CQ

October 1975
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CONSTRUCTION DETAILS ON PAGE 16

The Radio Amateur's Journal



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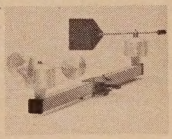
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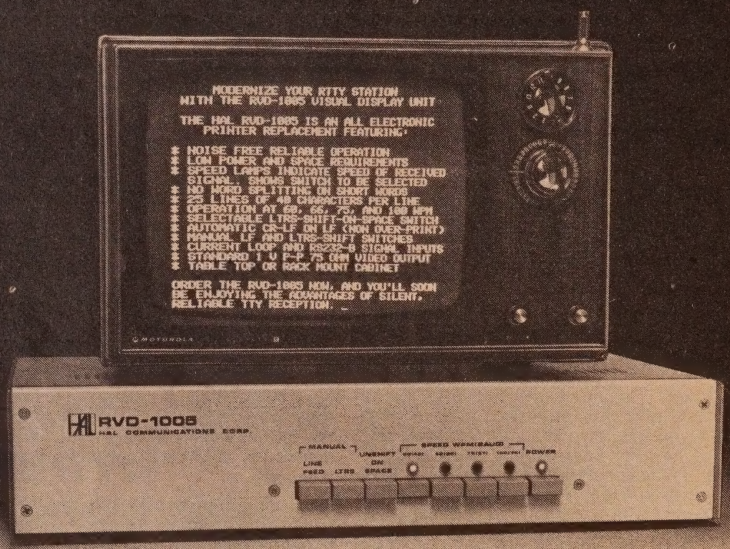
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OCTOBER, 1975 VOL. 31, NO. 10

The Radio Amateur's Journal

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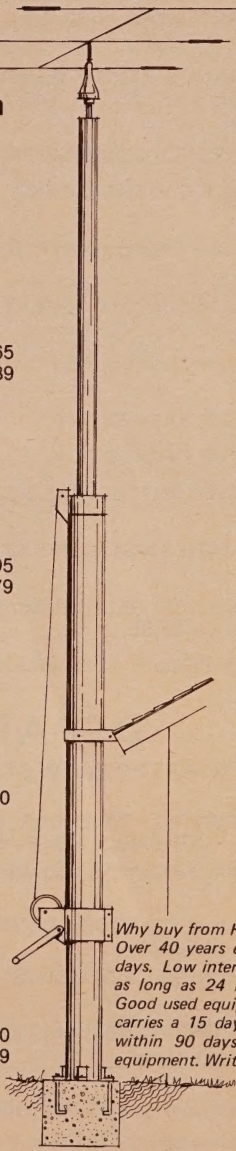
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A New Chief

The announcement of the retirement of A. Prose Walker, W4BW, as Chief of the Amateur and Citizens Division of the FCC in July, was predictably followed by many weeks of interesting speculation about who would be the one to fill this important gap in this important (to us) division. At the ARRL National Convention in Reston, Virginia on September 12, 13 and 14, the speculation was abruptly and pleasantly ended with the announcement that the new Chief was none other than John Johnson, K3BNS, formerly of the Office of the Chief Engineer, where he was Deputy Chief of the Spectrum Management Task Force. Prior to that he was Chief of the Rules and Legal Branch of the Amateur and Citizens Division where he was heavily involved with Docket 18803 (Repeaters) and more recently did 2½ years service in the preparation of Docket 20282 (Restructuring).

John is an active Amateur on both h.f. and 2-meter f.m., and is an active contester.



John Johnson, K3BNS, newly-appointed Chief of the Amateur and Citizens Division of the FCC.

He's dabbled in RTTY, operates mobile and is equally at home on voice or c.w. He's the kind of guy who wants first-hand information before delving into something. For instance, when he became involved in the Repeater docket, he promptly began building his own 2-meter handy talkey so he'd better understand the comments and complaints of Amateurs to the docket. We wish K3BNS well in a difficult job.

Job Exchange

It's become pretty obvious that the U.S. economy is still a long way from being fully recovered, and unfortunately, among the millions of victims of this depression are many thousands of skilled and experienced Amateurs. I only wish it were possible to find employment for all these fine fellows and gals, but perhaps we can help a few.

As you may realize, **CQ** is received and read by just about every potential employer in the Amateur Radio field, and by thousands of other potential employers who happen to be Radio Amateurs. So beginning immediately we will run free of all charge "Employment Wanted" ads in a specially designated area in **CQ**'s Ham Shop department.

We request that these ads be limited to 3 or 4 lines, and will be run for two months per request. We suggest that in those few lines you briefly outline your experience, licenses, Degrees, your geographic area, willingness to relocate, and so on. If you wish, we will maintain a **CQ** box number for you to maintain confidentiality in the event that you don't want your name in print.

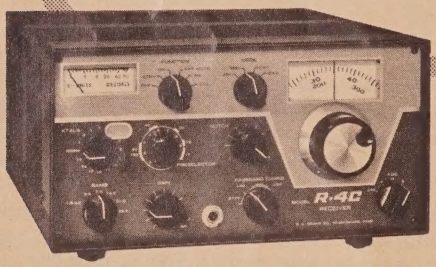
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73, Dick, K2MGA

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OUR READERS SAY

FCC Delays

Editor, *CQ:*

After reading Jim Jaffe's Letter in the September 1975 *CQ,* (Our Readers Say), I too can directly sympathize with his feelings of such a long 'sweating-it-out' period in order to receive his new ticket.

I was orginally licensed in the late fifties and maintained my license for a number of years. After an absence from amateur radio for a few years, I decided to obtain my license again after being off the air for several years. Since April of this year, I have successfully taken my Tech, General, and Advanced exams and have heard nothing from the FCC. (Successful meaning that the local FCC field office confirmed passage).

I have written four letters to Washington, D.C. inquiring about the status of my license and have only received one reply, which stated that they had indeed confirmed with my local field office that I had passed the exam, although they (Washington) had lost my application. Therefore, I was instructed to fill out the enclosed re-application and mail it back.

After a couple of months, I wrote to the FCC again asking if I was going to get my ticket. No answer after a month and a half. I again called my local field office and asked if there was anything they could do on this end and was told that once the application was made and the test taken at the field office, it was out of their hands. My only recourse was to write to Washington, D.C. I was further told that if Washington failed to answer my letters, the only further recourse was to write to my Congressman and ask him to inquire on my behalf.

It has been five months since I passed my first examination, three since I passed the other two and no word has reached me concerning the status of my license. So along with Jim Jaffe, and who knows how many others who 'sweated-out' the FCC exam, we are all forced to wait for our tickets at the pleasure of the FCC. I feel that they could at least let us know if they received our applications so we won't wonder if they have lost them. Further, I endorse the idea that licensing could be done on the local field office level via computer tie-in. Further, perhaps, the Amateur and Citizen's Band licensing office could be separate in issuing licenses. There is quite a difference between someone who sweated out an exam and someone who signed his name.

Jim Jackson
San Francisco, CA

Deaf Amateurs

Editor, *CQ:*

Perhaps the readers of *CQ* can help me, I would like to get in touch with deaf hams. I was talking with a deaf man recently who expressed an interest in amateur radio. He wanted to know if it was possible for him to get an amateur license. I told him that I had read about deaf hams but didn't know whether they'd gotten their licenses before or after they because deaf. I thought I'd heard people being allowed to take the code test tactilely, i.e. by touching the speaker cone, but I haven't been able to confirm that yet. If any of *CQ* readers are deaf or know of deaf hams I would be grateful if they would write to me. I would like to know about deaf hams' experiences as amateurs, how they got interested, any problems they had getting licensed, and whether they use modes other than CW such as ATV or RTTY.

Deafness is not just the inability to hear. More importantly it is an impairment of the ability to communicate. Since our hobby is centered around communication, anything that can be done to make it more accessible to deaf people is important. Any help *CQ* readers can give me in exploring this would be deeply appreciated.

Jerry Lane, WN9NPC
DeKalb, IL

Pulls the Trigger

Editor, *CQ:*

I imagine you may already have heard some complaints such as mine, but I would like to add mine, too. Hopefully, your magazine will be able to help warn others before they get burned, too.

It concerns Trigger Electronics, 7361 North Avenue, River Forest, IL 60305. I sent an order to them on June 20, 1975. My check cleared soon after. I waited over two months before I called to ask about my order and was told that it would take ten days to check into it. I then told them to cancel my order and send me a refund immediately. That was a week ago and I haven't heard anything since.

I plan to give them another week before I take them to court. At that time I will not only take them to small claims court, but I will also give my information to the B.B.B.

I wouldn't have bothered to write, except that this was not an isolated incident. My two brothers are having the same problems with Trigger and I read a letter in the August issue of *73* Magazine written by Scotty Bottom of Worcester, MA who is also having the same problems, therefore, I feel that the Hams who read your magazine should receive a warning about this company, so they won't join the group.

Jan T. A. Veen, WN8VVF
Holland, MI

Hum!

Editor, *CQ:*

Thanks for running my friend Jake's, (J. K. Bach) article in the September issue, entitle "Hum!" To those of us who are interested, it was enlightening. He is entirely correct that all is not as simple as it seems when an indirectly heated cathode is used. By the way, I wonder how many know that at least one company is making transmitting tubes with gas-fired cathode?

My main purpose in writing is to straighten out my call sign; it is W5RIQ, not W5AIQ as in the article, and in case anyone has one of those old McMullouch, (I believe it is spelled that way with the ch instead of the gh) tubes, I would surely like to hear from them. It was called, I think an "AC 401". I had at one time four of them. They were

[continued on page 78]

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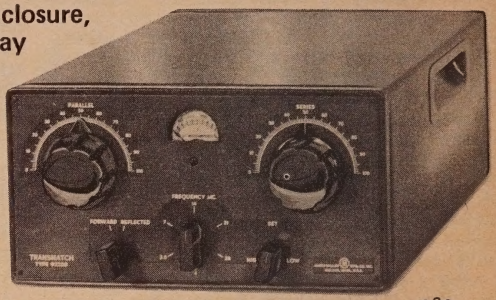
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Announcements

● **West Orange, N.J.** - The Nutely Amateur Radio Society will conduct classes in Morse code and basic electricity and radio theroy for prospective Novice amateur radio operators. The first class will be held on October 6, 7p.m. in the Nutely Red Cross Building, 169 Chestnut Street, Nutely, NJ. for more info. contact Noel Scheffern, WB2LDN at 201-661-2057. ● **Columbus, Ohio** - The Columbus Amateur Radio Association, W8TO, announces the 1975 ARRL Great Lakes Division Convention to be held at the Ohio State Fairgrounds in Columbus, Ohio, on Oct. 10 and 11. Included in the activities is family entertainment. Advanced registration is $2.50. For registration and info contact Mary Gibb, W8RVP, 293 Ceramic Dr., Columbus, OH 43214. ● **Bedford Indiana** - The Hoosier Hills Ham Club is preparing its annual Hamfest to be held this year, Sunday, Oct. 12 at Spring Mill State Park, Mitchell, Indiana. There will be door prizes, a flea market and plenty of playground for the children. All registration is $2.00. Send your advance registrations to Hoosier Hills Ham Club, P.O. Box 375, Bedford, IN 47421. ● **Lima, Ohio** - The Northwest Ohio Amateur Radio Club, Inc. is holding a Hamfest on Oct. 12, 1975 in Lima at the Allen County Farigrounds. There will be prizes dealer tables, displays and free camping space Sat. night. Tichets are $2.00 at the gate and $1.50 for advance registration. For more info write to NOARC P.O. Box 211, Lima, OH 45802. ● **Fairfax Station, Virgina** - The Foundation for Amateur Radio will hold its annual Hamfest at the Gaithersburg Fairgrounds, Gaithersburg, MD, on Sunday Oct. 17. Featured is a large flea market, food services, exhibits, ladies' events, children's programs, and many prizes. The participation fee is $1.50 and sales space is $5.00. For info write or call Bill Miller, K4MM, 10910 Woodfair Rd., Fairfax Station, VA. (703) 978-4020. ● **Rome Georgia** - The Northwest Georgia Amateur Radio Club invites everyone to attend the annual Rome Hamfest at the Rome Civic Center on Sunday Oct. 26. For info contact WB4AEG, Harold Dale, Box 274, Adairsville, GA 30103. ● **LaMarque, TX** - The Tidelands Amateur Radio Society will hold their first annual Hamfest on Sunday, October 5, 1975 at the Galveston County Park, League City, Texas. For more info S.A.S.E. to WB5FIE, 105 Seabreeze Drive, League City, TX 77573.

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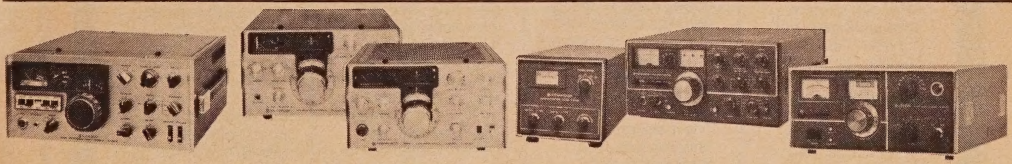
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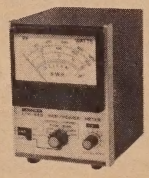
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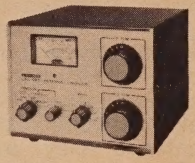
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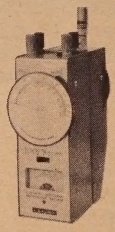
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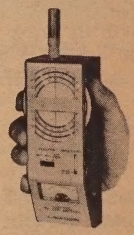
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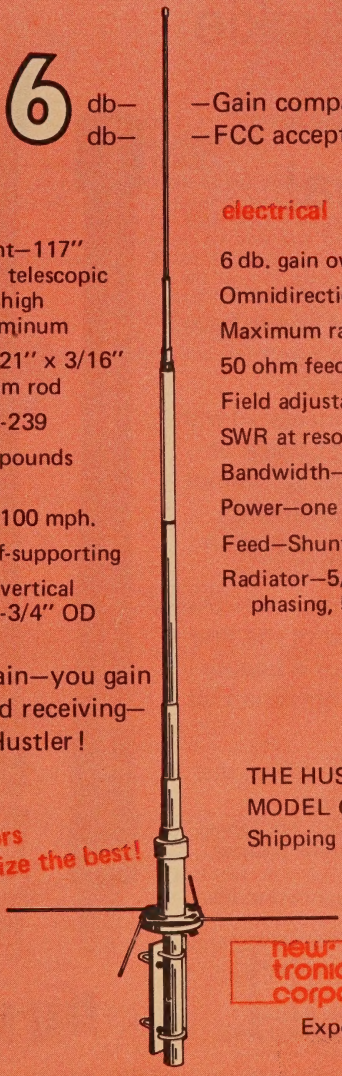
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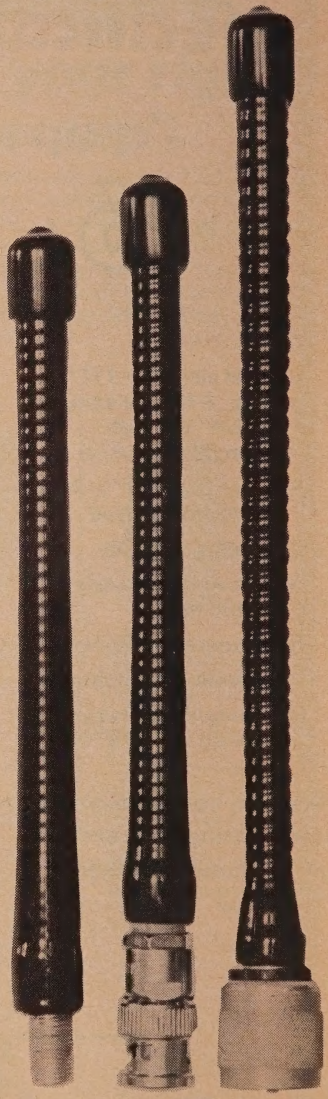
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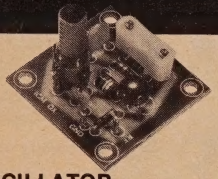
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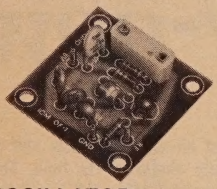
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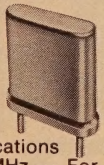
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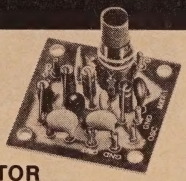


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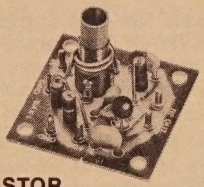


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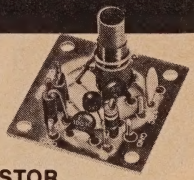
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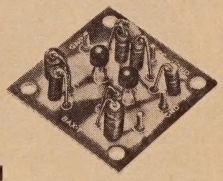
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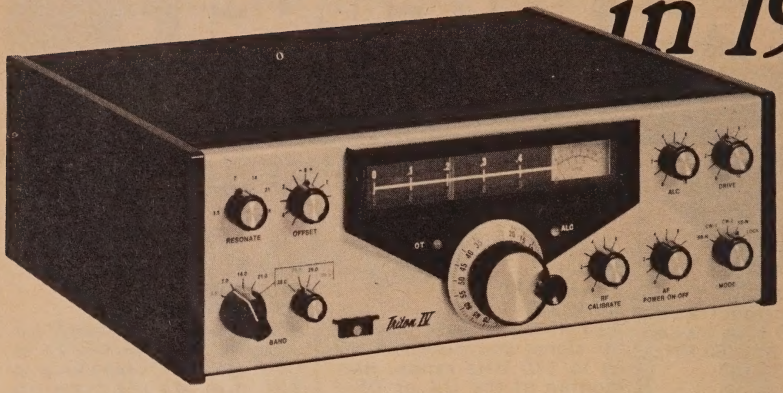
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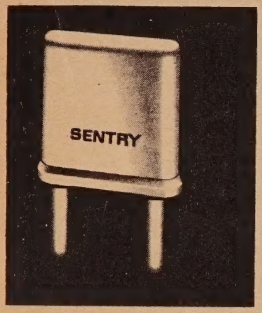
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A Programmable Keyer for the Contest Operator

BY JERRY VANASKEY,* K8YQW

BEING a somewhat avid contest operator, it has been my desire for some time now to have a c.w. message generator to perform the more repetitive exchanges and messages. For my purposes, a minimum requirement for such a unit should have a built-in keyer with dot and dash memories, iambic operation, and synchronous clock. The unit should have at least two separate programmable memories loadable directly from the keyer. Memory size should be large enough to contain a decent length CQ and large enought to contain what I feel is the longest contest exchange, the Sweepstakes exchange.

The described unit fits these requirements very nicely. Any other features seen commercially and in other articles such as several different memories, the ability to chain several memories together, digital speed readout, etc., would only add to the cost and complexity. These features, in my opinion, have questionable value.

This unit has been used by less experienced operators during Field Day and by some very highly regarded c.w. operators with no operational difficulties and very nice comments from all.

Logic Description

In trying to develop a circuit, I searched past issues of the various ham publications to get some ideas. WB4VVF had an article[1] on a keyer that seemed very promising. WA1BYM had an article[2] on a programmable memory. Now wouldn't it be nice if I could marry these two fine units together! That's exactly what this unit is, WB4VVF's keyer installed in WA1BYM's memory with a second separate memory.

A short review of the articles would be helpful here.

The keyer, all IC's labeled U_{101}, etc., has a synchronous clock which is held reset until keying is started, making it much easier to operate than a free-running type of clock. Clock pulses from U_{109} are applied to the keyer through U_{111A}. The clock is allowed to run or is held reset depending on the output of U_{111B}.

IC's U_{101}, U_{102}, U_{103} contain the dot and dash memories and iambic circuits. U_{104} and U_{105} are the counters for proper dot and dash length and the automatic letter spacing. The auto letter spacing feature can be disabled with the switch at U_{105B} allowing the operator to generate his own spacing. U_{106} and U_{111C} contain the output gates and some keyer control functions.

Shift registers are used as memory elements. A dot would be stored in one bit position, a dash in three consecutive positions. Proper letterspacing would be three consecutive blank positions and word spacing would be five blank positions.

When playing out the memories, the message will repeat continuously unless stopped by the memory Stop button or by detecting a 'stop code' stored in the memory. The 'stop code' consists of four consecutive bits manually stored in the memory. Upon decoding these four bits at U_{203} or U_{213} the memory will stop, waiting to be restarted with a depression of a memory Start button. The stop code will not be heard in the monitor or be sent over the air.

IC's U_{201}-U_{206} make up memory #1 which is identical to memory #2, IC's U_{211}-U_{216}. The memory elements are U_{202-1} through U_{202-4} and U_{212-1} through U_{212-4}.

Clock pulses at the output of U_{113A} fire the singleshot at U_{201} to shift the memory. Data is loaded into the memory from the output of the keyer, the sampling taking place at U_{113B} pin 4 and gated to the input of the memory at U_{202-1} pin 2. U_{206B} and U_{113C} determine whether the data will be regenerated in the Operate mode or will be lost when clearing the memories in the Clear mode.

The four bit stop code is detected at U_{205}. U_{204A} prevents the stop code from being transmitted.

The reader should refer to the aforemen-

*4540 Foster Dr., N.E., Louisville, Ohio 44641.

[1] Garrett, J. M., "The WB4VVF Accu-Keyer," *QST*, Aug. 1973, p. 19.

[2] Riley, T. P., "An IC Keyer with Programmable Erasable Memory," *QST*, Feb. 1973, p. 26.



The author's keyer showing the remote switch box and Brown Brothers paddle. Sharp eyed readers will notice two extra push buttons on the main unit and one extra on the remote box which were intended for memory controls not needed in the final design.

tioned articles for a detailed description of each. I will explain the circuits used to marry the two units together and some problems encountered with the original circuits and how they were solved.

The Keyer

The main problem with the original keyer was the clock. The first clock pulse after key closure does not exist as shown in WB4VVF's otherwise fine article. This caused two problems:

1. The first element generated is short by the length of the clock pulse.
2. The memories are loaded on the trailing edge of the clock pulse; therefore, if the first element to be stored was a dot, it would be completely lost. If the first element was a dash, it would only be two thirds as long as necessary.

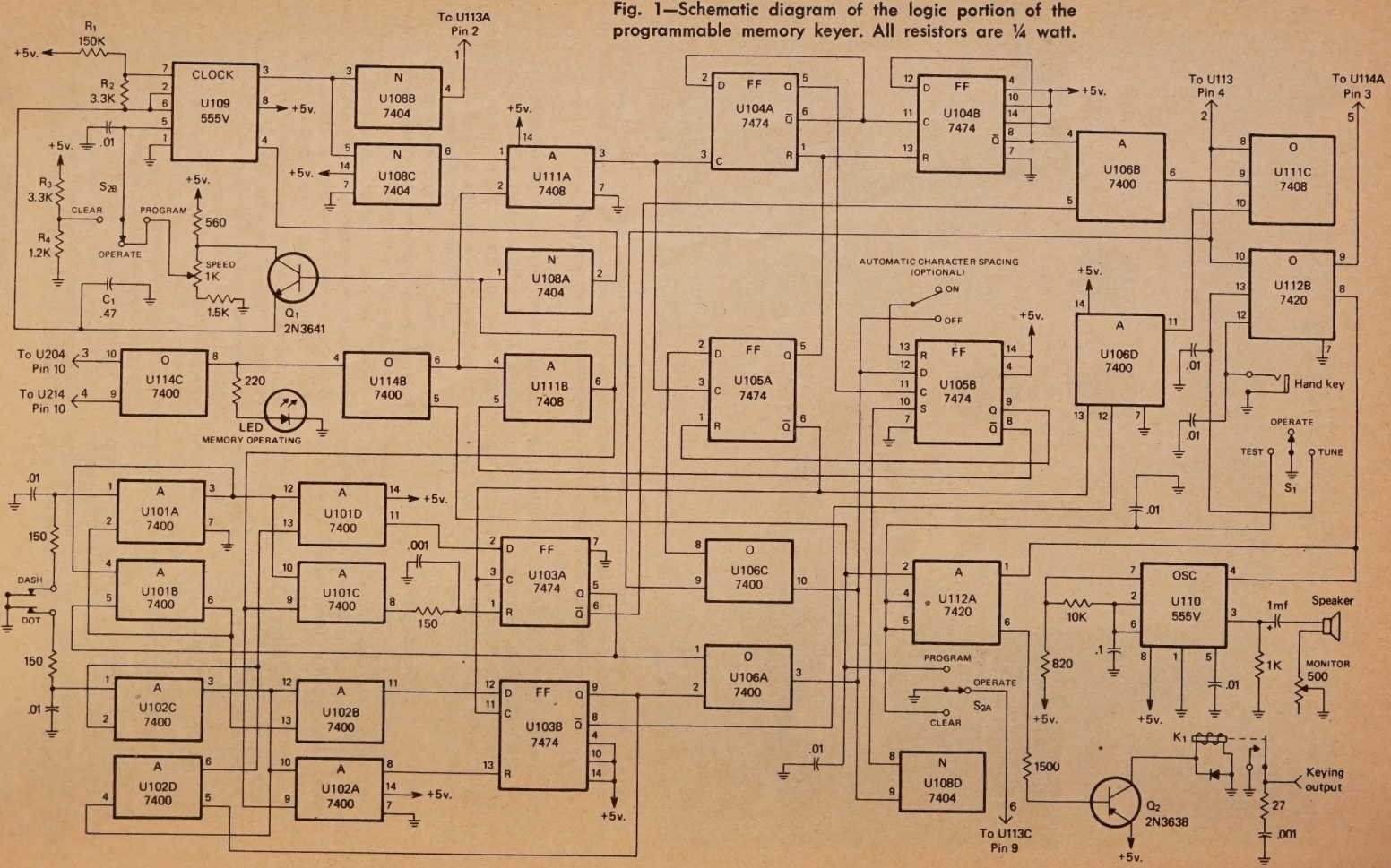
Signetics had just introduced the 555V timer IC, so an effort was made to use it. The results exceeded all expectations with less components and therefore a more physically compact clock.

The speed control is wired into the 555V clock, U_{108}, at the control voltage input, pin 5. This allows the Speed control to be completely independent of the timing components, R_1, R_2, and C_1. This means a linear wound control for the Speed pot gives a nearly linear speed range. With the values shown, the speed range is from approximately 14 to 36 w.p.m.

The 555V is wired as an astable multivibrator but also using the reset terminal, pin 4, so that it is a start-stop type of clock. However, if the 555V is used in this way without using Q_1, the first element generated after the clock has been reset is considerably longer than the following elements. This is caused by C_1 voltage going to zero volts instead of the normal discharge voltage of ⅓ Vcc. During reset time, output of U_{111B} high, Q_1 conducts keeping C_1 charged. This keeps the first timing cycle the same duration as all others.

As can be seen from the diagram, several logic blocks have been added after the clock. These comprise the set and reset controls to the clock and will be explained later.

Fig. 1—Schematic diagram of the logic portion of the programmable memory keyer. All resistors are ¼ watt.



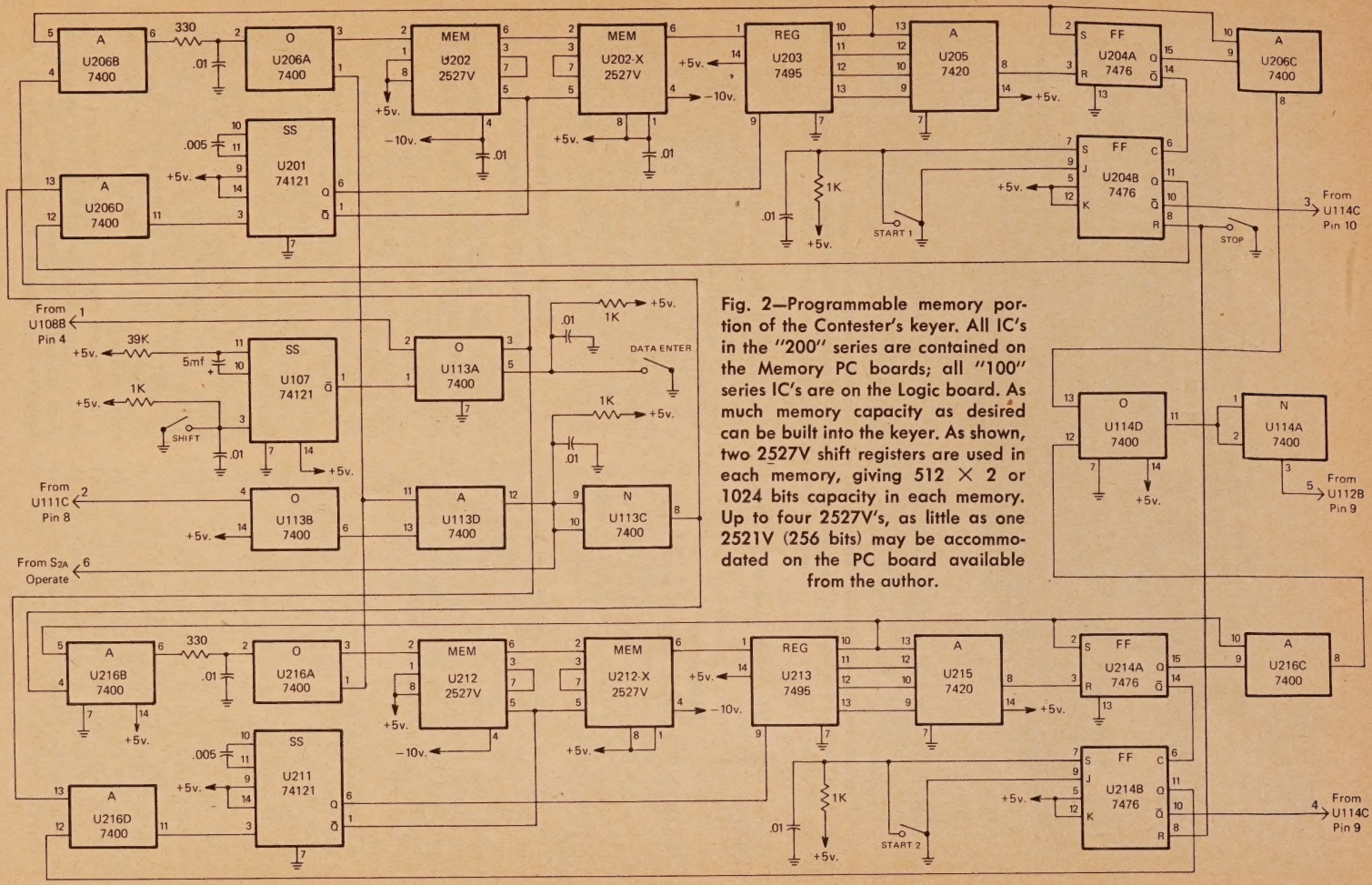
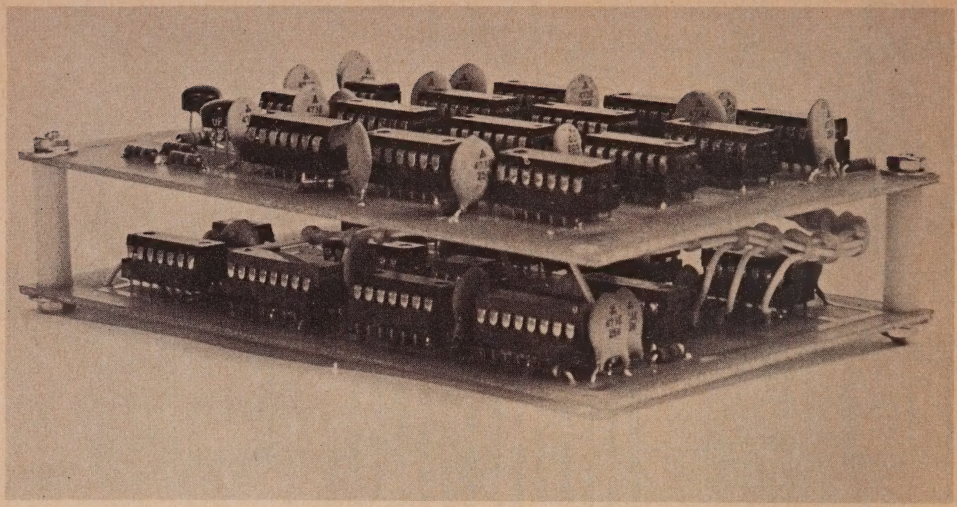


Fig. 2—Programmable memory portion of the Contester's keyer. All IC's in the "200" series are contained on the Memory PC boards; all "100" series IC's are on the Logic board. As much memory capacity as desired can be built into the keyer. As shown, two 2527V shift registers are used in each memory, giving 512 × 2 or 1024 bits capacity in each memory. Up to four 2527V's, as little as one 2521V (256 bits) may be accommodated on the PC board available from the author.



A set of circuit boards completely wired and ready for assembly in the enclosure of the builder's choice. A set of two double-sided PC boards complete with assembly instructions is available from the author for $12.00 postpaid.

Another 555V, U_{110}, was used as a sidetone oscillator.

Memories

WA1BYM's memory circuit used separate clocks and separate speed controls for the memory and the keyer. Now just the one clock, U_{106}, controls both keyer and memory speeds which, of course, keeps both exactly the same speed.

Two separate memories are used with a common clock line at the output of U_{113A}, a common Shift control using U_{107}, a common Stop control, and a common data input from the keyer at the output of U_{113B}. Only the memory whose Start button has been depressed will be active. The operation of the memory, including the four bit stop code, is as WA1BYM describes.

A disadvantage in the original memory was in entering data from the keyer into memory. In that mode, the keyer clock is free-running requiring the operator to keep up with the clock to load the memories. In this unit, the keyer is in synchronous mode during Program (memory load) operation. This means an operator can take his time entering data, even have time for a cup of coffee and the memory will not shift until he resumes keying. The spaces between characters will be EXACTLY right because of the auto character spacing in the keyer. Data can be loaded into the memories at any setting of the Speed control and the data can be played out at any setting of the Speed control.

As used in this circuit, the shift registers must be cleared before data can be entered into them. At normal clock speeds, this takes some time. However, in this circuit when S_{2B} is in the Clear position, voltage from the R_3, R_4 divider is applied to the control voltage input of the clock causing it to clear the memories at approximately 65 w.p.m. Clearing a memory capacity of 512 bits takes only 7 seconds.

Clock Set and Reset

The clock controls perform the following functions:

1. Allow the clock to run in synchronous mode when using the keyer in both normal and Program mode.

2. Allow the clock to free-run when playing out the memories, only stopping when a four-bit code is decoded or when the memory Stop button is depressed.

3. Disable the clock to the keyer when a memory is started in Operate or Clear mode.

Normal keyer operation is as follows; neither memory has started so both inputs to U_{114C} are high, U_{114C} pin 8 low, U_{114B} pin 6 high. Both inputs to U_{111B} are high, U_{111B} pin 6 high which is the reset condition for the clock. A key closure causes U_{111B} pin 5 to go low removing the reset to the clock allowing it to run until U_{105B} pin 8 again goes high when the operator stops sending.

In Program mode, a low is applied to pin 5 of U_{114B} keeping its output high even though we have started a memory by depressing a Start button. From there on, it is the same as normal

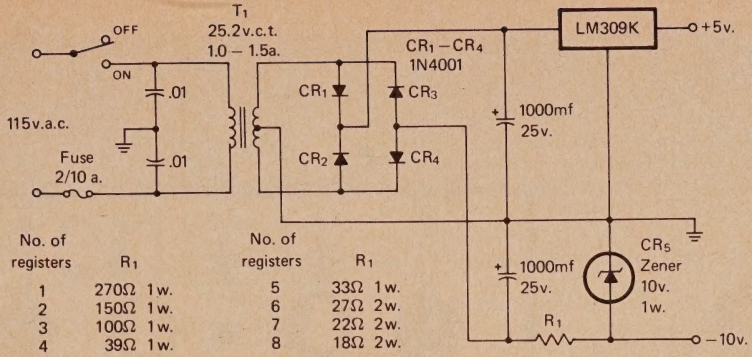


Fig. 3—Power supply suitable for operating the programmable memory keyer. The value of R_1 depends on the number of shift registers (memory elements) used in the memories, and should be selected from the table.

keyer operation.

In the Clear mode, we start to clear either memory by depressing either Start button making one input to U_{114C} low causing pin 8 to go high. U_{114B} pin 6 is now low removing the clock reset and it free runs. Decoding a stop code or depressing the Stop button causes pin 10 of U_{204B} and U_{214B} to go high, causing a low on U_{114B} pin 4, high on U_{111B} pin 4, high on U_{111B} pin 6 causing the clock to be reset.

Circuit operation in Operate mode is exactly the same as just described for the Clear operation, except, of course, in Operate mode the data is allowed to be regenerated and in Clear mode it is lost; these functions handled by S_{2A}.

The clock to the keyer is disabled when a memory is started in Operate mode or Clear mode by U_{111A}.

Other Features

At U_{112B} there is a provision for plugging in a hand key or bug; very handy, for instance, at Field Day for those operators not desiring to use an electronic keyer but still having use of the memories.

The output circuits are disabled by S_{2A} when in the Program or Clear position to prevent keying the transmitter when in these modes. The Test position of S_1 does the same thing; which is useful when just practicing keying or checking the memory contents in S_2 Operate mode.

The writer's model has a remote Mini-box on which are mounted the memory Start and Stop buttons. This box is located next to the keyer paddles so that the memories can be operated with very little hand motion. The buttons on the remote box parallel those in the main unit.

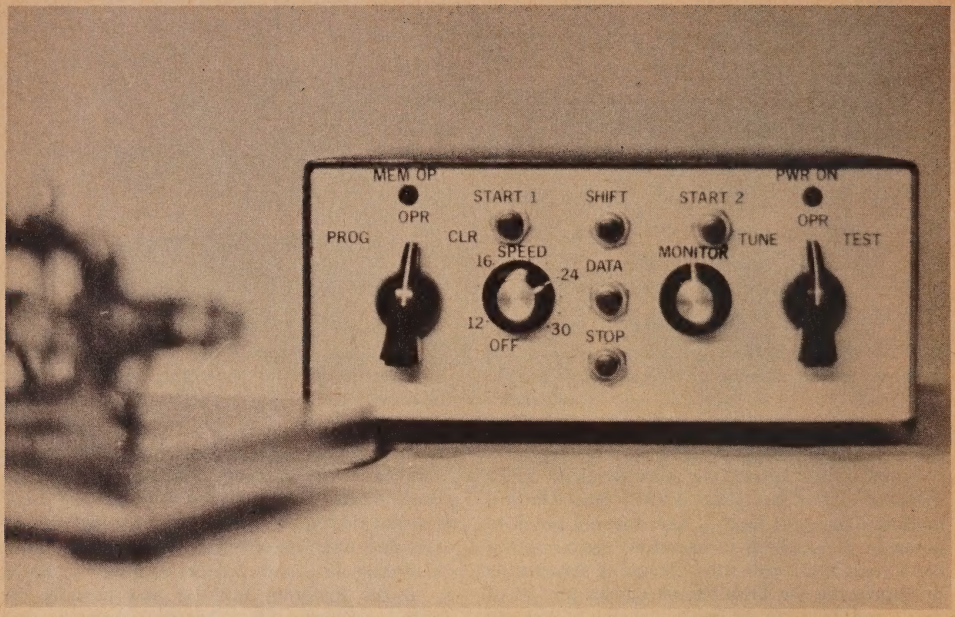
Operation

To load data into the memories, they first must be cleared. Place S_2 in the Clear position and depress either Start 1 or Start 2 button to clear the desired memory. The memory is completely clear if the Memory Operating LED does not extinguish and can be verified by no more data coming out of the monitor.

Loading data into memory is done by setting S_2 to the Program position and pushing the desired memory Start button. Data is now entered through the keyer paddles, remembering that if you stop, the memory stops allowing you plenty of time. One point here; if the builder elects to install the Auto Character Spacing switch at U_{105B}, it is recommended that it be in the On position when loading the memories so that the keyer can generate the proper letter spacing automatically. To generate proper word spacing, the Shift button should be depressed twice at the end of a word (word spacing is the length of five dots, three dot intervals were generated by the keyer and two entered manually). If the Auto Character Spacing switch at U_{105B} is in the Off position, three depressions of the Shift button should be made at the end of every letter and five depressions at the end of a word to maintain proper spacing.

The stop code, four bits in a row, is used to stop the memory at any desired point. They can be entered as many times as desired or not at all. They are entered by placing S_2 to the Program position, depressing the desired memory Start button and holding the Data Enter button while depressing the Shift button four times. You must now let up on the Data Enter button and depress the Shift button at least one more time. The reason for this last operation is to insure a space between the stop code and the first code element, otherwise if a dot is first sent this will end up in memory as five bits in a row and a dash will be seven bits in a row.

Dots and dashes along with stop codes could be entered manually by means of the Data



Identical electrically to the author's keyer, this one built by WB8JVT is somewhat different in mechanical design, but uses the K8YQW PC boards.

Enter and Shift buttons. However, this is not to be recommended as it would take quite long and chances for error are quite great. The procedure would be similar to entering stop codes: S_2 to Program, start the desired memory, depress the Data Enter button before the Shift button if a bit is desired or if no bit is desired just press the Shift button alone.

A recommended procedure for entering a message with a stop code would be to enter the stop code first, depress the Shift button once and then key in the message. This will insure that the message will be at the beginning of the memory and therefore will start immediately after depressing the Start button when playing out the message.

It should also be remembered that the keyer is disabled when playing out the memory in S_2 Operate mode. This means that if a very short message is entered into a very large memory capacity, the keyer will be inoperative while the memory is shifting over 'dead space' until the stop code is found. This situation can be easily overcome by entering several messages into the memory remembering to enter a stop code at the beginning of each message.

Circuit Boards

The author will make available a set of boards for the unit. Referring to the diagram, it should be noted that all IC's labeled in the U_{100} series mount on the upper or Logic board and all IC's labeled in the U_{200} series mount on the lower or Memory board. The boards are approximately 3¾ × 5¼ inches in size. They are pre-drilled, tinned, double-sided glass epoxy type boards. The boards are $12.00 per set of two, postpaid.

The boards have provisions for up to four shift register packages per memory. The 2521V shift register has a single capacity of 256 bits, so four will give a capacity of 1024 bits. The 2527V shift register has a capacity of 512 bits, giving a possible capacity of 2048 bits. All shift register modules need not be installed. The builder can only install enough modules to obtain his desired capacity, jumpering the input and output pins of blank positions. 2521V and 2527V modules could also be inter-mixed. The shift register modules can be obtained through Hamilton Avnet Electronics, 118 Westpark Road, Dayton, Ohio 45459.

Acknowledgements

In closing, the author would like to express his gratitude to Chet, W8KEL, who made up the artwork for the boards and Frank, WB8JVT, who helped in checking out the artwork and building the first circuit board model and to Harold, WB8TSJ, who did the photography for this article. ■

antennas

BY WILLIAM I. ORR,* W6SAI

"Congratulations," said Pendergast, shaking my hand warmly.

"Thank you," I replied. "But what's the occasion?"

"Sixteen years ago this coming December our first adventure was recorded in *CQ* magazine. Do you remember *"Sunspot Madness or, the Day We Boiled the 304TL?"*

"I certainly do," I replied. "That story was about the sunspot madness that hits every DX-minded amateur on the day the sunspot cycle hits the absolute minimum. We're coming up on the sunspot minimum again, so it looks as if we'll have to beware of this terrible affliction."

"Right," said Pendergast. "The story should be a warning to all amateurs[1]."

"And now that we are at the bottom of the sunspot cycle, how does that affect antennas and DX?" I asked rhetorically.

*48 Campbell Lane, Menlo Park, CA 94025.

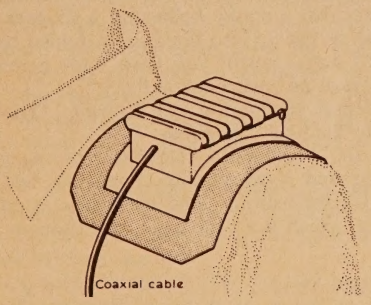


Fig. 1—The shoulder-mounted multi-turn v.h.f. loop antenna. This compact, low profile antenna is designed for shoulder mounting and is only about one-half inch high. It weighs less than 3 oz. and is used with a shaped "ground plane" which fits the shoulder of the operator. Used in conjunction with a microphone head-set, the antenna provides hands-free operation with the transceiver clipped to the belt. (Illustration courtesy of *Radio Communication).*

"More amateurs are interested in the low frequency bands—160, 80 and 40 meters and others have concentrated on the v.h.f. bands. I'll admit that 20 meters is crowded, but it is taking the overflow from 15 and 10 meters." Pendergast sighed. "All you have to do is look through the 1954 and 1965 copies of *CQ* and *QST* to see how DX was running at the bottom of the last two sunspot cycles. Then compare that information with copies of the magazines for 1958 and 1968, near the peak of the cycles."

"That's the reason for the increase in interest in the low bands and the v.h.f. bands," I said. "Antennas for those bands are of exceptional interest these days because that's where the action is . . ."

"What's new in v.h.f. antennas," asked Pendergast eagerly. "Hasn't everything been developed that can be developed. What's left to be new?"

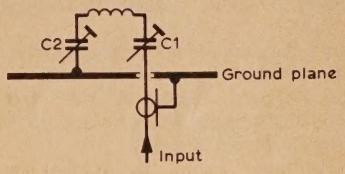


Fig. 2—Schematic of the multi-turn v.h.f. loop antenna. Capacitor C_1 is 0.35 pf to 3.5 pf and establishes the correct impedance to match the 50 ohm transmission line. Capacitor C_2 is 0.8 pf to 10 pf for tuning the antenna to resonance. For 150 MHz to 170 MHz the loop consists of 3.5 turns of ⅜-inch wide copper strap wound on a styrofoam form 2.7" × 2.7" × 0.7" high. Slightly more inductance would be needed to tune the 144 MHz band. (Illustration courtesy of *Radio Communication).*

"Well, I found a very interesting v.h.f. antenna in the June, 1975 issue of the RSGB's *Radio Communication* magazine. It is a summary of an article in *IEEE Transactions on Antennas and Propagation,* March, 1975. The article concerns a workable and reliable antenna for personal handy-talkies or hand-held portable transceivers working in the v.h.f. region. The problem is to make an antenna that be placed so as to minimize absorption losses in the human body, which are quite high at those frequencies. Studies made in England in 1968 showed that when a v.h.f. antenna is close to the body or limbs of an operator, up to 90 percent of the signal may be lost. This problem

[1] For a free copy of "Sunspot Madness," send a self-addressed business-size (4" x 9½") envelope with 10¢ postage to the editor of this column, c/o EIMAC, 301 Industrial Way, San Carlos, CA 94070.

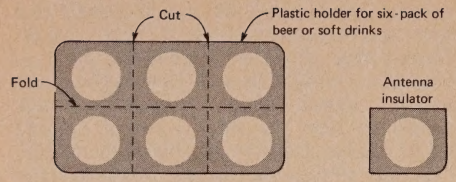


Fig. 3—The ecology-minded WA4BAX designed this antenna insulator to be made from the plastic holder for a six-pack! Cut it into three pieces and fold the sections back on themselves for double strength. The pull of the antenna distorts the circular plastic into a longish sort of loop whose strength is amazing. This is a great temporary antenna insulator for Field Day operation!

applies to the 'rubber duckie' antenna used with a lot of hand-held f.m. equipment."

"Rubber Duckie?" asked Pendergast with amazement.

"That's the name given to the flexible, helical wound antennas that are encased in black plastic," I replied. Pendergast rubbed his eyes and replied, "I guess I'm just not up with all the latest technical terms."

"To continue," I said, "the antenna described is a very compact, low-profile device for shoulder mounting that is just over one-half inch high (fig. 1). It is used with a 'shaped' ground plane that fits around the shoulder of the operator. The antenna is tunable over the range of 150 to 170 MHz, with a bandwidth of 1.4 MHz for an s.w.r. range of less than 3:1. No doubt it could be tuned down to 144 MHz.

"The antenna is worn on the shoulder and connected via a coaxial line to the equipment. It is possible to wear a jacket or coat over the shoulder antenna with only a little loss of efficiency; with a microphone headset and VOX it could provide completely hands-free operation if the equipment were carried in a pocket or clipped to the belt."

"Damned clever," muttered my friend. "What does the antenna consist of?"

"Our British cousins call it an *aerial*," I replied. "In any case, it is a multi-turn loop wound on a styrofoam form measuring 2.7" × 2.7" × 0.7". The coil consists of 3½ turns of ⅜-inch wide copper strap. The coaxial cable and tuning and matching capacitors are assembled on a metallic ground plane which is extended by a 4½" × 6½" 'counterpoise' plate shaped to fit the shoulder. The schematic of the antenna is shown in fig. 2.

"Detailed radiation patterns in the *IEEE Transactions* show this unit has an average gain of 3.8 db over a shoulder mounted 6.6" helical-wound whip ('rubber duckie'), which in itself is roughly 5 db down on a full size ¼-wave whip.

"A disadvantage compared with the helical antenna is the restricted band width, which calls for careful tuning. This should be done with the antenna in position on the shoulder (requiring an assistant or a contortionist!) though there is little change in tuning adjustment from person to person so it can be tuned on someone else. It is also shown that better results are achieved with the loop axis running fore and aft, as shown, rather than directed sideways along the shoulder. Polarization is primarily vertical."

"How would you tune the gadget up?" asked Pendergast.

"I would surmise that a combination of an s.w.r. meter in the coaxial line, plus a field strength meter would do the job," I replied.

"Great," replied Pendergast, as he made notes in his black notebook. "Now, do you have anything in your mail box for the so-called d.c. bands?"

"I certainly do!" I replied. "Dave, WA4BAX, is the Hero of the Month. I just received a letter from him in which he solves both the ecology and antenna insulator problems with one amazing stroke of genius! He's made the earth-shaking discovery that a plastic holder for a six-pack of beer can be cut up into three parts, folded back on itself and—presto! you have three antenna insulators at no cost! Look at fig. 3."

Pendegast squinted at the drawing. "You've got to be kidding," he stated.

"No, sir," I responded. "Dave sent me a sample insulator and it works fine. You can't tear it apart. It's very strong. And the plastic is polyethylene, which is a very good r.f. insulator. So

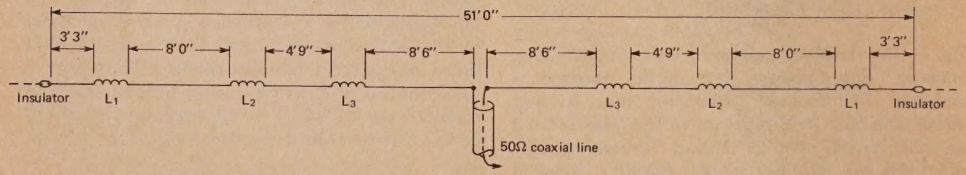


Fig. 4—The multi-band antenna of W4JRW. This "loaded" antenna exhibits resonance at 3.9MHz, 7.25 MHz, 14.2 MHz and 28.6 MHz. Coil pairs marked L_1 art 81 microhenries each, coil pairs L_2 are 25 microhenries each, coil pairs L_3 are 7 microhenries each. Each coil is approximately 3 inches long. Overall antenna length is 51 feet.

from each six-pack, you get three free antenna insulators for a wire antenna."

"Well, I'll be dipped," mused Pendergast. "Think of all the plastic holders I've thrown away."

"Before you rush out and buy a six pack, you might be interested in a note I received from Bill, W4JRW. I commented on some of his interesting work with loaded dipoles in my July antenna column. Bill has been playing with an experimental dipole antenna using loading coils that exhibits resonance on 10, 20, 40 and 80 meters (fig. 4). The dipole is only 51 feet long and is center-fed with a 50 ohm coaxial line. Three loading coils are used in each half of the antenna. The self-resonant frequencies are 3.9 MHz, 7.25 MHz, 14.2 MHz and 28.6 MHz."

"Too bad it doesn't work on 15 meters," observed Pendergast.

"It's a cut-and-try operation," I replied. "If you want to take additional time and you are an avid experimenter, no doubt the design could be altered to accept 15 meters."

"It sounds just like the thing for Field Day," admitted Pendergast. He paused a moment, then asked, "Has the mailman brought any interesting letters?"

"A few," I replied. "I am still getting feedback from the discussion on vertical versus horizontal antennas. Obviously many fellows, such as WA7-YRP are having a lot of luck with well-made vertical antennas. Alan has a short vertical, such as described in the March, 1974 issue of *QST*. Basically, it is a four-band job for 40, 20, 15 and 10 meters. It is placed in the center of a 10 by 25 foot patio. He uses 70 radial wires. This modest and compact antenna has accounted for 42 countries on 40 meters, 95 on 20 meters, 55 on 15 meters and 20 on 10 meters during the past 10 months! That's not bad at all, considering the state of the sunspot cycle. Alan says, "With a little good skip I can often crack the pile-ups and I have no shortage of wallpaper in the shack." So, you see, the battle isn't over. And the fellow that said the vertical antenna is one that radiates poorly in all directions will have to eat his words."

"Well," said Pendergast, "it looks as if there's no definitive answer to the question of horizontal versus vertical. Isn't that the provocative question you have run across?"

"No, it isn't," I replied. "The greatest mystery to many amateurs seems to be in the area of standing wave ratio. That still confuses a great many amateurs. I thought when Walt Maxwell, W2DU, ran his fine series of articles in *QST* that the s.w.r. problem had been put to rest for good. But that isn't the case at all. There's even flak over Walt's article, as you've probably seen in the August issue of *CQ*.

"Well, why worry about s.w.r. at all?" queried Pendergast. "If the antenna works, it works. I think the s.w.r. meter is the invention of the devil. All it does is confuse the issue. My motto is: don't bother me with the facts—my mind is made up."

"The s.w.r. meter can certainly serve a useful propose," I replied, "But some amateurs make a fetish out of their s.w.r. reading."

"Look at this," said my friend, flinging an instructional manual across the table to me. "Here's an instruction book for a linear amplifier. The manufacturer states that the amplifier is to be run into a 50 ohm load with the s.w.r. not to exceed 2-to-1. Why? What will happen at 2.1-to-1? Or at 5-to-1? Will the amplifier explode at a high s.w.r. reading? Or will your report drop from S9 plus to S6 in Outer Baldovia?"

"It may seem obscure, but there are very good reasons why manufacturers state the maximum

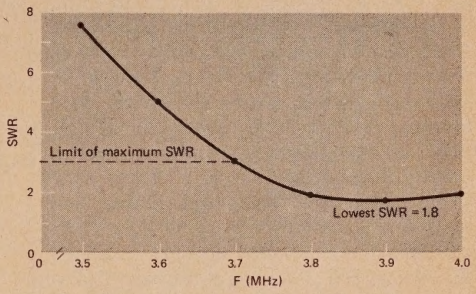


Fig. 5—S.w.r. plot of 80 meter dipole cut for 3850 kHz and located 25 feet above the ground. If the maximum limit of s.w.r. set by the equipment is 3 to 1, the antenna should not be operated below 3.7 MHz. S.w.r. rises rapidly below 3.7 MHz, reaching 7.5 to 1 at 3.5 MHz. Lowest value of s.w.r. is 1.8 to 1 at 3.9 MHz. Dipole is fed with a 50 ohm coaxial line and s.w.r. measurements were taken at the station end of the line, which is about 150 feet long. Changing line length will not change the value of s.w.r. on the line.

s.w.r. limit for their equipment. One reason is that when the equipment is operated into a high value of s.w.r, it may not tune properly. It's possible to run right off the scale of the loading control of an amplifier if the antenna presents a high s.w.r. at the equipment. Then, again, a high value of s.w.r. may lead to flash-over in the amplifier. If the network voltage is too high at the antenna terminals, the output loading capacitor of the pi-network may flash over. If the amplifier is underloaded, the peak plate voltage may flash over the tuning capacitor. And, if the amplifier employs a screen grid tube, the screen dissipation may be exceeded if the amplifier is improperly loaded."

"What about a grounded grid amplifier?" demanded Pendergast. "There are plenty of them,

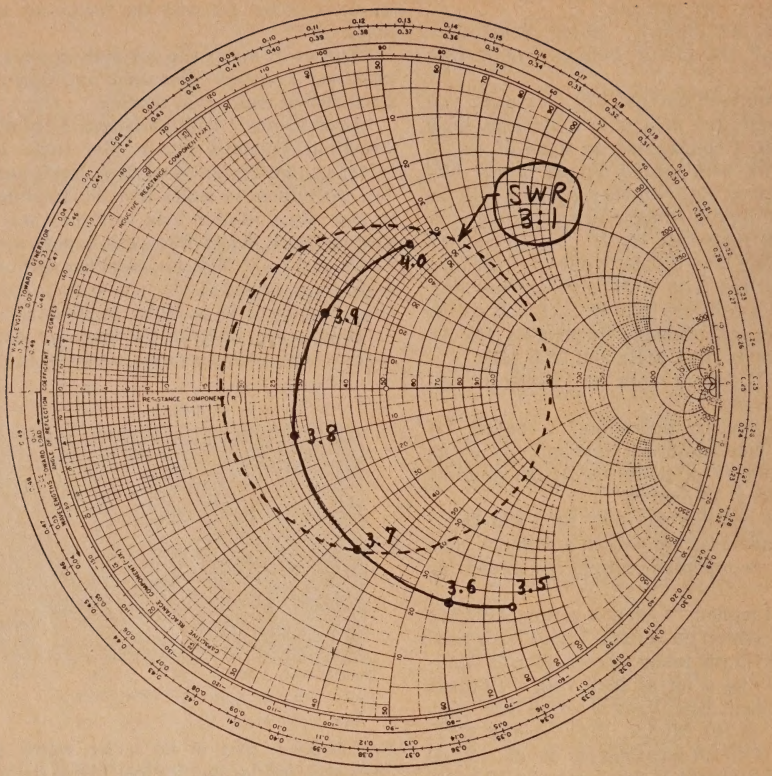


Fig. 6—Smith Chart plot of the 80 meter dipole of fig. 5. The 3 to 1 s.w.r. circle is drawn on the chart. The resonant frequency of the dipole is about 3830 kHz, the point the curve passes through the resistive axis (X-axis) of the chart. Below this requency, the antenna appears as a resistive-capacitive reactance at the input end of the line and above this frequency the antenna appears as a resistive-inductive reactance. At resonance, the antenna exhibits a load of about 28 ohms. At no point in the 80 meter band does the antenna present a 50 ohm load and range of operation is limited to the frequency span of 3.7 MHz to 4.0 MHz, within the 3 to 1 s.w.r. circle.

using 3-500Z's. What happens to the tubes when the amplifier is operated into an antenna having a high standing wave ratio?"

"If the amplifier can be properly loaded into the antenna, nothing will happen," I replied. "Trouble can arise if the amplifier is loaded up into an antenna having a high s.w.r, and if the operator shifts frequency *without retuning* the amplifier. If this is done, the amplifier becomes improperly loaded. In addition, the plate circuit is out of resonance. This can lead to dangerously high levels of grid current for an underloaded condition or flat-topping in an overloaded condition.

"It is best to have a relative low s.w.r. on the antenna system. By that, I mean 3 to 1, or less. But it is not imperative to beat your brains out for a 1 to 1 ratio. Even if you get it, the s.w.r. will rise as the antenna is operated off the design frequency.

"Where you really run into trouble is on 80 meters, where the width of the band is large in comparison to the frequency. Very few 80 meter antennas will show a low value of s.w.r. across the band. And since most of them are close to the ground in terms of wavelength, the radiation resistance is very low. Look at fig. 5. This is the s.w.r. plot of an 80 meter dipole about 25 feet above the ground. That's a typical antenna. The best value of s.w.r. is about 1.8 to one. And you can see the reason for this when the antenna is measured with a *General Radio RF Bridge* (fig. 6). Look at the plot on the Smith Chart."

"Smith Charts make me nervous," observed Pendergast in a mild voice.

"They tell you a lot more than an s.w.r. meter," I replied. "In this instance, the dipole is

[*Continued on page 80*]

Announcing the

USA WPX - '76 Award

A Bicentennial Prefix Award Program Sponsored By CQ

To commemorate the Bicentennial of the founding of the United States of America, CQ is proud to sponsor a special WPX award for working 200 USA Amateur Radio stations using the distinctive Becentennial prefixes which may be used in 1976. Here are the rules for the USA-WPX- Awards

Award Requirements

1. The "USA-WPX-76" Award will be issued without charge to any licensed amateur in the world who meets the award requirements.
2. A total of 200 special bicentennial prefix stations must be worked. Of the 200 special prefix stations, there must be at least 35 DIFFERENT prefixes worked. The special Bicentennial prefixes are in the AA1 through ALØ prefix allocation which has been authorized for use by the United States Federal Communication Commission for the year 1976.
3. Contacts may be made on any band or mode which is authorized for use by the applicant. No special mode or band options or endorsements are available, however certificates will be numbered.
4. Contacts from fixed location station applicants must be made from the same QTH. Mobile and Maritime Mobile stations will be eligible for the award regardless of location, however all 200 QSO's necessary for the award must be made as Mobile or Maritime Mobile.
5. The following definition of the prefix of portable USA special Bicentennial stations will be used for this award.

a. Within The Continental 48 states, portable prefixes will count for the call area in which operation is conducted. Thus AA6ISP/7 would count for AA7 and AC2-GT/1 would count for AC1.

b. Special Bicentennial prefix stations operating portable in Alaska, Hawaii and other possession will count for the special prefix being used in the area.

c. Special Bicentennial prefix stations from Alaska, Hawaii or other possessions who operate in the continental 48 states will count for the prefix AA plus the call area in which the operation is conducted. Thus AH6GDR/2 would count as AA2 and AJ4ST/4 would count as AA4.

d. USA stations using their own call with a portable suffix in foreign countries through reciprocal licensing agreements will not count for the award.

[continued on page 78]

US Bicentennial Callsign Prefixes

Between 0500 GMT Jan. 1, 1976 and 0500 GMT Jan. 1, 1977, the FCC has authorized the optional use of special amateur prefixes to help celebrate America's Bicentennail. Any licensed Amateur may, at his discretion, use his proper Bicentennial prefix or his regular assigned calletter prefix. No application or filing with the FCC is necessary for Bicentennial prefix operation. One call or the other should be used throughout a given contact, however. Prefix equivalents are as follows: WA equals AA, WB equals AB, W equals AC, K equals AD, WD equals AE, WR equals AF, WN equals AK, KB6 equals AG2, KC4 (Navassa) equals AL4, KG6 (Guam) equals AG6, KH6 equals AH6, KJ6 equals AJ7, KL7 equals AL7, KM6 equals AH7, KP4 equals AJ4, KP6 equals AIØ, KS4 equals AH4, KS6 equals AH3, KV4 equals AJ3, KW6 equals AG7. For Novices - WB6 (Baker, Canton, etc.) equals AG3, WG6 (Guam) equals AG5, WH6 equals AH1, WJ6 equals AJ1, WL7 equals AL1, WM6 equals AH2, WP4 equals AJ8, WS6 equals AH5, WV4 equals AJ2, WW6 equals AG1.

Regulated 200 Watt-12 Volt D.C. Power Supply

BY ALEX M. CLARKE,* K4JYM

THE problem of producing a 200 watt power supply at 12 volts, while in fact being no more difficult than at 600 volts, does represent a significant difference in approach from that used for "tube" type devices familiar to most older electronickers. Low voltage (anything less than 25 v., for the present purpose) supplies capable of delivering less than 1 ampere have been described in an excellent review by W6GXN,[1] several variable voltage supplies capable of up to 5a, appear in the *Handbook*,[2] and fixed voltage supplies capable of up to about 2a. appear in numerous places.[3,4,5]

Unfortunately, none of these are capable of delivering the 15a.-plus required for many 2 meter f.m. "boosters," the new Swan "SS" rigs, the "Triton" or the RF403 recently released through MARS. The purpose of this article, then, will be to describe a supply capable of delivering 15a. and indicate where parts may be obtained, and to give the means of calculating the necessary capacitance needed in the filter.

Specifically, the difficulties associated with a transistor supply, as opposed to a tube one, are: the serious consequences of "overvoltage," the fact that a one volt drop at 12v. represents a tremendous percentage drop when compared to even a 10 volt drop at 700v., the difficulty of reducing "ripple," which cannot be done at 12 volts with simple Pi or *L-C* filters, all on top of the fact that transistor circuits are a great deal more voltage-sensitive than tube ones.

The Circuit

The supply shown in the figures is capable of delivering up to 20a., depending on the choice of components. Variations of this supply are described in a Fairchild Applications Bulletin.[6] The heart of the supply is a Fairchild μA7812 (or the equivalent "second source" suppliers, Motorola Mc7812, National LM340T-12/7812, etc.), readily available from Circuit Specialists for $2.50 plus 35 cents shipping (while you're at it, buy several, as you'll find lots of applications and wonder how you did without them).

The circuit used is slightly different from the pass tube/transistor arrangement which is normally seen. The regulator (7812) conducts and regulates until the current demand is such that the *IR* drop across R_s is sufficient to overcome the base-emitter junction potential (0.2v. for Ge, 0.6v. for Si) of the switch transistor Q_s. Once this *IR* drop exceeds the junction potential, Q_s is turned on, with the current/voltage regulation to the base of Q_s being controlled by the regulator IC.

The 7812 requires that the input voltage exceed the output voltage by 2v.; otherwise, it will

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[1]H. Olson, W6GXN, "A survey of solid-state power supplies," *Ham Radio*, Feb. 1970.
[2]*Radio Amateurs' Handbook*, American Radio Relay League, Newington, Connecticut, 1972 and later.
[3]G. E. Zook, K9STH, "Regulated AC Supply for Small Rigs," *CQ*, July, 1973.
[4]A. M. Clarke, K4JYM, "Simple, Super Regulated 12V Supply," *CQ*, April, 1974.
[5]P. B. Bobosz, WA8TMP, "Regulated AC Power Supply for Mobile F.M. Equipment," *Ham Radio*, June, 1973.

[6]"μA7800 Series Three Terminal Positive Voltage Regulators," Fairchild Semiconductors, 313 Fairchild Dr., Mountain View, CA, July 1972.

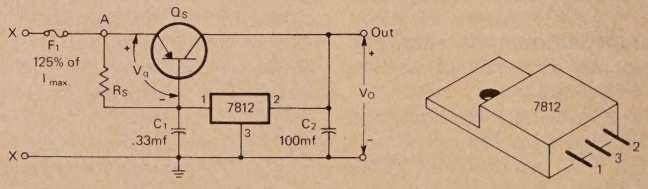


Fig. 1—Voltage regulator circuit for high current applications. Qs is two 2N174's in parallel; Rs should be 2 ohms for 2N174's or other Germanium types, 3 ohms for Silicon types. The regulator should be fused for 125% of Imax.

Table 1 — Typical Diode Parameters

	Vf	Imax
1N3208 R	1.7	20a.
1N2154 R	0.6	25a.
1N1612 R	0.64	5a.

not regulate. Further, the input voltage to Q_s (point A) should not exceed the output voltage by any more than is necessary, as the voltage drop across the circuit times the current drawn represents power that must be dissipated by Q_s, and should be kept to a minimum. With this in mind, the component selection can begin.

Component Selection

Transformer: The voltage rating on a transformer is usually at full current load. Thus, in choosing the transformer or combination of transformers to get to 12 volts or more, be sure that the combination is capable of delivering the full current load you expect to draw. Suitable transformers are available from Barry, Fair Radio, and other surplus outlets.

Diodes: Locating surplus diodes is not difficult, but even purchased new, they do not represent a great expense. Remember, however, that the diode junction potential is at least 0.6v., and that the diode must dissipate a power equal to this voltage times the current drawn. At 15a., this is 9 watts, enough so that if you elect to chance not using a heat sink, you'd better be careful about touching them. Stud mounted 30a., 50 p.i.v. diodes are probably best. To avoid mounting problems with the diodes, a "reverse" diode pair can be used such that they are heat sunk directly to the chassis. This nonconventional approach, shown in fig. 2B is useful only in the full-wave, centertapped configuration.

Filter Capacitor (C_f): You can now calculate what filter capacitance will be necessary to hold the voltage at point X above the necessary value. The capacitor should have a voltage rating of at least 1.4 times the V_{rms} rating of the transformer. This voltage represents the peak voltage out of the transformer, and will be seen by the capacitor, 120 times a second.

The necessary capacitance can be calculated easily, but as will become obvious, careful estimation or measurement of the voltages is very important, as a few tenths of a volt error can be the difference between good regulation and very poor regulation.

Note the following definitions and explanations:

V_{rms} — The root-mean-square secondary voltage of the transformer. This is usually given for the transformer at its full rated load. Any standard VOM will read this voltage, even if the transformer is in the circuit. Be sure to make the measurement at the input to the diodes.

V_f — The forward voltage drop across the rectifier diodes (per diode). Although the nominal V_f for silicon diodes is 0.6 v., some high current diodes may have as high as 2.0v. drop at full current load. The specifications for several suitable diodes are given in Table 1, or may be found in recent Newark or Allied catalogs. There is no way to measure V_f on the rectifier diodes

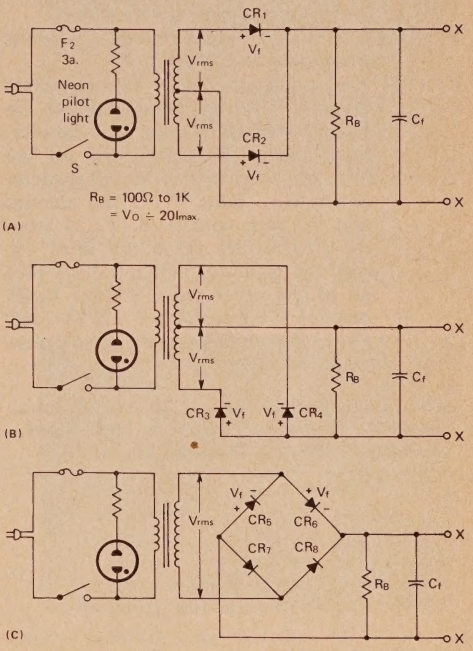


Fig. 2—(A) Normal full wave rectifier circuit. (B) Full wave rectifier circuit using stud mounted reverse diodes. (C) Full wave bridge rectifier circuit. All diodes are 50 p.i.v. rating for power supply voltage outputs of 25 volts or less, and should have current ratings greater than the maximum current output of the supply.

in circuit. However, a similar diode (the extra one you bought "in case") may be placed in series with the load, and the forward voltage drop, under full load, measured.

V_d — The "dropout voltage" for the regulator. This is the voltage drop necessary across the 7812 regulator to maintain regulation. Reference 6 indicates this is 2 volts, at 1 ampere current out of the regulator chip (*i.e.*, 14 volts is necessary at the input to the 7812).

V_q — The base-emitter junction voltage of

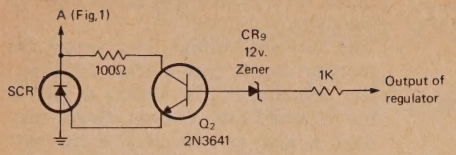


Fig. 3—Crowbar overvoltage protection circuit for low voltage, high current supply. The SCR is a 25 amp. 50 p.i.v. or more device.

the power "switching" transistor (0.2v. or greater for germanium, 0.6v. or greater for silicon transistors.)

V_o — The supply output voltage (12 volts when using the 7812).

V_r — The capacitor ripple voltage. Note that this is the parameter that we are interested in calculating. It is the minimum change in voltage that we can have at the capacitor at full current. Alternately stated, V_r is the amount that the peak voltage ($1.4V_{rms}$) from the transformer secondary must exceed the regulated output voltage plus all of the other series voltage losses between the transformer and the output of the regulator. Full wave center tapped configuration:

$$V_r = 1.4V_{rms} - V_f - V_d - V_q - V_o$$
Equation 1

Full wave bridge configuration:

$$V_r = 1.4V_{rms} - 2V_f - V_d - V_q - V_o$$
Equation 2

As an example, suppose we use the center tapped configuration and V_{rms} = 12.6v. (each side of the center tap). Then estimate:

$V_f = 0.8$v.
$V_d = 2$v.
$V_q = 0.3$v. (2N174, Ge, PNP)
$V_o = 12$v.

Then $V_r = 2.54$V.

A quick review of the definition of capacitance leads us to

$$C = \frac{IT}{V_r}$$
Equation 3

where I = Full load current in Amperes
T = Ripple period in milliseconds (8.3 ms for a full wave rectifier at 60 Hz line frequency)
C = Capacitance in *thousands* of microfarads.

Therefore, if $V_r = 2.54$v.

$$C = \frac{(8.3)}{(2.54)}\ 1000 =$$

3,400 mf per ampere of current at full load.

Table 2 — Capacitor Values for Regulated Supplies Using 3 Terminal Regulators

Vr (from Eq. 1 or 2)	C in mf per a. at full load
0.6	13,800
0.8	10,400
1.0	8,300
1.2	6,900
1.4	5,900
1.6	5,200
1.8	4,600
2.0	4,200
2.2	3,800
2.4	3,500
2.6	3,200
2.8	3,000
3.0	2,800
3.2	2,600
3.4	2,400
3.6	2,300
3.8	2,200
4.0	2,100
4.5	1,800
5.0	1,700
5.5	1,500
6.0	1,400
6.5	1,300
7.0	1,200
7.5	1,100
8.0	1,000

Table 2 gives a summary of the necessary capacitance per ampere as a function of V_r. It, and the 3 equations, are suitable for calculating the capacitance necessary for any of the 78XX family regulator supplies.

Switching Transistor (Q_s): Fairchild [6, 7] suggests using a silicon 2N4398 ($11.75 in the Newark catalog) or 20a., or a 2N3789 ($4.32) under 10a., two 2N174's are adequate (and, in (2 or 3) are sufficient at 15a. The junction potential is 0.2v., so less power is dissipated, but this does little to lessen the heat sink requirements, as germanium transistors are maximum temperature rated at 55°C, while silicon ones are rated at over 150°C. (55°C is about as hot as you can stand to touch for 10 seconds).

2N174's are available from Poly-Paks, already mounted on a heat sink, at a very reasonable price. When using two or three in parallel, they should be matched for forward current gain (beta) to within about 20%. At

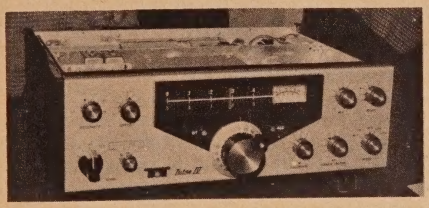
[7] J. E. Trulove, WB5EMI, "Three Terminal Voltage-Regulator I.C.'s," *Ham Radio*, Dec., 1973.

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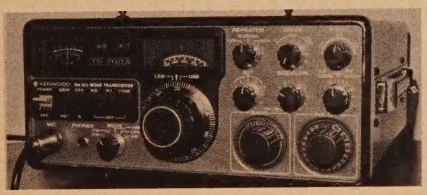
Reston Convention - 1975

Snapshots from the ARRL National

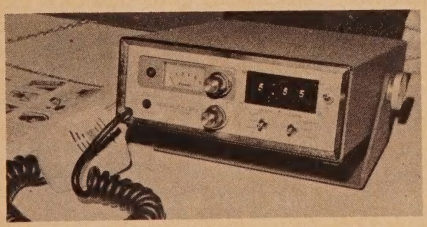
Seen at the 1975 ARRL National Convention, September 12, 13, 14 at Reston Virginia, were people, gadgets and new gear from several of the Ham manufacturer's. Here are a few shots of some of the newly-introduced equipment and at least two notables who happened by the *CQ* booth. Our apologies to our friends at Yaesu. The photos of their new FR-101 digital receiver and their other snazzy new gear just didn't turn out. Blasted cheap photo strobes!



Ten Tec's latest in the Triton line is the Triton IV with a new conversion scheme giving identical bandspread on 80-10 meters. Still a super rig for the c.w. man as well as s.s.b.



From Trio-Kenwood comes a complete 2 meter transceiver. AM, FM, SSB and CW, 10 watts nominal output, v.f.o. tuned plus 12 crystal-controlled channels, a.c. and d.c. supplies internal, plus noise blanker. Neat. The TS-700, $700.



A step up from the HW-202 from Heath is the synthesized HW-2026. Similar specs to the '202 but synthesizer gives 5kHz increments, plus 600 or simplex operation, and a new 8 pole i.f. filter $289.95.



As if in reply to our comment on the lack of an analog dial in addition to the beautiful digital dial in the Heath SB-104, meet the new HW-104 with... of all things...an analog dial. $539.95.



W4NJF (left) and W4LRN sit securely ensconsed at the top of the 2 Way SSB and Mixed WPX Honor Rolls, respectively, and both happened by the *CQ* booth to pose for a snapshot. Now if only W8LY (c.w.) had been around . . . .



Heath again. This time a 1 watt 5-channel hand held 2 m. HT with optional TT pad. Very compact and well thought out. Basic unit, the HW-2021, $169.95 in kit form.

ALICE IN BASIC-LAND

BY IRVING M. GOTTLIEB,* W6HDM

where .....Capacitance is DISTANCE

Resistivity is Time !

an Ampere-Meter is no instrument at all, but is, rather, the unit of magnetic pole strength

INDUCTANCE is Upsidedown Acceleration

Conductivity is FREQUENCY

Magnetic field strength ?.....Divide a current by a distance !

But, tell me the TIME needed to traverse a DISTANCE and I will give you the number of OHMS.

The Mad Hatter's Incoherent Ramblings? Just Good Basic Physics from which our electrical units were originally derived. It is respectfully suggested that a re-acquaintance with the basics behind basics might well prove a rewarding experience.

WITH undiminishing fervor, the self-generating arguments concerning the basic constituency of our universe flow on like an endless stream. Scientists, philosophers, and theologians postulate a continuum of intellectual recipes in which various mixes of entities and non-entities allegedly underlie all that is. We have heard that *all* is electricity, or *all* is idea, or that *all* stems from some minimal number of very-special particles. Intriguing as such speculation is to the human mind, you must, by now, be pondering its relevency to theoretical or applied *electronics*. Admittedly, unless this author can show how such a far-out editorial prelude justifies further reading by the electronics buff, this article deserves no place amongst these pages. It fortunately happens that the bridge between the esoteric cosmos and the hardware world will not be difficult to construct—indeed, we may well stumble upon some surprisingly useful insights for our everyday problems in design, operation, and maintenance of circuitry and systems!

Have you ever wondered, for example, just how the henrys and farads in the formula,

$$f = \frac{1}{2\pi\sqrt{LC}}$$

combine to give us *frequency*, *f*? Oh sure, we may have pacified our perplexity by the "explanation" that the inductive and capacitive reactances cancel, thereby invoking the wondrous phenomonon of *resonance*. Great! But, must resonance be expressed as a frequency? Why not bales of hay, degrees Farenheit, or fifths of Scotch? A crude attempt at satire, perhaps, but be assured that this is in no wise mere philosophical nitpicking. The ability to answer this and similar questions with regard to other relationships cannot help but clarify our technical insights. And, clearer insight feeds both the intuitional and the analytical processes we deploy in both the theoretical *and* the hardware phases of electronics.

We find that all things and all manifestations can be described in terms of a few basic Basics. These are the concepts of *length*, *mass*, *time*, and the possible inclusion of *electrical charge*. The somewhat nebulous wording of this statement stems from the fact that charge, itself, can actually be described in terms of the first three concepts. In any event, length, mass, time, and charge are refered to as dimensional quantities. And when resistance, reluctance, power, capacitance, or you name it, are defined by these quantities, a certain dimensional aspect is thereby imparted. Capacitance, for example, has the dimensional characteristic of *length*. If this appears strange, an inspection of fig. 1 will reveal many more unfamiliar, if not downright weird dimensional identities of parameters we have known all about for years—or have we?

Oftimes, example casts more illumination on things unfamiliar than does formal explanation. Inasmuch as we already have touched upon the resonance formula, let us now use fig. 1 to search out an answer to our unanswered problem concerning the derivation of "frequency" from a combination of "pi," inductance, and capacitance. First off the bat, we need not bother with

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"pi" at all, inasmuch as it is a dimensionless numerical-constant. It has no influence over the *dimension* of f which we have set about to determine. From fig. 1, we see that the dimensional identity of inductance is

$$\frac{m\,s^2}{q^2}$$

and that of capacitance is

$$\frac{t^2\,q^2}{m\,s^2}$$

We will now substitute *these* expressions for L and C in the formula and see what happens. Although it may initially appear that we are in for some formidable mathematical gymnastics, we quickly find that we are blessed with some very fortuitous cancellations, and the plum falls into our lap. The procedure goes as follows:

$$f = \frac{1}{2\pi\sqrt{LC}}$$

This is the formula for resonance. It is desired to show that "f" is a *frequency*.

$$f = \frac{1}{\sqrt{LC}}$$

We do not need a numerical operator such as 2π. It is only desired to "prove" that the dimension of "f" is frequency.

$$f = \frac{1}{\sqrt{\frac{m\,s^2}{q^2}\;\frac{t^2\,q^2}{m\,s^2}}}$$

Let's face it... this is beginning to partake the form of a hairy exercise in algebra! But, hold on a moment; look what happens when we perform a few cancellations. We see that m, q^2, and s^2 all cancel, leaving us with with the very simple expression:

$$f = \frac{1}{\sqrt{t^2}}$$

And, of course, this simplifies further to:

$$f = \frac{1}{t}$$

We know that the reciprocal of time or (period), t, is frequency, f. So, we might as well write:

$$f = f$$

Which shows that the right side of the equation, whether it is expressed in traditional LC units, or in our "basic" units, has the dimension of *frequency*.

Almost invariably, the psychological reaction to confirmation of this kind is amazement on one hand, but on the other hand, there is usually voiced the suspicion that some sort of *trickery* is involved—that the inductance and capacitance have been cleverly "coded" to lead to the desired result. Coding is indeed involved, but under the auspices of nature rather than man. If the coding were in any way "artificial," the probability of

I Quantity	II Symbol	III Dimensional identity	IV Simplified dimensional identity	V Common unit
Length or distance	s	s		Centimeter
Mass	m	m		Gram
Time	t	t		Second
Charge	q	q		Coulomb
Capacitance	C	$\frac{t^2q}{ms^2}$	s (length)	Farad
Conductivity	σ	$\frac{tq^2}{ms^3}$	$1/t = f$ (frequency)	Mho/Cm
Current	I	$\frac{q}{t}$	Charge per unit time	Ampere
Electromotive force	V	$\frac{ms^2}{t^2q}$	Energy per unit charge	Volt
Energy	W	$\frac{ms^2}{t^2}$	Product of force and distance	Watt-second
Inductance	L	$\frac{ms^2}{q^2}$	$\frac{t^2}{s}$	Henry
Magnetic field-strength	H	$\frac{q}{ts}$	Current per unit distance	Oersted
Magnetic flux	ψ	$\frac{ms^2}{tq}$	Volt-second	Weber
Power	P	$\frac{ms^2}{t^3}$	Energy per unit time	Watt
Resistance	R	$\frac{ms^2}{tq^2}$	$\frac{t}{s}$	Ohm
Resistivity	S	$\frac{ms^3}{tq^2}$	t	Ohm-Cm

Fig. 1—Basic dimensions of various quantities. Distance, mass, time and charge are the basic "building blocks." However, some quantities can be expressed in fewer terms, and in considerably simplified form.

obtaining correct results from the numerous permutations of these quantities would be very slight indeed. Everything works—voltage times current yields power, the square root of inductance over capacitance produces an impedance or resistance, resistance times capacitance gives time units, etc. Examples will be shown later. For the moment, some explanation is in order with regard to the third and fourth columns of fig. 1.

Column four of fig. 1 is essentially the reduction of the expressions in column three to the simplest possible terms. This ultimate simplification is accomplished by substituting for q^2 its equivalent in terms of distance, mass, and time. (This applies only to those quantities involving q^2, *i.e.*, capacitance, conductivity, inductance, resistance, and resistivity. For the other quantities, the expression is either left as is, or the simplification if affected by more difficult mathematics.) To make a long story short, everytime we encounter q^2, we substitute its equivalent from the equation,

$$q^2 = \frac{m\,s^3}{t^2}$$

The derivation of this will not be given here, but it is relevant to note that we are expressing q in terms of *mass*, *length*, and *time*. Surprisingly, the math operation is not at all difficult. For example, suppose we wish to know the dimensional expression for conductivity in its simplest form. In column three, we see that conductivity is

$$\frac{t\,q^2}{m\,s^3}$$

Let us make the suggested substitution and see what happens:

$$\frac{t\,q^2}{m\,s^3}$$

This is the conductivity expressed in terms of four basics. We can get rid of one of these, q, by the aforementioned substitution as follows:

$$\frac{\dfrac{t\,m\,s^3}{t^2}}{m\,s^3}$$

Wherein $m\,s^3$ cancels, leaving us with

$$\frac{t}{t^2}$$

which simplifies to

$$\frac{1}{t}$$

and, as we know, the reciprocal of time is *frequency*.

Therefore, the simplified dimension of conductivity is frequency, "f" as shown in column four! Do you find this hard to believe? We know that the commonly used unit of *conductance* is the mho, suggesting its reciprocal relationship to the *ohm* of resistance. *Conductivity* is measured in ohm-meters, or in ohm-centimeters, from which we find no hint or clue of the dimensions of frequency, repetition, rate, or the like. Is this sensible?

Although it is true that conductivity is not stipulated as Hz or c.p.s., its fundamental dimension as a frequency *does* make sense! What we are being informed here is that conductivity is the property of a material which determines how many electric charges (electrons) can pass through a prescribed geometry of the material per unit time. Thus, a high-conductivity material will, indeed, allow a higher rate, or frequency of charge transit, other things being equal, than will low-conductivity material. And, the greater number of charges passing through the material in a given time constitutes a higher current. Is this not what we intend to imply when we state that one material has a higher conductivity than another one?

It is instructional to "monkey" around with these very basic concepts. For example, we should be able to change conductivity into conductance by multiplying by length. (This is because the definition of conductivity is predicated on a per-unit-volume basis, whereas the conductance is inversely proportional to length. A material which has a conductivity of one mho per cubic centimeter will have a conductance of one-third mho for a piece with the same cross-sectional area, but three-centimeters in length.) Thus, if we multiply *conductivity*,

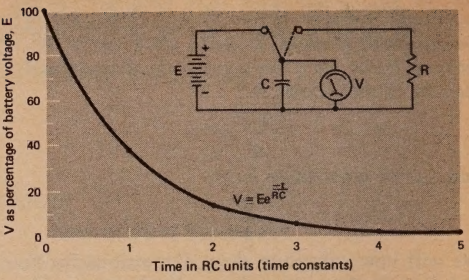


Fig. 2—The discharge of an initially-charged capacitor. V is the capacitor voltage as a function of time after the discharging resistance, R, has been connected. But, this can only be so if the entire exponent, t/RC is dimensionless. For t/RC to be dimensionless, RC must be in the nature of a time, t. This mathematical requirement is confirmed by the fact that RC does, indeed, have the physical dimension of time.

$$\frac{t\,q^2}{m\,s^3}$$

by length, s, we obtain

$$\frac{t\,q^2}{m\,s^2}$$

for *conductance*. Are we on the right track? Very likely so, for in fig. 1, we see that the dimensional identity of *resistance* is just upside-down from our result. This satisfies us because we know that resistance = 1/conductance. In turn, if we multiply the dimensional identities of resistance and current together, the anticipated result, electromotive force, or more commonly, voltage, is the result. Thus,

$$\frac{m\,s^2}{t\,q^2} \cdot \frac{q}{t} = \frac{m\,s^2}{t^2\,q}$$

which happens to be *voltage*! Enough examples have been given to suggest that all combinations of these dimensional identities "work." And that naturally applies to the simplified dimensions of column-four as well. Assuming, then, the inviolate workability of these "coded" concepts, let's try to gain a few more insights pertaining to *circuit behavior*.

What about those various timing relationships involving resistance and capacitance? Dare we suppose that the so-called time constant, *RC* is truly a time in the dimensional sense? The quick answer to this is gleaned from column four of fig. 1 from which we multiply the simplified

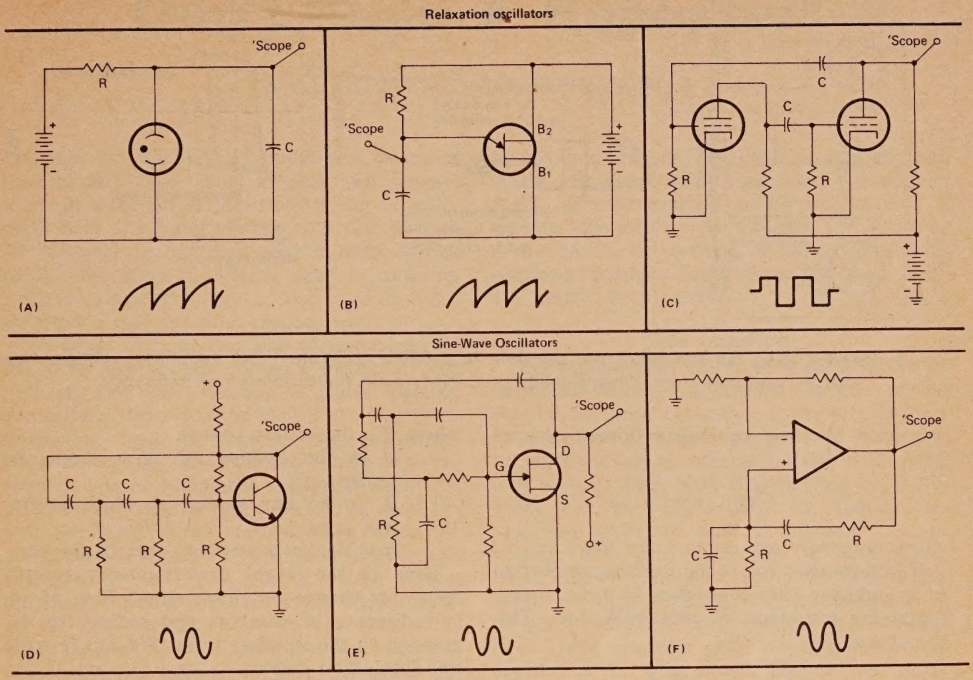


Fig. 3—Resistance-capacitance oscillators. Although different operational modes are involved in these oscillators, the main factor in their frequency equations is $1/RC$, the basic dimensional equivalent of frequency. (A) Gas diode relaxation oscillator. (B) Unijunction oscillator. (C) Multivibrator. (D) Phase-shift oscillator. (E) Parallel T oscillator. (F) Wien bridge oscillator.

dimensions of these quantities together as follows:

$$\frac{t}{s} \quad s$$

yields t, or time. Therefore, wherever we encounter RC, we can safely bet the dimension of time is involved. This applies beautifully to the equation for the discharge of a capacitor,

$$v = Ee^{\left(\frac{-t}{Rc}\right)}$$

See fig. 2.

In order for this equation to produce the desired dimensional quantity, a voltage, the entire exponent, $-t/RC$, has to be dimensionless. And this is seen to be so, if we merely substitute for RC, its dimensional equivalent, time, or t. Thus, t/t, by cancellation becomes dimensionless. Is it not more meaningful to approach a math equation in this way, rather than to merely assume it must be basically OK, because it is known to give the sought answers?

Incidentally, all of those RC oscillators, whether they are of the relaxation or feedback varieties, generate frequencies defined by equations dimensionally equivalent to

$$\frac{1}{RC}.$$

Again, we see that 1/time, or frequency is the quantity being decided. Thus, the diverse RC oscillators shown in fig. 3 all generate frequencies governed by the $1/RC$ factor.

So much for RC time units. Similar sense can be made out of L/R units. Thus, replacing these

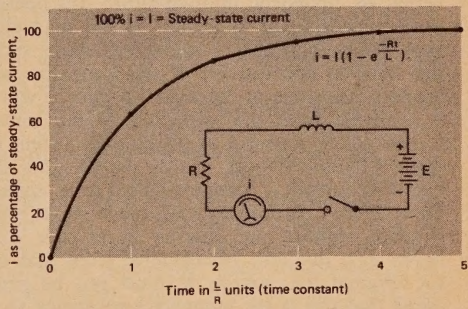


Fig. 4—The build-up of current in a suddenly-energized inductance-resistance circuit. Current in the circuit as a function of time after closure of the switch is expressed as i. But this can only be so if the entire exponent, Rt/L is dimensionless. For Rt/L to be dimensionless, L/R must be in the nature of time, t. This mathematical requirement is confirmed by the fact that L/R does, indeed, have the physical dimension of time.

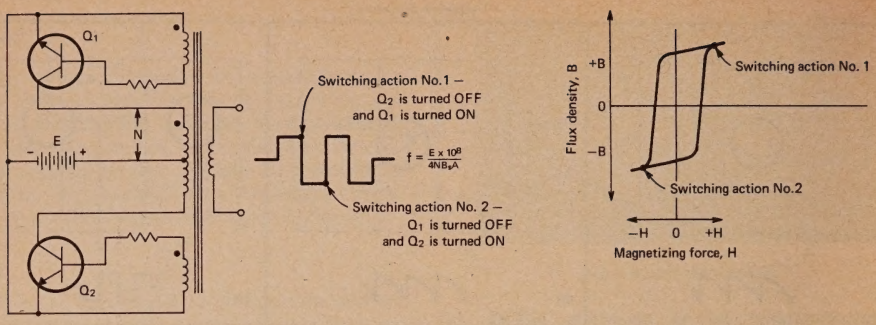


Fig. 5—Inverter using the saturated-core principle to produce oscillation. The quantities, voltage, flux density, and core area, dimensionally combine to yield the dimension of frequency.

quantities by their equivalent dimensions, we have,

$$\frac{t^2}{s} \div \frac{t}{s}$$

which obligingly reduces to t, for *time!*

It follows also, that in the formula for current in an inductor after connection to a d.c. source containing resistance, R, will work, too: This formula is

$$i = I\left(1 - e^{\frac{-Rt}{L}}\right)$$

Because I is a current, we know that the exponent $-Rt/L$ must be dimensionless. Let's see if it is. From the previous example, we already know that L/R is time. Therefore, turning this fraction upside down, we have 1/time, or $1/t$. So, we get t/t when we make the substitution. And t/t, or 1/1, is of course, dimensionless. Figure 4 depicts this situation.

The circuit shown in fig. 5 is that of an inverter, or "magnetic multivibrator." It's operation depends upon saturation of the magnetic core, which produces a switching action such that turn-on and turn-off of the transistors alternates from one to the other. A square wave is available from the secondary of the transformer. Thus, a source of alternating current is derived from a battery or d.c. source. This alternating current is sometimes used as is, sometimes filtered to provide a near-sine wave, and is often rectified and filtered to provide d.c. power at a different voltage-level from that of the original d.c. source. It must not be supposed that this is the inductance-resistance version of an *RC* relaxation oscillator, such as an ordinary free-running multivibrator. For example, *the circuit would not work with an air core transformer.* Core saturation is the unique operating mechanism of these oscillators. The frequency of the square-wave generated is given by the formula:

$$f = \frac{E \times 10^8}{4 \times N \times B_s \times A}$$

where E is the battery voltage

N is the number of turns from the center-tap

B_s is the flux density at which saturation occurs.

A is the cross-sectional area of the core.

How in the world can frequency emerge from this strange conglomeration? First of all, let's dispense of numbers and reduce the expression to the simplest form. We can re-write this formula as follows:

$$f = \frac{E}{B_s \times A}$$

(N, being a number, is deleted along with 4 and 10^8)

A further simplification can be made. Flux density times area yields total flux, ψ Therefore, we finally have:

$$f = \frac{E}{\psi}$$

and the question before the house is whether voltage divided by magnetic flux is dimensionally a frequency. Making the appropriate substitutions from the third column of Table I, we have,

$$\frac{\frac{m\,s^2}{t^2\,q}}{\frac{m\,s^2}{t\,q}} = \frac{m\,s^2}{t^2\,q} \times \frac{t\,q}{m\,s^2}$$

which beautifully cancels to leave $1/t$, or *frequency!*

Where, indeed, has Alice been? To a bizaare place, to be sure! A place where "ordinary" things are viewed from a *different* vantage-point. But, what initially appeared to be fantastic ways of describing things, later endowed them with greater clarity than derives from the "conventional" way of looking at them. That topsy-turvy world of basic-Basics appears that way only when vision is narrowed by a provincial viewpoint. And you can bet your Cheshire Cat that the Mad Hatter has all of his marbles! ■

Don't Build A Repeater!

BY STEPHEN P. COLE,* WB8BGQ

If you are thinking of building a repeater, for heaven's sake, don't! Unless you happen to be in a section of the country that is really away from it all and are the type that likes to hit yourself on the head with a blunt instrument every hour, it is fairly hard to come up with any logic that says, "Yep, you're right, we need a nice repeater around here."

To begin with, putting one of those infernal machines together and getting it on the air just isn't all that easy. Getting a group together and talking them into the idea is the easy part. Extracting from that group the dedication, perseverance, genuine technical know-how, ingenuity, bits of equipment and some dollars, is when things begin to get a bit sticky. And the real test hasn't even started when, after the grand plan is down on paper and applications submitted to the FCC, you've waited several months for action while members of the group go off on vacation, move to the next state, chalk the idea up as a figment of your diseased imagination or take to knitting tea cozies instead of amateur radio as their consuming hobby.

But in the event you are the kind with hidden masochistic tendencies and are determined to give your all to better serve the fraternity, here are some thoughts that may be of some help in your thinking and planning.

The Frequency

Of course, getting some sort of organization glued together as a cadre for the care and feeding of the idea and then whatever is given birth by that idea is pretty much the first essential. Beyond that, and before you start to collect or spend anybody's money, you'd better figure out where this repeater-to-be is going to be. And by that is meant both the physical location and the slot in the repeater frequency allocation plan that is pretty universally adopted. Each of these things affects the other. For example, there is a repeater in Wisconsin that the group in Michigan would prefer to see in North Dakota or on a different frequency pair.

Co-channel separation of at least 300 airline miles is desirable . . . and feasible, too, with some judicious frequency coordination and selection. With machines that respond today at an input signal level of around 0.1μv/m, it is not uncommon for mobiles or base stations a couple of hundred miles away to be constantly bringing up a machine with extremely noisy signals and driving the control stations, and others who monitor full time, right out of their skulls. A good example of this is the .16-.76 repeater operated by the Chicago FM Club. It is sort of like the method of allocations in the standard broadcast band: they who were there first should be protected.

The Location

So assuming that you have made a thorough frequency search, and enlisted the help of the area coordinating committee in the process, you have located a frequency that will likely not be objectionable to others and that will serve well in your area. Now find the hill or courthouse that you want to put it on. And be sure that you really do have permission . . . in writing. This may take time to accomplish. After all, why should anybody let you tromp about on their property and install a lot of dangerous junk that might set fire to the premises? There are some good locations under the control of the U.S. Forest Service, and other governmental agencies. It took a group in northwestern Michigan fifteen months to clear away the red tape on getting permission to use the side of a fire tower! So be a bit cautious when negotiating with 'officials.' Here is the chance for the politician in the group to do a bit of judicious public relations work . . .something you may find is needed on a continuing basis, by the bye. Come to think of it, you had better try to locate two or three good spots to start with. Even if the owner of the local f.m. station says, "Sure, go ahead," his gear may make it impossible to operate yours . . . and you'd better not cause any interference with his stuff either!

A spot out in the boondocks would be best . . . but that brings up some problems in the control method and possible higher costs if you plan on wire control. There is a dandy fire tower up north, but the nearest power is four miles away and vandals have been taking the tower apart piece by piece over the past several years, especially since snow-mobiles became popular. Didn't think of that angle, did you?

If you're still with it, the next thing to do is to make some field tests. Check out how well you can work simplex from your new-found location, and under varying conditions. Try several antennas and power levels. Here is a chance for your entire group to get in on the action, as they check out range and terrain. Follow this up with a critique . . . does that hot

*488 Fourth St., Manistee, MI 49660.

spot on top of the silo do the job you want or hadn't you better try one of the alternate locations next Sunday afternoon?

Control Systems

Now comes one of the tougher phases of the job. How are you going to make the blamed thing work, how are you going to control it, how many antennas will the system need and the location allow, what auxiliary functions does the group feel important, do you have somebody with the smarts to take on the job as technical director? You're going to want a block diagram of all of this, keeping an eagle eye on the regulations to make sure your application will have a chance of approval. This sort of thing is not something that gets whipped out in an evening . . . nor is it a job for a large group. Turn the three or four dedicated souls loose on this and go out and get your by-laws in shape, raise some dues money and keep the rest of the folks up to date on how the paper work leading to the license application is coming along.

Old Teletype Machine Parts to be Discontined

A memo from Teletype Corporation dated August 12, 1975 is of particular interest to owners of Teletype Models 14, 15, 19 and 20. The memo announces the firm's plans to discontinue manufacture of maintenance parts for the models listed. Orders for maintenance parts for these models will be accepted up to December 1, 1975 and will either be shipped from existing stocks or manufactured and delivered prior to September 1, 1976. Orders will be considered complete for any given item if the quantity shipped is within 10% of the quantity ordered.

Parts to be discontinued are those with part numbers under 150,000, with the exception of tools, grease, oil, cleaners, etc., and other items used on current models. Parts should be ordered referring to Teletype Parts Bulletins for the various models.

Orders and questions concerning their status should be directed to:

Teletype Corporation
5555 Touhy Avenue
Skokie, Illinois 60076
Attn.: Mr. R. A. Morton, Dept. 3121
312 982-2168

Quotations will be issued for items not shown in Teletype's current "Parts Price List," November 1, 1974 edition.

This action is being taken due to the low demand now being experienced for a high percentage of these parts, according to Teletype's Director of Marketing. Thanks to W8KAJ for passing along this information.

The License(s)

When the plot is thick enough to look like a sure-fire proposition, double check everything, including that permission to use the hill or whatever the location is going to be. You might just consider incorporating as a non-profit organization (even break-even plans tend to go in the hole!) to lessen any individual liability. And on that general topic, how about some insurance to cover the liability you're about to create, and maybe even cover your investment? Sound kinda simple up to this point? Mebbe so, but you've probably taken six months or more in just getting ready to send in your application. Before you get that coveted WR call it may take more than that, unless you've done an exceptional job and the backlog in Washington has been whittled down a good deal.

But you've done a good job (or that application wouldn't have gone in) so get the gear together and build the machine. Make sure your control system really works, that your antennas won't blow down, get some good coax, and—"Oh my gosh, did the control station applications go in with the repeater application? What about the separate application that the down-link has to have? Did we overestimate the power needed for the radio control? Does the phone company now tell us that they can't install a line without some special construction costs?" So squirm a bit while your technical types putter away with trying to make the Thing work. If the whole project starts off like a rocket and comes down like a stick, don't be surprised; nobody said you had to do it and it would be easy, did they? Don't say that you weren't warned!

Success

Of course, being the persevering kind, you tough it out. And a few days after you've decided to call the chairman of the Commission, you get a brown envelope, call a meeting of the club, and celebrate by broaching a keg of something. Now comes the more difficult part of the whole deal: Laddie, you've got a tiger by the tail and you don't dare let go! You've finally got a repeater on the air; now keep it there, make it do what you set out to do, try not to listen too much to the 'experts' who heard about that famous system over at West Podunk and why don't you try something like that! The really sad thing is, your system *does* work and now folks are beginning to rely on it. So you *can't* shut it down and take a vacation even when all the other control operators do. Just to put the frosting on the cake two other groups, who haven't considered some of the items discussed so far, have put machines on the air on your frequency. So

[*Continued on page 80*]

Using Epoxy Cement in Electronic Projects

BY KATASHI NOSE,* KH6IJ

EPOXY cement and its relatives are a far cry from the old glue pots of yesterday which required continuous heating to keep it pliable, and neither does the work become "unglued" as a result of moisture. It is so convenient to use and widely available that there is no point in looking for special glues.

The author has been using epoxy cement for electronic projects for a number of years and is extremely satisfied with "held together with glue" projects. Broken parts which are irreplaceable have been restored and in some instances to better than original shape. The only disadvantage of using epoxy is that you cannot change your mind because the job is permanent.

Repairing Small Parts

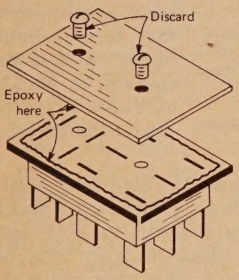


Fig. 1 — Epoxy cement solves sticky problem on special imported Jones plug.

Jones Plug: One imported 2-meter transceiver has a multi-pin Jones plug held together with small screws which are unavailable in this country since they have metric threads. The screws invariably worked loose, causing intermittent contact. The cover shown in fig. 1 was epoxied into place and produced a solid permanent cure.

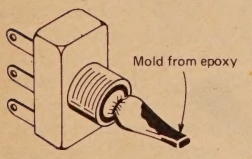


Fig. 2—The missing half of a toggle switch handle can be molded from epoxy.

Bat-Handled Knob for Toggle Switch: This special switch with a long plastic handle split lengthwise and unfortunately the part was lost, which meant that a moulding job was necessary as described later. See fig. 2.

*4207 Huanui St., Honolulu, HI 96816.

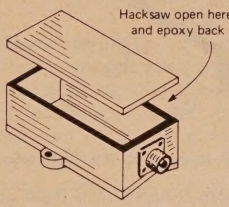


Fig. 3 — An inexpensive repair to an arcing balun requires only a little epoxy and some elbow grease.

Antenna Balun: A puzzling case of intermittent TVI was traced to arcing balun (between winding and powdered iron core). The moulded case was hacksawed open as shown in fig. 3 and epoxied back into place after being repaired.



Fig. 4—Repairing an IBM Selectric typewriter ball is easily done using epoxy and ingenuity.

IBM Typewriter Ball: If the typing ball on an IBM Selective typewriter falls on a concrete floor, the chance of one of the teeth breaking off is very good since the ball is made of metal coated plastic. If you cannot find the broken teeth (the impact flips it far away) you can sacrifice one ball and repair several other balls. Merely break off the teeth with needle-nosed pliers from the ball to be sacrificed. You can effect quite a savings ($18 each). See fig. 4.

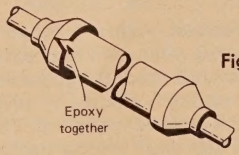


Fig. 5—Repairing antenna trap housing.

Weatherproof Cap for Antenna Traps: After about 8 years of exposure, the weatherproof cap covering of a well known brand antenna (see fig. 5) developed cracks. Bathtub caulking or substitute could have been used but epoxy did a smoother job.

Construction Projects

Additional Contacts for Relays: The design engineer may not like this but it works. Figure 6 shows how extra sets of contacts were added to an existing relay for additional switching.

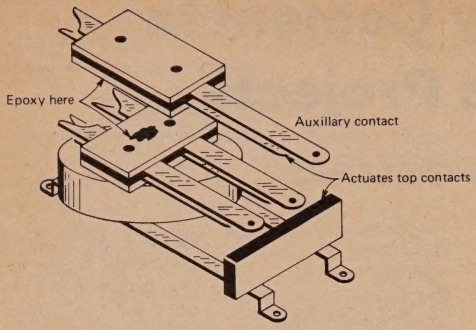


Fig. 6—Adding auxiliary contact to existing relay.

Auxiliary contacts were cannibalized from another relay. Be sure that the relay leaf springs are soft and that the modified relay pulls in reliably. Let the impact do the closing if the auxiliary contacts.

Angles and Brackets: There is no reason why metal parts cannot be epoxied at any angle, thereby eliminating the need for special brackets.

Potentiometers, switches and padding capacitors have been mounted successfully directly on metal surfaces.

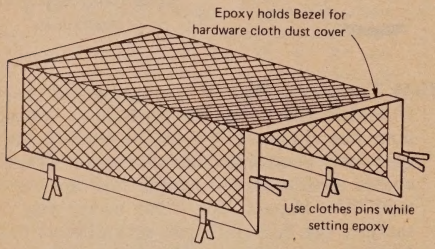


Fig. 7—Constructing dust cover for electronic equipment is easy using screening, aluminum strips and epoxy.

Non-Standard Construction: Figure 7 shows a method of constructing your own dust cover which lends a professional touch to equipment. Hardware cloth or netting is framed by strips of aluminum which is epoxied into place. This method is far easier and looks more attractive than spot welding or attachment with nuts and screws and applies to all bezels, escutcheons, and frames.

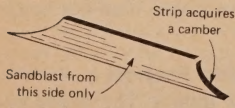


Fig. 8—A bit of camber may be given to aluminum strips by sand blasting one side.

If you have access to a sand blasting machine you can lend further artistic effect to thin strips of aluminum which will require a camber on the side which is sand blasted. Sandblasting hammers and stretches the aluminum as shown in fig. 8.

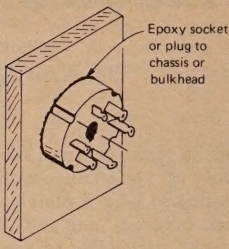


Fig. 9 — Mounting socket or male plug where bulk-head is too thick for standard socket mounting.

Figure 9 shows a method of mounting sockets to chassis and bulkheads which are too thick to accept conventional male or female sockets. There is no reason why this method cannot be applied to standard mounting and thereby eliminating screws or rivets.

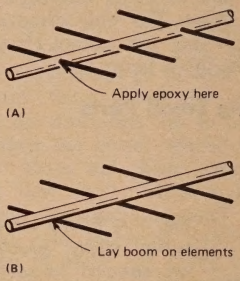


Fig. 10 — Simple method of adding elements to the boom of a u.h.f. array. (A) Elements are cemented where they pass through boom. (B) Cement elements to outside of boom for very easy construction.

Fastening Yagi elements to VHF and UHF booms: Figure 10A shows a solution to a sticky problem of fastening elements to VHF and UHF yagi antennas which normally calls for the use of hardware or other nuts and bolts and thereby eliminating corrosion problems.

Figure 10B shows a simpler method whereby elements are just laid on a surface with globs of epoxy, over which the boom is placed for a permanent job.

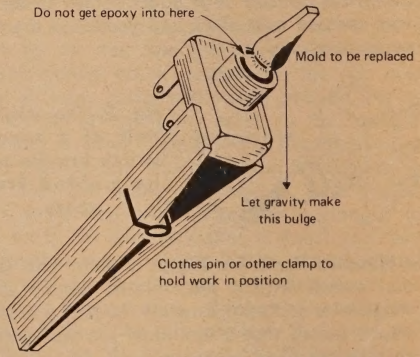


Fig. 11—How to make gravity do your work.

[*Continued on page 80*]

Peak Envelope Power — What It Is

BY JAMES E. SWAFFORD,* W7FF

THE FCC Restructuring Docket 20282 has an interesting provision for amateur transmitter power measurement. If implemented, it will provide for a maximum power output of two kw p.e.p. for the Extra, Experimenter and Advanced class licenses, and a five hundred watts p.e.p. output for the Generals. This is a departure from the old d.c. power input requirement of one kw maximum as measured by the product of the final amplifier plate voltage and current. It is however, very compatible with today's modern amateur transmitters using the s.s.b. mode of voice modulation. It also happens to apply very nicely to c.w. transmitters during keyed conditions.

In discussing this on the air with numerous amateurs, some of long-standing ham experience, I was surprised to find a general confusion and misunderstanding of the p.e.p. concept of power definition. Therefore, this article is an attempt to clarify and remove some of the mystery and concern surrounding the p.e.p. measurement of amateur transmitter power input and output. Principles and general techniques will be discussed, leaving the specific details of equipment hookups of measuring devices and instruments to the several excellent amateur books on the subject.

The ARRL *Handbook*[1] states, "Linear amplifiers are rated in "p.e.p. input" or "p.e.p. output." The p.e.p. stands for *peak envelope power*. P.e.p. input is not indicated by the maximum reading the plate milliammeter kicks to; it is the input that would be indicated by the plate milliammeter and voltmeter if the amplifier were driven continuously by a single r.f. signal of the peak amplitude the amplifier can handle within it's allowable distortion limits. In other words, it is the "key-down" input within the allowable distortion limits. The p.e.p. output is the r.f. output under these same conditions." Now, it is essential that the above definition of p.e.p. be clearly understood and accepted before proceeding further. It is this definition that seems to cause most hams trouble. They tend to think of "peak power," "peak and instantaneous power," and other terms that involve mathematical relationships that have no bearing on this discussion. The above definition of p.e.p. can be re-stated as "for a continuous single tone sine wave signal, the peak envelope power input to the linear amplifier and the d.c. input as measured by the product of the plate voltage and current meter readings are the same." In other words, under these conditions the ratio of p.e.p. to average d.c. input is one. (1.0).

Now, down to cases. Let's assume that you have access to a fifty ohm dummy load capable of absorbing your transmitter's full output power, a calibrated watt-meter with a full scale capability equal to or exceeding your transmitter's output power, and an oscilloscope with appropriate connections to your transmitter's output line. Under key-down, single tone conditions adjust your amplifier for full undistorted power output into the dummy load, and observe the maximum deflection of the trace on the oscilloscope. If the sensitivity of the scope deflection is variable, adjust it for some given deflection, such as two inches, or any other convenient value. This deflection then represents the p.e.p. output power level produced by the input power as measured by the product of the plate voltage and current as read on the d.c. meters. It also corresponds to the p.e.p. input which happens to be the *same* as the d.c. input read on the meters in this single tone, key-down example. (Remember our previous definition of p.e.p.) Notice I said it *corresponds* to the input power. It releates to it by the efficiency of the amplifier.

Amplifier efficiency can be measured directly by use of the calibrated r.f. wattmeter in the output circuit. The ratio of the power output (as measured by the wattmeter) to the input (as read on the meters) is the overall efficiency. If the linear amplifier happens to be grounded-grid, remember to subtract the exciter's power output (this would also have to be measured separately with the wattmeter) from the output before dividing by the input power to get the efficiency. This is necessary since in the grounded-grid connection, the exciter's power output is in series with the power converted from d.c. by the amplifier tube and adds directly to the output.

A word of caution is in order here, since depending upon the plate dissipation ratings of the amplifier tubes and the power supply ratings, it is possible to burn up either or both under prolonged key-down conditions. If the

*5906 W. Miramar Dr., Tucson, AZ. 85715.

[1]*The Radio Amateur's Handbook,* 1968, page 260.

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ratings don't lend themselves to continuous operation at these maximum levels, then "bursts" of short duration can be used, or a two-tone test signal can be used. In the case of a two-tone test signal, a factor of 1.57 can be applied which is the ratio of p.e.p. to average power with two tones.[2] This means the plate current meter will read 1.57 times as much on a single tone as on the two-tone signal. Thus plate dissipation can be reduced during the test by using the two-tone signal as the plate current will be 0.64 (the reciprocal of 1.57) times that for a single tone, for the same p.e.p.

Once the efficiency of your amplifier is known, you never again need to measure the power output directly, unless you change the operating conditions. (You can return the expensive r.f. wattmeter to the laboratory or affluent fellow ham from whom you borrowed it!) For on-the-air monitoring purposes you merely adjust your audio gain and drive your amplifier such that the deflection on your scope does not exceed the two inches or other fixed value that you noted during the measurement. It doesn't matter whether you are using voice, keyed c.w., or other types of modulation. Your p.e.p. will be the same as long as you drive the peaks up to the noted deflection on the scope.

What about the ham who wants to run maximum legal power, but just doesn't have access to an r.f. wattmeter of known accuracy? Well, there's another way. I see no reason why *assumed efficiency* would not be acceptable to FCC, should it decide to use output power as a criterion, provided it is not materially less than the maximum theoretical value of 78.5% for a Class B amplifier.[3] Using this value would be conservative, since practical amplifiers in use would have lower values of efficiency than the maximum theoretical value. All one would have to do is adjust his amplifier such that the d.c. input under key-down single tone conditions times the assumed efficiency factor does not exceed the legal limit.

The advantage of direct measurement and rating of a transmitter in p.e.p. input/output is that it puts to rest the old argument about the ratio of "peak to average" power when using a voice or other complex waveform for modulation. As long as the acceptable critera is p.e.p., then no one should care what his ratio of peak to average is as long as he is not producing intolerable distortion and resultant broad signals. His scope patterns should tell him that. I can forsee that the market for devices designed

[2]From "Interpreting the Linear Amplifier Plate Meter Reading," *QST*, August 1955.
[3]*Radio Engineering*, F. E. Terman, Second Edition, Chapter VII.

[*Continued on page 81*]

THE SASA STORY

BY LAURIE MARGOLIS,* G3UML

THE amateur radio station at Kibbutz Sasa in Israel has an almost unequalled record in international contests. Probably the only group that approaches Sasa for consistency is that which goes down to Curacao. But the Sasa station, usually signing 4Z4HF, has featured right at the top of the listings in the various *CQ* contests for over a decade now. I was lucky enough to be one of the 4Z4HF operators for the *CQ* WPX contest in March, 1975.

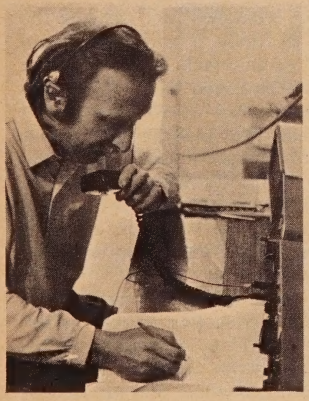
Kibbutz Sasa was founded in 1949 by American and Canadian pioneers, and it still retains a North American flavor. It is located in a strategic position very close to the Lebanese border, in the Upper Galilee area of Northern Israel. This isn't, incidentally, the same Sasa as that which featured strongly in the 1973 fighting—there's another Sasa on the Golan Heights forty miles to the east. But Kibbutz Sasa is in a heavily militarized area, much frequented by Arab guerillas when they can get across the nearby border. Machine gun fire can often be heard during the night and moonlit strolls are not encouraged.

From the amateur radio point of view, Sasa is one of those locations you dream about. It's 3000 feet up and only 25 miles from the sea. The take-off in all directions is little short of stupendous, and on a clear day you really can see forever, or at least to the distant Mediterranean. To the east you can see across the Jordan valley to Mount Hermon, on the junction of the Syrian, Lebanese and Israeli borders.

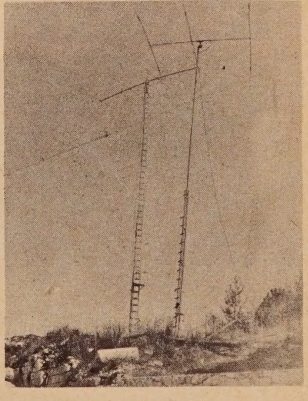
But the physical position of the Kibbutz is not the only reason for its excellence as a contest location. Israel is in the special position of being very close to a populous continent without actually being part of it. Transplanted into contest terms, that means masses of contacts at three points at a time. There are, of course, other parts of the world that fulfill this criteria. The obvious example is Curacao and the northern coast of South America. Possibly the very best area to go to win a contest is the northwest coast of Africa, as the Finns have proved in Gambia. In fact, this area, which includes EA8, CR4 and CT3, is perhaps the ultimate since a pipeline into Europe and the U.S. is guaranteed, and the JA's also count for maximum points.

Israel isn't as well located as it might be—in fact, conditions to the States were lousy during the WPX contest—but it's close enough to Europe to make that less important. Before eliminating the duplicates we made about 3400

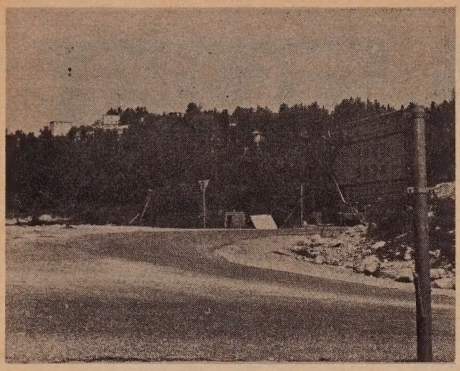
*95 Collinwood Gardens, Ilford, Essex IG5 OAN, England.







From left to right, Keith, 4Z4IX, is shown trying to make sense out of the QRM at the 20 meter position; The 15 meter beam atop 4Z4IX's house, from where the 4Z4HF operation took place. Also on the mast is a two meter yagi with which Keith works into Cyprus when conditions are right; The 20 and 10 meter beams. The 80 meter sloper was strung out left from the top of the big tower.



The entrance to Kibbutz Sasa. Archaeological digs have revealed at least seven civilizations who have lived on this hill, going back beyond biblical times.

contacts in the contest, and at a guess I'd say over 2500 were with Europe. We had only one decent stateside opening, on twenty, and fifteen failed almost completely, so those G's, YU"s, DL's and all were very welcome.

I was in Israel on a spring vacation, and I'd arranged to meet Mr. 4Z4HF, Joe Lieberson, at his inlaws' house near Tel Aviv on the Sunday before the contest. That liaison went smoothly enough, as this was my third trip to Israel and I'd long since mastered the efficient but complicated bus system. Cars are very expensive in Israel and if you can afford one, you probably can't afford the $3 a gallon for gas.

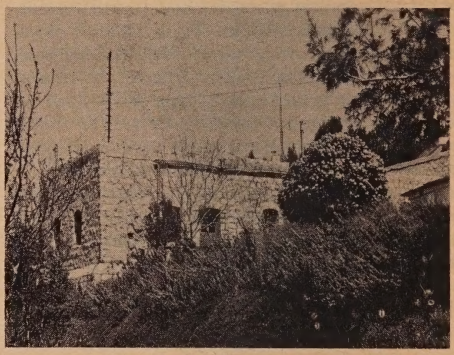
When I saw the work schedule Joe had set out for me in the pre-contest week, I nearly got back on the plane to London. It was like this. Monday, we make the long bus journey back to Sasa. Tuesday, we erect an eighty foot tower. Wednesday, we put together a 204BA and fixed it onto the tower. Thursday, we erect another mast with a tribander atop it, this one to be used on ten meters. Friday, we do anything that hasn't been done and gather strength for the weekend. And as an afterthought, Saturday and Sunday we try to win the multi-multi section.



Riki, 4X4NJ, concentrates on 15. Riki has also had considerable success in his own right from his home at Gan Yavne, south of Tel-Aviv.

Well, we were on schedule for the first day at least. The eighty foot Tri-X tower had been rescued from imminent destruction by the Israeli army, and considering its size, Joe and I got it up fairly easily. It had been slightly buckled in transit, and there were some scary moments as I jumped up and down on the top section to try and free the central sections, but eventually it wound all the way up.

Wednesday we hit trouble, and the culprit was the weather. Israel has a mild southern-California type of climate, but high in the hills the winters can be quite fierce. Although this was the end of March, winter hadn't quite ended yet. During the morning we assembled the 204BA in a big workshed, not noticing the gathering clouds. By noon it was windy, and by the time we'd eaten lunch it was blowing a gale and raining cats and dogs. This routine carried on for the rest of Wednesday and Thursday. The winds were so strong that it was dangerous to do any outdoor antenna work, and we were virtually stuck. Cables could be prepared but not strung up. So much for Joe's schedule. In addition, I got a touch of bronchitis which nearly killed my voice, a useful asset in a phone contest.



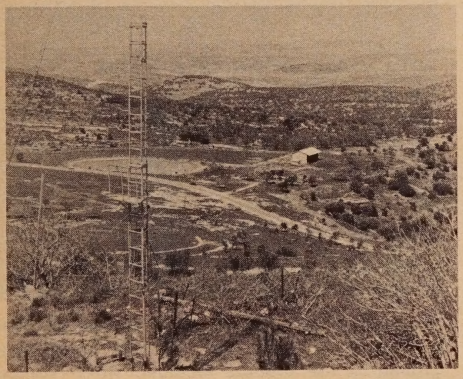
The antennas from the lower levels of the Kibbutz. The residential area is on the side of a hill.

It really froze those two days. In London I'd debated whether it was worth even bothering to bring a sweater, but fortunately in the end I brought two. I wore both of those plus a huge Canadian woolen jacket and an anorak. And I went to Israel for the sun.

Thankfully the weather cleared on Friday and we got the remaining chores done, albeit with little time to spare. During the evening,

we set up the four rigs, though in the event we only needed three. We had Joe's Drake line, and another Drake station which had been brought up by Riki Kline, 4X4NJ, a former inhabitant of Las Vegas who's now settled in Israel. Then there was an FT-200 and linear belonging to Keith Kahn, 4Z4IX who is also G3RTU when he's in Britain. Keith lives on Sasa, as does the owner of rig number four, Yossele, 4Z4LF. He has a Swan 350 and a tower on his house, but for the contest he carted his transceiver up the hill to help the general effort. Yossele was also the owner of our 204BA, which was up in the dark ripping the cogs off the rotator as it swung around on the big tower. As well as the 204BA and the ten meter beam, we had 4Z4IX's tribander for fifteen.

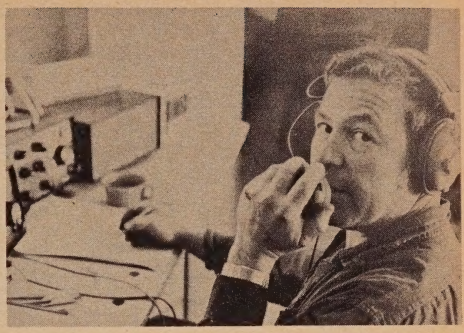
The 204BA was a sensational antenna, as it was mounted on the edge of a cliff and had an effective electrical height of about 300 feet.



The take off towards the U.S. and Europe, one reason for the acceptable signal! The 20 meter tower is in the foreground, and the OD5 border is just over the wooded ridge.

In fact, in some ways it was almost too good because it tended to overshoot Europe, though it made up for this by giving us a big signal into the States when conditions were marginal. But even the modest tribanders took on the characteristics of much bigger beams because of the quality of the location. On 40 and 80, we used sloping dipoles tilted towards Europe and North America.

Anyway it was, as they say, all right on the night, though only just. Technically everything worked perfectly apart from the antenna rotors which gave a lot of trouble. Fortunately we spent most of the time aimed northwest so this wasn't such a great disadvantage. On the ten meter beam there was such a big voltage drop on the control cable that we had to mount the control box at the base of the mast. By Sunday it was no hardship to go and turn the

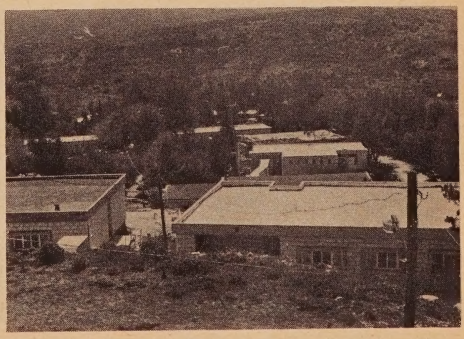


Yossele, 4Z4LF, who also has his own station at his house on Sasa.

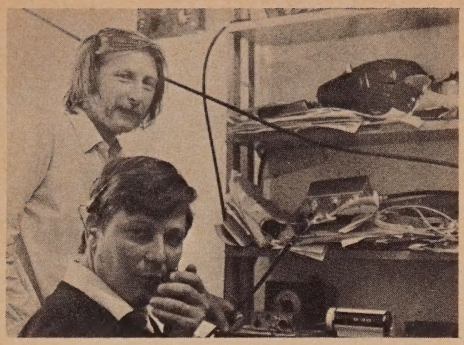
beam, because it was nice to get out into daylight for a couple of minutes!

The contest itself went unremarkably. Conditions were, as I've said, mediocre, with occasional good openings, notably to the States on Saturday night and Oceania on Sunday morning. Fortunately we had the non-stop propagation into Europe, so we were always busy. Although we made some 700 contacts on the two lower bands, conditions were horrible down there and the night-time shifts were tougher than usual. There seemed to be some kind of ionized gas cloud over the Mediterranean, and while this didn't kill the bands it was like looking at Europe through a dirty window. At no time was there the cracking kind of opening that can occur, particularly on eighty, though there were some big signals from the east. Fortunately, again because of the outstanding antennas, we were able to do quite well on these bands regardless.

Contest operating at Sasa has a flavor all its own because you're living in a very close and unfamiliar kind of community. The Kibbutz is populated by over 200 people, plus a transient number of young volunteers from all over the world, though mainly Britain and the U.S. The



The Kibbutz from the roof of the operations house. The schools are in the foreground.



Keith, 4Z4IX, and Benzi, 4X4IL, manage a weak smile late on Sunday.

permanent residents live in comfortable apartments in small blocks, and they're given money to furnish them as they please. After they reach the age of five small children are moved into the Children's House, where they stay till they become adult. Although this might sound strange to family-orientated westerners, in practice the kibbutz child sees more of his parents than the city-kid, because mom and dad work from early morning to lunchtime. The rest of the day is theirs, and they spend it with their children.

There are none of the stresses and strains of typical American life, such as where the rent and food money will come from. You are given either the commodity, or, more likely, the cash to get it yourself. Everyone normally eats communally, though there's no pressure to do so. Of course, kibbutz life is not paradise and there are problems. Being in such a remote spot the older teenagers can get bored, though they mostly go away to the military and then to college. The tensions of living your whole life with the same group of people can also tell after a time. But basically the kibbutz is a very happy and exceptionally healthy miniature welfare state.



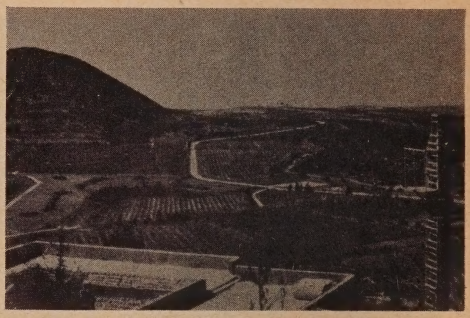
Riki, Yossele, and Keith contemplate the ten meter mast.

The main industry at Sasa is apple cultivation, though they're considering some diversification. The inhabitants work on a kind of long term rota system, ensuring that everyone does everything over a period. Typical jobs include apple picking, ditching work, kitchen duties, office work, minding animals and maintaining machinery. The whole shebang is governed by committee meeting.

The children have elementary and high schools of their own, beautifully equipped, and the educational standard is good. Other facilities include an enormous gym/meeting hall, a splendid new dining room, pool and comprehensive dental and medical care.

Everyone is also fully concerned with military duties, as is every able bodied person in Israel, apart from the very religious and Arabs. This aspect is of crucial importance at Sasa because of its frontier location.

As far as 4Z4HF is concerned, everyone is



The Sasa apple orchards, with the twenty meter tower on the right. The building in the foreground is the Kibbutz museum, which contains numerous finds from many periods in the area.

familiar with "Joe's radio" at the top of the hill, though most are not really sure what it's all about. They are aware that whatever is done up there is done better than anywhere else in the world, and so they're quite possessively proud of 4Z4HF. I say most are slightly confused, but in fact some of the sane inhabitants (ie non-amateurs) are very fully clued up on the contest side of amateur radio. Thus my hostess, Shoshana Baruch, formerly of Liverpool, runs the secretarial side of the contest, filtering out the dupes, and keeping all and sundry up to date with the score, the needed prefixes and so on.

These knowledgeable ones can cause slightly piquant situations. I was operating early on the Sunday when a gentleman I recognized only vaguely stood beside me and viewed the proceedings with obvious interest. "How's it going then," he asked.

"Oh, pretty good, "I answered, not feeling lively enough to go into the detailed pleasures

of twenty meters at 6 A.M.

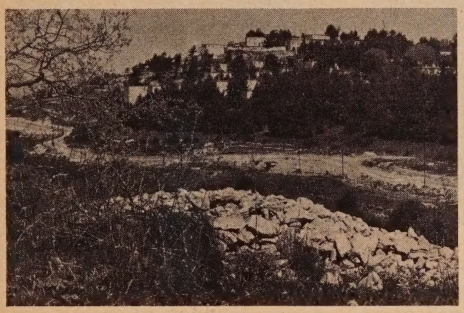
"Long path open yet?," he queried.

That's an intelligent question, I thought. "Just starting to come through."

"Yeah," he nodded sagely. "The VK's and ZL's should be through soon. But you want to watch fifteen to the east. Keep it up." He wandered off leaving me suitably bemused. This type of conversation is not unusual at Sasa.

The bulk of the operating was done by Riki, Joe, Keith and myself, though at no time were more than three bands usable. We were reinforced by Yossele, 4Z4LF, and also Benzi and Devora Sha'al from Haifa, 4X4IL and 4X4NW. And, of course, we had our full logistical staff marshalled by Shoshana in the rear.

One problem for Israelis in a contest is the Russians. Hopefully, by the time this is read they'll be working Israel again, but at the time of writing, they have, for their own perverse



Sasa from across the valley, with the antennas right at the top, where they should be!

reasons, decided to boycott the Israelis. Now the conversational standards of the U's is such that under normal circumstances this is no hardship—indeed, it's a pleasure not to have some of those wretched signals following you about. But during the contests it means the Israelis are barred from many contacts and, more importantly, a block of forty prefixes.

However, an examination of our log will reveal several dozen U-contacts and a few of the prefixes. This is basically because the Russians are very careless, and in some cases very stupid, operators. Apparently, they are taught at Ham School that in a contest you jump in, get your number, and then worry about such formalities as the call and whether you've worked the other guy before. Thus a typical exchange would go like this. "QRZ, UA7AAA".

"UA7AAA, you're 59123".

"Roger", says the Russian. "You're 59456. What's your call?"

"QSL 59456. This is (very deliberately) 4Z4HF in Israel".

Three things would follow the exchange.

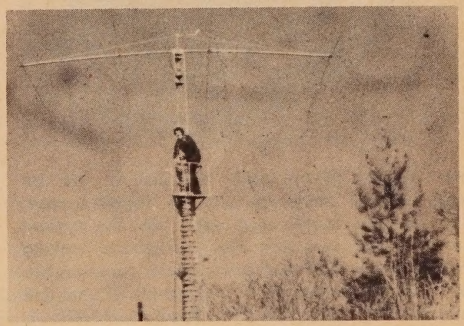


Yossele, 4Z4LF, gives 10 a going over. Ten never really opened wide but provided many useful African prefixes, and also a pleasant respite from the QRM on the other bands.

From the guy out in the Kazakh boondocks, who hadn't yet heard the five year old ruling, a straightforward acknowledgement. Or there'd be an embarrased silence. Or, from the cheeky ones, a quick "negative contact". This would be met with a definite "Like hell, positive contact, baby", and we carry on with our pile-up.

Now this routine, though amusing at the time, makes the Russians look idiotic and irritates everyone else. It also puts 4X4's under a totally unfair handicap, which I feel should be made up by some kind of multiplication factor, or alternatively the disqualification of all Russian entries until they cut this business out. It clearly annoys the many good operators in the USSR as well, since familiar voices would often chime in with a quick word of good luck.

Anyway, even without the Russians, we managed a lot of contacts and several mega-points in very average conditions. How successful we were is not up to us any more, but it was fun. I left Sasa with Riki the following day and drove down south to continue my vacation, studiously avoiding amateur radio from then on. ■



The author in the shadow of the twenty meter beam.

THE OPTACON

BY GAYLE SABONAITIS,* WA1OPN

For the past five years there has been research, and now finally production on an instrument known as the Optacon or OPtical-to-TActile-CONverter. This instrument converts anything on the printed page to a tactile form.

Initially, a prospective user of the Optacon is given an evaluation test to test their suitability to the instrument. Not all blind people will have a sensitive enough sense of touch to fully utilize the unit. For those who do, an intensive fifty hour training course ensues whereby the user becomes completely familiar and comfortable using the Optacon.

The Optacon itself is a light-weight (four pounds), small (2"x6"x8"), easily portable instrument consisting of three major parts, whose function is to convert regular inkprint into a readable, vibrating tactile form:

*11 Maxwell St., Worcester, Mass. 01607.



The Optacon shown ready for use. It can be easily carried anywhere with its carrying case. The Optacon looks very much like the typical portable tape recorder. The microphone looking object to the right is the miniature camera. The tactile screen is located in the center of the unit and is easily accessible. The three front controls are located by position making any adjustment simple.



The typing attachment for the Optacon. The blind typist can now readily check what has been typed as well as use standardized pre-printed forms such as found in everyday business. When the camera moves to a blank space or simply white paper the operator knows he is either at the end of a line or to insert information here since the screen stops vibrating.

The Camera—The miniature camera, the size of a small pocketknife, contains two tiny lamps and 144 light-sensitive photo-transistors (the retina) These photo-transistors produce signals that are transformed into electronic impulses which activate vibratory reeds in an array to form a readable, tactile facsimile of the original image. For example, as the camera is moved across an upper case "E", the reader feels a large vertical and three horizontal lines moving beneath his finger. There is also a zoom lens adjustment on the camera for finer work.

The Tactile Screen—The tactile screen is a trough-like device within the main package upon which the users finger rests. It is composed of 144 miniature rods arranged in 24

[*Continued on page 81*]

QRP

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG/ϕ

Putting The MFJ Modules On 80 Meters

Thank heavens that summer QRN is gone and 80 meters will be open again for the QRPp Net Activities. The sessions, which begin in mid-spring, attracted more participation than I had anticipated. While we never had more than a dozen or so check-ins, this was a boon in that everyone had a chance to get in on the action. I hope that we can continue to have a good time this season. One problem is with west coast check-ins—doesn't anyone run QRPp out there on 80 meters, or is the time just bad? Let me know what the situation is.

We'll start the QRPp Net back up on October 14, 3540 kHz, at 2200 Eastern time. Procedure is simple. NCS will call "CQ QRP Net" and take check-ins for the first 10 minutes. Next, NCS will broadcast the assembled list and proceed to contact each station in order. When recognized, a station has two options: first, request clearance to call another station on the list; or, if no specific QSO is desired, give an RST report to every station on the list that he copies. This is an important part of the Net activity since it provides an overall picture of QRPp coverage of the parts of the country involved. The lists of reports gathered in this fashion during the spring reveal a remarkable effectiveness of QRPp getting out all over, not merely to a few specific "perfect path" locations.

*213 Forest Ave., Vermillion, SD 57069.

MFJ Module Modifications

One problem that many fellows drew my attention to was that the HW-7 does not operate on 80 meters, hence HW-7 owners were almost automatically excluded from participation in the Net. What follows will permit a degree of rectification of the HW-7 problem, since most stations have all-band receivers in addition to the QRPp rig. The MFJ 40-T transmitter and 40-V v.f.o. modules can be put on 80 meters with little effort and hence enable the HW-7 owner to get on that band, as long as he has a separate receiver. Actually, building a simple converter (see ARRL Handbooks, any year) for the HW-7 receiver will do as well. Fifteen bux will get you the 40-T transmitter and only a few extra parts are necessary. Any QRPp'r who doesn't operate 80 meters is missing the boat—I say that as a one-year veteran of 80 following about 20 years of a "can't work anything on 80" attitude! On to the mods.

In the July, 1975 QRPp COLUMN, we presented a step-by-step guide for the complete assembly of the transmitter and v.f.o. modules in a very compact rig. If you haven't built anything before, reference to that column will give you a good idea of how to proceed.

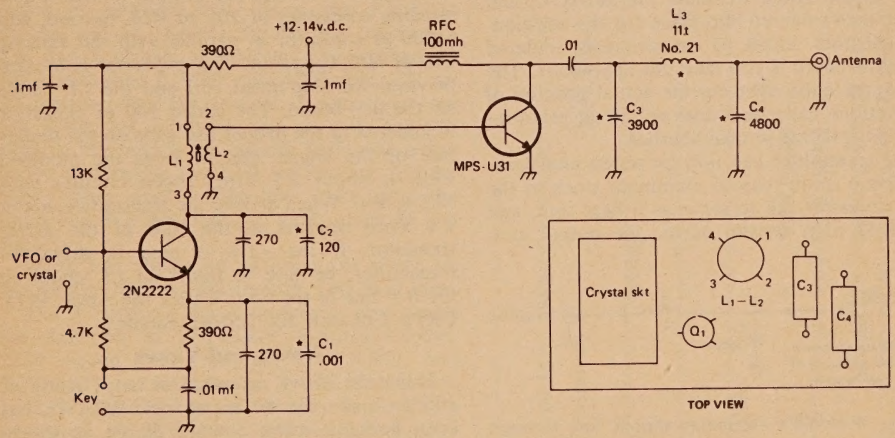


Fig. 1—The modified circuit of the 40-T board. The starred items (*) are new parts added to the p.c. board. C_1-C_2 are soldered to the foil on the underside of the board. C_3-C_4 (if same polystyrene types as the original capacitors) will fit in the original holes and mount above the board. See text for coil details. Coil form lug connections for L_1-L_2 are shown in the call-out. All capacitors greater than one are in pf.

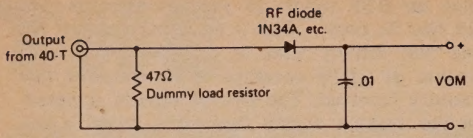


Fig. 2—R.f. probe for use with a v.o.m. as an output indicator when checking the modified transmitter.

The major modification to the 40-T consists of rewinding the driver tank and the pi-net output toroid and replacing a few parts. The modified circuit is shown in fig. 1. C_1 and C_2 are simply soldered to the proper foils on the under side of the p.c. board. C_3 and C_4 are the new pi-net capacitors. Either silver micas or polystyrenes will fit into the original holes in which the original capacitors were mounted. Another approach is simply to add the necessary extra capacitance to the foils on the under-side of the p.c. board.

Begin modifications by first adding C_1 and C_2. Then carefully remove the driver tank (L_1-L_2) coil and the pi-net output parts. Next, rewind the driver tank with 18t. of #28 wire for L_1. Before removing the original winding, carefully note which end of each coil connects to a specific lug on the slug-tuned core. Rewind in exactly the same fashion. Wrap a proper size piece of tape around the primary winding, and then wind the 4½ turn link over the center of the primary tight-spaced. The wire from the original primary winding can be used for the new link coil. Remount the coil on the p.c. board. Next remove the winding from the output pi-net toroid and replace it with 11 turns (#21 is just right). Remount the toroid. C_3 and C_4 are then soldered into place (or the additional capacitors added to the originals soldered on below board if you take this approach). The fit may be quite tight but the actual position of these output capacitors does not affect performance, so feel free to take liberties.

The transmitter can now be tested and peaked. Bolt a small strip of aluminum stock to the final transistor tab to serve as a heat sink, and put a 47 ohm resistor across the output connection and ground for a dummy load. A v.t.v.m. with an r.f. probe is helpful for testing and tuning. With an 80 meter crystal (or the v.f.o.) plugged in and a receiver tuned to the crystal frequency, adjust the slug of the driver coil until the crystal breaks into oscillation. If an r.f. probe is available, check out the voltage on lug 3 of the coil and adjust the slug for maximum indication (about 7 Vrms). The base of the final should show about 0.7 Vrms. Once the driver is tuned up, check the output from the final. It may be quite low (under 2 Vrms) before peaking the output toroid. If no v.t.v.m. and r.f. probe is available, the circuit of fig. 2 will allow you to use a regular cheapie v.o.m. as an output indicator. The pi-net is peaked by pressing the windings of the pi-net toroid together (or apart, as the case may call for). The peak can be rather critical and a bit of careful adjusting will be necessary to get best output. In my modified version, 13.7 Vrms was developed across the 47 ohm dummy load with 12.2 V. on the final collector. The same output was obtained with v.f.o. control. Output will drop noticeably either side of the peak frequency due to the tuning of the driver tank circuit. If you plan on moving around the band with the rig, a 100 pf variable capacitor can be paralleled with C_2 in order to be able to retune after a significant change in frequency is made. The transmitter is ready to go on the air.

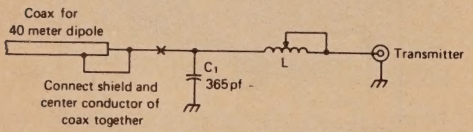


Fig. 3—W4AWS's 40 meter dipole fed through an L-net tuner for 80 meter operation. Experiment with various taps on L_1 in combination with various settings of C_1 for best output as indicated by a #49 or #47 bulb inserted at "X". L can be 1.5"d. with 20 turns. Each installation will require its own specific combinations.

V.F.O. Modification

Modification to the v.f.o. (MFJ 40-V) is considerably simpler. All that must be done is to remove the v.f.o. slug-tuned coil, remove the original winding, and replace it with a new winding consisting of 20t. of #28. Second, add a 100 pf capacitor in parallel with the existing 270 pf tank capacitor. This capacitor is located between the slug-tuned coil and the r.f. choke on the p.c. board. The added 100 pf capacitor is soldered to the proper foil pads on the underside of the board. Output from the modified v.f.o. is about 2.5 Vrms (open circuit) with 12.2 v. B+. When driving the transmitter, about 1.1 Vrms appears at the base of the driver transistor. If the v.f.o. is used to drive the transmitter, be sure to insert an r.f. choke in the B+ line to the v.f.o. Check the April, 1975, QRPp COLUMN for further details.

News and Views

Hope the above information helps many of you to make the 80 meter net. W4AWS has been doing it using a 40m. dipole as shown in fig. 3. And now, let's hear from some of the gang that has written.

de . . . **WA2YEM, R. O. Titus, 137 W.** Monroe Ave., Magnolia, N.J. 08049. "My first (2w.) contact with KV4AA provided a real good start in QRP. Since then I've bagged 41 states and

10 countries, mostly on 40 meters. I'm using dipoles for 40/20/15. Of about 150 QSO's to date, I've only worked three other QRPp stations running less than 10 watts. Endless patience and early operating hours are essential to me. I have a feeling that band conditions on 20 are generally going to work against much success there for some time. The QRO fellows often reflect on their past or future intentions to try QRPp although several have been critical of having been asked to copy such a weak signal as mine! Suggesting 'QSY' to some of them is like asking them to rewire their receivers I call CQ only during the weekdays and a comeback is really an event! I have found various contests a very useful tool for gaining confidence that my HW-7 is still working, particularly on 20 meters After between 20-50 contacts I'm content to pull the switch and pat the little fellow on its cabinet top." . . . **W2CRS, Doug Allen,** Hilltop Road, Pattersonville, NY 12137: "As for QRPp operation, I'm new to the game. In early August while in Maine at my summer QTH (with the call K1UGQ) I bought a used Ten-Tec PM-1 and strung up 80 and 40 meter dipoles in parallel about 35 ft. up. I was amazed at how easy it was to make contacts with the two watts input (maybe less because the lantern batteries came with the second hand Ten-Tec and had been used many hours). In about three weeks of operation I worked 26 states, best DX being about 1250 miles. 25 states were worked on 40 plus one on 80 where I worked 14 total. During the QRP contest I made 70 contacts with multipliers. It was a thrill to work W4VNE and some of the gang. Am now at home in up-state N.Y. using the PM-1 to dipoles and an 18AVQ. In the few hours that I've had a chance to operate, I've worked 13 states including a 1500 mile QSO with TX on 40 meters using the vertical. I sometimes use my R-4B for receiving and to give S-meter reports. My reports are usually S5-7, with a few above and below that. I'll be looking for the QRPp gang around 3540 and 7040 using the home call W2CRS. Hope to work many of you soon."

We're just about out of space, so better tie the ribbons on it for this month. One final note.

The Argonaut Club is underway now under the direction of WA4BAA, Edward Tanton, 2829 Arden Way, Smyrna, GA 30080, and WA7OKF, Lance Harmon, 711 E. 3rd North, Lehi, UT 84043. The club is open to all QRPp operators, so if you are interested in joining up, drop a card to the above. In the works (tentatively) is a big all-band c.w./s.s.b. QRPp Contest lasting over Thanksgiving holiday. Please indicate your activities ideas along with

[*Continued on page 82*]

BUY SOMETHING FOR YOU !

Most people give and get the regular run-of-the-mill kind of presents each year. A necktie is a nice thing to receive as a gift, just as a dozen handkerchiefs or some new socks would also be nice to get this holiday season. The plain fact is that you probably will get some or most of these this year and that none of them will really nourish the inner you. Socks are dull!

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MATH'S NOTES

BY IRWIN MATH,* WA2NDM

LAST summer, we had the need to erect a short tower to move our antenna array away from the chimney of our house to a flat section of roof. A search through various catalogs indicated that the going prices were about $35-40 per 8-10′ section plus a similar amount for a base mounting, (depending on manufacturer) and we became somewhat discouraged.

Sometime later, after passing through the stock room at our "salt mine" we noticed the ideal way that shelving was assembled—ideal that is for antenna tower basic raw material.

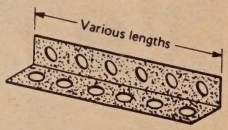


Fig. 1—Typical metal shelving angle iron support.

Anyone who has ever had to do any so called free standing metal shelf installations is well aware of the steel angle iron that is used for the vertical supports of these shelves.

Fig. 1 is a sketch of the type of angle iron used at our place of business. This stuff is 1/8″ thick steel, quite heavy but also extremely strong. It is available in many lengths including 8 foot sections and 10 foot sections and it was these "10 footers" that we decided to use.

In fig. 2 we have shown the basic method of constructing a tower section. Three lengths of angle have been used although four could be used for a box-type tower. Three is extremely strong however, and should be certainly adequate to support anything the amateur would be likely to put up. The cross-members are also common shelving items called "the bars", "stiffeners", "stringers" etc. depending on whom you talk to. In any case 14-16″ cross members are the size you need.

*5 Melville Lane, Great Neck, N.Y. 11023.

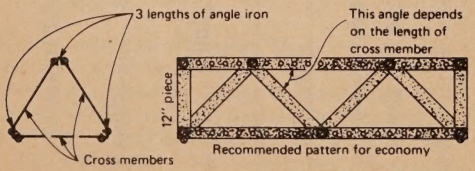


Fig. 2—Assembly details for the tower section.



Fig. 3—A climbing tower section. I would be extremely careful climbing a home-made tower such as this, but if you have the nerve!

To construct a tower section proceed as follows:

1. Decide on how high you want the sections to be.
2. Select angles of the proper length and attach the cross members between two angle iron's as shown with standard 1/4″ shelf hardware. For a climbing tower (not for me) use the patterns of fig. 3.
3. Bend an adequate number of additional cross members as shown in fig. 4 and attach the third angle.

To join the various sections you will have to cut short pieces of angle as shown in fig. 5. These can then be bolted between sections to join them. In cases where the holes don't exactly line up you may have to drill out the joining pieces to allow the screws to clear. Be certain to use at least four holes on each section and run screws for the various cross members, etc. through the joining section.

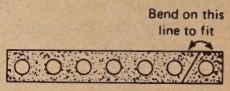


Fig. 4—Bending for attachment to third section.

Be absolutely certain that all screws are as tight as possible. It is even advisable to use hex head bolts, nuts and lockwashers for added strength. Once you have finally assembled the number of sections you desire it will be necessary to mount your creation in some manner. Our requirements were on a flat roof (20 foot tower height) and the tilt over method shown in fig. 6 fit the bill perfectly. Be certain to use the largest hinges your local hardware store can supply as the torque at the mounting point is tremendous. Also, do not skimp on the screw eyes or turnbuckle.

The base plate is bolted through the roof to the beams in our unit, after coating the bottom of the plate with roofing cement to prevent any leaks from occuring.

Another way to mount the tower would be to the side of a house or chimney without the tilt over feature.

If a mount on the ground is desired, the

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hinge method could probably be adapted between sections, and then one half or more of the bottom section should be buried in the ground and the hole filled with cement. Mounting details for antennas and rotators are not given as there are so many possibilities and different styles. A good look at the TV antenna mounting hardware section in a local hardware store, department store or radio TV distributors catalog will offer the exact solution toward a custom mounting method.

After completion, the entire assembly should be given a couple of coats of rustoleum or other rust-inhibiting paint as it is made of steel and can corrode. I would paint everything including the nuts and bolts.

A 20 foot tower carefully made in this manner will be essentially free standing but, being a rather cautious person I would suggest that you guy this thing no matter how high you make it.

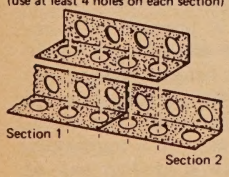


Fig. 5—Method of attaching sections.

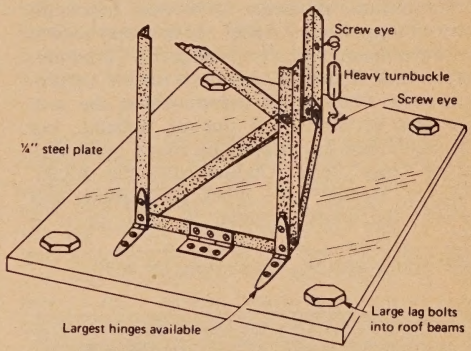


Fig. 6—Tilt-over base mount.

Best of all—the materials are readily available from just about any used business equipment company or scrap-metal dealer and will cost a very small fraction of the price of a commercial tower. Even if you must purchase the materials brand new (and you should be ashamed of yourself if you do) the prices of these shelving items will still amount to a third or less of a ready made tower.

Just one final word of caution. Please be extremely careful, the angle irons are very heavy

[*continued on page 82*]

NOVICE SHACK

BY HERBERT S. BRIER,* W9EGQ

Getting Ready For The Communicator License

It was semi-officially predicted in July that the new Communicator license will authorize repeater and simplex operation in the 144-MHz band, whatever other privileges may be granted. Also that the changes in amateur regulations generated by FCC Docket No. 20282 will start in October. These predictions do not guarantee that the FCC will start issuing Communicator licenses in October if for no other reason that it is already 12 weeks behind in processing present licenses. Nevertheless, it is time for potential Communicators to learn something about the v.h.f.'s that they will be using. Starting with this column, we will try to include information about them in these pages each month.

We do not know whether the FCC will grant Communicator privileges to Novices automatically as suggested by ARRL. If not, they should not have much difficulty passing the Communicator exam, if they take time to review a Communicator study guide before taking the test. The test certainly will not be difficult, but overconfidence has tripped up many applicants taking "easy" tests. Undoubtedly, the ARRL "License Manual" and other publications will publish the study material as soon as it is available. In the meantime, we recommend obtaining and reading an amateur v.h.f. handbook.

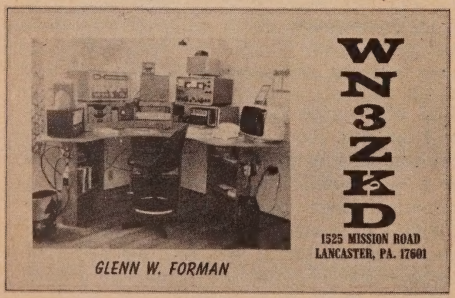
We like the *VHF Handbook For Radio Amateurs,* by Herbert S. Brier, W9EGQ, and William I. Orr, W6SAI, available from Radio Publications, Inc., P. O. Box 149, Wilton, CT 06897, for $6.20, postpaid, or from many amateur distributors. Also good are the *VHF Handbook* and *FM and Repeaters* from the American Radio Relay League Inc., Newington, CT 06111. These books give us an overall picture of the amateur bands above 30 MHz where some dedicated amateurs communicate over fabulous distances on code and s.s.b. phone by using high power transmitters, huge high-gain beam antennas; and super-sensitive receivers and expedients such as bouncing their signals off the moon and meteors shooting across the sky, or relaying them through OSCAR amateur satellites orbitting the earth every two hours. Some of these activities will be beyond the reach of Communicators until they earn a Technician or higher grade license. But they can join the majority of v.h.f. amateurs in their enjoyment of f.m. (frequency-modulated) phone using low-power transceivers no larger than a fair-sized book and simple vertical antennas installed in their homes and automobiles. The distances worked seldom exceed 100 miles, except under unusual atmospheric conditions, but the pleasures of f.m. communications are not measured in miles.

The big advantage of f.m. is freedom from noise. After an f.m. signal exceeds a critical threshold level at an f.m. receiver, it is received with virtually no noise. In contrast, an a.m. signal of equal strength would probably be readable but would be accompanied by static crashes and any man-made noise pulses striking the receiving antenna. Most noise "looks like" a.m. signals; so the a.m. receiver reproduces it. In an f.m. receiver, however, the received signal is fed to a "limiter" stage that chops off all noise pulses stronger than the signal before it is fed to the f.m. detector which removes the f.m. intelligence from the signal and sends it to the loudspeaker. To answer an obvious question: f.m. is not used extensively in the lower frequency amateur bands; because, for optimum noise reduction, f.m. signals occupy 10 times the channel space of an s.s.b. signal; and there is not that much room on the lower frequencies.

Equipment And Operation

It would be wise for a prospective Communicator to wait until the official word on the specifications it must meet before ordering any equipment. In general, however, practically all amateur f.m. operation is with crystal-controlled transceivers. They employ a multi-position crystal switch to switch in another pair of

*409 South 14th St., Chesterton, IN 46304



The home-constructed operating console of Glenn Forman, WN3ZKD, excites such favorable comment from those that see it, we thought you would like to see it, too.

crystals when it is desired to switch to another channel. Transmitter power is normally a nominal 10 to 15 watts output, and antennas are usually omni-directional, ¼, ½, or ⅝-wavelength verticals, primarily for ease in working mobile stations.

The *VHF Handbook* describes a number of suitable antennas you can build. And they are not too expensive, ready made. Two good rules to observe in erecting v.h.f. antennas are put them up as high as you can and use the shortest length of the best coaxial cable you can afford to feed them. RG-8A/U is satisfactory.

Most f.m.'ers flip on their units as soon as they enter their radio shacks or cars to monitor their favorite channel. Crystal control eliminates the necessity of tuning for stations. If a station is on channel and in range, it will be heard. Crystal control also makes it unnecessary to call "CQ" to make a contact. Instead, the operator presses his microphone button and asks, "Is there anyone on frequency. This is XX9XXX. Over." The response can be, "Hello XX9XXX. This is YY9YYY. Over." It is nerve wracking (to other people, at least) to listen to a continuous rushing noise from the loudspeaker when no one is transmitting; therefore, all modern f.m. communications units are equipped with "squelch" circuits on their receivers. The squelch circuit, which is an electronic switch, disables the receiver loudspeaker when no readable signal is in range of the receiver. When a signal pops on the channel, however, the "squelch circuit" immediately unlocks, and the signal is audible from the loudspeaker. A panel control adjusts squelch sensitivity from the point that it is inoperative to a point where only extremely strong signals will open it.

Repeaters

In its simplest form, a repeater is a station located in a central location operated by an amateur club or individual and equipped with high antennas capable of picking up a signal on one frequency and simultaneously retransmitting it on another frequency in the band. To communicate through a repeater, you and the stations you wish to work transmit on the repeater input frequency and receive on its output frequency. Repeater directories publish these frequencies for repeater stations throughout the country. Repeaters are invaluable to mobile stations and others with weak signals for any reason. Communicating through them improves the range of the latter many times.

News and Views

With one thing and another this response by **Jon Taute, WNØMNK** (13), 2314 South 40th St., Omaha, Nebr. 68105, to a letter from **Moe, WN3VLA,** published in News And Views in April is a little late in appearing. Jon says,

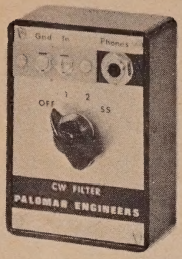


Thomas James Hoke, WN5NZH, 4805 Willowbend Blvd., Houston, TX 77035, has just started in 7th grade. He shares the equipment in the picture with his dad, K5ODZ, ex-HC1TH in Ecuador. Dad is stuffy about Tom using the linear amplifier until he gets his General ticket. Most of the QSL cards belong to the OM, too. The equipment includes Drake R-4B receiver, T-4XB transmitter, Heathkit control console, and Heathkit SB-220 2-KW PEP amplifier. Antennas are a 40-meter dipole and a Mosley TA-33-SR tri-band beam. We are sending WN5NZH a one-year subscription for CQ for submitting this winning photo in our Monthly Photo Contest. You are invited to enter by sending a clear picture (preferably black and white) of you at the controls of your station and information about your radio career to: CQ Novice Shack Photo Contest, c/o Herbert S. Brier, W9EGQ, 409 South 14th St., Chesterton, Indiana 46204. Non-prize winners will be published as space permits.

"You can tell that Moe, WN3VLA, is a Novice without looking at his call letters. There are a few things Moe didn't list about 'those Generals with their full gallons purposely congesting our Novice bands.' He says, 'They're not only knocking us out of our first DX QSO, but are also wiping out the few QSO's we do have.' " Jon's version, "teaching us how to pick up DX out of a pile up and to sharpen our ears and copying ability. They have just as much right to the band as we do, and I dearly welcome them. The main reason that Generals move into the Novice band is that they want to help us. They do one thing different than us Novices. They do not conduct 'Hello-Tnx-RST-QTH-name-73 type QSO's. Come one. Come all Generals, cuz we need the help!!!"

Floyd Gerald, WB5HVY, 4706 Washington Ave., Gulfport, MS 39501, contributed an article on working DX as a Novice much too long to print in our limited space; so we will pull a few goodies out of it from time to time. WN5HVY used a Heathkit HW-16 c.w. transceiver and matching v.f.o. and a 15-meter beam 50 feet high." The beam was a great help, but

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a beam is not a must. Randy, WB5JBW, using the same equipment and a dipole antenna worked almost everything I did and some that I didn't. A v.f.o. is also helpful, but I worked five of the six continents while my transmitter was crystal controlled. The big secret is to listen, listen, and listen! You can't work any station until you hear it. Next is patience to call the same station each time it signs off *after* a contact until you are heard."

Glenn W. Forman, WN3ZKD, 1525 Mission Road, Lancaster, Pa. 17601, has a photograph of his "Ham Shack" on his QSL card, which we print. He gets many favorable comments on his operating console, which he built for under $45, using ordinary hand tools. If you have any carpentry skill, you could probably duplicate it from the picture. Or Glenn might answer questions about it, if you include a postpaid reply envelope.

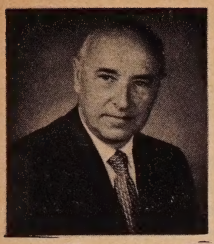
FCC Notes: Amateurs and prospective amateurs who have to write to the FCC in Gettysbury, PA 17325, for Novice, Technician, or Conditional examination papers, license renewals or modifications, be sure to send the letter to Box 1020 to bypass the logjam of CB applications. It will avoid weeks of delay. Prose Walker, W4BW, resigned as chief of the Amateur and Citizens Division of the FCC effective July 31, 1975.

Loren Noyes, W6MCV, 211 S. Verdugo Rd., Glendale, CA 91205, was 6LU in the Spark days and at 74 years of age, he studied for a new ticket and got on the air a month before he wrote. Because his grandson, a Novice for a year, had so much good luck with a 40-meter and a 15-meter dipole fed from the same feedline and running at right angles to each other, Loren put up the same type with equal success—s.w.r., 1.75:1 on 40 and 1.1:1 on 15 meters. A friend told them the 15-meter wire was "redundant," and Loren asked my opinion. Answer: a 40-meter dipole usually works fairly well as a 3/2-wave dipole on the 15-meter Novice band but with a fairly high feedline s.w.r. If your antenna works, leave it alone.

Remember. The success of *your* column depends on your contributions to "News And Views," suggestions, and entries in our Monthly Photo Contest. Send all mail to our new address, 409 South 14th St., Chesterton, Indiana 46304, for fastest service. 73, Herb, W9EGQ

Spread The Word

An eye-catching bumper sticker encouraging the man in the street to "Talk to the World—Become A Ham Operator" is available from *CQ* for 25¢ plus a legal-size s.a.s.e. Quantity prices upon request. Write to: *CQ*, 14 Vanderventer Av., Port Washington, NY 11050.



DeWitt In Focus

BY BILL DeWITT,* W2DD

IN SSTV as in printing, lithography, photography, Xerography, or other image reproducing systems, there is a need for some means of measuring the maximum number of discernible black and white lines that can be reproduced within the dimensions of the image.

Resolution is the term used to describe this resolving capability of an image reproducing system. It is obvious that a two dimensional image will have horizontal and vertical resolution and that these values may or may not be the same.

I have never seen any published information regarding the use of resolution test charts to measure or estimate the resolution of the MacDonald SSTV system, and to the best of my knowledge, there are no charts designed for this purpose available.

Because most SSTVers are concerned about this important quality of their picture transmissions and are seeking a means of measuring or comparing the performance of their cameras, monitors, etc., it seems that a brief review of the subject is in order.

The following comments relate to directly viewed SSTV images, i.e., no scan conversion is involved. To avoid confusion with other resolution measurements, it should also be understood that the space between two black lines is considered a white line—and that all lines (white and black) are counted.

The vertical resolution of our SSTV system can be defined as the maximum number of black and white lines that can be resolved within the height of the screen image. See fig. 1. The nominal 120 line scan per frame obviously limits the vertical resolution to a value approaching 120 lines (or 120 lines, should they exactly coincide with the scanning trace).

The horizontal resolution of an SSTV image can be defined as the maximum number of black and white lines that can be resolved within the horizontal expanse of the raster. See fig. 2.

*2112 Turks Hill Road, Fairport, NY 14450.

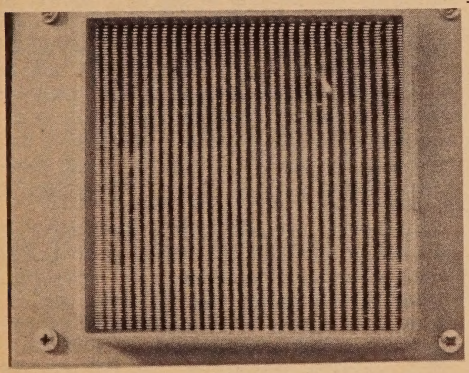


Fig. 1—The vertical resolution of an SSTV image.

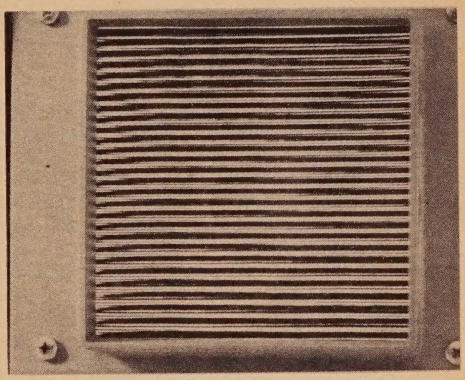


Fig. 2—The horizontal resolution of an SSTV image.

In view of the 1:1 ratio of our system, and recognizing bandwidth considerations, horizontal resolution is generally thought to have a limit of about 120 lines. At this point I am trying to verify tests that indicate somewhat better capability. More on this later.

In broadcast television, a resolution chart such as the one shown in fig. 3 is used to check system performance. (In addition to many other tests!) The numbers on the chart indicate the number of lines per picture height when the test pattern exactly fills the camera field. Resolution is measured by an observer viewing the monitor screen from a distance four times the height of the screen.

The resolution of the system equals the number of lines still clearly discernible in the wedge pattern at a point just before they start to blend together. Depending upon the system used, commercial TV resolution ranges from 250 to over 600 lines.

The BC/TV resolution chart shown in fig. 3 is not satisfactory for use in our SSTV system with its 120 line non-interlaced frame. Virtually

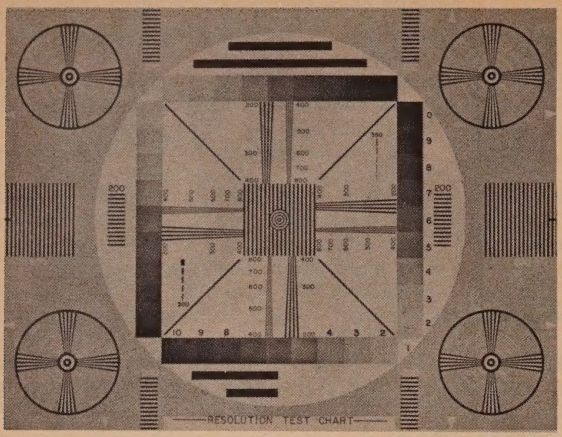


Fig. 3—A broadcast television resolution chart.

all detail is lost when we try to show it on an SSTV monitor. See fig. 4. We need to zoom in on the line patterns and get down to fewer lines per picture!

In fig. 5 you can see that I've taken parts of a BC/TV chart and pasted them together to make a strip 12.5cm long. Why 12.5cm? Well, it just happens that the black and white lines on this strip are 1.25mm wide, so there are 100 of them in the 12.5cm length of the strip. We don't need a strip 12.5 cm long for a test chart, but if we use the same line *rate* in a test chart that is 12.5cm square, we can see how the system reproduces a 100 line pattern. *(If the test pattern exactly fills the length and width dimensions of the camera field.)*

By the same token, if we include a wedge pattern that has lines 1.25mm wide at one end and 0.7mm wide at the other, we can see where the system begins to fail in the range between 100 and 179 lines per picture.

These features are included in the simple SSTV resolution test chart shown in fig. 6. This chart is exactly 12.5cm square.

To complete this review of SSTV resolution, let's take a look at fig. 7 which shows how our system treated the chart. The herring-bone pattern caused by the lack of interface makes it difficult to accurately estimate the vertical resolution. However, I would estimate from the wedge pattern that it is close to 120 lines.

So far as the horizontal resolution is concerned, the visual results exceed the theoretically possible values by about 10 per cent. Judging by the line detail showing in the wedge patterns, the horizontal resolution appears to be about 130 lines per picture* versus a calculated value of 118.8. Why this disparity exists is a point on which I hope to have more information in the near future. In the meantime I would like to hear from anyone else who has made an effort to physically measure the resolution of our SSTV system.

Some of the uses of resolution charts were described in my August column. With the advent of scan conversion there will be new opportunities to use this kind of a tool for comparing system differences. I plan to make some minor revisions to the simple chart shown above prior to offering it in printed form at a nominal price to *CQ* readers. If enough interest is shown, we'll print up some charts with a space for your own call letters and location.

I am fully aware of the multiplicity of variables that have been ignored in describing the use of the charts mentioned here. For the sake of brevity and because of the large variety of gear in use, one can only assume that the operating characteristics and condition of equipment to be used in similar experimentation will be reasonably good! There is an obvious need for either electronic or physical test devices to ensure the correct performance of cameras and monitors. Perhaps Dr. Suding can work something for this purpose into a microprocessor program.

A few final comments on this subject. Lest anyone get the idea that there is a "sacred tablet" significance attached to the 12.5cm dimensions of the SSTV resolution test chart—the size was chosen in consideration of the line

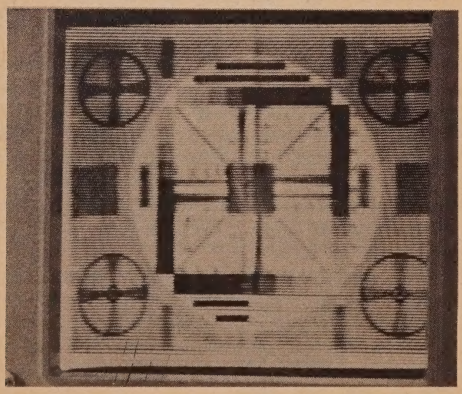


Fig. 4—Almost all detail is lost when a BC/TV resolution chart is shown on SSTV.

*Due to a typographical error, this was reported to be 150 lines in my Aug. column.

pattern available from the BC/TV chart mentioned earlier. Other line rates and dimensions could be used.

Before making up the SSTV chart I asked for suggestions from a number of knowledgeable SSTVers. Some of their suggestions have been included in the chart. It is my feeling however, that one chart cannot serve all purposes. A useful gray scale chart, for example, should occupy at least a third of the screen, better yet, *all* of it. To check for distortion, you really need a pattern of several circles or squares. So the emphasis in this chart is on simplicity and usefulness for one purpose. If you have thoughts on how to improve its effectiveness in measuring resolution I would welcome your suggestions.

Needless to say perhaps, I have made some resolution tests on scan converted SSTV images. Photographs of these images and a discussion of the interesting effect of interlace (as introduced by a storage tube scan converter) will be included in an early issue.

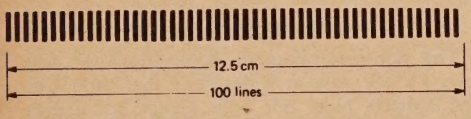


Fig. 5—A composite test strip made from a BC/TV chart 12.5 cm long. This strip has 100 lines.

How To Add Some Sparkle To Your SSTV "Programs"

The present state of the SSTV "art" is sufficiently advanced to permit the transmission of excellent quality pictures. Unfortunately, it's only once in a while that one sees some good quality stuff coming in on the tube. What's the reason? Sometimes I get the impression that it's just lack of coordinated effort, or a piece-meal approach to making up a tape. (I include myself in this observation!) A recent letter from Hal Godfrey, W6EYY, of San Carlos, CA. explains how you can get away from this haphazard habit and create an interesting program for your avid viewers.

Hal's got it all organized. He uses a standard card size for his photos, cartoons, or graphics. A simple jig holder that lies flat on the desk top makes it easy to insert or remove the cards. The camera is mounted vertically and generally stays at one distance from the subject. Now, with Hal's permission, here are some excerpts from his letter.

"First, use your imagination to diversify and improve your subject matter. In addition to photographs of your family, pets, home, gear, antenna, and any outstanding vacation scenes (like the Eiffel Tower!), give some thought to

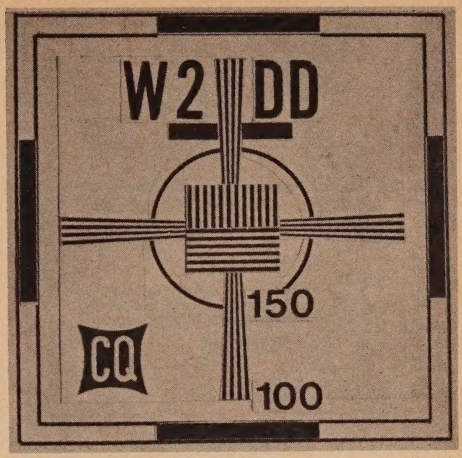


Fig. 6—A simple SSTV resolution test chart. The chart is exactly 12.5 cm square.

cartoons. Okay, so you're not a commercial artist and you can't even draw a straight line with a ruler. Don't worry, you *can* create something personal, humorous, or representative of where you live. It's *easy!* Just condition yourself to "think SSTV". Every newspaper, every magazine, in fact every publication has material which can be used for SSTV. Keep an eye out for pictures and cartoons that you may wish to use.

"Professional lettering can be cut from old magazines. Cartoons can be re-drawn using carbon paper or free hand sketched. Heavily accent all your art work with a black felt pen.

"If your location has a scenic site (like the Golden Gate Bridge), you can use a locally

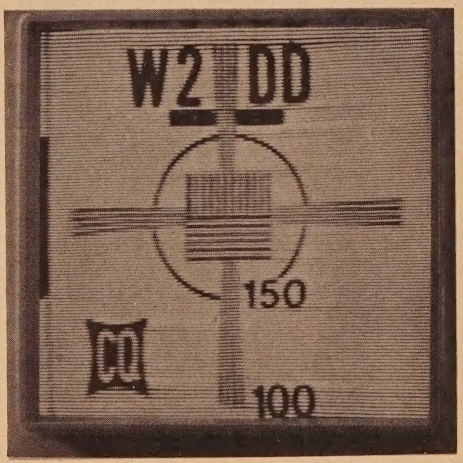


Fig. 7—How the author's SSTV system treated the chart depicted in fig. 6.

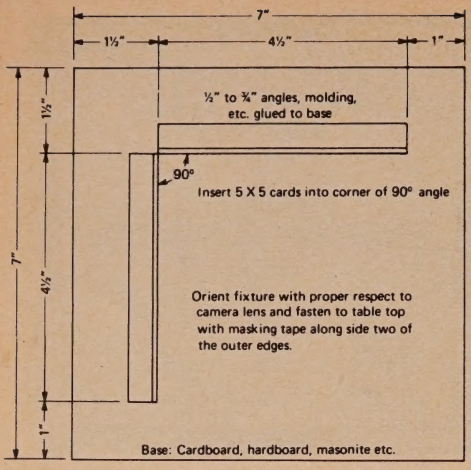


Fig. 8—An SSTV positioning jig designed and used by Hal, W6EYY.

available postcard of the site with 'QTH IS' pasted appropriately on the card to give good composition. But use *big enough letters* because QRM plays the devil with itsy-bitsy print via slow scan. This'll give you the idea, and remember, *everything* goes on those cards."

Hal standardized on a 5" × 5" size card. This size card is easily made from standard 5 × 7 unlined cards. These dimensions will fill the monitor raster when a 25mm focal length macro-lens equipped camera is approximately 14" from the subject matter, so the camera can remain in one position.

The jig used to hold the cards in place can be constructed using a piece of heavy cardboard and some strips of angle aluminum as indicated in the sketch, see fig. 8. The angle strips are just cemented to the cardboard.

Mounting the camera and lights vertically



Fig. 9—Hal, W6EYY's desk top unit for SSTV "programming."

may present a bit of a problem unless you have a sturdy tripod or wall mount. However, the accompanying photo should be helpful in arriving at a solution. See fig. 9. There is an advantage in having the camera and jig combination at one side or the other of your operating desk —from the standpoint of space.

In actual practice, Hal uses a 75 watt photoflood reflector type lamp in a gooseneck fixture. He controls the lamp brightness with a Variac. This means that after his preliminary camera adjustments, he uses only the Variac to compensate for the nature of the subject matter.

Hal prefers to make "live" transmissions with selected subjects rather than use taped material. His standardization of cards and operating methods makes it easy for him to tailor each "program" transmitted for the particular QSO. However, he did make up a demonstration tape for yours truly, and I must say that it was very smooth—no flubs, no partial frames, no loss of synch! And, it was fun to watch. After much talk about photos via SSTV, I should include one of Hal's but I can't resist showing you his clever station ID!

Non-Entertainment TV

The non-entertainment applications of fast scan TV are now so widespread that little kids and oldsters alike not only accept but expect the presence of the big eye at parking lots, banks, schools, sports affairs etc. Here are two good examples of how television can or could assist physically handicapped individuals.

My Mother-in-law's eyesight has deteriorated markedly during the last few years. The problem is not correctable. She is unable to read anything written or printed in much less than one inch letter size. She recently acquired a *Visual-Tek Miniviewer* with a 12 inch screen. It is a closed circuit TV camera/monitor combination that makes it easy for near-blind people to read books, letters, newspapers, etc.

The human engineering of this device is nicely worked out so that the user can easily position the material he wishes to read on a sliding platen under the viewer. There is a diffuse light source above the platen to provide even illumination of the subject material. The display can be either positive or negative, and super contrast can be secured by adjustment. (I believe that the usual clamping of blacks is eliminated in the monitor.) Probably the best feature of the unit is a zoom lens that covers the range from 4× to 40× magnification. Folded optics (with prism) make the device very compact. It's only slightly larger than a "regular" 12 inch portable.

The use of the Visual Tek Miniviewer has made it possible for my Mother-in-law to read all of her incoming mail and write notes or

[*continued on page 82*]

DX

BY HUGH CASSIDY,* WA6AUD

THE most-wanted country list for DXCC keeps a lot of DXers waiting for the day to arrive when one or more will be on the air but the possibility for many seems remote at this time.

There have been some deletions or impending deletions of the wanted list with 8Z4-Saudi/Iraq Neutral Zone; AC3-Sikkim; AC4-Tibet and Blenheim Reef either disappearing or possibly on the verge of going off. Hope for the long needed Bouvet, Clipperton, South Sandwich, Burma or Kamaran would seem to be a rather thin hope with not even some solid possibilities of these being heard recently.

Bouvet has an automated weather station which periodically needs servicing. The high winds which rake the island may always be a problem though the indicators are that landings are not too difficult on the northwest portion of the island. In recent years queries to possibilities for South Sandwich have brought no encouragement that anyone may be going there in the near future but this and others may develop on short notice. Heard Island is moving up on a lot of wanted lists with the last sustained action being VK0HM back in 1970, Hugh Milburn, WA6EAM, being active on the island for several months. Heard is another site of an automated weather station for the Australian government and the possibility of operations there for any long period is another long chance at this time.

There is always the possibility that some of the top ones on the needed list will show unannounced but it would seem that this would be a remote possibility. In most cases they can be expected to be well advertised before hand through a number of sources. However, there is always the possibility of a non-DX type finding himself on one of these spots and deciding to see if there might be any one around with whom he might talk. The big operations in the last several years, operations such as Kingman, Bajo Nuevo, Aves, Manihiki, Tokelaus, Spratly, Mt. Athos, Albania, Abu Ail and many others, have not come without warning and there was plenty of advance notice. In recent years JY may have been the only one which surfaced without any advanced warning and the interest of JY1 in amateur radio must be regarded as the reason why JY-Jordan has been back on the air.

In some instances it has been decades or longer since some of these most wanted ones might have been heard. Possibly it will be a long time before some are heard again. However, this probably will not deter DXers one bit from their watch for these countries and the hope that they will be heard.

*77 Coleman Drive, San Rafael, CA 94901

The WAZ Program
Single Band WAZ

20 Meter Phone

14 ..... K6GA

S.S.B. WAZ

1276 ..... K6GA
1277 ..... JA8QX

C.W.—Phone WAZ

3860 ..... VE3FLE
3861 ..... WB9LHI
3862 ..... ON5KD
3863 ..... SP8SR
3864 ..... OK3KFF
3865 ..... OK3KAS

Phone WAZ

507 ..... K6GA

Complete rules for the Single Band WAZ program appear on pgs. 57-58 of the December, 1972 issue of *CQ*. Complete rules for regular WAZ are found beginning on pg. 46 of the April, 1975 issue. Application blanks and reprints of the rules for all WAZ awards may be obtained by sending a self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

Hutt River

VK4ABA, Ed DeYoung, has been invited by Prince Leonard of the Hutt River Principality



John Kroll, WA8TDY, is the newest member of the CQ DX Advisory Committee. He represents the Michigan DX Association. John has been well-known in DX affairs for many years and holds WAZ, WPX and DXCC. He is QSL Manager for DU1FH (1971 WPX 'Test and 1972 ARRL DX 'Test), FC2CH, FG7TD, FM7AA, HD1RF, HD1QRC, HD0QRC, HC1EE, HC1EE/HC5, HC1MM/HC5, HC5EE, HL9WC, HU2CN, HU0A, KS4KZ, KZ5JF, KZ0WPX, VP2AR (1972), WB8ABN/HC0, WB8-ABN/HC5, WA6JZL/TI2, WC8ITU, KT8ITU, KE8-ITU, YS2CEN, and YN0HSM (1972).

WPX HONOR ROLL

The WPX Honor Roll is based on confirmed *current* prefixes which are submitted by separate application in strict conformance with the *CQ* Master Prefix List. Scores are based on the current prefix total, regardless of an operators all-time prefix count.

Mixed

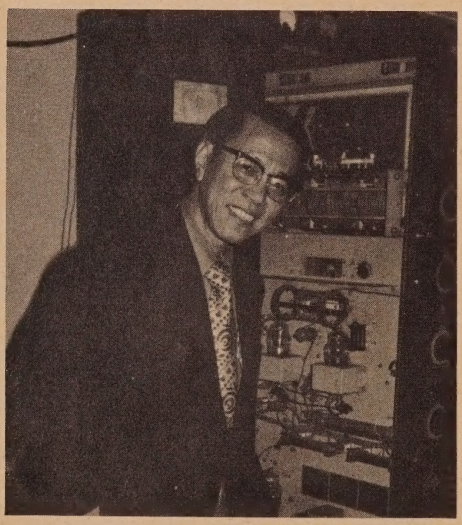
W4LRN 1425	YU1BCD 1066	WA2EAH 900	SM7TV 822	CT1LN 749
WA6MWG 1276	W4BQY 1058	WA5VDH 896	W3YHR 818	WA5LOB 749
F9RM 1187	W3GJY 1052	I6SF 893	W6NJU 811	PY4AP 735
W2NUT 1183	PAØSNG 1017	YU20B 881	W9WHM 811	KØBLT 733
W8LY 1165	WA6GLD 1001	W4WSF 877	IØJX 803	WA1JMP 727
W6TCQ 1157	YU2DX 995	DL1CF 872	SM6DHU 803	K7NHG 719
VE3GCO 1142	W9FD 984	K2AAC 863	K6ZDL 802	WA6EPQ 713
W4CRW 1140	WB4KZG 980	W4BYU 859	IT9AGA 791	PAØVB 706
W3PVZ 1138	YU1AG 957	WB4SIJ 853	K2ZRO 782	W9ZTD 700
W8ROC 1111	W4IC 950	G3DO 849	K4KQB 769	WAØCPX 693
DJ7CX 1102	DL1MD 940	W6ISQ 847	JA1AG 765	WA6TAX 655
WB2FMK 1100	WØAUB 929	WA6JVD 836	K8UDJ 750	
ON4QX 1088	K6SDR 914	WAØKDI 824	WØSFU 750	

C.W.

W8LY 1150	W9FD 903	VK3AHQ 809	K2AAC 736	VO1KE 650
W8KPL 1064	W2HO 885	WA6JVD 803	SM5BNX 706	WA2HZR 650
DL1QT 995	YU1BCD 883	W3ARK 800	I6SF 702	K2ZRO 649
W2AIW 972	DJ7CX 841	VO1AW 798	K6ZDL 699	K1LWI 629
WB2FMK 960	G2GM 840	W4BYU 768	OK2DB 693	VE4CX 600
WA6MWG 946	K7ABV 812	YU1AG 760	W6ISQ 685	OK2QX 600
ON4QX 920	W6TCQ 811	W4IC 754	WA5VDH 675	

2 × SSB

W4NJF 1200	HP1JC 954	DL1MD 858	W3YHR 793	W6YMV 720
F9RM 1135	CT1PK 923	DK2BI 856	OE2EGL 780	WB6DXU 708
IØAMU 1061	PAØSNG 908	IT9JT 833	G3DO 765	WA6TAX 705
W6TCQ 1015	F2MO 904	YU1BCD 824	OK1MP 763	CX2CN 702
WA6MWG 1008	I8YRK 900	W6RKP 822	WB4SIJ 763	W2EHB 700
W9DWQ 987	I4ZSQ 893	W3DJZ 818	DJ7CX 752	WB4KZG 700
I8KDB 985	WØYDB 884	PY3BXW 808	WA2EAH 750	WA5VDH 691
IØZV 982	K2POA 883	WB2NYM 806	WA5LOB 747	CR7IK 613
DL9OH 954	ZL3NS 874	W4IC 800	YU1AG 727	I4LCK 608



Tim Chen, BV2B, is very active most weekends on 20 m. s.s.b. on his favorite frequencies, 14.219 and 14.250 MHz. He has a long history in amateur radio, dating back to AC3WW in 1933 and XU6A in 1940. From 1956-1959 he held the call C3YW. He also operates c.w station BV2A on 14.040 MHz. *(Photo courtesy Tomo, JA3DWT)*

in Western Australia to visit during the Christmas holidays. Ed will seek to establish a permanent amateur station in the principality. Hutt River declared its independence from Australia in 1970 after a dispute over wheat quotas and proceeded to serve secession notices on the Australian government. Prince Leonard has created agents-general and consulates in many places outside Australia, including London, Vienna, South Africa, Canada and New Zealand.

VK4ABA says that application has been made to the ITU for a prefix allocation. There have also been inquiries made on DXCC status for the Hutt River Principality.

Brunei

Maurice Caplan, VS5MC, has left Brunei on a trip that will take him to England and should have brought him to the Reston Convention in September, to the W9 DX meeting in September and to the W1 DX meeting this October at Waltham, Mass. VS5PM is currently active from Brunei, often found on twenty c.w.

Rodriguez

3B8DA, Alex Mootoo, was headed for Rodriguez early in August to put in a tour of duty there. Alex reported that the home equipment was too heavy to attempt to take to Rodriguez

but that he would attempt some operations during his visit to give out some 3B9 QSOs. Alex notes that he has no stateside QSL Manager and QSLs for 3B8DA should go directly to him with s.a.s.e. and IRCs.

3B8DL, Roddy Prayag, has also mentioned the possibilities of some Rodriguez operations, his problem being that during the summer months he does not have access to any transmitter. WA5ZWC shipped an HW-16 to Roddy last July and c.w. operations should be available when Roddy travels in the future.

Some DX Notes

The PY7YS Fernando de Noronha effort of last July ran into almost complete equipment failure on the second day of operation, this explaining some of the questions on this effort.

SV1GA/A was another effort plagued with equipment problems with the TS-520 that was to be used in the mid-July operation damaged by high voltage applied to it, which affected one of the plate voltage capacitors. A trip was made to Athens for a replacement rig, this taking almost 48 hours. In spite of all these troubles over 4000 QSOs were made on this effort.

The CQ DX Award Program

C.W.

181.....YU3NP

2 × SSB

407.....OK1CFH

Endorsements

CW: YU3NP-150, WA2MBP-150. SSB: WA2MBP-150. Complete rules and application forms for the *CQ* DX Award Program may be obtained by sending a business size #10 envelope, self-addressed and stamped, to: CQ DX/WPX Awards, Box 3388, San Rafael, Calif. 94902.

Many DXers have been following the W4UMF/W3ASK articles on short-range forecasts of conditions, this development being noted by many as a significant aid to serious DXing. There was a period of improved conditions with considerable sunspot activity in early August but it is still felt that the bottom may not be reached in the present cycle until next year. There has not been a cycle since 1750 which did not hit 10 or lower before bottoming out.

The Arkansas DX Net meetings are on Mondays and Thursdays at 3815kHz from 0200Z and the Pacific DX net at 1426kHz from 0600Z most days. The International DX Net meets at 14250kHz from 0600Z and the YL SSB System at 14333kHz from 1700Z. The amount of DX that one can accumulate by regular attendance on these nets or information as to what is going on in DXing is often surprising. The Southern California DX Club Bulletin-of-the-Air is on Thursday at 0200Z at 14265kHz.



WAZ winner Sydney Lefton, G3ZBA, is a physician in Leeds, Yorkshire. In three years of DXing he has worked 296 countries using a KW Vespa, KW1000 and an Eddystone receiver. His antenna is a TH-3 at 50 ft. on a Versatower. Sydney has a XYL and four harmonics ranging from 5 to 17 years.

Bob Furzer, A2CCY, has been visiting about the country after an expected position in the Arkansas area did no jell. In August Bob was in California checking the action.

Dale Meade, WB8QMG, was operating with the unusual HK9 identifier from San Jose del Guaviare in Vaupes, Colombia. The area was only open to colonization ten years back and is mostly deep jungle. Dale believes that his is the only use of the HK9 prefix to date. He was signing WB8QMG/HK9 on Mondays from 2300Z around 14260kHz.

DE Extra

Should DXers Organize? Why not? Everybody else does. And you would hardly dispute the fact that it does get results.

And if you would want to know why DXer's need to organize, look about you in the year of the Bicentennial less one. With fees being



Recently qualifying for WAZ is Walt Seighman, WA3AXQ, of Belle Vernon, PA. Walt received his General ticket in 1964, his Extra in 1968 and operates 20 m. c.w. only using an HT-32A, 30L-1, and 75A-4. The skyhook is a 5-element 20 m. Telrex beam up 19 meters on a Tri-Ex tower.



If you have worked Sakae Tomogami, JA1ATF, at AC4TF (Tibet, 1941) and MX3M (Manchuria, 1939-1941), then you are certainly a very successful old-time DXer. Sakae was first licensed in Dec. 1930 as J7CG, and his second QSO was with W6FZY on 40 meters. His AC4TF was a DXpedition station, while MX3M was a regular call.

attached to your certificates and endorsements, is this not the year to put down your tea cup and stand firm at the bridges?

DXer's generally are disorganized. Local clubs that meet regularly are frequently divided . . . divided between the subject of DX and the social amenities. Perhaps it is time to get thinking of organizing to protect our home, our land and our DX.

You need not look much further than this last Spring to see how DXer's fare when someone is looking for the fatted calf. The dollar sign is plastered all over the DXCC. By a feat of tortured syntax, the decision was cast that DXer's will have to pay but if you send an application through a third party for checking, review or forwarding . . . such as BPL for instance, you are different and untaxed. To add further abrasion, it was noted that DX was termed one of 'the less beneficial activities' of Amateur radio.

Back in the mid-sixties, about 1969, the Northern California DX Club did propose a loose federation of DX Clubs to possibly take simultaneous action on matters of interest to DXer's. Let's face it. The weakness of the DXer under the present set-up is because they are lost in the multitude of other interest groups. If you have a problem, you tell your Director. He tells the other Directors what he believes your problem to be. Often, if the other Directors do not have input from their own area, they could care less. Maybe it might be a time to consider a change.

The proposal of the Northern California DX Club got a good response. Unfortunately, it was lost during a change over in officers and in those days most DXer's were fat and happy with a big bulge of sunspots. And no one was talking of taxation . . . taxation with little representation it would seem.

It might be time to again think along these lines. Certainly if a large number of DX Clubs were to press for the same goals it would have an impressive effect. Some may think that the

[*Continued on page 81*]

The WPX Program

Mixed

492.....W6CLM
493.....WB4TPU
494.....JH1VRQ

C.W.

1407.....OK3BDE
1408.....K2UPR
1409.....SP2BMX
1410.....SP7ATA
1411.....YO9HI

2 × SSB

861.....CT1RM
862.....PY1FI

VPX

91.....OK3BDE

WPNX

84.....WN2TVU

Endorsements

Mixed: WB4KZG-1050, PA0SNG-1150, K4KQB-800, SP9AI-650/700/750, W6CLM-550, WB4TPU-450.
C.W.: K8MFO-800, PAØSNG-600, SP1BHZ-550, K4-KQB-550, OK3BDE-350/400/450/500.
SSB: PAØSNG-1000, CT1RM-400, K4KQB-600, WA-2EAH-750.
80 Meters: OK3BDE, SP1BHZ.
40 Meters: OK3BDE, SP2BMX.
20 Meters: OK3BDE, SP7ATA.
Asia: JH1VRQ.
Europe: OK3BDE.
South America: LU9FAZ.
Oceania: JH1VRQ.

Complete WPX Rules may be found on page 67 of the February 1972 issue of *CQ*. Application forms and prints of the rules may be issued by sending a business sized, #10 envelope, self-addressed and stamped, to *CQ* DX/WPX Awards, Box 3388, San Rafael, Calif. 94902.



Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Oct.	4-6	W. E. Phone/C.W. Party
*Oct.	4-5	California QSO Party
*Oct.	4-5	Rocky Mountain QSO Party
*Oct.	4-5	VK/ZL/Oceania Phone
*Oct.	11-12	VK/ZL/Oceania C.W.
Oct.	11-12	Big 15 QSO Party
*Oct.	12	RSGB 21/28 MHz Phone
*Oct.	15-16	YLRL Anniv. C.W. Party
Oct.	17-19	Boy Scouts Jamboree
Oct.	18-19	WADM C.W. Contest
Oct.	18-19	RSGB 7 MHz C.W. Contest
Oct.	18-19	Manitoba QSO Party
Oct.	**25-26**	**CQ WW DX Phone Contest**
Nov.	1-3	CHC/FHC/HTH QSO Party
Nov.	1-2	RSGB 7 MHz Phone Contest
Nov.	3-9	ARCI QRPp C.W. Contest
Nov.	6-7	YLRL Anniv. Phone Party
Nov.	8-9	European RTTY Contest
Nov.	9	Czechoslovakian Contest
Nov.	8-9	ARRL C.W. Sweepstakes
Nov.	15-16	Missouri QSO Party
Nov.	22-23	ARRL Phone Sweepstakes
Nov.	**29-30**	**CQ WW DX C.W. Contest**
Dec.	6-7	Tops 3.5 MHz C.W. Contest
Dec.	6-7	ARRL 160 Meter Contest
Dec.	13-14	ARRL 10 Meter Contest

* Covered last month.

Big 15 QSO Party

Starts: 0001 GMT Saturday, October 11
Ends: 2359 GMT Sunday, October 12

This contest was organized by the Big 15 Club to increase membership in the Club and to stimulate activity on the 21 MHz band. Contacts are limited to 15 meters, phone and c.w., and you need not be a member to participate.

Exchange: RS(T), state, province or country, and name. Members include membership number.

Scoring: Contacts with stations in same country 1 point, other countries same continent 2 points, DX on other continents 3 points. (Inc. KL7 & KH6) QSOs with members count 10 points. Double your points if QSO is with Zone 15 and triple points on your 15th QSO.

Multiplier: Total of states, provinces and DX countries worked.

Certificates to all participants sending in a log. Include a large s.a.s.e. for copy of the results and membership card.

*14 Sherwood Road, Stamford, Conn. 06905.

Mailing deadline November 15th for North America and the 30th for all others to: Pete Palsen WN9PIC, 622 East 2nd St., Carlinville, Ill. 62626

Scouting's Jamboree-on-the-Air

Starts: 6:00 P.M. Friday, October 17
Ends: 12:00 P.M. Sunday, October 19
(Local Time DST)

This is the 18th annual worldwide Jamboree in which amateurs may assist in promoting Scouting fellowship on the air. It is also a fine opportunity to introduce amateur radio to newcomers. Individual amateurs and club stations may invite scouting groups to their station to contact similar groups at other stations. Interested stations should contact their local scout council and give them details of availability for the JOTA.

Frequencies: Phone—3740, 3940, 7090, 7290, 14290, 21360, 28990. C.W.—3590, *3740, 7060, *7140, 14070, *12140, 28190. (*Novice) Also 2 and 6 meters, (Above are calling frequencies.)

Logging Info: List all stations worked or heard in JOTA activity, time in GMT. Indicate if other station is a Scout, Scouter or has been either one. And how many Scouts or Scouters were present. Tally up the number of JOTA contacts, stations with Scouts or Scouters operators, and number who participated from your station.

Awards: The JOTA Certificate, designed by Hank Ketcham (Dennis the Menace) will be awarded to all participants, amateurs, Scout groups and s.w.l.s who submit a report.

Scout and Scouter amateurs are urged to participate with National K2BSA in the new informal nets Wednesdays from 2000 to 2300 on 3740, 3940, 7140, 7290 MHz, and on Saturdays from 1000 to 1400 on above frequencies plus 14290, 21140, 21360. All times local DST. If no activity is heard start some by calling "CQ Boy Scouts."

Logs and reports for the JOTA go to your National Organizer. In the USA it is Walter Maxwell. W2DU, c/o National Headquarters, Boy Scouts of America, North Brunswick, N.J. 08902

WADM C.W. Contest

Starts: 1500 GMT Saturday, October 18
Ends: 1500 GMT Sunday, October 19

We have not officially heard from the GDR but we feel reasonably sure that the following rules are OK. Use all bands 3.5 thru 28 MHz on c.w. only. There are 3 classifications, single operator, multi-operator and s.w.l.

Exchange: RST plus QSO no. starting 001.

Scoring: Three points for each DM/DT contact. Multiply total by sum of DM districts worked on each band. A district is identified by the last letter in the call, **not** by the number in the prefix. (A thru O, a maximum of 15

possible on each band.)

Awards: Will be in the forms of certificates. Contest QSOs may also be applied for the many GDR awards. WADM, DMCA, DMDXC and DMKK. More information available from the GDR.

Logs go to: Radio Club of the GDR. Att: DM2ATL, DDR 1055 Berlin, P.O. Box 30, German Democratic Republic.

RSGB 7 MHz Contest

C.W.—Oct. 18-19 **Phone**—Nov. 1-2
Starts: 1800 GMT Saturday
Ends: 1800 GMT Sunday

Like the 21/28 MHz phone contest this one is based on contacts between the British Isles and the rest of the world. However the scoring is different and also changed from that used in previous years. Only single operator entries are acceptable. Phone and c.w. are separate contests.

Exchange: RS(T) report plus a progressive QSO number starting with 001.

Scoring: Overseas stations in Europe score 5 points for each B.I. contact, those outside Europe score 50 points. In addition, all may claim a bonus of 20 points for each different B.I. country/number prefix worked. (G2, GC3, GD4 and etc. a max. of 36 possible) No bonus for GB prefixes. Just add your total QSO and bonus points for your final score.

Awards: Certificates to European entrants who make at least 50 contacts and non-Europeans with at least 10 contacts.

There is a s.w.l. section with scoring same as above except that the prefix bonus points is 50. Overseas stations log British Isles stations only.

The c.w. entries must be *received* no later than Dec. 15th and phone Dec. 29th. They go to: The HF Contests Committee, c/o John Bazley, G3HCT, Brooklands, Ullenhall, Solihull, West Midlands, England.

Manitoba QSO Party

Starts: 0001 GMT Sunday, October 19
Ends: 0300 GMT Monday, October 20

This is the second QSO party sponsored by the Amateur Radio Clubs of Manitoba. The same station may be worked on each band and mode, VE4 to VE4 contacts are permitted as are 2 meter simplex.

Exchange: QSO no., RS(T), name and QTH. City or town for Manitoba; state, province or country for others.

Scoring: One point per QSO. VE4's multiply by number of US states, VE provinces and DX countries worked. All others use number of Manitoba cities and towns worked.

Frequencies: Phone—3770, 3905, 7195, 7230, 14190, 14285, 21245, 21355, 28600. C.W.—3705, 7105, 14065, 21205, 28205.

Awards: Certificates to top scorers in each province state and DX country. Plaques to the highest scoring station outside Manitoba, and highest VE4. Additional awards if warranted.

Mailing deadline for logs is November 10th to: Doug. Bowles, VE4QZ, 1104 First Street, Brandon, Manitoba, Canada R7A 2Y4.

IARS CHC/FHC/HTH QSO Party

Starts: 2300 GMT Friday, October 31
Ends: 0600 GMT Monday, November 3

It is suggested you send a s.a.s.e. to K6BX for detailed information. Here are rules in brief.

Exchange: QSO no., RS(T), name, CHC/FHC no., state, county or similar division. Non-members omit no. and send HTH instead.

Scoring: *For CHC*—1 point per QSO with other CHCers, 2 points if its a HTHer, 1 additional point if its a YL, B/P, FHC, Novice, CHC 200, Merit or Club station, or if its on vhf/uhf. Double above points if QSO is out of own country. *For HTH*—Contacts with other HTHers 1 point, with CHCers 3 points, rest same as above. S.w.l. use same scoring as for HTHers.

Multiplier: Each continent, country, ITU zone and U.S. state. (counted only *once*)

Final score: Total QSO points from all bands times the sum of the multiplier. Multi-op stations divide score by number of operators. (The same station may be worked on each band and mode for QSO points but not multiplier).

Frequencies: C.W.—3575, 3710, 7070, 7160, 14075, 21075, 21090, 21140, 28090. Phone—3770, 3790, 3943, 3960, 7090, 7210, 7275, 14320, 14340, 21360, 21440, 28620, 28690. And 50.1 - 50.5, 145 - 147. For US and DX as allowed.

Awards: The party supports hundreds of certificates and trophies in all categories and divisions. A s.a.s.e. will get you a list. Include extra postage for ITU, IARU, IARC, IARS country, prefix and zone list.

Send all requests and your log to: International Amateur Radio Society, K6BX, P.O. Box 385, Bonita, Calif. 92002

ARCI QRPp C.W. Contest

Starts: 1300 GMT Monday, November 3
Ends: 2300 GMT Sunday, November 9

This is the 5th annual QRPp contest sponsored by the QRP ARC International, with emphasis on real low power, 5 watts or less output. The contest is open to all whether or not they are members of ARCI.

Exchange: RST, QTH (state, province or country) and QRP number. Non-members send NM and power in lieu of number.

Scoring: Contacts with members count 2 points, non-members 1 point. A station may be worked on each band for QSO and multiplier credit. There is also a power multiplier as fol-

lows: 15 if output is ½ watt (500 mw) or less, 10 if 2 watts, 5 if 5 watts, and no multiplier if over 5 watts.

Final score: QSO points × QTH multpilier × power multiplier.

Frequencies: 3540, 7040, 14065, 21040, 28040.

Awards: Certificates. 1. Top scorer world wide. 2. Highest scorer in each state, province and country. 3. Lowest powered station working 3 or more skip contacts.

Include a summary sheet with your log showing the scoring, equipment description and power used. Also a signed declaration that all rules and regulations have been observed.

Logs must be postmarked no later than December 10th and go to: Earl R. Lawler, W5JLY, Rt. 2, Box 24K, Burnet, Texas 78611

European RTTY Contest

Starts: 0000 GMT Saturday, November 8
Ends: 2400 GMT Sunday, November 9

The DARC has streamlined its WAEDC contest program to three basic contests each year. The dates are etablished as the second weekends of the month. August—CW, September—Phone, and November—RTTY.

Rules are the same for all three contests with one exception. In the RTTY contest contacts with stations in one's own continent are permitted and count 1 point per QSO, but they have no multiplier credit other than the countries outlined in the rules. Everything else remains the same.

Since the rules are quite lengthy, QTC feature, WAE country list and etc., it would serve no practical purpose to repeat the WAEDC rules recently shown in the July CALENDAR.

Copies of the rules, log and summary sheets can be obtained from the addresses below. Logs go to the same place. (s.a.s.e. please)

Mailing deadline is December 1st.

WAEDC Committee, D-895 Kaufbeuren, Postbox 262, Germany.

North American stations may send requests and logs to: H. E. Weiss, WA3KWD, 762 Church St., Millersburg, PA 17061

Czechoslovakian Contest

Starts: 0000 GMT Sunday, November 9
Ends: 2400 GMT Sunday, November 9

Rules are the same as previous years. Phone and c.w. is permitted. The same station may be contacted only once on each band for QSO and multiplier credit.

This is a world-wide type contest but QSOs with Czech stations have additional value. OK stations are looking for more state-side and Canadian activity and entries.

Categories: Single operator, both single and all band. Multi-operator all band only.

Exchange: RS(T) report plus two figures indicating your ITU zone. (List and map available from C.R.C., s.a.e. and 2 IRC)

Scoring: One point per QSO, 3 points if its with a Czech station. Contacts with own country permitted for multiplier credit but have zero QSO point value. Multiply total by sum of ITU zones worked on each band for final score.

Awards: Certificates to the top scoring stations in each category in each country.

The "100 OK" and "S6S" awards are available for contest contacts upon written application with your contest log.

Mailing deadline for your entry is December 31st to: The Central Radio Club, P.O. Box 69, 113 27 Praha 1, Czechoslovakia.

Missouri QSO Party

Starts: 1800 GMT Saturday, November 15
Ends: 2300 GMT Sunday, November 16

This is the 12th annual party sponsored by the St Louis A.R.C. Special effort will be made to activate rare Missouri counties.

The same station may be worked on each band and mode, and Missouri mobiles from each county change. Mo. stations may work in state stations for QSO and state multiplier.

Exchange: QSO no., RS(T) and QTH. County for Missouri, state, province or country for all others.

Scoring: One point per QSO. Mo. multiply total by sum of states, provinces and DX countries worked. Others use Mo. counties for their multiplier. (max. of 115) Mo. mobiles total separate score for each county activated

Frequencies: 60 to 70 kHz up from low end of each band, phone and c.w.

Awards: Certificates to top scorers in each state, province and DX country, the top 10 Missouri entries, and the top 3 Mo. mobiles.

Mailing deadline is December 15th to: The St. Louis A.R.C., KØLIR, 842 Tuxedo Blvd., Webster Groves, Missouri 63119. Include a s.a.s.e. for copy of results.

CQ World Wide DX Contest

Phone: Oct. 25-26 C.W.: Nov. 29-30
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

Rules in details appeared in last month's issue, no changes from previous years. A reminder however, the ARRL and DARC WAE country lists are the standards to determine your multiplier. The latest WAE list will be found on page 62 of the July issue.

We would rather have your original log but if you do recopy it make sure it stays in its original form, showing the duplicate contacts if any, but of course no credit taken. Make sure your name and address appears on your summary sheet, keeping in mind that it should be one that is good for at least 10 months after the contest.

Not necessary to use official *CQ* log forms but its desireable if possible, especially the sum-



GIANT ALBATROSS SALE

(or Marc Gilman where are you?)

A week or so before the announced size change in the amateur radio magazines a truck backed up and unloaded scads of old sized binders fresh from the manufacturers. This was of course the first of a two truck shipment, so we anticipated literally scads more to inundate us. Well, once you've made several hundred stack tables, desks, plant stands, Japanese style bridges you're still tripping over the remaining boxes of binders. We would like to sell them preferably before the trucks come back with the newer sized binders.

Here's your chance to organize your back issues, make points with the XYL on neatness, save some money, and help us find our mailboy Marc who was last seen trapped behind some heaps of binders. For as long as they last, you can take them off our hands (and Marc's body) for the low price of:

3 for $8.50 Postpaid

Use the order form below (as soon as possible) and you'll be happier being able to find every issue of CQ, we'll be happier just being able to move around the office and Marc's wife will be happier having someone to put out the garbage.

CQ Magazine
14 Vanderventer Ave.
Port Washington, NY 11050
OK, I'll do you a favor and take___ binders off your hands.

Name _____ call_____

Address _____

State _____ Zip_____

mary sheet. A large s.a.s.e. will get you a supply.

Mailing deadline for Phone entries is Dec. 1st, and Jan. 15th for the c.w. section. To *CQ* World Wide DX Contest, 14 Vanderventer Ave., Port Washington, L.I., N.Y. USA 11050. Please indicate Phone or C.W. on the envelope.

Editor's Notes

The Western Electric party information was not received in time to cover in details, however Bill Barr, K4KZP can give you all the information, he is co-ordinator of the affair.

The United Nations ARC will have their station K2UN at the New York headquarters on the air during the WW phone section of the contest. Max, HB9RS president of the club has asked ARRL for separate country status. That of course is a very remote possibility, but you never can tell so don't pass up a contact if you hear them.

We, Anne and I, had a most enjoyable stay in Bermuda back in July. It was not by accident that our stay coincided with the date of the annual "Barbecue" the VP9 boys have each year. This one was held at John Young, VP9HL's home. Any superlatives used would not be adequate in describing the beautiful surroundings, the scrumptious steak dinner and the hospitality of our host and hostess and the members of the Bermuda Radio Society. We had a delightful time.

It was good to meet so many of the VP9 boys, especially Jim 9BY, Dave 9HP, Frank 9GR and Al 9AD who helped make our stay so enjoyable. And also Ted, VP9EP who made it so easy for me to get on the air and make some of the boys back home happy. Especially Vic W1NU who chalked up his 197th VP9 station when he worked W1WY/VP9.

By the way, the 1975 winners in the Bermudian Contest are Pete Butler, W1BPW and B.V. Marshall, G3RUX on c.w., and John Kenny, W1CMH and O.S. Chilvers, G3JOC on phone. They'll be making the trip to Bermuda this month. (Lucky dogs).

73 for now, Frank, W1WY

For $7.50 you can get 7½ issues of CQ at your newsstand when they're not sold out, and if the dealer wants to rip an issue in half. The trouble is which half will you wind up with, the beginning of an article or the end, the top half or the bottom? In any event you are still missing 4½ great issues of CQ.

For the same $7.50 you can subscribe to CQ and get twelve complete issues with every page intact. Now we ask . . . which is better?



Propagation

BY GEORGE JACOBS,* W3ASK

DX CONTEST SPECIAL

The 1975 *CQ* World Wide DX Contest will be held on the following dates:

Phone Section: 0000 GMT October 25-2400 GMT October 26

C.w. Section: 0000 GMT November 29-2400 GMT November 30

For the 25th successive year, this month's *Propagation* column contains a special forecast for use during the Contest sections, both phone and c.w.

Sunspot Activity

A short-period increase in solar activity during this past July and August has further slowed the present sunspot cycle's progress towards its minimum value.

The Swiss Federal Observatory at Zurich, the world's official keeper of sunspot records, reports a mean monthly sunspot number of 28.3 for July. Spots were visible on the sun's surface every day during the month, with a peak count of 49 occurring on July 13. This results in a smoothed sunspot number of 23, centered on January, 1975.

A smoothed sunspot number of approximately 12 is now forecast for October. This will be the lowest level of solar activity experienced during any *CQ* World Wide DX Contest since the Contest of 1964. The smoothed sunspot count during last year's Contest was between 30 and 28. This means that propagation conditions on the **10** and **15** meter bands, and to a lesser extent on the **20** and **40** meter bands, should not be as good during this year's Contest when compared to last year. Conditions should be somewhat better, however, on the **80** and **160** meter bands since DX propagation on these bands usually improve considerably during periods of low solar activity.

Band-By-Band Conditions

The following is a band-by-band summary of DX propagation conditions normally expected from mid-October through mid-December, and centered on the Contest periods.

10 Meters—With the bottom of the present sunspot cycle slowly approaching, very few DX openings are expected on this band. During *High* or *Above Normal* conditions look for some openings towards Africa before noon, towards Central and South America from a few hours before until a few hours after noon, and towards the South Pacific during the afternoon.

15 Meters—Although DX conditions are not expected to be as good as last year, *15 meters* should be a fairly good band during most of the daylight hours. When conditions are *normal,* the band should open to many areas of the world from shortly after sunrise through the late afternoon. Signals from Europe and Africa should peak an hour or two before noon, while signals from Central and South America, the Far East and the South Pacific should peak during the late afternoon. During *Below Normal* or *Disturbed* conditions, *15 meter* openings will be spotty and of very short duration, if they are possible at all.

20 Meters—This is again expected to be the "backbone" band during the Contest. During *Normal* conditions good DX openings are expected to almost every corner of the world sometime between sunrise and the early evening hours. Conditions should peak for a few hours after sunrise and again during the late afternoon and early evening. During these peak periods, *20* meters should be the optimum band for DX, with openings usually characterized by strong signal levels. When conditions are *Below*

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For Oct., 1975

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date				
Above Normal: 14, 25	A	A	B	C
High Normal: 7, 12-13, 15, 21	B	B	C	D
Low Normal: 2-3, 6, 8, 10-11, 16, 20, 23-24, 26-27, 29-31	B	C	D	E
Below Normal: 1, 4-5, 9, 17, 19, 22, 28	C	D	E	E
Disturbed: 18	D-E	E	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index,* use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of (3) will be fair (C) at the beginning of the CQ World-Wide DX Contest on Oct. 24; excellent (A) on the 25th and fair (C) on Oct. 26, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 86, Northport, NY 11768, or check WWV at 14 minutes past each hour.

*11307 Clara St., Silver Spring, MD 20902.

Normal, 20 meter openings should be fewer in number, of shorter duration, and with weaker signal levels. In general, however, the band should hold up for some DX openings during all but *Disturbed* conditions.

40 Meters—The band is expected to open during the late afternoon hours, and remain open for DX to one area of the world or another until shortly after sunrise. Look for openings to Europe and Africa from an hour or so before sundown to about Midnight in the MST and PST time zones, and to at least 2 A.M. in the CST and EST zones. Good openings toward Central and South America should be possible throughout most of the hours of darkness. Openings towards the South Pacific and the Far East are expected to peak during a two hour period before sunrise. During most of the hours of darkness, *40 meters* should normally be the optimum band for DX propagation. When conditions are *Below Normal or Disturbed*, openings will be spotty and considerably fewer in number.

80 Meters—DX propagation conditions are generally at their best of this band during periods of low solar activity. Some fairly good *80 meter* DX openings are expected to several areas of the world during the hours of darkness and the sunrise period. When propagation conditions are *Normal*, signal levels should be strong on many openings. Even during *Below Normal* or *Disturbed* periods, there is a fairly good chance that some DX openings may be possible during the hours of darkness. Expect conditions normally to peak around Midnight for openings towards Europe and Africa, after Midnight and before sunrise for openings towards Central and South America, and just before sunrise for openings towards the South Pacific and the Far East.

160 Meters—DX possibilities are also improving on this band as the solar cycle declines towards a minimum. While not as good as on *40* or *80 meters*, DX openings should be possible to many areas of the world on *160 meters* during the hours of darkness and the sunrise period. Because of power limitations imposed in this band in many areas of the world, signals at best are likely to be weak, especially on phone. The best time for *160 meter* DX is when a path is in complete darkness, or when the sun just begins to rise at the *easterly* terminal. The best forecaster for *160 meter* DX is a set of sunset and sunrise tables. For example, if the sun is expected to rise at 0600 GMT in western Europe, then this would be the best time to check *160 meters* for openings between the USA and western Europe, plus or minus a half hour. Conditions on *80 meters* can often also serve as an indicator for *160 meter* openings. When conditions seem to be peaking on a particular path on *80 meters*, check for the same path to open on *160*. With these tips and some patience, it should be possible to work several DX areas of the world on *160 meters* during the Contest.

Contest Work Plan

The *DX Propagation Charts* on the following pages show the times when each amateur band from *10* through *160 meters* is expected to open for DX from the United States to the major areas of the world. Instructions for the proper use of these *Charts* are given elsewhere in this column.

The information contained in the *Charts* can easily be reorganized into more convenient types of operational work plans, or schedules, which can serve as valuable propagation guides during the Contest. Experience gained through previous years has shown that such plans can be extremely useful in piling up points with a minimum of wasted time.

The following is an example of one of several type plans that can be devised. It shows, for each three hour period throughout the day, the areas of the world to which *20 meter* propagation conditions are expected to be optimum. Optimum conditions are considered to exist when an opening is rated in the *Charts* with a propagation index of (3) or (4).[1]

A western USA QTH has been chosen for this example, but similar plans can be devised for other locations, for other bands or for multi-band operation and for other time spans.

Sample 20 Meter Operating Schedule for Western USA QTH

Areas to which openings should be optimum

Time PST

00-03 At best, an occasional opening to South America, South Pacific, New Zealand and Australasia. A good time to catch up on some sleep.

03-06 No optimum openings, and band should be pretty dull. If you didn't get some sleep before, get some now!

06-09 Should open in almost all directions: Europe, areas of Africa, Eastern Mediterranean and Middle East, most of Asia and the Far East, Pacific Islands, New Zealand, Australasia, and most of South America. A good period in which to rack up lots of points.

09-12 Openings in much the same direction as during previous time period, but not optimum. Signals should be weaker, especially towards Europe, Africa and South America.

12-15 Western and Southern Europe, most of Africa, most of the Caribbean, Central America and the countries of northern South America.

[1]If other than optimum conditions, openings with a propagation index of (2) or (1) can be shown with appropriate comments.

15-18 All of South America, West and Central Africa, Pacific Islands and New Zealand, Far East.

18-21 Another good time period to increase score. Most of Asia including the Far East, Pacific Islands, New Zealand and Australasia. Expect openings to South America, but falling off. Antarctica should open.

21-00 Not an optimum period, but look for openings to South Pacific, New Zealand and Australasia. Some openings possible towards South America and Antarctica, and to Europe and Africa.

Up-Dated Contest Info

In order to meet printing and publication deadlines, the "Last Minute Forecast" appearing in this column was made more than two months before the beginning of the Contest, and is subject to change. For up-dated propagation data, specially tailored for the radio amateur and available just before the Contest begins, check Mail-A-Prop and Dial-A-Prop.

A special Mail-A-Prop forecast will be issued for both the Phone and C.W. sections of the Contest. Mail-A-Prop forecasts, issued bi-weekly in newsletter format, contain day-to-day descriptions of expected conditions and openings on each h.f. band. All regular subscribers will automatically receive the Contest forecasts. The annual subscription rate, for 26 issues of Mail-A-Prop is $25 postpaid, but a special two-month trial subscription, including the Contest forecasts, is available for $5. Checks should be sent to Mail-A-Prop, 11307 Clara Street, Silver Spring, Md. 20902, before October 10 to receive this special subscription.

A two-to-three minute summary of the special Mail-A-Prop Contest forecasts will be carried on *CQ*'s Dial-A-Prop service beginning October 21 for the Phone section and November 25 for the C.W. section. Dial-A-Prop forecasts are available around-the-clock by dialing Area Code 516-883-6223. They are issued every Tuesday, and are made for a week in advance.

Mail-A-Prop and Dial-A-Prop forecasts are tailored for the radio amateur and apply specifically to the amateur bands. Updated propagation data of a more general nature is available from the propagation and geo-physical alert broadcasts from WWV, Fort Collins, Colorado, made at 14 and 18 minutes past each hour, and from WWVH, Hawaii made at 45 minutes past each hour.[2,3] WWV forecasts are available by telephone by calling Area Code 303-499-8129.

Radio Storm

The propagation data appearing in the *Charts* in this column are based on *Normal* conditions for a sunspot level of approximately 12. If a radio storm should develop during the Contest, conditions may drop to *Below Normal or Disturbed*, depending upon its severity. Under such conditions, expect considerably fewer openings on *10, 15* and *20 meters*. During periods of radio storminess, propagation conditions on *40, 80* and *160* meters become erratic, with poorer conditions during certain phases and improved conditions at other times.

If a storm should develop, circuits passing through or near polar regions will become weak, fade considerably, or may even black-out entirely. Concentrate on working the higher frequency bands and paths to the northeast, north and northwest during the daylight hours, and the lower bands to the east, south and west during the evening and early morning hours. A "Last Minute Forecast" for the Phone section of the Contest, made at press time, appears at the beginning of this column. A similar forecast for the C.W. section will appear in next month's column.

For a more complete discussion of radio storms, and what can and cannot be done about them on the amateur bands, see "Don't Be Afraid Of The Big Bad Blackout", by John J. Schultz in the November, 1969 issue of *CQ* (page 31).

V.H.F. Ionospheric Openings

While the *CQ* DX Contest *does not* include the v.h.f. bands, some interesting ionospheric activity may be possible on these bands during October.

Orionids, a major meteor shower is expected to last for about two days, peaking during the early evening of October 21, with an hourly count of about 25 meteors. This should make possible some fairly good meteor-scatter type openings on the v.h.f. bands.

Auroral activity is expected to increase during the month, and some auroral-scatter type v.h.f. openings are expected during periods when h.f. propagation is either *Below Normal*, or *Disturbed*. Check the "Last Minute Forecast" appearing at the beginning of this column for the days that are expected to be in these categories during October.

C.W. Contest Forecast

This month's *Charts* are valid for *both* the Phone and C.W. sections of the 1975 Contest. *Be sure to keep them for use during next month's C.W. section as well.* Next month's column will contain *Short-Skip Charts* for November and December, 1975. Short-Skip

---

[2]See "A Breakthrough In Simplifying Ionospheric Propagation Forecasts", by Cohen, T.J. and Jacobs, G., *CQ*, March, 1975, p. 16.

[3]Information concerning WWV and WWVH propagation and geophysical alert broadcasts can be obtained from the Institute of Telecommunication Sciences, U.S. Dept. of Commerce, Boulder, Colorado 80302.

propagation forecasts for October appeared in last month's column.

CQ DX Contests generate a very large amount of radio amateur operating activity throughout the world. For this reason, these Contests offer an excellent opportunity to check the accuracy, or inaccuracy of the *CQ* forecasts. Reports received during the Contest periods for the past 24 years have contributed considerably in improving these forecasts. Any comments or observations concerning this year's Contest forecast would be appreciated, and can be sent directly to W3ASK, the Editor of this column.

Good luck in the 1975 Contest!

73, George, W3ASK

October 15-December 15, 1975

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Central Europe & North Africa	08-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-08 (2) 08-09 (4) 09-11 (3) 11-13 (4) 13-14 (2) 14-15 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-01 (2) 01-02 (3) 02-03 (2) 03-04 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 20-23 (1)* 23-01 (2)* 01-02 (1)*
Northern Europe & European USSR	08-10 (1)	06-07 (1) 07-11 (2) 11-13 (1)	17-19 (1) 19-22 (2) 22-00 (1) 00-01 (2) 01-02 (1)	19-22 (1) 22-01 (2) 01-02 (1) 22-01 (1)*
Eastern Mediterranean & Middle East	08-09 (1) 09-10 (2) 10-11 (1)	06-07 (1) 07-09 (1) 09-12 (1) 12-14 (2) 14-17 (1)	17-19 (1) 19-23 (2) 23-02 (1)	20-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	10-14 (1)** 08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-18 (2) 18-19 (1)	18-20 (1) 20-22 (2) 02-03 (1)	20-22 (1) 22-01 (2) 01-02 (1) 22-01 (1)*
Eastern & Central Africa	10-13 (1)** 09-11 (1) 11-13 (2) 13-15 (1)	07-15 (1) 15-17 (2) 17-18 (1)	20-01 (1)	21-00 (1)
Southern Africa	09-12 (1)** 08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-15 (1) 15-17 (2) 17-18 (1)	18-19 (1) 19-22 (2) 22-00 (1)	20-23 (1) 20-22 (1)*
Central & South Asia	17-19 (1)	07-08 (1) 08-10 (2) 10-12 (1) 19-21 (1)	18-21 (1) 05-08 (1)	18-20 (1) 05-07 (1)
Southeast Asia	17-19 (1)	07-08 (1) 08-10 (2) 10-13 (1) 18-21 (1)	17-20 (1) 05-08 (1)	05-07 (1)
Far East	17-19 (1)	07-08 (1) 08-10 (2) 10-11 (1) 16-19 (1) 19-21 (2) 21-22 (1)	17-20 (1) 04-08 (1)	05-07 (1)

* Indicates best time for 160 Meter opening.
** Indicates best time for 10 Meter opening.

How To Use The DX Propagation Charts

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this Propagation column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Time shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 P.M., etc. Appropriate *standard* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate Chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 14 in Washington, D.C. is 19 GMT. When it is 20 in Los Angeles it is 04 GMT, etc.

5. The charts are based upon a transmitter power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10 db loss, it will lower by one level.

6. Propagation data, contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

South Pacific & New Zealand	13-16 (1)** 12-15 (1) 15-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-11 (2) 11-17 (1) 17-18 (2) 18-20 (3) 20-22 (2) 22-00 (1)	00-03 (1) 03-05 (3) 05-08 (2) 08-09 (1)	02-04 (1) 04-07 (2) 07-08 (1) 05-07 (1)*
Australasia	14-16 (1)** 14-16 (1) 16-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-20 (1) 20-22 (2) 22-00 (1)	02-04 (1) 04-08 (2) 08-09 (1)	04-05 (1) 05-07 (2) 07-08 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1)** 09-14 (2)** 14-15 (1)** 07-08 (1) 08-10 (2) 10-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	00-03 (2) 03-06 (1) 06-07 (2) 09-11 (3) 11-15 (2) 15-16 (3) 16-18 (4) 18-19 (2) 19-00 (1)	18-19 (1) 19-21 (3) 21-03 (4) 03-05 (3) 05-06 (2) 06-07 (1)	19-21 (1) 21-01 (2) 01-03 (3) 03-05 (2) 05-06 (1) 22-02 (1)* 02-04 (2)* 04-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina and Uruguay	10-15 (1)** 07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-18 (1)	02-06 (1) 06-08 (2) 08-11 (2) 14-16 (1) 16-17 (2) 17-18 (3) 18-20 (2) 20-23 (1) 23-02 (2)	20-22 (1) 22-04 (2) 04-05 (1)	21-23 (1) 23-03 (2) 03-04 (1)

[*Continued on page 82*]



THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll
All Counties

#131—John D. Moore, W5UUM 6-26-75.
#132—Phyllis Hoffman, K1QFD 6-27-75.

THIS is your life, per:

Marvin L. Hagen, WB2SJQ

All Counties #34, 6-29-70

"Being the son of a traveling salesman, it was only fitting that my life started in Kansas City, MO, in the year 1923, where I resided till the ripe age of 6. From there my family moved to New York where I still live.

"Attended No. Carolina State College in Raleigh, N.C., in 1941 and graduated finally in 1947 from the School of Textiles. My family still insists I was quite stupid, since it took me so long to get my college degree, but in actuality, my education was interrupted for a tour of service in Uncle Sam's Army. Had the pleasure (or displeasure) of being attached to the 1st, 3rd & 7th Army and saw duty in France, Holland, England, Germany, Belgium and Luxemburg with a Combat Engineer Battalion. Under mutual agreemeent, I was mustered out of service in late December 1945, and thrown out into the wide world of civilian life where once again I returned to Raleigh to complete my education.

"The year 1947 was the beginning of a new life, I not only got a certificate stating that I was an Expert in the field of Textiles, but I took the fateful step forward and married my XYL, Pauline. Also during that year I joined the Textile firm, 'M. Lowenstein & Sons, Inc.", and spent the next two years working at our plants located in Alabama, North and South Carolina. After finally returning to the 'Big City', I was sent to Baltimore, Maryland to represent my firm in sales there for the next 4 years. My roots finally settled in Woodmere, L.I. in 1955 and I became a happy (?) commuter of the Long Island Railroad, ever since.

"We have two sons; Leonard the younger just graduated Ithaca College in N.Y. State and the older, Samuel is attending Cornell University for his MBA. It was through Sam, WB2RGR, that I became interested in amateur radio in 1965. Using an Eico 720 Xmtr and SX110 RX, the world of dots and dashes came into being. After months of hard studying I got my General ticket in the Fall of '65 whereas Sam ended up as a Tech. It was the end of that same year that I traded in my Novice equipment for my present Drake Line -T4X & R4A with a Hy-Gain 3 element beam. As happened to many County Hunters, it was by accident that I stumbled across a group operating on 7223, working each other and mobiles for Counties of the U.S.A. After listening for a few minutes I stammered out my call and made my first contact with Otts, K8CIR. It was through his patience and understanding that he explained the purpose of the County Hunters to me and what they were striving to do. It was not too long after that when I was bitten by the bug and became a steady participant in their activities. Shortly after, we started the 20 meter Net where I got so involved, I would take Net Control on weekends and holidays for 12 hour stretches at a time. My thought was that if I was Net Control, I could be the first one to work a station for his County. This was all done with less than 100 watts output, as it was not till 1972 that I added an SB200 to the line.

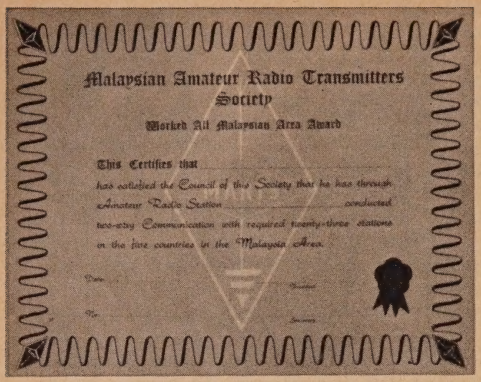
"The first high light of my amateur career took place in 1970. At a convention of the County Hunters at Knoxville, Tenn., where at the last minute I had to cancel my plans to attend, I was awarded the First plaque ever given to any County Hunter, 'The Net Control Station of the Year, 1969'. This is an honor that I still cherish to this day.

"The second highlight of my ham career came during the same year, *#34 Worked All Counties.* This feat was accomplished the hard way. Up till Feb. 26, 1970, I still needed Kauai and Kalawao (Hawaii). My very good friend Armond, VE6AYU called me on the telephone at 3 A.M. to say he had KH6GQO,



Marv Hagen, WB2SJQ.

*P.O. Box 73, Rochelle Park, N.J. 07662.



Worked All Malaysian Award for DXers.

Kauai on frequency—I worked him half asleep and with my eyes closed. Only us crazy County Hunters would do this for each other. Then in June 1970, under terrible conditions I heard a 3-3 report and gave a 339 to KH6TS for the last one!

"As what happens to many of the County Hunters after they have completed their feat, there was a tremendous let down or deflation. What will I do now? My last five years were spent with such a fine group of amateurs, so I decided to represent as QSL manager for the County Hunters, our friends from DX land. Today I handle G4JZ, GM3BCL, SM3BCZ, SM6CKU, SM6DUU, TI2WX and VP9GE.

"After attending two conventions, KC in 1971, Peoria in 1972 (and several Mini-conventions), I must say that I never met a finer group of OM, XYLs, and families. The County Hunters should be proud of what they represent not only in life but in amateur radio. My only regret is that so many of the ones who have completed their Counties, have disappeared to other endeavors."



Novice All-American Award.

Awards Issued

John D. Moore, W5UUM, joyfully made *All Counties,* All S.S.B.

Phyllis Hoffman, K1QFD, finally found time to get the necessary data together to acquire USA-CA-500 through 1500 endorsed All A-1, All S.S.B., All Mobiles. USA-CA-2000 through *All Counties,* endorsed Mixed.

Herb Peery, WØGQR prepared some material for USA-CA-500 through USA-CA-3000, endorsed All 75 2 × S.S.B., the *first* 3000 so endorsed.

Richard Karl, W3ZUH also did some work and obtained USA-CA-500 through USA-CA-2500.

Dale Bagley, WBØELJ claimed USA-CA-500, 1000 and 1500.

Charlie Smith, WA4EMA was issued USA-CA-500 endorsed All A-1, All Novices; and USA-CA-1000 and 1500 endorsed Mixed.

George Dunn, WBØJYB applied for USA-CA-500 and 1000 endorsed All S.S.B. (Other active County Hunters with the name Dunn that I can think of right off are Cletus Dunn, W1DIT and Riley Dunn, WAØCEL.

Awards

Novice All-American Award: Sponsored by the radio club at San Rafael High School with two purposes in mind. First to provide an Award that is well within reach of any Novice. Secondly to encourage the more advanced license holders to work a few Novices. A Novice need work one station (any license) in each of the ten call areas. More advanced license holders must work a Novice in each of the ten call areas. As a wild card for incentive purposes, any territorial possession of the U.S.A. outside the continental limits (including Hawaii and Alaska) listed by ARRL as a country, may be substituted for *one* of the ten call areas. Submit a list of contacts with the date and time of QSOs and $1.00 or 4 IRCs to: William A. Pearson, WB6QBJ, Awards Manager-Novice All American Award, 25 Rudnick Avenue, Novato, California 94947.

Worked All Zone 14 Countries Award: Issued by the SWL Club Activity, Box 209, S-780 24, Idkerberget, Sweden. Issued in 3 classes: A—For working 27 Countries; B—For working 22 and C—For working 15 Countries. Class C is basic Award with Red sticker. Stickers for higher classes cost 2 IRCs. The Award costs $1.00 U.S. dollar, 10 IRCs or 5 SwCrs. Send GCR and application to Awards Manager at QTH listed above. S.W.L.s can also apply for Award under same rules. Countries located in Zone 14 are: CT1, CT2, C31, DJ/DK/DL/DF/DM, EA, EA6, EI, F, G, GC-Guernsey, GC-Jersey, GD, GI, GM, GW, HB9, HBØ, LA, LX, ON, OY, OZ, PAØ/PI, SK/SL/SM, ZB2, 3A and 4U-Geneva.

USA-CA HONOR ROLL

3000		1500		500	
W0GQR	154	W3ZUH	267	W3ZUH	1049
K1QFD	155	WB0ELJ	268	WB0ELJ	1050
		W0GQR	269	W0GQR	1051
2500		WA4EMA	270	WA4EMA	1052
W3ZUH	191	K1QFD	271	K1QFD	1053
W0GQR	192	**1000**		WB0JYB	1054
K1QFD	193	W3ZUH	357		
		WB0ELJ	358		
2000		W0GQR	359		
W3ZUH	225	WA4EMA	360		
W0GQR	226	K1QFD	361		
K1QFD	227	WB0JYB	362		

Worked All Malaysian Award (WAMA): Sponsored by MARTS, P. O. Box 777, Kuala Lumpur, Malaysia. It will be issued to any amateur that can prove two way contacts with the following call prefixes: 10 9M2 contacts with different call signs; 10 9V1 contacts; 1 VS5; 1 9M6, and 1 9M8. And most requests for special endorsements can be met. Send list showing all contacts made, indicating callsign, date, time, mode and band. It is not necessary to include QSLs received if the list has been certified by the local amateur radio society or two other amateurs (GCR). Send with 5 IRCs to MARTS (Malaysian Amateur Radio Transmitters Society) to QTH listed above.

Notes

Dave Manescu, W6CCM, P. O. Box 146, Lakeside, CA. 92040, should be very proud of the "New" *County Mapbook* he has put out after nearly a year's work. It sells for $3.50, he also operates a fine QSL Bureau for the County Hunters, so send him an s.a.s.e. for full details.

Fine QSL Bureaus (or whatever their special name) for County Hunters are also run by Jim Hoffman, K1ZFQ, 42 Gresham St., Milford, Conn. 06460, *and* Bob Schmarden, WA2 AEA, 4 Pinewood Circle, Corning, N.Y. 14830. Send s.a.s.e. to both for details or better yet, send s.a.s.e. with 3 stamps on it (present rate @10¢=30¢) to Bertha Eggert, WA4BMC, P. O. Box 6811, Southboro Station, West Palm Beach, Florida 33405 for lots of data on County Hunting, routine, frequencies, CH special QSLs and etc. . .

You are also missing something if you don't drop a card to TAB Books, Blue Ridge Summit, PA. 17214 and request their latest catalog of books, kits, etc. . .

How was your month? 73, Ed., W2GT.

Spread The Word

An eye-catching bumper sticker encouraging the man in the street to "Talk to the World—Become A Ham Operator" is available from *CQ* for 25¢ plus a legal-size s.a.s.e. Quantity prices upon request. Write to: *CQ*, 14 Vanderventer Av., Port Washington, NY 11050.



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SURPLUS sidelights

BY GORDON ELIOT WHITE*

As I mentioned in a column last summer, I had the privilege of testing a Collins 51S-1 general coverage receiver for several months. This is the successor to the R-390 and R-390-A receivers, and the last tube-type Collins. The present Collins general coverage receiver is the 651S-1, a solid state design with nixie type readout—very very expensive.

The 51S-1 is probably the last American-made general coverage receiver of its quality that will be available for Amateurs and s.w.l.s for a long, long time. There may be some future surplus from the intelligence agencies that will surprise me, but there is little in the current commercial market that I'd trade for a really good R-390-A.

I'm not sure I would trade my R-390-A for a 51S-1, today, although the set is pretty good. The 51S-1 specs are good, but they don't overwhelm the 390 sets. Calibration accuracy, for example, is rated at plus or minus 400 Hz when the receiver is zeroed by the internal calibrator at the nearest 100 kHz point. The R-390-A is rated 25 percent better, with resettability accurate to 300 Hz when calibrated.

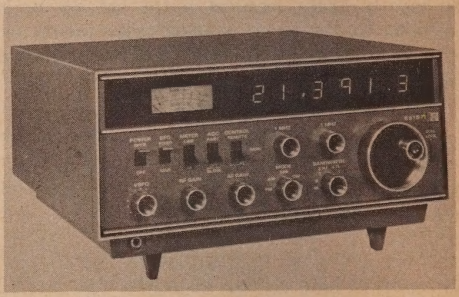
The 390 receivers used the well-known Collins sealed permeability-turned oscillator with an oven to provide excellent overall stability over a wide ambient temperature range—Collins says the total drift of the 390-A after warmup is no more than 300 Hz.

The 51S-1 uses a later, smaller P.T.O. without an oven. Specified drift after warmup is as high as 1.21 kHz on some bands, but is measured over a zero to plus 50 degrees Centigrade range. I don't think that kind of stability figure means much to most of us. Collins says the 51S-1 has a stability figure of plus or minus 100 Hz at 72 degrees F.

Whether the differences in calibration accuracy and stability between the 51S-1 and the 390 receivers is meaningful is questionable—they are both high quality equipment, but the 390 series doesn't give up much to it later cousins.

Where the 51S-1 beats the R-390-A is sideband capability. The 51S-1 has a product detector with upper and lower sideband selectability, while the R-390 receivers were a.m., c.w. or FSK—only. Sideband can be received by adjusting the beat frequency oscillator on the 390 sets, but a product detector is definitely a desirable addition to the 390. (see *CQ* August 1973 p. 43 for a 390 product detector designed by K6TS)

On the other hand, the 51S-1 is not adjustable from the front panel, a definite drawback for use as an FSK receiver for RTTY. The



The newer Collins 651S-1 general purpose h.f. receiver.

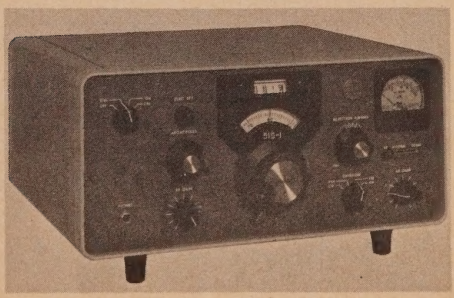
51S-1 does have a Q-filter with rejection tuning on the panel. It does not have the 390's bandwidth selection, limiter control, audio response adjustment, line gain, or break-in control.

Intermediate frequency of the 51S-1 is 500 kHz, as was the 51J-4 (R-388) receiver. The R-390's have a 455 kHz i.f. Aside from the crystal filter and rejection control on the 51S-1 there is no particular bandwidth shaping available. The 390-A as you know, has mechanical filters for various bandwidths.

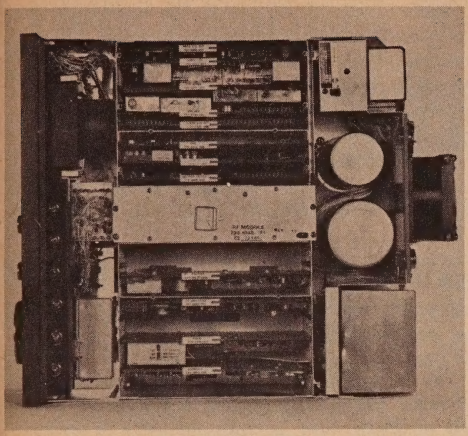
Overall, the 51S-1 is a modern, lightweight receiver in the pleasant styling of the Collins amateur equipment (S-line). Although not built under a military design contract like the 390's a great number of 51S-1 sets were sold to the government, and can occasionally be found in surplus. I have no particular source to recommend except the usual dealers. The set I have been testing was sold by Henry Radio for $1,295 last year, used.

Broadly speaking, the 51S-1 is a 2-30 MHz general coverage receiver with a 200-2000 kHz low band converter built in. It is nothing

*1502 Stonewall Rd., Alexandria, Va. 22302.



Front view of the Collins 51S-1 receiver.



A top view of the 651S-1 receiver with the dust cover and card cage covers removed.

special on the low end, and in fact suffers from internally generated hetrodyne birdies at 333, 1000, 1,500 and 2000 kHz.

The h.f. portion of the receiver is triple conversion from 2-7 MHz; double conversion from 7-30 MHz.

The set is conventional using tubes, except for a 2N388 transistor for pre-amp into the detector stage, and the usual 1N128 detector diodes and 1N1695 power supply rectifiers. Tubes are miniature 9-pin types such as 6EA8 (r.f. amplifier) and 7-pin such as 7543 (PTO).

There are three i.f. stages, and a low-frequency mixer for the low band stages. According to my count the circuit uses 20 crystals for bandswitching plus a 100 kHz calibration crystal, and 14, 15, and 17.5 MHz oscillator rocks.

Mechanically, the set is far simpler than the 390 types, with their racks of variable, slug-tuned i.f.s and their complex gear trains.

Other relevant specs are: power consumption 125 watts (115 or 230 volts a.c. Use gray cord for 115, black card for 230 volt service).

Antenna input is 50 ohms, unbalanced. Audio output is 4 or 600 ohms, 1 watt. A 500 kHz i.f. output at 50 ohms, 50 mv minimum, is also provided.

AM sensitivity is rated at 3 microvolts, with c.w. sensitivity of .6 μv for 10 db carrier on/off gain.

A.m. bandwidth is 5 kHz, c.w. is rated at 800 Hz 6 db down. s.s.b. width at 3.5 db points is 2.75 kHz.

Weight of the set is 28 pounds, about a third of three R-30-A. In addition to a tabletop version, the 51S-1 can be obtained in rack-mount style.

The 51S-1 came out in 1961. The one I have been using is serial 4685, and was apparently manufactured in 1967. ■

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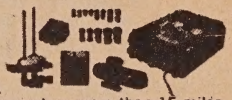
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Letters *[from page 7]*

all constructed very poorly; the glass bulbs were crooked and the insides crooked, too. However, they worked pretty well. The filament connections were on the sides of the base, two little screw terminals.

Joe Cecil, W5RIQ
Austin, TX

Pendergast

Editor, *CQ:*

Sure do hope that Pendergast does NOT move as he adds to the articles and we don't want Bill talking to himself.

Richard W. Randall, K6ARE
Livermore, CA

Electronic Word Puzzle

Editor, *CQ:*

Just wanted to say I enjoyed your July 1975 issue of *CQ* Magazine, and in particular enjoyed working the Electronic Word Puzzle. I hope to see more of them in future issues.

Jack Marx, WA7GOJ
Seattle, WA

USA-WPX-76 Award *[from page 27]*

Application Requirements

1. Applications may be made on the regular WPX Award Application Form 1051B or equivalent form. Only the complete call of the station worked is required for the award. Be sure to plainly note your name in block letters as it should be on the award, plus address and zip code.
2. The 35 **DIFFERENT** prefixes should be listed in alphabetical order on the left column of the application.
3. The remaining 165 prefixes whould be listed in 3 columns of 50 prefixes and one column of 15 prefixes.
4. QSL's are not required to be obtained for the award.Each application must be signed by an officer of a local radio club or 2 individual amateurs (in rare, isolated areas this requirement is waived). This certification denotes that the applicant has properly met the requirements of the award within the terms of his own amateur license.
5. Applications should be submitted directly to the WPX Contest Manager, Bernie Welch, W8IMZ, 7735 Redbank Lane, Dayton, Ohio 45424.

Forecast of Things to Come

Want the finest in long-range forecasts of radio propagation conditions? Want to know what band to use and when? Want to set a sked to any place in the world? *CQ*'s Propagation Column can give you all the answers with hard-to-beat accuracy. It'll even tell you what sort of signal strength to expect! Months in advance!

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200 W. Power Supply *[from page 30]*

under 10a, two 2N174's are adequate (and, in the prototype, didn't even heat very much—they got HOT at 17a., however).

The heat sink is obviously important. We mounted the transistors on 5 inches of heat sink material that is approximately 4 inches wide and double vaned. Individual pieces of this material are available from Newark, Radio Shack, and the surplus houses. For "low power" units, heat sinking directly to the chassis is adequate.

Switching Resistor (R_s): Fairchild recommends that R_s be 3 ohms for the silicon transistors. Thus, for germanium units, 1 ohm would suffice. These values will cause Q_s to "turn on" when the current through the 7812 reaches approximately 200 ma.

Transient Suppression: C_1 and C_2 are included to avoid spurious signal pickup and suppress transient effects on the regulator IC. The prototype unit was originally built without C_2 with the startling result that if a load was suddenly switched onto the circuit, the IC would immediately go into its "short circuit" mode, shutting down the regulator. After much headscratching, C_2 was soldered in, and the problem disappeared.

Output Protection

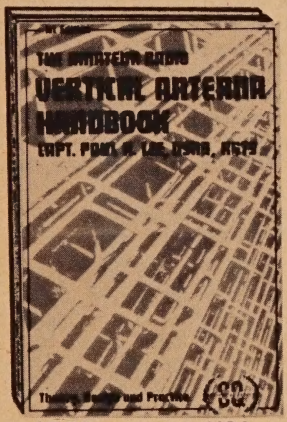
To avoid the possible disastrous consequences of overvolting the circuit being powered by the supply, should either the switching transistor or the regulator IC fail, some form of output protection is often considered advisable. If the peak voltage on the filter capacitor is kept below 20 volts, most of thte transistors in most of the more modern transistor units would survive a failure of this type, but the inexpensive insurance provided by the zener-transistor-SCR-fuse crowbar circuit make it a worthwhile addition. The circuit used in the "final" version of the high current supply is an adaptation of "crowbar" circuits described by W4KXV[8], and W1SL[9]. Q_2 conducts only when the zener volt-

[8]R. Phelps, W4KXV, "Protective Circuits for Transistor Power Supplies," *CQ*, March, 1973.
[9]T. F. McMullen, W1SL, "A Crowbar Circuit for Power Supplies," Hints and Kinks, *QST*, Aug., 1973.

Two Exciting New Books From the Publisher of CQ

from Capt. Paul H. Lee, USNR, K6TS (ex-W3JHR)

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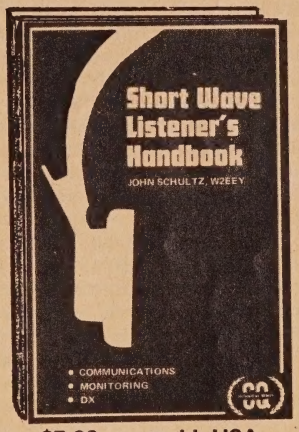


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from John Shultz, W2EEY

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Whether you're an amateur, an s.w.l. or just like to evesdrop on police and fire department calls, you'll find this new book to be the complete source for information on frequency assignments, radio propagation, transmission modes, antennas, receiver design and operation, large-scale receiving installations, transmission schedules, test equipment and procedures...in short, all you need to know about every aspect of receiving. 6" X 9" 152 pages.

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age of CR_9 (plus the junction voltage of Q_2 and the SCR) is exceeded. Q_2 then drives the SCR into conduction, which places a short across the filter capacitor, blowing the fuse at the input to the regulator circuitry. The fuse used here should be rated at no more than half again the full load current. The CR_9-Q_2-SCR combination used in our unit fired at 2.2 volts above the zener voltage of CR_9, due to the internal junction potentials of Q_2 and the SCR. This "firing voltage" should be checked, using a variable voltage source (which could be made up of several batteries of 1.5-6-9-12, etc. voltages). Be sure to put a 10 to 100 ohm resistor in series with the anode of the SCR during the tests so you can use a meter to see when the anode voltage of the SCR drops to zero, instead of a disintegrating fuse.

Performance

From no load to 2a., the voltage drop on both high power units is less than 0.1v., and between no load and 15a. is approximately 0.2v.—just as good as an auto-type storage battery. Ripple at full load is insufficient to cause any hum in the low level audio circuits when the supply is delivering 180 watts.

The two "low-power" 5a. units, when used with 10 watt output rigs drawing about 3a., were sufficiently well regulated to show "less than a needle's width" regulation between transmit and receive.

All new parts for the high power supply (17a.) would run close to $65, which is a bit high, and would probably warrant purchasing a readymade unit. However, a quick look through the surplus catalogs, the Poly-Paks ads, etc., shows that the supply can be produced for approximately $15, not bad when you consider the cost, inconvenience, and possible safety problems of a battery/charger combination. Both the prototype and the MK1 version weigh considerably less than the battery W4FJ had under his desk powering his high power f.m. rig. W4ZSH and W4JHK built 3 to 5a. supplies for "mobile" f.m. rigs, for less than $5, using judicious "flea market" purchases and raids on several friends' junque boxes. ■

Antennas [*from page 26*]

seen to have a radiation resistance value of about 28 ohms at 3830 kHz. At 4.0 MHz, the radiation resistance is nearly 40 ohms, but the antenna presents a high value of inductive reactance at the input end of the feedline. At 3.5 MHz, the radiation resistance is 25 ohmns, and the antenna appears highly capacitive. Note that the 3 to 1 s.w.r. circle is drawn on the graph. If you stay inside that, your range of antenna operation is limited to the 300 kHz span from 3.7 MHz to 4.0 MHz."

"Well, how do you lower the s.w.r. on this particular antenna? Can you get it to work across the whole band," demanded my friend.

"As a starter, I suggest you get the November, 1974 issue of *CQ* and read *"Impedance Measurements at Radio Frequencies,"* by K4KJ. Then read *"How to Use the Smith Chart,"* by W1DTY in the November, 1970 issue of *Ham Radio* magazine. In addition, there was a good article in the January and February, 1966 issues of *QST* by K1PLP on Smith Chart calculations. All of these are recommended reading. Finally, *CQ* had a two-part article by W7RGL on antenna impedance matching in the November and December, 1963 issues. You might be able to pick these up at a library, or get copies from some of the fellows that sell back-dated magazines in the classified columns. In any case, all of these articles are very good reading for the amateur who wants to know more about the workings of his antenna."

"Do you have to use a Smith Chart?" Pendergast asked suspiciously.

"Don't be afraid of the Smith Chart," I replied. "It might look confusing to those who have not used it, but it is relatively simple. A variation of the Smith Chart was used by astronomers and navigators at the time of Columbus. So there's nothing new about it. Sometime when you are in a more relaxed mood, I'll give you a quick rundown on this interesting and very useful device." ■

Repeater [*from page 38*]

after a lengthy period of having your nice, open-access repeater keyed up by squatters using those machines with no regard to tripping yours, you go to tone access. Holy mackerel, the howl *that* action raises from amongst the troops! But it was either keyed-access or shut it down just to comply with the requirements of the law, let alone reducing the irritation factor to a livable level. It is at this point that you begin to tell other people: If you are thinking of building a repeater, for heaven's sake, DON'T. ■

Epoxy Cement [*from page 40*]

How to work with Epoxy

For small work, hardening time is 24 hours, preferably longer for larger globs of cement. It becomes tacky in three hours but keeps on flowing for another ten hours. You must take advantage of these three stages to produce the correct or preferred bulge or contour in the right place

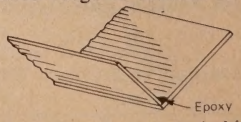


Fig. 12—Let epoxy flow while holding work at desired angle.

by gravity flow, otherwise you are liable to end up with carbuncles in the wrong place.

A test of your skill in manipulating epoxy is shown in fig. 11, which shows how to make a bulge in the work by letting gravity aid the bulge. You must use the correct amount of cement and must hold it at the correct angle until it becomes tacky and then keep the work in place for another 24 hours. Add or remove epoxy by means of a toothpick during the tacky stage. Small points and bumps will smooth themselves out.

Figure 12 shows another example of gravity aided flow. Two sheets of aluminum are held so that the cement flows to build a reinforcement. ■

P.E.P. [*from page 42*]

to increase the average power without increasing the p.e.p. will surely pick up if p.e.p. output power is adopted as the official standard method. I can only hope that amateurs will use restraint and still be concerned about the quality of signals as before.

One final note on power measurement. The "purists" in the fraternity will be pointing out that making the measurement with a continuous tone will result in an error depending upon how bad the voltage regulation on the final amplifier's power supply is, since the voltage would be higher on the instantaneous voice peaks than when running the "key-down" tone. This is true, however, if your voice peaks during operation are kept at or below the value measured on the scope with the single tone, the error is on the conservative side and you will not be exceeding the single tone p.e.p. Another source of error would be the antenna system. If, in switching from your fifty ohm dummy load to your actual antenna, you incur a mis-match, then the power output would not be the same depending upon the degree of mis-match. If the actual complex impendance of the antenna is known, then the true power output can be calculated, and the peak voltage excursion on the scope adjusted accordingly to maintain the desired output power. ■

DX [*from page 64*]

DX Advisory Committee is the way. From the track record to date and the quality of topics surfacing as indicators of the work of the DXAC, this group appears to be more of a DX round file than an influential factor.

DXers! ! ! Is it not time to speak on the unfair taxation that George has burdened we poor DXer's with?

QSL Information

BV2B to WB2UKP.
C31IX to DL3MY.
EP2OD—Via K4OD, P.O. Box 135, Front Royal, VA 22630, or to EP-Bureau.
FB8XJ to F2MO.
FG7AR/FS7 to F6BBJ.
G4DEM—Via VE2YG.
WB8QMG/HK9 to W8HVY.
HL9TG to WA7KYZ.
KG6RI to KG6SW.
KQ9EAA to WA9GJU.
LC1J to LA4LN.
SV1GA/A to OH2BH.
VQ9D (Bip) to VQ9D.
VS9MB to G3KDB.
VU2DX—Via E.S.A. Saifudeen, 103 8th St., Gandipuram, Coimbatore 64102, India.
WB8HOF to W8OYV.
ZK1DA to WA5OCN.
ZS6CB—Via K6TTF/S, Scotty Meadows, 4417 Scottsdale St., Mesquite, TX 75150.
3B9DA to 3B8DA.
4X4EV and 4X4PX—Via WB4FSV, Thunderbird Trail, Maitland, FL 32751.
K5ETA/6Y5 to K5ETA.
7P8MA—c/o K6TTF/S, 4417 Scottsdale St., Mesquite, TX 75150.
7X0WW to REF only.
9Q5SW to JA8JN (?).
CE9AT to SE2MZ, Box 1137, Valparaiso, Chile.
FG7XJ to Box 572, Lazarde, Guadeloupe.
HM#S to Box 1189, Seoul, Korea.
LZ1CY/6W8 to Box 185, Plovdiv, Bulgaria.
WC8CAL to Village Hall, Calumet, Mich. 49913.
WU5AST to Space Center Radio Club, NASA, Houston, TX 77058.

73, Hugh, WA6AUD

The Optason [*from page 48*]

rows and 6 columns. The users sense of touch and print recognition (what a given letter feels like) facilitate reading.

The Electronics Package—Besides an ON-OFF switch there are two basic controls. INTENSITY, which adjusts the strength of the vibrations of the pins on the screen and THRESHOLD which compensates for differences in the reflectivity of inks and papers and affects the apparent stroke width of the letters.

There are numerous accessories available for use with the Optacon such as CRT readout (for computer programmers) Typewriter readout (to check what has been typed) page scanners and other tracking aides. The basic cost for the Optacon is $2,895. For complete technical information and pricing schedule I suggest that you contact the manufacturer, Telesensory Systems Inc., 1889 Page Mill Road, Palo Alto, California 94304, or call 415-493-2626.

I have taken the evaluation test for the Optacon but because of other commitments have not taken the course as of yet. The course was primarily given at Palo Alto but now many states offer courses at agencies for the blind plus Telsensory is providing teacher training courses for blind and sighted teachers to further increase course availability.

The Optacon has opened brand-new areas to the blind making it possible for the blind to readily read ordinary material instead of specially prepared text. Although it is costly to own and few can afford it on their own, Optacons are being used by blind and deaf-blind people through-out the world. Whether just reading the latest novel or programming a computer, the long range effects for the blind are countless. The increased modality increases a blind persons ability to compete with the sighted for jobs plus offer a new degree of independence while enhancing the educational, vocational, and everyday living activities of the blind and deaf-blind. ■

QRP [*from page 51*]

your interest in membership. Personally, I'm really getting anxious to meet up with many of you on s.s.b. and hear what QRPp'rs really sound like as opposed to what their fists sound like! And for the time being, don't forget the QRPp Net, Tuesdays, 2200 Eastern time, 3540 kHz, and the 40 meter session, Saturdays, 1700Z, 7040 kHz, and 20 meters, 14065 kHz, Saturdays, 1600Z. Hang around these frequencies whenever possible, and don't be afraid to give out with a "CQ QRPp" if you don't hear anyone. Hope to see a lot of you on the air this season! Till then,

73, Ade, K8EEG/Ø

Math's Notes [*from page 53*]

and the completed sections even heavier. Don't skimp on anything and above all don't try to build a tower that is just too high. Remember —this assembly is not a welded-factory produced product and, under the right conditions could easily damage property or even other people.

As with high voltages, large masses of steel should be respected.

73, Irv, WA2NDM.

In Focus [*from page 60*]

checks. Learning to write on lined paper as you watch on a TV screen requires a certain amount of coordination, but the little-old-lady (she's 85!) is doing just fine! Visual Tek is located in Santa Monica, CA.

In contrast to this existing TV application, Lee Brody of Fairlawn, N.J. is anxiously searching for a TV system that can be used for the transmission of sign language over conventional telephone lines. Lee, who has a hearing problem himself, says that deaf people everywhere would like to have this capability available so that they could converse over long distances by the use of the International sign language. In a recent telephone call, Lee explained that RTTY is used over phone lines, but TV would be preferable in many cases. There are three forms of sign language, alphabetical, idiomatic, and the much faster International sign language which uses a combination of signs and hand motion. Still picture transmission would offer no advantage, motion is a must.

So far, the high cost of coaxial lines, special TV pairs, and mileage charges have prevented any progress towards the goal of a Sign Language Picture Phone. Maybe here's a project to spark the "Motion SSTV" interests of W9NTP, WB9LVI, and WØLMD!

It would seem that a need of this kind deserves the attention of our creative designers and a grant from the National Institute of Health. If you have any ideas on how to solve this problem, please write or phone Lee at 1425 Plaza Rd., Fairlawn, N.J. 07410, Tel. 201-796-5414.

From Overseas

The British Amateur Television Club puts out an excellent quarterly journal called *CQ-TV*. Although most BATV members are fast scan oriented, *CQ-TV* carries news and information of interest to slow scanners too.

C. Grant Dixon, G6AEC/T in Herefordshire has been instrumental in stirring up 2 meter SSTV net activity during the evening hours. Ron Johnson, G3GRJ, in the same area is another prime mover in this s.s.b. SSTV group operating on 144.28 MHz.

After reading a recent note about this G-based SSTV action on 2 meters, I made a sked with Bob Hanson, WB2DHL about 100 miles from here and gave my new Multi-2000 its first work-out on SSTV. Two meter SSTV is really great!

Send along your news and views to the same old address, 2112 Turk Hill Road, Fairport, N.Y. 14450 73 Bill, W2DD

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SEE PAGE 51

Propagation [*from page 72*]

McMurdo Sound	15-17 (1)	20-22 (1) 22-00 (2) 00-07 (1)	00-03 (1) 03-05 (2) 05-07 (1)	03-05 (1)

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Northern Europe & European USSR	08-10 (1)	06-07 (1) 07-11 (2) 11-13 (1)	18-19 (1) 19-21 (2) 21-01 (1)	20-00 (1) 20-23 (1)*
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Western Africa	10-13 (1)** 08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	18-20 (1) 20-01 (2) 01-02 (1)	19-20 (1) 20-00 (2) 00-01 (1) 20-00 (1)*
Eastern & Central Africa	10-12 (1)** 08-11 (1) 11-13 (2) 13-14 (1)	07-15 (1) 15-17 (2) 17-18 (1)	20-00 (1)	21-23 (1)

Southern Africa	10-12 (1)** 08-10 (1) 10-11 (2) 11-12 (3) 12-13 (2) 13-14 (1)	07-15 (1) 15-17 (2) 17-18 (1)	18-19 (1) 19-22 (2) 21-23 (1)	19-22 (1) 20-22 (1)*
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South-east Asia	16-18 (1)	07-08 (1) 08-10 (2) 10-13 (1) 18-21 (1)	04-08 (1) 17-19 (1)	05-07 (1)
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South Pacific & New Zealand	12-17 (1)** 11-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-17 (1) 17-18 (2) 18-20 (3) 20-22 (2) 22-00 (1)	23-01 (1) 01-03 (2) 03-07 (3) 07-08 (2) 08-09 (1)	00-02 (1) 02-07 (2) 07-08 (1) 02-07 (1)*
Austral-asia	14-17 (1)** 10-14 (1) 14-18 (2) 18-19 (1)	05-07 (1) 07-08 (2) 08-10 (3) 10-11 (2) 11-15 (1) 15-17 (2) 17-19 (1) 19-23 (2) 23-02 (1)	02-04 (1) 04-08 (2) 08-09 (1)	03-04 (1) 04-07 (2) 07-08 (1) 04-07 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1)** 09-14 (2)** 14-16 (1)** 07-08 (1) 08-09 (2) 09-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	02-06 (1) 06-07 (2) 07-09 (4) 09-11 (3) 11-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-23 (1) 23-02 (2)	18-19 (1) 19-20 (2) 20-21 (3) 21-03 (4) 03-05 (3) 05-07 (1)	19-21 (1) 21-00 (2) 00-03 (3) 03-05 (2) 05-06 (1) 21-02 (1)* 02-04 (2)* 04-05 (1)*
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McMurdo Sound Antarctica	15-17 (1)	18-20 (1) 20-23 (2) 23-08 (1)	23-02 (1) 02-05 (2) 05-06 (1)	02-05 (1)

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WESTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Central Europe & North Africa	08-11 (1)	06-07 (1) 07-09 (2) 09-10 (1) 10-13 (2) 13-15 (1) 23-01 (1)	18-20 (1) 20-22 (2) 22-00 (1)	19-23 (1) 20-22 (1)*
Northern Europe & European USSR	08-10 (1)	06-07 (1) 07-11 (2) 11-12 (1) 23-01 (1)	21-00 (1)	21-23 (1)
Eastern Mediter-ranean & Middle East	08-10 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-14 (1) 21-23 (1)	18-22 (1) 06-08 (1)	*Nil*
Western Africa	09-11 (1)** 08-10 (1) 10-13 (2) 13-14 (1)	07-10 (1) 10-14 (2) 14-16 (3) 16-17 (2) 17-18 (1) 22-00 (1)	18-23 (1)	19-22 (1) 19-21 (1)*
Eastern & Central Africa	09-12 (1)	08-13 (1) 13-15 (2) 15-17 (1) 21-23 (1)	18-22 (1) 06-08 (1)	*Nil*
Southern Africa	08-10 (1) 10-13 (2) 13-14 (1)	06-09 (1) 09-10 (2) 10-13 (1) 13-16 (2) 16-18 (1) 23-01 (1)	18-19 (1) 19-20 (2) 20-21 (1) 06-08 (1)	18-20 (1)
Central & South Asia	16-18 (1)	08-11 (1) 16-17 (1) 17-18 (2) 18-19 (1)	17-19 (1) 04-09 (1)	05-07 (1)
South-east Asia	14-16 (1)** 14-15 (1) 15-17 (2) 17-18 (1)	07-09 (1) 09-10 (2) 10-13 (1) 17-19 (1) 19-20 (2) 20-21 (1)	02-03 (1) 03-06 (2) 06-08 (1)	03-07 (1) 04-06 (1)*
Far East	13-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-09 (2) 09-11 (1) 11-13 (2) 13-16 (1) 16-18 (3) 18-19 (2) 19-21 (1)	22-00 (1) 00-02 (2) 02-06 (3) 06-08 (2) 08-09 (1)	23-01 (1) 01-05 (2) 05-07 (1) 01-06 (1)*
South Pacific & New Zealand	12-14 (1)** 14-16 (2)** 16-17 (1)** 11-13 (1) 13-16 (2) 16-17 (4) 17-18 (2) 18-19 (1)	04-08 (1) 08-10 (3) 10-12 (2) 12-16 (1) 16-17 (1) 17-18 (3) 18-20 (4) 20-21 (2) 21-02 (1) 02-04 (2)	21-22 (1) 22-05 (3) 05-07 (2) 07-09 (1)	22-00 (1) 00-05 (2) 05-07 (1) 02-06 (1)*
Austral-asia	15-17 (1)** 11-12 (1) 12-15 (2) 15-17 (3) 17-18 (1)	17-19 (2) 19-20 (3) 20-21 (2) 21-03 (1) 03-05 (2) 05-08 (1) 08-10 (3) 10-12 (2) 12-17 (1)	02-03 (1) 03-04 (2) 04-07 (3) 07-09 (1)	03-04 (1) 04-06 (2) 06-08 (1) 04-07 (1)*
Caribbean, Central America & Northern Countries of South America	08-10 (1)** 10-14 (2)** 14-15 (1)** 07-08 (1) 08-11 (2) 11-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	08-09 (4) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (2) 18-22 (1) 22-02 (2) 02-06 (1) 06-08 (2)	18-19 (1) 19-01 (3) 01-04 (2) 04-05 (1)	19-22 (1) 22-01 (2) 01-04 (1) 22-00 (1)* 00-02 (2)* 02-03 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, and Uruguay	09-11 (1)** 11-14 (2)** 14-15 (1)** 07-08 (1) 08-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-16 (1)	12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-22 (1) 22-01 (2) 01-06 (1) 06-07 (2) 07-09 (1)	19-21 (1) 21-02 (2) 02-05 (1)	20-23 (1) 23-00 (2) 00-02 (1) 23-01 (1)*
McMurdo Sound, Antarctica	14-16 (1)	17-19 (1) 19-22 (2) 22-02 (1) 08-10 (1)	23-02 (1) 02-05 (2) 05-06 (1)	02-05 (1)

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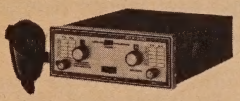
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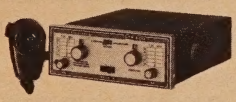
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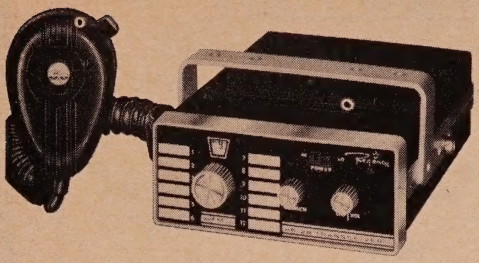
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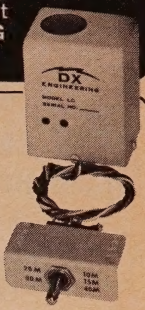


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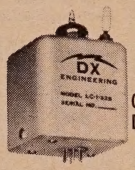
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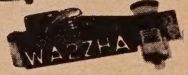
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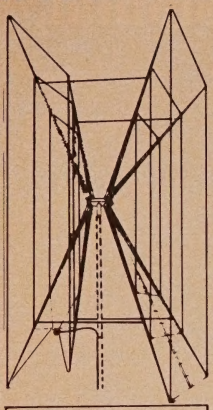
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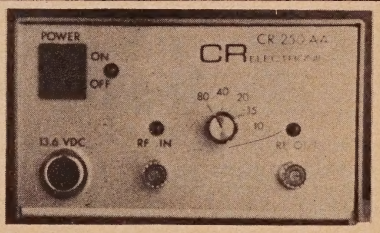
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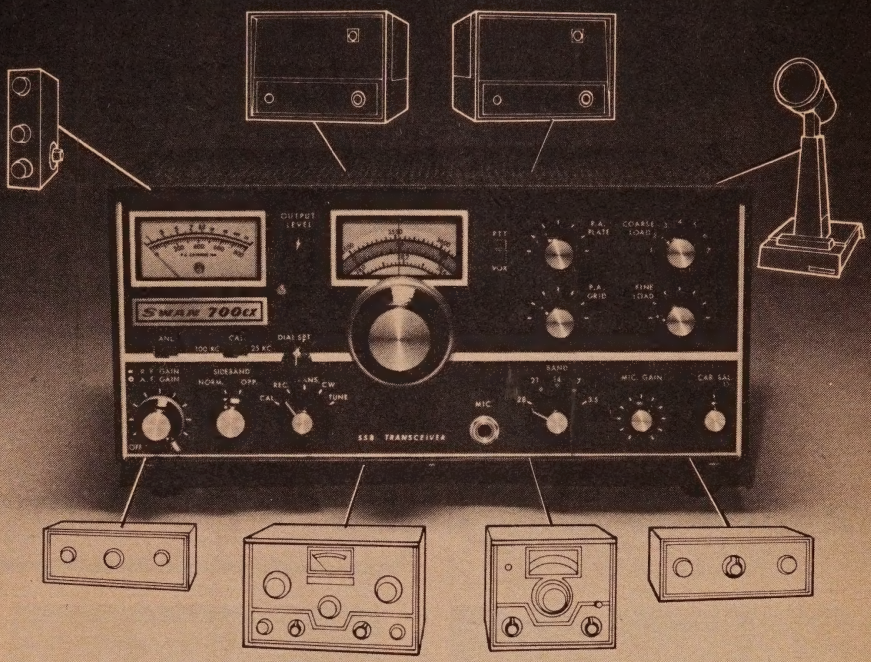
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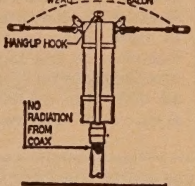
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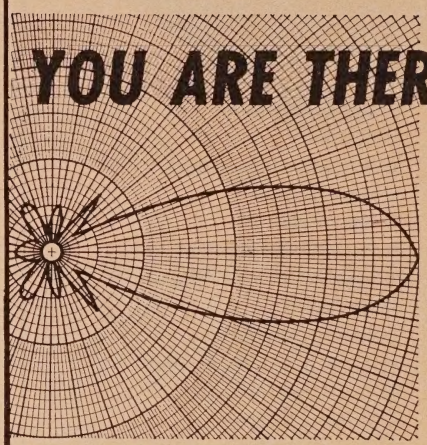
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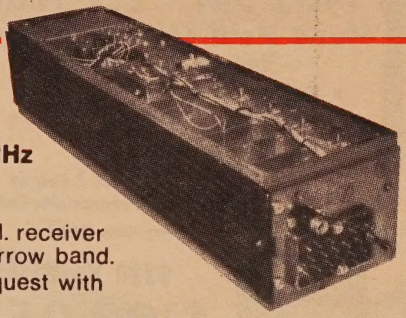
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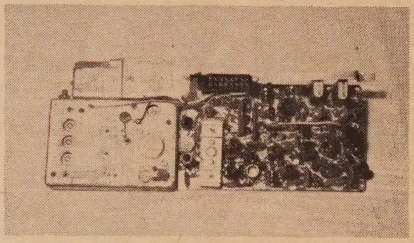
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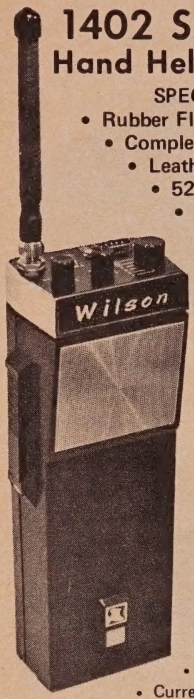
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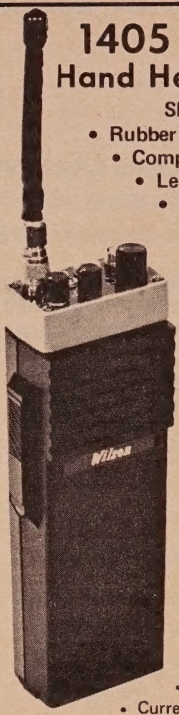
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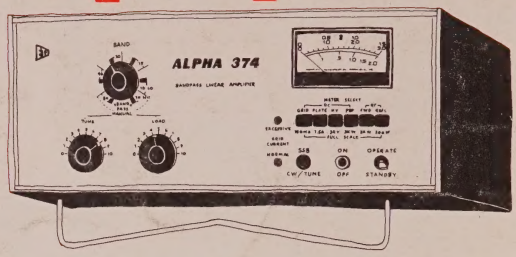
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