CQ

November 1972

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PHONE BANDS EXPANDED ....see page 5

160 M contest RESULTS

See Page ...65

OSCAR 6 IS IN ORBIT

The Radio Amateur's Journal

08240

The peanut whistle heard 'round the world...

and Heathkit instruments tha

The New Heathkit FET VOM... 79.95*. This is the tool hams have been waiting for. A portable lab-grade FET VOM combining accuracy, versatility, convenience and ruggedness – in an easy-to-build dollar-saving kit! Our new IM-104 has low-drift 1% precision metal film and wirewound resistors for exceptional stability. Dual FET meter amplifier circuitry for 10 megohm input impedance and instant operation. And there are 53 ranges on four scales. Nine DCV ACV ranges from 0.1V to 1000V. Six current ranges cover 0.01mA to 1000mA, DC & AC. Seven resistance ranges from 1 ohm to 100 megohms, conventional or low voltage modes. Decibel ranges from –40 dB to +62 dB. DC null scale with better than 1 mV resolution. The 4½" ruggedized, taut-band meter is diode protected, built to take plenty of abuse. Built-in circuitry shows battery condition at the flip of the range selector.

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The Heathkit 10 MHz Triggered Scope...229.95*. Maximum flexibility in a general purpose scope, at a price to fit any budget... the new Heathkit IO-103 is a ham's dream come true! Big 6x10 cm screen with lighted graticule for easy, accurate measurements. DC-10 MHz ±3 dB response with less than 50 ns rise time on vertical channel. Ho zontal expansion gives x2 magnification ±5% a 50 ns/cm sweep rate. Triggered sweep, too, wi selection of either normal or automatic mod Other features are switch controlled AC-DC co pling; provision for external triggering signa and horizontal deflection signal; front-mount connectors for vertical inputs and 1V peak-t peak signal for checking calibration; easy-acce cabinet with removable side panels for servi or demonstration purposes; 120/240 VAC oper tion. Put this budget-minder in your shack no

Kit IO-103, 37 lbs. **229.9**

e latest QSL count is 27 countries, 40 ates, all continents! That's what the ms at Heath have scored field testing e new HW-7 CW QRP Transceiver. And e new contacts are coming in every day. e HW-7 is flea-power operation at its est. With three-band CW coverage, run- g a tidy 3 watts on 40, 2.5 watts on 20 d 2 watts on 15 meters. That's a bare nimum, but the HW-7 gives you more an a sporting chance. It has both built- VFO and crystal transmit capability. nsitive Synchrodyne Detector receiver cuitry for a readable signal with a 1 uV out or less.

eration is nice and neat too. Band se- tion is at the push of a button, and the vernier drive gives you "backlashless" O tuning. The pushbutton crystal trans- t provision makes the HW-7 perfect ar for novice or QRP roundtable use. ilt-in sidetone and relative power eter are other top quality features.

u can carry your HW-7 peanut whistle ywhere. As you see it at left it's ready run on any 12 VDC supply. For a fixed a-power station there is an optional low voltage power supply that plugs into your 120 VAC line.

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cepts input levels m less than 50 mV over 200V, depend- g on frequency, thout damaging e instrument; full igit readout can be expanded to 8-digit capa- ity with range selector and overrange circuitry; cimal point automatically positioned with nge selection; MHz, kHz, overrange and gating nditions indicated by illuminated legends on nt panel; one megohm input impedance & low out capacitance minimize possibility of cir- it loading; all solid-state circuitry with cold thode readout tubes for instant operation; unt storage circuitry gives non-blinking or unt-up readout, changing only with count; able time-base crystal has better than ±3 ppm m 17° to 32° C. dual primary, 3-wire line cord regulated supply for stable operation over ng periods.

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CQ

NOVEMBER, 1972 VOL. 28, NO. 11

The Radio Amateur's Journal

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DEPARTMENTS

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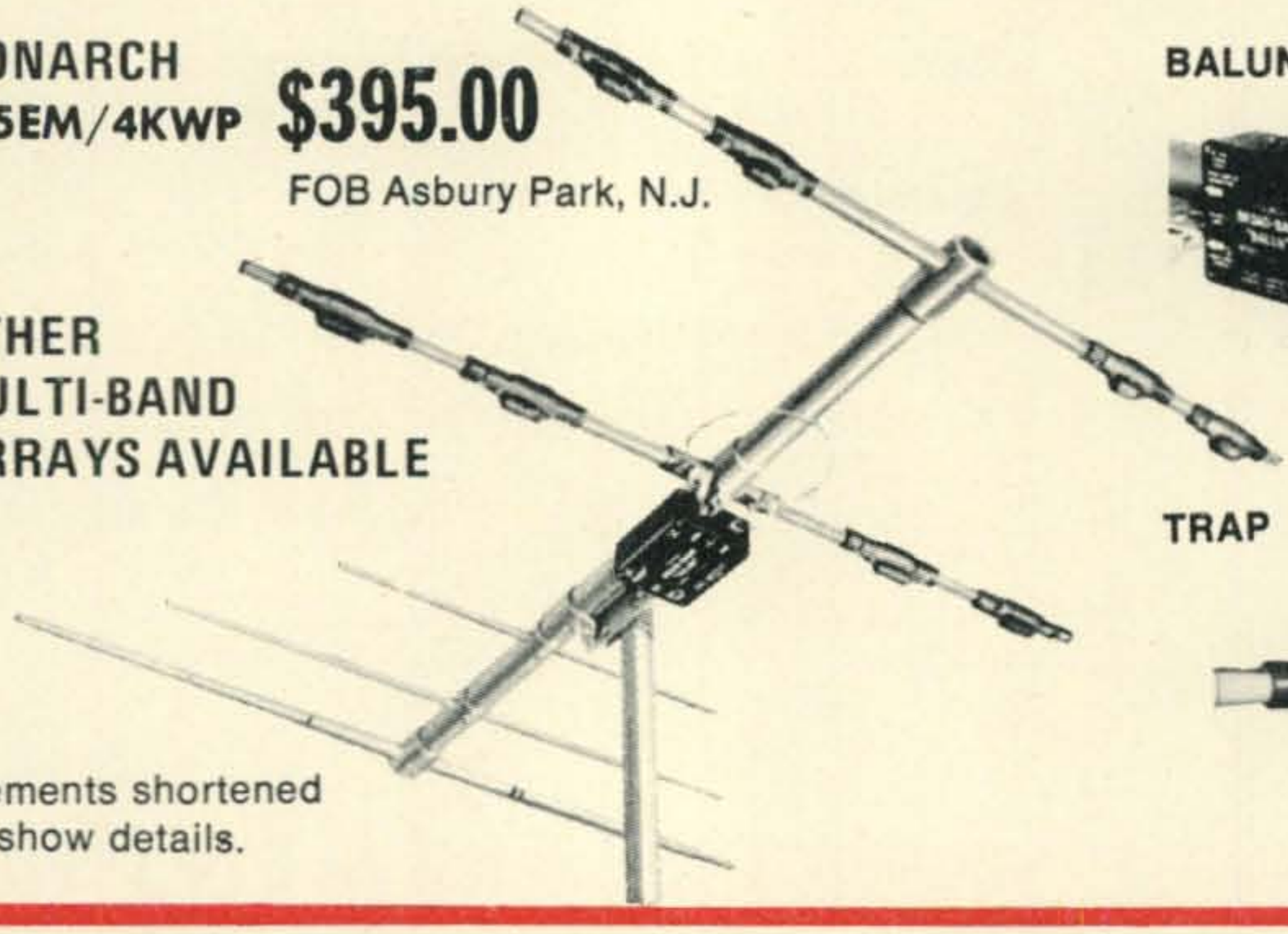

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OSCAR 6 In Orbit!

OSCAR 6 was successfully launched at 1719 GMT on Oct. 15, 1972 and, as this is written, has completed it's first dozen orbits. Scores of stations have already worked through the satellite's 2-to-10 meter repeator. See page 48 for information on using the satellite.

Hard on the heels of Docket 18803 - the Repeater Docket - FCC has dropped another administrative bombshell into our midst in the form of revised sub-band breakdowns in several of the amateur bands. The changes adopted by the Commission in Docket 19162 affect all classes of amateur licenses except Technicians and will become law on November 22, 1972, the fifth anniversary of the adoption of Incentive Licensing.

Press deadlines prevent us from presenting the full text of Docket 19162 in this issue, but we are able to bring you the specific details of the changes. On a band-by-band basis the changes will affect amateurs in the following ways:

80m. - The exclusive Extra class phone segment has been shifted from the current 3800-3825 kHz down to 3775-3800 kHz which was formerly only c.w. The exclusive Advanced and Extra class segment will now be from 3800-3890 kHz and General class licenses will be restricted to 3890-4000 kHz. No changes in Novice sub-bands on 80m.

40m. - The phone sub-band has been extended downward by 50 kHz to cover 7150-7300 kHz, divided as follows: Extra and Advanced licenses only may operate phone from 7150 to 7225 kHz. General class licensees may operate phone from 7225-7300 kHz. As a result of the widened phone sub-band, Novices will now be permitted to operate from 7100 to 7150 kHz and may no longer operate between 7150 and 7200 kHz. Outside of Region II (North and South America), U.S. amateurs may operate phone from 7075-7100 only.

20m. - No changes.

15m. - While the 15m. phone sub-band has not been widened, the breakdown of frequencies allotted to the various license classes has been changed somewhat. In the phone portion of the band, the exclusive Extra class segment has been reduced by 5 kHz to 21,270-21,350 kHz. The General class segment remains unchanged. The 15m. Novice c.w. sub-band has been narrowed by 50 kHz to 21,100-21,200 kHz.

10m. - No changes in Extra, Advanced or General class privileges, but Novices may now operate c.w. between 28,100 and 28,200 kHz.

2m. - Novices may no longer operate in the 145-147 mHz sub-band on any mode.

To ease the effects of the Novice band frequency changes, the Commission has wisely decided to permit the use of v.f.o.'s by Novice class licensees, breaking a 22 year tradition of crystal control for Novices.

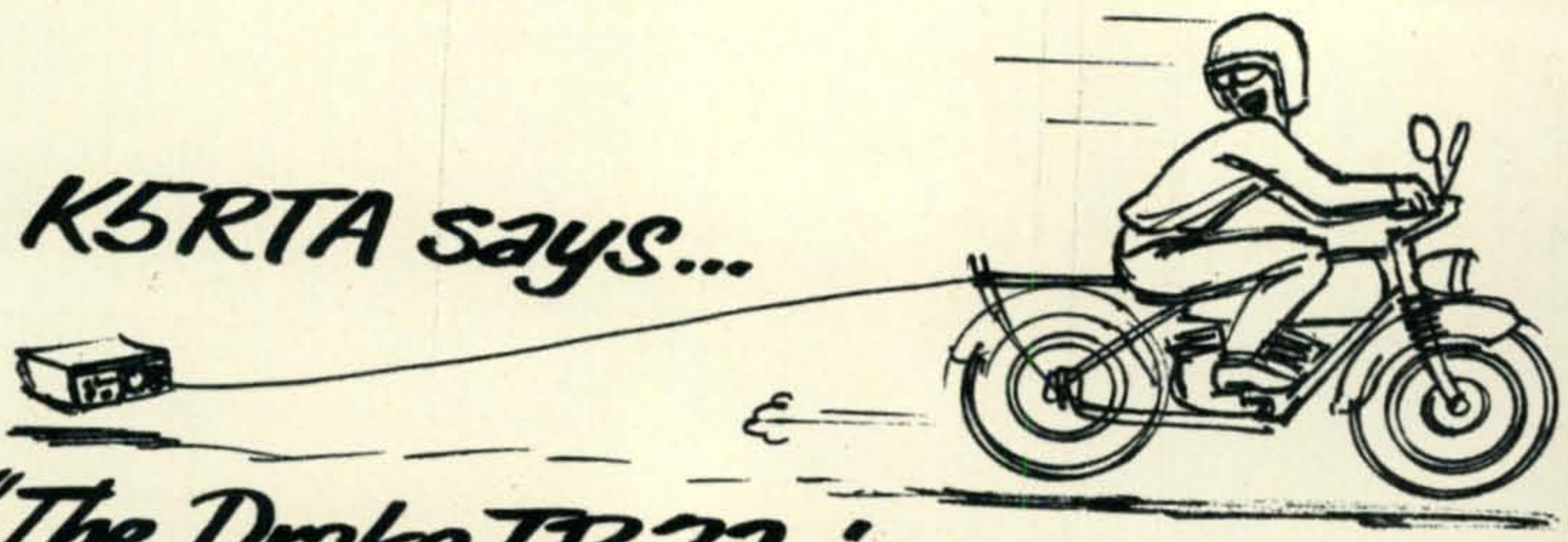
It will be disappointing to many U.S. DXers that the 20m. phone band has not been widened. The Commission decided that expansion of the 14.200-14.350 mHz would seriously degrade c.w. operation. Bowing to pressure to maintain "traditional" mode of communication – c.w. – and to pressures from non-domestic groups and individuals to adhere to gentleman's agreements on sub-band usage, FCC submitted, and chose not to take steps at this time to alleviate over-crowding on 20m. The Commission, in fact, expressed a belief that widening the 20m, phone sub-band would do little to solve the over-crowding problem.

An interesting sidenote in the Report and Order is the intention of the FCC to periodically review the number of amateur licenses of each class with an eye towards sub-band size. Thus, if the declining trend in the number of General class licenses continues, we may expect an appropriate reduction of sub-band space available to these licenses. Adjustments in sub-band sizes would be made in 5 kHz increments. We feel that this approach to the problem of uniform band occupancy is fair and progressive.

All in all, we feel that the new Report and Order is a good step in the proper direction – that of more flexible regulation of amateur radio responsive to todays needs and not rigidly confined by tradition. The progressive attitude towards todays version of amateur radio which the FCC has demonstrated in these past few months is truly exciting. We may not be totally in accord with all of the Commission's views, (we'd still like to see an extra 50 kHz phone on 20m.), but we're pleased that things have come even this far.

73, Dick, K2MGA

K5RTA says...



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Just have to drop you a note and tell you what a tough little rig the TR-22 is. I have been using mine mobile in the car and on my motorcycle and portable at the office.

Yesterday, I had it strapped to the luggage rack on the motorcycle and was working motorcyle mobile on the way to work. Unfortunately, I took a new road that turned out to be rougher than anything I had previously been on with the radio . I suddenly caught sight of the TR-22 in the rear view mirror bouncing along the pavement behind me. I was doing about about 40 MPH and was dragging the TR-22 by the mike cord. I drug it for at least a block before I stopped.

The carrying case was pretty torn up and the antenna was snapped off right at the case. I returned home and hooked it up in the car and it works like it always did.

The TR-22 certainly lived up to all the expectations I had for it after owning the TR-3 and RV-3 for many years.

Gene C. Berrier

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OUR READERS SAY

RE: WA2RJV

Editor, *CQ:*

I disagree with WA2RJV regarding phasing out all amateur a.m. operations in favor of s.s.b. He states, "No operator should be compelled, because of price to maintain an a.m. station.

Many owners of a.m. stations are on Social Security or have a limited income. Such persons would be unable to afford scrapping their transmitters and buying s.s.b. transmitters. It makes just about as much sense as advocating phasing out c.w. because most operators use phone.

Phasing out a.m. will discourage new license applications and new blood will be lost through this procedure. I have been conducting a class in code and theory since November 1969 and ten of my members are now licensed.

I am badly crippled but not to the extent that I cannot help others get started in amateur radio.

My receiver will handle s.s.b. but I would not be interested in converting my entire station to s.s.b. The only ones who would benefit would be the manufacturers of radio equipment.

I have been in and out of radio communications since 1917 and have held a license for many years. If a.m. is phased out, I will not renew my license.

A. Edw. Terpening, W4VCY
Tarpon Springs, Florida

Editor, *CQ:*

I have to take issue with a statement of Paul, WA2RJV, in his Letter to the Editor appearing in the September 1972 issue of *CQ* (Phase Out A.M.?) He states, "Aviation is almost entirely s.s.b. or f.m."

Apparently Paul is *not* a pilot. All, I repeat all, of the private, business and airline planes in the United States that have radio have a.m. radio. Why? Because that is the mode used by the Federal Aviation Administration at all Airport Control Towers, Flight Service Stations, Unicom Stations, Air Traffic Control and the like. If Paul takes off in a plane equipped only with s.s.b. and f.m. radio he will have a hard time making anyone understand what he is saying and he will have an equally hard time trying to understand what they might be trying to tell him.

Marion C. Cruce, K5MID
Oklahoma City, Oklahoma

Editor, *CQ:*

Ref: WA2RJVs proposal to ban a.m. I have to chuckle, as a.m. is dying a natural death without a nudge from Mr. Abbott.

I would point out a significant portion of current activity on 10 meters is a.m. There is *no* overcrowding with these *6 kHz* signals. Generally, I prefer to use s.s.b. to chase DX. However, I prefer 10 meter a.m. to rag chew where I use a 5-watt converted CB rig. I have made 250 contacts in the last year with

this QRP rig. To increase the activity on 10 meter and keep it alive during the solar minimum, I would propose the adaptation of the following: Put a C rig to good use — convert it to 10 meters!

Any kind of activity on 10 meters is healthy — even a.m.

Bob Rose, K6GK
El Cajon, Californi

Editor, *CQ:*

Would like to let Mr. Paul S. Abbott, WA2RJ know that I agree with him that a.m. should b phased out (Sept. 72 *CQ*). I totally disagree with th suggested future date, and suggest June 30, 1973 — in other words, the quicker the better.

Wm. L. Hayes, W4AFM
Asheville, North Carolina

Editor, *CQ:*

Re the letter from WA2RJV (*CQ*, Septembe 1972): Paul's statement that hams "cling to the old fashioned notion that a.m. sound better as it eats u 10 kHz for every station . . ." is an error. Paragraph 97.193 of the U.S. Amateur Regulations specifie 6A3 as an authorized emission, but not 10A3. Paragraph 97.195 defines 6A3 as commercial quality amplitude modulated telephony, which may cause confusion to those unfamiliar with the fact that the 6 in 6A3 specifies the bandwidth in kHz. What we know as single sideband is symbolized properly as 3A3J (the J indicating suppressed carrier), although the Regulations alludes to this mode only by name not by symbol.

I generally agree with the advantages of eliminating a.m. below 30 mHz, but not above. Band space is not so critical at v.h.f. and higher, and the difficulties of building sufficiently stable receivers and transmitters is many times more difficult. No one can argue the inefficiencies of a.m., which is why f.m. is rapidly rising in popularity, but simple a.m. gear is not difficult to build and helps many a budding v.h.f.er get started. Besides, f.m. is 5 kHz wide, so is almost as band-consuming as a.m. (assuming n.b.f.m.; the f.m. width can be much higher). And what of conversions from a.m. to d.s.b.? Equipment like the Viking Ranger and Viking II can be converted to a balanced-modulator output circuit, thus eliminating the carrier while retaining the 6 kHz bandwidth. With a good s.s.b. receiver, one cannot tell d.s.b. from s.s.b. unless one happens to look specifically for the other sideband; to many, it just sounds like another station

[*Continued on page 102*]

Announcements

Las Vegas, Nevada

The National Post Office Meeting will be held in conjunction with SAROC at the Flamingo Hotel in Las Vegas, Nevada from January 4th to 7th, 1973. Further information may be obtained from Herb Guckel, W7IIX, Nevada PON Manager, 4617 Rip Van Winkle Lane, Las Vegas, Nevada 89102.

Brownfield, Texas

The 18th Annual Brownfield Free Swapfest, sponsored by W5HPI, Terry County ARC, will be held in the National Guard Armory on October 29. Army MARS and West Texas VHF Clubs meetings. Doors open 7:00 A.M. Catered Dutch buffet lunch. Eyeball QSOs, refreshments and entertainment evening of October 28 for early Arrivals.

Q AND A

WILFRED M. SCHERER, W2AEF

"Changing of the Guard"

Dear Readers:

With the decision to take life a bit easier an to get away from the daily grind, this month Q & A Column will be the last to be conducte by yours truly after a stint of almost 5 year handling your technical questions and answers

It is with regret that this is the case, inas much as much joy and satisfaction has bee realized in helping others, or at least in a tempting to do so.

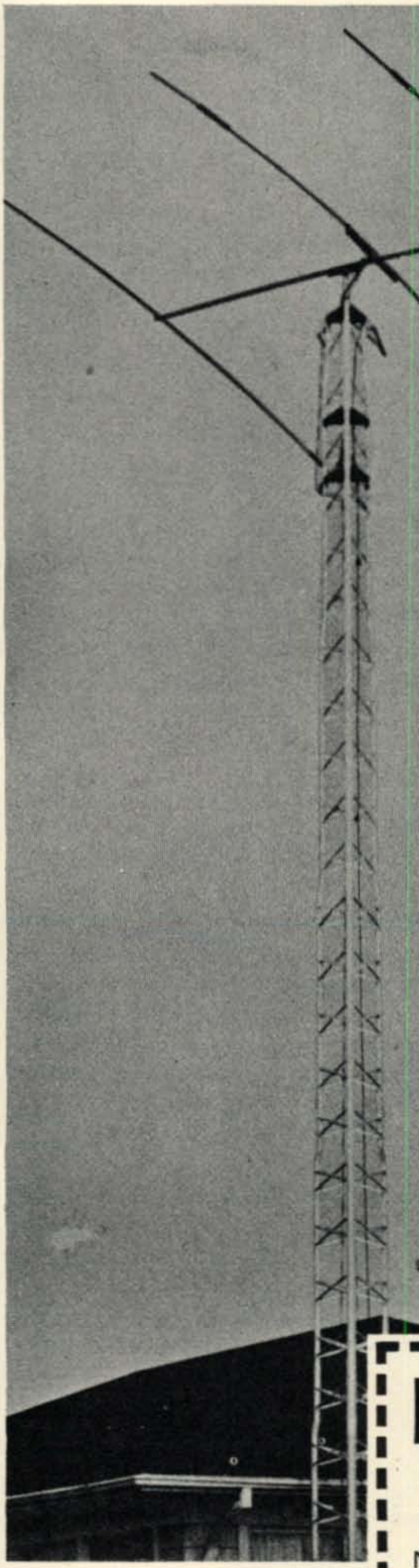
In conjunction with whipping up the *C* Equipment Reviews each month, the wor load has been heavy. As a result many answer have been delayed, for which thanks are give to those concerned for their patience. Unfor tunately we were not able to get around to for warding answers to a number of other in quiries, for which sincere apology is made. T those who have written expressing thanks fo aid or otherwise commenting favorably on th Column, special appreciation is given.

Happily the Q & A Column and the *C* Technical Answering Service will be conduct ed in the future by Chuck Schauers who for merly handled "Ham Clinic." Chuck did beautiful job in this respect and it is certain h will do so again. It is asked that you suppor him to the fullest extent and *please* fella's (an gals) drop him a line of appreciation when hi aid has been forthcoming. You have no ide how this buoys one up in the seemingly endles hours (and often tedious ones) consumed i handling the job.

As for myself, I shall not completely "re tire," inasmuch as it is planned to still becom involved with an occasional equipment revie or other article.

I also wish to thank my fellow co-workers a

Q & A is a free technical assistance program offered by CQ its readers. We ask your cooperation to enable us to assist many amateurs each month as possible. Always include a se addressed stamped envelope with your question. Only one que tion per letter, please. Before writing to ask where a publish article appeared, try to find it yourself by consulting the annu indexes of the various amateur magazines. Mail questions t CQ Q & A, 14 Vanderventer Ave., Port Washington, N.Y. 1105



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CQ for their aid and encouragement in many aspects and to also express appreciation with Cowan Publishing Corporation.

Of course, when it comes to thanks, there is one person in particular who must be mentioned. She is my XLY, Betty, who forfeited many hours of companionship to enable extra time to be devoted to my work, time we shall now look forward to sharing together.

Best wishes to all — good luck to you. Chuck.

Vy 73, Bill, W2AEE

Trouble-Shooting Hints

As a parting shot, the following few hints are presented concerning equipment problems to hopefully enable readers to search out solutions for themselves.

One of the most essential aspects is that of having on hand some proper test equipment. The number-one item in this regard is a v.o.m. or better still a v.t.v.m., for measuring d.c. and a.c. voltages, resistances and for checking circuit continuity. Although a bit more expensive, the v.t.v.m. provides the advantage of a very high input impedance on all ranges to minimize circuit loading on high-impedance circuits. It also permits use of an r.f. probe therewith, another item of particular aid where r.f. problems are concerned.

A grid-dip oscillator will come in handy for determining if tuned circuits are still resonating as they should and for checking the presence of r.f. at such circuits. A simple wavemeter type detector also may be used for the latter. The g.d.o. also may be used as a substitute oscillator where non-functioning of the equipment oscillators might be involved. Its use as a signal generator also may be a help for determining if various stages in a receiver are functioning.

A standard signal generator also may be used for this and for checking receiver sensitivity and the gain of different stages where a loss is suspected. Alignment adjustments too can be made therewith.

An a.f. oscillator will come in handy as a signal source for checking a.f. circuits such as mic amplifiers, a.f. output stages, etc. Such checks may be made in conjunction with oscilloscope observations. The scope also is desirable for checking a.f. waveforms (particularly where distortion may be involved) as well as checking modulated-r.f. waveforms.

Data on using various pieces of test gear may be found in *CQ* V.o.m.s — Jan., Feb., March, April, May; Scopes — July, Aug., Sept., Oct. 1966; G.D.O. — May, June, July 1968.

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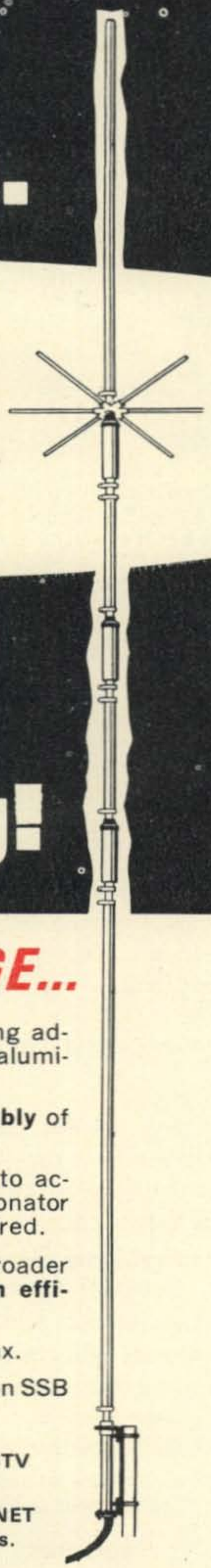

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The general approach in connection wit trouble-shooting gear is to localize the prob lem to a specific area or stage in the equip ment. For example: if a transmitter p.a. doe not appear to function or has low outpu check to see if the driver or other precedin stages are still working properly. In othe words, back-track from stage to stage until th one that malfunctions is located. Receiver an a.f.-amplifier problems also may be localize using stage-by-stage testing. Use of an r. probe or a.f.-responding a.c. voltmeter is rec ommended in these cases as the need dictates Power-supply faults too may be located b back-tracking along the voltage-supply lines Here filter capacitors may need checking fo leakage or be substituted where doubt exists.

Where troubles are suspected, the obviou procedure is to change tubes in the particula section, even though the one in normal us may check out "good" on a tube tester. In th case of a transister, substitution also may b made, but first these sometimes can be checke before removal by use of an in circuit teste however, a more positive method is to remov the transistor and check it out of the circu with a tester or with an ohmmeter (using n lower than a × 100 ohms range).

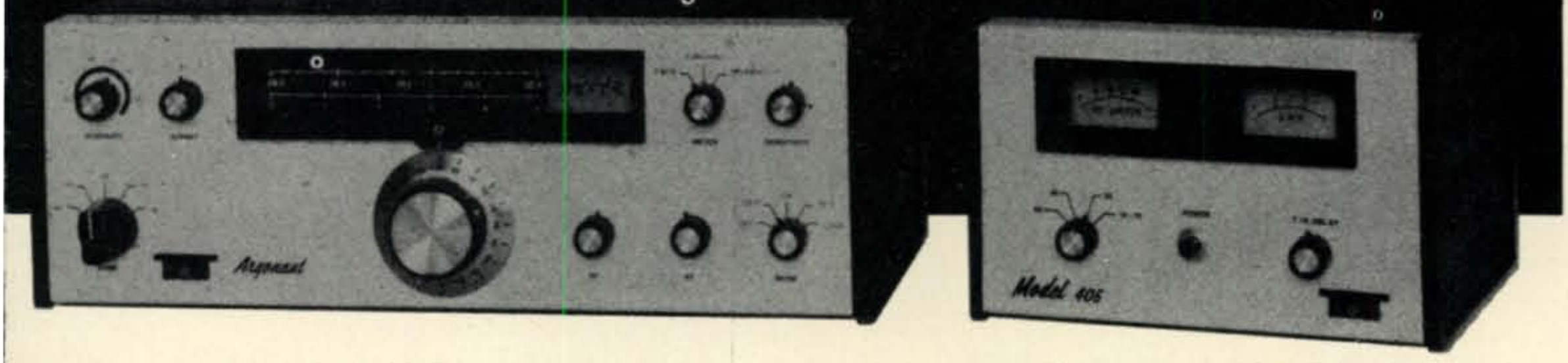
To do this, connect one of the ohmmete leads to the base, the other first to the collecto and then to the emitter. The reading in eac case should be approximately the same. The reverse the leads following the preceding proce dure. Depending on the meter polarity an whether the transistor is a PNP or an NPN type, one set of measurements should indicat a low resistance between base and collector o emitter, the other a high resistance between th same junctions. If both sets of measurement indicate the same low resistance, or a short, i both directions between the related junctions that section is defective. On the other hand infinite resistance in both directions betwee the indicated junctions indicates an ope section. A low resistance or short in *both* directions of polarity with a test between th emitter and collector, of course, indicates defect across these elements. (See Q&A fo Sept. 1968.) Ohmmeter tests on most FETs ar not recommended.

The next step is to check operating voltage and resistances according to the manufac turer's specifications. With new equipment o on already-working gear where these and th r.f. voltages are not specified, it might be wis to make measurements at salient points an record the results for future reference.

In the case of a defective resistor or bypas

[*continued on page 104*]

The Argonaut has a stalwart new companion—a Solid State Linear!



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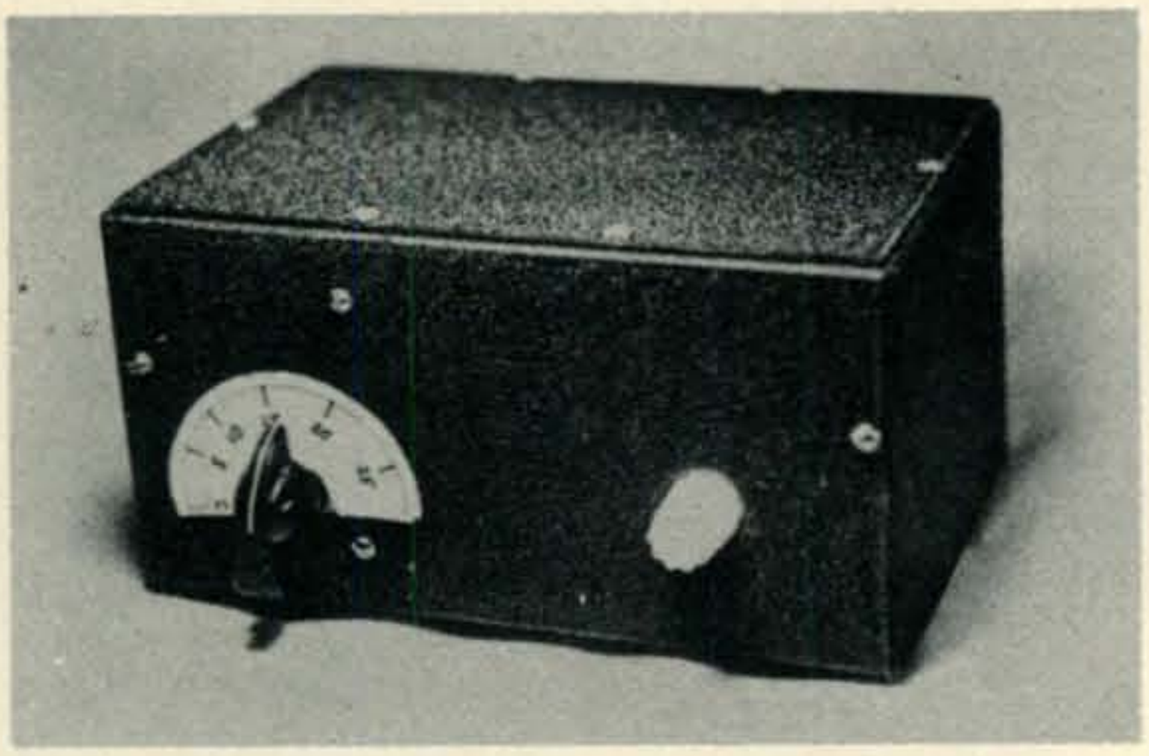
Design Notes On A Moderate Power Solid State Transmitter for 1.8 mHz

By Adrian Weiss, *K8EEG/1

During the past five years or so, solid state devices capable of up to 20 watts r.f. output have become increasingly available to amateur experimenters on the surplus market at very reasonable prices (the 2N3632 at Polypaks for $2.99), and an entire new generation of r.f. devices designed for large signal operation is available commercially, although at prices prohibitive for normal amateurs such as myself. Many of these new breed r.f. devices, such as the RCA 2N566-5 series, are "ballasted" or "mismatch protected" by means of internal structure—many small individual transistors, all with individual emitter resistors, are mounted on a single chip in a single case, and can withstand any mismatch condition from direct short circuit to perfect match. I suspect that in the next five years, a device will appear within reach of the amateur pocketbook that will equal the venerable 807 for ruggedness, and following old-time practice, be run white-hot to get a few extra watts, and that without damage (for a while!) to the device. At present, however, the cost of devices with internal mismatch protection and capable of producing above ten watts output cost a bit too much for the normal experimenter.

Older devices, such as the 2N3632, and the TI487 which is used in this transmitter, can be had for under $10.00, but the amateur must provide the "mismatch protection" and take the consequences if he doesn't—usually a sizzled 2N3632 in this case, although I haven't been able to blow a TI487 yet! It seems likely, therefore, that the production of moderate power solid state transmitters will make a decided move from the RCA or Motorola laboratories into amateur shacks in the true tradition of amateur radio, and hence, some idea of what to expect from the design and construction of such transmitter would be provided by such papers as this slanted especially for non-engineers![1] This paper is a history of the development of such a transmitter by a non-engineer and can illustrate some of the stumbling blocks one might encounter and emphasize, at the same time, that just about anyone can come up with a working circuit if he is willing to expend the time and thought necessary. It goes without saying that using a rig designed and constructed from scratch is still the greatest enjoyment available in amateur radio.

*117 Central F10, Acton, MA 01720



The solid state 160 meter transmitter is v.f.o. controlled over one 25 kHz segment of the band.

Design Objectives

At the inception of this project, several design objectives were formulated, as follows:

1. V.f.o. control to allow for frequency flexibility essential to success on the air at this power level, with coverage for one 25 kHz segment at the low end of the 160 meter band.

2. Since the transmitter was to be used both in the shack and in the field, dependability and flexibility were essential, with provision for operation with various supply voltages that might be available under different circumstances, and finally, allowance for matching to different types of antennas.

3. A number of tuned stages sufficient to insure low harmonic content in the output

[1] Lowe, "A 15-watt Output Solid State Linear Amplifier for 3.5 to 30 mHz," QST, Dec., 1971; Hejhall, "Broadband Solid-State Power Amplifier for SSB Service," QST, March, 1972; Hayward, "Increased Power for the Solid-State Transmitter," QST, May, 1972.

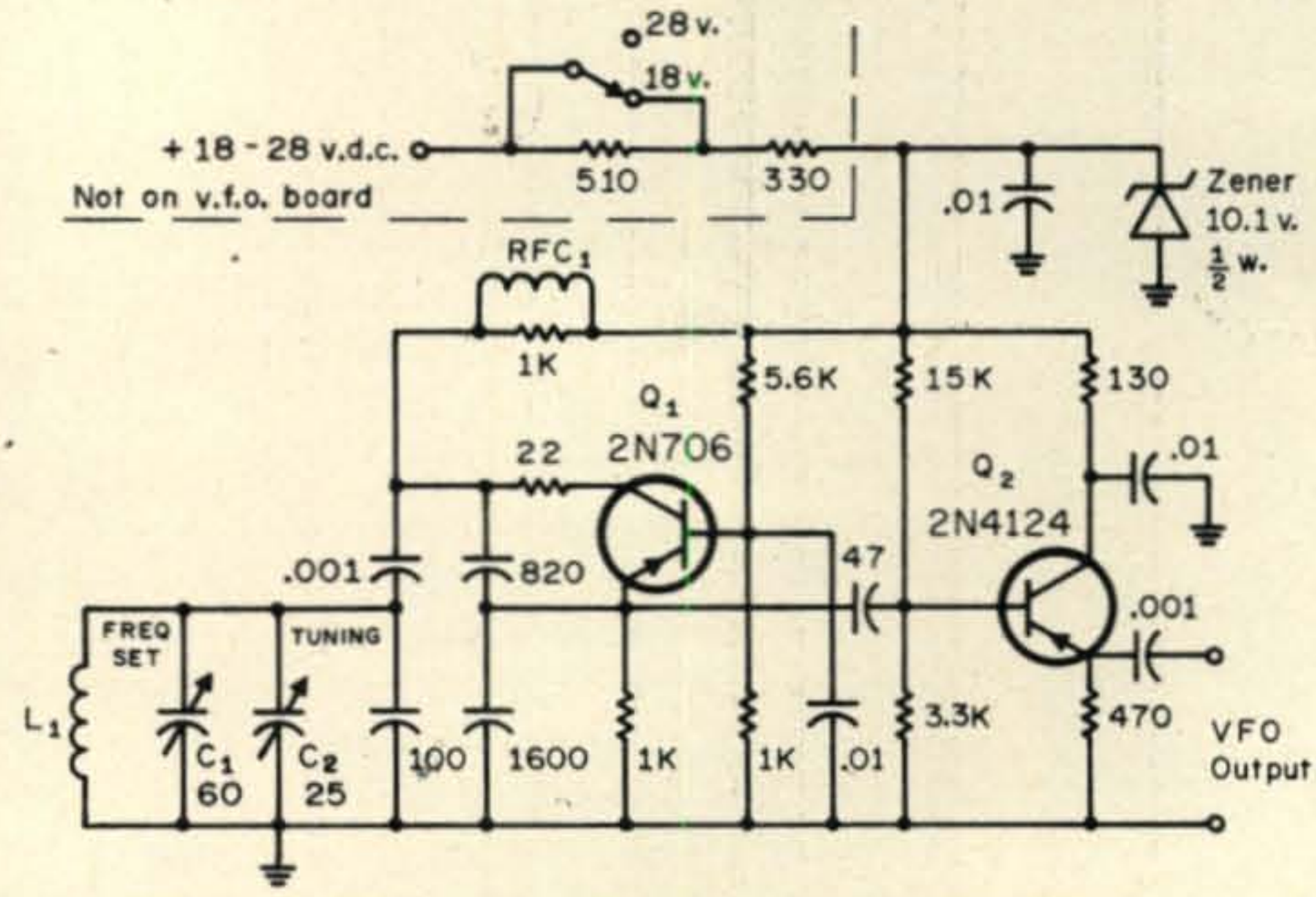


Fig. 1-Schematic diagram of the 160 meter v.f.o. Circuitry is contained on a small PC board with the exception of the tuning capacitor. L_1 is 52 turns No. 28 e. on Amidon T50-2 toroid core. RFC_1 is a Miller 70F824A1 850 uh r.f. choke.

signal without the necessity of resorting to an external filter and the like.

4. And finally, the usual objective of a cleanly keyed, parasitic-free c.w. signal with low current drain during unkeyed cycles.

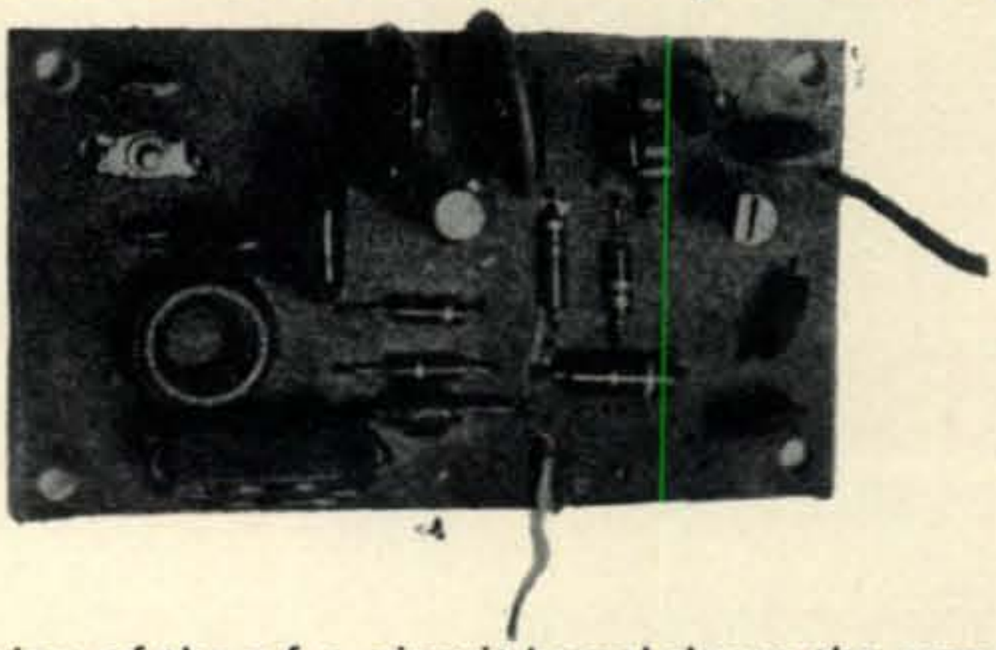
In lieu of expensive test equipment, such as a scope or spectrum analyzer, both of which are beyond this amateur's financial resources (and probably beyond most), means of determining the purity of the transmitter signal had to be devised with existing equipment. The cheapest solution proved to be a sensitive frequency meter tuneable from 1 mHz into the u.h.f. region, and a general coverage receiver tuning 0.55-30 mHz with an S-meter. The boob-tube is a natural detector of unwanted v.h.f./u.h.f. emissions. The actual design and development of the transmitter follows below.

V.F.O.

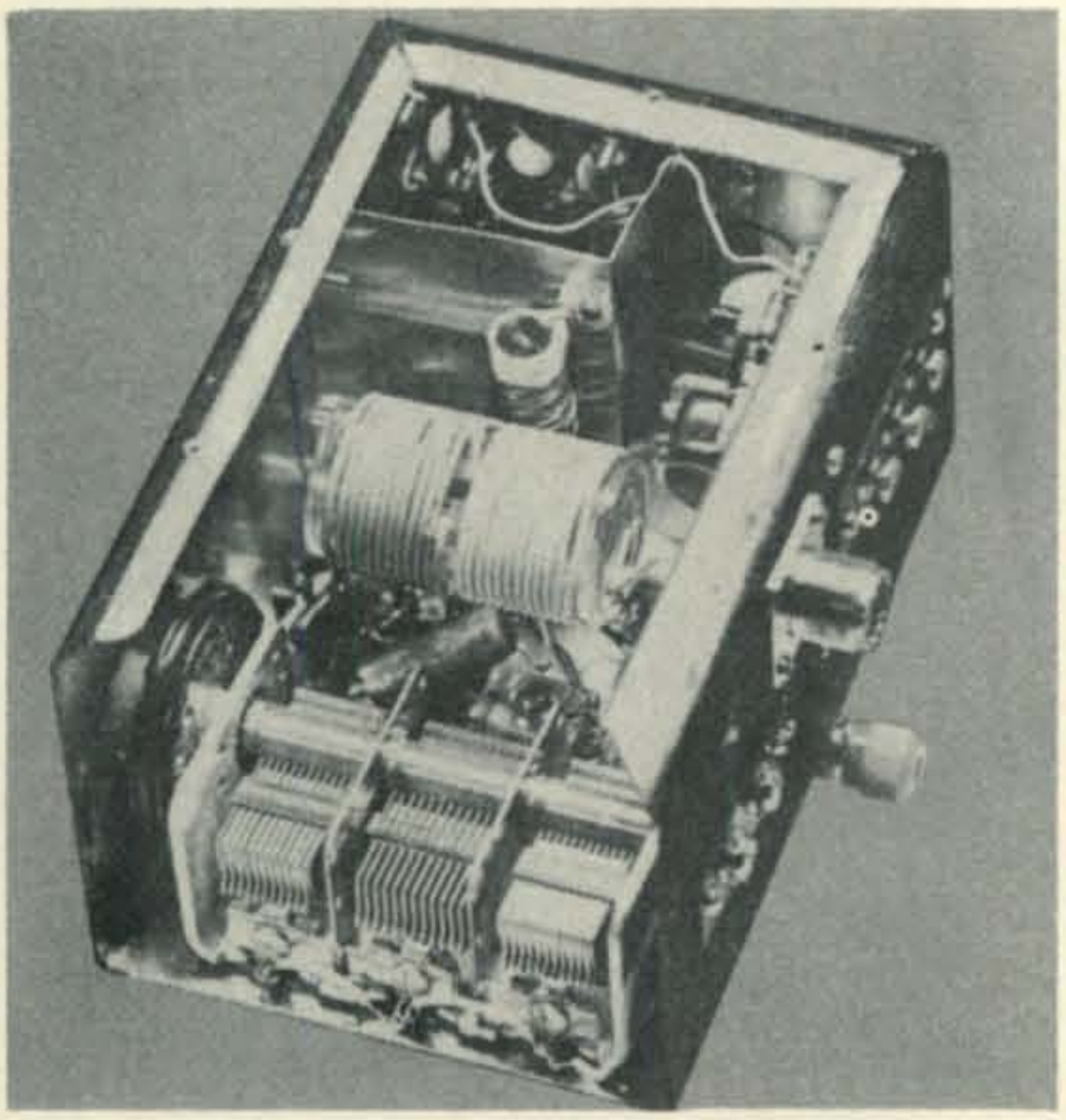
A standard Colpitts oscillator with emitter follower was chosen for the v.f.o. circuit because of simplicity and dependability. A high beta, high f_t device—2N4124—was chosen for the two v.f.o. stages since it fit the general criteria for v.f.o. design. Output would be taken from the low impedance point of the emitter follower, insuring adequate isolation between v.f.o. and later stages. Zener diode regulation was a must to provide stability under conditions which might include a weak battery with considerable voltage swing under load when in the field.

When the circuit was transferred to the breadboard, it was found that the 2N4124 would not perform adequately at 1.8 mHz, and not all devices could be made to oscillate in the circuit. The substitution of another high beta, f_t device—2N706—proved to help out the situation, and with considerable experimentation with circuit values, the final circuit, shown in fig. 1, resulted, and worked well with all 2N706's tried in it, and provided about 0.7v.r.m.s. output. Further, the v.f.o. could be keyed with a good clean chirp-free signal, and proved insensitive to changes in B+ down to the level that the zener regulator kicked out. In testing for unwanted parasitics, a low level oscillation was discovered about 150 kHz below the operating frequency, and after numerous "tricks" were tried and found wanting, it was decided to depend on the following tuned stages to eliminate the parasitic, and ultimately, it didn't appear in the transmitter output.

In the finalized transmitter, the v.f.o runs continuously while the later stages are keyed, a system resulting in chirp-free keying. When undergoing B+ excursions of about 12%, the output frequency "slides" about 50 Hz, but this is due to the change in the load on the v.f.o. represented by shifts in characteristics of later stages. With a stable power supply, keying is sharp and clean. One side of a d.p.d.t. switch is used to insert the proper voltage dropping resistor into the B+ lead to the v.f.o. to bring it down to about 11.5 v.d.c.



Top view of the v.f.o. circuit board shows the component layout. The tuning capacitor is mounted on the cabinet front panel.



Interior view of the complete transmitter. At the upper corner is the shield compartment housing the v.f.o. circuitry. Mounted on this shield is RFC_4. L_4 and L_5 are on the same form at the center. Terminals on the rear one for power, keying and additional loading capacitance.

With the resistance shown, current drain for the v.f.o. is about 25ma. When mounted as shown in the accompanying photo, with only the frequency tuning capacitor mounted off-board, an extremely stable configuration results. I don't believe that anyone will ever get me to put one of my concoctions to the usual test for stability—dropping it on concrete from a height of six feet—but it does take quite a bit of knocking around on the table and remains on frequency!

Buffer/Amplifier

For the r.f. section of the transmitter, it was decided to employ a single stage of buffer/amplification, and a driver and final in Class C. In traditional fashion, the high voltage gain figure of Class A operation was utilized in the third stage, and an output of approximately 200 mw the objective. Several high beta, f_t devices—2N706, 2N2102, 2N3053—were tried out, but we settled on the MPS6514 which provided the best gain and most efficient operation. A parallel tuned circuit with a high C/L ratio and link matching served to match the stage to the driver adequately while providing the best harmonic rejection. Both output and rejection of the second order harmonic were enhanced with the addition of the 220 pf mica from collector to ground. Highest harmonic rejection occurred when the buffer tank was tuned through and beyond the point of resonance, which sacrificed a small bit of fundamental power, but there is a lot to spare. Output was sufficient to light to moderate brightness a No. 49 bulb substituted for a 10 ohm composition resistor and r.f. indicator upon which output was monitored during testing the stage (see fig. 2 for r.f. indicator setup).

After the addition of the driver stage however, an objectionable degree of interaction between the two stages was discovered. To remedy this, a 22uh r.f. choke was inserted in the B+ to the buffer, and a 750uh choke in the lead to the driver, with bypassing at both ends. With this remedy, tuning of the driver had little effect on the buffer and v.f.o. frequency. The use of a high C/L ratio in the buffer tank resulted in a lower loaded Q and less susceptibility to changes in the load presented to the buffer when the driver moved through varying current levels. A bit of pruning of the buffer toroid inductance allowed the use of a fixed capacitor instead of a variable.

Driver-Final

Practical problems began to crop up in abundance with the breadboarding of the driver and final. About 1 watt output was desired from the driver to allow for loss that was expected in the process of eliminating harmonic energy, and this was easily obtained with a parallel-tuned tank circuit with the collector of Q_4 tapped down, designed for an impedance of about 75 ohms and a loaded Q of about 15. Harmonic content, however, was high—never more than 12 db below the fundamental. Several different methods of tuning the parallel tank were tried, but no improvement was noted. During development of the driver after initially getting it to work, the final with a parallel tuned output circuit was kept in the circuit in order to determine whether a proper match was being achieved through the link. It was found that retuning the final would have a pronounced effect on the driver, and when things were right, the final would break into self-oscillation. What probably was happening was that the link coil to the final was ruining the Q of the

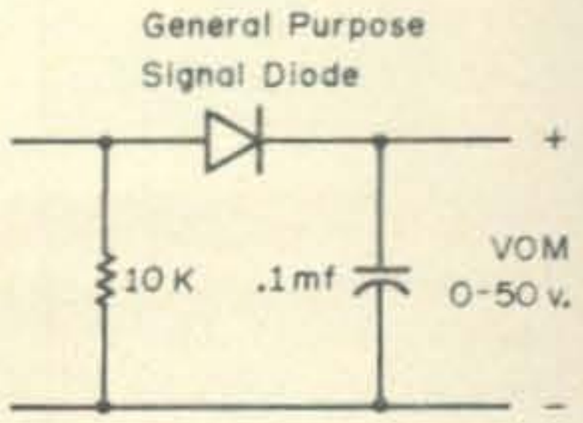


Fig. 2-Simple r.f. indicator used for initial adjustment of individual stages.

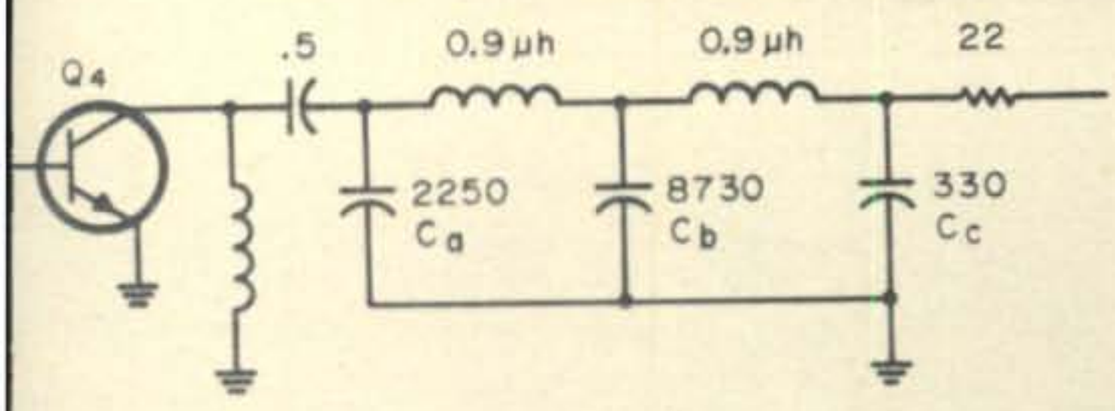


Fig. 3-Two-section pi-network was tried at the driver output for matching and harmonic suppression, but was discarded because of driver instability.

driver tank in addition to upsetting the electrical symmetry of the tank toroid inductance. The substitution of an air-wound inductance provided somewhat better results in this respect, but harmonic content was still quite objectionable.

It was decided to consider the use of some other method of interstage coupling between driver and final. The theoretical bugaboo facing us appeared to be the input impedance of the final transistor, consisting of a resistive component (the base spreading resistance, usually designated R_{bb}) and a reactive component consisting of the input capacitance (C_{be}). An interstage matching network must accomplish two functions: 1. transform the collector load impedance of the driver to the input impedance of the final; and 2. cancel out the reactive component of that impedance. This latter function is usually accomplished through one of two methods: the use of a series inductance whose reactance is greater than that of the input capacitance; or, the use of a series capacitance whose reactance is much greater than that of the input capacitance. In order to design the matching network, specific data with regard to base resistance and input capacitance of the 2N3632 were needed.

This in itself proved to be a considerable problem, since manufacturers have only recently begun publishing this data for large signal r.f. operation of specific devices. Figures for the 2N3632 were acquired in the Motorola Operating Note AN267, but these

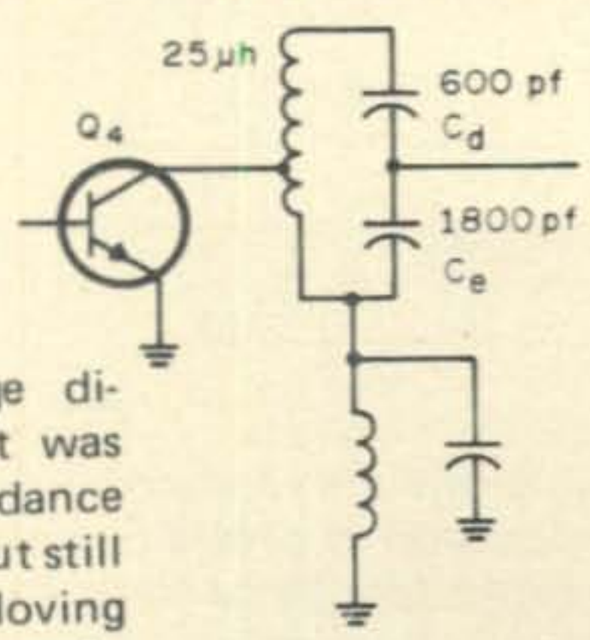
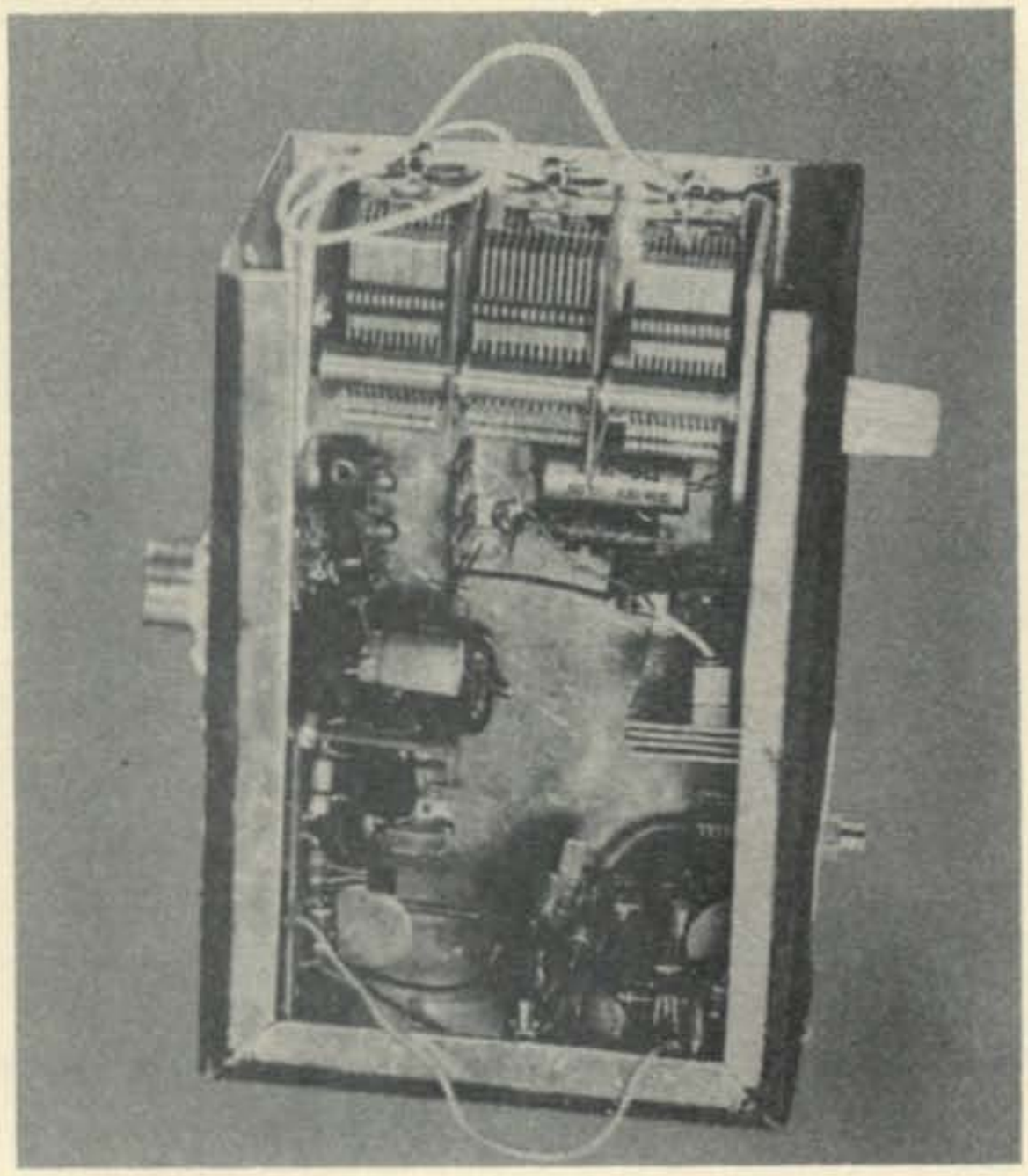


Fig. 4-Capacitive voltage divider across tank circuit was tried to provide impedance matching to final amp, but still encouraged instability. Moving tap to top of coil as shown in fig. 5 corrected the problem.



View of the partially completed transmitter shows the placement of the driver board on edge at the rear and PA transistor Q_5 on a home-brew heat sink near the front panel.

extended down only to 50 mHz, the usual cutoff for testing. Being desperate for any kind of information that would aid, I resorted to extrapolation of the graphs found in AN267, which would, of course, provide nothing better than +15% "ball park" results, but that was better than nothing! The extrapolation is given in Chart I, with plots for both 5 and 10 watt r.f. output at 28 v.d.c Vce. Our contemplated operation was in this range. Results indicated approximately 18 ohms and 2000 pf input capacitance in parallel configuration, and it was necessary to convert this to series configuration for us in the formula for network design, with the following formula used in the conversion:

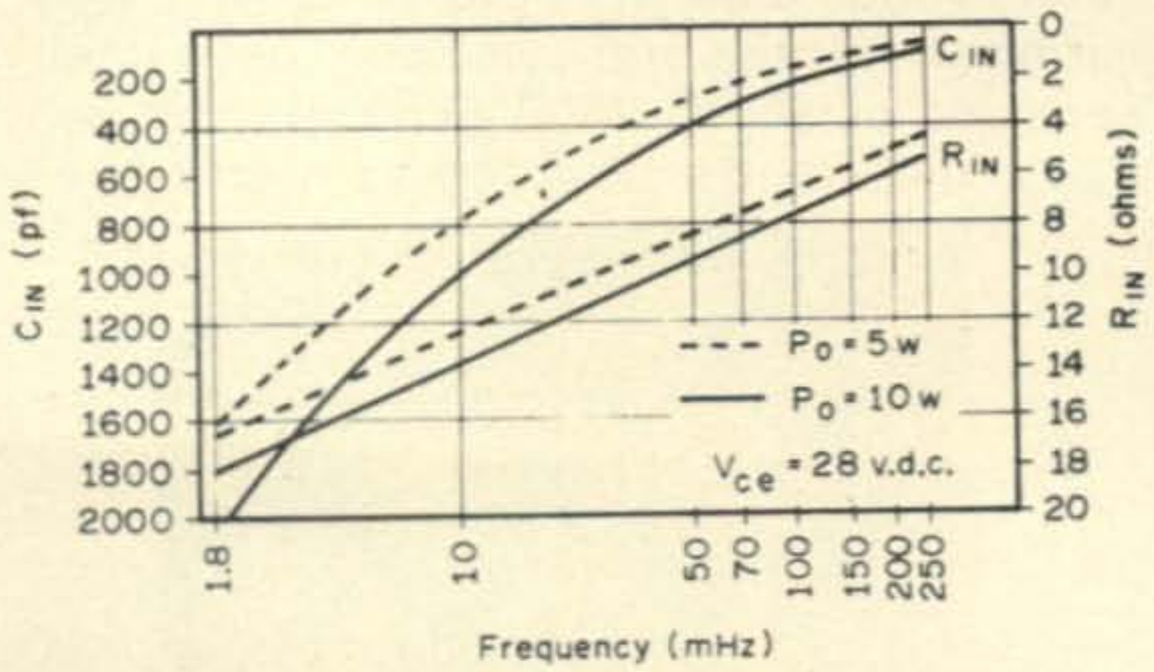


Chart I-Curves showing input capacitance and input resistance vs. operating frequency for the Motorola 2N3632 operating at power outputs of 5 and 10 watts. Curves are extrapolated from Motorola published data.

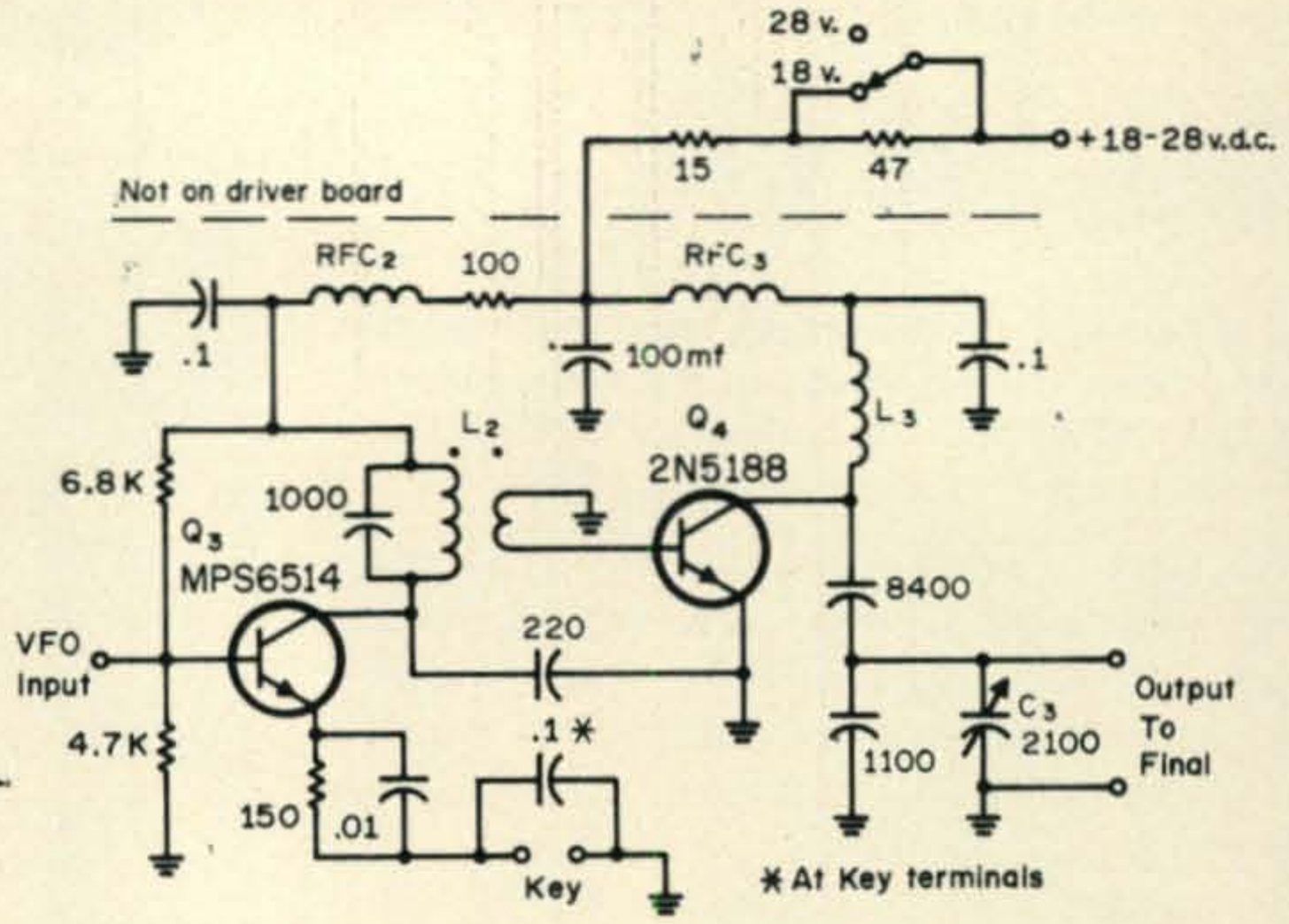


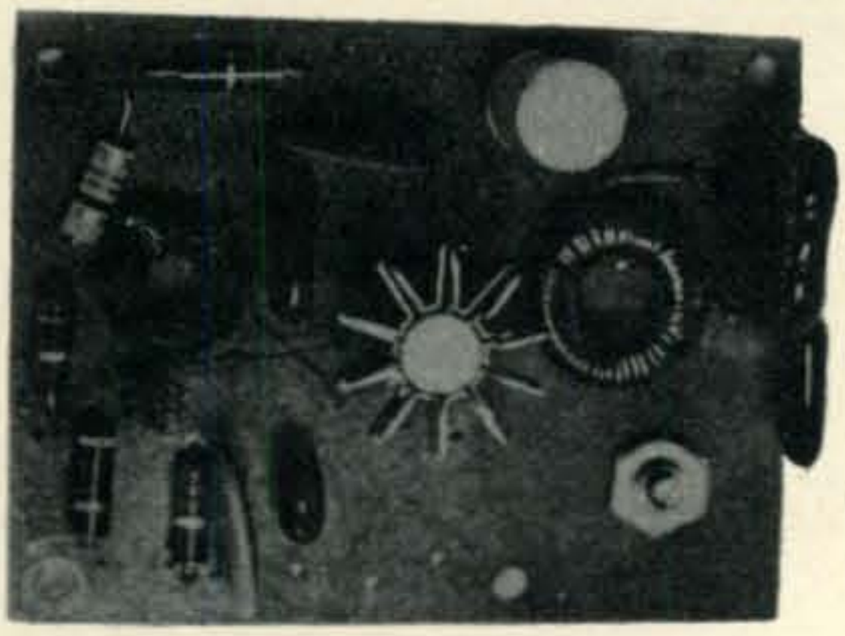
Fig. 5-160 meter Buffer/Driver module is built entirely on a small PC board as shown in the photo. L_2 is 42 turns of No. 24 e. on an Amidon T50-3 toroid core. Link is 10 t. No. 24 e. beginning at B-plus end of L_2, occupying 1/3 of toroid core. L_3 is 60 turns No. 28 e. on Amidon T60-2 toroid core. C_3 is an Elmenco No. 311 padder. RFC_3 is a National R-33.

$$Rs = \frac{Rp}{1 + (Rp/Xp)^2}\text{; and } Xs = Rs\,\frac{Rp}{Xp}$$

(where Xp = reactance of input capacitance) which yielded Rs = 14.9 ohms and Xs = 6.9 ohms, or approximately 12,000 pf for input capacitance in the parallel configuration! We very clearly had a real problem on our hands –if we used a network employing a series inductance, we would end up with a fraction of a microhenry, or a series capacitor in excess of 12,000 pf!

Undaunted, nonetheless, we decided to try a return to the breadboard and a Pi network with a very small inductance. This seemed to do the job, but high harmonic content remained. It seemed worth adding another Pi section to the network to achieve both matching and harmonic rejection, assuming that each section worked properly. Using inductances of about 1 uh, with *C*a-*C*c 2200 pf, *C*b of fig. 3 was gradually increased, and around 5000 pf, a dip in second order harmonics began and increased until it disappeared at about 9000 pf. Tinkering with *C*a-*C*c indicated little effect in regard to *C*a variations, but decreasing *C*c increased output considerably. We thought that we had it made, but a check for parasitics indicated what was actually happening–the final was oscillating on its own about 100 kHz up the band with a signal in excess of that on the operating frequency! Clearly this was not the solution! In addition, both 2N3632's in stock were vaporized by this time, and the trusty TI487 was put into the circuit.[2]

Next, an attempt was made to match through a capacitive divider across a tank circuit (fig. 4) with calculated values indicated for a Q of 5, but harmonics were still high. Further, when the matching capacitor (*C*e)



Top view of the buffer/drive board shows parts layout which corresponds closely to schematic at fig. 5. RFC_3 is located under the board.

[2] While the 2N3632 is a higher gain, *f*t device than the TI487, it is destroyed quite easily and rapidly, and I've blown several for no more cause than a few seconds of s.w.r. in excess of 2.5 to 1. While the builder can expect about 20% more output with the 2N3632, I would strongly recommend the TI487 for it's much greater durability. It is available for $5.60 from Newark Electronics, or any other industrial distributor carrying Texas Instrument products. A possible replacement with similar characteristics is the TIP 14.

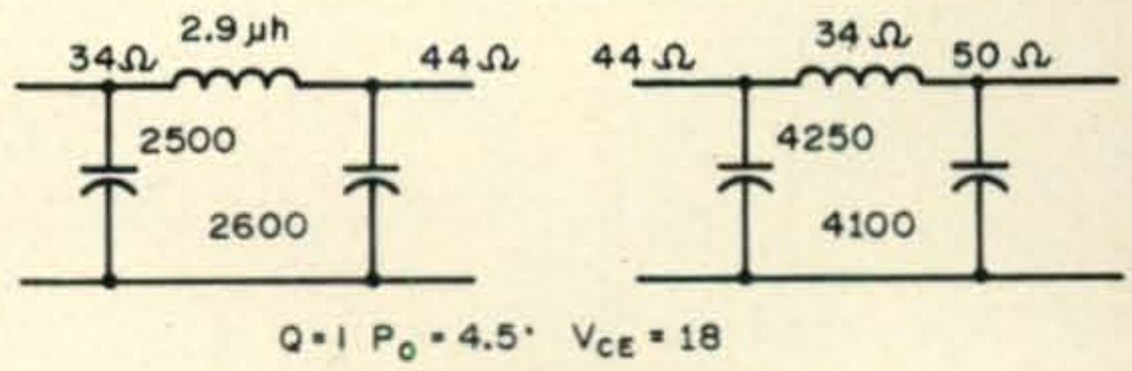
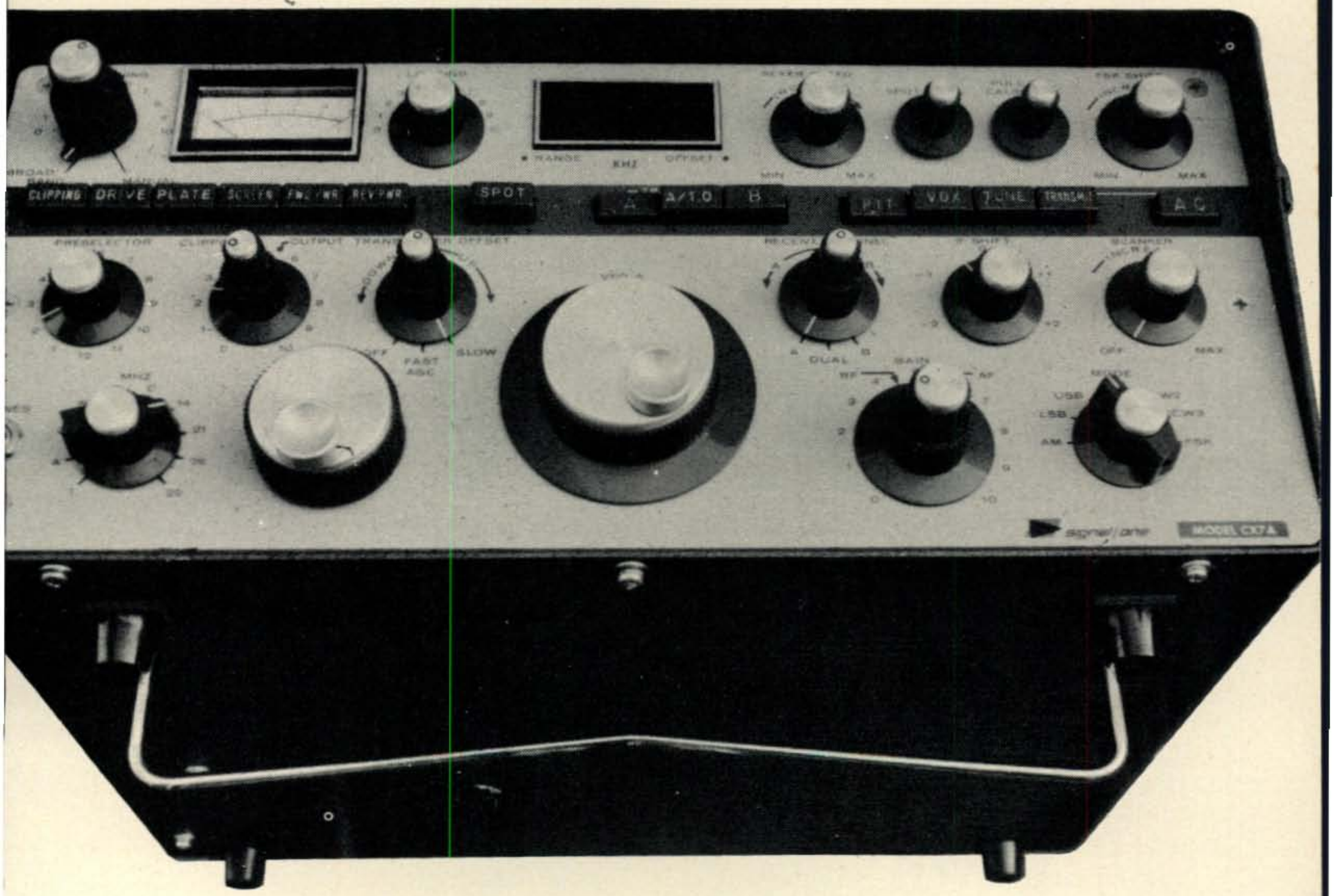


Fig. 6-A two-section pi-network output circuit was designed to provide two stages of impedance transformation: 34 to 44 to 50 ohms. The values shown, while theoretically correct for a Q of 1, did not produce the desired results and were discarded in favor of those shown in fig. 7.

A room full of gear ...right here.



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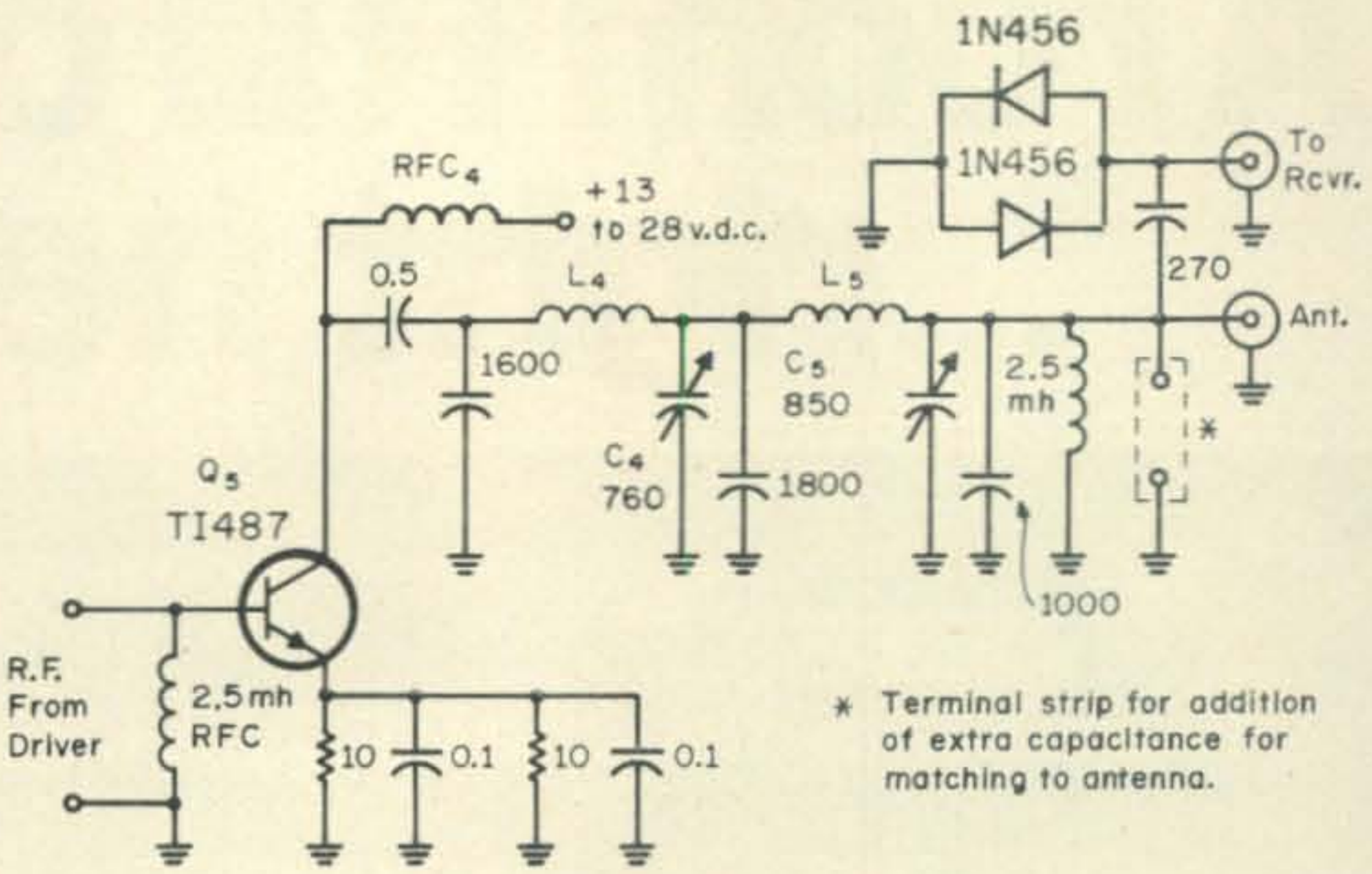


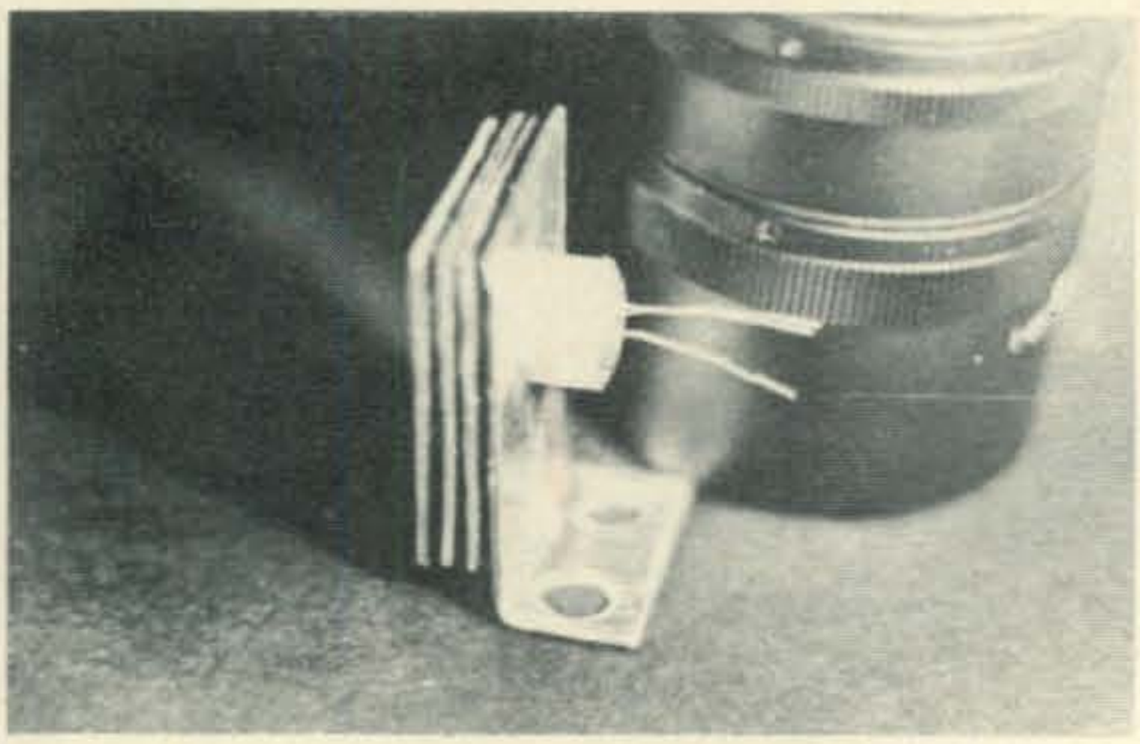
Fig. 7-Circuit of the final amplifier for 160 meters which delivers output power in excess of 5 watts. L_4 and L_5 are each 12 turns of No. 18 plastic covered wire wound on the same 1.25" dia. coil form, spaced to occupy 1.45" each. RFC_4 is scramble wound with No. 24 e. wire on a 1/4" dia. ferrite rod as described in the text. C_4 is an Elmenco No. 305 padder. C_5 is a three gang broad cast band variable capacitor with all sections paralleled.

was peaked, the final would take off on its own. Some tinkering indicated that the base r.f.c. of the final was critical, with values much below 1mp increasing the tendency of the final toward instability. 2.5mh seemed to work well. The problem of swamping out the harmonics through increasing *C*d-*C*e was next for consideration, and it was found that increasing *C*d to 8000 pf brought second harmonics way down, and the rejection was even greater with *C*e at around 3000 pf. Even so, the final exhibited tendencies toward instability as long as the collector of Q_4 remained tapped down, but with the movement of the tap to the top of the tank, everything operated smoothly at a low level of harmonic output. This is the circuit finally used in fig. 5. The adjustment of C_3 produced a very small peak in final output, indicating that the network was matching the two stages, although very broadly and with a low loaded *Q*. We went on to the testing of the final.

During testing of the driver, it was noted that the parallel output tank circuit in the final provided at best 18 db of suppression of second order harmonics. Tinkering with different values did not change or improve this. We decided to use a Pi net, and achieved better results with a single section. A second Pi section ought to improve things, it seemed. Aiming for a loaded *Q* of 1 and an output of 4.5 watts at 18 v.d.c. collector potential (load impedance of 34 ohms), a two section Pi network was calculated for steps of 34 to 44, and 44 to 52 ohms as shown in fig. 6. The network didn't work. The difficulty of dealing with the Pi network at 1.8 mHz become immediately clear when we moved on to calculations for one at a *Q* of 5. After the inductance of the first section came out to around 0.455 uh and C_1 to 10000 pf, we gave it up. When theory failed, experimentation was the only alternative! After much juggling of values, the final circuit worked as desired–very low harmonic output with decent 160 meter output. After observing the operation of the final at various level of *V*ce, it appeared that the resulting Pi network was a 1:1 transformation device–the collector load impedance remained at approximately 50 ohms for each of the *V*ce levels tried–13.5, 18, 22, and 28 v.d.c. It worked, though, and that was the big thing! The final circuit for the most part looked nothing like the paper design.

After a final readjustment of all stages, the transmitter appeared to perform as desired. When a random wire antenna was connected through an L network coupler, however, the final took off readily, but a low reactance r.f. choke across the output stabilized the final. Connected to a tuned frequency antenna, the transmitter worked well.

[*continued on page 98*]



Detail of home-brew heat sink for Q_5. Sink is built up from pieces of aluminum spaced by washers.

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

Owners of "old style" vacuum tube equipment will be happy to learn about a new line of solid state vacuum tube replacement modules now being offered by Teledyne Semiconductor.

Similar in shape to the commonly available rectifier replacements, the Teledyne "FETRONS" are direct pin-for-pin plug-in replacements for the popular 12AT7 dual triode, and the 6AK5 pentode. Specifically selected FET's and internal circuitry allow these devices to improve signal to noise ratios by about 4 db and because they are solid state, increase life expectancy many times.

Figure 1 shows the comparison characteristic curves of a typical 6AK5 and the FETRON replacement. At present four units are available. The TS6AK5AMP1 is intended for narrow and wide band use up to 500 mHz while the TS6AK50SC1 is primarily for oscillator use. The TS12AT7AMP1 can be used for frequency converters and push pull cathode drive amplifiers in the 100 mHz area while the TS12AT7OSC1 is designed for oscillator use.

With the introduction of these devices, even the most die-hard vacuum tube individual can finallly "go solid state."

Another interesting item we would like to mention this month is a couple of subminiature broadband double balanced mixers being offered by Anzac Electronics, 39 Green Street, Waltham, Mass. 02154. These commercial mixers, schematics given in fig. 2, can be used as frequency converters, d.s.b. suppressed carrier modulators, and phase modulators and detectors. The MD-108 is designed to operate from 5 mHz to 500 mHz with a 7-9 db conversion loss while the MD-109 operates from 200 kHz to 200 mHz with a conversion loss of 6-7.5 db maximum. When in actual use, isolation of unwanted products are a minimum of 20 db depending on frequency and actual application. Cost for a single unit is $17 which is quite reasonable for a commercial item.

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

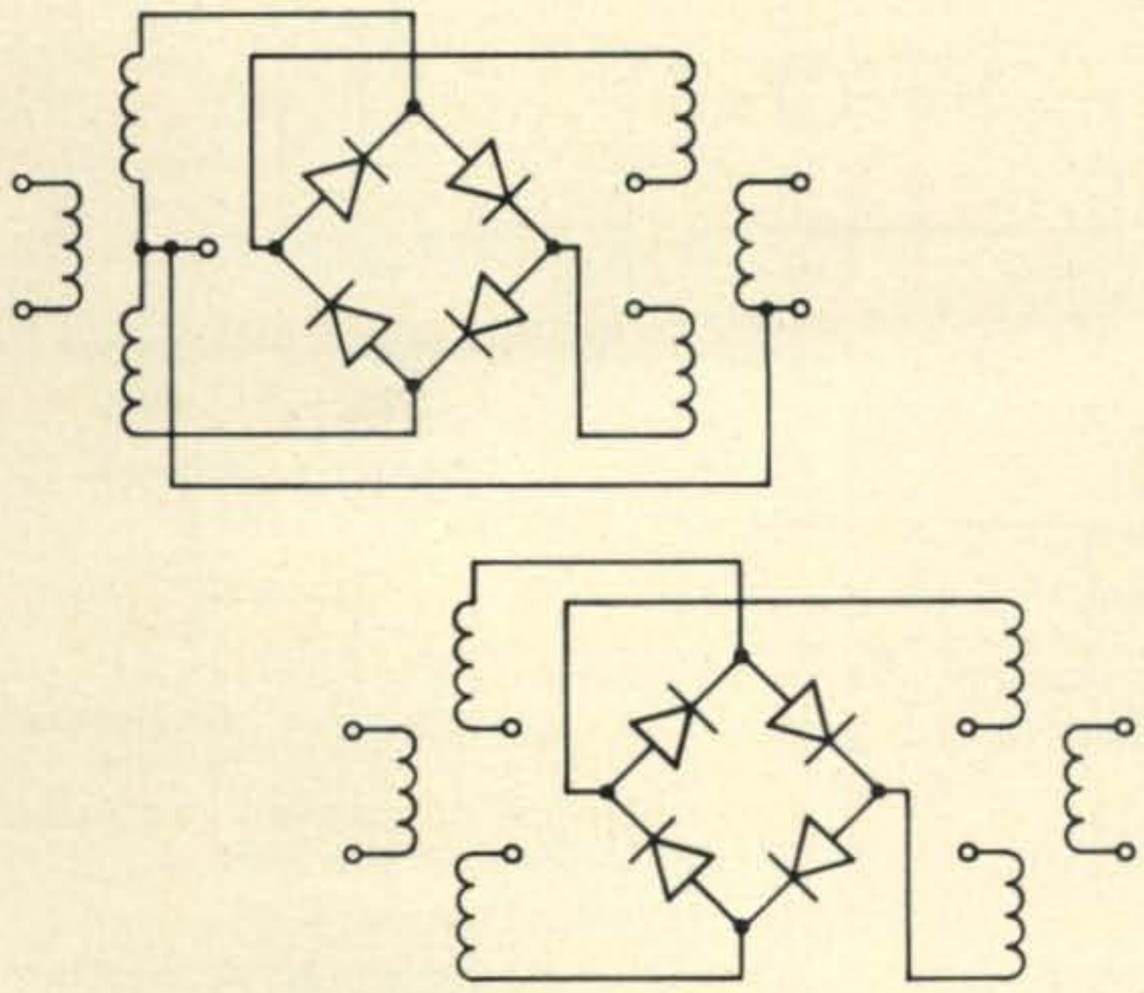


Fig. 2 — Schematic diagram of mixers described in text.

Everyone is quite familiar with zener diodes as voltage regulators. A relatively new type of diode has been introduced however, that is intended for use as a current regulator. This current regulator diode or field effect diode as it is sometimes called has a characteristic curve that is shown in fig. 3. Also shown in the figure is the schematic symbol and a test circuit.

As the voltage in fig. 3 is increased, the current through *R* and the diode increases nor-

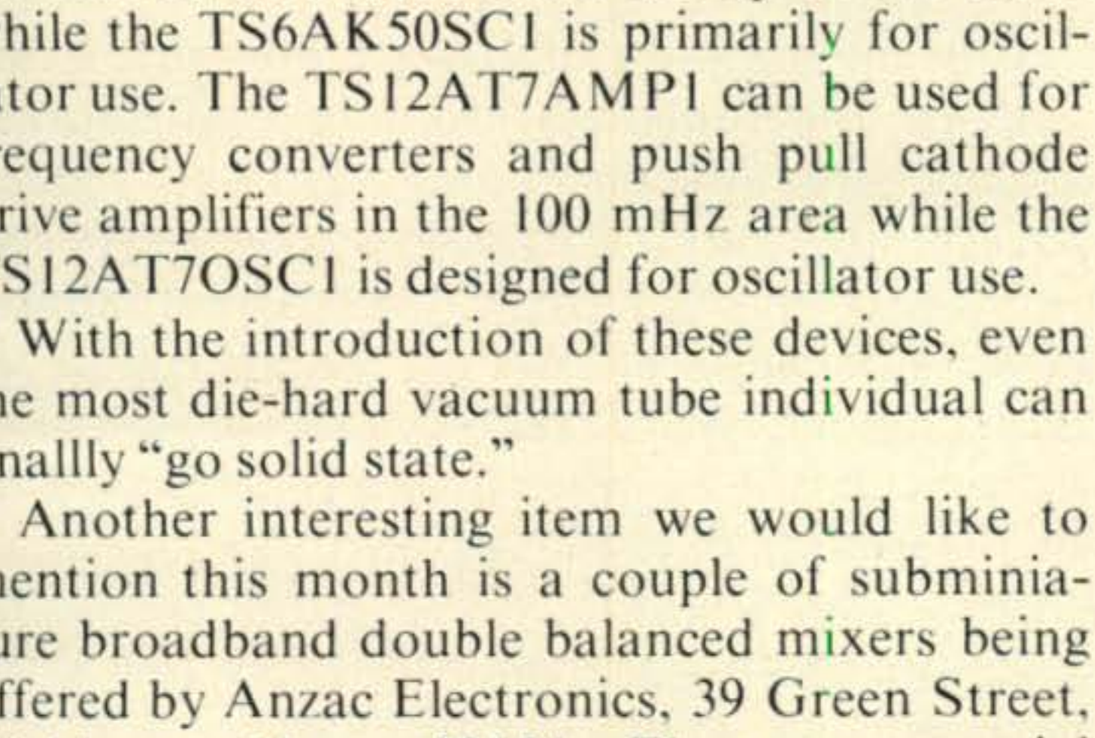


Fig. 1 — Comparison of 6AK5 vacuum tube and Teledyne FETRON.

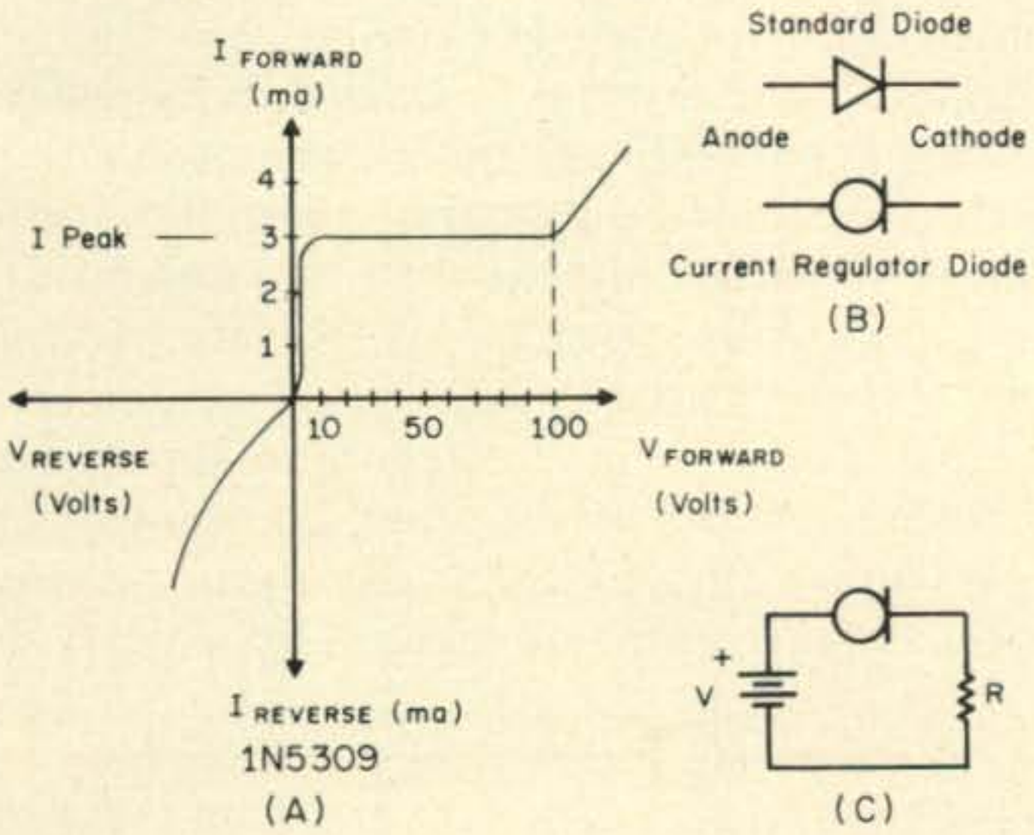


Fig. 3 — (A) Typical characteristics of current regulator diode. (B) Schematic symbols for current regulator diodes. (C) Test circuit described in text.

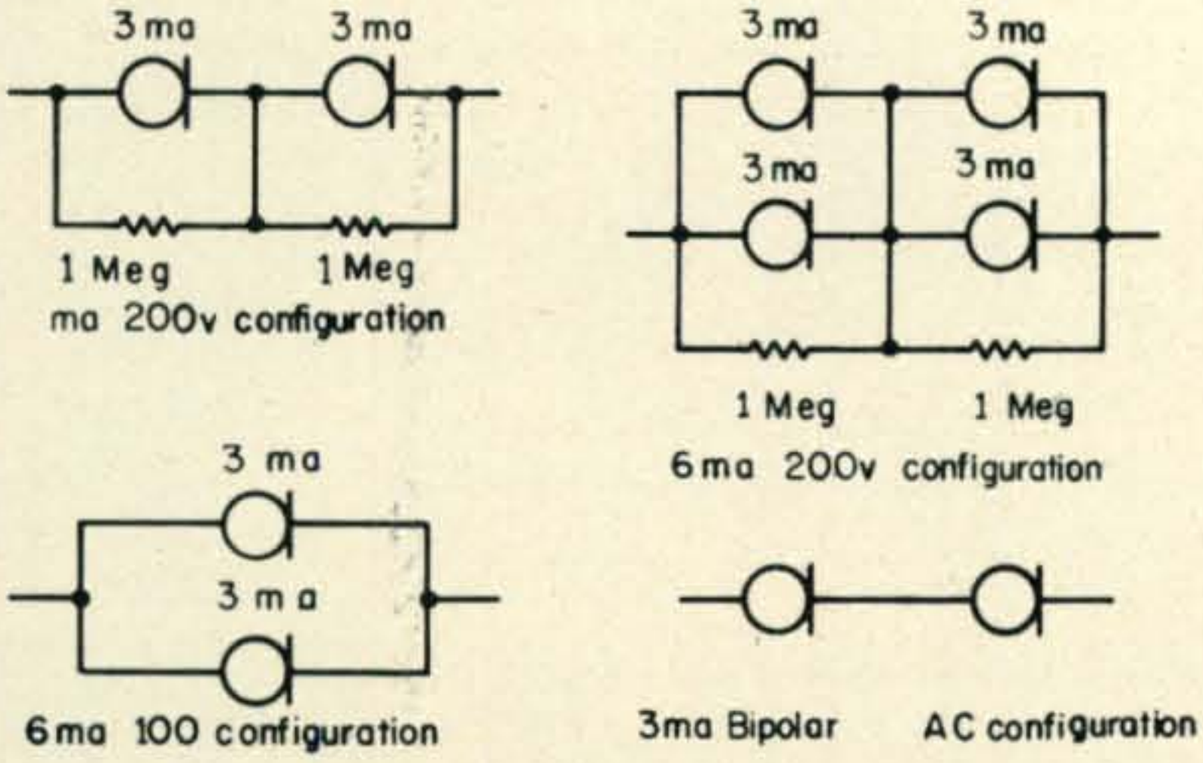


Fig. 4 — Typical hookups of current regulator diodes.

mally until a point *I* is reached. A further increase in voltage does not allow the current through the diode or *R* to increase beyond *I* . When the voltage applied exceeds 100 volts, the diode breaks down. Between 3 volts or so and 100 volts, however, the current is regulated to better than 1%. If it is desired to operate over a range greater than 100 volts, diodes can be series connected as shown in fig. 4. High value voltage equilizing resistors must be

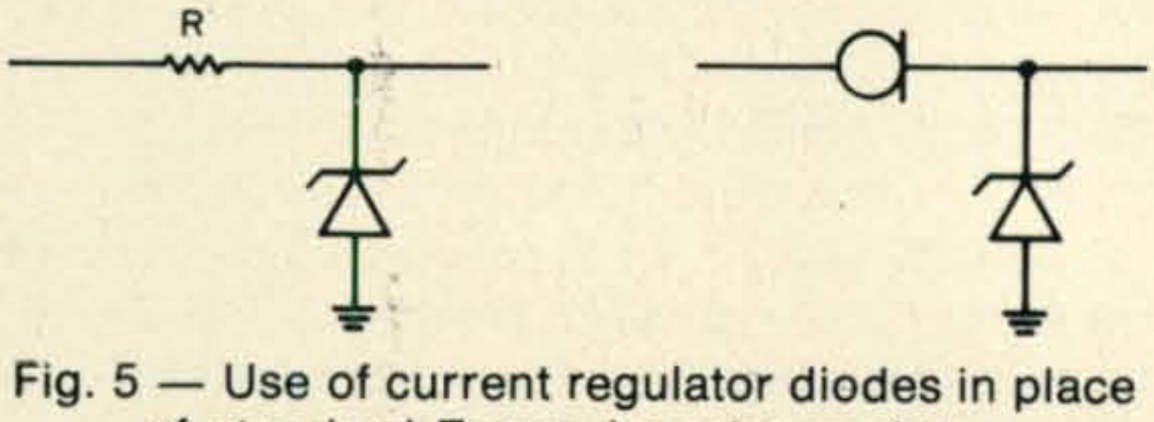


Fig. 5 — Use of current regulator diodes in place of standard Zener dropping resistor.

used here as shown. Since these diodes are only available at currents up to 4.7 milliamperes, fig. 4 also shows how to parallel them for higher current uses.

Applications for current regulator diodes are many. Some of the more common are shown in the following examples.

In fig. 5, the normal zener dropping resistor, *R*, has been replaced by a current regulator diode. This now allows the unregulated input voltage to rise as high as the breakdown of the diode (100 volts typical) plus the zener voltage. Unlike the resistor, however, high power is not dissipated in the current regulator diode. Furthermore, because of the combined current/voltage regulation of the circuit, a much better overall regulator results. By using a zero

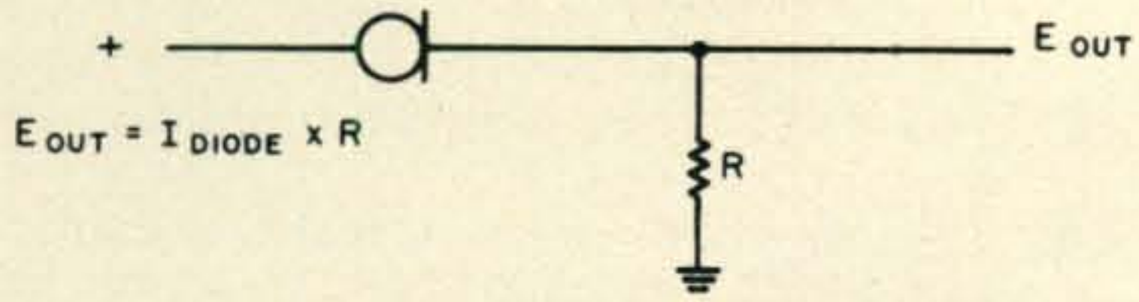


Fig. 6 — Very low voltage regulated supply described in text.

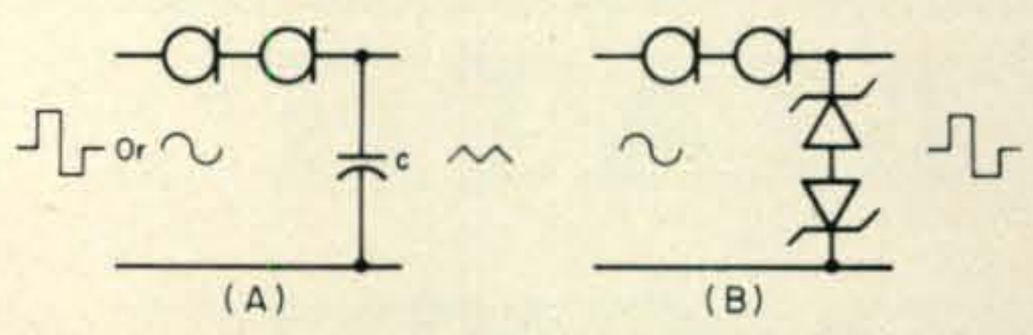


Fig. 7 — Simple triangular wave generator and square wave generator.

temp coefficient reference zener and selected current limiter diode, regulators with this simple circuit can be fabricated with stabilities of 10 millivolts over a range of 9 to 100 volt input. Diodes for this use could be 1N4569A zeners and 1N5290 current regulators.

In fig. 6 we have described a very low voltage regulated supply. Since the diode regulates the current flowing through *R*, the voltage across *R* is constant and equal to (by Ohm's Law) the diode current multiplied by the value of *R*.

Two more uses for current regulator diodes are shown in fig. 7. In (A), the diodes are used as a very simple triangular-wave generator. The circuit can be driven with either sine or square waves. Shown in (B) is a simple square wave clipper. Here the current regulator diodes are used in conjunction with two zener diodes to produce good quality square waves from sine waves.

Current regulator diodes are presently available to experimenters from several sources, among those Motorola and Siliconix. Typical part numbers are 1N5283 through 1N5314 and MCL 1300 through MCL 1304. These families cover the range of 220 microamperes to 4.7 milliamperes. Most distributors of semiconductors should be able to supply units and the two manufacturers will be glad to supply data sheets.[1]

Before closing this month, there are a few new items we would like to mention. National Semiconductors has just introduced the LM120, high power negative voltage regulator. This device, similar to the LM109 ½

[1]References for the current regulator application came from: Motorola Applications Note AN-221; Motorola Applications Note AN-462; "Applications of the Current Regulating Diode," *Electronics* mag.; *FET Applications Handbook*, TAB Books; *Siliconix Semiconductor Devices*, 1972 edition.

[*Continued on page 99*]

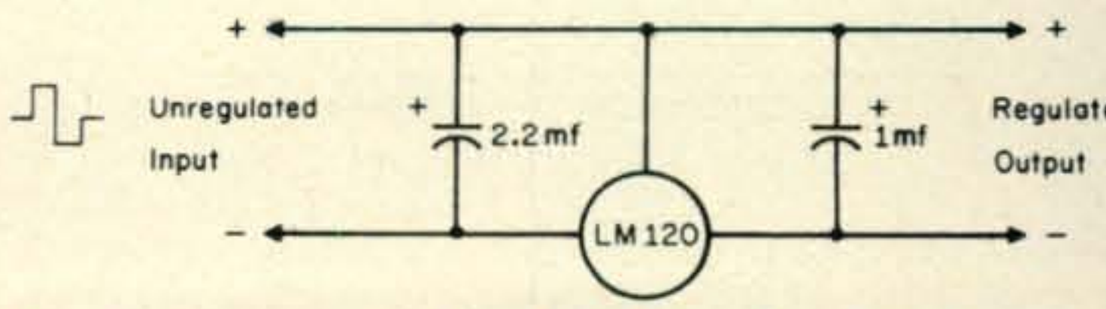


Fig. 8 — Hookup for LM-120 1.5 a. high power negative voltage regulator.

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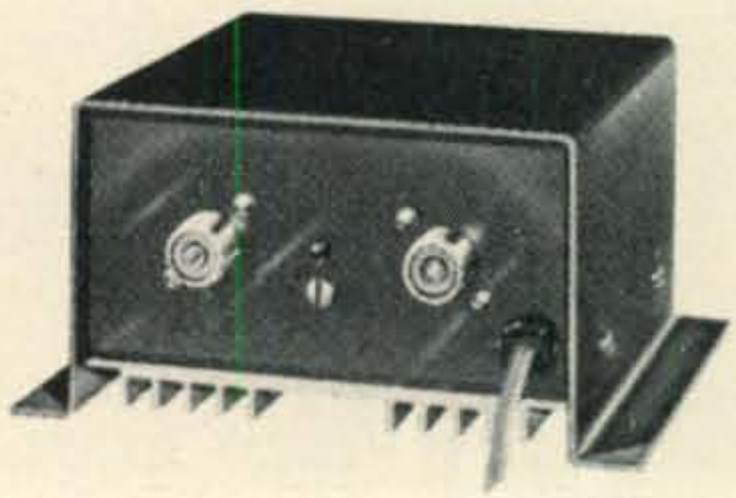

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West African DXpedition

Part II

BY GEORGE PATAKI,* WB2AQC

Last month we described our travels from the US to Nouakchott, Mauritania; Dakar, Senegal; Bathurst, The Gambia; Freetown, Sierra Leone and Monrovia, Liberia. This concluding installment relates the story of our operations at Ivory Coast and five other West African DX locations.

Abidjan, Ivory Coast

We arrived at Abidjan with an early morning plane and we were welcomed by Sully, TU2BX, Joe, TU2AZ, the president of the amateur radio association, and Michel, TU2DD, a French marine biologist. Sully invited us to stay with him. He is the secretary of the ham association. He was instrumental in getting the licenses and gave us the assigned callsigns well in advance; TU4AB for Eva and TU4AC for me.

From the airport all the way to Sully's house, the three cars of the welcoming committee were in constant contact via v.h.f. radio; a new technique in TU2-land.

Abidjan is beautiful indeed. Built around some large lagoons, is the most modern city I ever visited in Africa.

I was invited by the "Radio Television Ivoriénne" to give an interview about our DXpedition. The conversation was supposed to be in French, but I was confused and spoke mostly Hungarian.

The first day I expressed the desire to eat "typical African food." Sully, TU2BX, and Michel, TU2DD, took Eva and me to a "typical African restaurant." We finished our dinner in about one hour but the "typical African stomach ache" stayed with us three more days.

One morning Michel, TU2DD, took us sightseeing outside Abidjan. We saw the former capital of Ivory Coast, and some coconut, banana and pineapple plantations. We visited Joe, TU2BC, and his wife Jacquie who just got her call; TU2DN. Both are very active, but mostly with French speaking amateurs.

The last evening we were invited to a dinner party at the house of Joe, TU2AZ, where they served mainly African specialties. A large group of local hams; Felix, TU2BB, Dan, TU2CY, with his XYL Andrée, Michel, TU2BN, Paul, TU2DA, Jacques, TU2CW, Sully, TU2BX, Michel, TU2DD, and others, created animated conversation, like a real pile-up; everybody was talking in the same time.

I recommend visiting this country; the TU amateurs are very friendly and happy to meet foreign amateurs. The license with all the extras is quite expensive but a lot less the red tape found in other African countries.

I don't recommend relying only on English; before the trip you should take a short but intensive French language course.

Lomé, Togo

During a QSO, Fern, 5VZYH, invited us to Togo. When we arrived in Lomé, he picked us up at the airport and took us to his house.

I was anxious to get on the air, so we went to pick-up our licenses. At the Dept. of Telecommunications where we sent our applications many months in advance, we were told that the approval from the police did not arrive yet. We

Eva, TU4AB, visiting Joe, TU2AZ, the president of the radio amateur association of Ivory Coast.

*34-24 76th Stree, Jackson Heights, N.Y. 11372

Eva, 5VZAA, visiting Togo's most active amateur: Fern, 5VZYH.

started a long journey, visiting a lot of dignitaries, each one sending us to another. We explained the purpose of our radio expedition again and again to high-ranking officials who never heard of amateur radio before. They did not say it but I could guess these thoughts: "They seem like spies, but why are they asking for licenses? They must be crazy."

Finally the vicious circle was closed and we went back to the Dept. of Telecommunications. There we found out that they don't issue callsigns; every applicant picks a call for himself, hopefully one that was not picked by somebody else. We decided to choose 5VZAA for Eva and 5VZBB for me. They insisted on the 5VZ prefix instead of 5V followed by a number. Personally I think they are wrong, I suspect they missread the number 2 in the instructions as the letter Z.

We operated quite a lot in Togo where we stayed about 5 days. We went sightseeing and later met another amateur; Garland, 5VZGE. We even got involved in a street fight. On a tour through the city, Fern, 5VZYH, spotted one of the local workers of his company playing the slotmachine in a bar instead of being a work. Summoned to return to work, the angry worker gave Fern a chase, first around the car then through the streets. We ran a few blocks back and forth, Fern leading the way, the angry Togolese after him, followed by me who took some excellent action photos, and by hundreds of local people ready to intervene. Everything ended in a mass confusion.

In Lome, Togo, Eva, 5VZAA operating assisted by Garland, 5VZGE and Fern, 5VZYH.

I recommend applying for a license at least 6 8 months in advance and reminding them every month that you are coming soon.

Don't rely on the efficiency of the local administration.

Tema, Ghana

Ghana initially was not included in our schedule because it seemed that we cannot get any license. Emile, 9G1WW, and his wife Tara, 9G1YA, invited us to visit them so we took a side trip. We left Lomé with Fern and his wife Laura and in 2½ hours we got to Tema, where Emile works for Valco, one of the world's largest and most modern aluminum plants.

To illustrate the state of affairs in some of West African countries, I'll describe my "border incident." We arrived to the Togo-Ghana border where we stopped for the formalities. On one side of the border is a big sign "La douane Togolaise," on the other side is a large arch with "Welcome to Ghana" sign. I walked to the border barrier with my camera. On each side of the barrier, a guard was watching me closely. I stepped on the Ghana side and tried to photograph the welcome sign. Suddenly the Ghanian guard jumped in front of me, waiving his submachine gun and yelling:

"It is strict forbidden to photograph this side."

There was not any military installation there but I learned early in my life that a man with a machine gun is always right. I turned around slowly and stepped over the border trying to photograph the Togolese side. Now the Togolese guard jumped eagerly and said:

"Il est defendu de photographier ici."

"Pardon monsieur," I answered politely, "but can I photograph the other side?"

"Of course monsieur," replied the guard, "as long as you wish."

Standing on the Togolese side, 10 feet from the Ghanian guard, I photographed the 9G1 side, then I stepped again over the border and I said to the man with the machine gun, "I know it is strictly forbidden to photograph this side but can I photograph the Togolese side?"

"Certainly, Sir," came the polite answer, "you can photograph Togo, we won't stop you."

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Eva, WA2BAV/9GL visiting the most active amateur radio couple in Africa: Emile, 9GLWW and Tara, 9GLYA.

Ten feet from the Togolese guard I took several shots of the 5VZ side. Fern, who just finished with the paper work, came by. I jumped on the car waving good-by to the two very strict but confused border guards and drove away.

On our way to Tema, we had to pass through several military check points; it was an uneasy feeling.

In Tema we met Emile and Tara and we continued our journey to Accra, to see if we could get licenses. At the Dept. of Telecommunications we were informed that it was not possibl to issue callsigns at such short notice (it take many months), but we can work "portabl 9G1" from a licensed station. This was the wa WA2BAV/9G1 and WB2AQC/9G1 wer born.

Emile, 9G1WW, is a successful contestman Tara, 9G1YA, is an active DXer, they have a exceptionally good station, and we used it fo more than 1,100 QSOs.

My recommendation to apply for license a least 6-8 months in advance is valid here also.

I don't recommend arguing with men in uni form, they may shoot first and ask question later.

Niamey, Niger

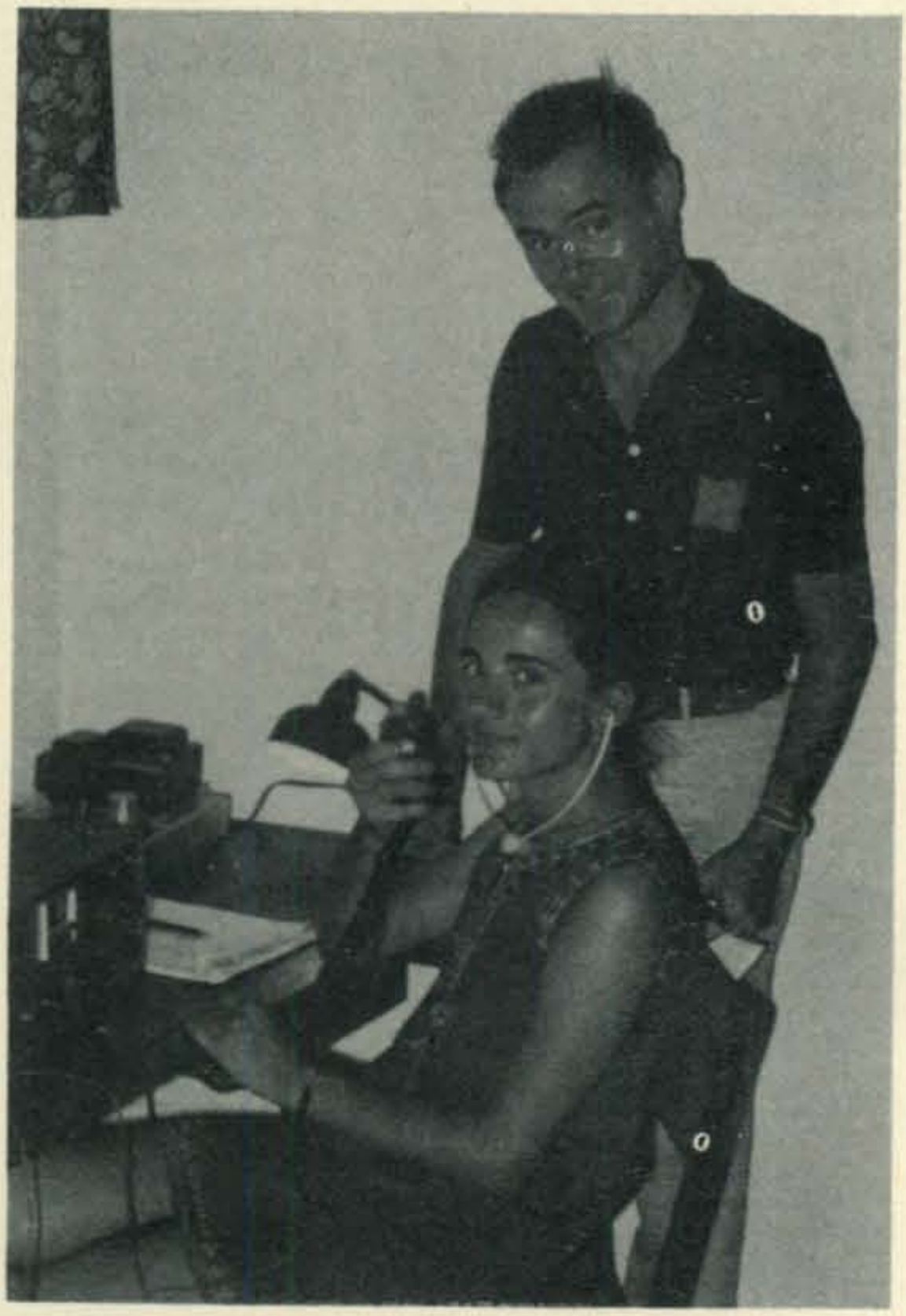
Walter, DJ6QT, the famous Germa Dxpeditioner advised me to visit Niger and I am happy I did. I wrote in advance to Jacques 5U7AH, a Frenchman working for the Dept. of Telecommunications, asking his coopera tion. He is not active anymore but was very helpful in getting our licenses.

We left Lomé and with a stop i Ouagadogou, in Upper Volta, we arrived t Niamey, the capital of Niger. We went directly to the Hotel Les Ronniers, then to the Dept. o Telecommunications to see Jacques, 5U7AH. There we heard again the old story; "The police did not send yet their approval." We went to see the Minister of the Interior, the Director of the Security Police, and many other people. Finally we received the answer: negative. We started the visits from the beginning, we told once again the same story to the same people; the answer: positive. The logic, the reason? Don't look for logic in this part of the world. Personally I think the Minister thought if he refuses me the second time, he'll have to see me for the third time. I know my calm French is not a pleasant thing to listen to but my angry French is just awful.

As a matter of fact Gus Browning, W4BPD, the former DXpeditioner, printer and publisher, wrote me: "You can expect to camp for 2-3 days near various Ministries, and wait for days for a simple signature."

But everything went OK; Jacques called us up at the hotel, giving us the callsigns; 5U7AV for Eva and 5U7AU for me. This was quite a coincidence because in Liberia Eva got the suffix AV and I got the suffix AU. We operated a lot from this location, giving a new country to a large number of amateurs. The whole country has just two active hams; Paul, 5U7AW, a Frenchman from Marseille who talks mostly with French speaking amateurs, and Dave, 5U7AK, a missionary.

We had dinner in Paul's house and operated his TR-4. His wife Huguette has a license, but



Jacques, 5U7AH, who was very helpful in getting the licenses in Niger, is visiting Eva, 5U7AV.

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she is not active at all.

Nicole, 5U7YL, the XYL of Jacques, 5U7AH, took us sightseeing and we saw fascinating places. There is a huge, colorful and smelly market where with a telephoto lens you can photograph the most picturesque characters South of the Sahara. The telephoto lens is essential to keep yourself unobserved. I saw a man walking his pet; a large hyena, another man carrying a 10 foot long snake. I saw Bedouins high up on their camels, with their faces completely covered except the eyes, Tuaregs with sharp spears, various nomad tribes.

I recommend visiting Niger. Write all the correspondence in French; even a bad French is better than a perfect English. And this goes for all the former French colonies.

I don't recommend the Hotel Les Ronniers; it is too far out from the city and has no good antenna location.

Cotonou, Dahomey

From Niamey we flew to Cotonou and at the airport we were welcomed by Robert, TY1ABE, his wife and his son, and by Armin, TY3ABF. Robert is a French military instructor for the local Rangers and Armin is a broadcast engineer from Germany. Both were extremely helpful to us in preparing this trip and during our stay in Dahomey.

I was warned that in Dahomey you have to apply for licenses 6-8 months in advance. We applied in December and in May when we arrived in Cotonou, the licenses were not ready. We had to lose precious time visiting local officials, explaining the purpose of the DXpedition to some high officials of the "Suréte" (the Security Police) who never heard of amateur radio before but were suppose to approve it. They were very suspicious; in their mind every foreigner is a possible spy. If the foreigner has a radio transmitter, the possible becomes probable. But the fact that we were pushing for licenses, confused them very much.

Finally we solved the problem, installed our antenna in the hotel Pam-Pam in the center of Cotonou and started to operate.

The owner of the hotel Pam-Pam is a former communications officer of the French army and I think he was the only one in the whole Dahomey, besides the three existing hams, who understood what amateur radio is all about.

We visited Armin, TY3ABF, and operated with success his excellent and powerful station. With Robert, TY1ABE, and his family we went sightseeing. Robert is at the end of his tour of duty in TY-land and Dahomey is losing its most active ham, who made many thousands of QSOs, both on c.w. and s.s.b.

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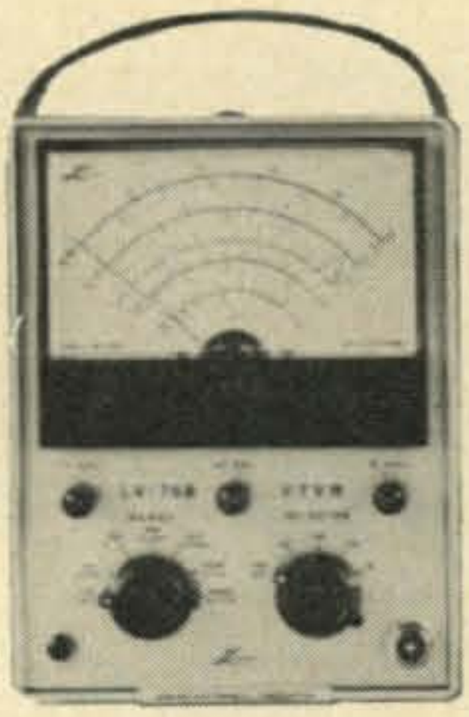

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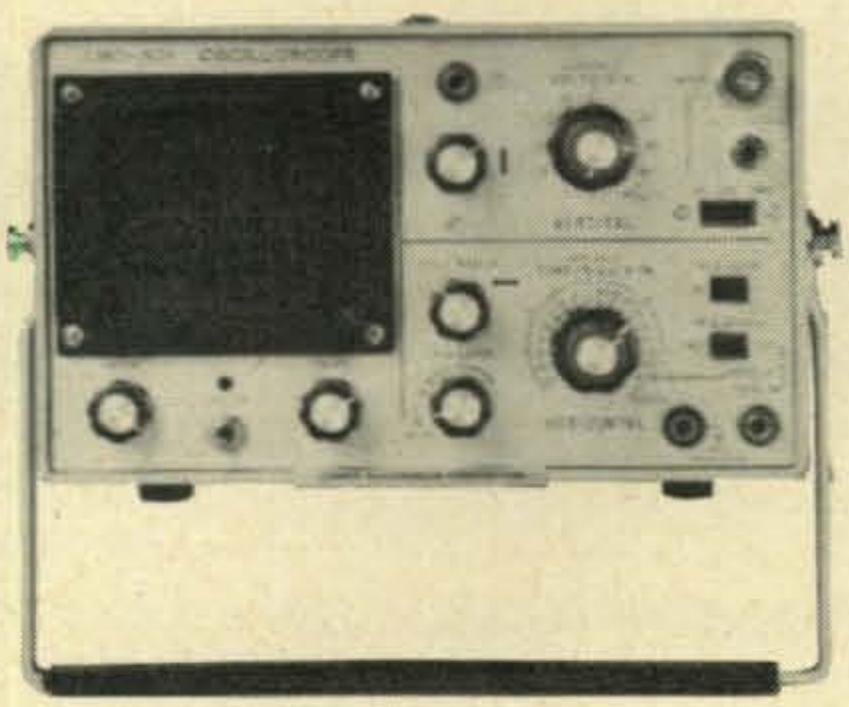

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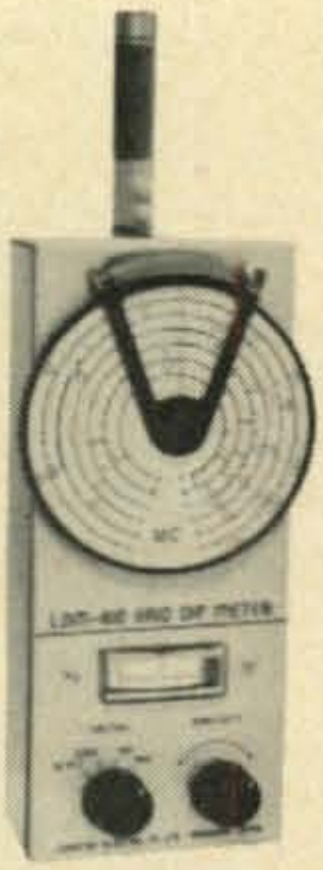

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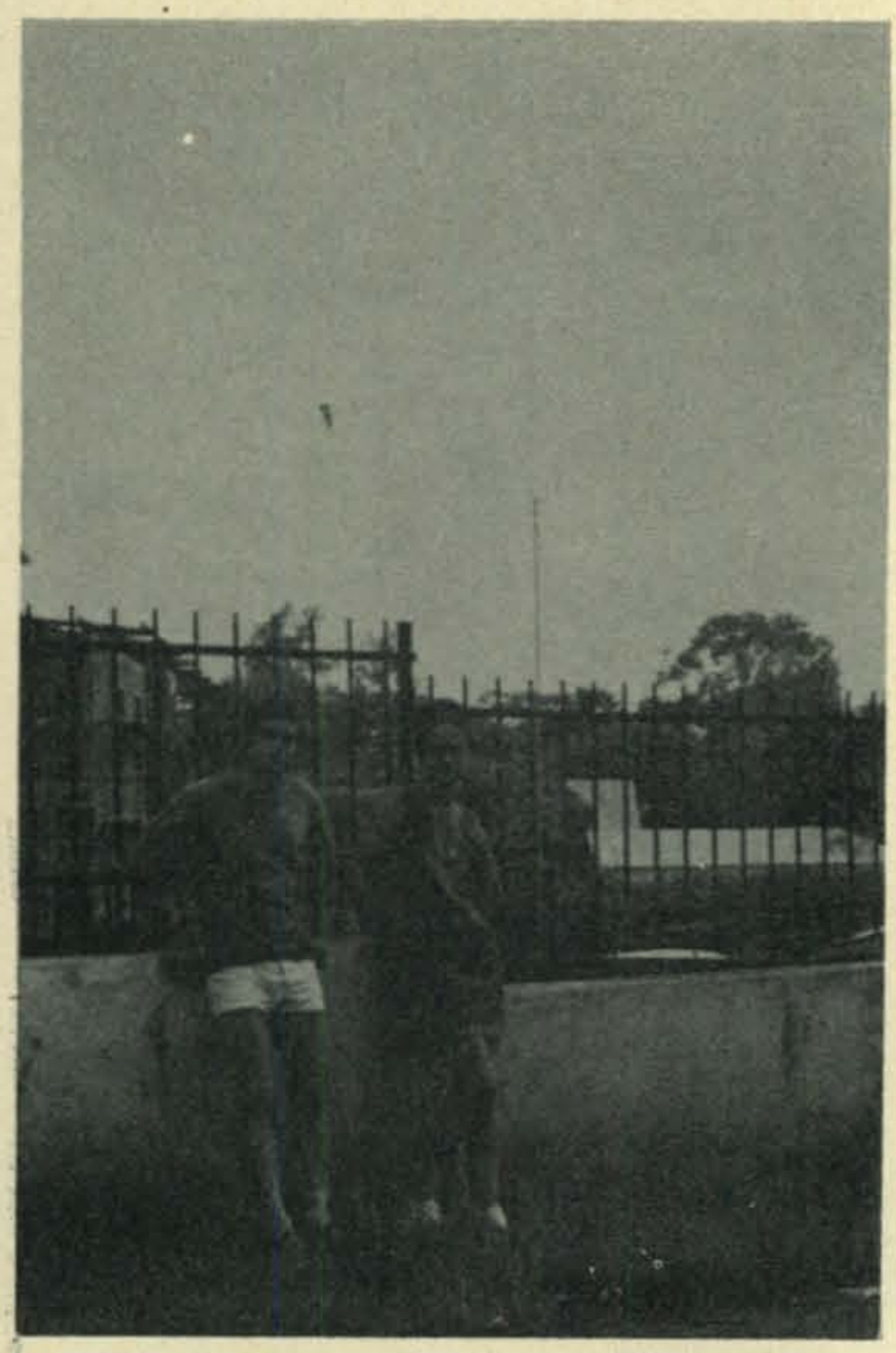


Haim, TJ1BF (also 4X4RH), and Eva, WA2-BAV/TJ1, in front of the antenna.

The city of Cotonou is without any interest for the tourist, but you have to see Ganvie, a lake dwellers village. The homes are built right on the water and the population, all fishermen, spend all their life on the water.

Don't go to Dahomey without having first confirmed your license and don't rely on the help of the American Consul; he cannot cut through the red tape. The only factor which solves anything is time, lots of time.

In Abidjan, Ivory Coast, Eva, TU4AB, was the guest of Sully, TU2BX, the secretary of the amateur radio association.

Nigeria

Getting a tourist visa for Nigeria is no problem but I was informed by several sources that it is impossible to get a license in Nigeria. In the middle of March I received an answer from the Ministry of Communications in Lagos, saying: "I am directed to acknowledge the receipt of your letter dated 31st December 1971 and to inform you that you may wish to apply for amateur radio licenses when you arrive in Nigeria in April-May."

I did not understand the meaning of this letter and nobody else understood it. Do they want to give us licenses when we arrive in Nigeria or they just want to inform us that we "may wish to apply for amateur radio licenses?" About this wish we knew even before their letter; we informed them on the first place.

Their position was so confusing that we decided to just skip the 5N2-land.

Yaoundé, Cameroon

From Cotonou we flew to Douala, but because we did not know any active amateur in Douala, we continued to Yaoundé, the capital city where Haim, TJ1BF, was helping us in getting our licenses.

The customs inspection was easy. I stuck my passport in the face of the inspector and said: "American tourist." He looked at my bush jacket and cowboy boots and asked with suspicion:

"Do you have any guns?"

"No, just a bazooka," I answered seriously.

"OK, go ahead," was the satisfied answer.

I wonder what will be his delayed reaction if he would ever look up the word in a dictionary.

I have to emphasize that from all the 11 countries we visited during this DXpedition, Cameroon was the worst. I did not listen to those who wrote me that it takes very long to get a TJ license and you have to have connections to the right people. We applied for the licenses five months in advance, I contacted the Ambassador of Cameroon to the US and I asked him to help us in getting the licenses in time. With all the correspondence, the intervention and the promises, when we went to the Ministry of Posts and Telecommunications, the licenses were not ready. Here again I had to talk, argue, explain and push. But while in most of the other African countries I had to accelerate a slow moving bureaucratic process, here in Cameroon the process was not moving at all. Finally after we cut through the tremendous red tape, we were left with very little operating time.

We stayed in the hotel Mount Febe outside the city, but spent lots of time with Haim, TJ1BF. Haim is a "Sabra" (native Israeli), known also as 4X4RH. He is a communications technicians, working closely with the local Dept. of Telecommunications, but it took him about a year to get a license.

In Yaoundé, like in many other African cities, the power voltage fluctuates quite a lot and sometimes is turned off completely. One night working the pile-up, while I got a half of a callsign; ". . . 9AA," the lights went off. 25 minutes later when the power was turned on again, I called:

"9AA, this is WB2AQC/TJ1, are you still there?"

"WB2AQC/TJL this is JA9AA, thanks for coming back, you are 59," said a calm voice as though there's nothing unusual to wait half an hour for an answer.

In Yaoundé the climate is better than in Douala but like in Douala there is nothing to see. In the city you are constantly annoyed by souvenir vendors. On the streets they follow you, at the restaurant they sit at your table, and talk, and talk, and talk. The asking price is 3-4 times the selling price.

While for the other countries like Togo, Dahomey, etc. I recommend applying for license at least 8-10 months in advance, for Cameroon I recommend completely avoiding it. You could spend a lot of money and time going to Cameroon only to face ignorance and hostility.

Conclusions

In a DXpedition there are only three periods of hard work: preparing the trip, during the trip and after the trip.

Getting all the necessary information, applying for licenses, choosing the most advantageous itinerary, making reservations in hotels with best position for radio communications, checking out thoroughly your equipment, are only a part of the pre-expedition work. Taking a short but intensive language course is not only advisable but can be fun and very useful.

During the trip, presuming that the license is already in hand, the most demanding job is working the pile-ups for long hours.

After the trip, answering thousands of QSLs, is a dull, routine task but it can sometimes be transferred to volunteers.

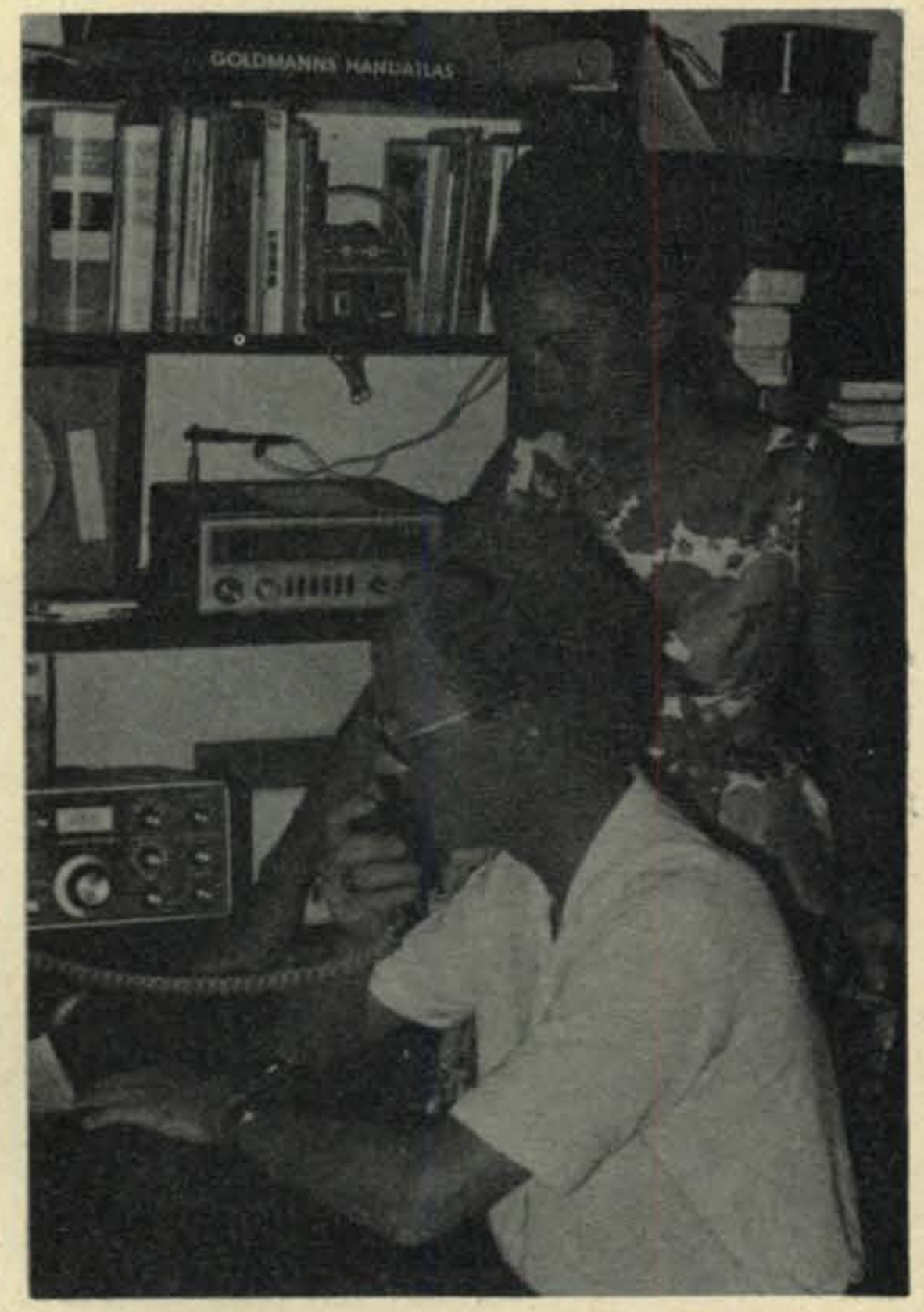
Why people go on DXpeditions? There are many reasons. Some people find pleasure visiting new countries, meeting interesting people and learning about their lives. Others will be happy doing something unusual, different

In Dahomey Eva, WA2BAV/TY3, the guest, and Robert, TYLABE, the host, on a sightseeing tour.

from the every day life and different from what other people are doing.

Many will find satisfaction giving a new country to fellow amateurs.

Last but not least, some will go on DXpedition only to get away from their wives. No matter what your reason is, my recommendation is go on DXpedition and go as soon as you can. Prepare it well, but don't delay it. I had the best time of my life even though I took my wife along!



Eva, WA2BAV/TY3, visiting Armin, TY3ABF, the only one amateur in Cotonou, Dahomey.

Slow Scan TV

By Copthorne Macdonald, *W1GNQ

Equipment Evaluation

As slow-scan is becoming more popular, more manufacturers are coming out with equipment, and lots of construction articles are appearing. The ham who wants to get started in slow-scan is faced with the difficult job of choosing between the equipment of different manufacturers, or worse yet, between different schematics to build from. The unfortunate truth is that properly evaluating video equipment is much more difficult than evaluating audio equipment or ham rigs. It is difficult and perhaps impossible to put numbers on all the factors that go into making up that subjective thing we call picture quality. Seeing the equipment operate would at first thought seem to be the ultimate test. However, the picture you get when the camera feeds directly into the monitor is just the first step in evaluating overall performance. Certain problems may be immediately apparent. Many others will only show up with the aid of special test signals, test patterns, and test procedures — or over a considerable period of time in actual on-the-air use. Unfortunately, this kit of evaluation tools is only partially complete today; and the scary thing is that not even the manufacturers have all the tools. Thorough coverage of this subject will take a lot of space. Let's start talking about perfection and reality and some of the ways in which they differ.

*P.O. Box 261, Forest Park Station, Springfield, Mass. 01108

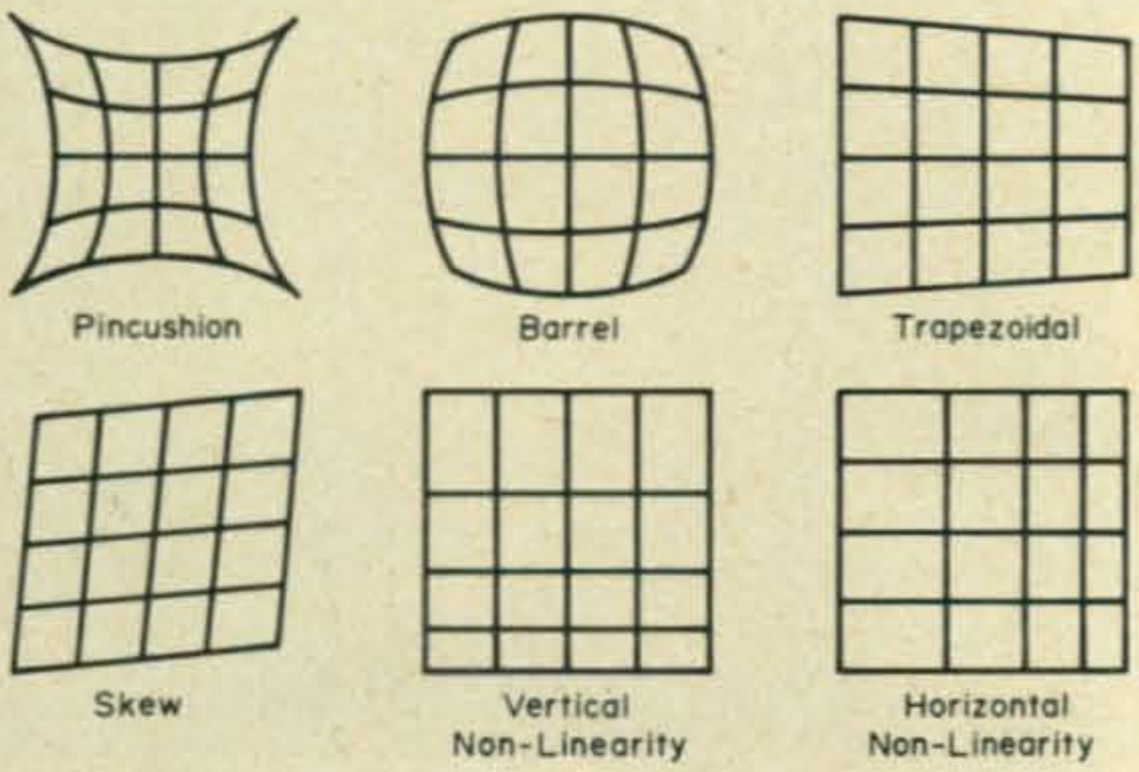


Fig. 1 — Various types of "smooth" or gradual distortion (extremely bad cases).

Geometric Distortion

Our image pickup device, be it camera or flying spot scanner, converts space related information — form, shape, distance, orientation, etc. into 14,400 separate instants on a string of time 8 seconds long. The monitor weaves that time string back into spatial relationships of light and dark patterns on our viewing screen. It's easy to comprehend that if we do bad "space" things, or bad "time" things in the boxes at either end, or do bad time things to the signal going from one box to the other, the spatial relationships on the monitor screen won't duplicate those in our original image. This failure of the images to match spatially is called geometric distortion.

There are many variations on the geometric distortion theme. Some types are more disturbing than others. A certain amount of it is unavoidable. Figure 1 illustrates some of the more common types. Barrel and Pincushion distortion are fairly common problems, particularly with magnetic deflection CRT's. Minimizing the effect with a given tube type is part of the yoke designer's art, and correcting the problem electronically is quite complicated. Commercial vidicon yokes are generally fairly free of these problems, giving an overall geometric distortion of 1 or 2%. (This means that every point in the electronic image is within 1 or 2% of where it should be.) The problem can be appreciable if a monitor CRT is used with a yoke selected at random, that is, designed for the geometry of some other tube type. Trapezoidal distortion can occur in electrostatic CRT's if a set of deflection plates is not truly paralle, since deflection sensitivity is affected by plate spacing. It will also occur if unbalanced deflection is used, that is, if the sawtooth voltage applied to one plate of a pair is much larger than to the other one. Trapezoidal distortion will also occur if there is cross-coupling between horizontal and vertical deflection. This might happen even with magnetic deflection if the loading on the power supply by one of the sweep circuits changes the supply voltage which in turn affects the other sweep amplitude.

Skew distortion is the result of the horizontal plates not being oriented at 90 degrees

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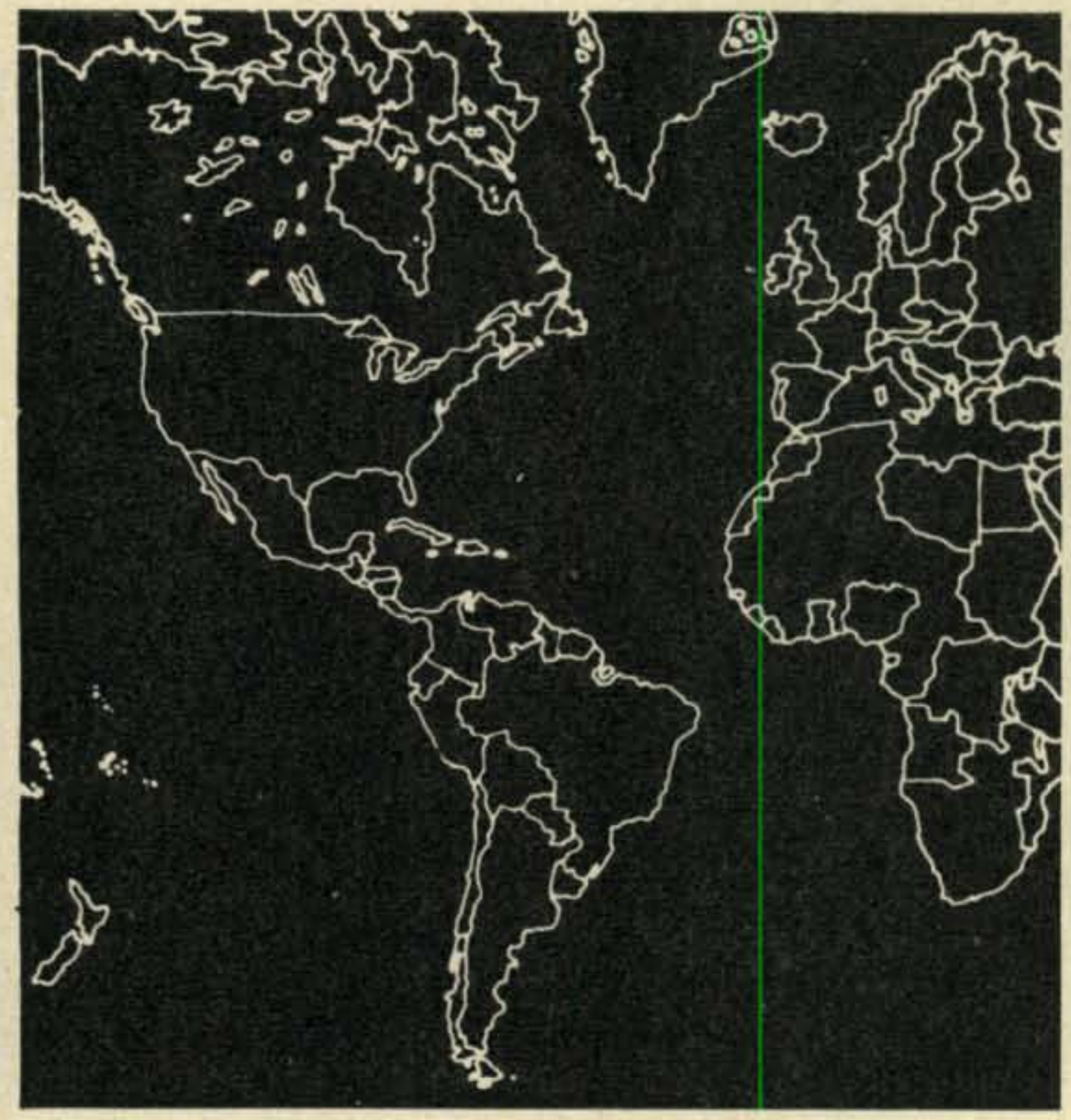

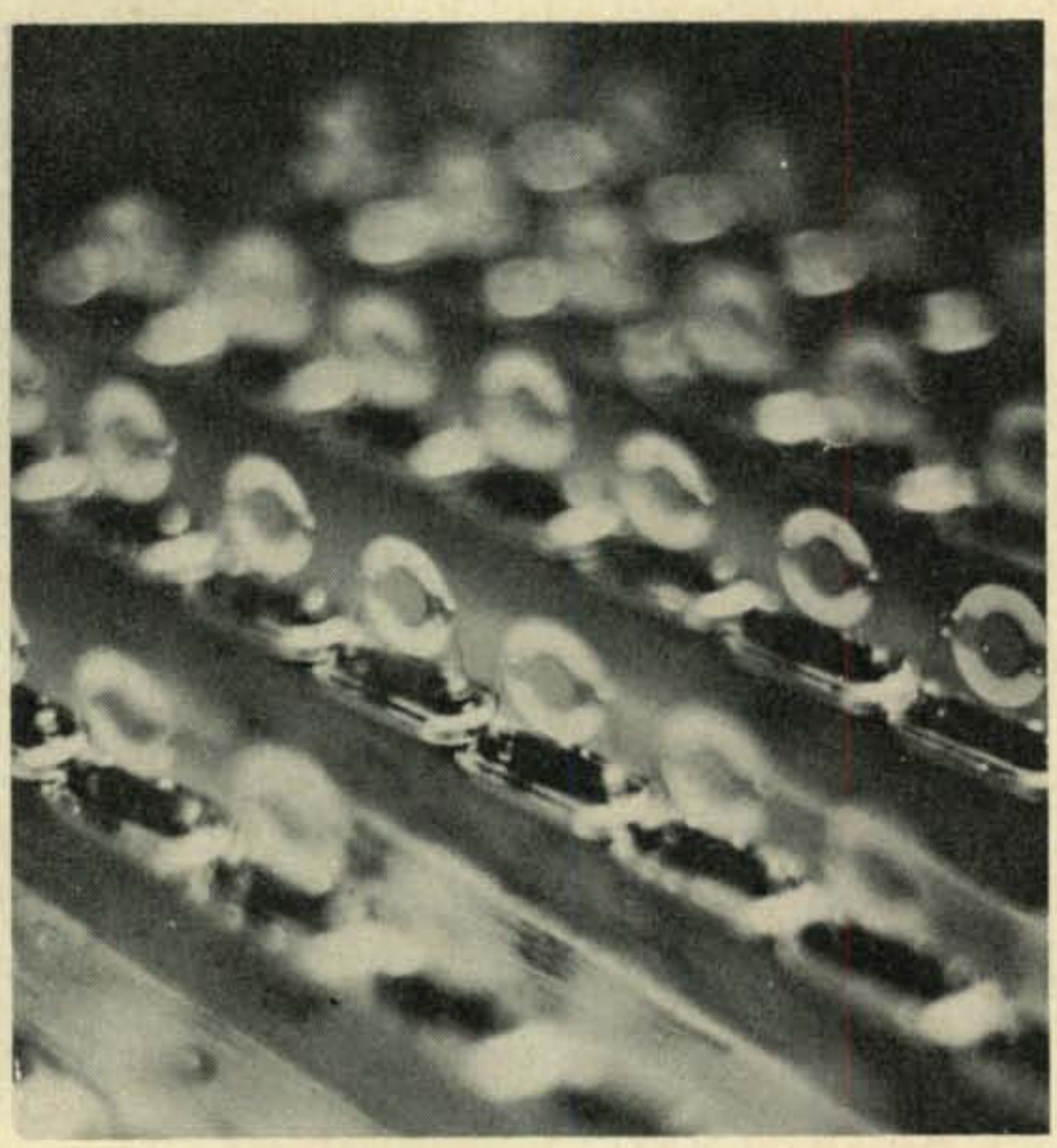

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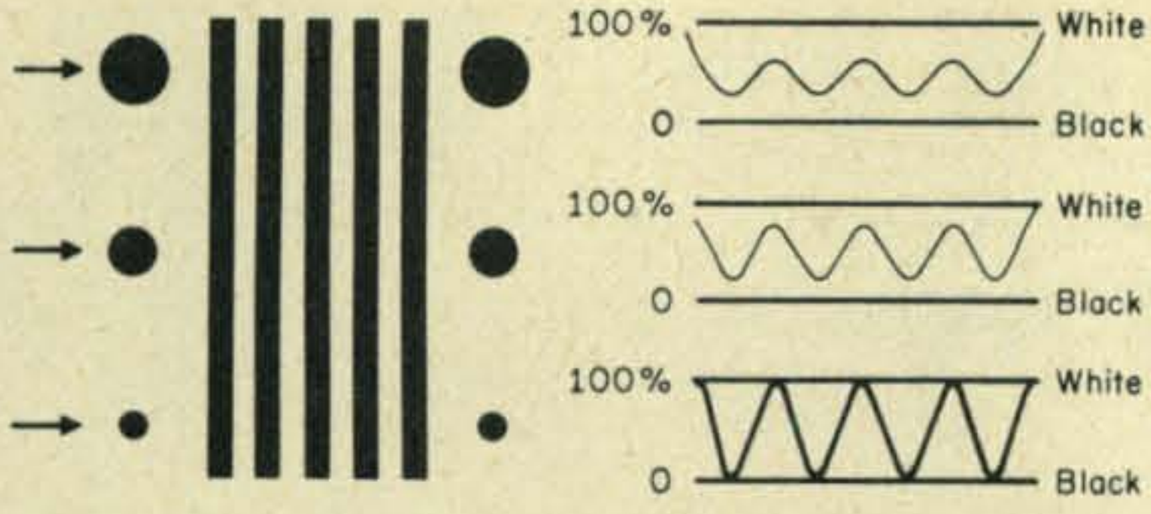

Fig. 2 — Baseband video signal generated by large, medium, and small apertures scanning a black and white bar pattern.

to the vertical plates, or the horizontal deflection coils not being at 90 degrees to the vertical coils.

Vertical non-linearity of the tape shown is quite common in slow-scan monitors. If an electrolytic capacitor is used to generate the sawtooth, the top few rastor lines will appear spread apart due to a "fast start" of the vertical sweep. This abrupt rise in voltage, that occurs when the sawtooth generating capacitor is unshorted after retrace, is caused by the release of energy absorbed by the dielectric. The solution is designing-in capacitors with low dielectric absorption such as plastic film or paper types. A more gradual start-fast-then-slow-down non-linearity will result in both horizontal and vertical circuits even with good capacitors, if the charging current is not constant. Charging through a resistor from too low a supply voltage or using an amplifier that loads down the capacitor will cause the charging current to diminish as the voltage builds up.

We can tolerate some types of geometric distortion much more than others. With typical pictures we can tolerate a modest amount of pincushion or barrel distortion. We don't like to see curved raster edges, however, and can tolerate less of this type of distortion if we see the whole raster than if the edges are hiding under a mask.

Generally speaking, we can tolerate gradual changes. A 3% positional error could easily be unnoticed if it is a smooth, overall, geometric distortion. An abrupt change of a fraction of a percent can be quite disturbing, as we noted in September's discussion of spurious 60 Hz vertical deflection. Line-to-line displacement such as might result from noisy horizontal sync triggering or tape recorder wow, is also tolerable only in very small amounts. This makes number specs on geometric distortion a bit dangerous. In broadcast TV, geometric distortion is measured with the aid of special test charts and electronic crosshatch pattern generators. No doubt these tools, tailored to amateur slow-scan standards, will eventually become available. At present, a high contrast crosshatch grid similar to the one in figure 1, viewed by the camera or FSS, will give a good idea of overall system linearity.

One of the most disturbing geometric "departures from perfection" in slow-scan monitors is the "wavy scan line effect" which becomes objectionable when viewing slow-scan pictures not synchronous with the monitor's power line frequency. Many hams believe that this effect is *caused* by the other fellow's signal. Not so. As explained in the September column, there are several possible causes, all within the monitor itself. It is a residual design "bug" present even in the most popular store-bought monitors. This problem will be around for awhile because its total elimination can be expensive: magnetic shielding of both CRT and power transformer in the extreme case.

Resolution

What is the resolution of an amateur slow-scan TV system? "Easy," he said, "120 lines." Not so easy. How about the SSTV pictures you've seen that are really "fuzzy" and others that are "sharp?"

"But that's focus, not resolution."

Yes and no. The missing ingredient here is the concept of *aperture response*. Figure 2 shows the same bar pattern being scanned by scanning apertures of three different sizes, and the electrical output signal that would result in each case. Pretty obviously the smallest aperture is going to give the "crisper," sharper looking, picture even if the system bandwidth limits the maximum possible horizontal resolution in each case to 120 TV lines.

"Where is the aperture?" There are several, all cascaded together in a TV system. The first is the optical "circle of confusion" in the camera or FSS lens. When the lens is optimumly focussed, this aperture will generally be small compared to the bars in a 120 line pattern. The next aperture encountered is the vidicon's electron beam in a camera, or the electron beam/phosphor spot diameter in a CRT. Figure 3 shows a typical vidicon aperture response curve. If the vidicon views an image consisting of two vertical bars — the left hand side of the image being black, and the right hand white — the resolution of that pattern is only 2 TV lines. We will call the electrical output as the beam scans from black half to white half of this pattern, 100%. As we scan finer and finer patterns, the size of our electron beam becomes large with respect to the width of an individual bar. The putput will no longer be 100%, but something less. Fortunately, most vidicons are capable of delivering about 90 percent response at 120 TV lines *when properly set up*. (This means optimized electrical focus,

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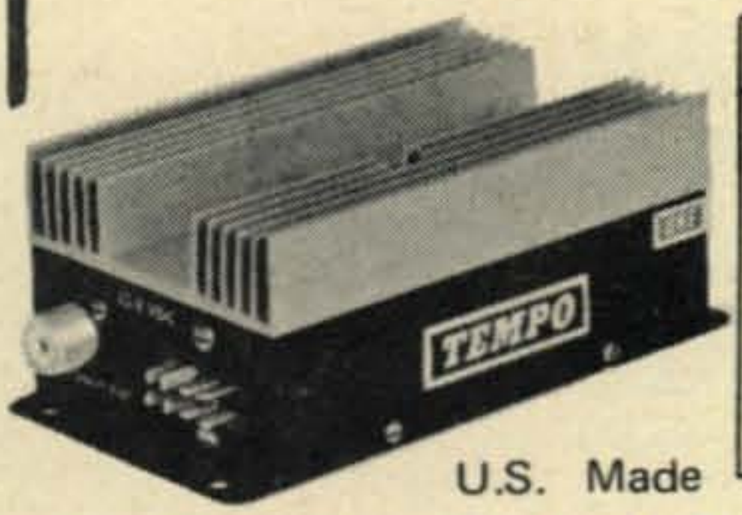

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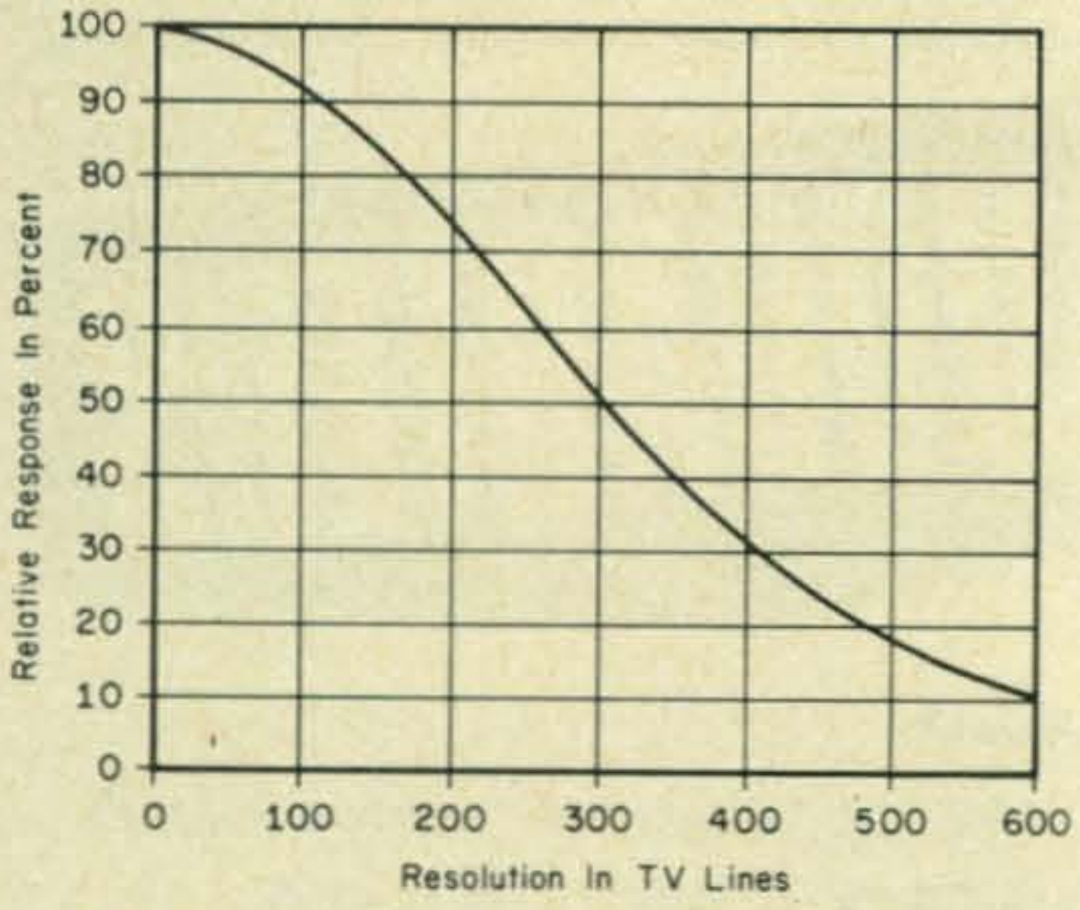

Fig. 3 — Aperture response of a typical vidicon when scanning a black and white "square wave" bar pattern.

and clean voltages on the tube electrodes.) Many people familiar with closed circuit TV are surprised at the crispness of good slow-scan pictures. Part of the reason for this is that while the bandwidth of the CCTV system may permit 500 TV lines resolution, the vidicon aperture response at 500 lines is only 18%!

The modulator/demodulator/transmission system, while not an aperture in a physical sense, sets the limits of the system response. Ideally, the electronics would maintain 100% response out to the bandwidth limit of the system where it would exhibit a sharp cutoff effect.

The final aperture is the monitor CRT electron beam that produces the scanning line on the tube face. Without a calibrated microscope, spot size is difficult to measure directly. A good rule of thumb is that if there is black space visible between scan lines, the CRT is not seriously degrading performance. Take care when applying this rule to electrostatic deflection CRT's, as improper setting of the astigmatism control will give a distorted spot shape and unequal effective aperture sizes in the X and Y directions.

If a pattern of parallel vertical bars is viewed by a camera or FSS, and the "baseband" video (not subcarrier) is monitored on a scope sync'd to the 15 Hz line scan frequency, percentage aperture response of the pickup device can be measured. This is also an excellent way to optimize focus: adjust optical and electrical focus to maximize the amplitude of the "burst" in the electrical waveform.

Next month we'll take a look at evaluation of limiter and sync circuit performance, and video/display considerations.

Q & A

Q. Wouldn't diversity reception help to minimize the multipath effects in SSTV?

A. In a typical space diversity reception installation, two antennas spaced several wavelengths apart feed two receivers, and the "best" receiver/antenna combination at any instant is the one that feeds the audio output bus. The problem comes in making the "best" receiver decision. In clear channel voice or c.w. transmission, signal strength is a valid criterion. When the a.g.c. voltage of one receiver drops below that of the other, the output automatically switches to the receiver getting the stronger signal. It seesm reasonable to assume that when the path lengths are about the same and we are getting a "selective fading" multipath effect, that space diversity would help a lot in SSTV too. In the case of very different path lengths the improvement might not be so great, or some decision criteria other than just signal strength might be required. QRM is another potential problem. It would be an interesting area of experimentation for someone with a couple of receivers, and the antenna space.

There are other types of diversity. The hams experimenting with color SSTV normally make time exposures of several slow-scan frames. This integration of several images is a form of "time diversity" where the common features in several pictures sent at different times add, but the occassional sync dropouts and QRM streaks in individual frames don't.

Vy, 73, Cop, W1GNQ

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CQ Reviews: The Miida Digipet-60 Digital Frequency Counter

BY WILFRED M. SCHERER,* W2AEF

A newcomer to the low-cost digital frequency counter field is the Miida Digipet-60. It is a general-purpose job with a rated range of 1 kHz to 60 mHz, thus making it appealing to radio amateurs or others for making frequency measurements up through the 50 mHz band. In addition, an add-on accessory unit, the Digipet-160 Frequency Converter, provides an extended coverage of 130-160 mHz, making the setup also attractive for 144 mHz band use.

The Digipet-60 has a high input sensitivity of 50 mv r.m.s. and provides a 5-digit readout with a fixed decimal point. Accuracy is rated as ±1 count ± time-base accuracy. The frequency coverage is divided into two ranges, one denoted in mHz with a resolution to 1 kHz, the other in kHz with a resolution to 1 Hz.

Other features include three sensitivity positions, one each for 50 mv, 0.5 v. and 5 v. There also are two input-impedance positions. One is 1 megohm, the other is 50 ohms. Operation may be had from a 110/120 or 220/240 v.a.c. 50/400 Hz source or from 12-14 v.d.c., thus permitting use indoors or in the field. Power consumption is 11 VA.

*Technical Director, CQ.

The Digipet-60 Digital Frequency Counter shown with the display of a 21.365 mHz signal using the mHz range of the instrument. Use of the kHz range would show 65 kHz *plus* the fractional part of 1 kHz or read in Hz.

Technical Notes

A block diagram for the Digipet-60 is shown at fig. 1. A complete technical description is given in the manual, but the general principle of operation is the usual one whereby the number of frequency alternations of the input signal are counted within a given time. The setup thus includes an accurate time base, a signal-gating circuit that passes the signal only during a fixed period of time and a scaling setup that counts the signals passing through the gate. Also included to perform these functions are in input amplifier, waveshaping circuits and a counting display section made up of storage registers, decoder drivers and Nixie display tubes. There also is an over-range indicating affair using a light-emitting diode.

The input is a.c.-coupled. An input attenuator, operated by a three-position switch, provides optimum operation within the input levels specified earlier. Its main function in this respect is to prevent incorrect counter performance under conditions of accompanying noise on the signal or by highly distorted signals. A measure of protection for the input amplifier also is provided therewith.

The action is handled by a Schmitt waveshaping circuit whereat the difference between a preset positive and negative voltage creates a "hysteresis" voltage that holds the Schmitt circuit quiescent. There is no output from this circuit, unless the excursions of the input-signal level pass through *both* limits of the hysteresis barrier. Thus any incidental noise between these limits will not produce any related output from the Schmitt circuit and therefore will not interfere with the true count.

In the case of a distorted signal, this setup eliminates the possibility of frequency multiplication at the wave-shaping circuits that would otherwise cause an erroneous count.

Another switch provides an input impedance of 1 megohm or 50 ohms. The 1 meg position is used to prevent loading on high-impedance circuits and is mostly used for measurements at comparatively low frequencies. At

this setting a minimum input of 150 mv is required at 1-5 kHz. At 5 kHz to 60 mHz the rating is 50 mv. Where circuit loading is not a consideration, the 50-ohm input is suggested for measurements above 5 mHz, in which case stable and correct readings are possible even when low-frequency signals or noise of a relatively high amplitude are superimposed on the input signal. The maximum allowable input level at 1 meg. is 150 v.r.m.s. At 50 ohms it is 5 v.

Timing is controlled by a 10 mHz crystal-controlled clock with a series of frequency dividers. The aging rate for the crystal is rated as 1×10^{-6}/week and the temperature stability is 5×10^{-6} (25 ±5 deg. C.) or 4×10^{-5} (0-40 deg. C.) for the worst case condition. The crystal is adjusted at the factory against a standard having an accuracy of atomic time absolute value of 1×10^{-10}. Should recalibration be required at a later time, this can be done by the customer against WWV or another such standard. The operating temperature range for the instrument is 0-40 deg. C. and the storage temperature range is -55 deg. C. to 70 deg. C.

Construction

The Digipet-60 is assembled on a fiberglass circuit board. There are 12 transistors and 29 IC's (besides a number of diodes) all of which are soldered directly to the board. The attenuator and input amplifier are shielded against stray fields. The power transformer is electrostatically shielded in addition to which the power supply, that is regulated by a transistor and an IC, is boxed in a shield. Both features thus minimize the introduction of stray noise. Separate fuses are provided for the a.c. and d.c. power inputs.

The unit is housed in a sturdy ventilated metal case that has a carrying handle which also serves as a tilt-up stand secured in various positions by serrations at the swivel. A dangling a.c.-power cord during transportation or storage is avoided by the inclusion of four brackets at the rear of the unit around which the cord may be wrapped. These brackets are so constructed that they also serve as a stand when the instrument is used in a vertical position.

The unit is quite compact, measuring only about 2¾" × 6⅞" × 7⅜" (H.W.D.). Weight is 3¾ lbs.

Frequency Converter

A current trend for extending the range of a frequency counter is the employment of a "scaler" whereby the input frequency is divided by a factor of ten or by some other integer to provide a signal that falls within the normal

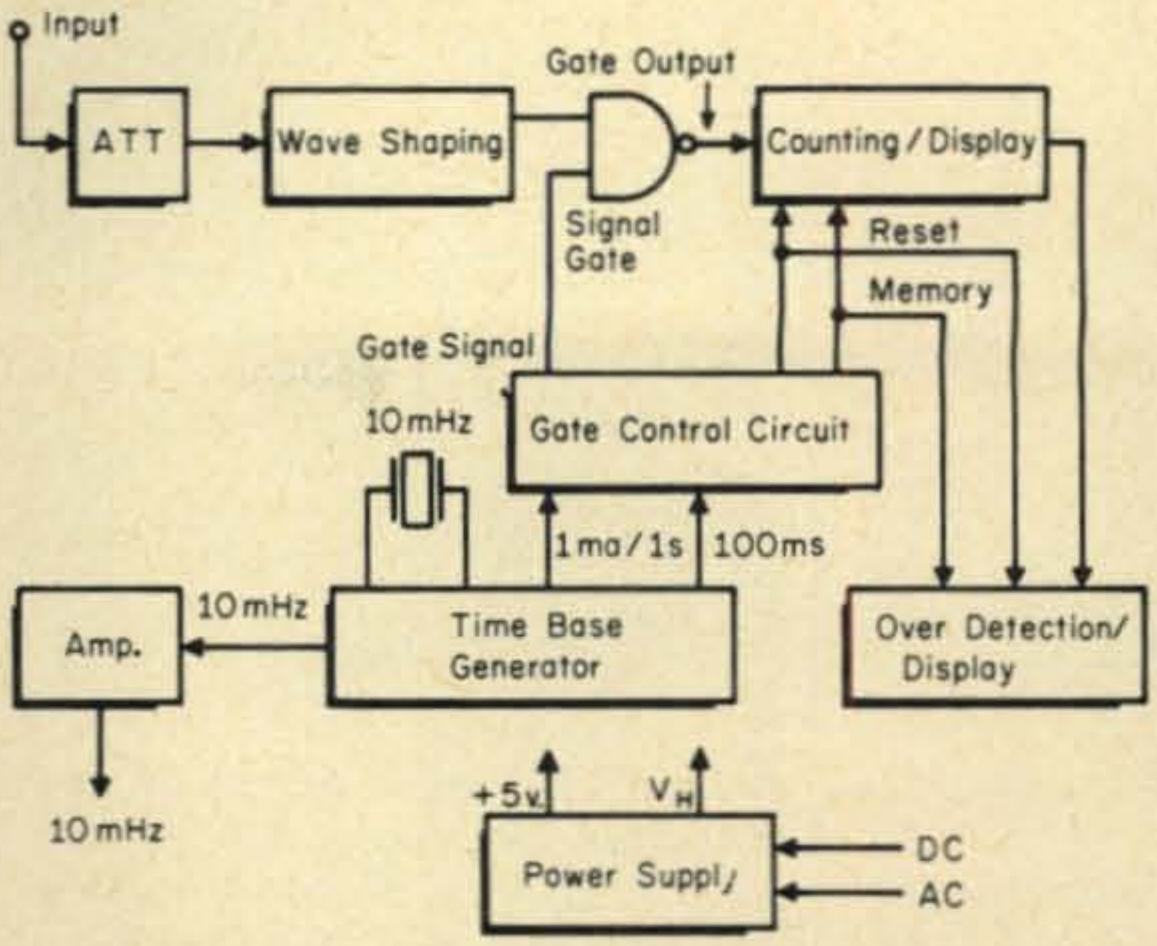


Fig. 1 — Block diagram for the Digipet-60 Digital Frequency Counter. A brief explanation is given in the text.

frequency range of the counter. Although it is not new, a different approach is engaged with the Miida system.

This involves the use of a frequency converter, the Digipet-160, in which the input signal is heterodyned with a 100 mHz signal to produce an i.f. that falls within the counter's response capability. Referring to the block diagram at fig. 2, the 100 mHz heterodyning signal is derived from a frequency-multiplier chain driven by the 10 mHz crystal-controlled clock of the counter. This is combined at the mixer with the input-signal frequency which in the case of a 130-160 mHz signal produces an i.f. of 30-60 mHz readable by the counter.

The actual input-signal frequency is then that displayed by the counter *plus* 100 mHz (added mentally). The filters each side of the mixer minimize spurious responses and ensure counting of only the desired signal.

This method maintains a total resolution equivalent to that of the counter range employed, which with the Miida setup can be retained to within ±1 Hz with input frequencies of 130-160 mHz. Use of a conventional scaler would cut down the maximum resolution by a degree according to the scaling factor. In the

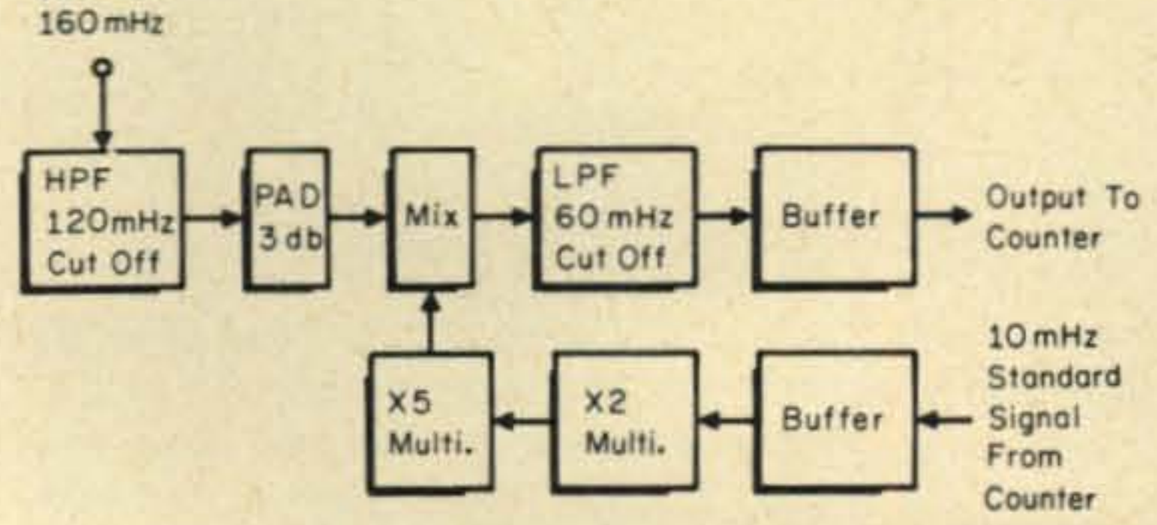


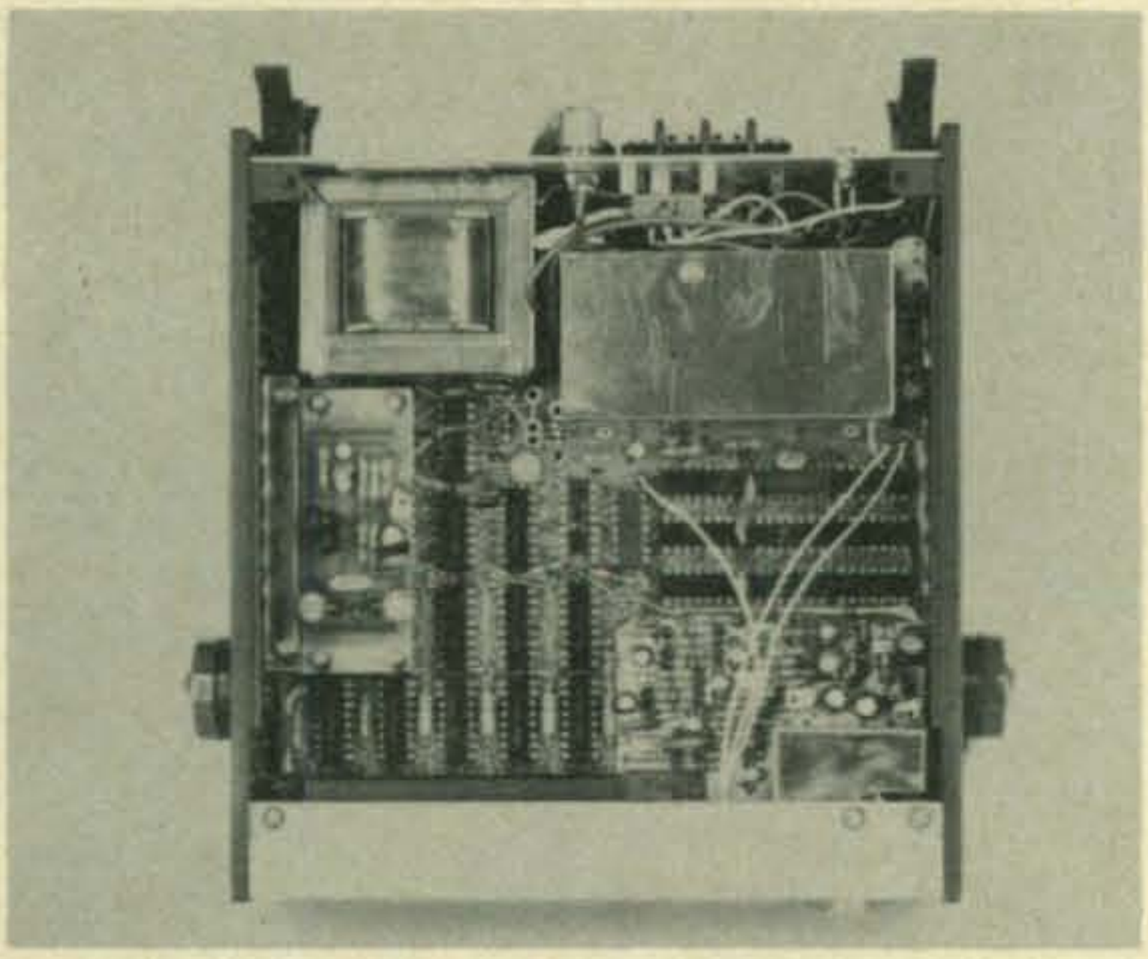
Fig. 2 — Block diagram for the Digipet-160 Frequency Converter described in the text.

The response of a 146.940 mHz signal on the mHz range of the Digipet-60 used in conjunction with the Digipet-160 Frequency Converter. Only 46.940 mHz is displayed to which 100 mHz must be mentally added.

case of a divide-by-ten scaler used with the Digipet-60, the maximum resolution would then be limited to ⁺10 Hz.

On the other hand, when the converter is used, the accuracy of the counter's time-base oscillator not only affects the accuracy of the counter, but also that of the converter's heterodyning frequency; whereas, the accuracy of a scaler does not hinge on that of the time-base oscillator. It might also be noted that with the converter, a "hole" is left in the range between 60-130 mHz; however, as far as work in the amateur-radio field goes, this might be of little consequence.

The unit is exceptionally small with dimensions of approximately 1" × 6¼" × 5½" (H.W.D.) and it weighs ¾ lb. It is installed out of the way attached at the bottom of the counter's case. Power is obtained from the counter unit. Switching is not provided for bypassing the converter, but it is a simple matter to interchange the required cables at the BNC connectors provided therefor.



Interior view of the Digipet-60. The input attenuator and amplifier are in the shielded box at the lower right. The power-supply section is in the box at the upper right. The crystal-controlled timebase clock is on the small circuit board at the left above the main board.

Operation and Performance

A coax input cable with a BNC connector at one end and leads with clips at the other end is supplied with the Digipet-60. The leads may be connected directly to a circuit under test, provided the circuit voltage is within the rate tolerance. Otherwise, this may be safely done using a "gimmick" type coupling capacitance made up of a few twists of wire, by a capacitance voltage divider, or by forming a closed coupling loop with the cable leads clipped together. In some cases, particularly at the higher radio frequencies, sufficient pickup may be had with a short lead placed near the circuit under measurement. For r.f. transmitter work we found this easily done with a lead placed near the antenna relay.

Operation from a 12 v.d.c. source (negative ground system) is handy for mobile use with the equipment plugged into a cigarette lighter receptacle and a small pickup antenna held by hand or installed on the vehicle. This makes a handy test or monitoring setup with mobile gear.

With the necessary cables connected (converter in or out), the general operating procedure is one of selcting the least sensitive setting at the input attenuator that permits the instrument to produce a count with a stable display. The input-impedance switch also is to be set as required.

With the range switch set at mHz, the frequency is indicated as shown and described at the photo with the 21.365 mHz display. When the range switch is shifted to indicate kHz, the first two significant figures will be the same as the last two insignificant ones were on the mHz range, with the remaining three indicative in Hz or the fractional part of 1 kHz.

For example: if the 21.365 mHz signal were actually 21.365678 mHz (21,365.678 kHz), the kHz position of the counter would display 65.678 kHz. In addition, the over-range lamp would light, indicating that the true frequency is higher than that displayed.

The other photo shows the display resulting from a 146.940 mHz signal while the frequency converter is engaged. The counter displays only 46.940 mHz, but by mentally adding 100 mHz (or simply mentally visualizing a figure 1 at the left) the complete frequency is ascertained.

[*Continued on page 94*]

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OSCAR-6: It May Already Be In Orbit!

By George Jacobs* W3ASK

FLASH! OSCAR IS IN ORBIT_ See p. 5

Surprise! Surprise! The OSCAR-6 radio amateur communication satellite may well be in orbit by the time this appears in print.

Originally planned to be launched during this past summer, then delayed until December with the possibility of a further delay until June of next year, NASA found that it had enough room on an ITOS weather satellite launch to accommodate OSCAR-6 as a piggy-back passenger. During the last week of August NASA officials asked AMSAT if its A-O-C satellite, the sixth in the OSCAR series, could be readied for a mid-October launch. You can guess AMSAT's reply!

Bringing all of its resources to bear, and literally working around-the-clock, AMSAT is assembling the A-O-C satellite into its final flight package and has begun the long series of pre-launch tests as this is being written (early September). If all went according to plan and AMSAT won its race against time, the satellite should have roared into space from NASA's Western Test Range in California during mid-October.

OSCAR-6 is a communications satellite and its circuitry has been described in the May, 1972 issue of *CQ* ("Summer Launch Planned For OSCAR-6," p. 40). Information for tracking and communicating through the satellite appeared in the June, 1972 issue of *CQ* ("Getting Ready For The OSCAR-6 Satellite," p. 31). A similar article also appeared in the May issue of *QST* ("How To Get Ready For OSCAR DX," by W. I. Dunkerley, Jr., p. 69). It is suggested that these articles be reread if you plan to communicate through the satellite.

OSCAR-6 Data

Here is a summary of the main orbital and communication parameters of the OSCAR-6 satellite.

Uplink frequency passband (ground transmit): 145.90 to 146.00 mHz.

Downlink frequency passband (ground receive): 29.45 to 29.55 mHz.

Downlink-Uplink Frequency relationship: $F_{down} = F_{up}$ 116.45 mHz + $F_{Doppler}$ where $F_{Doppler}$ = +4.5 kHz near the beginning of an overhead pass, 0 kHz at the middle of a pass, -4.5 kHz near the end of an overhead pass.

Passband Characteristic: Non-inverting; upper sideband remains upper sideband, etc.

Beacon frequency: 29.45 mHz

Beacon modulation: A-1 emission (c.w.)

Repeater power output: Up to 1.3 watts into a 10-meter dipole antenna.

Operating modes: c.w. and s.s.b. are recommended. *Do not use f.m.*

Minimum ground power required: 100 watts of effective radiated power should produce full output from the repeater at a near maximum range of 2000 miles. A 10 watt output transmitter used with an antenna array with 10 db gain in the direction of the satellite should be adequate, so should a 100 watt output transmitter using an omnidirectional antenna, etc.

Satellite Orbit: Near sun synchronous,[1] polar, at an altitude of 900 miles.

Direction: The satellite's orbit will cross the equator at an angle of 102 degrees (inclination) when travelling in a south-north direction. This is equivalent to a bearing of 348 degrees with respect to true north. During the daylight hours the satellite will travel in a generally north-south direction; during the hours of darkness it will travel in a south-north direction, assuming a daylight launch.

Period: The satellite should complete an orbit about every 115 minutes.

Equatorial Crossings: The satellite will cross the equator approximately 28.8 degrees of longitude further west for each successive south-north crossing.

Velocity: OSCAR-6 will be travelling at approximately 250 miles per minute.

Number of passes per day: Three or four consecutive orbits will pass over the USA each morning and evening, for a total of between six and eight passes a day.

Communication Range: Geographically, the satellite will see a circular area approximately 4600 miles in diameter, with the point on earth directly beneath the satellite as its center.

Communication Period: Up to twenty minutes on overhead passes, and progressively less on passes to the east and west.

Late OSCAR News

Since the satellite may now be in orbit, the best sources of up-to-the minute data concern-

*Space Communications Editor, *CQ*, 11307 Clara Street, Silver Spring, Md. 20902

[1]This means the satellite will pass within range at approximately the same time every day, give or take an hour.

ng its orbit and operating condition are daily bulletins transmitted by W1AW and by a special AMSAT h.f. network, and from information being transmitted directly from the satellite itself. Each of these transmissions will contail times and longitudes of equatorial crossings as well as approximate times that the satellite will pass over selected areas.

W1AW normally transmits official ARRL bulletins in c.w. at 0000 and 0400 GMT on 1.805, 3.580, 7.080, 14.080, 21.080, 28.080, 50.080 and 145.588 mHz at 18 w.p.m. Phone bulletins are transmitted 0100 and 0330 GMT on 1.820, 3.990, 7.290, 14.290, 21.390, 28.590, 50.190 and 145.588 mHz. An RTTY bulletin is given at 0300 GMT, first at 850 Hz shift, repeated at 170 Hz shift, on 3.625, 7.095, 14.095, 21.095 and 28.095 mHz. Normally the 0000 and 0100 GMT transmissions are carried Monday through Saturday (GMT), while the other transmissions are on a Tuesday through Saturday schedule. While OSCAR-6 is in orbit these bulletins may be given on a daily basis and at other times as well.

An extensive AMSAT h.f. network is planned to be in operation on a daily basis for at least a month following the launch of the OSCAR-6 repeater. The net control station will be W3ZM, and operations will take place on 3855 kHz l.s.b., 14280 kHz USB and 21280 kHz u.s.b. Stations in other areas of the world may also assist as net control, and other frequencies adjacent to these may also be used. In addition to orbital information, the network can be used for reporting successful communications through the satellite, reduced telemetry data and observations of unusual propagation conditions.

Orbital and other information also can be received directly from the satellite by means of a novel electronic memory device designed specifically for this project. Called CODESTORE, it is capable of storing c.w. messages aboard the satellite for repeated transmission, upon command, on the satellite's 29.450 mHz beacon frequency. The memory length of CODESTORE is sufficient to permit storage of approximately 15 words. The unit is set to transmit at about 13 w.p.m. It is hoped to be able to load CODESTORE with orbital data at least once daily, with the following being a typical readout:

"ORBIT 1120 1000Z AT 52.1W ADD 115R111 MIN AND 28R78 DEG PER ORBIT"

This would mean that OSCAR-6's 1120th orbit should begin by crossing the equator at 52.1 degrees west longitude at 1000 GMT. The latest period is given as 115.111 minutes, and successive orbits will pass 28.78 degress of longitude further to the west.

CODESTORE will also be used to transmit other information concerning the satellite, and for other messages of importance. It is an experiment of great potential both in the area of public service and spacecraft operations. Listen for it on the beacon frequency of 29.450 mHz.

All of the command functions of the OSCAR-6 satellite as well as loading the CODESTORE memory device will be accomplished by ground control from a selected number of radio amateur stations located in key areas of the world.

Recommended Operating Procedure

AMSAT recommends the following procedure for communicating through the OSCAR-6 repeater:

1. When orbital data indicates that the satellite is expected to come within range, begin listening for the c.w. beacon signal on 29.45 mHz. Be sure to use your b.f.o. Note the strength of the beacon signal.
2. Once you have located the beacon signal on 29.45 mHz, tune *up* the band and begin looking for signals from the repeater in the 29.45 to 29.55 mHz range.
3. To call a station that you may hear on the 10 meter band requires that you transmit on a related frequency in the 2 meter band between 145.90 and 146.00 mHz. The correct transmit frequency can be determined from the following equation:

$$F_{trans.} = F_{receive} + 116.45 \text{ mHz}$$

4. When you transmit in the 2 meter uplink band, you should be able to hear your own signal coming back on the corresponding 10 meter frequency, if you have successfully accessed the repeater.

Jan King, W3GEY, assembling the A-O-C amateur radio communication satellite in preparation for a mid-October launch.

5. Adjust the power output of your transmitter so that the level of your returned signal is approximately equal to the level of the beacon signal. This will assure that you take the correct share of the repeater power without overloading the repeater and running down the satellite's battery unnecessarily. Keep in mind that the power must be divided among all stations in the passband. If you use more power than is necessary you will be depriving other amateurs of the chance to use the satellite. If you do not have a convenient method for directly controlling your power output, an alternative technique is to aim your antenna away from the satellite until the signal is reduced to the proper level.

6. If you intend to operate with high power or use a large antenna array such that the transmitted output power multiplied by the antenna gain is more than 100 watts effective radiated power, then AMSAT suggests that you operate slightly off from the regular passband of 145.90 to 146.00 mHz. The repeater has an "extended passband" feature in its design, so that the -10 dB response is + 120 kHz from the center frequency (*i.e.*, the passband is 240 kHz wide at the 10 db down points.) Therefore, if higher power stations will transmit between 145.83 and 145.89 mHz or from 146.01 to 146.07 mHz,[2] their signals will be compensated for by the roll-off of the repeater's frequency response, and they will not take more than the correct portion of the repeater's power.

A 435.10 mHz beacon with a power output of about 400 milliwatts is in its final stages of construction as this is being written. If completed in time it will be placed aboard the satellite and will also transmit CODESTORE and telemetry data.

The 24-volt nickel-cadmium battery power supply aboard OSCAR-6, which is rechargeable by banks of solar cells mounted on the satellite's outer surface, is expected to keep the repeater and other electronic equipment in operation for at least a year. If all goes according to plan, OSCAR-6 should provide radio amateurs with a means to communicate through space for a much longer period than any of its predecessors.

The telemetry system aboard OSCAR-6 is both complicated and simple. It's relatively simple, if you can copy numbers at 20 w.p.m. c.w., since it is a straightforward c.w. system; it's complicated because the system measures 24 different parameters of the satellite and spews out a complete set of readings every 90 seconds!

The telemetry sequence begins with the transmission of the familiar HI (.... ..), followed by 24 groups of three numbers each. The first number in each group is associated with a parameter being measured. The following two numbers indicate the relative level of measurement. When this value is inserted into an appropriate equation, the actual level being measured can be determined. The sequence ends with HI. The entire sequence is repeated for 14 minutes, followed by a 14 minute CODESTORE transmission, followed by another telemetry transmission, etc., on the beacon frequency of 29.45 mHz.

A more complete discussion of the telemetry system, including appropriate equations for determinining actual levels being measured, will appear in next month's issue of *CQ* under the title "OSCAR 6's Novel Telemetry System." An explanation of the telemetry system can also be obtained directly from AMSAT Headquarters, P.O. Box 27, Washington, D.C. 20044.

The Federal Communications Commission has notified AMSAT that certain regulations will be waived as they apply to OSCAR-6, making it permissible for Novice and Technician Class licensees transmitting in the 2 meter band to communicate through the satellite.

AMSAT requests that all successful QSOs through the satellite be reported as soon as possible to AMSAT Headquarters, P.O. Box 27, Washington, D.C. 20044. Reports can also be given on the AMSAT h.f. network discussed earlier. QSL cards should be exchanged in the usual manner between stations successfully conducting communications through the satellite, however AMSAT will also issue a distinctive QSL card for every report it receives. The card will also be issued for reports from *satellite-listeners* who report hearing the beacon transmissions, or stations communicating through the satellite, or may want to report on stations they have heard through the satellite.

To keep interference to the OSCAR-6 satellite to a minimum, 2 meter stations *not* desiring to communicate through the satellite are requested to 'refrain from conducting ground-based communications in the 145.83 to 146.00 mHz passband. Likewise, 10 meter stations should not conduct ground-based communications in the segment of the band between 29.38 and 29.55 mHz. Leave these frequencies clear so that they may be available for all those who may want to use the satellite. Amateur radio can be very proud of the results of the OSCAR 3 and 4 repeater satellites, during which time not a single case of interference was reported between ground-based stations and those using the satellites. It is even more important now that this splendid record be upheld during the period that OSCAR-6 will be in orbit. ■

[2]Frequencies above 146.00 mHz are not available to radio amateurs outside of the Western Hemisphere. Use of these frequencies in densely populated US areas is to be discouraged for accessing the satellite as they are widely used for f.m. repeater input channels.

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424	100	50 U	<0.3	44	57	>60	LPF	Citizen Band	12.45
425	1000	50 U	<0.3	34.0	52.0	>70	LPF	Radio Amateur TVI Filter	24.95
426	1000	70 U	<0.3	34.0	52.0	>70	LPF	Radio Amateur TVI Filter	24.95
427	1000	50 U	<0.3	55.0	63.5	>70	LPF	Radio Amateur 6 Meter Filter	29.95
419-80	100	50 U	<0.3	5.6	7.0	>45	LPF	Harmonic 80 Meter Radio Amateur	15.00
420-40	100	50 U	<0.3	11.2	14.0	>45	LPF	Harmonic 40 Meter Radio Amateur	15.00
421-20	100	50 U	<0.3	22	27.5	>45	LPF	Harmonic 20 Meter Radio Amateur	15.00
422-15	100	50 U	<0.3	30	36	>45	LPF	Harmonic 15 Meter Radio Amateur	15.00
428-80	1000	50 U	<0.3	5.6	7.0	>45	LPF	Harmonic Radio Amateur 80 Meters	24.95
429-40	1000	50 U	<0.3	11.2	14.0	>45	LPF	Harmonic Radio Amateur 40 Meters	24.95
430-20	1000	50 U	<0.3	22	27.5	>45	LPF	Harmonic Radio Amateur 20 Meters	24.95
431-15	1000	50 U	<0.3	30	36	>45	LPF	Harmonic Radio Amateur 15 Meters	24.95

All above Filters Are Also Available in 70 Ohm Unbalanced Impedances.

Model Number	Center Frequency	Bandwidth at 3 db	Shape Factor	Insertion Loss		Price
373-2	146 MHz	5 MHz	40 db/3db—12 max.	1.5 db (max.)	—	$39.95
373-6	51 MHz	3 MHz	40 db/3db—20 max.	1.5 db (max.)	—	39.95

Input/Output Impedance..... 50 ohms
Maximum R.F. Power (PEP)..... 100 watts
Mounting..... Integral wall bracket furnished
Size..... 6¾" x 8¾" x 3⅜"
Weight..... 2 lbs.

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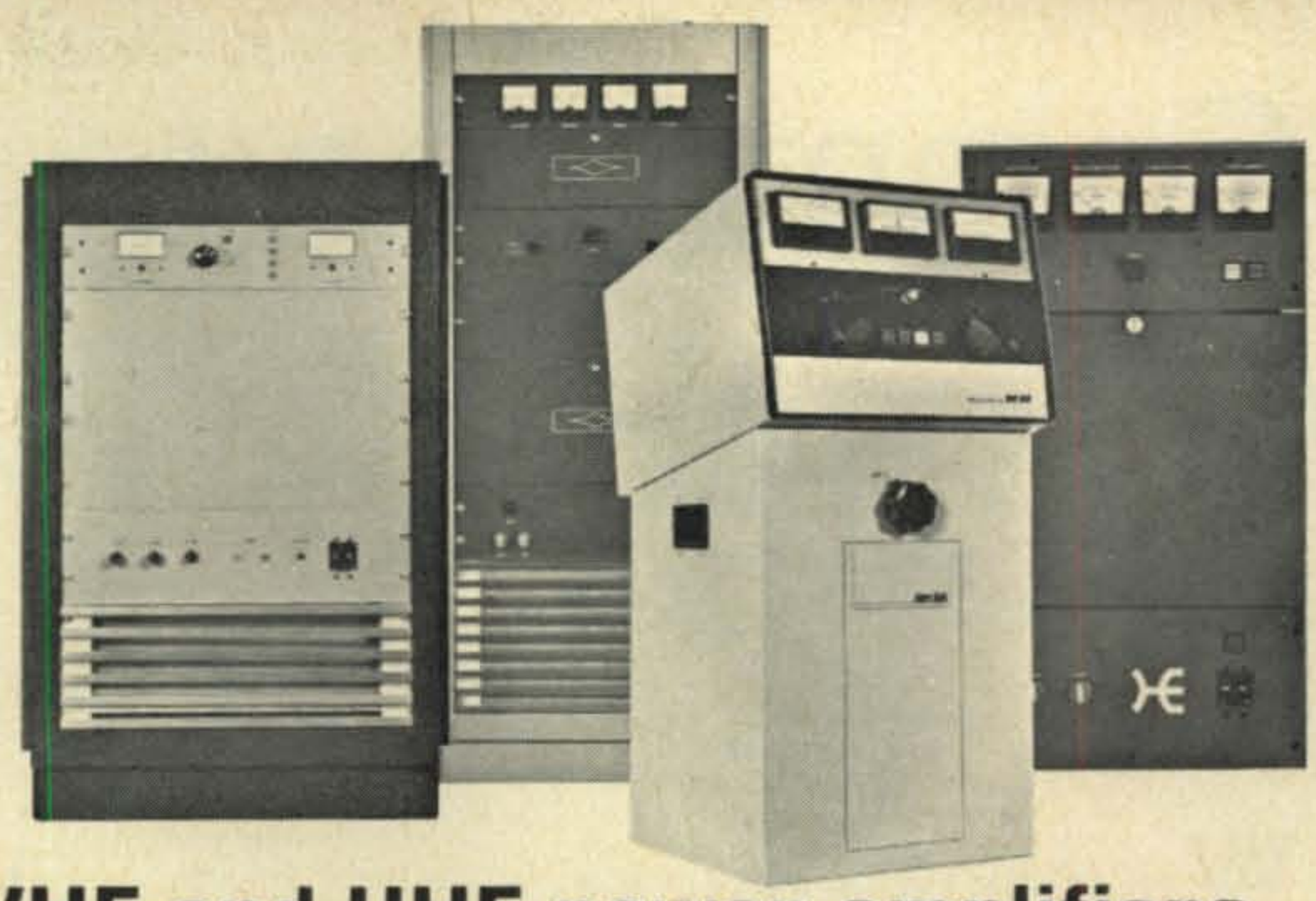

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Commentary:

Docket 18803

By GLEN E. ZOOK,* K95TH/5

Well, fellers, the famous (or is it infamous) repeater rule-making docket 18803 is finally law. As in most cases part of the docket is very good and part is very bad, and we can probably learn to live with most of it. First notification of the Report and Order was made on August 30, 1972. At that time a short notice was released to the various amateur publications giving a very brief idea as what was to come. The final Report and Order was not out until September 8, 1972. Therefore, we were not able to put the entire docket in the October issue. Dick Ross was standing by at the printer's holding the presses until the last possible moment. Unfortunately, the October issue had to go without the text of the Report and Order. Only the preliminary announcement could be included. Therefore, this November issue has been pushed as far forward as possible to get the Report and Order in sooner. The full text of the Report and Order appears elsewhere in this issue. Only comments regarding the new regulations will appear here. Please refer to the full text for the legal wording.

As you will notice when reading the Report and Order, it is divided into two distinctive portions: Comments by the Commission; and the actual wording of the new regulations. The comments give some insight as to why the regulations were made in the direction of tighter restrictions and, in some cases, how the regulations may be interpreted. All comments should be read, but the following paragraphs require a bit more study than the others:

Paragraph 3. Background on comments and trends.

Paragraph 4. Commission attitudes towards repeaters.

Paragraph 12. Regional and national frequency coordination.

Paragraph 13. Cross-banding of repeaters.

Paragraph 15. Effective radiated power restriction reasons.

Paragraph 16. Eliminates unattended repeaters.

Paragraph 22. Autopatches (not very favorable).

Regulations

The actual wording of the regulations themselves appear as 16 type-written pages in the Report and Order. They cover a much wider range affecting all amateur radio than originally expected. Much space is taken with setting up definitions, new station classifications, and the like. However, a quantity of space is also taken with new regulations that directly affect our operations as both individuals and repeater licensees.

For example the new 97.7(c) opens the top 1 mHz of two meters to the Technician Class operator. This was not originally a part of the repeater docket. But, in the opinion of this columnist, this was a very good move. The top 1 mHz of two meters has been relatively unused, and activity is what we need to keep frequencies. Just wonder why the Technician Class was not given the lower 1 mHz also. We need activity down there too. Oh, well, I can remember when Novices had the middle two mHz on two meters and the Technician Class could not even operate there! Since I have been able to operate on all of two meters for almost 14 years, the new regulations do not help me, but there is sure a need for more activity on the low end.

The new 97.41 covers the revised procedure for obtaining a station license. Therein are several items which have not been seen before. 97.41(d)(4) requires a description of how provision is made to monitor the output frequency of the repeater. This will probably require some cut-and-try methods before finding out just what will be accepted and what will not be accepted. For example, I believe that a receiver located at the repeater transmitting site tuned to the transmit frequency and tied to a u.h.f. link for monitoring would suffice. This would

* F. M. Editor, *CQ*.

llow any station with u.h.f. receiving equipnent to know if he was interfering with others sing the same frequency for simplex operation. Of course the control stations would lso monitor the link. Another possibility is a eceiver which would shut down the repeater when a signal appeared on the output frequency when the repeater was not in use. There could be some problems here, especially f one station in QSO was using the repeater nd one was direct.

Monitoring of link frequencies is also required if those frequencies are below 225 mHz. n 97.41(e)(2) appears the requirement for stating how the monitoring is to be done. However, there is salvation in 97.110(a) wherein it states that link frequencies above 225 mHz do not have to be monitored. The solution is simple, use 450 links.

97.41(f) is quite different from what we are used to in the amateur service. The various subparts of this section govern how the effective radiated power of the repeater is determined. For example, the location and calculation of height above average terrain for the repeater transmitting antenna must be undertaken using one certain type of topographic map published by the U.S. Geological Survey. Other information includes power output of the transmitter, line losses in db, maximum gain over a half-wave dipole of the transmitting antenna, horizontal radiation pattern of the transmitting antenna AS INSTALLED, and vertical radiation pattern of the transmitting antenna AS INSTALLED. The real kicker is the method of determination of these figures must also be given. Power output of the transmitter is simple: virtually every repeater group has an accurate wattmeter available. Line losses require only a bit more work in using two wattmeters, one at the input to the line, and the second between the line and a termination load or dummy-load. The losses in db can then be easily calculated. Things start getting a bit tougher when measuring radiation patterns and antenna gain. To get really accurate measurements a fully equipped antenna range is required. However, usable measurements of gain and horizontal radiation pattern can be made using some type of portable or mobile receiver taking relative readings (*e.g.*, limiter voltage) at a number of points an equal distance from the antenna site. For reference a ground-plane could be installed to get the gain over that antenna of the final transmitting antenna design. But, did you ever try to measure the vertical radiation pattern? Helicopters anybody? If the Commission will accept radiation patterns furnished by antenna manufacturers our jobs will be a bit easier. However, aren't amateurs supposed to be innovators? This bit of regulations doesn't sound like it!

Repeater Sub-Bands

The new regulations set a precedent in that sub-bands are being established by use rather than mode. Above 1215 mHz there are no sub-band restrictions for repeaters. These sub-bands are as follows:

10 Meters	29.5 mHz -	29.7 mHz
6 Meters	52.0 mHz -	54.0 mHz
2 Meters	146.0 mHz -	148.0 mHz
1¼ Meters	222.0 mHz -	225.0 mHz
¾ Meters	442.0 mHz -	450.0 mHz

The ten meter sub-band is not normally available for repeaters, and special permission based upon need for intra-community communications must be submitted. On six meters present mode restrictions limit the 52.0 - 52.5 mHz to either a.m. or n.b.f.m. (+3 kHz or less deviation). In all cases these sub-bands follow pretty much what we are now using for repeaters. Of course f.m. simplex activity can take place outside these sub-bands where the mode is permitted. The sub-band on 220 mHz effectively eliminates the 3 mHz input/output spacing in repeater systems. Anyone for the 1 mHz spacing proposed in this column previously and by the plan of the Texas VHF FM Society?

Effective Radiated Power

97.67(c) limits the effective radiated power of repeaters. For those who are not really familiar with this term, it is basically the power radiated by the entire transmitting system as if it were coming from a single dipole with the transmitter putting out a given power level equal to the present power times the power gain of the antenna system. This can be calculated by multiplying the actual transmitter power output by the power gain given by (antenna gain in db less line losses in db). For example, if the transmitter power output were 100 watts, the antenna gain 6 db, and the feed line losses 3 db, the effective radiated power would be 3 db above 100 watts (6-3) or 200 watts.

The restrictions per band range from 100 watts e.r.p. at low antenna heights on 6 meters to 25 watts e.r.p. above 1000 feet; 800 watts e.r.p. below 50 feet antenna heights on 2 meters and 220 mHz, to 100 watts e.r.p. above 1000 feet; 1 kw input below 100 feet on 450 mHz to 400 watts e.r.p. above 1000 feet; and 1 kw input on 1215 mHz and above. All these

restrictions except six meters are livable. For good coverage they all should be about twice what they are now, but we can work with the power levels given. Now, for six meters. There is just not enough power allowed to get adequate coverage on six meters. 25 watts e.r.p. just won't hack it. Thus, six meter repeater operators and licensees will have to petition for higher power levels.

This e.r.p. reeks of Radio Common Carrier (RCC) commercial regulations. There is some reasoning behind limiting the e.r.p., but generally amateurs have been able to work out their overlap problems. Guess it was those few Alligators (bit mouth, little ear repeaters) that did it to us.

Some More Good Points

Leaving the ulcer-making points for a while, we get into some more of the finer points of the Report and Order. For example, 97.97 makes portable and mobile operations a bit simpler. Now the only notification of being away from the fixed location during operations must be given only if those operations are for more than 15 days at a single location. Sure takes care of those notifications that we used to have to send even for long weekends.

Next, the new 97.103 relaxes logging, especially for mobiles. After 17 October, a mobile within 100 miles of fixed location is considered "local." also, during cross-country driving the location at the first transmission of the day and the location at the end of the last transmission of the day are the only locations that have to be entered. When working through a repeater a mobile station will have only to log times into and out of the repeater. Also, the call signs of station worked through the repeater do not have to be recorded!

Logging requirements by repeater stations are a bit confusing. This writer interprets that the control stations will have to log the system in and out of service, but that call signs of individual stations using the repeater do not have to be recorded. However, further clarification is quite necessary in this area.

Repeater Restrictions

97.111 sets forth the rules for the operation of the repeater itself. For example, the squelch tail cannot be more than 5 seconds long. Cross-band repeaters are banned except when approved upon special need. Multiple outputs in a single band are prohibited unless otherwise approved on an individual basis by the commission. Also, the primary input and output of the repeater must be in the same band.

General Comments

Well, as said before, some of this Report and Order is good, some bad, and a lot will require some bending on the part of all of us. The reasons for the major restrictions are usually the actions of a relatively few, stubborn amateurs who have refused to cooperate with other repeaters and repeater groups in various localities. Well, the FCC has now placed the burden of cooperation squarely upon our shoulders (Paragraph 12 of the comments). If we don't want to see even tighter restrictions, then we will all have to pull together and *cooperate*.

Finale'

This has been one of the toughest articles to write to keep it from being overly emotional. There are portions of the Report and Order, especially those dealing with antenna radiation pattern determinations, which I feel will be harmful to experimentation in the antenna field. Also, since the burden of proof is placed upon the amateur, things could get a bit tough for the smaller repeater groups. Sure, those of us who are actively working in commercial f.m. communications and in related communications fields can get the tools and instruments needed to make the measurements. The systems people of Motorola, General Electric, RCA, etc. do it all the time for RCC system licensing. But, most f.m.'ers do not work for or around these companies, and do not have the test equipment needed for really accurate measurements even if the techniques were well known. Well, I'm starting to get emotional, so lets drop it there.

Six Meter FM

The opening of the 147-148 mHz segment of two meters to the Technician Class operator may, for a short time, take some of the pressure off two meters. However, the need for additional spectrum space will become as acute as in the 146-147 mHz within a short period of time. Many amateurs are going to 450 mHz and even to 220 mHz, thus bypassing a proven amateur v.h.f. band, namely six meters. Ten years ago six meters was bustling with activity. Frequencies like 50.4 and 50.16 mHz were the 146.940 mHz of a.m. operation. The Heathkit "lunch box" was to be heard everywhere. But, with the rising popularity of the two meter band, due, of course, to f.m., many amateurs have deserted six meters. Sure, 52.525 mHz is very popular, and several repeaters are now operating on six, but, by and large, the entire 50-54 mHz range is basically devoid

[*Continued on page 98*]

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Text of F.C.C.'S Decision on V.H.F. Repeaters

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	
Amendment of Part 97	
of the Commission's	Docket No. 18803
Rules concerning the	RM-388, RM-1087,
licensing and operation	Rm-1209, RM-1542,
of Repeater stations in the	RM-1725
Amateur Radio Service	

REPORT AND ORDER

Adopted: August 29, 1972; Released: September 8, 1972 By the Commission: Commissioner Johnson concurring in the result; Commissioners H. Rex Lee and Reid absent; Commissioner Hooks not participating.

1. The Commission adopted a Notice of Proposed Rule Making in the above entitled matter on February 26, 1970, which was published in the Federal Register on March 5, 1970, (35 FR 4138). Interested parties were invited to file comments on or before May 15, 1970, and reply comments on or before June 1, 1970. The time for filing comments and reply comments was subsequently extended to June 15, 1970 and July 7, 1970, respectively.

2. The Notice proposed to specifically provide rules for the operation of amateur stations which receive and automatically repeat the radio signals of other amateur stations. Although the rules have not specifically referred to amateur repeater stations, per se, the Commission has licensed hundreds of repeater stations to operate under the rules applicable to amateur radio stations in general. We are of the opinion that this activity is in keeping with the fundamental purpose of the Amateur Radio Service expressed in the principles set forth in Section 97.1 of the Rules, particularly with respect to paragraphs 97.1(b) and (c):

"(b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

(c) Encouragement and improvement of the amateur radio service through rules which provide for advancing skills in both the communication and technical phases of the art."

The high quality of the technical content of the comments received is evidence that the basis and purposes of this Service are being served by this amateur repeater activity.

3. Both formal and informal comments were received from numerous individuals and amateur radio organizations. Since the comments received were so numerous, it is not practicable to discuss each herein. However, every comment has been given careful consideration by the Commission. Many include statements describing the value of repeater stations to the Service and predict further technological developments and increasing benefits if their usage is permitted to continue unhampered by the imposition of unnecessary restrictions. Generally, they heavily favor the adoption of specific rules governing the licensing and operation of repeater stations, but not necessarily in the manner proposed in the Notice.

4. The Commission finds that amateur terrestrial repeater stations are useful for increasing the reliable range of VHF and UHF [1]/vehicular and hand-held mobile stations in conducting intra-community amateur radio-communication, and for effecting emergency radiocommunication which possibly could not otherwise be conducted on the amateur bands. Again, this is in keeping with Section 97.1 of the rules:

"(a) Recognition and enhancement of the value of amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications."

Accordingly, we believe that rules to provide for the operation of repeater stations are desirable. It is apparent that repeater stations have become a significant part of the Service. There is no reason to expect their growing popularity to quickly diminish, nor is there reason to anticipate the innovative skills that amateur operators have demonstrated in designing and planning repeater systems to suddenly dissipate. We would prefer to have this activity continue in an orderly fashion, in a spirit of cooperation among amateur operators. Just as it was not possible to foresee the interest in repeater stations, it is similarly impossible to fully predict the eventual products of the amateurs' imaginative application of the electronic and radio arts. For this reason, the rules adopted herein are intended to introduce provisions into the rules which permit the flexibility needed in the Service, and to provide the licensing framework for accommodating future technical and operational advancements in amateur radiocommunication. Despite our efforts to forecast future needs and provide appropriate rules, we recognize that in all probability further advancements in remote control and automatic control technology will necessitate additional amendments. We urge interested parties having information and suggestions in these areas to submit them to the Commission for consideration.

5. Beginning July 1, 1973, a separate station license will be required for every amateur repeater station regardless of when it was first licensed. Applications for new, modified or renewed repeater station licenses must meet the new requirements upon the effective date of the new rules. These stations will be identified by a call sign having the distinctive prefix WR. In order to qualify for a repeater station license, the applicant must be at least a Technician Class licensee and must submit certain data regarding the technical and operational provisions included in his proposed station. The requirements for this showing are intended to verify that the applicant has given careful consideration to the planning and design of his repeater station, addressing particular attention to the geographical area to be covered. We desire that the applicant for a repeater station license predict by analysis the approximate coverage area needed for intra-community amateur radiocommunication, using the desired mode of emission. After the repeater is licensed and in operation, the licensee should verify his assumptions of community radiocommunication requirements and his prediction of the station coverage through testing and operating experience, and make appropriate adjustments based thereon. The foregoing approach should be accomplished giving due consideration to minimizing harmful interference to other amateur radio operators in the same or nearby communities desiring to use the same frequency, or frequency bands.

6. Upon reviewing the comments, and in consideration of the increasing complexity of systems described in applications received by the Commission for remotely controlled repeater stations, we recognize the need emerging in the Service for a licensing structure that facilitates combining several amateur radio stations into a radiocommunication system. It has not been uncommon to receive an application for a proposed "station" having fifty or more remote control points and a half-dozen remote receiving sites which involve a multiplicity of transmitters and frequencies. This is clearly a complex system comprised of special purpose stations, each performing one or more functions in a network. A thorough review of this matter has been undertaken, and the resulting Commission determination is reflected in the amended rules. The review indicated the difficulty in providing operating and licensing rules for the Service without taking into account the functions performed by various types of specialized amateur radio stations. Accordingly, we are adopting a structure of definitions and station privileges related to the major functions performed by such specialized stations. Under this concept, and with the one exception of repeater stations, a single station may be licensed for one or more special purpose privileges according to the functions to be performed by that station. This permits a licensee to combine several stations into a system. We feel this "building block" approach is consistent with the increasing complexity of amateur system networks, will provide the necessary flexibility, and at the same time, retain the means for the Commission to exercise its requisite obligations.

7. Every amateur radio operator is affected by the adoption of this licensing structure to some degree. For example, an amateur's license which now specifies the location of his station and indicates his operator privileges, i.e., Technician, General, etc., will also include the privileges authorized for his station. As a minimum, the station privilege would be "primary station." Every operator must have a primary station. This is necessary so that every amateur will have a call sign with which he may identify his radiocommunication, if required. Normally, the primary station license will be issued for the amateur's home address. However, those amateurs not having a permanent address within the United States, its territories and possessions should furnish the address of a relative or friend who will receive and forward mail to the licensee. Every licensee will be accountable for mail sent to the address of record given for a station license. Therefore, every amateur must have a license

[1]/ Article 2, Section III of the I.T.U. Radio Regulations defines VHF as Band 8, 30-300 MHz (Metric waves) and UHF as Band 9, 300-3000 MHz (Decimetric waves).

for a primary station, and this license will also authorize his operating privileges. The license may also contain additional station privileges for the same station. Licensees other than those desiring remote control or repeater station privileges will have their licenses updated upon renewal.

8. The various kinds of additional station privileges, some of which may be combined with a primary station license, are: repeater station, control station, auxiliary link station and secondary station. Repeater station privileges may not be combined with another station license because of their distinctive call sign assignment. A control station privilege authorizes the station to exercise control over a remotely controlled station. An auxiliary link station authorizes a station to relay a radio signal point-to-point within the same system network. Either or both may be combined with a primary station for the same location. A secondary license is for a station at a different location, such as a vacation home, and is obviously a license issued in addition to the primary license. These various privileges may be added to an existing license by modification, or at renewal, upon submital of the appropriate information.

9. The rules for remote control proposed in the Notice have been relaxed in three major areas. First, the control operator may be any qualified amateur designated by the licensee. Secondly, provisions are adopted for any repeater station authorized to be operated by radio remote control to also be so operated from a portable or mobile station, provided all of the required monitoring and control functions can be satisfactorily performed, from either the authorized control point or from the mobile or portable control station. This will enable a licensee to make use of his own repeater station while he is operating mobile or portable. Thirdly, since the comments frequently and persuasively mention terrain and other considerations which make necessary "multiple-hop" control links, we are deleting the proposed limit to a direct (single-hop) control link and providing for auxiliary link stations, which may be authorized for this and also for other point-to-point intermediate relay applications, such as a relay between a remote receiving site and a repeater station.

10. We have considered the advisability of adopting rules for control links based upon current amateur control link techniques, versus rules which would allow greater latitude. We find the latter approach to be more flexible and appropriate to the amateur service, but it requires a showing of the design and operational features of an applicant's proposed control system network. The applicant must submit a diagram showing the inter-relationship of all of the stations and control points in the system network configuration. The station license will list the control points and the control stations authorized to operate the remotely controlled station.

11. In the past, we have permitted a very broad interpretation of the term "wire" remote control as applied to Part 97 of the rules, including the use of commercial telephone lines and command signal techniques. This has exempted stations employing relatively sophisticated and sometimes questionable approaches in the design and operation of wire remote control links, from submitting information on their proposed station with their applications. Upon the effective date of this Report and Order, only stations having the most elementary form of interconnection comprised of electrical conductors directly between the transmitter and the control devices, and having all of the elements of the station located on the same premises, will be considered as not constituting remote control. Applicants proposing to use any other form of remote control must submit the information required by Section 97.41. Stations other than repeater stations now authorized to be operated by wire remote control and not in compliance with the licensing requirements of the amended rules may continue to operate under their present authorization until the expiration date of their current station license.

12. Restriction of repeater operation to specific portions of the amateur bands above 50 MHz has not been adopted as proposed in the Notice. Approximately one-half of the Amateur VHF bands and 8 MHz of the 420 MHz band is being authorized for repeater usage. The Commission is persuaded by the comments and by observation that regional and national frequency planning and coordination by amateur radio operators themselves can result in the best spectrum utilization appropriate to the service. However, we are prepared to reverse this decision should plans and their implementation not occur within a reasonable period. To solve the problem presented by Technician Class privileges in only one-half of the 146-148 MHz sub-band authorized for repeater operation, the Rules are amended to permit Technician Class licensees to also operate in the entire 145 to 148 MHz segment

13. We are of the opinion that terrestrial repeater stations should be utilized only for intra-community radiocommunication and should not be used, directly or indirectly, as a means to circumvent the rules regarding authorized amateur operator privileges for the different classes. Repeating a lower class operator's radio signal from one frequency band into another band having higher operator privilege requirements is unfair to those operators who have properly qualified for the higher requirements. For these reasons, we are persuaded to adopt the provisions of the Notice prohibiting multiband, crossband and linked repeater operation even where operator privileges would permit it. Similarly it is not in the interest of spectrum conservation to utilize crossband and multiband operation. Many comments argued against the proposed rule to prohibit linking repeaters. In weighing these arguments against the desire to conserve spectrum and to encourage the use of amateur terrestrial repeaters for intra-community coverage, we find that a majority of situations can be accommodated with a maximum of two linked repeaters. Therefore, two repeaters may be linked together, and under certain circumstances as provided for in Section 97.89(c), more than two.

14. As pointed out by a large number of respondents the changes proposed by the Notice for defining the maximum authorized transmitter power for an amateur station would affect a much broader segment of the Service than those pursuing an interest in repeaters. For that reason, action on this topic is postponed with the intention of making it the subject of a future rule-making proceeding as recommended in the comments submitted by the American Radio Relay League and others.

15. The proposed 600 watt input power limit on repeater transmitters is not being adopted herein as a means of regulating a reasonably balanced receive-to-transmit repeater coverage. A decision is made to incorporate into Section 97.67 the provisions of Section 324 of the Communications Act of 1934, as amended, to emphasize its particular applicability to amateur terrestrial repeater stations. We conclude that a repeater station which transmits a signal at many times the range over which it is capable of receiving would be in violation of the Act. In reviewing several frequency plans proposed for the VHF bands, we observe that a typical plan would allocate about one to two dozen frequency channel pairs per megahertz. With limited channels available, the possibility of interference between repeater stations in adjacent communities desiring to use the same frequencies must be considered. For this reason, limits are established for effective radiated power from a repeater station antenna, based upon the power normally required for reception by a typical vehicular mobile station over a nominal community coverage area. A major consideration in establishing these limits is the encouragement of the practice of achieveing the desired coverage through the use of a low power transmitter in conjunction with an antenna located at an optimum height above average terrain. The operation of a control station or an auxiliary link station which does not use directional antennas in conjunction with low transmitter power to minimize the possibility of harmful interference is not considered good amateur practice, and will be carefully evaluated by the Commission if proposed.

16. As stated in the Notice, Section 310(b) of the Communications Act requires, in effect, that the licensee of a repeater station maintain supervision and control of both the technical and operational performance of his station. Although several of the comments addressed this topic, as do RM-1542 and RM-1725 filed by Mr. Ken W. Sessions, the Commission is not ready to make a determination of rules for automatically controlled stations in the Service. We do not consider access to a repeater station controlled by the users via coded signals alone on the receiving frequency to be active supervisory control by the control operator. Such coded signals are permissible for secondary control but are not required.

17. Comments were received in response to the additions to Section 97.87 proposed in the Notice, correctly noting that the implications extend beyond that of properly identifying a repeater station. All stations would be affected. However, the proposal reflected the policy position then held by the Commission, and the comments prompt a review of the matter. The amended section is a means to accomplish two partially conflicting purposes: rapid identification of a station causing interference to another service, and identification of the operator in order to determine his class of license for verification of his privilege to operate within a restricted sub-band. Under the amended rules, a visiting operator must use the call sign of the station he is operating. Should his class of operator privilege exceed that of the station licensee, and should he desire to operate the section within the sub-bands available to him but not to the station licensee, he must identify with both the station call sign and his own. Provision for automatic identification of a repeater station by telphony as well as telegraphy is adopted. The requirement for repeater identification is designed to provide assurance that a short single transmission or a short exchange of transmissions will include at least one repeater station call sign transmission.

18. Received comments highly favor simplified logging. The section has been restructured and requires only a minimum of information to be recorded in written form. The proposed requirement

for recording all installation, service or maintenance work in the station log is deleted. Although the use of such a routine is encouraged, we find that since the station licensee is responsible for the technical performance of the station, the procedure to be employed to meet this obligation is a matter of personal choice.

19. A new requirement is added for the identification of the antenna and/or transmission line associated with a remotely controlled transmitter in order to facilitate contacting the station licensee should the need arise — a process which has been time consuming in some instances where the radiating antenna of a station in violation has been identified by radio location techniques. To minimize the prospect of interference to radio-communication already in progress on a given frequency, the rules to require continuous monitoring of a remotely controlled transmitter are expanded to require continuous monitoring of the frequencies while in operation, which is good operating practice. Frequencies above 225 MHz used for remotely controlling a transmitter are exempted from the continuous monitoring requirement since the interference potential with UHF is much less than with VHF.

20. Section 97.89 has been reorganized editorially and the invitation to incorporate into the text a reference to Appendix 2 is taken. Numerous comments were concerned with the omission in the Notice of provisions for various test, control and experimental transmissions. The amended rule includes these provisions.

21. The Section containing definitions, §97.3, has been expanded to include those terms frequently used in the amendments. They are defined in order to minimize possible ambiguities in the statement of the rules.

22. The rules adopted herein do not proscribe amateur radio stations, including repeaters, from being automatically interconnected to a telephone exchange system. Amateur licensees should be aware that rules governing that type of facility will be considered for other of the Commission's radio services in a separate proceeding. It has been brought to the Commission's attention that numerous violations of Sub Part E of Part 97 of the Rules have taken place through the use of such interconnection, which facilitates communication from moving vehicles. Therefore, it may be necessary at some future date to examine in detail the current usage of "autopatch" facilities; and possibly restrict the use of such devices in the Amateur Radio Service. Pending the adoption of any such regulations, amateurs are warned that usage of such interconnecting devices must be limited to amateur radiocommunication and may not be used for any type of business communication.

23. These amendments shall become effective upon the date stated in paragraph 25. Existing remotely controlled stations may continue to operate under their current authorizations until midnight local time June 30, 1973, or until the expiration date of their license, whichever occurs first. All new and renewed stations must comply with the rules as amended. Applications for all stations will continue to be filed on Forms 610 or 610-B, as appropriate. Parties desiring instructions for completing applications requiring additional showing may obtain same upon written request addressed to the Chief, Amateur and Citizens Division, Federal Communications Commission, Washington, D.C. 20554.

24. We find the attached amendments to the rules are necessary and desirable for the execution of the Commission's duties. Authority for adoption of these amendments is contained in Sections 4(i) and 303 of the Communications Act of 1934 as amended.

25. Accordingly, IT IS ORDERED, that effective October 17, 1972, Part 97 of the Commission's Rules IS AMENDED as set forth in the attached Appendix. IT IS FURTHER ORDERED, that in addition to RM-388, RM-1087 and RM-1209, the pending petitions of Mr. Ken W. Sessions, Jr., RM-1542, filed December 8, 1969, and RM-1725 filed December 7, 1970, have been fully considered and, to the extent that they are at variance with the rule changes adopted herein, they are DENIED.

26. IT IS FURTHER ORDERED, that this proceeding IS TERMINATED.

FEDERAL COMMUNICATIONS COMMISSION

Ben F. Waple
Secretary

APPENDIX

Part 97 of the Commission's Rules is amended as follows:

1. Section 97.3 is revised to read as follows:

§97.3 *Definitions*

The following definitions are used in this part:

(a) *Amateur Radio Service.* A radiocommunication service of self-training, intercommunication and technical investigation carried on by amateur radio operators.

(b) *Amateur Radiocommunication.* Non-commercial radiocommunication by or among amateur radio stations solely with a personal aim and without pecuniary or business interest.

(c) *Amateur radio operator.* A person interested in radio technique solely with a personal aim and without pecuniary interest, holding a valid Federal Communications Commission license to operate amateur radio stations.

(d) *Amateur radio license.* The instrument of authorization issued by the Federal Communications Commission comprised of a station license, and in the case of the primary station, also incorporating an operator license.

Operator license. The instrument of operator authorization including the class of operator privileges.

Station license. The instrument of authorization for a radio station in the Amateur Radio Service.

(e) *Amateur radio station.* A station licensed in the Amateur Radio Service embracing necessary apparatus at a particular location used for amateur radiocommunication.

(f) *Primary station.* The principal amateur radio station at a specific land location shown on the station license.

(g) *Military recreation station.* An amateur radio station licensed to the person in charge of a station at a land location provided for the recreational use of amateur radio operators, under military auspices of the Armed Forces of the United States.

(h) *Club station.* A separate amateur radio station for use by the members of a bona fide amateur radio society and licensed to an amateur radio operator acting as the station trustee for the society.

(i) *Additional station.* Any amateur radio station licensed to an amateur radio operator normally for a specific land location other than the primary station, may be one or more of the following:

Secondary station. Station licensed for a land location other than the primary station location, i.e., for use at a subordinate location such as an office, vacation home, etc.

Control station. Station licensed to conduct remote control of another amateur radio station.

Auxiliary link station. Station, other than a repeater station, at a specific land location licensed only for the purpose of automatically relaying radio signals from that location to another specific land location.

Repeater station. Station licensed to automatically retransmit the radio signals of other amateur radio stations for the purpose of extending their intra-community radiocommunication range.

(j) *Space radio station.* An amateur radio station located on an object which is beyond, is intended to go beyond, or has been beyond the major portion of the Earth's atmosphere. (Regulations governing this type of station have not yet been adopted and all applications will be considered on an individual basis.)

(k) *Terrestrial location.* Any point within the major portion of the Earth's atmosphere, including aeronautical, land and maritime locations.

(l) *Space location.* (reserved)

(m) *Amateur radio operation.* Amateur radiocommunication conducted by an amateur radio operator from an amateur radio station. May include one or more of the following:

Fixed operation. Radiocommunication conducted from the specific geographical land location shown on the station license.

Portable operation. Radiocommunication conducted from a specific geographical location other than that shown on the station license.

Mobile operation. Radiocommunication conducted while in motion or during halts at unspecified locations.

(n) *Remote control.* Control of transmitting apparatus of an amateur radio station from a position other than one at which the transmitter is located and immediately accessible, except that direct mechanical control, or direct electrical control by wired connections, of an amateur radio transmitter from a point located on board any aircraft, vessel, vehicle, or on the same premises on which the transmitter is located, shall not be considered remote control within the meaning of this definition.

(o) *Control link.* Apparatus for effecting remote control between a control point and a remotely controlled station.

(p) *Control operator.* An amateur radio operator designated by the licensee of an amateur radio station to also be responsible for the emissions from that station.

(q) *Control point.* The operating position of an amateur radio station where the control operator function is performed.

(r) *Antenna structures.* Antenna structures include the radiating system, its supporting structures and any appurtenances mounted thereon.

(s) *Antenna height above average terrain.* The height of the center of radiation of an antenna above an averaged value of the elevation above sea level for the surrounding terrain.

(t) *Transmitter.* Apparatus for converting elec-

trical energy received from a source into radio-frequency electromagnetic energy capable of being radiated.

(u) *Effective radiated power.* The product of the radio frequency power, expressed in watts, delivered to an antenna, and the relative gain of the antenna over that of a half-wave dipole antenna.

(v) *System Network diagram.* A diagram showing each station and its relationship to the other stations in a network of stations, and to the control point(s).

2. In §97.7, paragraph (c) is amended to read as set forth below and the note at the end of the section is deleted:

§97.7 Privileges of operator licenses.

* * * * *

(c) *Technician Class.* All authorized amateur privileges on the frequencies 50.1-54.0 MHz and 145-148 MHz and in the amateur frequency bands above 220 MHz.

* * * * *

3. Section 97.37 is revised to read as follows:

§97.37 *General eligibility for station license.*

An amateur radio station license will be issued only to a licensed amateur radio operator, except that a military recreation station license may also be issued to an individual not licensed as an amateur radio operator (other than an alien or a representative of an alien or of a foreign government), who is in charge of a proposed military recreation station not operated by the United States Government but which is to be located in approved public quarters.

4. Section 97.40 is added to read as follows:

§97.40 *Station license required.*

(a) No transmitting station shall be operated in the Amateur Radio Service without being licensed by the Federal Communications Commission.

(b) Every amateur radio operator must have a primary amateur radio station license.

(c) An amateur radio operator may be issued one or more additional station licenses, each for a different land location, except that repeater station, control station, and auxiliary link station licenses may also be issued to an amateur radio operator for land locations where another station license has been issued to the applicant.

(d) Any transmitter to be operated as part of a control link shall be licensed as a control station or as an auxiliary link station and may be combined with a primary, secondary, or club station license at the same location.

(e) A transmitter may only be operated as a repeater station under the authority of a repeater station license.

5. Section 97.41 is amended by modifying paragraph (a), adding new paragraphs (b), (c), (d), (e) and (f), then redesignating former paragraphs (b) and (c) as (g) and (h).

§97.41 *Application for station license.*

(a) Each application for a club or military recreation station license in the amateur radio service shall be made on the FCC Form 610-B. Each application for any other amateur radio station license shall be made on the FCC Form 610.

(b) Each application shall state whether the proposed station is a primary or additional station. If the latter, the application shall also state whether the proposed station is a secondary, control, auxiliary link or repeater station.

(c) When an application(s) is made for a station having one or more associated stations, i.e., control station and/or auxiliary link station, a system network diagram shall also be submitted.

(d) Each application to license a remotely controlled amateur radio station, whether by wire or by radio control, shall be accompanied by a statement giving the address for each control point. The application shall include a functional block diagram and a technical explanation sufficient to describe the operation of the control link. Additionally, the following shall be provided:

(1) Description of the measures proposed for protection against access to the remote station by unauthorized persons.

(2) Description of the measures proposed for protection against unauthorized station operation, either through activation of the control link or otherwise.

(3) Description of the provisions for shutting down the station in case of control link malfunction.

(4) Description of the means to be provided for monitoring the transmitting frequencies.

(5) Photocopies of control station license(s) and auxiliary link station license(s), or the application(s) for same if such stations are proposed for the system network.

(e) Each application to license a control station or an auxiliary link station in the amateur radio service must be accompanied by the following information:

(1) The station transmitting band(s).

(2) Description of the means to be provided for monitoring and transmitting frequencies.

(3) The transmitter power input and justification that such power is in compliance with §97.67(b).

(4) If remote control of an auxiliary link station is proposed, all of the information required by paragraph (d) of this section shall also be provided.

(f) Each application to license a repeater station in the amateur radio service must include the following information for each frequency band proposed for operation.

(1) Location of the station transmitting antenna, drawn upon a topographic map having the scale of 1:250,000 and a contour interval of 50 feet.[1]

(2) The transmitting antenna height above average terrain.[2]

(3) The effective radiated power in the horizontal plane for the main lobe of the antenna pattern, calculated for maximum transmitter output power.

(4) The transmitter power output with an explanation of the basis for the measurement or computation.

(5) The loss in the transmission line between the transmitter and the antenna expressed in decibels, and method of determination of the loss.

(6) The horizontal and vertical radiation patterns of the transmitting antenna as installed, with reference to True North (for horizontal pattern only), expressed as relative field strength (voltages) or in decibels, drawn upon polar coordinate graph paper, and method of determination of the patterns.

(7) The relative gain of the transmitting antenna in the horizontal plane and method of determination of the gain.

(8) If remote control of the repeater station is proposed, all of the information required by paragraph (d) of this section also shall be provided.

(9) If auxiliary link station(s) are also proposed, include photo-copies of the auxiliary link station license(s), or the application(s) for such licenses.

* * * * *

6. Section 97.43 is revised to read as follows:

§97.43 *Location of Station.*

Every amateur station must have one land location, the address of which is designated on the station license. Every amateur radio station must have at least one control point. If the control point location is not the same as the station location, authority to operate the station by remote control is required.

7. In §97.47, the note following paragraph (c) is deleted and paragraphs (d) and (e) are added to read as follows:

[1]/Indexes and ordering information are available from U.S. Geological Survey, Washington, D.C. 20242, or Federal Center, Denver, Colorado 80225.

[2]/See appendix 5.

§97.47 *Renewal and/or modification of amateur station license.*

* * * * *

(d) When an addition to the control point(s) authorized for a remotely controlled station is desired, an application for modification of the remotely controlled station license shall be submitted. Authorized control points may be deleted by letter notification to the Commission.

(e) Should the licensee desire to effect changes in his station which would significantly change the system network diagram or other technical and operational information on file with the Commission, revised showings for the proposed alterations shall be submitted for approval. An application for modification of the station license is not required.

8. In Section 97.61, the introductory text of paragraph (a) is amended and new paragraph (c) is added to read as follows:

§97.61 *Authorized frequencies and emissions.*

(a) Following are the frequency bands and associated emissions available to amateur radio stations, other than repeater stations, subject to the limitations stated in paragraph (b) of this section, §97.65, §97.109 and §97.110.

* * * * *

(c) The following transmitting frequency bands and the associated emission authorized in paragraph (a) of this section are available for repeater stations, including both input (receiving) and out put (transmitting):

FREQUENCY BAND (MHz)

52.0 - 54.0
146.0 - 148.0
222.0 - 225.0
442.0 - 450.0

any amateur frequency above 1215 MHz.

The frequency band 29.5 - 29.7 MHz may be authorized upon a special showing of need for repeater station operation in this band for intra-community amateur radio communications.

9. Section 97.67 is revised by designating the existing text as paragraph (a) and by adding new paragraphs (b) and (c) to read as follows:

§97.67 *Maximum authorized power.*

* * * * *

(b) Notwithstanding the provisions of paragraph (a) of this section, amateur stations shall use the minimum amount of transmitter power necessary to carry out the desired communications.

(c) Within the limitations of paragraphs (a) and (b) of this section, the effective radiated power of a repeater station shall not exceed that specified for

the antenna height above average terrain in the following table:

Antenna height above average terrain	*Maximum effective radiated power for frequency bands above:*			
	52 MHz	146 MHz	442 MHz	1215 MHz
below 50 feet	100 watts	800 watts	Paragraphs (a) and (b)	
50 to 99 feet	100 watts	400 watts	Paragraphs (a) and (b)	
100 to 499 feet	50 watts	400 watts	800 watts	Paragraphs (a) and (b)
500 to 999 feet	25 watts	200 watts	800 watts	Paragraphs (a) and (b)
above 1,000 feet	25 watts	100 watts	400 watts	Paragraphs (a) and (b)

10. In §97.79, the headnote and text are revised to read as follows:

§97.79 *Control operator requirements.*

(a) The licensee of an amateur station shall be responsible for its proper operation.

(b) Every station when in operation shall have a control operator at an authorized control point. The control operator may be the station licensee or another amateur radio operator designated by the licensee. Each control operator shall also be responsible for the proper operation of the station.

(c) An amateur station may only be operated in the manner and to the extent permitted by the operator privileges authorized for the class of license held by the control operator, but may exceed those of the station licensee provided proper station identification procedures are performed.

(d) The licensee of an amateur station may permit any person to participate in amateur radiocommunication from his station, provided that a control operator is present and continuously monitors the radiocommunication to ensure compliance with the rules.

11. In Section 97.87, paragraph (d) is amended and redesignated as (h) and new paragraphs (d), (e), (f), and (g) are added as follows:

§97.87 *Station Identification.*

* * * * *

(d) Under conditions when the control operator is other than the station licensee, the station identification shall be the assigned call sign for that station. However, when a station is operated within the privileges of the operator's class of license but which exceeds those of the station licensee, station identification shall be made by following the station call sign with the operator's primary station call sign (i.e. WN4XYZ/W4XX).

(e) A repeater station shall be identified by radiotelephony or by radiotelegraphy when in service at intervals not to exceed five minutes at a level of modulation sufficient to be intelligible through the repeated transmission.

(f) A control station must be identified by its assigned station call sign unless its emissions contain the call sign identification of the remotely controlled station.

(g) An auxiliary link station must be identified by its assigned station call sign unless its emissions contain the call sign of its associated station.

(h) The identification required by paragraph (a), (b), (c), (d), (e), (f) and (g) of this section shall be given on each frequency being utilized for transmission and shall be transmitted eigher by telegraphy using the International Morse Code, or by telephony, using the English language. If by an automatic device only used for identification by telegraphy, the code speed shall not exceed 20 words per minute. The use of a national or internationally recognized standard phonetic alphabet as an aid for correct telephone identification is encouraged.

12. Section 97.89 is amended to read as follows:

§97.89 *Points of communications.*

(a) Amateur stations may communicate with:

(1) other amateur stations, excepting those prohibited by Appendix 2.

(2) stations in other services licensed by the Commission and with United States Government stations for civil defense purposes in accordance with Subpart F of this Part, in emergencies and, on a temporary basis, for test purposes.

(3) any station which is authorized by the Commission to communicate with amateur stations.

(b) Amateur stations may be used for transmitting signals, or communications, or energy, to receiving apparatus for the measurement of emissions, temporary observation of transmission phenomena, radio control of remote objects, and similar experimental purposes and for the purposes set forth in §97.91.

(c) Notwithstanding the provisions of paragraph (a), no more than two repeater stations may operate in tandem, i.e., one repeating the transmissions of the other, excepting emergency operations provided for in §97.107 or brief periods to conduct emergency preparedness tests.

(d) Control stations and auxiliary link stations may not be used to communicate with any other station than those shown in the system network diagram.

13. Section 97.95 paragraph (a)(1) is amended as follows:

§97.95 *Operation away from the authorized permanent station location.*

(a) * * *

(1) When there is no change in the authorized land station location, an amateur radio station other than a military recreation or an auxiliary link station may be operated under its station license anywhere in the United States, its territories or possessions as a portable or mobile operation, subject to §97.61.

* * * * *

14. Section 97.97 is revised to read as follows:

§97.97 *Notice of operation away from authorized location.*

Whenever an amateur station is, or is likely to be, in portable operation at a single location for a period exceeding 15 days, the licensee shall give advanced written notice of such operation to the Commission's office specified in §97.95. A new notice is required whenever there is any change in the particulars of a previous notice or whenever operation away from the authorized station continues for a period in excess of one year. The notice required by this section shall contain the following information:

(a) Name of licensee

(b) Station call sign

(c) Authorized station location shown on station license

(d) Specific geographical location of station when in portable operation

(e) Dates of the beginning and end of the portable operation

(f) Address at which, or through which, the licensee can be readily reached.

15. Section 97.103 is revised to read as follows:

§97.103 *Station log requirements*

An accurate legible account of station operation shall be entered in a log for each amateur radio station. The log shall bear the call sign of the station and the signature of the licensee. The following information shall be recorded as a minimum:

(a) Written entries for all stations which are required only once, or when there is a change thereto.

(1) The signature of the control operator on duty and the call sign of his primary station, if he is other than the station licensee.

(2) The location of the station. Stations in mobile operation may enter the word "local" for amateur radiocommunication conducted within 100 statute miles of the address shown on the station license, otherwise the location of the first and last radiocommunication of each day. Stations in mobile or portable operation shall make an entry showing compliance with §97.97, if required.

(3) The input power to the transmitter final amplifying stage.

(4) The type of emission used.

(5) The frequency or frequency sub-band used for transmitting.

(b) Other entries for all stations which may be

recorded in a form other than written but which can readily be transcribed by the licensee into written form:

(1) The dates of operation.

(2) Except for repeater stations, names of persons other than the control operator using the station, either directly or indirectly, for amateur radiocommunication.

(3) A notation of third party messages sent or received, including names of all participants and a brief description of the message content.

(4) The call sign of each station actually contacted, or other purpose of the transmission, i.e., those set forth in §97.89. Stations in mobile operation and repeater stations may omit this entry. Control stations shall enter the call sign(s) of each station in the control link. An auxiliary link station shall enter the call sign of its associated station(s).

(5) All stations shall enter the times the station is put into, or taken out of, service. Stations, and repeater stations shall enter the times of commencing and terminating each exchange of radiocommunication.

16. Section 97.105 is revised as follows:

§97.105 *Retention of logs.*

The station log shall be preserved for a period of at least 1 year following the last date of entry and retained in the possession of the licensee. Copies of the log, including the sections required to be transcribed by §97.103, shall be available to the Commission for inspection.

17. Section 97.111 is redesignated as §97.112 and a new undesignated center heading and new §§97.108 through 97.111 are added to read as follows:

Operation of additional stations

§97.108 *Operation of a remotely controlled station.*

(a) An amateur radio station may be operated by remote control only from an authorized control point, and only where there is compliance with the following:

(1) The license for the remotely controlled station must list the authorized remote control point(s). A photocopy of the remotely controlled station license must be posted in a conspicuous place at the authorized control point(s), and at the remotely controlled transmitter location. A copy of the system network diagram on file with the Commission must be retained at each control point. The transmitting antenna, transmission line, or mast, as appropriate, associated with the remotely controlled transmitter must bear a durable tag marked with the station call sign, the name of the station licensee and other information so that the control operator can readily be contacted by Commission personnel.

(2) The control link equipment and the remotely controlled station must be accessible only to persons authorized by the licensee. Protection against both inadvertent and unauthorized deliberate emissions must be provided. In the event unauthorized emissions occur, the station operation must be suspended until such time as adequate protection is incorporated, or there is reasonable assurance that unauthorized emissions will not recur.

(3) A control operator designated by the licensee must be on duty at an authorized control point while the station is being remotely controlled. Immediately prior to, and during the periods the remotely controlled station is in operation, the frequencies used for emission by the remotely controlled transmitter must be continuously monitored by the control operator. The control operator must terminate transmission upon any deviation from the rules.

(4) Provisions must be incorporated to automatically limit transmission to a period of no more than three minutes in the event of malfunction in the control link.

(5) A remotely controlled station may not be operated at any location other than that specified on the license without prior approval of the Commission except in emergencies involving the immediate safety of life or protection of property.

(6) A repeater station may be operated by radio remote control only where the control link utilizes frequencies other than the repeater station receiving frequencies.

§97.109 *Operation of a control station.*

(a) Amateur frequency bands above 220 MHz, excepting 435 to 438 MHz, may be used for emissions by a control station. Frequencies below 225 MHz used for control links must be monitored by the control operator immediately prior to, and during, periods of operation.

(b) Where a remotely controlled station has been authorized to be operated from one or more remote control stations, those remote control stations may be operated either mobile or portable.

§97.110 *Operation of an auxiliary link station.*

(a) An auxiliary link station may use amateur frequency bands above 220 MHz excepting 435 to 438 MHz for emissions. Frequencies below 225 MHz used by an auxiliary link station shall be monitored by the control operator immediately prior to, and during, periods of operation.

(b) An auxiliary link station may only be used for fixed operation from the location specified on the station license, and only when its associated station(s) is operated from its authorized land location.

§97.111 *Operation of a repeater station.*

(a) Emissions from a repeater station shall be discontinued within five seconds after cessation of radiocommunication by the user station. Provisions to automatically limit the access to a repeater station may be incorporated, but are not mandatory.

(b) The transmitting and receiving frequencies utilized by the repeater station shall be continuously monitored by the control operator immediately prior to, and during, periods of operation.

(c) A repeater station may be concurrently operated on more than one frequency band, provided the necessary showings have been approved by the Commission for each frequency band of operation. Crossband operation of repeater stations is prohibited, i.e. both input (receiving) and output (transmitting) frequencies for a particular repeated transmission must be within the same frequency band. Operation on more than one output frequency on a single frequency band is prohibited except when specifically approved by the Commission. Repeater stations authorized to operate in conjunction with one or more auxiliary link stations may utilize an input frequency in a different frequency band provided the input frequency of the auxiliary link station(s) is in the same frequency band as the output frequency of the repeater station.

(d) A repeater station shall be operated in a manner so as to assure that the station is not used for one-way radiocommunication other than provided for in §97.91.

(e) A station licensed as a repeater station may only be operated as a repeater station, excepting for short periods for testing or for emergencies.

18. In Section 97.193, the introductory text of paragraph (a) is amended, and a new paragraph (e) is added to read as follows:

§97.193 *Frequencies available*

(a) Except as provided in paragraph (e) of this section, the following frequency and frequency bands and associated emissions are available on a non-exclusive basis to the individual class of stations or units of such stations in the Radio Amateur Civil Emergency Service.

* * * * *

(e) A repeater station in the Radio Amateur Civil Emergency Service may operate on any frequency, and with any associated emission, above 50 MHz listed in paragraph (a) of this section, except for 220 MHz to 222 MHz.

19. Appendix 2 is amended by adding a footnote to Section I as follows:

Sec. 1. Radiocommunications between amateur stations of different countries[1] shall be forbidden if the administration of one of the countries concerned has notified that it objects to such radiocommunications.

* * * * *

20. Appendix 5 is added, reading as follows:

APPENDIX 5

DETERMINATION OF ANTENNA HEIGHT ABOVE AVERAGE TERRAIN

The effective height of the transmitting antenna shall be the height of the antenna's center of radiation above "average terrain." For this purpose "effective height" shall be established as follows:

(a) On a United States Geological Survey Map having a scale of 1:250,000, lay out eight evenly spaced radials, extending from the transmitter site to a distance of ten miles and beginning at 0° T (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° T). If preferred, maps of greater scale may be used.

(b) By reference to the map contour lines, establish the ground elevation above mean sea level (AMSL) at 2, 4, 6, 8, and 10 miles from the antenna structure along each radial. If no elevation figure or contour line exists for any particular point, the nearest contour line elevation shall be employed.

(c) Calculate the arithmetic average of these 40 points of elevation (5 points of each of 8 radials).

(d) The height above average terrain of the antenna is thus the height AMSL of the antenna's center of radiation, minus the height of average terrain as calculated above.

Note 1: Where the transmitter is located near a large body of water, certain points of established elevation may fall over water. Where it is expected that service would be provided to land areas beyond the body of water, the points of water level in that direction should be included in the calculation of average elevation. Where it is expected that service would not be provided to land areas beyond the body of water, the points at water level should not be included in the average.

Note 2: In instances in which this procedure might provide unreasonable figures due to the unusual nature of the local terrain, applicant may provide additional data at his own discretion, and such data may be considered if deemed significant.

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[1] As may appear in public notices issued by the Commission.

160 Meter Contest Results

13th Annual CQ Contest

By Charles M. O'Brien,* W2EQS

"Of all the words of tongue and pen the saddest are 'it might have been'" — Tennyson.

Friday, the 13th, to many is an unlucky omen. This contest didn't commence on the 13th; it was the 13th Annual *CQ* 160 Meter WW Contest with its starting time changed to Friday. Hundreds who participated ran into an unlucky weekend where conditions were horrible while others commented that conditions were terrific. Generally speaking, stations west of the Mississippi reported conditions ranging from only fair to extremely poor. The opposite was noted from those east of the Mississippi. Why? Maybe George Jacobs has the answer.

Throughout late Fall '71 and up to the end of January, German commercial DHJ on 1831 kHz had unbelievable signals . . . they were heard with good strength even on the west coast. Since then . . . When DHJ is blasting in it's a sure indication that conditions to Europe are wide open. But, where are the European hams? No signals heard from them on so many, many nights.

Many of the gang now know the full meaning of frustration as, in the east on the Tuesday before the Contest, many lost antennas in gale winds reaching 63 m.p.h. (75 m.p.h. is hurricane force). I lived that day in terror.

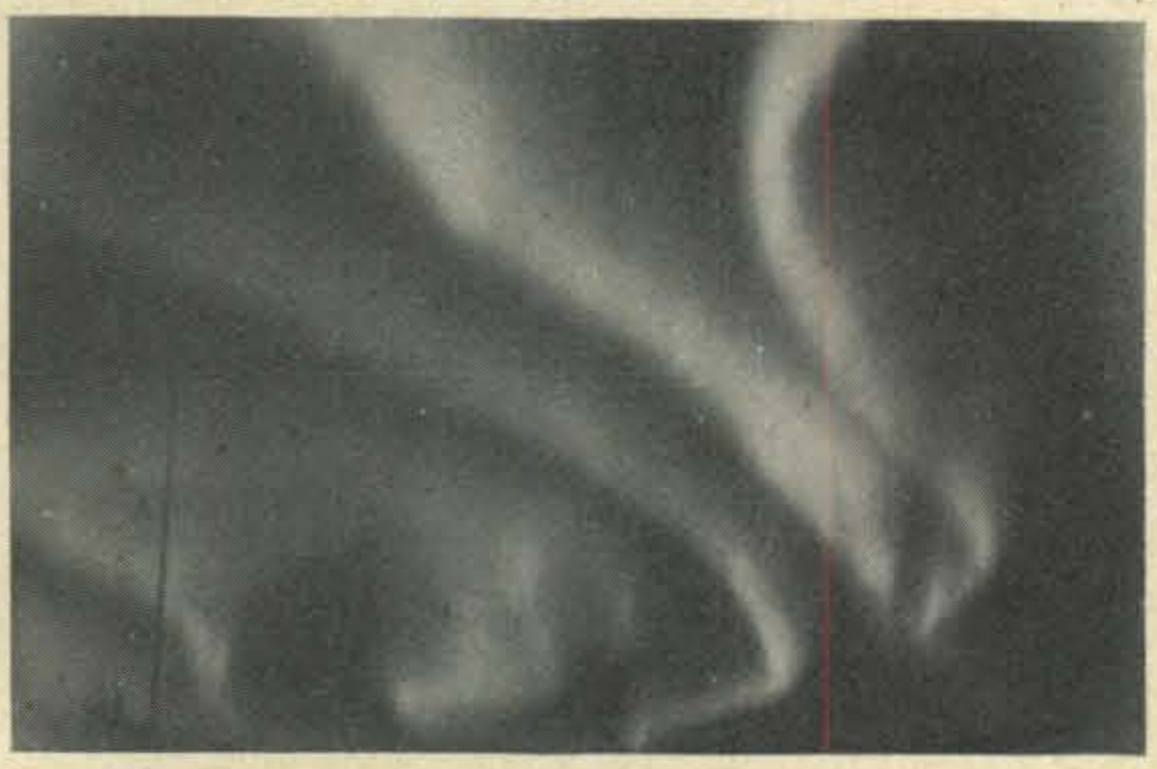
Many missed VE1ASJ Friday night/ Saturday morning when he was on from Prince Edward Island, the first time there has ever been any Contest activity from this Province. Saturday night/Sunday morning he was back home in New Brunswick.

All previous existing records were smashed by a good margin. Here on the east coast the Europeans were QRMing themselves to an extent that can only be termed "unbelievable." Then there were the Caribbean, Central and South American signals in there who gave many from coast to coast a QSO. Further west the boys didn't have too much trouble with such goodies as VK, ZL, KH6, KL7 and JA.

Over the entire weekend QRN was at a minimum; even the weakest of signals could be copied.

Previously, the greatest number of countries to participate in this Contest was 38 and that was just last year. This year the total increased to 43. You will find them listed in the results but it might be equally interesting to see what other countries were on but from whom no logs were received: CO, F (I am very skeptical on this one, an FØ. Unless he received permission to operate in the contest only, France isn't permitted the use of 160), GC, GI, HK, HR, HZ, KP4, OHØ, VP2A, XE, YN, ZB2, ZL, and 4S7.

EQ2BQ (Iran) reports: "This was my 1st attempt at a 160 contest. It was most astounding to hear such activity on the band. At one time KV4FZ, VP2AAA and 4S7GV all at 589 and QRMining each other. A great pity that I wasn't able to work all I heard for the contest has given me the incentive to be more active." Harry did manage to work 4S7GV, though. He is also ex-VS5JO and ex-ZL4JA whom many of you may remember. EL2CB is to be congratulated for his stick-to-itiveness. He heard a number of the boys but his only contact was to A1, W2BP. Lee went out of his mind calling KV4FZ, VP2AAA and W4BRB/VP7 but with no luck. Many Eu-



Ever wonder why it's so difficult to work Alaska? Here's the answer. This is what the sky looked like at KL7HEE not only this year, but last year as well, at contest time.

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Some of the gang at the Rice University Radio Club 160 set-up. L. to R.: WA5FTP, WA5LVJ, WA5RXT. Others who pitched in were WA7DAC, WB0BMT, and K5YNJ.

ropeans, from notes taken from their logs, called Lee but had no luck in raising him.

Regardless of conditions, the highest multiplier ever made in this Contest came to 69 and is the effort of W3GM. The greatest number of countries worked goes to KV4FZ with 22. Never before have we had as many as 300 QSOs by any one station. This year five exceeded that number . . . W4BRB/VP7 and W3IN with 372, W9DL with 357, W3GM with 329 and K9SKX with 325. Those making over 250 contacts numbered in the dozens. There's the proof of how good the conditions actually were. It is unfortunate, though, that the northern Plains and Pacific northwest were subjected to a bad Aurora storm and the photo received from KL7HEE shows exactly what I mean.

A question that has haunted me and has been asked of me by many is, "Where are the VEs?" The showing this year was the worst of any although all Provinces were on but Nova Scotia and Alberta. Yup, VE8 was on! Also, for the 2d consecutive year all 50 States participated. A great number of you added many new ones and some finally made their 50 state 160 WAS.

Once again, may we request the phone boys to operate above 1835 kHz for this one weekend only? Thanks, fellows. Remember that this contest is a yearly event scheduled to run over the last full weekend of January from 2200 GMT Friday to 1600 GMT Sunday.

A most attractive certificate will be sent the winners in each State, Province and DX country and, in cases where scores are close, one will also be sent to 2d and 3d place contestants. This year we are reverting to a single type of entry regardless of whether the station was manned by only one operator or several. In a contest which is so short and whose operating hours are even shorter we see no further need to break the results down into single and multi-operations. Logs should be submitted directly to *CQ*.

Comments

1st District — *W1WY:* Biggest thrill was finally working KH6 as well as creating a pile-up of W6/W7 boys Sunday morning. *W1SG:* Thrill working KH6IJ in broad daylight getting S7 report for 1st KH6 on 160. Picked up 3 new countries. *WA1OPF:* First time ever heard DX on 160. *WA3JSU/1:* Hope you and ARRL get together — 160 Test and Simulated Emergency Test on the same weekend! That, my crummy skyhook and a strategic attack by Murphy kept my first *CQ* Contest score low. Had fun, though! *K1PBW:* I might have been able to do better if my Beverage antennas hadn't become disconnected early in the Contest and especially if I hadn't been sick the 2d day. My stomach kept me out of commission 'til 0200Z Sunday and then intermittently after that. Must be getting too old for these Contests — can't keep up the pace without indigestion. *W1BB/1(* I could hear KH6s for an hour to hour and a half calling CQ and working no one even though dozens of East Coasters were calling them — one way skip — then suddenly the skip became two way and they worked one after the other East Coasters — most interesting. Had a wonderful time as usual. Some great operating.

2d District — *W2KHT:* Great Contest. The hours just rolled by too fast! W2AZQ: Looks like a real fine year — wish I had spent more early morning hours for KH6s, EL2CB, etc. *K2STO:* Really enjoyed it even tho snow got into the tuning unit of our vertical helix and wasn't removed 'til 2d night. *WA2KWB:* Sure wish I could have spent more time in Contest. Fantastic sigs from W4BRB/VP7. W5SUS strongest W5 heard. CU next year! *W2DEN:* This contest worked W6 and W7 for 1st time on 160. *WB2OZW:* We had a little fire here the Wednesday before the contest but wanted to put in a short while on band for Test and to unwind. We had 7 people working here cleaning up the mess. *K2VGR:* Some of the best condx I've ever heard. Unfortunately, I can't compete with the "big guns." *W2GP:* Boy — band sounded like 20 meters! Too bad a few "spoil sports" insisted on their right to louse up the DX Window. *W2ONP:* Working two countries — 1st ones on 160. Heard a lot more than I could work with my poor antenna.

3d District — *W3AGC:* My Big Antenna came down during a windstorm. Sorry I couldn't give more time this year. There's always next year to come up with the ⅝ wave vertical *W3IN:* Condx good but not excellent. Band seemed reluctant to really open to West Coast. Short Eu openings after our sunset did not hold to anywhere near Eu sunrise. KH6s very strong for 2 hours before they heard us. New 95' vertical has lots more clout than old LW. *W3CNS:* Heard 13 different countries — only worked 6. Those Beverage receiving antennas really work!

[*Text continued on p. 68*]

You can't come up with a much neater layout than this one of Charlie Klüttz, W4TMR, in Winston-Salem, North Carolina. Charlie ran up 218 QSO's with a multiplier of 52 to finish second only to K4CIA.

The first column indicates the number of contacts, second is the multiplier, third is the number of different countries worked and the last column is final score.

Connecticut

W1WY	207	57	15	34,542
W1SG	192	51	15	27,336
WA1OFP	132	37	7	11,248
WØDRE/1	101	31	10	8,494
W1TX	64	25	10	5,000
WA3JSU/1	65	22	3	2,992
WB2SEZ/1	51	20	3	2,240

Massachusetts

K1PBW	275	68	20	67,320
W1GBG	236	61	16	42,456
W1PL	188	57	14	29,184
W1BB/1	111	47	21	24,628
W1HGT	100	47	17	23,688
W1CVO	77	23	4	3,910
K8EEG/1	24	12	2	576

Maine

W1FZN	25	15	1	750

New Hampshire

W1GBP	131	42	7	13,692

Rhode Island

W1OP	75	27	3	4,424
W1FLN	24	14	3	784

Vermont

W1TH	87	34	3	6,188
K1KSH/1	76	25	3	4,175

New Jersey

W2EQS	263	61	15	43,798
W2KHT	164	45	8	17,280
W2AZQ	104	33	8	8,646
K2STO	110	27	4	6,554
WA2KWB	83	27	4	4,904
W2BP	30	28	15	4,760
W2DEN	64	30	5	4,560
WB2OZW	138	25	4	3,450
W2GBY	54	20	5	2,640
K2AA/2	40	16	2	1,408
WB2NUW	22	13	2	572

New York

W2DXL/2	280	67	18	48,776
K2GNC	128	39	7	12,168
K2VGR	121	36	6	9,864
W2GP	83	27	2	5,130
W2ONP	20	27	4	4,752
W2VXA	78	25	4	4,300
W2HXI	62	21	5	3,066
W2KTU	46	13	2	1,300
WA2MZH	31	13	2	806
W2QBB	8	8	2	128

Delaware

W3AGC	127	40	5	11,440

Maryland

W3IN	372	67	19	64,856
W3GN	130	33	6	9,636

Pennsylvania

W3GM	329	69	20	64,618
W3AJS	165	47	8	17,390
W3UHP	186	42	5	16,884
W3BUR	152	51	11	15,127
W3WGH	136	43	6	12,728
W3CNS	130	41	8	12,256
W3QOR	26	14	3	952

Alabama

K4MG	59	25	3	3,350

Florida

K4BHG	181	50	14	23,700
W4GGU	95	37	7	7,365
WB4JFK	62	30	8	5,160

Georgia

W4YWX	261	63	15	40,446
K4BAI	9	7	2	184

North Carolina

K4CIA	247	60	17	37,800
W4TMR	218	52	8	25,584
W4OMW	59	25	5	3,550

Kentucky

K4GSU	153	48	7	17,006

South Carolina

WA4LDM/4	1	1	1	2

Tennessee

W4HYY	130	41	5	11,641
W4UD	80	30	4	5,280

Virginia

W4PRO	266	50	10	30,200
W4QCW	152	49	13	20,776
W4WSF	178	42	9	20,188
W4SHX	129	41	8	12,546
W4YZC/4	136	39	5	11,544
WA4RGH	124	36	6	10,080
W4KXV	96	36	7	7,852
W4KFC	100	29	5	7,366
WØVEH/4	100	30	6	6,960

Arkansas

W5SUS	226	56	8	27,104

Louisiana

WA5QBO	171	44	4	15,752
W5MPX	109	39	5	9,438
W5KC	54	31	7	4,588

Mississippi

W5RUB	138	37	3	10,508
K5MZU	100	32	2	7,360
K4UCQ/5	78	32	4	5,760

New Mexico

WB5BHN	107	42	7	10,668
K5MAT	28	27	4	2,052
W5RSZ	25	16	2	928

Oklahoma

K5JVF	62	33	2	4,092

Texas

W5RTQ	209	52	11	25,480
K5LIW	184	54	9	23,328
K5PFL	184	53	11	23,320
W5YG	185	51	8	21,318
K5SOR	157	49	9	18,130
W5FIX	34	20	3	1,680

California

W6NUT/6	212	58	12	32,480
K6DDO	156	52	13	20,800
WA6PGB	143	44	6	15,048
W6YY	144	40	5	12,480
W6AJJ	114	35	6	9,100
W6HVN	95	33	7	8,382
W6AMO	108	36	4	8,352
WB6NRK	101	33	4	7,194
W6GWQ	84	29	4	5,568
W6NKR	52	29	4	3,480
WA6VNR	64	13	2	1,664
W6DQX	40	14	2	1,232
W6MZW	42	10	2	840

Arizona

W7NQ	188	53	9	24,592
K7NEQ	59	29	4	3,886
W7BNZ	40	16	2	1,280

Idaho

W7HZL	57	28	2	3,192

Montana

W7MKB	31	15	1	930

Nevada

K7ICW	100	38	4	8,208

Oregon

W7GZL	78	31	2	4,836
W7AVV	63	21	5	3,150

Utah

WA7OAU	78	37	2	5,772
W7ZC	84	31	2	5,208

Washington

WA7ILC	88	27	5	5,616
W7FIM	32	9	2	576
K7UWT	15	5	2	150

Wyoming

W7HLA	21	15	3	750

Michigan

K8VQP	285	56	9	35,056
WA8WCZ	219	39	5	18,018
W8MAI/8	146	40	4	11,704
K8LJQ	113	34	6	8,772
W8TZZ	82	29	3	4,930
WA8OEZ/8	83	25	2	4,350
W8WVU	55	21	4	2,646
WA8USU	10	7	2	196
WB8HCV	13	6	2	156

Ohio

K8RNE	265	61	16	39,650
K8CCV	242	48	6	25,152
K8KAS	170	43	8	16,296
WA8TNO	102	33	3	6,996
W8PCS	65	29	5	4,698
K8SJU	57	22	3	2,684

West Virginia

W8BT	225	52	14	28,392
K8UZX	211	40	7	18,720
W8HZA	24	14	2	672

Illinois

W9DL	357	63	11	50,526
K9SKX	325	63	15	47,502
W9DY/9	204	50	5	21,600
W9ABA	119	39	4	9,652
WA9TTH	100	32	2	6,656
W9JS	100	37	3	5,513
W9PNE	35	23	8	2,668

Indiana

K9YWO	199	51	7	22,338
WB9BUV	150	37	7	12,284
W9DPL	80	30	3	4,872
W9LVH/9	39	21	3	1,974

Wisconsin

K9GZK	227	54	7	27,108
W9LXE	71	28	2	3,976

Colorado

WAØCVS	224	56	11	28,224

Iowa

WØNFL	176	49	9	19,992
WØII	139	45	6	13,950

Kansas

WØPSF	227	58	10	30,508
WØFCL	146	48	4	7,008

Minnesota

WØAIH	232	60	9	32,488
WØRHI	40	26	2	2,200
WØIH	32	21	1	1,344

Missouri

WAØRDJ	210	57	7	26,220
KØJPL	158	46	5	15,548
KØDYM	90	40	4	7,840
WØBV	80	37	4	6,512

Nebraska

WØMSC	80	42	4	7,392

North Dakota

WØSDN	88	39	3	7,176

South Dakota

WAØOML	41	24	2	1,968

Newfoundland

VO1FB	47	19	10	6,194

Ontario

VE3BMV	226	51	10	26,724
VE3CKU	8	6	2	96

Manitoba

VE4JB	107	43	5	10,234

Saskatchewan

VE5XU	9	7	2	126

British Columbia

VE7AKI	58	16	2	2,112
VE7HQ	55	13	2	1,430

Northwest Territories

VE8OK	2	2	1	8

Alaska

KL7HEE	10	6	2	600
KL7HGA	7	4	3	248

Australia

VK3QI/3	11	4	4	144

Austria

OE8MI	123	10	10	6,060
OE1KU	76	9	9	3,393

Bahama Islands

W4BRB/VP7	372	63	15	228,942

Barbados

8P6DR	61	31	11	17,515

Bermuda

VP9BO	103	32	8	31,744
VP9FW	65	25	4	15,800

Brazil

PY1DVG	20	17	8	2,754

Czechoslovakia

OL1AOH	179	16	16	10,816
OK1MAC	170	16	16	10,176
OK1JAX	137	12	12	6,012
OK1HBT	141	10	10	4,800
OK1DJK	86	7	7	1,806
OK1HAS	65	8	8	1,616
OL6AMI	45	6	6	738
OK1KWP	8	1	1	16

Dominican Republic

HI8LC	6	6	3	300

Eire

EI9J	120	25	15	15,775

England

G3VRW	209	23	15	20,240
G3HZL	140	21	17	12,222
G3XEP	126	18	14	9,648
G3KMI	169	15	14	8,970
G3VIP	151	15	15	8,775
G2DC	137	16	15	8,608
G4AR	178	13	13	7,670
G3XTT	94	13	13	5,070
G3XWZ	122	11	11	4,708
G3VDW	84	12	12	3,360

Germany

DL9KR	269	39	21	60,996
DJ5PN	101	16	14	8,672

Guantanamo Bay

KG4CS	85	31	7	25,172

Hawaii

KH6HCM	26	14	2	3,304
K5CIT/KH6	11	4	2	376

Hong Kong

VS6DO	5	2	2	50

Iran

EQ2BQ	12	7	7	420

Isle Of Man

GD3TNS	41	10	10	2,020

Japan

JA1YAC	52	5	3	835
JA7AO	51	5	4	730
JA6KBK	36	3	3	281
JR1IHM	46	2	2	196
JA3AA	43	2	2	176
JH1BRB	41	2	2	176
JA4CKR	39	2	2	168
JA4EXA	33	2	2	144
JA7COI	32	2	2	140
JA7MJ	31	2	2	130
JA4IGW	22	2	2	100
JA1KKA	23	1	1	46
JA1DH	21	1	1	42
JA1XFB	5	1	1	10

Liberia

EL2CB	1	1	1	10

Netherlands

PAØPN	124	21	16	13,944
PE2EVO	78	10	10	3,970

Okinawa

KR8CF	30	3	3	441
KR8AG	18	2	2	168

Scotland

GM3IGW/A	236	32	16	43,776
GM3YCB	180	27	18	26,298
GM3YOR	191	17	13	16,252

Switzerland

HB9NL	98	26	—	12,896
HB9QA	103	9	9	4,455
HB9UD	52	8	8	2,032

Virgin Islands

KV4FZ	284	64	22	166,128

Wales

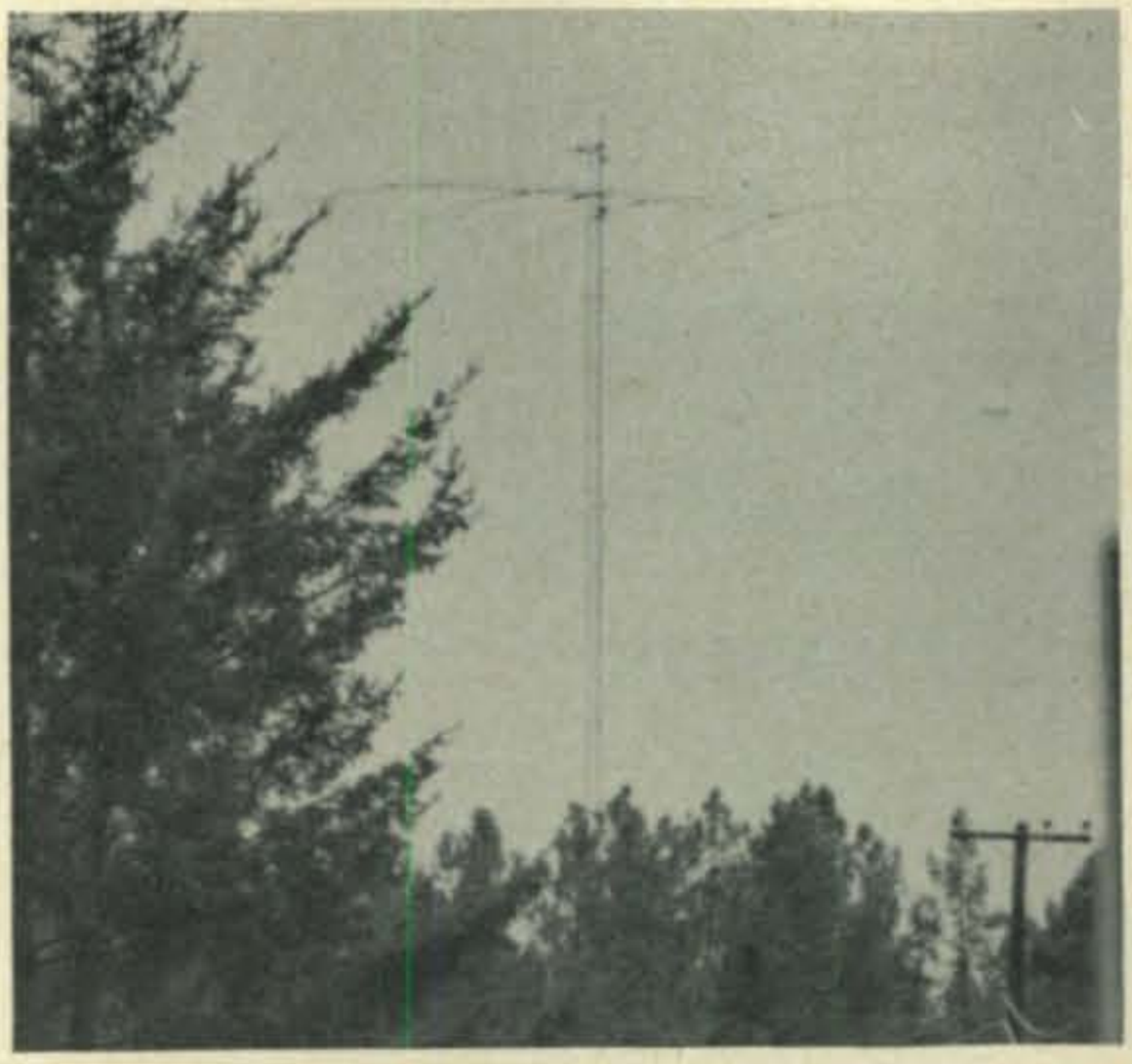
GW3UPK	275	29	14	45,849
GW3UCB	140	11	11	7,579

4th District — *K4MG:* Got all set for the Contest, made one contact, and then Murphy walked in and clobbered transmitter. Next morning receiver went out. *K4BHG:* Had a real good time, Charlie. Good Luck with your sorting and scoring job. You'll need it. The activity was just overwhelming this year. *W4GGU:* Attached are the disappointing results of my first 160 contest. Band condx seemed to be fair but the LORAN interference is very bad here and it's almost impossible to hear anything above 1810kHz. Took me 10 minutes to get my report from HR2HH. My experience on 160 is limited but I do enjoy operating "up" there. Understand the LORAN system will be phased out in the not too distant future. If this is true, Top Band will be a jim dandy spot to hang around. At least the TVI isn't a problem. Really did enjoy working those stations I could hear and I'll be back next year. *WB4JFK:* Worked 5 new States. *W4YWX:* Great Contest — Better every year!

5th District — *WA5QBO:* Real surprised to hear so many on. Lots of QRM. Why no activity on high end? It would make for less QRM and more QSOs. *W5KC:* Put up an inverted Vee for the last night of the contest and was surprised to hear so many stations on this band. This was my 1st 160 Contest and I got a big kick out of it. Am looking forward to the next one already. *WB5BHN:* I was surprised to work any DX at all. Guess feedlines radiate well. *K5MAT:* Sorry about the poor quality of this photostatic copy. It matches the quality of the courtesy of some lids in six land that don't know the meaning if *KN*. They were responsible for the fact I missed R.I. who would have been State #50. *K5JVF:* W4BRB/VP7 peaked S-8 both nights. Condx generally fair. Gotta put up a decent antenna this summer. Sure nice to be active again. Antenna 75' extension cord stapled to rafters in attic! Honest, Chas . . . *W5RTQ:* Finished with highest total yet after 1 night. 2d night took a break at 0240 GMT, fell asleep on sofa 7 hours (Sob!). Probably missed PY1DVG and others due to this. Wait'll next year! Also, local rain and precipitation static 2d night didn't help. 183 QSOs 1st night; 2d night 26 QSOs!! High Point: Working DL9KR (only European heard!). I assume this was Jan, DL9KRA without the "A".

6th District — *W6NUT/6(* Once again the band was open for hearing signals from the southeast long before sunset . . . W4BRB/VP7, KV4FZ and VP2AAA all heard anywhere from one to two hours before our local sunset. They peaked to RST 589 but it is impossible to raise such stations 'til after local sunset. Heard W3GM 'til about 1½ hours after his sunrise. Biggest thrill was working W1TH in Vermont for a new State. The opening to W1/2/3 on Sunday morning was the best I have heard from W6. The mix-up in ending times (1600Z according to W2EQS report in December CQ and 1500 in the January Contest Calendar) probably resulted in several less JA OSOs since sunrise here is 1516 and the band was beginning to really open for the weaker JA's at 1500. No sign of amateur signals from Europe but DHJ was heard around 0300 the first night. *K6DDO:* Condx poor but my 2-el full size cubical quad (fixed) helped a lot although there were many weak sigs calling whom I couldn't read. Nice surprise to work XE2VB and 2 new countries — 8P6DR and YN1CW. *WA6PGB:* Soapbox — Condx excellent but QRM made for contacts few and far between. Look forward to next year.

7th District — *W7NQ:* I'm certainly glad the West Coast gang has the Fresno thing organized now. I wasn't able to attend this year but it at least allowed me W6 activity. *W7BNZ:* Had to work part of both evenings. Didn't hear very many sigs from the East Coast for some reason. *W7HZL:* Heard W1TH (Vt.) but he was driven out by lids QRM — "Operate with courtesy and get more points." *K7ICW:* Dawn QSO with JA4AI and hearing W4BRB/VP7 2 hours before dark and continuously throughout Contest. *W7GZL:* Didn't get serious in the Contest as have only 100 watts and didn't think could compete with the 200 watt boys. *W7AVV:* Condx very poor here. Hope to do better next year. Had fun. *W7ZC:* Condx poor and band went out on me. Also, got tired. Guess I'm getting old. Suggestion: let's forget the reports next year — just have the number and State. Believe would help a bit. Reports don't mean a damn thing anyway in a contest!



At K6EBB the antennas consisted of 3 sloping dipoles for 160 supported by a 170' tower. That little yagi on top is a 4-element 40 meter beam!

8th District — K8LJQ: My 1st contest. Where were the Ve and W7 multipliers? Took a 12 hour nap in middle of contest. *WB8HCV:* Condx excellent but couldn't work any DX with my 6 watt home brew. Heard PA0PN and KH6IJ but no chance in working them. This was my 1st contest (age 16) and I plan to be back next year with more power. *K8RNE:* Balloon supported antenna disappeared in middle of night. *K8CCV;* Anyone who operates 1825/30 should be disqualified. Murphy's law not so much in evidence this year. *K8KAS:* Thought contest went well even though condx were not all that good. Wait 'til next year! *K8SJU:* Sorry coudln't compete this year but XYL is expecting any day now. She got sick plus both other harmonics got sick as well. So, I ended up playing doctor for the weekend.

9th District — *W9DL:* How about a "window" for W9 stations? Worked all States except KL7 for 2d year in a row. *K9SKX:* Antenna a 260' wire supported by balloons and Beverage for receiving. Biggest thrill was working HB9NL 1st call. *WA9TTH;* I must thank you for running this contest. It was my 1st contest of any type and I enjoyed it very much. See you again next year with a more proficient code speed. *W9PNE:* The unexpected death of my mother just before contest time limited my total participation to about 4 hours on Friday. Heard piles of DX! Worked 6 DX countries before QRT just when DX was getting good. However, I didn't feel much like operating at all. Wait 'til next year. *WB9BUV:* Condx were terrible. Do you always have bad condx especially on Saturday evening? Anyway, on Friday, after getting everything set up, I discover the new starting time and find I am 1 hour late already. So, what do I do? Go have a big supper with the future (at that time) XYL. Was at home that evening and did fairly good until about 2 A.M. when I fell asleep. When I had last checked I was about 20 QSOs ahead of K9YWO and thought I was going to walk away with Indiana. Well, my "little" snooze of 8 hours killed that thought. Will definitely be in the '73 Contest.

10th District — *W0NFL; WA0TVD* operated my station Friday night and I operated Saturday. But, we were disappointed in results. Just couldn't pick up the multipliers. Condx poor plus troublesome line noise. *W0II:* Perhaps I'm wrong but it seemed that a lot of familiar calls were missing. Condx to the west weren't anything to brag about but going east was an improvement over last year. Once again my spirit was strong but about 3 A.M. Saturday the old body gave out. I got up again at 6:30. Lasted only 3 hours Saturday evening. Went to bed and slept at least 12 hours! Perhaps you should have a contest for

Texas sure did have great representation in the contest. Here's winner Earl Cunningham, W5RTQ. He really had to battle to win, though.

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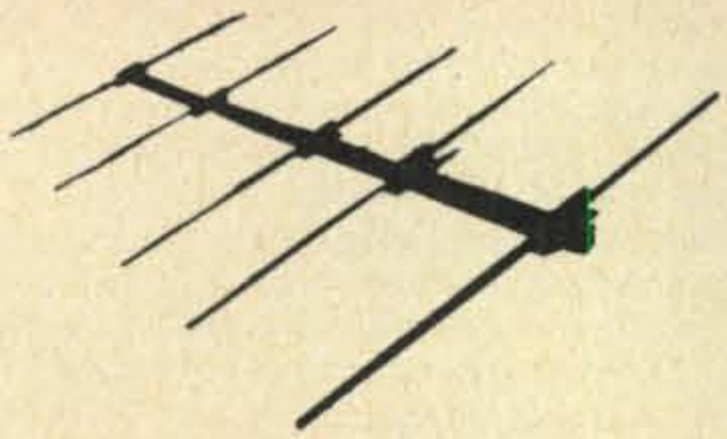

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DB65	6 ELE. 15 & 5 ELE. 10 INTERLACED BEAM Gain 13 DB—15 12 DB—10. Boom length 32 ft. 3" OD .065 wall.	$219.95
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PRICES EFFECTIVE MARCH 1, 1972

Yuri, VE3BMV, couldn't stay the second night because he went to see something . . . Miss Canada! Hmm! What's new, Yuri?

old timers lasting only one night . . . or something! Sure hope you get the rules straightened out before next year. Kind of struck me as odd when I got on at 0001 GMT the first station gave me #39. I thought that was real fast work for one minute! *W0PSF:* Drove home 240 miles Thursday night in blinding snowsorm. Shack temp about zero even with my little electric heater and plastic sack around the gear and myself. Also had a touch of the Hong Kong flu. What a surprise to have KL7HEE call and give me #2. I made a practice of running a ¼ mile or so every couple of hours to stay fresh. I forgot about the eclipse and was shocked at 4 A.M. to step out into darkness when 2 hours before had full moon. Funniest comment is having YN1CW break in giving me 599 and asking what time the contest is over.

Canada — *VE3BMV:* I couldn't stay 2d night because I went to see something. See picture — hi! *VE3CKU:* My 1st contest. Have only been on 160 a month. Learned a lot and will be back next year with more power, a v.f.o. and better antenna. It would be great if there was a QRP multiplier! Rig is home brew (6T9) with 10 watts input and just 2 xtals — 1804 and 1995 kHz. *VE7AKI:* Home brew tx from junked Atwater-Kent and Marconi radios, junked TV sets and war surplus. Originally built in 1945 but many modifications. Microphone home brew in a Campbell's soup can. *VE7HQ:* Enjoyed the contest. Seemed to be lots of interest in it. Would like ending time extended one hour to 1600Z. Japanese stations were better here after 1500Z. *VO1FB:* Thanks for yet another FB Contest. QRN was very low indeed and coupled with good propagation made for an enjoyable weekend.

DX DX DX DX DX DX DX DX DX DX

KL7HEE: Monitored KPH and 1805 all weekend. Band finally opened for one damn hour on Saturday night with peak lasting 20 minutes. I am disgusted again. Northern lights on all thru January here. It's a real shame . . . 2 years in a row shot. *VK3QI/3:* Two week previously I QSOd 9 W and VE stations in one night. Was very disappointed to find condx so poor this weekend. Why is it that the Australia static *peaks* on the last weekend in January? Somebody doesn't want us making QSOs — hi! *OE8MI:* This was the 1st *CQ* 160 Contest I've entered and really had a lot of fun. Heavy snow falls on both days caused QRN. The antenna was snow-loaded and broke down just when the contest was over. Strongest DX heard were VO1FB, PY1DVG and W1HGT| *W4BRB/VP7:* Condx great but the crying towel is still soaking wet after learning EL2CB called me many times but I didn't hear him. *8P6DR:* Think, perhaps, the scoring could be a little better with extra points for distance. I would guess the VP7 fellas got a lot of points just by being close to USA. DX aren't so lucky. *VP9BO:* 2 new countries and hearing although not working KH6. I would suggest that European and Oceanic DX check their own freq. for other DX stations and indicating QSX when calling CQ. *PY1DVG:* The contest was marked by lots of QRN but 2 new ones were worked (PAØ and VP7). I called the VP7 for 3 hours before a QSO and he was always FB here. He must have had terrific QRM there. After that I QRT because of terrific headache for listening to S9 plus 30 db QRN. Couldn't stand it anymore — hi! *HI8LC:* Very pleased to work 160 CW Test. My 1st experience on that band. EI9J: Very poor effort. Found DX condx poor but okay to Eu. Bad line noise both nights so went to bed early. No fun raising stations and not being able to copy them. *G3VRW:* Condx far better than last year's event even if most of the DX did get away. *G3HZL:* Condx were good most of the time. Many more Ws heard than worked. Also heard with good signals W4BRB/VP7, VP2AAA, PY1DVG and 8P6DR. G3KMI: Heard a lot of DX this year. Biggest "thrill" was when it snowed and half inch sparks jumped from the feeder continuously. *DL9KR:* After only 2 initial contacts a couple of weeks before the contest I entered the affair with mixed feelings and a very rusty fist having returned from KL7-land only that morning. Thought I was dreaming when this one proved to be the biggest ever. Noise level high on vertical but so were DX signals. W5RTQ peaked 589 and never heard VK5KO or PY1DVG so well let alone VP2AAA and KV4FZ. Had EL2CB listened for Europeans I could have worked all continents. Also heard VP9BO and HR2HH. Nothing at all heard from OH, OHØ, GC, ZB2 or 9H1. Second night much worse but what more could one want? Thanks! *KG4CS:* Too much CQ-calling by Ws and not enough listening. W4BRB/VP7 blocked 9 kHz of the band — stronger than any station I've ever heard including KG4EQ with 100 watts! Picked up 2 new States. Now have 36 on 160. But, contests aren't good for me. I need W7s and all the Ws who are 1500 miles closer beat me to the punch. Not a single 6 or 7 worked this test. *KH6HCM:* Condx very good. Due to social commitments I was able to participate for a few hours. Big thrill for me to work the East Coast boys. Next year I'll be in the mainland and contacts will be a lot easier (hi!). W7SFA had the loudest signal out this way. *K5CIT/KH6:* Noise out here was tremendous. Will work on antenna which has less noise pick-up. *VS6DO:* No Ws heard in *CQ* Test. Condx fairly poor. *EQ2BQ:* This was my 1st attempt at a 160 contest. It was most astounding to hear such activity on the band. At one time KV4FZ, VP2AAA and 4S7GV all at 589 were QRMing each other. A great pity that I wasn't able to work all I heard but the contest has given me incentive to be more active on 160. *GD3TNS:* I fell asleep during contest. I may have worked another country or I may have dreamed I did! *JA7AO:* Thrill working during the contest but condx not so good . . . very regretful. *JA6KBK:* Condx were no good. KPH (2045 kHz) was very weak. On 30 Jan. I had a sleep carelessly so I missed the chance to contact with West Coast — hi! *EL2CB:* Condx were rather poor here for the most part. Thought I would get on just for the contest so I tacked some wire onto my 80 meter dipole to lengthen it out to 160. Saturday was a fairly good day and I heard a number of Ws around 0630-0730Z. KV4FZ was a consistent 579 both nights all night followed by W4BRB/VP7 and VP2AAA. Frankly I expected it to be a lot easier to get across the pond as I put in a great signal on the Eastern seaboard on 80. I am no longer on 160. This was the 1st 160 operation of course and likely to be the last. *PAØPN:* Biggest thrill was working PY1DVG and meeting so many old friends Stateside. *GM3IGW/A:* Once again we operated from our Castle QTH. Had 46 TA QSOs in favorable condx. However, we always hear much more than we can work — and so we always return aiming to do better! *GM3YOR:* A most enjoyable contest although Arctic wx condx, with 6 inches of snow, over the weekend. Certainly doesn't make for easy erection and dismantling of aerial. *HB9QA:* This time I contacted 5 HB stations — the greatest number I've ever met on Top Band. *GW3UPK:* Made 45 QSOs to USA and 2 to Canada but no other DX worked at all.

Multi-Operated Stations

WA1OFP (WA1OFP - WA2HHO); K2STO (K2STO - WA2FGF); WB2NUW (WA2LYS - WB2JYM); W4PRO (W4PRO - W4GSM - WA4DUS - K3RUQ); W5YG (WA5FTP - WA5LVJ - WA5RXT - K5YNJ - WA7DAC - WBØBMT); K5SOR (K5SOR - WA5UHT - WB5CKM - WAØYRX); W6YY (W6JU - K6STI); W6NUT/6 (W6NUT - WA6UZA); W6HVN (W6HVN - K6CAZ); K8VQP (K8VQP & K8MFO); WA8OEZ/8 (WA8OEZ - W8TZZ); WA8WCZ (WA8WCZ - W8KAZ - K8QDZ - WB8BAU); K8KAS (K8KAS - WA8IJI - WB8JKA); W9DY (W9DY - WB9CJS); WØNFL (WØNFL - WAØTVD); W4BRB/VP7 (W4BRB - WB4TAF - WB4OUH); G3KMI (GC3XYC - G3ZER - G3WIE - G3XSV - G4APA); GM3IGW/A (GM3IGW - G4MH); GW3UCB (G3WKH - G3WXS - G3XNS - G3YIQ - G3VRZ - GW4AQR - G4AUC); PE2EVO (PAØPFW - PAØBE).

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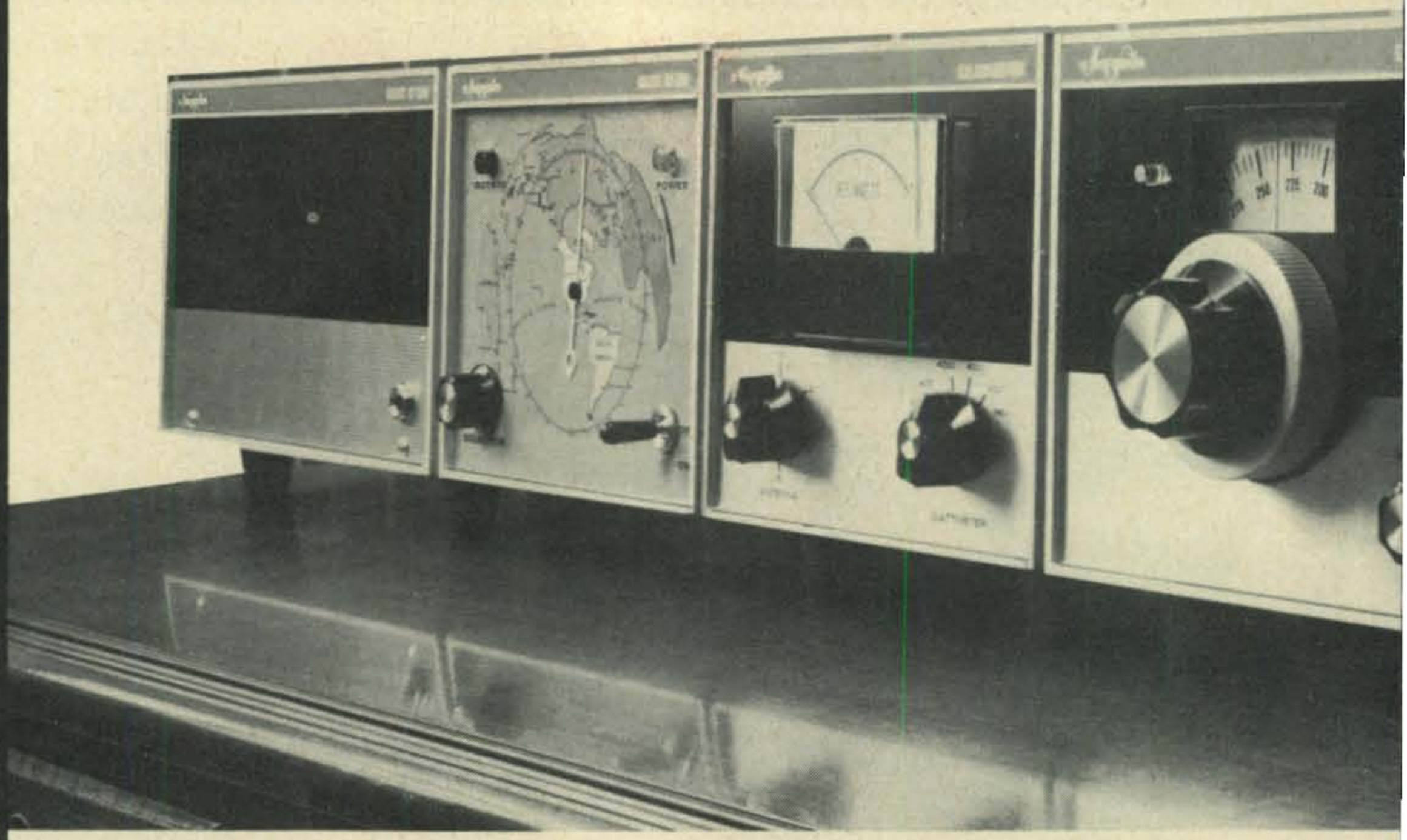

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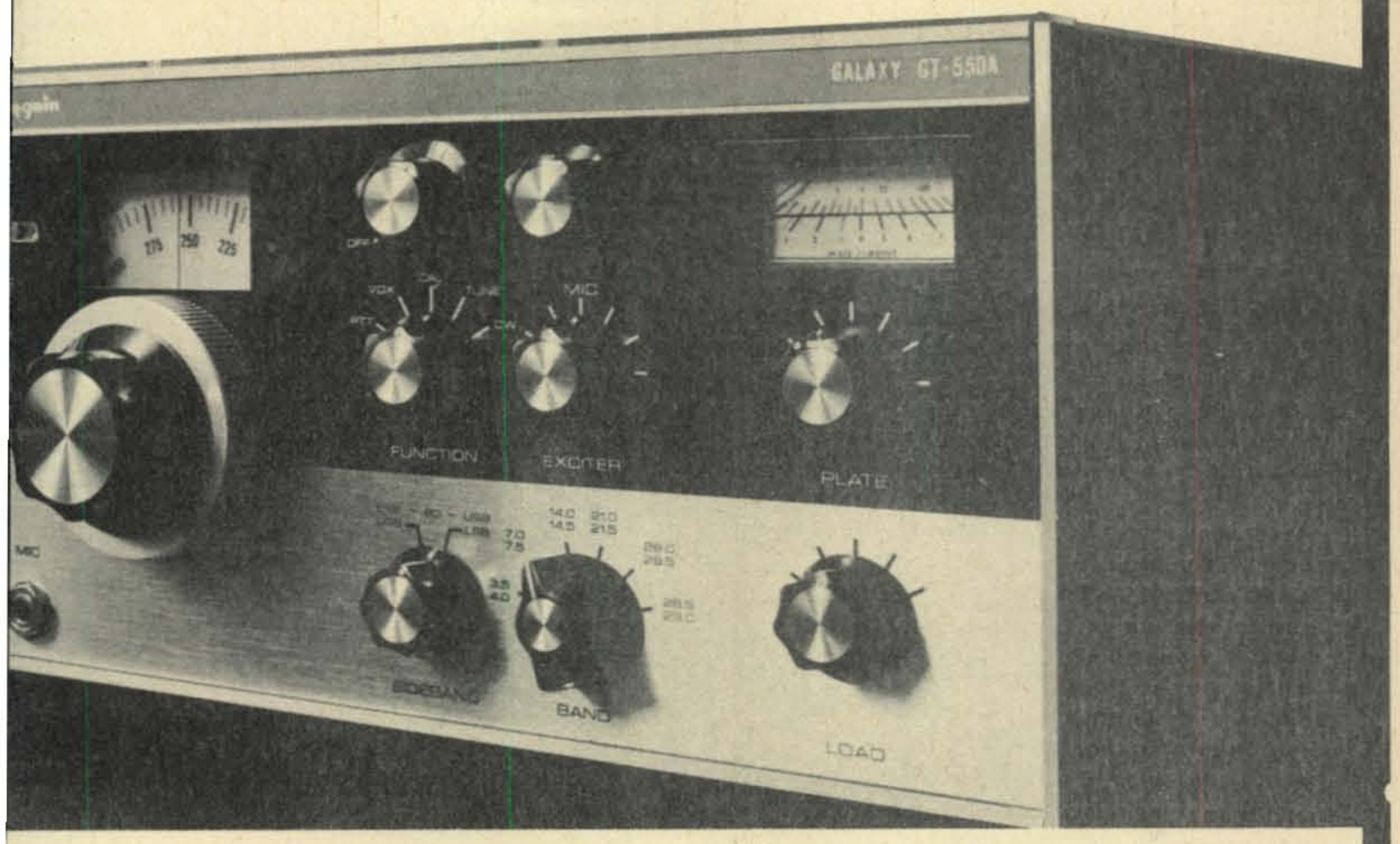

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DX

By John A. Attaway, *K411F

There are only a few times in the life of a DXer when he has the opportunity to start work on a major new DX award from ground zero, nobody ahead, everyone in the starting gate together. Only 3 such opportunities have been presented to U.S. amateurs during the past 25 years. Two of these three were introduced by *CQ*, namely the WPX award, won first by Loyd Colvin, W6KG, and the S.S.B. DX award. The third was 5-Band DXCC where the initial plaque went to Bob Eshleman, W4QCW. The new *CQ* C.W. DX award and updated version of the *CQ* S.S.B. DX award allowed contacts from November, 1945.

CQ is now giving you yet another crack at a fresh horse race with our new monoband WAZ program, discussed in some detail last month. Actually there will be ten horse races in one, as plaques will be awarded to the first station to confirm contacts with all 40 zones, beginning 0001 hours GMT on Jan. 1, 1973, on each of the 5 major ham bands, both phone and c.w. Thus there will be both a phone and a c.w. winner on 80, 40, 20, 15 and 10 meters. Number one on each mode on each band will receive a plaque, while subsequent winners will receive certificates.

Complete rules will appear in the December issue, but will be essentially unchanged from our regular WAZ rules. Copies will be sent to all the major DX bulletins well in advance of Jan. 1. Pick your band, get those antennas high. This should be an interesting chase.

*P.O. Box 205, Winter Haven, FL 33880

The WAZ Program

S.S.B. WAZ

1015 . . ZL1BKS	1019 . . JH3CIQ
1016 . . OZ4TA	1020 . . I3ZOF
1017 . . K3GKU	1021 . . XW8CS
1018 . . WB9BWU	1022 . EP2TW

C.W. — Phone WAZ

3398 . . VK3JF	3404 . . W9BMD
3399 . . SM6AFH	3405 . . W7PFZ
3400 . . YU2BQR	3406 . . YU2QZ
3401 . . DL7PH	3407 . . W2AXR
3402 . . DL8AN	3408 . . W6YUS
3403 . . LA4DM	3409 . . W8CFG

Complete WAZ rules are shown on pgs. 64-66 of the June, 1970 issue of *CQ*. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, FL 33880.

De Extra

In the October, 1972 issue, De Extra considered the possibility of "revitalizing" the amateur radio countries list through a reinterpretation of the status of certain entities by the ARRL DXCC Advisory Committee. An example cited was the Caroline Islands, now divided into 2 countries for amateur radio purposes, but into 4 districts within the Trust Territory of the Pacific for governmental purposes. These are the Palau, Yap, Truk and Ponape Districts.

Another area in the Pacific where a change could be made is the Territory of Papua and New Guinea, which includes the northernmost of the Solomon Islands. This area is now divided into 2 amateur radio countries, the Territory of Papua and the UN Trust Territory of New Guinea. Possibly there should be a third, the Northern Solomon Islands.

Let's consider this complex and interesting situation in detail. The northern Solomon Islands, of which the largest is Bougainville of World War II fame, have a combined area of 4,100 square miles and a population of about 72,490. They were occupied by Germany from the 1880's until 1900 when all but Bougainville were transferred to Britain. After occupation by Japanese and U.S. forces during World War II these islands, including Bougainville, were transferred to Australia which governs them as part of the U.N. Trust Territory of New Guinea. Amateur stations in the northern Solomons use the VK9 prefix.

The southern Solomon Islands, which include Guadalcanal of World War II fame, Santa Isabel, San Cristóbal, Malaita, New Georgia and Choiseul, have a combined area of 11,500 square miles and a population of 159,000. They became a British Protectorate in 1893 and were returned to Great Britain after the war. Amateur stations in the British Solomon Islands Protectorate use the VR4 prefix.

At present, the Territory of Papua and New Guinea is under the jurisdiction of a single Au-

stralian Administrator located in the territorial capitol, Port Moresby, Papua. However, we do not fault the division into two countries for amateur radio purposes as the Territory of Papua, once known as British New Guinea, has a different history from that of its northern neighbor the Territory of New Guinea. In addition, the latter is under U.N. Trust which Papua is not. Future political change could conceivably lead to the creation of separate states, so De Extra goes a step further to suggest the third country. The northern Solomon Islands have a unique history and would seem just as entitled to separate country status as are Papua and New Guinea. It is our suggestion that the ARRL DXCC Advisory Committee give some consideration to such a classification.

The Trust Territory of New Guinea is quite an interesting area and could contribute other entities worthy of amateur radio country status in future years. It not only includes the northern Solomons and the northeastern section of the island of New Guinea, but all of the islands of the Bismarck Archipelago as well. Some of the major islands of the Bismarck Archipelago are New Britain with 14,100 square miles and 154,000 people, New Ireland with 3,340 square miles and 43,000 people and the Admiralty Islands with 800 square miles and a population of 18,500.

Those Tough Zones

From the U.S. the most difficult zones to work are #18, the Central Siberian Zone; #19, the Eastern Siberian Zone; #23, the Central Zone of Asia; #24, the Eastern Zone of Asia; and #34, the Northeastern Zone of Africa. Zone 23 has traditionally been the toughest because of its geographic location combined with a scarcity of active stations. Zone 18 suffers from the same problems and many find it more difficult than Zone 23. The same can be said for Zone 19, but the level of activity has increased appreciably. Zone 24 has recently rejoined the list as a result of reduced activity from BV and CR9. However, the VS6 stations continue to dish out many Zone 24 contacts. The departure of U.S. forces from Wheelus Air Force Base in Libya several years ago tightened up Zone 34, but a few active stations in Egypt and the Sudan continue to make contacts possible.

Some stations recently reported from these zones are as follows: *Zone 18:* UA9VB and UAØSB are active on s.s.b. UA9VB can sometimes be found just above 14200 at 0130 - 0200 GMT, while our last report on UAØSB was 21280 at 1430 GMT.

Zone 19: C.w. operators may find UAØFBO

Joe Liberson, Chief Operator at 4Z4HF, the club station at Kibbutz Sasa, Israel. The new shack is located in the highest portion of the kibbutz on top of a 3000 ft. mountain in northern Israel. A 40 ft. home made tower on top of the building supports a three element tri-bander beam. *(Photo courtesy of K2BYB).*

at 7003 kHz just before sunrise, or UKØFAF near 14015 kHz about 1530 - 1600 GMT. Sidebanders should listen for UWØIQ on 14220 at 1230-1300 or UAØZAR on 14210 around 1200 GMT.

Zone 23: Recent reports indicate a lot of activity from JT-Mongolia stations but not much from the UAØY- stations in Tana Tuva. We have four c.w. reports of JT1AA activity between 1330 and 1430 GMT on 14025, 14040, 14055 and 14083. Other c.w. reports include JT1AJ, 14006 at 1610; JT1AN, 14050 at 2015; JT1KAA, 14040 at 1605; and JTØAE, 14010 and 14022 at 0040 and 0056 respectively. S.s.b.

The CQ DX Award Program

C.W. DX

95 ....G3HRY
96 ....G2GM
97 ....SP5YL

S.S.B. DX

225 ...G3WQA
226 ...VE3MR
1192 ..OK3CGP
227 ...YJ8BL
228 ...WA5UCT
1194 ..DM2CRM

CQ DX Endorsements

C.W.: G2GM — 250 and G3HRY — 200
S.S.B.: VE3MR — 310

Complete rules for the *CQ* DX Award Program may be found on pg. 58 of the January, 1971 issue. Application blanks and copies of the rules may be obtained by sending a business size, self-addressed stamped envelope to the DX Award Manager, P.O. Box 1271, Covina, CA 91722, or to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

CQ DX AWARD HONOR ROLL

C.W.

The *CQ* DX Award Honor Roll recognizes those DXers who have submitted proof of confirmations with 275 or more countries for the mode indicated. The ARRL DXCC Country List, LESS DELETED COUNTRIES is used as the country standard.

W6ID 318	W4IC 307	K1SHN 294
K6EC 317	WØAUB 305	WA6EPQ 293
W8LY 310	DL3RK 303	W6NJU 290
VK3AHQ 307	ON4QX 300	WA6MWG 282
W4ØPM 307	W4BQY 295	WA8DXA 278
K6LEB 307	W6ISQ 295	

S.S.B.

TI2HP 320	W4IC 311	K4RTA 299
W2TP 320	W6NJU 311	YS1O 299
W9ILW 320	ZS6LW 311	ZL3NS 299
DL9OH 319	XE1AE 310	WA2HSX 298
WA2RAU 319	IT9JT 309	ZL1AGO 298
K2FL 318	VE2WY 309	WA6MWG 297
W3NKM 318	VE3MR 309	VE3GMT 294
K6LGF 318	G3DO 308	XE2YP 293
W6REH 318	F2MO 307	WØYDB 292
IØAMU 317	VE3ACD 307	WB2RLK 291
K6YRA 317	F9MS 306	K8GQG 289
G3FKM 316	I1AA 306	HP1JC 284
SM5SB 316	K6EC 305	W9HRU 283
W6EUF 316	I1ZV 303	WAØKDI 281
W6RKP 316	W6KZS 303	OE2EGL 279
W9JT 315	W6FW 301	WAØCPX 277
I8KDB 314	W9QLD 301	WA3IKK 275
W3DJZ 314	WA2HSX 300	WØSFU 275
W4OPM 314	K4HJE 300	DL1MD 275
W6KTE 313	KH6BB 300	G3WW 274
W9DWQ 313	G3RWQ 299	K9LUI 274
W6YMV 312	OZ3SK 299	WB6DXU 274
WA2EOQ 311	K1SHN 299	

reports include JT1AG on 20 meters at various times and JTØAE on 14310 around 1830 - 1900.

Zone 24: We have several reports of BV2A on 14023 only and assume that he is crystal controlled. He has been reported on that frequency at 1030, 1320 and 1400 GMT. VS6DO is very active on s.s.b. from 1130 - 1430 GMT. Some of the frequencies where he has been worked included 14210 and 21350. Some other VS6 reports are VS6BS, 14205 at 1415 and 14220 at 1330; VS6CY, 14210 at 1405; VS6EG, 14210 at 1415 and VS6FJ, 14232 at 1445.

Zone 34: ST2SA in the Sudan has been worked on 14275 at 0500 and on 21295 at 2015 GMT. SU1MA in Egypt frequents 14195 at 2230 - 2300 GMT.

For the Stamp Collector

The many DXers who have adopted the companion hobby, stamp collecting, will be interested in a new series of four stamps recently issued to commemorate the 100th anniversary of telecommunications in Barbados. The Philatelic Bureau of the Barbados, G.P.O. has sent us a beautiful, uncancelled set of these stamps and we feel they will be a hit with collectors specializing in electronic and communications issues. The 4¢ stamp illustrates "Transmitting Then and Now" with an original "brass-pounder" key and a modern code machine. The 10¢ stamp shows the telecommunications ship *Stanley Angwin* off the St. Lawrence Coast, the 35 stamp shows the Barbados Earth Station and Intelsat IV, and the 50¢ stamp shows the antenna system at the Mount Misery Tropospheric Scatter Station.

Maria — Minerva Se Fue

Effective Oct. 1, 1972, two Pacific countries have been removed from the Countries List. The deleted entities are Minerva Reef and Maria Theresa Reef. We understand that this

action was taken upon the recommendation of the ARRL DX Advisory Committee, and we are pleased to see that the League has begun to make use of this group.

The reason for this action in the case of Maria Theresa Reef, according to various reports, was that the country did not exist. Minerva, on the other hand, has been claimed by Tonga which is less than 500 miles away. However, this country could conceivably appear again as the independent Republic of Minerva is said to be pressing its case before the "court of world opinion."

Amateur Radio in Other Countries — The U.S.S.R., Part II.

In the January, 1972 issue we touched briefly on amateur radio in the Soviet Union. Now, as a result of a recent trip by Jack Reed, VE3GMT, our DX Committeeman from the Canadian DX Association, we are able to present more information, particularly regarding their DX awards program. Jack sends the following:

"No trip to Moscow is complete without a visit to the Central Radio Club, Box 88. The club is housed in a modern building of several stories with a beautiful mural on one outside wall.

"We visited personally with Mr. Demyanov, UW3ID, the General Secretary, and discussed both UA and VE amateur problems. Mr. Demyanov expressed interest in expanding the *numbers* of Canadian amateurs applying for UA DX awards, presently rather low because of the fear of lost QSLs. We agreed that a checkpoint in Canada would be desirable so that cards could be verified and only a copy of the log or application sent to Moscow. I volunterred to be the checkpoint for VE amateurs and Mr. Demyanov accepted. (Jack already checks cards for Canadian amateurs applying for WAZ and the *CQ* C.W. and S.S.B. DX Awards. He is going to be a busy fellow.) We also agreed that all UA awards sent to VEs from this date forward would be free of charge. For this I thanked the Secretary on behalf of all the Canadian amateurs.

"The principal UA awards are the 'R-15-R', for working stations in 15 Soviet Republics: the 'R-6-K,' for working stations in the 6 continents plus special contacts in European and Asiatic Russia; the 'R-100-O,' for working 100 regions (oblasts) of the USSR; the 'R-10-R,' for working stations in 10 amateur radio regions; and the 'R-150-S,' for contacts with 150 countries of the world including 15 of the Soviet Republics. The countries list for the 'R-150-S' award has only 200 countries, making it

Sorting QSL's at P.O. Box 88. A clerk, W4LKM, and Mr. I. Demyanov (UW3ID), Secretary General of the Central Radio Club of the USSR at right. 237,900 cards were forwarded to the US in 1971. 44 certificates were sent to the US, while 630 certificates were received from the US *(Photo vis W4CWV).*

much shorter than the U.S. list. Two specialized awards are called the 'Jubilee' Award and the 'Cosmos' Award. The fee for each of the Russian DX awards is 1 Ruble or 14 IRCs. (Complete rules may be obtained by writing Box 88, Moscow.)

"I learned that there are 3 classes of operators in UA-land. These are the first class, which may use up to 200 watts, the second class which may use up to 40 watts and the third class with a 10 watt ceiling.

"Mr. Demyanov gave us a tour of the QSL processing facilities of the club where we

Here are some of the top operators of the Radio Society of Zambia. Back row left to right are 9J2LK, 9J2GU, 9J2CL, 9J2TL, 9J2DT (overseas winner of the RSGB 21/28 mHz Contest), 9J2KL, 9J2XZ (3rd place winner in the 1970 *CQ* World Wide DX Contest), and 9J2DA. Front row left to right are 9J2-241, 9J2SS, 9J2LL (winner of the Italian contest), 9J2DN and 9J2WR. Address of the Radio Society of Zambia is P.O. Box 332, Kitwe. *(Photo via 9J2WR).*

Left to right are A51TY; Radha, XYL of Venkat, VU2KV/A51KV; and Venkat, A51KV during their recent DXpedition to Thimpu, Bhutan. *(Photo via W6KNH, QSL Mgr. for A51KV).*

Barry Merrill, KG4CS/K4CSY, operating at "Gitmo." Barry is back in the states now and will answer QSLs from his home address, 1625 Linville St., Kingsport, TN 37664.

learned that over 3,000,000 cards per year are received through Box 88. In 1971, over 18,000 QSLs went out to VE-land alone.

"Our last stop was the club library which has amateur and electrical publications from all over the world. The Central Radio Club produces a monthly magazine with several pages in full color."

Thanks Jack for some very interesting information. Now that VE-land has a checkpoint for those wishing to apply for Russian DX awards perhaps someone in the US, possibly through the ARRL, can make a similar arrangement for W,K amateurs.

New NJDXA Officers

The North Jersey DX Association informs us that their current officers are: President, Dave Beckwith, W2QM; Vice President, Jack Lee, W2RGV; Treasurer, Bob Crawford, W2JLH; Secretary, Brother Patrick Dowd, W2ZTV.

New and Rare Prefixes

A4 — The ITU has allocated the A4A-A4Z callsign block to the Sultanate Oman, formerly MP4M.

EIØ — EIØDI operated from Dalkey Island

[*Continued on page 102*]

Dave, ET3DS, of the Addis Ababa Gang. QSL cards for Dave go to VE2DCY.

The WPX Program

S.S.B. WPX

702 . . . W9IRH	706 . . . DJ7CX
703 . . . KP4CQB	707 . . . ZL1AGO
704 . . . G2MI	708 . . . OZ4TA
705 . . . W8PQD	709 . . . VK5FY

C.W. WPX

1192 . . PK3CGP	1194 . . DM2CRM
1193 . . JA1CC	1195 . . DM2BBK

Mixed WPX

345 . . . CE2PN	347 . . . W5QBM
346 . . . DJ4WG	348 . . . WA2AUB

WPX Endorsements

S.S.B.: W6RKP—650, DJ7CX—550, ZL1AGO—550, W1MZB—450, K2JFE—450, and OZ4TA—300.

C.W.: W8LY—1000, DL1MD—550, WA9UES—550, I0ZQ—450, OK3CGP—400, and DM2BBK—350.

Mixed: YU2OB—600.

80 Meters: DJ7CX

20 Meters: W7QNI

15 Meters: W9IRG

10 Meters: W9IRH

Africa: W9IRH and DJ7CX

Asia: YU2OB, W9IRH and DJ7CX

Europe: DJ7CX, OK3CGP and WA2AUB

Oceania: W9IRH and W7QNI

South America: VE3AAZ and DJ7CX

Complete rules for WPX, WPNX, and VPX may be found on pg. 67 of the February, 1972 issue. Application blanks and reprints of the rules may be obtained by sending a business size, self-addressed, stamped envelope to DX Award Manager, P.O. Box 1271, Covina. CA 91722, or to the DX Editor.

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Oct.	**28-29**	**CQ WW DX Phone Contest**
Nov.	1-2	YLRL Anniv. Phone Party
Nov.	3-6	CHC/HTH/FHC QSO Party
Nov.	4-5	Illinois QSO Party
Nov.	4-5	RSGB 7 mHz Phone Contest
Nov.	6-12	QRPp C.W. QSO Party
Nov.	12	Czechoslovakian Contest
Nov.	11-12	Space Net VHF Contest
Nov.	11-13	ARRL Phone Sweepstakes
Nov.	18-20	ARRL C.W. Sweepstakes
Nov.	**25-26**	**CQ WW DX C.W. Contest**
Dec.	2-3	Telephone Pioneers Party
Dec.	2-4	Lone Star QSO Party
Dec.	9-10	ARRL 160 Contest
Jan.	6-7	Friendly Firebird Party
Jan.	**27-28**	**CQ WW DX 160 Contest**

YL Anniversary Party

Starts: 1800 GMT Wednesday, November 1
Ends: 1800 GMT Thursday, November 22

This is the Phone section, the c.w. was last month. Complete rules in last month's CALENDAR.

Mailing deadline is November 18th to: Betty Marsh, KL7FJW, 2411 King Road, Fairbanks, Alaska 99701. (Better send 'em Air Mail.)

RSGB 7 mHz Contest

Starts: 1800 GMT Saturday, November 4
Ends: 1800 GMT Sunday, November 5

This is also the Phone section, the c.w. portion having taken place a couple of weeks ago. Complete details in last month's CALENDAR.

Logs should be in the hands of the Committee before January 1st, (Dec. 22nd for the c.w.) and go to: HF Contest Committee, c/o J. Bazley, G3HCT, Brooklands, Ullenhall, Solihull, Warwickwhire, England.

CHC/FHC/HTH QSO Party

Starts: 2300 GMT Friday, November 3
Ends: 0600 GMT Monday, November 6

This is the Fall edition of the International Amateur Radio Society QSO Party. Rules are the same as they have been the past few years, but I highly recommend that you write K6BX for official rules and forms. (Include s.a.s.e.)

Exchange: QSO no., report, name, CHC/FHC no., state and county or similar subdivision. Non-members send HTH in place of number.

Scoring: For CHCers: 1 point per QSO with other CHCers, 2 points if its a HTHer, and 1 additional point if its a YL, B/P, FHC, Novice, CHC-200, Merit or Club station. Double above points if QSO is out of own country.

For HTHers: Contacts with other HTHers 1 point, with CHCers 3 points, otherwise same as above. The same station may be worked on different bands and modes. Scoring for s.w.l. same as HTH.

Multiplier: Each continent, country, ITU Zone and US state. (counted once only)

Final Score: Total QSO points from all bands × the sum of the multiplier. Multi-operator stations divide score by number of operators.

Frequencies: C.W. — 3575, 3710, 7160, 14075, 21075, 21090, 21140, 28090. Phone — 3770, 3775, 3790, 3943, 3960, 7070, 7090, 7210, 7260, 7275, 14320, 14340, 21360, 21440, 28620, 28690. Both for US and DX as allowed.

Awards: Hundreds of certificates and trophies for CHC, FHC, SWL-CHC, HTH, VHF, Novice and blind/paralyzed. Suggest you send large s.a.s.e. (8¢ or 1 IRC) for rules and awards list.

Also available are lists showing official countries, prefix and Zone map for the I.T.U., I.A.R.U., I.A.R.C. and I.A.R.S. (10¢ s.a.s.e. or 2 IRCs)

Send logs and all requests to: I.A.R.S., K6BX, P.O. Box 385, Bonita, Calif. 92002.

Illinois QSO Party

Starts: 2000 GMT Saturday, November 4
Ends: 2400 GMT Sunday, November 5

This is the 10th annual Illinois QSO Party is again sponsored by the Radio Amateur Megacycle Society. The same station may be worked on each band and mode for QSO points.

Exchange: QSO no., RS(T) and QTH. County for Illinois; State, province or country for others. (Ill. may work in-state stations)

Scoring: One point per QSO. Illinois multiply total by sum of states, VE provinces and countries worked. Others use Ill. counties as their multiplier. (max. of 102)

Count the US, Canada, Hawaii and Alaska as country multipliers. And Hawaii and Alaska again as states. (Also count Ill.)

*14 Sherwood Road, Stamford, Conn. 06905.

How's that for a collection of CQ WW Contest certificates ? Count 'em, 10 of them, won by Alex Desmeules, VE2AFC the past 10 years on 21 mHz Phone. Looks like Alex has run out of wall space. Now he has to make space for the VE6TP Trophy won in the 1971 Phone Contest.

contacts with the same county.

Frequencies: 3560, 3735, 3900, 7060, 7175, 7260, 14060, 14275, 21060, 21100, 21360, 28060, 28660.

Awards: Certificates to the top stations in each state, VE province and country in which two or more valid entries are made. In Illinois, single and multi-operator stations compete separately for 1st, 2nd and 3rd place awards.

A summary sheet showing the scoring and other pertinent information is reqquested. Include a large s.a.s.e. if results are desired.

Mailing deadline is December 1st to: Radio Amateur Megacycle Society, K9CJU, 3620 N. Oleander Ave., Chicago, Ill. 60634.

QRPp C.W. QSO Party

Starts: 1300 GMT Monday, November 6
Ends: 2300 GMT Sunday, November 12

This is a week long affair on c.w. only, sponsored by the QRP ARC International, with the emphasis on real low power, 5 watts output or less. The contest is open to all, whether or not they are members of QRP ARC.

Exchange: RST, state/province or country and QRP no. (nonmembers send NM and power)

Scoring: Member QSOs count 2 points, non-members 1 point. A station may be worked on each band for QSO and multiplier credit.

There is also a power multiplier as follows: 15 if output is ½ (500 mw) or less, 10 if 2 watts or less, 5 if 5 watts or less, and no multiplier if over 5 watts.

Final Score: QSO points × states/provinces/countries power multiplier.

Frequencies: 1.8-2, 3540, 7040, 14065, 21040, 28040.

Awards: (1) Certificates to highest scoring station in each State, Province and country. (2) Top scorer world wide. (3) Lowest powered station showing 3 or more skip contacts.

A summary sheet with the scoring, equipment description and power used. And a signed declaration that all rules were observed.

Mailing deadline is Dec. 4th to: Earl R. Lawler W5JLY, Rt. 2, Box 24-K, Burnet, Texas 78611.

Czechoslovakian Contest

Starts: 0000 GMT Sunday, November 12
Ends: 2400 GMT Sunday, November 12

Rules are the same as last year, phone and c.w. on all bands, 1.8 thru 28 mHz. (OK stations are only licensed for c.w. on 160)

This is a world-wide contest, contacts between stations in the same country permitted for multiplier credit but not QSO value.

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

Exchange: RS/RST report plus two figures indicating your ITU Zone.

Scoring: One point per QSO, 3 points if its with a Czech. station. Multiply total by sum of ITU Zones worked on each band.

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

The "100 OK" and "S6S" awards are available for contest contracts upon written application with your log. Two IRCs to the C.R. C. will also get you a ITU Zone map.

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

Space Net VHF Contest

Starts: 6:00 p.m. Saturday, November 11
Ends: 6:00 p.m. Sunday, November 12
(Your Local Time)

This is another Space Net contest in the series commemorating Apollo moon missions. This one is for Apollo 12, the second manned exploration of the Moon in November 1969.

Activity will be during the 24-hour contest period your local time, on any of the v.h.f. bands, 50, 144, 220 and 432 mHz. All modes may be used but not repeaters.

Exchange: RS/RST and Zip Code number. (non-US use P.O. name)

Scoring: Two points per QSO on each band. Multiplier is sum of different Zip Code areas worked. (Counted only once) There is also a bonus of 10 you add to your multiplier.

Final Score: Zip codes + 10 × QSO points. The same station may be worked on different bands for QSO points but multiplier is counted once only.

Awards: Will be made for 1st and 2nd place winners in three classes based on power used. 1-25 watts, 25-100 watts and over 100 watts. There are also awards for multi-operator stations and club participation. All stations submitting a log will receive an attractive Participating Certificate.

Address for contest logs and additional information is: Space Net VHF Contest, Att: A. W. Slapkowski, WB2MTU, Box 909, Sicklerville, N.J. 08081. Mailing deadline December 2nd.

ARRL Sweepstakes

Phone: Nov. 11-13 *C.W.:* Nov. 18-20
Starts: 2100 GMT Saturday
Ends: 0300 GMT Monday

This one has been around a long time, this is the 39th running to be exact. The new format used last year proved so successful that it will be used for this years's "shindig." One change, your low power figure has been increased to 200 watts input, from 150 watts.

All the essential details should have been in the October *QST* but basically the exchange is similar to a message preamble and as follows:

QSO no., power input (A) if less than 200 watts, otherwise send (B) your call, the CK, (last two digits of year first licensed) and your ARRL section.

Count two points for each completed contact and multiply total by number of ARRL sections worked, a possible total of 75. You may operate a total of 24 hours out of the 30-hour contest period, off periods must be at least 15 min.

It is advisable to send for the "SS Package" which includes log and summary sheets, and Operating Aid 6. Figure 100 QSOs to the sheet and include a large s.a.s.e. with your request. If you're just an average week-end contester 16¢ or 24¢ should cover the postage, but if you're one of the "hot shots" you had better figure your requirements accordingly.

Mailing deadline for logs is December 15th and go to: ARRL Communications Dept., 225 Main Street, Newington, Conn. 06111.

Editor's Notes

The phone section of the contest will be over by the time you read this column. Hope you had a good week-end. W3ASK had forecasted that conditions would be normal to above normal, so we should have had another good one.

However there is still time to plan for the c.w. weekend and hope George is kind to us for that one. With the slumping c.w. returns last year we need a break.

It's unfortunate that our c.w. week-end follows the ARRL C.W. SS. That plus also being on the Thanksgiving week-end probably knocks out a lot of stateside activity.

There have been suggestions that we change the c.w. date but we would be very reluctant to make any change. The last week-ends of October and November being so well established world wide for these many years.

The above however does not effect overseas activity, and the SS is a totally different type activity, so maybe it's not bad after all.

Let's see what happens this year.

73 for now, Frank, W1WY

Propagation

BY GEORGE JACOBS,* W3ASK

ONE of the most severe radio storms recorded during the past several years took place between August 4 and 7. The storm began at 0120 GMT on August 4th and continued for about 80 hours!

During the storm the earth's magnetic field was severely disrupted, the ionosphere lost much of its ability to reflect h.f. radio waves, and widespread auroral displays were reported as far south as the temperate regions of the earth.

While conditions on the h.f. bands were generally poor to many areas of the world during the disturbed period, at 0621 GMT on August 4 and at 1500 GMT on August 7, solar flares caused a *complete* blackout of h.f. communications throughout the daylight portion of the world for several hours.

The sunspot cycle also continues to behave in an unusual manner. The Federal Solar Observatory at Zurich reports a monthly mean sunspot number of 79 for July, 1972. This results in a smoothed sunspot number of 71, centered on January, 1972.

During the period from August, 1971 to January, 1972, the solar cycle *increased* from 65 to 71, instead of decreasing as expected. There is no explanation for this increase in solar activity, other than short-term increases of this nature have occurred during the declining portions of some of the previously recorded cycles.

There are indications that the present cycle may now be declining again, and a smoothed sunspot number of 52 is now forecast for November, 1972.

C.W. Contest Period

The c.w. section of the 1972 *CQ* World Wide DX Contest will be held during the weekend of November 25-26. Last month's column contained special DX Propagation Charts for use during the c.w. section. If you plan to participate in the Contest be sure to check last month's column for band opening predictions, work plans and other propagation data that could be helpful in piling up contacts and points. For a day-to-day forecast of general propagation conditions expected during the month, including the contest weekend, see the "Last Minute Forecast" appearing at the beginning of this column.

Here are some propagation rules of thumb that should be useful for working DX during November, especially during the c.w. contest weekend:

During and shortly after *sunrise,* excellent DX conditions are expected on 20 meters, in practically all directions. Also check reception at this time from the south and west on 40, 80 and 160 meters.

From a few hours *after sunrise* until *late afternoon,* 15 meters should be optimum for worldwide DX, with some fairly good openings forecast to some areas of the world on 10 and 20 meters as well.

During the *late afternoon* and *early evening* hours, 20 meters is expected to be the best DX band, with openings in almost all directions. Fairly good DX openings to the east and south should also be possible on 40 meters during the early evening hours.

Good openings are forecast to most areas of the world for 40 meters during the *late evening* and *early morning* hours. During these hours fairly good openings should also be possible on 20 meters to the south and west. Some 80 and 160 meter DX openings should also be possible during the hours of darkness.

V.H.F. Ionospheric Openings

Two 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 is scheduled to occur between November 3 and 5, peaking during the early morning hours of the 4th, with a rate of about 15 meteors per hour. Later in the month the *Leonids* shower should take place. This shower will peak on the 16th, but its effects should be noticeable from the 15th through the 17th. During the peak of the *Leonids* shower about 15 meteors should enter the earth's atmosphere each hour.

November should be a fairly good month for 6 meter trans-equatorial, or TE scatter openings between the USA and South America. The evening hours are the best time to catch TE openings, between about 8 and 11 P.M., local standard time.

Some auroral-type v.h.f. inospheric openings are

*11307 Clara Street, Silver Spring, Md. 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For November, 1972

	Rating & Forecast Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date				
Above Normal: Nov. 3, 5, 13-14, 18, 30	A	A	C	C
Normal: Nov. 1-2, 4, 6-8, 12, 15, 17, 19, 23-24, 27-29	B	C	D	E
Below Normal: Nov. 9-11, 16, 20, 22, 25-26	C	D	E	E
Disturbed: Nov. 21	D	D	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals.

B—Good opening, moderately strong signals with little fading and noise.

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

D—Poor opening, signals weak with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the particular opening for any day of the month. For example, all openings shown in the Charts with a *propagation index* of (3) will be excellent on Nov. 3, but only fair on Nov. 15, and poor on Nov. 25-26, etc.

likely to occur during the month, especially 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 during November.

Good luck in the c.w. Contest, and please let me know how the DX Propagation forecast for the Contest turns out.

73, George, W3ASK

CQ Short-Skip Propagation Chart

November & December, 1972

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*	08-11 (0-1) 11-17 (0-2) 15-17 (0-1)	08-09 (1) 09-11 (1-2) 11-15 (2) 15-17 (1) 17-19 (0-1)
15	*Nil*	09-11 (0-1) 11-15 (0-2) 15-18 (0-1)	07-08 (0-1) 08-09 (0-2) 09-11 (1-3) 11-15 (2-4) 15-16 (1-3) 16-18 (1-2) 18-19 (0-1)	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (4) 15-16 (3) 16-18 (2-3) 18-19 (1-2) 19-21 (0-1)
20	10-12 (0-1) 12-14 (0-2) 14-16 (0-1)	06-07 (0-1) 07-10 (0-2) 10-12 (1-3) 12-14 (2-4) 14-16 (1-4) 16-17 (0-3) 17-19 (0-2) 19-22 (0-1)	06-07 (1) 07-09 (2-3) 09-10 (2-4) 10-12 (3-4) 12-16 (4) 16-17 (3-4) 17-19 (2-3) 19-22 (1-2) 22-00 (0-1)	06-07 (1-2) 07-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-21 (2-3) 21-22 (2) 22-23 (1-2) 23-00 (1) 00-06 (0-1)
40	07-08 (0-2) 08-09 (1-3) 09-17 (3-4 17-19 (2-3) 19-21 (1) 21-00 (0-1)	06-07 (0-2) 07-08 (2-3) 08-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-21 (1-3) 21-00 (1-2) 00-03 (0-2) 03-06 (0-1)	06-07 (2-3) 07-08 (3) 08-09 (3-2) 09-15 (3-1) 15-17 (4-2) 17-19 (4) 19-21 (3-4) 21-03 (2-4) 03-06 (1-3)	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) 21-01 (3-4) 01-04 (2-3) 04-07 (1-2) 07-08 (3)	08-09 (4-2) 09-16 (4-1) 16-18 (4-3) 18-01 (4) 01-04 (3-4) 04-07 (2-3) 07-08 (3)	08-09 (2-1) 09-16 (1-0) 16-18 (3-1) 18-20 (4-3) 20-04 (4) 04-06 (3-4) 06-07 (3) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (1-0) 18-20 (3-2) 20-04 (4) 04-06 (4-2) 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 (4-2)	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 (4-2) 04-06 (2-1) 06-07 (1-0)

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 80 Meter openings. Openings on 160 Meters are likely to occur during those times when 80 Meter openings are shown with a *propagation index* of (2), or higher.

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 mid-point*. For example, on a circuit between Maine and Florida, the times shown would be EST; on a circuit between NY and Texas, the time would be CST since the path mid-point falls in this time zone. Determine the path mid-point, and use the appropriate standard time. 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, 3 hours in MST zone; 4 hours in 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 are given in GMT. To convert to *standard* time in Alaska and other areas of the USA, subtract 10 hours in the Alaskan Standard zone; 9 hours in the Yukon zone; 8 hours in PST zone, 7 hours in MST zone, 6 hours in CST zone, 5 hours in EST zone. For example, at 20 GMT it is 12 Noon in Juneau and 15 or 3 P.M. in NYC.

4. The Short-Skip Chart is based upon a transmitter 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 cw 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 10 db 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.

HAWAII

Openings Given In Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	08-10 (1) 10-12 (2) 12-14 (1)	07-08 (1) 08-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	06-08 (2) 08-13 (1) 13-14 (2) 14-17 (3) 17-20 (2) 20-00 (1)	16-18 (1) 18-02 (3) 02-04 (1) 18-20 (1)* 20-01 (2)* 01-03 (1)*

[*continued on page 92*]

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Cat. No.	Description	Reg. List	Our Price
	STANDARD PACK		
	CONSISTS OF: CAMERA, CASE, STRAP, PAD, AND ACCESSORY SHOE		
	AUTOREFLEX "T"		
	Brushed Satin Chrome Finish		
702-155	AUTOREFLEX "T" w/52mm f/1.8 Hexanon Lens, Case, Shoe, Strap and Pad	$339.95	**$254.95**
702-154	AUTOREFLEX "T" w/57mm f/1.4 Hexanon Lens, Case, Shoe, Strap and Pad	384.95	**289.95**
702-153	AUTOREFLEX "T" w/57mm f/1.2 Hexanon Lens, Case, Shoe, Strap and Pad	469.95	**352.95**
	Professional Black Finish		
702-168	AUTOREFLEX "T" w/52mm f/1.8 Hexanon Lens, Case, Shoe, Strap and Pad	364.95	**273.95**
702-167	AUTOREFLEX "T" w/57mm f/1.4 Hexanon Lens, Case, Shoe, Strap and Pad	409.95	**307.95**
702-166	AUTOREFLEX "T" w/57mm f/1.2 Hexanon Lens, Case, Shoe, Strap & Pad	494.95	**371.95**
	AUTOREFLEX "A"		

Brushed Satin

Chrome Finish

702-182	AUTOREFLEX "A" w/52mm f/1.8 Hexanon Lens, Case, Shoe, Strap and Pad	289.95	**212.95**
702-181	AUTOREFLEX "A" w/57mm f/1.4 Hexanon Lens, Case, Shoe, Strap and Pad	334.95	**251.95**
702-180	AUTOREFLEX "A" w/57mm f/1.2 Hexanon Lens, Case, Shoe, Strap and Pad	419.95	**314.95**

"A" not available in Professional Black Finish

CAMERAS WITH SHOE, STRAP & PAD WITHOUT CASE

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Brushed Satin Chrome Finish

702-161	AUTOREFLEX "T" w/52mm f/1.8 Hexanon Lens, Shoe, Strap & Pad w/o Case	320.00	**240.00**
702-160	AUTOREFLEX "T" w/57mm f/1.4 Hexanon Lens, Shoe, Strap & Pad w/o Case	365.00	**274.00**
702-159	AUTOREFLEX "T" w/57mm f/1.2 Hexanon Lens, Shoe, Strap & Pad w/o Case	450.00	**338.00**
	Professional Black Finish		
702-174	AUTOREFLEX "T" w/52mm f/1.8 Hexanon Lens, Shoe, Strap & Pad, w/o Case	345.00	**259.00**
702-173	AUTOREFLEX "T" w/57mm f/1.4 Hexanon Lens, Shoe, Strap & Pad, w/o Case	390.00	**293.00**
702-172	AUTOREFLEX "T" w/57mm f/1.2 Hexanon Lens, Shoe, Strap & Pad, w/o Case	475.00	**356.00**

AUTOREFLEX "A"

Brushed Satin Chrome Finish

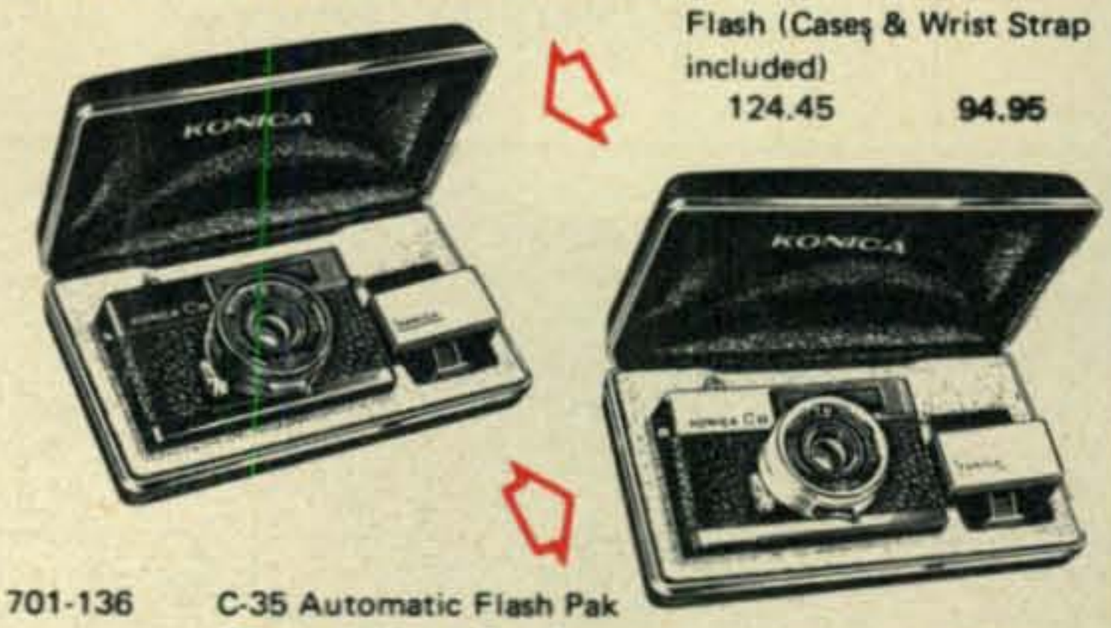
702-189	AUTOREFLEX "A" w/52mm f/1.8 Hexanon Lens, Shoe, Strap & Pad, w/o Case	270.00	**203.00**
702-188	AUTOREFLEX "A" w/57mm f/1.4 Hexanon Lens, Shoe, Strap & Pad, w/o Case	315.00	**226.00**
702-187	AUTOREFLEX "A" w/57mm f/1.2 Hexanon Lens, Shoe, Strap & Pad, w/o Case	400.00	**300.00**

"A" not available in Professional Black Finish

KONICA C35 COMPACT CAMERAS

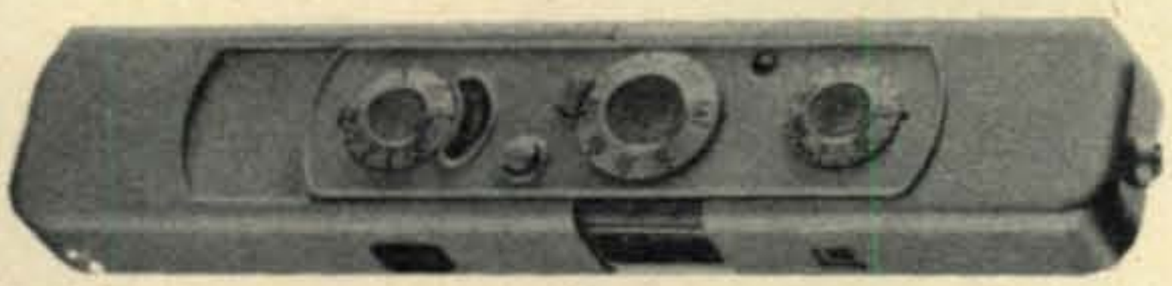
C35 RANGEFINDER CAMERAS

701-133	C-35 Automatic Chrome w/ Case and Wrist Strap	109.95	**82.95**
701-134	C-35 Automatic Deluxe Black w/Case and Neck Strap	114.95	**86.95**
701-135	C-35 Automatic Chrome Gift Pak w/Camera & Cube Flash (Cases & Wrist Strap Included)	119.45	**90.95**
701-137	C-35 Automatic Deluxe Black Gift Pak w/Camera & Cube Flash (Cases & Wrist Strap included)	124.45	**94.95**



701-136	C-35 Automatic Flash Pak (Chrome) (Flash Pak Consists of: C-35 Camera, Soft Pouch Case, Wrist Strap & X14 Compact Electronic Flash)	146.90	**109.95**

701-138	C-35 Automatic Flash Pak (Black) (Flash Pak Consists of: C-35 Camera, Soft Pouch Case, Neck Strap & X14 Compact Electronic Flash)	151.90	**113.95**



701-139	C35 ZONE FOCUS CAMERA C35-V CHROME w/Case and Wrist Strap	89.95	**67.95**

CAMERAS

171-012	MINOX B, chrome; w/ built-in exposure meter, standard leather case & chain	209.50	**157.95**
171-014	MINOX B, "Private Eye", black: w/built-in exposure meter, standard case & chain	239.50	**180.95**
173-134	Belt Case, leather, for Minox B	8.25	**6.25**
171-017	MINOX C, Automatic Electronic, chrome; w/ eveready leather case & chrome chain	244.95	**183.95**
171-018	MINOX C, "Private Eye", black: Automatic Electronic w/eveready leather case & chrome chain	275.95	**206.95**
173-139	Belt Case, leather, for Minox C	8.95	**6.75**

FLASH EQUIPMENT

172-031	BULB FLASHER for Minox B & C; chrome; w/belt case	23.45	**17.45**
172-049	UNIVERSAL MINOX BULB FLASHER: chrome; w/belt case	24.50	**18.45**
172-036	Eveready No. 504 15V battery for Bulb Flasher	1.15	**1.15**
172-040	CUBE FLASHER for Minox B and C; chrome; w/belt case	24.50	**18.45**
172-043	UNIVERSAL MINOX CUBE FLASHER: chrome; w/belt case	24.50	**18.45**
172-044	UNIVERSAL MINOX CUBE FLASHER: black, for "Private Eye" cameras; w/belt case	27.50	**20.95**
172-052	Set of two PX-825 batteries for Cube Flasher	1.50	**1.50**
172-039	Adapter for mounting standard flash units on Minox cameras	3.75	**3.00**

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- Extremely easy to focus.
- Advanced 16-element fully coated optical system uses micro-mimiature "roof" prisms to avoid weight and bulge of ordinary binoculars.
- Protective rubber eyecups fold back when wearing eyeglasses. They prevent scratching of safety lenses.
- Costs about $50 less than comparable value.

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THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll All Counties

#79—Richard G. Werth, WA0GZA, 7-13-72.
#80—Jerry H. Fischer, W2KXL, 7-19-72.
#81—Arthur R. Dority, Sr., K1OAZ, 7-27-72.
#82—Don Brickey, W7OK, 8-2-72.

USA-CA HONOR ROLL

3000		2000		1000	
WA0GZA	101	WA0GZA	158	WA0GZA	275
W1AQE	102	W1AQE	159	W1AQE	276
W2KXL	103	K8NQP	160	K2LFG	277
K0AYO	104	W7OK	161	W7OK	278
W7OK	105	**1500**		**500**	
		WA0GZA	190	WA0GZA	907
2500		W1AQE	191	W1DKD	908
WA0GZA	135	K8NQP	192	WA1DFL	909
W1AQE	136	W7OK	193	W1AQE	910
W7OK	137	W2RPZ	194	W7OK	911

THE November, "Story of The Month" is:

ICHN 72 Cliff Corne Memorial

Marv Hagan, WB2SJQ writes: "ICHN Peoria 1972 was a rousing success, not only in the numbers that attended but also due to the fine job Max, W9SOM and his lovely XYL Lois, Ray, VE3CBY and his XYL Petti all did in getting things in order. They did a tremendous job in making all the arrangements and activities. Special compliments to WB9DFJ who handled all registrants.

"As in the past, your reporter was an early arrival at the Peoria Ramada Inn, arriving on Wednesday, June 28, to be greeted by Max, Ray, WB4SLS, K0YGP and W2KXL who were in the process of installing antennas on the roof. Regretfully, we were not permitted to have a special call this year, so we all used our own call/P.

"Thursday was spent greeting new arrivals, registration, swapping stories re-catching new countries, mobile trips, etc. I had a golf match with W9ZHD and W8HMB, and naturally there is always an incident that takes place during any convention that usually causes frustration or excitement as did the golf match on hole 15 which is a par 3, 155 yards surrounded by a large stretch of water. I hit the ball badly and instead of getting up in the air, it shot like a bullet, hit the water and skipped along like we used to scale rocks atop the water. It hit a lily patch, bounced on the green just 25 yards from the cup. I putted into the cup for a birdie 2. From then on they all referred to me as Moses who parted the waters for the Israelites.

"Friday afternoon, convention business began in earnest with the meetings on Net procedures, future plans and the site for ICHN 73. K9MNE requested that the next convention be held in Ft. Wayne, Indiana and it was approved. Festivities continued with the women shopping, children going to the zoo, swimming at the pool, etc. Later that night a wonderful Dutch supper was held, after which the crowd gathered in Room 303 getting better acquainted, swapping stories, checking logs, etc. until bed time, what ever that time was.

"On Saturday activities began at 0930, again Jack, W0SJE gave his talk on noise suppression and Dave, W6CCM talked about the QSL Agency. The rest of the morning and part of the afternoon, the ICHN business meetings took over and many plans were finalized.

"At 1800 the photo session was held, and Mr. and Mrs. Cliff Corne, Sr., WA9DCQ (Mom and Dad of Cliff Jr., the very first amateur to confirm contacts with ALL 3079 Counties back August 15, 1965 as K9EAB. A silent key since November 1, 1969

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

The faithful: W5HDK, W4YWX, K5KDG.

ICHN 72 General Photo.

Stories and foto on K9EAB in October and November *CQ* of 1965), attended the sit in. Pictures of the groups were taken and a most impressive one was that of the 26 recipients (present) of the Cliff Corne 3079 Award, with Mr. Corne, Sr., sitting in position #1 where Cliff Jr., belonged. After the picture taking, we headed into the banquet hall for the annual ICHN Banquet.

"The invocation was given by Reverend Andy, WB9OBR. MC as usual was Joe, W9DRL who did an excellent job. After all at the the head table were introduced, Mr. Corne gave a very heartfelt talk about the family and Cliff Jr., and how he went out to get that last county for K9EAB. (For those who do not know, K9EAB did all his haming from an iron lung). Then each of the Cliff Corne Award holders were introduced. The annual WA0 "should keep quiet" Award (quarter horse trophy) went to K5HKG. Many important announcements were made, and the many door prizes were drawn. We were then entertained by a fine choral group, "The Bells of Harmony." Each year a Plaque is given to the outstanding Net Control station — it went to Max, W9SOM. Also a Plaque is given to the Mobileer of the year, and that went to WB5DVT.

"One of the highlights of the evening was the folks all singing the song written by Bea, WA2GPT for the occasion, and sung to the tune of Cruising Down the River: 'Saga of The Mobileer.'

(OOH) I'm cruis-ing down the high-way
On a jol-ly af-ternoon
An-ten-na point-ing at the sky
Mo-bile rig in tune

Con-tro-ol are you red-dy
Com-ing up to a coun-ty line
Give me a time & start me of
I— roger your five by nine.

(OOH) I'm sit-ting on a county line
And hav-ing a lot of fun
The pile-ups start-ed and its great
The trip has just begun.

Tell him to give me numbers again
I'm get-ting him three by three
Two by two? the son of a gun
I'll bet he didn't hear me.

(OOH) I'm park-ed upon a county line
By gol-ly and I won't budge
The cop he said you're just a nut
You can tell it to a judge.

I'm pull-ing off the high-way
and thanks for your com-pan-y
It's swell to have a lot of friends
Eighty eights and seven-ty three. . . . . .

"For the rest of the evening there was dancing and frolic till the wee hours of the morning.

"The success of the affair could not be without the full cooperation of Mr. Stanley Hatch and Sherline O'Connor of the Ramada Inn in Peoria."

Max Stephens, W9SOM writes: "Lois and myself want to express our profound thanks to everyone who assisted us in presenting ICHN-72. To name all individuals would be futile, just let us say, 'many thanks to all of you' from Lois and Max. To everyone who attended ICHN-72, we regret we couldn't have spent more time with each of you. It was so much fun having you and we sure hated to see you go!"

The General Convention Picture

(Courtesy, Max, W9SOM)

First Row, left to right: K4RQX, W9SDK, K4LRX, WØGV, WNØEKM, KØQIX, WAØJRZ, K4ZA, W9DRL, K6HZI, VE3CBY, WB6EXT, W4YWX, WA5FRN, WB2SJQ and K9GTQ.

Second Row: WIEQ, W8OA, W7KOI, K9HRC, K9QGR, WA3GLJ, W8WUT, W9BJH, WØAYL, WA4LSU, WDX6ETT, K2KQC, WA9DCQ, W7OK, W7CDH, W5HDK, WAØSHE, K8DCR, K5JBC, WB4TNY, K9UTI, W8WT and WB8ZLZ.

Third Row: WIDIT, WØKYG, WAØOJYL, KØCMF, W9CTA, WAØSKQ, WBØCPC, KØYGP, W3SQA, W9FDY, WB4WDY, WA4LMR, WAØEVO, W8HMB, W4GGU, K9KKX, WA9ZRP, W9CNG, W9MNE, WA4ULL, WAØLPA, K7JWZ, and W6CCM.

Fourth Row: KØPFV, WAØSBR, WAØZCQ, K7LTV, WB9DFJ, WA9OBR, W0SZC, W4YWV, K5YWX, WB4SLS, W4UVP, W3FVU, W9FGG, W9CFS, WA9BHH, WB4GGA, WA9SKB, W9SUQ, K9DCJ, K9EMV, K5KDG and WB5DVT.

Fifth Row: W4HA, K2PFC, W9SOM, KØARS, K8CIR, W9ZHD, W3GWA, WA9LNW, W4JVN, WA9SXQ, WAØKQQ, W7BBX, KØAYO, WØBL, W2BLM, WA9NKN, W4IGW, W8CXS, WAØDCQ, W4OWE, WB6AUA, W5MYA,

WBØCQE, WB8DRR, WA9GMK, WAØWOB, W4IZR and WB4FBS.

Among those NOT in the picture were: W2KXL, K3FFJ, WA7QQQ, WA8YPZ, K9CSL, WA9GOH, WØSJE, KØYGH, VE4SK and many YLs/XYLs.

Awards Issued

As listed under the Special Honor Roll, four more qualified for All Counties Plaques, thus getting up to #82 and ever closer to #85. Starting with #85, the Plaque will cost the applicant $15.00 as mentioned in the August Column (This will cover about half the cost).

Dick Werth, WA0GZA waited until he had them all and then applied for All 14mHz, All SSB, All Mobiles USA-CA-500 through 3000 and All Counties endorsed All SSB.

Jerry Fischer, W2KXL stopped chasing DX on c.w./s.s.b./SSTV to qualify for USA-CA-3000 and All Counties.

Arthur Dority, K1OAZ obtained All Counties endorsed All SSB.

Don Brickey, W7OK was another surprise as he also waited until he had them all and was issued USA-CA-500 through USA-CA-2500 endorsed All 14mHz, All SSB, All Mobiles. USA-CA-3000 endorsed All SSB, All Mobiles, and All Counties Mixed.

Steve Morris, W1AQE in his first application made it All A-1 for USA-CA-500 through USA-CA-1500, and USA-CA-2000, 2500 and 3000 Mixed.

Bob Dyson, K0AYO was able to upgrade the endorsement to his USA-CA-2500 to All SSB and also got Mixed USA-CA-3000.

Joe Vaughan, K8NQP added USA-CA-1500 and 2000 endorsed All A-1.

Edgar Newman, W2RPZ obtained USA-CA-1500 endorsed All A-1.

Manuel Greco, K2LFG was issued USA-CA-1000 endorsed All A-1 (you can see that c.w. is *not* dead).

Bob Jennings, W1DKD qualified for USA-CA-500, endorsed All 50 mHz (#9), All Phone.

Steve Rich, WA1DFL (right behind Bob, W1DKD) also qualified for USA-CA-500, endorsed All 50mHz (#10), All Phone.

Charlie Smith, WN4UCC who had USA-CA-500-#879 dated 2-7-72 endorsed All A-1 and #4 to a Novice, submitted proof to increase the endorsement to read All Novices and thus become #1 Novice to work All Novices. (The other Novices to obtain USA-CA were WN4EBE, WN4LSU and XYL WN71RD. Others to work All Novices were K8ZNI and K8SWW).

Notes

Skip, WA0WOB was kind enough to send along a photograph of the only three County Hunters who have been to All County Hunter Conventions including the first one in Jackson, Miss. in March prior to Mountain Home, Arkansas (1969); Knoxville (1970); Kansas City (1971) and Peoria, Ill. (1972) but not counting mini-conventions. They are: left to right, W5HDK, W4YWX and K5KDG.

Sorry, but I have run out of space, but I wanted to give all as much data on ICHN-72. How was your month? 73, Ed., W2GT.

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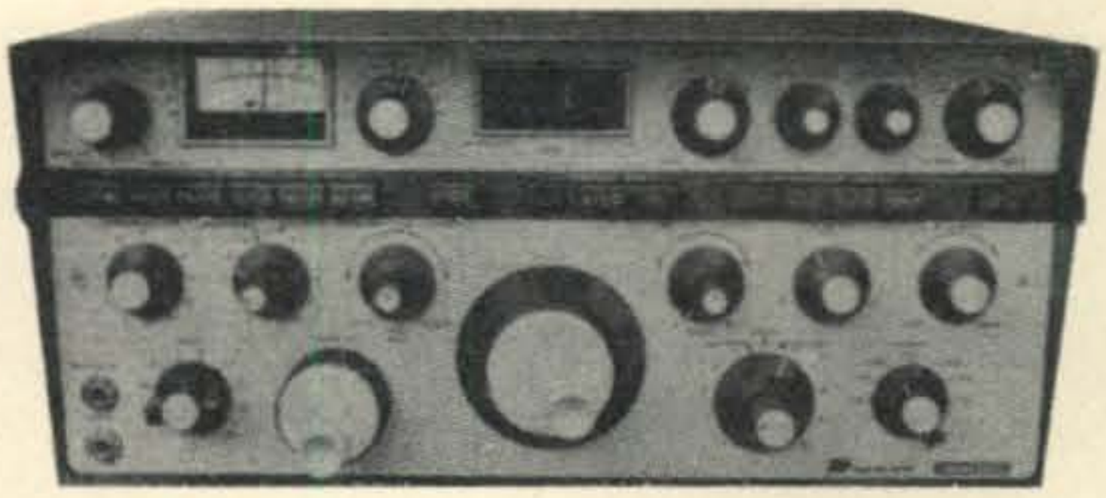

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- BROAD-BAND TUNING. Instant band changes without tuning.
- TRUE BREAK-IN CW with T/R switching.
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- SELECTIVITY: 2.4 KHZ @–6db, 1.8:1 (6:60 cb) shape factor. (16 pole crystal lattice Filters) optional:
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- POWER AMPLIFIER: 8072 final completely broad-banded driver and final. 150 watts continuous dissipation rating.

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CX-10	**Integrated Station** ..... Single VFO, PS-10 required, optional plug-in keyer.	**$1795**
CR-1200	**State-of-the Art Receiver** ..... Single VFO, I.F. shift, noise blanker, high sensitivity -selectivity.	**$1095**
CT-1500	**State-of-the Art Transmitter** ..... Single VFO, 300 watts, PS-10 A/C required.	**$1450**
CR-1500	**Special Application Receiver** ..... Two VFO's.	**$1650**
PS-10	**A/C Power Supply**	**$ 210**
PS-10	**D/C Power Supply**	**$ 210**
EV-10	**VFO for CX-10**	**$ 225**
SC-10	**Station Console**	**$ 350**
CX-2X	**Two meter transverter**	**$ 460**

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SURPLUS sidelights

BY GORDON ELIOT WHITE*

WHILE travelling from Washington to Miami last summer for the political conventions for my newspaper, I tried to see what interesting surplus sources I could find along the way. Some of the old familiar places in the southeast have moved, and at least one new one has turned up. Here is what I found:

Miami: Microwave Equipment, 4121 NW 27th St. (opposite Miami International Airport) Sam McIntosh has one of the largest stocks of all sorts of electronic surplus in Florida. He deals chiefly with commercial customers, but should be a good source of military electronics stretching back to WW II. He, like many of the dealers, is so busy with his main business that he may not have time for someone looking for a few resistors.

Ham Shack: Formerly a traditional military electronic surplus store in Miami, Ham Shack has moved to a warehouse section at 1665 NW 35th Avenue, Hialeah, and specializes now in components.

MarMax Sales: 3815 NW 35th Ave., Miami. (Call first as they are not open full time. Their number is 633-6647)

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

Peninsula Aircraft Equipment, 5591 NW 36th St. Phone 888-6714. They deal in current aircraft gear, but have a few pieces of other surplus around. I suggest calling first with specific needs, as they are not set up for browsing.

In Tampa I stopped in at Bill Slep's place, which is just across the bay in Ellenton, on U.S. route 301. Bill has a general type of surplus stock, but deals more with commercial than ham customers. He still has a lot of interesting material, in a section of the state that is not well-supplied with surplus stores.

In downtown Tampa I visited J & H Sales, on Waters Street. Once a regular surplus store, they are more and more into components, but might be worth a check by local residents.

Some other Florida dealers are Acme Surplus, 928 Main St., Jacksonville, Florida, and United Surplus, 1002 Tropic Street, Titusville, near Cape Canaveral.

In Georgia, see Quality Surplus, L. B. Wilson Airport, Macon; Baker Aircraft Supply, Warner-Robbins; and Mitchies' Surplus, Mableton, Ga.

In Tennessee, Signal Surplus, 12 Kell Rd., Signal Mountain, might be worth checking. In South Carolina see Electronic Supperett, 3586 Dorchester Rd., Charleston Heights.

The most interesting new source I found was in Burlington, North Carolina, just off Interstate 85 between Durham and Greensboro. It is G & W Metals, on Motley Street. Phone 227-9608. Motley street is a dirt road about a mile west of the center of Burlington off route 87. It is a little hard to find, but ask about it after going under the railroad bridge.

Although G & W is a scrap yard, they buy quantities of military gear of all kinds, chiefly electronics. They had a shed full of receivers, 'scopes, RTTY de-

Type Of Installation	Type Of Equipment	Purpose
A Airborne	Invisible Light (Heat)	Auxiliary Assemblies (not complete units)
B Underwater	Pigeon	Bombing
C Air transportable	Carrier (Wire)	Communications (rcving and trans)
D Pilotless Carrier	Radiological	Direction Finder
F Ground Fixed	Photographic	—
G Ground General Use	Telegraph or Teletype	Gun Directing
H —	—	Recorder
I —	Interphone or P.A.	—
K Amphibious	Telemetering	ECM (rcving and trans)
L —	Countermeasures	Searchlight Control
M Mobile Ground	Metrological	Maint. and Test Assy
N —	Sound in Air	Navigational Aids
P Pack or Portable	Radar	Reproduction (Photo or Sound)
Q —	Underwater Sound	Special or Combination of Types
R —	Radio	Receiving or Listening
S Water Surface Craft	Special Types (Mag)	Detecting and Range of Bearing
T Ground Transportable	Telephone Wire	Transmitter
U General Utility	—	—
V Ground Vehicular	Visual or Visible Light	—
W Underwater, fixed	—	—
X —	Facsimilie or Television	Identification and Recognition

Surplus nomenclature chart (see text).

NEW G&G CATALOG MILITARY ELECTRONICS

24 PAGES crammed with gov't surplus electronic gear — the biggest bargain buys in America. It will pay you to send 25c for your copy - - refunded with your first order. **SEND 25¢**

AN/APR 4Y FM & AM RECEIVER

Originally designed for AM reception, this receiver can easily be modified for FM. High precision lab instrument for monitoring and measuring frequency and relative signal strength, 38 to 4000 Mc in 5 tuning ranges. For 110 v, 60 cycle AC. Built-in power supply.

"FB" for Satellite Tracking

Original circuit diagram included.

All tuning units available for above (Price upon request).

- Calib. Accuracy: 1% approx.
- Video output: 1.5v at 70 ohms.
- Audio output: 100 Mw into 600 ohms.
- Sensitivity: 35 to 50 Mv avg.
- Selectivity: 4 Mc wide position and 600 Kc narrow position.

Checked Out Perfect, Like New **$88.50**

HEADSET

Low impedance. W/large chamois ear cushions. 4' cord & plug. Reg $12.50. Our Special Price **$2.95**

Less ear cushions $1.95

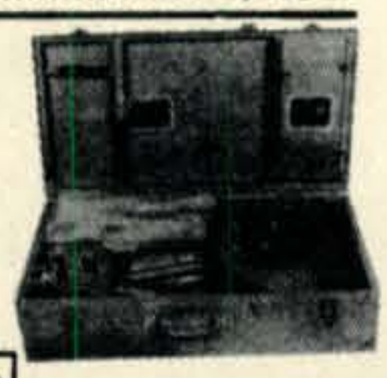
High impedance adaptor for above 69

SCR-274-N, ARC-5 COMMAND SET HQ!

Freq. Range	Type Complete w/Tubes	Exc. Used	Like New	Brand New
RECEIVERS				
190 - 550 Kc	BC-453	$16.95	$23.50	$27.50
6 - 9.1 Mc	BC-455	$16.95	.....	.....
1.5 - 3 Mc	R-25	.....	.....	$21.50
TRANSMITTERS	Complete with Tubes			
4 - 5.3 Mc	BC-457			$7.95
5.3 - 7 Mc	BC-458			$7.95

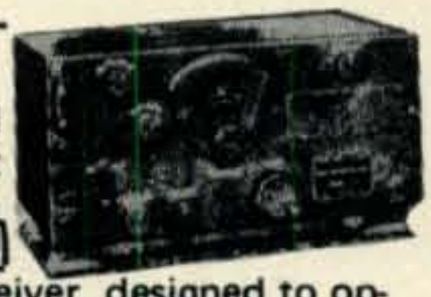
SCR-625 ARMY MINE DETECTOR

Locates any metal buried to depth of 2 feet in ground or water. Audible tone indicates presence of metal. Equipment back pack weighs only 15 lbs. Sturdy wood storage chest and 64 page manual included. Adaptable for underwater use. Complete as pictured, less batteries. **$42.50**



BC-348 RADIO RECEIVER

200-500 Kc & 1.5-18 Mc. 8-Tube 6-Band Communications Receiver. Excellent Used, with tubes and Dynamotor. Checked out **$69.50**



This is a locally controlled superhet receiver, designed to operate from 28 V DC source. Features: 2 RF Amplifiers, 3 IF Amplifiers, Crystal filter, AVC & MVC Control and BFO control. Size: 10" x18" x10". Wt. 38 lbs.

BC-604 FM TRANSMITTER (20 to 27.9 Mc.) $12.50

BC-645 TRANSCEIVER BRAND NEW

EASILY CONVERTED FOR 420 MC OPERATION

This equipment originally cost over $1000. You get all in original factory carton.

Dependable Two Way Communication more than 15 miles.

- Frequency Range: About 435 to 500MC
- Transmitter has 4 tubes: WE-316A, 2-6F6, 7F7
- Receiver has 11 tubes: 2-955, 4-7H7, 2-7E6, 3-7F7
- Size: 10-½" x 13-½" x 4-½"

Makes wonderful mobile or fixed rig for 420 to 500 Mc. Easily converted for phone or CW operation.

"SPECIAL PACKAGE OFFER"

BC–645 Transceiver, Dynamotor and all accessories below, including conversion instructions for Citizens Band. BRAND NEW, while stocks last. **$26.95**

- Mounting for BC-645 transceiver
- PE-101C Dynamotor, 12-24V (easily converted to 6 volts)
- Mounting for PE-101C Dynamotor
- UHF Antenna Assemblies (set of 2)
- Complete set of 11 connectors
- Control box BC-646
- Mounting for BC-646 ctr. box.

Transceiver only . . . $16.95

F.O.B. NY City or Ogden, UT for Savings on Freight Charges.

TEST SETS

SIGNAL DATE RECORDER - Test set, new / w man	$29.50
TS-239/UP Oscilloscope	$99.50
TS-100 AP Test Oscilloscope	$69.50
TEST SET I-96A	$44.50
TEST SET RADAR TS-1021/FPS 19	79.50
TESTER ASSEMBLY T-101001	29.50
TEST SET 159 TPX	22.50
CAVITY TUNED FR-72/UP Test Set	21.50
TS-147 B/UP	39.50
ID-135E Test Unit Handie Talkie	49.50
WAVEMETER TS 111 CP	69.50
TS-51 APG-4	39.50
TS-204/AP	19.25
TS-258/UP	24.75
TS-62/AP	19.50
TS-102B/AP Range Calibrator	32.50

BC-221 FREQUENCY METER $59.50

With Crystal and Calibration Book. Exc. used; checked out.

LM FREQUENCY METER

Fine general purpose Navy unit 125 to 20,000 Hz. Operates on 12 or 24 VDC. Complete with tubes, crystal, calibration book.

Checked out, Excellent Used. **$59.50**

As above, less book. $22.50

ID-93/APG-13 INDICATOR SCOPE UNIT

Operating voltage is taken from the PO-43A power inverter All controls are mounted on front panel. Uses a 3BP1 Cathode Ray Tube, and 5/6SN7, 2/6H6, 1/2X2, 1/5Y3. Controls: Horizontal, Vertical, Zero, Slope, Intensity, Focus, Marker Amplifier, Yards Range, Receiver Gain. For operation on 28 V DC, 115 V AC 380-1600 cps. Complete, NEW..... **$16.50**

TRANSMITTER/REC TRANSPONDER APX-6

RT82/APX-6 Radar Identification Set. Receiver-Transmitter covering range of 950-1150 Mc. (Can be converted to 1215, 1296 Mc). With 30 tubes. Digit counter on tuners for trans-rec-lo freq. controls. Voltage required: 24 and 115 V., 400/800 cycle. Size: 13" x13" x10". Weight 45 lbs. Like New **$34.50**

BC-603 FM RECEIVER

converted for 35-50 mHz. 10 preset push-button channels or manual tuning. Complete with 10 tubes, check out, like new $39.50

AC Power Supply. New $14.95 Technical Manual $2.50
DM 34 24V Power Supply New $4.45 Set of 10 tubes for BC 603 recv. $5.95 DM 36 24 V Pwr Supply Exc. Used $2.25

BC-604 FM TRANSMITTER (20 to 27.9 Mc.) $12.50

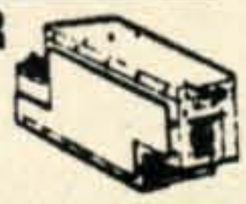
CATHODE RAY TUBES

Standard make. All new in original carton

3FP7	$ .98	5AP1	$3.75
9GP7	$3.95	5MP1	$2.75

SHIELDS:
3" . . . $1.29
5" . . . $3.25

ARC-5 VHF RECEIVER, TRANSMITTER MODULATOR 100-156 MC



R-28/ARC5 VHF RECEIVER — Tunes 100 to 156 Mc AM. Easy to convert for 2 meter Operation! Ideal for installation in vehicles. Excellent Used With Tubes **$19.50**

T-23 TRANSMITTER with tubes and crystals. Brand New in original carton. $21.50

MD-7 MODULATOR with tubes, exc. used. $10.50

TG-34A CODE KEYER

self-contained, automatic, reproduces code practice signals from paper tape. 5 to 12 WPM built-in speaker. Brand new with tech manual AC line cord. **$24.50**

Code practice tapes. Price upon request.

BC-1206-C RECEIVER

Aircraft Beacon Receiver 200 to 400 Kc. Operates from 24V DC 1.5A. Continuous tuning, vol. control NEW on-off switch and phone jack. Very sensitive. Compact. Complete with tubes, **$12.50**

Terms: 25% with order, balance C.O.D., or remittance in full. F.O.B. NYC. Subject to prior sale & price change. Minimum order $5.00

G & G RADIO ELECTRONICS COMPANY
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New York, N.Y. 10007 / (212) 267-4605

mods, and other interesting goodies. Prices were in line with their scrap-yard setup.

One interesting Item I found was an Air Force seat strap reel. With this you can easily install the double strap type shoulder harness in your car — far better than the 'round the neck strap the car builders provide.

Another new source of surplus I have turned up is Rush Electronics and Surplus, 537 North State St., Clairton, Pa. 15025. Western Pennsylvania is rather bereft of good surplus stores, and Rush appears to be well-supplied with components and complete equipment items.

Surplus Nomenclature

Reader WA4WKL/5 submitted the enclosed compilation of surplus nomenclature:

Joint Army — Navy System Designations

During the course of the average amateur's career, he sooner or later comes across surplus or obsolete military electronic equipment. As an aid to identifying the next "Black Box" you may come across, the chart below may be useful in determining the equipment's original use. I should note here that most System Designators began with the letter group AN which denotes Army-Navy this does not necessarily mean that both services use that particular piece of equipment.

Example: AN/TRC — 132

Ground transportable radio communications. The AN/TRC-132 is a multichannel tactical communication terminal. The number 132 indicates the unit number of the system. ■

Propagation [*from page 83*]

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

ALASKA

Openings Given In GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	19-22 (1)	16-18 (1) 18-21 (2) 21-23 (3) 23-00 (2) 00-01 (1)	18-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-04 (1)	06-12 (1) 07-11 (1)°

Central USA	19-23 (1)	17-18 (1) 18-21 (2) 21-00 (3) 00-01 (2) 00-01 (2) 01-02 (1)	17-20 (1) 20-23 (2) 23-02 (3) 02-03 (2) 03-05 (1)	06-14 (1) 07-12 (1)*
Western USA	19-21 (1) 21-23 (2) 23-00 (1)	17-20 (1) 20-21 (2) 21-22 (3) 22-00 (4) 00-01 (3) 01-02 (2) 02-03 (1)	14-17 (1) 17-20 (2) 20-22 (3) 22-00 (4) 00-02 (3) 02-04 (2) 04-06 (1)	02-03 (1) 03-05 (2) 05-14 (3) 14-15 (2) 15-16 (1)

CQ Reviews [*from page 46*]

Using the Digipet-60 alone, our unit counted correctly from 200 Hz up to 78 mHz. In conjunction with the frequency converter it provided accurate and stable measurement of 120-170 mHz signals right down to the last ±1 Hz. Sensitivity in either case was well within the ratings.

These units are of high-quality workmanship, appearance and performance that should make them well suited for many applications in the radio-amateur shack, the maintenance shop, the professional lab or in the field.

They are manufactured in Japan by Takeda Riken for Miida Electronics, a Division of Marubeni America Corporation, 2 Hammarskjold Plaza, New York, N.Y. 10017. The Digipet-60 Digital Frequency Counter alone is priced at $299. Along with the Digipet-160 Frequency Converter, the total price for the two items is $349.

Miida guarantees their measured results traceable to the National Standard. The equipment is warranted to be free from defects in workmanship and material and to perform in full accordance with the specifications for a period of 12 months from the date of original shipment when properly used.

—W2AEF

SOME VERY TRIVIAL STATISTICS about not-so-trivial money ...

Statistic .... In 1971, 127 new businesses advertised in one or more of the amateur radio magazines for the first time.

Statistic .... Of those 127 that tested the ham marketplace, only 64 continue to advertise products or services for hams.

Statistic .... Of those 64 that survived, 51 advertised in CQ with consistency.

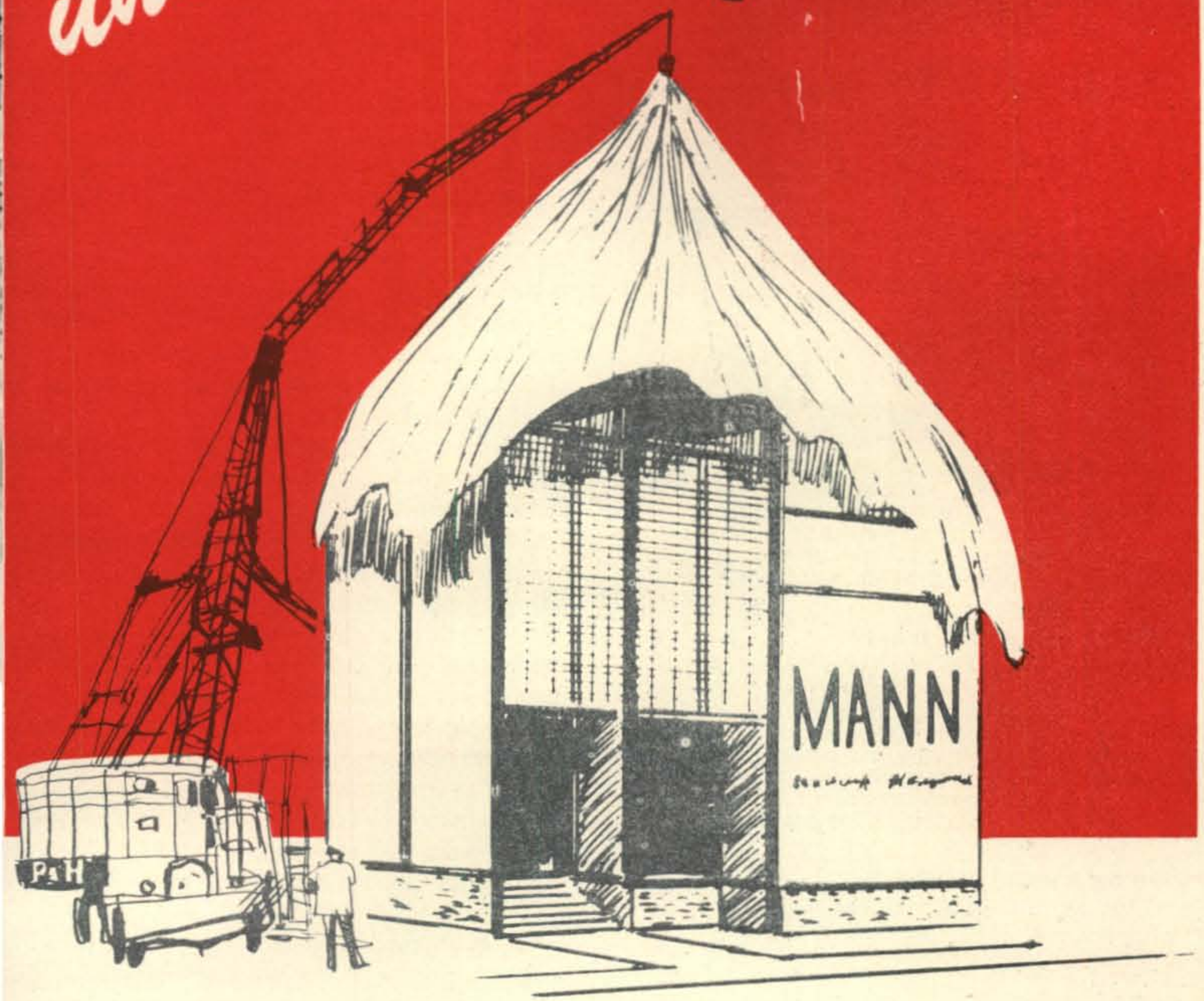
Statistic .... Of those same 64 that survived, 46 advertised in CQ first as their primary test.

Statistic .... Of those same 64 that survived, 58 used CQ as their heaviest advertising medium.

What does all this prove? Only that CQ readers are darned good customers, for which we are indeed grateful.

So, if you have a product or service to sell your fellow hams, it might pay to try CQ first with your advertising campaign. Somehow those that don't have a strange way of becoming unfortunate statistics.

Annnouncing the unveiling of our BRAND NEW QUARTERS



We are proud to announce the opening of our new headquarters and extend an invitation to all our customers to come and visit us.

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213/889-6666

also located at 2837 North 24th Street, Phoenix, Ariz. 85008 (602) 955-4570

Six Meter FM [*from page 56*]

of operations except during band openings. Even then, only the lower 500 kHz or so has much activity.

Six meters is immediately adjacent to one of the most crowded commercial bands ("low band"), and commercial interests are always a threat when we do not use a band. Although obsolete commercial gear pioneered two meters, it was not until the "off-the-shell" rig was available that f.m. took off. Maybe the same is true of six meters. The early work on six meter a.m. was with the Gonset Communicator equipment and later with the Heathkits. In some major cities upwards of a thousand amateurs operated partially or entirely on six a.m. This has dwindled to a relative handful. We need to get operation on six, and f.m. is the logical way to go. TVI problems are much reduced by f.m. over a.m., thus eliminating one of the major problems in Channel 2 fringe areas.

There have been some attempts to market a six meter f.m. unit. Unfortunately those firms either dropped the project or the company "went under." Possibly, had these firms held on, there would be much more f.m. activity on six meters. Fortunately, manufacturers are again realizing the potential in six meter equipment and are again bringing out six meter f.m. equipment. One of the first to go into six meters in a big way is Regency. They have recently announced a 25 watt output six meter f.m. transceiver designed along the same lines as their two meter HR-212. Although full details were not available at the time of this writing, the unit is planned to be in the under $250 class.

So, gentlemen (and ladies) the handwriting is again upon the wall. We are fighting for out lives on 220 mHz, and soon may be fighting for 50 mHz. Frequency space is an extremely rare commodity, so let's not lose any more! ■

160m. [*from page 24*]

Construction

The accompanying photos will give the reader an idea of my approach in the construction of the transmitter. The v.f.o. and the buffer-driver stages are put on separate PC boards, which are then mounted on the side and rear panel of a chassis bent from a 0.03 aluminum cookie sheet found in the hardware store. The trimmer capacitor in the v.f.o. tank is mounted on the underside of the v.f.o. PC board, and a hole drilled in the side wall to allow access for a screwdriver for final adjustments. The same mounting scheme is followed with the buffer-driver

Math's Notes [*from page 26*]

amp regulator, will supply 1.5 amperes at 20 watts. The LM 120 comes in a TO3 package and is available in one of three +2% pre-trimmed outputs of -5.2 volts, -12 volts or -15 volts. Line regulation is said to be 25 mv maximum and load regulation 75 mv maximum. Hookup is as shown in fig. 8 and cost in 100 quantities is $9.95. There will also be lower cost units with somewhat relaxed specs. available.

Analog Devices, 221 Fifth St., Cambridge, Mass. 02142 has just announced the next lower price break in a Digital panel meter. The AD2002, a 2½ digit unit (maximum reading 1.99) has a basic input sensitivity of 0 to 1.99 volts with an accuracy of ½%. The unit measures only 1.8" wide ¢ 3.0" wide ¢ 1.5" deep and operates from an external 5 volt source obtained from the equipment the DPM will be used in. Other common features are RCA 7 segment displays, 4 readings per second, over voltage indicator, and a provision for holding a reading indefinitely. The cost of the AD2002 at the time this is being written is $50 in 100 quantity.

Finally, Kandu, Inc., 6115 Miller St., Arvoda, Colorado 80002, has just introduced their $7.95 "Make Your Own Printed Circuits" kit. This kit, employing a new technique for preparing boards, contains one special glass epoxy board; one plastic template with logic symbols, schematic symbols, P/C board layout patterns, and drill jig; 6 ozs. of ferric chloride etchant, enough to completely strip three 4 × 6 boards, a 4H drafting pencil and 4 page instruction sheet. Because of the special nature of the circuit board supplied in this kit, we would suggest that you write for details before purchasing ny materials. The technique used however, might be just the thing for those occasional P/C boards that we all need.

73, Irw, WA 2NDM

board, where, in addition, the r.f. choke to the driver is located on the underside of the board. A shield for the v.f.o. is made from soft aluminum sheet. The final stage is mounted on several tie points as indicated in the photo, and these are arranged to provide for shortest lead length to the central ground point on the main tie point strip. Key leads and B– come through a three screw terminal strip mounted directly behind the buffer-driver PC board, and an extra terminal strip is mounted to the right of the coax output jack to allow for the addition of parallel capacitance across the output as may be needed when matching the transmitter to various antenna impedances.

Two items were specially constructed. The first is the heat sink which is fashioned from four rectangular pieces of .03" aluminum, with a proper size hole drilled in the center of each for acceptance of the transistor lug mount, and one of these pieces is extended 3/4 inch beyond the others, drilled with two 1/4" mounting holes, and bent into a right angle to serve as the mount for the transistor on the chassis. Teflon insulators isolate the sink from the chassis. The four pieces of the heat sink are separated by standard metal washers. While the transistor rapidly increases heat without the sink to the blistering point, it runs mildly warm at maximum output with the sink installed.

Secondly, in order to accomodate the high final amplifier collector current, an r.f. choke RFC_4 was wound on a 2 inch length of 1/4" diameter ferrite rod which was scavenged from a transistor a.m. broadcast receiver where it served as the antenna core. 27 feet of No. 24 enameled copper is scramble-wound the length of the rod in this fashion: starting at one end, the wire is wound for a length of 3/8 inch before doubling back to the starting point, and the winding is built up about 1/8 inch, at which point the next section is begun. Storebought chokes will not accommodate the high collector current, and due to their internal resistance, cut the collector voltage in half until they burn out. This choke performs its job adequately.

The v.f.o. tuning capacitor was homebrewed because we had two Johnson subminiature "M" series 2.3-14.2 pf variables in the junk box. These were soldered across the rotor plates and the two stator mounting rods. An APC capacitor could be substituted and the trouble avoided, so long as the size of the chassis is increased accordingly. 25 pf ought to provide about 25 kHz of band-

FOR THE MAN WHO TAKES CW SERIOUSLY.

Model KB1
$265 net

For you, only the best will do. Your traffic, your QSO's must be perfect. This is the Keyer which will do it for you. Perfect letters and spaces, all automatically. **12-72 WPM.** Keys positive or negative loads. Built-in Monitor OSC/AMP for Speaker. Weight Control to suit your preference.

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Order your KB-1 Now!

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100 WATTS from a TR-22?

YES... WITH NEW DYCOMM MODEL 1-10-0 BOOSTER

- 1-2 WATTS IN GIVES YOU 90-100 WATTS OUT
- THE ULTIMATE IN MOBILE POWER USING YOUR PERSONAL PORTABLE

$220.00

UHF *models now available...*

MODEL 470-25	3-7 WATTS IN	15-30 OUT	$197.00
MODEL 470-30	1-2 WATTS IN	20-30 OUT	$227.00

PLUS *the old reliables...*

10-0	10 W input	100 W output	$195.00
D	10 W input	40 W output	99.95
ES	1 W input	40 W output	99.95
ECHO in Rack Mounted Repeater			600.00

Write for data sheets on all MODELS

948 AVE. E. P. O. Box 10116
RIVIERA BEACH, FLA. 33404

DYCOMM

spread, quite adequate for smooth tuning without a vernier. The transmitter is completed by the addition of a "Simplest TR Switch" which allows complete break-in operation.

Tune Up

If the specifications for coil windings are followed closely, the completed transmitter should require very little tuning and pruning. If the builder has built and tested each stage of the transmitter as he progressed in the project, he will know that each is working and delivering the proper amount of r.f. to the next stage. Similarly, with a 50 ohm resistive load connected to the output and the r.f. output indicator installed, the final adjustment of the driver matching capacitor C_3 should produce a very small peak in output at the proper position. If this does not appear, I wouldn't worry about it, as this small peak does not significantly affect either harmonic output or 1.8 mHz r.f. output. Adjustment of the output capacitor *Cs* will produce a small peak sloa when connected to an antenna, experimentation will indicate the amount of capacitance that must be added to the output terminal strip in order to achieve the best match. Typically, my version has required about an additional 1500 pf.

You will find that C_4 will also produce a peak in output when taken through its range: it can be set with the 50 ohm load in place and forgotten.

The transmitter has performed perfectly on the air. To give you some idea of what to expect from 3-8 watts output on 160 meters, let me simply note, that with a decent antenna, QRPp on 160 meters is probably more at home than anywhere else except 10 meters. During the last *CQ* WW DX 160 CW Contest, I was able to work stations at the rate of 15 per hour with an output of 3 watts to a balloon-mounted quarter-wave vertical without radials. Using other transmitters with longwire antennas, I was able to work all over the U.S. with less than one watt output, and managed many perfect QSO's on d.s.b. with about 1.5 watts. This is far short of WAC with 150 watts as achieved by W9PNE many years since, or 100DXCC with 100 watts by the venerable "Mr. 160"–W1BB–himself, but it sure has provided a lot of enjoyable operation on the band where the courtesy and slow pace of the "good old days" still pervades. This rig is a very practical way of getting into QRPp and 160 at the same time. ■

Our Readers Say [*from page 8*]

running the opposite sideband right next to the d.s.b. station being worked. This would make enforcement of any bandwidth regulation difficult for monitoring stations.

As the trend of manufacturers continues along the lines of quality s.s.b. equipment, even for low-powered rig, a.m. will continue to fade from popularity until no old rigs are left to buy and no die-hard old-timer a.m. men are still active. Thus, why go through the pains of regulating a.m. away? Let it die a peaceful, natural death — after all, it's had an honorable existence.

Paul H. Bock, Jr., K4MSG
Avon, North Carolina

Keyer Kudos

Editor, *CQ:*

Just a short note to let you know that the two articles by Al D'Onofrio, W2PRO, in the August, 1972 *CQ* were right in point with information I had been looking for. The "Adjusting and Cleaning of Speed Keys" should be basic reading for a number of hams heard daily misusing those fine speed keys.

Henry Morrison, W5RIY

DX [*from page 78*]

in late July using c.w. and s.s.b. on 10 - 160 meters. QSL to E17CC.

FC6 — FC6ABP was heard on 14198 s.s.b. He is Jean-J. Filippi, L'Ile Rousse, Corsica, P.O. Box 44.

HD8 — HD8IG is in the Galapagos Islands. QSL Manager is said to be W3ABC.

JY4 — Ibrahim, JY4IA, is active on 15 and 20 meter s.s.b. QSL to Box 2353, Amman, Jordan.

LX — The LX1 prefix is used by Luxemburg nationals, LX2 or /LX is used by operators in Luxemburg with reciprocal licenses. LX3 calls are no longer being issued, LX9 prefixes are used by club stations and LXØ is only used by LXØPTT at the present time.

VA1 — VA1ND was an expedition to Miscou Island, N.B. QSL to VE1TC, Box 412, Fredericton, N.B. VA1SUN operated on July 10 from Caraquet, N.B., site of a research team monitoring the solar eclipse. QSL to VE1TC.

VA2 — VA2VO has been reported on 20 meter s.s.b. His QSL Manager is W2GHK.

VA6 — VA6NC was also on 20 meter s.s.b. QSL to Box 5986, Postal Station L, Edmonton, Alberta.

VA8 — VA8RA will be used by VE8RA until Dec. 31, 1972.

WI7 — WI7UKE operated July 29 - Aug. 4 from the Universal Esperanto Congress in Portland, Oregon. We understand that cards go to KH6GT.

WS0 — QSL WSØEJ via Box 291, Omaha, Nebraska.

The DX Department would appreciate news of rare prefix activity and proposed operation with special prefixes during various events

Send all such news to the DX Editor, P.O. Bo 205, Winter Haven, FL 33880.

QSL Information

The following volunteers to be a QSL. Manag for any interested DX station: Lloyd Liun WB9DLO, 829 N. 5th. St., Eau Claire, WI 54701.

A35FX Via ZL2AFZ
A51KV To W6KNH, ,42 Donald Drive, Orinda, CA 94563
BV2A c/o WB2UKP
DU7SV Via WA6KGP
ET3USE To K8IRC
ET3ZU/A (May 3-6, 1971 operation) c/o 11IJ
ET3ZU/A (Sept. 5-9, 1971 operation) Via Aldo Zumbo, P.O. Box 379, Asmara, Ethiopia
F6BTQ — To WB9ETQ
F0AHY/FC C/o DJ4UP
F1.0QQ Via F2QQ
FM7AD/FS7 To W5GJ
FM7WN c/o K2KGB
FW8AA Via DL2CP
FY7AE To WA4WTG
HL9UP c/o WA7HXS
HS4AFN Via WA6GZZ
HS9AFW To VE7BWG
IF9PVG c/o IT1ZGY
IH9LAW Via IT9GAI
JT0AE To OK1AQW
JY6FC c/o K6AQV
JY9LOM Via W6LOM
KB6CU To K3RLY
KC6SX c/o KH6HIF
KC0KC Via K0AYO
KG4CS To K4CSY, 1625 Linville St., Kingsport, TN 37664
KG6JBS (ex-W0KON KG6) c/o W1DXB, 21 Stanford Rd., Nashua, N.H. 03060
KT0NEB Via W0JCP, 2933 Dudley St., Lincoln, NB 68503
KW0SCF To W0BRB
LX1BW c/o W3HNK
LX2CQ Via DK1YK
MP4BIN To WA5UHR
OY9LV c/o W3HNK
SK0ITU Via SK0CC
TI9C To TI2CAP
TJ9BF c/o WA4WTG, 445 N.W. 202 Terrace, Miami, FL 33169
TY7ABM Via DL7JK
VK2BQQ/LH To G.P.O. Box 3209, Sydney, N.S.W., 2001 Australia
VK9MM c/o K4MQG
VK9XW Via W2GHK
VP2MAC To VE3CO
VP2SAB c/o WB8HZG
VP2VV/FS7 Via F6AEV
VP8LR To WB4FIN
VQ9DJ c/o W4DJ
WA9OTH/TF To WA9PZ
WJ4ULY Via W8TO
XQ3YO To CE3YO
XV5AC c/o W1YRC
XZ2AD (1955-62) — Via WA6NSC, 995 Pine St., Apt. 502, San Francisco, CA 94108.
YJ8BD To 10IJ
YJ8CS c/o ZL4NH
ZD6AF Via K5KH
ZD8CS To K1BTD
ZD8CW c/o W2MUM
ZK2DX Via WB5BHN
ZS5AR To WB2RLK
3D6AD c/o KP4DKY
3F1IE Via W2GHK
4W1AF To DJ9ZB
4X4BL c/o WB2EDV
4X4NJ Via WA4WTG
4Z4AI To WA2KWP, 17 Orchard Rd., Middlesex, NJ 08846
4Z4DX c/o WA4WTG
4Z4IB Via WA2KWP
5R8AP To WA2BVU
5U7AU c/o WB2AQC
5W1AU Via W6KNH
5X5NK To DJ3JV
7X2BK c/o W5LUJ
7X7Y — Via 10IJ
9J2HI To WA2CRD
9L1JT c/o WA4ZYQ
9Q5RD Via WA9AES
9Q5RW To WA6CEB

73, John, K4IIF

Q&A [*from page 14*]

capacitor (leaky or shorted one), either o which could cause a complete failure or inter- mittent troubles, monitoring the voltage at the suspected point for a change often will provide a clue as to the culprit.

Malfunction due to an *open* bypass usually can be detected by temporily jumping the sus- pected one with a new capacitor.

Look for burned or overheated resistors (or bypasses) and determine the cause for this. Charring at sockets may be indicative of poor contacts or voltage breakdown.

Poorly-soldered connections at grounds or

CQ Survey Shows Ham Market Growth

We're pleased to announce that CQ's marketing staff has just completed a new market survey, and from all outward indications, the amateur radio market has reached its highest peak in the history of the service.

On June 2, 1972, five thousand questionnaires were mailed to randomly selected amateurs. Of these, approximately one hundred seventy were not delivered by the post office because of innacurate addressing, and of the remaining forty eight hundred thirty that did reach addresses, fifteen hundred forty four were completed and returned as of August 3. This is a 32% return, extremely high, and we wish to thank all those amateurs who took the time and effort to aid in this project.

Some of the results were exciting to behold. For example, of the 1,544 amateurs participating, 1,065 spent money during the past year on parts for building and experimenting, and spent a total of $184,493 in this area alone, or an average outlay of almost $180 per person.

The figure for replacement parts was 948 amateurs with a cash outlay of $47,437.

The money spent by hams on equipment was equally impressive. The 1,544 amateurs bought 751 pieces of new major equipment (transceivers, receivers, transmitters and amplifiers) and they spent a total of $295,929 in just twelve months.

For antennas the figures were also substantial: 666 new antennas purchased at a gross cost of $37,278.

It was fascinating to discover that v.h.f.-f.m. equipment and accessories represent almost 25% of all dollars spent, and about 33% of all units purchased. A similar interesting response was noted on questions pertaining to amateur TV. The survey indicates that approximately 5% of all hams are already experimenting with or operating ham TV, and that an additonal 10% will join the ATV ranks within the next twelve months.

A complete thirty-six-page report has been printed and mailed to all major manufacturers and dealers in the amateur market. If by any chance we've missed someone who can use a copy of the report, just get in touch with the CQ marketing staff and we'll be happy to accomodate. However, we must mention that the supply is limited and must be restricted only to companies or individuals who sell products or services to amateurs.

tube sockets may need touching up with a ho soldering iron. Weak heater connections at th socket or poor contact at the tube pins may b responsible for a drop in heater voltage with consequent loss or fade-away of signal level Wiggling the tube in its socket will sometime provide a clue as to this. A socket change ma even be in order. Power plugs may be a sourc of trouble. Make sure their contacts are clea and seat tightly at the receptacles. A sligh bending of the plug prongs inward or outward may be helpful for a better contact. R.f circuits may show good d.c. continuity with a ohmmeter, but may still involve a poor r.f connection. These too may need touching u with an iron.

Intermittent, faulty or noisy operation o other malfunctions may be due to poor switch contacts (at bandswitches, function and mode switches, slide switches, etc.) or at variable capacitor ground wipers. Use a good contac cleaner at these spots. Relay contacts ofte become dirty or otherwise cause faulty oper ation. Clean them with a relay-burnishing too (not a file) or by sliding a good grade of bond paper through the contact points while man ually holding the contacts closed.

Tuned circuits should be checked for prope resonance at the desired frequency. A faul here may be due to a loose or broken tuning slug for the inductor, shorted or open inductor turns, defective shunt or series capacitor, or due to external components across the circuit.

P.a. trouble often are due to "beat-up" tubes (particularly the TV-sweep types), improper or wandering bias, excessive plate dissipation or improper loading, instability due to defective parasitic suppressors, defective bypassing, poor ground connections or improper neutralization. Arcing in the p.a. may be caused by insufficient loading or as a result of dirt and moisture, burned spots or pitting of variable-capacitor plates that may have occurred at some previous occasion. Faults due to antenna or feedline problems (which may cause the p.a. to act up) can be checked by comparing operation against that with a dummy load.

V.f.o. and other oscillator problems have been extensively covered in past Q & A Columns. In addition to the points mentioned before, malfunctioning of oscillators sometimes can be checked by listening for their signals on another receiver.

These are by no means all the avenues to follow in trouble shooting; nevertheless, a good start with them on the job should at least be forthcoming for the task at hand.

HAM SHOP

Advertising Rates: Non-commercial ads are 10 cents per word including abbreviations and addresses. Commercial and organization ads are 35 cents per word. Minimum charge $1.00. No ad (non-subscriber) will be printed unless accompanied by full remittance. Free to CQ subscribers (maximum 3 lines per month). Recent CQ mailing label must accompany ad.

Closing Date: The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publishers of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, New York 11050.**

CREATIVE QSL cards. Personal attention. Imaginative new designs. Send 25c. Receive catalog, samples and refund coupon. Wilkins Printing, Box 787-1, Atascadero CA 93422

TRAVEL-PAK QSL KIT - Send Call and 10c; receive your Call sample kit in return. Samco, Box 203-A, Wynantskill, NY 12198

QSLs - See our new leatherfinish cards before you buy. Samples 10c. Practical products. Box 1365 -C Pittsfield, MA 01201

QSLS' Second to none. Same day service. Samples 25c. Ray, K7HLR, Box 331, Clearfield, Utah 84015

Sell: BC 375 complete unused 14" Conrac TV monitor, coiled telephone cords, new; TDQ 2 mt transmitr, Beckman Scanner, 24 V PS 40 amp reg. K H Paquee, 53 Jerome Av, Trumbull, CT 06611

COLLINS R-390A like new $695. Motorola R-390A, good, $595. Will take 32 or 32 Teletype part payment. Alltronics - Howard Co. Box 19, Boston, Mass. 02101 (617-742-0048)

SELL Swan 350 with AC/DC supply 410 VFO, 405 Mars adaptor plus mic, $450 plus shipping. WB6GFJ, P.O. Box 11, Los Altos, CA 94022

MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO issues at 10 cents each (plus shipping) from Lockheed Ham Club, 2814 Empire, Burbank, CA 91504. Send list and check. Available issues and any refund due will be sent promptly.

HOOSIER ELECTRONICS— Your ham headquarters of the Midwest. Individual, personal service by experienced and active hams. Factory-authorized dealers for the finest ham gear on the market: Drake, Regency, Standard, Hy-Gain, Ten-Tec, Galaxy, Cush-Craft, and accessories. Write today for our quote and try our personal, friendly Hoosier service. We accept Master-Charge and BankAmericard. Hoosier Electronics, R.R.25, Box 403, Terre Haute, Indiana 47802

EXCITING, beautiful QSL and SWL cards from the plates of the late Warren Rogers, KØAAB. Samples 25c. James Patterson, 3013 North Victoria, St. Paul, MINN 55113

SELL: Gertsch FM6 frequency meter 20-1000 mHz .0001%, excellent condition, recently factory calibrated $750, Harold Smith, W4PQW, 615 S. Palafox St., Pensacola, FL 32501

WANTED: A YaesuFTDX560 or 400 that has a some sort of problem. Please state trouble & price. WN5GMY, Rt. 1, Box 162, Wiemar, TX 78962

HEWLETT-PACKARD SALE: audio oscillators; 202 low frequency $50; 650 wide range $75; 205 AG with input and output level meters $130. All in good condition, but uncalibrated, with manuals. Freight collect. Martin Gary, 1404 Maple Ave, Richmond, VA 23226

SAROC Eighth National Convention the PRESTIGE convention at the Flamingo Hotel Convention Center, Las Vegas, Nevada 89109, January 4 thru 7, 1973. SAROC special room rate $15.00 plus tax, per night, single or double occupancy, only 500 rooms so get your accommodations request in early. Advance Registration $10.00 per person. Registration and eyeball session on Thursday. Seminars, Meetings, Exhibits, open Friday and Saturday. SAROC-SWAN Electronics Social Hour, Friday. Ladies Program, Saturday. SAROC Sixth National FM Conference, Friday and Saturday. SAROC-HY-GAIN/GALAXY Cocktail Party, with Leo W0GFQ, at the organ, Saturday. SAROC Buffet Hunt Breakfast, with Champagne, Sunday. Advance registration with Sergio Franchi Flamingo Midnight Show, two drinks, $17.00 per person. Advance Registration with Sergio Franchi Flamingo Dinner Show, no drinks, $21.00 per person. SAROC Jet Roundtrip Vacation Package Plan includes airfare, Deluxe Flamingo Hotel Room for three nights, SAROC Advance Registration with Flamingo Hotel Dinner Show: via United Airlines departure cities: Baltimore/Washington, $280.00 Boston, $312.00; Chicago, $220.00; Cleveland, $250.00; Columbus, $246.00; Detroit, $244.00; Hartford, $304.00; Milwaukee, $233.00; New York/Newark, $296.00; Philadephia, $290.00; Pittsburgh, $262.00; via Frontier Airlines departure cities: St. Louis, , $209.00; Kansas City, $188; Denver, $135.00; Omaha, $182.00; Lincoln, $176. The price quotes is per person, double occupancy in hotel room. If single occupancy in hotel room is desired add $25.00 additional per person to each amount quoted. All fares and schedules are subject to CAB rules and regulations, send for additional details. Remember to send accommodations request to Flamingo Hotel. Send Advance Registration and information request to SAROC, P.O. Box 73, Boulder City, Nevada 89005.

FREE INFORMATION - UHF-VHF Communications Antennas, Mobile/Base, 140-470 mhz. Amateur-Commercial. Antenna Engineering Co., Inc., P.O. Box 19449, Indianapolis, IN 46219

SELL: Dumont scope, 5 in., 304H, w/manual $60 surplus Navy 3 in. scope OS8C/U, w/schem $50 Kiethley RMS voltmeter, 124R, w/manual $100 Receivers w/schem, BC-348-R, modified for 120 VAC, $75; Hallicrafters R-274/FRR $285; R-390/URR $750; RTTY audio TU, CV-60/URR, w/schem, $70; gas driven alternator, 2.5KW, 120VAC 1 ph. 60 cyc $250; microswitches, 230 pcs., 5A-125 VAC, SPDT 50c ea, $5/doz. All excellent, prices FOB, Stan Gritsevicz, 11 New Pine St., Nanticoke, PA 18634, 717-735-3190.

WANTED: Schematic for Precise 3151 'scope. Paul Wappler, 2448 E. 23, Tulsa OK 74114

CAPTAIN CRUNCH 2600 hz. L.D. Disconnect whistle $10. Card Dialer $88. Call Commander (Director) 18 button $90. Dial telephones 2/$28. Touchtone 5-line, $33 FOB. G. Garton, 1301 W. Estes, Chicago 60626

SELL: 2 meter AM equipment. Gonsett Comm II, III, IV, matching VFOs. Pawnee with matching linear. K6RQT, 5541 Mistridge Dr., Palos Verdes, CA 90274

WANTED: HA144 am. AM transceiver also elements for Bird 43 wattmeter. R. Terrey, K6RQT, 5541 Mistridge Dr., Palos Verdes, CA 90274

URGENTY NEED: solid state VLF receiver, RAK, AN/URM-6, Rustrak recorder and/or tape, professional weather instruments, for research programs by children. Dr. R.B. Ammons, 411 Keith, Missoula, Montana 59801. Or call collect evenings.

WANT: manual or copy for CE-200V xmtr. Jose Vianna, PY1-GG. Senador Verguerio 167, Rio de Janeiro, Brazil.

QSL manager for DX stations. Write for details. WB4YIX, 821 Heron Rd., Cocoa, FL 32922

SELL: HW-22, HP-23 and PTT mike, good condx, $95, you ship. W.R. Crockett, 100 Alexander, Greenville, NC 27834

SELL: IC-2F 2 mtr FM xcvr with xtals, DC p/s mobile ant. WA8WTK, 1258 Bunkerhill Blvd "D" Columbus, Ohio 43220

Sell: Duncan & Drew radio tel & tel 919 pages, 1921 $5 FOB Douglas, 2254 Pepper, Concord, CA

Sell: mod 14 tltype w/table p.s. & few parts; Stoner RTI TV highest bidder over $200, must pickup W9VSR, East Moline IL

Drake low pass filter TV-1000-1000 watts, $10, six mosley TA33 SR traps w/aluminum ends adjustable, perfect condx, $30, WB2UFY, 139 Howe Av, Passaic NJ 07055

Hammalund HQ-180A rcvr new condx, orig carton & manual $295 W Cordell, R 3, Weaverville NC

Swan 500 AC supply, DC supply, VOX access. manual mint condx $450, hardly used W2ASI, 15 Kensington Oval, New Rochelle NY 10805

Want: Heath SB-10 adapter, cables & manual, G M Mondrush W8GIV, 600 Beechmont, Dearborn Hills, MI 48124

Sell: Swan 240 w/homebrew AC supply $160 or trade 2M FM, K3PEQ, J Cook, 1626 Park St, Parkersburg, W VA 26101

French America award-QSO since 1966 2xFP8-2xFYF and 1xFMF or FSF, send list w/10 irc to VE2AFC, PO Box 382, Quebec 4 Canada

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Want: Heath AT-1 transmitter, must be mint condx & operating, W8TXX, Box 1111, Benton Harbor, MI 49022

KWM-2 w/gold plated plugin relays, Waters Notch Filter, new tubes & completely re-aligned $550, L. Williams WB9FBJ Star Rt Box 109B Townsend WI

Sell: Heath HW-12 excellent condx $85 Wayne Miskelly, P.O. Box 333, Millville, NJ 08332

Sell or Swap: BC348 receiver w/ac power. W7INR/6, 360 Sharry Lane, Santa Maria, CA 93454

Sell: 2 meter Eldico trans & BC454 & 417A converter. Separate power supply & ant. included. Ball, W9LJO, Rt. 4, Lake Geneva, WI 53147

Sell: commercially made 2 element tri-band Quad $35 insulated aluminum speaders break down into: 5 ft lenghts for easy shipping, W5WH, 2700 N. 7th St., McAllen, TX 78501

Sell: still in orig carton 203G Hy-Gain Gammaxial matching 20 meter beam, never unpacked, cash & carry $55, W3TMJ, Glenside Pa, TU6-9491

Trade: mint HR-Z regency loaded xtals & varitronics PA-50A linear w/Hustler BBLT-144 mobile ant. for mint TR-4, Cliff Brown, WA3GBT, Box 600, Kane, PA 814-837-9683

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3 KW Linear all bands, pair 4-400s, table top, vac. variable, roller ind., no power $195 W6RW, 8600 Skyline Dr., Hollywood, CA 90046

Sweep/Marker Gen. Jackson TVG2, mint condx w/manuals & marker xtals $40, P Carron, 205 Ridgewood Rd, Easton, PA 18042

Swap or sell: KT-320RX; 6M conv, Eico 723 60w TX swap for 2m AM gear, WA1NYV, Box 363, Uxbridge, MA 01569

HW12 mike, spkr, AC & DC ps mobile rack cables & ant, extra tubes w/FSM will deliver 100 miles $150, W5KRZ, Hubbard, TX 76648

SELL: D-104 microphone $25; Electro-voice microphone $15; Sony Cassette Tape Recorder with AC/DC model TC60 $55; Drake FET six meter Converter with power supply $85, strictly cash no trade. T Jacobsen WA2MSG, 3371 Decatur Av, Bronx NY

Sell: 3" refractor telescope, CE10B w/VFO, will take audio equipment in trade. WA8CKT

Want: Heath shawnee or Gonset comm 6 meter transcvr, can repair, quote best price, C Foltz, 234 S. Richmond, Carson City, NV 89701

CE200V, the ultimate xmtr 80-10 broadband bilt-in scope, all xmt modes, unmodified best offer over $300, D McSmith, K4KTR, 500 Chapel St., Hampton, VA 23369, 703-722-8488

Want: old or used amateur equipment suitable fo novice licensee, write giving price & equip. R H Phillips, R. 2, Box 47-A, Tunnelton W VA

Wanted: manual for B&W model 600 gdo, E A Sjolander Jr, 218 2nd Ave E, Ashland, WI

Sell: tube collection of over 1,000 tubes, date from 1920, write for info W6ANN, Str R. 2, Box 242, 29 Palms, CA 92277

Want: early vacuum tubes pre-1920, need DeFores spherical audion w/candelabra screw base & Hudso filament tubes, need not be working condx, W9L GH, 610 Monroe, River Forest, IL 60305

Regency ATC-1 5-band solid state converter $50 H Anderson 639 N. Wahstach Av, Colo. Springs CO 80903

Want: Linear 10-15-20 beam, 2 meter FM, send fo list, cash/trade, K5ZUV/4, PO Box 7502 Miami FL

Magazines for collectors, Radio Craft, Radio Age Short Wave Craft, others; cr. 1920s, SASE list, wan old baseball cards, WB2FKA, 201-531-2286

Sell: HRO dial & gear assembly $10, Dow Co-ax re lay, d.c. coil 440 ohms at 28v.d.c. $8, W6BLZ 528 Colima St., La Jolla, CA 92037

Conar 500 rcvr 80, 40, 15, $15, Heath HP-23 ps $4 WB9FZX, 4 N Wisconsin, Janesville, WI

Heath twoer, mike, keyer, VTVM etc, best offer- SASE Jurow, Box 183, Olympia Fields, IL

Sell: Hewlett Packard model 758A wavemeter w/ instruc book $200 pp & insured Ken Morey, 803W Sixth St., Pittsbug, KS 66762

Wanted: Ham in Lansdale-Norris Town area to teach OM-52-theory for general class ticket, Vince, Box 73, Cedars, PA 19423

Sell: old QST, CQ, 73 mags at 35c ea pp w/3 or more. L M Covey, K1JAE, 238 Jenness St., Lynn, Mass 01904

Wanted: Collins 312B4 station control state price, condx, s/n W2EHB, 32 Bryant Rd., Blackwood NJ.

Wanted: Heath twoer, hallt. HA-2 2 mtr transcvr, 432 & 220 mHz gear, Clem K8HWW, 33727 Brownlea, Sterling Heights, MI 48077

Sell: HX-10, perfect $180; SX-99, $45, you ship. HB KW linear/supply $140, pickup only, M C Mayerl, 312 S. Lafayette. St., Shawand, WI 54166

Sell: Hy-Gain 204BA, like new condx $95, will deliver within 100 miles DX60 $50, W8CUT, 1776 Walnut St., Coshocton, OH 43812

Sell: Linear BTI-LK2000 $390 FOB, W1DBS, J Savonis, 410 Blake Rd, New Britain, CT 06053

Heath Solid State voltmeter IM-16 excl condx, D Cook, 674 Oakridge Dr, Youngstown OH 44512

Want: SW General recvr, prefer Eico Space Ranger model DX-718 or any other SW rcvr in good condx between $55-$65, S L Ballinger, 11 Lawn Ct, Poughkeepsie, NY 12603

Have Heath Mohican solid state amateur rcvr; need Linear amplifier. Can anyone help? Oung, XZ2AD, 995 Pine St. no 502, San Francisco CA 94108

Instructograph code machine complete w/10 tapes $40; Drake MS4 spkr & cabinet $15, H Roeder, 329 Wheatland Av, Shillington, PA 19607

Collins 75S1 excl condx w/15 extra xtals for SWL, CB, Ham satellite. $275 C Moore, 3329 March Ln, Garland, TX 75042, 214-348-6217

Want: 01-61 xtals for HR2A. Have 16-76. Trade or cash; Sell: twoer, WA1GFJ, 17 Whitney St., Hartford CT 06118 (203-569-2266)

Want: Johnson KW matchbox, state price & condx, WANYY, J Souvestre, 211 Atherton, Metairie LA

Sell: Swan TV2 converter, like new in orig carton $125, WB4SRP, E Barker, Pulaski TN

ell: Drake TR3, AC3, Hy-Gain 18AVT/WB, 2 syn-ro, 1 20 rpm AC motors, transformer 1500 VAC T w/fil volt, WA1ING, Saundertown, R'I' 02874

X100, $30, twoer w/ps, manuals $30; Adcom DC upply $50, want TV test equipment, K5BCQ, 114 Geneva, Friendswood TX

Vanted: old radio rcvrs & wireless gear of 1920 & lder, also Breadboard Atwater-Kent msc, parts. J. Horvath, W6GPB, 522 3rd St., San Rafael CA

ell or trade Leica equipment send SASE for list, vant electronic keyer & matchbox, complete de-ails in first letter W6AT, 367 N. West St., Vaca-ille, CA 95688

Sell: Gonset G-66 rcvr w/12V DC & 110V AC comb. P'W'R' supply. excl condx incl manual $85 FOB, Epstein W0NXZ 1776 Montreal, St Paul MN

Wanted: SBE SB34 for conversion to solid state, need not be operational, bad ps or final amp ideal, state condx & price RG Werth, Concordia College, Moorhead, Minn 56560

Cleaning shack 75A4, KWS-1, SP6000, Hunter bandit 2000B, SBE34 others, offer W/check or, SASE for list J B Forman, General Elec Co, 2001 Jefferson Davis, Arlington, VA

Are you a Journalist, net control, grand ma/pa novice, QRPer, B-H, QCWA, OTC, OCTC, DXer, if so, the Int. AR Society sponsors such a club. For info write Box 385, Bonita, CA 92001

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Muffin fans 115v, 60Hz, used, excl 4 3/4x4 3/4x 1 /2 $6 ea pp, SP Clarke 380 Via Almar, Palos Ver des Estates, CA 90274

Will buy your unusable equipment if suited to my experimental needs, defective kits, etc. State details, price E Erickson, 13 Robert Cir, S Amboy NJ

Valiant wanted, will trade 1600 WPEP HB 80-10 linear, W8IFN, M. Caldwell, 1068 Windsor, Morgantown, W VA 26505

Cash for Gonset 76 AC PS (fb) W6ZI, 595 Midway, Novato, CA 94947

Z8ASR & 28KSR floor console cabinets w/or w/out LESU and cables, D C Harrington, KØSHK, 1620 Gardena Av, Fridley, Minn 55432

Wanted: linear or VHF send for my list, K5ZUV/4 P.O. Box 7502, Miami FL 33155

Sell: CQ June 1948 todate $50, QST Oct 1931 to-date $100, R. Senechal, W6PYR, 4028 China Ct, Hayward, CA 94542

BC-645 transceiver for 420-450 mhz complete w/ connectors, dynamotor, ant., etc $35 pr, WB6PWG 1A St. James Ct., Chico, CA 95926

Want: Ballantine 310B VIDE VTVM operating manual, Lee, 540 Stony Brook Dr, Somerville NJ

Sell: surplus, receivers, test equipment, meters, assorted components, reasonable, send SASE for list, J Lisaius, 116 Orton Rd, W. Caldwell, NJ 07006, 201-226-7943

Want: Master mobile loading coil, all band manual or remote tuning, continuous variable, K9JPY, 841 W 4th Oskhosh, WI 54901

Sell: Millen antenna bridge brand new $30, pp, 4Cx1000A tube brand new $100 pp, xtals 1000 Khz $3 ea HC6/U pp, MRC 10 VHF monitorradio, xtal & tuned to desired freq $55 pp, W5TEP, 1225 W Bridge St., New Braunfels, TX 78130

Collins KWM2-A, 516F2 pwr suply, mint condx, $699 will ship, E Eckberg, 1478 A Caino Peral, W A6VSC, Moraga, CA 94556

Jan tubes: /AQ5-.45; OA2-.34; OB2-.38; 6AK5-.68c; 6AG5-.70; 6C4-.38; 6J6-.42; 6V6GT-.65; 6AV5GA-.78; add postage, K Maas, Burlington WI

Sell: Newtronics 80 & 40 meter cliff dweller, rotable dipole, F. Miller III, Clarkson, Nebr. WA0ILV

Building a linear? Order my 30 amp filament choke and save, new not surplus, bifilar wound, $5 ea, 2/ $9.50, V. Murrell, 712C Rich Rd, Newport TN

Want: black powder pistol or rifle, PA only, Sell/ trade HT40, AF67, new classic 33, 412-761-5920, Paul, 3535 California Ave, Pittsburgh, PA 15212

Mobile converters, midland 30-50 MHz, 108-136 MHz, 148-174 MHz, new in box w/warantee, $25 WA4ZYU, 1904 114 Ave, Tampa, FL 33612

Mechanical filters: 455kc for solid state, excit for SSB, $12.95 W/instruc. E. Jeltrup, Box 361, Mamaroneck, NY 10543

CHESS! If you have played by radio please contact K3RCF

Want: Heath xtal calibrator, cantenna, wattmeter/ SWR tunnel dipper, SB600 spkr, also, 71 callbooks & 3-5 pos. coax switch, T Coffington, WB6AWC, 7825 Scotts Valley Rd, Lakeport, CA 95453

Wyoming ranch land, Antalope, deer, 10 acres, $20 down, $20 mo. photos, maps, K6ICS, 9418 Florence Downey, CA 90240

Want: R4B, SB300s, HW16, HG10B, Tempo One, FM Handi-talkies & mobile rigs. all must be excit or vy gd, J. Meilahn, Box 186, Chetek, WI 54728

Want: xtal blanks for 80/40 CW bands FT-243 type holders, plates & hardware, no lot too large, price lst letter, W6DOR, 2921 Loyola Dr. Davis, CA 95616.

National NCX3 transceiver, ac supply $160 plus shipping, W7IEX, 1402 W. Ajo Way No. 307, Tucson, AZ 85713

Sell: Morrow falcon ham band receiver, ac supply & spkr, $45. W6DJZ, 3748 Floresta Way, Los Angeles, CA 90043

2 Meters - Ameco TX-62 transmitter, brand new w/ manual reg $180 only $90. DYCOMM10-0 100w amplifier, new w/warranty $145; 500D, 50w $60. Sochor, Box 552, Arlington Heights, IL 60006

Want: manual or schematic Packard Bell CCTV camera DX920, buy or copy, B. Farmer VE6PW, 1155 Reader Cr, Calgary, Alberta Canada T2N5J8

Will pay $15 for your good HP477B thermistor mount K A Schwieker, 1124 Opelika Road, Auburn, ALA 36830

Mechanical filters: 455Khz 2.1Khz $18.95. 300Hz $22.95. J A Fredricks, 314 S 13th Av, Yakima WA

Will pay cash for QST issues prior to 1920. W6AKM 1289 Glen Eyrie Av, San Jose, CA 95125

Sell: HT-40 75 wxmtr w/extals & shipping $55 Johnson eltnnic TR sw $25 plus $5 shipping, want kw or less amp, need not work WB2CGH, 213 19 St S. Brigantine, NJ 08203

Collins KWM2A $650, PM2AC supply $85, 312B5 status control & VFO $350, crystal pack CPI $175 all mint TR3 w/noise blinker $315 Mooty Box 11235 Elkers Park, PA 19117

Touchtone pads, 12 button lighted w/hookup instruc $17.50, cover plates for pads, flat $2.50, wrap around $4, Autopatch Systems, Box 291, Western Springs, IL 60558

Sell: Ten 8008 mercury vapor rectifiers, pullouts $2 ea or will trade for pr sockets for 4-400s. K5-GKN, Box 249 Osceola, AR 72370

Want: SB10 adapter, swrmeter, rotor & twoer, WN3SCP, 340 W 2nd Ave, Latrobe PA 15650

Want: connector & pwr suply lable to fit KWM-1, also pwr suply 516F1 or 516F2, F Platner, 720 Eckton Rd, Akron, OH 44303

Want: scope, GDO, Sig, Gen, other service gear, CB or ham xcvr, have tower, tubes, gear & lots more to trade. Adams, 1402 W. 13th St, Panama City, FL 32401

Sell: new Cornell-DuBilier power con model 6 DRA 6 input 6 VDC, output 300v at 200 ma. $20 w/instr. & data sheet W6 PZX, 549 Valverde Dr., S San Francisco, CA 94080 589-1369

Sell: HQ110, clock, matching spkr, manual, Ranger II PTT' MIC manual, W9 ZEW, Rudolf Oras, 3636 S. 59th Av, Cicero, IL 60650

Ariz Phoenix VHF Radio Club 1st & 3rd Wed 8 pm 1510 E. Flower (Red Cross Bldg) visitors welcom.

Sell: 117 VAC 125w transistorized inverter $33 12 VDC, 160m, car radio .75-2.1 mc calibrated, vy nice, $35 WN3SOT R Toth, Harmony, PA 16037

Sell: R-388 (51J3) w/product detector builtin $325 FOB Want: Heath counter, W4AIS, 300 Thornwood Dr., Taylors, SC 29687

Heathkit GR-78 six band receiver, new condx $60, local, R Selleck, 23311 Iris Av, Torrance CA, 90505

BC-342 1.5-18.1 mhz rcvr w/manual & matching LS -3 spkr AC pwr $80 Silbert, Box 77, White Sulphur Springs, NY 12787

Drake TR-3, AC pwr supply, MS-4 w/manual & shipping cartons $350 A-1 condx, W1FLM, 18 Fox Den Rd, Glastonbury, CT 06033

GE 30/w FM mobile on 146.94 w/control $40, RCA 150 mc mobile $10, link 50 mc mobile w/control $20, K6KZT, 4434 Josie Av, Lakewood, CA

Drake 2-C, 2-CQ, 2-NT, xtal calib, Heath HG-10B VFO excit, package only $400, W7GMT, S Hjerleid 111 Forest Dr., Riverton, WYO 82501

Brand new attache case 11 channel telephone complete w/Nicads $500 or trade, S. Cserpnayak, 5619 Robinhood Rd, Charlotte, N.C. 28211

Swap old network radio programs on tape, send your list & preferred tape media. I will send mine. WB4OWQ, Norm, 3777 Montford Dr, Chamblee, GA 30341 (collector)

E-Z way tower, crank-up, layever 40 ft w/ground post. Must be picked up, W1MZB, Bristol, RI

Sell or swap: SX100 rx DX 100 xmtr Hb patch, Selsyns Kw 1p fltr 6 mtr cnvtr, Want: 6 mtr trncvr or Heath 1 band tcvr K3CWD Box 14 Hillsville PA

Sell or trade: aniurm-79 freq-meter (FR-4) 100kc-20m.c. in transit case $65 K7LQY, 1849 Stevens Dr., Richland, WA 99352

Sell: DX-100B, SB10, HR-10B, all perf condx w/ manuals, built by expert, First $175 take or make offer, u ship-cert check, G Williams, R 4, Corry PA

Sell: HT-37 Hallicrafters xmtr $175 mint condx w/ I.B., WA1ELQ, T Browning, 32 Beaufort Av, Needham, MA 02192

Want: socket for 4CX1000 tube, any useable condx W2KZ, 61 E. Depew Av, Buffalo, NY 14214

DX40, VF-1, $35 or best offer FOB SASE, P. Crowley, K2UOQ, P.O. Box 24, Hazlet, NJ 07730

Sell: 2304 Mhz converter, original 3 thru line version in March issue of Ham Radio, needs only L.O. injection, pretuned, ready to use $25, WA2VTR, 14 Oakwood Tr, Spring Valley, NY 10977

Wanted: Vibroplex, any model, unmodified, send price first letter. Charles H. Bennett, YA1AB, Kabul, Dept. of State, Washington, DC 20521

CAPTN CRUNCH whistles, 2600 C.P.S. L.D. telephone disconnect frequency $10. Card dialer w/ cards $88. TT Call director, 18 button, $98 ea & $4 post. G. Garton, 1301 W Estes, Chicago 60626

ARIZ Thunderbird Chapter 10/10 net every Mon. 29 Mhz (AM) 28.770 (SSB) 7 PM local time

Sell or trade: Office type-ultra violet lamp, J. Schwartz, 43-34 Union St., Flushing, NY

Sell: Ranger Viking in mint condx, used vy little, in orig carton $65 FOB Bertha Swenson Alamo, N.D.

IARINE ELECTRONICS of HALESITE — Sales nd Service on Pearce-Simpson, Konel, Sonar, itizens Band. Retail only. 76 New York Avenue, alesite, L.I., New York 11743. Phone 516/427-199.

)X'ers attention! Join largest DX organization in vorld. 1200 members, 250 countries, 550 ITU pre-ixes. Write IARS, Inc, Box 385, Bonita, CA 92002

Awards, The International Amateur Radio Society nc., a tax exempt order, sponsors more world's wards. Write IARS, Inc, Box 385, Bonita, CA

Heath AM2 SWR meter, Lafayette VOM $8 ea, DPDT 6 VAC or DPDT 110 VAC coax ant. relay $6 a pp, W9DI 22 S. Clay, Hinsdale, IL 60521

Want: Heath SB110 and control box for TR44, WA8WOY, C. Watson, Scottown, OH 45678

Swan 250 6-M SSB xcvr w/117 xc supply $299, Sonset sidewinder 2M, SSB xcvr w/ac $199, exclt K4HHH, Box 1391, Clearwater, FL 33517

Have HRO-60 & ABCD-AD coils, need all plus mtch pkr, crystl calbrtor, other accessories, good condx .J. Bondurant, Box 7171, Tampa, FL 33603

Sell: Heath HW-17A 2meter rig AC & DC suply, FM or AM w/crystals mike, will ship pp, $120 or rade WB4OQL, 14 Lorena Dr., Taylors, SC 29687

Two stancor transformers, P-6379 12v 16A; 24v 8A 115/220 small, new cost $22, FOB $12; new W&R RA-300 250w reg pwr 12v 4&A, 24v $25 W4API, Box 4095, Arlington, VA 22204

Sell: 3600-0-3600 1 amp plate xfmrs 110-220 pri-mary $25 FOB. Want: Telrex 40, 20, 15 mtr beam. WØAIH, P. Bittner, 814 4th St., S. Virginia, MN

Ham mags for sale-immaculate condx CQ 1958-70 QST 1958-68, 73 1964-71, Ham Radio 1968-71, Hop Electronics 1961-71, no reasonable offer re used, K8OUQ, 268 Annis Court, Chillicothe, Oh

Sell or trade: B&W 5100B/51SB-B CW/AM/SSB ng cost $740 new. Now on air as standby 4 thru 0mc. Make offer, W9TLU 312-34505191 May Wood, IL

Sell: 2 Meter HW-17Aw FM kit, unused, small bug, m lazy, $95. M. Kinney, WA2CDE, 2 Howard Blvd lyde Park, NY 12538

Want: owners opinion of Justin 5-watt SSB rigs, FT-101, KWM2 & Swan noiseblankers, vert arrays n 40 meters. Dave, K9UIM, Olney, IL

Sell: Ten Tec PM-3A QRP transceiver, 40-20 met-rs, 5 watts, like new condx, $45 plus shpg, Tony asciato, K4DSZ, 3813 Charter Oak Rd, Virginia each, VA 23452

Sell: HP-522 counter & manual, delay line missing 25, as is. Marty WB6NWW, 5349 Abbey Field, ong Beach, CA 90815, 213-597-2631

IBM model B standard electric typewriter, very gd ondx, $125, 28LPR typing reperf, unused, $45. Aircraft engcy horn 28v @ 5.5A, $29, K3MNJ 8361 Langdon, Phila, PA 19152

Wanted: TR-4 rotor gud condx, name price, WN6-XM, 5917 Stoneview Dr., Culber City, CA 90230

Wanted: FCC 1st class correspondence course. KH-HFJ, P.O. Box 514, Wailuku, Maui, Hawaii 96793

Sell: SBE34 transciever very gud condx, certified heck or MO for $175, will pay shpg, K3MJL, 1202 . Gemini St., Nanticoxe, PA 18634

Want: schematic or panalyzor model SB-8b, type 0,000, please quote price, W4NEF, 1157 River-ront, Eau Gallie, FL 32935

Heath freq counter & home brew prescaler to 150 hc, $150, HyGain 64-B6 mtr beam $15, WB2NRU, . Graulich, 1157 Concord, Haddonfield, NJ

Sell: SB-300 $165, gd condx, also new Electro-Voice noise canceling mic EV-609, $24, M. Patton, Madrid Plaza, Mesa, AZ 85201, 602-833-2570

NCX-3, NCXD AC plus shprk, Linear sys DC supply mic; all exclt elec & mech $250 plus shpg, WB6KFI 30646 Rigger, Agoura, CA 91301

6-ft rack w/five 19-in panels (3 new alum.) will de-liver nearby $17, W2WLJ, 17 Coleman, Berlin NJ

Wanted: SB-630 station console, SB-610 signal monitor, SB-620 spectrum Analizer - any condx considered, sell: HD-10 Keyer $25, K9WQY, Bill Vokec, Box 216, Mansfield, IL 61854

Acapulco vacations: rent a furnished apartment w/ air conditioning in Acapulco, in front of the beach XE2RJ, Box 978, Monterrey, Mexico

Tone burst units, 12 button touch tone encoders, transistors, send 25c for lists, CRD Amateur Radio Club, P.O. Box 291, Western Spring, IL 60558

Novices: Eico 723 60 watt xmtr w/4 xtals. $25 you pay shpg, B. Frahm, WAØTAS, RFD 2, Box 110, Colby, KS 67701, 913-462-3716

Y.C.B.U. young cb'ers united. JOIN TODAY! Write Dennis Dean, KDR2451, 500 Oxford St., Baycity, MI 48706.

REALISTIC HI-LO BAND POLICE & FIRE radio, 1 1/2 watt walkie-talkie. Portable low band crystal radio. Brett Berrie (516) 466-5959.

FOR SALE: Old echophone and Clarion Jr., Elec-trio radios, name price. Puzo Crystal Microphone-$5.00. Write only to Dwight, WNØGUA, Overton, WE 68863.

TRANSFORMERS REWOUND, Jess Price, W4CLJ, 507 Raehn St., Orlando, Fl 32806.

WANTED: Chandler Code and Speed Typing cour-ses. WA2GJY, 9017 Brookside, Niag. Falls, NY.

FOR SALE: Lafayette HE45-B 6-meter trans-ceiver. $75. Will Ship collect. WØOCO, 108 W. 11th St., Sedalia, MO 65301.

HQ-180A Gen. Coverage $280. Galaxy V MK II 400 w. Pep with AC and DC supplies, VOX, and Hamcat with 15m and 20m Resonators, $295. You ship. All in perfect operating condition. Bill Win-stead, Rt. 3, Box 396, Phil. Miss., 39350. 601-656-5404.

FOR SALE: HR-10B, needs slight alignment $40. HG-10B VFO, needs work $15. Lafayette Semi-Automatic Bug $10. Todd Hayen, WB4RMQ, Box 151, Middletown, VA 22645.

Two Channel G.E. Pocketmate walkie-talkie, 2 1/4 X 7 3/4 in. Easy conv. to 2m. First $150. M.O. tales; Ken Prouty, WB4SPD, Greensboro, NC27407.

TELETYPE TAPE 11/16 Yellow oiled. 40 roll case. $6.00 (plus shipping) KØYLY, 8620 West 74 St., Overland Park, Kan. 66204. 914-432-7566.

SWAN DC Module 14-C, Lafayette HA-460 6M xcvr. Both excellent condition. Best offers. WA3-RJM, 1180 Ruxton Road, York, PA 17403.

SELL: 10 pr 110 v AC Synchronous Units type XV. Unused surplus in original metal in wooden containers. $20 pr. Use on globe to show antenna direction. W4BPQ, 1414 Ft. Bragg Rd., Fayette-ville, NC 28305.

WANTED: Hunter Bandit Linear Amplifier 2000B. Must be sound and clean. W9CN, P.O. Box 129, Lake Forest, IL 60045.

WANTED: Info or any clue to determine IC type or number for many unmarked SN74 series IC's on hand. Your postage costs guaranteed. WA6MWG, 4040 Via Opata, Palos Verdes Est., CA 90274.

Motorola, 25w, Consolette Base, T34/94, R76/94, 110VAC, $320. 5w, P-33 H-T, 6/12 UDC Nicads, T34/94, R94, w/mic $235. WB4VEL, Bowman, 30 Lakeshore Dr. 10B, Hampton, VA 23366.

FOR SALE: Johnson Valiant I-$135.00. Johnson 6N2-$85.00. Hammarlund Super-pro BC-779B w/ AC Power $75.00 Norther 4A Rtty fsk w/AC $60. All with manual fob. Ashley, Box 254, Ware Shoals SC 29692.

HALLICRAFTERS HT-37, mint condx - $194.95. Also, Hallicrafters SX-111 - $145. Marine Electronics 76 New York Ave., Halesite, L.I., New York 11743. Phone 516/427-7199.

ARIZ. Phoenix VHF Radio Club, 1st and 3rd Wed. 8 PM, 1510 E. Flower (Red Cross Bldg) Visitor welcome.

WANTED: AMRCO CN 50 CN 144 CN 220 432 15-N PS1 5-W CB-6 CB-2 $10.00 (W6 RQZ) 1330 Curtis St., Berkeley, CA 54702 (415) 526-7345.

6AG7, 6SN7, 6SL7, 6SQ7, 6SK7, 5U4, 5R4, 2D21, 12A6, 6AL5, VR-tubes, 4 for $1.00. 6L6, 6V6, 6Y6, 6F6, 2 for $1.00, 6146, 416B, 807, 1625, $1.50. Good Pullouts, J. Schrenk, 2707 McDivitt Rd., Madison.

WANTED: Galaxy V Crystal Adapter (NOX 1) SELL: GSB 201 Linear - excellent-$175. Nathan J. Capon - WA2PHF - (212) 358-3009.

WANTED: ART-13 or other surplus xmitter HV. N.R.I. + spayberry servicing course to sell, Don Ryan, Star Rt., So. Plymouth, NY 13844.

FOR SALE: Precision ES200 Scope, Precision E200 C Signal Generator, Globe Scout 6-80A with power booster, any offer, K5ZUV, Box 7502, Miami, FL 33155.

Sell CQ's from 1945, QST's from 1915. Wanted old battery radios, Wireless receivers, transmitters books catalogs, magazines, Call books and radio books. Erv Rasmussen, 164 Lowell, Redwood City, CA.

Selling Hallicrafters SR-150 Xceiver and mobile accessories, phone patch, SWR coupler, grid dip meter, mikes, headphones, others. Send SASE. WA3LRJ, 1160 King George Ct., Pittsburgh, PA.

4BTV WANTED. C. R. Sprague, 2016 Madison St., Stevens Points, WI 54481.

SALE-NO TRADES: SB400 $180, Warrior $160, HQ 170 w/spkr $175. Offer? Dick Sloan, W6NOQ, 3700 Christmas Tree Lane, Bakersfield, CA 93306.

Many thanks to all the fine 6 meter ops who helped me qualify for USA-CA 500 No. 10 all 50 MHZ phone. WA1DFL, Steve, Revere, MA.

RTTY PICTURE TAPES error free. Sell or swap, Stamp for list over 300. Also have 8-level form. K2AGI, 5 Hansell Rd., Murray Hill, NJ 07974.

Free Book on auto ignitions "VIX" for postage. K6ICS, 9418 Florence, Dowiley, CA 90240.

Sell: Heath HW12A, AC and DC supply $135.00, HW32A AC and DC $135.00 Ameco R-5 Rcvr. $40 Mint, DiLiberti, 1601 Chickasaw Rd., Arnold, MD.

SELLING: Mosley CL-33 Tribander, $50. Pickering IC Keyer $50. Heath Lab Signal Generator $50. Heath Apache $75. Hammarlund HQ-110 with HC-10 Slicer $125. Johnson Matchbox $20. Q-5er converted, $10. Collins 2.1 kc, 455kc center filter with two tube converter $20. Joseph Marshall, 147 Middleville Rd., Northport, NY.

SELL: Motorola U43 GGT and HT-200. Both on 2 meters with xtls and accessories. SASE for details W4JGO, 643 Diamond Rd., Salem, VA 24153.

TA-31 Rotary Dipole used indoors $25. Polycom 6 & 2 Tranceiver with M+2 Turner Preamp Mike-$100. HA460 6 Meter Transceiver with Squallo Ant. $95. DX60B $50. Heath IM-36 Transistor Testor $45. Pick up only. Dave Buda, WA2RYC, 25 Meacham St., Belleville, NJ 07109.

Air-Dux Coil 195-2 $15. Tubes 6021, 6AJ4, $100. Johnson Modulator $3.00, Sig Generator TS-497A/URR offers, ship xtra. W5SYB, 5000 Hall, Amarillo, TX 79109.

Kuhn Model 357C VHF-UHF Monitor Receiver 25 to 250 Mc's $60. J. Mazur, Jr., 894 South Park, Buffalo, NY 14210.

Blind-handicapped awards hunters. Join CHC and its 12,000 members worldwide. No dues or fees charged the B-H. Apply to IARS, Inc., Box 385, Bonita, CA 92002 (IRS Tax Exempt).

WANTED: Old radio tubes & radios made before 1925. State condition & price. Leo L. Gibbs, W8 BHT, 701 Brookfield Rd., Dayton, OH 45429.

FOR SALE: NCX500 with matching AC supply. 500 watts ssb/cw 5 bands FACTORY RECONDITIONED. $225 plus shipping. Tom Dornback, 2515 College Rd., Downers Grove, IL 60515.

KWM-2 w/Waters Notch Filter, plug-in gold plated relays, in Mint Condition $550. L. Williams, WB9FBJ, Star Rt., Box 109B, Townsend, WI 54175.

Sell or trade: TS-173UR freq meter, new 7213 tube, need any module boarder for ANUSM 207 freq counter. D. DeCobert, 609 Henrietta, Gillespie, IL 62033.

Wanted: old battery operated radios of the early 1920's, need not be working. Also want crystal sets old iron or tin toys and trains and lead molds, give price & model. McKenzie, 1200 W. Euclid, Indianola, IA 50125

Want: mint 32S-1 with AC supply & manual. Must be reasonable. Rotunno WA2CKM, 1816 Park View Ave., Bronx, NY.

Galaxy 300, AC supply, H.B. Amp. Pair 813 $200. Sixer $30, WRL techceiver w/AC $25. KOAHL, H. R. Thompson, Centralia, MO 65240, 314-682-3170

FTDX560, mike, spkr, new finals, $400. W3MBO, 2004 M 61 St., Philadelphia, PA 19151.

Yaesu FTDX 400 $299, FL2000 $199, Both $439. Factory A-1 shape, mint box, 1975 Beverly Hills, CA 90213, 213-472-2413.

DXCC with under five watts? Read about it in The Milliwatt, plus QRPp transmitter projects, news, QRPp WAS/DXCC, QRPp bibliography, $3.40 per year. Ade Weiss, K8EEG/Ø, Meckling, SD 57044.

Homebrew Linear. 4-811A in GG in Bud cabinet. First $75 takes both FOB Dallas, M. Gaston, 2117 Westlake Dr., Plano, TX 75074.

NOVICES-Compete for awards with the best of them. I am Secty Int. Novice AR Assn., of International Amateur Radio Society, Inc., an IRS tax exempt Foundation. Write WB9AHJ.

JOIN UP. International AR Society, Inc. a non-profit, IRS tax exempt Foundation with over 100 category sub-divisions worldwide with 12,000 members. Write Box 385, Bonita, CA 92002 for dull details.

FOR SALE: New Simpson Model 351 TV Antenna Compass. $5.00 plus postage. Sly, 217 Santa Mariana, La Puente, CA 91746.

FOR SALE: HG-10B, $30; SX-100, $60; SB-10, $70; Apache (TX-1), $75; Swan 410-C, $65; Pay Postage. WA9MFZ.

Drake TR-3, AC-MS-4, & Mike, 325, Swan 140 with DC supply $90. 7104 Deveron Ridge, Canoga Pk., CA 91304.

SALE: Two JAN-813 tubes, two RCA-809s. Make offer. Good condition. W6DOU, 3154 Stony Point Rd., Santa Rosa, CA 95401.

NEW DOW COAX RELAYS $10. 150w/2kmHz, 250w/150mHz continuous, low loss. SASE for specs. Fenwick, 220 19 St. NE, Cedar Rapids, IA 52402.

Background Music Tapes. All Different. Plays 13 hours. $15.00. Schunke, 14 N. Avena, Lodi, CA 95240.

WANT: Wm B. Duck Catalogues No. 12-13-14-15 also De Forest Unit panel. Buy or trade for. Glen Angle, KØTAM, Clear Lake, S. Dak 57226.

FOR SALE: Central Electronics 200V, Manual $30
WANTED: SB-640 LMO, Manual. K3MGO, 12 Larchwood Rd., Wyomissing, PA 19610. 215-374-9342.

FOR SALE: New Ten-Tec PM3A xcvr $59 (reg. $79) Knight T-175 linear $69. RCA WV-38A VOM $15. WAØBXD, P. Aadland, Sisseton, S. Dak.

FOR SALE: Heath DX-60 Xmtr, HG-10B VFO Collins 75A1. Morrow MB-560-A xmtr. Eico 42 scope. Make offers. WB6GHO, Mike Axton, 103 Remington Dr., Building 4, Apartment 1, Sunnyvale, CA 94087.

FOR SALE: HT 37 with new power transforme and VOX relay spare tubes for finals and othe stages, ship anywhere in original carton $175 pe fect condition. Dave Goggio, W4OGG, 1419 Fave Dr., Memphis, TN 38115.

TEAC 1500D Tape Deck, perfect condx. Cost $45 new; I'll ship to you for $220. WN4UCC, No. 96 Hallmark Estates, Athens, GA 30601.

SALE: Turner M+3 transistorized mike. New $20 Heath GH-12 PPT Mike $5.00 Douglas, 6 Damo St., Belen, NM 87002.

CLEGG ZEUS 6 and 2 meter transmitter, need work, bad modulation, $100 as is. You pay ship ping. Box, WA8IWX, 23016 Schafer Dr., Mt. Cle mens, MI 48043.

Collins 75A4 Receiver $275. Hammerlund HQ17 AC Receiver $225. Both good condition with orig inal books. WA4AUF.

DRAKE DC-13 12 volt DC supply for TR-3, TR T4x $65.00 Delivered. Perfect condition. With man ual and cable. W4YOK, 2063 Wyandotte, Owen boro, KY 42301.

SALE: Heath HR10B with speaker $65. Allie A2515 with speaker $70. Roger Hamilton, WN8LI 5001 Shelbyshire, Utica, MI 48087.

Unconverted BC-453 Low Freq. "Q" Fiver Receive $15.00 plus postage. W6BLZ, Colima St., La Jolla CA 92037.

NEED: Schematic for Gonset Super Six and Gon set Two Meter Converter model 3008. Sell 75A- $390, CE-100V $275. K8EKG, 1020 Fourth SW Massillon, OH 44646.

FOR SALE: MX128/ART-13 transmitter, New 81 tube & full manual. You pay shipping. Best offe over $50.00. J. Manion, 1208 W. Fairview, Dayton OH 45406 - WB8CZX.

SELL: New IC 21 $250. plus postage. Yaesu FT 101 w/acces, other Jad equipment, KIPSK, 51 Midland Ave., Stamford, CT 06906.

FOR SALE: AC Adaptors, 6 VDC 150MA, Standard plug, brand new. $3.50 postpaid. K2MFY, 2 Nutley Ct., Plainview, NY 11803.

CLEANING SHACK-everything from Rtty convert ers and ham equipment to parts and tubes. SASE for list. Barry Ford, 305 N. 5th, Millville, NJ 08332

FOR SALE OR TRADE: One - 500C Globe King transmitter $150. One - complete rig multi-Elmac AF68 Transmitter PMR8 Receiver and power sup ply. $125. All in good working condition. Bob True, K4JBP, Madison, Ala. 35758.

SALE: Pair unused 4 X 150's $10., cartoned West inghouse 0-300 Volt AC panel meters, 2 1/2" sq cases $3.50 ea. SASE for goody listing. G. Samkof sky K4HRU, 4803 Brenda Dr., Orlando, FL32806

VESTO 61' tower, $125.00. SB-10p/s, $40. TTY 15, $30. Mod 14 Typing Rep, $25. Mod 14 T.D. $20. Drake 2B, $150. Temp 12 V.D.C. MPX/FM car stereo, $45. Jim K6QDV, 2976 Los Altos, An tioch, CA 94509.

SALE: 24V 40A Reg.Ps., 4 wire coiled cords, xtal marker generator, 2 mtr xmtr TDQ, PC card assy Conrac 14" monitor, ball bearing casters. Paquee 53 Jerome Ave., Trumbull, CT 06611.

FOR SALE: BC 375 complete unused; 14" Conrac TV monitor; coiled telephone cords, new; TDQ 2 meter transmitter; Beckman Scanner; 24 V PS 40 Amp reg. Karl H. Paquee, 53 Jerome Ave., Trum bull, CT 06611.

WANTED: 19" racks, "B" or "C" Band transmit heads for TRC-24. T.N. Colbert, 1008 Englewood Dr., Parma, OH 44134.

CQ BOOK SHOP

Ham's Interpreter

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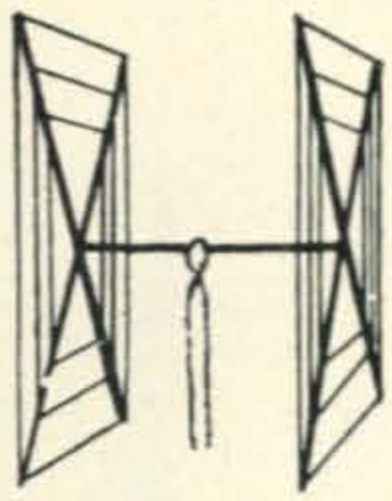
Worked 42 countries in two weeks with my Gotham Quad and only 75 watts . . .



W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount: uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished); 52 ohm coaxial cable

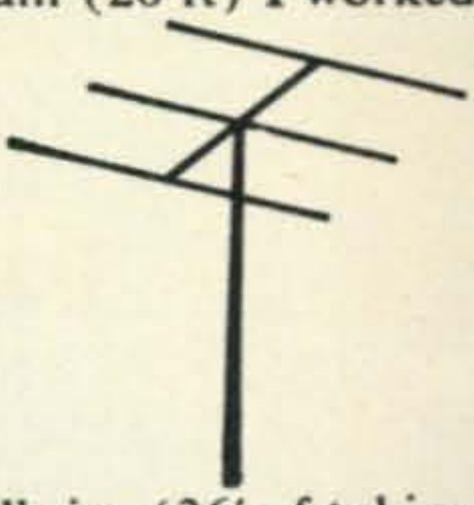
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$37.00
10-15 CUBICAL QUAD	32.00
15-20 CUBICAL QUAD	34.00
TWENTY METER CUBICAL QUAD	27.00
FIFTEEN METER CUBICAL QUAD	26.00
TEN METER CUBICAL QUAD	25.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$21	4 EL 10	20
3 EL 20	27	7 EL 10	34*
4 EL 20	34*	4 EL 6	20
2 EL 15	17	8 EL 6	30*
3 EL 15	21	12 EL 2	27*
4 EL 15	27*		
5 EL 15	30*		

*20' Boom

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts!
FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
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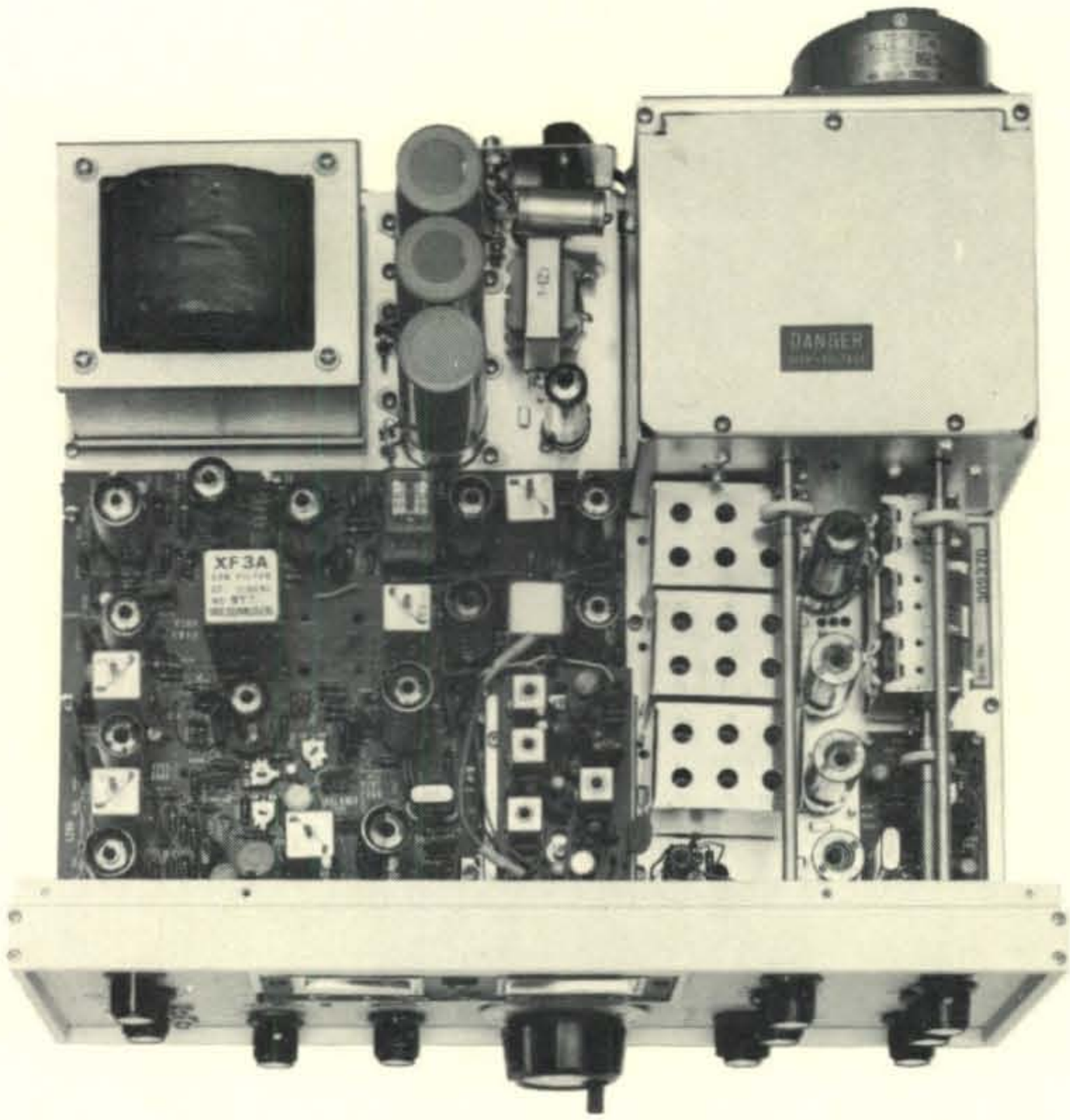

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