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A Safari With The President ...p. 14

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THE RADIO AMATEUR'S JOURNAL

W. TRAVIS '78

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logic "1" thresholds (HI-LED)	2.25V ± .15V	70% Vcc ± 10%
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Min. detectable pulse width 50nsec. guaranteed.

Pulse detector (PULSE LED) in PULSE position of PULSE/MEMORY switch, ⅓-sec. pulse stretcher makes high-speed pulse train or single events (+ or − transitions) visible; in MEMORY position, first transition lights and latches LED

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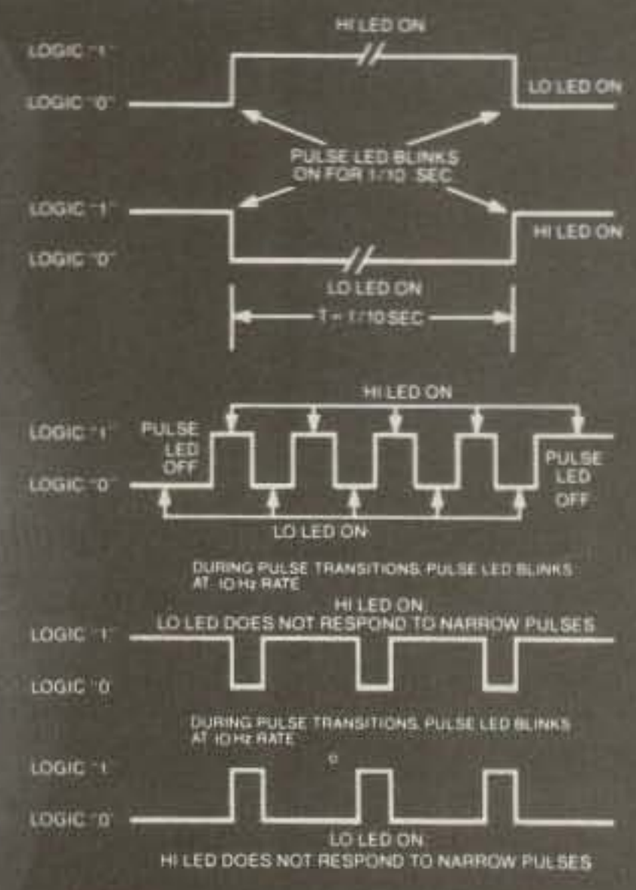
Physical size (l x w x d)
5.8 x 1.0 x 0.7" (147 x 25.4 x 17.8mm)

Weight 3oz. (.085Kg)

Power leads removable 36" (914mm) with color-coded insulated clips; others available

Input protection overload, ±500V continuous; 117 VAC for less than 15 sec.; reverse polarity, 50V; power leads reverse-voltage protected.



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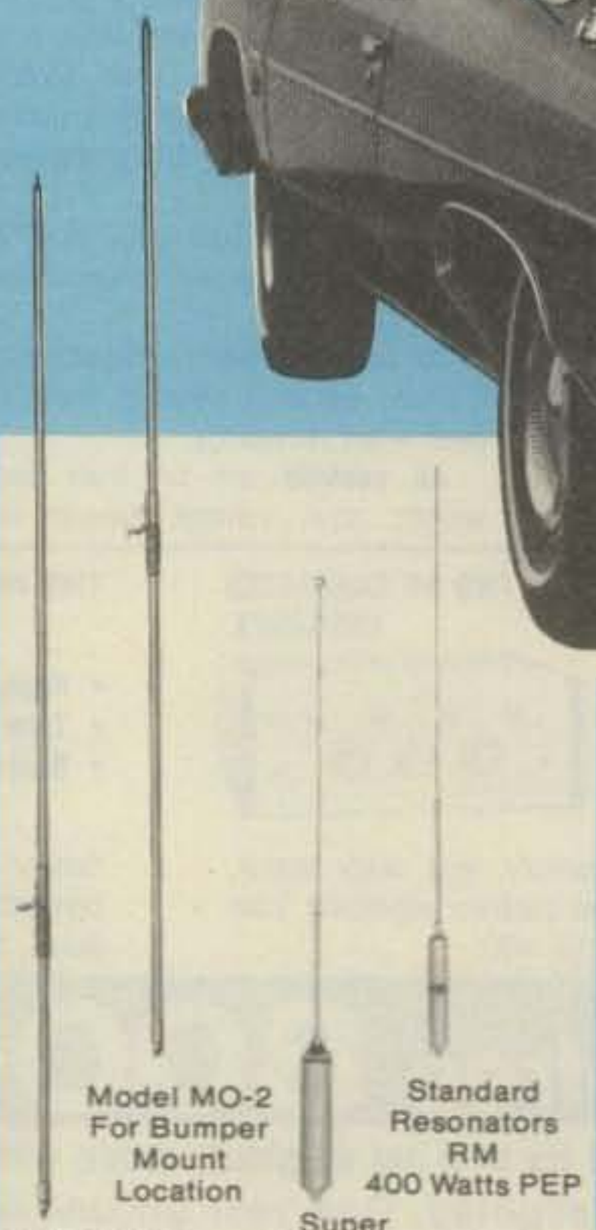

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NOVEMBER, 1978 VOL. 34, NO. 11

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

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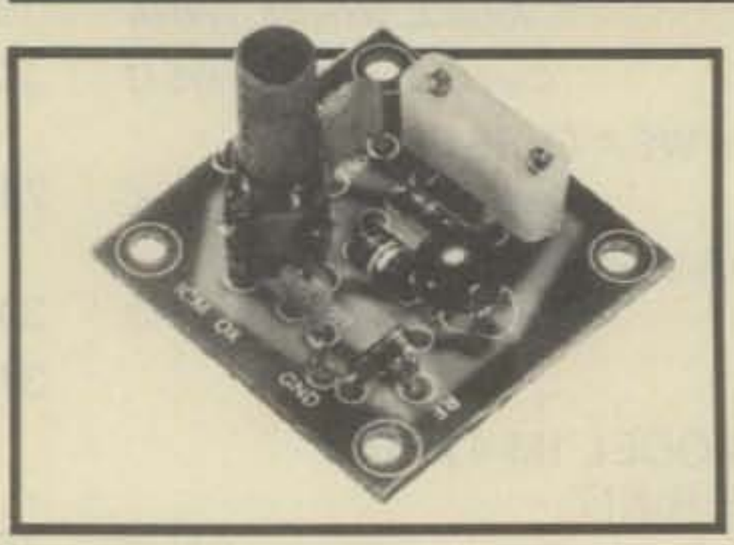

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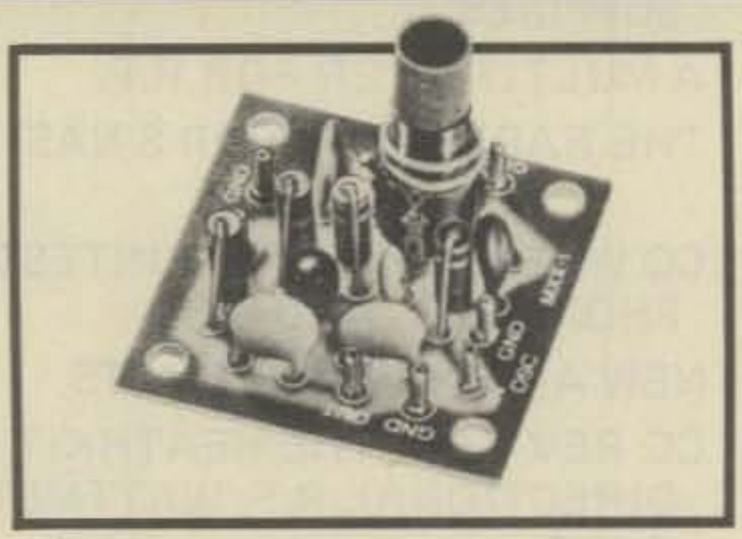

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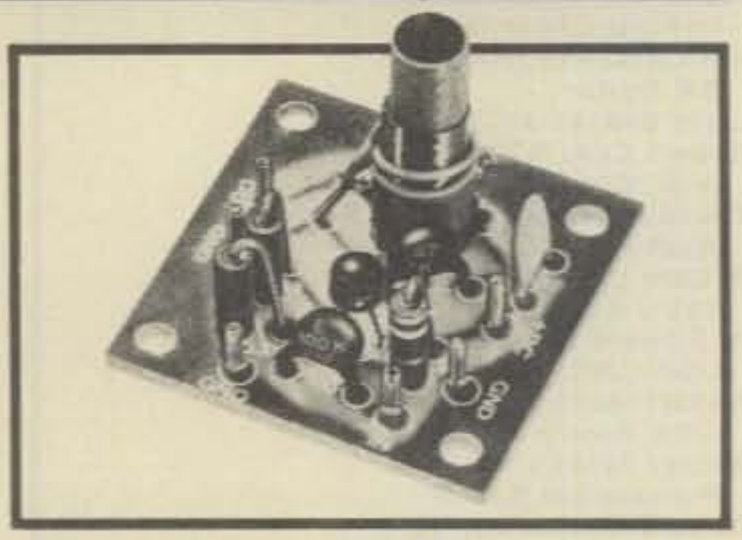

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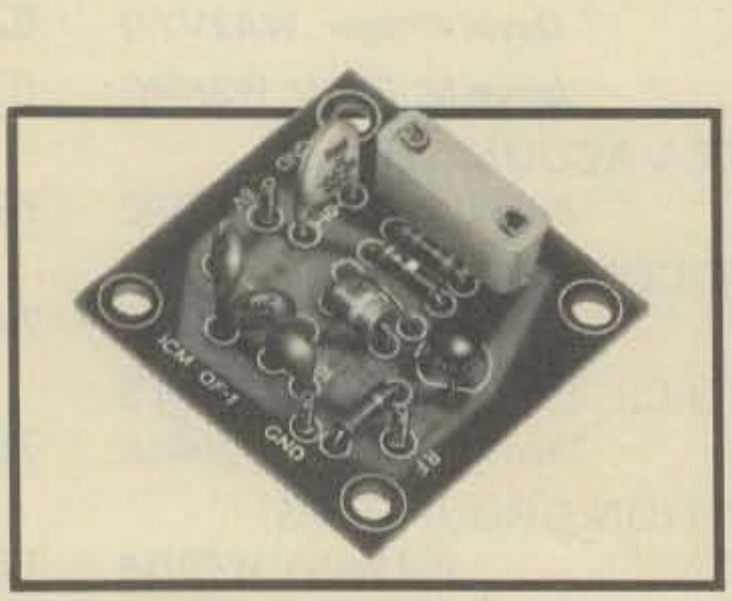

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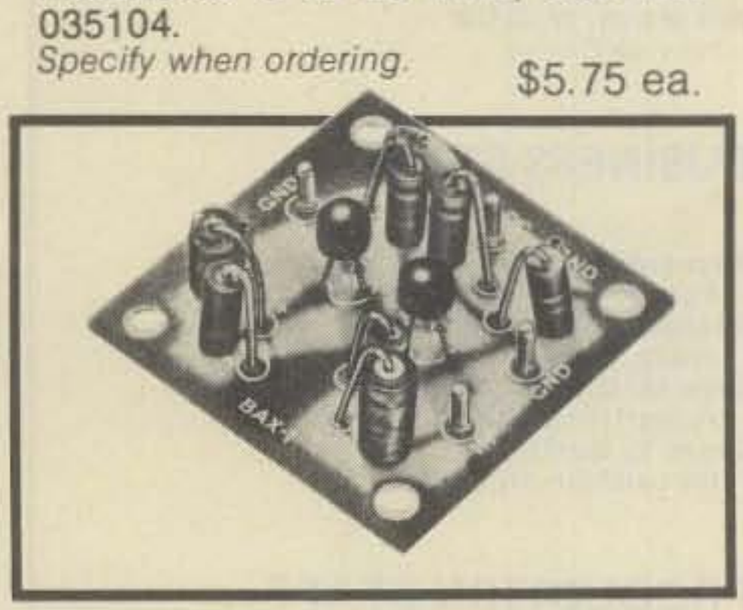

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Zero Bias

an editorial

Ten years ago this month amateurs began to feel the effects of Incentive Licensing. The guise of this program was to demonstrate to one and all that American amateurs upgrade their technical proficiency and are a viable resource for this country. Incentive Licensing was foisted upon the amateur community with the subtle innuendo of "International Reasons." This meant that supposedly the emerging nations or nations in transition would be impressed by our behavior and support amateur radio at future frequency conferences (WARC-79).

This rather naive rational had the "in" people believing or espousing the theory that these countries would then relinquish their military, industrial and social needs for communications in response to our studious efforts. It apparently hasn't worked as we still face the same problems. All countries including ours still face a growing need for frequencies for a variety of reasons. By demonstrating our ability to memorize anything does not in any way diminish that need. Incentive Licensing was and still is a farce.

Let's look at the "emerging nation" complex or the nation in transition for a moment. For the most part amateur radio is not looked upon with great favor or looked on at all. Governments are suspicious (including ours) of anybody with a transmitter. At the same time there exists a tremendous need for a strong growing technical base, whereby modern communication systems can be designed, built, installed, used and maintained by indigenous personnel rather than by imported technicians. The need for such systems is there and evident. The need for personnel is there and also evident.

Currently it is the practice to send these personnel abroad for specialized training and experience. In some instances the individual sees a different life style or the chance to capitalize on his newly acquired skills by making far more money staying where he is rather than return home. The incentive for him is not always to be altruistic. We are not talking about large numbers of people in any event so that the loss of a few magnifies their importance tremendously.

Amateur radio sets the tone for developing a technological base. Amateur radio provides an atmosphere whereby people can become aware of communicating, learn the fundamentals of electronics and share their experiences with others. . . right where they live. We can all look at the rapid rise in technology experienced in Jordan to bear out this point. Jordan managed a spectacular growth with their introduction of amateur radio. Obviously Jordan's needs, as the needs of any other country, are far greater than amateur radio can satisfy but it was the first step and a very important catalyst in creating home-grown technology. This was done without the help of American Incentive Licensing or the particular amateur radio convenants of any other country. It can be repeated practically anywhere. The only drawback to leading by example is that everyone may not want to go to the same place.

Amateur radio is important for what it can do not for what it is. It has a long history and tradition in our culture. The American electronics industry and communications field developed through the interests and curiosity of innovative amateurs. For the most part we are evolving past that stage, now becoming consumers rather than innovators but in essence we still provide a service. As we go through our growing pains here, others are starting their cycle elsewhere and at different points. What amateur radio evolves to here should not reflect on what it can do somewhere else. Nations that feel amateur radio is taking vital frequencies from them and subsequently vote for curtailment are actually robbing themselves in the long run. We on the other hand react to the imminent threat as a matter of personal attack and how this may hamper our activities. Although in some sense this is true, the far greater loss will be experienced by those countries rejecting amateur radio. Having frequencies and being able to use them are two different and distinct things. It is not only our problem but theirs too.

Amateur radio is evolving and in ten years will probably have an entirely new face here. What we become here may reshape some of our traditions (and create new ones). In the long run it is hoped that we can still be innovative and have a positive input into the technological system. It is evident though as our numbers increase markedly (as they have been) the numbers of amateurs engaged in experimentation and research as a percentage will go down. The numbers engaged in generalized communicating will go up and it is again hoped that this generation of amateur will provide a useful service to his country by his available means.

What is likely to occur in this country and others is a form of amateur radio in the broadest sense. Licensing procedures and grades of licenses will eventually change to become more inclusive of a generalized population with a desire to communicate. If the CB boom taught us anything it is that there are millions of people out there who want to talk to millions of others. Whether we deem this communication substantive or not or whether it falls directly within the realm of Public Service is up for grabs but it is the direction that the majority of the people want to go. We can continually dredge up atavistic arguments for a conservative and cautious approach to a future amateur radio, but that will not answer the need. There is a need to communicate just as there is a need to tinker and invent. Both will out despite feelings to the contrary.

As I have reported, hearings are being held to rewrite the Communications Act and possibly replace the FCC itself to bring things in line with todays needs and demands. There will be a meeting at the FCC in late October to discuss amateur radio exams which I will tell you about later. Things seem to be moving to a point of relevence, i.e. having a regulatory body that can regulate and having exams that perhaps can actually measure what is needed to operate a station and measure an applicants ability in real terms. It would be nice for example to denote what skills or knowledge an applicant should be able to demonstrate and which are icing in the cake. After all, it isn't necessary for most of us to know the theory of the combustion engine in order to pass a driving test or operate a car.

So, if the ten year reign of Incentive Licensing has taught us anything it is that "they" don't always know what is best for *us* or *them*. What we endeavor to legislate or do should be done for our mutual improvement and enjoyment and not as a prospective object lesson. After all, it was no incentive at all for the countries we were trying to impress. At the same time however, it was a tremendous incentive for American amateurs to cry out blindly that it made no sense and was punitive. Well, ten years has proven them right. There is a definite need for the concept of amateur radio both in this country and abroad. If we are worried about how certain countries will vote then it behooves us to show them how they can achieve their own goals and aspirations via their own application of amateur radio. It doesn't solve one problem or change one thing to toss the names of several hundred thousand Extra Class licensees on a conference table, even if it were possible.

73, Alan, K2EEK

Announcing

• **Cumberland, MD** — The Mountain Amateur Radio Club of Cumberland, is proud to announce the celebration of its Silver Jubilee during the year 1978. In order to afford other amateur Radio operators an opportunity to join us in our commeration of the anniversary, the Mountain Radio Club has proposed a special event. The M.A.R.C. Silver Jubilee Celebration starts: 0000 G.M.T., November 4, 1978 and ends: 2400 G.M.T., November 5, 1978. Stations may be worked only once regardless of the Band or Mode. Repeater contacts are not valid. Exchange: RS(T) QTH (State of Country). Frequencies: 3540, 3910, 7040, 7240, 14040, 14295, 21110, 21360, 28110, 28600. Awards: A special Multi-colored QSL card for contact with W3YMW (Club Station). Silver Jubilee Certificate will be awared to any amateur who contacts Five members of M.A.R.C. Mailing deadline is December 31, 1978. Please send a no. 10 s:a.s.e. for QSL card. Large envelope for certificate. Entries should be addressed to: John P. Fanelli, Jr., WA3WSW, 609 Piedmont Ave., Cumberland, MD 21502.

• **Clearwater, FL** — The Florida Clearwater Convention on the Gulf of Mexico, Sheraton Sand Key, will be held on November 25 & 26, 1978. The Convention will feature: Commerical equipment displays, forums, contests, FCC exams all day, radio group meetings, door prizes, and much more. Swap tables inside are $10 for both days, advance sold only. There will be plenty of off-hotel parking and courtesy buses and security provided. Reserve early for special rates: 1-800-325-3535. Talk-in on 37/97, 16/76, 3940, 223.34/224.94. Call CQ Ham Holiday (CQ HH DE WB4BZF). Work their Ham Holiday station 21.150, 7140, 21.400, and 7250 for special QSL. Hamfest donation is $3 for single, $5 for the family. Advance registration gets 2 extra prize tickets. For more information, contact: The Florida Gulf Coast Amateur Radio Council, Inc., P.O. Box 157, Clearwater, FL 33417 or Charlotte, WB4PEL at 1-813-461-HAMS.

• **Fort Myers, FL** — The Fort Myers Amateur Radio Club will be holding "Hamarama 78" on Sunday, November 5, 1978, from 8 a.m. to 4 p.m., at the Lee County Fairgrounds in North Fort Myers. Children will be admitted free with parent. Admission will be $3.00. For more information, contact: Bob Sloat, K4VGN, Hamarama Committee Chairman, FMARC, P.O. Box 0537, Tice, FL 33905.

• **Sellersville, PA** — The RF Hill would like to announce the Winter Indoor Hamfest II to be held on November 12, 1978, at the Sellersville National Guard Armory, Rte. 152 (Park Ave.), in Sellersville. All indoors and heated. Prizes and refreshments. Talk-in on 52 and 28/88. Time: 9 a.m. to 5 p.m. Donations will be $2.00, XYLs will be admitted free. Dealer space will be $3.00, bring your own tables. For more info, write: Sam Cox, WA3IUH, P.O. Box 29, Colmar, PA 18915.

• Anyone desiring to list stolen Amateur radio equipment, please send information to Colorado Council of Amateur Radio Clubs, c/o Charles E. Myers, W0RNT, 1120 Yosemite Dr., Colorado Springs, CO 80910 or call (303) 632-0848. Please include as much indentifying information as possible. Free distribution will be made to all amateur radio magazines and Colorado amateur radio clubs. Funds for postage and printing is appreciated.

• After 4 years of inactivity, the AUARC is in the process of re-establishing themselves. Anyone who has attended Auburn University and has knowledge of past activities of the club, please write to: Robert Alexander, WA4 RRN, President, AUARC, James E. Foy Union, Auburn University, Aubrun, AL 36830.

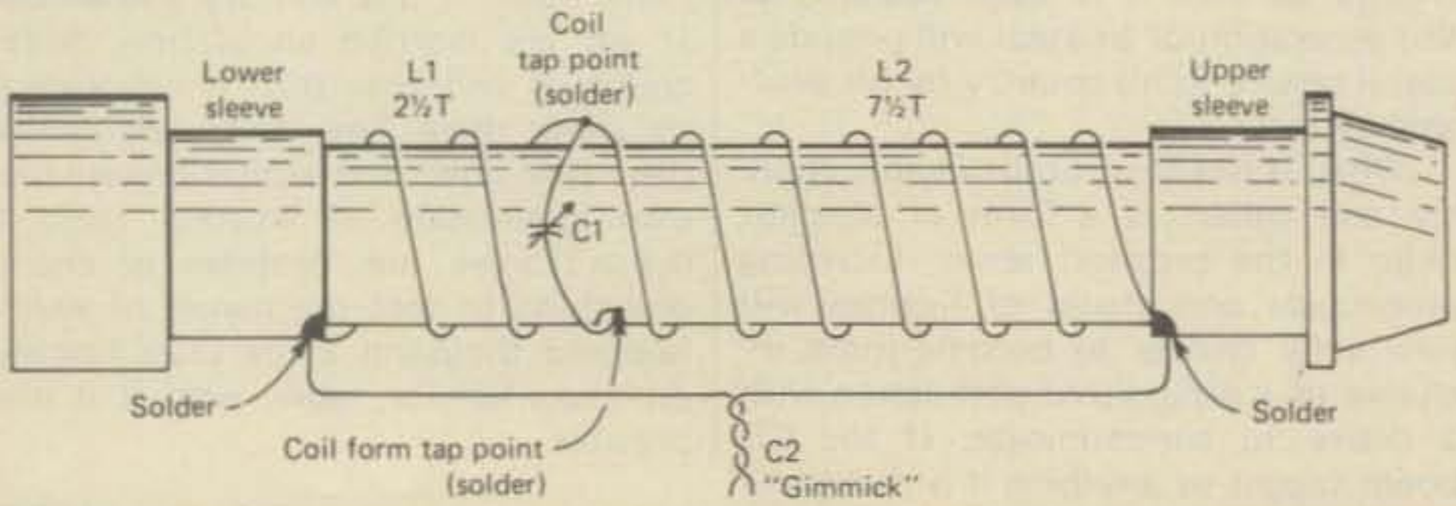
Corrections

"Dummy Up for DX"

Fig. 2 of W8FX/4's article, "Dummy Up For DX" (August 1978 **CQ**) has a small omission. A wire should be drawn from the top of C1 to the case ground.

"Gimmicking a CB Mobile Antenna"

Fig. 3 of WA2ANU's article, "Gimmicking a CB Mobile Antenna for Two Meter Use" (August 1978 **CQ**) had a couple of gremlins. Below is the corrected drawing:



"How to Update your Ham-M Rotor"

Richard Klinman, W3RJ, author of "How to Update Your Ham-M Rotor," (June 1978 **CQ**) writes, "The Ham-M Ham-II and current Ham-III rotors use a ***cast*** final drive gear, or ring gear. This is CDE part 50313-10 as stated in the article on page 36, and the current price is $3.50. The ***steel*** final gear, or ring gear, is part number 51494-10 at a current price of $20.00. This part is standard in the ***Tail-Twister*** but is interchangable with the cast gear in the Ham-M units."

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- **Continuously Variable Bandwidth:** The **IC-701** provides all filter widths for SSB, CW, RTTY, and even SSTV.
- **Double Balanced Schottky Diode 1st Mixer** is standard to provide the finest receiver IMD possible in a Hamband transceiver.
- **RF Speech Processor:** This is an **IC-701** standard feature at no extra cost.
- **VOX; Fastbreak in CW; RIT; AGC; Noise Blanker; Full Metering;** and many more ICOM quality standard features come with your **IC-701** HF Maximizer.

The new IC-701 is simply the best HF transceiver ever made: that's all. For more information and your own demonstrations, see your ICOM dealer. The ultimate HF Maximizer is yours in your ICOM IC-701.

Sold complete, with base mic and AC power/speaker, as shown.

IC-701 meets FCC Part 97.73.

All ICOM radios significantly exceed FCC specifications limiting spurious emissions.

Specifications: ☐ Frequency Coverage: 1.8 MHz — 2.0 MHz; 3.5 MHz — 4.0 MHz; 7.0 MHz — 7.5 MHz; 14.0 MHz — 15.2 MHz; 21.0 MHz — 21.5 MHz; 28.0 MHz — 30.0 MHz ☐ Frequency Control: LSI based 100 Hz step Digital PLL synthesizer. Independent Transmit-Receive duplex on same band, standard with every radio. ☐ Frequency Readout: 6 digit LED 100 Hz readout ☐ Power Supply Requirements: DC 13.6 V± 15% Negative ground current drain, 18 A max at 100 W output; AC power supply, speaker console for AC operation ☐ Antenna Impedance: 50 ohms unbalanced, VSWR 2.0:1 ☐ Weight: 7.3 Kg ☐ Size: (transceiver unit only) 111mm (h) × 241mm (w) × 311mm (d) ☐ RF Power Output: CW (A1), RTTY (F1), 100 W; SSB (A3J), 100 W PEP; Continuously adjustable 0-100W ☐ Emission Modes: A1, CW; A3J, SSB; F1, RTTY ☐ Harmonic and Spurious Output: more than 60 dB below peak power (meets FCC 97.73) ☐ Carrier Suppression: more than 40 dB down ☐ Unwanted Sideband: more than 40 dB down at 1000 Hz AF input ☐ Microphone Impedance: 600 ohms ☐ Receiving System: triple conversion, super heterdyne, with continuous bandwidth control (100 Hz — 2.4 KHz) ☐ Receiving Modes: A1, A3J (USB/LSB), F1 ☐ IF Frequencies: 1st & 3rd, 9.0115 MHz; 2nd, 10.7015 MHz; with continuous bandwidth control ☐ Sensitivity: better than 0.25 microvolts for 10 dB S+N/N ☐ Selectivity: SSB, RTTY, ± 1.1 KHz at −6 dB (adjustable to ± 0.5 KHz min), ± 2.0 KHz at −60 dB; CW, ± 250 Hz at −6 dB ± 700 Hz at −60 dB; CN-N, ± 100 Hz at −6 dB, ± 500 Hz at −60 dB (with Audio Filter) ☐ Spurious Response Rejection Ratio: better than 60 dB

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CIRCLE 22 ON READER SERVICE CARD

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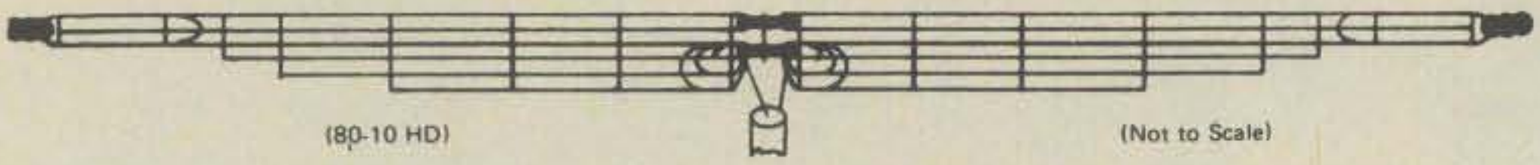

(80-10 HD) (Not to Scale)

multi-band HF communications antennas – half size · full performance

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80-10HD(N/T) ... 69' overall length for 80/40/20/15/10 meter coverage $84.50

80-40HD(N/T) ..... 69' overall length for 80/40 meter coverage $63.75

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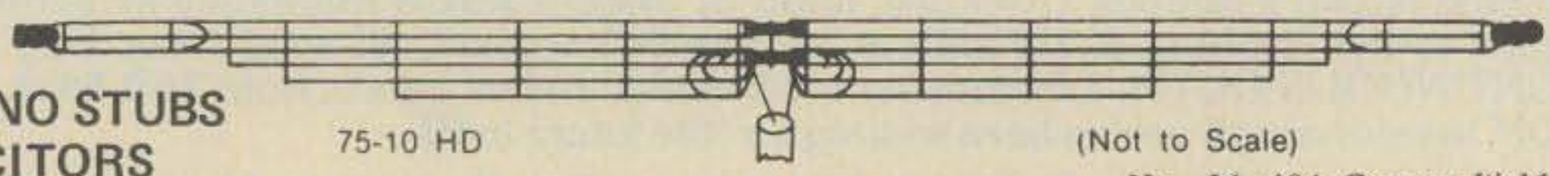
NO TRAPS, NO COILS, NO STUBS NO CAPACITORS



75-10 HD (Not to Scale)

MOR-GAIN HD DIPOLES . . . ● One half the length of conventional half-wave dipoles. ● Multi-band, Multi-frequency ● Maximum efficiency - no traps, loading coils, or stubs. Fully assembled and pre-tuned - no measuring. no cutting. ● All weather rated - 1 KW AM, 2.5 KW CW or PEP SSB. ● Proven performance - more than 15,000 have been delivered. ● Permit use of the full capabilities of today's 5-band xcvrs. ● One feedline for operation on all bands. ● Lowest cost/benefit antenna on the market today. ● Fast QSY - no feedline switching. ● Highest performance for the Novice as well as the extra-class op.

EXCLUSIVE 66 FOOT, 75-10 METER DIPOLES

● All models above are furnished with crimp/solder lugs. ● All models can be furnished with a SO-239 female coaxial connector at additional cost. The SO-239 male coaxial cable connector. To order this factory installed option, add the letter 'A' after the model number. Example: 40-20 HD/A. ● 75 meter models are factory tuned to resonate at 3950 kHz. (SP) models are factory tuned to resonate at 3650 kHz. See VSWR curves for other resonance data.

No. 16 40† Copper Weld wire annealed so it handles like soft Copper wire - Rated for better than full legal power AM/CW or SSB-Coaxial or Balanced 50 to 75 ohm feed line - VSWR under 1.5 to 1 at most heights - Stainless Steel hardware - Drop Proof Insulators - Terrific Performance - No coils or traps to break down or change under weather conditions - Completely Assembled ready to put up - Guaranteed 1 year ONE DESIGN DOES IT ALL; 75-10HD - Only $12.00 a band!

Model	Bands (Meters)	Price	Weight (Oz/Kg)	Length (Ft/Mtrs.)
40-20 HD	40/20	$49.50	26/.73	36/10.9
80-40 HD	80/40 ½ 15	57.50	41/1.15	69/21.0
75-40 HD	75/40	55.00	40/1.12	66/20.1
75-40 HD (SP)	75/40	57.50	40/1.12	66/20.1
75-20 HD	75/40/20	66.50	44/1.23	66/20.1
75-20 HD (SP)	75/40/20	66.50	44/1.23	66/20.1
75-10 HD	75/40/20/15/10	74.50	48/1.34	66/20.1
75-10 HD (SP)	75/40/20/15/10	74.50	48/1.34	66/20.1
80-10 HD	80/40/20/15/10	76.50	50/1.40	69/21.0

NOVICE LICENSE OPERATION. The MOR-GAIN HD Dipole is the ideal antenna for the new or Novice operator. As the Novice progresses to higher license classes, he can easily re-tune the HD Dipole to the new frequencies of his higher frequency privileges. The HD Dipole is thus a one-time investment. HD Dipoles are available for all Novice frequencies.

LEAST COST. Dollar for dollar, the HD dipoles are the highest performance, least cost multi-band antennas on the market today. For example: the 5-band 75-10 HD dipole costs less than $15.00 per band - an unbeatable low cost.

LIMITED REAL ESTATE. Where real estate for antenna installation is limited, the HD dipole is the ideal solution. Operation on 80/75/40 meters is now possible since the HD dipole is only half the length of a conventional half-wave dipole. For all around operation, the HD dipole will outperform any trap loaded horizontal or vertical dipole.

Above Models furnished with lug terminations. Cap-female SO-239 connector assembly – $3.75 additional. Include $2.50 for Shipping & Insurance with your order.

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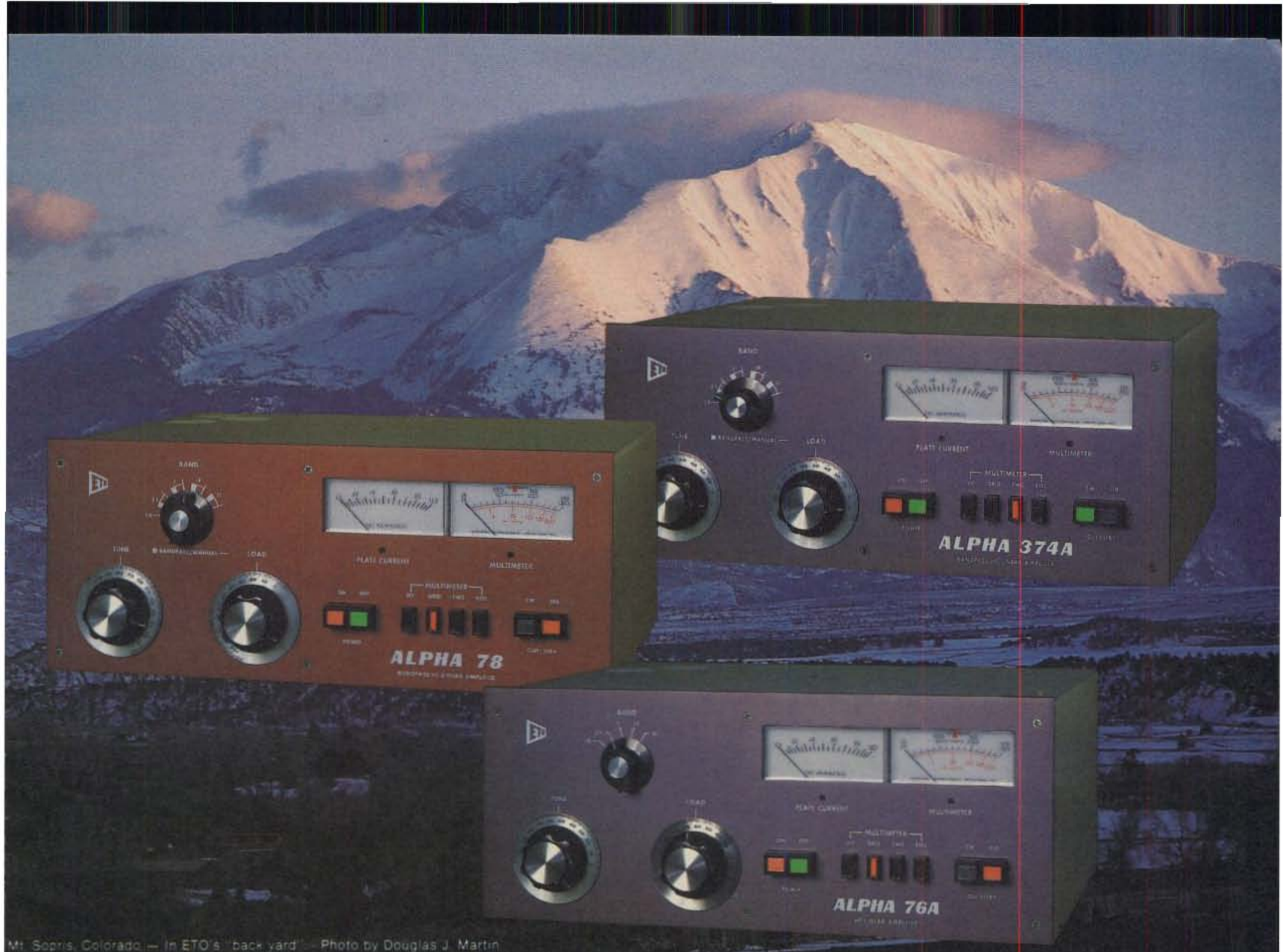

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Model	Frequency Range	Accuracy Over Temperature	@150MHZ	@250MHZ	@500MHZ	Number Of Readouts	Size Of Readouts	Power Requirements	Size
3600A	50HZ-600MHZ	OVEN .5PPM 50° to 100°F	10MV	10MV	50MV	8	.5 inch	115VAC or 8.2-14.5VDC	2⅞"H x 8"W x 5"D
3550W	50HZ-550MHZ	TCXO 1PPM 65° to 85°F	25MV	25MV	75MV	8	.5 inch	115VAC or 8.2-14.5VDC	2⅞"H x 8"W x 5"D
3240HH	2MHZ-250MHZ	3PPM 65° to 85°F	100MV	100MV	NA	7	.4 inch	4AA Batt.	5"H x 3"W x 2"D

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CIRCLE 12 ON READER SERVICE CARD

there's a world of difference in TEN-TEC's *all-new* hf transceiver—

OMNI

The traffic jams in Lagos are so long that people circulate with food to feed the multitudes.

r.f. remote. It was decided that we would run a 450 MHz remote base from the Nigerian External Communications building (referred to as the NET building) for return cue, and transmit to one of several sights with the RPU equipment. Simple he said. Ha!

As the weeks got closer the Nigerian government allocated frequencies to us. The RPU frequency was to be 147.095. Well that settled the question of the remote receivers. One of them would be my KDK mobile rig. McMartin, a commercial manufacturer, would supply the rest. And the gear came. On a normal remote we might take 12 to 15 cases. This time we put a stop to it at 38. This included 5 cases of bottled water. Remember, we were told, it's a jungle out there. That proved to be the understatement of the trip.

Travel day arrived. We were to go into Nigeria three days ahead of the President and get set up. We showed up at the Pan Am counter and were told that we would be allowed two bags each. And how many did we have? I beg your pardon, I thought you said 38. You did say 38. Oh. Well let's see that's only about $7,500 in excess baggage fees, so I guess you really don't want to take all of that stuff; right? Wrong. Well, pay the cashier if you really mean it. Such was the start of the trip. Some 14 hours, and 9 meals later we touched down in the gray morning light at Dakar, Senegal. A sleepy flight full of people wandered into the transit lounge to see what Africa had to offer. Later back on the airplane we world travellers and statesmen of the broadcast world sheepishly showed each other the tourist trinkets we had bought. Three more hours brought us to Monrovia, Liberia. Another rest stop. I am the QSL manager for Ben, EL2BA, and thought that I should call him and let him know I was in the area. Sorry, no phones into town from the airport. This is Africa, remember. So, on to Lagos. On arrival we stepped from the air conditioned plane into the sunny 96 degree day. That alone was like culture shock. But through customs with the help of information ministry people ("How many bags did you say you had?"). And on the road to the Hotel EKO (like "echo"). This proved to be a Holiday Inn. Only CBS would send you half-way across the world to a Holiday Inn. It was our fortune, however, to find that this Inn was the best hotel in Lagos. On arrival I looked up to see the smiling face of a crew cut young man hauling a radar dish out to the roof. The EKO was to be the headquarters for the Secret Service and the White House Communications Agency also. We, and our 38 bags settled in. By the next day, you would have thought that Field Day was taking place. Between our several systems, the special communications gear that WHCA had going, several dishes to shoot various satellites, and the secret service base station, the roof would have made a respectable contest club proud. As the base equipment was getting set up Joe and Tony rented a Volkswagen station wagon, and set up the mobile reporting point. Onto the van went a three element beam, rotatable (armstrong method), a three element 450 MHz beam, a 450 MHz whip, and v.h.f. gutter mount. A 25 watt McMartin transmitter would get the word out, while a 50 watt 450 MHz Motorola mobile would give coordination return. In addition a second v.h.f. system was set up to allow a Com-Rex receiver in the van to relay another v.h.f. frequency (172 MHz) into the 147 MHz system for reporting away from the truck. Sort of a double hop idea. We installed the 450 MHz and the two v.h.f. stations in the hotel on the roof, ran the wires down to our control point in the hotel ballroom, and set up the various audio mixers. The day before arrival Tony and Joe set out to check as many of the expected points of interest as possible. They would also set up a 147 MHz receiver in the NET building and we would have another remote receiver to choose from. Communications with the NET building would be via 450 MHz walkie-talkie. Even though the building was the incoming point for all telecommunications to Nigeria, it was felt by them that their phones were just too unreliable. I wonder if the Bell system would admit to that.

The van checked out the sports palladium. 5 by 9 signals on both v.h.f. and u.h.f. Now to several memorial sights. Fine signals again. Next would be the presidential residence where the talks would be held between the two leaders.

As the police told it, it looked like this: a strange looking van with some kind of possible weapons pulls into the residence courtyard. These two Americans get out and look around, pointing to the residence and talking about a clear shot to the hotel after shooting the President. Wrong choice of words. They were surrounded, asked for papers, found to have none on them, and marched into the van for a trip to the hotel. At gunpoint! On arrival at the hotel I looked up to find them walking in front of a man with a machine gun pointed at them. Had they asked for a direct QSL from a U station? Offered to sell our cans of Coke? No, they had been heard to say they would shoot the President. Did I know these two men? Sure, I said. In fact one even is a good guy. What about the other I was asked. Just joking I said.

A footnote here. Nigeria is a dictatorship, run by a military government that takes people who have committed serious crimes out to the beach on Saturdays, and executes them by firing squad on public television. You can't joke with these fellows.

Three drinks later we sat down to test with the New York end of the circuit. As ABC had the starting pools in South America it was decided to have the ABC master control handle the entire trip. At the appointed time we all held our breaths and called

An aerial view of Monrovia.

Transport, Lagos-style. Manual transportation is still the fastest way to get around. Everyone else gets stuck in the traffic jam.

ABC New York for an audio test. The reply? "Wait three seconds for the repeater to drop out please." Hmmm. Sounds familiar. Instead of the usual question about quality, I requested to know if I could make a "call please." Back came "Wait for the beep." It was now time for QRZ. Back came a laugh and the reply that it was Bill Nicosia, WB2ZKX. Bill informed me that for the occasion the master control operators would be himself, Mike, K2OUD, and Rich, K2RVM. That made a 6800 mile circuit via wire and satellite with amateurs at either end. This is how the Networks handle the big stuff. The confidence in amateurs is still there in our industry.

The Man Arrives

The next day the van rolled out to the airport, and the horde descended on us. The two press planes arrived about an hour before the President so they could report his arrival. Tony, out on the tarmac had the Comrex equipment, and was sending v.h.f. signals to Joe in the van in the parking lot. Joe relayed the reports to me and out to the waiting world press. Two hundred weary reporters, producers, engineers, and White House staff stood in line with the pride of the diplomatic corps to report on the arrival ceremonies. As the man shook hands with the President of Nigeria, General Obasanjo, the reporters lined up and did "ROSERS" (Radio On Scene Reports) describing the scene. Three minutes and nine reports later the motorcade left the airport for the residence. The press busses, with a police escort, left for the Hotel EKO.

For three days there had only been the pool people at the hotel. All told; about twelve. This allowed another guest, U.S. U.N. Ambassador Young to play tennis, and relax. Now the White House press corps, like locusts, had descended on us and suddenly we were 212. All the reporters had trip pieces that they wanted to file, so up went the sign in list (see, you DXers are not the only ones with lists. Even the creme of the journalists have to use them) and report after report winged its way to New York and Washington. Airport pieces, Color pieces, In-flight pieces, Pool pieces from Air Force One describing how the President felt about the trip, and finally, the Bible. The little list of the President's travel for the next day. Remember no phones were really available. The first day of the President's stay was a quickie. Only 23 hours long. No matter where he went the press filed stoires. By radio. At night America heard the sounds of the native drums at a festival. During the day, military bands and speeches that all politicians love to make. President Carter's remarks were heard as he walked across a square. Not on tape, but live via walkie-talkie remote pick-up unit. On the second day, after bilateral talks Mr. Carter was scheduled to visit a port facility called "Tin Can Island."

A Lagos tour bus.

A word about Nigeria. It is the second largest exporter of oil in the world to the United States. We owe them 5 billions of dollars in balance of trade. They will not take IRCs. That's why the President went. They also have a line of ships waiting to get in to Lagos harbor which is two miles long. It can take up to a year to get your goods to the dock. That's the reason for the new port facility. This was to be the "super remote." Tony and Joe took the van to the island by bridge. The President was to go with the General by water in a cabin cruiser. The press boat was to be a hydrofoil. I drew that duty. The reporters would send in their reports via a 3-watt RPU transmitter that I would hold up above the deck. Sounded good. The motorcade proceeded to the statehouse to pick up the President. I asked if anyone wanted to file a report and would up hanging out of the bus as they took the mic to report what the streets of Lagos looked like (dirty) and how the ships along the quay blew their horns at the motorcade. We picked up the Presidential detail and headed for the water side. With great pomp (for the cameras) the President made his way aboard the cabin cruiser. The press boarded its craft and we set out. Or rather the President did. We proceeded at a majestic 3 knots due to a faulty engine. The reporters sunned themselves on deck, and I reported all of this to the EKO base via 450 MHz.

As it looked like we might be there for a while the Presidential security advisor, Zbigniew Brzezinski, gave a short briefing to the reporters. This led to the request to file stories from the boat. Could it be done? It would be a first. I called EKO on 450 MHz and asked them to listen for us on 147 MHz. "5 by 9" came the report. We started to file stories. Mr. Brzezinski came aft to see what we were doing and about then the boat started like a colt out of the starting gate. He had the presence of mind to grab the door jamb with one hand, and my belt buckle with the other. I was falling backwards over the stern at the time, RPU held high over my head. Bill Lynch, NBC reporter, just kept talking, although he couldn't keep from sailing. After the report we both thanked Mr. B.

Five minutes later we docked at the port, were loaded on board a flat bed trunk, and we rolled after the President. I made contact with Joe on 450 MHz, and we proceeded to double hop back to the EKO through the van. Round the island with the reporters describing every scene, and a few words by the President who came over to say hello. Then into six small boats for a cruise into the harbor. Sam Donaldson of ABC decided to file a story, and I climbed into the stern railing to get a clear shot back to the Island. About that time the President made a U-turn and headed back towards the press boats which were lined up in two rows of three behind him. It looked like the end of a bowling alley after a strike. The boats went every which way to avoid being hit. This time it was Bill Lynch who kept me from going over the side. I gave up and sat out the rest of the trip. So did the walkie talkie batteries about that time.

Land never looked so good!

The state dinner went smashingly, with all in black tie and

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TOTALLY SOLID-STATE. Sharing the TEN-TEC heritage of solid-state design leadership with its companion transceivers, the highly successful 540/544, OMNI has all the advantages of proven solid-state technology—reliability, long life, cool performance, better stability.

8-BANDS. The world now and in the future. OMNI covers 160, 80, 40, 20, 15, and 10 meters now (crystals included for all present Amateur bands, 1.8-30 MHz). And it has convertible 10 MHz and "AUX" band positions for the future.

BROADBAND DESIGN. Permits changing bands without tune-up, without danger of out-of-resonance damage to the final stage.

ANALOG OR DIGITAL READOUTS. OMNI-A features an analog dial with 1 kHz dial markings. OMNI-D has 0.43" LED readouts with the 5 most significant in red and the 6th in green to show 100 Hz increments.

BUILT-IN VOX AND PTT. Smooth VOX action with 3 easy-to-adjust front panel controls. PTT control is available at both front and rear panel jacks; an external microphone switch may be used.

BUILT-IN SQUELCH. Unusual in an hf rig, but handy for tuning or monitoring for a net or sked.

BUILT-IN 4-POSITION CW/SSB FILTER. 150 Hz bandwidth with 3 selectable skirt contours for optimum CW reception.

8-POLE CRYSTAL FILTER. 2.4 kHz bandwidth, 1.8 shape factor.

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ADJUSTABLE AUTOMATIC LEVEL CONTROL. For setting output power level from low power to full output, for retaining low distortion at desired drive power to linear amplifier.

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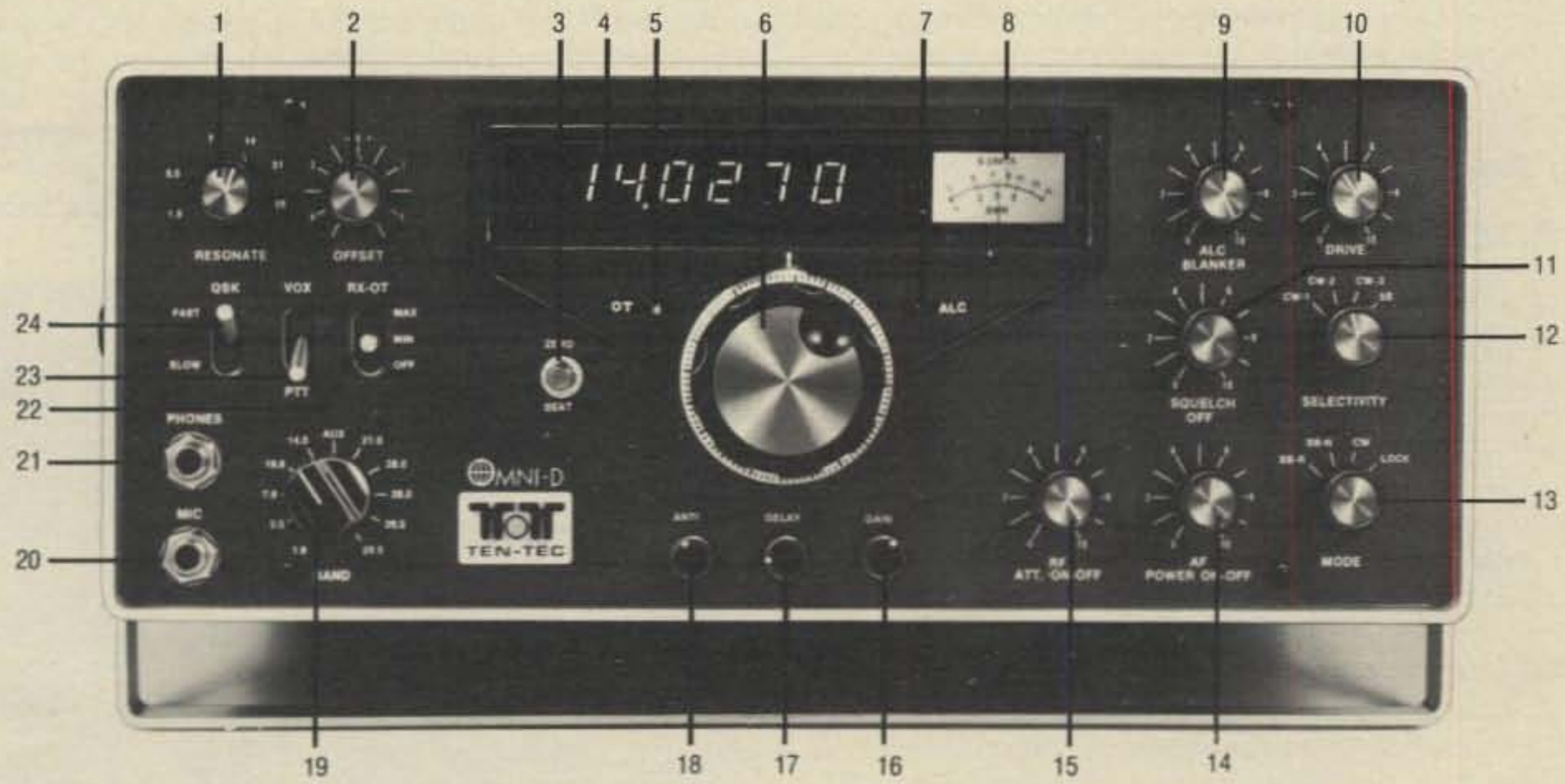

1 Receiver RESONATE control for peak sensitivity.
2 Receiver Dual Range OFFSET TUNING control for off-frequency work.
3 ZERO BEAT switch; spring-loaded, momentary contact.
4 6-Digit LED FREQUENCY READOUT for 100 Hz accuracy.
5 OFFSET TUNING LED indicates OT switch is "on".
6 MAIN TUNING KNOB; big, easy-to-grip with integral spinner.
7 AUTOMATIC LEVEL CONTROL LED indicates ALC-region operation.
8 Combination "S" and SWR METER; switches automatically.
9 Combination ALC control and NOISE BLANKER on/off switch.
10 DRIVE control for final stage.
11 SQUELCH combination on/off switch and control.
12 4-Position SELECTIVITY switch for SSB and CW.
13 4-Position MODE switch; automatic SSB Normal, Reverse, CW, and Lock (key down).
14 Combination push-pull POWER switch and AUDIO LEVEL control.
15 Combination RF ATTENUATOR on/off switch and control.
16 VOX GAIN control.
17 VOX DELAY control.
18 VOX ANTI-TRIP control.
19 11-Position BAND SWITCH.
20 MICROPHONE jack; hi-z input.
21 HEADPHONES jack.
22 RECEIVER OFF-SET TUNING SWITCH; 3-position: Max-Min-Off.
23 VOX-PTT SWITCH.
24 QSK (full break-in) SWITCH; 2-position: Fast-Slow.

Amateur Radio is not only a hobby. Indeed, it is defined by the F.C.C. as a service. In this exciting article WA2DHF relates his recent amateur radio service to President Carter and the United States.

Amateur Radio Serves the News Media

A Safari With the President

BY STEPHEN MENDELSOHN*, WA2DHF

You guys are going to have more shots than a police pistol range. Your arms will look like sieves by the time they get done with you. Joe Kulin, WB2UOM, and I looked at each other and wondered if this would really be the trip that an amateur would enjoy. The look on the face by my boss, Bud Arnow, W2BCM, told me that it would not be the easiest of remotes. We were to go to Africa to run the radio "pool" for the three broadcast networks, Mutual, Voice of America, UPI, and AP audio services. The reason for the trip? Jimmy Carter, President of the United States, was on the move again. When the President moves through four countries on two continents in just over a week, that's news. All of the broadcasters' gear up for a giant effort to let the people at home know how Mr. President is doing. This was to be his second trip of 1978, so ABC, and CBS (my employer) split up the responsibilities. His three day stay in Lagos, Nigeria would be the longest, and it was decided that CBS would handle that part of the trip.

Into The Pool

With all of that territory to cover it was decided to mount a pool engineering effort. This required CBS to assign two engineers, Joe and myself, with an executive producer. This was to be Tony Brunton, WA1QHS. We would provide all of the engineering services for the correspondants sent over to the "zoo," or press airplane. A pool effort thus saves having to send engineering personnel from each network and the 7 "subscribers" would divide the costs of the manpower and shipping. Each network would then have to send only one additional engineer to cover individual special assignments their home bass might want. For CBS it was decided that the unilateral producer would be Richard Reeves, KA2ABL. The next question asked was: Why so many hams? The answer was training in communicating. Lagos only has 1100 telephones and the usual fare for a overseas reporter is to call his stories into New York, or Washington, or a foreign bureau. We were going to be allowed only 4 telephones. This would mean, W2BCM said, that all of the stories would have to be filed into one central point via r.f. Remote pick-up equipment is simply standard v.h.f. and u.h.f. f.m. equipment with wide deviation for a more high fidelity sound. Wider bandwidths. As we were known to frequent the 2 meter f.m. portion of the band, it was decided that this constituted unique experience applicable to RPU equipment also. Who said that 2 meter f.m. experience doesn't pay off? The only question left unanswered at the early engineering meetings was whether I would be able to access the CBS repeater on the Chrysler building in New York City from Lagos with a Wilson Mark II.

How It Is Done

On a presidential remote it is usual for the broadcast organizations to have a 4-wire system at each presidential stop. This means that they have a broadcast grade circuit outgoing (7 kHz audio line) for voice use, and a "cue return" so the studio could talk to the reporter on the spot. Duplex operation. No such facilities existed in Lagos. There were not even four 4-wire set ups in the country! So we took the only one of three available (pool TV got the second, the White House the third) and made arrangements to run history's first pool audio

President Carter inspecting the port facility at Tin Can Island. He was riding in a World War Two jeep.

*144-25 33rd Ave., Flushing NY 11354

Announcing

HENRY RADIO'S

1KD-5

A BRAND NEW MEMBER OF THE FAMOUS HENRY RADIO FAMILY OF FINE AMPLIFIERS

The 2KD-5 and 2K-4 linear amplifiers completely fulfill the needs of discriminating amateurs who want the very best and are willing to pay the price. But we have long felt that many amateurs would be satisfied with less power if they could still have the same high quality and dependability. The 1KD-5 fulfills that need beautifully.

- **Quality that is unmatched in any other linear in its class. The same high standards of engineering and construction as the 2KD-5 and 2K-4. Heavy duty components guarantee years of trouble free, dependable performance.**
- **Smaller and lighter. Weighs about 27 pounds less . . . easier to take along on vacation trips and DXpeditions.**
- **Less expensive. If your budget is limited, but you still want a GOOD quality linear to kick your signal way up, with sharp, clear signals, the 1KD-5 will give you just about everything you want . . . and without sacrificing quality.**

GENERAL INFORMATION

The 1KD-5 is a 1200 watt PEP input (700 watt PEP nominal output) RF linear amplifier, covering the 80, 40, 20 and 15 meter amateur bands. (10 meters on units shipped outside the U.S.)

Tube Complement: Eimac 3-500OZ glass envelope triode operating in a grounded grid circuit.

ALC Circuit: ALC Circuit to prevent overdrive from high power exciters, also boosts average talk power.

Type of Emission: SSB, CW, RTTY or AM

Antenna Relay: DC relay system for hum-free operation, requires shorting contact to ground during transmit to key amplifier into transmit.

Power Output Indicator: Self-contained relative RF power meter.

Tank Circuit: Pi-L place circuit with a rotary silver plated tank coil for greatest efficiency and maximum attenuation of unwanted harmonics.

Input Circuits: Cathode Pi input matching circuits for maximum drive and linearity.

Power Supply: Conservative power supply with solid state rectifiers for reliable, long term operation.

Dimensions: 8.75" high x 14" wide x 15" deep. Weight: 48 pounds.

Price: $695.00

2K-4 floor console linear amplifier . . . still the "workhorse" of Amateur Radio. Engineering, construction and features second to none. Provides a long life of reliable service while its heavy duty components allow it to loaf along at full legal power. $1095.00

2KD-5 desk model linear amplifer . . . lighter, more compact and less expensive, but still a heavy duty, high quality linear that will operate at full legal power month after month for years to come. $895.00

Tempo 2002 amplifier for 2-meter operation. 2000 watts PEP input on SSB or 1000 watts input on FM or CW. $745.00

Tempo VHF/UHF solid state power amplifiers for use in most land mobile applications. Call or write for list of models available.

Tempo 100AL10 VHF linear amplifier. Power output of 100 watts (nom.) with only 10 watts (nom.) in. $209.00

3K-A linear amplifier (for export and military use only) Superior quality, extremely reliable. At least three kilowatt PEP input on SSB . . . 2000 watt PEP output. $1495.00

4K-ULTRA linear amplifier (for export and military use only) For the most demanding operation . . . SSB, CW, FSK or AM. For general coverage operation from 3.0 to 30 MHz, but can be modified for operation on frequencies up to 100 MHz. 100 watts drive delivers 4000 watts PEP input. $3250.00

All of the above except the 2002, 3K-A & 4K-ULTRA are available at Tempo dealers throughout the U.S.

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CIRCLE 27 ON READER SERVICE CARD

Security advisor Zbigniew Brzezinski briefing the press during the boat ride. In the background are Bob Shieffer of CBS and Bob Lynch of NBC.

jackets. I stayed home at the EKO with a lobster color sunburn. The next day saw the departure and again like lemmings the horde was gone. Twelve people just breathed a sigh of relief. New York congratulated all around and asked to close us down so they could start operations from Monrovia, the next stop on the trip. As a last request I asked them to have someone in Monrovia call Ben, EL2BA, and tell him that I was in Lagos. I had tried to call him, but to no avail. 25 minutes later he called me. Via London, and the Canary Islands! I wonder what that comes out to on a miles-per-watt basis? As long as I was there why not take a few days off and relax in Monrovia, he asked? It was on the way home, so I said I sure would.

Lagos has a strange problem. Power goes off for 2 to 6 hours a day, and although the EKO had its own generator, it was a bit disconcerting. And the water, undrinkable to me, contains some of the foulest stuff you can imagine. And worse of all, I met no amateurs. A license? The PTT people said "operate if you like, but issue yourself a call. We would rather not." I decided it was not worth the effort. Efforts to locate Kunle, 5N2NAS came to no good end. I gave up on Lagos, and as my Air Nigeria 707 left the Lagos airport, I was glad to have gotten out of there. The corruption is a story for another time.

Monrovia, Sweet Monrovia

On arrival at Monrovia I was looked at rather oddly. Was that coil of wire (100 feet of RG8/U) really for the press. Sure it was. And besides, the new headquarters station of the Liberian Radio Amateur Association could use it. Sort of good-will coax. Ben was there to meet me when I got out, and he took me to meet Cecil, EL2C who is "just a poor chemist." If there is a

This village, accessible only by wooden bridge, is typical of the many in Lagos.

The White House, Liberian-style.

human alive who lives in Monrovia, and doesn't know EL2C the chemist, he was on vacation when I was there. Everyone from government ministers to street cleaners knows him. Ben then took me around Monrovia, and showed me the city. Liberia has an amateur population of 80, and everywhere you go you see quads, and tri-banders. Our next stop was to see Sewell Brewer, Mr. FCC of Liberia. In short time I had a seat, a Coke, and a shiny new EL2SM license. Our next stop was at the home of Carlo, EL2AG. Carlo asked if I would like to try out my license. I assured him I would, and he took me to his shack. All Carlo runs is old Geloso tube equipment. You remember tubes don't you? Well his station, with its home brew linear, and simple TA-33 made quite a dent in 20 meters. Seems Carlo had the station built over a salt marsh! Two days later, and having racked up WAS in 15 hours of operation with over 750 QSO's made from "not so rare EL land," I was dragged away from the gear and taken to the airport. If anything can be said for the EL amateurs it's that they sure know how to treat a guy! A wonderful bunch of people all around.

Back To Reality

Stepping off of the plane in New York City I took the Wilson and checked into the local 2 meter repeater with the EL2SM call. After having told my friends to stand-by while I worked the sevens for several days, they heard the call, and asked me to stand by for a day or two, and get on the list for working rare stations like W, and K2's. I knew I was home.

It is quite an experience going to Africa. Going with the President of the United States is like nothing in the world. My biggest impression? His motorcade doesn't stop for traffic lights. That's real executive power. CQ

U.N. Ambassador Andrew Young after a policy meeting with the President.

The main ingredients of a power supply are a transformer, a rectifier and filtering. John Schultz explains how to choose the proper components.

Constructing Simple, High Current Power Supplies

BY JOHN J. SCHULTZ*, W4FA

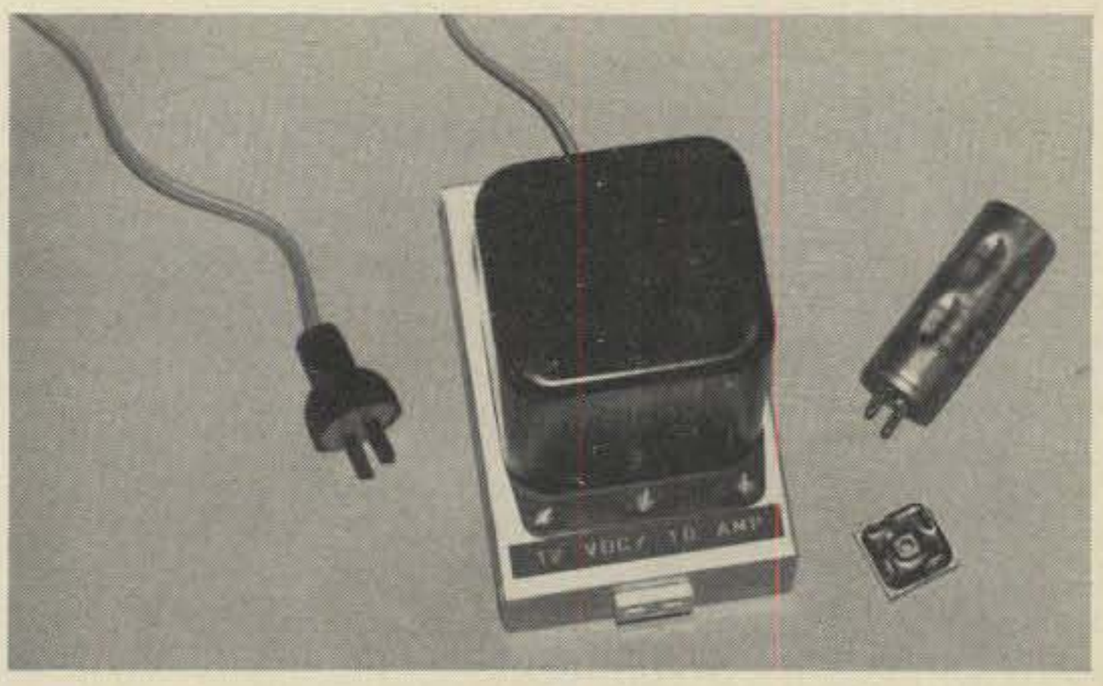
Low voltage, high current power supplies are very much in use these days to power the final stages of solid-state, high-power transceivers and other high current demand circuits. On the surface these power supplies seem simple enough; consisting basically of just a transformer, rectifier and some filtering. They are tempting units for the amateur to try to home-brew to save a few dollars because of their surface simplicity. But, often amateurs who have tried to home-brew such supplies have been sourly disappointed because of poor power supply performance. Often this is because some of the "little" things that don't come into play when dealing with low current drain power supplies were overlooked. This article explores some of the factors that one has to keep in mind when constructing even a simple, high-current supply.

The heart of any power supply is the power transformer. Fortunately, many good surplus bargains are still available in this area if one takes the time to dig them out (e.g., 110 v.a.c. transformers supplying 13 volts at 10 amperes continuous for under $10). Many of these transformers are one of a kind items but, nonetheless, very useful for many power supply projects. Some of the firms that have interesting items in this area are: Fair Radio Sales, P.O. Box 1105, Lima, Ohio 45802; Delta Electronics, P.O. Box 2, Amesbury, Mass. 01913; and Electronics Supermarket, P.O. Box 619, Lynnfield, Mass. 01940.

The secondary voltage and current rating the transformer should have depends on the load requirements. Usually a full wave or bridge type rectifier will be used as shown in fig. 1. The rectifier will, of course, produce a peak voltage output which is 1.4 times the r.m.s. voltage rating of either half the secondary or of the whole secondary, depending upon which rectification circuit is used. Adding filter capacitance after the rectifier smooths out the half-sine wave shown and with no load drawn from the supply, the charged filter capacitor will tend to maintain the supply output at the peak voltage level. Of course, one wants to draw current from the power supply and so the question really is What happens to the output voltage when the supply is loaded? This depends on the value of the filter capacitor used and the characteristcs of the transformer used. It doesn't take too much intuition to guess that the bigger the filter capacitor value, the "stiffer" the power supply output voltage will be with varying loads. How much filter capacitance to use can be fairly easily calculated and is covered later. However, the transformer characteristics present a more interesting unknown.

One usually thinks of a transformer simply in terms of its primary voltage and secondary voltage and current rating. However, a transformer is an involved component in terms of its actual construction and there are many ways of constructing a transformer that will have the same "ratings." There are iron losses and copper losses that affect the performance of any transformer. There are, of course, all sorts of technical terms and measurements that spell out quite definitively the performance of a transformer. But, there is little use to dwell on them here when the practical application of a surplus transformer is being considered.

There is no doubt, however, that a well built transformer will have better voltage regulation under a load than a cheaply made transformer. For instance, the table below presents the



This small 10 a., d.c. supply was built using a surplus filament transformer and the type of rectifier and computer type filter capacitor shown alongside the chassis. A regular 110 v.a.c. chassis mount socket makes a handy, inexpensive output connector.

*c/o *CQ* Magazine

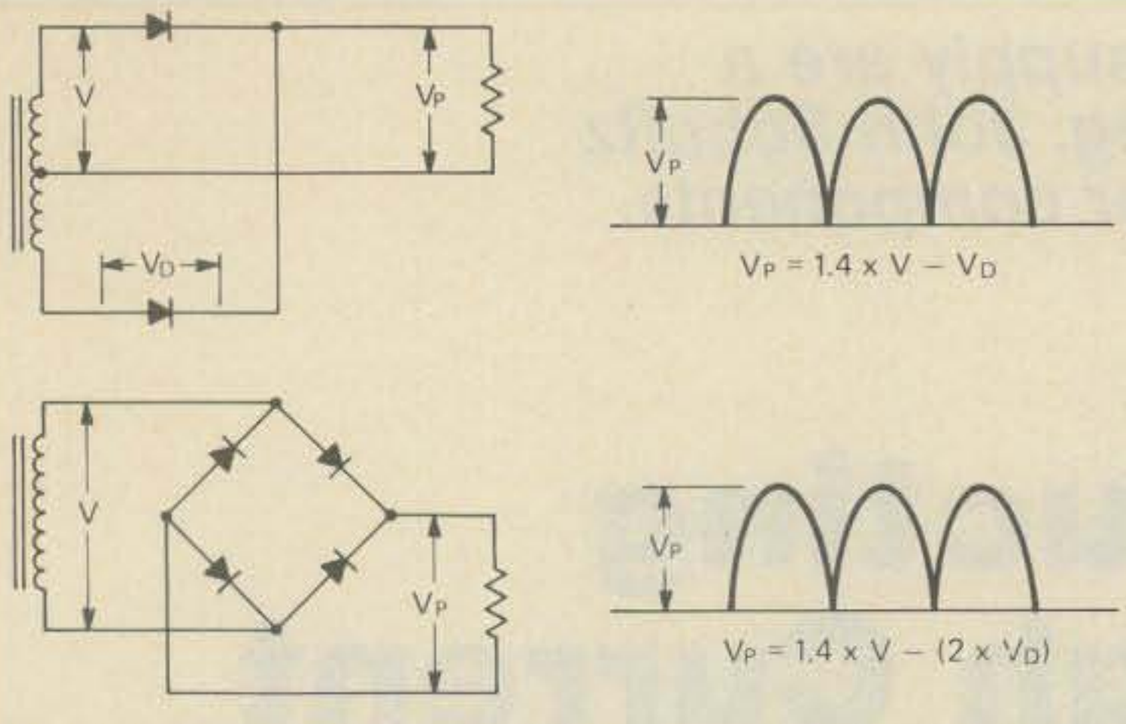


Fig. 1 — Typical full-wave and bridge rectifier circuits. V_d is the voltage drop across each diode (usually 0.7 to 0.9 volt). The V_d drops do affect the output voltage, a point most literature on basic electronics fails to mention.

average results obtained when testing a selection of transformers. Transformer type A represents well made U.S. manufactured transformers including the types of heavier units one is likely to find available from surplus outlets. Type B represents the "cheapie" type imported transformers. The transformers all had a nominal voltage rating of 12 volts and ranged from fraction of an ampere units to units going up to 10 amperes (although it must be admitted that the "cheapie" transformers were concentrated in the lower current ranges).

Transformer Type	No Load Voltage	Rated Current at Voltage
A	12.4	11.7
B	13.1	10.2

The percentage change of the output voltage when going from no load to full load based on the no-load voltage was 6% for type A and 22% for type B transformers.

Not everyone will, however, have a variety of load resistors available, particularly high wattage units, to check a transformer by fully loading its secondary. However, there is another simple test that one can perform to check and gain a good indication of the voltage "stiffness" of a transformer.

Short the primary of the transformer and feed a variable a.c. voltage into the secondary. Increase the variable voltage until the current flowing in the secondary is equal to the rated current of the secondary winding. Then find a percentage using the formula:

$$\% = \frac{V_L}{V_{UL}} \times 100$$

where V_L is the voltage across the secondary with the rated current flowing and V_{UL} is the unloaded voltage produced by the secondary. Transformers having a percentage of 10 or less will usually be found to provide good voltage "stiffness" in the order of the type A transformer in the test results previously mentioned. Note that the variable a.c. voltage needed for the test is only a fraction of the rated secondary voltage being tested. It can usually be supplied using a series variable resistor and a filament transformer (or any quality) that can temporarily supply the needed current. Fig. 2 illustrates the test setup.

With some reasonable estimate of the transformer voltage drop under load, one can go back to fig. 1 to figure in the other voltage drops involved in a given circuit. Note that the voltage drop across each diode in the rectifier circuits will be between .7 and .9 volt. Also, note that the rectifier voltage drop in the bridge type rectifier circuit is twice that of the full-wave circuit. This is because on each half-cycle cycle of current flow, two

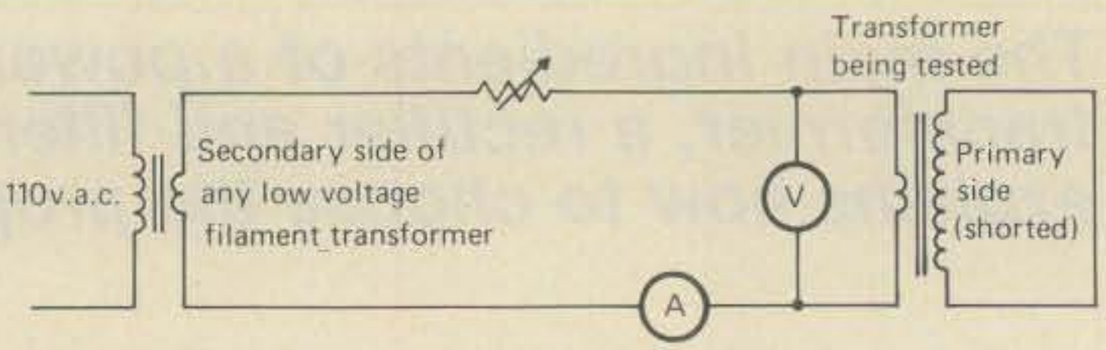


Fig.2 — A test setup which will lead to an indication of the voltage "stiffness" of a transformer under load without actually having to test the transformer under load.

diodes of the bridge are always conducting. Thus, if the transformer used produced 12 volts under load across its secondary, the output voltage would be between 10.2 and 10.6 volts.

The fact that a voltage drop across the rectifier diodes exists is often forgotten by home-brewers and has also lead to another problem. Many builders think from working on low current supplies that no heat is dissipated in a rectifier diode. However, if one considers that a diode has a voltage drop of about 0.9 volt across it and, say, one is drawing 10 amperes, it doesn't take too much use of Ohm's Law to calculate that the diodes must dissipate a fair amount of watts.

The problem of heat sinking rectifier diodes need not be complicated. One particularly interesting approach is shown in fig. 3. This is a full-wave rectifier circuit with the circuit arranged so the diodes are in the negative return leads. Using diodes, then, where the metal stud mounting of the diodes is the anode, one can bolt the diodes directly to the chassis of the power supply to let the cha-sis act as a heat sink. If these types of diodes cannot be found, regular diodes, where the stud mounting is the cathode of the diode, can be used but insulated from the chassis with mica washers. The use of silicone grease (heat sink compound) on both sides of the mica insulators is a *must* for good thermal conductivity. On small chassis, it is also a good idea to mount the stud type rectifiers to the chassis with a piece of aluminum bar stock to spread the heat out more quickly over the chassis area.

The use of a bridge type rectifier circuit, when possible, has some advantages in that molded case, high current bridge rectifiers have recently been coming available at very reasonable prices. 25 ampere, 200 p.i.v. units have been advertised at only a few dollars, for instance. These molded type rectifiers are usually in a square molded case with a metal plate on bottom which is insulated from the diodes within. So one only has to bolt the unit (without insulation but using silicone grease) to a chassis or finned type heat sink. When using a chassis as a heat sink an additional square, ⅛" thick aluminum plate should be used between the rectifier and the chassis. A rule-of-thumb is to use a 5" square plate for a 10 ampere supply and proportionately larger square areas for heavier duty supplies.

Assuming the transformer voltage does not change significantly with a load, the amount of filter capacitance used will then determine the voltage regulation for a given load. Referring to fig. 4, the peak voltage (V_P) is the peak output voltage of one of the rectifier circuits shown in fig. 1 taking into account the voltage drop across the rectifier diodes. V_L is the value the

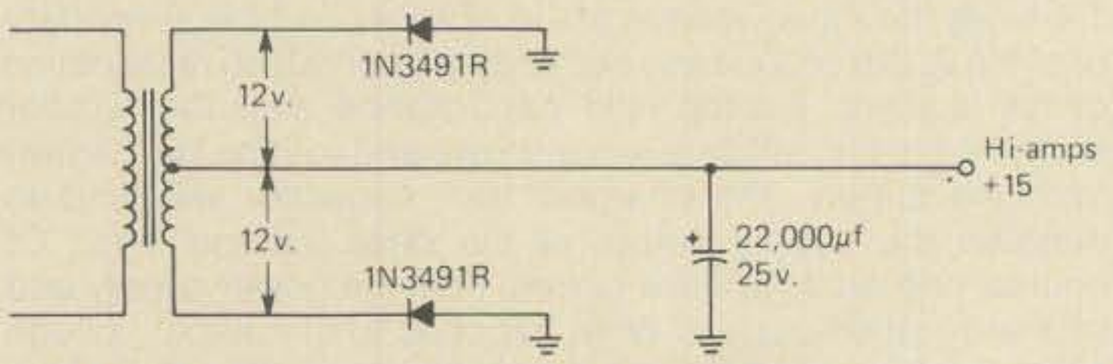


Fig. 3 — A handy way to wire a full-wave rectifier circuit using stud mount rectifier diodes where the anode of the diode is the stud. The circuit comes from part of the power supply for Atlas *transceivers.*

output voltage falls to under full load. The difference between the two voltages is the so-called ripple voltage or a.c. component which remains on the filtered d.c. voltage. Whether the ripple, as such, is more significant when powering a given circuit or whether the actual change in output voltage matters more depends upon the type of circuit one is powering. For audio circuits, one might want to hold the ripple to 1% (as a percentage of the peak voltage) while the collector voltage supply for a solid-state final could have 20% or more ripple.

A good approximation as to the amount of filter capacitance that is needed can be obtained from the formula:

$$C \text{ (in Farads)} = \frac{.01}{\% \text{ ripple} \times R_L}$$

In this formula, the % ripple is expressed as a fraction (1% equals .01; 20% equals 0.2; etc.) and R_L is a resistance found by dividing the peak voltage across the load by the load current. For example, say we have a supply which delivers 14 volts peak after the rectifiers, the load draws 10 amps and we think we can tolerate a 20% ripple. R_L would be 14/10 or 1.4. From the formula, the capacitance required would be 36,000 pF. With 20% ripple, the ripple voltage would be 2.8 volts (peak to peak) and the output voltage would fall to 11.2 volts when the full 10 amperes are drawn. For many solid-state r.f. power amplifiers, this would probably be a satisfactory situation. Of course, if the full 10 amperes are not always drawn from the supply, one can go backwards with the formula to determine ripple or voltage drop at lighter loads.

The question often arises when powering a linear r.f. amplifier as to how the power transformer should be rated. That is; if the linear draws 16 amperes peak, should the power transformer have a nameplate rating of 8, 10 or 16 amperes? If all the parameters of a situation were known one could give a firm answer. However, a good rule-of-thumb seems to be that the transformer continuous current rating can be ⅓ less than the peak current drawn. If very heavy speech processing is used which tends to keep the average current drawn very high, the transformer used should have a higher current rating. The rectifiers used should be rated at somewhat more than the peak current drawn.

There are many other factors that one could consider in building even simple power supply. These factors would include surge currents, proper fuse selection for short circuit protection of the supply, etc. However, it is not the intent of this article to discourage the building of high-current power supplies. In fact, it should be encouraged since one can save a considerable amount of money building such supplies when using surplus transformers and large value computer type capacitors. But, it is worth a bit of time to plan out in advance what value components to use and what grade of performance the supply should deliver before quickly slapping together a transformer, rectifier and filter capacitor in order to construct a "simple" power supply.

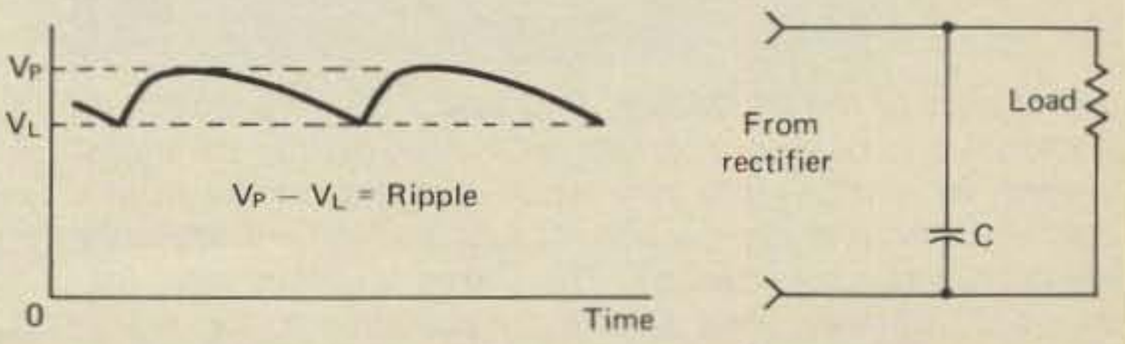


Fig. 4 — As explained in the text, a simple calculation for C can be made to control the amount of ripple voltage appearing across a load.

Here's an interesting and versatile instrument to add to your test bench . . . and you can build it yourself in one evening.

A Multitester for R.F.

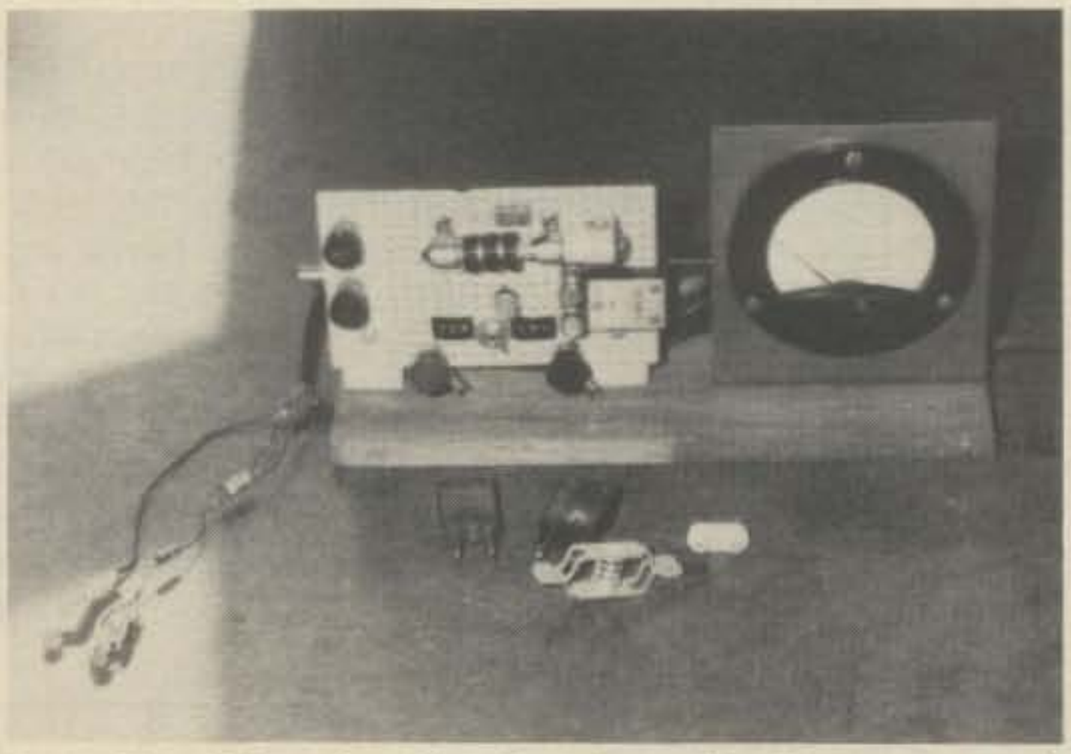
BY CARL C. DRUMELLER*, W5JJ

An experimenter has many occasions for using a device which would tell him the frequency of an unmarked crystal, show him the relative activity of crystals, or enable him to use a crystal-controlled marker for frequency spotting or receiver alignment. Too, there are times when he wants to check unidentified transistors to ascertain if they're NPN or PNP, if they'll oscillate at radio frequencies, and, if so, what their relative power outputs are.

These tests can be made, but often you use a variety of instruments to come up with the desired answers. Wouldn't it be convenient to have a single compact testing device that would tell you all these things, plus a number of others?

This article describes such a device. It's an oscillator that's adapted for testing crystals for relative activity and for frequency check (with an external freq-meter). Also, it'll check transistors for oscillation at radio frequencies. With various crystals, you can find just how far up into the r.f. region a given transistor will function; this will give you an indication as to how it will perform as an amplifier. At a selected frequency, the tester will help you pick out the "hottest" transistor in your stock, a real help when you're trying to build an r.f. amplifier.

*5824 N.W. 58th St., Warr Acres OK 73122



Front view of the r.f. sniffer. Two lower binding posts are for external d.c. power. The two on the left are for r.f. output. A crystal is inserted into two binding posts on the right. The transistor socket is near the middle and above the polarity-reversing d.p.d.t. switch. The three crystals are for the highest, medium, and lowest frequencies to be tested. A small crystal socket is for adapting to short-prong crystals. A two-ended test clip holds an additional series resistor for reading higher r.f. voltages.

In addition to being an oscillator, it also provides a d.c. power supply having a selectable voltage of either 9 or 18 for powering other transistor projects. And, finally, it embodies a "sniffer" for indicating relative levels of r.f. voltage; this can be used for powers ranging from faint milliwatts to husky multiwatts.

Building it is no task at all. The circuit, as the schematic diagram shows, is well-adapted for laying out on perf-board. Of course, you could make up a printed circuit board if you're that ambitious. There is some advantage to mounting the oscillator vertically, using angle brackets, and placing the power supply on the baseboard. The r.f. sniffer is best kept as a separate unit, yet mounted on the same baseboard. Then it'll always be at hand for use with the oscillator and still be available for other projects.

As built at my station, the perf-board is laid out for maximum versatility of use. The crystal is mounted in binding posts, which permits using a variety of holders. Short-pronged holders, however, require the use of an adapter in the form of a modern crystal socket. The transistor socket is centrally mounted, with a d.p.d.t. switch just below it. This switch is for reversing the power supply polarity, facilitating testing of both NPN and PNP transistors. At the bottom are color-coded binding posts for providing power to other projects. R.f. output binding posts are mounted opposite those for the crystal. In back of the panel, on the baseboard, is the power supply. This is simplicity personified. It consists of a 117 v. to 6.3 v. 60 Hz transformer, two non-descript rectifier diodes, two 25 μF, 25 v. capacitors, and a s.p.d.t. switch which has a center-off position. Two terminal strips are used for mounting the rectifiers and capacitors.

The r.f. sniffer has its microammeter mounted on the baseboard, vertically. I used a 0 to 20 μA movement only because it was at hand. A less-sensitive meter will serve quite well. A length of shielded but flexible cable connects the meter to the filter, r.f. rectifier, and pick-up terminals. In addition to the permanent isolating resistor, a double-ended test clip is kept available for placing other resistors in series. This permits the sniffer to be used with quite high r.f. voltages. You, of course, will have to determine experimentally the resistor value needed for your particular application.

You may be a bit hesitant about plugging an unknown transistor into the socket and then hoping you'll be applying the correct polarity of collector voltage. Relax! Despite the many horror stories about ruining transistors with wrong collector voltage polarity, I've tested hundreds without "cooking" a single one. Of course, you need to watch the sniffer's meter as you apply collector voltage. No r.f., you kill the voltage, flip the d.p.d.t. switch, and try again. No r.f., and you have either a bad transistor or one good for only a.f. If it oscillates, you can try ever-higher crystal frequencies to see

just how high it'll go. The extent of sniffer needle deflection gives you an indication of relative transistor "hotness." The same indication is used for ascertaining relative crystal activity.

The sniffer is the best device to use for tuning up transistor transmitters. I use it also on very low-powered vacuum tube transmitters.

You'll find the multi-tester a really handy device to have around your radio shack. You'll find a new use for it just about every day. Built it, and explore those fields of usefulness!

CQ

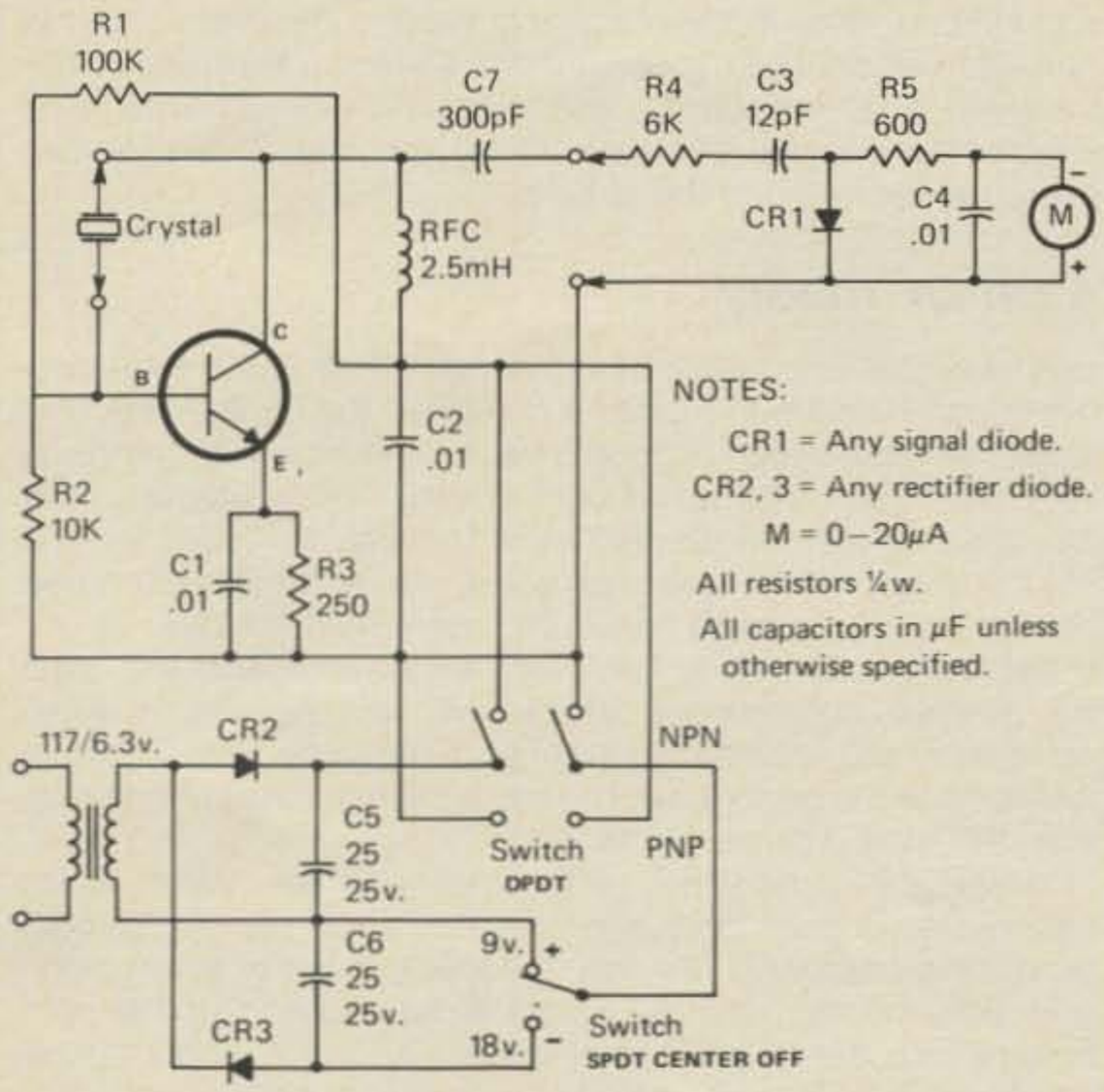
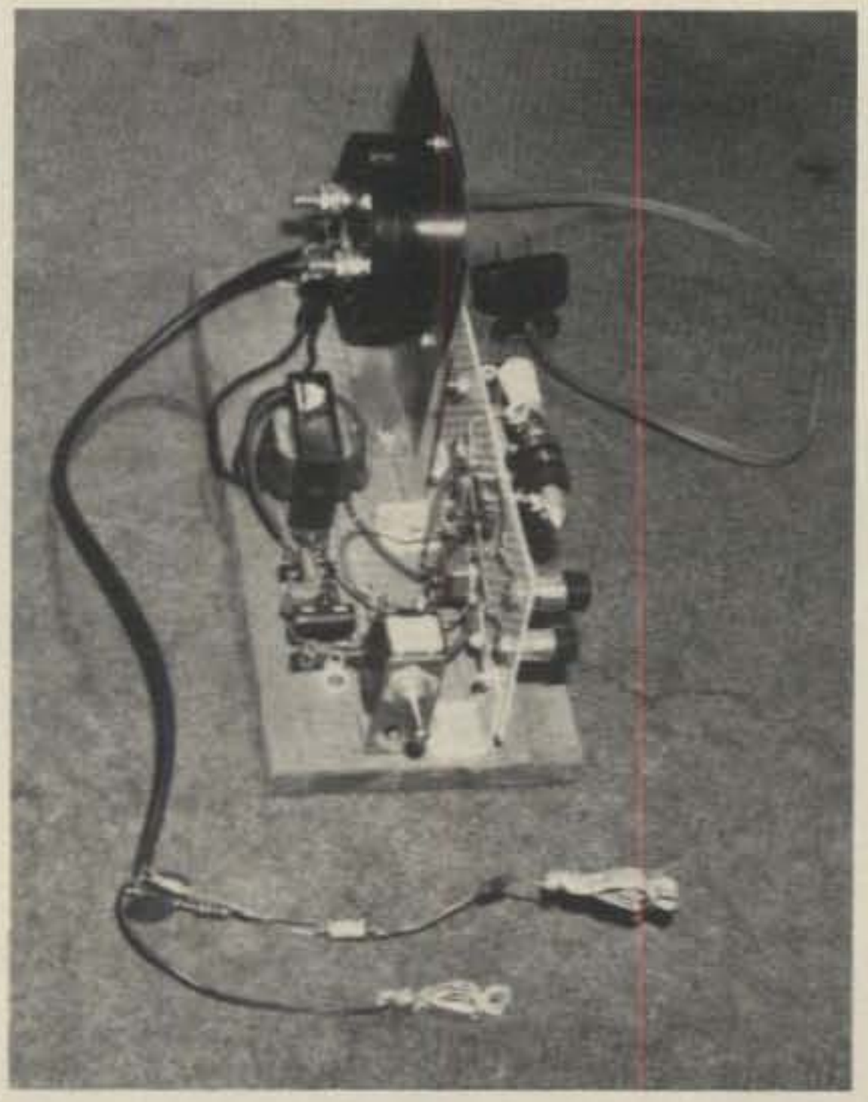


Fig. 1 – Schematic diagram and parts list for the r.f. sniffer.



Top view of the r.f. sniffer. This photo shows the power supply and, on the right, the 9v.-off-18v. s.p.d.t. switch.

Here's some important information about getting the jump on bad weather. Reading it may some day protect you and your gear.

The Radio Amateur's Nasty Weather Primer

BY VERN A. WEISS*, WA9VLK

With the storm season upon us, everyone becomes interested in weather, particularly the storm phenomenon. So conscious are we amateur radio operators of threatening weather that most amateur radio clubs have established "emergency net" frequencies to be monitored by members when the weather takes a turn.

Amateurs are dependent on a limited number of sources for weather information: 1) radio or television 2) National Weather Service v.h.f.-f.m. radio stations and 3) Civil Defense channels (i.e., police and fire scanners). These sources of input many times are unable to forecast or report severe weather conditions until the worst has passed. Tornado and funnel sightings are reported and warnings are issued long after the tornadic condition has dissipated. For this reason, the amateur radio operator should prepare himself with a basic knowledge of meteorology so as to sharpen his senses to the possible genesis of severe weather.

By "knowledge of meteorology" I am not referring to a multi-year doctoral study in climatology. In fact, the weatherwise sayings of farmers, mariners and aviators yield surprisingly accurate results and should not be scoffed at as wives' tales and folklore. Knowledge of some of these sometimes amusing phrases will sharpen your weather senses. "Red sky in the morning is a shepherd's warning; red sky at night is a shepherd's delight" has save many picnics! Other weather rules can be found in this article.

A Bit Of Theory

All weather is caused by movement of air. This air movement, combined with moisture comprise the largest percentage of weather which concerns us; rain, storms, high winds. A very small percentage includes conditions which are of a localized nature and caused by air pollutants.

In order for any storm to occur there must exist three conditions: 1) Enough moisture content in the air, 2) Air instability and 3) A lifting force for the moist unstable air. Once we possess these three conditions, rain begins. If these conditions are intense enough and prolonged to a certain level, a storm is generated. The more intense these conditions, then the more intense the storm.

Water is in a constant state of evaporation. When water evaporates it goes only one place . . . into the air. Without burdening ourselves with the dynamics of water evaporation and atmospheric moisture potential, let us just say that from time to time the air's mood changes. At one moment the air

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may be able to hold more moisture (water) than another. When the air's "mood" allows it to contain, for instance, 92% of it's water holding capacity, we say the air, at that moment, has a **relative humidity** of 92%. Let's now say the air's "mood" has improved and it is willing to hold twice as much water as it did before. But let's say the actual amount of water in the air stayed the same. Since the air's water bearing capacity has doubled, but the actual amount of water floating around in the air has remained the same, the relative humidity is now 46% . . . even though the very same amount of water is in the air.

When the relative humidity reaches 100% we say the air is **saturated** and cannot take on any more water. When the relative humidity is 100%, visible moisture will probably occur in the form of drizzle, rain or fog.

Imagine what happens to a cool glass of iced tea when it sits on the patio on a hot July day. When the moisture in the hot air around the glass comes into contact with the cool glass, the air's moisture condenses and turns to droplets of water visible on the side of the glass. We sometimes say the glass is "sweating" but this is inaccurate since the moisture is a product of the air and not the glass itself.

Air operates in a similar manner when coming into contact with cold things other than glasses of tea, such as cold air. When warm moist air comes into contact with cold air, the moisture condenses. Since these water droplets are free standing in space, gravity controls their destiny by pulling them downward. These water droplets caused by introducing a warm, moist parcel of air to cold air is also known as **rain.** When the water droplets are small enough so that their weight is less than the weight of surrounding air, the droplets remain in the air as **clouds**. The temperature to which you must cool a parcel of air for this condensation to occur is called **dewpoint**.

Now you may be asking, "Where do you find cool air in the hot summer months?" Though International Falls, Minnesota may be reporting 96° in the shade, there is cool air if you know where to look for it.

Obviously we are not going to be able to move horizontally across the land to find our cool air therefore we only have one alternative, move vertically away from the ground.

Adiabatic Lapse Rate (What'd He Say?)

The higher in altitude you go, the lower the temperature is. Compare the action of a spotlight shining against a wall. At the point on the wall where the light is centered, the wall warms to a point which can be detected with your finger. Should you hold your hand a few inches away from the wall, warmth can still be detected but not like when you were touching the wall. The sun acts upon the earth in much the same manner as does the spotlight against the wall. In fact, the decrease in temperature with increase in altitude is a fairly predictable thing. Actually, the rate at which the air cools as a function of altitude is dependent upon whether the air is moist or dry, but generally we can say that air cools at an average rate of 3½°F per 1000 feet of altitude. This cooling rate is known as the **adiabatic lapse rate.**

Since clouds are nothing more than condensed water droplets, it is interesting to estimate how high the clouds are.

Take the temperature outside your shack window. Call the nearest National Weather Service office (or listen to their broadcasts on 162.55 MHz) and ask the dewpoint. Subtract the dewpoint from the outside temperature and divide by 4.6 (the adiabatic lapse rate of moist air). Then, multiply this figure by 1000. The product is the altitude where you will find clouds.

As an example, let's say we have a temperature of 78°F with a dewpoint of 65.

78 (temperature)
−65 (dewpoint)
13

Now divide 13 by moist air's adiabatic lapse rate (4.6).

$$\frac{13}{4.6} = 2.8$$

Now multiply 2.8 by 1000.

$$2.8 \times 1000 = 2800$$

You will find clouds at an altitude of 2,800 feet above ground level.

Now if only we could figure out a method by which we could lift the air up into the cooler altitudes, we would have two-thirds of what we need to make ourselves a **thunderstorm.**

Enter: The Lifting Force.

Wind Direction	Sea-level Barometric Pressure in Inches	Character of Weather Indicated
SW to NW	30.10 to 30.20 and steady	Fair, with little temperature change, for 1 to 2 days.
SW to NW	30.10 to 30.20 and rising rapidly	Fair, followed within 2 days by rain.
SW to NW	30.20 and above and stationary	Continued fair with no marked temperature change.
SW to NW	30.20 and above and falling slowly	Fair for 2 days with slowly rising temperature.
S to SE	30.10 to 30.20 and falling slowly	Rain within 24 hours.
S to SE	30.10 to 30.20 and falling rapidly	Wind increasing in force, with rain within 12 to 24 hours.
SE to NE	30.10 to 30.20 and falling slowly	Rain in 12 to 18 hours.
SE to NE	30.10 to 30.20 and falling rapidly	Increasing wind, and rain within 12 hours.
E to NE	30.10 and above and falling slowly	In summer, with light winds, rain may not fall for several days. In winter, rain within 24 hours.
E to NE	30.10 and above and falling rapidly	In summer, rain probably within 12 to 24 hours. In winter, rain or snow.
SE to NE	30.00 or below and falling slowly	Rain will continue 1 to 2 days.
SE to NE	30.00 or below and falling rapidly	Rain with high winds, followed within 36 hours by clearing and in winter by cold.

Fig. 2 — This handy little chart is amazingly accurate. You might consider cutting it out and keeping it conveniently visible in the shack.

Four Types Of Thunderstorms

There are four types of thunderstorms known. It can be said that these four types are characterized by the lifting force which provides the vertical transportation of moist air up into those cooler altitudes. The four types are commonly referred to as **frontal, orographic, convective** and **nocturnal.**

If we could see the profile of a cold front (the most common cause of super storms), we would see that it's shape resembles that of a wedge (fig. 1). As this wedge of cold air moves along the ground, it scoops the warmer air upward. As I stated before, when moist air is forced upward into cooler places you can expect condensation to occur with resultant rain when the

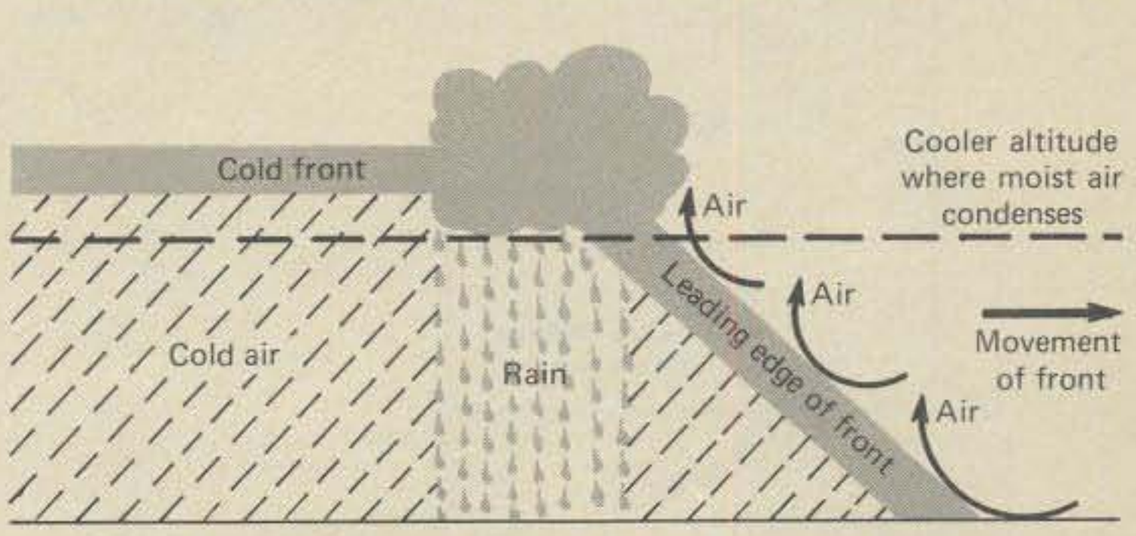

Fig. 1 — The mechanics of a frontal thunderstorm.

condensation (water) becomes too heavy for the air to support it's weight. Since cold fronts are often several hundred miles long you can easily see that there is a very large "scoop" working for us, forcing the air along the cold front's line upward and producing a several hundred mile long line of storm activity. These lines are known popularly as **squall lines** and yield the most severe weather, including tornadoes.

Another type of thunderstorm is called *orographic*. Let's say that there is a mountain sitting fat and happy out in the middle of nowhere with an advancing parcel of moist air approaching on the sloping side. Once this moist air arrives at the mountain's base, due to the upward slope of the mountain, the air continues to move. However, since the mountain is in the way, the air must move up with the rising gradient of the ground. Eventually, the moist air has followed the mountain up high enough to where the moisture in the air condenses due to lowering temperature of the ambient air. Whammo . . . thunderstorm.

Way back in grade school we all learned that warm air rises. With that axiom in mind, if we could build a big enough bonfire, maybe we could heat enough air so that it would rise up into the cooler altitudes, condense and rain. Put your flint sticks away, Tonto. Ol' Sol is doing it for us. When the sun heats-up a parcel of air, it rises, cools, condenses and if enough moisture was available in that air, it rains. This condition, if mixed with intense meteorological parameters is aggravated and produces what is called a *convective* thunderstorm.

The final thunderstorm classification is the *nocturnal* storm. As the name would imply, this one has something to do with night-time. The nocturnal thunderstorm is not yet fully understood, but popular theories lean toward the sun beating down on the earth all day long so that the ground stores up a quantity of heat; when evening comes, the ground begins releasing this stored-up heat to the surrounding air which is then heated and lifted upward . . . into the cooler altitudes, condenses and . . . well, somehow this all sounds familiar.

You can further separate these four types of thunderstorms into two larger categories: **frontal** and **air mass.** Frontal thunderstorms are predictable, intense critters forming in lines and covering much territory. Air mass storms, on the other hand, are localized in nature, are generally less intense than their frontal counterparts and are unpredictable. Air mass thunderstorms are more often referred to as "scattered" thunderstorms. Of the four types of thunderstorms listed, orographic, convective and nocturnal fall into the "air mass" grouping whereas frontal thunderstorms only belong to the "frontal" classification.

There are some handy rules-of-thumb which can aid the amateur radio operator in being weather-ready. These weather apothegms are included not to make you a meteorologist, but simply to better your awareness of potential bad weather so that you don't stray too far from the two meter rig.

1) Bad weather generally travels from southwest to northeast or west to east. When the skies look dark in the southwest or west, you'd better keep your eye on things. You might even consider forming a v.h.f. net with stations located in the southwest or west as your "advance warning" weather watchers. Usually, when the skies to the northwest of you are dark, the weather associated with that darkness will miss you.

2) Good weather generally travels from northwest to southeast. If you are considering the construction of an ark, but then an amateur station to the northwest reports improving weather, you probably won't need that ark, this time.

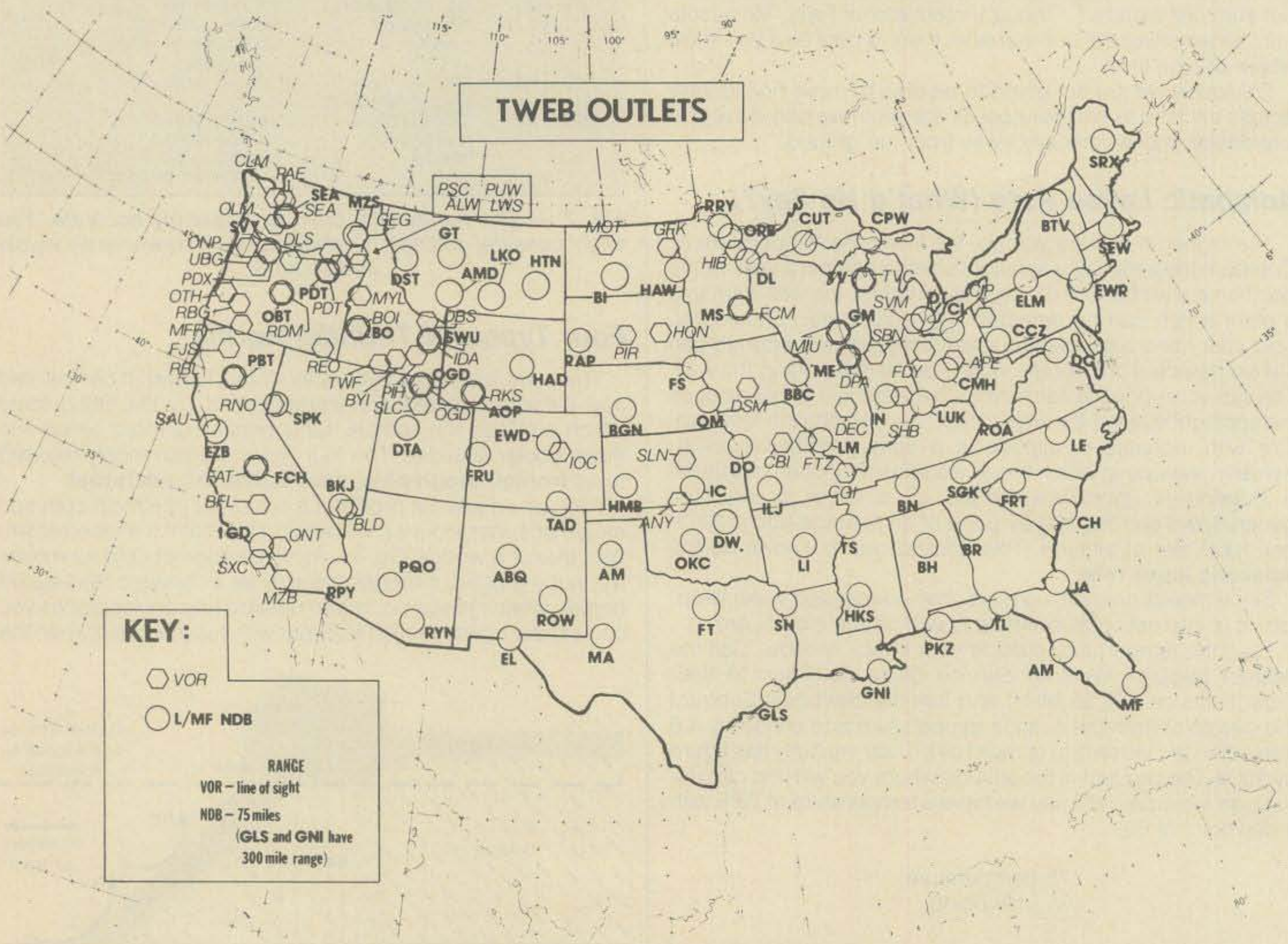

Fig. 3 — TWEB outlets across the country.

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. . . RON–WB4GWA
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. . . JOAN–WD6BNH
SANTA BARBARA, CA.

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. . . RICK–WB9AZN
FT. WAYNE, IN.

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3) Winds blowing from the south and the east usually foretell stormy weather. When winds are blowing from the southeast, you might consider starting back to work on the ark.

4) A falling barometer of at least .03 per hour is warning of impending storm activity.

5) The presence of clouds in the sky by 7 o'clock in the morning (local time) more times than not warns of rain.

6) A sky with a reddish color at sunrise is a clue toward a stormy day.

7) A halo around the moon indicates that a warm front will soon be moving into your area. Storms associated with a warm front are generally less severe than those connected with cold fronts.

8) A "white" sky opposed to a blue sky most times means impending stormy weather.

9) Lightning seen in the south or southeast will not reach you. Lightning in the west or northwest will. We're talking about lightning here and not the dark blue caused by precipitation. See fig. 2.

Ah-hah! Lightning!!! "I'm glad you brought it up," you say? Lightning is one of those humbling forces which puts even the most cocksure atheist in his place. For those of you who have been too busy fearing this spectacle it is also a very glorious and beautiful display to let envelop you.

Lightning is an illuminous discharge of electricity that has built up in clouds in much the same way as the charge you acquire when shuffling your shoes across a carpet. In the atmosphere, everything constantly seeks an electrical equilibrium, so when the clouds (like you shuffling on the rug) come into contact with another uncharged cloud (like, heh-heh, the dog sleeping on the sofa) a transfer of excess electric charge is made (the dog receives several kilozaps).

As clouds move through the air, they, like shoes on the carpet, build up this charge. When too much electrical charge has been acquired, the cloud seeks an electrically deficient receiver so it can return to a matched positive/negative electrical balance. The earth is a very convenient receiver due to it's proximity to the clouds.

While metal structures such as radio towers do not attract lightning, lightning does not act entirely on it's own. Grounded conductors, when the air is all charged up, release what is called **return strokes.** This is a misnomer because the travelling spark or return stroke actually occurs at the same instant that the lightning does. When this travelling spark meets the lightning, a circuit is completed to ground. Before the travelling spark is released, however, lightning is for the most part uninfluenced by objects on the ground. That's why it is a good idea to disconnect everything before your structures start emitting travelling sparks.

When the lightning meets this travelling spark (or return stroke), the current which is created amounts to real QRO! We are talking here of **tens of thousands of amperes.**

Like the electric cord going to your air conditioner, anytime anything is drawing high current, there is heat produced (the cord sometimes gets very warm). Can you imagime how much heat is created when we are dealing with tens of thousands of amperes? Like the cord, this current rapidly heats up the air along it's path which, like those (darned) sticking dresser drawers in the summertime, causes the air along it's path to quickly heat up and expand. This rapid expansion is called **thunder** and it's reverberation in adjacent clouds can echo sometimes ten or fifteen seconds. With light moving at about 669,600,000 miles per hour and sound moving at 3,960,000 miles per hour, you can see why you always see lightning before you hear it.

Persons who are struck by lightning (either directly or via strikes through electrical equipment) can receive severe electrical shock and sometimes external and internal burns. However, lightning strike victims carry no electrical charge and are not a shock threat to persons attempting to administer first aid.

TWEB OUTLETS BY STATE

NDB FREQUENCIES ARE KHZ — **VOR FREQUENCIES ARE MHZ**

ALABAMA		INDIANA		GT	371	PENNSYLVANIA	
BH	224	IN	266	HTN	320	CCZ	254
ARIZONA		SBN	115.4	LKO	400	CIP	112.9
PQO	326	SHB	112.0	NEBRASKA		S. CAROLINA	
RYN	338	IOWA		BGN	224	CH	329
ARKANSAS		BBC	224	OM	320	FRT	248
LI	353	DSM	114.1	NEVADA		S. DAKOTA	
CALIFORNIA		KANSAS		BKJ	206	FS	245
BFL	115.4	ANY	112.9	BLD	116.7	HON	117.6
EZB	362	HMB	257	RNO	117.9	PIR	112.5
FAT	112.9	IC	332	SPK	254	RAP	254
FCH	344	SLN	115.3	NEW JERSEY		TENNESSEE	
FJS	109.6	LOUISIANA		EWR	379	BN	304
IGD	332	GNT	236	NEW MEXICO		SGK	281
MZB	117.8	SH	230	ABQ	230	TS	371
ONT	112.2	MAINE		ROW	305	TEXAS	
PBT	338	SRX	344	NEW YORK		AM	251
RBL	115.7	MARYLAND		ELM	375	EL	242
RPY	251	DC	322	N. CAROLINA		FT	365
SAU	110.4	MASSACHUSETTS		LE	350	GLS	206
SXC	109.4	SEW	382	N. DAKOTA		MA	326
COLORADO		MICHIGAN		BI	230	UTAH	
EWD	379	CPW	400	GFK	109.4	DTA	212
FRU	396	CUT	227	HAW	365	OGD	115.7
IOC	117.5	DT	388	MOT	117.1	OGD	263
TAD	329	SVM	114.3	OHIO		SLC	116.8
FLORIDA		TV	365	APE	116.7	VERMONT	
AM	388	TVC	114.6	CL	344	BTV	323
JA	344	MINNESOTA		CMH	391	VIRGINIA	
MF	365	DL	379	FDY	108.2	ROA	371
PKZ	326	FCM	111.8	LUK	335	WASHINGTON	
TL	379	HIB	110.8	OKLAHOMA		ALW	111.8
GEORGIA		MS	266	DW	375	CLM	108.4
BR	266	ORB	341	OKC	350	GEG	115.5
IDAHO		RRY	356	OREGON		MZS	365
BO	359	MISSISSIPPI		DLS	112.3	OLM	113.4
BOI	113.3	HKS	260	MFR	113.6	PAE	114.2
BYI	114.1	MISSOURI		OBT	368	PSC	108.4
DBS	116.9	CBI	111.2	ONP	117.1	PUW	109.0
IDA	109.0	CGI	112.9	OTH	112.1	SEA	116.8
LWS	108.2	DO	359	PDT	114.7	SEA	362
MYL	116.2	FTZ	110.8	PDT	341	WISCONSIN	
PIH	112.6	ILJ	254	PDX	116.6	GM	242
SWU	350	LM	338	RBG	108.2	MIU	116.4
TWF	115.8	MONTANA		RDM	117.6	WYOMING	
ILLINOIS		AMD	329	REO	112.5	AOP	290
DEC	110.6	DST	308	SVY	332	HAD	269
DPA	108.4			UBG	117.4	RKS	114.7
ME	350						

Fig. 4 — TWEB outlets listed by state.

So, where does your new fifty-foot tower stand as far as it's vulnerability? A fifty-foot tall structure of any kind will be struck by lightning once each four to six years.

Tornadoes

If thunderstorms were broadway shows, the **tornado** would have to be the appearance of the star of the show. The thunder, the lightning and the rain are only heralding trumpets for this most destructive but fascinating of all weather phenomena. If you are really into meteorology, you probably know the conditions which are most conducive to tornadic genesis; 60° dewpoint, surface winds of ten knots, warm moist air aloft with overriding cold dry air, an active jetstream, a nearby front and a squall line preceding a cold front or overrunning a warm front. Pay close attention to the words "squall line." Most tornadoes are spawned out of squall lines, so when you hear those words, think tornado. Squall lines are lines of thunderstorms, very intense. Remember I said that a cold front moves along the ground covering maybe hundreds of miles causing it to rain along the leading edge of the front. If the three conditions necessary for a thunderstorm (moist air, lifting force, unstable air) become intense enough, thunderstorms will start forming along the front. When storms form in this

manner they are known as squall lines.

Unfortunately, tornadoes cannot be forecast. We can observe atmospheric conditions and when the conditions are right for the formation of a tornado, keep a sharper watch on things. When we actually see a funnel cloud or tornado, we can report it and therefore warn others. But this is sometimes difficult because number one, you have to be in the right place at the right time and, two, nighttime hides tornadoes very well. What about radar? Of all the tornadoes which occur, radar only detects fifty percent of them. *Fifty per cent!* Now you can appreciate Man's limitations.

Before we go further, I feel it necessary to define another couple of words which are interchanged . . . inaccurately. Funnels and tornadoes and the difference thereof. A **funnel cloud** is a cyclonic cone-shaped weather phenomenon which has not come into contact with the ground. A tornado, on the other hand, is a cyclonic cone-shaped weather phenomenon which has come into contact with the ground.

Two more frequently misunderstood words are tornado **watch** and tornado **warning**. A *watch* is issued only when conditions are favorable to the production of a tornado; one, however, does not actually exist. When a watch is issued, it covers 14,000 square miles (118 miles × 118 miles) and is valid for from four to six hours. A tornado *warning* is issued only when a funnel or a tornado has been sighted, either visually or by radar. When a warning is issued, the text of the warning specifies an exact locality in which the warning is in effect as well as other localities which appear to be in the tornado's path. A warning is usually valid for one hour.

On the average, tornadoes rarely travel more than sixteen miles and their lateral coverage ends at around three hundred yards. Speeds vary from no forward motion to seventy miles per hour. The average speed of a tornado, however, is twenty-five to forty miles per hour. Don't let these figures lure you into a false of security. In 1917, a tornado ripped through 293 miles of Illinois and Indiana during a nearly eight hour period!

According to National Weather Service records, tornadoes are most likely to form from noon to midnight (the warmest hours). The greatest concentration of tornado activity is between four and six o'clock p.m. local time. Don't ignore the morning hours. The most devastating weather my home town ever saw was ten years or so ago when *three* tornadoes struck in succession at eight o'clock in the *morning*!

Some broadcasting stations do an acceptable job of staying on top of severe weather but the best means, I feel, is the National Weather Service's v.h.f.-f.m. radio stations operating on either 162.40, 162.475 or 162.55 MHz. There are stations located in most larger towns providing continuous recorded and updated weather forecast information. Most of these stations operate with about three hundred watts so you can receive them as far away as sixty or seventy miles. Call your nearest National Weather Service office for information on the one nearest you. Many manufacturers have come out with little receivers which are either crystal controlled on one of the three current frequencies or can be tuned. The best deal I've seen around is the one produced by *Radio Shack* for sixteen dollars or so, called the **Weathercube.** A single bar-button on top turns the unit on and off. You select the NWS frequency nearest you by a knob on the bottom and set the volume in the same manner. With an external antenna. (t.v. aerial) I can pick up KWO-39 in Chicago, sixty miles away.

Tornadoes Are Active On Six Meters

An interesting method of detecting tornadoes in your area utilizes the television set.

1. Warm-up your television set and tune in channel 13.
2. Darken the video to almost black with the brightness control.
3. Turn to channel 2 and leave the volume control all the way down.

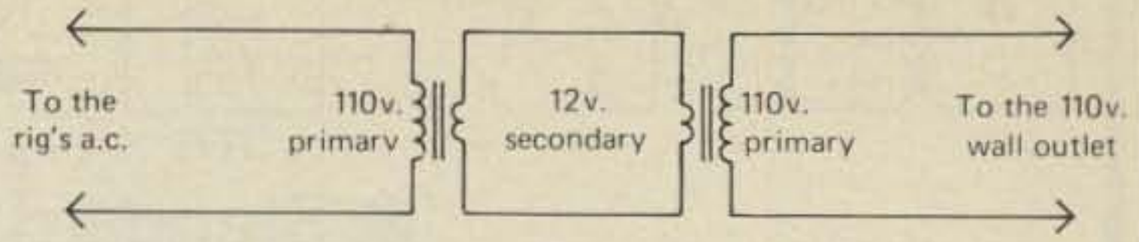


Fig. 5 — A simple method of protecting equipment from a.c. strikes.

Lightning produces periodic white bands of varying widths across the screen. If you use a color set, these bands will be colored but still remain a light color.

If a tornado is within twenty miles, your t.v. screen will turn all white and remain that way. Obviously, your t.v. set has done it's job and should be turned off *and shelter sought.*

Lightning and tornadoes generate r.f. at 55 MHz which is where channel 2 is located in the t.v. spectrum. Channel 13 is located at 210 MHz and is unaffected by the 55 MHz "transmissions." This is the reason why the adjustment to all-black is made on channel 13. It wouldn't be accurate to adjust to all-black on channel 2 when a tornado was actually in the area. Lightning also transmits r.f. on 55 MHz. However it is easy to distinguish between lightning and tornadoes since lightning is of relative short duration and a tornado "white-out" will remain for a period of minutes.

Another excellent means of getting accurate weather information is the "TWEB" (pronounced "tweeb") broadcasts down in the "d.c." bands (215-400 kHz). These stations emphasize aviation weather, but the information transmitted as well as radar information is provided for a 150 mile radius of the TWEB station. TWEB broadcasts are also emitted from aviation navigational v.h.f. omni-range stations in the 108-118 MHz portion of the spectrum. Since these stations are pretty much line-of-sight, unless you live within five or ten miles of one you probably won't be able to hear it. See figs. 3 and 4.

Be Weather-Ready

Amateurs have always prided themselves in maintaining amateur stations capable of operation under the most undesirable conditions (battery/generator power, auxiliary transmitters, etc.), but what about preparedness as far as organization goes?

First, equip your shack with some kind of weather receiver—don't depend on Rocking Roscoe at WZIT to break in to his records with weather bulletins. Frequently, I will hear on two meters someone state that severe weather is expected. Invariably someone else will retort that he "hasn't heard anything on the radio." This always brings to mind an experience of mine a few years back when employed by an a.m. broadcast station. The weather teleprinter was dinging away and the phones were going crazy. As the announcer was preparing to read the bulletin, stating a tornado warning was issued for the town, a salesman broke into the studio infuriated by the fact that the announcer was going to read the bulletin! A big account of the salesman's was an outdoor event which would suffer attendance if the word got out that a funnel had been sighted. So, the bulletin went unannounced. Good sound reasoning here. And how many Donnie and Marie records and catsup commercials have you had to sit through waiting to learn why the tornado sirens just sounded?

Buy yourself a 162 MHz or TWEB receiver. Many law enforcement offices are good sources of severe weather information, if you own a scanner, since most transmit weather bulletins when they come over the department's weather teleprinter.

Strength In Numbers

If your community does not already have one, learn what band on which the majority of amateurs have capability and form an emergency weather network. Many amateur groups are finding their own two-meter repeater is an excellent facility

Pages -29-30 - missing

for this sue. Also, there are many good, old Heath Two'ers and Sixers floating around for fifteen dollars which would be an excellent club project. Start something.

As I stated earlier, most severe weather gives ample warning of it's visit. Keep in mind the hints in this article as well as keeping a running watch on the daily weather maps in the newspaper. The existence of a low-pressure area or any kind of front generally west of your location means bad weather is not too far off. As you drive to work in the morning, note the wind direction as well as the other pre-storm clues in this article. I do not mean for you to start regular tornado scares on the local repeater . . . but be aware of the storm potential when conditions indicate there is one.

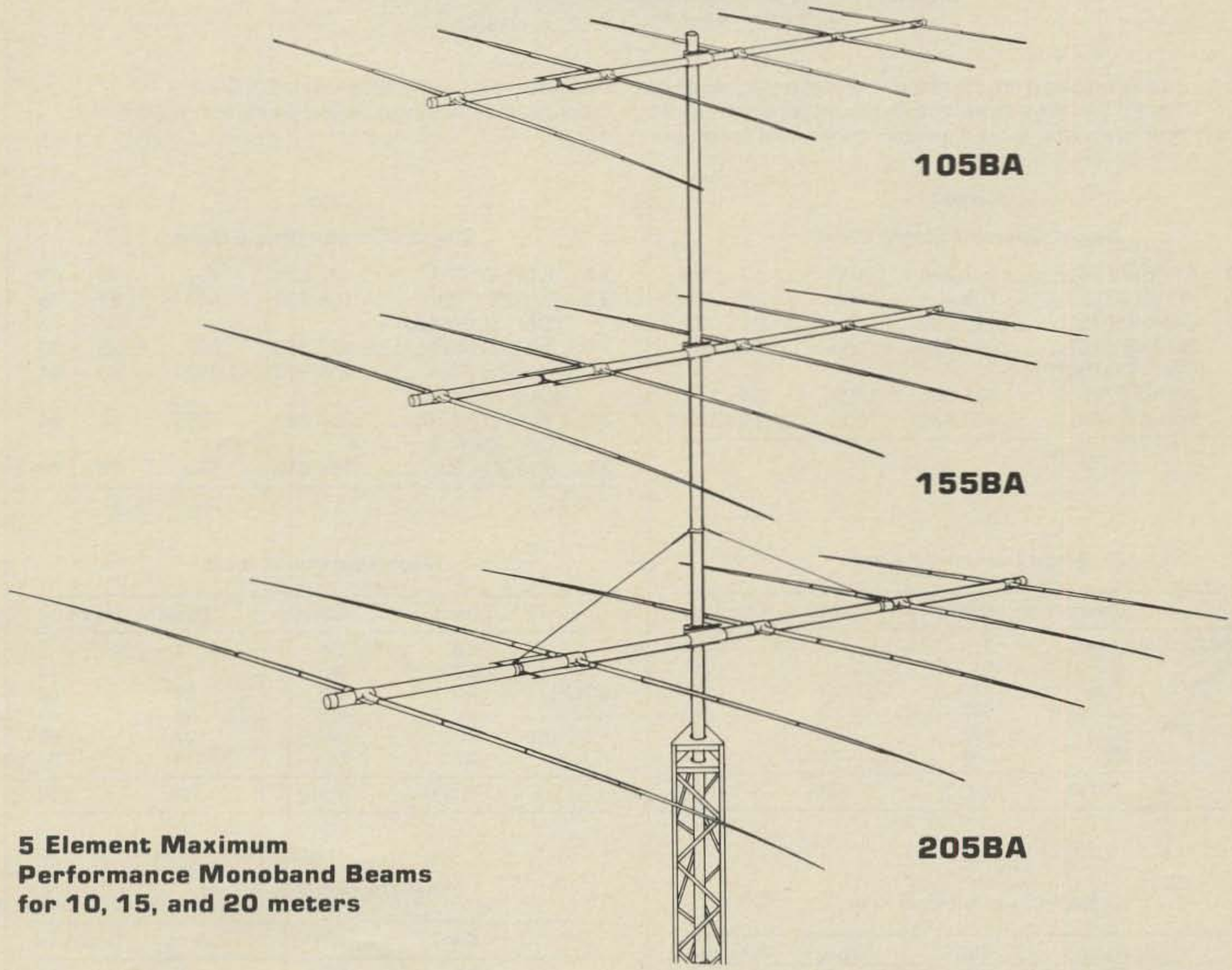
When You're Not At Home, Don't Leave A Snake's Cage Open

During a storm alert last year, our local weather net was going strong when suddenly a hysterical woman came on the repeater. It seemed her amateur radio operator husband was away from home and there were "pops and sparks" coming from his shack. You guessed it. Antennas were still connected to everything.

Never, **NEVER** leave the house when your antennas are still connected. I even make it a practice to switch all my antennas to ground by way of a Pro-Tax switch every time I run upstairs for a sandwich. Instruct family members on how to disconnect your antennas, preferably by way of antenna switches as previously mentioned. The height of a storm is no time to be dangling over the back of electrical gear unscrewing antennas.

You can inexpensively prevent damage to your radio gear from strokes coming in off the a.c. electric mains by rigging up a simple safeguard using two identical transformers with 110 volt primaries and secondaries of any value (fig. 5). WA9VLK has used this system for eight years now with no equipment ever suffering a.c. strikes. Two years ago I should have had one on a kitchen clock. Storms of all sizes and shapes have inflicted havoc on thousands of people. For as long as there are storms, there will be unfortunate occurrences associated with them. But amateur radio operators have access to the best communications possibilities around and should make every effort to know about and prepare for this part of everday living.

BE PREPARED FOR CYCLE 21
GET HY-GAIN'S NEW LONG-JOHNS
"THE STACKABLES"



5 Element Maximum Performance Monoband Beams for 10, 15, and 20 meters

With sunspot cycle 21 now in the upswing, you should be prepared for the DX available on the 3 top HF bands, if not, our new "Long-Johns" are for you. The new 5 element "Long-John" monobanders are ideal for the serious DX'er. Each utilizes Hy-Gain's unique Beta-match for optimum power transfer. Also each antenna uses taper-swaged tubing for minimum wind load and maximum strength. For maximum durability each "Long-John" uses Hy-Gain's rugged boom-to-mast clamp.

Specifications:

Order Number	**377**	**376**	**375**
Model Number	**205BA**	**115BA**	**105BA**
Gain	11.6 dB	12.0 dB	12.0 dB
Front-to-back ratio	20 dB minimum	20 dB minimum	20 dB minimum
SWR (at resonance)	Less than 1.5:1	Less than 1.5:1	Less than 1.5:1
Impedance	50 ohms	50 ohms	50 ohms
Power rating	Maximum Legal	Maximum Legal	Maximum Legal
2:1 VSWR Bandwidth	400 KHz	500 KHz	1.5 MHz
Longest Element	36½'	24½'	18½'
Boom Length	34'	26'	24'
Boom Diameter	2"	2"	2"
Turning Radius	25'	17½'	15'
Surface Area	9.0 sq. ft.	5.2 sq. ft.	3.9 sq. ft.
Wind Load at 80 mph	230 lbs.	133 lbs.	100 lbs.
Maximum Wind Survival	80 mph	100 mph	100 mph
Mast DIA Accepted	1¼" to 2½"	1¼" to 2½"	1¼" to 2½"

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CIRCLE 28 ON READER SERVICE CARD

CQ World-Wide DX Contest
All-Time U.S.A. Records

BY FREDERICK CAPOSSELA K6SSS

Tabulated below are the record-high scores achieved by U.S. contesters in the CQ World Wide DX Contest. All-Time World-High scores are shown on pages 40 and 41. Number groups following calls and bands are: year of operation, total score, contacts, zones, and countries.

PHONE

Single Operator/Single Band

1.8	K1PBW ('76).....7,280	100	10	30
3.5	W2VP ('77) 108,405	465	24	75
7.0	W3PHL ('75).....110,799	337	29	88
14	W4AXE ('70).....595,725	1068	39	156
	(Opr. WA4PXP)			
21	W2AH ('72) 485,605	1129	34	111
28	W2SKE ('68).....429,976	1030	34	108

Single Operator/All Band

	Band	QSOS	Zones	Countries
W3WJD	1.8	7	4	5
OPR.	3.5	74	18	38
WA3LRO	7.0	110	23	60
(1977)	14	507	33	88
2,377,560	21	867	29	96
	28	148	21	64
	TOTAL	1,713	128	357

Multi-Operator/Single Xmtr

	Band	QSOS	Zones	Countries
	1.8	16	5	10
	3.5	82	20	40
K5JA	7.0	101	25	57
(1977)	14	321	32	86
2,643,580	21	693	29	100
	28	589	29	91
	TOTAL	1,802	140	384

Multi-Operator/Multi-Xmtr

	Band	QSOS	Zones	Countries
	1.8	35	6	9
	3.5	376	19	49
W2PV	7.0	221	23	69
(1977)	14	1740	38	137
7,302,350	21	1663	32	124
	28	356	23	76
	TOTAL	4,391	141	464

CW

Single Operator/Single Band

1.8	K1PBW ('76).....22,626	157	15	39
3.5	W1MX ('76).....108,288	403	21	75
	(Opr. WA8WNU)			
7.0	W5WZQ ('76).....322,383	907	33	90
114	K1OX ('77).....450,596	1,217	33	94
	(Opr. K1UA)			
21	WA8LYF ('70) 286,767	756	35	94
	(Opr. K8HLR)			
28	K1JGD ('68).....158,510	520	28	82

Single Operator/All Band

	Band	QSOS	Zones	Countries
	1.8	12	7	9
	3.5	96	16	44
W3LPL	7.0	335	28	68
(1977)	14	436	32	89
1,693,956	21	381	27	81
	28	57	18	32
	TOTAL	1,317	128	323

Multi-Operator/Single Xmtr

	Band	QSOS	Zones	Countries
	1.8	20	9	20
	3.5	130	19	50
AA5LES	7.0	633	30	80
(1976)	14	566	30	96
2,246,989	21	292	27	75
	28	29	15	28
	Total	1670	130	349

Multi-Operator/Multi-Xmtr

	Band	QSOS	Zones	Countries
	1.8	14	4	5
	3.5	173	25	56
W4BVW	7.0	665	33	86
(1970)	14	810	38	122
5,552,362	21	909	37	107
	28	485	31	80
	Total	3056	168	456

Club Record: Frankfort Radio Club ('77) 62,769,387

CQ World-Wide DX Contest All-Time Phone Records

BY FREDERICK CAPOSSELA, K6SSS

In the records listed below, boldface listings denote world records. Number groups after calls are: year of operation, total score, contacts, zones, and countries. All-band and Multi-Operator records include a band-by-band breakdown of the world leader in each category.

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8	**KV4FZ ('76)**	**37,584**	**380**	**11**	**37**
7.0	**KX6LA ('77)**	**405,678**	**1,523**	**28**	**63**
7.0	HR1RF ('72)	399,542	1349	28	93
14	**FY7AK ('76) (Opr. F5QQ)**	**1,415,329**	**2950**	**36**	**127**
21	**CW4CR ('70)**	**1,196,085**	**2462**	**39**	**126**
28	**KG6SL ('72)**	**993, 577**	**2467**	**33**	**94**

AFRICA

1.8	No Entrant				
3.5	EA8CR ('76)	200,850	657	20	83
7.0	EA8CR ('74)	253,528	639	31	103
14	CR6WW ('74)	1,058,446	2152	35	132
21	EA8JJ ('77)	766,125	1,900	31	104
28	IG9SKO ('77)	651,904	1,718	29	99

ASIA

1.8	4S4UR ('74)	1,188	35	3	9
3.5	VE3MR/4X ('71)	197,106	742	22	69
7.0	VE3MR/4X ('72)	215,840	643	27	88
14	K21ZN/4X ('76)	829,962	2056	34	113
21	JA1RJW ('69)	379,136	1197	37	91
28	4X4JU ('79)	570,836	1522	34	99

EUROPE

1.8	PAØHIP ('74)	5,200	249	4	16
3.5	13MAU ('75)	113,535	778	18	69
7.0	OH5NW ('75)	167,751	798	29	80
14	OH2BH ('75)	981,815	2098	37	142
21	YU3ZV ('77)	1,047,321	2,483	36	113
28	DL4PM ('68)	614,544	1858	34	84

NORTH AMERICA

1.8	**KV4FZ ('76)**	**37,584**	**380**	**11**	**37**
3.5	**KV4FZ ('75)**	**275,319**	**1297**	**23**	**80**
7.0	**HR1RF ('72)**	**399,542**	**1349**	**28**	**93**
14	KV4FZ ('71)	1,208,180	2680	40	153
21	VE3BBH ('77)	583,737	1,716	28	105
28	KP4AST ('70)	630,180	2010	31	104

OCEANIA

1.8	KH6CHC ('77)	1,404	36	7	6
3.5	KH6XX ('77)	116,416	606	28	40
7.0	**KX6LA ('77)**	**405,678**	**1,523**	**28**	**63**
14	VK6HD ('72)	706,251	1483	37	132
21	KG6AQY ('70)	749,529	2353	32	72
28	**KG6SL ('72)**	**933,577**	**2467**	**33**	**94**

SOUTH AMERICA

1.8	HK4EB ('76)	3,672	34	4	9
3.5	YV4AGP ('72)	72,666	388	18	48
7.0	CX4CR ('76)	363,110	1125	30	80
14	**FY7AK ('76) (Opr. F5QQ)**	**1,415,329**	**2950**	**36**	**127**
21	**CW4CR ('70)**	**1,196,085**	**2462**	**39**	**126**
28	CV4CR ('75)	668,624	1745	30	101

Single Operator/All Band

AF	**ZD3X ('74)**	**6,653,881**	**4611**	**115**	**372**
AS	XU1DX ('74)	2,607,750	2711	133	342
EU	CT4AT ('76)	3,077,930	2746	110	356
NA	KV4FZ ('70)	4,961,551	4362	128	369
O	KH6RS ('72) (Opr. K2SIL)	5,331,072	4739	128	256
SA	FY7AK ('75) (Opr. F5QQ)	6,636,348	4586	126	372

WORLD RECORD

Station	Band	Contacts	Zones	Countries
ZD3X	1.8	10	5	5
Opr.	3.5	225	12	34
OH2BH	7.0	288	19	57
(1974)	14	1184	27	96
6,653,881	21	1771	26	89
	28	1133	26	91
	Total	4611	115	394

Multi-Operator/Single Xmtr.

AF	6W8MM ('77)	4,942,160	4,371	99	280
AS	4L6M ('77)	5,993,520	3,938	117	403
EU	DLØWU ('75)	4,208,312	3237	111	367
NA	FMØFC ('77)	6,832,004	5,739	128	380
O	5W1AZ ('77)	5,452,302	5,154	125	241
SA	**PY2CAB ('74)**	**6,959,474**	**4495**	**130**	**397**

WORLD RECORD

Station	Band	Contacts	Zones	Countries
	1.8	—	—	—
PY2CAB	3.5	13	5	7
(1974)	7.0	48	18	23
6,959,474	14	1535	39	154
	21	1993	36	127
	28	906	32	86
	Total	4495	130	397

Multi-Operator/Multi-Xmtr.

AF	**EA8CR ('77)**	**21,351,898**	**10,290**	**153**	**544**
AS	4Z4HF ('71)	6,106,290	3994	125	409
EU	OH5SM ('69)	11,593,925	6771	153	526
NA	VP5M ('76)	10,533,172	7783	136	462
O	KS6DH ('72)	5,488,856	5304	116	242
SA	PJ9JR ('74)	19,469,094	10043	142	519

WORLD RECORD

	Band	Contacts	Zones	Countries
	1.8	123	10	26
	3.5	737	22	83
EA8CR	7.0	1038	22	79
(1977)	14	2466	37	144
21,351,898	21	2992	32	110
	28	2934	30	102
	Total	10,290	153	544

Club record: Frankfort Radio Club ('77) 62,769,387

CQ World-Wide DX Contest All-Time C.W. Records

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8	**KV4FZ ('76).....42,800**	**390**	**13**	**37**
3.5	**CT3/OH1TV ('77) ...223,364**	**1,066**	**19**	**57**
7.0	**KP4AST ('73).....447,421**	**1479**	**32**	**95**
	(Opr. WA4PXP)			
14	**CX4CR ('75).....935,025**	**2303**	**34**	**103**
	(Opr. CX9BT)			
21	**CW9BT ('72).....696,133**	**2068**	**31**	**82**
28	**CX1AAC ('70).....681,636**	**1711**	**36**	**93**

AFRICA

1.8	EA8CR ('76).....7,696	100	8	18
3.5	CT3/OH1TV ('77)....223,364	1,066	19	57
7.0	5A1TW ('64).....227,814	918	22	64
14	CR6IK ('74).....925,386	2021	38	116
21	TJ1AW ('70).....549,888	1447	35	93
28	CR6IK ('69).....498,800	1439	36	80

ASIA

1.8	4X4NJ ('74).....4,818	76	6	16
3.5	4X4NJ ('75).....103,572	584	14	49
7.0	4X4FA ('64).....174,505	781	25	60
14	UA9DN ('76).....344,520	1176	26	82
21	KA6AY ('72).....264,688	920	30	78
28	HZ1AB ('68).....132,390	578	21	55

EUROPE

1.8	PAØHIP ('77).....17,346	297	12	30
3.5	DK3GI ('77).....165,216	967	23	73
7.0	UA6LO ('77).....269,654	1,167	32	87
14	OH8OS ('77).....625,812	1,961	34	87
	(Opr. OH2BH)			
21	G3HCT ('70).....317,312	924	38	96
28	DL4AAP ('57).....253,680	728	36	84

NORTH AMERICA

1.8	**KV4FZ ('76).....42,800**	**390**	**13**	**37**
3.5	**KV4FZ ('75).....190,082**	**789**	**24**	**77**
7.0	**KP4AST ('73).....447,421**	**1479**	**32**	**95**
	(Opr. WA4PXP)			
14	KV4FZ ('70).....908,514	2315	36	117
21	WA8LYF ('70).....286,767	756	35	94
	(Opr. K8HLR)			
28	K1JGD ('68).....158,510	520	28	82

OCEANIA

1.8	KH6CHC ('77).....8,400	139	10	10
3.5	VR3AH ('76).....178,560	956	24	40
7.0	VK6HD ('76).....266,750	934	29	68
14	VK6HD ('75).....469,320	1325	32	8
21	KX6LA ('77).....543,345	2,068	29	60
28	VK8UG ('67).....320,008	1048	32	72

SOUTH AMERICA

1.8	YV1OB ('77).....14,220	192	9	21
3.5	N4JI/HC1 ('77).....77,748	463	21	36
7.0	CV4DL ('75).....230,040	1020	24	57
	(Opr. CX1BBL)			
14	**CX4CR ('75).....935,025**	**2303**	**34**	**103**
21	**CW9BT ('72).....696,133**	**2068**	**31**	**82**
28	**CX1AAC ('70).....681,636**	**1711**	**36**	**93**

Single Operator/All Band

AF	C5AZ ('76).....3,580,980	3084	100	290
	(Opr. OH2MM)			
AS	UK9ABA ('70).....1,719,663	1366	124	327
EU	CT4AT ('76).....2,809,421	2881	97	312
	(Opr. WA3HRV)			
NA	KP4RF ('77).....3,732,350	3,507	122	303
	(Opr. N6CJ)			
O	KH6RS ('72).....2,748,307	2990	121	190
	(Opr. W6MAR)			
SA	**9Y4VT ('77).....4,697,304**	**3,992**	**122**	**275**
	(Opr. N6AA)			

WORLD RECORD

	Band	Contacts	Zones	Countries
	1.8	73	7	9
9Y4VT	3.5	336	19	44
(Opr. N6AA)	7.0	553	21	55
1977	14	1407	29	70
4,697,304	21	1045	25	60
	28	578	21	37
	Total	3,992	122	275

Multi-Operator/Single Xmtr

AF	ZD8W ('76).....3,652,143	3385	103	260
AS	**4L6M ('77).....6,095,824**	**4,058**	**128**	**390**
EU	GU4DAA ('77).....2,842,776	3,175	111	317
NA	VP2M ('77).....2,766,433	3,592	97	240
O	5W1AZ ('76).....2,534,416	3043	108	176
SA	**FY7AK ('75).....4,197,364**	**3670**	**98**	**288**

WORLD RECORD

	Band	Contacts	Zones	Countries
	1.8	—	—	—
	3.5	465	18	58
4L6M	7.0	694	20	67
(1977)	14	1512	31	85
6,095,824	21	1070	35	110
	28	317	24	70
	Total	4,058	128	390

Multi-Operator/Multi Xmtr

AF	ET3FMA ('67).....1,387,680	1476	106	231
AS	UK9AAN ('77).....6,540,380	4,567	141	407
EU	YU1BCD ('77).....4,707,000	4,143	135	388
NA	KP4EAJ ('77).....7,177,275	7,017	129	312
O	KS6ER ('73).....1,415,650	2136	102	123
SA	**PJØFC ('70).....11,586,428**	**7080**	**150**	**401**

WORLD RECORD

Station	Band	Contacts	Zones	Countries
	1.8	92	8	8
	3.5	668	17	46
PJØFC	7.0	1338	26	75
(1970)	14	1974	34	109
11,586,428	21	1641	34	64
	28	1377	31	79
	Total	7090	150	401

CQ looks at some of the latest equipment and accessories of interest to amateurs.

New Amateur Products

Heath Company HA-201A and HA-202A Two-Meter Solid-State FM Amplifiers

The Heath HA-201A and HA-202A amplifiers are solid-state Class C designs which feature electronic switching, improved harmonic and spurious output, improved stabilization, low-pass filters and simple alignment.

The HA-201A can be used with any 2-meter transmitter or transceiver that puts out from 1 to 3 watts and will boost the output to the 10-watt range. The HA-202A is intended for use with 2-meter transmitters and transceivers that are capable of supplying 5 to 15 watts of f.m. driving power. The HA-202A's output is from 20 to 50 watts, depending upon the input power level.

Both amplifiers have automatic antenna switching, emitter-ballasted transistors and efficient heat sinking for adequage v.s.w.r. protection without complex sensing circuits. All hardware and connectors necessary for installation are supplied. The units operate on 12 v.d.c., negative ground, and require no additional power supplies.

The HA-201A sells for $34.95 and the HA-202A sells for $59.95. Both are available from Heath Co., Benton Harbor MI 49022.

MFJ Enterprises MFJ-721 Super Selector CW/SSB Filter

MFJ Enterprises is introducing a new CW/SSB active filter.

The model is called the MFJ-721 Super Selector. It has a 2-watt audio amplifier, switchable noise limiting and an input selector switch for two rigs.

The c.w. filter is an eight-pole active filter centered at nominally 750 Hz. It has four selectable bandwidths: 180, 150, 110 and 80 Hz. In the 80 Hz position the response is at least 60 dB down one octave from the center frequency.

With a pair of stereo headphones, simulated stereo reception provides the narrow filtered signal to one ear and the unfiltered signal to the other.

The s.s.b. filter is designed to improve readability by reducing sideband splatter, removing low and high pitched QRM, hiss, static crashes and eliminate 60 and 120 Hz hum.

The filter measures 5 x 2 x 6 inches and requires a 9 to 18 v.d.c. supply. It costs $59.95 and is available from MFJ Enterprises, P.O. Box 494, Mississippi State MS 39762.

Radio Shack's Micronta Digital Frequency Counter (#22-351)

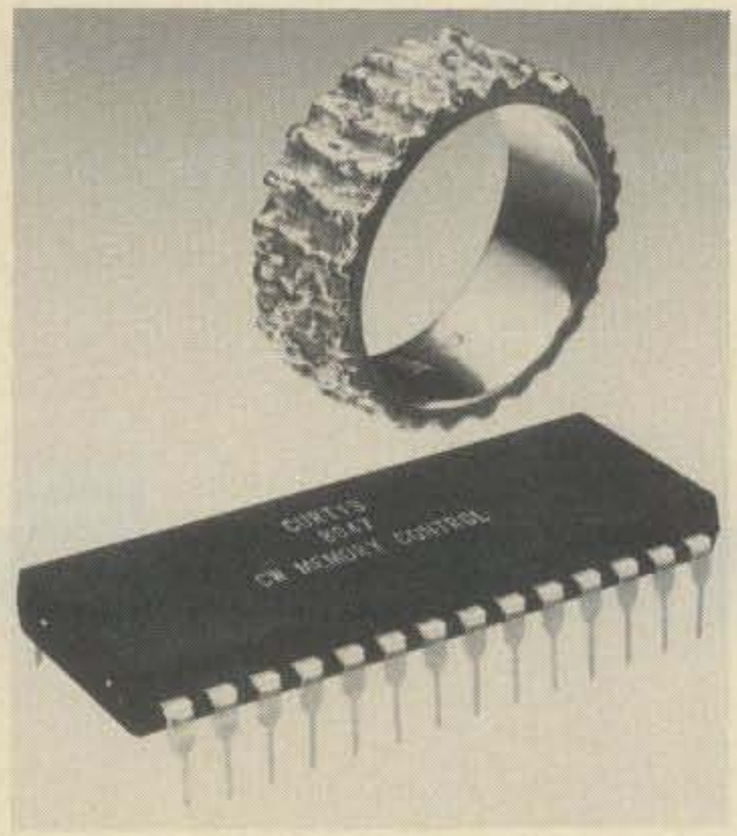
Just introduced by Radio Shack is the new Micronta Digital Frequency Counter for use in making accurate frequency measurements in audio, r.f., video, ultrasonic and digital applications.

The counter has an easily readable 0.6" six-digit LED display with lead zero blanking. Frequency resolution is 100 Hz to the 45 MHz range and it is protected against input voltage overload.

Accuracy is given as ±3 p.p.m. at 25°C. The display update is 5 times/second via internal multiplexing; the gatetime is 0.1 second.

The unit is small (6 x 3⅛ x 1¾ inches) and requires one 9-volt battery or an optional a.c. adapter.

The Micronta Digital Frequency Counter, complete with carry pouch, mini-rod antenna and test leads is priced at $99.95 and available from all Radio Shack stores and dealers.

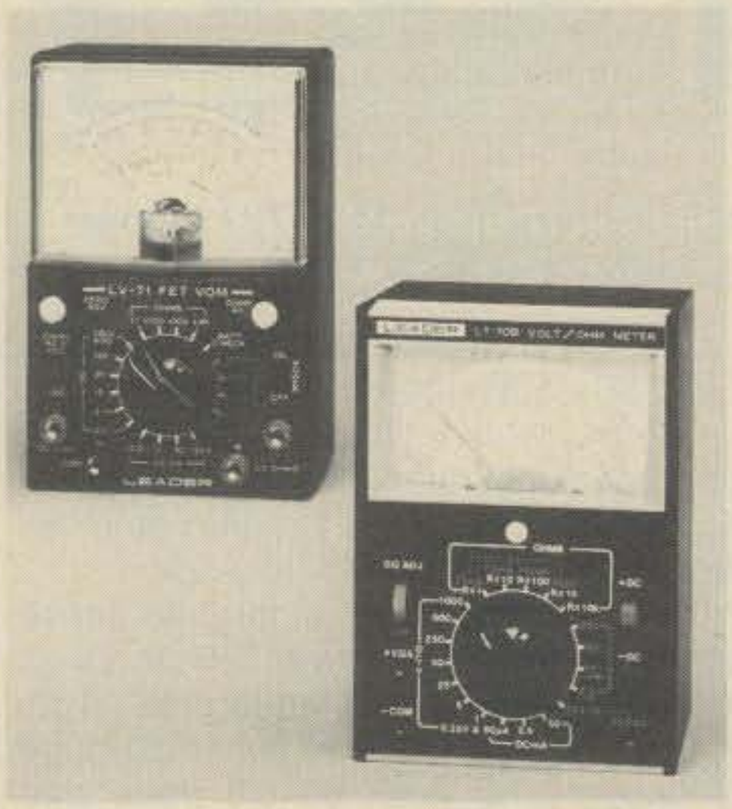


Curtis Electro Devices Inc. Integrated CW Message Memory

A one-chip message memory control IC has been introduced by Curtis Electro Devices. Called the 8047, this 28-pin CMOS device requires a 1k x 1 RAM and an 8043/8044 or equivalent keyer to provide a program of four 32-character c.w. messages. Features include variable pause repeat and automatic "end-of-message" reset.

Additional chips can be added for almost unlimited memory storage.

The 8047 operates from 5V d.c. and draws less than 10 mA of current. It is priced at $39.95 and is available from Curtis Electro Devices Inc., Box 4090, Mountain View CA 94040.



Leader Instruments Corp. Model LT-70B Volt-Ohmmeter

The Model LT-70B is Leader Instrument Corp.'s new v.o.m. It is protected from overload and polarity reversal.

Voltage ranges are from 0.25V d.c. to 1000V d.c., in ten steps and 2.5V a.c. to 250V a.c., in three steps. There are four current ranges: 0.5 μA to 50 mA (d.c.), 0.A to 2.5 A (a.c.), and two positions for diode testing (0 to 75 μA to 750 mA and 0.75 mA to 75 mA).

The LT-70B sells for $42.95 and comes with one set of heavy-duty test leads and one set of alligator clip adapters.

The unit is available from Leader Instruments Corp., 151 Dupont St., Plainview NY 11803.

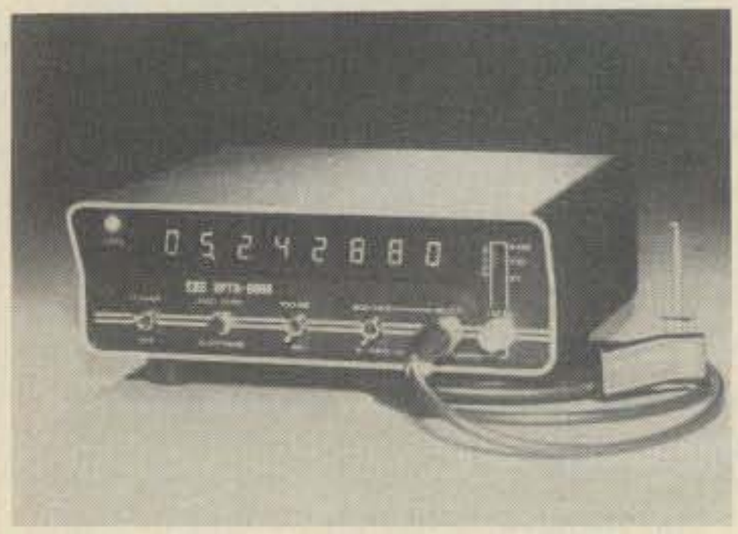
Optoelectronics Inc.'s Model 8000.1 Frequency Counter

Optoelectronics announces a deluxe 600 MHz frequency counter for a.c., d.c. or portable operation. The 8000.1 offers a manufacturer's guarantee of a ±0.1 p.p.m. t.x.c.o. time base stability, eight LED digits, a selectable input attenuator, 1 second and 0.1 second gate times and a variety of power cables and jacks for flexible powering.

Optoelectronics also offers a complete line of accessories for the unit.

The OPTO-8000.1 is available in kit form ($249.95) and factory wired with a two year guarantee ($299.95)

For more information contact Optoelectronics, Inc. at 5821 N.E. 14th Ave., Ft. Lauderdale FL 33334.



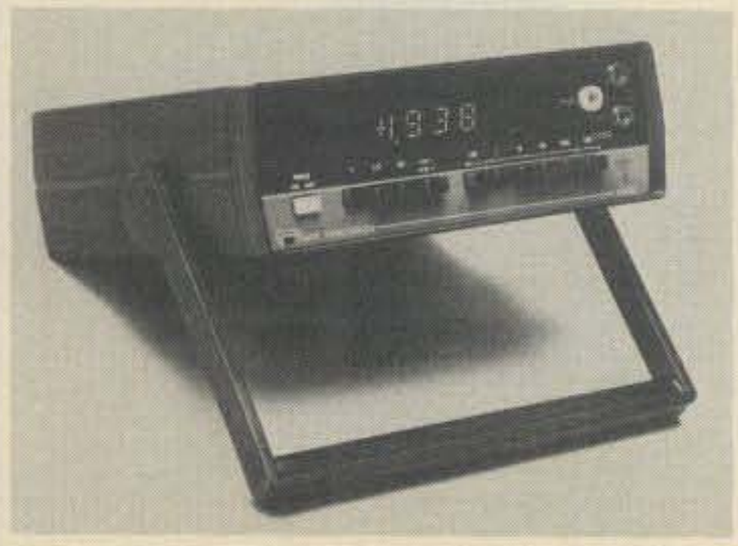
Data Precision's Model 1350 Multimeter

The Data Precision Model 1350 3½ digit multimeter offers 0.1% accuracy in the measurement of a full range of voltage, current and resistance.

The 1350 measures d.c. volts from ±100 μV to 1200 V, a.c. volts from 100 μV to 1000 v.r.m.s., resistance in both high (2.8V) and low (300 mV) excitation from 100 milliohms to 20 megohms, and both a.c. and d.c. current from 0.1 μ A to 2 A.

The Model 1350 is line-powered and features a 0.43" LED display. It costs $169.

For more information on this unit contact Data Precision Crop. at Audubon Rd., Wakefield MA 01880.



the super-compact

alda 103

only 3¼" high x 9" wide x 12½" deep • less than 8¼ pounds

ALDA 103, the trim little powerhouse with incredible performance for the price! ALDA 103 provides a full 250 watts PEP input for SSB operation, and 250 watts DC input for CW. And when it comes to performance, ALDA 103 is the hottest little transceiver going — all solid state, totally broadbanded and super-stable VFO.

Ideal first transceiver for brand new novices! You'll want a full-capability CW/USB/LSB unit with all the power and performance you can use. ALDA 103 gives you 250 watts DC input for CW, the maximum allowable power for your novice license. When you upgrade to technician, you've got 2 bands for CW operation. And with your general license, just plug in your mic and use the ALDA 103's full 250 watts PEP on SSB!

Perfect second or mobile unit for seasoned hams! If you're looking for a super-sharp, compact unit to use in your car or boat, ALDA 103 will live up to your expectations. Absolute worst case sensitivity 0.5 uV for 10 dB S+N/N — a must for mobile operation. Receiver audio output of 3 watts minimum — another must. Also, very low receiver power drain of only 5.5 watts — that's 0.4 amps at nominal 13.8 VDC including power for dial and meter lamps!

GENERAL SPECIFICATIONS

Semiconductors:	39 diodes, 23 transistors; 11 integrated circuits
Power Requirements:	Nominal 13.8 VDC input at 15 amps, negative ground only
Power Consumption:	Receive — 5.5 watts (includes dial and meter lamps); Transmit — 260 watts
Dimensions:	3-1/4" high x 9" wide x 12-1/2" deep (82.55 mm x 228.6 mm x 317.5 mm)
Weight:	8-1/4 lbs. (3.66 kg)

PERFORMANCE SPECIFICATIONS

Frequency Range:	80 meter band — 3.5 to 4.0 MHz 40 meter band — 7.0 to 7.5 MHz 20 meter band — 14.0 to 14.5 MHz
Modes:	CW; USB; LSB
RF Input Power:	SSB — 250 watts PEP nominal CW — 250 watts DC maximum (adjustable)
Transmitter:	
Antenna Impedance:	50 ohm, unbalanced
Carrier Suppression:	Better than −45 dB
Side-Band Suppression:	Better than −55 dB at 1000 Hz
Distortion Products:	Better than −26 dB
AF Response:	500 to 2500 Hz
Spurious Radiation:	Harmonics better than −45 dB below 30 MHz; better than −60 dB above 30 MHz
Frequency Stability:	Less than 100 Hz drift per hour (from a cold start at room temperature)
Microphone:	High impedance 3000 ohm
Receiver:	
Sensitivity:	Better than 0.5 watts audio output for 0.5 μV input
Signal-to-Noise Ratio:	Better than 10 dB S+N/N for 0.5 μV input
Image Ratio:	Better than −60 dB (typical with respect to 0.5 μV input: 80 meters — −130 dB; 40 meters — −100 dB; 20 meters — −75 dB).
IF Rejection:	Better than -70 dB (typical with respect to 0.5 μV input: 80 meters — 110 dB; 40 meters — 80 dB; 20 meters — 75 dB).
Intermodulation Intercept Point:	Better than 10 dBM
Selectivity:	2.5 kHz — 6 dB; 5.0 kHz — 60 dB
Audio Output Power:	More than 3 watts
Audio Distortion:	Less than 5% at 3 watts

$495

OPTIONS & ACCESSORIES

Microphone **$14.95**

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Noise Blanker — Model No. PC 701 ..... **$39.95**

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Portable Power Supply — Model No. ALDA PS 115: average duty 15 amp unregulated; input — 115/230 VAC, 50/60 Hz; output — 13.8 V nominal at 15 amps... **$84.95**

Heavy Duty Power Supply — Model No. ALDA PS 130: output — regulated 30 amp at 13.8 VDC; input — 115 or 230 VAC, 50/60 Hz... **$149.95**

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ALDA 103 is completely manufactured in the U.S.A.

CIRCLE 1 ON READER SERVICE CARD

CQ Reviews: Heath Co. Model IM-4190 Bidirectional R.F. Wattmeter Kit

BY IRWIN SCHWARTZ*, K2VG

The Heath Model IM-4190 Bidirectional R.F. Wattmeter measures forward and reflected power in transmission lines for frequencies between 100 MHz and 1 GHz.

Specifications

Power Ranges (full scale)	
Forward	30, 75 and 300 watts
Reflected	3, 7.5 and 30 watts
Frequency Range	100 MHz to 1 GHz
Characteristic Impedance	50 ohms
Connectors	Type N (standard 50 ohm) with UG + 146/U adapters supplied for use with PL-259 UHF plugs (up to 300 MHz only).
Accuracy (full scale)	
30, 75 and 300 watt ranges	+5% at 25°C when connected to a 50-ohm load.
7.5 and 3 watt ranges	+7.5% at 25°C when connected to a 50-ohm load.
Power	9-volt battery
Dimensions overall	4½"H x 4-¼"W x 4-⅝"D
Net weight	28oz.

Construction

The construction of the IM-4190 was simplicity itself. The unit took three hours (steady work) to put together and it worked the first time around. The small components and the function switch are mounted on a single circuit board. Once again, as always, Heath's instruction manual makes this kit a simple enough project for even the beginner. There are no tricks or special techniques required in building the kit.

The pickup assembly (with N-type connectors attached) is in one piece and is held in place by two screws.

This kit should present no difficulty at all to anyone who has handled a soldering iron.

The initial testing and adjustment of the IM-4190 is accomplished without the use of any additional pieces of test equipment. Adjustment consists of meter zeroing using the meter-adjust screw and scale adjustment using the meter in conjunction with one pot in the unit.

For those who have a better equipped test bench (a signal generator capable of producing a 400 MHz signal with a variable power output of from 3 to 300 watts, a power meter capable of measuring the frequencies and power of the signal generator and an r.f. load which presents a v.s.w.r. of 1.1:1 or better), Heath outlines a procedure for calibration with those instruments.

*Technical Editor, *CQ*

Operation

Connected in its "normal" configuration (transmitter output to meter input; meter output to transmission line), the meter will measure forward and reflected power at the turn of a switch. In addition, with a little elementary math the percentage of reflected power can be found by use of the formula

$$\%\ \text{refl. pwr.} = \frac{\text{refl pwr}}{\text{inci pwr}} \times 100$$

and by use of charts supplied by Heath, the actual v.s.w.r. can be determined.

Since the unit is bidirectional it can be inserted in the power output circuit "backwards," that is, transmitter output to the "load" connector and the load to the "input" connector. In this configuration, the meter can be used to determine if an extreme mismatch exists in the transmission line or at the load.

Conclusions

The Heath Co. Model IM-4190 Bidirectional R.F. Wattmeter is a simple unit to build. It can be put together in one evening. The unit performed admirably with my two-meter staton and, in fact, I used it to trim my dipole antenna. It would be a handsome and useful addition to any v.h.f.-er's station. In addition, it can be easily used in the field since it is internally powered and has a convenient handle on the back (which can be used to clip the meter to your belt when you climb your tower).

The unit is available from Heath Co., Benton Harbor MI 49022 for $114.95 in kit form or for $195.00 in the assembled version (SM-4190). CQ

Okay, you guys. Dig into your junk boxes and pull out some of those things you thought you'd never have a use for. You'll be glad you saved them when you build this rig!

A Two Meter Transmitter for A.M.

(Yes, Harry, there is A.M.!)

BY BYRON H. KRETZMAN*, W2JTP

The really capable amateur of today, the one who still builds the gear he needs to operate a particular band and mode, has a "junk box" from which he can draw the parts required. The term "junk box" is a common but poor description of this well stocked *and* carefully sorted storage of components and hardware that makes it possible to build in spite of the unavailability of over-the-counter "radio" store items—transmitting variable capacitors, for example. (If they *were* available they would be priced far out of reach.)

The really capable amateur of today designs his rig (or other gear) around what he has or what he can scrounge from other local amateurs. Many times a fortuitous buy at a radio club auction or flea market can be the impetus for a project.

This is the story of how a 2-meter a.m. transmitter was created to satisfy the need to participate more fully in the local a.m.[1] and f.m. 2-meter activity. (Our station was already equipped for f.m.) Low power, 10 to 20 watts, was required for this single-frequency a.m. operation. The receiver on hand was an old Erco 397R aeronautical ground station a.m. fixed frequency v.h.f. receiver. For the antenna a halo was scrounged.

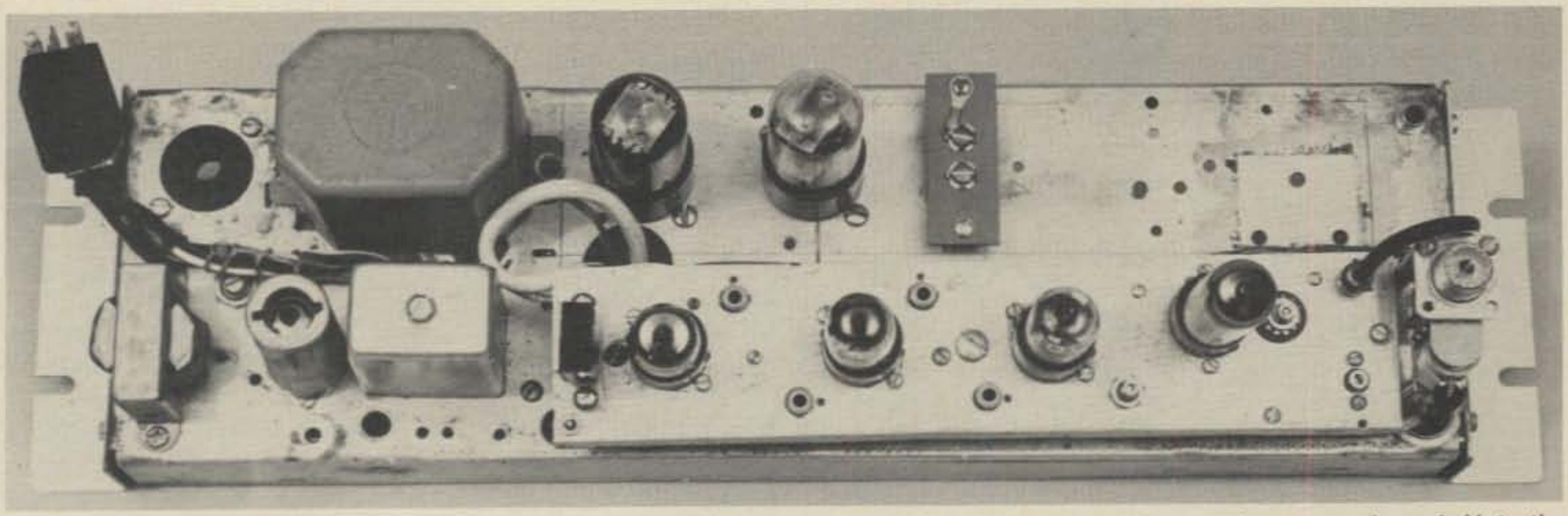
*431 Woodbury Rd., Huntington NY 11743

[1]Kretzman, B.H. "No, Harry, A.M. is Not Dead!", *CQ*, March, 1977, p.56.

Design Process

Vacuum tubes rather than solid state devices were used because these, and their companion components, were much, much, more available. Considered for the final amplifier were the 829B, 832, 5763, 5686 and the 6360. The dual tetrode 6360 was chosen because of its small size as well as its reputed smoothness of operation on v.h.f. Frequency multiplication chosen was 18 times, pretty much standard for 2-meter a.m. rigs, in order to use either an 8 MHz crystal on hand or to enable its purchase at low cost, like $3, if it *had* to be bought. (A v.f.o. was deemed not worth the trouble since this is a *fixed* frequency operation.) Once the final tube type was decided, a practical scheme of multiplication, using the minimum number of stages, was selected: triple in the oscillator to about 24 MHz, double to about 48 MHz in the next stage, then triple to 2-meters in the driver stage. Four tubes, total, including the p.a. The 5686, many of which came from a local, was the perfect choice for the oscillator and multiplier stages. Usable, but with different base connections, are the 5763 and the 6CL6.

A pair of 6V6GT tubes were selected for the modulator. Considered briefly were the 6L6, 5881 and 6AQ5. A 12AT7 was selected for the speech amplifier. An interstage audio transformer was eliminated by connecting the 12AT7 in a



2-Meter Transmitter for A.M., constructed on a 5" by 17" metal chassis with rack-mounting angles on each end. Note the separate r.f. sub-chassis mounted on pillars above the main chassis. The power supply is on another chassis.

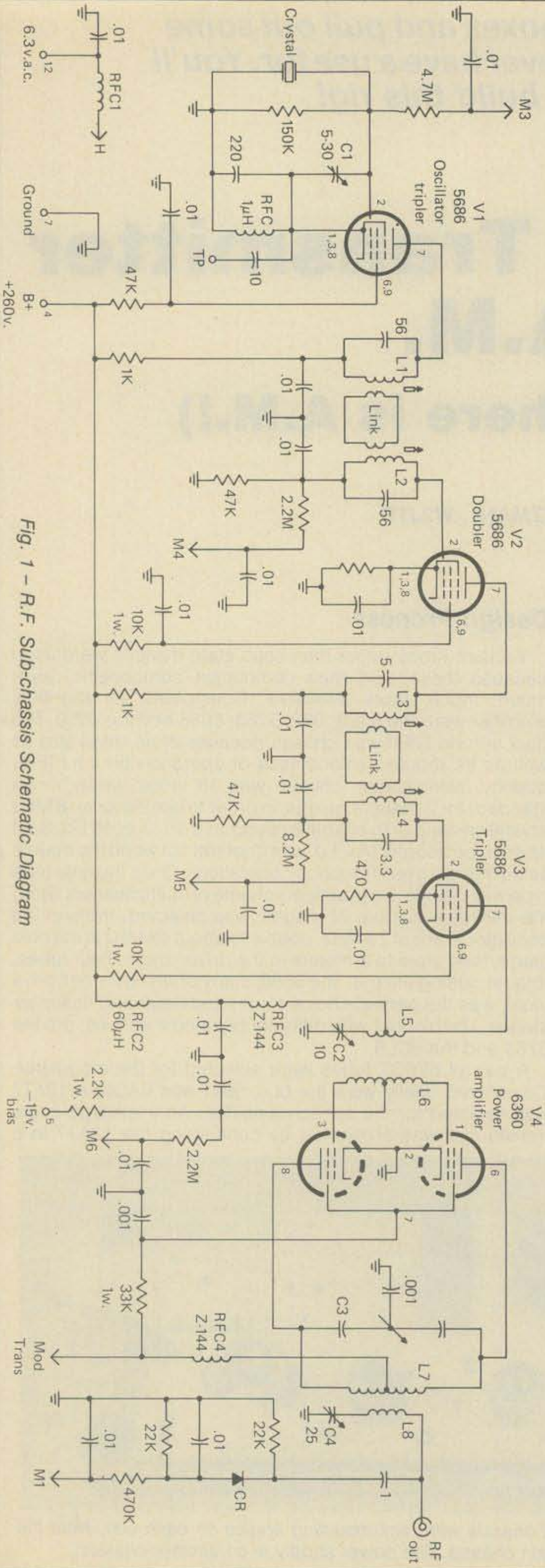


Fig. 1 – R.F. Sub-chassis Schematic Diagram

phase inverter circuit. The circuit is an old "hi-fi" circuit[2], simple but providing perfect balance. Since the overall gain was more than sufficient for the carbon microphone input required, inverse feedback in the order of 10 dB was added in accord with the "hi-fi" circuit.

Last but not least, a good multi-impedance modulation transformer was a decided necessity. This was not on hand, but a diligent check of the local boys turned up a UTC S-18 (12 W). Perfect. The larger S-19 (30W) could also have been used to match the 8000 ohm plate-to-plate modulator impedance to the 3000 ohm p.a. load. Similar Stancor transformers are the A-3891 (15 W) and the T-13M14 (30 W). Similar Thordarson transformers are the T-19M13 (15 W) and the T-13M14 (30 W). Similar Kenyon transformers are the T-489 (15W) and the T-454 (30 W). Watch the flea markets for these.

The power supply is not described since it is simple and easily thrown together. Requirements are 250 volts at about 200 mA. A separate, handy, 6.3 volt, 4 ampere, filament transformer was used. The plate transformer was military surplus, marked for less than 100 mA, but it doesn't even get warm. Low voltage filament windings were used to get a −15 volt bias and antenna relay source. (The relay we *had* was 12 volts, d.c.)

Construction and Components

This 2-meter transmitter is built on a stripped Motorola TU-277 power supply chassis 5" by 17" deep. L-shaped end brackets were added to permit relay rack mounting. The r.f. portion of the transmitter is built on a separate aluminum sub-chassis 2" by 10" (see fig. 3) which is mounted above the main chassis on 1" spacers. Connections to the power supply here are made by means of a Jones P-315-CCT plug connector. An 11-pin socket *M* is mounted on the main chassis to enable a Motorola-type test set[3] to be plugged in to measure relative grid (drive) voltages, and the plate and screen current of the 6360 p.a.

Coils used, up to the plate circuit of the driver, are made from modified "CB" coils bought from a side-walk vendor in downtown New York City. These are slug-tuned with threaded slugs requiring a Heathkit-type of plastic hex tuning tool. Coil diameter is 5/16". Winding information is shown on the schematic diagram, fig. 1. The driver plate coil, the p.a. grid coil and the p.a. tank coil were air-wound as indicated on the schematic. Note that the p.a. plate tank tuning capacitor C_3 rotor is insulated from the chassis. A one-turn antenna coupling coil is wound around L_7 and a 25 pF variable capacitor C_4 is used for antenna circuit tuning and p.a. loading.

Since −15 volts protective bias is supplied to the p.a., the 6360 will not go ape without exitation. The doubler and tripler stages are provided with cathode bias resistors so they are protected.

Tuning

Tuning is simple if the Test Set previously mentioned is used. Recommended is an s.w.r. bridge in the output circuit although one position M_1 on the Test Set connects to an r.f. voltmeter (diode) arranged to sample the r.f. voltage at the antenna connector. This, or the bridge, permits tuning the p.a. tank capacitor and the antenna link capacitor for "maximum smoke."

Tuning can begin with the Test Set switched to position M_3. Actually, no tuning is done at this point; the meter reading merely tells us that the crystal is oscillating. With the Test Set switched to M_4, the oscillator plate coil and the doubler grid

[2]Sprinkle, M.C. "Viewer's Amplifier", *FM-TV*, January, 1951. p.38.
[3]Kretzman, B.H. "A Test Set for F.M." *CQ*, November, 1963, p.74.

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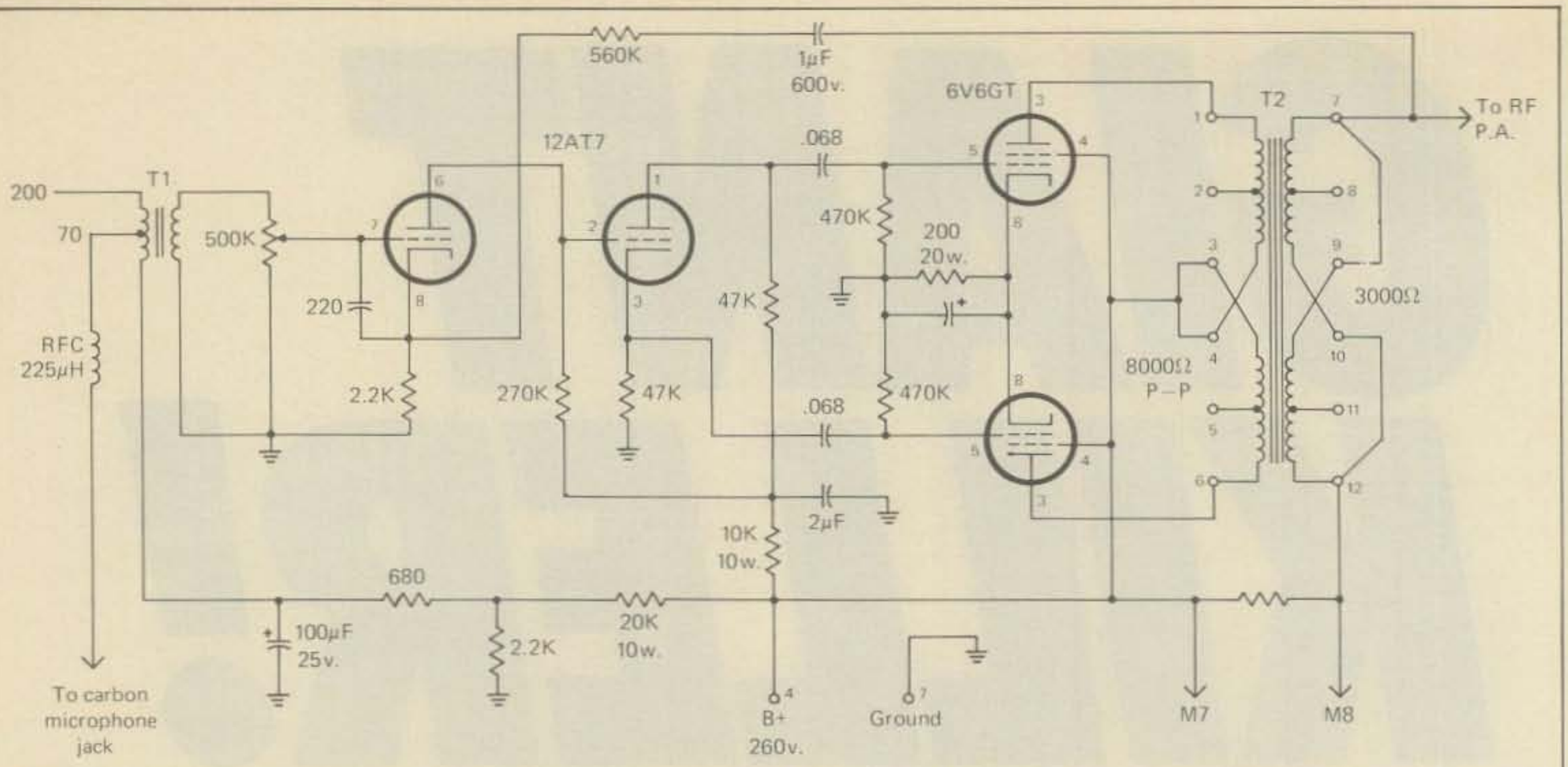


Fig. 2 – Modulator and Speech Amplifier Schematic Diagram T_1 – Carbon Microphone-to-grid transformer; Stancor A-4705 T_2 – Modulation Transformer; UTC S-18

coil are tuned for a maximum meter reading. It is necessary to go back and forth between the two coils a few times as there is naturally some interaction between the two coils due to the link coupling. In the same manner, with the Test Set switched to M_5 the doubler plate coil and the tripler/driver grid coil are tuned for a maximum meter reading. With the Test Set switched to M_6 to read the p.a. grid voltage, the tripler/driver tank capacitor C_2 is tuned for a maximum (drive) meter reading. (The p.a. grid is not separately tuned but is roughly resonated by the tripler/driver tuning.) A test point, TP, is installed for connection to a counter so that the oscillator may be put on frequency by the variable grid capacitor C_1 in the oscillator stage.

Loading of the p.a. can be checked by switching the Test Set to position 7. This measures the plate and screen current of the 6360. If the Test Set is not available, a 0-100 mA can be connected to pins 7 and 8 on the metering socket M. Loading should be about 75 to 85 mA. Maximum r.f. output may not occur exactly at minimum plate current but don't let that disturb you. As we said, tune for maximum smoke (output) but be sure that the combined plate and screen current does not exceed 85 mA.

Comments

Of course the carbon microphone leaves a little to be desired from the audio quality standpoint. However, this was what was available initially. Considerable improvement was obtained by using a dynamic mobile microphone such as the Motorola TMN-6020A which has a stage of transistorized pre-amplification built-in. A GE "controlled reluctance" mic-

Bill of Materials

C_1 — 5-30 pF, N750, Ceramic Trimmer
C_2 — 10 pF, Air; Johnson 160-127-9
C_3 — 10 pF per section, Air; Johnson 160-208
C_4 — 25 pF, Air; Johnson 148-2
CR — Germanium diode; 1N34, 1N54, etc.
L_1, L_2 — Turns #22E, spaced wire dia., on 5/16" slug tuned form; 1 Turn link on cold end
L_3, L_4 — 7 Turns #22E, spaced wire dia., on 5/16" slug tuned form; 1 Turn link on cold end
L_5 — 4 Turns #14 bare, ½" dia., ⅝" long, CT
L_6 — 3 Turns #22 insulated, ⅜" dia., inside L_5
L_7 — 5 Turns #14 bare, ½" dia., CT
L_8 — 1 Turn #22 insulated, around L_7
RFC_1 — 6 Turns #22 insulated, ¼" dia.
RFC_2 — 60 µ encapsulated
RFC_3 — Ohmite Z-144
RFC_4 — Ohmite Z-144
XTAL — FT-243 fundamental, 1/18th output frequency (8075 kHz for 145.350 MHz)
M_n — Metering Socket pin number (M_{11} is ground)
n — Power Connector pin numbers

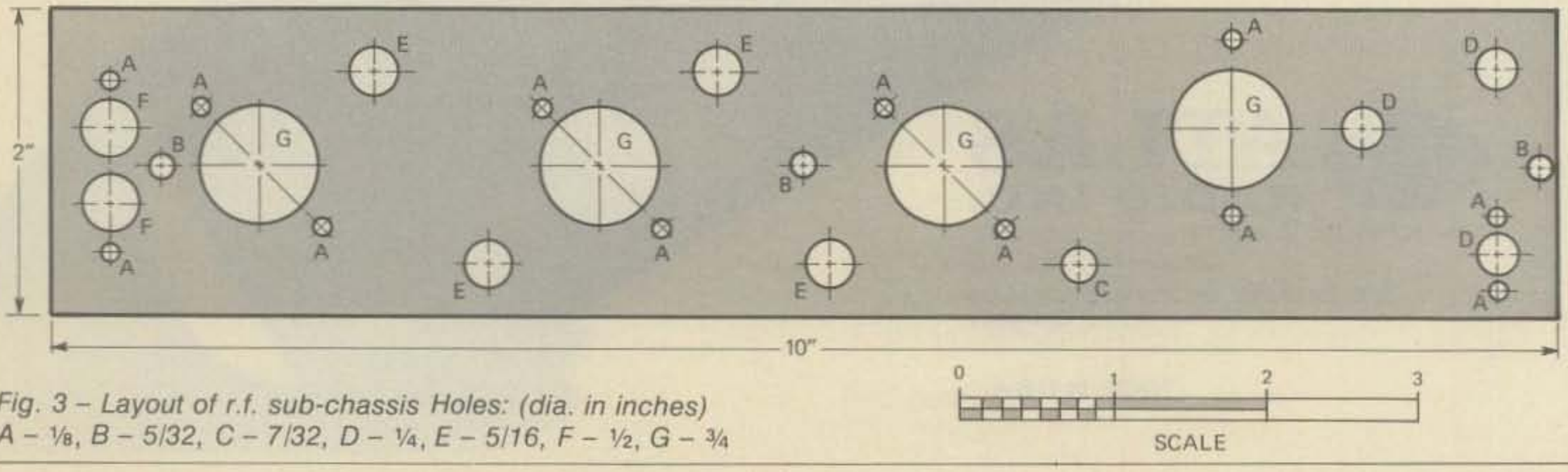


Fig. 3 – Layout of r.f. sub-chassis Holes: (dia. in inches) A – ⅛, B – 5/32, C – 7/32, D – ¼, E – 5/16, F – ½, G – ¾

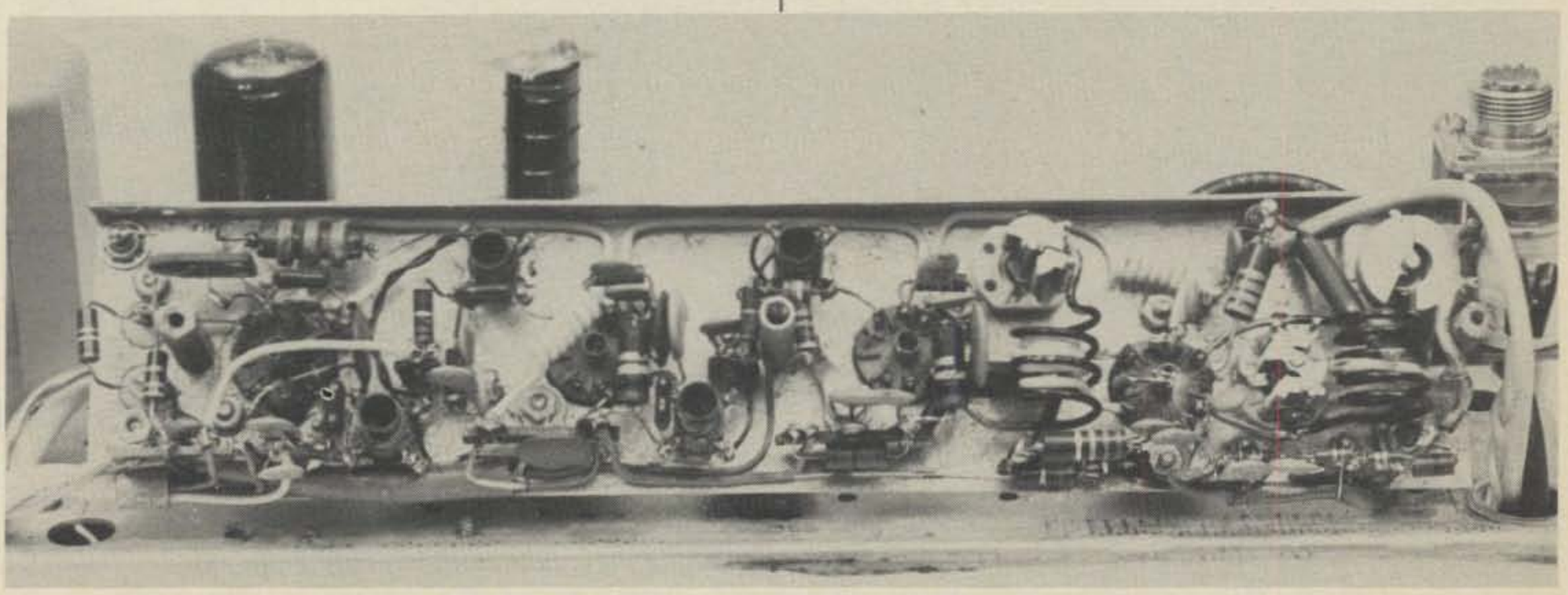
rophone such as the Shure EM-25A may also be used but you will have to build in the transistorized pre-amplifier yourself.

This transmitter, and the associated receiver as previously mentioned, has been used quite successfully (meaning with considerable pleasure) on the local duplex operation where the a.m. set is on 145.350 and a separate low power f.m. set is on 146.94. Duplexing is easy (look Ma—no cavities!) because of the wide frequency separation, the difference in antenna polarization (a.m. horizontal—f.m. vertical) and a reasonable amount of separation of the two antennas. Perhaps the operation can be more correctly termed "semi-duplex" because press-to-talk is used, especially when three or more stations are involved. This allows you to interrupt the other fellow, by transmitting the opposite mode, if he is making a long "old buzzard" transmission. Old timers will readily recognize the similarity to the old 5-meter duplex operation back around 1935 to 1938.[4]

Finally, don't let anybody kid you that parts are not around to allow you to build something like this 2-meter a.m. transmitter. You know, collecting the parts (scavenger hunting) is half the fun!

Personal thanks go to those who provided critical parts for this rig: the late WB2KGS, K2IEG, K2HTX, W2JND and W2SOB. CQ

[4]Coward, W.N. "New Regulations (1938)", *73*, February, 1974, p.34.



R.F. sub-chassis up-ended to show coils and wiring.

The 1930's were probably the most influential years for the evolution of modern amateur receiving techniques. K4KJ describes an amateur receiver of that era which helped to blaze a trail to today's advanced craft.

The SW-5

A Pioneer Amateur Receiver

BY JOHN J. NAGLE*, K4KJ

To most amateur radio operators, foreign short-wave broadcast stations are a pain and a nuisance, especially at the high end of 40 meters. However, it was not too many years ago that "copying" a new foreign BC station was one of life's greatest thrills; so much so, in fact, that it created a market and this market brought about the development of a receiver that was a state-of-the-art jump over previous sets. Many of the refinements of this receiver soon found their way into new and improved amateur gear, contributing to the build-up of the amateur radio industry of the 1930s. They led to such famous models as the HRO, Super-Pro, and the Hallicrafters Super Skyrider series.

In the course of the early development of the all-band short-wave receiver, many technical problems had to be overcome . . . problems that seem simple and trivial from today's perspective, but that were major obstacles to the advancement of receiver technology in the 1920s and 1930s.

One of the first commercially available receivers to solve these problems was developed by the National Company, then located in Malden, Massachusetts; it was known as the **SW-5**. A photograph of this receiver with its external power supply is shown in fig. 1.

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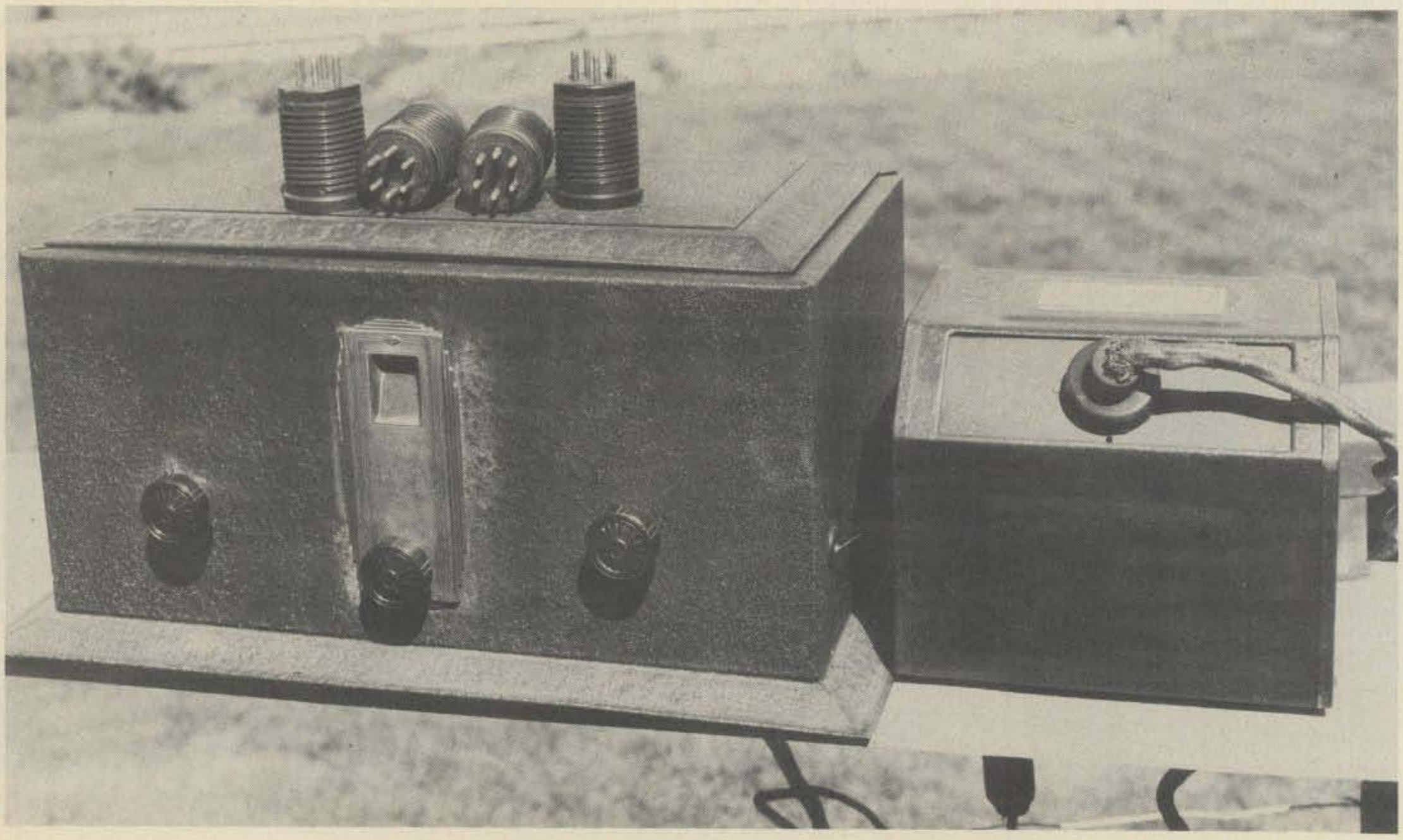

Fig. 1—Overall view of the SW-5 with power supply and two sets of coils.

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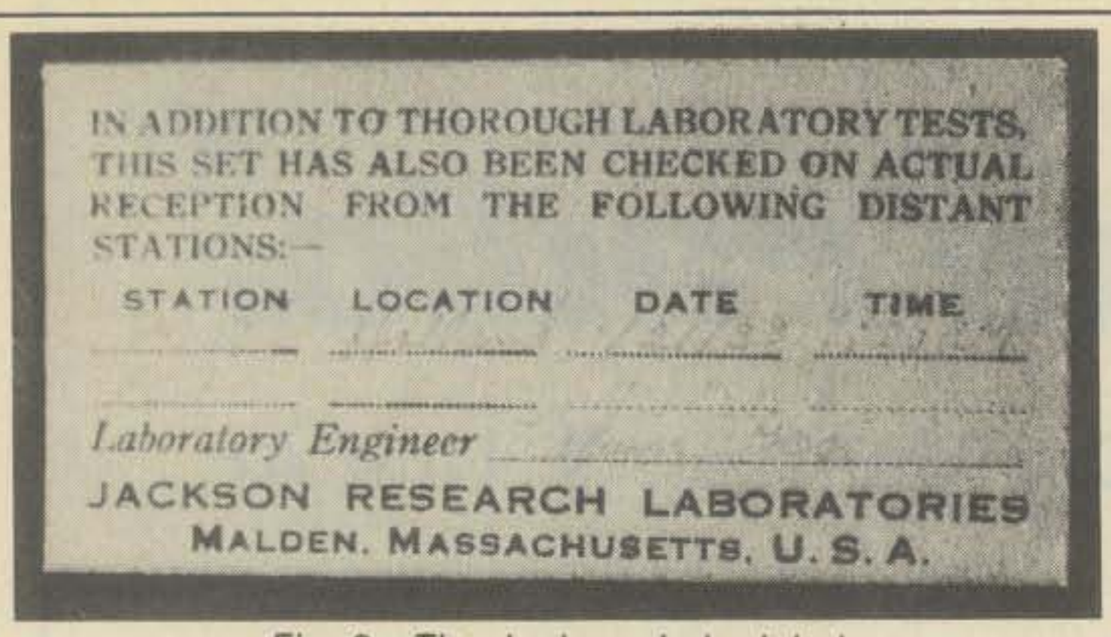

Fig. 2—The Jackson Labs label.

To the best of my knowledge, the SW-5 was announced in June 1930. An article in the June 1930 issue of *Radio News*, written by James Millen and Robert S. Kruse,[1] describes the set, its technical problems, and how they were solved. Much of the information in the present discussion was taken from the Millen-Kruse article.

James Millen needs no introduction to most amateurs; until recently he manufactured a large number of components and equipment for the amateur market. In the 1920s and 30s, he was General Manager and Chief Engineer of the National Company and so guided the development of quite a few amateur products. Robert S. Kruse is not as well-known. He was a technical editor of *QST* from January 1923 to June 1928 and later became one of the first consulting radio engineers.

But we're getting away from our story. Chronologically, the SW-5 came after the SW-4 but before the SW-3. The letters "SW" stand, of course, for "short-wave," while the number following gives the number of tubes in the receiver and has nothing to do with the numerical order in which the receiver was developed. Hence, the SW-5 used five tubes: an r.f. amplifier, a regenerative detector, an audio voltage amplifier, and, since one of the objectives of the set was comfortable loud speaker operation, a push-pull audio power amplifier output stage for a total of five tubes.

The SW-4, which had been developed earlier by RCA and manufactured by both National and Westinghouse, had four tubes and used only a single-ended audio output stage. The SW-3, developed a year or so after the SW-5 by National, was intended for headphone operation only; therefore the audio power amplifier was dispensed with, and only three tubes were used.

Many early National receivers including the SW-5 were

Fig. 3—This picture of an SW-4 was taken from the National Company's 50th Anniversary photo album. Note the difference in the tuning dial between it and the SW-5 in fig. 1.

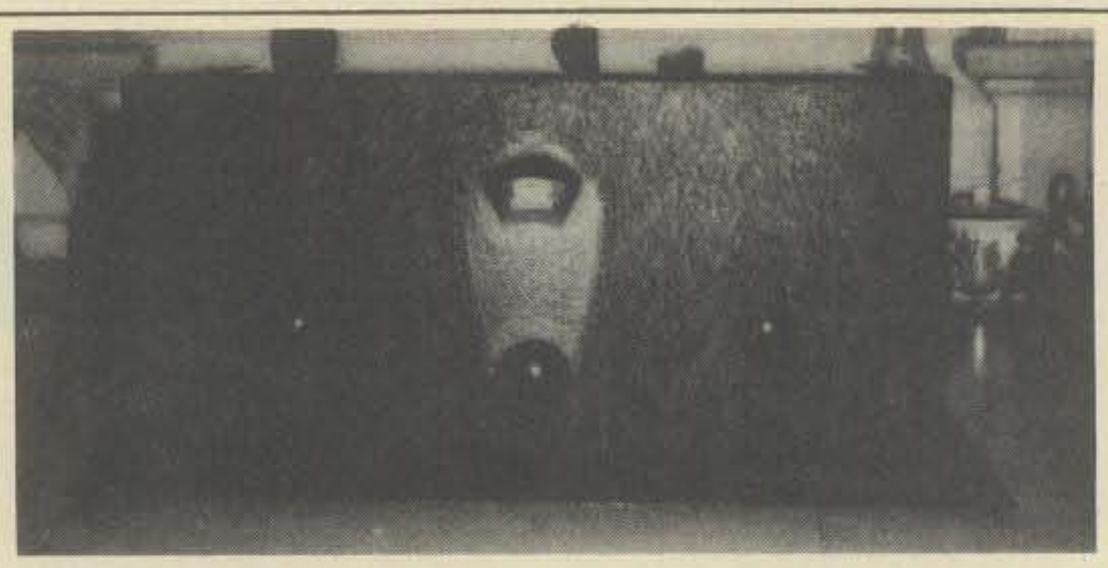

Fig. 4—A front view of the Wholesale Radio version of the SW-5. Note the similarity to the SW4 of fig. 3. (Photo by Fred Linn, W9NZF)

actually assembled by a "Jackson Laboratories" and carry a paper label to that effect. If your National receiver has a Jackson Labs Label, it verifies the antiquity of that set. These labels were attached to the inside of the top cover; a photograph of one is shown in fig. 2. The label says the receiver was assembled on 7/23/30 and tested by Calvin Foss by actually receiving PCT and and PCQ from Holland.

Jackson Labs was so named because it was located on Jackson Street just around the corner from the old National Company plant in Malden. The purpose of Jackson Labs was to assemble receiver kits made by National which used RCA controlled patents.

It is my understanding that, when a company obtained an RCA patent license, they had to pay a percentage of their total gross sales as royalties, whether all of their products used the patents or not. National, therefore, manufactured their products using RCA patents in kit form, which was exempt from royalties, and "sold" the kits to Jackson Labs who assembled and "resold" them. Jackson Labs paid the patent royalties and, as their output consisted exclusively of products using RCA patents, their royalty efficiency was 100 percent; they paid only on radio-type products. Old-fashioned New England Yankee shrewdness! As RCA's patent base expanded and National's products became more sophisticated, National eventually took out an RCA patent license in their own name and sold their products directly.

As seen from fig. 1, the SW-5 is very similar in appearance to the earlier SW-4. A photograph of an SW-4, taken from National's 50th anniversary photo album, is reproduced in fig. 3. The only difference in appearance is the tuning dial mechanism. On the -4 the dial turns parallel to the front panel while with the -5 a drum rotates in a plane perpendicular to the front panel. The shape of the tuning dial is thinner on the -5

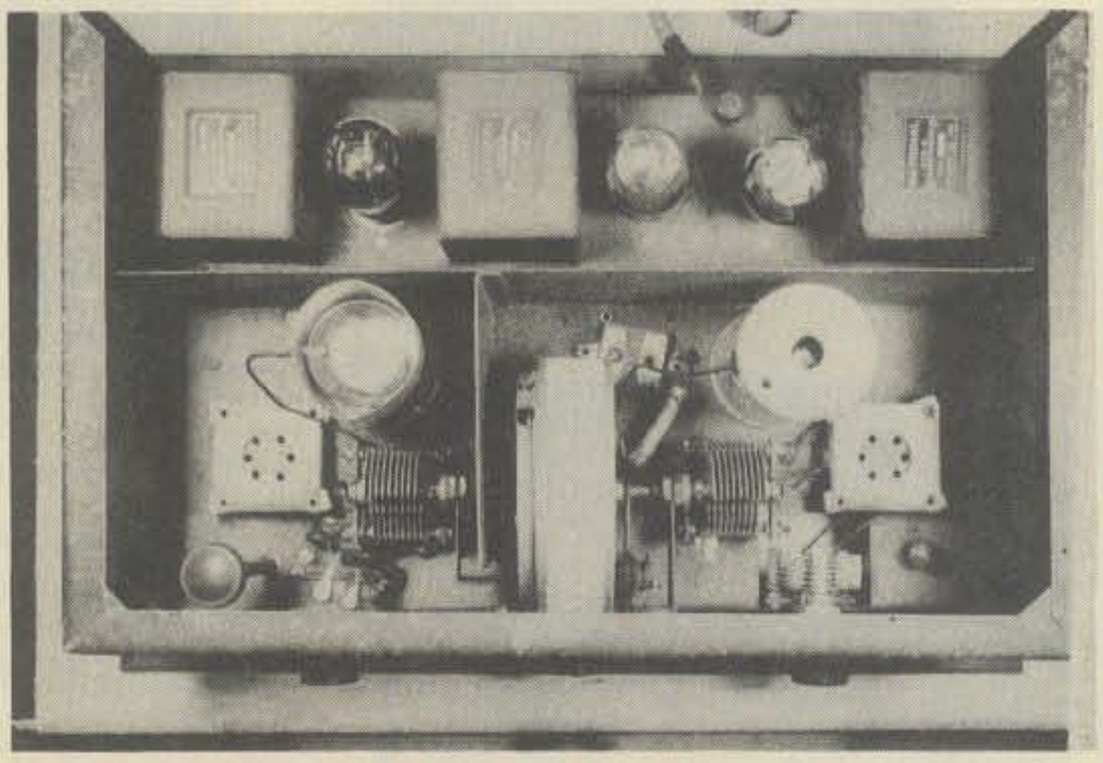

Fig. 5—Inside view of the Wholesale Radio version of the SW-5. Except for the switch in the lower left-hand corner this set appears identical to the SW-5 shown in fig. 13. (photo by Fred Linn, W9NZF)

than on the -4. For those who are purists, the tuning dial on the SW-4 is a National type E while the dial on the SW-5 is a type H.

To add confusion, or interest, to the situation, some collectors may have a receiver that looks like an SW-4 but has 5 tubes; which is it? It turns out that National manufactured a variation of the SW-5 which was sold as a "house brand" receiver by Wholesale Radio Company (now known as Lafayette Radio). Fig. 4 shows a front view of this model which is being restored by Fred Linn, W9NZF; fig. 5 shows an inside view. Compare fig. 5 with figure 13 which shows an inside view of the SW-5. The distinguishing feature of the Wholesale Radio model appears to be the switch shaft sticking up from the chassis behind the regeneration control. This can be seen in the lower left-hand corner of fig. 5.

The purpose of the switch appears to be to change from battery type tubes, with directly heated filaments, to a.c. type tubes with their indirectly heated cathodes. As biasing requirements are different for the two types of tubes, the circuit configuration must be switched, depending on which type of power source was being used, as both were common in this time period. This same type of switching was also provided on the "universal" model of the SW-3.

Fig. 5 is also interesting as it gives a good view of the plug-in coil sockets. Plug-in coils for the SW-3, -4, -5, AGS, and FB-7 all used the same base. These coils all have six pins arranged in two groups of three and not evenly distributed, as on a six-pin tube socket. As far as I know the National Company was the only manufacturer of this type coil form, which makes it impossible to wind coils for these receivers using coil forms of other manufacturers.

I have seen two schematic diagrams of the SW-5; the schematic of fig. 6 was taken from the Millen-Kruse article while fig. 7 was supplied by National. The differences are very minor and appear to be limited to the input tuning circuit and the method by which regeneration is controlled. The Millen-Kruse circuit controls regeneration by means of a 4k variable resistor shunted across the detector plate tickler winding while the National schematic varies the screen voltage of the detector tube to control regeneration. I suspect that the Millen-Kruse schematic is the developmental schematic while the National copy is the actual production version.

Basically the receiver consists of an r.f. amplifier followed by a regenerative detector. These stages use type -24A tubes in early versions and type -35's in later versions; the two types are interchangeable. The regenerative detector drives a type 27 voltage amplifier which is transformer-coupled to a push-pull audio output power amplifier. Collectors should be aware that two versions of this receiver were manufactured, using different audio power output tubes. A National advertisement in the July 1931 issue of *Radio News* reads in part:

> "We now announce a special broadcast receiving model of the THRILL-BOX, equipped with 245 tubes in Push-Pull for audio output. This gives very fine quality with large volume. For technical and amateur communication we recommend the Push-Pull 227 model."

Old-timers will remember that type 45 tubes require a 4-pin base while 27 tubes use 5 pins. Therefore either type of output tube may be used depending on whether the original purchaser was a BC listener or used the receiver for "technical and amateur communication."

The first three stages of the schematic of fig. 7 are almost identical to the schematic of the SW-3, as given by William I. Orr, W6SAI.[2] The principal differences are that the SW-3 has an audio gain control as well as a regeneration control; also Orr's schematic shows the main tuning condenser connected to a tap on the coil. I believe this latter difference is because Orr shows bandspread coils whereas my fig. 6 and 7 show

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*with optional converter
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Unwanted Sideband Suppression ... 40 dB
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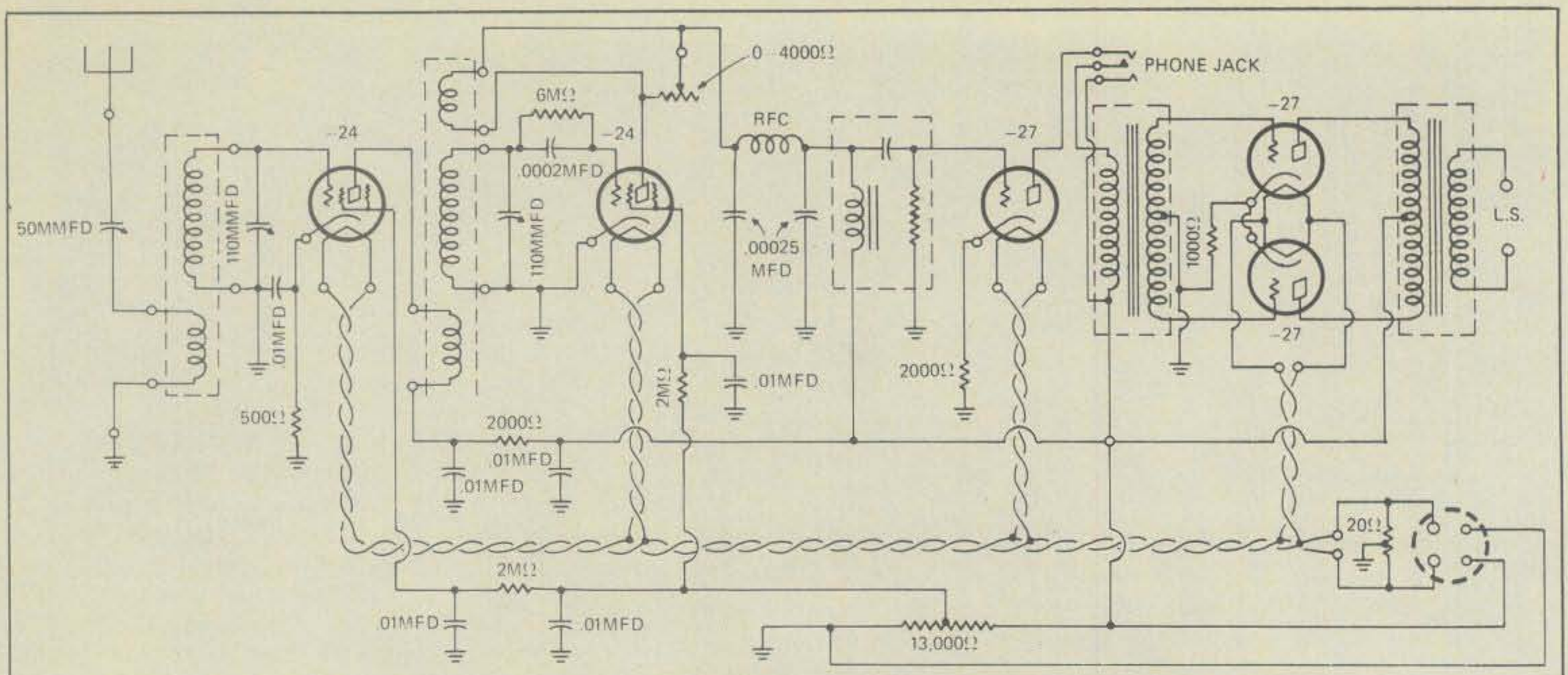

Fig. 6—The schematic diagram of the SW-5 from the Millen- Kruse article, reference 1.

general coverage coils. I will discuss the bandspread problem later on.

As originally presented, the receiver covered the frequency range of 2 to 20 MHz by means of four sets of plug-in coils. Each set consisted of two identical coils, the r.f. amplifier and detector coils usually being interchangeable. Later, particularly after the introduction of the SW-3, additional coil sets became available to cover the frequency range of 90 kHz to 35 MHz. Fortunately, coils for the SW-5 and SW-3 are interchangeable which is a help to collectors. As pointed out by Bill Orr,[2] it may be necessary to add or subtract a few turns from the tickler winding to make the regeneration control work properly.

Unfortunately for collectors, however, the coil forms do not use a standard base. The forms have six prongs, but the prongs are bunched in two groups of three and not equally spaced as were the old six-prong tube sockets. Thus, 6-prong coil forms of the conventional variety can not be used to wind replacement coils. The SW-3, AGS, and FB-7 receivers all use the same 6-prong pin arrangement as the SW-5.

The principal design objectives for the SW-5 were: (1) absolutely humless a.c. operation; (2) single dial frequency control; (3) loud speaker operation for foreign short-wave BC stations; (4) noncritical tuning; (5) absence of hand effect; and, finally, (6) a neat appearance.

By today's technical standards, these objectives appear commonplace—now, no one would think of buying a receiver without these features—but in the late 1920s they represented a real technical challenge.

Take, for instance, the problems of humless a.c. operation. National really meant humless, and humless they were—which is a lot more than you can say about many receivers on the market today.

By the late 1920s, a.c. powered broadcast band receivers had been made reasonably humless; but hum-free short-wave operation was a different story. Tunable hum was a major problem; receivers that were hum-free in one section of town hummed at the other end of town . . . possibly a reflection of the local power mains peculiarities. Tube manufacturing techniques were not what they are today either and a.c. leakage across ceramic insulators inside the tubes was a problem. Therefore, interstage coupling divices had to be designed to pass the signal with high stage gain, but not the hum. This eliminated direct coupling. National found that an r.f. filter in the power supply between the rectifier and the B+ filter was necessary. As vacuum techniques were not what they are today, switching transients in the rectifier tubes possibly excited residual gas in the tube giving rise to r.f. noise.

Another problem was dead spots. Here again, the causes were many and varied. It was found, for example, that a conventional 0.5 uF paper capacitor (*condenser* in those days) had a much higher r.f. impedance at the higher frequencies than a good 0.01 pF mica capacitor.

Another cause of dead spots was tuning capacitors. As seen from fig. 8, variable capacitors of that period had either a box type form or a "U" type frame. The shorted turn this created caused undesired and unpredictable resonances. In addition, the bearing surfaces were points of uncertain contact which generated tuning noise.

The solution of these two problems was to insulate the rear

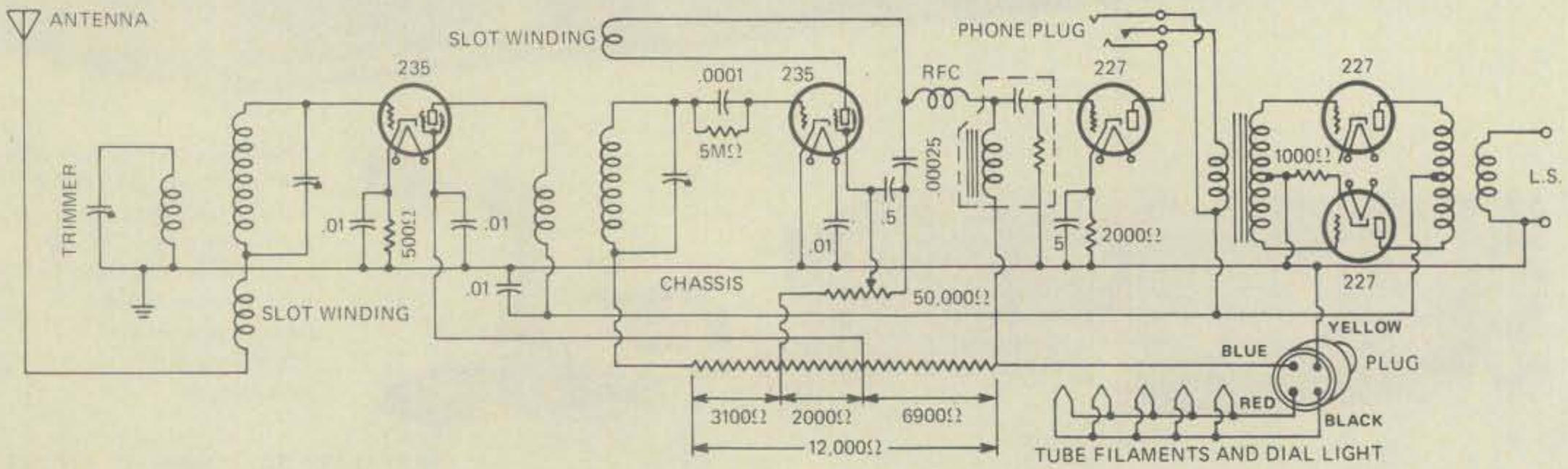

Fig. 7—The SW-5 schematic as provided by National.

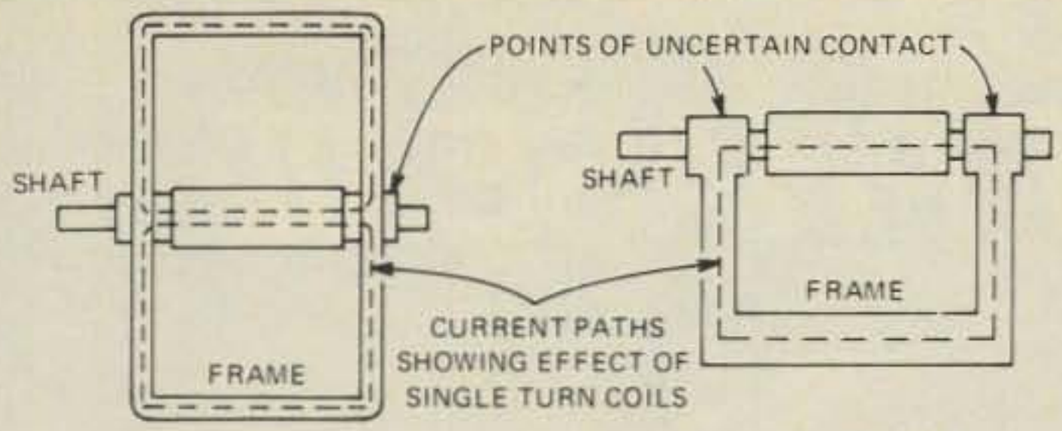

Fig. 8—A sketch of a variable capacitor with box and U-type frames. The possibility of an undesired tuned circuit is apparent.

bearing so as to break the loop. In order to eliminate the bearing noise, a constant impedance pigtail was used to make contact with the variable plates. These two fixes are shown in fig. 9.

Answers to all these problems had to wring from Mother Nature the hard way—by careful analysis, thorough experimentation, and more than a little luck.

When the basic qualities of the SW-5 became known in the amateur community, amateurs began adapting the receiver to their own use. One of the problems amateurs encountered when they tried to adapt general coverage receivers to amateur use was the band-spread problem. What was desired was a method of spreading the amateur bands over a larger portion of the dial without, if possible, reducing the performance of the receiver or making the receiver unusable for general coverage purposes.

At the time, one common method of increasing the band-spread was to remove plates from the tuning condenser. This, of course, was a permanent alteration to the set and made it unusable for general coverage work.

Another trick was to put a fixed mica capacitor across the tuning capacitor. This usually messed up the LC ratio so performance suffered.

The solution that National came up with was to tap the tuning condenser down on the coil, as shown in fig. 10. This trick is well-known today, but was new then.[3] The farther down on the coil the tuning condenser was tapped, the more band-spread was obtained. One problem arose here, however: as the tap was moved down, the resonant frequency of the tuned circuit approached the natural resonant frequency of the coil so that the r.f. losses of the coil increased rapidly and degraded the receiver performance. This problem can be avoided by placing shunt capacity across the entire coil thereby operating well below the natural period of the inductor. Shunt capacitances of 3 to 5 pF were used with the SW-5 coils.

In the case of the SW-5 where receivers and coil forms had been designed, built, and sold prior to the introduction of the band-spread coils, it was necessary to bring the grid lead out the top of the coil to avoid increasing the number of pins required or to rewire the receiver. This, in turn, required putting

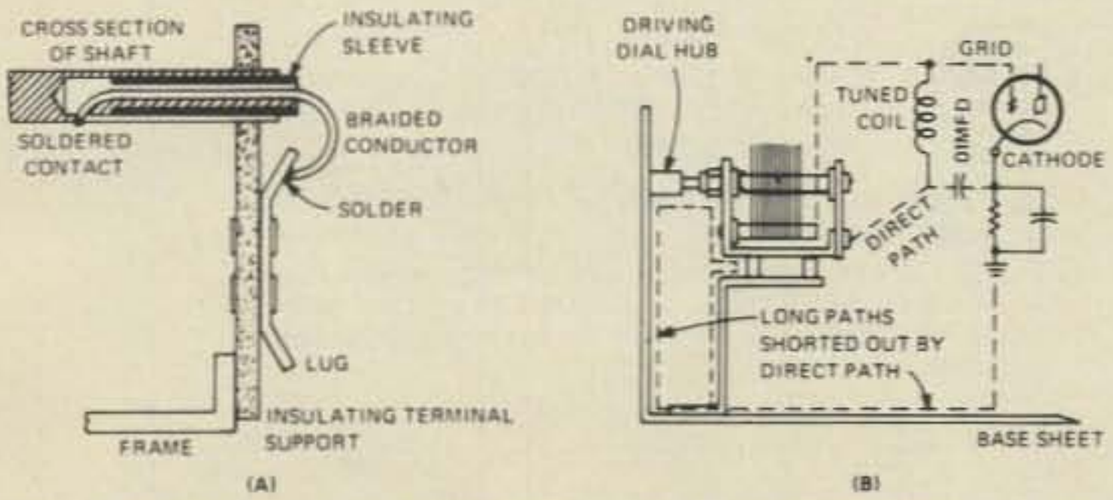

Fig. 9—Two methods of eliminating the parasitic tuned circuits as developed by National.

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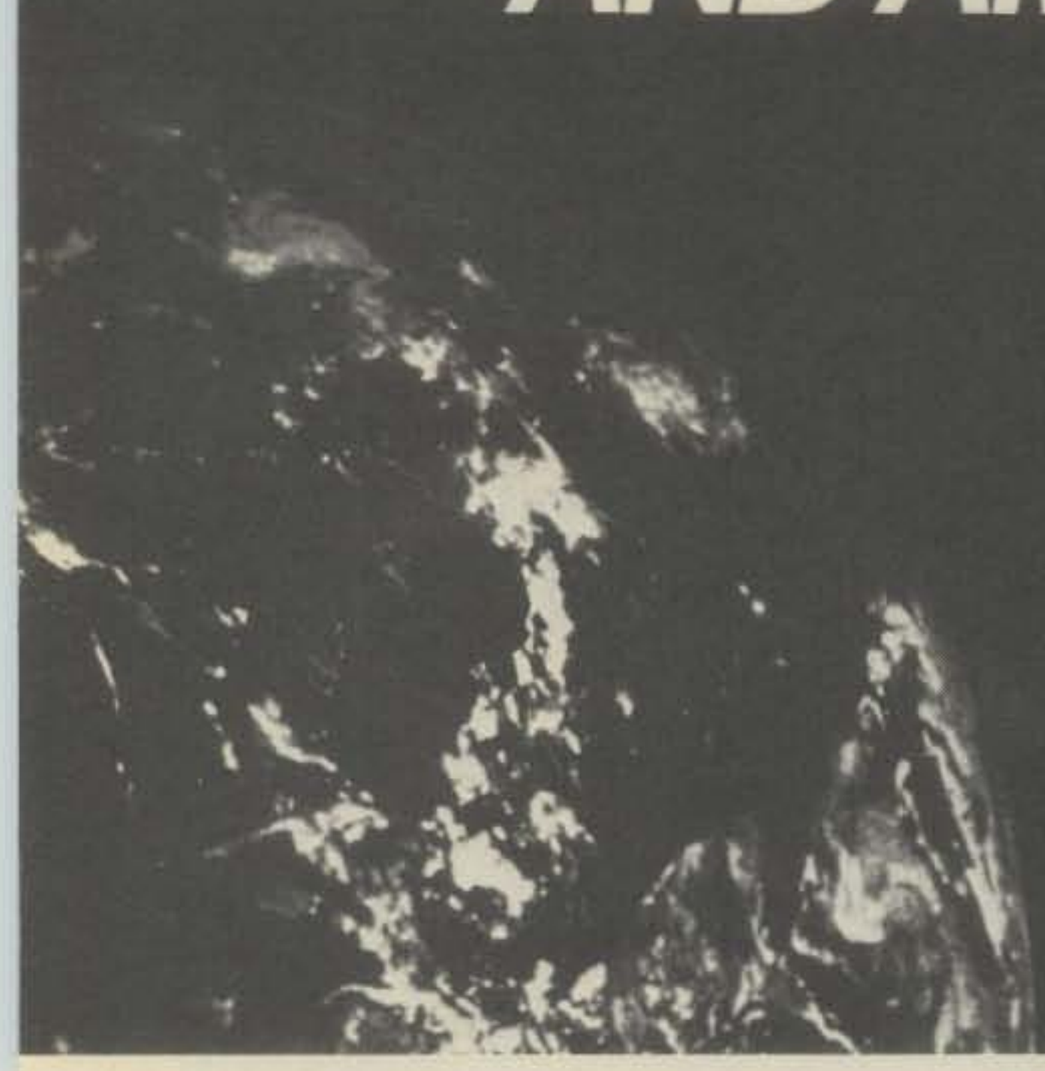

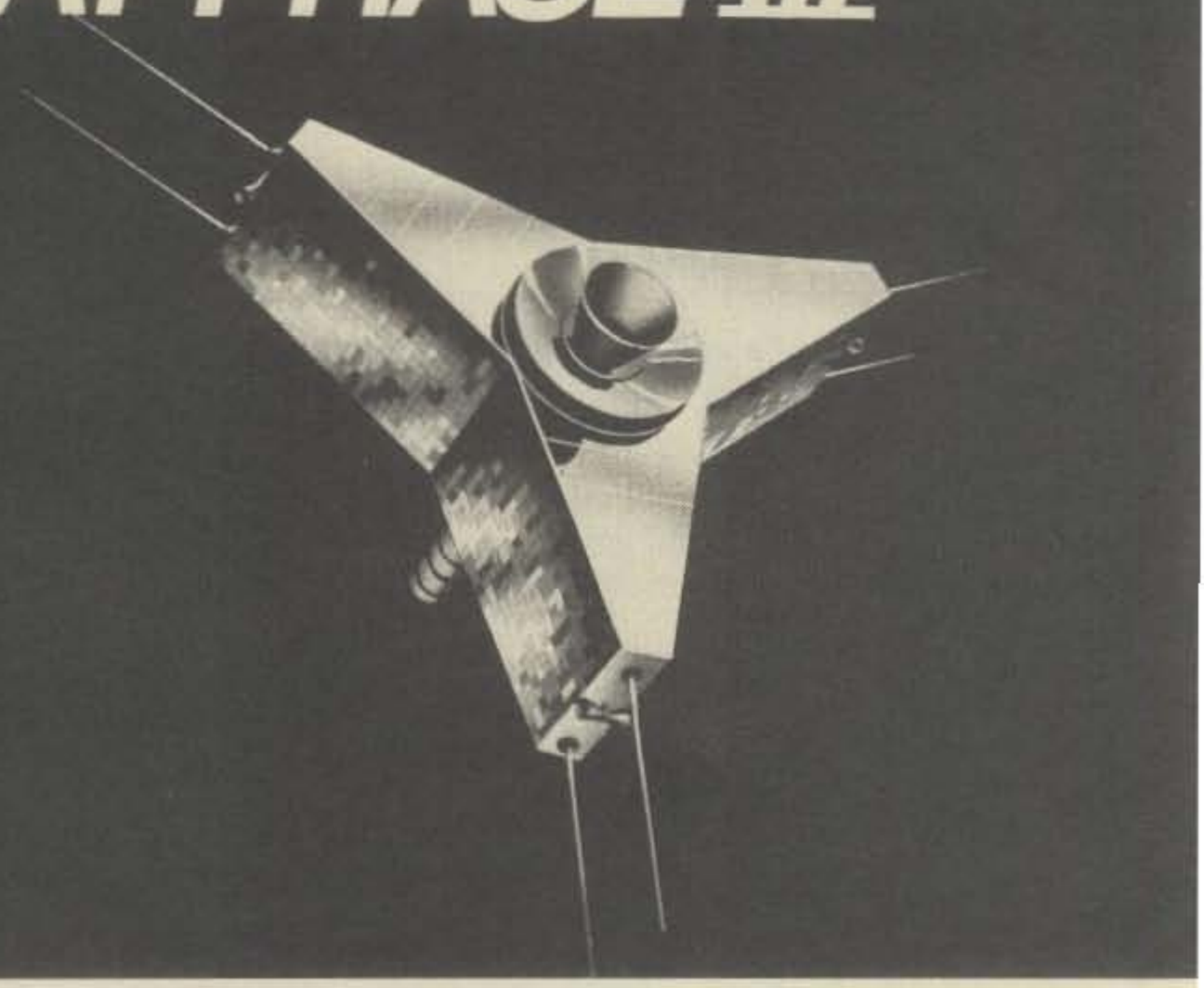

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the grid leak inside the coil form. The final schematic of a band-spread coil is shown in fig. 11.

Bill Orr, W6SAI, very kindly took the photograph (fig. 12) which shows a pair of band-spread coils. Both band-spread and general coverage coils are usually interchangeable between the SW-3 and SW-5.

If the receiver you are buying is just out of someone's attic or basement, inspect it thoroughly before firing it up for the first time. Begin with the power supply, if one is included. The power pack that came with my SW-5 was a Model 5880-AB; it provides about 200 volts d.c. of B+ and 2.5 volts a.c. for the filaments. The SW-5 uses 2.5 volt tubes, so don't use a 6.3 filament transformer if you build your own power supply.

The cover of the power supply slides off the top after removing four screws around the bottom edge of the cover. If the rectifier tube, a type 80, has an old stype envelope, replace the tube with a new one. The old style tubes are more valuable and there is no sense taking a chance on ruining one if something breaks down. Save the old tube for demonstrating the receiver at club meetings or for friends . . . after you are sure nothing will break down.

The filter capacitor will probably have to be changed. The original unit was a triple-8uF; no voltage is given, but the power supply voltage goes up to about 250 volts while the receiver is warming up. Triple-8 or -10uF replacement electrolytics at up to 450 volts are readily available, so this should pose no problem.

In applying power to the power pack for the first time, I

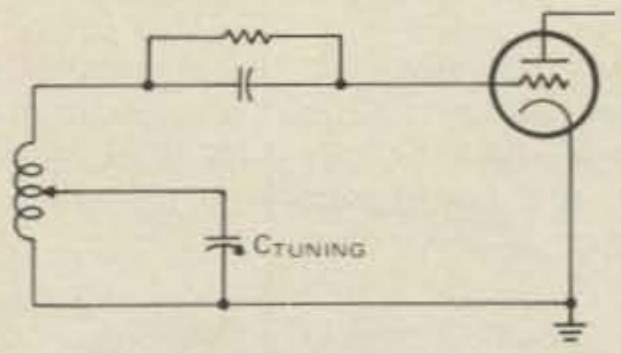

Fig. 10—Tapping the tuning capacitor down the coil increases the bandspread, as developed for the SW-5.

suggest the use of a variac in the a.c. power line. Bring the a.c. up slowly with a d.c. voltmeter across the d.c. output of the pack. In this manner any breakdowns will occur at minimum voltage and do the least amount of damage. Furthermore, the rectifier filament voltage will be low . . . which will tend to limit rectifier anode current and protect the tube and other components. When you successfully reach full line voltage with the variac, check the filament voltage with an a.c. voltmeter; it should be on the high side of 2.5 volts with no load.

Now for the receiver itself; a top view of the chassis is shown in fig. 13. If tubes are missing, replacements can be obtained by advertising in the classified section of the radio magazines or in the *Olde Timer's Bulletin* published by the Antique Wireless Association. Either type 24A's or 35's may be used for the two r.f. stages. The audio stages used type 27's which had sockets with 5 pins. A type 56 may be substituted for the 27's. If any of the audio sockets have 4 pins, type 45's must be used. I am not aware of any substitutes for this tube type.

If there is a bottom plate on the receiver, remove it next, and check the large wire-wound resistor seen in the upper-right of fig. 13; the value of this resistor is 12,000 ohms. This resistor should have two taps, one at 6900 ohms from the B+ end and the other at 8900 ohms from the same terminal. Also check the bottom section, 3100 ohms to ground. If any section is open, you can solder a 2-watt carbon resistor of the appropriate value across the bad section.

If you get a dead short across the B+, also check the 'phone jack on the rear chassis; the frame of the jack is at B+ potential, so the jack must be insulated from the chassis. *Do not use crystal headphones with the receiver!*

When all the shorts have been cleared, connect a loud speaker (8 ohms or so) to the output terminals and apply power. The first thing that struck me when I did this is that without an antenna, the set is absolutely dead! When National said the SW-5 was to be humless, they really meant it! The set was so dead that I thought I still had a problem and spent about 20 minutes checking various tube voltages. When I accidentally touched the input grid with the voltmeter test lead, the receiver really took off; I nearly jumped out of my skin! I then connected the antenna and returned to my boyhood . . .

For those who have never had the thrill of tuning a regenera-

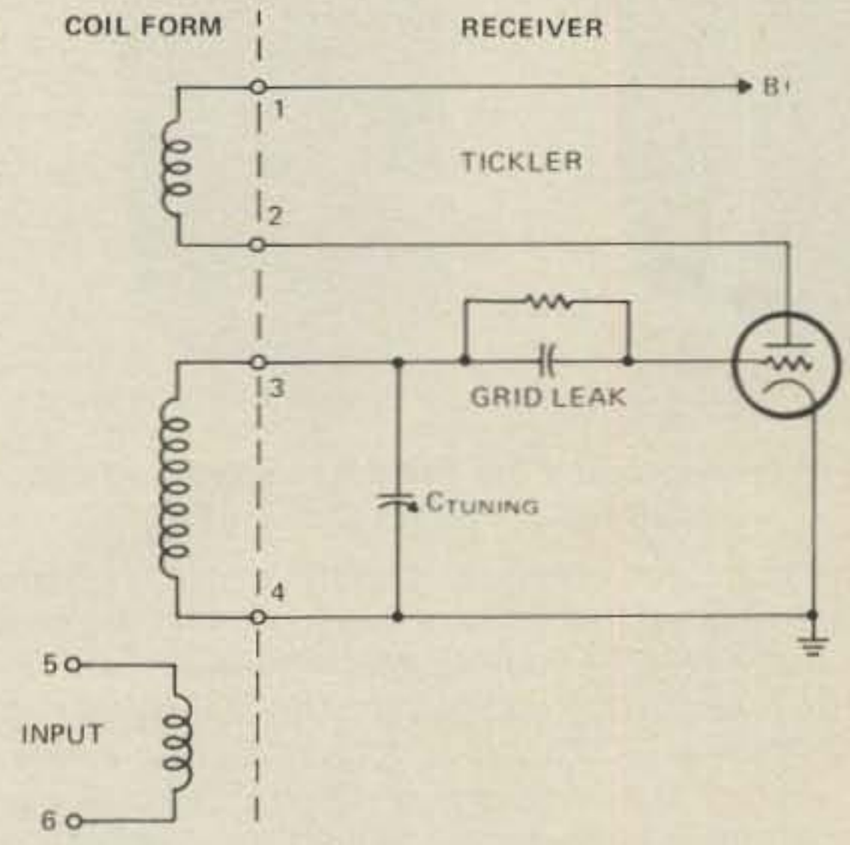

Fig. 11—The schematic of the bandspread coils for the SW-5 (and also the SW-3) showing the need to bring the grid lead out from the top of the coil instead of through a pin connection.

tive detector, a few tips are in order. With a regenerative detector, the optimum setting of the regeneration control is right at the point of oscillation. The only way I can describe this point is to say that the loud speaker will go "plop" as the regeneration control is turned through it.

If you are trying to tune in a c.w. signal, set the regeneration control (left-hand knob) to the point where the detector just barely oscillates. The oscillating detector will beat with the incoming c.w. signal to give an audible tone. If the regeneration control is set so the detector is strongly oscillating, a high grid bias is built up which reduces its sensitivity as a detector.

To receive an a.m. phone signal, the regeneration control should be adjusted to the point where the detector is just ready to oscillate, but not actually oscillating. If the detector is set

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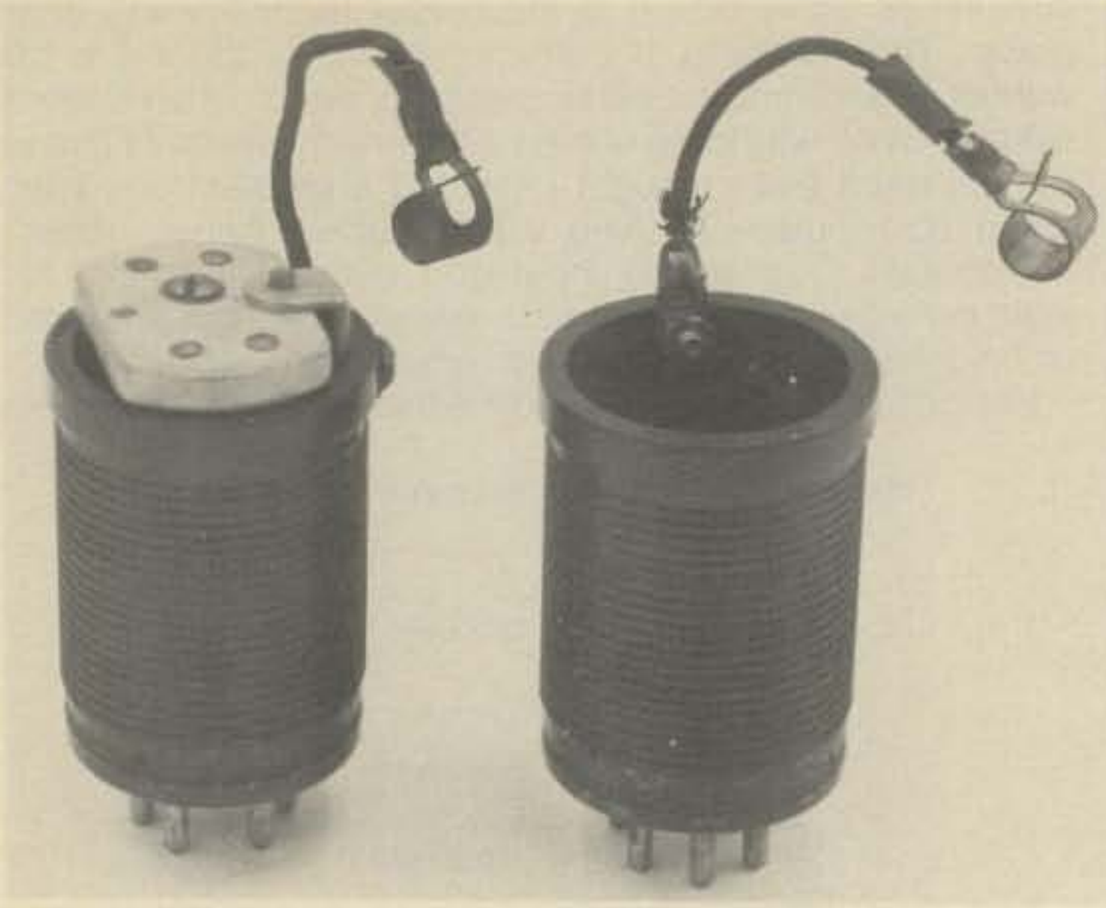

Fig. 12—A photograph of the SW-5/3 bandspread coils. (Photo courtesy of William Orr, W6SAI)

below this point, you are not getting the maximum benefit from the regeneration; if the set is adjusted so that the detector is actually oscillating, all you get is a "squeal."

As you tune from one end of the band to the other, the point of regeneration will, unfortunately, change, so it will be necessary to readjust the regeneration control. After a signal has been tuned in, it should be "peaked-up" with the antenna trimmer (right-hand control).

As mentioned by Bill Orr in his SW-3 article, receivers in those days were designed for a much weaker signal environment than is prevalent today and the SW-5, like the SW-3, tends to overload very easily. I followed Bill's advice and put a capacitor (50 pF or so) in series with the antenna lead and this improved performance.

With a little practice, I have had no trouble in picking up foreign broadcast, c.w. stations, both commercial and amateur, and Teletype® signals. In fact, the SW-5 does surprisingly well on RTTY. I have not been successful with amateur s.s.b. signals. With the general coverage coils, the tuning rate is too high for really good reception in the amateur bands.

If you are fortunate enough to get several coil sets with your SW-5, the appropriate tuning range of the coils is shown by color code as follows:

Green	2.5 to 4.5 MHz
White	4.3 to 8.0 MHz
Red	7.0 to 13.8 MHz
Black	12.8 to 22.1 MHz

The above information was taken from a tuning chart supplied by National.

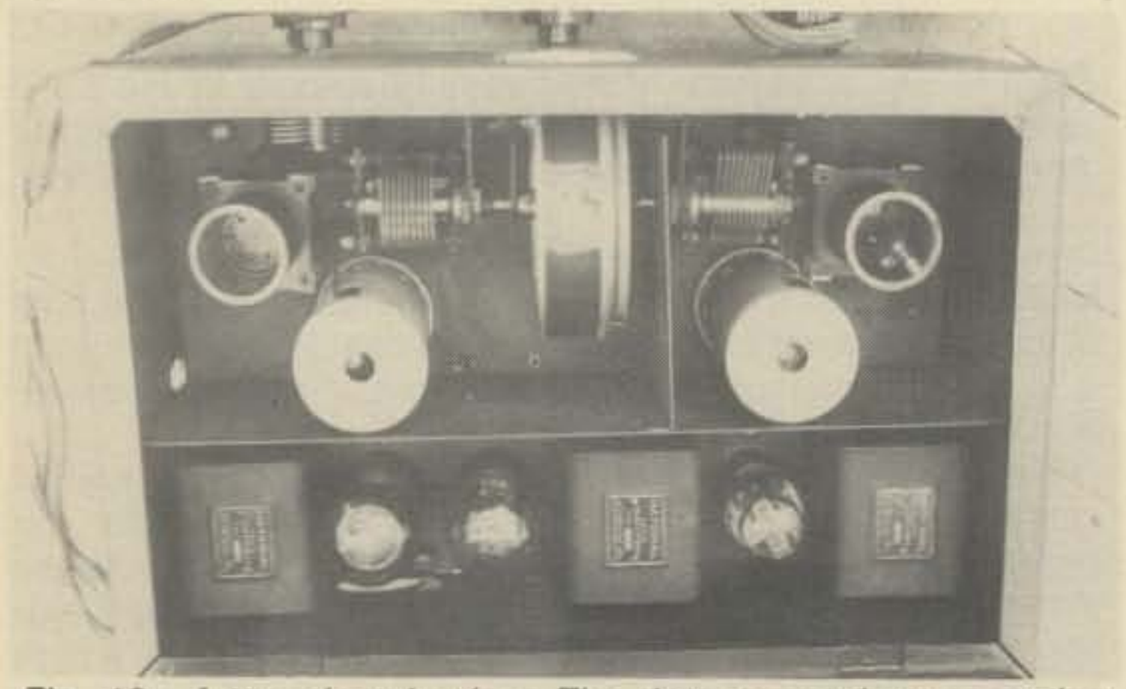

Fig. 13—A top chassis view. The detector and regeneration control are on the left-hand side while the r.f. amplifier and antenna trimmer control are on the right. The antenna terminal is in the lower left-hand corner.

I also obtained two additional pairs of coils with my SW-5 color coded yellow and orange. The yellow pair covers the lower end of the broadcast band and the orange pair covers the upper end to about 2 MHz. The coils of each of these pairs are not identical; one coil of each pair has a mica capacitor inside the coil form, the other coil does not. This capacitor is not to be confused with the grid leak and grid lead mentioned earlier for band-spread coils. I found the best performance was obtained when the coil with the capacitor was put in the detector side, behind the regeneration control.

As mentioned earlier, coils for the SW-3 may usually be used in the -5. The tuning range of the SW-3 coils is given below and was taken from Orr's article.[2] The tuning range should be about the same in the SW-5.

	Coil Set Numbers		
Range (kc or mc)	*Universal Model 3*	*Model 2*	*Model 1*
90-160 kc	42	72	22
150-220 kc	41	71	21
190-280 kc	40	70	20
250-390 kc	39	69	19
320-650 kc	38	68	18
500-900 kc	37	67	17
690-1500 kc	36	66	16
1500-2700 kc	35	65	15
2500-4500 kc	34	64	14
4200-8000 kc	33	63	13
7.0-12.0 mc	32	62	12
12.0-21.0 mc	31	61	11
19.0-35.0 mc	30	60	10

NOTE: Bandspread coils have suffix letter A. For example, the 80 meter bandspread coils are 34A, 64A, or 14A. Early Model 1 coils are not numbered, but are color coded.

I have found my SW-5 to be an interesting receiver and have spent several very enjoyable hours bringing it back to life. I believe that after using one for a while, you will develop a lot of respect for the operating ability of any old, or new, timer who has made WAC or DXCC using one . . . I sure have!

Footnotes

1. Millen, James and Kruse, Robert S., "An Analysis of A.C. Operated Short-Wave Receiver Design." *Radio News*, Vol. XI, No. 12, June 1930, pp. 1101-1103.
2. Orr, William I., "The Year is 1931. National Radio introduces the SW-3 All-Wave Receiver." *CQ*, Vol. 27, No. 7, July 1971, pp. 34-38.
3. Millen, James, "Solving The Band-Spread Problem," *Radio News*, Vol. XII, No. 11, May 1931, pp. 996-997. CQ

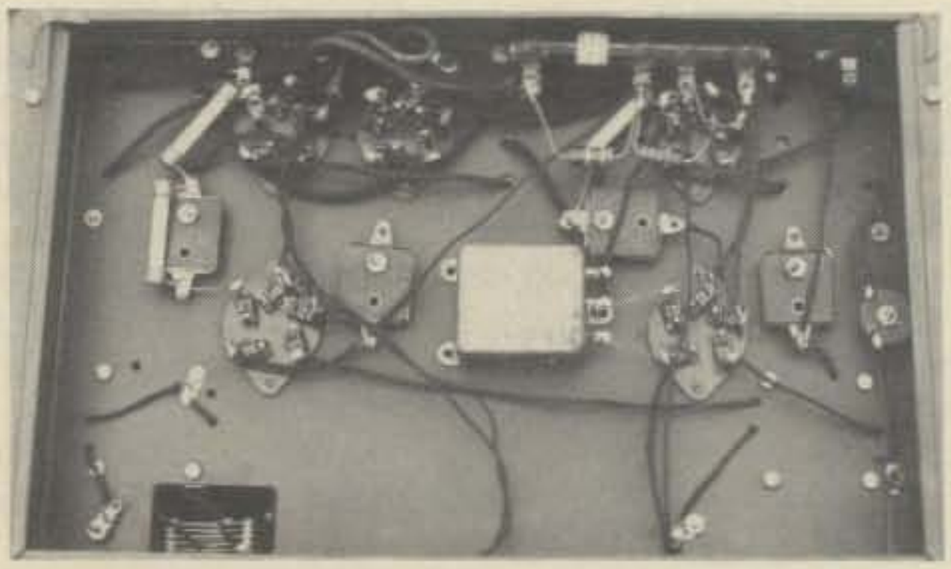

Fig. 14—The underside of the chassis is relatively simple and easy to work on. The wire-wound voltage divider is seen in the upper right-hand- edge. Two sections of this resistor were open in my receiver; carbon resistors can be seen soldered across the open sections.

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A Cheap and Easy Memory Keyer

(With Computer-Style Address Display)

BY DAVID KRIEGER*, WA2VYU

Here at WA2VYU, the equipment situation (new Drake R-4C and almost new HT-32A) and operating requirements (DX and contest, mostly c.w.) dictated that the next piece of gear should be a new keyer, preferably with memory. The recent purchase of the aforementioned gear and the expense of a new QTH made any of the commerical units, with prices ranging anywhere from $90 to $400, way off limits.

Being armed with some free time, much desperation and about $35, I came up with a compact (4" x 7") versatile memory keyer. The keyer featured all the standard desirables such as iambic operation, variable character length, selectable messages, dit memory, dah memory, etc.

I chose to wire-wrap this project for the following reasons: (1) a wire-wrapped logic board gives greater component density and (2) since this keyer is composed entirely of 14 and 16 pin DIP packages, maximum advantage of this space-saving technique could be taken. Wire-wrapping also seemed to be safer and less messy. In addition, the cost of wire-wrap/unwrap, 30 ga. strip tools and wire-wrap DIP sickets, available from DIGI-Key Corp.[1], is at least competitive with the printing technique. I also wanted to incorporate a feature not usually found on the available units — a front-panel display of the binary "address" of the information being read from, or written into, the memory. These address bits can be converted into *percent of memory quadrant* and can inform the operator as to the amount of memory left. See fig. 1.

*3260 Cruger Ave., Bronx NY 10467

The front panel of the WA2VYU memory keyer

The Circuit

The keyer was designed to operate as independently of the memory as possible. The keyer can be built alone using E8c and E8d, thus eliminating the need for E2. If this is done you must remember to tie pins 8 and 9 together and pins 11 and 12 together, if these gates are used as inverters. In this case, build from fig. 2, but within the "keyer" boundary.

E15 is the dit/dah memory and interfaces with the paddle through a 1.5k pull-up resistor. Germanium diode 1N305 or 1N914 (or equivalent) will do. The paddle should use two conductor, shielded wire for grounding the diodes and preventing r.f. from entering the dit and dah leads. E16 and E4 provide the main clock and all other timing signals. Dit and/or 1/3 dah-time is 1/16 of the main clock frequency. E5 and E6

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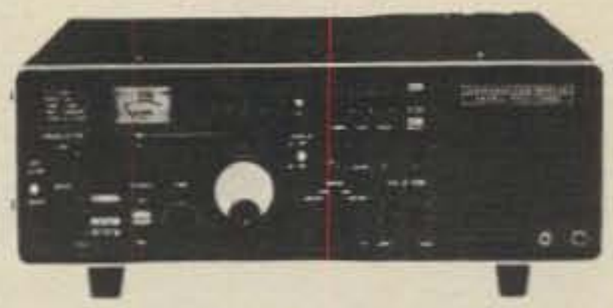

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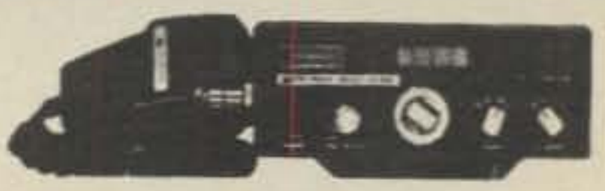

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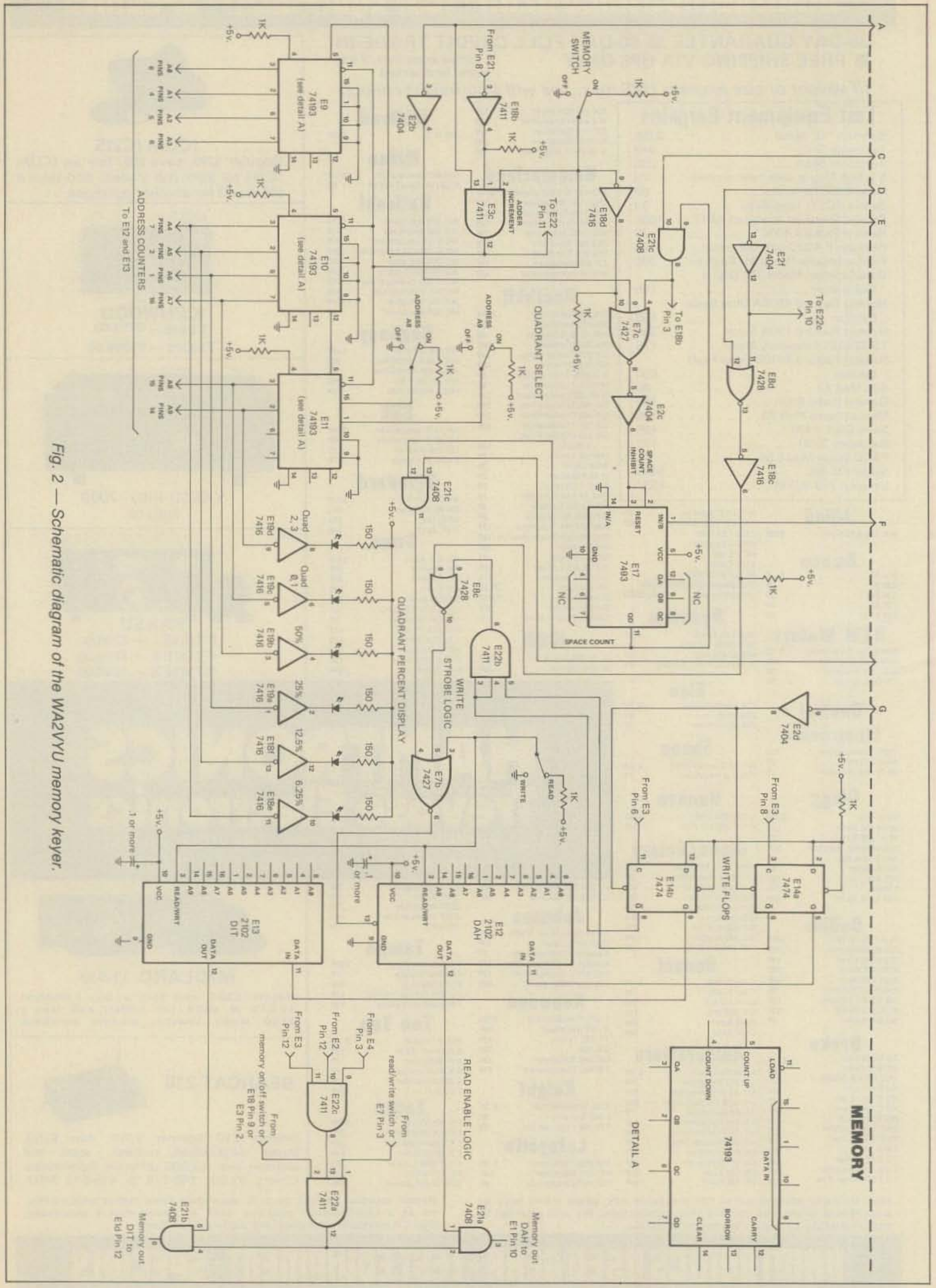
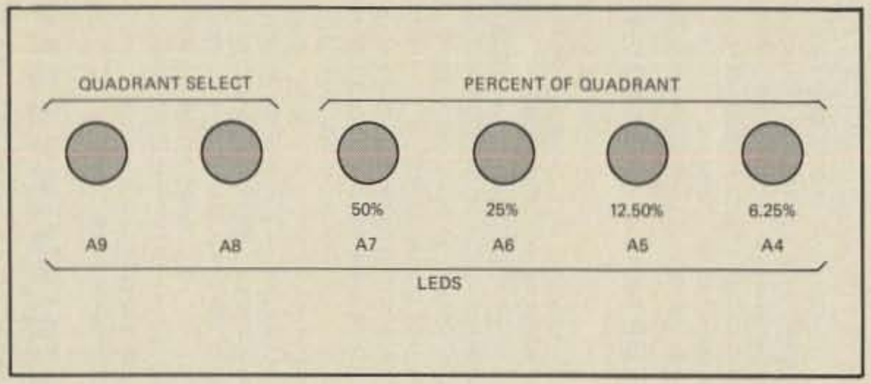
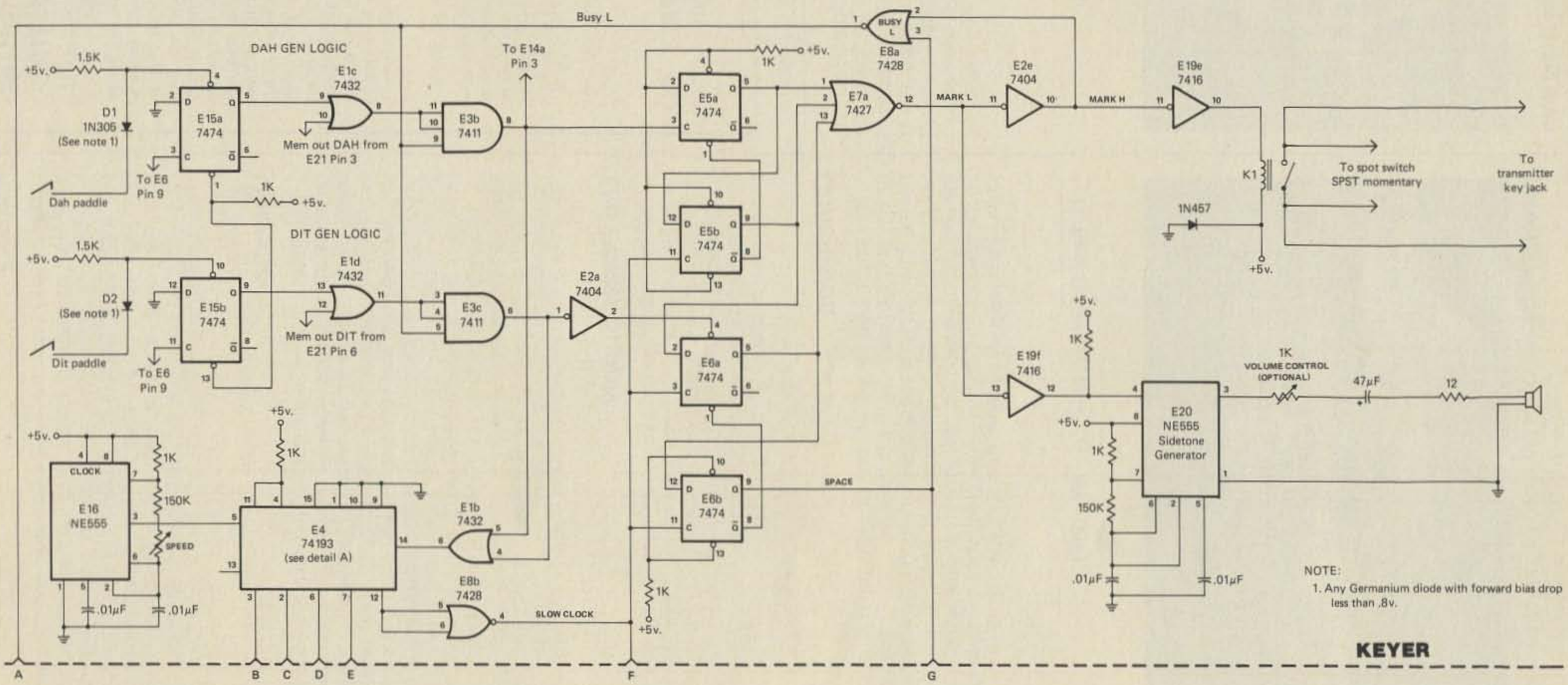


Fig. 2 — Schematic diagram of the WA2VYU memory keyer.



NOTE:
A9 + A8 not lit = Quadrant No. 1
A8 lit = Quadrant No. 2
A9 lit = Quadrant No. 3
A9 + A8 lit = Quadrant No. 4

Fig. 1 —LED's A8 and A9 indicate which front-panel addressable portion of the memory the keyer is in. LED's A4-A7 indicate the percentage of the quadrant already used and should be added. For example, if A5 and A7 are lit, approximately 62.5% of the quadrant indicated by A8 and A9 are used up.



NOTE:
1. Any Germanium diode with forward bias drop less than .8v.

form the dit and dah generation shift register, whose outputs are OR'ed at E7 to form a mark. Flip-flop E6b forms the character space. Mark and space are OR'ed to prevent access to the shift register when a dit, a dah or a space is in progress (*Busy L*). E19e is a 7416 buffer which drives a 5-volt reed relay in a DIP. This is available from Formula International Inc.[2] for $2.25 each. A local surplus house may have this increasingly common item.

Memory

The memory uses the widely available and inexpensive 2102 RAM memory-on-a-chip. These are addressed by E9-E11, which also generate quadrant and percent signals on pins 2 and 3 of E11 and pins 2, 3, 6 and 7 of E10. When *Busy L* goes high, i.e., when the keyer completes a dit or dah read/write, the memory advances one location. Similarly, if no dits or dahs are read or written, E17 will count a space-time and advance the memory.

Operation

Care must be taken in the loading of messages since logic demands that full space-time be allowed by the operator to avoid dropping an intended space. The keyer is, however, very forgiving of waiting too long for a proper space-write; so if you are generous with your spaces, you can be assured of good c.w. on the replay. This takes a little getting used to but is the only idiosyncracy of the beast. Messages may take up any number of quadrants. *Quadrant select* is automatically made according to the setting on the front panel. Quad-select switches every time the memory is turned off. A space may be left blank in the memory for RST's, call letters, etc., to be inserted while the memory is running.

The Power Supply

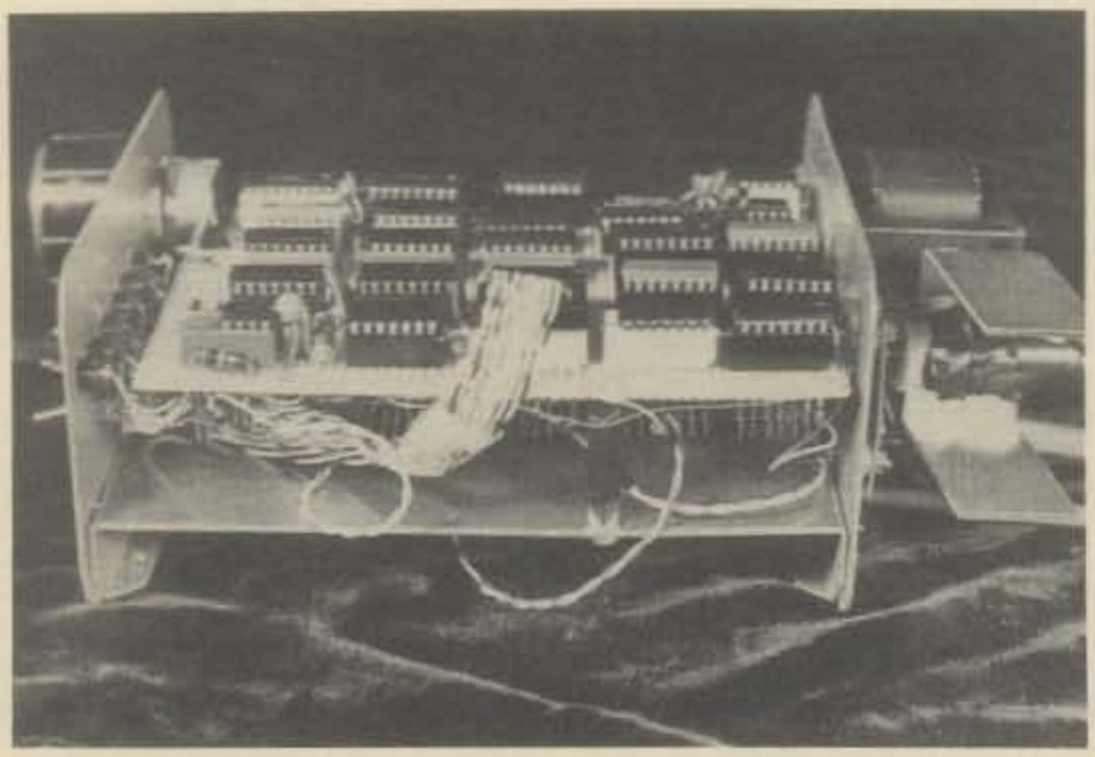
The required power is 5 volts, regulated. A very fine kit is available from Cortlandt Electronics[3] for six dollars. It comes complete with a transformer and a heatsink. V_{cc} pins should be r.f. bypassed by .01 uF capacitors on all chips. The keyer draws about 700 mA; so make sure that your supply is rated at one ampere or more.

Conclusion

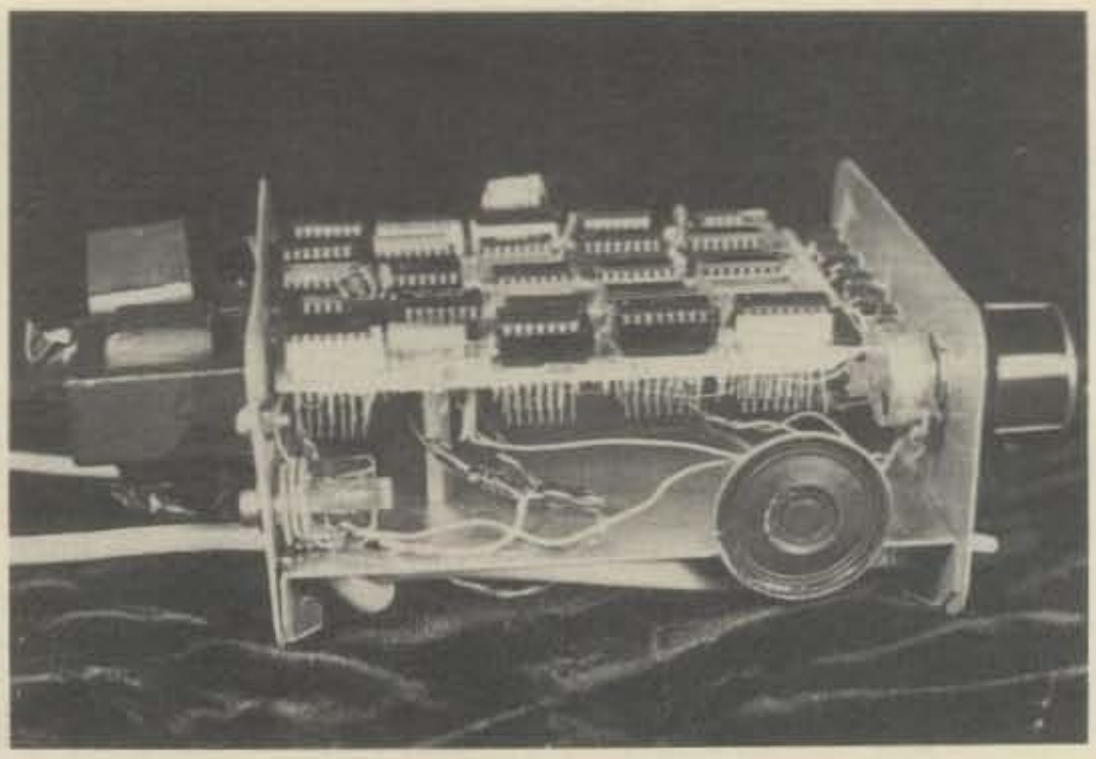
This keyer was tested on the air with gratifying results. Strings of QSO's were made with the keyer sending everything but the other station's call and signal report. These two items were manually filled in at the proper blank space in the memory. At this station it is now almost possible to make a run up the tower or a trip to the nearest parts store for spare finals, while simultaneously sending that "CQ WW DX 'TEST!" CQ

[2]12603 Crenshaw Blvd., Hawthorne GA 90250.

[3]114 West Broadway, New York NY 10013.



Upper-right inside view of the keyer, showing the wiring strap.



Upper-left inside view of the keyer, showing the chips and the monitor speaker.

If you're a suburban home-owner and have neither the desire nor room to erect a big beam, you've probably been scratching your head about what to do. W3KNG has some suggestions for those who don't care to have an imposing antenna on their property.

Wire All-Band Antennas

BY JAMES M. FISHER*, W3KNG

For the suburbanite, living on a lot 50 by 150 feet, the all band wire antenna is a needed investment. It serves well if you do not care to mount a beam or if your beam is temporarily out of service. It will also work well when you need 360 degree coverage.

If your home is like many in this part of Pennsylvania, it will be a single dwelling set at or near the front of the lot. Your antenna farm will be 80 to 100 feet long and perhaps 50 feet wide. Available supports for the ends will be the house and a utility pole or tree at the rear of the lot. Height will probably be 18 to 24 feet. Such a space is fine, if properly utilized, and if you will be satisfied to yield the most remote DX to specialists. (Sometimes it is easier, or more desirable, to add an amplifier than to struggle with a beam. The end result may be the same level of signal at the other end.)

The wire you stretch through your back yard is going to be the radiating element, so the main concern is to establish a feed line to move energy from your transmitter to this radiating element. Regardless of the feed method chosen, you will end up with a good strong signal on 80, 40, 20 and 15, with indifferent results on 10. Having used such antennas for years, I am satisfied that there is no noticeable directivity. The pattern is no doubt broken up by power and telephone lines, aluminum foil house insulation, and house wiring.

The feed method you choose should be considered with respect to the radio location in the home. The groundwire must be short for end-feed or off-center-feed. It may be necessary with some installations to place your operating table next to a ground pipe or a metal post in the cellar. With a balanced center-feed you have much more leeway in your grounding.

Financial considerations may also influence the type of feed. A tuner for the center fed antenna is the most expensive of the types considered here. You may be concerned with the exposure of a wire hot with r.f. to children or pets, although any open wire is more dangerous than coaxial cable. With the above considerations in mind, how do you choose the best antenna for you?

Balanced Center-Feed

Let us first examine the balanced center fed antenna. The feed line may be an open wire line or 300-ohm twin lead. I have had excellent results with TV "track." It is not too heavy for the antenna to hold and it seems to be very efficient. It stands 600 watts of r.f. output without trouble. This antenna is not critical in either length or height. The only catch to this method is the complicated tuner required. This tuner must transform the radiation resistance as presented at the transmitter end of the feeders to 50 ohms and cancel out the reactance which is also present at the same point. This is done by tuning a link for the 50 ohm side and coupling this link to a balanced and tuned "secondary." It is necessary to tap in on this secondary in most cases. This tap may be mechanical or by means of a special differential dual capacitor. Such a tuner is quite expensive if

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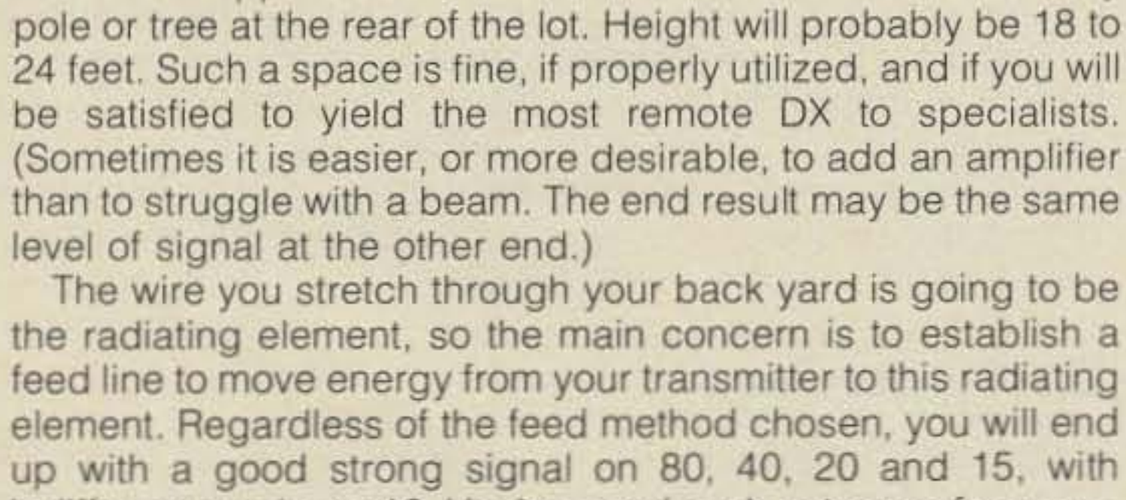

Fig. 1 – The balanced center-fed antenna. The feedline may be an open wire line or 300-ohm twin lead.

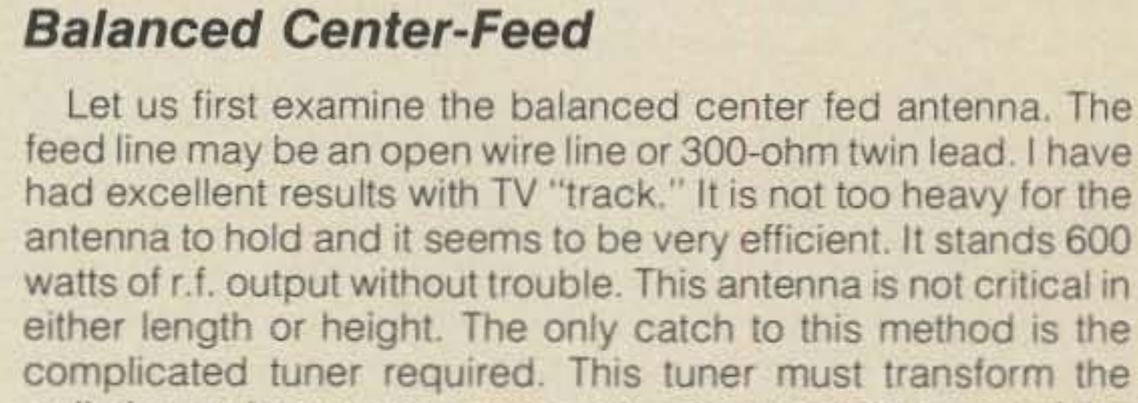

Fig. 2 – The end-fed "Hertz" antenna.

purchased in the kilowatt size. It is a tricky job to build a big one. The switch must be a good one. Resonances can develop in the unused portions of the coils. Different antennas which you may have later may require moving the taps to change the effective sizes of the coils. The whole thing gets pretty complicated. If you simplify the tuner by using plug-in coils, which is not a bad scheme, you have a very efficient tuner which you will enjoy using until you get tired of plugging in and removing coils. I have seen no really high power switched units described which would do the necessary job, however, so plug-in coils would be my choice unless I just wanted to spend a lot of time tinkering. Good examples of medium sized tuners for this feed method are one described by Lew McCoy in *QST* for July 1965, using plug-in coils, and another by Mr. McCoy in *QST* for June 1964 using a switching arrangement.

It is also possible with this feed method to use a balun and a single ended network. I have not tried this yet, but when I do, I'll watch for high voltage on the balun. 600 watts can produce really high voltages on a resonant or semi-resonant line.

To sum up the center fed antenna system: rate the performance excellent, dimensional requirements extremely flexible, ground requirements nominal, and tuner convenience poor.

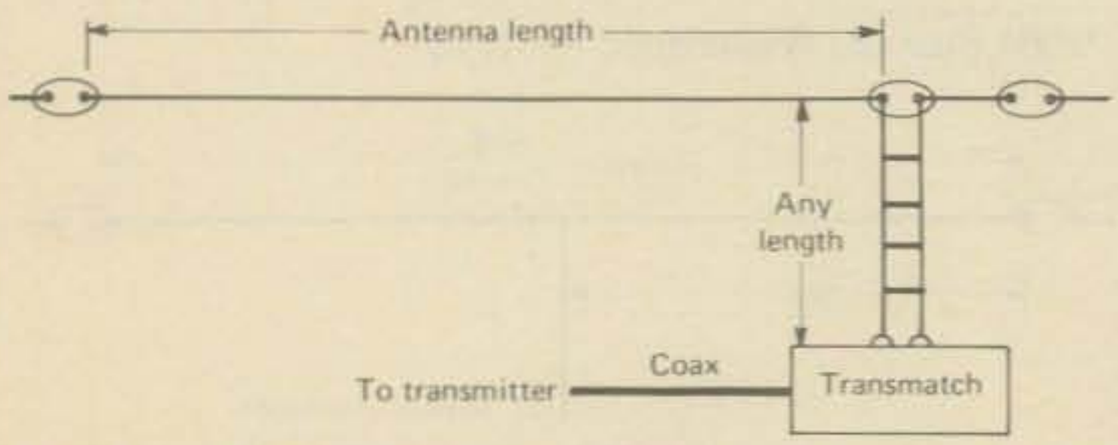

Fig. 3 — The off-center-fed antenna (sometimes called a "Windom" antenna).

End-Feed

The second system under consideration is the rudimentary "Hertz" or just plain end-fed wire. Where the flat top ties to a gable end or chimney, the wire is brought down the side of the house and into the operating area. Mine comes in above a cellar window, crosses the ceiling to a point above the operating table, and terminates at a tuner placed next to the transceiver.

My system is approximately 130 feet in overall length. The whole wire radiates. The wire is hot for r.f. Guards are necessary. My friends think this is a real haywire antenna, but it is like an old shoe: a good worker and no trouble. A tuner for this is a cinch to build at any power level. If you install one, try as your first experiment in tuners an L-network, with the coil in series with your line and the variable capacitor across the output of the coil. To set up this tuner, start with low power. Pick any likely looking 80 meter type coil, and any normal 100-200 pF variable. Start tapping and tuning, watching an s.w.r. meter in the line from the transmitter to the tuner setup. You will soon find a pair of settings which will show a 50 ohm load on the transmitter. Do the same thing to verify the configuration for each of the higher bands. If you are getting good results, repeat the same procedure using coil stock at least three inches in diameter and a variable with at least 4 kV ratings. You want big parts to keep down losses and stand the awesome voltages you can develop here with a kilowatt. Expense goes down with complexity in this tuner. If you shop prudently for surplus, cost is the least of your worries.

I have tried both the tapped coil and roller coil methods of construction. The roller is more flexible but a bother to turn. Once the tap points are established, the tapped method is a very quick and easy tuner to use. A good example of this tuner is shown in *QST* for December 1960—but make it bigger! This feed method requires a good *short* ground. Even with a fifty inch ground line my microphone would burn my lip on 15 meters, although the "hot" state of the transmitter did not seem to have any other ill affects. Such a situation may be corrected by installing a series resonant ground line for the offending band. This worked for me, even though it paralleled an existing d.c. ground.

With this end feed, you may rate performance as excellent, dimensional requirements flexible, ground requirements stringent and tuner convenience excellent.

Off-Center Feed

The last antenna to be considered is the 1929 model Windom. It is now almost fifty years old and still a good antenna. With this, it is best to stick to a radiator length of 120 to 130 feet, even if you have to bend the ends down or sideways. The feeder, one wire, taps 14 percent off center. Use a good splice, because the feeder has a habit of breaking off at the antenna. This single wire is also hot with r.f., and should be guarded. A ground is necessary, usually a short one. Tuner requirements are close to that of the end-feed and the tuner can be designed the same way. Voltage at the tuner will usually be less. This antenna is not a good choice unless you have an operating area near the center of the flat top. Large trees at the front of the lot may make this a good choice but in most locations these trees are not available.

Conclusions

Normally, end feed is best for the suburban home. Balanced center-feed is over-engineering unless grounding is a problem. Off-center feed is a substitute for center-feed when the operating position is near the center of the antenna.

How can you have the coolest station in town? By replacing those heat generating vacuum tubes in your equipment with solid-state equivalents. WB4APC shows how to do it.

Beat the Heat

BY BILLY L. NIELSEN*, WB4APC

In a recent issue of *QST* there appeared an excellent article on the use of solid-state devices to replace tubes in the Drake T4X transmitter. One of the major reasons for converting to solid-state of course is to reduce the heat generated in tube-type equipment. Another reason, is to update older equipment to modern standards and ease of acquiring replacement parts. It was because of this article that I decided to consolidate all of the circuits in use in my own equipment, and pass this information on to my fellow amateurs. These circuits are being furnished only as a guide to show what can be done to replace tubes that are no longer available or difficult to locate.

In beginning, let me state that the most common source of heat generation in tube-type equipment is the high-voltage rectifier. There are commercial solid-state diode rectifier units available for almost all rectifier tubes from the 6X4 to the 866A/3B28 series. Table 1 gives a partial listing of common rectifier tubes and their solid-state equivalents. In a majority of equipment, the use of the solid-state plug-in replacements will not only help to reduce heat, but will also give a slight voltage gain. In all cases of substitution, the user should ensure that the high voltage is taken off the appropriate pin as illustrated in the diagrams. In substituting the commercial units, it is only necessary to plug the appropriate unit into the socket.

In substituting the solid-state 6AL5, it is important to determine if the 6AL5 filaments are in series or parallel. If they are in series, as is the case in most mobile equipment designed for 12 volt d.c. operation, then a substitute must be made for the voltage drop across the 6AL5 heater. In fig. 1a, b, c are examples of the various ways that this can be done. As shown in fig. 1a, the 6AL5 is in series with a 6AU6. In this case, as shown in fig. 1b, it is merely required to put a jumper across the filament pins of the 6AL5 and substitute a 12AU6 for the 6AU6. A very simple jumper can be made for a short

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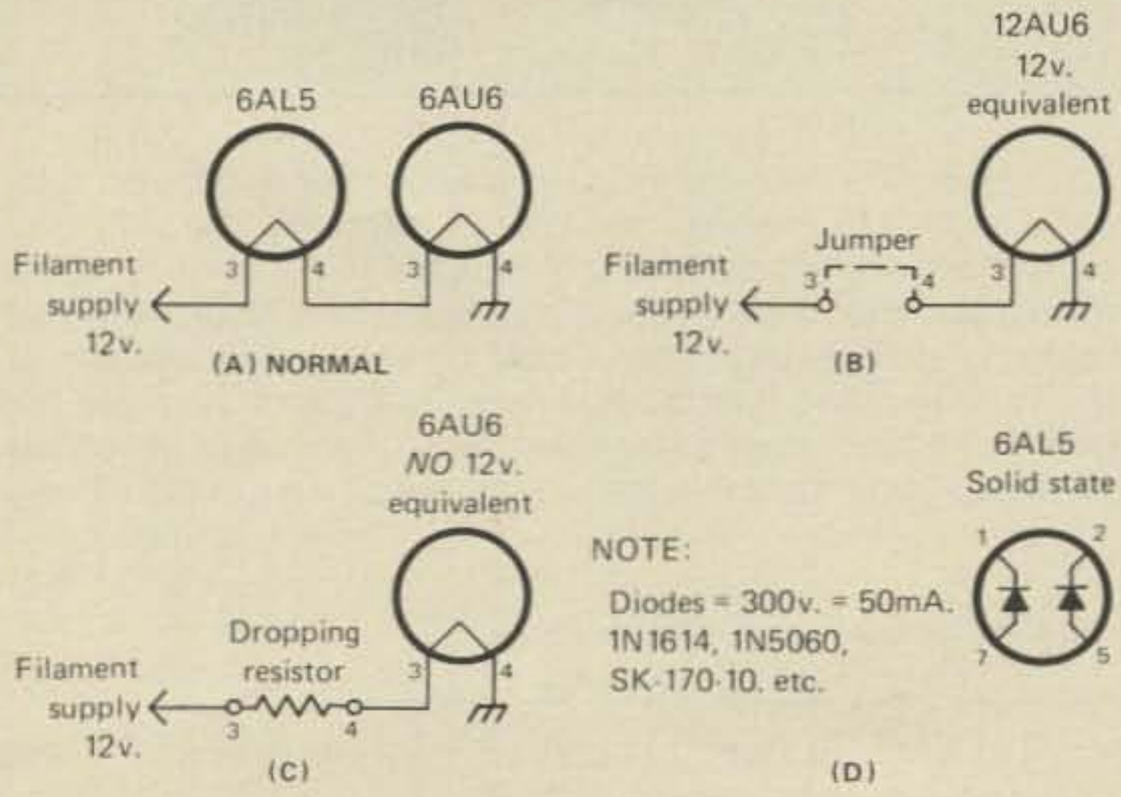


Fig. 1 – Changing six-volt filament circuits for twelve-volt use. In (a), two 6-volt tubes are in series, being fed from a common 12-volt filament supply; in (b), by placing a jumper across one tube's filament (inserting the jumper in the socket) a 12-volt tube can be used in the other socket; in (c) a dropping resistor is placed in series with the filament supply to bring the voltage down to a suitable level; in (d) a diagram of a "solid-state 6AL5."

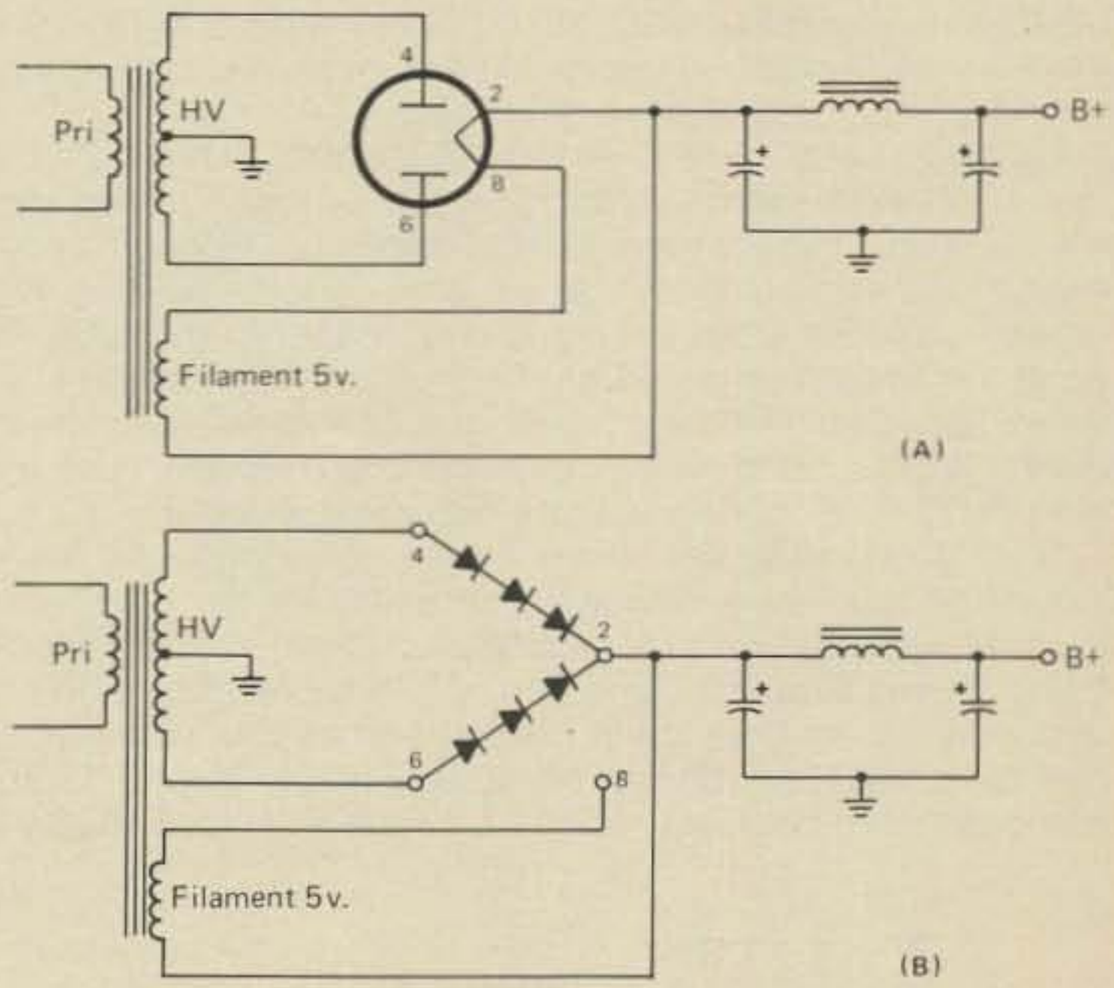


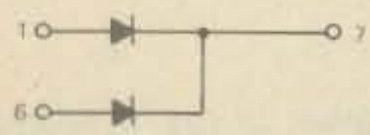
Fig. 2 – A tube-type rectifier is shown in (a); a solid-state replacement is shown in (b).

piece of the bent end of a paper clip and merely plugging it into the appropriate pins of the 6AL5 socket (pins 3 & 4).

In the event that a twelve volt equivalent is not available, it will be necessary to insert a resistor in series with the other tube's filament to provide the required voltage drop. This information may be determined for each individual application using the information given in the various handbooks by use of Ohm's Law. When rolling your own solid-state assemblies, I recommend using the seven and nine pin standoff socket assemblies available through the parts houses. In this manner, should you decide to trade gear, you can unplug your assembly and replace the tubes.

For the larger base rectifier tubes (5R4, 5Y3, 5U4, etc.) you may build the assembly in an appropriate base by knocking the glass out of an old tube. In most cases any eight pin octal based tube can be used. Use extreme care in breaking the glass in the old tube. I recommend wrapping the tube in paper or an old rag to prevent flying glass from getting into your eyes. When soldering the diodes, use some type of heat dissipating clamp to prevent damage to the diodes. I use an old pair of surgical hemostats which are self-locking.

To understand a little of the basics for rolling your own substitute solid-state device, let us compare the tube-type rectifier with the solid-state rectifier. As shown in fig. 2a, most basic power supplies using a single tube for the rectifier, apply the a.c. voltage to the plates (read anode) of the tube and take the d.c. voltage off at one of the heater (read cathode) pins. Basically, this is a simple full-wave rectifier circuit. In converting to solid-state, all we are doing is substituting a diode or string of diodes for the plate in the tube. The a.c. is applied at the anode end of the diodes and the d.c. voltage is taken off at the junction of the two cathode ends, which are tied together. See fig. 2b. You will note that the filament line to the rectifier tube is now open and therefore draws no current. This is our first step in eliminating heat. This step also reduces the current demand on the secondary of the power transformer, and also allows the transformer to operate cooler. In addition, it gives a slight gain in high-voltage winding.



NOTE:
Diodes = 700v. @ 400–500mA

Fig. 3 – A solid-state alternative to a 6X4.

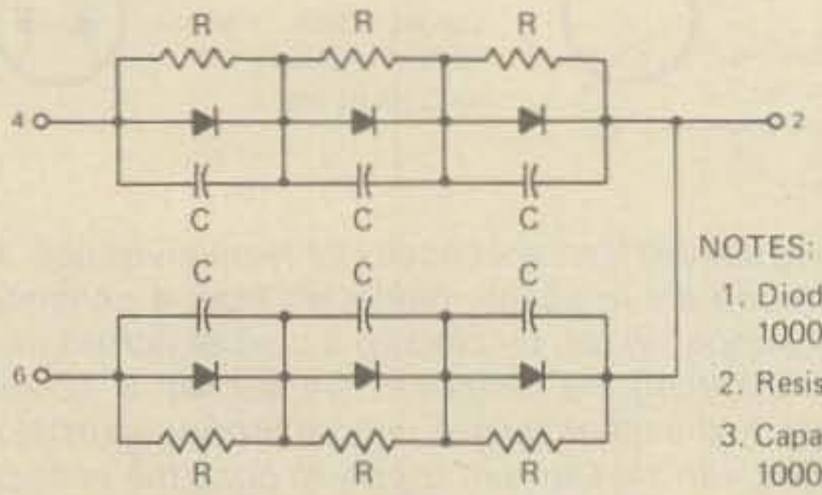
In selecting the diodes for the substitute assembly, I use the following rule-of-thumb to ensure adequate ratings and long life. Using the specifications given for any rectifier tube, I compare the maximum d.c. current with maximum peak current per plate to get the peak current requirement for the diode string. I compare the supply voltage to the maximum peak inverse voltage rating (PIV) to get the voltage rating of the diodes. Using the 5R4G as an example, we see that the ratings are:

Maximum Peak Inverse Voltage	2800 volts
Maximum Peak Current Per Plate	650 mA
RMS Supply Voltage Per Plate	750 volts

Table 1

Solid State Device		Tube Replaced
X3DR/6AL5		6AL5
X1DR/6X4		6X4
CR273/8008	(RCA)	8008
CR274/872A	(RCA)	862A
CR275/866A	(RCA)	866A, 3B28
1N2367	(Sarkes-Tarzian)	866, 866A, 3B28, 3B25
1N1237	(Sarkes-Tarzian)	5839, 5852, 6AX5, 6W5, 6X5, OZ4, 5X4, 5Y4
1N1238	(Sarkes-Tarzian)	5AU4, 5Z4, 5V4, 5AZ4, 5AW4, 5W4, 5AX4, 5Y3, 5U4, 5U4G, 5931
1N1239	(Sarkes-Tarzian)	5R4, 5RU4WGY
1N1262	(Sarkes-Tarzian)	17D4, 12AX4, 6AU4, 6AX4, 6BL4, 6U4, 6W4, 25W4
1800/1/8		5Y3, 5U4,5V4
1500/1/4		80, 5Z3, 83
4000/1/8		5R4

Applying the information to my way of selecting the diodes, each leg would require three diodes rated at 1000 volts d.c. and have a current capability of a minimum of 700 mA to allow for surges. For more precise calculations, I would suggest referring to 'The Radio Handbook' by William Orr, W6SAI, or the various diode handbooks. Figs. 3, 4, and 5 illustrate the circuits of solid-state assemblies that I have used in various pieces of equipment that I have owned and the tubes that they



NOTES:
1. Diodes = 1000v.d.c @ 1000mA.
2. Resistors = 470K, ½w.
3. Capacitors = .001 @ 1000v.

Fig. 4 – A solid-state replacement for a 5R4, 5U4 etc. rectifier tube.

replace. For maximum diode protection, I recommend using the resistors and capacitors in parallel with each diode to help reduce voltage surges and current transients across the diodes. In most cases these will be on the order of 470k ohm resistors at ½ watt rating and .0015μF capacitors with a voltage rating of 1000 volts d.c.

Another source of heat, in addition to the rectifier tube, is the voltage regulator tube found in many pieces of equipment where a regulated voltage is needed for good stability. In most instances, this will be either an OA2 or an OB2. With the recent introduction of the voltage regulating Zener diode a few years ago, even these tubes can now be replaced. Fig. 6 illustrates the base diagrams and some recommended diodes for the replacement of these tubes. Observing proper polarity, the Zener diode could be plugged directly into the proper tube socket terminals. Remember that there is high voltage across the diode, and that it is safer to unplug the equipment and make sure that the filter capacitors in the power supply have been completely discharged. Even a partially charged capacitor can give you quite a bite. In my own installation, I used a red laundry marker to make a circle around the socket on the chassis to remind me of the high voltage potential.

As an added bonus, I am also including two other circuits of

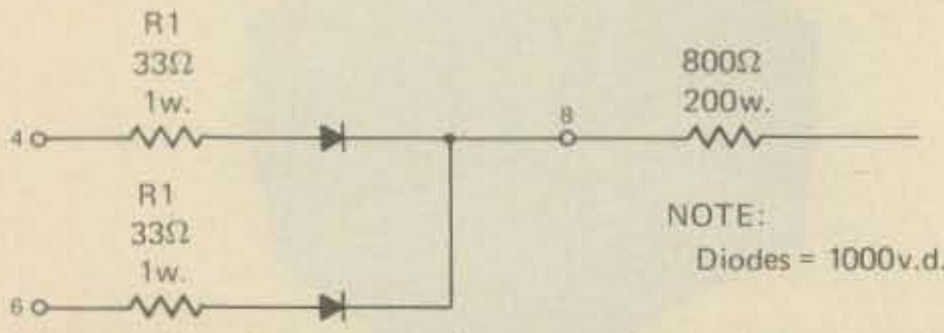


Fig. 5 – A solid-state replacement for a 5Y3, 5V4, 5T4, 5AX4, 5AW4, etc.

NOTE:
Zener diodes=
OA2 – 1N1375, HEPZ3536, 150v.
OB2 – 1N5383, 1N1812, 100v.

Fig. 6 – A Zener regulator which replaces an 0A2 or 0B2.

solid state assemblies to replace the filament regulators in some equipment. In the case of the R-390 series of receivers, this is an 3TF7. This circuit is illustrated in fig. 7. To make the modification, insert the 41 ohm resistor in series with the 26 volt filament supply line at the socket and add the two diodes. Components without values in the diagram are original parts as identified by the R-390 circuit part numbers.

The other circuit is for the replacement of the 4H4C ballast tube used in the National NC-300 receiver. To perform this modification ground pins 1 and 8 at the tube socket. Then substitute the circuit shown in fig. 8. In constructing the circuit, it can be installed right at the socket or built in a discarded tube base.

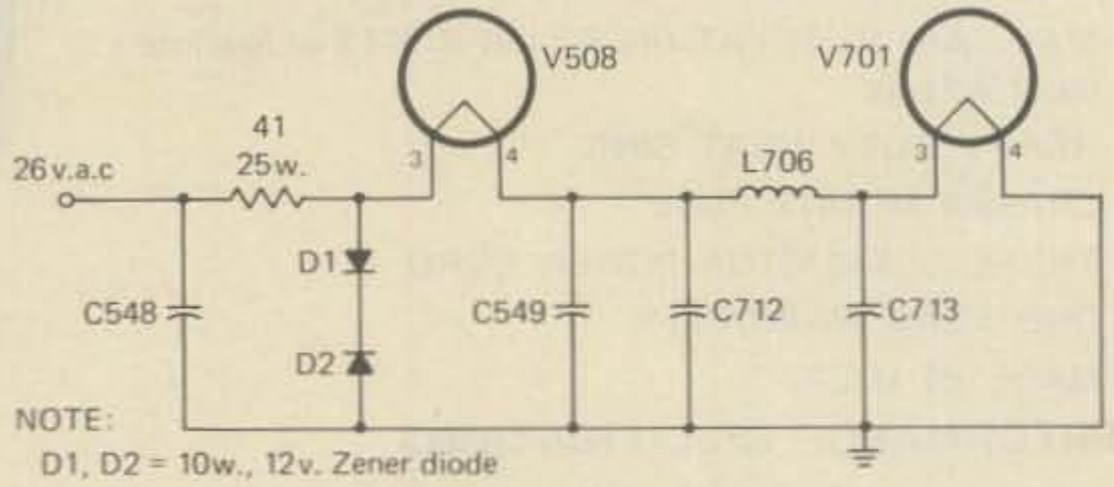
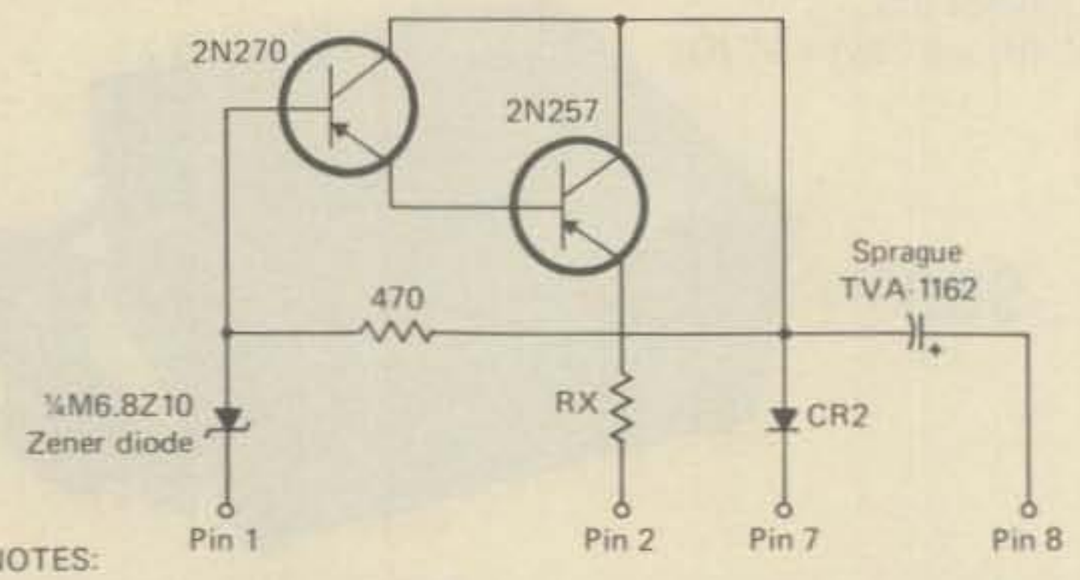


Fig. 7 – A solid-state 3TF7.

Whatever your particular situation may be, do not be afraid to experiment. Two excellent reference books are the General Electric *Tube Manual* and the RCA *Transistor, Thyrister and Diode Handbook*. In addition to giving information on the individual diodes and transistors, the RCA manual also gives some good basic information on using the solid state devices and also gives some experimenter circuits.

Happy hamming with a cooler rig and the energy you have conserved.

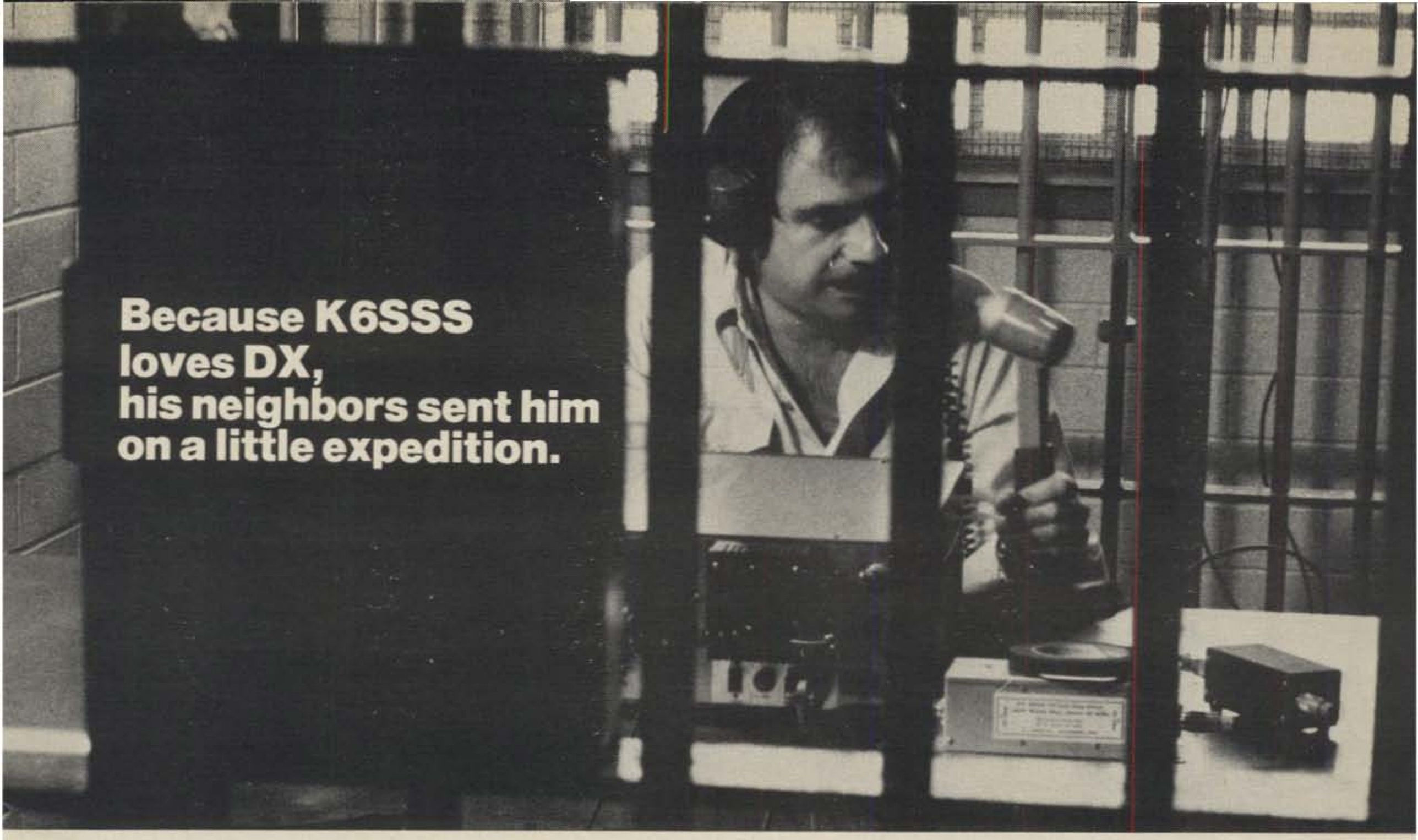


NOTES:
1. RX selected to give 6.2v. at Pin 2.
2. CR2 = DI-56 diode .75a., 50PIV

Fig. 8 – A solid-state 4H4C ballast.

References

1. Howard J. Sartori, W5DA. "Solid-Tubes—A New Life for Old Designs." *QST*, April 1977, p. 45.
2. John J. Schultz, W2EEY. "Converting Vacuum Tube Equipment to Solid-State." *Ham Radio*, August 1968, p. 68.



One neighbor sued him for interfering with Lawrence Welk. Another filed a complaint about that "monstrosity" in his backyard—a tribander at 40 feet.

7,781 tangled with the law

The K6SSS case is an example of what can happen to you these days. No matter where you live. It is hypothetical. But real lawsuits are being fought right now by people like K50VC, W2LTP, WB7NOM, W8NRM and W6UFJ/N6QQ to name a few. Last year nearly 8,000 unsuspecting hams and CB'ers ran afoul of the law. Sure, they're taking their fight to court—but they're losing! Never mind that they've got building permits for their towers. Or that the FCC says their rigs are "clean." Judges are ruling against them. The alarming part is that every suit lost makes it that much easier to nail the next guy. Prosecuting attorneys love to cite recent adverse decisions during a trial.

Legal ammunition available

The tragedy is that suits are being lost that could have been won. But TVI/RFI and tower cases fall into a little-known area of the law. Unless your lawyer is a specialist, he could spend hundreds of hours researching court decisions. And still not be sure he's put together the strongest defense possible. It's expensive (expect to spend an average $4,000 to $8,000 if you're sued). And risky. Which is why we formed the non-profit Personal Communications Foundation.* To provide your lawyer with legal ammunition.

Who we are

We're a handful of ham lawyers, professors and judges (all volunteers) who wanted to help before it's too late. We're putting together the first research library of personal communications and zoning law. And having briefs written by the best legal brains. It's all available to your lawyer. For 10¢ a page. We can't guarantee you'll win. We can't try the case for you. But if you or your lawyer contacts us, we'll sure make sure you get a fighting chance.

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PCF Personal Communications Foundation

Defending the rights of hams

a monthly feature by

IRWIN MATH, WA2NDM

Math's Notes

A look at the technical side of things

Temperature Control of Electronic Circuitry

A couple of months ago we presented some simple construction details for a temperature testing chamber that was made from a converted toaster-oven type broiler. Interest in this type of equipment was surprisingly high, seeming to indicate that the electronics experimenter has progressed to a point where the elaborate testing of his designs is approaching industrial standards.

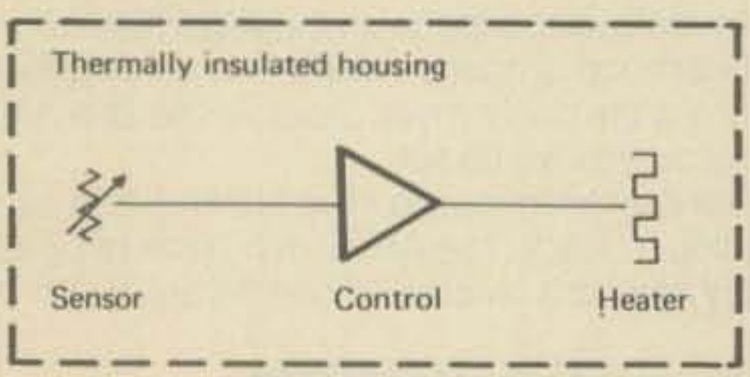


Fig. 1 — General temperature control system.

With this thought in mind, we decided to carry the temperature controlled enclosure idea a step further and indicate just how such control can be added to practical circuitry. By proper utilization of these techniques, the effects of changing ambient temperatures can be eliminated from critical circuitry.

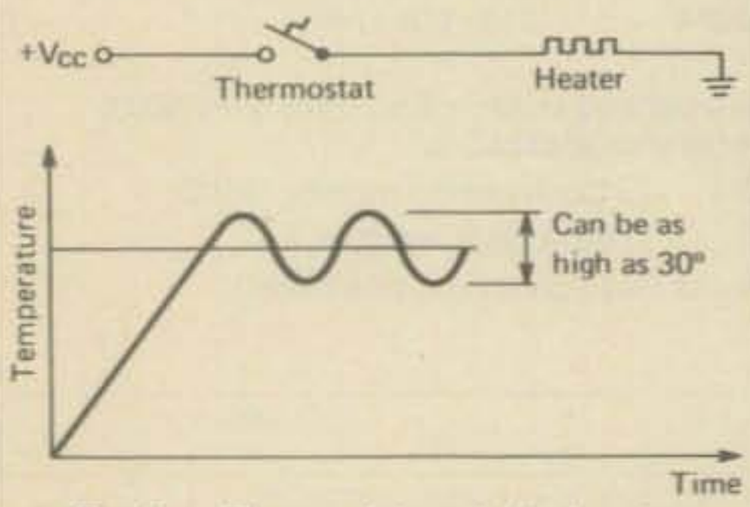


Fig. 2 — Thermostat controlled system.

The basic idea of temperature stabilization is to enclose cell circuitry that we wish to stabilize (v.f.o.'s, oscillator, d.c. amplifiers, etc.) in an enclosure that will maintain its internal temperature stable to 1 or 2 degrees at most, even when the outside temperature varies by 20 to 30 degrees. The implementations of this technique is simple and inexpensive.

The general temperature control system is shown in fig. 1. A thermally insulated chamber is fitted with a heater, control circuit, and temperature sensor. The entire chamber is then heated to a temperature 5-10° higher than the maximum outside temperature to be encountered. The control circuit/temperature sensor is then adjusted to maintain this temperature by adding or subtracting heat as required by changing outside conditions.

Fig. 2 is the circuit of the simplest form of such an arrangement—a normally closed thermostat connected in series with a suitable heater. When power is applied the heater warms up to the point where the thermostat opens, and then cools to some point where the thermostat again closes. As can be seen from the operating "graph" of this system the ultimate stability depends on the open/close difference temperature of the thermostat. This can be anything from 1-2° for a high quality unit or 10-15° for a toaster-oven type control.

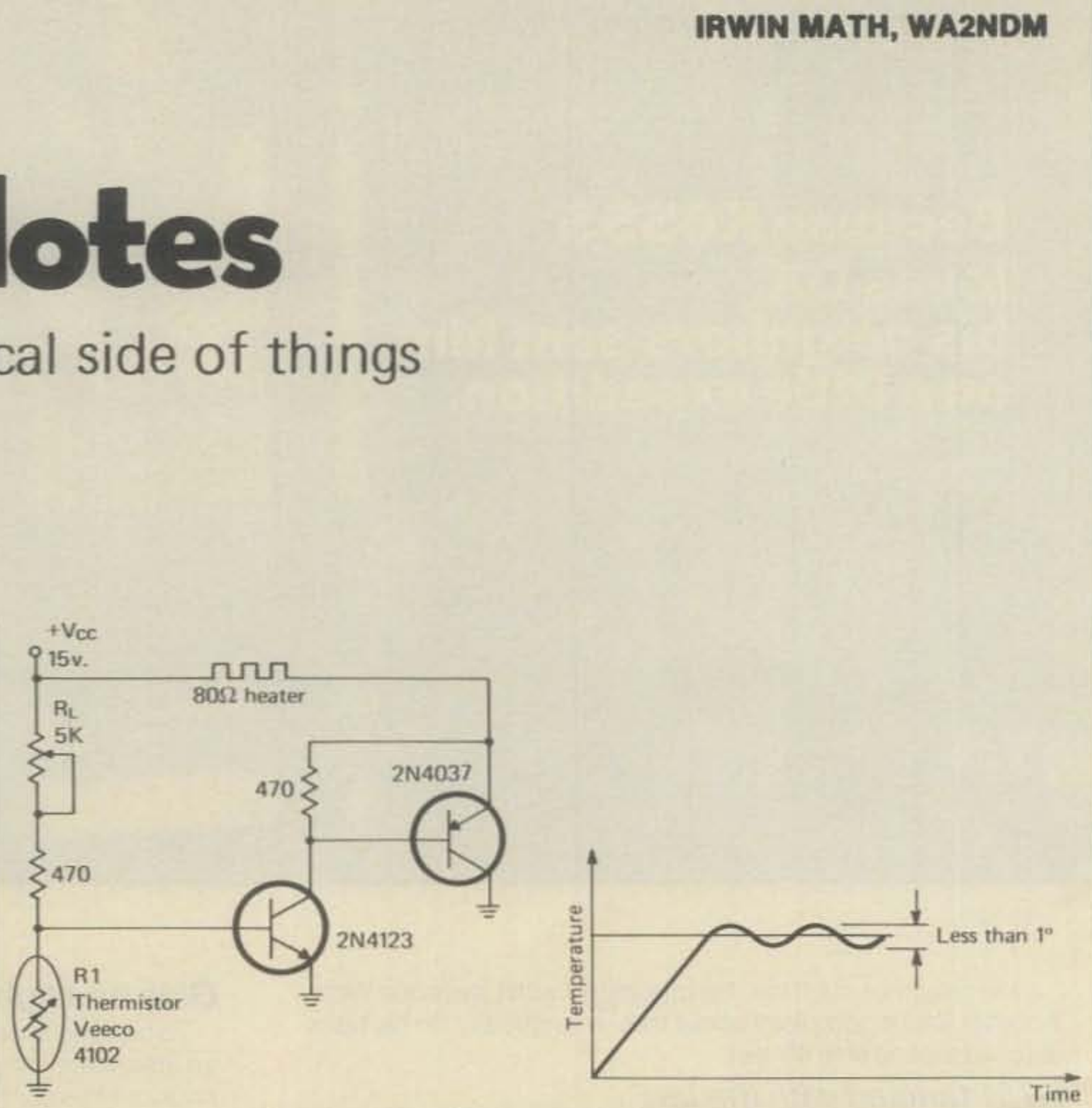


Fig. 3 — Thermistor proportional control system.

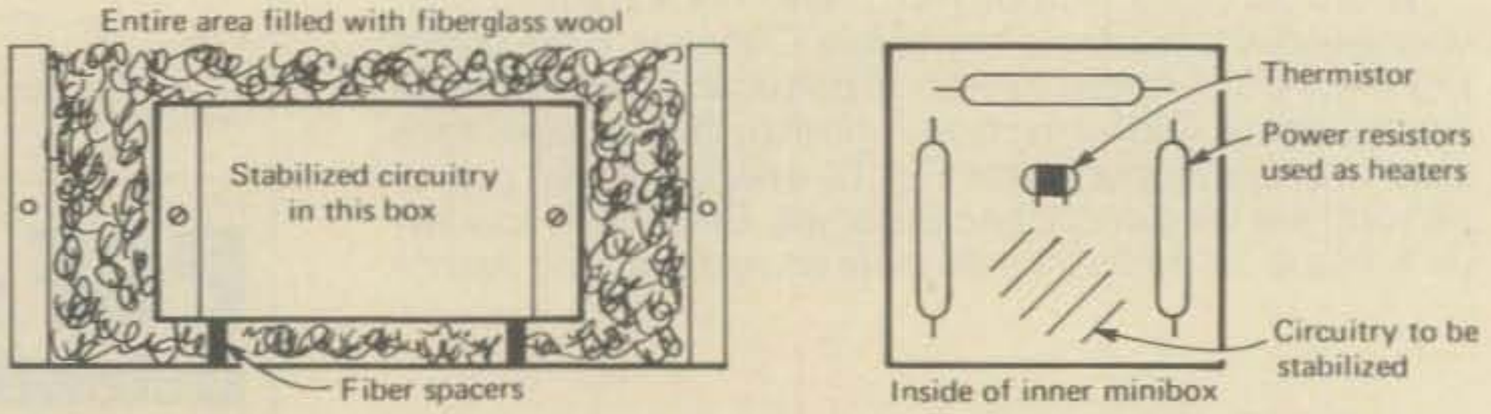


Fig. 4 — Layout of temperature controlled chamber discussed in text.

*5 Melville Lane, Great Neck, N.Y. 11020

Fig. 3 is a more sensitive temperature control system allowing differentials of better than a degree to be achieved. Here, a small signal n.p.n. transistor Q_1, is biased into or out of conduction as a function of the value of a thermistor (R_1) and a potentiometer (R_2). The n.p.n. transistor then drives a p.n.p. unit which in turn supplies current to the heater. Such a hookup delivers current to the heater that is proportional to the resistance (temperature) of the sensor unlike the first example which was either full on or full off. The operating "graph" of this system, fig. 3, shows no differential at all and is capable of practically perfect control.

To build such a system requires that the circuitry to be controlled be enclosed in a thermally insulated housing. Such a housing can be simply one or two wraps with a fiberglass wool blanket (of the type used for home insulation) or a slightly more elaborate assembly. One method that we have used very successfully is shown in fig. 4. This housing is made of a couple of miniboxes with fiberglass wool insulation in between as shown and works very well. The insulation, by the way, is available in most hardware stores and is sold in a convenient size for wrapping waterpipes to prevent "sweating" Additional holes can be drilled through both boxes to pass wires, coax, for alignment pots or even for variable capacitor shafts if necessary. If you do this be sure to employ a non-metallic shaft to prevent heat leaks.

For heaters we employ several 5 or 10 watt wire wound resistors connected in series and placed so that they uniformly heat the enclosure. Fig. 4 also shows suitable placement areas for these resistors.

The sensor employed for this control system is a thermistor and its placement is at the most sensitive point (regarding temperature) in the enclosure. If the area being controlled is large, two or more thermistors can be connected in series thereby distributing the "sensor" around the enclosure. Since the actual temperature sensor is the thermistor, it is at the most thermally stable point in the enclosure and this fact should be kept in mind when deciding where to actually place it.

A temperature controlled enclosure such as the one described was used to temperature stabilize a d.c. coupled amplifier over the range of 25°C ± 10°C. The enclosure was set to 45°C (well below the 75°C rating of the IC's used) and the internal temperature was held to within ½° of the set point. Such stability should be more than adequate for all but the most stringent amateur applications. Furthermore, with proper insulation the variation could be reduced even further.

Pages - 75 - 76 - missing

a regular feature by

THEODORE J. COHEN N4XX

dateline... Washington, D.C.

The ins and outs of the Washington scene

Communications Act of 1978 would abolish FCC, promises action on RFI

The proposed Communications Act of 1978 (HR 13015, introduced into the House Communications Subcommittee by Subcommittee Chairman Van Deerlin and Representative Frey, Jr.), would establish a new, independent, regulatory agency to replace the Federal Communications Commission (FCC). The agency to be called the Communications Regulatory Commission (CRC), would be composed of five Commissioners who would be appointed by the President.

While communications services other than the Amateur service will be more affected by the provisions of the new communications act, a number of specifications within the Act pertain to the matter of radio frequency interference . . . a problem of immense concern to the Amateur community.

More specifically, the following are excerpts from the Communications Act of 1978 which, at the least, indicate that the House Communications Subcommittee is cognizant of the RFI problem, and would direct the CRC to take action in this matter.

"The Communications Regulatory Commission:

"Shall prescribe rules governing the interference potential of equipment which shall apply to the manufacture, import, sale, offer for sale, shipment, or use of such equipment;

"May regulate the performance characteristics of television receivers which are shipped in interstate commerce, or are imported from any foreign nation into the United States, for sale or resale to the public."

In addition, the following provisions are also included in the new Act:

"The Director (of the CRC) shall conduct a study designed to collect and analyze data relating to the characteristics of the electromagnetic environment in the United States.

"The Director (of the CRC) shall conduct a study of problems and issues relating to the susceptibility of consumer electronics to interference which is caused by the transmission of radio signals."

While the choice of words regarding ". . . interference which is caused by the transmission of radio signals . . ." is unfortunate, there is no question that the Congress will task the proposed CRC to address the RFI problem.

* * *

Canada Moves on RFI While FCC Procrastinates

As reported here last month, the FCC will issue, a Notice of Inquiry (NOI) to solicit comments on the RFI problem. Such an inquiry, supposedly, will provide the Commission with the background it requires to resolve RFI problems experienced by electronic home-entertainment equipment.

While the FCC procrastinates, however, the Canadian government is moving quickly, and effectively, to encourage Canadian manufacturers to increase the immunity of their electrical/electronic equipment to electromagnetic fields.

In particular, the Telecommunication Regulatory Service of the Canadian Department of Communications has released an Electromagnetic Compatibility Advisory Bulletin, the purpose of which is to describe "the radio environment which may be encountered in typical Canadian urban and suburban communities," and to indicate the immunity levels required for operation in this environment.

At this time, observance of the immunity grades in the Canadian bulletin are not mandatory. However, the Department of Communications stresses that if Canadian citizens are to enjoy effective use of the radio spectrum, electrical/electronic devices designed for their use must be designed to operate in the radio environment. Further, the Department intends to work toward the implementation of voluntary standards of immunity which, if met, could be used by a manufacturer in his advertising to notify the consumer of a product's immunity to r.f. fields.

* * *

Concern rises on biological effects due to radiation

Problems alleged to be caused by microwave radiation at the U.S. embassy in Moscow, as well as near the Soviet Embassy in Washington, D.C., raise serious questions on the biological effects of radiation. In some cases, municipalities are acting to set power density standards which are designed to prevent biologically deleterious effects . . . standards which could act to limit the operation for stations operating in the Amateur service.

The Board of Health of New York City, for example, recently proposed to

*8603 Conover Place, Alexandria, VA 22308

amend Article 175 of the Health Code to read as follows:

"S175.125 Microwave and other radio frequency power density standards

(a) No person shall possess, maintain or operate equipment, sources or facilities in fixed or stationary installations which generate microwave, very high radio frequency (v.h.f.) or high radio frequency (h.f.) emissions where such emissions may affect persons in uncontrolled or unregulated areas, including residential or recreational areas and areas open or accessible to the public, unless such equipment, sources or facilities comply with the (prescribed) maximum permissible power density standards."

The standard, prescribed for all frequencies above 10 MHz., is 50 microwatts per square centimeter averaged over any 0.1 hour period.

In addition, Section (b), as seen below, did not exempt equipment used by Amateurs:

"(b) This section shall not apply to microwave ovens and mobile equipment, sources and facilities including citizen band (CB) radios and police, fire, ambulance and other mobile emergency response units."

While it is commendable that the medical community has begun to study extensively the harmful effects caused by radiation, we believe that the New York Board of Health is premature in its proposed imposition of standards. This opinion is supported by the fact that the New York City resolution does not even take into account the distance between a subject and a radiating element.

* * *

Comment on the Times

The following editorial excerpt, taken from the July 27, 1978 edition of the *Wall Street Journal*, is timely:

"Today, punitive action against malefactors is a no-no; instead, social ends are achieved by restrictive ordinances on entire classes of innocent citizens . . . Airport searches substitute for reprisals against terrorists. Gun control laws substitute for incarceration of armed criminals. Complicated personnel screening substitutes for firing cheats and incompetents."

They should also have added: A ban on the manufacture of amplifiers having a 28 MHz. capability substitutes for effective control of the Citizens Radio Service!

* * *

Your Editor thanks Jack Kelleher, W4ZC, for his contributions to this month's column.

This month by
ROD LINKOUS, W7OM

DX

News of communications around the world

We are now in the midst of the DX contesting season. Thanks to the DX contesters of the world, new countries are available for the newcomers and on different bands for those pursuing the five band awards. Even some rarer countries will be available for us all.

DXers and the DX Contesters

It is a very funny paradox when one considers the DXer and the DX contester. In a few cases they are one and the same. Yet in many DX clubs they are almost two distinct factions.

The DXer who wants to work the countries on his own without the lists will find the DX contests a true test of his skills and station. But when he is asked to submit his score as part of a club effort, he is reluctant, usually doesn't and often resists the DX club's involvement. The main reason is his desire to work the contest in a low-key manner which results in a low score. And since he is a big gun DXer he believes he should have a big score. Not submitting the score keeps from revealing his competitive status. Most contesters will tell you that when it comes to club competitions, the little scores make the difference. (Look at this year's results).

Many DXers fail to realize the real contribution made to our hobby by the DX contest enthusiasts like Marty Lane, OH2BH; Jim Nieger, N6TJ; Chip Margelli, K7JA; Phil Williams, 5W1AU et al; just to mention a few. The DX contesters can and have given out more countries in less time than any other group. Most initial DXCC applications contain a very high percentage of QSLs obtained via the contest and DXpedition route.

It is also interesting to note that many of our best DXpeditions are by DX contesters. It is amusing that most of the bad things said about a specific DXpedition is a result of their ineptness at the contesting skills.

My point is to recognize the large contribution to DXing made by a small group of dedicated enthusiastic DX contesters. Today the pileups are getting bigger and the wait is getting longer. Without the DX contesters it would even be a longer wait for the next new one.

To the DX purist, those DX contests are opportunities knocking, not just your AVC pumping from the wall-to-wall QRM. The final score is not as important as the DX game. Try it, you might just enjoy it and your score, regardless of size, will be appreciated by your DX club in pursuit of being the number one DX club.

5632 47th Ave., S.W., Seattle, WA 98136

DX Extras

DE 5B4PW: Did you ever wonder why you couldn't find Cyprus on c.w.? The following note may shed some light. BT the reason is that I am the only 5B4 out of approximately 100 stations licensed here who regularly operates c.w. In fact there are only four stations who can use the Morse code and the other three have more or less given it up or have left Cyprus. The other 96% are really CBers not having passed either a Morse test or

The CQ DX Awards Program

S.S.B.

583 . . . WA9FXJ
584 . . . WA0TUW
585 . . . WB7HNC
586 . . . I3LLD
587 . . . WB7BFK
588 . . . WD4EYD
589 . . . WB3HAZ
590 . . . N8AC
591 . . . WB6PEF
592 . . . VK3AH
593 . . . LA6OT
594 . . . PP8DD
595 . . . K5VNJ

C.W.

317 . . . W3OGY
318 . . . K9QVB
319 . . . SM0DJZ
320 . . . W5RBO

S.S.B. Endorsements

310 . . . K2FL/316
310 . . . F9RM/312
310 . . . I8KDB/312
310 . . . K4MQG/312
310 . . . VE3MR/312
310 . . . W3AZD/312
300 . . . W4DPS/308
300 . . . ZL1AGO/303
300 . . . W0SFU/302
275 . . . DL6KG/294
275 . . . I3LLD/284
275 . . . W7OM/283
250 . . . K7RI/259
200 . . . K5VNJ/235
200 . . . VK3AH/215
200 . . . KG6SW/209
150 . . . I8IGS/187
150 . . . WA7LAG/175
150 . . . PP8DD/159

C.W. Endorsements

310 . . . W8KPL/310
300 . . . K6JG/304
275 . . . K4CEB/280
150 . . . W7OM/188
150 . . . K9QVB/176
3.5/7 MHz . . . W3OGY/100

Complete rules and application forms for the CQ DX Awards Program can be obtained by sending a business size, No. 10, envelope, self-addressed and stamped to: "CQ DX Awards", 5632 47th Avenue S. W., Seattle, Washington 98136 U.S.A.

Here's Jack Quinn, W6MZ, EI2MC (left) and Gerard DeBuren, HB9AW, WA6QAU (right) "Chief Op." at 4U1ITU. Photo was taken at 4U1ITU.

technical examination but have been issued full amateur licenses merely on application. AR Pat West goes on to say he is currently having fun operating QRP with a 2 watt rig: both on c.w. and d.s.b. (Thanks to Pete Billon, K6JG for sharing Pat's note with us.)

DE VK9ZM: BT On my last trip to Willis from December 1976 until June 1977, I used a FT200 and dipoles and long wire "V" antennas. I worked 3,757 stations in 127 countries of which, to date, I have 98 confirmed. For the current trip (June until December 1978) I will be using: a FT200 into dipoles (80 and 40) and a TH3MK3; 25 watts into 5 element yagi on 6; 100 watts into 10 element yagi on 2; and 12 watts into stacked rhombics and crossed yagis on 432 (I will be working through Oscar). On 40 and 80 I can *not* work split frequency so I ask you to be tolerant as I change up and down on the VFO. I will work anybody on any band on s.s.b. or c.w. on request and these may be made on the air or through my QSL manager VK4ABW. AR Bill was a brand new amateur on his first trip and he wound up a seasoned hand. I know him to be one of the most cooperative chaps on the air when it comes to schedules and band changes.

DXese Translated

I thought you might enjoy Orm Meyer's (K6QX) translation of the common phrases overheard during the recent Clipperton pileups. What was said (what it means):

I think list operations should be abolished.
(I've got 3 tons of aluminum at 150 feet.)

I only work 'em on phone.
(I've forgotten the code.)

I only work 'em on c.w.
(I can't break the phone pileups.)

I'm not proud—I'll work 'em any way I can get 'em.
(I've got a lousy quad at 40 feet.)

Those . . . are sure a buncha lousy lids.
(I've been calling for 16 hours.)

The FOØ's are starting to shape up.
(I finally nailed 'em.)

All in all—the Clipperton boys did a great job.
(I worked 'em on all bands.)
(Thanks to *The DXer* for the tidbit.)

DX Honor Roll

The activities from Clipperton and Iraq are causing great changes in the Honor Roll standings. One of the significant accomplishments is finally having a Honor Roller with all 317 countries on 2XSSB. The honor goes to Dr. Sam Rosen, WA2RAU. Sam knocked off YI1BGD in a pileup to make it complete. The European gang confirmed the contact and noted it was one of the first U.S. contacts they had heard without the list system. His sons are also very proud of the accomplishment. The DX contest community know them well as Dave, K2GM and Dick, K2RR. *Congratulations* Doc!

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The top SSTV DXers are also listed. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. Total number of current countries on the DXCC list as of this listing is 317*. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be submitted anytime, in any number. Updates indicating "no change" will be accepted.

C.W.

W6PT	317	DL7AA	311	N6AV	302	N6FX	295	N6CW	281
K6EC	314	W8KPL	309	W9DWQ	302	K9MM	290	DJ7CX	280
ON4QX	314	W2GT	305	W4BQY	300	WA8DXA	290	K4CEB	280
W6ID	312	K6JG	303	DL3RK	295				

S.S.B.

WA2RAU	317	W6EUF	311	SM6CWK	307	K6XP	299	W8ILC	285
K2FL	316	W9JT	311	W6YMV	307	WB6DXU	299	OE3WWB	284
W2TP	316	SM6CKS	310	F2MO	306	XE1KS	299	I3LLD	283
IØAMU	315	W2QK	310	K6EC	306	VE3GCO	298	N6FX	283
G3FKM	314	W4UG	310	K9MM	306	N4MM	297	W7OM	283
K6YRA	313	K6WR	309	OE2EGL	306	W9SS	297	K3EH	282
XE1AE	313	WA2EOQ	309	ZS6LW	306	WØSD	297	N6AW	281
F9RM	312	I8YRK	308	I4ZSQ	304	F9MS	295	OK1MP	281
I8KDB	312	IØZV	308	YV1KZ	303	N6AV	295	W7JYX	281
K4MQG	312	K6JG	308	DK2BL	302	DK6KG	293	K8LJG	280
VE3MR	312	W4DPS	308	VE2WY	302	JH1EIG	293	WB2RLK	280
W3AZD	312	W9QLD	308	ZL1AGO	302	K9RF	291	VE7HP	280
W4SSU	312	ZL3NS	308	EA4LH	301	W6FET	290	9H4G	279
W9DWQ	312	K8DYZ	307	VE3GMT	301	DJ7CX	288	DJ2AA	276
VE3MJ	311	OZ3SK	307	WØSFU	301	SP5BSV	287	JH1VRQ	275
W6EL	311	SM5SB	307	I5WT	300	YS1O	286		

SSTV

W8YEK	108	G3IAD	101

* Rio de Oro, EA9, deleted effective this listing.

Forty with Five

Many have said how difficult it is to work WAZ. Compared to working a hundred countries it is a real challenge. One QRPer took on the challenge with 5.0 watts. John Akiyama, W6PQZ was up to the challenge and made it with 5 watts maximum. It almost makes you want to turn off the linear and cry. *Congratulations* John!

Feedback

The article on DX QSLing drew some great responses. A note from Dave CEØAE of Easter Island is well worth sharing. "Amen" to the statement 'When a DX station has a manager, sending direct just isn't smart.' How right you are! In spite of the fact that I have one of the best managers in the business, and pass her call to all my contacts (WA3HUP,

The DX location of the month is the QTH of Graeme Eden VS5DX. Brunei is heard on the 14225 MHz. net thanks to the efforts of VS5DX. Using a TH6DXX at 60 feet and the impressive station many are one country richer. (Photo via W7PHO)

Alan, ZK1DR, on Rarotonga just completed his two element triband quad. This along with a new electronic keyer ought to improve Alan's QSO rate in the coming contest. Alan is QRV on all bands 80-10 and enjoys making new friends worldwide. (Photo W0WP)

Oscar Ocampo, EL3A will be appearing with a new prefix soon. The big signal from Greenville, Liberia will be missed by the prefix hunters. Oscar is a doctor (MD) when not operating in the DX pileups.

A little DX nostalgia. The place Chalimbara, Zambia as 9J2CL/P. The occassion the 1974 field day operation. From left to right - Brian Otter 9J2BO, Don Radley 9J2GE (G4ABI), Barrie Clark 9J2CL (G3VCL and Carl Andersson 9J2KP). (Photo G3VCL)

Mary Ann), I still get an awfully large number direct. Since I'm too busy to answer them, I just throw them in a large carton and about twice a year I clean it out; not answering them, but by passing a list of cards received to my manager. A fellow sending a SASE to my manager will have a reply within a week, as I pass log data daily on 15 meters. A fellow sending the card direct will usually use a wrong address (the 1976 and 1977 Call Books are wrong), and it eventually reaches me 3 weeks later, being forwarded. Chile doesn't accept IRCs, but they come anyway. Those few I do answer personally, I buy the stamps and reuse the IRCs or send them to Mary Ann. But the return takes about a year. So, you are right—it just isn't smart!" Thanks father Dave.

Dave didn't write just to remind us of the July column. He wrote to share some excellent thoughts on how to use mint stamps. Here are a couple of thoughts with the Chilean flavor that really apply worldwide.

1. Send more stamps than you think you need. The last two cards I received with mint Chilean postage did not have sufficient postage. Postage is always being increased here, just as in the states, and those who sell mint postage must keep up to date on all the increases. This isn't easy to do as there is a time delay in getting the information.

2. Include the mint stamps in the envelope, but don't paste them on. If there is an excess, it will only be wasted; if not enough, it is not always possible to get the right value stamps to make up the difference.

Another great letter came from Steve Thompson, N4TX. Regarding the comment on using "Green Stamps", a word or two of caution is certainly in order.

"While it is true that these 'stamps' (ed. Green) are cheaper than IRCs and acceptable to many DXers, they pose a danger to overseas amateurs in some countries with strict rules against possession of foreign currency. Certainly most European countries and many other countries with devleoped economies and relatively free political systems won't object to one of their citizens getting a buck in the mail.

But other countries *will* object if the dollar is discovered in a search of the mail. In some under-developed countries and others with government control of the economy, a foreign amateur can expect to be in a heap of trouble if his mail is opened and a dollar discovered. And, unfortunately, mail *is* opened in some countries.

One prominent Asian DXer recently wrote to an amateur from the Washington DC area asking that only IRCs or mint stamps be sent to avoid such trouble. Unfortunately, possession of a big antenna is often enough to mark an overseas

Bill McDermott returned to Willis Island for another six months as VK9ZM. This small coral atoll, 27 kilometers in diameter, rising 1,000 meters above the sea bed on the outer most edge of the Great Barrier Reef.

amateur as a potential subversive or spy in some nations. He can do without the threat of being cited for currency violations on top of it all.

Mint stamps, of course, work well! I am grateful to Steve for the informative letter on one of DXing's common practices from another point of view. A few words to the wise: "Be cautious, you may deprive many of a chance to work a rare one."

Tricks of the DX Trade

One of the most enjoyable parts of writing this column is receiviing feedback from the readers. Most of the time it happens when you goof. But a note from Bob W4DZZ made my whole year. Hint 13.9 in the July 1978 column was the work of Rich Lawton, N6GG. It had to do with what direction to point your beam. Bob relates "Boy, the Hint 13.9 sure was timely because I just worked Cocos Keeling last Friday and my DX buddies gave me the razz when I told them my beam heading. I had tried both short (350°) and long path, but the signal continued to be strongest at 220°. Anyway that's where I finally worked him." This is the case where one good DXer learned from another. Thanks Rich!

The tidy station belongs to Jim Simmons W7KVV. Operating from LaGrande, Oregon, Jim has accomplished the requirements for 100 countries on cw while snuggled in the valley among the beautiful Blue Mountains.

In recent years Idaho has become more active and the quest by foreign DXers for WAS has been satisfied by DXers like Steve Hoggan, N7SW of Burley, Idaho. Steve claims not to be a 'big gun' but his DXing accomplishments speak otherwise. With the modest station and DXing skill, Steve has acquired most of the DX awards.

Here is another great input from Rich N6GG about something that few of us give thought to:

Hint 12. Creature Comforts. The operating chair is an important piece of your operating equipment. If you don't have a comfortable chair, chances are you won't be able to sit for hours at a time at the operating position chasing the rare ones without undue fatigue. Several points should be considered in selecting a good chair. 1—It should have roll casters and must be a swivel to cut down on the fatigue of constantly moving to reach everything. 2—It should be comfortable and be of a material that can breath (cloth weave is better than the hot leather). 3—It must be the correct height off the floor to prevent cutting off the circulation to your legs. 4—It must provide the proper back support. (Thanks to *The DXer*/N6GG)

DX Club—1978 Style

As the new year approaches, plans for the 1979 activities should be getting off the ground. An interesting club project is an internal race to 100 countries. A club reports that they have a competition to see who can get the first 100 countries confirmed. This can be done in several ways—one band, one mode, multiband, multiple modes and combinations. The benefits are in the envolvement in working DX. The old timers helping the newcomers to better their skills and increased activity on the 2 meter alert net are but two profits of the undertaking.

When confirmations are in hand, it might be timely to submit them for the DX awards. It is not a difficult task to check the cards under the General Certification Rule for a variety of awards.

The CQ DX awards, including WAZ, are awarded using the checkpoint system. A recognized checkpoint in the club can certify that he or she has verified the QSL cards against the application. Then the application can be submitted without the cards. Many of the DX clubs have a local CQ DX checkpoint for this purpose. Our current U.S.A. and Canadian checkpoints are:

Jack Reed VE3GMT
Canadian DX Association

Art Westneat W1AM
Southern New England DX Assoc

Ed Hopper W2GT
North Jersey DX Assoc

Jack Heisey K2FL
Frankford Radio Club

John Kanode N4MM
Potomac Valley Radio Club

Gary Milus W4UG
Virginia Century Club

Jack McClain W4KNW
Southeastern DX Club

J. L. Cross N4NO
North Alabama DX Club

Russ Gidry K5YMY
Delta DX Association

Rick Roderick K5UR
Arkansas DX Association

David Busik N5JJ
Texas DX Society

Don Brickey W7OK
Southern Nevada DX Club

Rod Linkous W7OM
Western Washington DX Club

John Kroll K8LJG
Michigan DX Association

Ed Goodbout W9DWQ
Northern Illinois DX Assoc

Taking a pause between contacts is Boris "Bob" Anponovski YU5XSX. Bob has achieved many of the DX awards since becoming an amateur in 1969. He is the recent recipient of the CQ CW DX award.

The DXing team of Rubin and Ferne Hughes are known by most active DXers. Rubin WA6AHF is a DX Honor Roller and part time QSL printer. Many of us have received a rare QSL card from Ferne, the stamp collector. The license on Rubin's car is not unique among amateurs but the one on Ferne's makes most DXers do a double take on the Bay Shore freeway.

The proud owner of this impressive station is Gerson Rissin, PY1APS. Better known under his old call as PY7APS. He gave us a new country as PY7APS/0 ('67) and as PY0APS ('68) from Fernando de Noronha. Gerson is an avid DXer with 325 countries and several DX contest awards. He is active on SSTV.

The chap at the controls of W5QEE in Dallas, Texas is Max Farell, ZL1WE. Normally we hear Max from home station in Hamilton, New Zealand. (Photo by W5QEE)

After 25 years as a SWLer, Peter Rasmusson became SM4ACH in 1973. With a Single Band Phone WAZ on 20 meters and over 100 countries on SSB, Peter is busily chasing the rare DX. (Photo by SM4AOK)

Bob Parlin WØSFU
Twin Cities DX Association

Max Gilliand WBØNHG
Mile-Hi DX Association

Dewey Treavor KØSVX
Eastern Iowa DX Assoc

J. P. Pat Corrigan KH6GQW
Honolulu Amateur Radio Club

The CQ WPX Program

Mixed

668 . . . I2MQP
669 . . . WA7GVM
670 . . . W8ILC/QRPp
671 . . . K4PI

S.S.B.

1069 . . . I6PQO
1070 . . . JH3XCU
1071 . . . G3YSK
1072 . . . I6NOA
1073 . . . ON5RW
1074 . . . I2MQP
1075 . . . W8ILC/QRPp
1076 . . . I3ZKD

C.W.

1717 . . . DJØGD
1718 . . . I1QJC
1719 . . . SMØDJZ
. . .

WPX Award of Excellence

ZL3GQ, W4BQY

Endorsements

Mixed: 450 WA7GVM, W8ILC/QRPp, 550 W8ZPX, 650 HI-8MOG, 700 W8ILC, K4PI, 750 YU1OBA, 800 PY4OD, KØDEQ, 1000 ZL3GQ, HE9ILN, 1350 K2VV.

SSB: 300 I6PQO, JH3XCU, I6NOA, W8ILC/QRPp, I3ZKD, 350 EP2TY, I8KUT, G3YSK, 400 I2OMF, 450 ON5RW, 500 ZL3GQ, W8ILC, 550 PY4OD, 600 WA4QMQ, 700 G3YBH, 750 W2CC, 1500 IØAMU.

CW: 300 DJØGD, 400 SMØDJZ, 450 I1QJC, W8ILC, I2DMK, 500 ZL3GQ, JA1VE, 550 N4WX, AA4A, K1WJB, JH1VRQ, 600 OK1DKR, 650 OK3BT, 700 PY4OD, 750 K9QVB, 850 SM5CMP, 900 W5MCO, 1000 W5MCO, 1100 W3ARK.

10 meters: HE9ILN, K2VV, KØDEQ, K4RDU.
15 meters: WA5ALB, K2VV, W4BQY.
20 meters: EP2TY.
80 meters: G3YSK, HE9ILN.
160 meters: HE9ILN.
Europe: I2OMF, N4UF, G3YSK, I2MQP, W4BQY.
No. Amer.: N4UF, JH1VRQ.
Oceania: W2CC, N5FG.
So Amer.: W2CC.

Complete rules for WPX can be found in the May, 1976 issue of CQ Magazine. Application forms may be had by sending a business-size, self-addressed, stamped (foreign stations send extra postage for air-mail) envelope to "CQ WPX Awards" 5014 Mindora Dr., Torrance, Calif. 90505, U.S.A.

In addition, the following checkpoints, affiliated with other CQ activities can verify QSLs:

Frank Anzalone W1WY
Al Dorhoffer K2EEK
John Attaway K4IIF
Leo Hoijsman W4KA
Bob Huntington K6XP
Bernie Welch W8IMZ

For further information on DX club checkpoints write to us (K4IIF or W7OM).

73 and the best of DX, Rod W7OM

QSL Information

A4XGY—To K2RU
C6ABA—To G3AMR
EL2BJ—To WA4FPT
EL2SM—To WA2DHF
FØCVF/FC—To DJ4PX
FRØCDK—To F3OM
FSØEID—To K7GEX
HD1A—To WA4QMQ
HH2YL—To W7RQ
J3AAG—To K1DBA
JD1YAH—To JR1FRO
JD1YAK—To JR1FRO
N4JI/HC1—To WA4QMQ
PJ1VD—To PAØVDV
PJ2VD—To PAØVDV
PJ2YL—To PAØVDV
PJ4VD—To PAØVDV
PJ7VD—To PAØVDV
PJ7VL—To PAØVDV
PJ7VL—To W2BBK
PZ2AC (post Jun '78)—To WB4RRK
TJ1AD—To WB4WHE
TR8GDC—To WB4RZN
VP1AJ ('77)—To N5UR
VP1WS ('77)—To N5UR
VP2LEX—To K7GEX
VP2MX—To VE1ASJ
VP5DM—To WB4RRK
VS5XU—To DL1LD
VS6HK—To W6EL
WA4UAZ/HC1—To WA4QMQ
YN1Z—To WA4ZXC*
3AØPN—To DF4PN
3B6DA—To 3B8DA
5W1BD—To N5EA
5W1DF—To N5EA
8P6GN—To WB4RRK
8P6JB—To WB4RRK
8P6JC—To WB4RRK
8P6JP—To K7GEX
9L1KB—To WB4WHE
9L1SL/A—To WA3NCP
9L1SL/B—To WB4WHE
9L1SL/D—To K7BHM
***WA4ZXC**—2611 Locksley Rd, Melbourne, FL 32935
YB7ACW—Vic Aaen, P.O. Box 75, Balikpapan, Kalimantan, Indonesia

The WAZ Program

20 Meter C.W.

54 . . . JAØBKX
55 . . . JA1JWP
46 . . . W8RSW

15 Meter Phone

5 . . . JA4DLP

20 Meter Phone

148 . . . ZL3BK
149 . . . KØIEA
150 . . . KØIEA
151 . . . W4DZZ
152 . . . PY2ELV
143 . . . WBØRTZ
154 . . . PY2BU
155 . . . N4NX
156 . . . JA7GLB
157 . . . W8CBA

S.S.B. WAZ All Band

1496 . . . WAØTUW
1497 . . . K4RSB
1498 . . . KØIEA
1499 . . . ON5FU
1500 . . . EA3AEA
1501 . . . W8NNR
1502 . . . WA2BDP
1503 . . . YU2RVL
1504 . . . W6PQZ
. . .

C.W.—Phone WAZ Mixed

4313 . . . JA3RRN
4314 . . . GM4DKO
4315 . . . YU2CBK
4316 . . . WB9YHP
4317 . . . K3RB
4318 . . . LA6OT
1419 . . . F5TO
4320 . . . VE2QV
4321 . . . JAZETQ
4322 . . . K9QVB
4323 . . . WB6BSI
. . .

Phone WAZ Mixed

542 . . . W6BCQ
543 . . . K8VIR

The complete rules for WAZ are found in the May, 1976 issue of *CQ*. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to the WAZ Manager, Mr. Leo Haijsman, W4KA, 1044 Southeast 43rd St., Cape Coral, FL 33904.

a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

Amateur Radio Station Grounding—Part III of III

The last two Novice columns provided the first two parts of this three part article about grounding amateur radio stations. Each of the three parts is useful by itself but the entire article should be read at least twice to extract as much information as possible.

Station safety requires that each piece of station equipment, plus all associated accessories, be at a common electrical potential to avoid any possibility of electrical shock when anyone simultaneously touches any two different units. Station safety is further improved by attaching the station ground lead to an efficient (zero voltage potential) external ground. It should be impossible for anyone or anything to be harmed by electric shock in an amateur radio station.

In addition to the obvious advantages of good grounds which we have just covered, there is another basic reason for establishing and maintaining a good station ground.

The efficiency of both transmission and reception is related to the effectiveness of the electrical ground system in the immediate vicinity of the station. Since most amateurs want optimum communication capability, it is important for them to understand that communication efficiency is directly related to the effectiveness of the station ground.

Vertical Antenna and Ground.

Vertical antennas are very susceptible to vertically polarized electromagnetic interference such as automobile ignition noise. However, the simplicity of the vertical and its small horizontal space requirement cause it to be used by many amateurs.

Vertical antennas have a low angle of radiation and transmission, which means they provide good long range communication capability. Verticals are extremely sensitive to the effectiveness of their associated station ground system, since the ground electrically acts like one half of what is essentially a vertical dipole antenna. The station ground functions as a mirror image of the actual vertical antenna section erected above ground.

Any amateur operating with a vertical antenna and an ineffective station ground is wasting r.f. output power. I have often seen installations where 70 to 90 percent of the r.f. output is dissipated in the poor ground.

Earth ground acts as the return circuit for electron flow back to the transmitter as r.f. is transmitted from an antenna. If the earth ground circuit is highly conductive, maximum power is radiated by the antenna, since less energy is dissipated in the resistance of the nearby ground.

Commercial radio stations and their military counterparts almost always are operated in conjunction with an excellent ground system. The people installing these stations expend the time, effort, and money needed to establish suitable ground systems. Their efforts are rewarded with excellent transmissions and reception capabilities.

Electric Power and Ground

Another ground we must consider is the electric power system ground in our home. Although we seldom attach our station ground lead to the a.c. power ground, the power ground is of great importance to us.

Older 2-wire electric power systems have a "hot" (high) line and a "return" (low) line. This return line is called ground neutral but it is not at true ground potential, despite its name. These 2-wire systems are particularly dangerous be-

This is Doug Johnson (WD9IIX), 4421 W. 87th St., Hometown, Il. 60456 who became a Novice 1 March 1978 and has already logged about 500 contacts. Doug has earned the Worked All States (WAS) and Worked All Continents (WAC) awards with his Yaesu FT-101-E, Wilson duo-band beam and 10 and 15 meters, and inverted vee antennas on 40 and 80 meters. WD9IIX owns an insulation business and he attended a K9VAV-taught licensing course after his CB operating got him interested in amateur radio. He is married and the father of two children.

*2814 Empire Ave., Burbank, CA 91520

cause a.c. voltage "leaks" to the metal chassis and panels of electrically powered devices, creating a hazard. This leakage is usually due to poor insulation on the wires. If a person is in contact with a good ground and touches a device (toaster, drill, hair dryer, vacuum cleaner, etc.) powered from a 2-wire system, electric shock will result if the wiring insulation is not good. This danger is particularly obvious when operating a radio from a.c. power while near an excellent outside ground such as a metal lawn sprinkler system or swimming pool.

The hot and return wires of 2-wire a.c. electric power systems are coded. The white wire is almost always ground neutral and it is not broken by fuses or switches. The hot wire is usually covered with black insulation but it can have any color other than white. The hot wire is the one which is broken by the series connected fuses and switches. The associated power receptacles (wall outlets) are also color coded to indicate where wires should be attached. The natural brass is for the hot side of the a.c. line and the silvery (tinned, nickel, cadmium, etc.) is the return wire connection point.

The 3-wire electrical power systems are much more common in modern installations and they provide more safety than the older 2-wire systems. However, the designed safety aspect of a 3-wire system is lost if one uses special plugs and adaptors which eliminate the critical third (ground) wire connection. Electric power wall receptacles include a connection for the third wire ground connection and the screw head is a bluish-green color. If a device uses a pigtail lead, it is usually covered with white insulation.

In older 3-wire electric power installations, the pin-hole ground connection is at the bottom, the line ground (neutral) is at the left side, and the hot wire is connected to the right side. The pin-hole ground is at the top in most newer 3-wire installations since it has been found that there is less danger of a metal object falling across the high and low wire prongs of a plug and causing a short circuit. When the main prongs are at the top, it is easier for a metal object to fall across them and possibly cause an electrical short circuit that could result in personal injury or fire. The neutral slot in 3-wire wall sockets is sometimes larger than the hot wire slot.

The pin-hole ground is usually connected to conduit (pipe) or BX (armored) cable and either provides satisfactory grounding at house power frequency (usually 60 Hertz) even though the r.f. ground capability is usually far from satisfactory. A bare wire is used as the ground connection in some metallic sheathed cables such as Romex.

When using a 3-wire electric power system, the metal chassis of the equipment or accessory should be connected to the wire which is attached to the pin-hole ground. This wiring configuration provides safety from electrical shock and it should not be lost by making unwise wiring changes. Do not use a 3-wire to 2-wire adapter unless the 2-wire side includes a pigtail lead to complete the ground connection. If one of these adapters is used, be sure to connect the pigtail lead to ground, which is usually the metal box in which electric power switches and outlets are mounted. The pigtail lead is easily attached to the a.c. power ground by just loosening a screw holding the cover plate in place. The pigtail lead connector is slipped under the screw head and the screw is tightened in place. Pigtail connections should be made before the 3-wire plug is attached to the other side of the adapter. In other words, connect the adapter to the wall socket before plugging the equipment line cord plug into the adapter. If one does not complete the pigtail lead attachment first, it is possible to suffer electric shock as one attempts to make the pigtail lead connection with the associated equipment connected. To avoid the possibility of electric shock. The preceding procedure should be reversed when disconnecting a 3-to-2 wire adapter. Unplug the load (the equipment) before loosening the cover plate screw to remove the adapter's pigtail lead.

Ground-fault indicator (g.f.i.) type electrical circuit breakers are now required under the National Electric Code for use in electrical circuits feeding power receptacles that can be reached from outside (possible grounded) areas or any inside wet location such as a laundry room.

A dependable indication of an inadequate amateur radio station r.f. ground is g.f.i. circuit breakers tripping (opening) when the station is operated. Poor station grounding results in r.f. (radio frequency) voltages that can trip these circuit breakers.

G.f.i. circuit breakers are easily identified since they include a push-to-test button. They can be by-passed with a small mica or disc ceramic capacitor to prevent r.f. trips, but it is better to eliminate the r.f. by properly grounding the station.

While on the subject of a.c. power in amateur stations, this is a good time to point out that it is a good practice to disconnect all electric power from station equipment when the station is not in use. One easy way to accomplish this is to plug all station equipment and accessories into a powerline strip. These powerline strips contain several parallel outlets to accept the plugs on your station's power cords. The powerline strip usually includes a light to indicate when electric

power is available to the station. The strip normally includes a fuse or circuit breaker which opens in the event of an electrical overload or short circuit.

Safety Precautions

Any amateur with a Pacemaker must take special precautions to avoid exposure to radio frequency energy. They should not open equipment and expose themselves to high r.f. levels which exist in transmitter output tank circuits. The station ground is of utmost importance to any amateur who has a Pacemaker assisting his heart. A poor ground can cause unacceptably high r.f. levels throughout the station.

Another major grounding consideration for amateur radio stations is protection against static electricity discharges, including lightning. The previous information about grounding still applies but there are some special considerations related to protection against static electricity discharges. If an antenna tower is used, the associated ground system must be excellent. In any case, the antenna system must include a static electricity discharge path. If you use a balanced antenna with a coaxial cable feedline, you can insert a special static discharger in the coax to provide the required protection but the ground line from such a device must be adequate to handle extremely high momentary currents. If a small wire is used, a high level static discharge will just "evaporate" it like the metal link in a fuse is blown out by a current surge.

Longwire and dipole antennas can develop extremely high static electrical charges, even when there is no electrical storm in the immediate area. These charges present an electrical shock hazard to people and pets. Furthermore, they can damage the antenna input coil of the receiver if the antenna's electrical charge is not drained off before the antenna is attached to the station equipment.

I have found it to be a good practice to attach a jumper across the transmission line connector of each antenna that is not in use. This jumper can be a simple piece of wire with a clip lead connector at one or both ends. If you use coax antenna feedlines, it is simpler to short one end of a female coax connector and attach the transmission line to the other end of this shorted connector. Any jumper used to electrically short circuit one side of a balanced antenna to the other side will prevent the buildup of a large static charge between the antenna halves but the resultant composite voltage developed across the entire antenna can be harmful and it should be temporarily attached to the station ground to drain it off to zero voltage potential prior to use.

Conclusion

Here are references to a few articles in other magazines on grounds and grounding. Regular *CQ* readers can use the December index issues to locate desired information in these magazines.

Ham Radio
June 1969, Grounding, page 67
May 1970, Ground Plow, pages 64-66
May 1971, Ground Rods, pages 67-68
May 1972, Safer Grounding, page 59
May 1974, Vertical Antenna Ground Systems, pages 30-35

Ham Radio Horizons
April 1977, Your Station from the Ground Up, pages 28-34

QST
February 1976, Danger Lurks, page 15
July 1976, Grounding AC Lines, page 42
December 1976, Removing Grounds Rods, Grounding Strap Substitute, page 42
August 1977, Ground-Fault Indicators and EMI, page 42
April 1978, More About AC Grounds, page 40

An excellent source for information about wiring, grounding, and lightning protection is the National Electric Code which is adapted to suit the needs of individual municipalities. This helpful book is available at many public libraries.

This concludes the 3-part article about grounds and station grounding. It is hoped that you benefitted from reading this material. This article was written in response to requests for this information. I cannot individually reply to each request involving a very long explanation. However, I do provide prompt hand printed replies and the best subjects are answered in the form of a Novice column.

I have had the good fortune to recently contact the following stations in the Novice bands:
WB1HKG Brian @ Naples, Maine,
WB2MHF Walt @ Maywood, N.J.,
WB3LHK Peter @ New Hope, Penn.,
WD4JSX Don @ W. Palm Beach, Fla.,
WB5SBN Fred @ Amarillo, Texas,
KA6AQB Jack @ Stockton, Calif.,
WB7BTZ Robbie @ Ashland, Ore.,
WD8PUX John @ Doylestown, Ohio,
KA9AFU Bill @ Kokomo, Indiana,
WBØSPX Terry @ Cedar Rapids, Iowa,
KH6JMW John @ Pearl City, Hawaii

Novices are urged to submit good black-and-white pictures of themselves at their operating positions. If your photograph is printed in a future Novice column, you will receive a one year subscription (or renewal) to CQ. A brief description of operating activities and some personal background information are needed with your picture.

73, Bill, W6DDB

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

The c.w. section of the 1978 *CQ* World Wide DX Contest will take place on the weekend of November 25-26.

If you are planning to participate in the c.w. section, be sure to check the special DX Propagation Charts appearing in last month's column for band opening predictions, work plans and other propagation data especially tailored for the contest period. For a day-to-day forecast of general propagation conditions forecast for November, including the contest period, see the "Last Minute Forecast" appearing at the beginning of this column.

Contest Tips

Here are some propagation guidelines that should be helpful in working DX during November, particularly during the c.w. section of the 1978 *CQ* World Wide DX Contest.

During and *shortly after sunrise*, excellent DX conditions to most areas of the world are forecast for *20* meters. Also check for openings on *40*, *80* and *160* meters towards southerly and westerly directions.

From an hour or so *after sunrise*, and until *late afternoon*, *15* meters is expected to be the optimum band for worldwide DX, with both *10* and *20* meters close runner-ups. Reception on all three bands should favor signals from an easterly direction before Noon, from the north and south shortly after Noon, and from southerly and westerly directions during the later afternoon hours.

During the *late afternoon* and *early evening* hours, check *15* meters for signals arriving from the south and west, and *20* meters for signals from just about every direction. Fairly good DX openings towards the east and the south should also be possible on *40* meters, beginning an hour or so before sundown.

During the *late evening* and *early morning hours*, *20* meters should open for DX towards the *south*, *west* and *northwest*, often with strong signals. Good openings to most areas of the world should also be possible on *40* meters during the hours of darkness. Some fairly good *80* meter, and some *160* meter DX openings are also possible during this period.

Signal levels on most DX openings should be noticeably stronger during November, as a result of a seasonal decrease in static levels and solar absorption.

*11307 Clara St., Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for Nov., 1978

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 2, 12, 14-15, 25	A	A	B	C
High Normal: 1, 5, 10-11, 16, 18, 24	A	B	C	C-D
Low Normal: 3-4, 6-7, 9, 13, 17, 19, 23, 26, 29-30	B	C	D	D-E
Below Normal: 8, 20, 22, 27-28	C	D	D-E	E
Disturbed: 21	C-E	D-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 Propagaion 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 and day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) on Nov. 1, excellent (A) on the 2nd, fair (C) on the 3rd and 4th etc. Conditions during the CQ WW CW DX Contest should be above normal on Nov. 25 and low normal on the 26th.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD 20902.

Sample Contest Work Chart

The following is a sample Work Chart for the c.w. contest period, devised from the *DX Propagation Charts* which appeared in last month's column. This particular example is for the *20* meter band, and for western QTHs in the PST zone. Similar charts can be devised for other bands, for multi-band operation, and for other QTHs.

Sunspot Cycle

The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 68.4 for July, 1978. Solar activity varied considerably during the month, with a low of 13 recorded on July 26th, and a high of 127 observed on the 11th. This results in a 12-month running smoothed sunspot number of 59.7, centered on January, 1978. The sunspot

Sample Single Band Operating Plan
20 Meters- Western USA QTH

Time PST	*Areas To Which Openings Should Be Possible*
00-03	South Pacific, New Zealand, Australasia, Antarctica
03-06	About the same as previous period, with some South Americans as well. Good time to catch some sleep.
06-09	All of Europe, Eastern Mediterranean and Middle East, Far East and Asia, South Pacific, New Zealand, Australasia, and northern and central South America.
09-12	Some European, Far East and northern South Americans, as well as some South Pacific, New Zealand and Australasians.
12-15	Most of Europe, Eastern Mediterranean and Middle East. Most of Africa. Northern and central South America and a sprinkling from the Far East.
15-18	All of Africa, all of South America, and some European and a few Far Eastern.
18-21	Most of Africa. All of South America, South Pacific and New Zealand. Most of the Far East and Asia. A few Europeans.
21-00	Most of the South Pacific, New Zealand and Australasia. Antarctica and most of deep South America. A few Europeans.

cycle is measured by the value of smoothed sunspot number.

A smoothed sunspot number in the upper 90's is forecast for November, 1978, as the present cycle continues to climb at an accelerated rate.

V.h.f. Ionospheric Openings

Solar activity is now high enough to permit fairly regular F-2 layer openings on the 6 meter band. During November, some transcontinental 6 meter openings should be possible, as well as openings between Hawaii and the mainland. DX openings from the USA towards South America, from the eastern states towards Africa and from the western states towards the South Pacific, New Zealand and Australasia should also be possible on 6 meters this month. The best time to check for 6 meter F-2 layer openings is from just before Noon, through the late afternoon hours.

Some TE-scatter type openings should also be possible on 6 meters during November, particularly between the southern tier states and deep South America. The evening hours are the best time to catch TE openings, between approximately 8 and 11 p.m., local standard time.

While signal levels may at times be exceptionally strong during 6 meter F-2 layer openings, they are expected to be weak, with considerable flutter fading during TE openings.

Two short, but significant meteor showers are expected during November, which should make possible some meteor-scatter type openings on the v.h.f. bands. The *Taurids* shower, which is expected to last for a day or two, should peak on November 4, with an expected meteor count of about 15 an hour. A second shower of about the same duration and intensity, called the *Leonids*, should peak at about 5 a.m. EST on November 17.

Some auroral-type v.h.f. ionospheric openings are likely to occur during November, particularly when ionospheric conditions on the h.f. bands are BELOW NORMAL or DISTURBED. Check the "Last Minute Forecast" at the beginning of this column for the days that are most likely to be in these categories this month.

This month's column contains Short-Skip propagation data for use between distances of approximately 50 and 2300 miles, and between the states of Alaska and Hawaii and the Continental area of the USA.

Good luck in the c.w. section of the *CQ* World Wide DX Contest, and please let me know how the special Contest propagation forecasts work out.

73, George W3ASK

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 80 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. 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 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.

3). Times 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. On the Short-Skip Chart appropriate *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 4 hours in the MST zone; 3 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 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 10dB loss, it will lower by one level.

5. 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.

CQ Short-Skip Propagation Chart
November & December, 1978
Local Standard Time at Path Mid-Point
(24-Hour Time System)

Band (Meters)	*Distance From Transmitter (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	*Nil*	07-09 (0-1) 09-11 (0-2) 11-15 (0-3) 15-16 (0-2) 16-18 (0-1)	07-08 (1) 08-09 (1-2) 09-11 (2-3) 11-15 (3-4) 15-16 (2-3) 16-17 (1-3) 17-18 (1-2) 18-20 (0-1)
15	*Nil*	08-10 (0-1) 10-16 (0-2) 16-18 (0-1)	07-08 (0-1) 08-09 (1-2) 09-10 (1-3) 10-11 (2-3) 11-16 (2-4) 16-18 (1-2) 18-20 (0-1)	07-08 (1) 08-09 (2) 09-11 (3) 11-16 (4) 16-18 (2-3) 18-20 (1-2) 20-22 (0-1)
20	09-11 (0-1) 11-15 (1-2) 15-17 (0-1)	07-09 (0-2) 09-11 (1-3) 11-15 (2-4) 15-17 (1-4) 17-18 (0-3) 18-20 (0-2) 20-07 (0-1)	07-09 (2-3) 09-11 (3-4) 11-17 (4) 17-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-07 (1)	07-09 (3) 09-15 (4-3) 15-18 (4) 18-19 (3-4) 19-20 (3) 20-21 (2-3) 21-22 (2) 22-00 (1-2) 00-06 (1) 06-07 (1-2)
40	07-08 (0-2) 08-09 (1-3) 09-17 (4) 17-19 (2-3) 19-21 (1-2) 21-07 (0-1)	07-08 (2-3) 08-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-20 (2-4) 20-21 (2-3) 21-06 (1-2) 06-07 (1-3)	06-08 (3) 08-09 (3-2) 09-15 (3-1) 15-17 (4-2) 17-20 (4) 20-21 (3-4) 21-03 (2-4) 03-06 (2-3)	06-08 (3-2) 08-09 (2-1) 09-15 (1-0) 15-17 (2-0) 17-19 (4-3) 19-03 (4) 03-06 (3)
80	08-21 (4) 21-00 (3-4) 00-04 (2-3) 04-07 (2) 07-08 (3-4)	08-09 (4-2) 09-16 (4-1) 16-18 (4-3) 18-00 (4) 00-04 (3-4) 04-07 (2-3) 07-08 (4-3)	08-09 (2-1) 09-16 (1-0) 16-18 (3-1) 18-20 (4-3) 20-04 (4-3) 04-07 (3) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (1-0) 18-20 (3-1) 20-04 (4) 04-06 (3-2) 06-07 (3-1) 07-08 (1)
160	07-09 (3-2) 09-11 (2-0) 11-17 (1-0) 17-19 (3-2) 19-07 (4)	07-09 (2-1) 09-17 (0) 17-19 (2-1) 19-04 (4) 04-07 (3-2)	07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-21 (4-2) 21-04 (4) 04-06 (2) 06-07 (2-1)	07-19 (0) 19-21 (2-1) 21-04 (4-3) 04-06 (2-1) 06-07 (1-0)

ALASKA
November & December, 1978
Openings Given in GMT #

To	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	16-18 (1) 18-23 (2) 23-01 (1)	15-17 (1) 17-20 (2) 20-23 (3) 23-00 (2) 00-02 (1)	12-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-05 (1)	06-12 (1) 07-11 (1)*
Central USA	18-20 (1) 20-23 (2) 23-01 (1)	16-18 (1) 18-20 (2) 20-00 (3) 00-02 (2) 02-03 (1)	12-17 (1) 17-18 (2) 18-21 (1) 21-23 (2) 23-03 (3) 03-04 (2) 04-06 (1)	06-08 (1) 08-13 (2) 13-14 (1) 07-12 (1)*
Western USA	18-20 (1) 20-21 (2) 21-22 (3) 22-00 (2) 00-02 (1)	17-19 (1) 19-21 (2) 21-22 (3) 22-00 (4) 00-02 (3) 02-03 (2) 03-04 (1)	12-17 (1) 17-20 (2) 20-22 (3) 22-01 (4) 01-03 (3) 03-05 (2) 05-07 (1)	02-03 (1) 03-05 (2) 05-14 (3) 14-15 (2) 15-16 (1) 04-06 (1)* 06-14 (2)* 14-16 (1)*

HAWAII
November & December, 1978
Openings Given in Hawaiian Standard Time #

To	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	06-07 (1) 07-10 (2) 10-11 (3) 11-13 (4) 13-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	13-15 (1) 15-17 (4) 17-21 (3) 21-00 (2) 00-06 (1) 06-08 (2) 08-13 (1)	18-19 (1) 19-20 (1) 20-01 (3) 01-02 (2) 02-04 (1) 19-20 (1)* 20-01 (2)* 01-03 (1)*
Central USA	06-07 (1) 07-09 (2) 09-10 (3) 10-14 (4) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-11 (2) 11-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-09 (3) 09-14 (2) 14-16 (3) 16-18 (4) 18-22 (3) 22-00 (2) 00-06 (1) 06-07 (2)	18-19 (1) 19-20 (2) 20-02 (3) 02-03 (2) 03-05 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Western USA	07-08 (1) 08-09 (2) 09-10 (3) 10-12 (4) 12-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-13 (3) 13-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	08-10 (4) 10-16 (3) 16-22 (4) 22-00 (3) 00-03 (2) 03-06 (1) 06-08 (2)	18-19 (1) 19-20 (2) 20-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)* 20-21 (2)* 21-04 (3)* 04-05 (2)* 05-06 (1)*

#See explanation in "How To Use Short-Skip Charts" in the box at the beginning of this column.

*Indicates best time to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2), or higher.

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For openings over shorter distances, use the preceding Short-Skip Propagation Chart.

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The November, "Story of The Month" courtesy of Art, WØBK and Jim, WØFF is:

The 1978 MARAC County Hunter's Convention

The 1978 MARAC County Hunter's Convention held at St. Louis, Missouri July 6, 7, 8, and 9 was a huge success and a good time was had by all.

By all, we mean well over 200 being at the Saturday evening banquet, representing 32 states.

*P.O. Box 73, Rochelle Park, NJ 07662

USA-CA Honor Roll

3000		1000	
WØIU	211	WØIU	489
2500		WB5NFS	490
WØIU	267	WA6OKQ	491
WØLRH	268	500	
2000		JA2HGA	1262
WØIU	317	K1YRP	1263
WØLRH	318	WØIU	1264
1500		WB5NFS	1265
WØIU	368	KH6HC	1266
WBØMIX	369	WB9YZE	1267
CT1QZ	370	OK1WC	1268
K2UVG/6	371	DJØYD	1269

Yes, 32 states were represented in the registration and those attending included Ontario, Canada and New Zealand.

Those registered but not attending included: Les, WB4TNY; Henry, W9CRN, and Bob, WØKMH.

Those attending but not registering included: Joe, K3VQD; Tom, KBØAP; and Max, ZL1WE.

Those not able to attend but who sent for tickets included: W1LQQ, K4ELK, WA4HXG, WB4TNY, W5AWT, W5UMD, W7BQG, W7GHT, W7GL, W7KOI, W7LUQ, W8CXS, WB8JIX, WB8MDG, W8WT, W9CFS, W9CRN, K9HCK,

Holders of all counties awards

Row 1: *W9CNG, W5TQE(ex WØYLN), W4GGU, WBØCQO, WAØUPL, W8WUT, K9QGR, WAØYJL.* **Row 2:** *W9ABM, W6CCM, WØFBB, WØGV, K1UNM, WB9NHM, K2PBU, K9HRC.* **Row 3:** *WAØGZA, W1DIT, WA5YSC, W9JR, WAØDCQ, WØBK, KØPFV, WAØWOB.* **Row 4:** *K9DCJ, WB9DCZ, VE3CBY, W5HDK, W9ZD, KØAYO, W4IZR.*

That fine bunch at the 1978 MARAC County Hunter's Convention

Row 1: *WØDSY, W5TQE, W4GGU, WØOWY, WB8YBH, W5FS, WBØCQO, WAØYJL, WAØATI, XYL-WØLRH, WØFF, K2PBU, WØGV, grandson-WØGV, WA2RYQ, K9QGR, K9HRC, K7GNC, WAØDCQ, W3RWJ, N7TT Jr. op., N7TT, W9LMT Jr. op.* **Row 2:** *W9CNG, XYL-W9CNG, WA5YSC Jr. op., W9JR, K1UNM, WB1ENJ, W8WUT, W9CTA, XYL-W9CTA, WØLRH, XYL-WB4AIL, WB4AIL, WØMRJ, WB4UPW, XYL-WB4UPW, WB4UPW-Jr. op., WB9QDX, N9TN, XYL-K9GTQ, K9DCJ, W9LMT.* **Row 3:** *WA5YSC, WA5YSC Jr. op., WD5HNG, WBØOSV, XYL-WBØOSV, XYL-WØACK, WØACK, niece-WØACK, WB9NUL, XYL-WØGV, WØGV, YL-WØGV, XYL-WBØJYB, WBØJYB Jr. op., WBØJYB Jr. op., WBØJYB Jr. op., WBØJYB, XYL-WBØICP, WBØICP, WB4RVW, K9GTQ Jr. op., XYL-W9LMT.* **Row 4:** *W9ABM, W9GBI, WAØGZA, XYL-Jiggs, WN5MBS, K2KQC, W5ILR, XYL-W5ILR, K5WQM, WA4CHI, W6CCM, K8FO, WØBK, WBØGRN, XYL-WBØGRN, XYL-K9PBV, K9PBV, WB7EME, XYL-K9GTQ, KØRRO, XYL-WØBL.* **Row 5:** *WD9AXF, XYL-WD9AXF, W1DIT, K4ZT, WB8SNO, WA8WPR Jr. op., YL-WA8WPR, WA8WPR, YL-WA8WPR, WAØUHC, XYL-WAØUHC, XYL-WØDG, WØDG, WAØVDO, KØPFV, XYL-K4RQX, K4RQX, W5VQR, WD8MCK, K9DZG, WD9ITF.* **Row 6:** *WB5YRF, K9GTQ, XYL-N5QQ, N5QQ, WA4NPW, WB4VEU, KØDJC, XYL-N9ER, N9ER,XYL-WA8ASV, WA8ASV, WAØSGJ, WBØWPU, XYL-WBØWPU, XYL-KØAYO, KØAYO, WA6HGA, WA6UFY, WB9NUL, WA9BHH, WA9BHH Jr. op.* **Row 7:** *WBØUUL, XYL-WB2CUI, WB2CUI, WB2CUI Jr. op., WB2PJE, W4KFA Jr. op., W4KFA, XYL-W4KFA, W4KFA Jr. op., ZL1WE, WB9AAJ, W6TKV, W4IGW, K8ODY, XYL-WB2NFB, WB2NFB, XYL-WAØWOB, WAØWOB, W9ZD.* **Row 8:** *W8WUU, WØBM Jr. op., WØBM Jr. op., WØBM, XYL-WØBM, WBØSPT, XYL-WBØELJ, WBØELJ, YL-WBØELJ, W4ISF, W4MNZ, XYL-W3FVU, W3FVU, K80DY, WB9RCY, N9WA, KA8BAA, YL-WD8MCL, WD8MCL.* **Row 9:** *XYL-WBØHLW, WBØHLW, XYL-W5HDK, W5HDK, K4IUO, XYL-K4IUO, W4OWY Jr. op., XYL-W4OWY, W4OWY, WD4KQN, WB9TKR, WØPUD, VE3CBY, WB9DCZ, W4IZR, K9CSL, K1VKY, W8RKL, WD8AAE.* **Row 10:** *Judy, Cheryl, Dolores, Carol, Sue Gohndrone, W1SXX. NOTE: Those apparently not in the photographs include: Harry, WB4RTC, Rundy, K4ZA, Rick, WB5YEF, George, WA6CQW, Patti, WD8BTV, Jim, WA8PWR, Dixie, WD9ITE, Jim, W9NS, Max, W9SOM, Charlie, WØBL, Jim, WBØTVL and Barbara, WBØUVO.*

WB9SPD, W9WDN, WA9ZRP, WØKMH, and KØMT. Missed by all, Jack, WØSJE.

In addition to the 32 states being represented, 5 additional states were represented by those sending only for tickets.

The state of Illinois led with 12, Missouri and Minnesota were next with 10 each. Florida and Kansas followed with 9 each, then Texas and Wisconsin with 6, Michigan with 5, California and New York with 4, Colorado, Iowa and Virginia with 3. Arizona, Nebraska, Oklahoma, Pennsylvania and West Virginia with 2 each. Then Alabama, Arkansas, Connecticut, Georgia, Kentucky, Maine, Massachusetts, New Jersey, North Carolina, Rhode Island, and Tennessee with one each.

The Zero district led with 40 present, the 9th district had 30, the 4th had 19, the 8th 13, the 5th had 11, the 2nd 6, the 1st, 6th and 7th had 5 each, and the 3rd district had 3.

Prizes awarded and winners were too numerous to mention, except to say that the Triton IV was won by Bob, WØKMH, Les, WB8SNO won a TR-7400A, Charlie, K7GNC a watch and Elred, W5ILR won a 20 meter beam and rotator.

Jim, WØFF, says, "I personally had a good time putting the convention together and spent many hours worrying about all the details. Without Art, WØBK, I don't know where I'd have been. Our prize committee from Macon did an outstanding job and furnished us with some great prizes, they are also to be commended (also those who donated those prizes). Sunday afternoon as we started home we could not believe it was over. Dave, W6CCM, George, WA6CQW and wife Jean (AA) came home with us and as we sat around talking it over, I felt relieved and sorry it was over, at the same time.

We ended the convention solvent, and will have a surplus to go toward the next conventions, as needed. Again thanks to all for your kindness and help in making it a really good and successful convention.

The Holiday Inn was very happy about our convention and expressed the best wishes of the management and felt that ours was the finest bunch they had ever had the privilege to serve".

Awards Issued

Clayton Donaldson, WØIU acquired USA-CA-500 through USA-CA-2500 endorsed all SSB; all Mobiles; all 14 MHz. Also USA-CA-3000 endorsed Mixed.

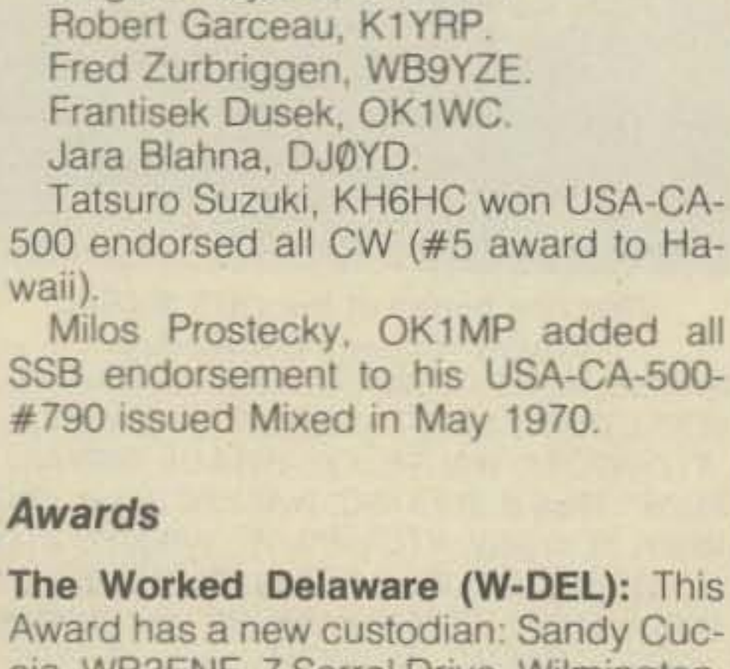
Tom Duderstadt, WØLRH obtained USA-CA-2000 and 2500 Mixed.

Jim Roberts, WBØMIX was issued USA-CA-1500 endorsed Mixed.

Bert Pinto, CT1QZ claimed USA-CA-1500 endorsed all SSB (#4 to Portugal).

Hank Kahrs, K2UVG/6 applied for USA-CA-1500 endorsed Mixed.

Lynn White, WB5NFS qualified for USA-CA-500 and 1000 endorsed all SSB.


This is to certify that

has been elected a member of the
RADIO AMATEURS
Old Timers' Club

and is authorised to nominate other qualified amateurs
for membership.

Membership is accorded to radio amateurs who have
been qualified to hold an amateur licence for 25 years.

The objects of the Club are to promote the interests and
good fellowship among older members
in the common cause.

Date
Original No. Australia

Old Timers' Club of Australia

Paul Veltman, WA6OKQ collected USA-CA-1000 endorsed all SSB.

Mixed USA-CA-500 Certificates went to:

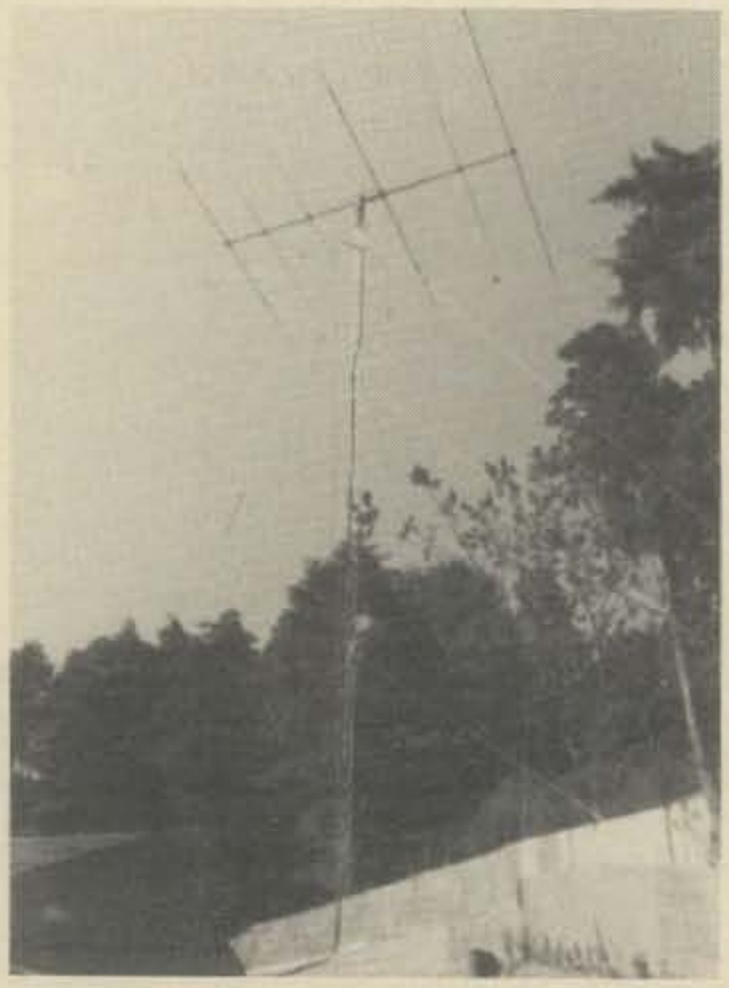
Shigeto Kayano, JA2HGA.
Robert Garceau, K1YRP.
Fred Zurbriggen, WB9YZE.
Frantisek Dusek, OK1WC.
Jara Blahna, DJØYD.

Tatsuro Suzuki, KH6HC won USA-CA-500 endorsed all CW (#5 award to Hawaii).

Milos Prostecky, OK1MP added all SSB endorsement to his USA-CA-500-#790 issued Mixed in May 1970.

Awards

The Worked Delaware (W-DEL): This Award has a new custodian: Sandy Cuccia, WB3ENF, 7 Sorrel Drive, Wilmington, Delaware 19803. This Certificate of Achievement is issued for confirmed QSOs with the three Counties of Delaware which are: Kent, New Castle and Sussex. QSOs after May 1956 are valid. Send QSLs and postage for their return and also to cover postage of the Award to Sandy, WB3ENF. The award is sponsored by the Delaware Amateur Radio Club.



Working on the antenna at CT1TZ (Mat.)

Iowa-Queen of Sports Award: This award which was pictured on page 86 of *CQ* of August 1978 has some rule changes, so here are the corrected rules:

1. All contacts must be made after January 1, 1978.
2. Points:

A. U.S. Stations need total of *ten* points.

B. DX, Iowa, and states bordering Iowa need total of *five* points. All applicants must make *one* contact with a 10 - X member station in Knoxville, Iowa.

3. Point Count:

A. *Five* points for any 1st State Award Holder of the Queen of Sports Award.

B. *One* point for 10—X member in Iowa.

C. *One* point for Queen of Sports Award Contact.

D. *Two* points for DX Station with Queen of Sports Award.

4. Cost: $1.00 + log excerpts.
5. Non-chapter Award.
6. Send to Award Manager: WBØWRL, D. Swisher, 601 West Main, Knoxville, Iowa 50138 *or* WØMHK, B.Grim, 517 East Madison, Knoxville, Iowa 50138.

Old Timers' Club (Australia): This Old Timers' Club was started some 4 years ago by Bob Cunningham, VK3ML/VK2CT, and now has nearly 200 members in and out of Australia and is affiliated with the Wireless Institute of Australia. But membership is open to any Amateur licensed for 25 years in any part of the world. One big purpose is to maintain interests and good fellowship among older members in the common cause, also to set up some Nets to maintain this good fellowship.

Eligibility: a. An amateur who has been qualified to hold an amateur license for 25 years is eligible for membership.

b. Evidence of eligibility to be submitted by applicants should include:

1. Date of original license.
2. Operator's certificate number.
3. Original call-sign held.
4. Present call-sign.

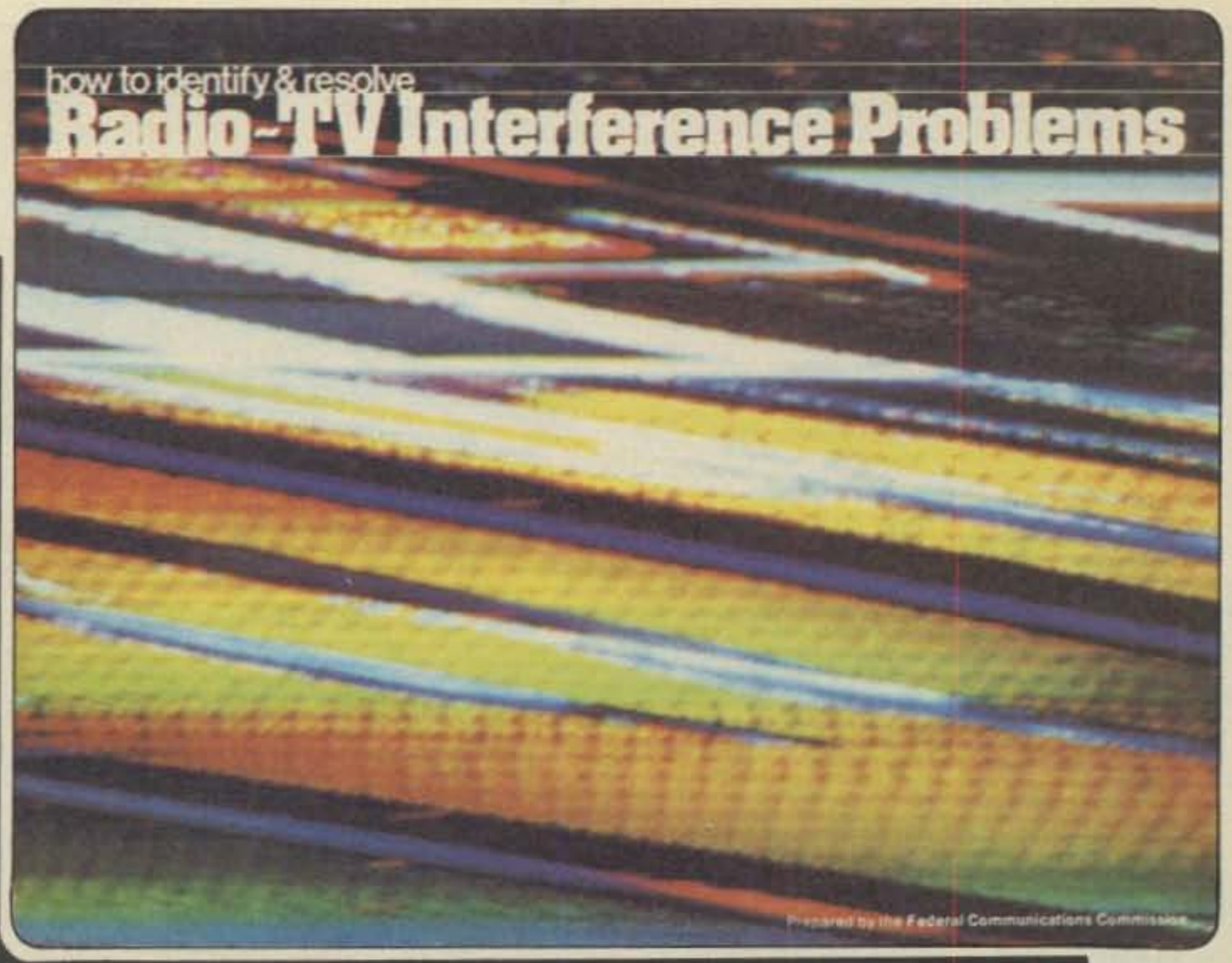
c. All applicants shall be nominated and seconded by two members of the Club.

Forward the above information and $2.00 to: Harry Cliff, VK3HC, P. O. Box 50, Lonsdale, 3225, Victoria, Australia.

Notes

If you find too many mistakes in the column, please excuse me, you get your *first grandchild* only once, our granddaughter, *"Kristen"*, arrived at 11:39 AM Thursday, August 10th, which also happens to be her Daddy's birthday. Karl (daddy) and Debbie (mama) and Helenmae and myself are Flying!

How was your month? 73, Ed., W2GT



Let the FCC's own Radio-TV Interference booklet be your club's first line of defense on the TVI front.

For the first time here's an easy-to-read guide showing all of the classic TVI symptoms and their cures.

Use it as a "handout" by the local TVI committee, defuse tricky "irate neighbor" situations, help the local TV repair shop root out RFI/TVI problems in your area.

This top-quality booklet (40 pages 10¼ x 8") is available in quantities of 12 at $9.00 plus $1.00 shipping. Single copies are available for $1.25, postpaid. Note that the FCC offers the self-same booklet for $1.50 per copy with no quantity discount.

Prepared by the Field Operations Bureau of the Federal Communications Commission and reprinted at low cost by the Publishers of CQ, the booklet offers guidelines for the amateur, non-amateur and CBer alike in dealing with RFI and TVI. A dozen full-color illustrations show most interference patterns with descriptions and solutions for each problem.

The booklet should be on your "must" list for reading and your "do" list to help eliminate the problem. Order a dozen copies today!

CQ 14 Vanderventer Ave.
Port Washington, N.Y. 11050

12 copies $9.00
plus $1.00 shipping

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Address _____

City _____ State _____ Zip _____

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

It is now official, the ARRL Spring DX Contest has been reduced to a single weekend for each mode. It will probably be held the 1st and 3rd weekends of March, Check *QST* for an official announcement and more details.

It is a well known fact that I have been advocating this change for these past many years. So now I am probably expected to make a few choice remarks, with toungue-in-cheek of course.

Not so however, I am happy to see this progressive change. Now there will be more elbow room for other organizations to hold their contest activities.

The ARRL CAC is to be commended for this proposal, and the Board of Directors for finally giving it their approval.

We have received many favorable letters approving our decision of finally holding a WPX C.W. Contest. However many stateside fellows are unhappy that we are holding it on Memorial Day weekend.

We would like to hold it on the last weekend of April but the PACC has held that spot for many years, and no way are we going to barge in and take over. We will just have to do a little more researching.

There was an omission in last month's Column in the paragraph about new phone trophy donors. It should have read, the South American all band trophy is being donated by Rafael Ponce de Leon, CX3BR, and the world QRPp trophy is donated by Adrian Weiss, K8EEGØ.

Just a final reminder of the c.w. section of our World Wide Contest coming up at the end of this month. Complete rules were in the October issue.

If all goes according to schedule the DXpedition to Navassa Island should be on the air for the contest beginning midday Saturday, November 25th.

They will concentrate their operation on all bands 80 thru 10 meters c.w. during the contest weekend and go to s.s.b. later since they will be on the island until December 2nd.

Their call on c.w. will be WØRJU/KP1, and NØTG/KP1 on s.s.b. See John Attaway's DX Column for more details.

See you in the pile-ups.

73 for now, Frank W1WY

* 14 Sherwood Road, Stamford, CT 06905

Calendar of Events

***Oct.**	**28-29**	**CQ WW DX Phone Contest**
†Nov.	11-12	European RTTY Contest
Nov.	11-12	Missouri QSO Party
Nov.	11-12	Int. Police Assoc. Party
†Nov.	12	Czechoslovakian Contest
Nov.	18-19	ARRL Phone Sweepstakes
†Nov.	18-19	Austrian 160 CW Contest
***Nov.**	**25-26**	**CQ WW DX C.W. Contest**
Dec.	2-3	Spanish Phone Contest
Dec.	2-3	Telco. Pioneers QSO Party
Dec.	2-3	Inter. Island DX Contest
Dec.	2-3	ARRL 160 Meter Contest
Dec.	9-10	Spanish C.W. Contest
Dec.	9-10	ARRL 10 Meter Contest
Dec.	9-10	Hungarian Contest

* Covered last month
† Not officially announced.

IARS/CHC/FHC/HTH QSO Party

Starts: 2300 GMT Fri., November 3
Ends: 0600 GMT Mon., November 6

A SASE to K6BX will get you detailed information. Essentially rules are as follows:

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

Scoring: :*For CHC*—1 point per QSO with other CHCers, 2 points if it's a HTHer, 1 additional point if it's a YL, B/P, FHC, Novice, CHC-200, Merit or Club station, or if it's on v.h.f./u.h.f. Double above QSO 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 HTHers.

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

Final Score: Total QSO points from all bands times the sum of the multiplier. Multi-operator 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, 7125, 14075, 21075, 21090, 21140, 28090, 28125. Phone—3770, 3790, 3943, 3960, 7090, 7210, 7275, 14320, 14340, 21360, 21440, 28620, 28690. And 50.1—50.5, 145—147. For U.S. and DX as allowed.

Awards: The Party supports hundreds of certificates and Trophies in all categories and divisions. A SASE will get you a list, include extra postage for ITU, IARU, IARC, IARS country, prefix and zone lists.

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

Three doctors are shown in the above photos. However it's not a medical event we are reporting but events in connection with their hobby. "Amateur Radio." In the photo at the left Doc Evans, W2BBK/PJ8AA has just presented Dr. Hiilesmaa, OH2MM, the Larry LeKashman, W2AB Trophy. Ville won it for making the top world all band score at EA8CR in the 1975 CQ WW C.W. Contest. At the right is Doc Rosen, WA2RAU presenting Ville with the Don Miller, W9WNV Memorial K2HLB Trophy. This award was for his operation at C5AZ, judged to be the top Contest Expedition station in the 1976 CQ WW C.W. Contest.

ARRL Sweepstakes

C.W.: Nov. 4-6 Phone: Nov. 18-20
Starts: 2100 GMT Saturday
Ends: 0300 GMT Monday

There is plenty of activity in this one, especially on the c.w. weekend, between stations in ARRL sections.

In order to minimize QRM to non-contesters it is recommended that operation be confined to certain portions of the bands. It is suggested that you check *QST* for this and other information.

Operating time is limited to 24 out of the 30 hour contest period. And cross-check sheets are required if you make 200 or more contacts. There are several more other operating regulations therefore it is recommended that you send for the "SS package" which includes log and summary sheets and Operating Aid No. 6. A large SASE will get you enough forms for 300 contacts.

Requests and logs go to: ARRL, Communications Dept. 225 Main Street, Newington, CT 06111.

European RTTY Contest

Starts: 0000 GMT Sat. November 11
Ends: 2400 GMT Sun. November 12

Rules for the RTTY contest are the same as the DARC phone and c.w. contest held in August and September, and since they are quite lengthy they will not be repeated here. They were given in detail with a WAE country list in the August Calendar.

There is one exception in the RTTY contest contacts are also permitted between all continents as well as one's own continent, and count 1 point per QSO. They have no multiplier value other than the countries as listed in the rules (ARRL and DARC country lists). QTC traffic exchange is also allowed between all stations, but not between stations in the same country. Everything else remains the same.

North American stations may get copies of the rules, log and summary sheets by sending a large SASE with sufficient postage to H. E. Weiss, WA3KWD, 323 North Street, Millersburg, PA 17061. There are also available from the WAEDC Committee.

Mailing deadline for your contest entry is December 1st and go to: WAEDC Committee, Postbox 262, D-895 Kaufbeuren, Germany.

Missouri QSO Party

Starts: 1800 GMT Saturday, Nov. 11
Ends: 2300 GMT Sunday, Nov. 12

This is the 14th annual party sponsored by the St. Louis, ARC. Activity will be between Missouri and out-of-state stations.

The same station may be worked *once only* in each different Missouri county regardless of band or mode. Missouri mobiles however may be worked and count separate from each county change.

Exchange: QSO no., RS(T) and QTH. County for Missouri; state, province or country for others. (Mo. mobiles will start with no. 1 from each new county.)

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

Frequencies: 3540, 3910, 7090, 7240, 14040, 14270, 21110, 21360, 28110, 28600, 50-50.5.

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

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

Czechoslovakian Contest

0000 to 2400 GMT Sunday, Nov. 12

This is a world-wide type contest but QSOs with Czech. stations have additional point value.

All bands, 1.8 thru 28 MHz. may be used, and contacts may be made both on phone and c.w. The same station may be contacted once on each band for QSO and multiplier credit. (On 160 the OKs are only permitted to operate on c.w. Cross-band and cross-mode contacts are not permitted.)

Classifications: Single operator, both single and all band, and multi-operator all band only.

Exchange: RS(T) plus two figures indicating your ITU zone. (List and map are available from the C.R.C. SASE and 3 IRCs. Also check May '78 issue of *QST*.)

Scoring: One point per QSO, 3 points if it's a Czech. station. Multiply total QSO points by the sum of ITU zones worked on each band for your final score. Own country may be worked for multiplier credit but no QSO points.

Awards: Certificates to the top scoring station in each class in each country. (The Czechs are looking for more stateside participation before making awards by districts.)

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

Use a separate log for each band, include a summary sheet showing the scoring, and the usual signed declaration that rules and regulations have been observed.

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

Int. Police Assoc. Contest

Sat. Nov. 11 and Sun. Nov. 12
0800-1000, 1400-1700, 1800-2000
GMT each dav.

This contest has been organized by the International Police Assoc. Radio Club (German Sect.) to enable participants to get credit for the Sherlock Holmes Award. It's open to non-members as well as members, and to s.w.l.s too.

Exchange: RS(T) and QSO number. Members will identify by sending IPA before their report. (IPA57(9)001)

Scoring: Contacts on 80 and 40 count 2 points, and 4 points on 20, 15 and 10.

The number of IPA countries worked on each band determines the multiplier. An IPA country is only counted if an IPA station has been worked in that country. (The same station may be worked once on each band for QSO and multiplier credit)

Final Score: Total QSO points from all bands times the sum of the IPA multiplier from each band.

Frequencies: C.W.—3575, 7025, 14075, 21075, 28075. S.S.B.—3650, 7075, 14295, 21295, 28650.

Certificates to the top three scorers and credits for other awards.

A large SASE to Vince Gambino, WB4QJO, 7606 Kingsbury Road, Alexandria, VA 22310 will get you all the details and information about the Sherlock Holmes Award.

Mailing deadline for logs is December 31st and go to: Adolf Vogel, DL3SZ, Ritter-von-Eyb-Str. 2, D-8800 Ansbach, Germany.

Austrian 160 C.W. Contest

Starts: 1900 GMT Sat., November 18
Ends: 0600 GMT Sun., November 19

Not much has been heard about this Top Band activity but it has been on for the past couple of years. Although geared for Europeans it is possible for stateside stations to work the OE's and other Europeans under favorable conditions.

Exchange: RST plus a QSO number starting with 001.

Scoring: Each completed QSO counts 1 point. Score a multiplier of 1 for each country prefix worked, 2 multiplier points if it's an OE prefix (OE1-OE9). Final score, total QSOs times the sum of multiplier points.

Frequencies: Austrian stations are authorized to use 1823-38, 1854-73, 1879-1900 kHz. Others according to frequencies authorized in their country. There is also a s.w.l. division with scoring same as above.

Awards: Certificates to top scorers in each country, special awards to over-all winners.

Mailing deadline is December 15th to: Landesverband Salzburg des Oe.V.S.V., c/o Wolfgang Latzenhofer, OE2LOL, Pfeifferhofstrabe 7, A-5020 Salzburg, Austria.

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SELL: CL300 Tri-Bander beam, $100. NC-300 Recevier, $100. Both with manuals. Paulsen, W5FTK, RFD 1, Franklin, LA 70538.

THE FT101 Parametric Amplifier, very unique design, 18 to 25 dB gain. Attaches to RF amp module. Amazing results. Easy installation. Free catalog. American Crystal Supply Co., P.O. Box 638, W. Yarmouth, MA 02673, (617) 771-4634.

SWAN 500C for $450. NC-155, DX-60, HG-10B, $175. WA5KOS, Rt. 1, Box 98D, Olla, LA 71465, (318) 992-8760.

DXERS! Use ham sentences in 54 languages on outgoing QSLs and get results. K3CHP's DX QSL Guide, $3.95. Joe Mikuckis, 6913 Furman Parkway, Riverdale, Maryland 20840.

MULTI-2700, $600. WA1RQU, 17 High Field Lane, Madison, CT 06443, (203) 245-9679.

WANTED: Fourth edition (Dec. 1928) ARRL Radio Amateur's Handbook. W9DDL, 5006 N. Second St., Loves Park, IL 61111.

75A4 Mint, cosmetically perfect, S/N 5973. All mechanical filters, Collins noise blanker, $495. R. Sherman, 83 Fox Blvd., Massapequa, NY 11758.

CQ AND QST Mags. '76, '77, '78, 20 cents each, 12 for $2.00 plus postage. W2JBL, 123 Davis Ave., Hackensack, NJ 07601.

WANTED: Towers, rotator and tri-band beam also TS-520. WA1RQU, 17 High Field Lane, Madison, CT 06443, (203) 245-9679.

HAL DS-3000 KSR with vido monitor and the HAL ST-6000 with all cables and orginal boxes 2 months old, $1,500. J.P. Johnson, WB4BYO, P.O. Box 26037, Jacksonville, FL 32218.

COLLINS 75A4, KWS-1, speaker and cables. Sell as a unit, no shipping. W8IM, R. Sever, 248 Sheraton Dr, NW., No. Canton, OH 44720.

QUIT HAMMING SALE: Yaesu FT101E, Yaesu FT221R, much more. SASE for big list. R. Hajdak, 1644 Morris St., SE, Mineral Ridge, OH 44440.

CAPACITOR variable small 3 section 430 mfd each for PI output, antenna tuner, new $3 postpaid. Art Ford, 56 Gildare Dr., East Northport, NY 11731.

WANTED: Vibrofles, will swap Swan 406B VFO for Swan 410 VFO. WB1HKV, Rick Kickson, 40 Mathewson Ave., Enfield, CT 06082.

FOR SALE: Squirrel cage blower, 6" dia x 4" with 230 volt motor. $10. Burke, WA2SLK, RR1, Box 164A, Farmingdale, NJ 07727.

SELL Clegg 27B, four position switch, perfect condx. $175. W2LXC 163-10 20 Ave., Beechhurst, N.Y. 11357.

SELL: Used copperweld by the pound, no. 12 no. 14 50 cents/lb. Xfmrs 3600-0-3600 at 1.5 Amp $60; 1 Amp $40 with 110/220 Pri. W0AIH, Paul Bittner, 1616 South St., Eau Claire, WI 54701.

TIRED of the same QSL styles? Samples, 50 cents. WA9VLK, Box 1664, Kankakee, IL 60901.

QSL CARDS: Free samples. Send addressed business envelope with 28 cent stamp. Your custom design using my samples for ideas. Marv Mahre, W0MGI, 2095 Prosperity Ave., St. Paul, MN 55109.

WANTED: Early AC radios, state condition, make, model and price. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

DXERS! Ham sentences in 54 languages on your QSL cards get prompt replies. K3CHP's DX QSL Guide, $3.95. Joe Mikuckis, 6913 Furman Pkwy., Riverdale, MD 20840.

GENERAL RADIO 1001-A Signal generator, excellent condition, with GR-874 to PL-259 adaptor cable and manual, $300 FOB UPS. W6TDA, PhD, 5220 Carlingford, Riverside, CA 92504.

SELL: Heath GR-54, mint, You pay shipping, $65. C. Klawitter, 4627 N. Bartlett, Milwaukee, WI 53211.

SLOW SCAN- Venus SS2 monitor like new $225. Firm. N200, Bob Schenck, 212 Oak Leaf Dr., Tuckerton, N.J. 08087. 609-296-0307.

SELL CQ ALL, 73 ALL, Ham Radio All, R9 and Radio 33-42, QST 21-78, RCA Review 36-65 SASE with offer, N2IN 8 Winding Way Denville, N.J. 07834.

LINEAR BUILDERS Send SASE for list of goodies W6RW, 8600 Skyline Dr. Hollywood CA 90046.

EICO no. 435 scope $80, Weston 0-1 MA-meter $6 Eico 221 VTVM $20, PPD, SASE Misc. items, W9DI, 13 E. Hickory St. Hinsdale, IL 60521.

WANTED 75A4 Serial number over 5000 with manusl and 500 HZ filter. R. Umbraco, 723 Ventura St., Richmond, CA 94805.

LOOKING FOR Western Electric M/N528 headset with headband (40-50 OHMS) with Navy/CG type split-phone cords. Will buy headset, cords or both. Good to VG Condition. Otto Freytag, 301 East 24th St. Rivera Beach, FL 33404

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HOW MUCH FOR 75-10 HD Mor-Gain in orig carton. SASE for info. Brown, 1484 Elm Ave. Longbeach, CA 90813.

HAL 2550 IAMBIC KEYER $50, Autek QFI Filter - $45 Dynascan VTVM $50 - Gary, WA8KME, Box 278, Lawton, MI 49065. 616-624-5961.

SELL: U.S. made, SSB/CW, 400W. input xcvr Swan 400/410 VFO, AC supply in spkr., manual. $285 ships. WB9JHW, Box 18139, Milw., WI 53218.

ROTATOR, MIMS massive heavy duty w/control box $150; FPM Mk2 transceiver modified internal keyer, SWR, MFJ CW filter, clean wrk, $400 Art Ford, 56 Gildare Dr., East Northport, N.Y. 11731.

WANTED: SSB adaptor for DX-100B also 6 meter rig. James, Wood, N4ACL, 7304 Dixon Ave., Tampa, FL 33604.

NEW AM FILTER for Yaesu FT-101's or FT-301's $29. postpaid K8AQ, Len Malone, 949 Havensport, Cincinnati, OH 45240.

IMPORTANT NEWS FROM YAESU

This is to advise that early Yaesu advertisements for the new FT-225-RD were incorrect, in that they tend to indicate that the Memory unit was included in the price, whereas in fact, it is an option.

We apologize for this error and hope that this has caused our valued customers no inconvenience.

Vy 73, YAESU ELECTRONICS

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TEST EQUIPMENT collector's surplus, HP, GR, Tek. Excellent stuff. Free list. PhD, 5220 Carlingford, Riverside, CA 92504.

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WANTED: Like new NC303 National receiver. John Shiels, 3212 Chestnut St., Murrysville, PA 15668.

WANTED: Manual for Lafayette HE-40 general coverage receiver. Mark Osinski, 21230 Lakeland, St. Clair Shores, MI 48081.

WANTED: Drake TR-22C two meter rig in any condx. K9KC, 4 Shore Circle, St. Joseph, IL 61873, (217) 469-7554.

SELL: B & W T/R switch, new, unused, $7. Astatic model GD-104, mint, $22. David Mitchell, 1620 Young Rd., Lithonia, GA 30058.

WANTED: Small power transformers, 500-650 v.c.t. 40-70 ma. 6.3v at 2A, Stancor PC-8436, Triad R-4-A, R-5A, or similar equivalents; any quantity. Alvin Bernard, WA2 JTN/4, P.O. Box 14576, Orlando, FL 32807, (305) 277-1992.

FOR SALE: National Receiver, NC 300, $100 National Speaker, $10. Hammarlund SSB Transmitter HX50 with 160 meters, $150. Gonset Linear Amp, 80-10 meters GSB 201, 550 Watts RMS output, $250. Johnson VSWR Meter, $15. Johnson 6N2 Converter for NC300 $25. Dynamic Mike and Stand for HX50 $25. All above for $500 cash. Gonset GC105 2 meter AM transceiver $75. W2JBI, S. Krevsky, 69 Judith Rd., Little Silver, N.J. 07739, Phone 201-741-4918 or 201 532-5952

I'M LOOKING FOR CW/SSB Skeds with Wyoming and North Dakota, I need QSL's for WAS, Richard Servan, CX2AQ, 25 de Mayo, 587 ap. 202, Montevideo, Uruguay.

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RADIO MUSEUM now open. Free admission, 15,000 pieces of equipment from 1850 telegraph instruments to amateur and commercial transmitters of the 1920s. Amateur station W2AN. Write for information: Antique Wireless Association, Main St., Holcomb, NY 14469.

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LOOKING FOR old Lionel trains. Interested only in "O" Gauge, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap radio gear to meet your needs. Write: Dick Cowan, WA2LRO, c/o CQ Magazine, or call (516) 883-6200.

FOR SALE: Spectra Physics 137P 2mw laser tube, brand new, never used, $80. G.R. 572B 1 kHz Hummer, $15. Irwin Math, 320 Northern Blvd., Great Neck, NY 11021.

FOR SALE: Old issues of Ham Radio, 73, CQ, and QST. Some complete runs. Send s.a.s.e. for lists and prices. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

HW-202 w/built-in Sandlin scanner, crystals; ITC Multi-2000; Bearcat 101 scanner. All good condition. Karl Thurber, W8FX/4, 233 Newcastle Lane, Montgomery, AL 36117.

WANTED: Extra coils for SW-3 receiver. I have odd-ball coils and need your single extras to make up complete set. Buy or trade. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

SELL: 2 meter FM Sonar transceiver, AC P/S, mobile bracket, $175. Heath HW-32A with spare tubes, $65. George Pataki, WB2AQC, 34-24 76th St., Jackson Hgts., NY 11372.

WANTED: Comercial outdoor type 50 ohm dummy load; 2 kw or greater. Rod, W7OM, 5632 47th Ave., SW, Seattle, WA 98136.

SALE: Sony ICF-5900W multi-band receiver. Designed for SWLs. Like new condition w/ manuals. $100. Schultz, W4FA, Box "L", FPO, New York 09544.

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"DX-pedition" XYL approved? VP2M QTH for rent. Beautiful brand new house. 2 1/2 acre tropical garden overlooking Caribbean and mountains. Swimmingpool, 3 bedrooms, maid-service. Hamshack and antenna farm. VP2MF, Box 272, Plymouth, Montserrat, West Indies.

FOR SALE: Manuals for some 540 series and older Tektronix oscilloscopes and plug-ins. Send stamp for list. WB0NPM, 7741 Chanhassen Rd., Chanhassen MN 55317.

SWAN 350 All Band SSB/CW and P.S. cheap. Will deliver in So. Cal. G. Andary, N6UU, 4674 Olive, Montclair, CA 91763, (714) 626-7325.

MANUAL WANTED: Morrow CM-1 Conelrad Monitor. Have manual for Morrow converter 5BR-2/5BRF-2/5BRLN-2. N0RF, 603 Joyce Ann Dr., Manchester, MO 63011.

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TRS-80 Microcomputer system, 4k, Level I Basic, complete with monitor, recorder, etc. New, in original box. Save $100—$495.00, will ship. V.M. Faulkner, RR2, Box 294A, Yorktown, IN 47396.

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NOSTALGIA BUFFS and old radio fans. Copies of rare 1943 edition 36 page Allied Radio Builder's Handbook. Circuits, theory, and inspiration for beginner. Great for gifts! $6.95 each postpaid. Ohio residents add 4 1/2 state sales tax. R.A. Russ Co., Box 601 Fairborn, Ohio 45324.

FOR SALE: Hy-Gain 18AVT-WB, 10-80 meter trap vertical, new in sealed carton, $70. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

FOR SALE: Cushcraft A147-22, stacked 11 element 2 meter beam, $70. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

NOVICE XTALS: 80: 3725, 30, 35, 40 also have 40 meter xtals, some freq standards. Also desperately need stero rcvr, pse sacrifice. M. Stennett, 315 Country Club Ln., Atlantic Beach, FL 32233.

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TRANSFORMERS: 10VCT, 13A - $10; 10 VCT 10A $10; 1100VCT, 300 MA + 960 VCT, 330 MA + 700V, 70 MA - $25; 10 Watt Modulation $5; Capacitors: 1800 UF, 350 V $4 Total of 12. Roland Guard, 301 Acalanes Dr., no. 49, Sunnyvale, CA 94086.

813 Sockets - $5; 8008 Sockets $5 (removable pins can be used on 4-1000A), 4-65A Sockets $1, 9 Pin (12AU7) Sockets with shield base - 10/$1, Subminiature 8 pin pencil tube sockets 10/$1, 3 Pin Xsistor PC sockets - 10/$1. Roland Guard, 301 Acalanes Dr. no. 49, Sunnyvale, CA 94086.

SPECIAL 250HZ 8 Pole CW Filter for TS-520 new only $40.00 Len Malone, K8AQ, 949 Havensport, Cincinnati, OH 45240.

SELL: Vibroplex, "Vibro-keyer", mint, $30. David Mitchell, 1620 Young Rd., Lithonia, GA 30058.

SELL: Galaxy GT 550 10-80M Transceiver. Brand new $275. WD0FBM, 507-7[illegible]-2232.

TEST EQUIPMENT collector's surplus, HP, GR, Tek. Excellent stuff. Free list. PhD, 5220 Carlingford, Riverside, CA 92504.

QSL QSL QSL QSL Please send QSL Cards to Philip Steven Kurland, P.O. Box 1686 New Haven, CT 06507.

QSL CARDS Ham-CB reprints or design your own. As low as $13.95 per 1000. J. Secovnie, P.O. Box 462, Frederick, MD 21701 or (301) 662-7753 (after 5)

WANTED: VFO for Globe Scout, 80-10 meters. Dwayne Kincaid, WD8OY6, P.O. Box 18, Clear Creek, WV 25044, (304) 877-5471 after 4PM

WANTED: Pre 1930 radios, tubes, parts and literature. Also pre 1940 amateur equipment. Troe, 111 Skyline, Morristown, N.J. 07960.

FOR SALE: Complt Hal RTTY Station DS-3000 V-3 and the ST-6000 3 mos. old. Send SASE for info. J.P. Johnson, 7602 Timberwood Dr. Jacksonville, FL 32224.

WANTED: Hallicrafters HA-10, HT-45; any national receiver, working or not. T.N. Colbert, 1800 Rhodes Rd. no. 612, Kent, OH 44240.

WANTED SW3 and other early amateur and wireless equipment. also early broadcast sets, Troe, 111 Skyline, Morristown, N.J. 07960.

SELL: Silicon Plug-in Rectifiers. Sarkes T. No. S5343. Replaces 816, 866, 3B28 etc. New. $4.00 ea. W4JGO, 643 Diamond, Salem, VA 24153.

MOTOROLA VHF dest top monitor rec $25. G.E. 30-50 MC Public Service mobile receivers 10 for $100. K6KZT 2255 Alexander Ave., Los Osos, CA 93402.

NEW CALL! WA3BGN/1 is now AA1K. Jon P. Zaimes, 72 Oronoque Trail, Shelton, CT 06484.

WANTED: DC supply for Tempo One, 572B tubes, triband beam. Will Roberts AA4NC, Box 907 Roseboro, N.C. 28382.

RCA IP 501 Rcvr. wanted. R. Randall, K6-ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

100's of Motorola manuals, 1940's, 50's, 60's, 70's. Many GE's, RCA's, Heath. SASE your needs one book or all. Farmer 3605 No. Columbia, Plainview, TX 79072.

WANTED: Manual and/or alignment info for Allied Knight R-100 Rcvr. WD8DAS, Steve, 823 Irvington, Massillon OH 44646.

WANTED: 12AH8 Tubes for well known 50 PAC DXer. Pls Contact QSL Mgr. W0JRN, Give Price, etc. D. J. Shearer, 5985 S. Milwaukee Way, Littleton, CO 80121.

YAESU FT-101; 10-80 Meters. SALE: $400. or best offer. R.E. Dorn, 645 W. "C" St., Burns, OR 97201.

SELL: 4CX300A's & 4X150A's. Pull-outs from military surplus. GTD. $5.00 ea. W4JGO 643 Diamond, Salem, VA 24153.

WANTED: Any Novice equipment for my Novice class graduates. Transmitters, receivers or transceivers. Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, N.Y. 11355. Local only. Will pick up.

WANTED: A few good 4X150A and 12AT7 tubes. W7KE, 1109 S. 2nd St., Hamilton, MT 59840.

SELL: Heath VF-1, VFO adn Eimac AF-67A. Best offers. Contact Joe Reinhardt, 106 Pine St., Garden City, N.Y. 11530 or call (516) 742-8837.

AMATEURS: We have what you need at the lowest prices possible. Write us for a price quote. Unit 65 Communications, P.O. Box 312, Mansfield Center, Conn. 06250.

WANTED: Used Xcvr. Yaesu 101, 401 or Kenwood 520, also linear. Will pay cash! WB6OHK, 704 Edwards Lane, Visalia, CA 93277.

SELL: Swan 240 with Swan AC Supply $150. Clean (213) 346-5871. WB6VNR, 7104 Deveron Ridge, Canoga Pk., CA 91307.

EXPERIMENTER'S DREAM, 5 page list of parts and equipment cleanup. Send large stamped, addressed, envelope, W4API, Box 4095, Arlington, VA 22204.

FOURTH EDITION (Dec. 1928) ARRL Radio Amateur's Handbook wanted. W9DDL/W9SS, 5006 N. Second St., Loves Park, IL 66111.

WANTED: 572B/T160L's at reasonable price. Art Ellis, W8PBO, 11064 Speedway, Utica, MI 48087.

WANTED: 6M SSB rig. WD8KRE, 27 Boehler St., Tiffin, OH 44883.

QST 1920-63 request list and make offer for lot. W0QZZ, 12 Clerbrook, St. Louis, MO 63124.

Please send all reader inquiries directly

VFO Bud 40-80 meters w/coils, $22. Simpson Therm-o-meter mod. 388. Hamilton, 6050 North Oakley, Chicago, IL 60659.

TRADE: FM-27B and new Clegg FM-28 for RX/TX combo. A.C. Bell, P.O. Box 562, Deming, NM 88030.

SELL: HW8 p.s. ohones, 4 months old, mint condx, $120. I ship USA. Charles Casey, AA4BA, 206 Queen Guenever Terrace, Garner, NC 27529, (919) 772-1428.

SSTV AND PHOTOGRAPHERS: Make offer, I each, like new, Fujitar Lenses, 135mm, f 4.5, telephoto, 35mm, f 3.5, wide angle. Cary Cowan, c/o CQ Magazine, or call (516) 883-6200.

SELL: CQ Magazines complete. Reasonable offers, cash or trade. Nagle, 12330 Lawyers Rd., Herndon, VA 22070.

WANTED: Pre-war issues of Short Wave Craft Magazine. Bill Orr, W6SAI, Eimac, 301 Industrial Way, San Carlos, CA 94070.

WANTED: Collins 51-R recevier (VHF). Bill Orr, W6SAI, Eimac, 301 Industrial Way, San Carlos, CA 94070.

HEATHKIT QF1 Q multiplier, $25 postpaid. H. Anderson, 816 No. Cedar, Colorado Springs, CO 80903.

SELL: National variables 500 pf and 235-235 pf at 9 kv. each , $25, pair $48, f.o.b. Ideal for Transmatch! Send stamp for parts list. W0AIH, Paul Bittner, 1616 South St., Eau Claire, WI 54701.

SALE: Heath IM-28 VTVM kit. New, perfect. Ordered by mistake. $40. Schultz, W4FA, Box "L", FPO, New York 09544.

COMPLETE HAL RTTY Staion (version-3) for sale. Send s.a.s.e. to: J.P. Johnson, 7602 Timberwood Dr., Jacksonville, FL 32224.

TRADE: Homebrew 6m AM/CW TX, 60w, for homebrew 1750m (expermenter band) TX or what have you? Bill Smith, Brown Ter., Uxbridge, MA 01569.

CRYSTALS: SASE my list. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

FOR SALE: Over 55 used radio tubes most good not checked, assorted types. All of them for $25. Write before sending money. Steve Kerns, Rt. 2, Box 54, Bradford, AR 72020.

DISABLED Ham needs used portable typewriter. N.Y.C. area cash or trade. Dr. Eric Palmer, W2RD, 1602 Mermaid Ave., Coney Island, NY 11224.

WANTED: Desk for my shack, also US or DX callbokk, any year. John Graybill, WB3KYQ, 504 Main St., Middleburg, PA 17842.

NEED any information or manual on a "Chiba" 2m FM hand-held model CPF12. Jung Y. Lem, KB6BO, 5222 Coringa Dr., Los Angeles, CA 90042.

BUILDERS: Send for our catalog of hard-to-find components and much more. SST Warehouse Outlet, 1215 Manhattan Ave., Hermosa Beach, CA 90254, (213) 376-5887.

WANTED: Operating service manual for Triplet mod. 3433 sig. gen. Hamilton, 6050 North Oakley, Chicago, IL 60659.

WANTED: Low priced linear amplifier. Sell: 1938 ARRL Radio Amateur's handbook, $10, fair condx 1955 edition, $7. WA2IGK, Rt. 1, Portageville, NY 14536.

WANTED: HG10 or HG10B VFO for Heath HW16 transceiver. Bill Longe, 2309 N. 83rd St., Wauwatosa, WI 53213.

TRADE: 64 Key keyboard, 124 unique 7-bit codes for 444 or D104 mike. R. Stigney, WD0AAQ, 8400 Eastwood Dr., Minneapolis, MN 55432.

SELL: Shrink Tubing, first quality, several sizes. $8.00 per 100 ft. coil. SASE for samples. W4JGO, 643 Diamond, Salem, VA 24153.

STATESIDE QSL Manager available. Reply to: Dan, WA4JTI, 405 Tusculum Blvd., Greeneville, TN 37743.

SPECIAL NEW 250 Hz 8 pole CW filter for TS-520, $40. Yaesu AM filter, $28, New. K8AQ, 949 Havensport, Cincinnati, OH 45240.

WANTED: Any National receiver, Hallicrafters HT-45, HA-10 receiver tuner. WA8MLV, 1800 Rhodes, No. 612, Kent, OH 44240.

EICO 723 60w CW xmtr, $30, QRP xcvr 40m $45, Quasi-Lugarithmic processor, $30, MFJ 16010 wire tuner, $30, set of 20 and 40m mini-miser rcvr p.c. boards (QST Sept. '76) $5, Homebrew reflectometer, $7, 12v 2.5A p.s. regulated, $12, 12v 1.75A p.s. (2) $8 ea. WB2UNH, 128 Tomcyn Dr., Williamsville, NY 14221, (716) 632-8923.

SELL: New Drake R-4C receiver, MS-4 speaker, Noise blanker. $800 value will take $500. Dr. Phoenix, RR 3, Columbia, TN 38401.

WANTED: MT-65 and MT-61 mounting racks and C-42 control boxes, w/plugs for ARC-5 VHF sets. C. Huth, 146 Schonhardt St., Tiffin, OH 44883.

SALE: 32 ASR w/stand, perfect condx, $300. Kenwood 520 w/xtal filter and matching external VFO, $600. Clegg 22 Mark 2, $125. Clegg 22, $65. Ameco 6 & 2 xmtr w/matching VFO, $125. Globe VFO, 160 to 6 meters, $50. Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355, (212) 461-5933.

CANADA: Selling QST 1929 to 1977. $10 for calendar year. VE3HU, Box 2747, Thunder Bay, Ontario, P7B 5G2.

MUST SELL, make offer, Heath 80-10 Sidebander HR20, HX20, HP23, mint condx. Professionally wired, manuals. Albert, 2256 Claude SE., Salem, OR 97301.

WANTED: HEATH HM-102 HF wattmetter, 1 s.w.r., HW-16 transceiver in excellent condition, state price. Caswell Davis Jr., CET, 601 Delmar, Apt. 2, San Antonio, TX 78210.

WANTED: Books and magazine dealing wiht early radios, state condx and price. H.F. Schnur, 115 Intercept Ave., N. Charleston, SC 29405.

LINEAR BUILDERS: Send SASE for list of goodies. W6RW, 8600 Skyline Dr., Hollywood, CA 90046.

WANTED: Vacuum tube manuals or data sheets for 1950-1970 tubes. Will copy and pay postage or buy. WD5FMP, Rt. 5, Box 317, Greenville, TX 75401.

WANTED: UHF Tempo or KLM amp 10w/40w type, G.E. Master 450 recevier and transmitter strip only. K6KZT, 2255 Alexander Ave., Los Osos, CA 93402.

WANTED TO BUY: Old issues of Radio Electronics, Elementary Electronics, or Popular Electronics. WD4OCD, D.V. Walker, Rt. 6, Box 137, N. Wilkesboro, NC 28659.

FOR SALE: Com IV 6m, SR34 AC, JRC425, Globe h-bander, Bendix PAR80 w/mans. Any offers. Joe Bedlovies, 30 Ridge St., Milford, CT 06460, (203) 877-3596.

BROWNING MD33 FM Modulation monitor, $80. Beckman 75 pH meter, $50. TV-7 tube checker, $40. VO1HH, Box 500, Carbonear, Newfoundland, Canada.

FOR SALE: DX-160 communications receiver, $129 or best offer. Bruce Hillier, 6401 N. US-23, Oscoda, MI 48750, (517) 739-8168.

WANTED: SSB Linear amp for 80-10 in good condition. Cliff Branham, P.O. Box 68, Matewan, W. VA 25678.

HEATHKIT STATION Monitor model SB-614 assembled, factory aligned, only 3 months old, $140. Wm. Shevtchuk, 1 Louis Ave., Clifton, NJ 07014, (201) 471-3798.

HEATH HW-8 QRP transceiver, with manual, HWA-7-1 ps.s, in ex. condx., $100. R.J. Litt, WA6JXD, 17251 Dearborn St., Northridge, CA 91325, (213) 993-5488.

FOR SALE: NC183D recevier for $150. W6IRK, 625 Tufts, Burbank, CA 91504.

SB303 SSB/CW 2 years old, $289. HS-24 speaker, $8. New England Engineer crud-o-jet cw filter, $18. Master Crafters 191C wall clock, $13. All seldom used pre-paid UPS. W7JUA, 314 Columbia Dr., Woodburn, OR 97071.

SWAN 350A, $495. Heath SB-614, $145, both in mint condx. WD0COT, Steve Moore, 1501 Belle, Topeka, KS 66604, (913) 272-9091.

ICOM IC215 port. 2m trans w/ni-cad charger and xtals. Used once, sell, $250. Astatic D104 microphone, new $50. Michael J. Spohn, WB6WVZ, 522 Shady Oak Lane, Diamond Springs, CA 95619.

WANTED: Antique Glass—Looking for old milkglass—purple, slag, carmel, and greetwon, Tell me waht you have. I pay the highest prices. Write: Jack Schneider, c/o Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, NY 11050.

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The book "CQ YL" has been updated agian with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in June '76. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can be inserted directly into the book's spiral backbone), drop a note with your request to author/publisher W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., N.W., Albuquerque, NM 87114. Please enclose $1.00 to cover the cost of printing and mailing. The one and only book about YLs in ham radio, "CQ YL" contains 23 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.50, postpaid.

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