CQ

February 1972
$1.00

1971 CQ WPX Contest Results

.....see page 34

The Radio Amateur's Journal

08240

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"Maxi-Rig" is your ticket to the world.

The incomparable Heathkit SB-102 Transceiver.
SSB/CW, 80-10 meter coverage. Still only 380.00*

The Heathkit SB-220 Linear Amplifier.
2,000 watts P.E.P. SSB input, 1 kW CW. Just 349

Here's exceptional stability and dial linearity — made possible by an all solid-state linear master oscillator with 1 kHz calibration. The SB-102 stabilizes itself in a fast 10-minutes, drifts less than 100 Hz per hour after initial warm-up. The new receiver section delivers an S+N/N ratio of less than 0.35 uV for 10 dB — with front-panel selection of built-in 2.1 kHz SSB crystal filter or optional 400 Hz crystal filter. And there's a dial resettable to 200 Hz; 180 W PEP SSB input, 170 W CW input; switch selection of upper or lower sideband and CW; built-in sidetone for monitoring; built-in 100 kHz crystal calibrator; triple action level control to reduce clipping and distortion; built-in VOX, and complete metering.

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Kit SB-102, 24 lbs. **380.00***

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SBA-100-1, mobile mount, 6 lbs. **14.95***

The Heathkit SB-220 is the linear amplif that the competition tries to measure up Two conservatively rated Eimac 3-500Z's i grounded grid circuit offer up to 2000 W P SSB input, or a full 1 kW on both CW a RTTY. The broad-band pretuned pi-input livers maximum efficiency with low distorti over 80-10 meters. Only 100 watts of drivi power is neded to produce full-rated input.

SB-220 features include a built-in solid-sta 120/240 V power supply; circuit breaker p tection; zener diode regulating operating bi to reduce idling current for cooler runni and extended tube life; a large quiet fan; A to the driving unit to prevent over-drivir front panel switch selected monitoring of gr current; relative power and high voltage. T SB-220 offers a clean, compact design wi the liberal use of internal shielding for ext strength and component isolation. Its gre table-top cabinet complements all your S series gear.

And tune-up is fast and easy. Just set the bar switch, push the CW-Tune/SSB rocker swit to CW-Tune, adjust the Tune and Load co trols for maximum relative power. Push th rocker switch to SSB and you're ready with full 2-gallons. The Heathkit SB-220 brings yo rig up to the performance limits — order you now!

Kit SB-220, 69 lbs. **349.95**

FEBRUARY, 1972 VOL. 28, NO. 2

The Radio Amateur's Journal

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OTHER MULTI-BAND ARRAYS AVAILABLE

Elements shortened to show details.

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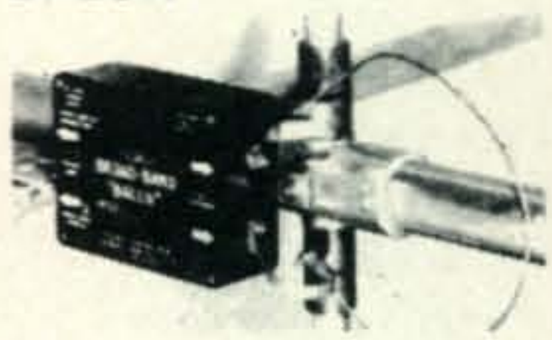

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Mod. 2M814C-	2 mtr. 8 el. array, 16.5 DB gain, 300 W pow. rat., 1.375" x 14' boom	59.00
Mod. 6M516-	6 mtr. 5 el. array, 13 DB gain, 400 W pow. rat., 1.5" x 16' boom	63.95

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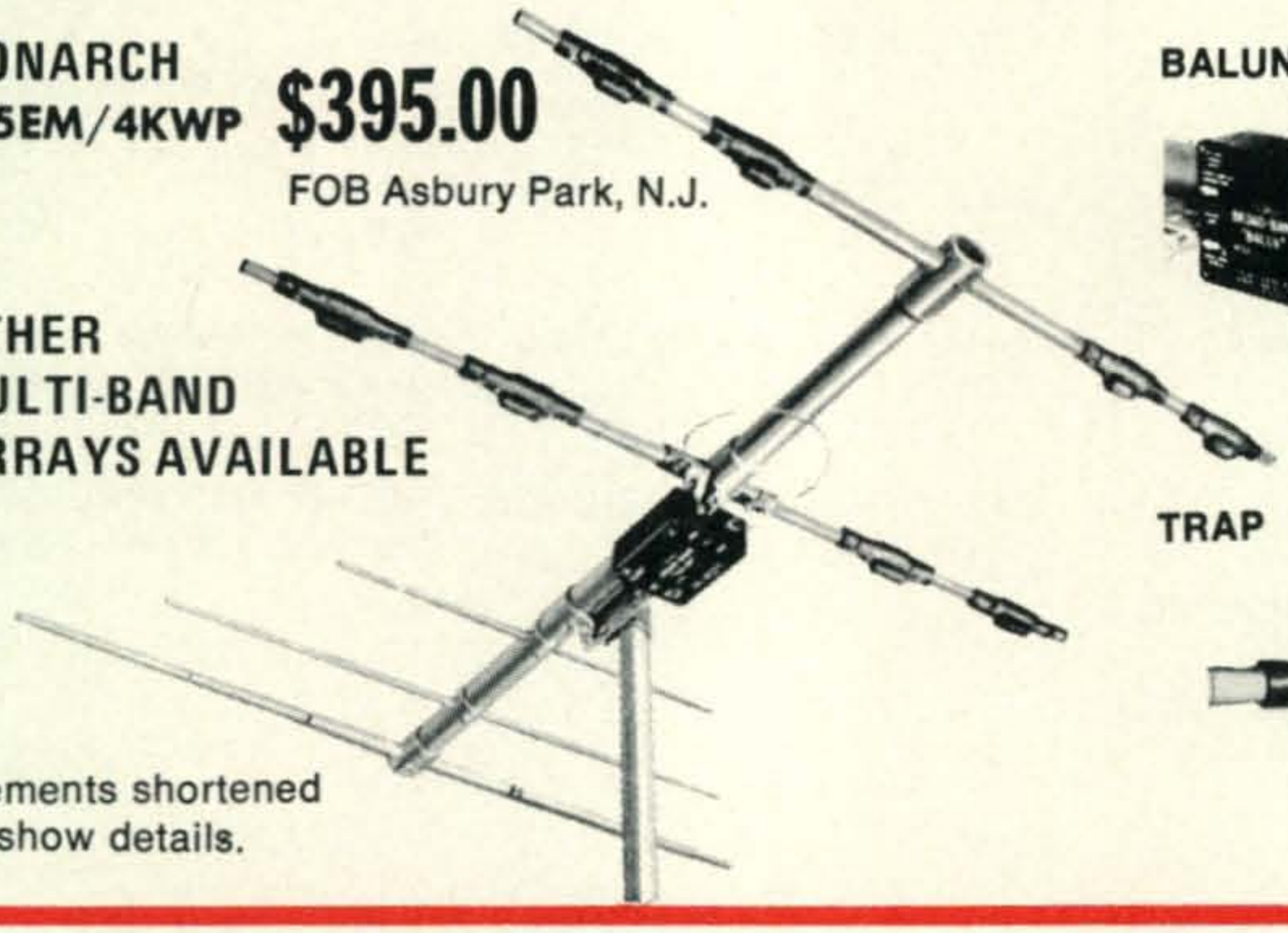

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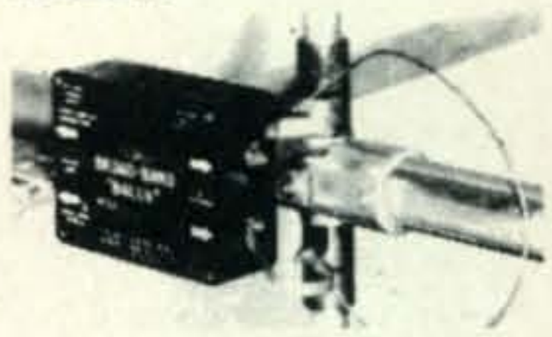

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SINCE 1921

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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.

OUR READERS SAY

APO QSL'ing

Editor, *CQ:*

Here are a few facts about Germany that you may not be aware of. Also, you may be wasting some of your hard-earned cash needlessly.

As of last January, Germany started issuing the DA1 and DA2-prefix callsigns to Americans serving with the NATO forces in Germany. Add these new calls to the already existing DL4 and DL5 calls, and you have quite a few American hams in D-land. When the holders of the DL4 and DL5 leave Germany, the calls will be reissued to Germans.

All U.S. military personnel serving overseas world-wide have either an Army Post Office (APO) or Fleet Post Office (FPO) address which is connected to some U.S. city (*i.e.:* APO NY, APO San Francisco; FPO San Diego, etc.). It has been noted that some hams, especially novices, are putting entirely too much postage on their QSL cards addressed to an APO or FPO. All that is needed is the standard First Class postage. Once the card reaches the APO or FPO city involved, it is air mailed to its destination. If you do send your card via APO or FPO, *do not* list the call sign country (*i.e.:* DA1KL, APO NY 09154 West Germany). This may be interpreted as international mail and then it will cost you a lot more. Just use the person's name, military address, and the APO. Also, instead of an expensive IRC, just place a First Class postage stamp in your envelope. This will cover any return QSL card from any APO or FPO in the world.

Bill Moore, Publicity Director
ARC of Stuttgart
Stuttgart, West Germany

The Golden Years

Editor, *CQ:*

Having operated similar junk box gear as described on page 16 of November '71 issue, I certainly appreciated the article; especially the remarks vis. store boughten stuff. Small wonder that many of us old timers have been disgusted with the present day conditions on the ham bands.

Enough of this. My question is this: in reference to schematic on p. 18, how does this rig get its drive inasmuch as the circuit shows an awful big air gap between C_6 and grids of the pair of 46's. I'm sure the original must have been connected okay. Those rigs sure did get out and had a nice sweet sounding signal. Of course in those days we didn't need umpty thousand kw. Had more of a brotherhood. Keep up the good work.

E. H. "Ed" Marvin, W7IIA
Beaverton, OR

Editor, *CQ:*

I read the article written by Bill Orr, W6SAI, with much interest and considerable nostalgia. I built my first "tube type" receiver around a UV-199 peanut tube in 1921. Circuitry was "single circuit, regenerative, and very hot."

My present call and license was received in 1939, after a year of bootleg operation. A 45 tube as a Hartley Oscillator with "loop modulation" was the phone rig. You late comers with factory built transceivers *did not* discover f.m.

Back to the W6SAI article, the schematic (fig. 1) with "phantom" drive to the 46's is a dandy. Is *CQ* emulating *QST* with the unedited schematics? I hope you get those 46 grids connected to the oscillator before too many of the gang build by the schematic.

D. V. "Den" Tolle, W9EBT
Canton, IL

Editor, *CQ:*

Bill Orr's article on the 1934 transmitter I found very delightful. I have also become fascinated with the antique aspects of amateur radio. I believe that the future of amateur radio is dependent upon having more home construction. If we cannot have people build modern equipment, let us at least have them build replicas of the old, when things were a lot simpler. Perhaps when they have gotten a taste for building the old, they will try building the new.

On the day when I read Bill's article, I had just worked Japan on 80 meter c.w. using my new "1927" transmitter based upon the cover article in January 1927 *QST*, which incidentally was the first issue of my regular subscription. When I became interested in antique wireless, I was intrigued with the idea of going on the air with the earliest type of transmitter that would put out an acceptable signal, and it seemed that an all-triode crystal controlled one was probably the best I could do. That article was by no means the earliest on an amateur crystal controlled transmitter, but it appears the first one to attempt to popularize the subject, as the circuit is unusually simple. To avoid neutralization, the final is operated as a doubler.

My transmitter employs the same general layout and method of construction as the original with the important difference that it uses the tube line up of 210 crysal oscillator and 203A final instead of 112 and 210 respectively, but this change is historically correct. Not having a center-tapped filament transformer, following the First Edition of the ARRL *Handbook* (1926), I made a center-tapped resistor out of two Christmas tree bulbs in series. I have worked Japan on 40 meters with the final frequency doubling as in the original, but most of the time I operate the amplifier straight through with a neutralizing capacitor mounted on the plate tank coil. The 203A is drive hungry and is not driven to full output, but the output is approximately equal to another transmitter with a 6146B in the final. I have had nothing but favorable comments on the signal. Ironically, simultaneously, I have had a number of complaints on "chirps" and "ICW" on a modern commercial s.s.b. rig when used on c.w.

While in principle the rig is operational in its

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original bread board state, I have not even bench tested it in this condition. I have been worried not only about TVI, but, also in my present ancient absent-minded state, about the exposed high voltage. Therefore, before applying any power, I put it bodily in a shielded box with extra by-passing and a TVI filter on the output. It seems to be completely clean on our TV set.

As a receiver, at present I am using a modern one. Since my objective is to have a pre-1930 all-triode station, I am looking for a Grebe CR-18 on the antique market rather than for an SW-3. I do not expect to find one. Therefore, I am collecting the parts to make a receiver using the same circuit—a detector and one step with 201A's (see June 1926 *QST*, p. 24). I shall compromise with the modern world by mounting it in a shielded box with extra by-passing on the output and by putting a Pi step attenuator on the input to help protect it from blocking. A couple of years ago I built a transistorized regenerative receiver this way, and it appears to be completely free of body capacity and it is stable enough to copy s.s.b. on 75 meters.

I hope that we shall have a lot of other "antique" stations on the air.

Yardley Beers, WA1NOJ
Boulder, CO

Editor, *CQ:*

I just received the November issue of *CQ*. I was especially interested in that old time transmitter using a 47 oscillator and a pair of 46's in the amplifier. Many years ago I had a transmitter identical to that one. I noticed a little difference in the wiring however. My rig had a coupling condenser from the plate of the oscillator and also had a resistor going from the grids of the final to ground.

Richard E. Wheaton, W9HL
Valparaiso, IN

Equipment Stolen

Editor, *CQ:*

On September 26, 1971 my home was burglarized. In addition to a list of hi-fi and electronics equipment that was taken, my new General Electric Personal Master Portable Radio Model PR-36-RFS-55, serial #1041218, 4-frequency (.28/.88; .94/.94; .34/.94; .34/.76) is also gone. This unit can be positively identified by special modifications and markings. A reward is offered for information leading to its recovery.

Contact me or the Rochester, Police Department, Detective Division.

Melvyn S. Stoller, K2AOQ/WA7QYM
373 Park Ave.
Rochester, NY 14607

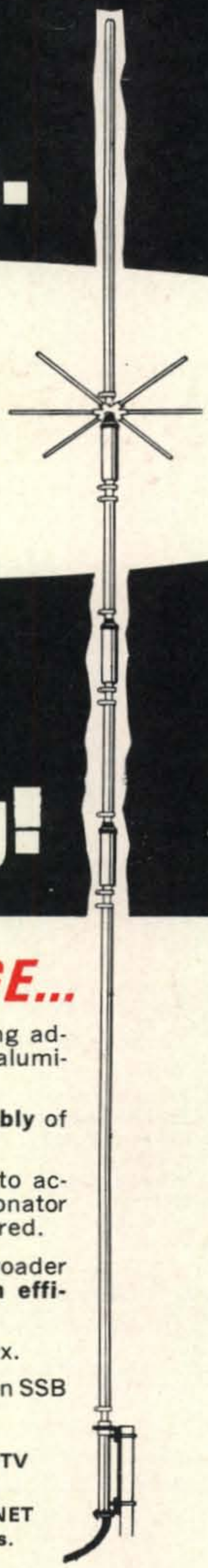
When A Bargain Is Not A Bargain

Editor, *CQ:*

While I have faithfully read and enjoyed Gordon Eliot White's SURPLUS SIDELIGHTS for years, the November '71 article is for real. Reading it made me laugh and cry depending on which of my experiences I remembered.

By not examining Defense Surplus Sales offerings personally I have become the unproud owner of cables without connectors, meters without glass coverplates, receivers without tubes

Everyone has something.



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Ben Bryant
W8IGQ

and lots of assorted electronic parts that weighed one-half of what the description listed.

Bidding is fun and can be rewarding but never —I mean *never*—bid without looking.

As Mr. White also stated, scrap (junk) yards *can* be excellent sources of electronics equipment. Lots of my best buys, condition and price-wise, were from junkyards I was patronizing for other materials.

More articles along the lines of this one will be appreciated. While I don't like to be burned, neither do I wish it on someone else. Keep telling it like it is!

Joseph I. Lisaius
W. Caldwell, NJ

Announcements

Southfield, Michigan

The Southfield High School Amateur Radio Club will be holding its 6th annual Swap and Shop on January 16th, 1972 at Southfield High, 24675 Lasher Rd., Southfield, Michigan (just northwest of Detroit near 10 Mile Rd. and Telegraph Rd.) It will run from 9 A.M. to 5 P.M., with refreshments available.

Schererville, Indiana

The Lake County Amateur Radio Club, Inc., announces its 19th Annual Banquet to be held at 6:30 P.M., CST, February 12, 1972, at a new location. They outgrew the old place; therefore, have moved to the Scherwood Club, 600 E. Joilet St., Schererville, Indiana. Join them with your wife or girl friend and enjoy good food (all you can eat), entertainment, speeches, awards, and fellowship. At the new location, there is plenty of space to circle around to visit with your friends throughout the room. The Scherwood Club is less than a mile from the junction of U.S. Routes 30 and 41. And to help people unfamiliar with the area they have printed a simple map on the back of each ticket. Tickets are $5.00 each and are available from Herbert S. Brier, W9-EGQ, Ticket Chairman, 385 Johnson St., Gary, IN 46402, and from various other club members. Positively no tickets sold at the door.

Wheaton, Illinois

The Wheaton Community Radio Amateurs (WCRA) will hold the tenth annual Mid-Winter Swap and Shop on Sunday, February 20, 1972 at the DuPage County Fair Grounds, Wheaton, Illinois. Hours—8:00 A.M. to 5:00 P.M. $1.00 Advance/$1.50 donation at the door. Send SASE for advanced tickets P.O. Box QSL, Wheaton, Illinois 60187. Refreshments and unlimited parking. Bring your own tables. Free coffee and doughnuts 9:00 to 9.30 A.M. Hams, CBers, electronic hobbyists, friends and commercial exhibitors are cordially invited. Write W.C.R.A., L. O. Shaw, W9OKI, P.O. Box QSL, Wheaton, Illinois (60187) for information.

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- Built-in VFO (Frequency converted for stability*)
- AM and FM both crystal and VFO
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- 10¼"W x 6¼"H x 7½"D

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*VFO operates from 7 to 9 MHz and is converted to 72 to 74 MHz using a 65 MHz crystal oscillator. 72 to 74 MHz is then doubled to 2 meters.

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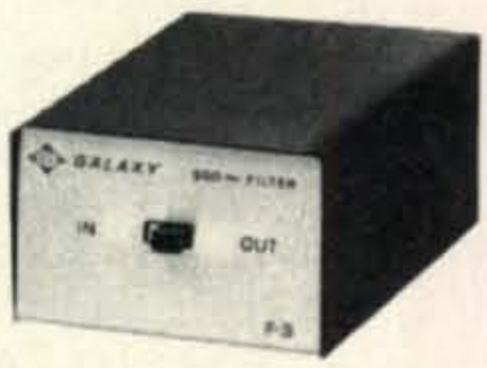

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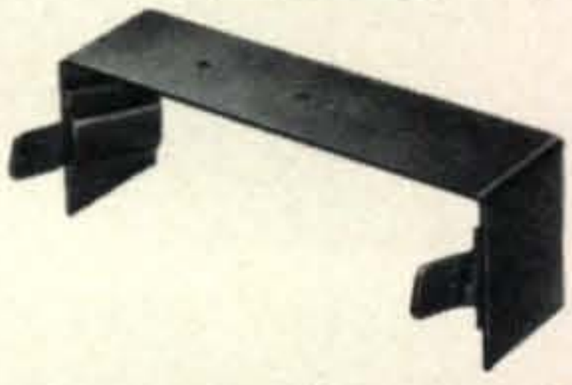

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Putting The Heath HW-17 and HW-17A On 2 Meter F.M.

BY IRWIN MATH,* WA2NDM

THE Heath HW-17 and HW-17A two meter transceivers are "naturals" for conversion to f.m. operation. They feature crystal controlled transmitters and tunable receivers capable of much more sensitivity than rated. This article will provide a straightforward and relatively inexpensive conversion of the HW-17 to the HW-17A, and then to full a.m./f.m. operation. The final product will have an a.m. or f.m. sensitivity of 0.25 to 0.3 microvolts, and an f.m. r.f. output of 10-15 watts.

HW-17 to HW-17A Receiver A.M. Conversion

The following steps are necessary only for the older HW-17 units, to bring them up to HW-17A standards.

1. Remove top and bottom covers of the transceiver and be sure to save all hardware, feet, etc.
2. Referring to the receiver printed circuit board, in the vicinity of Q_{12}, remove C_{234}, a 10 mf electrolytic capacitor, and replace it with a .01 mf disc ceramic.
3. Remove R_{238}, a 470 ohm resistor.
4. Add a 1N914 silicon diode from the junction of the .01 mf capacitor just added and Q_{12}, to the cathode of D_{204}. D_{204} is located right near the printed circuit potentiometer. The cathode of the 1N914 should go to D_{204}.

These steps will eliminate the noise fed to the audio amplifier from the microphone stage while in the RECEIVE mode. Now, the minimum setting of the volume control will be just that—no more annoying background hissing noise.

This completes the a.m. receiver conversion as far as Heath is concerned. It will be noted, however, that there really isn't adequate gain in the system. The FET front end is quite hot but the i.f. strip leaves much to be desired. Figure 1 shows a broadband amplifier with a gain of at least 20 db (at the first i.f. frequency) that is installed at the output of the tuner between T_1, and L_6. This amplifier will do wonders for the i.f. stages. The background noise will not overload the audio stages at full volume and 0.25 microvolt signals should be Q5 copy. For ease in construction, a phenolic board, 1 × 2 inches was used with push-in terminals. Layout is not critical except to keep inputs away from outputs. After installation, re-touch the slugs of L_6 slightly for maximum gain on a test signal at 146 mHz. The location of the amplifier board in the HW-17 is shown in the photo.

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

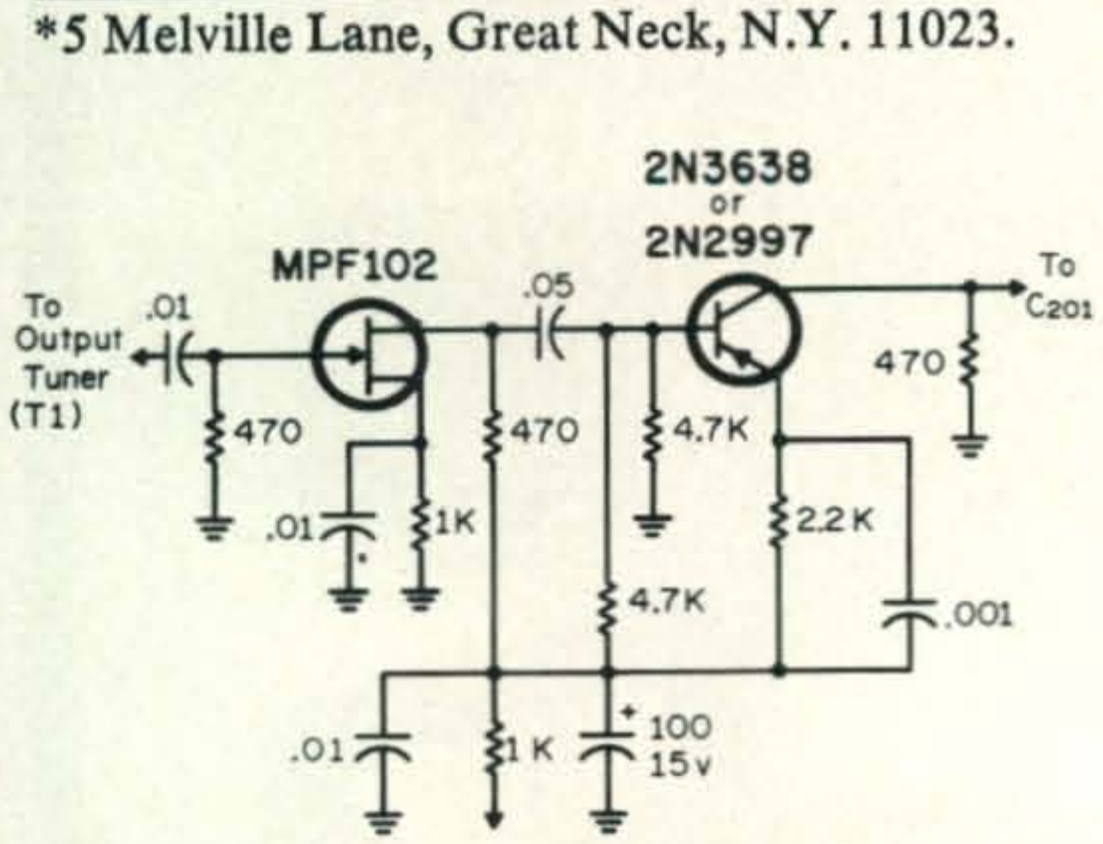


Fig. 1—I.F. preamplifier for the Heath HW-17 2-meter transceiver. The +15 v. is obtained from the positive terminal of C_{325} (2500 mf).

Transmitter A.M. Conversion

1. Remove C_{124}, a .22 mf capacitor from the screen lead of V_3, the output amplifier.
2. Connect a 470 mmf mica capacitor from pin 7 of V_3 to the transmitter shield. Solder directly to the shield.
3. Connect a 470 mmf capacitor from pin 11 of V_3 to the shield. Solder directly to the shield and use the hole remaining from the .22 mf capacitor.
4. Solder a 470 mmf capacitor from the hole remaining from the .22 mf capacitor to the transmitter shield.
5. Remove R_{107}, a 470 ohm resistor and re-route it to the violet wire at point U.

Figure 2 shows the position of the 470 mmf capacitors in detail.

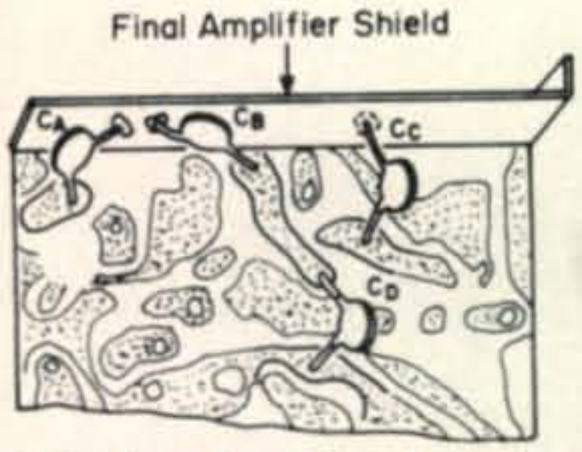


Fig. 2—Sketch showing the locations of three additional 470 mmf disc ceramic capacitors at the screen of the final amplifier. Capacitors C_A, C_B, and C_C are new; C_D is already installed in the HW-17.

Be sure to very carefully check the condition of the air-wound coils. Power output and general overall transmitter operation is directly related to the symmetry of these coils and how well they are "tuned up."

The unit should now be complete and should operate as a good two meter transmitter/receiver on a.m. Replacement of the microphone cartridge with a good quality replacement element will do wonders for the audio quality. The original one is OK for communications, however.

Receiver F.M. Conversion

The f.m. conversion of the receiver consists of the addition of a Signetics N5111A f.m. detector and limiter integrated circuit. This unit has been tried and tested and found to be an excellent, low cost device that is ideal for f.m. detection.[1] The schematic of the converter is shown in fig. 3. Construction, as in the case of the amplifier, is on a 1 × 2 inch phenolic board. Be sure to keep the leads from pins 5, 6, and 12 at short as possible. Also keep the lead from pin 4 as far away from that of pins 9, 10, or 12. All .1 mf capacitors should be disc ceramic types, but the 300 mmf should be a silver mica. A J. W. Miller 4000 series coil can be used for the tuned circuit. Alternately, the 300 mmf capacitor can be replaced with a compression type trimmer of 300-400 mmf max. and 30-50 mmf min. and the coil replaced with a 36 microhenry peaking coil. The location of this unit in the receiver section of the HW-17 is seen in the photo. A typical method of mounting these boards is with small angle brackets made of aluminum or steel. Mine were cut from a tin-can and soldered from a ground point on the circuit board, to ground on the

[1]Math, I, WA2NDM, "A Simple IC F.M. Detector," *CQ*, Nov. '71, p. 23. A small error in Fig. 2 of that article results in the loss of 50% of the audio recovery, but this loss will be significant only on very weak signals.

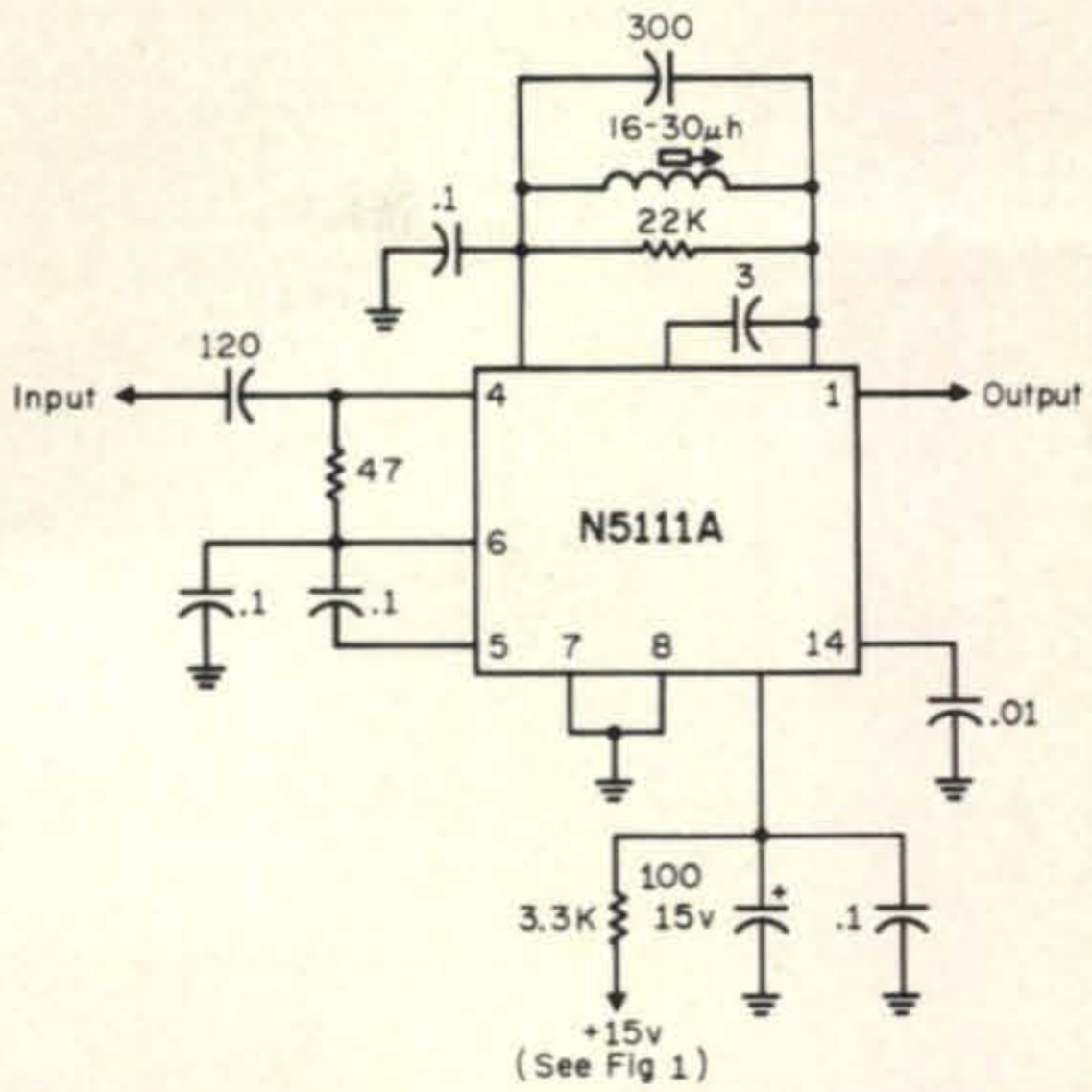


Fig. 3—F.m. detector circuit identical to that shown in Nov. '71 CQ, with the exception that a small error existed in the original presentation.[1] The circuit above is correct.

printed circuit board. Mechanical rigidity is a must—especially for mobile work.

A hole should now be drilled through the front panel to mount the a.m./f.m. switch. This switch can be any 3 pole double throw type as long as it fits into the space shown and can handle 400-500 volts.

Figure 4 shows the wiring of the a.m./f.m. switch. The original diode detector is kept as it develops the a.m. signal, a.v.c. and i.f. stage bias. Only the audio is switched between detectors. After wiring, tune the HW-17 to a local f.m. station with the switch in the a.m. position. Peak the tuning control for maximum signal as shown on the front panel meter—not best audio. In fact, at the exact peak, there should be very little audio if any. Now turn the switch to the f.m. position. Adjust the coil for maximum audio output. If a trimmer capacitor was used instead of the slug-tuned coil, adjust it for maximum audio. This adjustment sets the N5111A chip exactly to the i.f. frequency. The detector is now fully aligned.

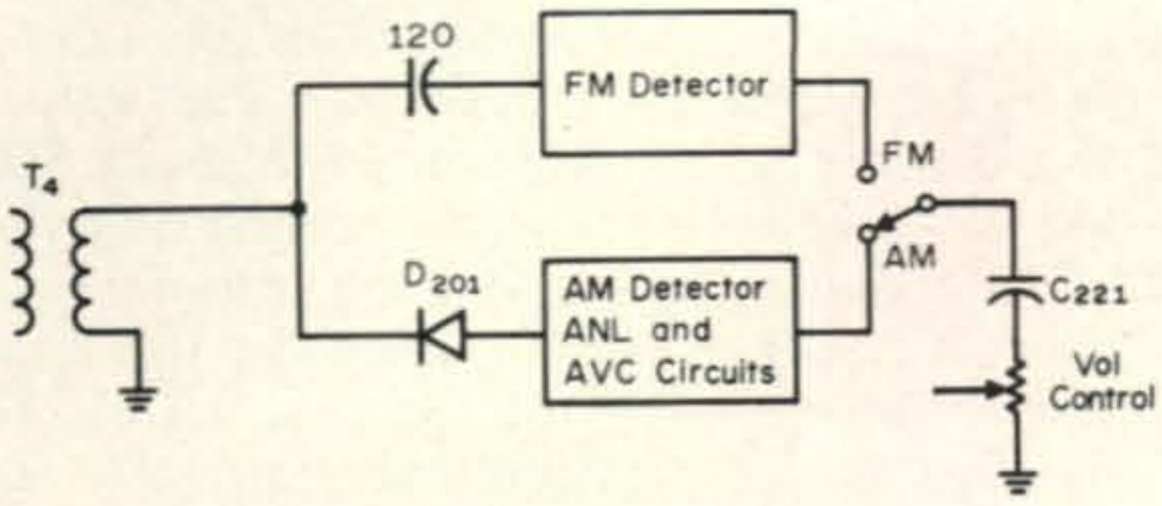


Fig. 4—Installation of the f.m. detector circuitry in the HW-17.

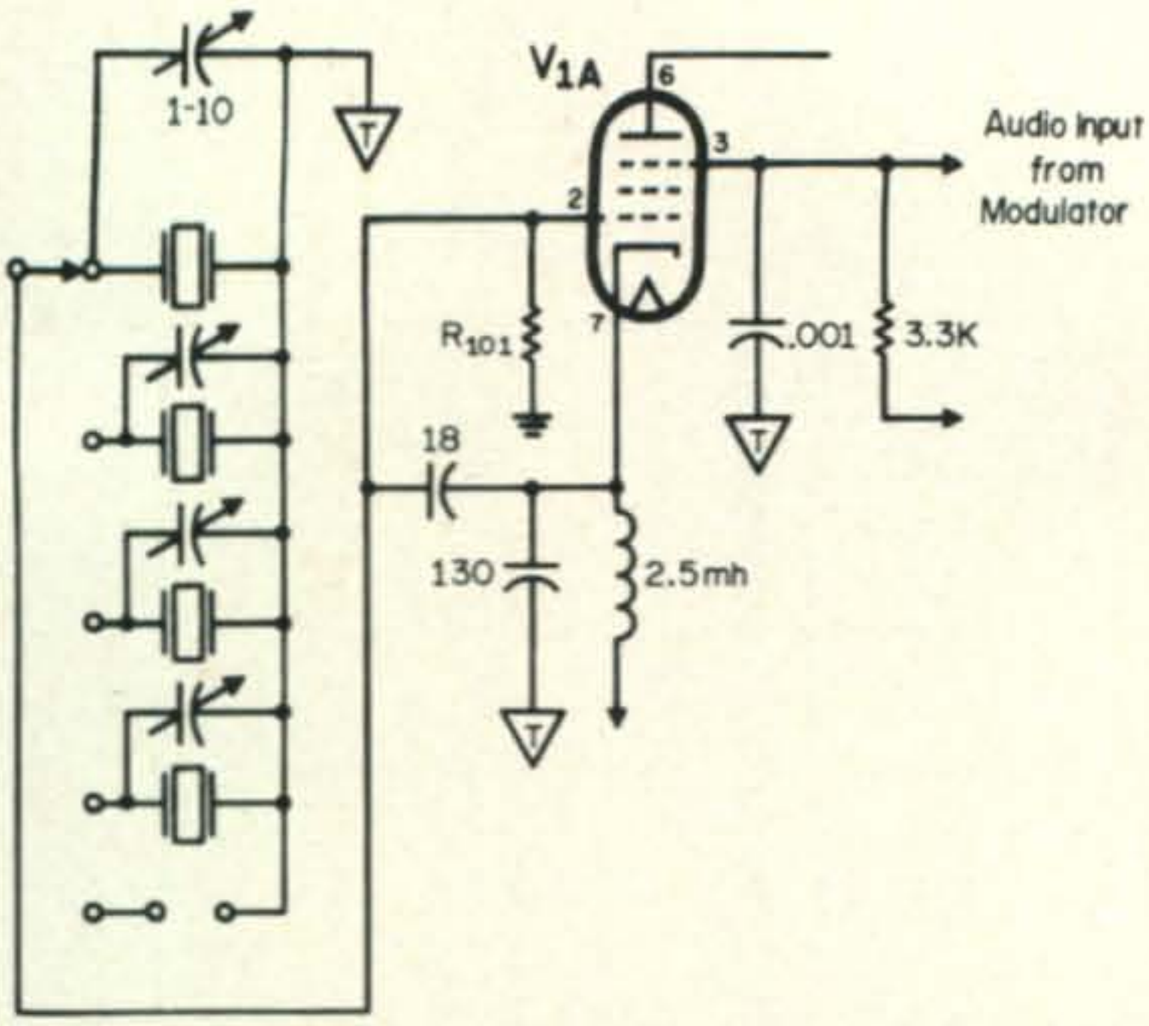


Fig. 5—Schematic of the modified transmitter oscillator.

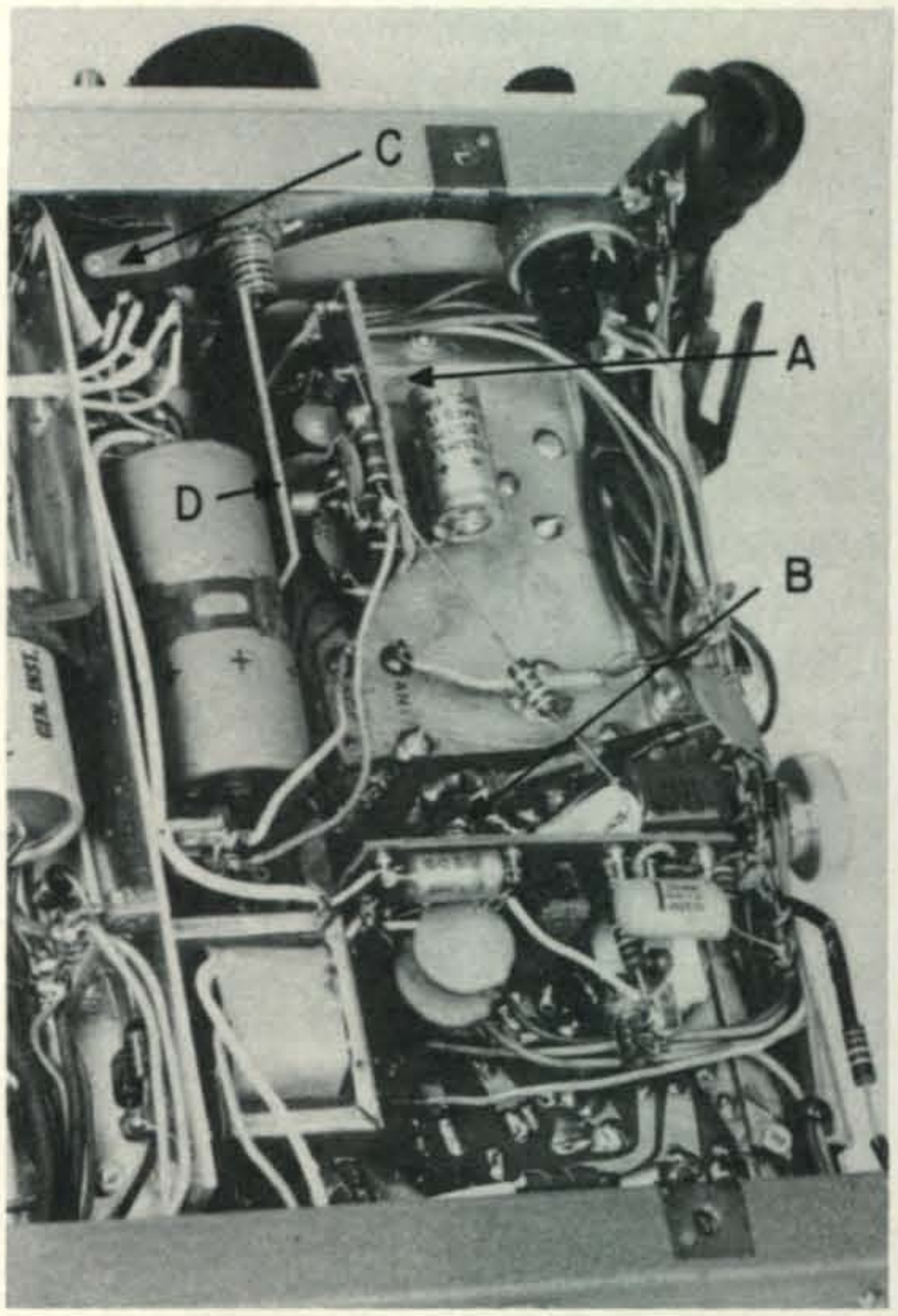
Transmitter F.M. Conversion

For best f.m. operation with a wide variety of 8 mHz crystals, it is advisible to modify the HW-17's oscillator stage. The procedure is as follows:

1. Remove the lead of C_{305}, the .001 mf capacitor that goes to the common crystal wire and connect it to the ground point at the center of the tube socket.
2. Run a short wire from the common crystal wire to ground on the printed circuit board.
3. Remove C_{101}, .005 mf, and replace it with a 130 mmf capacitor. This should be a silver mica type.
4. Add an 18 mmf silver mica capacitor between pins 2, and 7 of V_{1A}, the 7059.
5. Remove R_{102}, a 150 ohm resistor, and replace it with a 2.5 mh r.f. choke.

This completes the oscillator modifications. It will now be found that almost any HC6/U or FT-243 type crystal of the proper frequency will work reliably in the circuit. Figure 5 is a schematic diagram of the converted oscillator. Notice that the v.f.o. connector has been removed, and an additional crystal socket has been mounted in its place. This simplifies the use of crystals other than those in the unit. The trimmer capacitors across the various crystals are for fine tuning to local repeater frequencies. The values shown offer a 2 meter range of about 500 Hz with typical crystals of normal activity.

Referring to fig. 6, wire the transmit section of the a.m./f.m. switch. In the a.m. mode, the circuit is the same as before. In the f.m. mode, the modulator operates into a 3.6K 15 watt load and audio is taken through a 68K resistor and .1 mf capacitor



Close-up of the modified underside of the Heath HW-17 2-meter transceiver showing the perf-board i.f. amplifier (A), f.m. detector board (B), AM-FM switch (C), and a small shield of copper laminate board (D) which proved to be unnecessary. The boards are soldered to the main circuit boards using small angle brackets of tin can stock.

and fed to the screen grid of the oscillator tube. This type of phase modulation scheme works perfectly for ±5-7 kHz deviation at two meters.

The 3.6K resistor was made up of three 1.2K 5 watt resistors connected in series and cemented to the chassis with epoxy cement. If less audio is needed, just move the 68K/.1 mf combination between 1.2K resistors.

A final modification that will speed up the

[*Continued on page 84*]

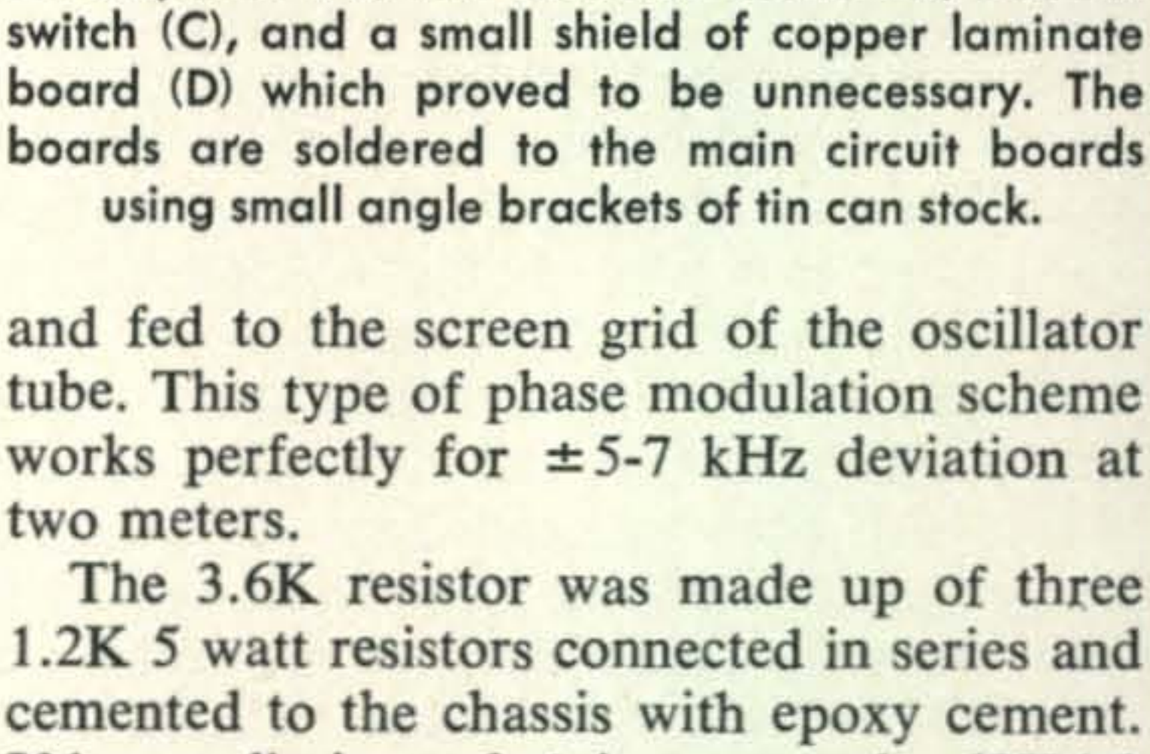
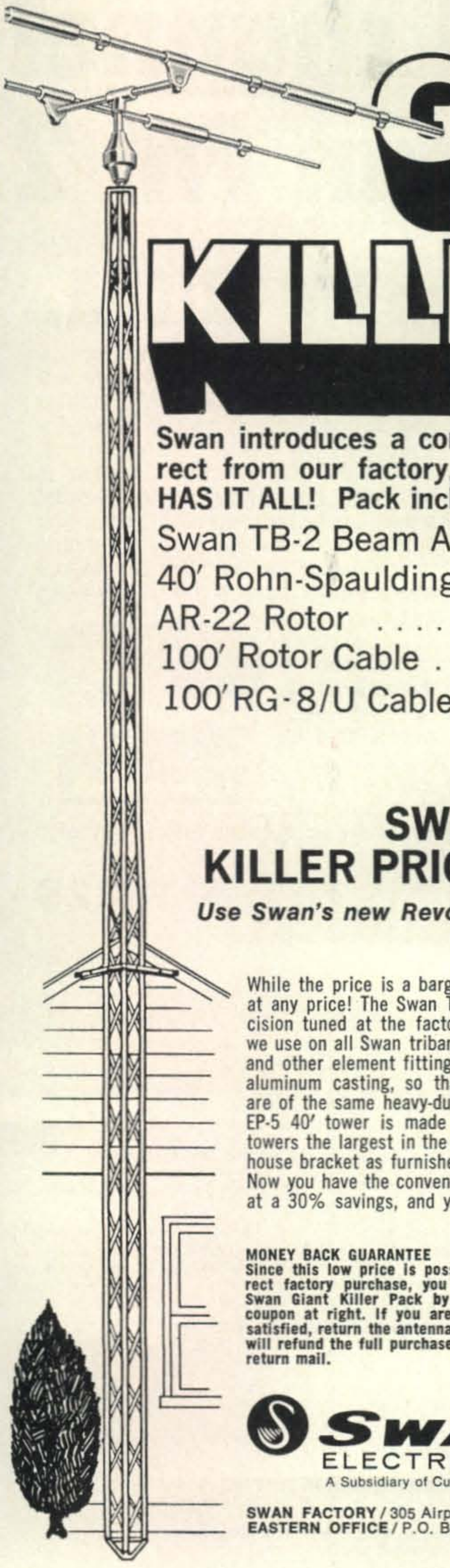


Fig. 6—F.m. modifications to the HW-17 modulator.



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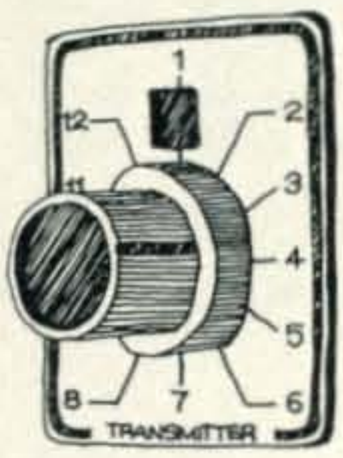

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FM-2X SPECIFICATIONS

General

- Frequency coverage 144-148 mc.
- Number of channels: 12.
- Crystals installed for 3 channels as follows: Channel 1: transmit and receive 146.94 mc; Channel 2: transmit 146.34, receive 146.94 mc; Channel 3: transmit 146.34, receive 146.76 mc.
- Modulation: frequency modulation (phase type).
- Transmitter control: push to talk on microphone.
- Power source: AC 117 volts 50-60 cycles, DC 13.5 volts ±10%.
- Dimensions: 8¼" x 7" x 3".
- Weight: 8¼ lbs.
- Furnished with unit: dynamic microphone, antenna connector plug, spare fuses and lamps, AC power supply, DC power cord with fuse holder.

Transmitter

- Fully solid state.
- RF power output 10 watts nominal.
- Frequency deviation adjustable to ±15 kc; factory adjusted to approximately 5 kc.
- Frequency stability: ±.001%.
- Spurious radiation: —60 db below carrier.
- Frequency multiplication: 12 times.

Receiver

- Circuitry: crystal controlled double conversion superheterodyne.
- Input impedance: 50 to 75 ohms.
- Intermediate frequencies: 10.7 mc and 455 kc.
- Sensitivity: 0.5 uv for 20 db quieting, 0.5 uv for 12 db SINAD.
- Intermodulation: more than 50 db down.
- Audio output: 1 watt to internal speaker.

combinations* meter transceiver?

FM 1210-A SPECIFICATIONS

- Frequency coverage 144-148 mc.
- Number of channels: 144 (12 rcv, 12 xmt, independent switching).
- 8 crystals are included as follows: TRANSMIT: 146.22, 146.34, 146.76, 146.94.
  RECEIVE: 146.28, 146.88, 146.76, 146.94.
- Modulation: frequency modulation (phase type).
- Transmitter control: push to talk on microphone.
- Power source: AC 117 volts 50-60 cycles, DC 13.5 volts ±10%.
- Dimensions: 8¼″ x 7″ x 3″.
- Weight: 8¼ lbs.
- Furnished with unit: dynamic microphone, antenna connector plug, spare fuses and lamps, AC power supply, DC power cord, and mobile mounting bracket.

Transmitter

- Fully solid state, no tubes.
- RF output power: 10 watts nominal.
- Frequency deviation: phase type, factory adjusted to 5 kHz.
- Frequency stability: ±.001%, −30° to +50°C, oven controlled.
- Spurious & harmonic radiation: −60 db minimum.
- Frequency multiplication: 12.

Receiver

- Type: superheterodyne, dual conversion 16.9 mHz and 455 kHz IF.
- Input impedance: 50 to 75 ohms.
- Sensitivity: 0.5 uv for 20 db quieting. 0.25 mv for 12 db SINAD.
- Intermodulation: greater than 55 db.
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- Squelch threshold: less than 0.3 mv.
- Adjacent channel rejection: −55 db.

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New Transformers for Old

BY J. L. SMITH,* W5LLE

THE coming of transistors and integrated circuits has dealt a severe blow to the junk box in many of our ham shacks. Those prized goodies that we have so vigorously defended from the sweeping arm of the inevitable "clean-up" are now bordering on obsolescence and are likely to succumb to the invitation of the trash can. The capacitors are now too small, the filter inductors are too large, and the secondaries of those faithful power transformers, alas, offer voltages for which there is no longer a request.

But, janitor, spare that transformer! Touch not a single turn! Just a little effort can turn these retired servants into items of utility and demand. It is, indeed, a simple matter to wind new secondaries on transformers that have a suitable primary. Or, if the worst comes to the worst, then even the primary can be rewound. Another possibility is that the core and mounting of a filter choke can be used to wind a power transformer suitable for transistor and integrated circuit uses. Fortunately, the transformers for solid state equipment are generally smaller than those used in tube-type equipment of similar functions. This makes rewinding very practical.

This article will outline the routine for rewinding small transformers in solid state equipment. Most of us must wind by hand, so it is not easy to deal with windings of many hundreds of turns. For that reason, these procedures have the most utility for transformers with less than 50 volt secondaries.

Getting Started

The first task is to define the end product. Decide what the primary voltage will be (usually 115 volts, 60 Hz) and the voltage and current requirement of the secondary or of each secondary if there is to be more than one.

The core size of a transformer is influenced by the power that the transformer must deliver from its secondaries. Calculate the product of voltage and current, VA, for each secondary then add these to obtain the total volt-ampere product for the transformer, *e.g.*,

$$VA = V_1A_1 + V_2A_2 + V_3A_3 + \ldots$$

where VA is the total volt-ampere product and V_1A_1, V_2A_2, etc. are the volt-ampere products of secondary 1, secondary 2, etc. Use the VA product just calculated in combination with fig. 1 to determine the required cross-sectional core area. This area applies to the *E-I* type of laminations in which the cross-sectional area of the "tongue" or the portion of the core that fits within the winding is listed as the ordinate of fig. 1 and the total *VA* of the transformer secondaries is listed as the abscissa.

*2405 Mesa Drive, Richardson, Texas 75080

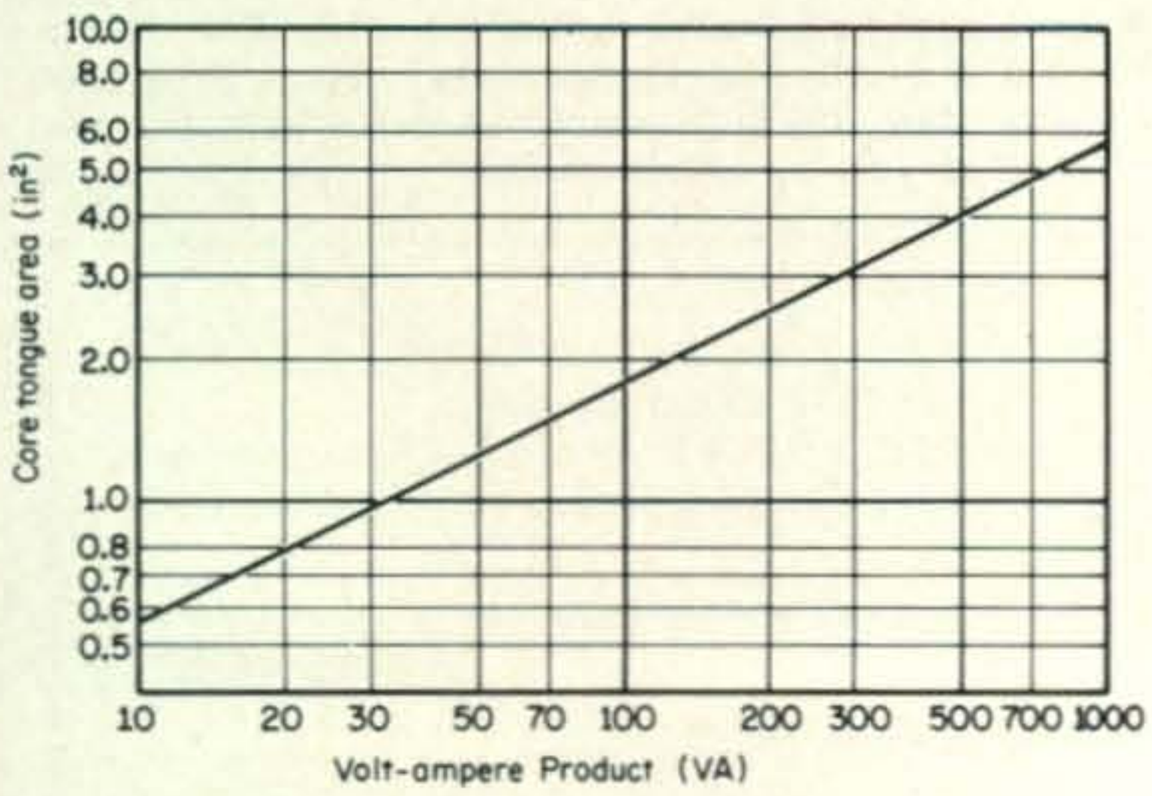

Fig. 1—Core area vs volt-ampere product.

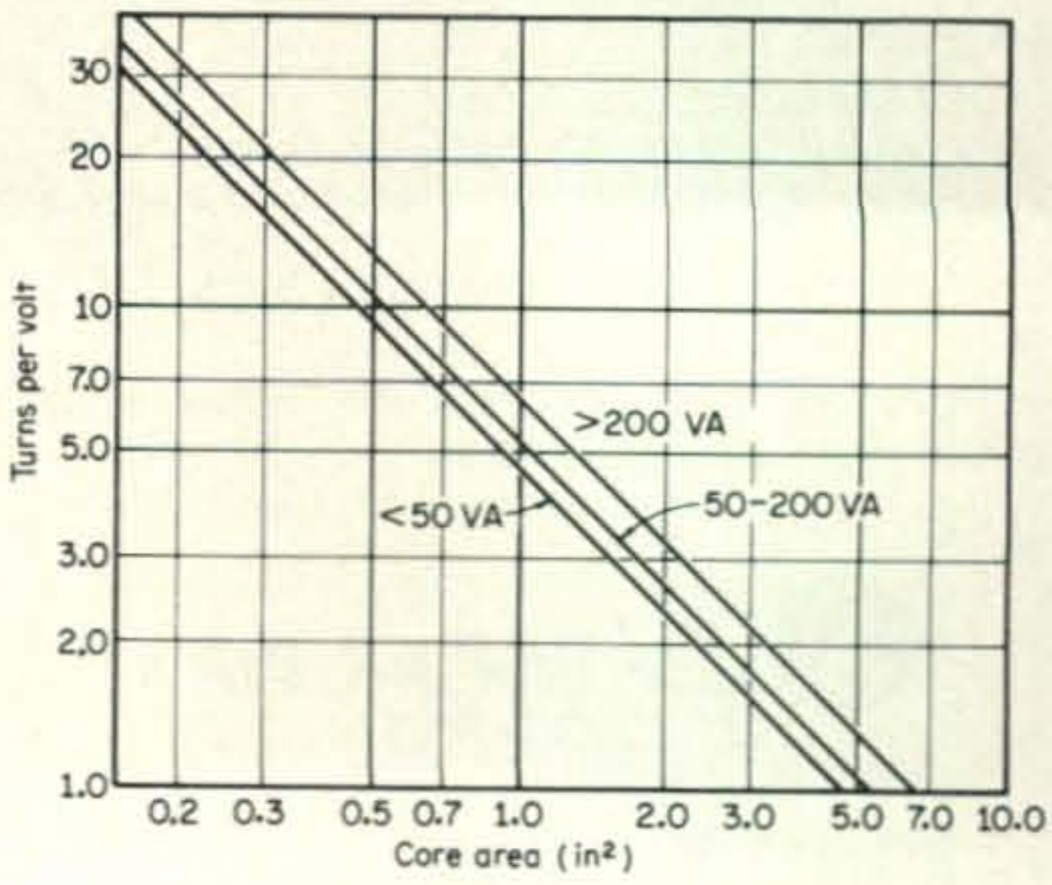

Fig. 2—Core area vs turns-per-volt.

The Primary Winding

The core size dictates the characteristics of the primary winding. If a suitable core is selected and contains a primary winding, then the existing primary may be used provided it is rated at the desired primary voltage. Assuming this to be the case then it is necessary to determine the turns per volt factor, T/V, of the existing primary. This factor will be used to design the new secondary windings. The factor is easily determined when it is realized that the turns-per-volt is constant (or nearly so) for all windings on the transformer. So before a selected transformer is dismantled, excite the primary with the proper voltage and carefully measure and log the voltage of each secondary. Then when the transformer is dismantled and the secondaries unwound, count the number of turns of each of the voltage windings. For each secondary, divide the number of turns by the voltage developed by that secondary. The quotient will be practically the same for all windings of a given transformer and will be the turns-per-volt factor associated with the existing primary.

If the existing primary cannot be used, then it will be necessary to wind a suitable one. Calculate the turns-per-volt factor required for the selected transformer core from fig. 2. Here the turns-per-volt is plotted as the ordinate and the cross-sectional area of the core tongue is plotted as the abscissa. The turns-per-volt factor is somewhat dependent upon the power capacity of the transformer, so three values of this parameter have been included on fig. 2. Notice that the smaller transformers require fewer turns per volt for a given core size.

The number of turns for the primary is now determined by multiplying the primary voltage by the turns-per-volt factor obtained from fig. 2.

The wire size to be used on the new primary is determined by the current that will flow in the primary. This, in turn, is determined by the power delivered from the secondary windings. Because the transformer cannot generate power (in fact, it uses a little), the power consumed by the primary will be just a little more than the sum of that delivered by all the secondaries. Figure 3 gives an approximation of the primary current as a function of the total power (or volt-ampere product) delivered by the secondaries. An allowance has been made on this

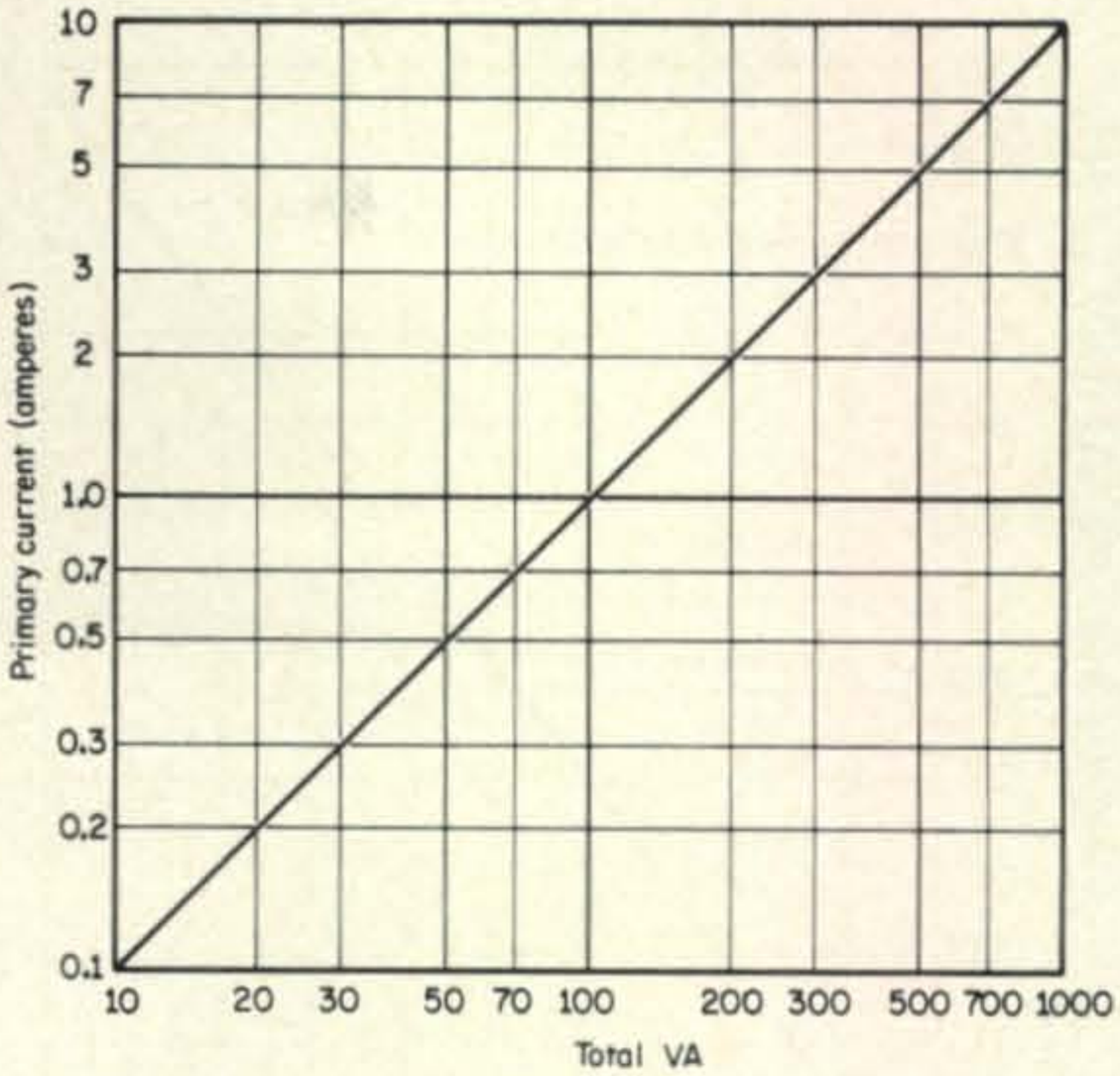

Fig. 3—Primary current vs transformer volt-ampere product.

graph to account for the transformer efficiency. With the primary current known, fig. 4 is used as a guide to estimate the wire size.

The Secondary Windings

The number of turns for a given secondary is calculated by multiplying the turns-per-volt factor by the desired voltage. The wire size to use for a given secondary winding is determined by the current to be drawn from that particular secondary. Enter fig. 4 at the specified current and read the wire size from the abscissa. Note that wire sizes are integral so select the next lower listing when fractional values are obtained from the graph.

Doing the Work

After a transformer with a suitable core has been selected, the transformer must be dismantled. If an existing primary will be used,

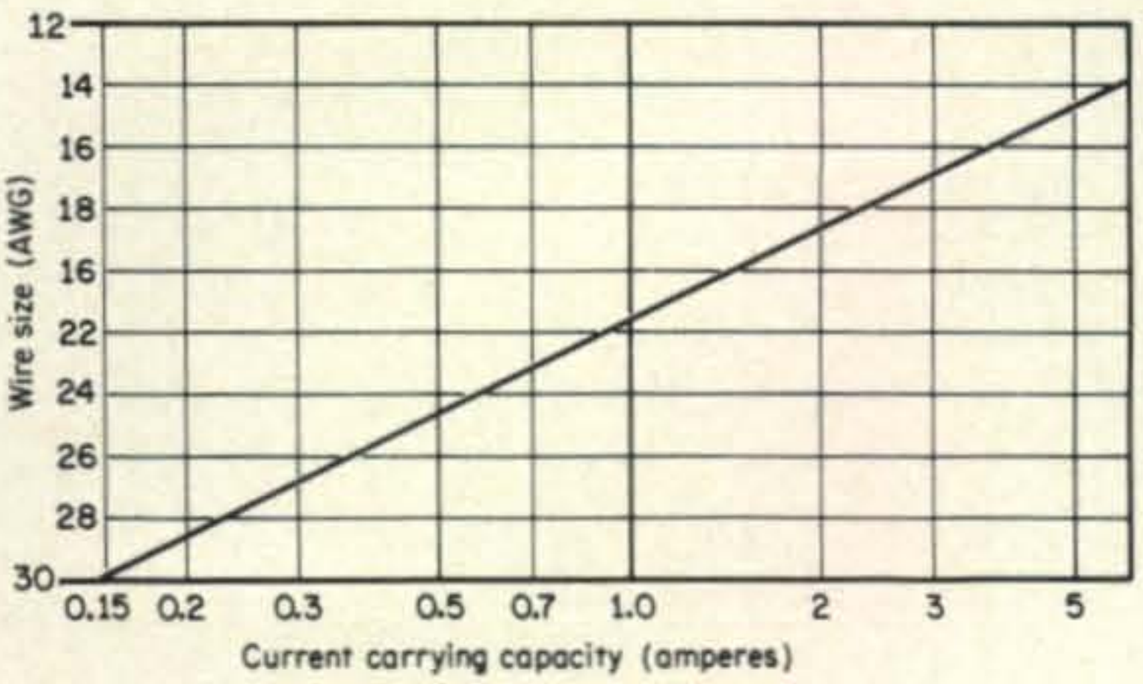

Fig. 4—Wire size vs current carrying capacity.

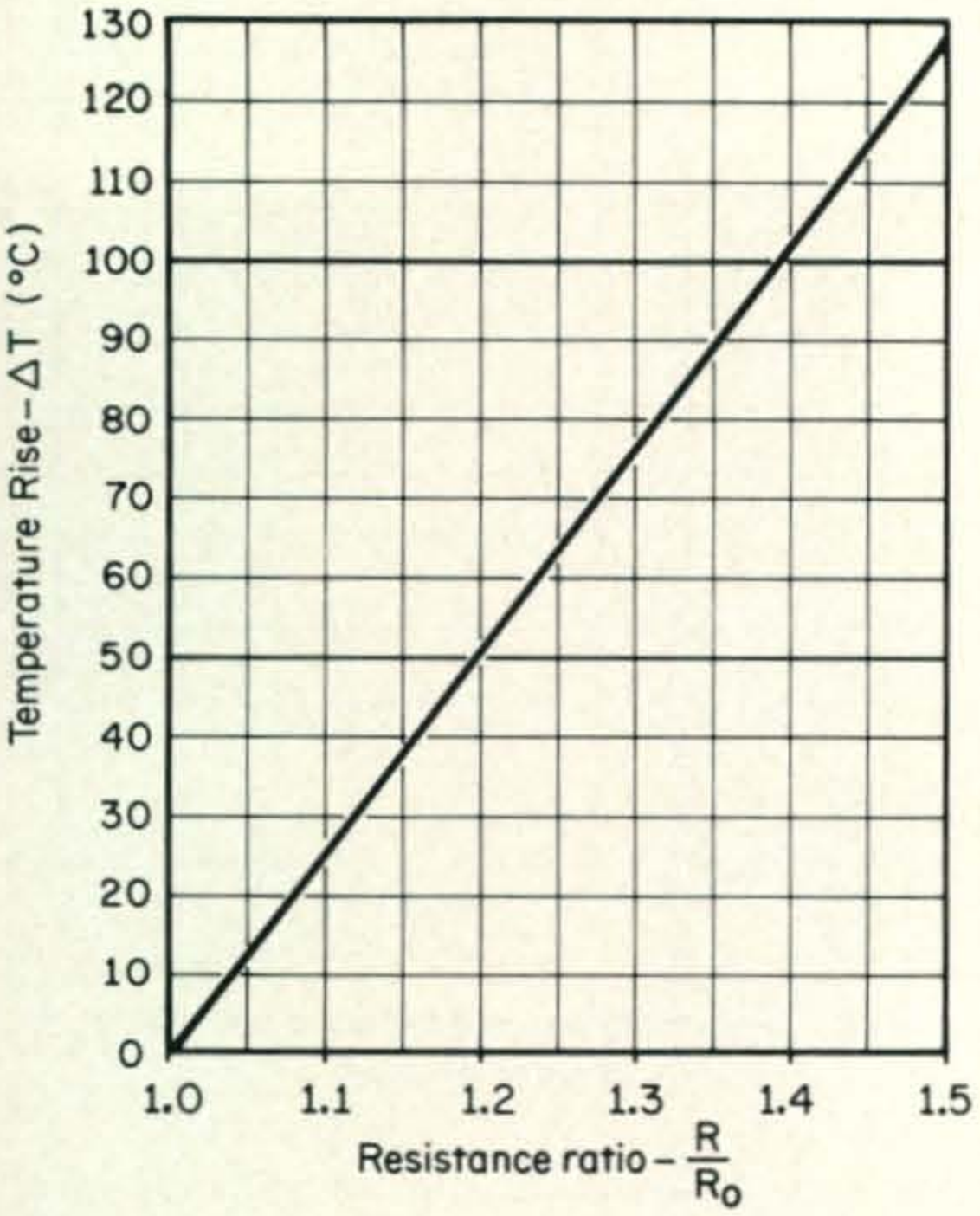

Fig. 5—Temperature rise vs resistance ratio.

work carefully not to damage the usable winding. The laminations of the core are usually interleaved, so note the pattern used in stacking and use the same in reassembly. Also note the manner of lead connections and insulation and use these as a guide in reassembly. The new windings do not necessarily have to be neatly side by side. Random winding is usable but severely limits the number of turns that can be placed on a given form. Be particularly careful to insulate the primary windings. Be careful not to allow potential shorts to core or secondary windings. Examine the construction practices followed on the original transformer and try to duplicate these as close as possible.

If the wire of a particular winding is very small, then larger lead wires must be attached. Ordinary plastic electrical tape is satisfactory to anchor and insulate these points. If the wire of the winding is large enough, the ends may be sleeved and brought out as leads. In either event, provide a reasonably secure mechanical joint.

Core Cross Section 1.0 sq. in.

	Voltage	Current	VA	T/V	No. turns	Wire Size
Primary	115.	0.217	25	4.8	552	28
Sec. #1	9.0	1.0	9.0	"	44	20
Sec. #2	16.0	0.5	8.0	"	77	24
Sec. #3	16.0	0.5	8.0	"	77	24
Sec. #4						

Room Temperature 26° C — Room Temperature 28.5° C

Primary Resist (R) 14.9 — Primary Resist (R_0) 17.5

$\frac{R}{R_0}$ 1.175 — ΔT 42.5 °C

Fig. 6—A convenient form for logging transformer data.

Checking the Results

A little initial checking before putting the transformer into service will save a lot of heartache in the end. First, use your ohmmeter to test for shorts and to verify the leads. On the highest ohmmeter range, check from each winding—especially the primary—to core and to all the other windings. You should find many megohms. Next, verify the primary winding; it should measure a few tens of ohms as opposed to the lower voltage windings that should measure a few ohms. Temporarily, attach a line cord to the primary and measure the voltage developed on each secondary. They should be reasonably close to the design values.

Finally, load the secondaries with suitable loads of ample power rating and let the transformer run for several hours to check the temperature rise. The resistance of the copper wire changes with temperature, so an estimate of the internal temperature of the transformer can be obtained from fig. 5. Measure the resistance of the primary winding when the transformer is stabilized at room temperature. Call this R_0. Note this reading and the room temperature. Let the transformer run fully loaded for several hours until it has stabilized at its loaded temperature; then again measure the resistance of the primary. Call this reading R. Figure 5 is a plot of the ratio R/R_0 vs temperature rise in degrees Centigrade. The insulation materials begin to degrade at about 105°C so the temperature must stay below this value.

An Example

Assume it is desired to rewind a transformer for use in a utility power supply. Output voltages of + 5 volts d.c., + 12 volts d.c. and −12 volts d.c. are desired. The primary voltage is 115 volts, 60 Hz. The secondaries must deliver 9 volts a.c. at least to the 5 v.d.c. rectifier and 16 volts at 500 ma to each of the 12-volt rectifiers.

The total *VA is*

$$VA = (9\times1) + (16\times0.5) + (16\times0.5)$$
$$= 25\text{-volt amperes}$$

Figure 1 shows a core cross-sectional area of 0.88 square inches is required. The junk box yields a 6.3 volt, 3 amp filament transformer with a core having a tongue area 1" ×1", so this will be used. This transformer also has a 115 volt primary, so its primary will be used as is.

The primary is excited with 115 v.a.c. and the voltage of the secondary winding is measured as 6.45 volts.

When the transformer is dismantled, 31 turns are unwound from the secondary. The turns-per-volt factor is then:

$$T/V = \frac{31}{6.45}$$
$$= 4.8$$

The number of turns of the new secondaries are calculated by multiplying the desired a.c. voltage by 4.8 (the turns-per-volt factor).

Secondary #1 = 4.8×9 = 43.2 = 44 turns
Secondary #2 = 16 ×4.8 = 76.8 = 77 turns
Secondary #3 = 16 ×4.8 = 76.8 = 77 turns.

Figure 4 shows a 1-amp. winding must have a wire size slightly larger than #22, so a #20 is chosen for the 9-volt winding. The 500 ma windings must have #24 wire.

The transformer is wound and the preliminary test made. The resistance and voltage measurements turn out okay. The 9-volt winding is loaded with two 18-ohm, 10-watt resistors in parallel. Before the transformer is turned on, the primary winding measures 14.9 ohms at 26°C room temperature. After the unit operated 4.5 hours, the room temperature was 27.5°C and the primary winding measured 17.5 ohms.

R/R_0 is 1.175 and fig. 5 shows this represents a temperature rise of +45°C. However, 1.5° was due to a change in room temperature, so the losses of the transformer contributed 4—1.5 or 42.5°C rise in temperature. The room ambient may rise as high as 62.5°C before the internal insulation will approach its 105° limit. This is entirely satisfactory.

The transformer may now be put in service.

In Summary

The method outlined above is not necessarily exact. Copper losses, iron losses, cou-

[*Continued on page 90*]

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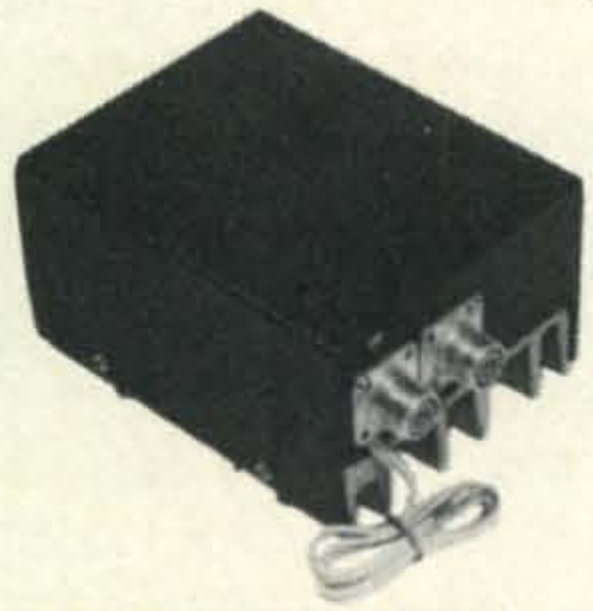

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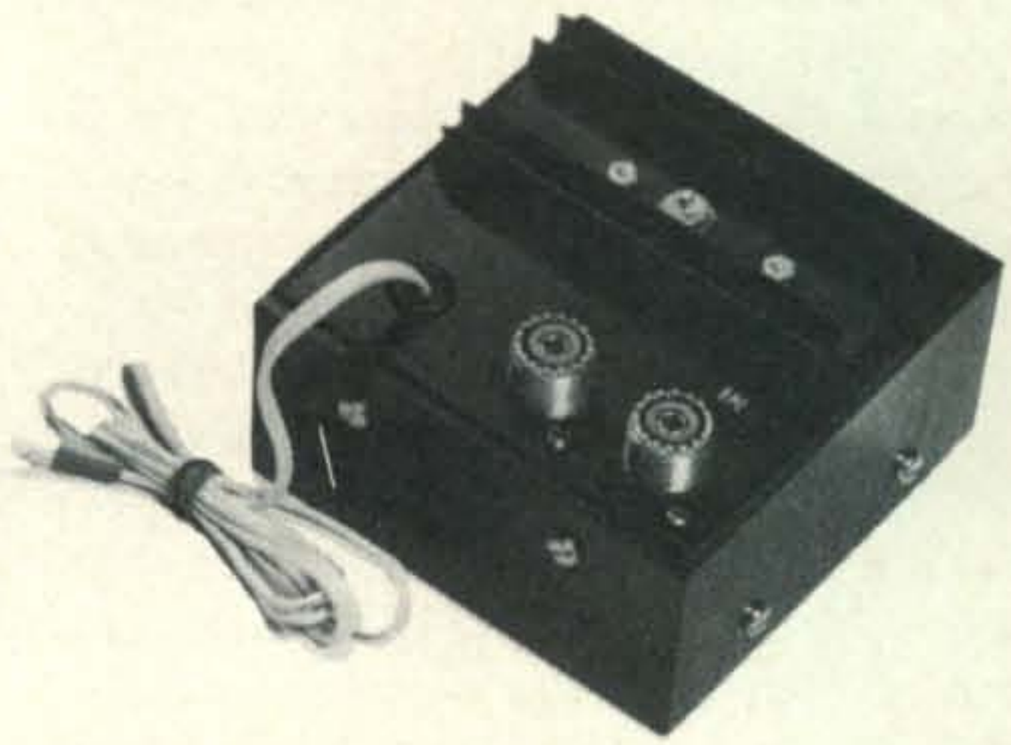

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F. M.

BY GLEN E. ZOOK,* K9STH/5

A number of previous columns have included plans and pleas to inform the newcomer to f.m. about local operating practices. Things like information meetings, handouts at the local ham store, and a regular mailing list help greatly. However, there are other things to be considered. First of all, it seems that the time spent operating on the repeater is inversely proportional to the time on f.m. That is, the longer one is on f.m., the less time spent in idle chit-chat. This is not unique to f.m. Everyone spends more time with a new endeavor than with something that is old hat. Thus, many of the operators a newcomer hears on the band are newcomers themselves. So, it is up to the old-timers to set a good example.

It is very easy to sit in an ivory tower and offer criticisms and suggestions. All of us need to stop once-in-a-while and take a good look at ourselves. Are our operating techniques what they should be? Do we set a good example for others? I know of no one, myself included, who has perfect operating habits. All of us talk too much at times, or forget to log a mobile contact, or some other infraction of either rules or procedures. If, however, we take time to re-evaluate ourselves, we are helping the repeater operation in general. Always remember that a little common and horse sense goes a long way.

Machine, System, or What?

K4FBG recently questioned the use of the term "machine" to describe the repeater. Herb points out that "machine" implies a large box with many greasy gears and the like. Since many repeaters are now very complex electronic systems maybe the term "machine" is outdated. I'm not sure where the slang "machine" for the actual repeater got started, but it is the most common term which I personally have heard. However, there now exists an opportunity to begin using some other term for the actual repeater. Lets hear what you want to call it.

Technical Talk

This month's Technical Talk concludes the usage of the Sentry STO series oscillators in multi-frequency applications and modifications of existing equipment. Last month suggestions for using the STO-30 type oscillators in tube-type receivers was covered. This month the STO-3 oscillators and their use in tube-type transmitters will be covered.

The physical appearance of the STO-3 oscillators is quite similar to the STO-30 units pictured last month. The voltage requirement is 9-12 v.d.c. @ 10 ma maximum. A variable capacitor is provided as a "warp" to bring the crystal right on frequency. Since many older units use 6 MHz crystals in the transmitter portions two STO-3 oscillators were obtained for use with a Motorola highband 60 watt "A" strip. This transmitter, and its little 30 watt output brother, is very common on 2 meter f.m. The same basic oscillator circuit is used in the low-band units and the newer "K" and "J" series as well. Also, many transmitters manufactured by other companies use similar circuits.

The basic "A" transmitter chassis has room for 3 tube-type oscillators. Other tube oscillators may be added, but the capacity (tube and stray) start adding up when 5 or more are used. This makes it very difficult to get all the channels needed in many areas. The solution is to leave only one oscillator deck intact and use it as a buffer-amplifier. Several STO-3 oscillators can be fed into the original circuitry. The frequencies can be switched by merely switching 12 volts to the respective oscillator. In 12 volt mobile installations this can be easily obtained from the 12 volt antenna relay coil connections, or in the same manner as follows for base stations. In base stations switched 12 v.d.c. can be obtained either from the same basic supply for the microphone d.c. or by building a voltage divider from the keyed low B+ line to the transmitter. The voltage must be applied only while transmitting to prevent blocking of the receiver. Since the low B+ may vary from unit to unit it will be neces-

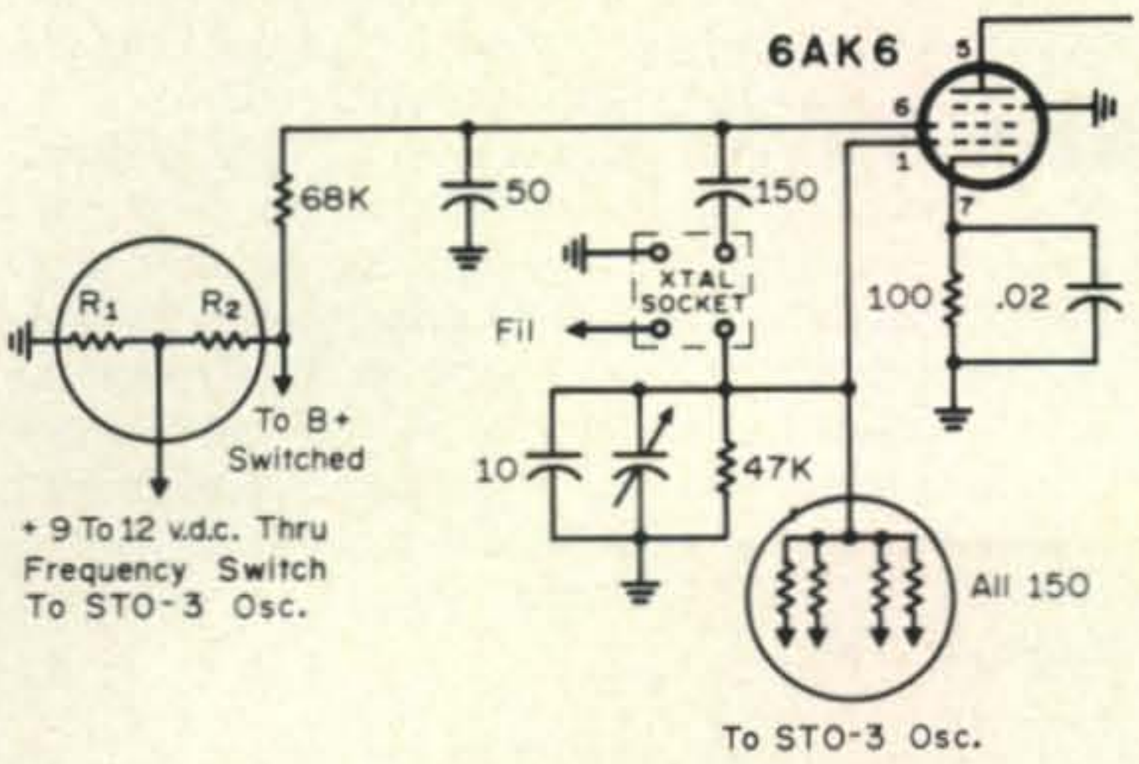


Fig. 1—Sample hook-up for the Sentry STO-3 oscillator into Motorola "A", "J", or "K" transmitters. The 6AK6 circuitry is original. Circled components are added. Calculate R_1 and R_2 from formula to give 9 to 12 v.d.c.

*818 Brentwood Lane, Richardson, Texas 75080.

sary to take measurements and calculate using ohm's law. However, use a divider rather than a simple series resistor.

When two or more STO-3 oscillators are used, they must be isolated from each other by a 150 ohm resistor in series with the output from the circuit board. In certain cases a little more or little less may be required, but 150 ohms is a good place to start.

In the trial transmitter the number 3 reading was lower than with a crystal directly into the oscillator (tube type). However, the later amplification and multiplication circuits brought the drive up for the usual 60 watts out. By the way, the trial unit obtained voltage from part of the mic d.c. circuit. Also, the signal was fed directly into the grid of the 6AK6. No troubles were discovered.

As suggested last month it is desirable to obtain a good grade of crystal for use in the STO-3 oscillator. This is to insure on-frequency signals. Sentry will furnish high stability crystals correlated for the oscillator when requested. The cost of the basic oscillator board (assembled, ready to go) is $5.00. Drop Sentry a line at Crystal Park, Chickasha, Oklahoma 73018, for information about the STO series oscillators.

News

The Technical Talk portion of this column has been dominant for quite a while. Mainly this was because of lack of news items. Well, this month there is no lack of news, so here goes.

Previous columns have mentioned state-wide or regional repeater coordination groups. Since information had been received from only a few groups many other groups were not reported. Fortunately, several organizations not previously reported have sent information for use in the column. There are still other groups, so let's hear from them.

Colorado

The coordination group for Colorado is the Colorado Council of Amateur Radio Clubs Repeater Committee. This group recognizes the standard 600 kHz spacings with 30 kHz channels on 2 meters. Also, their information sheet calls for 5 MHz input/output spacings on 450 MHz with 50 kHz wideband channels and 25 kHz narrowband channels. Much in line with the feelings of many f.m. groups around the country. The person to contact for repeater coordination and information in Colorado is John C. Nolan, WAØRLQ, 9762 Alamo Drive, Northglenn, Colorado 80221.

Indiana

According to the *Bison*, the official publication of the Indiana Radio Club Council, the Indiana Repeater Council is using the address of K9LSB, 1416 Lakewood Drive, Ft. Wayne, Indiana 46819. The goal of the council is to promote a spirit of cooperation between repeater organizations. Annual dues are $8.00 per organization. A copy of the by-laws and constitution may be obtained by writing to the above address.

Ohio

The place to get information about repeaters in Ohio and West Virginia is the Ohio Area Repeater Council, c/o W8LGL, P. O. Box 23, Delaware, Ohio 43015. This group puts out a good newsletter with a regional repeater directory included in various editions.

SERA

Although not new to these pages, the South Eastern Repeater Association has recently undertaken a new frequency plan. SERA was the heart of .34/.76 country, but, at the October meeting in Tampa, SERA adopted the 600 kHz input/output spacing for two meter operation. That will mean all present member repeaters with the .34/.76 combination will go to a 146.16 MHz primary input. 146.34 MHz will still be used for repeater operation, but will require a touchtone encoded access. Target date for operation of the 146.16 MHz receivers is January 15, 1972. In SERA territory (Atlanta and south) one doesn't talk about a repeater with an output on 146.94 MHz, for 94 is reserved for simplex only. Therefore, the dual input freuqencies to the 146.76 MHz output repeaters will present no problems.

CARC

Another regular state group in this column is the California Amateur Relay Council. A rather lengthy report on the October 2, 1971, meeting in Sparks, Nevada was received. A good portion of the meeting was spent in discussion of a plan to divide the CARC into a Northern and a Southern California group. Also, incorporation of the CARC was discussed. New officers were elected for the coming year. Elected were, Chairman Ross Stevens, W6FRE; Vice-Chairman Alan Burgstahler, WA6AWD; and Secretary-Treasurer Pres Thomson, WB6PUE. The next meeting will be held during February at Bishop, California, hosted by the Gronk Radio Network. The summer meeting will be held on June 3-4, 1972, at Fresno in conjunction with a general FM Hamfest.

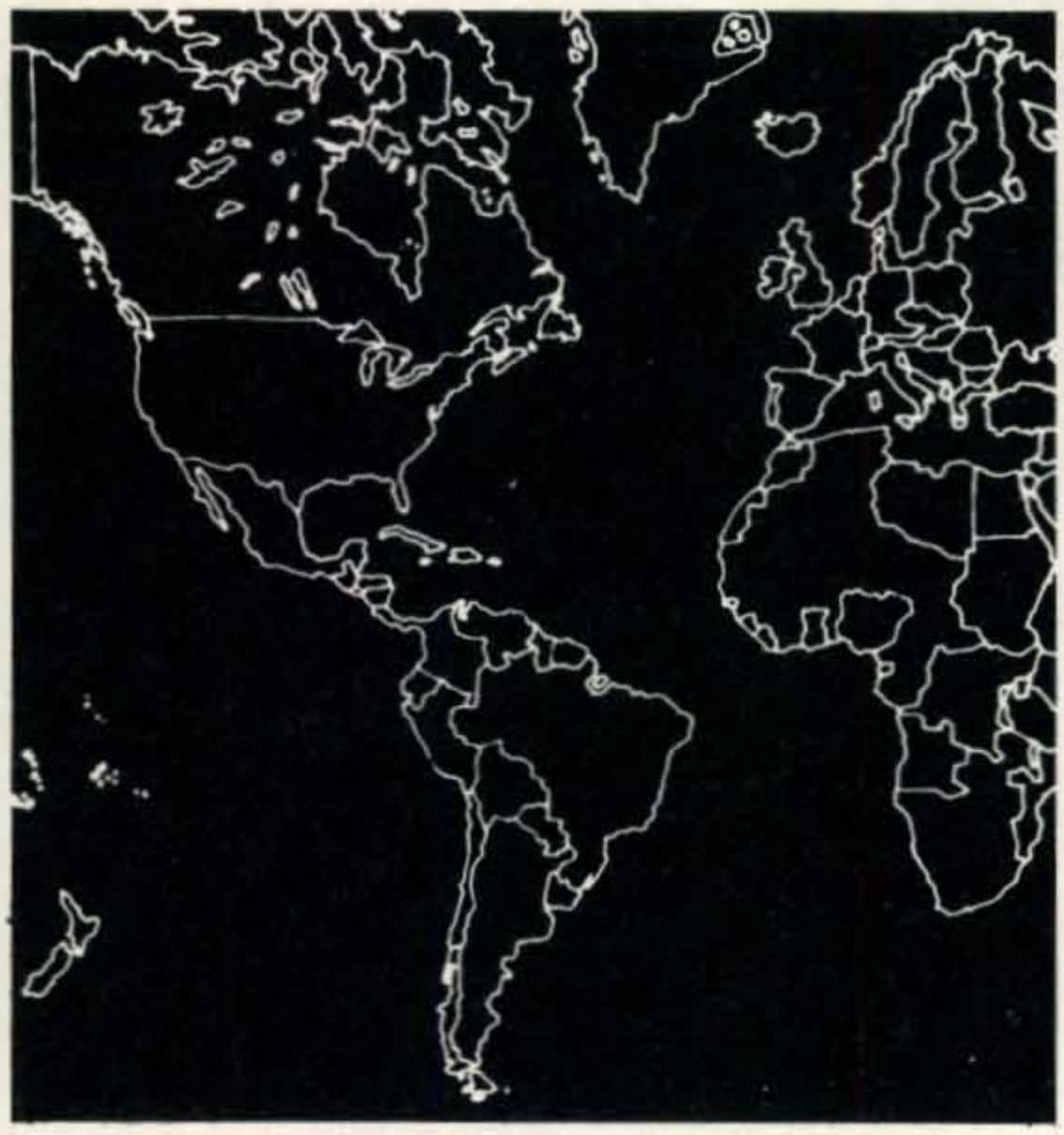
Texas

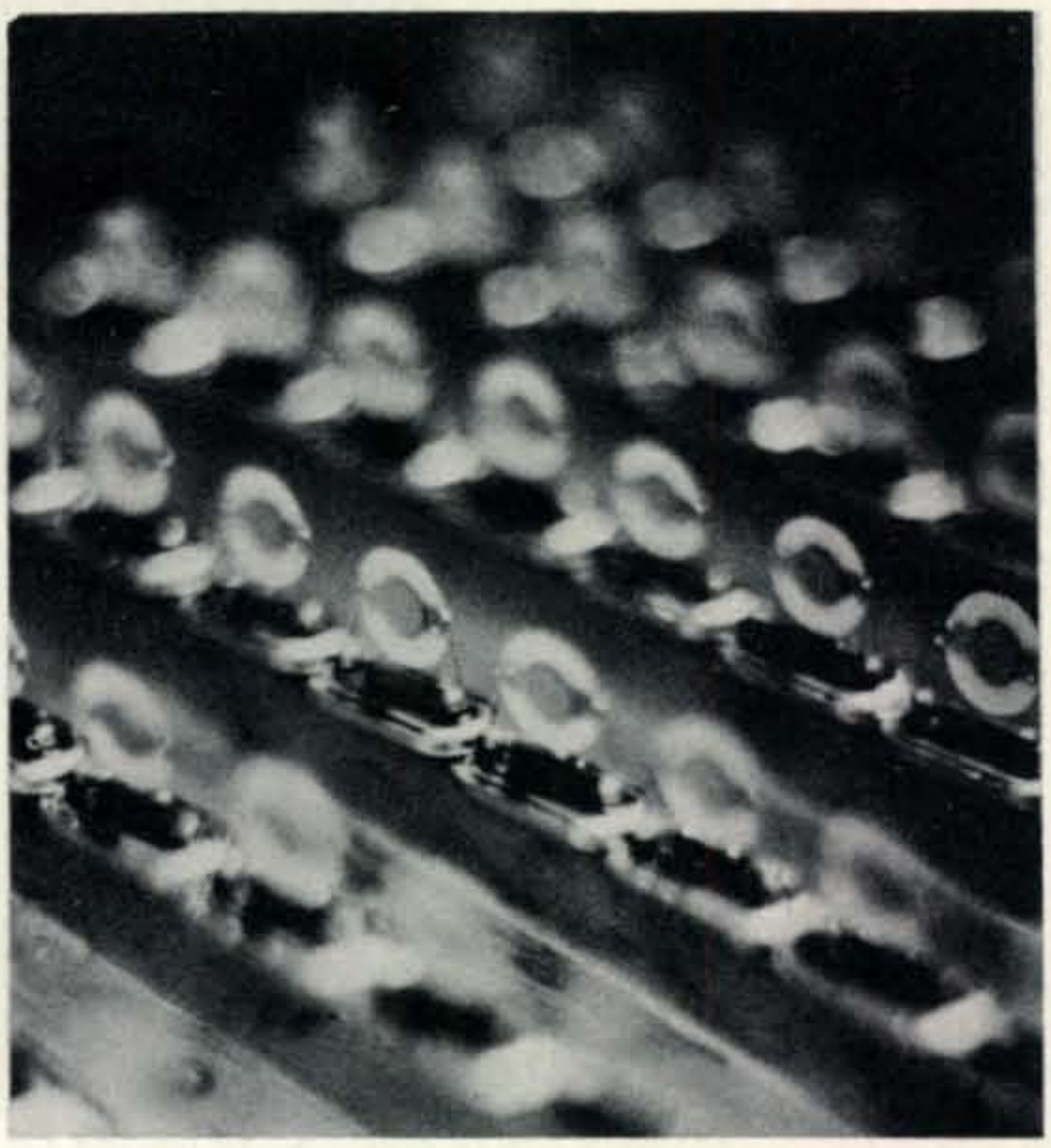
It's about time for the winter meeting of the Texas VHF FM Society. Although the exact date was not available at press time, plans call for an early February meeting in Corpus Christie. Of prime importance will be the adoption, or at least plans for such, of a formal Constitution. This meeting will be of the business session type, rather than a large hamfest. However, anyone interested in f.m. is invited to attend and join the association.

Q & A

Q. Although I operate amateur f.m. I also like to monitor certain local business and safety

People who know about quality know about Sentry





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transmissions. One station is cut out by another located only about 2 miles from my home. The frequency of the interfering station is exactly 1/2 way between the injection from the first oscillator and the desired frequency. What can I do?

A. In a case where the difference between the desired frequency and the interfering signal is 1/2 the high i.f. frequency and thus located midway between the 1st injection frequency and the desired carrier frequency, the only way to eliminate the interference without a cavity, filter, or other front-end device one must change the 1st injector frequency to the other side. That is, if low side injection is now being used, then go to high side. Of course, if the receiver has more than one crystal each one will have to be moved to the other side (an expensive proposition). In the case where the interfering signal is a 2 times the low i.f. frequency (e.g. 455 kHz if making 910 kHz signal difference) then swapping the 2nd injection frequency will take care of the problem.

Q. Will you design a squelch circuit for me to use with a . . . . . receiver? How about a solid-state conversion of the . . . .. ? Can you tell me where I went wrong when I designed this unit?

A. These are just a few of the questions which are beyond the scope of this column. Trying to debug someone else's homebrew project or to design from scratch would not give me time to answer any other questions. For someone needing information as to where to look for such information I am happy to help out, but cannot specifically design or debug. Look in the many amateur magazines for circuits with similar characteristics or go to the *Sourcebook Of Electronic Circuits;* John Markus, McGraw-Hill Book Company; New York; 1968. This book has hundreds of circuits from various publications. It should be in your local library or at a nearby college or technical school.

Finale

Enough repeater directory cards are in to prepare the first edition of the directory. It should be in either the March or April issue. Any update or additional information is always appreciated.

Since the interests of f.m.'ers are quite diversified in just what they want to see in this column, several things are now in the planning and/or debugging stages. Included are solid-state multi-frequency assemblies (5 or 10 frequencies) using cheap I.C.'s; more test equipment; and information straight from the horse's mouth (manufacturer) as to losses and other characteristics of feedlines.

I still need photographs of f.m. activities and of the repeaters and sites. They do not have to be fancy. A Polaroid shot is fine. An Instamatic does fine too, so get out and take some photos and forward them for publication. Enough for now. Best of luck and happy f.m.'ing. ■

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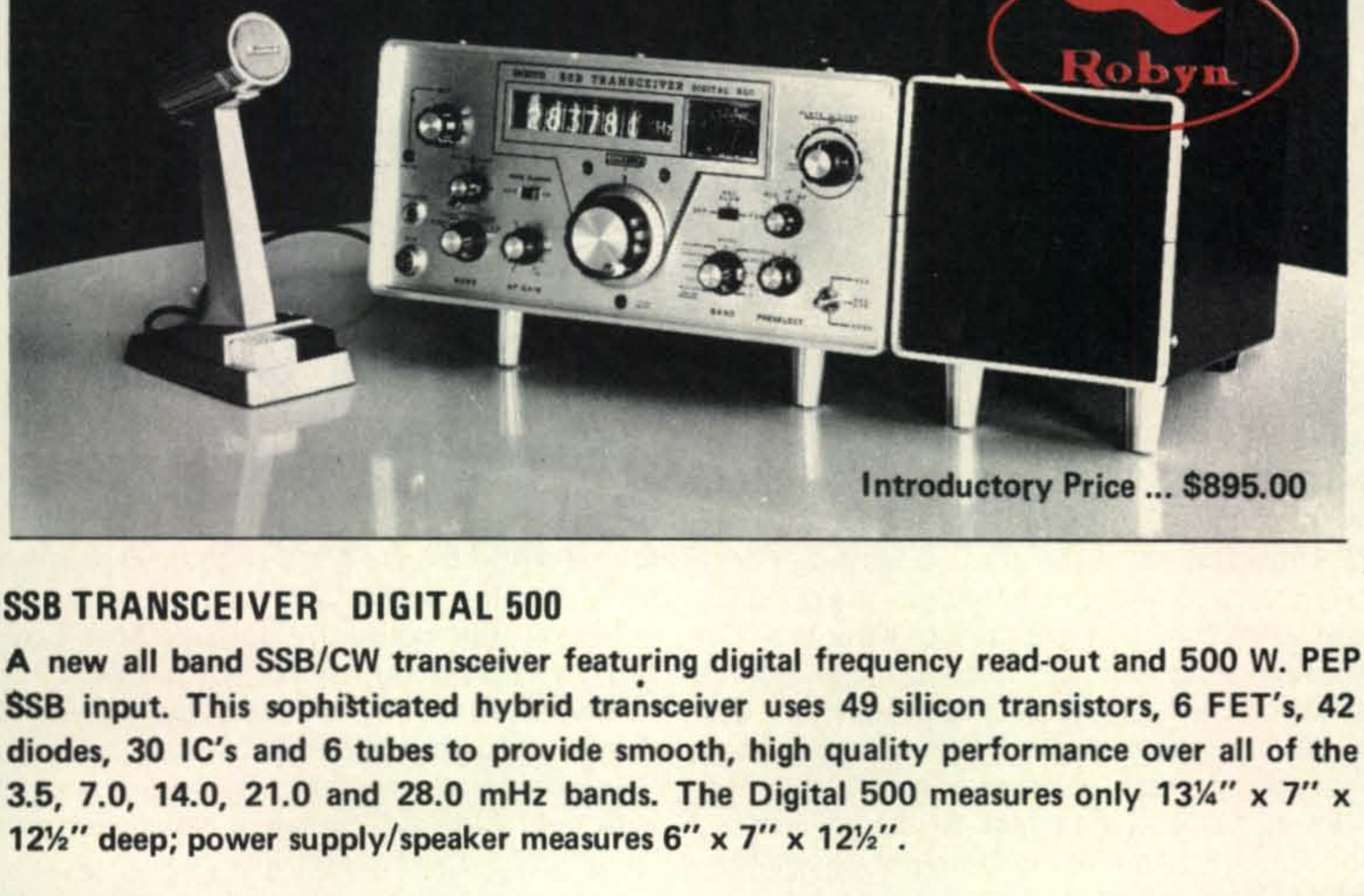

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QUICKER and BETTER LOW-PASS FILTER DESIGN

BY IRVING M. GOTTLIEB,* W6HDM

GOOD low-pass filters are very useful. For example, a valid "two-tone" test of a single-sideband rig requires low harmonic distortion in the output waveforms of the two audio oscillators. It is generally unlikely that the audio signals available in the shack will be up to snuff in this regard. The situation is readily remedied by passing the less-than-perfect audio waves through low-pass filters. Some eons distant in the electromagnetic spectrum, we find that a low-pass filter inserted between the final stage and the antenna lead-in, effectively strains out the harmonic energy that would otherwise raise havoc with the TV viewers. And there are lots of experimental situations wherein success depends upon our ability to enforce the dictum, "no higher frequencies than umpety-ump Hz will be allowed to pass from here to there." Surely, the skill to design predictable low-pass filters from a few inductors and capacitors can be a rewarding one. The image-parameter method, its foreboding name not withstanding, provides us with a few simple formulas and rules which should quickly lead to the requisite hardware and the desired response. But, sometimes there are a few snags in the path of progress!

Experience shows that the three-section filter of fig. 1 is a good universal circuit for the majority of a.f. and r.f. uses in transmitters and receivers. Such a filter is capable of giving us a nice flat pass-band and a steep transition into the region of attenuation, *i.e.*, the stop-band. It is always better to do the job right than to save a few pennies via the marginal performance provided by more primitive filters. The only hang-up is that the handbooks and manuals have withheld, or at least concealed, certain vital facts pertaining to real-world filters. Those who have dabbled in the art know that no matter how far we string out our decimal points, or how carefully we bridge out, select, or fabricate the components, the completed filter inevitably shows a response which cuts off at a *lower*-than-calculated frequency. So we go to work with our "fudging" empirics, endeavoring to "pull" the cut-off frequency by monkeying with the capacitors or inductors. What with our tweaking and cursing, we ultimately succeed, but at a price. Very often this process leads to ripple in the pass-band, accompanied by "bubbles" and inflections in the skirt of the response curve. See fig. 2. This may or may not be acceptable, but we cannot help but suspect there must be a quicker and better way!

Let us momentarily divert our attention to the single-section filter of fig. 3. If we could obtain the mathematically-ideal response

*931 Olive St., Menlo Park, Cal. 94025.

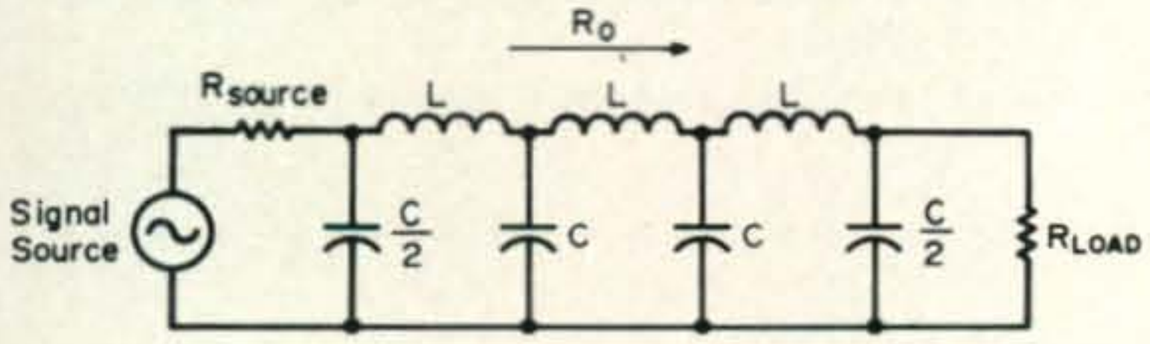

Fig. 1—A three section low-pass filter. In design formulas above, *Ro* is in ohms, *fc* is in Hz, *L* is in henries, and C is in farads.

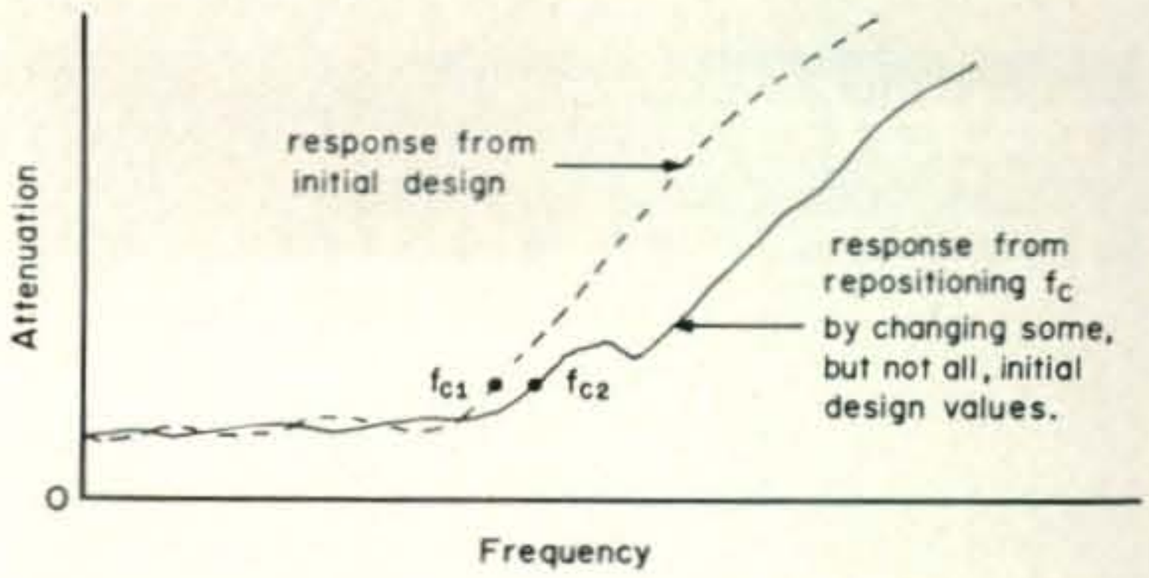

Fig. 2—Response degradation typical of "fudging" techniques. Two capacitors and one inductor of fig. 1 were changed from their initial design values to force fc_1 to move to fc_2.

from this section, our troubles would be over and this article would have no relevance. This ideal response has the general shape shown in fig. 3. One thing is quickly evident: any number of such filters (or such responses) could be cascaded without disturbing the cut-off frequency. Unfortunately, practical filters designed by the simple formulas of image-parameter theory *do not* produce the response depicted by fig. 3. Moreover, they would not even if the inductors and capacitors were perfect. Rather, we find that the response is more in the nature of the curve shown in fig. 4. Now, this is still a respectable response. The passband is still substantially flat and the transition into the region of attenuation hasn't really been too drastically affected. But a little consideration should make it evident that the cut-off frequency will now occur at *lower and lower frequencies* as we cascade filter sections. This is because the cut-off frequency is now located on a *rounded* portion of the response curve. Indeed, it is defined as that frequency which is 3 db down in amplitude from the amplitude referred to, say the first 20% of the pass-band. (or more accurately to zero frequency, *i.e.* to d.c.). But, why the curvature in the vicinity of f_c?

The ideal response curve of fig. 3 would be forthcoming from the single section filter of fig. 3 *if* the elements had *zero losses* and if the filter could be operated into a matched impedance *throughout its passband*. What impedance is this? Ordinarily, we designate it to be a resistance equal in value to $\sqrt{L/C}$, which is called the characteristic impedance of the filter. Moreover, the signal source

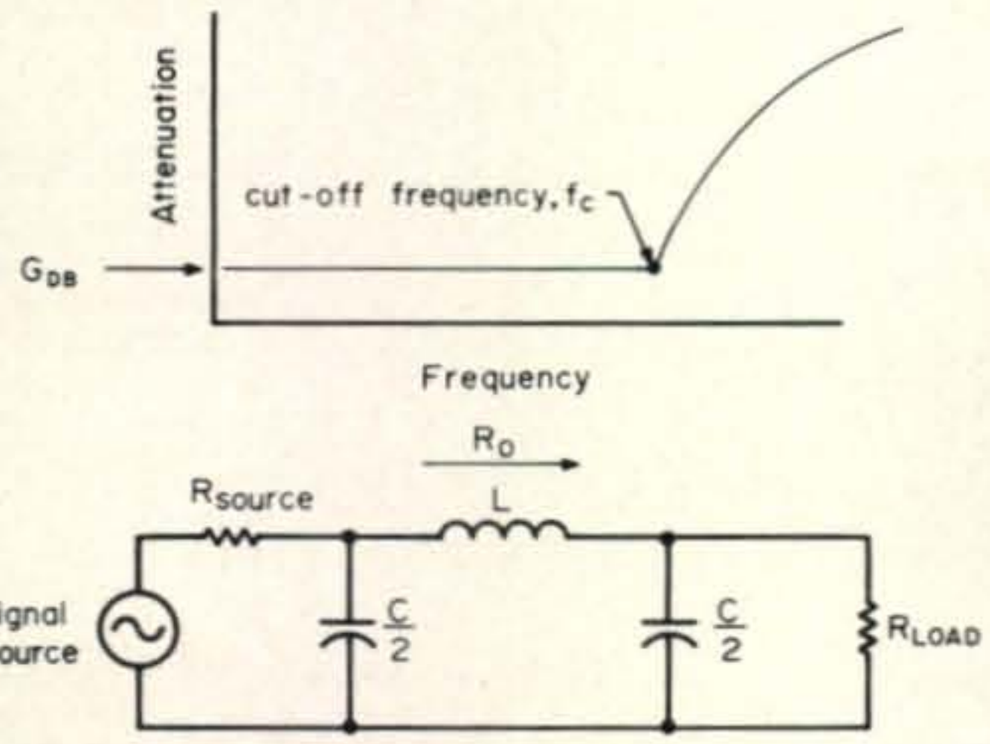

Fig. 3—The response of an ideal single section. This response is based upon the generally used, but unrealistic assumption, that *R*source and *R*load will be matched to *R*o from zero to the cut-off frequency, *f*c. It is also unrealistically assumed that the filter elements are lossless in general design procedure.

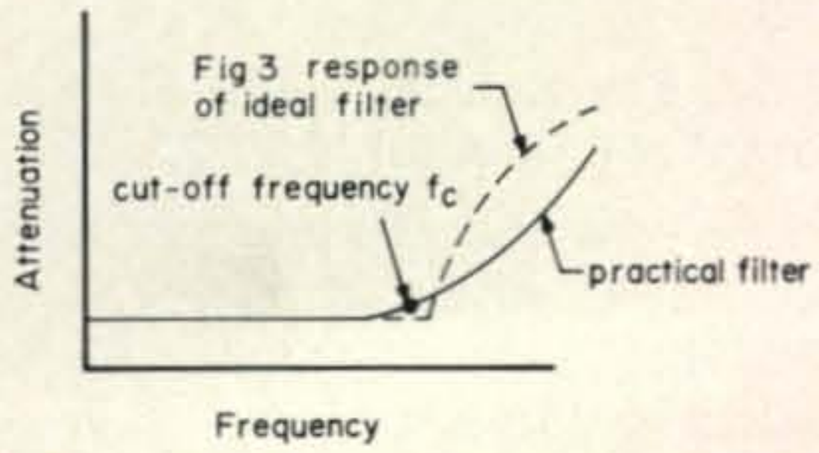

Fig. 4—Response of a practical single section filter. This response differs from that of fig. 3 because the characteristic impedance *R*o does not remain at its low frequency value $\sqrt{L/C}$, over the entire pass-band. Also, in practical filters, the position of the cut-off frequency, *f*c, is made even more indeterminate by the effects of losses in the elements.

ahead of the filter is also ordinarily made this value. Such operation yields a flat passband over most of the frequency region between d.c. and the cutoff frequency. If we refer to fig. 5, we see *why* the ideal response is not attained. Figure 5 reveals that the characteristic impedance of the filter is $\sqrt{L/C}$ at d.c. and at low frequencies, but as we approach cutoff the target is *infinite impedance*. Thus, we cannot match the input and output of the filter over the entire passband. Mismatch causes internal reflections, this being manifested by gradual excursion into the attenuating region. No wonder the passband connects to the stopband via a *rounded* segment! (Resort to mathematical rigor would be accomplished by pointing out that the oft-used expression for Z_o, the characteristic impedance does not tell the whole story. Rather, for the filter section of fig. 3,

$$Z_O = \sqrt{\frac{L/C}{1-\left(\frac{f}{f_C}\right)^2}}$$

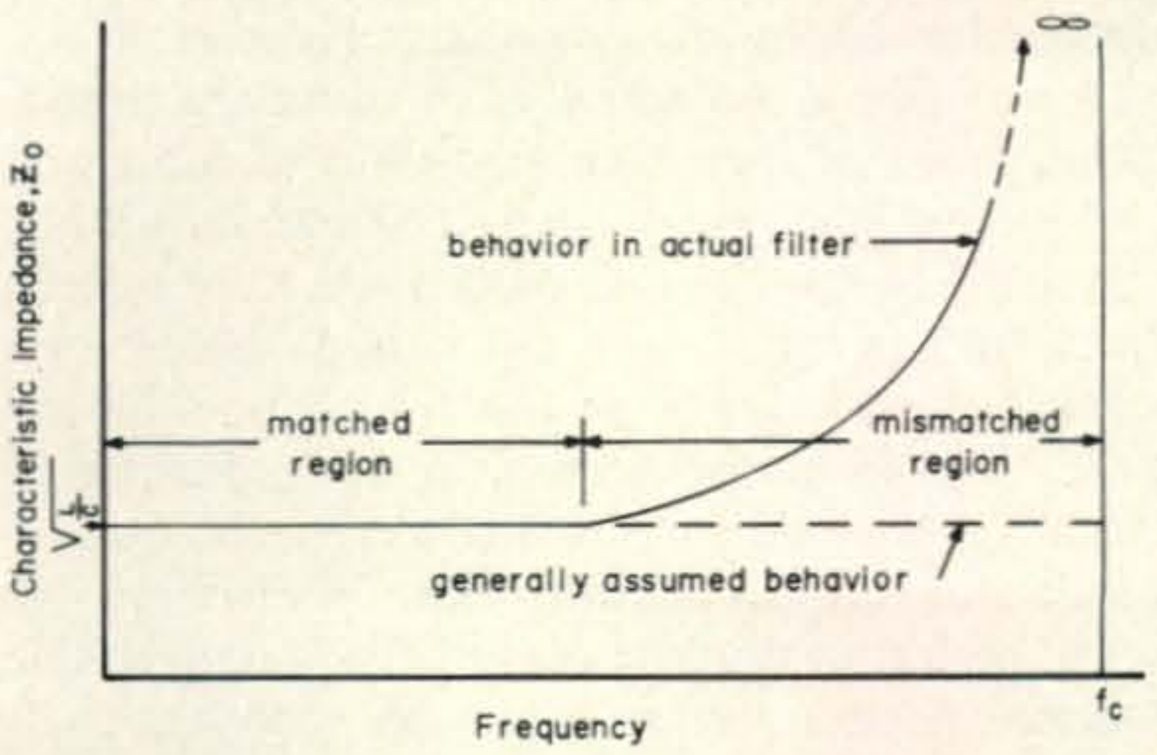

Fig. 5—Behavior of characteristic impedance in single section filter of fig. 3. Note that for zero, and for low frequencies, the characteristic impedance is the value $\sqrt{L/C}$. It is only possible to match this filter over this region of the pass-band.

Indeed, fig. 5 represents a plot of this more complicated equation for Z_o)

We have seen that the inherent nature of the filter section of fig. 3 dooms us to approximate the desirable conditions of impedance match. If this were the whole sum of the matter, we wouldn't be too badly off, for some "bugging factor" could be devised to take care of the effects of cascading on f_c. What louses up the situation is the inevitable presence of *dissipative losses* in the elements. Such losses generally are found to predominate in the inductors and it usually is found that the capacitors can be considered lossless. This is certainly true at audio frequencies. In any event, the general effect of element dissipation is included in fig. 6b. The departure from horizontal of the passband as we approach f_c adversely affects the cascading problem. f_o now occurs earlier in each section than would be the case if the inherent impedance-mismatch were the only culprit. Worse, the occurance of f_c is very much a matter of the losses incurred in the particular filter. This will vary widely and cannot be nailed down. All we can do is try to use inductors which are relatively good considering size, economics, availability, and various nebulous factors. When all is said and done, the cutoff frequency of a filter with three sections is likely to occur so much earlier than indicated by the formula, that our slipsticks appear to be sabateurs! But all is not lost! Both mathematics and cook-book technology conspire to provide a neat way out.

First off the bat, when we set up the design equations, let's make f_c about 10% *higher* than is ultimately desired. This makes sense because it is in the right direction to compensate the effect of cascading filter-sections. However, our objective is to cause the cutoff frequency of the completed filter to come out slightly *higher* than desired. Now, assuming that the inductors and capacitors have values within, say ±2% of computed values, we will not disturb any of the four capacitors or the three inductors shown in fig. 1. Rather, a small capacitor is connected across the output inductor. With a little experimentation, it will be found that the cut-off frequency of the three section filter can be conveniently *lowered* to yield the desired overall response. Manipulation of the cutoff frequency in this manner will not be accompanied by any of the "side-effects" which usually assert themselves when the cutoff frequency is pulled by tweaking the various elements of the original filter network. Such tweaking, incidentally is usually time consuming; it is often found that the cutoff frequency moves in unanticipated directions as we modify an element.

This is all there is to it, but it remains to be shown that the technique merits support from logician as well as empericist. In more advanced work with image-parameter filters, certain benefits are conferred by so-called m-derived sections. (It so happens that our output stage with its tuned inductor now has the circuit configuration of an m-derived section.) The resonant frequency of this tank is always made higher than the cutoff frequency and causes high attenuation in the stop band at a frequency region where the use of the filter indicates such a need. For example harmonic, intermodulation, crosstalk, or other interferences can be greatly attenuated by this technique. One may liken it to a wave-trap. It is often a more economical approach than the brute-force cascading of many filter sections. To those versed in the art, it is an "old-hat" maxim that the resonant frequency of the m-derived section affects the cutoff frequency of the filter. Moreover, the closer this resonance is to the designed cutoff frequency, the greater will be the effect. The direction of this effect, as might be anticipated, is the *lowering* of the cutoff frequency. See fig. 7. Inasmuch as we purposely made the cutoff frequency of the filter *higher* than desired, we now find ourselves in the favorable situation

[*Continued on page 84*]

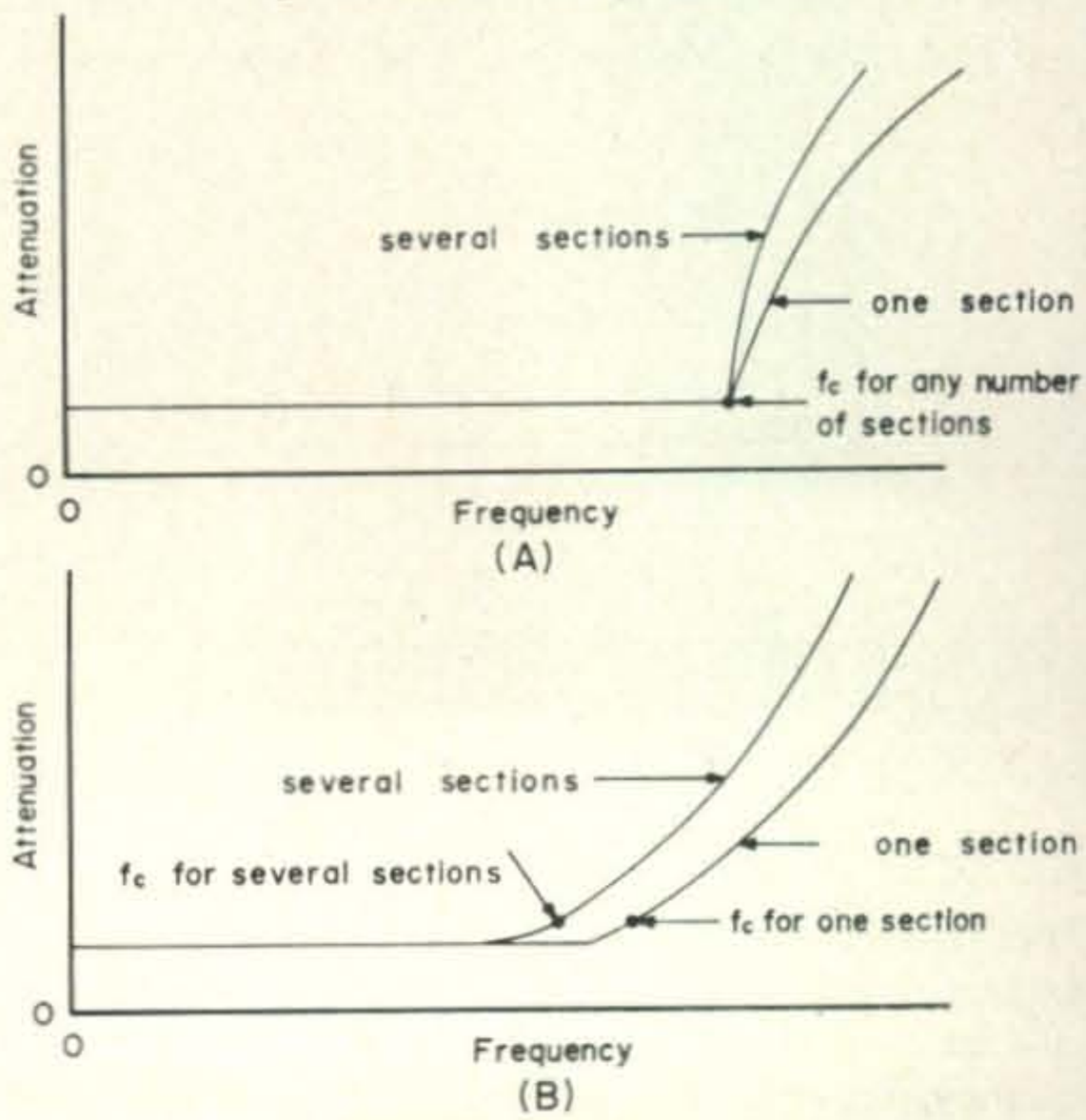

Fig. 6—Effect of cascading filter sections. (A) Ideal sections. (B) Real-world sections. Note shift of fc.

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This valuable book is imported from Germany and written by DL1CU. It contains a collection of phrases and expressions designed to assist those amateurs who wish to enlarge their knowledge of various languages for use on amateur radio. It is a must for every DX'er. $1.50

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Results of the 1971 CQ World Wide WPX SSB Contest.

BY FRANK ANZALONE,* W1WY

WE got our lumps in last year's WPX SSB Contest (March 1971). With more than a 25% decrease in returns we are wondering "what did we do wrong?"

Of course we had expected that conditions would not be as good as the past few years, especially on 10, but there seemed to be a lot of activity, and the size of some of the scores proves that.

With many single banders showing well over 1000 contacts and the prefix multiplier in the high 200's, lack of activity can hardly be blamed.

Guess the fellows are just not submitting their logs. They could show their gratitude by sending us a report. Look at all those juicy prefixes we created. HUØ from El Salvador, HQ2 from Honduras, TC3 from Turkey, OG2 from Finland, IE1 from Italy and 4M5 from Venezuela. Not to mention the RA, RC, RI and RJ from the USSR, and the always exciting surprise out of Brazil.

Once again Flavio, PY1CK did his usual outstanding job in printing and distributing log forms, summary sheets and check lists. The logs were in excellent shape and checking them was a pleasure. Brazil again was by far at the top of all participating countries.

Many of these unusual calls heard in the contest were assigned for the contest period only, so if you WPX chasers were not on that week-end, you're out of luck until next year.

If you are confused by some of the Trophy winners, remember that we have a three year limitation clause on winning the same award. Therefore the top scorer is not always the one who takes home the bacon.

Because of this, a special championship Plaque is being awarded to 4X4NJ, the same group who won top multi-multi honors last year as 4Z4HF. Their score this year sets a new record in their category in WPX competition.

I wonder what Gerson, PV7APS must be thinking. This is the third year he has been nosed out of top honors on a single band. This time by Jack, W3ZKH last year's all band champ, who again fired-up PJ9JR and this year set a new record on 14 mc.

Some excellent scores were turned in by YL's, notably Christina, EA8GZ on 28 mc, Carmen, HUØA (YS2CEN) on 14 mc, Irmgard, YV1YC on all bands and Jinny, VU2-IRA also on all bands. Jinny and Rosie the distaff members of the EP2FB team exchanged identical 1001 QSO numbers. This year Alicia, KP4CL was only able to put in a limited time. And where was Sonia, PY2SO? Oops! I forgot, Sonia only operates c.w.

On the whole most of the logs were in pretty good shape. A few are still counting the prefix multiplier on each band. It's just not done that way fellows, a prefix is counted *only once* as a multiplier in this contest. And many still fail to indicate the number of QSOs (minus the duplicates). We list them in the results, so please indicate the total on your summary sheets.

---

* Chairman, Contest Committee.

The winning Multi Multi team as DKØWA. L. to R.: A couple of s.w.l. loggers, DK2BI, DJ2BW, DK2BJ, DL9OH and another s.w.l. who kept the boys supplied with coffee and etc.

Like DL8FP, who approves of the rest period, this was the first WPX contest for many stations, and most all of them promised to be back for the next one. Checking over the list of entries I ran across many unfamiliar calls. Could be we are creating a new breed of contesters?

You fellows that have been passing up this contest might look into the possibility of joining us in the next one. With rest periods, double QSO points on 40 and 80, and awards not only for all band operation but for each single band as well, we think we've got something good going in this one.

Check this month's CALENDAR for a brief run-down of the rules. They will be given in detail in next month's issue.

Do you suppose Murphy is trying to tell Rick, WA8QIY something? In 1968 a shorted coax put him out of business at KL7AIZ, in 1969 it was the exciter that let him down at DL4USN, in 1970 back in the comforts of his home it was antenna trouble, and this year the linear went west.

At JA9APS, Murphy did not make an appearance until the contest was almost over, a high wind blew down the antenna.

And at VE1ACU the operator on the dog watch was a volunteer fireman. You guessed it, he got a call and had to drop everything and go out and fight a blaze.

The SK5AL multi operation was made by a group of c.w. men who found s.s.b. quite revealing, working stations they had not been able to contact on c.w. The location at an old ranch house provides plenty of room for an antenna farm and they are making big plans for future contests.

Another portable DX operation by a stateside station. Rick, WA8VRB/HR2 gets the 21 mc award for Honduras.

The younger generation in the contest. This is Roger, WA1KZE of the WA1LKX multi team. Roger is 15 and Stuart, the licensee, is 16.

The Old Timers DX Club was behind the IE1PUG Contest Expedition to the Lipare Island. No, it's not a new country, just another I1.

The new DA prefix issued to U.S. GI ham stations in Germany, was used for the first time in a WPX contest by DA1QH (WA7-MZR).

VE3BMV is none other than OK5BU, an active contester. Maybe Yuri will stir up some new life in that lackadaisical group across the border.

We had not heard from JA1AEA for some time, so it was a pleasant surprise to receive his log for his operation at CR9AK.

WA1LKX and WA1KZE claim they are the youngest operators in multi operation. Could be, they were not even born when *CQ* started its contest activity. They are 16 and 15 respectively.

To answer many inquiries. WPX credit for contest operation must be made via WA6-GLD, just like any other WPX application. Your contest log may be used as proof, provided we also have the log of the claimed prefix. But you have to make the application.

That's about it for this one. This was a two man effort, Bernie Welch, W8IMZ and yours truly. We received an assist from Andy, W1-GYE and Bob, W1MDO when time was running out on us. And of course Joan of the *CQ* office staff took care of contest secretarial chores at the office.

Hope we haven't made too many errors, blame me if you discover any. Air Force Sergeants are infallible, and did you ever try arguing with a woman.

73 for now, Frank, W1WY

[*Scores begin overleaf*]

TOP SCORES

SINGLE OPERATOR ALL BAND

PX3BXW	**1,376,145**	KS6DH	1,103,232
DU1FH	**1,264,640**	CR4BC	1,044,240
KP4AST	1,234,548	OK2RZ	1,028,741
W2SKE	1,202,814	W3GN	982,093
CT1BH	1,143,520	W6YRA	963,556

SINGLE OPERATOR SINGLE BAND

28 mc

LU2DEK	832,195
EA8GZ	740,814
4X4OC	404,766
ZS3CJ	362,970
CR7FR	336,042
ZD8H	327,250
UK9ABA	1,740,020
ET3ZU	1,062,776
VE7SV	1,021,585
IT1JT	923,508

21 mc

W3AU	1,435,230
PV2DSE	1,025,564
KG6AQY	930,936
4Z4CD	889,592
W7IEF	828,520
OH2BR	695,520

7 mc

WB6KBK	137,632
OA8V	126,046
W3AZD	114,168
I1ZSQ	97,104
DL8PC	90,090
XE1BT/XE2	70,794

14 mc

PJ9JR	**2,385,192**
PV7APS	2,085,993

3.8 mc

4X4DK	478,950
DL8MM	211,248
HQ2GK	91,676
SM7CRW	62,194
OK1MP	49,056
OK2BLI	45,938

MULTI-OPERATOR SINGLE TRANSMITTER

G3WYX	**2,120,885**	W6HX	1,606,176
OG2A	1,955,906	VE1ACU	1,580,985
UK2FAA	1,869,986	W2PV	1,477,476

MULTI TRANSMITTER

4X4NJ	**5,127,910**	DFØAFZ	1,604,556
DKØWA	**2,503,656**	WB6GFJ	1,117,398
DLØWW	1,782,535	W3SS	800,112

Number groups after call letter denote: Band, Score, QSO's and Prefixes. Bold listings are certificate winners.

SINGLE OPERATOR

North America

United States

K1CSJ	**A**	**334,611**	**508**	**243**
W1OKA	"	170,384	331	146
W1CHA	"	76,504	212	184
K1SHN	"	41,400	141	115
W1DQK	"	6,750	53	45
W1WY	"	3,815	40	35
W1PLJ	"	2,958	36	29
WA1CYT	"	1,899	29	26
W2SKE	**A**	**1,202,814**	**1303**	**326**
WA3BZA/2	"	255,360	447	210
W2LEJ	"	108,780	266	147
W2QKJ	"	24,992	100	88
W2EIQ	"	11,532	64	62
WA2AUB	"	8,692	62	53
F3VN/W2	"	3,193	38	31
W2MB	"	720	16	16
WB2RLK	**21**	**310,365**	**559**	**209**
WB2MQI	"	31,920	134	84
W2BHK	**7**	**36,540**	**172**	**90**
W3GNA		**982,093**	**1130**	**307**
		(Opr. WA3HRV)		
WA3MQJ	"	88,033	222	151
WA3NNA	"	71,421	244	133
WA3IXF	"	49,728	190	112
WA3GZT	"	37,600	149	94
WA3ENM	"	17,340	89	68
WA3KMA	"	4,653	55	47
W3JSX	**28**	**125,664**	**310**	**176**
WA3JIH/3	"	45,732	167	111
WA3HMM	"	29,610	123	90
W3AU	**21**	**1,453,230**	**1511**	**333**
		(Opr. K3EST)		
WA3IAQ	**14**	**84,184**	**233**	**136**
W3AZD	**7**	**114,168**	**212**	**134**
W3CRE	3.8	4,510	50	41
W3TV	"	2,050	30	25
K4EVY	**A**	**338,560**	**559**	**230**
WB4SJG	"	331,340	523	240
W4WRY	"	118,420	277	155
WA4FZA	"	111,202	246	169
K4OV	"	32,760	170	104
W4WSF	"	26,663	115	81
W4HOS	"	18,018	100	78
W4KMS	"	13,293	78	63
W4DS	"	4,608	48	48
K4AEH/4	"	3,808	53	34
W4UPJ	**21**	**328,062**	**540**	**214**
WA4DRU	"	194,474	327	203
WB4PTH	"	101,591	310	161
W4EEO	"	2,790	30	30
W4CYC	**14**	**123,880**	**319**	**163**
W4CRW	**3.8**	**24,850**	**132**	**71**
WA4PXP	**1.8**	**528**	**25**	**22**
W5LPO	**A**	**102,816**	**285**	**153**
W5OB	"	38,896	159	104
W5PM	"	13,688	83	58
W5WEE	"	10,092	69	58
W5QAM	"	6,105	68	55
W5RMC	**28**	**99,383**	**266**	**149**
WA5ZWC	"	540	22	18
WB5DYY	**21**	**313,020**	**625**	**188**
W5QBM	"	279,270	494	214
WA5ZGI	"	5,289	48	43
W6YRA	**A**	**963,556**	**1329**	**244**
		(Opr. WB6WIT)		
W6NJU	"	306,402	580	186
K6SSN	"	66,150	200	126
K6PIH	"	42,456	262	58
VE7BNE/W6	"	6,762	65	49
W6RQZ	"	6,443	81	41
W6MQF	"	5,928	62	39
W6ISQ	**28**	**71,706**	**264**	**114**
WB6VZI	"	34,000	164	85
K6ZQP	**21**	**267,963**	**533**	**179**
WB6AUA	"	7,911	102	27
WA6BNZ	"	1,911	65	39
K6SVL	**14**	**170,100**	**388**	**175**
K6YRA	"	105,455	285	161
WB6KBK	**7**	**137,632**	**331**	**92**
WB6UDC	"	74,424	221	84
WA6DKF	**3.8**	**7,520**	**67**	**47**
WA7CGR	**28**	**41,553**	**201**	**81**
WA7PEZ	"	30,855	175	85
WA7JBE	"	19,092	124	74
W7IEF	**21**	**828,520**	**1347**	**220**
W7AYY	"	93,667	476	113
WA7BPS	"	29,348	191	58
K7HTZ	**14**	**415,530**	**664**	**243**
K7UWT	3.8	216	20	18
K8UDJ	**A**	**435,444**	**643**	**262**
WB8EUN	"	274,950	480	225
WA8TBQ	"	270,979	475	233
WA8QIY	"	199,332	383	196
W8IMZ/8	"	33,368	139	97
WA8ASV	"	25,564	120	77
WB8IAY	"	1,960	48	35
WA8TKM	**28**	**29,853**	**128**	**93**
WA8VBY	**21**	**414,426**	**615**	**239**
K8SJU	"	14,400	86	60
K8QYG	"	3,379	43	31
W8IHD	**7**	**17,802**	**100**	**69**
K8CFU	"	9,120	59	48
WA9VGY	**A**	**10,230**	**64**	**62**
WA9GRK	"	6,862	56	47
W9IY	**21**	**222,831**	**420**	**189**
W9RXJ	28	3,774	39	37
W9ZTD	**14**	**175,306**	**360**	**206**
K9CUY	**3.8**	**33,140**	**182**	**72**
K9WTS	"	20,672	129	68
WAØOML	**A**	**12,749**	**84**	**61**
WAØETC	**28**	**76,720**	**211**	**137**
WØJJG	"	40,194	149	99
WAØPRS	**21**	**23,772**	**104**	**84**
WØFWN	"	2,106	37	26
WBØCSR	**14**	**133,724**	**288**	**192**
WAØEPG	"	37,070	142	110
WAØEMS	**7**	**36,980**	**171**	**86**
WØNGJ	**3.8**	**7,446**	**79**	**51**

Alaska

KL7MF	**A**	**141,114**	**469**	**127**
WB8BYT/KL7	**14**	**41,785**	**261**	**61**

Bermuda

VP9GO	**14**	**106,722**	**410**	**121**

Canada

VO1AW	**A**	**47,234**	**140**	**113**
VE1EK	**A**	**54,534**	**170**	**122**
VE1AIT	"	6,670	59	46
VE1AL	**14**	**163,372**	**356**	**188**
VE3GCO	**A**	**458,700**	**593**	**278**
VE1AI/VE3	"	45,753	158	101
VE3BR	"	24,070	109	83
VE3BMV	**21**	**539,325**	**783**	**255**
VE3ENM	**3.8**	**22,684**	**113**	**53**
VE4RP	**A**	**239,655**	**469**	**195**
VE6AGV	**21**	**44,903**	**196**	**83**
VE7AZG	**A**	**46,768**	**195**	**79**
VE7SV	**14**	**1,021,585**	**1352**	**295**
VE7IQ	**7**	**7,320**	**69**	**33**

Costa Rica

TI2CF	**A**	**863,010**	**1638**	**223**

Dominican Rep.

HI3XAM	**A**	**109,788**	**637**	**84**

El Salvador

HUØA	**14**	**690,430**	**1242**	**235**

Guatemala

TGØAA	**14**	**509,841**	**1083**	**207**

Honduras

HR2HHP	**28**	**166,080**	**846**	**96**
WA8VRB/HR2	**21**	**364,364**	**923**	**169**
HQ2GK	**3.8**	**91,676**	**286**	**82**

Mexico

XE1LLS	**A**	**95,546**	**387**	**86**
XE1BT/XE2	**7**	**70,794**	**307**	**57**

Panama

HP1JC	**A**	**135,366**	**248**	**154**

Puerto Rico

KP4AST	**A**	**1,234,548**	**1872**	**284**
WA4UTP/KP4	"	80,262	235	117
KP4CL	**28**	**60,160**	**283**	**94**

Africa

Angola

CRGLF	**A**	**779,746**	**1045**	**253**
CR6GA	"	353,808	709	168

Franco, IT1JT was the top European on 14 mc. This is one contest where the IT1 prefix pays off.

Miro Santos, CT1UA winner of the 21 mc award for Portugal. We see that Miro already has his WPX certificate. Maybe his contest operation added to his total.

U.S.A. TOP SCORES

Single Operator

All Band	W2SKE	1,202,814
28 mc	W3JSX	125,664
21 mc	W3AU	1,435,230
14 mc	K7HTZ	415,530
7 mc	WB6KBK	137,632
3.8 mc	K9CUY	33,140
1.8 mc	WA4PXP	528

Multi Operator

Single Xmtr	W6HX	1,606,176
Multi Xmtr	WB6GFJ	1,117,398

Ascension Island				
ZD8AB	**A**	**167,226**	**593**	**94**
ZD8H	**28**	**327,250**	**587**	**187**
Cameroon				
TJ1AW	**28**	**59,103**	**199**	**99**
Canary Island				
EA8HG	**A**	**60,170**	**187**	**110**
EA8GZ	**28**	**740,814**	**1119**	**222**
Cape Verde Islands				
CR4BC	**A**	**1,044,240**	**1141**	**285**
Chad Republic				
TT8AD	A	882	19	18
Ethiopia				
ET3ZU	**14**	**1,062,776**	**1253**	**286**
		(Opr. F5QQ)		
Liberia				
EL2CH	**A**	**923,525**	**1518**	**205**
Malagasy Republic				
5R8AP	A	2,550	34	25
Mozambique				
CR7FR	**28**	**336,042**	**634**	**189**
South Africa				
ZS1WS	**A**	**501,120**	**775**	**216**
Southwest Africa				
ZS3CJ	**28**	**362,970**	**660**	**185**
Asia				
India				
VU2IRA	**A**	**819,540**	**1215**	**261**
Iran				
9C9WB	**A**	**572,451**	**1071**	**209**
Israel				
4X4OC	**28**	**404,766**	**848**	**199**
Japan				
4Z4CD	**21**	**889,592**	**1400**	**242**
4X4DK	**3.8**	**478,950**	**515**	**155**
JA2JW	**A**	**433,004**	**640**	**236**
JA9APS	"	159,983	362	157
JH1ARJ	"	120,000	296	150
JA7KXD	"	20,250	102	75
JA5DDF	"	18,240	108	64
JA6IYF	"	2,728	39	31
JA7RY	"	435	16	15
JA3AVO	"	133	7	7
JA9AG	**28**	**28,314**	**151**	**78**
JA3ELU	"	2,059	38	27
JA7JGD	"	1,740	35	20
JA3LDH	**21**	**99,684**	**261**	**142**
JA3ERG	"	77,172	270	109
JA7HYS	"	53,244	173	108
JA5FMT	"	37,293	150	93
JA2JAB	"	26,880	154	64
JR1INZ	"	12,056	102	44
JA8FBT	"	5,940	65	33
JA1NAW	**14**	**261,534**	**532**	**182**
JA1DQT	"	42,222	160	93
JA2BAY	**7**	**13,524**	**75**	**49**
KA2QW	**A**	**443,377**	**878**	**187**
Lebanon				
OD5BA	**A**	**249,983**	**381**	**223**
OD5GQ	**28**	**313,728**	**652**	**172**
Macoa				
CR9AK	**A**	**772,027**	**2146**	**227**
Ryukyu Islands				
KR6JX	**A**	**558,000**	**930**	**250**
Thailand				
HS1ABU	**21**	**396,520**	**1501**	**184**
HS3AEN	"	22,592	263	64
Turkey				
TC3CH	**A**	**176,865**	**360**	**153**
U.S.S.R.				
Asiatic				
UW9BY	**A**	**392,000**	**748**	**200**
UA9QAA	"	207,765	445	171
UA9MR	"	50,666	205	94
UA9MDY	**28**	**4,995**	**93**	**37**
UK9MMM	"	384	12	12
UA900	**21**	**151,018**	**394**	**161**
UK9ABA	**14**	**1,740,020**	**1723**	**361**
		(Opr. UA9AN)		
UA9MT	"	602	15	14
RA0UBC	**28**	**6,060**	**174**	**30**
UA0ABC	**14**	**101,976**	**225**	**168**
UA0IW	"	10,665	107	45
UA0DG	"	7,612	113	44
Kazakh				
UL7YR	**14**	**15,114**	**103**	**66**
Kirghiz				
UK8MAA	**14**	**10,150**	**87**	**50**
Tadjik				
RJ8JBR	**28**	**18,900**	**211**	**60**
UK8JAD	"	6,840	64	45
Uzbek				
RI8LAF	**28**	**16,980**	**149**	**60**
Europe				
Aland Islands				
OH0NJ	**A**	**48,608**	**209**	**124**
Austria				
OE1MWW	**A**	**38,142**	**173**	**117**
Balearic Islands				
EA6BN	**28**	**35,432**	**175**	**103**
Czechoslovakia				
OK2RZ	**A**	**1,028,741**	**1445**	**281**
OK1FV	"	40,449	250	139
OK3EA	"	16,206	102	74
OK2QR	"	15,067	92	61
OK1AAA	"	2,205	37	21
OK2ABU	"	1,296	36	27
OK2BJJ	**14**	**42,560**	**199**	**112**
OK1AEZ	"	31,104	171	108
OK3RMG	"	3,470	68	46
OK2BOB	**7**	**1,012**	**24**	**22**
OK1MP	**3.8**	**49,056**	**210**	**112**
OK2BLI	"	45,938	220	103
Denmark				
OZ3CE	**A**	**264,132**	**659**	**207**
OZ7JZ	"	27,768	147	104
OZ2LW	"	15,050	104	86
OZ4H	"	6,936	70	51
OZ3PO	"	3,069	38	33
OZ5JR	"	1,378	33	26
OZ3SK	**21**	**207,746**	**553**	**133**
OZ9FA	"	231	11	11
OZ9FM	14	420	20	14
England				
G3WJN	**A**	**361,103**	**721**	**193**
G3YBH	"	105,523	378	181
G2AJB	"	55,937	258	131
G3WPO/A				
	28	**74,600**	**279**	**100**
G3KWK	"	35,244	196	89
G3YWI	**21**	**62,216**	**253**	**88**
G3FXB	**14**	**627,705**	**970**	**261**
G3NSY	"	52,500	266	140
G3MWZ	"	6,960	91	60
Finland				
OH5SE	**A**	**536,934**	**927**	**218**
OH2FS	"	27,132	127	84
OH2BCV	"	22,900	117	100
OH7OQ	"	21,538	164	89
OH6RH	"	11,680	87	73
OH2VZ	"	9,971	78	59
OH2LU	"	7,592	72	52
OH5OD	"	3,420	46	36
OH3JR	"	2,139	53	31
OH2BLY	"	1,363	34	29
OH5PA	"	1,225	27	25
OH1SJ	"	840	22	20
OH2BFX	"	392	16	14
OH2XA	**28**	**9,945**	**77**	**51**
OH2BR	**21**	**695,520**	**1266**	**207**
OH2RI	"	373,998	850	166
OH7OV	"	18,368	145	82
OH7SC	"	4,200	51	40
OH6ZJ	"	2,170	36	31
OH2CP	**14**	**319,207**	**731**	**217**
OH6RX	"	31,892	259	119
OH2WQ	"	3,696	71	48
OH2BHU	"	45	5	5
OH3MK	**3.8**	**4,180**	**57**	**38**
France				
F9MD	**A**	**276,966**	**501**	**207**
F3IJ	"	24,871	128	77
F5SP	"	1,560	27	24
F0WJ	**21**	**19,671**	**116**	**79**
F9XA	**14**	**19,292**	**199**	**91**
F6AJA	"	6,448	100	62
F6ATE	"	576	16	16
Germany				
K4II/DL	**A**	**543,084**	**814**	**271**
DL1MD	"	251,082	488	222
DL7EN	"	154,980	358	189
DJ6GW	"	127,260	363	180
DJ3EJ	"	114,741	312	183
DL7FP	"	60,600	200	150
DK6GK	"	48,552	209	136
DK0VS	"	37,152	188	129
DJ2ZG	"	14,175	107	81
DL3NO	"	8,142	75	59
DL8PC	**7**	**90,090**	**239**	**143**
DL6WE	"	47,988	164	93
DL8MM	**3.8**	**211,248**	**436**	**162**
DL4JW	**A**	**414,470**	**775**	**217**
DA1QH	"	46,265	211	95
DL4DL	**21**	**57,662**	**217**	**108**
DM2ATD	**A**	**416,999**	**711**	**227**
DM2CDL	"	58,225	272	137
DM2YLO	"	34,500	183	115
DM2BTO	"	25,460	143	95
DM2DDN	"	1,653	34	29
DM2AYK	"	363	11	11
DM2DEO	**14**	**1,534**	**51**	**26**
Guernsey (Channel Is.)				
GC3YIZ	**A**	**130,937**	**417**	**127**
Hungary				
HA5CQ	**A**	**122,322**	**353**	**174**
HA1ZH	"	11,022	100	66
HA4YD	14	34,299	270	111
Iceland				
TF3AU	**A**	**81,380**	**320**	**130**
Italy				
I1FLD	**A**	**818,100**	**1132**	**270**
I1CSP	"	6,148	65	53
I1WXY	**21**	**167,580**	**473**	**140**
I1DVT	"	108,968	370	106
I1CGM	"	98,864	279	148
I1PLN	**14**	**224,425**	**523**	**191**
I1MEC	"	61,758	318	146
IRØKGM	"	32,186	200	121
I1SGZ	"	29,841	153	147
I1PLS	"	7,440	113	62
I1ZSQ	**7**	**97,104**	**344**	**136**
Liechtenstein				
HBØAON	A	2,200	44	25
Netherlands				
PAØTO	**A**	**9,796**	**75**	**62**
Norway				
LA8OM	**A**	**52,962**	**182**	**97**
LA2GN	"	7,050	70	50
LA2S	"	1,924	40	26
LA7CL	"	768	18	16

The winner of the Canadian Trophy donated by Gene Krebiel, VE6TP for the winning score on a single band. Yuri, VE3BMV (ex-OK5BU) did it on 21 mc.

TROPHY WINNERS

WORLD—Single Operator, Single Band. The Jack Chalk, KC6EJ Trophy. Won by: **Jack Reichert, PJ9JR** (W3ZKH) 14 mc

WORLD—Single Operator, All Band. The Don Murray, K4FMA Trophy. Won by: **Eduardo Snel, PX3BXW.**

WORLD—Multi-operator, Single Xmtr. The Don Miller, W9WNV Trophy. Memory of Ted Thorpe, ZL2AWJ. Won by: Station G3WYX. (Oprs: G3HTA, G3RUV, G3RUX, G3TJW)

WORLD—Multi-operator, Multi Xmtr. The Don Miller, W9WNV Trophy. Memory of Chuck Swain, K7LMU. Won by: **Station DKØWA.** (Oprs: DK2BI, FK2BJ, DJ2BW, DL9OH)

CANADA—Single Operator, Single Band. The Gene Krehbiel, VE6TP Trophy. Won by: **Yuri Blanarovich, VE3BMV** (21 mc)

OCEANIA—Single Operator, All Band. The Jack Chalk, KC6EJ Trophy. Won by: **Station DU1FH,** Earl Hombostel, opr.

Special CQ Award World Champions

Station 4X4NJ. (Oprs: 4X4FV, 4X4GV, 4X4VE, 4Z4AI, 4Z4GV, 4Z4IX, 4Z4JT)

LA1YM	28	231	11	7
LA4LG	**21**	**7,820**	**64**	**46**
LA2DL	"	4,690	57	35
LA3CK	"	2,838	53	43
	Poland			
SP5XM	**A**	**68,019**	**241**	**123**
SP9VU	**28**	**9,150**	**65**	**50**
SP5BSV	**14**	**90,125**	**311**	**175**
SP2BSX	"	52,283	262	97
SP5BAK	"	29,792	215	98
SP9KR	"	15,687	134	83
SP7AWA	"	2,596	72	44
SP5CKM	"	1,656	24	23
SP6BQF	**3.8**	**21,120**	**137**	**80**
SP3BLG	"	17,250	114	69
SP5ELW	"	2,798	46	34
SP8EMO	"	198	11	11
	Portugal			
CT1BH	**A**	**1,143,520**	**1454**	**280**
CT1ZE	**28**	**74,315**	**305**	**89**
CT1UA	**21**	**305,805**	**694**	**185**
CT1ZG	**14**	**34,452**	**171**	**116**
	Romania			
YO8AMT	**A**	**36,580**	**197**	**124**
YO3RO	"	32,660	225	115
YO2CJ	"	5,863	61	41
	Sicily			
IT1JT	**14**	**923,508**	**1338**	**306**
	Spain			
EA3RF	**A**	**29,568**	**149**	**96**
EA4JV	**14**	**147,016**	**526**	**184**
	Svalbard Island			
JW7UH	**A**	**35,520**	**284**	**111**
	Sweden			
SM7TV	**A**	**199,844**	**454**	**188**
SM3AF	"	86,292	272	153
SK5AS	"	86,229	336	117
SM7ID	"	56,330	212	131
SM5CAK	"	53,328	249	101
SM6CIK	"	51,250	197	125
SM5BYF	"	43,250	144	78
SM2CTY	"	16,906	103	79
SMØBDS	"	6,696	80	54
SM5CCH/Ø	"	4,620	55	42
SMØCER	"	2,349	31	27
SM3DXC	"	2,077	39	31
SM5BFJ	"	2,070	31	23
SM7BGF	"	1,496	30	22
SM2CSA	"	954	24	18
SM5UH	"	675	15	15
SM3EVG	**21**	**670,600**	**1217**	**200**
SM7EVM	"	24,174	122	79
SM5CSS	"	7,650	70	51
SM7AIL	"	2,520	37	28
SM5AQN	"	126	7	6
SM4CAN	**14**	**324,543**	**820**	**251**
SM7DMN	"	93,636	480	162
SM5CMP	"	91,044	403	162
SM1EJM	"	45	5	5
SM7CRW	**3.8**	**62,194**	**263**	**121**
	Switzerland			
HB9UD	**A**	**19,108**	**110**	**68**
	United Nations (ITU)			
4U1ITU	**14**	**672,660**	**1007**	**303**
	Yugoslavia			
YU3TZC	**A**	**342,974**	**667**	**223**
YU1AHI	"	21.465	133	81
YU1NTO	**21**	**14,982**	**108**	**66**

U.S.S.R.

	European			
UA4QX	**A**	**350,280**	**911**	**210**
UA3GM	"	77,131	255	137
UV3FD	"	55,062	210	133
UW6LC	"	50,032	183	118
UK1ADZ	"	2,640	46	30
UA4AU	"	2,550	41	34
UA4YAC	**28**	**6,136**	**77**	**52**
UA3HB	"	3,392	40	32
UA4LG	**21**	**455,345**	**994**	**187**
UW3EH	"	252,456	723	157
UV3GW	"	225,990	670	162
UA1CK	**14**	**89,324**	**332**	**163**
UA3NG	"	7,296	60	57
UA4LT	"	7,200	113	45
UA3HE	"	1,800	42	36
	Estonia			
UR2ED	**28**	**13,456**	**97**	**58**
UR2OV	**21**	**4,832**	**67**	**32**
UR2BU	**14**	**11,250**	**122**	**75**
UR2QD	**3.8**	**17,382**	**128**	**69**
	Latvia			
UQ2DV	**A**	**13,728**	**149**	**88**
UQ2IL	"	11,780	98	62
UK2GAF	**14**	**111,628**	**380**	**172**
UQ2CR	"	44,702	204	103
UQ2NU	**3.8**	**10,026**	**88**	**57**
	Lithuania			
UP2CL	**A**	**139,826**	**437**	**151**
UP2OX	"	98,814	304	129
UP2CV	"	44,452	189	87
UP2ER	**28**	**35,061**	**153**	**93**
UP2AY	**21**	**14,076**	**109**	**68**
	Ukraine			
UB5WF	**A**	**944,016**	**1217**	**284**
UT5DL	"	14,076	83	69
UB5UN	**A**	**802,868**	**117**	**284**
UK5IAK	"	5,280	67	55
RB5EDU	**28**	**62,524**	**209**	**116**
RB5QAO	"	19,125	135	75
UB5EM	**21**	**132,908**	**359**	**149**
UY5SO	"	1,365	30	21
UK5FAD	**14**	**106,314**	**463**	**174**
	White Russia			
UC2BA	**A**	**3,332**	**42**	**34**
RC2WAQ	**28**	**2,460**	**36**	**30**

Oceania

	Australia			
VK5MF	**A**	**141,720**	**412**	**120**
VK1BC	**A**	**104,832**	**331**	**117**
VK4FH	**A**	**46,565**	**230**	**67**
VK5BW	"	18,762	98	59
VK3HE	**A**	**6,696**	**63**	**36**
VK3ACR	28	2,295	59	17
VK3SM	**21**	**87,192**	**333**	**84**
VK2APK	**14**	**676,148**	**970**	**242**
VK2BNK	"	26,640	120	80
	Guam			
KG6ASP	**28**	**300,580**	**767**	**133**
KG6AQY	**21**	**930,936**	**2224**	**158**
	Hawaii			
KH6FQB	**A**	**65,030**	**354**	**70**
	Johnston Island			
KW6HA/KJ6	**14**	**110,346**	**369**	**106**
	New Guinea			
VK9KS	**14**	**89,240**	**277**	**115**
	New Zealand			
ZL1AGO	**A**	**180,159**	**368**	**161**
ZL1AAS	**14**	**153,418**	**338**	**158**
	Philippines			
DU1FH	**A**	**1,264,640**	**1563**	**260**
		(Opr. Earl, H.)		
	Samoa (American)			
KS6DH	**A**	**1,103,232**	**1746**	**221**
	Western Caroline Is.			
KC6WS	**14**	**223,600**	**606**	**130**

South America

	Argentina			
LU2DEK	**28**	**832,195**	**1310**	**217**
	Bolivia			
CP3BY	**A**	**127,000**	**368**	**125**
	Brazil			
PX3BXW	**A**	**1,376,145**	**1811**	**265**
PP2BXV	**A**	**538,945**	**814**	**239**
PX2GE	**A**	**369,550**	**701**	**190**
PX1DEF	"	363,156	626	212
PW4KL	"	357,238	510	238
PV5UG	"	345,660	627	210
PV2YC	"	270,738	638	169
PW1MHB	"	242,150	510	167
PP1DLH	"	230,308	495	172
PW3APH	"	217,126	459	182
PX2ZAC	"	196,005	378	179
PW2DSQ	"	181,740	477	130
PX2DHM	"	123,540	270	174
PV2BZD	"	104,584	289	136
PP5EX	"	93,265	312	115
PV6OA		74,106	263	138
PY2DBU	"	45,252	162	108
PP6BQ	"	38,160	179	90
PP2HT	"	34,986	234	51
PP1HU	"	21,666	128	69
PW6BN		12,928	102	64
PP2CPK	"	4,560	64	40
PV1CLI	**28**	**215,025**	**529**	**141**
PX2PH	"	114,180	297	132
PV8GS	"	26,657	158	61
PV2DSE	**21**	**1,026,564**	**1180**	**303**
PX2CYK	**21**	**374,418**	**690**	**198**
PW2EWL	"	116,540	387	111
PP2RE	"	98,208	291	124
PX4AKR	"	63,180	248	78
PW1JZ	"	56,144	235	88
PW5GA	"	56,100	229	85
PV4KB	"	49,203	226	77
PP2DTV	"	31,837	146	79
PV3BAD	"	19,080	147	45
PV7APS	**14**	**2,085,993**	**2061**	**351**
PW2CAB	**14**	**906,525**	**1245**	**255**
PV4AS	"	173,988	436	162
PX4AJD	"	149,784	391	158
PV4ATG	"	109,300	413	100
PP7AEW	"	101,601	292	159
PV2EGT	"	63,427	220	119
PX7YS	"	61,364	204	116
PX4EP	"	55,332	200	116
PX2ARS	"	34,768	155	106
PW2ATV	"	29,815	157	89
PX1BOR	"	26,696	124	94
PX8JL	"	23,088	127	78
PP2ETK	"	22,420	125	95
PX2ELT	"	18,717	124	51
PY2BCQ	"	15,680	96	64
PP8AAX	"	13,260	118	52
PV1HX	"	3,402	53	41
PX6FI	"	2,035	39	37
PW1BOL	"	1,716	41	33
PP1CCX	"	1,115	45	33
PX1CJL	"	399	27	21
PY2DSC	**7**	**25,988**	**92**	**73**
PY3CGP	"	7,544	52	46
PY2DCA	"	6,930	41	35
PY2ELZ	"	5,168	42	38
	Chile			
CE8AO	**21**	**42,834**	**263**	**118**

[Continued on page 86]

Syl, I1ZSQ can always be found in contest activity. He was the top European on 7 mc in this one. The bright little harmonic should be ready for a multi team in the near future.

Exciting New Products

.....FREQUENCY MARKER STANDARD

Advanced marker, with seven selectable outputs: 5, 10, 25, 50, 100, 200 or 400 KHz. Complete with highly accurate 400 KHz crystal. Buffered oscillator. Zero beat holds on each marker position. Harmonics beyond 150 MHz. Low level logic used in divide chain. High noise level immunity output amplifier. Engineered to eliminate ghost markers. Adjustable to WWV. HF phono output jack.

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At last – a keyer that automatically sends all code elements: Dot, dash, dot space, dash space, character space and word space in an instant self-starting, self-completing mode. Advanced memories respond to momentary key closures or to closures extending to the end of the dot/dash space with a guarantee of no missed or extra dot or dash. Iambic operation. Dot and dash memories, adjustable weighting, jam-proof spacing, tone control, monitor/speaker, 3.5 to 85 wpm. Use any twin level (iambic operation) or single level key. **$89.50 Complete**

MEMORY-MATIC 500 KEYER.....

The newest and most advanced keyer. The keyer which gives you 500 bits of storage for automatic calling, contest operation, etc. – just right for on-the-air contacts. Instantly store any message, by keying the memory at any speed or weighting ratio. Stored characters can be automatically transmitted once, or on a repetitious basis. Complete with memory near-full and over load alarms. Indispensable for the serious code, contest or traffic operator. Also includes all features of the Space-Matic 21 listed above.

$198.50 Complete

ALL ITEMS SOLD WITH A FIVE-YEAR GUARANTEE and are shipped prepaid.

SEND FOR FREE BROCHURES

Late Amateur Satellite News

BY GEORGE JACOBS,* W3ASK

It seems reasonably certain now that there will be another radio amateur satellite orbiting the earth during the new year.

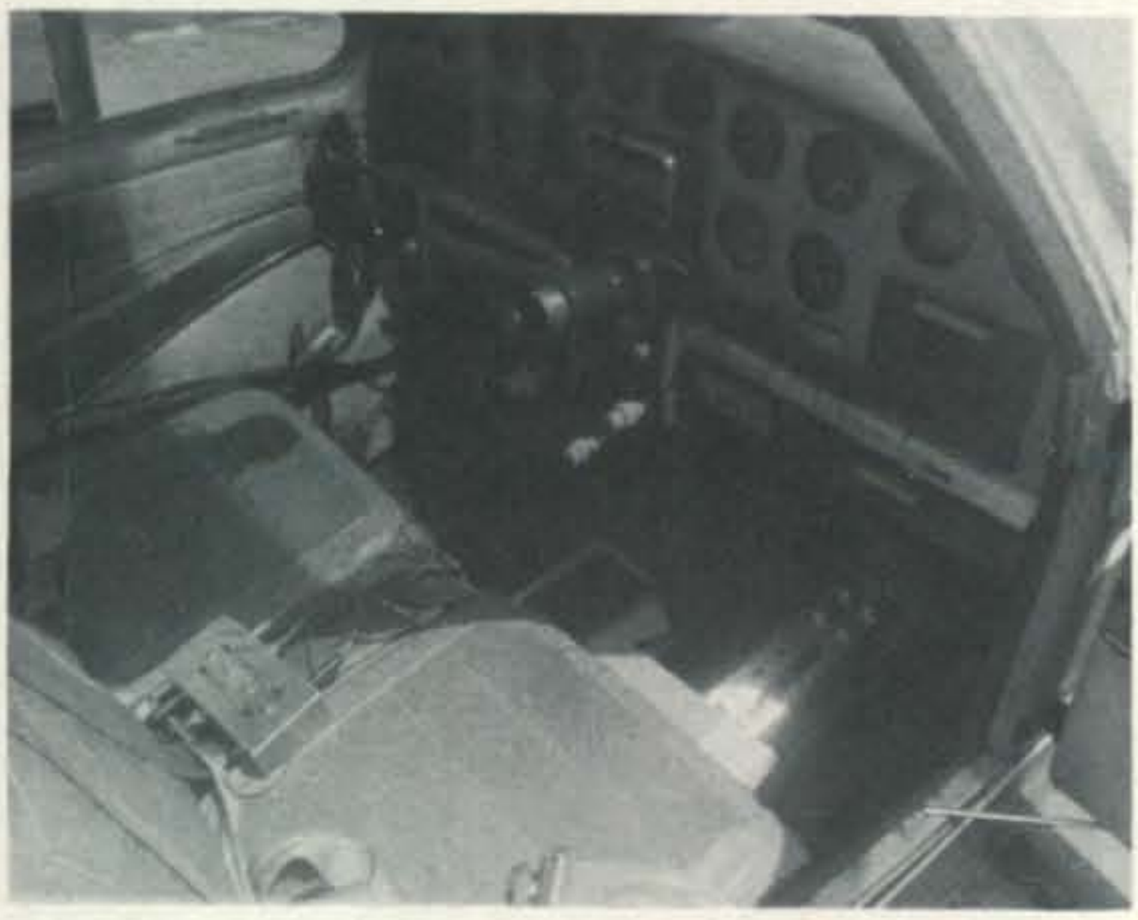
Arrangements have been completed between the *Radio Amateur Satellite Corporation* (AMSAT) and NASA for the launch of an amateur satellite sometime during 1972, probably around mid-year. Once successfully in orbit, the satellite, now called AMSAT-OSCAR-B (A-O-B), will de dubbed OSCAR-6.

Plans are to launch A-O-B piggy-back aboard a Thor Delta booster carrying an advanced weather satellite in the ITOS series from the Western Test Range in California. This is the same type of mission on which AUSTRALIS OSCAR-5 was sent into space on January 23, 1970. The orbit of OSCAR-6, therefore, is expected to be similar to that of the last OSCAR satellite, namely sun-synchronous, circular and polar, with approximately the following parameters:

Altitude —900 miles
Inclination to equator—102 degrees
Period for an orbit —115 minutes

In a sun-synchronous orbit, OSCAR-6 should pass nearest to directly overhead at the same time every day. From its circular altitude of 900 miles, the satellite should "see" an area of the earth's surface approximately 4,600 miles in diameter.

* 11307 Clara Street, Silver Spring, Md. 20902



The AMSAT 2-to-10 meter translator shown aboard a Bonanza-J aircraft prior to its successful flight test over California on Sepember 25, 1971. The tests were conducted for AMSAT by the Amateur Radio Club of the Jet Propulsion Laboratory of Pasadena, California. *(Photo JPL-ARC).*

Three Packages Aboard OSCAR-6

At the present time it is hoped to be able to place at least two, and perhaps three different amateur-built communication packages aboard OSCAR-6.

In describing these packages, AMSAT uses the term "repeater" when a signal is *detected* and *retransmitted* by the device. This is the way in which the many f.m. repeaters used throughout the country operate. On the other hand, devices which change the frequency and amplify incoming signals *without* detecting them are referred to as "translators."

Certain to be aboard the satellite is the AMSAT-built 2-to-10 meter translator. This will have the capability of receiving signals in a 100 kHz segment of the amateur 2-meter band, centered on 145.95 MHz and relaying them on 10-meters, over a band of frequencies 100 kHz wide, centered on 29.5 MHz.

As this is being written, the arrival of the EURO-OSCAR translator being built by DJ4-ZC and DJ5KQ is expected in the United States, where it will be put through its final pre-launch tests. Assuming that it will pass these tests with flying colors, this European package will also be placed aboard A-O-B. This translator will receive signals across a 50 kHz segment of the 70- centimeter amateur band, centered on a frequency of 432.15 MHz, and relay them on the 2-meter band, over a similar segment centered on a frequency of 145.95 MHz.

Nearing completion and ready shortly for final testing is a third package. This one has been built in Australia. It is a hard-limiting f.m. repeater which will receive and demodulate f.m. signals at 145.80 MHz in the amateur 2-meter band and remodulate and retransmit them in the newly allocated 70- centimeter amateur satellite band at a frequency of 435.1 MHz. These frequencies are still tentative and may be changed prior to the launch. If completed in time, this repeater will also be put aboard the A-O-B satellite.

OSCAR-6 will be ground controlled and its translators and repeaters cycled to operate so that they will not cause interference to each other. Normally, no more than one unit will be operated at any given time.

If present plans materialize, OSCAR-6 will be the most comprehensive communications satellite yet launched in the radio amateur series.

There will be lots more about OSCAR-6 on the pages of *CQ* as the launch date draws nearer.

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SYNCART and SKYLARC

These are two acronyms which radio amateurs may be hearing much more about during the new year.

SYNCART stands for Synchronous Amateur Radio Transponder. This is a plan to place a radio amateur built translator aboard the NASA-ATS-G satellite which is scheduled to be launched into a synchronous orbit sometime during 1975.

According to AMSAT, present plans call for a translator that will receive signals over a segment of the amateur 2-meter band between 145.75 to 145.95 MHz, and relay them over a corresponding segment of the 70-centimeter band, between 435.10 and 435.30 MHz.

Discussions are now taking place between AMSAT and NASA, and while this project has not yet been finalized, AMSAT does report that "things look quite good". SYNCART would be the first amateur translator to operate from a satellite hanging motionless in space. While it will require considerably higher power for amateur signals to traverse the almost 22,000 miles to the satellite, antenna orientation will be simplified. Such a synchronous satellite will be visible to radio amateurs over one-third of the earth's surface at the same time.

SKYLARC is an acronym for **SKYL**AB **A**mateur **R**adio **C**ommunications. Plans are to install a 10-meter amateur radio station aboard NASA's SKYLAB space laboratory, which is scheduled for a 1973 launch. The station would be used by astronauts during their leisure periods, to communicate with radio amateurs throughout the world. This would be the first opportunity for radio amateurs to talk directly with astronauts aboard an orbiting spacecraft!

A formal proposal has been submitted to NASA, but approval has not yet been received. Two astronauts, who are also radio amateurs, are interested in the SKYLARC proposal. They are Owen Carriott, W5LFL and Tony England, W5RAP. Astronaut Garriott is a member of AMSAT.

Ten meters has been chosen as the single band for SKYLARC, taking into account antenna-size limitations on the spacecraft, Doppler shift and availability of equipment.

SKYLAB is a space laboratory which will be launched into a 270-mile, 50° inclined earth orbit during 1973. Astronauts aboard will conduct scientific, technological, and biomedical investigations from this vantage point beyond the earth's atmosphere. The first team of three astronauts visiting the laboratory will stay up to 28 days, or twice the duration of any previous U.S. space mission. The second and third three-man missions are each planned to last up to 56 days.

The SKYLAB program will test earth resources remote sensing equipment and techniques for gathering information on the earth's ecology, oceanography, water management, agriculture, forestry, geology and geography. Astronomy experiments will substantially increase knowledge of the sun and its effects on man's existence on earth. The program will also test man's ability to remain in space for long periods of time.

SKYLAB Competition

In addition to the possibility of having an amateur radio station aboard, NASA is going to conduct a competition among students in grades nine through twelve, in seeking ideas for other experiments for the astronauts to conduct aboard SKYLAB.

NASA has selected the National Science Teachers Association to work with schools and to solicit ideas from students. The association will review all proposals and will select the top twenty-five. The students submitting the top suggestions will be treated to a special SKYLAB Student Education Conference at Kennedy Space Center, Fla., at the time of the SKYLAB launch.

In addition, NASA will select a limited number from the top twenty-five suggestions for inclusion in the SKYLAB on-board program, and they will be performed by the astronauts during the course of the mission.

Suggestions for experiments in crew recreation and other aspects of living in weightlessness will be considered along with those of a more scientific or technical nature. The competition is open to all students in grades nine through twelve in U.S. public, private, parochial, and U.S. overseas schools.

Additional information can be obtained directly from the National Science Teachers Association, 1201 16th Street, N.W., Washington D.C. 20036, telephone A.C. 202-833-4283. ■

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Twin Bisecting Loop Antenna

BY R. L. BRITTIN,* W9JBM

Constructing an effective antenna for the lower frequency bands has always been a problem where space is limited. The author presents one approach to achieving directivity on these bands with simple construction.

DURING my time as a ham operator and experimenter I have held a lingering interest in antenna designs which would conserve space and yet perform with acceptable efficiency. This approach is often dictated in the case of mobile or portable installations or when the real estate isn't large enough to support a full scale antenna on the medium frequency bands. Since loop antennas seem to contain the greatest length of wire consistent with maintaining minimum physical dimensions many of my experiments have centered around this shape. Except for the bisecting loops none have yielded the desired results.

I am advised that the basic principle of this antenna is not new and is, in fact, in current use. However, I have not known of it being described or used by the amateur fraternity. It may have a proper name but I have called it twin bisecting loops because the description fits.

As a matter of interest and to more clearly explain the concept, I will tell you how I happened across it. I began with two wooden cross members which afforded a winding size about two or three feet square. Placing one continuous turn of wire around the frame, I explored its characteristics with an antennascope and grid dipper at one corner where the two ends terminated. Resonant frequency 90 MHz, impedance 5 ohms. Replacing the single turn with two continuous turns I still measured 90 MHz but the impedance had increased to 20 ohms; understandable since the turns were very closely coupled.

I next separated the two turns physically and the resonant frequency dropped to 45 MHz. The solution was obvious, two loops in series, bisecting each other at right angles to minimize mutual coupling, would form a full

*17911 Riedle Court, Homewood, IL 60430

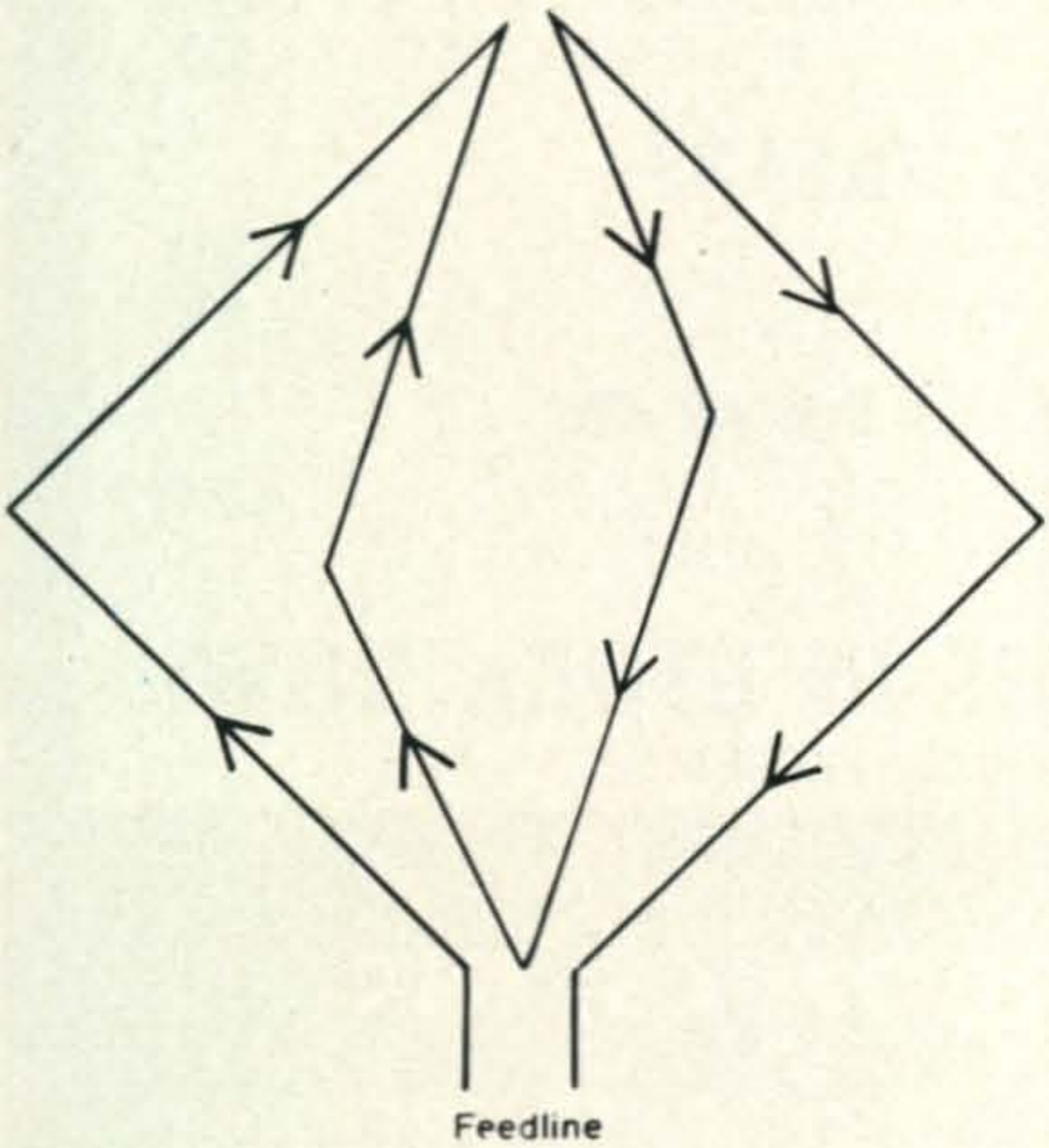

Fig. 1—Basic configuration of the square design Twin Bisecting Loop Antenna.

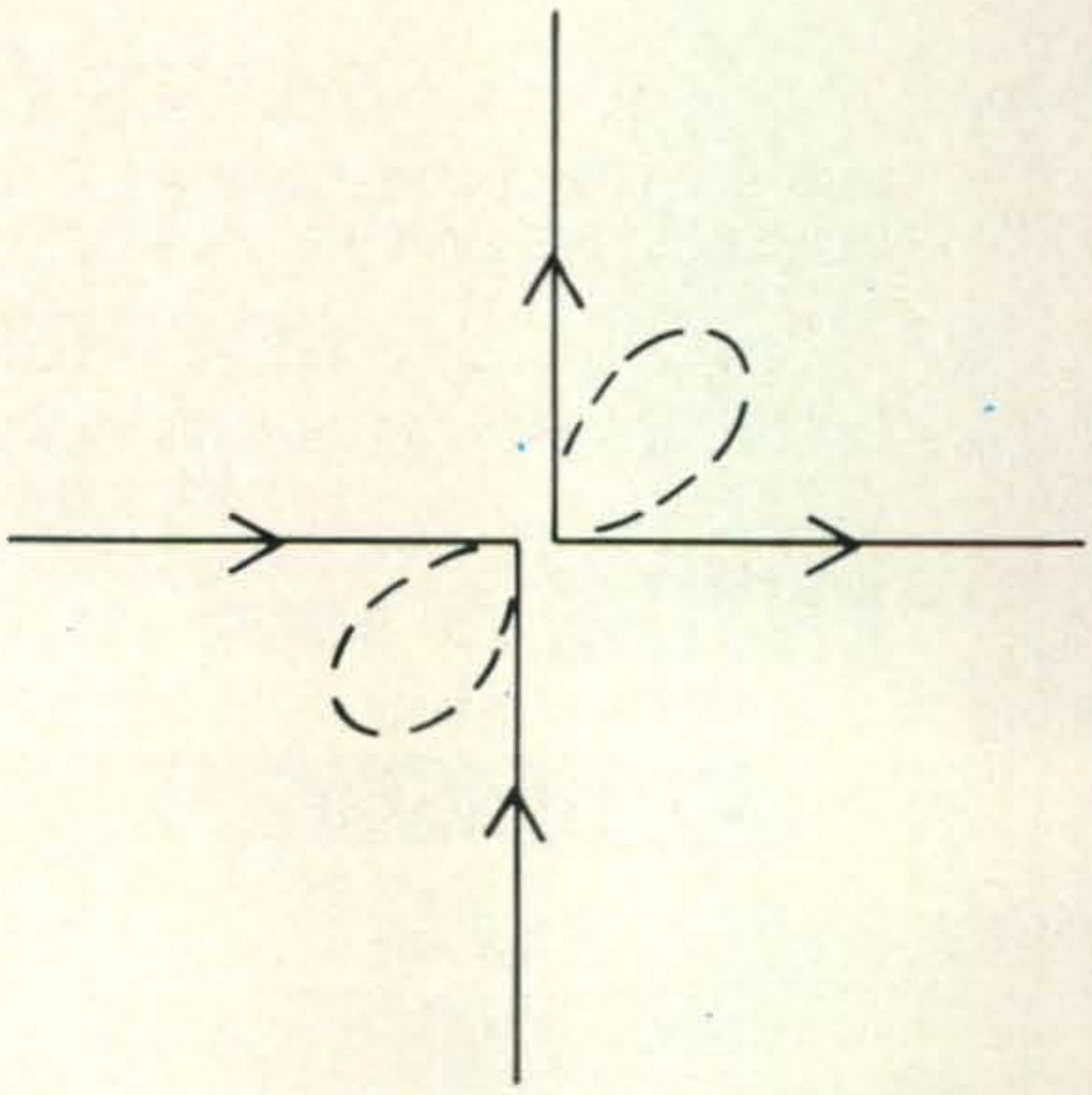

Fig. 2—Radiation from the antenna is sharply bidirectional from the apex of like-polarized elements.

wave antenna with no single leg longer than 1/8 wave length.

The Square Loop Antenna

The design is illustrated at fig. 1. Notice that the second loop begins its plane at the half way point in the first loop. Phasing will not be proper if you complete the first loop before changing planes. Notice the arrows indicating current flow. Each leg is 1/8 wave long, the voltage node of each loop appears at the top and the current node at the bottom. Limited tests here indicate that most of the energy is contained in a single doughnut pattern which cuts through the center of the antenna, vertically, half way between elements of the same polarity. See fig. 2. It appears somewhat elliptical with maximum field up and down in relation to fig. 1. The entire array may be placed on its side and rotated for horizontal or vertical polarization. Being a balanced system it does not rely on ground to complete its circuit. Impedance at the feed point is about 15 ohms.

Triangular Loops

Where space permits it appeared logical to reshape the loops into right triangles as shown in fig. 3. This lengthens the legs in which maximum current is flowing and shortens the vertical boom. I went one step further and built my 40 meter version upside down with the feed at the top. This gets the current nodes into the air and places the spreaders at the bottom. This is more easily constructed and not so top heavy. Spreaders are then not essential as the elements can be draped down from a single pole on four equally spaced guy ropes. With this arrangement the radiating sections somewhat resemble two Inverted V antennas mounted in perpendicular planes. The matching network is difficult to reach but it tunes broadly and can easily be pre-tuned before installation by loading it with a 15 ohm non-inductive resistor. The 52 ohm coax line drops down the center support. The frequency of the antenna may be lowered for spotting by adding some slight capacitance between the two voltage nodes or by moving the nodes closer together. The angle formed by the V at the current nodes has a pronounced effect on feed point impedance. A 90° angle results in a 15 ohm feed. Widening the angle raises the impedance. Closing the angle lowers the impedance.

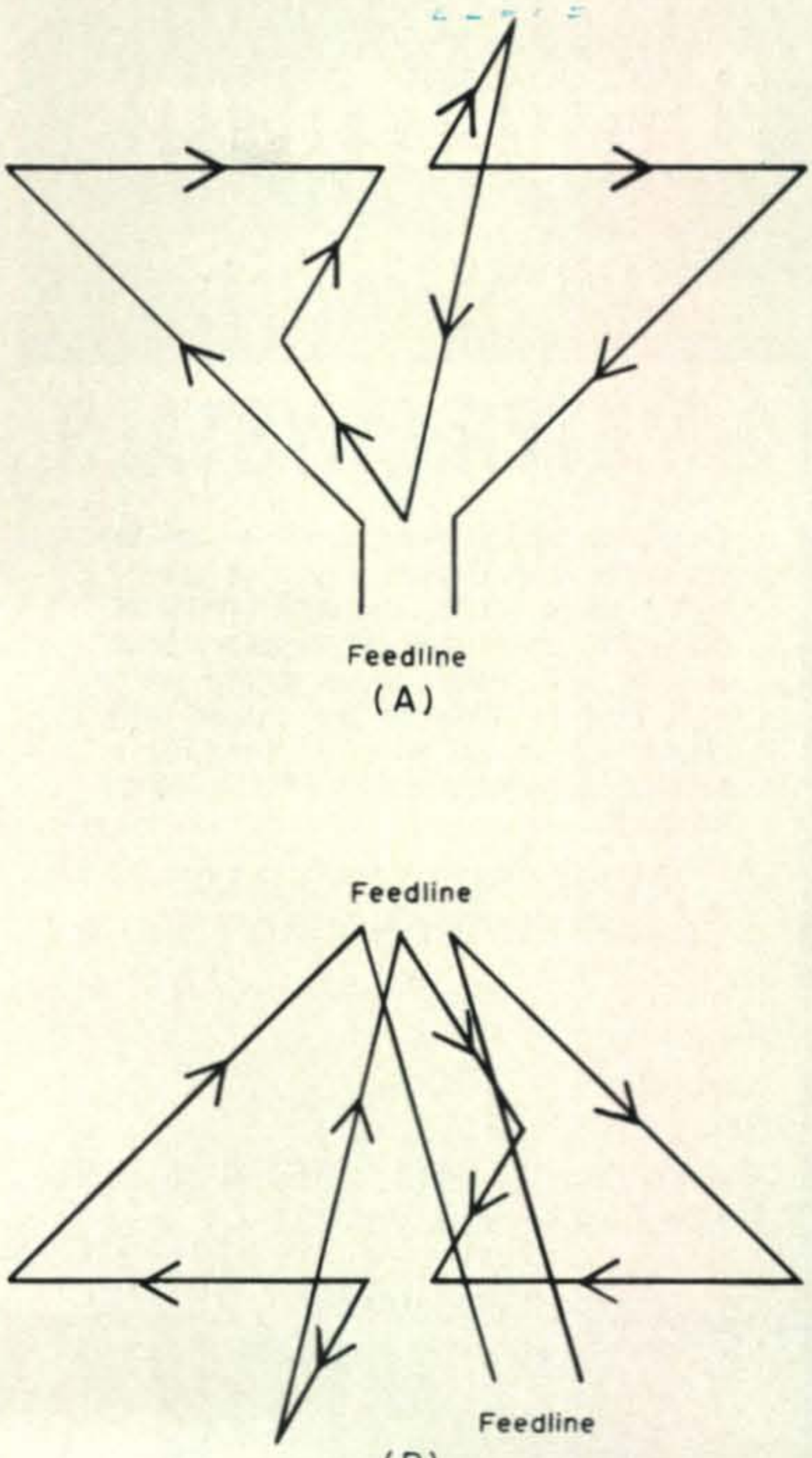

Fig. 3—(A) For more convenient construction, the antenna was re-shaped to the triangular scheme shown here. (B) At the expense of having the feed point at the top, still more convenient construction can be had by inverting the antenna. An extra advantage is that the high-current portion of the antenna is elevated.

Construction

The total length of the antenna wire is critical but runs about the same for either square or triangular loops. My 40 meter triangular antenna measures 136 ft. at 7300 kHz, and 137 ft. at 7250 kHz. For triangu'ar construction the tip to tip length of the spreaders can be estimated by multiplying the total length of the antenna wire by the factor 0.2072. The distance from the tip of the boom to the point where it attaches to the spreaders is one half of this length. Use the multiplier 0.1464 to find the inclined leg of the V. In the square loop design the spreaders and

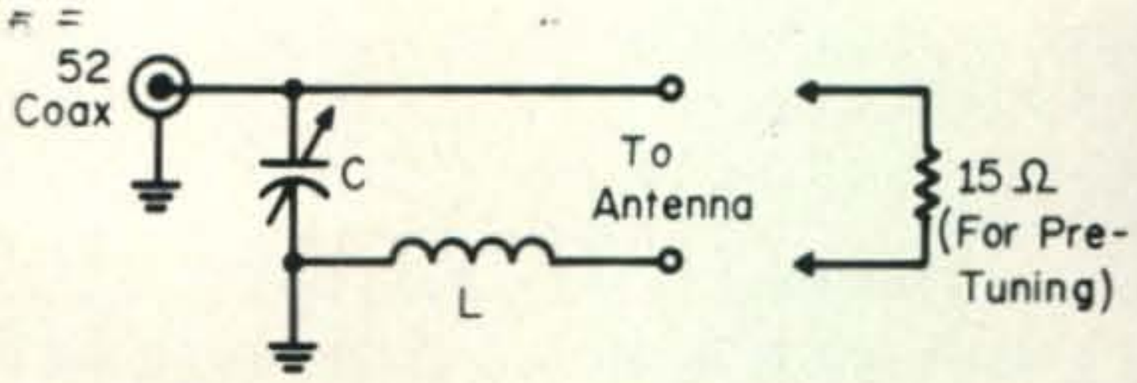

Fig. 4—Simple L-network matching unit may be built in a plastic box and mounted at the antenna feedpoint. Capacitor C need only be a mica compression trimmer since voltage at that point is low.

boom are all the same length. Use 0.1772 for the multiplier.

The matching network is slightly unconventional as shown in fig. 4. This arrangement, although not actually balanced, does uncouple the coaxial shield from the element. My network is built in a small plastic box. The joints and capacitor adjusting screw are sealed with glazers putty. The voltage is low at this point and I use a small Elmenco mica-compression padder condenser.

Tuning

The reactive values for *L* and *C* are 23 and 32.5 ohms respectively at the operating frequency. Table I lists the approximate values for several bands. I was able to pre-tune on the bench by cutting the transmitter drive as low as possible, using the s.w.r. bridge on the lowest range and applying power intermittently to avoid overheating the 15 ohm dummy load.

Antenna enthusiasts will enjoy working with this design and will find the results pleasing. It would seem that, properly spaced off the ground, it would provide a high angle pattern for short skip on the low bands. The 10 meter model is very interesting. In the square configuration each leg is about 4 ft. long, small enough to hand hold while you aim and rotate it to explore the directional features. On 2 meters it would be easy to stack several on one boom to study the effect on directivity. ■

Band	C (mmf)	*L* (uh)	*Coil*
10	175	0.13	6 t. B & W 3001
20	350	0.26	8 t. B & W 3005
40	700	0.52	8 t. B & W 3006
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Table I—Approximate values for C and *L* in fig. 4 for typical h.f. bands.

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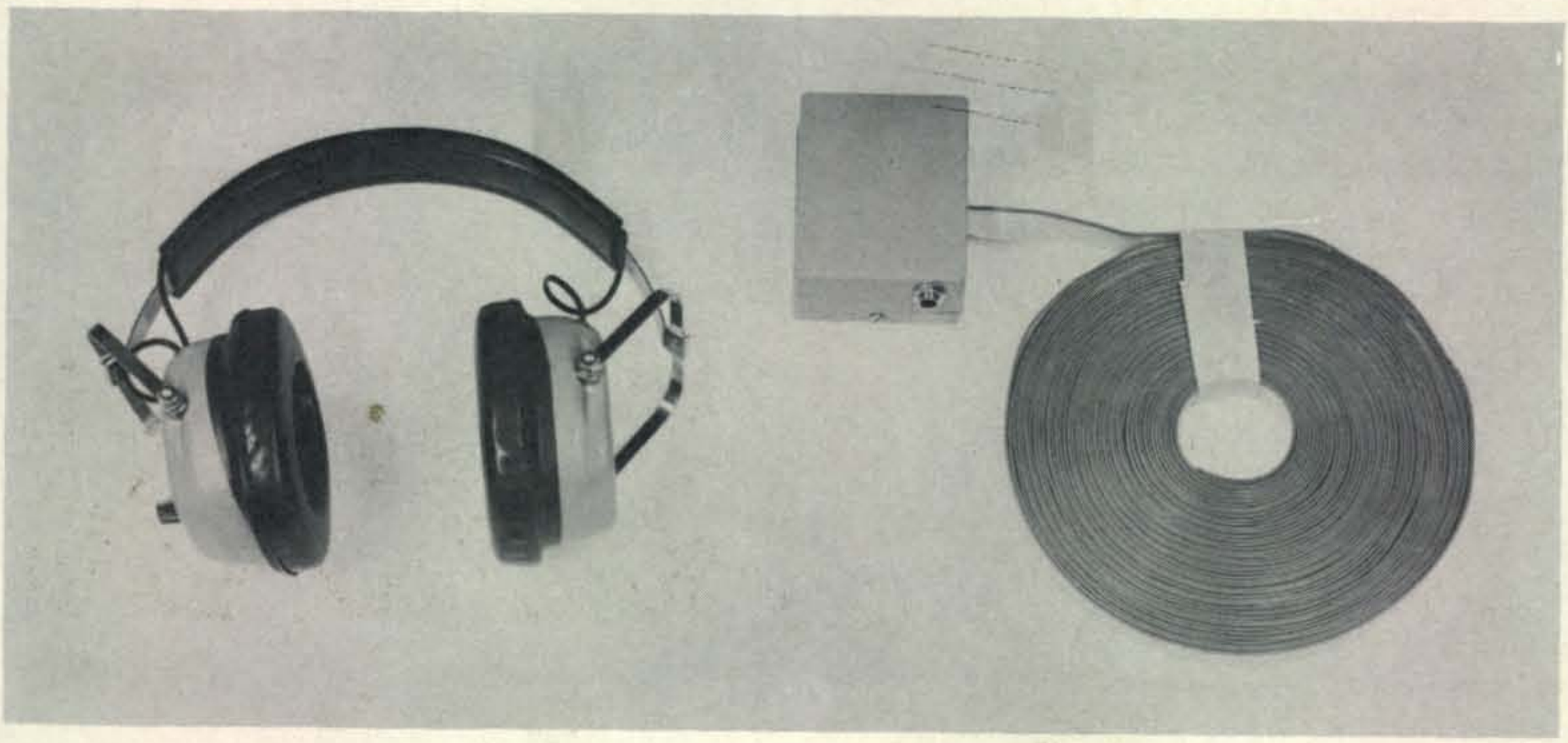

The Superex Cordless Headphone on the left with the induction loop and junction box on the right.

loop strung around either the floor or the upper section of the walls of the *CQ* Lab (plastic clamps with an adhesive backing are supplied with the induction-loop kit for the latter use). With normal ouput from radio receivers, comfortable listening levels down to the receiver noise level were obtainable with the headphones used anywhere within the room. With the application of higher levels to the loop, adequate a.f.-signal levels could be had in the headphones several offices away.

It was founud, however, that disortion was introduced with signals higher than at normal listening levels, particularly with s.s.b. signals; nevertheless, this can be avoided or minimized with the volume control on the headphones which is handily located for optimizing operating levels. An alternate method is changing the level applied to the loop.

Operation within a foot or so of a.c. lines or an a.c. power supply will induce 60-cycle hum into the phones, but his should seldom be the situation under normal conditions.

Where it might be deemed necessary to place the loop out of sight (possibly to satisfy the *xyl*), this may be done with its installation under a rug or in an attic above the operating room. Also, where necessary, the length of the loop may be somewhat shortened and even may be left more or less bunched up or strung out on a bench.

As might be expected from a solid-state device, r.f. from your own rig may be induced through the loop and in the case of an a.m. or s.s.b. signal may be demodulated by the headphone amplifier, making you a victim of your own TXI! In our situation where plenty of r.f. usually is floating around the shack, the level of such signals was low enough not to be annoying and of course is not present during listening periods.

So, for cordless headphone operation to achieve convenient, comfortable and unencumbered listening, the Superex Model FF-1 "Freedom-Fone" is available at $29.95, while the Model WL-2 "Edu-Fone" is $22.95. The Model LK-10 Super-Match Induction Loop Kit is $29.95.

A complete cordless listening center (for class-room work) also is available at $204.95. It includes 8 Model WL-C Edu-Fone Headsets, 100 feet of Super-Match Induction Loop with junction box and a.f. extension cable.

Further information may be obtained from the manufacturer: Superex Electronics Corporation, 151 Ludlow Street, Yonkers, New York 10705. —*W2AEF*

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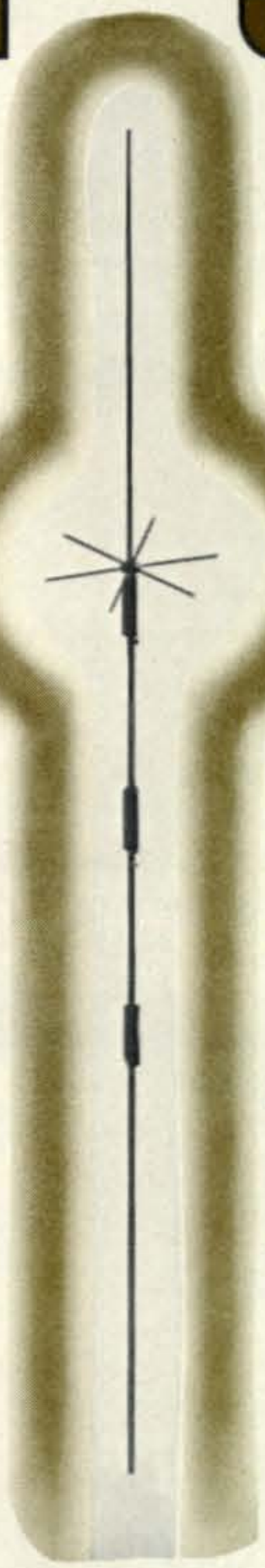

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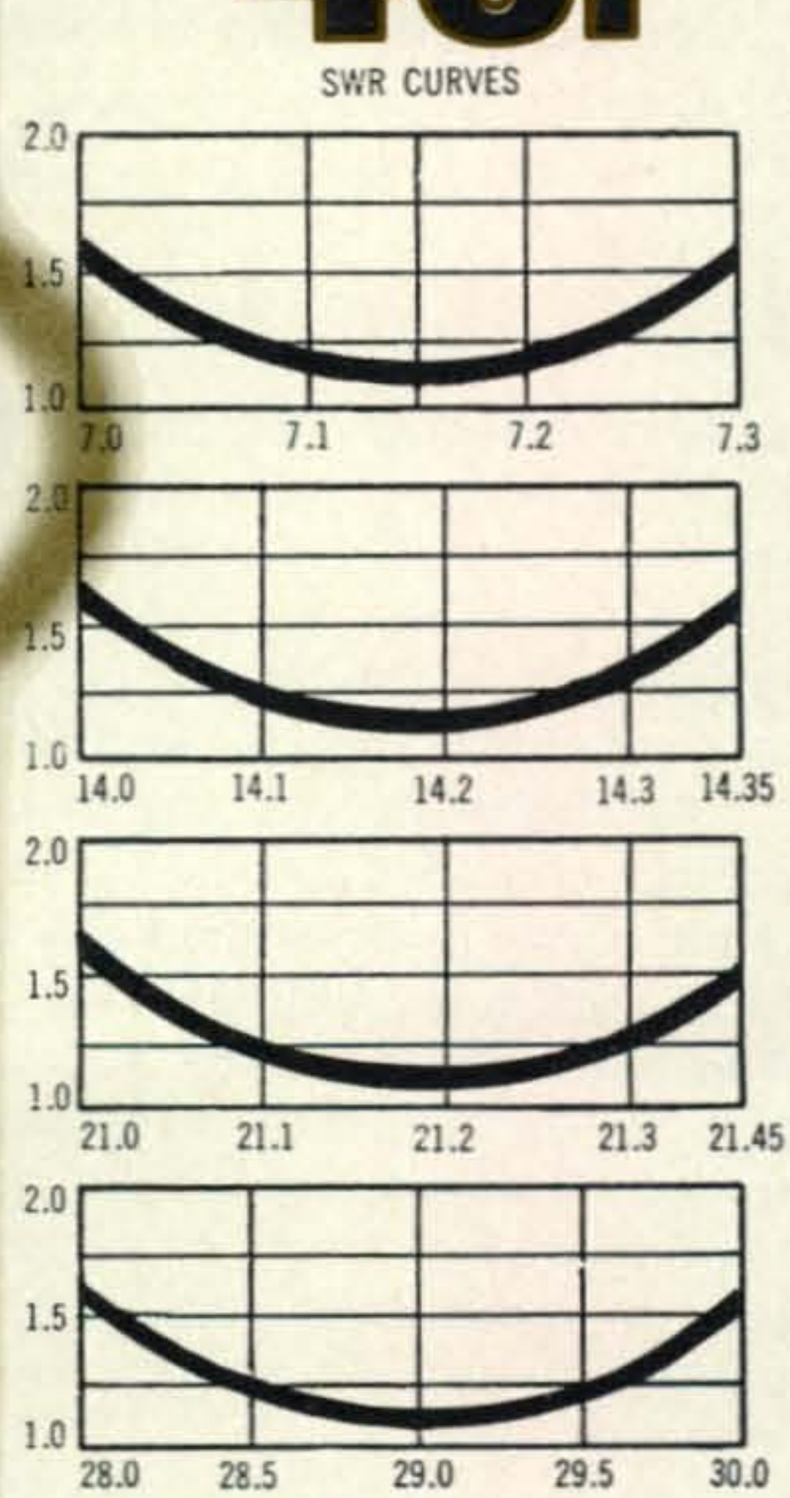

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A Ham's Vacation Guide to the Caribbean

BY GEORGE PATAKI,* WB2AQC, ex-YO2BO

Amateur radio's roving ambassador, George Pataki, is on the move again. His last article in October CQ told of his travels to Europe and North Africa. This time it's the Caribbean. Although the area covered is small by comparison to his previous trip, many more countries...and islands...and amateurs were covered, and so this episode describes only half the trip. Part II, next month, will conclude this latest ham travelogue.

JUST two days after my wife Eva, WA2-BAV, and I returned from a trip to Europe and North Africa, we left New York for a Caribbean cruise. We would have preferred to rest for a while, but I could not get a vacation at another time, so we left again.

Learning from past experience, I tried to prepare this trip long in advance. I wrote a letter showing my intentions to meet with local amateurs, and included our schedule. The letter was Xeroxed and mailed to one amateur on each of the 15 islands we intended to visit. I picked mostly QSL managers from the *Callbook* or amateurs whose photos I had seen in radio magazines, hoping that these people would be active and hospitable amateurs.

After a month, checking the answers, I wrote again to those islands from which I got no reply, but this time wrote to different amateurs. At the time of our departure from New York, I had already set up a meeting with hams on most of the islands.

*34-24 76 St., Jackson Heights, NY 11372.

In San Juan, Puerto Rico, the president of the Radio Club, Roberto, KP4AEF, is at the mike, while the vice-President, Elliot, KP4BSH, and WB2AQC are watching.

Puerto Rico

Our ship, the Norwegian M/S *Meteor*, was leaving Puerto Rico on a Saturday evening. We left New York by Pan Am 747, on an early morning flight, to have time for some sightseeing in KP4-land. From the airport we went to the harbor, found the ship, checked in and left for picturesque Old San Juan.

In the afternoon we made a few phone calls and found Elliot, KP4BSH, a college student, and at the same time the vice-President of the Radio Club de Puerto Rico. Elliot and Roberto, KP4AEF, the President of the club, met us later in the day and these two young Puerto Riquenos proudly showed us the beauties of their capital-city.

We went to see Luis, KP4WD, in whose backyard, for the first time in my life, I saw a coconut tree. You have to understand me; I spent half of my life in Romania and the last 5-6 years in New York City, so I thought the coconuts were growing on the shelves of the supermarkets.

Later we went to see the rigs of Roberto and Elliot. These two amateurs are among the nicest people I ever met. Their English is at least as good as mine, and because of the similarity of the Romanian language with Romance languages, I understood their Spanish quite well . . . when they reduced their customary high speed of talking.

If I would have had my license, I could have operated their stations, but as luck would have it, it arrived only after we returned from this trip.

I recommend visiting Puerto Rico any time of the year; it is beautiful and the people are some of the most open hearted I ever met.

I don't recommend behaving like a tourist, wearing colorful "tropical" shirts and large straw hats; you won't make a good impression.

St. Croix

Next morning we arrived at Fredericksted, in St. Croix, the largest of the U.S. Virgin Islands. Being the first who got off the ship, I ran to a phone booth and called up Van, KV4FC, a former CBS engineer. Van is living in Christiansted, on the other end of the island. He advised me to find father Ed Turner, KV4BQ, who is the minister of the St. Paul's Church in Fredericksted. This was on a Sunday morning and Van told me to go to the church, and also gave me KV4BQ's phone number. Getting all the necessary information, I hung up. We heard some church bells. My wife, Eva, who's sense of direction got us lost several times in several cities, said: "The church must be that way" and pointed vaguely to the hills. Just to be sure, I asked a gentleman who was standing about 10 feet from the phone booth, all the time I was talking with Van: "Sir, do you know where is St. Paul's Church?" "I certainly have to know," answered the gentleman, "because I'm the minister." "No, it is not possible," I said almost angry, "who will believe me when I will tell this story?" But it was possible, and that's the way I met KV4BQ. Now, as I write this article, I see the credibility gap widening between the readers and me, but KV4BQ is daily at 1130 GMT on 14,305 kHz and you would not doubt the word of a minister, would you?

Anyway, KV4BQ turned out to be a very nice person. Soon came one of his friends, Otto, KV4BI, and after a pleasant chat we left for the beaches. Later we went to the church, attended the mass and went to see KV4BQ's station.

We had lunch together, and Father Turner and his wife took us to see the surroundings. When we got back to the *Meteor*, I put a note on the ship's bulletin board: "If there is an amateur radio operator among the passengers, please contact George Pataki, cabin #233. Two minutes later, I saw a lady reading my note with visible interest.

"Are you a radio amateur?" I asked her.

"No—answered the lady—but they are" and pointed to 2 gentlemen. After shaking hands I found out that I just met Harold, KV4AM (also W3ZQ), and John, W3OB. Unfortunately Harold and John were not passengers; they only came to visit the ship. Harold told me that in a few days he was going to operate from the Saba island as PJ6AA, and Saba was included in our itinerary.

In St. Croix I recommend meeting Father Turner, KV4BQ.

I don't recommend limiting yourself to Fredericksted, try also to see Christiansted.

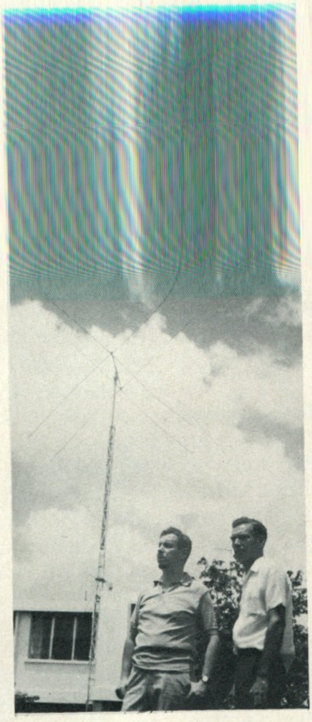
Montserrat

Next morning we landed in Plymouth, Montserrat, where Ernie, VP2MW, was supposed to meet us at the docks with a radio magazine in his hands. The *Meteor* could not dock at the pier, so we used a small launch. As soon as we hit the land, I spotted a gentleman holding high a copy of the latest *CQ*

Ernie, VP2MW, ex-G5OO, has one of the most beautiful locations in Montserrat.

Monty, VP2MJ, in Montserrat is also VE3EVW in Canada.

Cyprian, VP2SF, is the secretary of the St. Vincent Amateur Radio Club.



In Fort-de France, Martinique we visited Emil, FM7WF, who is a physics and chemistry teacher.

In Antigua, Jim, W1KIB and I tried in vain to meet local amateurs.

magazine; there was Ernie, VP2MW, ex-G5OO. Ernie had his car nearby, he drove us around a little, then we went to see his beautiful house and of course his station. Ernie, who is renting out half of his house, mostly to hams, is a very nice guy. His son E. H. Welling, VE3HD, is the editor of the excellent Canadian radio magazine, *Electron*. I had met VE3HD several times during all kinds of amateur radio conventions.

Ernie drove us to Monty, VP2MJ, who lives here about four months a year; the rest he is VE3EVW. Monty is a broadcaster like myself, so we had an interesting meeting.

When we got back to the ship, one of the passengers came to me and said:

'Hi, I am Jim, W1KIB, from cabin number 212. I understand you're a ham."

"Yes," I said, "I was YO2BO in Romania. I just got American citizenship and as soon as we return to New York, I shall take the amateur radio test. For the moment I am just floating between the past YO and the future W call."

We both agreed to do some visiting and sightseeing together.

Antigua

I wrote to two amateurs in Antigua but I got no answer. We landed in English Harbour and most of the amateurs were in St. Johns, on the other side of the island. I tried to call them up but if you never made a phone call in Antigua, you don't know what this means. For half of my calls I got wrong connections, for the other half I just lost my coins without getting anything.

So, Jim, W1KIB, and I just walked around and visited historical places in which I was not too much interested, and later joined Eva at the beach.

I recommend getting on the "right side" of the island, at St. Johns and try to meet a

[*Continued on page 82*]

Brother Vincent, FM7WG, in Martinique is the most polite man I ever met.

In Fredericksted, St. Croix, Eva, WA2BAV with Father Ed, KV4BQ.

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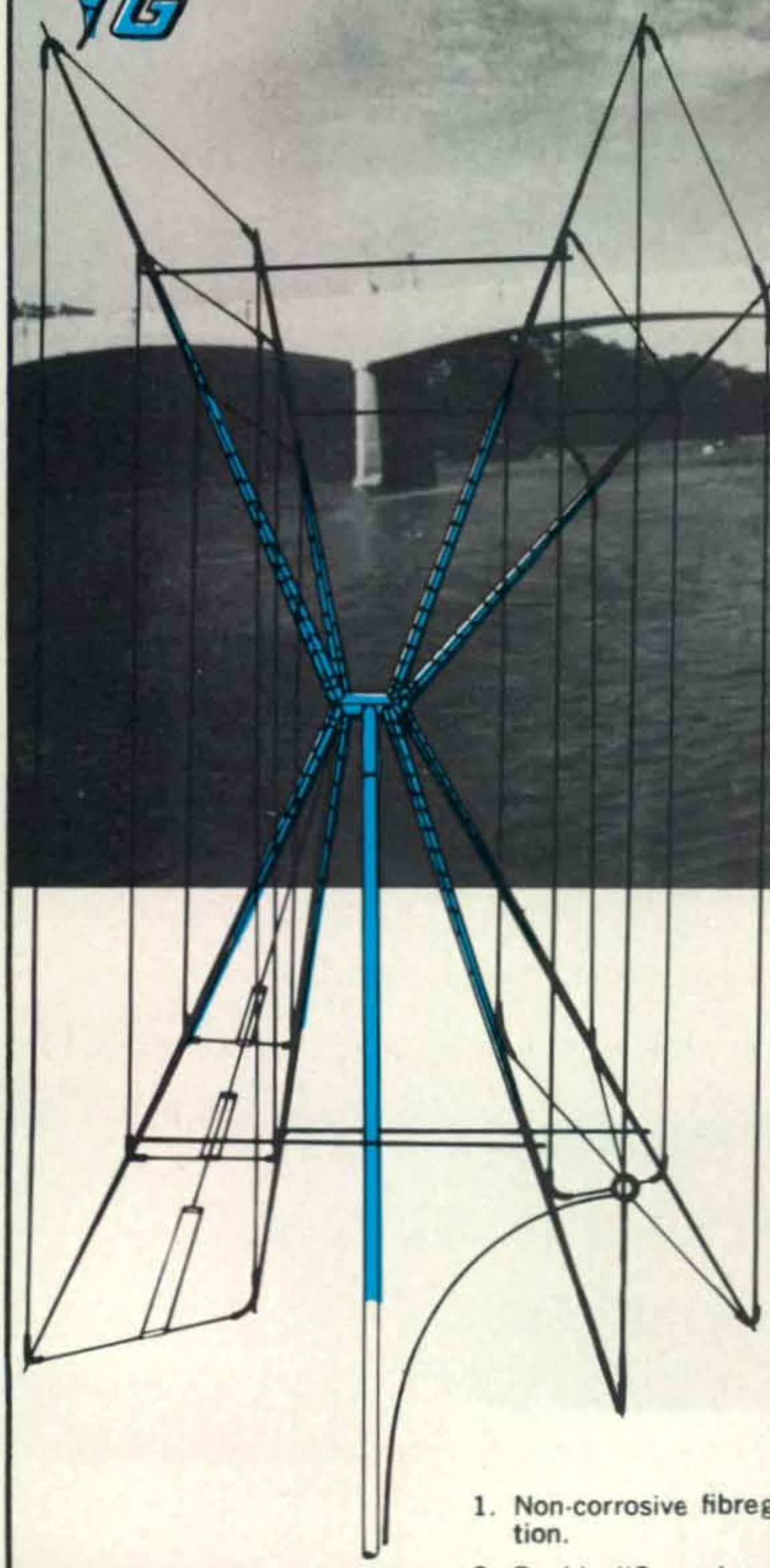

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- Low Wind Resestance

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10. Single 52 ohm feed line to all bands.
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15. Designed to withstand high winds.

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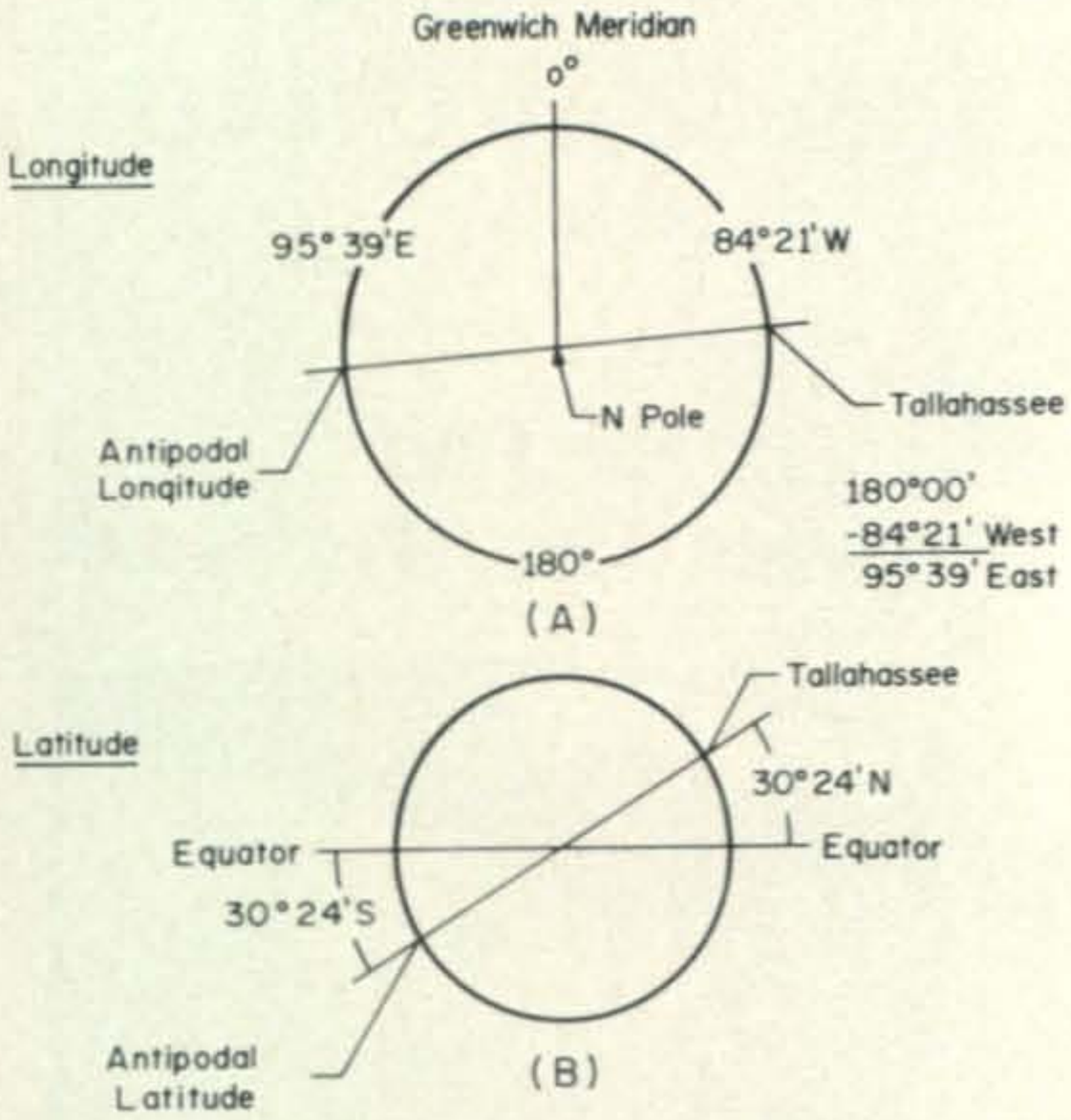

Fig. 1—Computing the antipodal latitude and longitude from the author's Tallahassee, Fla. QTH. (A) Viewed from the top of the globe (North pole), the longitude of Tallahassee, 84° 21′ W, is located and marked along the equator. The antipodal longitude is found exactly 180° further West along the equator. (B) Viewed from the side of the globe the latitude of Tallahassee, 30° 24′ N is located and marked on the 84° 21′ W meridian located at (A). Along the 95° 39′ E meridian, also located previously, mark 30° 24′ S, which is the antipode of Tallahassee.

WHEN he wants to point his beam right on that rare DX what ham is satisfied with an approximate heading? Guessing is not necessary if you can find a new, used or discarded world globe. A few simple calculations, a bit of modification with common hand tools, the application of a set of markings, and you are on your way to a three second determination of the proper heading.

While cleaning out the attic, I found my son's outgrown Replogle 12″ Reference Globe. It was discolored, battered and disfigured as could be expected after 12 years use. I found it still servicable and determined to modify it per the instructions in Chapter 13 of the ARRL *Antenna Handbook*. A few minutes study revealed that it had possibilities for even simpler determination of beam headings specifically tailored for my QTH.

A telephone call to the local Office of the Environmental Science Services Administration (ex-Weather Bureau) at the local airport indicated that Tallahassee's location was 84° 21′ W. and 30° 24′ N. With this information computing the antipodal latitude and longitude was quite simple as shown in fig. 1.

The globe was removed from it's frame.

*710 Middlebrook Circle, Tallahassee, FL 32303

SIMPLIFIED DETERMINATION OF BEAM ANTENNA HEADINGS

BY CY PERKINS,* W4VMO

Using a salvaged world globe to speed the location of beam headings from your own QTH.

Fig. 2—The "new North pole" is now Tallahassee, Fla., 84° 21′ W, 30° 24′ N.

Fig. 3—The antipode of Tallahassee becomes the "new South pole" at 95° 39′ E, 30° 24′ S.

Fig. 4—A new mounting bracket fabricated of flat iron mounts to the original globe bracket.

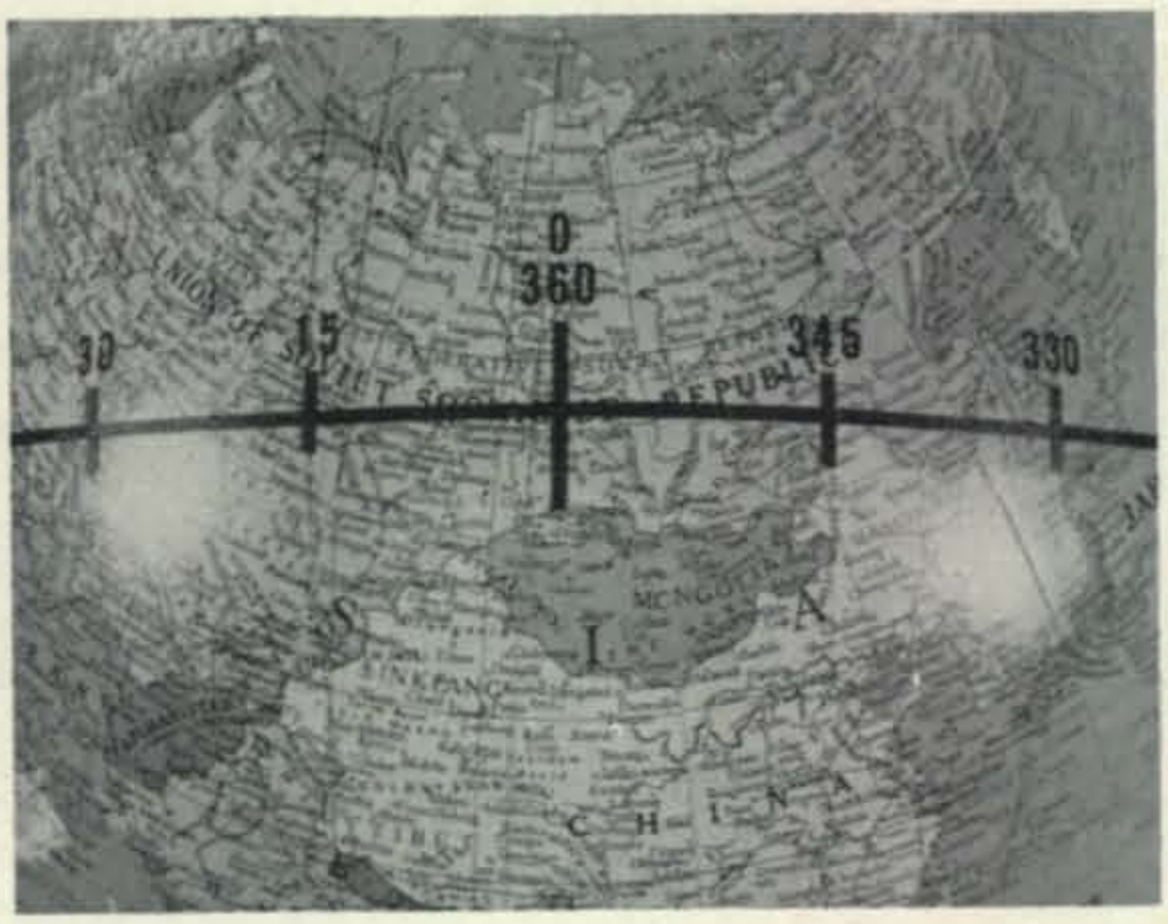

Fig. 6—The new equator and headings. Place markers every 15°.

Tallahassee's position and the antipodal position were marked, see fig. 2 and 3. A No. 9 drill was used to clear a hole at each position for a 10-32 machine screw. A washer was centered and cemented over each hole to provide a bearing surface. The former mounting studs on the cast curved bracket that had held the globe were removed with a file. Their positions were drilled and tapped for a 10-32 machine screw. A simple wall bracket was formed in a bench vise from a piece of 3/4" × 1/8" strap iron, and clearance holes for the machine screws were drilled near each end. The ends of this bracket must be far enough apart to fit over the outside of the curved mount and deep enough to clear the globe when installed. In my shack the homemade bracket was screwed to the wall in a convenient position near the operating table, and the assembly completed as shown in fig. 4. (The mounting screws go through both brackets and the washer into the globe.)

After assembly, a nylon tipped pen was held against the original mount at the 90° position with its tip just touching the surface of the globe. The sphere was turned 360° to establish a new "equator" halfway between the new poles. This line was then covered with black pressure-sensitive tape 1/16" wide (Zip-A-Tone or equal) available at stationery stores. Placing the true South Pole directly under the modified mount, which becomes the "lubber" line, the 180° position was established on the "new" equator. See fig. 5. Using a pair of dividers, the "new" equator was divided into 15° segments (spacing taken from true equator.) Short strips of the black tape were placed over each 15° marking. Rub-on numbers 1/4" high (Trans-Artype

[*Continued on page 87*]

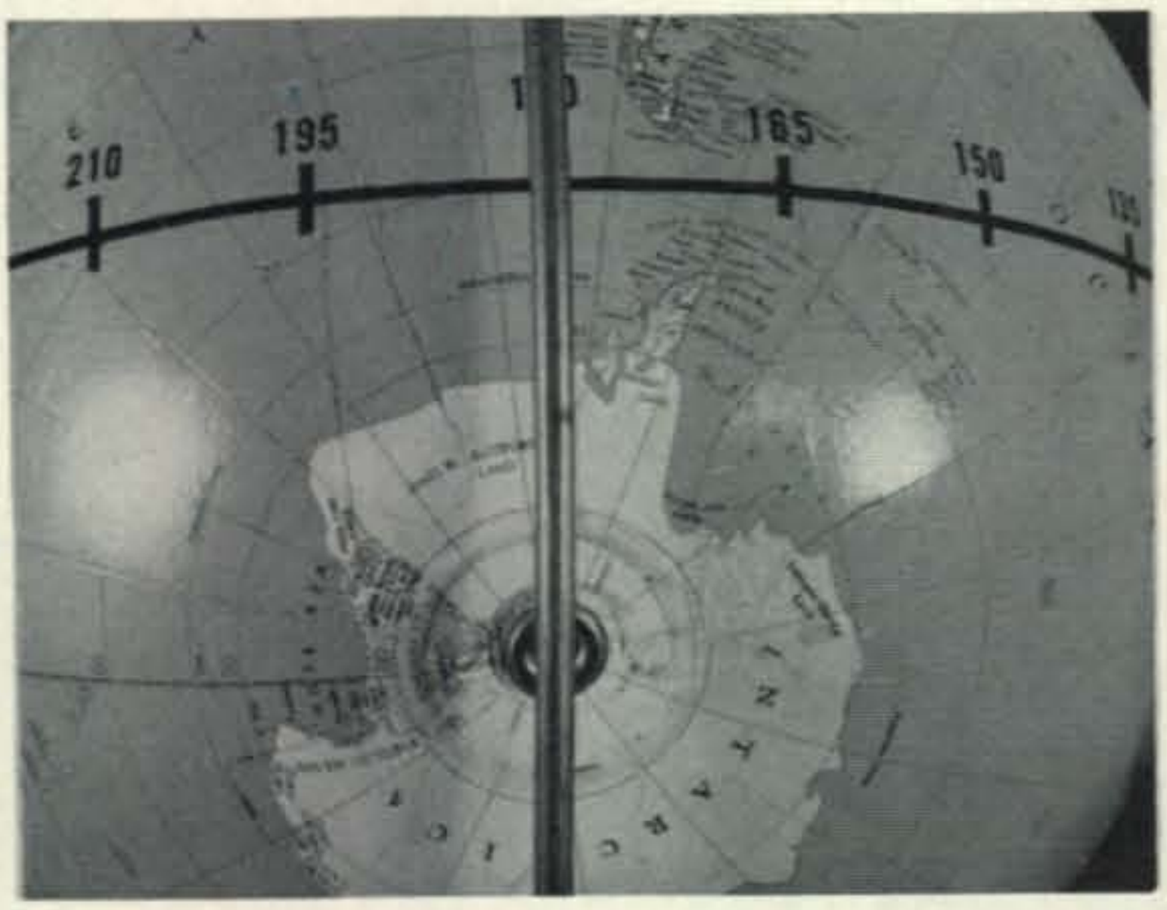

Fig. 5—The "old" south pole establishes the 180° point on the new equator.

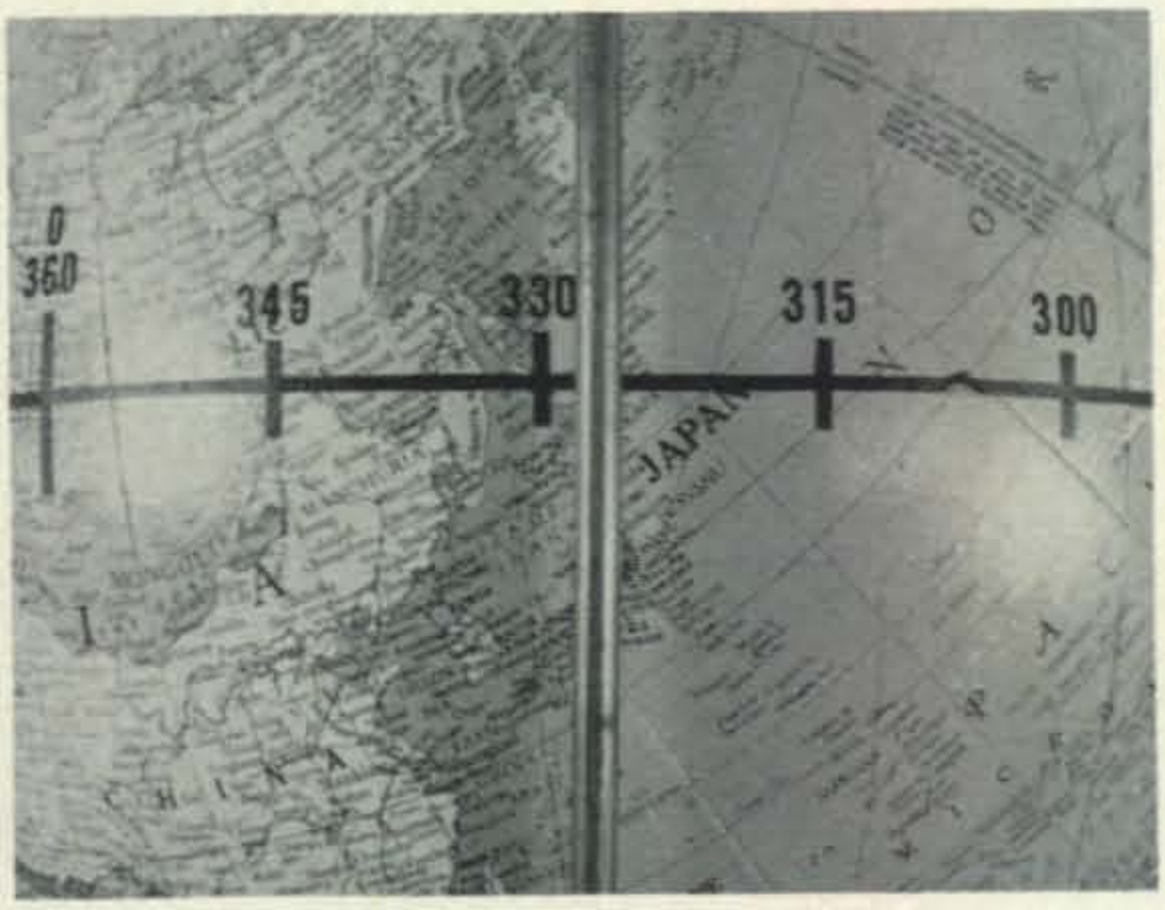

Fig. 7—Place the DX QTH under the "lubber" line and read the heading.

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SPECIFICATIONS

FREQUENCY RANGE: All amateur bands 80 through 10 meters, in five 500 khz. ranges: 3.5-4 mhz., 7-7.5 mhz., 14-14.5 mhz., 21-21.5 mhz., 28.5-29 mhz. (Crystals optionally available for ranges 28-28.5, 29-29.5, 29.5-30 mhz.)

SOLID STATE VFO: Very stable Colpitts circuit with transistor buffer provides linear tuning over the range 5-5.5 mhz. A passband filter at output is tuned to pass the 5-5.5 mhz. range.

RECEIVER OFFSET TUNING (CLARIFIER): Provides ±5 khz. variation of receiver tuning when switched ON.

DIAL CALIBRATION: Vernier scale marked with one kilohertz divisions. Main tuning dial calibrated 0-500 with 50 khz. points.

FREQUENCY STABILITY: Less than 100 cycles after warm-up, and less than 100 cycles for plus or minus 10% line voltage change.

MODES OF OPERATION: SSB upper and lower sideband, CW and AM.

INPUT POWER: 300 watts PEP, 240 watts CW

ANTENNA IMPEDANCE: 50-75 ohms

CARRIER SUPPRESSION: -40 dB or better

SIDEBAND SUPPRESSION: -50 dB at 1000 CPS

THIRD ORDER INTERMODULATION PRODUCTS: -30 dB (PEP)

AF BANDWIDTH: 300-2700 cps

RECEIVER SENSITIVITY: 1/2 μv input S/N 10 dB

AGC: Fast attack slow decay for SSB and CW.

SELECTIVITY: 2.3 khz. (-6 dB), 4 khz. (-60 dB)

IMAGE REJECTION: More than 50 dB.

AUDIO OUTPUT: 1 watt at 10% distortion.

AUDIO OUTPUT IMPEDANCE: 8 ohms and 600 ohms

POWER SUPPLY: Separate AC or DC required. See AC "ONE" and DC "ONE" below.

TUBES AND SEMICONDUCTORS: 16 tubes, 15 diodes, 7 transistors

TEMPO "ONE" TRANSCEIVER	$298.00*
AC/ONE POWER SUPPLY 117/230 volt 50/60 cycle . . .	$ 99.00*
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FRECK RADIO & SUPPLY 38 Biltmore Ave., Asheville, N.C. 28801 254-9551

HARRISON Rt. 110 at Smith, Farmingdale, N.Y. 11735 293-7990 8 Barclay St., N.Y. City 227-7922

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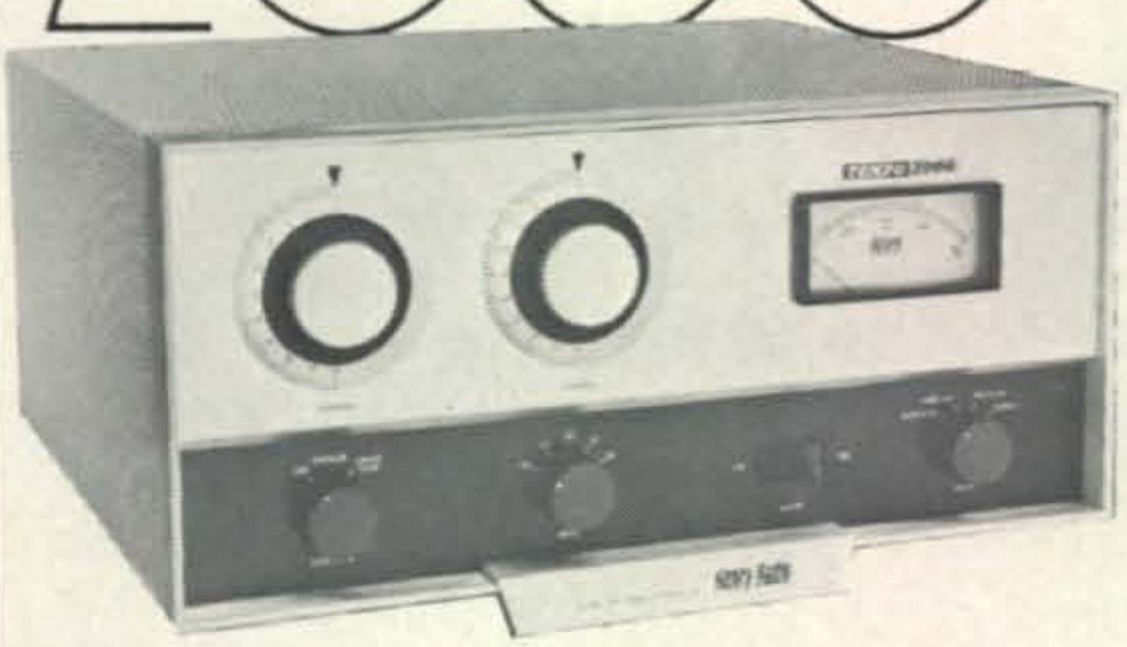


A LINEAR AMPLIFIER DESIGNED BY E.F. JOHNSON EXCLUSIVELY FOR TEMPO

The Tempo/2000 is the smallest self-contained, full-legal-limit kilowatt amplifier in its price range.

Full kilowatt input on all modes. ☐ Grounded — grid input for maximum compatibility with modern transceivers and transmitters. ☐ Complete compatibility with most transceivers. ☐ Entirely self-contained, solid-state power supply. ☐ Instantaneous and silent T-R and Bypass switching incorporating power-reed relays. ☐ Self-contained T-R switching for separate transmitter and receiver — operates even with transceiver turned off. ☐ Band-switched to cover 80 through 10 meters. ☐ Internal dummy-load for exciter tuneup. ☐ Smallest desk-top kilowatt amplifier in its price range. ☐ Double interlock system to eliminate shock hazard. ☐ Circuit breaker power supply protection. ☐ Relative RF power meter reads exciter or amplifier power. ☐ Operational within 3 seconds from turn-on. ☐ All necessary inputs and outputs for either transceiver or transmitter/receiver operation.

SPECIFICATIONS: Power Input: 1000 watts DC on SSB, CW, AM, FM and RTTY — 2000 watts PEP capability for SSB • **Duty cycle in all models:** 50% at 1KW DC input, 15 minutes "ON" and 15 minutes "OFF". • **RF driving power required:** 55 watts for 1000 watts in — 85 watts PEP for 2000 watts PEP in • **T-R switching:** Requires a closed circuit from the exciter in receive and an open circuit in transmit • **Final tubes:** Two rugged 3-400Z zero-bias triodes • **Input:** 50 ohms nominal, broadband • **Output:** Pi-network matches 30 to 100 ohms, minimum, on all bands (80-10 meters) • **Internal blower:** Provides a minimum air flow of 35 CFM upward around tubes • **Self-contained, solid-state power supply:** Provides 2500 volts or 1800 volts • **Inter-modulation distortion:** 35 dB below PEP output at full legal input • **Cabinet dimensions:** 7" high x 15½" wide x 14" deep

The TEMPO/2000..$395

DX

BY JOHN A. ATTAWAY,* K4IIF

AT a recent ham gathering a DXer asked if the *CQ* DX Awards Advisory Committee was still in existence. The answer is a definite yes!

Its true that the DX Committee is not in the news as much as in earlier years, however, this is because of its success. The Awards Program has been broadened to meet the needs of all DXers, and is constantly being re-evaluated to insure that it stays up to date. Therefore there hasn't been any controversy to produce headlines.

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

A long time booster of 10 meter operation is Eric, G3TXF, Editor of *Quax*. In this photo Eric is putting the finishing touches on the 28 mHz beam at GB-3SX, the "beacon station" used to study conditions on 10 meters. Eric says to earn that 28 mHz endorsement on your CQ DX Awards pretty soon, as band conditions are deteriorating. *(Photo courtesy Quax).*

Fresno International DX Convention

This great DX event is scheduled for Jan. 22 and 23, 1972 at the Del Webb Towne House in Fresno, California. Prominent DXers scheduled to attend include Marty Laine, OH2BH, Carl Fjell, SM5SB/ZA5Z; Larry Pace, K21-XP; and Darlene Souligny, WA6FSC/3B9DK, etc. Better put it on your calendar.

The Committee membership is periodically being rotated to give new people a chance to advance their ideas. All of the original 1967 Committee have now retired, and with the addition of new DX clubs the group has been enlarged.

Among the Committee's recent decisions was the elimination of the phone category from WPX. The Committee is also studying the checkpoint system, the future direction of the DX Hall of Fame, the outlook for a 5-band WAZ award, and measures to stimulate more interest in the c.w. DX award. They have also been polled to determine the 10 most needed countries on c.w., and the 10 most needed countries on s.s.b. Future decisions will be reported in later columns.

Present makeup of the *CQ* DX Committee, and the clubs each represents, are as follows: Jack Reed, VE3GMT, Canadian DX Association; Vern Dameron, Jr., K1DRN, New

The CQ DX Award Program

C.W. DX

74.....W3HQU
75.....G5GH
76.....W6ADK

S.S.B. DX

165.....WB2OBO
166.....IT9JT
167.....YU1AG
168.....W9QLD
169.....WA2RQH
170.....ZL3NS
171.....G3HVU
172.....GW3HUM

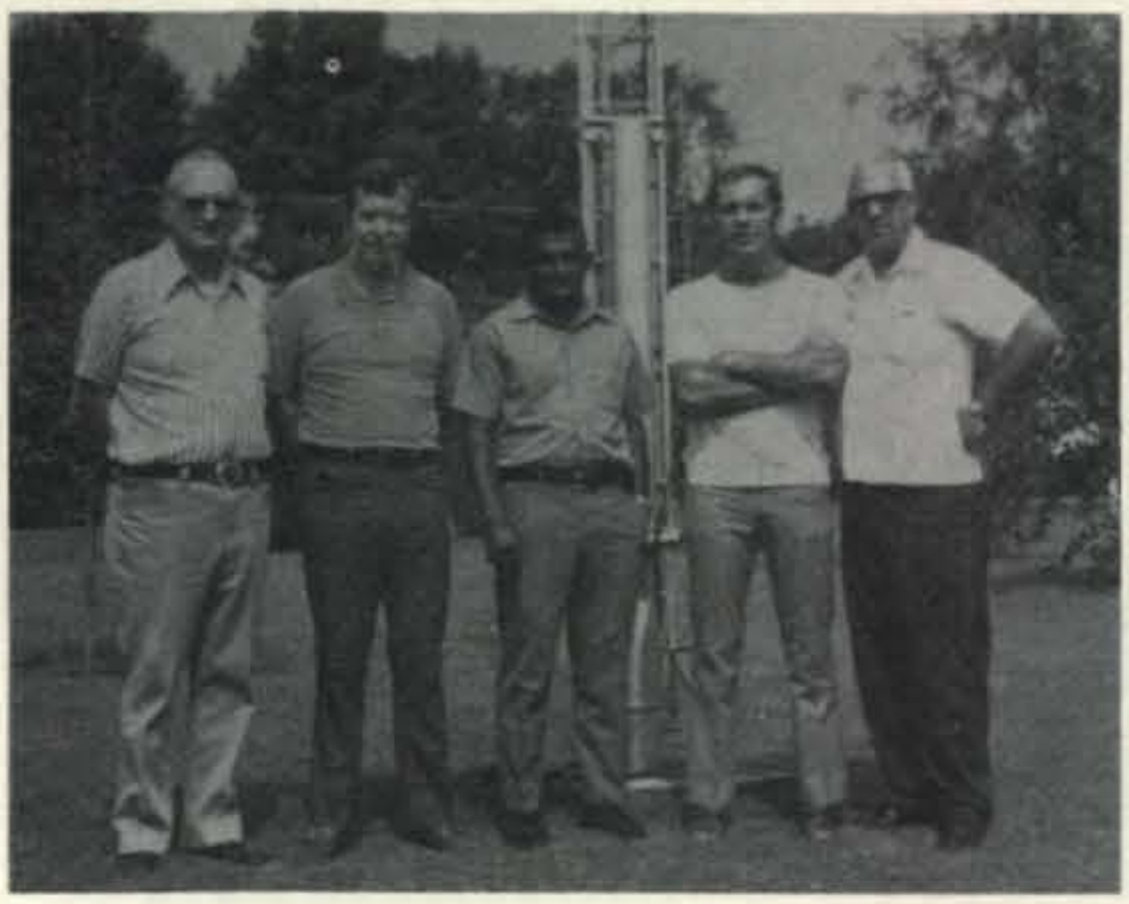
CQ DX Endorsements

C.W.: W6ADK—250, W3HQU—200, and G5GH—150, W3HQU—Low Band.

S.S.B.: IT9JT—300, W9QLD—300, ZL3NS—300, W6KZS—300, WB6DXU—250, F9MD—250, WB2OBO—200, K4EKJ—150, WB2OBO—28 Mc.

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 self-addressed, stamped envelope to the Award Manager, P.O. Box 1271, Covina, CA 91722, or to the DX Editor.

England DXCC; Lew Levitt, WB2NDI, Kings County Radio Club; Bob Wilson, W3GHD, Frankford Radio Club; John Kanode, W4-WSF, Potomac Valley Radio Club; Bob Rosier, K4OCE, North Carolina DX Association; Tava Franklin, K4AEB, North Alabama DX Club; Don Busick, K5AAD, West Gulf DX Club; Gary Stillwell, W6NJU, Southern California DX Club; Bob Ferrero, K6AHV, Northern California DX Club; Rod Linkous, W7YBX, Western Washington DX Club; ED Goodbout, W9DWQ, Northern Illinois DX Association; and Bill Higgins, WØYDB, Twin Cities DX Association.



Prominent group of DX'ers at the QTH of W3DJZ, left to right: Herb, WB2WOU, Glenn, K3SWZ, Cyril, 9Y4VT, Dusty, WA3IKK and Hop, W3DJZ.

De Extra

The DX Window on 160—Let's Respect It!—Thanks to the efforts of W1BB, DXing on 160 has become a popular pastime. Working "across the pond" through the QRN on 1.8 mHz is a real challenge, and to accomplish it consistently requires rules a little different from those on 15 or 20.

While here in W/K-land we are permitted the use of a respectable amount of power on top-band, indeed those in the interior can use up to a full kw, stations in the European region are limited to very low power, 10 watts. As a consequence it is difficult to hear the DX through the QRM even when conditions are favorable.

To overcome this problem, a gentlemanly arrangement was made by which the narrow segment, 1825-1830 kHz, was set aside for transmitting by low power overseas stations.

The WAZ Program

S.S.B. WAZ

930.....W4DRK
931.....VE3AES
932.....IT9JT
933.....G3KYF
934.....W2BHK
935.....YU3EM

C.W.—Phone WAZ

3275.....F6AOZ
3276.....W8LZV
3277.....K4EKJ
3278.....WA3DVO
3279.....VK6AI
3280.....JH1OFW
3281.....DL9WC
3282.....W9DE
3283.....WA9QAL
3284.....WA7CGR
3285.....OH2BFJ
3286.....UK5MAA
3287.....UB5JR
3288.....UA4YV
3289.....UO5AP
3290.....UW3EH

Phone WAZ

466.....I1TQ

Complete WAZ rules are shown on pgs. 64-66 of the June, 1970 issue of *CQ*. Application blank 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.

The WPX Prorgam

S.S.B. WPX

647.....WA9VGY
648.....F3IJ
649.....I1YV
650.....K1OME
651.....UO5BWG

C.W. WPX

1127.....WA2EAH
1128.....W4KFB
1129.....WA2RQH
1130.....K1OME
1131.....UWØAJ
1132.....UQ2KBC
1133.....UY5ZI
1134.....UW9AI
1135.....UK9AAZ
1136.....UV3BG

Mixed WPX

305.....K2KGB
306.....W8CNL
307.....W5LPO
308.....DJ5BV
309.....WA9VGY
310.....K1OME

WPX Endorsements

S.S.B.: DL1MD—700, F2MO—700, WA8-VFK—450, W2EHB—400, KC6WS—400, W9KAA—350, LA6RL—350, I1YV—350, and WA9VGY—300.
C.W.: WØAUB—800, UA3GO—500, W7-VSE—400, UA3BS—400, and KØEKR—350.
Mixed: W2NUT—900, W8ROC—850, WA-2FQG—650, DJ5BV—600, WA2EAH—500, K1KNQ—450, and W5LPO—450.
Phone: K2OLG—500.
40 Meters: UT5HP
20 Meters: UWØAJ and SM4-3434
15 Meters: WA8VFK
Africa: UT5HP
Europe: K1OME, UW3IN, and UK4WAB
Oceania: DL1MD and UT5HP
South America: W4WSP
VPX 450: SM4-3434

Complete rules for WPX, WPNX and VPX may be found on pgs. 66-67 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self- addressed, stamped envelope to Award Manager, P.O. Box 1271, Covina, CA 91722, or to the DX Editor.

Does this snappy operator, Trevor Evans, VK2NS, hold a world record? He and K6NB (WA6UNF) completed their 2000th consecutive daily QSO on 7023 wHz at 0800 GMT on Nov. 30, 1970. The first sked was on Oct. 5, 1963. 1200 hours were spent in actual contact during these QSO's, and no skeds were missed due to QRM, QRN, etc. Approximately 1,800,000 words have been sent. Guests in the 2000th QSO were VK2DK, KH6EFW and VK2DO.

It is popularly called the "DX Window," and US stations customarily transmit between 1800 and 1825 while announcing listening frequencies between 1825-1830. This system has provided many thousands of QSO's between the US and Europe which would not have been possible otherwise.

Unfortunately, a problem has developed. In recent months many new operators have discovered the fun on 160, and the "DX Window" is more and more frequently closed by strong US signals. Generally it is a case of not being aware of the tradition, and they are happy to QSY. However, there are a few bad apples who "stand on their constitutional right to transmit anywhere they cotton pickin' well please." De Extra considers this a very short-sighted attitude. One or two kilowatt signals pretty well close the window which could be open to 10 or more weak DX signals. This, gentlemen, is poor band usage and very questionable ethics.

Clay Sherrod, Jr., HS1ABU, keeps a weather eye out for stateside stations daily on 21.335 mHz from 1400 GMT onwards when conditions permit. QSL's for Clay should be sent via W5ZG.

Here and There

DXpeditions Planned: The Caribbean is heating up and I don't mean hot coffee or a hurricane. The troops are restive, DXpedition-wise. Among the spots on schedule are KC4- Navassa, VP2G-Grenada, and we keep hearing rumors of HKØ-Baja Nuevo.

Regarding Navassa, a letter from W4GKF tells us that four Atlanta amateurs are planning a 10 day DXpedition to take place near the end of April. They will include activity on 80, 40, 20, 15, and 10 on both c.w. and s.s.b. in their itinerary using 2 separate rigs. The call KC4DX has been requested from the FCC. Amateurs involved as of this date include W4GKF, K4TMA, WB4WMG, and WB4SEO.

Down Grenada way the action is slated for Feb. 5-20, including the two contest weekends in that interval. The operators will be Art Lewis, W3TV; Bill Robinson, W4GIV; Tony Susen, W3AOH; and Bill Taylor, W3VW. They expect to operate from the QTH of VP2GLE, but have applied for their own callsign. QSLs will be handled by "Big John," W3GJY.

DX Stamp Service: This service, which was operated for many years by Sax, W2SAW, is now under new management. Effective Jan. 1, 1972, the entreprenuer is George Robertson, W2AZX, of 83 Roder Parkway, Ontario, N.Y. 14519. George promises a continuation of the excellent, prompt service provided by Sax. To those unfamiliar with this idea, it gives you the opportunity to buy the stamps of most countries so that you may send an s.a.s.e. to a foreign amateur or QSL Manager with the proper stamps of his country already affixed to the envelope.

Amateur Radio In Other Countries

This month we decided to depart from the ordinary and feature the Spratly Islands, a country which is not a country in the conventional sense, but is nevertheless on the accepted country list for DX awards. To our knowledge the only successful operation from the Spratly group was the one conducted by Dr. Donald A. Miller five years ago using the call 1S9WNV. A DXpedition was recently

WPX HONOR ROLL

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

MIXED

W4OPM	Joe Hiller	1100
W8LY	Michael A. Bakos	867
W8ROC	Frederick W. Riecks	831
VE3GCO	Gary V. Hammond	825
W3PVZ	Joseph M. Olnick	811
W9WHM	John R. Leary	811
DL1MD	Heribert Rechl	809
DJ7CX	Leonard Poelt	808
K1SHN	Chuck Banta	808
W4IC	George A. Mack	803
ON4QX	Bob Berge	778
G3DO	D. A. G. Edwards	773
I6SF	Serafino Franchi	757
YU1AG	Djura Borosic	754
WØAUB	Bill Bergmann	752
CT1LN	Paulo J. S. Coelho Vieira	749
W4BQY	G. B. Fisher	741
WA6MWG	John P. Billon	738
KØBLT	Frank Cahoy	733
K8UDJ	Charles L. Hutchinson	712
DL1MD	Heribert Rechl	702
W4CRW	Robert C. Sommer	701
WA5LOB	James Edwards	699
PY4AP	"Biu" Marra	685
SM7TV	Boris Goransson	674
WA6EPQ	Larry Brockman	663
WAØCPX	Edward C. Gray	656

SSB

W4OPM	Joe Hiller	1025
W4NJF	Gay E. Milius, Jr.	933
DL9OH	Karl Muller	783
HP1JC	Juan G. Chen	750
W9DWQ	Edward A. Goodbout	741
K2POA	Arthur B. Johnson	733
I8KDB	Giampaolo Nucciotti	718
IØAMU	Alfonso Porretta	715
W4IC	George A. Mack	702
W3DJZ	Arden B. Hopple	694
WA5LOB	James D. Edwards	692
F2MO	Michel Dort	686
G3DO	D. A. G. Edwards	680
K1SHN	Chuck Banta	679
WØYDB	W. C. "Bill" Higgins	671

CW

W4OPM	Joe Hiller	950
W8LY	Michael A. Bakos	864
W8KPL	William W. Simpson	853
W2AIW	Charles W. Rogers	813
VK3AHQ	Henry Denver	809
W2HO	W. Vollokmmer	802
DL1QT	Helmut Baumert	780
ON4QX	Bob Berge	750
WB2FMK	Robert J. Rasche	700
OK2DB	Jaroslav Dufka	693
DJ7CX	Leonhard Poelt	680
W9FD	W. W. Johler	680
G2GM	F. D. Cawley	667
W4IC	George A. Mack	662
K1SHN	Chuck Banta	653
YU1AG	Djura Borosic	636
K2AAC	J. O. Archibald	625
I6SF	Serafino Franchi	622
VO1AW	Clarence Mitchell	605
VE4OX	D. E. McVittie	600

PHONE

CT1PK	Manoel F. DeAlmeida	894
W9WHM	John R. Leary	813
G3DO	D. A. G. Edwards	761
PAØSNG	Gerrit Mulder	754
W3DJZ	Arden B. Hopple	728
CT1LN	Paulo J. S. Coelho Vieira	710
CX2CN	Samuel C. Barreiro	666
I1YRK	Gennaro Casaburi	650
I6SF	Serafino Franchi	635
OE2EGL	Eugene Goffriller	601

scheduled by the VS6 boys, but was postponed because of the tense international situation, and the following information from *OHM* Magazine (Oriental Ham Magazine) and the West Coast DX Bulletin should be interesting to you.

The Spratly Islands consist of 96 coral atolls, almost all of them uninhabited, located in the South China Sea 350 miles southwest of Manila and 350 miles east of Saigon. Although they have a total area of only 1½ square miles, 3 different countries, Nationalist China or Taiwan, the Philippines, and South Vietnam, claim sovereignty over them, and it is rumored that Communist China and the Netherlands may soon join the party. The reason: *oil!* These tiny atolls are reported to lie over rich undersea oil reserves.

The Chinese name for this group is the Nansha or South Sand Islands, while the Philippines use the name "Freedomland," assigned by Thomas Clona in 1956. Taiwan seems to have the strongest advantage at present as they maintain a "military presence" on the 10 largest islands and are said to have restated their sovereignty in 1956.

The dispute came into the open in 1971 when a Philippine Congressman, Mr. Ramon Mitra, claimed that he was fired on while making a trip in the area. Philippine President Marcos followed with a statement that Nationalist Chinese troops had illegally occupied Itu Aba Island of the Spratly group, and that this threatened Philippine security. Mr. Marcos asked the government on Taiwan to withdraw its troops. Films released at a press conference in Manila showed Filipino soldiers at military installations on three other islands in what Mr. Marcos called "adequate steps" to protect the Philippines.

Gordon, ZB2A, at the rig consisting of a Racal receiver, a Vespa Mark II transmitter and an auxiliary R88D receiver. Gordon is a sergeant in the RAF. QSL ZB2A to WA9YNE, 17 W. 151 White Pine Tree, Bensenville, IL 60106. *(Photo via WA9YNE)*

China's original claim to the Spratlies dates back to the Han Dynasty, 206 B.C. to 220 A.D. Cheng Ho, sent by the imperial ruler of the Ming Dynasty, visited the islands on his way to Africa in 1405-33, and claimed them again for China. The Manchu Dynasty, 1644-1911, sent an envoy who reported a Chinese settlement.

The Chinese claim was challenged by Japan in 1917 when the latter initiated guano mining operations. The Japanese mining continued until 1929, after which a French warship visited the area. In 1933 France announced occupation of the Spratlies. French and Japanese occupation was challenged by the Chinese government in Nanking, but the Imperial Japanese navy drove the French out in 1939 and built a submarine base.

The Nationalist Chinese government took control of the islands after World War II and has kept a garrison there since 1956.The least hopeful contender seems to be South Viet Nam. The Saigon government sent a Marine contingent to the Spratlies inAugust, 1956, but soon withdrew it and is said to have dropped its territorial claims which dated back to 1934.

The smiling face of Jean, F7BDJ, prominent European DXer and one of our rapidly growing cadre of overseas subscribers.

Reports from the Rare Zones

The toughest zones to work from W/K-land are still those over the pole in Siberia, namely 18, 19, and 23. A part of the problem is the difficulty in determining the correct zones for the UA9 and UAØ stations.

Actually, it's not as tough as it may seem. The UA authorities assign these calls in a systematic manner, and consequently the zone can usually be located by the first letter after the prefix. For example, UA9, UK9, UV9 and UW9 stations having the letters H, I, O, P, U, V, or Y immediately after the figure 9 are in Zone 18. In addition, UAØ, UKØ, UVØ and UWØ stations with A, B, O, S, T, U, or V immediately after the Ø are also in Zone 18.

Those UAØ, UKØ, UVØ and UWØ stations with C, E, F, G, I, J, K, L, M, Q, R or Z immediately after the Ø are in Zone 19, while those with Y after the Ø are in Zone 23. All JT-Mongolia stations are in Zone 23.

Some stations recently reported from these zones include:

Zone 18: UA9VB, 14203 kHz at 0135Z and 14207 kHz at 0205Z; UAØAJ, 14209 at 1240; UA9IF, 14200 at 0200; UK9OAA, 14200+ at 0255, and UV9OM, 14027 at 0130.
Zone 19: UAØEH, 14008 at 1050; UAØFAT, 14017 at 0330; UAØFBA, 14004 at 1210; UAØKAF, 7002 at 0430 and 7009 at 0525; UKØZAD, 7002 at 1330 (W6-land); UAØLAJ, 14010; and UWØIE, 14229 at 0150.
Zone 23: UAØYA, 14026 at 0150; UAØYAE, 14031 at 0055; UAØYT, 14025 at 0200 and 14041 at 0235; JT1AG, 14196 at 1600, 142-04 at 0200, and 14202 at 1310; JT1AR, 140-40 at 1500; and JT1KAA, 14041 at 0035.

Rare and Unusual Prefixes for WPX

CV—This special prefix was used in Uruguay during the *CQ* Worldwide DX Contest in October.
EQ2—This prefix was used this fall by EP2 amateurs in Iran.
GW4—GW4ACO was worked on 21060 kHz at 1715Z.
KY6—KY6PMR on 14045 kHz in October was reported to be at Point Mugu Naval Air Station. QSL to WA6GFE.
OMØ—OK stations used this prefix from Oct. 1-Dec. 31, 1971 to commemorate the 20th Anniversary of the Central Radio Club of Czechoslovakia.

[*Continued on page 101*]

CQ WPX Award Rules

The *CQ* WPX Award recognizes the accomplishment of confirmed QSO with the many prefixes used by amateurs throughout the world. Separate distinctively marked certificates are available for two-way s.s.b., c.w. and mixed modes as well as the VPX award for shortwave listeners and the WPNX award for USA Novice amateurs.

I. Applications:

A. All applications for WPX certificates (and endorsements) must be submitted on the official application form *CQ* 1051A. This form can be obtained by sending a self-addressed stamped envelope to the WPX Manager. It is highly desirable to use business size envelopes, 9½ × 4 inches, for this purpose.

B. All call letters must be in strict alphabetical order and the entire call letter must be shown.

C. All entries must be clearly legible.

D. Certificates are issued for the following modes and numbers of prefixes. Cross mode QSO's are *not* valid for the c.w. or two-way s.s.b. certificates.

Mixed (any mode) — 400 prefixes confirmed
C.w. — 300 prefixes confirmed
Two-way s.s.b. — 300 prefixes confirmed

Separate applications are required for each mode.

E. Cards need not be sent, but must be in the possession of the applicant. Any and all cards may be requested by the WPX Manager or the *CQ* DX Committee.

F. The application fee for each certificate is $1.00 or eight (8) International Reply Coupons (IRC's).

G. All applications and endorsements should be sent to the WPX Award Manager.

II. Endorsements:

A. Prefix endorsements are issued for each 50 additional prefixes submitted.

B. Band endorsements are available for working the following numbers of prefixes on the various bands: 1.8 mHz—35; 3.5 mHz—150; 7 mHz—250; 14 mHz—300; 21 mHz—300; 28 mHz—250.

C. Continental endorsements are given for working the following numbers of prefixes in the respective continents: North America—126; South America—88; Europe—146; Africa—80; Asia—68; Oceania—51.

D. Endorsement applications must be submitted on *CQ* Form 1051A. Use separate applications for each mode and be sure to specify the mode of your endorsement application.

E. For Prefix endorsements list only additional call letters confirmed since the last endorsement application.

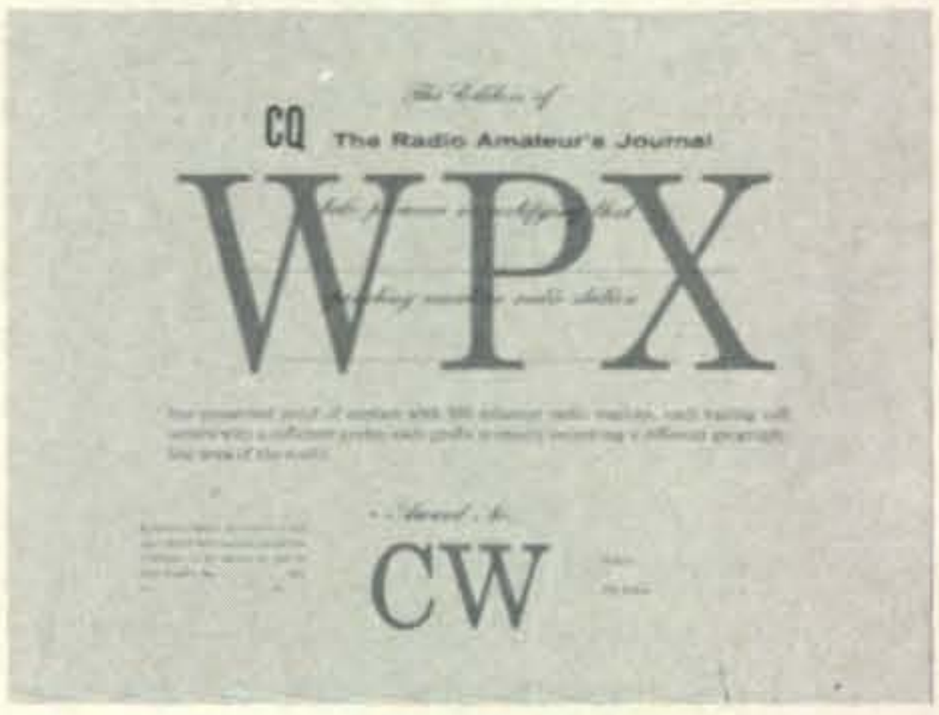
F. A self-addressed stamped envelope or self-addressed envelope with 1 IRC is required for endorsement stickers.

III. Prefixes:

A. The 2 or 3 letter/numeral combinations which forms the first part of any amateur call will be considered the prefix.

B. Any difference in the numbering, lettering or order of same shall constitute a separate prefix. The following would be considered different: W2, WA2, WB2, WN2, WV2, K2 and KN2.

C. Any prefix will be considered legitimate if its use was licensed or permitted by the governing authority in that country.



D. A suffix would designate portable operation in another country or call area and would count only if it is the normal prefix used in that area. For example, K4IIF/KP4 would count as KP4. However, KP4XX/7 would *not* count as KP7 since this is not a normal prefix. Suffixes such as /M, /MM, /AM, /A and /P are not counted as prefixes. (See also rule 3E). An exception to this rule is granted for portable operation within the issued call area. Thus contacts with a special prefix such as WS2JRA/2 counts for WS2 however, WS2JRA/3 would count for W3.

E. All calls without numbers will be assigned an arbitrary ∅ plus the first two letters to constitute a prefix. For example. RAEM counts as RA∅, AIR is AI∅, UPOL is UP∅. All portable suffixes that contain no numerals will be assigned an arbitrary ∅. For example, W4BPD/LX counts as LX∅ and HB9XYZ/PX counts as PX∅.

IV. VPX:

The VPX or Verified Prefixes Award can be earned by s.w.l.'s who possess QSL cards confirming reception of at least 300 different amateur prefixes. No Mode endorsements are available. Applications are submitted to the WPX Manager in accordance with WPX rules.

[*Continued on page 81*]

Propagation

BY GEORGE JACOBS,* W3ASK

THE solar cycle continues to decline at a steady pace.

The Swiss Federal Solar Observatory reports a monthly mean sunspot number of 51 for October, 1971. This results in a running smoothed sunspot number of 68, centered on April, 1971. A smoothed sunspot number of 50 is forecast for February, 1972.

Declining solar activity, coupled with normal seasonal changes in shortwave propagation conditions, should result in considerably *fewer* 10 meter DX openings during February and the early spring months. While some fairly good openings may still be possible on north-south paths, and on paths between the northern and southern hemispheres, few, if any are expected on east-west circuits. Whatever 10 meter openings might be possible during February, are most likely to occur during the hours of daylight.

The 15 meter band should be optimum for world-wide DX propagation during the daylight hours of February. Good openings are forecast to almost all areas of the world, with generally strong signals and little fading or noise. The band should open shortly after sunrise, and remain open to one area of the world or another through the late afternoon and early evening hours.

Excellent DX propagation conditions are forecast for 20 meters, with conditions peaking shortly after sunrise and again during the late afternoon and early evening hours. To some areas of the world, the band may remain open during the hours of darkness as well.

Fairly good DX propagation conditions are forecast for 40 meters from late afternoon, through the hours of darkness and continuing through the sunrise period. Exceptionally high signal levels are expected during some DX openings on this band during February.

Static levels should begin to increase during February, resulting in somewhat noisier conditions on 80 and 160 meters. Some fairly good DX openings, however, are forecast for 80 meters during the hours of darkness and the sunrise period. An occasional DX opening should also be possible during the same period on 160 meters, especially on nights when static levels are low.

*11307 Clara Street, Silver Spring, Md. 20902.

LAST MINUTE FORECAST

February, 1972

	Rating & Forecast Quality			
Days	(4)	(3)	(2)	(1)
Above Normal: 3, 5, 18-19, 25	A	A	B	C
Normal: 1-2, 4, 6, 8-10, 13, 16-17, 20-24, 26, 28-29	A	B	C	D
Below Normal: 7, 11, 14-15, 27	C	D	D	E
Disturbed: 12	D	D	E	E

HOW TO USE THESE CHARTS

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

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. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parenthese at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meaning: (A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak and considerable fading and noise; E—poor opening, or none at all.

4—This month's DX Propogation Charts are based upon a transmitter power of 250 watts c.w.; 1 kw p.e.p. s.s.b., or 1000 watts d.s.b., into a dipole antenna a quarter-wave above ground on 160 and 80 meters a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas: The Central USA Chart in the 5, 9, and 0 areas, and the Western USA Chart in the 6 and 7 areas. The charts are valid from February 15, 1972, through April 15, 1972 and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado.

V.h.f. Ionospheric Openings

The possibilities for trans-equatorial (TE) propagation openings on 6 meters improve as spring approaches. Some openings of this type, especially between southern regions of the USA and southern areas of South America may be possible during February. The best time to check for 6 meter TE openings is between 8 and 11 P.M., local time.

Auroral displays often occur somewhat more frequently during February than during the earlier winter months. This should make possible an increased number of short-skip openings, ranging in distance from a few hundred up to approximately 1300 miles, on both 6 and 2 meters. Such openings result from the intense regions of ionization associated with auroral displays.

While auroral ionization may improve propagation conditions on the v.h.f. bands, it often causes radio storms which disrupt propagation on the h.f. bands. Check the "Last Minute Forecast" appearing at the beginning of this column for those days that are likely to be disturbed of below normal during February. These are also the days on which v.h.f. auroral-type openings are most likely to occur during the month.

Sporadic-E ionization reaches a seasonal low during February, and few short-skip openings from this type of propagation are expected during the month.

No significant meteor showers are scheduled for February, and few, if any meteor-type ionospheric openings are likely to occur.

This month's *Propagation Charts* contain band opening predictions for major DX paths for the period February 15 through April 15, 1972. A short-skip propagation forecast for February appeared in last month's column. Instructions for the proper use of the *Propagation Charts* appear directly below the "Last Minute Forecast" at the beginning of this column.

73, George, W3ASK

February 15-April 15, 1972

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-12 (1)	08-09 (1) 09-10 (2) 10-13 (3) 13-14 (2) 14-15 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-17 (2) 17-19 (1)	17-18 (1) 18-19 (2) 19-22 (3) 22-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-00 (2)* 00-02 (1)*
Northern Europe & USSR	08-11 (1)	08-09 (1) 09-12 (2) 12-13 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (1) 00-03 (1)	17-19 (1) 19-02 (2) 02-03 (1) 20-01 (1)*
Eastern Mediterranean & Middle East	08-11 (1)	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-15 (2) 15-16 (3) 16-18 (2) 18-20 (1) 00-02 (1)	18-20 (1) 20-23 (2) 23-00 (1) 20-23 (1)*
West & Central Africa	09-11 (1) 11-13 (2) 13-14 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	05-06 (1) 06-08 (2) 08-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-22 (1)	18-21 (1) 21-01 (2) 01-03 (1) 22-02 (1)*
South Africa	09-10 (1) 10-12 (2) 12-14 (1)	07-10 (1) 10-13 (2) 13-15 (3) 15-17 (2) 17-18 (1)	07-14 (1) 14-16 (2) 16-18 (3) 18-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	18-20 (1) 20-23 (2) 23-00 (1) 21-23 (1)*
East Africa	10-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	19-23 (1) 23-01 (2) 01-02 (1)
Central & South Asia	08-11 (1) 19-21 (1)	08-10 (1) 19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	19-22 (1) 04-06 (1)
Southeast Asia	10-13 (1) 18-20 (1)	08-10 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	05-07 (1) 19-22 (1)
Far East	17-19 (1)	16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-20 (2) 20-22 (1)	05-08 (1) 05-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-18 (1)	10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	09-11 (2) 11-19 (1) 19-23 (2) 23-06 (1) 06-07 (2) 07-09 (3)	00-01 (1) 01-02 (2) 02-05 (3) 05-07 (2) 07-08 (1) 03-07 (1)*
Australasia	09-11 (1) 16-18 (1)	08-12 (1) 14-16 (1) 16-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-14 (1) 14-16 (2) 16-19 (1) 19-22 (2) 22-00 (1)	02-04 (1) 04-06 (2) 06-08 (1) 04-06 (1)*
Northern & Central South America	09-11 (1) 11-12 (2) 12-14 (3) 14-16 (2) 16-18 (1)	07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	22-00 (2) 00-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-19 (4) 19-22 (3)	18-19 (1) 19-20 (2) 20-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Brazil, Argentina, Chile & Uruguay	09-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-18 (2) 18-19 (1)	13-15 (1) 15-16 (2) 16-18 (3) 18-20 (4) 20-21 (3) 21-23 (2) 23-06 (1) 06-08 (2) 08-10 (1)	19-21 (1) 21-03 (2) 03-06 (1) 21-05 (1)*
McMurdo Sound, Antarctica	Nil	14-17 (1) 17-19 (2) 19-20 (1)	17-19 (1) 19-23 (2) 23-01 (1) 06-08 (1)	22-00 (1) 00-04 (2) 04-06 (1)

* Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2), or higher.

RESULTS OF THE 1971 CQ WORLD WIDE WPX SSB CONTEST ON PAGE 34

Time Zones: CST & MST (24-Hour Time)

CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-11 (1)	08-09 (1) 09-13 (2) 13-14 (1)	00-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-18 (1) 22-00 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Northern Europe & Eastern USSR	09-11 (1)	07-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-15 (3) 23-01 (1)	19-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Eastern Mediter-ranean & Middle East	09-11 (1)	07-09 (1) 09-11 (2) 11-13 (1)	07-12 (1) 12-15 (2) 15-17 (1) 22-00 (1)	19-22 (1) 20-22 (1)*
West & Central Africa	09-10 (1) 10-12 (2) 12-14 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-13 (4) 13-15 (3) 15-16 (2) 16-17 (1)	06-12 (1) 12-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-19 (2) 19-21 (1)	18-20 (1) 20-23 (2) 23-01 (1) 21-00 (1)*
East Africa	09-12 (1)	08-11 (1) 11-15 (2) 15-117 (1)	06-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-19 (1)	19-22 (1)
South Africa	08-09 (1) 09-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-15 (2) 15-16 (1)	05-07 (2) 07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-20 (1) 23-01 (1)	19-22 (1) 20-21 (1)*
Central & South Asia	07-09 (1) 17-19 (1)	08-10 (1) 19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (2)	05-07 (1) 18-20 (1)
Southeast Asia	08-10 (1) 18-20 (1)	09-12 (1) 16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-10 (2) 10-12 (1) 16-18 (1) 18-20 (2) 20-21 (1)	04-07 (1)
Far East	16-19 (1)	14-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-21 (2) 21-23 (1)	02-04 (1) 04-06 (2) 06-08 (1) 05-07 (1)*
South Pacific & New Zealand	11-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	10-12 (1) 12-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-18 (1) 18-20 (2) 20-21 (3) 22-00 (2) 00-02 (1)	22-00 (1) 00-01 (2) 01-06 (3) 06-07 (2) 07-08 (1) 00-02 (1)* 02-05 (2)* 05-07 (1)*
Austra-lasia	14-15 (1) 15-17 (2) 16-18 (1)	08-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-19 (1) 19-21 (2) 21-01 (1)	02-04 (1) 04-06 (3) 06-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Northern & Central South America	08-09 (1) 09-10 (2) 10-14 (3) 14-15 (2) 15-16 (1)	07-08 (1) 08-09 (2) 09-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-09 (4) 09-11 (3) 11-15 (2) 15-16 (3) 16-18 (4) 18-21 (3) 21-00 (2) 00-06 (1) 06-07 (2)	18-19 (1) 19-20 (2) 20-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Brazil, Argentina, Chile & Uruguay	08-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	14-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-00 (2) 00-02 (1) 04-06 (1) 06-08 (2) 08-14 (1)	19-20 (1) 20-02 (2) 02-05 (1) 21-03 (1)
McMurdo Sound, Antarctica	Nil	13-16 (1) 16-18 (2) 18-20 (1)	16-19 (1) 19-23 (2) 23-02 (1) 07-09 (1)	22-02 (1) 02-04 (2) 04-06 (1)

Time Zone: PST (24-Hour Time)

WESTERN USA TO:

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

[*Continued on page 90*]

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Jan.	15-17	5BWAS Contest
Jan.	**28-30**	**CQ WW 160 C.W. Contest**
Jan.	29-30	French C.W. Contest
Feb.	5-6	ARRL DX Phone Contest
Feb.	5 & 13	World SSTV Contest
Feb.	11-13	QCWA QSO Party
Feb.	12-13	CCHSRC "Operation's Day"
Feb.	13	Tennessee QSO Party
Mar.	18-19	Virginia QSO Party
Feb.	19-20	ARRL DX C.W. Contest
Feb.	19-28	IARC Propagation CW/RTTY
Feb.	26-27	French Phone Contest
Feb.	26-27	YL-OM Phone Contest
Mar.	4-5	ARRL DX Phone Contest
Mar.	11-12	YL-OM C.W. Contest
Mar.	11-13	Worldwide VHF Activity
Mar.	14-16	Old, Old Timers QSO Party
Mar.	18-19	ARRL DX C.W. Contest
Mar.	**25-26**	**CQ WW WPX SSB Contest**
Mar.	25-27	BARTG Spring RTTY Contest
Mr. 25-Ap. 2		IARC Propagation Phone
Apr.	29-30	WAE RTTY Contest

CQ WW 160 C.W. Contest

Starts: 2200 GMT Friday, January 28
Ends: 1500 GMT Sunday, January 30

The starting time has been made two hours earlier to take advantage of possible European openings, and the order of the exchange has been slightly modified. It's QSO nr., RST and your state or province. Otherwise rules remain the same as previous years.

Mailing deadline is February 29th to: CQ 160 Contest, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

French DX Contest

C.W.—Jan. 29-30 **Phone**—Feb. 26-27
Starts: 1400 GMT Saturday
Ends: 2200 GMT Sunday

You may work French stations as well as stations in French territorial areas. (9Q, 9U, 9X and etc.) And also ON, LX and HB stations who will be involved in their own activity.

Complete rules in last month's CALENDAR. This year logs go to: The REF Traffic Manager, Lucien Aubry, F8TM, rue Marceau 53, 91 Palaiseau, France.

5BWAS Contest

Starts: 0000 GMT Saturday, January 15
Ends: 0600 GMT Monday, January 17

This the first annual contest sponsored by the National Teenage Radio Society was organized to assist amateurs in getting their 5BWAS.

All bands, phone and c.w. may be used. The same stations may be worked only once on each band regardless of mode.

Exchange: QSO nr., RS/RST and state for W/K's, QSO nr., and RS/RST for others.

Scoring: One point per QSO on all bands except 28 mc which are worth 2 points. Final score, total QSO points times the number of states worked on each band. (50 per band, 250 total)

Frequencies: Phone—3910, 7265, 14280, 21360, 28600. C.W.—3550, 7050, 14050, 21050, 28050. Novice—3740, 7160, 21115.

Awards: Certificates to the top 3 in the U.S.,

Senator Barry Goldwater, K7UGA and Bernie Welch, W8IMZ, CQ Contest Committee member, find time to discuss amateur radio during a recent Air Force Sergeants Association convenion in Washington D.C. K7UGA the newly elected president of the QCWA was the guest speaker at the banquet. (Wonder if Bernie talked Barry into taking a crack at one of our Contests?)

(Photo by Ken Knox)

* 14 Sherwood Road, Stamford, Conn. 06905

Claimed Scores
1971 CQ WW DX Phone Contest

Single Operator
All Band

6D1AA	3,541,714
VK6HD	2,911,224
OB8V	2,446,566
G3LNS	1,414,336
5H3LV	1,369,088
W2PV	1,355,360
VE3BMV	1,324,809
9G1WW	1,284,969
ZP5AQ	1,264,540
W6RR	1,173,356
W6MAR	1,118,840

28 mHz

XX7IK	584,535
9E3USA	442,000
OB4PF	204,952
HR2GK	156,788
JA3MZH	96,135
KV4AM	71,040
WA8QIY	62,034
W6ED	57,591
W9YYG	53,486
WA1HFN	52,283

21 mHz

YU3EJ	289,912
VE2AFC	235,596
W6BH	226,240
W9LKJ	206,870
W9RER	202,640
W9IY	175,296
HS1ABU	170,765
WB8BLL	153,000

14 mHz

ZE1CU	672,690
K6LOM	456,726
W2ONV	420,831
XX7FR	263,500
JA2KLT	262,752
I3JR	191,516
WB2WJO	189,450
CE6EQ	184,030

7 mHz

HR1RF	207,749
WA8ZDF	45,214
ZD8CS	38,372
JA1OHV	36,719
G3SSO	24,968
IP1WXY	14,307

3.5 mHz

VE3MR/4X	203,484
HI8LC	56,903
CN8HD	44,200

1.8 mHz

K1PBW	60

Multi-Operator
Single Trans.

PJ1AA	3,407,987
ZF1WF	1,313,075
WA3ATP	974,460

Multi-Operator
Multi-Trans.

4M1A	11,744,590
4Z4HF	6,000,000
OH5SM	4,421,875

and 1st place in each state. Also to the top DX and Novice scores.

Mailing deadline February 15th to: Tom Harke, WB9BJR, 329 Cleveland Ave., Little Chute, Wis. 54140.

CCHSRC "Operation's Day"

Starts: 1300 GMT Saturday, February 12
Ends: 0100 GMT Sunday, February 13

The boys of the Colonie Central High School Radio Club will man four rigs on the air from their club station WA2DNR, full time during the above period. A special QSL card will be sent to every station contacted during that time.

Activity will be on the following frequencies: 3716, 7175, 21150 on c.w. and 3920, 7275, 14280, 21375 on phone.

Send your QSL cards to: Colonie Central High School, WA2DNR, 100 Hackett Avenue, Albany, N.Y. 12205.

ARRL DX Contest

Phone: February 5-6 and March 4-5
C.W.: February 19-20 and March 18-19
Starts: 0001 GMT Saturday
Ends: 2359 GMT Sunday

The 38th running of this contest will again have the DX stations pointing their beams to the USA and Canada and try to work as many W/Ks and VEs as possible on all bands.

The fellows on this side will send a signal report and their state or province. The DX stations will add three digits to their signal report indicating their power.

There are some minor rule modifications which you can pick up in the December issue of *QST*. One gives a little more latitude to multi-operator stations.

Log forms, summary sheets and check off sheets are available from ARRL.

Address all requests and your logs to: ARRL Communications Dept., 225 Main Street, Newington, Conn. 06111.

World SSTV Contest

Two Periods:
1500-2200 GMT Saturday, February 5
0700-1400 GMT Sunday, February 13

This second annual contest is again sponsored by **CQ Electronica** magazine of Italy.

All authorized amateur frequencies may be used. (The TVers have established spots)

The procedure is to exchange pictures, the message number may be given by voice.

Scoring: Score one point for each complete exchange. And a multiplier of 10 for each continent worked, and 5 for each DXCC country contacted.

Final score: Total exchange points times the sum of the continent/country multiplier.

Awards: 1st, 2nd and 3rd place will receive 12 months, 6 months and 6 months subscription to **CQ Electronica.** There is also a s.w.l. prize.

Logs must be received by March 20th by: Prof. Franco Fanti, via A. Dallolio 19, 40139 Bologna, Italy.

QCWA QSO Party

Starts: 0000 GMT Saturday, February 12
Ends: 2400 GMT Sunday, February 13

This year's party will again be sponsored by the Dallas Chapter of QCWA. Only contacts with other members will count for QCWA awards.

This is primarily a party to renew old acquaintances and see how many members you can work. Contacting overseas members is encouraged.

Like last year a simple scoring system will be used to make it more interesting.

Exchange: QSO nr., RS/RST, QTH, name and your QCWA number.

Scoring: Count one point for each QCWA member worked, multiply total by the sum of States, Canadian provinces, maritime mobiles and DX countries worked. (A member station may be worked only **once** for point and multiplier credit regardless of band or mode.)

Frequencies: C.W.—3580, 7080, 14080, 21080, 28080. Phone—3980, 7280, 14280, 14345, 21380, 21445, 28580. RTTY—3595/3600, 7095/7100, 14095/14100, 21070/21075, 28070/28075.

Awards: The QCWA Plaque donated by Head-

2ND WORLDWIDE SSTV CONTEST BEGINS FEB. 5, 1972

$495 Robot SSTV monitor & free personalized SSTV tape* equips any licensed ham to enter.

Sponsored by CQ Elettronica Magazine, the contest is open to all licensed amateurs qualified to operate SSTV. Details are listed elsewhere in this magazine.

*By taking advantage of our current offer of a free personalized SSTV tape with the purchase of a Robot Model 70 monitor (as described in our last month's ad), you will have a video SSTV signal you can transmit without having to own a SSTV camera.

So for the price of the Robot monitor alone ($495) you will have all the equipment necessary to enter the second WORLD WIDE SSTV CONTEST!

ROBOT MODEL 70 MONITOR **$495**
ROBOT MODEL 80 CAMERA **$465**
25mm fl.9 lens .....**$ 30**

FOR A FREE BROCHURE ON SSTV AND THE ROBOT CAMERA AND MONITOR WRITE

ROBOT

7591 CONVOY COURT, SAN DIEGO, CA 92111 (714) 279-9430

See the complete line of Robot SSTV equipment at your local Robot dealer listed below.

Birmingham, Ala. 35233, James W. Clary Company, 1713 Second Avenue South, (205) 322-2486 • **Anaheim, Calif. 92804,** Henry Radio Company, 931 North Euclid, (714) 772-9200 • **Los Angeles, Calif. 90064,** Henry Radio Company, 11240 West Olympic Boulevard, (213) 272-0861 • **Oakland, Calif. 94607,** Amrad Supply, 1025 Harrison Street, (415) 451-7755 • **Denver, Colo. 80202,** CW Electronic Systems, 1401 Blake Street, (303) 244-5523 • **Miami, Fla. 33137,** Amateur Radio Center, Inc., 2805 NE Second Avenue, (305) 374-4101 • **Honolulu, Hawaii 96803,** Honolulu Electronics, 819 Keeaumoku Street, (808) 949-5564 • **Reading, Mass. 01867,** Graham Radio Company, 505 Main Street, (617) 944-4000 • **Muskegon, Mich. 49441,** Electronic Distributors, Inc., 1960 Peck Street, (616) 766-3196 • **St. Louis, Mo., 63132,** Ham Radio Center, 8342 Olive Boulevard, (314) 993-6060 • **Amsterdam, N.Y. 12010,** Adirondack Radio Supply, 185-191 W. Main Street, (518) 842-8350 • **New York, N.Y. 10012,** Barry Electronics, 512 Broadway, (212) 925-7000 • **Asheville, North Carolina 28801,** Freck Radio Supply, 38 Biltmore Avenue, (704) 254-9551 • **Cleveland, Ohio 44112,** Amateur Electronic Supply, 17929 Euclid Avenue, (216) 486-7330 • **Dayton, Ohio 45404,** SREPCO, 314 Leo Street, (513) 224-0871 • **Trevose, Pa. 19047,** Hamtronics, 4033 Brownsville Road, (215) 357-1400 • **Fort Worth, Texas 76110,** Ed Juge Electronics, 3850 South Freeway, (817) 926-5221 • **Spokane, Wash. 99206,** HCJ Electronics, E. 8214 Sprague, (509) 924-2343 • **Milwaukee, Wisc. 53216,** Amateur Electronic Supply, 4828 W. Fond du Lac Avenue, (414) 442-4200 • **CANADA: Fredericton, N.B.,** Audio Lectronics Ltd., 79 Prospect Street, (506) 454-3380 • **Downsville, Ontario,** VE Amateur Radio, 3768 Bathurst Street, (416) 636-3636 • **Montreal, Quebec,** Payette Radio Company, 730 St. Jacques, (514) 866-6681.

Some of the members of the new South Germany DX Group who saw activity in our World Wide DX contests this past fall. Standing l. to r.: DJ3JV, DK2WY, DJ7CX, DJ5DA, DL3RK, DK2BL, DK1YK, DEM14829. Sitting: DJ7CY, DL8UP, DL1MD.

quarters to the "Top Banana" in the Party, to be permanently retained by the member winning it three times. Also a certificate to all stations working 100 or more members.

A special QCWA Silver Anniversary Certificate will be awarded to all members participating in the party and submitting a log. Your rank in the contest will be indicated on the certificate.

Mail your log by March 11th to: L. F. Heithecker, W5EJ, 1409 Cooper Drive, Irving, Texas 75060.

Tennessee QSO Party

Starts: 0200 GMT Sunday, February 13
Ends: 2400 GMT Sunday, February 13

This party is sponsored by the Tennessee Council of Amateur Radio Clubs. The same station may be worked on different bands and modes for QSO points, and Tenn. can work in-state stations for multiplier credit.

Exchange: RS/RST and QTH, county for Tenn. and state, province or country for others.

Scoring: One point per QSO. Tenn. use states, provinces, DX countries and Tenn. counties for their multiplier. Others use Tenn. counties. (Max. of 95)

Frequencies: 3580, 3980, 7070, 7270, 14070, 14290, 21050, 21375, 28100, 28600. Avoid traffic nets on penalty of being disqualified.

Awards: Certificates to each station working 10 or more stations. Also plaques for the highest Tenn. score and highest out-of-state. (minimum of 25 contacts to be eligible).

There will be portable and mobile activity in rare Tenn. counties.

Logs must be received no later than 30 days after the contest. Send your entry with a s.a.s.e. to: Dave Goggio, W4OGG, 1419 Favell Drive, Memphis, Tenn. 38116.

Virginia QSO Party

Starts: 1200 gmt Saturday, March 18
Ends: 1800 gmt Sunday, March 19

The same station may be worked on different bands for QSO point credit. Phone, c.w. and novice are different contests and require separate logs.

Exchange: QSO nr., RS(T) and QTH; county for VA. stations, state, province or country for others.

Scoring: One point per QSO, VA. multiply total by sum of states, provinces, countries and Va. counties worked. Others use Va. counties for their multiplier. (max. of 96).

Frequencies: c.w.—3560, 7060, 14060, 21060, 28060. Phone—3930, 7260, 14285, 21375, 28750.

Awards: Usual certificates to the top scorers in each section and category.

Logs must be received no later than April 30th and go to: Roanoke Valley ARC, c/o Charles Towles, K4BJM/4, 3007 Pebble Drive, Roanoke, Va. 24014.

IARC Propagation Contest

CW/RTTY: February 19 to 28
Phone: March 25 to April 2
Starts: 0001 GMT Ends: 2400 GMT

There has been a modification in the rules in this year's contest.

Categories: Single band, all band, mobile and s.w.l., single operator only.

Exchange: RS/RST plus your CPR Zone.

Scoring: One point for each QSO, and a multiplier of one for each Zone and each country worked on each band.

Final Score: Total QSO points multiplied by the sum of Zones and Countries worked. (If all band, sums from each band).

You may work stations in your own Zone but for multiplier credit only.

The same station may be worked as many times as desired. Contacts lasting more than 6 minutes may be credited as a separate QSO but each must be logged separately.

Contacts with stations operating in other contests may be credited by supplying the correct IARC Zone number.

Use official IARC log sheets and summary forms or a facsimile with 40 QSO's to the sheet. Indicate each new Zone and Country in appropriate columns only first time it is worked.

The IARC Zone/Country list will be the standard, and it is highly recommended that you get a copy of same, as well as log sheets from IARC address below.

Awards: Certificates to winners in each Zone in each category.

Logs and all inquiries go to: L. M. Rundlett, 2001 Eye Street, N.W., Washington, D.C. 20006.

YL-OM Contest

Phone: Feb. 26-27 **C.W.:** Mar. 11-12
Starts: 1800 GMT Saturday
Ends: 1800 GMT Sunday

It's the YL's working the OM's in this one.

[*Continued on page 87*]

THE dwards PROGRAM

BY ED HOPPER.* W2GT

THE February, "Story of The Month" is:

Andrew H. Abraham, W3JZY

(All Counties #64 9-18-71)

The *Ole Man On The Mountain,* Andy, W3-JZY (NØSRN, Navy Mars) near Smithburg, Frederick County, Maryland, got his last county needed for *All Counties* on August 29th. Andy had been waiting for Caldwell Parish, Louisiana since June 1971 and was able to get it through the kind cooperation of Larry, WB5CIC/M5.

Andy became interested in wireless about 1921 and in 1922 entered the military service. He was sent to Santo Domingo and was soon assigned to the Naval radio station NJG, which used the call letters HIA when handling traffic with ships and the U.S. This was a fine spot to learn about wireless and operating procedures. The equipment included a 5 kw spark transmitter and a Navy model 1420 receiver—a detector and 2 audio stages.

On returning to the Good Ole USA in 1924, an amateur license was obtained and the call 3RP. Other calls included 9AKZ, Brookston, Indiana in 1929; in 1932 W6MQS in California. In 1941 a transfer back to the east coast included the call, W3JZY which he has proudly held for thirty years.

Andy has operated his amateur station in many emergencies, including floods in California, hurricanes in the east, and heavy snow storms and drifts on highways, etc. He was elected ARRL Sections Communications Manager for the Maryland-Delaware-District of Columbia Section, for three years, and proudly held ARRL appointments of ORS, OPS for over thirty-five years.

For the past eight years, W3JZY has been very active as NØSRN with the Navy Mars program and enjoyably handling the traffic which keeps him very busy from 6 to 10 P.M. most evenings.

Andy is a member of the Old Old Timers Club #784, QCWA #848, Professional Loafers Club #143, A-1 Operators Club, Code speed 30 w.p.m., and has been a member of the Masonic Lodge #66 F. & A. M., Brookston, Indiana since 1926. Andy is now retired from the U.S. Coast Guard Service.

He also enjoys working the v.h.f. bands and needs only Utah, Nevada, Idaho and Montana to complete the continental U.S. on 6 meters. Contests are also enjoyed—see page 24, October 1966 *CQ* for (Maryland) results of *CQ* Twelve Hour VHF Contest. As I was unable to get a photograph from Andy, you will have to check that October 1966 issue of *CQ* for his foto at the bottom of page 24.

Andy waited until he had them all and on September 18, 1971 he was issued: USA-CA-500 endorsed All 14 MHz, All 7 MHz, All 3.9, and All S.S.B. USA-CA-1000 and 1500 endorsed All 14 MHz S.S.B.; USA-CA-2000 All S.S.B. and Mixed 2500, 3000 and All Counties #64.

Andy wants to say *Thanks* to all stations, especially the Mobiles, who took the time to verify and sign the cards to make All Counties possible.

Awards

Six Meter Key Club Award: In order to encourage six meter c.w. activity, this certificate is offered free for having 10 c.w. QSOs on 6 meters after January 1, 1971. Send log data to: D. E. McCormack, K1PLX, 113 Shore Drive, RR 2, Salem, New Hampshire 03079. He writes, "Because 95% of the 6 meter population can not use the c.w. portion, I suggest the use of 50.150 to 50.175 MHz as a *pseudo sub-band*".

50 MC Quarter Century DX Award: Sponsored by the Greater Pittsburgh VHF Society, this award represents a real challenge to 6 meter operators anywhere. Requirements are a certified list of confirmed two-way QSOs (no cross-band) with stations in at least twenty-five recognized countries. Data should include date, time, mode and reports exchanged There is no fee and

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

Six Meter Key Club Award.

no QSLs are required with the application but must be available upon request by the custodian. Send to: Edward C. Lips, W3BWU, 3302 Hazelhurst Ave., Pittsburgh, Pa. 15227.

Fort George RAC Award: Starting January 1, 1971, the Fort George Radio Amateur Club will issue an attractive certificate to any amateur radio station making five (or more) contacts with any amateur station in the city of Prince George. These contacts are to be five *different* stations on any mode on any band. Send log data showing date, time, mode and call of station worked to: Fort George Radio Amateur Club, C/O The Secretary Treasurer, Box 835, Prince George, B.C. Canada.

Four Awards Issued by The Radio Club Argentino:

R. C. A. 50th Anniversary Award: For period 21 October 1970 to 31 December 1971, for QSOs with different LU Provinces (Territories). For stations in LU, CE, CP, CX, PY and ZP QSOs with 100 different stations in 15 Provinces. DX stations need 50 QSOs in 10 Provinces. Note, calls with letter A, B and C after the digit in call are the Federal Capital and count as one unit (Province). Calls with D and E following the digit are in the Province of Buenos Aires. LU1GA to 9GOZ are in Chaco Province. LU1GP to 9GZZ in Formosa. LU1XA to 9XOZ in Santa Cruz and LU1XP to 9XZL in Tierra del Fuego. All other Provinces have a different letter after the digit and are explained in all callbooks. Cost is 7 IRCs, no restrictions as to bands or modes. Also available to s.w.ls. QSLs do not have to be sent but a certified and detailed list should be sent to the Awards Manager.

LU 10 Double Call Award: Issued for contacts with 10 stations of double letters from 1 to Ø without repeating the letters and at least one must be an LU. Example: PY1AA, CP2FF, HI3-JJ, LU4BB, etc. Starting date 1/1/65 and cost is 7 IRCs. Send certified, detailed list to Awards Manager.

Radio Club Argentino Award: Issued for QSOs with stations whose call letters (only two letters) following the digit to form those three words Radio Club Argentino. Using different prefixes, one must be LU: example—CT1*RA*—OK3*DI*—PY2*OC*—W2*LU*—LU3*BA*, etc. Starting date 1/1/65 and cost is 7 IRCs. Send certified, detailed list to Awards Manager.

C.E.M.A.R.A. Award: The Servicio de Radioaficionados de la Armada (SARA) and the Radio Club Argentino will issue this Certificado Mobiles Armada Argentina to any amateur for QSOs with 25 Maritime Mobile Stations. Starting date is 1/1/60. Ten QSOs to be with LU stations and 5 of these must be with the Argentine Navy, the other 15 can be with any nation. Separate Award for c.w.—a.m. or s.s.b., no mixed mode but mixed band is ok. Cost is 7 IRCs and send certified, detailed list to Awards Manager, C. L. Hardy, LU1DJU, P. O. Box 97, Correo Central, Buenos Aires, BA, Argentina, South America.

Ten New Awards issued by German B. Rey, LU9ACZ, Sanabria 1513, Buenos Aires, Argentina. Cost of each AWARD $1.00 U.S. or 10 IRCs, (Argentina cost is 5 IRCs). There is no time limit (starting date), any band or mode and no special endorsement unless specified. Send certified list by Amateur Radio Club or 2 licensed amateurs. You must have the QSLs on hand.

Worked Argentine Award: For contacts with different Argentine stations. Argentine need 300 QSOs, including 26 countries, 5 Antarctic bases. DX Class 1 need 200 QSOs including 22 counties, 2 Antarctic Bases. DX Class 2 need 100 QSOs including 17 counties, 1 Antarctic base.

Argentine CW Award: For c.w. contacts (only) with different Argentine stations. Argentine stations need 100 QSOs. DX Class 1 need 100 QSOs. DX Class 2 need 50 QSOs. DX Class 3 need 25 QSOs.

Argentine CW 579 Award: For c.w. Contacts only, with different Argentine stations but with minimum 579 report for DX only: DX Class 1 need 30 QSOs. DX Class 2 need 20 QSOs. DX Class 3 need 10 QSOs.

Buenos Aires City Award: For contacts with different Buenos Aires Stations. Argentine stations need 300 QSOs. DX Class 1 need 200 QSOs. DX Class 2 need 100 QSOs.

Buenos Aires County Award: For contacts with Buenos Aires County only (Buenos Aires City does NOT count). Argentine stations need 100 QSOs. DX Class 1 need 50 QSOs. DX Class 2 need 25 QSOs. DX Class 3 need 15 QSOs.

Buenos Aires County Cities Award: For contacts

50 MC Quarter Century DX Award.

with different cities of Buenos Aires County only. Argentine stations need 50 QSOs. DX Class 1 need 25 QSOs. DX Class 2 need 18 QSOs. DX Class 3 need 12 QSOs.

Argentine Capitals Award: For contacts with Argentine Capitals only. Argentine stations need 22 Capitals. DX Class 1—20 Capitals. DX Class 2—15 Capitals. DX Class 3—10 Capitals. Which are: Catamarca City, Corrientes City, Cordoba City, Formosa City, La Plata City, Mendoza City, Neuquen City, Posadas, Parana, Resistencia, La Rioja, Rawson, Rio Gallegos, San Salvador de Jujuy, Salta City, San Miguel de Tucuman, Santa Fe, Santiago del Estero City, San Luis City, Santa Rosa de Toay, Ushuaia, Viedma.

Argentine ITU Zones Award: Needed DX Class 1—ITU 14, 18 Counties, 40 QSOs. And ITU 16, 3 Counties, 5 QSOs. And ITU 73, 1 County, 2 QSOs. DX Class 2—ITU 14, 15 Counties, 35 QSOs. And ITU 16, 2 Counties, 3 QSOs. DX Class 3—ITU 14, 12 Counties, 25 QSOs. And ITU 16, 2 Counties, 2 QSOs. And ITU 73, 1 County, 1 QSO. NOTE—*ITU 14:* D, E, Buenos Aires. F, Santa Fe. G, Formosa. G, Chaco. H, Cordoba. I, Misiones. J, Entre Rios. K, Tucuman. L, Corrientes. M, Mendoza. N, Santiago del Ester. O, Salta. P, San Juan. Q, San Luia. R, Catamarca. S, La Rioja. T, Jujuy. U, La Pampa. Y, Neuquen. *ITU 16:* V, Rio Negro. W, Chubut. X, Santa Cruz. X, Tierra del Fuego. *ITU 73:* Z, Antarctica. These are the first letters after the digit.

Argentine Large Cities Award: Needed: Argentine—40 Cities. DX Class 1—30 Cities. DX Class 2—20 Cities. DX Class 3—10 Cities. Large cities are: Buenos Aires City, Avellaneda, La Plata, San Nicolas, Pergamino, Junin, Adreque, Lomas de Zamera, Vincent Lopez, Quilmes, San Vicente, Chasomus, San Pedre, San Fernande, San Isidro, Moron, Lujan, Mercedes, Chivilcoy, Bolivar, Mar del Plate, Necochea, Balcare, Tres Arroyes, Bahis Blanca, Olavarria, Tandil, Azul, Neuquen, Viedma, Rawson, Trelex, Comodere Rivadavia, Rio Gallegos, Ushuaia, Rio Cuarte, Salta City, San Salvador de Jujuy, Catamarca City, San Miguel de Tucuman, San Luis City, Villa Maria, Mendeza City, Santa Rosa, Cordoba City, Gral Pico, Santa Fe, Resistencia, Santiago del Estero City, Gualeguaychu, Formosa, Parana, Concordia, Corrientes, Pesadas.

LU 300 Award: Needed—DX Class 1, 300 points. DX Class 2, 200 points. Argentine, 400 points. LU1 counts for 1 point, LU2—2 points, LU3—3 points. LU4—4 points, LU5—5 points, LU6—6 points, LU7—7 points, LU8—8 points, LU9—9 points and LUØ—10 points.

Italian Prefixes Certificates: This new IPXC is sponsored by the TRIESTE DX CLUB, P. O. Box 1342, 34100 Trieste, Italy and is sent in a FLAG form— European Stations need 10 Pre-

Active County Hunters: L-R: Ray, K5RPC; Ben, K5YWX; Larry, W4GGU.

fixes on at least 3 bands (30 QSOs)—Others need 10 prefixes on at least 2 bands (20 QSOs). All modes are valid (ssb-am-cw-RTTY). QSOs since April 24, 1971 are valid. Another flag issued for each six new prefixes worked. Send certified, detailed list (certified by 2 other amateurs) and 20 IRCs or 2 U.S. dollars to Trieste DX Club.

10 DXpeditions Contacts Award: Also sponsored by the Trieste DX Club, P, O. Box 1342, 34100 Trieste, Italy. Issued in three classes, ck-ssb-RTTY for 10 QSOs with different DXpeditions —QSOs on any amateur band are valid. Send certified list and 5 IRCs to Trieste DX Club.

Notes

As the USA—CA Applications were a bit slow this month I took advantage of the space to *try* to catch-up on some awards data and to use the photograph of three active County Hunters.

Per the October MARAC Newsletter, in that photograph I have in January *CQ* of the group at KC July 71, the county hunter in the second row between WB4GGA and W1AQE is K3VLP, apparently still unidentified is the last person in row 2.

I had the pleasure of meeting that great guy, Jerry Hagen, WA6GLD at the November meeting of the NJDXA at the home of Leo, W2OEH. Jerry was on his way back from a fine time at WA6GLD/9Y5, and he had some fine photographs of many outstanding layouts of West Coast DXers.

Sorry I ran out of space, How was your month? 73, Ed., W2GT.

Q AND A

BY WILFRED M. SCHERER,*
W2AEF

Equipment Recommendations

An increasing number of letters have been received asking for our opinion on which pieces of gear we think better or would recommend over others. This we cannot do without violating certain ethics in respect to our advertisers. Furthermore, what we might recommend as our *personal* preference may not necessarily be that of others.

Judgment in such cases must be ascertained from the *CQ* equipment reviews (and those in *QST*) wherein to the best of our ability we attempt to present an honest and objective report on performance and other details. The reader thus must judge for himself according to the facts or observations given therein and by "reading between the lines."

Performance, of course, is of prime concern, but there are other factors to be considered such as appearance, available facilities, service and maintenance situations, availability of replacement parts, price, resale value, handling capabilities and just how the equipment "feels." The latter two must be judged by personal handling and observations as might be performance, inasmuch as the "proof of the pudding is in the eating." Comments from other users of the same type gear involved also are sometimes helpful, particularly in respect to inherent difficulties that might crop up.

It also might be noted that most of the available receiving and transmitting gear will perform satisfactorily for the job at hand and getting you on the air; as a matter of fact, we've lined up several receivers (including low-price ones along with the more sophisticated jobs) at one time on the same specific signals with little significant difference between signal readability. Similarly, we have switched back and forth between various s.s.b. transmitters with little significant change in signal quality detected by the listener.

*Technical Director, *CQ*.

Neutralization of TR-4 and Others

QUESTION: I had to replace the load capacitor in the p.a. of my Drake TR-4 and subsequently also had to re-neutralize this stage. This was done on the 10-meter band following the instructions in the manual—loading up and adjusting the neutralizing capacitor concurrently with the plate load control to achieve maximum output with maximum plate-current dip. I now find that on the 80-meter band that maximum output does not occur at plate-current dip. Re-doing the neutralizing job made no improvement. Any suggestions.

ANSWER: We have not seen many rigs wherein the neutralization holds *perfectly* on *all* bands. The chances of the maintainance of neutralization with the TR-4 however, should be greater than in other cases where capacitance-bridge neutralization is engaged, inasmuch as in this unit the appropriate optimized fixed capacitance in one leg of the bridge circuit (this is at the bypass at the bottom of the p.a. grid-input or driver-output circuit) is switched in or out on each band to compensate for strays in each case and thus equalize neutralization over the range of the transmitter.

It is therefore suggested that you check the related 80-meter bypass, C_{153}, or slightly alter the value here, until the desired overall result is accomplished.

When a final check of the neutralization is made, do this at *full* loading for coincidence of maximum r.f. output and plate resonance, indicated by plate-current dip which at full loading will be quite broad.

If the loading is too light, the screen current will be high and maximum output may not coincide exactly with plate-resonance dip, especially when the meter is in the cathode circuit of the p.a. tubes. As we've stated on other occasions, always load up to where the output starts to drop off at the point of resonance, which should be that where the output peaks when the plate circuit is tuned.

Manual Appeals

F. S. McCullough, W4WWH, Rte. A2 Box 236, Dunnellon, Fla. 32630 is in quest of a manual for a Browning Labs Oscilloscope

[*Continued on page 87*]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

THERE is a great deal of interest among readers of this column in space communications, both of the amateur and weather satellite variety, and fortunately there are a few really good pieces of surplus equipment coming on the market for space work these days.

The work of the AMSAT group in putting together stations for orbital launch is amply covered elsewhere in *CQ*, and the use of surplus parts for building ground-station transmitters is a bit outside our realm, but I have run across some receiving equipment that should be of interest to readers who want to communicate with either the AMSAT birds, or receive the ESSA weather satellite photos.

Reader John Hutchings reports that perhaps the best of this current crop of high-performance receivers now available is the DEI (Defense Electronics; successor to Nems-Clark) model G-175-H, a continuous-tuning receiver that covers from 30 MHz to 260 MHz in two bands. A higher coverage version is the G-166D receiver, which can receive from 260—1,000 MHz.

Both receivers were built by Ling-Temco-Vought Company, in Texas, using Nems-Clark components. They reportedly went into surveillance aircraft such as the U-2, and are probably being phased out for miniaturized versions in the YF-12-A spy plane. Production dates on the G-175-H and G-166-D range between 1966 and 1969.

Specs on the units are excellent, with sensitivity (properly aligned) of better than one microvolt. According to Defense Electronics technicians, sensitivity is *better* than on the later, all solid-state receivers—and they are more reliable. DEI incidentally builds a good receiver, perhaps too good, as the company has spent more on engineering than its sales have brought in, and it is now undergoing debt consolidation under the bankruptcy laws in an attempt to head off its collapse.

The G-175-H bands are 30-60 MHz and 60-260 MHz. Tuning is via a Mallory Inductuner, rather than the more familiar variable capacitor route. The r.f. amplifier tube is a 416B/6280 grounded grid low noise triode, blower-cooled. Linearity is excellent, John reports.

To protect the front end tubes, the sets have sixty second time delays in the B + circuit. The receivers have filament transformers usable on

*1502 Stonewall Road, Alexandria, Va. 22303.

Connections for G-175-H and G-166-D Receivers

J-101—Type N to Low band Antenna
J-102—Type N to High band Antenna
J-103—BNC to panadapter
J-105—BNC to panadapter
J-107—power to panadapter
J-108—audio output: pin 1 common
pin 2 150 ohm audio
pin 3 600 ohm audio
J-106—power pin 17—B + input, 240 volts d.c. (pin 16 on G-166-D receiver)
pin 11—a.c. input, 117 v.a.c.
pin 12—a.c. input, 117 v.a.c.
pin 18—ground
pin 7—ground

Table 1—hookup data for rear-panel terminals on G-175-H and G-166-D receivers.

power frequencies from the standard 60 Hz line up to 400 Hz aircraft a.c. power supplies.

To "convert" the sets, it is merely necessary to supply 240 volts d.c. to the B + line at 160 milliamperes, and plug in to the a.c. line.

The receiver has a very attractive, edge-lit plexiglass front panel, using 24 volt bulbs. The conversion could include replacement with six volt bulbs and the addition of a jumper to the filament transformer, which can easily handle the load. (24 volts is the common aircraft low-voltage buss supply).

The plugs on the rear of the receivers are unusual, and probably not to be found in your local surplus store. The hookup data is given in Table 1. Fig. 1 shows the layout of the G-175-H receiver, top view.

Additional specs are in Table 2.

The receiver is quite similar to the Nems-Clark 1302-A, with the addition of the 40 kHz nuvistor i.f. strip.

In addition to the G-175-H and G-166-D receivers, there is also available the G-186 spectrum display unit, a panadapter designed for use

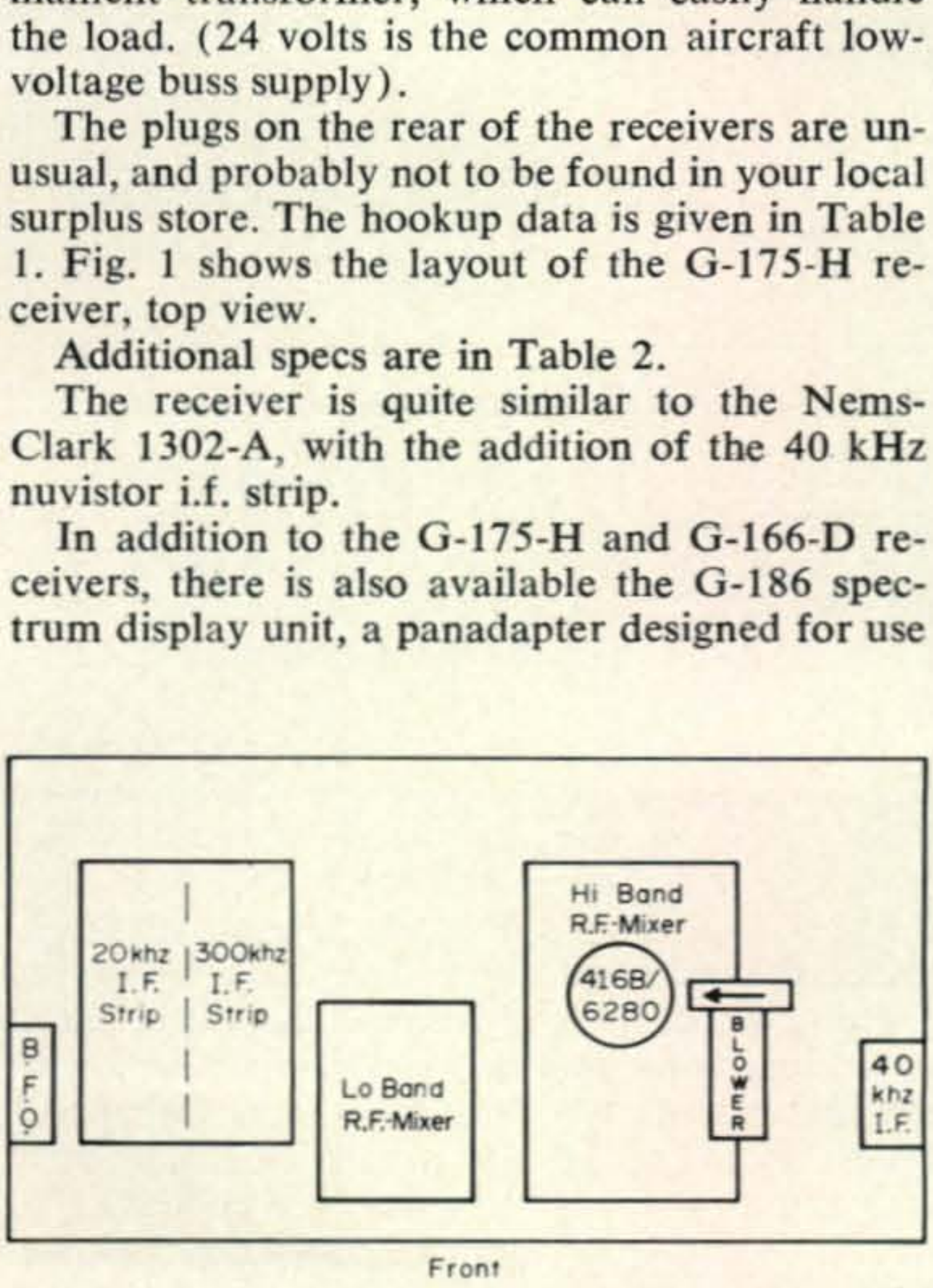


Fig. 1—Layout of G-175-H surveillance receiver, showing location of modules in chassis.

Antenna Impedance	50 ohms
I.F.	21.4 MHz; dual conversion
Bandwidths	300 kHz, 40 kHz, 20 kHz
Audio	600 ohms

Table 2—specifications of G-175-H receiver.

with the 21.4 MHz output of the receivers.

Among other dealers who have these late-model units in surplus, they are available from Ed Wubbin, at AN/COM Electronics, 5667 Lankershim Boulevard, North Hollywood, California.

A slightly older piece of Nems-Clark surveillance equipment is the 1302 mentioned above. With an accompanying "range extender" the 1302 will cover up to 475 MHz. This unit uses the Inductuner and a 417A triode in the r.f. stage for good sensitivity.

Going back to the November column, I want to correct myself—the 131B2 unit mentioned was not the device used with the two-headed Model 14 TD for crypto work using a plain text tape and a "key" tape to generate a code RTTY signal. There was another, similar-appearing cabinet, filled with relays, used to mix the tapes from the two-headed T.D. but it had different nomenclature. I have misplaced my sources in the recent house-moving episode, but there was enough similarity between the sets to lead to some confusion when the column was put together.

The 131B2 used a standard transmitter-distributor and a special one, variously called "receiving" or "multiplex." If you have seen a strange-looking #14 TD with an odd number of segments in the distributor disc, and other apparently non-standard wiring, that was probably what it was. There have been a lot around, and they are useful chiefly for parts, as they do not generate standard 7.42 code, 5-level Baudot signals.

The "key" tape was put in one transmitter and the plain text in the other. A mark and a space read at the same time on the two tapes produced a transmitter mark, while a space-space or mark-mark added up to a space—or the other way round on the competing Telekryption machine, according to KØNL, who filled me in on all this.

The 131B2 pre-dated the use of the two-headed TD by some years, and in fact the two-headed TD was used for diplex work before it was used for crypto. Andy notes that the diplex TD was bought with "standard" wiring and rebuilt by the using agency, either installing fully-insulated contacts or through a polar relay setup.

There was a question about the Viginere'

Square in the column, showing how the letters are transposed in substitution work, which is supposed to require 32 characters for teleprinter work. That one had 26, leaving the method of generating functions up in the air. The reason for the discrepancy was that the square was shown for illustration of the method, not as an actual example of the entire system.

Anyone else who has observations to offer on my foray into crypto is hereby invited to write, especially if he can correct any misconceptions on my part without violating security! ■

WPX Rules

[*from page 67*]

V. WPNX:

The WPNX Award can be earned by USA Novices who work 100 different prefixes prior to receiving a higher class license. The application may be submitted after receiving the higher license providing the actual contacts were made as a Novice. Prefixes worked for the WPNX Award may later be used for credit toward the WPX Award. The rules for the WPNX Award are the same as for WPX except that only 100 prefixes must be confirmed, and applications are sent to the WPX Manager.

VI. WPX Honor Roll:

The WPX Honor Roll recognizes those operators and stations that maintain a high standing in confirmed, current prefixes. The rules, therefore, reflect the belief that Honor Roll membership should be accessible to all active radio amateurs and not to be unduly advantageous to the "old timers." With the exceptions listed below, all general rules for WPX apply toward Honor Roll credit.

A. Only current prefixes may be counted toward WPX HR standings; those prefixes to be listed and updated annually in *CQ* or available from the WPX Award Manager.

B. Special Issue prefixes, *i.e.*, 3C, 4A, OF, etc. will be considered current during their existence and for five years after the date of last issuance after which time they will be deducted as credit for Honor Roll standings.

C. Honor Roll applicants must submit their list of current prefixes (entire call required) separate from their regular WPX applications. Forms are available for this purpose and there use is highly recommended. WPX HR applications may be obtained by sending a self-addressed stamped envelope (or 1 IRC) to the WPX Manager. A separate application must be made for each mode.

D. A filing charge of $1.00 is required for each original WPX application.

E. Endorsements for the Honor Roll may be made for 10 prefixes or more. An s.a.s.e. or IRC should be included.

Caribbean Trip

[*from page 56*]

hospitable VP2A amateur, if this is possible.

Don't rely on the telephone; I think they should give an award: "Worked one VP2A on the land line."

Martinique

Here we landed in Fort-de-France and we went to see Emil, FM7WF, who is a physics and chemistry teacher. In the city, the French influence showed up mostly in the helpful manner in which the local people try to accommodate a visitor.

FM7WF has a nice 2-element cubical quad but the station was not active.

Emil took us to see Brother Vincent, FM7-WG, a priest and the principal of a grammar school. Brother Vincent does not speak English and my high school French dried out before the graduation ceremony was over. I really don't know how, but we understood each other perfectly. Brother Vincent is quite active. He is so polite that it is almost embarrassing. He kept thanking me for visiting him, even when I was supposed to thank him for his hospitality. Later he wrote me a letter, telling me again how happy he was because we visited him.

After dinner, a local song and dance group came on the ship and gave a beautiful show. I strongly recommend seeing such a folk show; the music, the dances and the costumes are just wonderful.

Beware: many of the "typical local" woodcarvings are made in Haiti.

St. Vincent

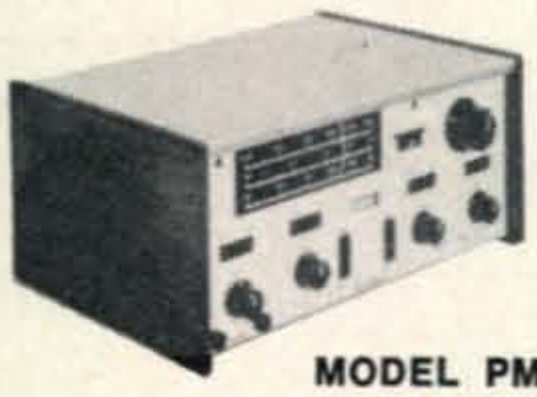
Long before we left for the cruise, Vincent, VP2SAZ, the secretary of the St. Vincent Amateur Radio Club, answered my letter giving valuable information and promising to wait for us at the pier. When we arrived in the morning at Kingstown, we took the first launch for the shore. A steel band with teenage musicians was playing on the docks. Vincent, VP2SAZ, and Cyprian, VP2SF, were waiting for us in front of the Tourist Information Office.

First we drove through the city, then we went to see VP2SF's station consisting of an Eico transceiver and an inverted V.

We had to visit the Botanical Garden, founded in 1765, to admire the beautiful tropical trees, some of them extremely rare specimens. Later we drove up to Fort Charlotte where the St. Vincent Amateur Radio

Everything you always wanted in keyers and QRP equipment.

■ POWER-MITES



MODEL PM2B

MODEL PM2B. Popular two watt CW transceiver. Operates on 80-40-20 meters. Side-tone. Lantern battery or 12 VDC power source. Size 10⅜″ W × 4½″ H × 6⅝″ D. Weight 2¾ lbs. **Price $64.95.**

MODEL PM3A. Advanced 5 watt CW transceiver. Operates on 40-20 meters. Side-tone. Push pull final. Pi Network. Break-in keying. Size 10⅜″ W × 4½″ H × 6⅝″ D. Weight 3 lbs. **Price $79.95.**

■ ANTENNA TUNER

MODEL AC5. Matches 52 ohm output of Power-Mites to open wire on random length antennas. Maximum power 10 watts. Size 4″ W × 2″ H × 4″ D. Weight 1 lb. 4 oz. **Price $8.95.**

■ SWR BRIDGE

AC4

MODEL AC4. Favorite for QRP. Measures from ¼ watt to 200 watts. Size 2″ W × 2″ H × 4″ D. Weight 1 lb. 2 oz. **Price $14.95.**

■ SIGNALIZER

S20

MODEL S20. Complete audio and speaker system for receivers/transceivers. Plugs into headphone jack. Provides maximum AGC to keep all signals constant level. Front panel headphone jack. Size 8¼″ W × 4½″ H × 6½″ D. Weight 3½ lbs. **Price $39.95.**

MODEL S30. Similar to S20 but has built in FR4 CW filter; switchable. Size 8¼″ W × 4½″ H × 6½″ D. Weight 4 lbs. **Price $49.95.**

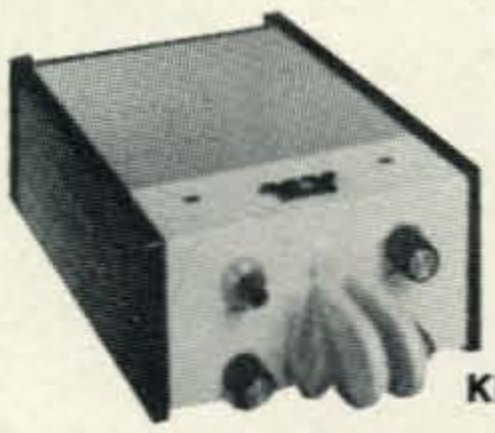
Argonaut

The Argonaut is for every ham.
A transceiver that operates
on an AC pack or lantern battery.
Covers Amateur bands 80-10, SSB and CW.

Completely solid state. Permeability tuning. Less than 100 Hz drift. ½ uv sensitivity. 9 MHz crystal filter. 2.5 kHz bandwidth, 1.7 shape factor. Amateur bands 3-30 MHz. AGC. Speaker, SWR bridge, S-meter built-in. Instant CW break-in. Side-tone. Plug-in circuit boards. Selects normal side band, reversible. One control tune-up. 50-75 ohm push-pull output. Direct frequency read out.

Argonaut price	**$288.00**
Power supply	**$24.95**
Microphone	**$17.00**

■ KEYERS AND KEYER PADDLES



KR40

MODEL KR40. Squeeze keyer. Iambic sequence. Full memories. Variable weighting. With dual paddles. Speeds from 6-60 wpm. 115 volt AC operation. Side tone. Size 4¾″ W × 2½″ H × 8″ D. Weight 4 lbs. **Price $89.95.**

MODEL KR20. Keyer. Self-completing. On/off weighting. With dual paddles. Speed 6-60 wpm. Monitor side tone. 115 V AC operation. Size 4¾″ W × 2½″ H × 8″ D. Weight 4 lbs. **Price $59.95.**

KR5

MODEL KR5. Keyer. Self-completing. Optimum weighting. Single paddle. Speed 6-60 wpm. Operates from 6 or 12 volts DC. Size 4″ W × 2″ H × 6″ D. Weight 1 lb. 6 oz. **Price $34.95.**

MODEL KR1. Paddles as used in KR40 and KR20. Mounted in formed aluminum case. Size 4¼″ W × 2″ H × 6″ D. Weight 1 lb. **Price $18.95.**

MODEL KR2. Paddle as used in KR5. Mounted in formed aluminum case. Size 4¼″ W × 2″ H × 6″ D. Weight 1½ lbs. **Price $12.95.**

k your TEN-TEC dealer to show you our com-ete line. If there is no dealer in your area, send ur order direct. Include $2.00 shipping for each gonaut, all other items shipped postpaid.

Dept. H-2

TEN-TEC, INC.

Highway 411 East ☐ Sevierville, Tennessee 37862

Club is located. The location of this club is picturesque; high up on the top of the mountain with a wonderful view of Kingstown and some of the Grenadines islands. For antenna, the position is ideal; but we found the club to be an empty building.

I recommend a few QSOs with the call of one of the local boys; it is a thrill to be a DX for a change, and you have to visit the oldest Botanical Garden in the Western Hemisphere and the radio club, up in Fort Charlotte.

I don't recommend to spend a long time on one island; it is more interesting to put a little effort and visit many islands.

Bequia

Bequia is one of the Grenadines; it has beaches, rich tropical vegetation, and lots of yachts in the harbour of Port Elisabeth. One big shortcoming: it has no radio amateurs. We arrived there in the afternoon but after two hours of strolling around, I got bored and returned to our ship where, by the way, we had the best meals I ever had.

[*Continued next month*]

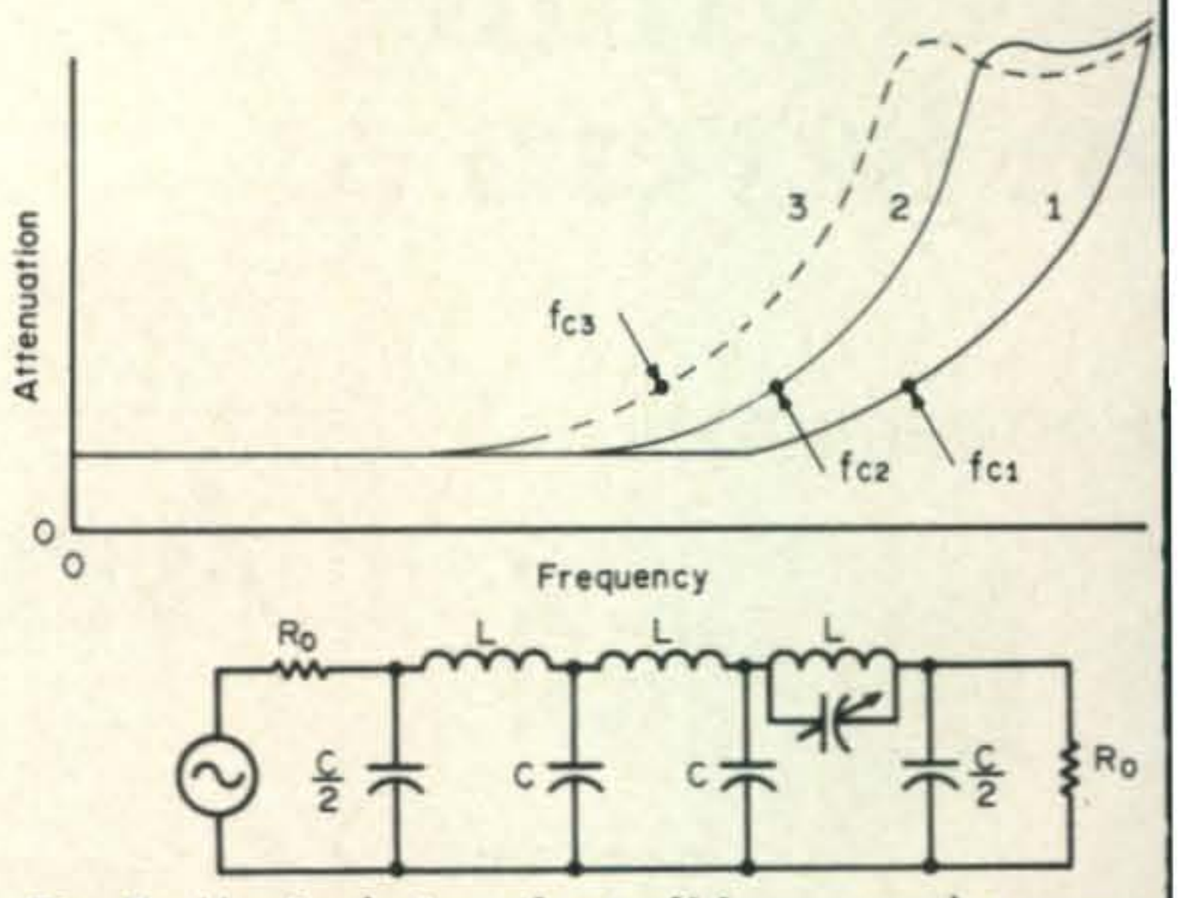


Fig. 7—Manipulation of cut-off frequency by means of "m" section resonance. Curve 1 is response of three-section filter with no "m" section. The cut-off frequency, fc_1 has deliberately been made higher than desired. Curve 2 is the response when output section of filter is modified to behave as an "m" section. Here the resonant frequency of the "m" section is relatively far from fc_1. Note that the cut-off frequency of the filter has now been moved to new position fc_2. Curve 3 is the response with "m" resonance closer to fc_1. New cut-off frequency of filter, fc_3, is now even lower than for previous situations.

HW-17 on 2M. [*from page 16*]

action of the squelch circuitry and will be greatly appreciated by repeater users is to simply remove C_{209}, a 10 mf electrolytic capacitor located on the receiver P/C board.

When operating on f.m., the procedure is to tune the transmitter up on a.m. in the normal manner, then flip the switch to f.m. and talk! Receiving consists of simply tuning to maximum signal as shown on the front panel meter.

A converted HW-17 is now being used in the mobile and results have been extremely satisfying. I have not yet heard ignition noise on f.m. even when a.m. reception was impossible. Apparently the only QRM that can block the receiver is the audible noise of a large tractor-trailer, without a muffler, passing within 3-4 feet of my ears. ■

Filter Design [*from page 32*]

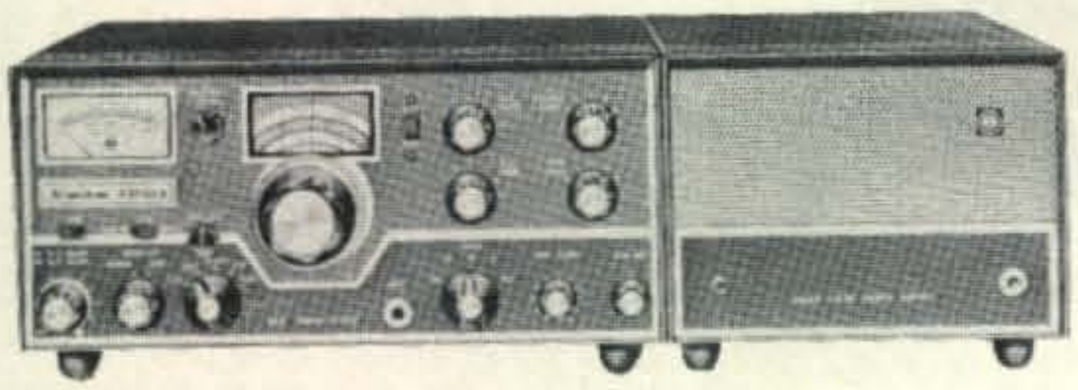
where the cutoff frequency can be readily moved to its desired position by appropriately resonating the "m section," that is, the inductor closest to the load. This is very easy to do in practice. All we need is a small collection of capacitors. One of these will turn out to be slightly too small, whereupon the addition of a smaller capacitor in parallel will usually suffice to position the cutoff frequency. For some unknown reason, nature appears to be on our side!

Although our "m-section" involves departure from rigorous design, undesirable side-effects from this technique will be negligible. This is because we are dealing with an m value of about 0.9. Such an m section employs element values quite close to those that we used in our design when we established the cutoff frequency at about 10% too high. And perhaps we have more luck than brains, but there is the possibility of another advantage from our efforts. It happens that when the m-section resonance corresponds to m in the vicinity of 0.9, the filter tends to provide greater attenuation to second and third harmonic energy. More often than not, isn't this just what the doctor ordered? In a three section filter, the effect on harmonic attenuation beyond the third will not be appreciable.

Not only is the above-described method of positioning the cutoff frequency easy to implement from the hardware standpoint, but we have avoided the rather awkward computations involved in the design of a composite filter in which the m section is designed by rigorous equations. One need not have an in-depth understanding of image-parameter filters to be successful with this method. Give it a try! ■

MORE GREAT BUYS FROM ARROW

NEW YORK'S FULL LINE **SWAN** DISTRIBUTOR



SWAN CYGNET 270B

260 Watts – 5 Bands – SSB Transceiver with Built-In AC Power Supply and Loudspeaker

$429.

Power input: 260 watts P.E.P. SSB, and 180 watts CW ● Frequency range: 3.5-4.0 mc, 7.0-7.3 mc, 14.0-14.35 mc, 21.0-21.45 mc, 28.0-29.7 mc● 5.5 mc Crystal Lattice Filter, same as used in the Swan 500CX. 2.7 kc with 1.7 to 1 shape factor. Ultimate rejection exceeds 100 db ● Pi antenna coupler for 50 to 75 ohm coaxial cable ● Grid block CW keying with offset transmit frequency ● Solid state VFO circuit temperature and voltage stabilized ● For 12-14 volt DC operation, a plug-in converter is available. This unit plugs into the back of the 270B in place of the AC power connector ●

Model 14A 12V DC Converter. **$39**

$259.

SWAN 500CX

550 Watts – 5 Bands. SSB – CW – AM Transceiver

Frequency range: 3.5-4.0 mc, 7.0-7.45 mc, 14.0-14.45 mc. 21.0-21.45 mc, 28.0-29.7 mc. Extended frequency coverage for MARS operation with plug-in crystal oscillator accessory, Model 510X ● 5.5 mc quartz crystal filter. Finest in the industry ● 2700 cycle bandwidth, 1.7 to 1 shape factor at 6 and 60 db, more than 100 db ultimate rejection ● Selectable upper and lower sideband ● Solid state VFO, highest stability, temperature and voltage compensated ● 13 vacuum tubes, 7 transistors, 11 diodes.

Price, less power supply. . . . . **$489.**

Model 117XC AC Power Supply. **$99**

SWAN FM–2X

10 WATTS – 2 CHANNELS

● Frequency coverage 144-148 mc ● Number of channels: 12 ● Crystals installed for 3 channels as follows: Channel 1: transmit and receive 146.94 mc; Channel 2: transmit 146.34, receive 146.94 mc; Channel 3: transmit 146.34, receive 146.76 mc. Modulation: frequency modulation (phase type) ● Transmitter control: push to talk on microphone ● Power source: AC 117 volts, 50-60 Hz, DC 13.5 volts + 10% ● Dimensions: 8¼" x 7" x 3". Weight: 8¼ lbs. ● Furnished with unit: dynamic microphone, antenna connector plug, spare fuses and lamps, AC power supply, DC power cord with fuse holder.

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NEW YORK CITY, N.Y. 10007, 97 Chambers Street, 212-349-4411, Between Broadway and Church Street
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NANUET, N.Y. 10954 195 West Route 59, Half Mile East of Thruway Exit 14
FARMINGDALE, L.I., N.Y. 11735 900 Route 110, One Mile South of Republic Aviation
MINEOLA, N.Y. 11501 525 Jericho Turnpike, One Half Block East of Herricks Road
TOTOWA, N.J. 07511 225 Route 46, 201-256-8555
NORWALK, CONN. 06850 18 Isaac Street, Shopping Pl., 203-838-4877

WPX Contest Results [*from page 38*]

CE3OE	**14**	**115,950**	**282**	**150**
Curacao (N.W.I.)				
PJ9JR	**14**	**2,385,192**	**2335**	**348**
(Opr. W3ZKH)				
Ecuador				
HC1RF	**21**	**503,312**	**1021**	**166**
HC1NLG	**3.8**	**41,454**	**152**	**47**
Guyana				
WA4OVP/8R1				
	A	**546,084**	**846**	**197**
WA2HYX/8R1				
	21	**19,527**	**99**	**69**
Paraguay				
ZP5TU	**A**	**201,025**	**389**	**187**
Peru				
OA8V	**7**	**126,046**	**226**	**107**
Saba (N.W.I.)				
PJ6AA	**A**	**21,744**	**102**	**72**
(Opr. KV4AM)				
Uruguay				
CX1BBR	**A**	**25,830**	**127**	**82**
Venezuela				
4M5BPG	**A**	**696,720**	**915**	**240**
YV1YC	**"**	**246,233**	**510**	**169**

MULTI-OPERATOR
Single Transmitter

United States			
W6HX	**1,606,176**	**1857**	**264**
W2PV	**1,477,476**	**1461**	**369**
DJ6RX/W6	1,132,166	1515	238
W4FDA	**1,035,538**	**1107**	**323**
W7EXM	**943,040**	**1234**	**280**
K4PUZ	585,855	833	277
K4ZA	228,921	385	231
WA1LKX	**209,032**	**416**	**212**
WB6JOD	126,269	351	143
WA1LMJ	51,546	187	121
W0YKE	**24,552**	**112**	**88**
North America			
VE1ACU	**1,580,985**	**1844**	**315**
VP5JA	**1,122,816**	**2218**	**204**
FG7TI/FS7	**870,058**	**1758**	**203**
VE6GS/6	193,936	562	136
Asia			
EP2FB	**846,963**	**1204**	**247**
JA3YBF	**686,147**	**1103**	**209**
JA9YBA	346,104	948	207
JA3ZDX	318,920	451	238
U.S.S.R.			
Club Stations			
UK9CAA	**357,296**	**538**	**274**
UK6QAD	**166,152**	**367**	**168**
UK9CAM	66,789	195	123
Europe			
G3WYX	**2,120,885**	**2248**	**335**
OG2A	**1,955,906**	**2602**	**314**
LA1K	**1,469,240**	**2067**	**280**
DL8RL	**1,236,060**	**1644**	**27**
SK5AL	**1,189,552**	**1525**	**30**
G5YC	1,096,305	1567	26
F0ZZ	**819,462**	**1369**	**21**
HA5KDQ	**790,625**	**1249**	**25**
IE1PUG	**493,520**	**1098**	**24**
G3FVA	463,980	855	22
HA9KOB	260,616	569	26
SP6PZB	**225,515**	**599**	**18**
EI9ONE	**170,232**	**585**	**17**
OK3KGI	**163,020**	**456**	**19**
G3ZBI	90,744	359	15
HA6KNB	81,216	365	14
G3ZEN	52,582	258	12
HA7KPO	24,984	206	9
HA3KSA	10,270	108	7
HA7KLF	6,596	91	3
U.S.R.R.			
Club Stations			
UK2FAA	**1,869,986**	**1805**	**37**
UK6LAZ	**1,145,952**	**1571**	**34**
UK2BBB	**843,600**	**1326**	**30**
UK3R	768,542	1356	29
UK5IAZ	**697,680**	**1265**	**28**
UK4FAD	503,004	789	33
UK5MAF	330,280	745	23
UK3YAB	273,792	400	24
UK5VAA	201,376	610	21
UK5VAC	119,682	395	18
UK3SAC	110,979	383	17
UK1NAD	**54,252**	**375**	**13**
UK2WAF	**41,796**	**162**	**8**

MULTI-OPERATOR
Multi-Transmitter

4X4NJ	**5,127,910**	**4468**	**394**
DK0WA	**2,503.656**	**2232**	**402**
DL0WW	**1,782,535**	**1935**	**335**
DFØAFZ	**1,604,556**	**1942**	**358**
WB6GFJ	**1,117,398**	**1544**	**258**
W3SS	**800,112**	**936**	**316**
WØMYN	**727,914**	**1086**	**246**

Our thanks to the following stations who submitted their logs for checking purposes.
DK4QD, DM2CXN, DM2CYO, K3-KMA, HC1HV, LU2FAO, OH5YX, OK1TA, OZ1TD, OZ8MG, PJ2HT, PY1KJ, PY2FCX/W2, PY9AI, SM7-BBV, SMØMC, SP9BLF, UA1OE, UA2WO, UA3IE, UA3OG, UA6LAT, UA6WS, UA9VX, UC2BF, UB5-WAD, UK5HAH, UK9OAD, UK0-AAB, UØ5OAB, UT5DF, UV3DN, UV3MM, UW3FW, UW4NH, UW-4NP, UY5YB, VE7BB, W1PCD, W3GNA, W5EDX, W6NYG, WB4-NRI.

STATION OPERATORS

Multi-Operator Single Transmitter

DJ6RX/W6: & W6UF. **DL8RL** & DJ4GO, DJ5FW, DJ6WO, DL3LU. **EI9ONE:** EI2CA, EI7CC, EI7CD, EI8CC. **EP2FB** & EP2YL. **FØZZ:** F2QQ, F5HN, F5ZK. **FG7TI/FS7:** PJ7JC, W9ZRX. **G3FVA** & G3FNM, G3RVQ, G3WFT, G3ZKO, G8DKG, G8DMJ, G8DNQ.**G3WYX:** G3HTA, G3RUV, G3RUX, G3TJW. G3ZBI: Club. **G3ZEN** & G3ZRR, G3ZZA, G4AAW. **G5YC:** G3-SEP, G8BAH, G8CZL, G8EQG. **HA3KNA:** HA3NA & Gyorgy. **HA5KDQ:** HA5DE, HA5FM, HA5HO. **HA7KLE:** HA7MI, HA7-LW. **HA7KPO:** Club. **HA9KOB:** Club. **IE1PUG:** I1AA, IT1PUG, IT1SEZ, IT1ZWS. **JA3YBF:** JA3FGJ, JA3KGF, JA3OLO, JA3TRW, JA4FTD. **JA3ZDX:** Club. **JA9YBA:** Club. **K4PUZ** & K4AMC, K4SXD, WB4FEC. **K4ZA** & WA6QAU/3. **LA1K:** Club. **OG2A:** OH2BC, OH2SB. **OK3KGI:** Club. **SK5AL:** SM5BGK, SM5DFM, SMØDSG, SMØGM. SP6PZB: Club. **VE1ACU** & VE1ASJ, VE1DH. **VE6GS/6** & VE6AAD, VE6LB. **VP5JA:** K4IIF, W4DQD, W4PJG. **WA1LKX** & WA1KZE. **WA1LMJ** & WA1NII. **W2PV** & WB2BMQ. **W4FDA** & WB4EYX, WB4IAE. **W6HX** & WB6OLD, WB6VFJ. **WB6JOD:** K6QJZ, W6JET, W6KHS, WA6HCL, WA6OAA, WA6UAY, WA6UPV, WB6FFB, WB6SZY.**W7EXM** & K7JCA, K7VPF, W7GLC, WA7FDF. **WAØ-YKE:** WAØKMI, WAØZYE.

Multi-Operator Multi Transmitter

DFØAFZ: DL8AJ, DL8AM, DL8CH, DL8CM, DL8DC, DL8FR, DL8HA. **DKØWA:** DJ2BW, DK2BI, DK2BJ, DL9OH. **DLØWW:** DC6FF, 8DE, DJ2YF, 3GR, 6NT, 3YV, 3ZA, 3ZC, 4OQ, 6DU, 6NT, 9VS, DK3ZX, DL1OP, 2UU, 6NK. **W3SS** & K3JLK, WA3LRO. WA3LRN. **WB6GFJ** & WA6BVY, WA6DIL, WA6GTE. **WØMYN:** WAØYHZ, WAØZSH, WBØCMM. **4X4NJ:** 4X4FV, 4X4GV, 4X4VE, 4Z4AI, 4Z4GV, 4Z4IX, 4Z4JT.

PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

Beam Headings [*from page 59*]

No. T-2049 or equal) were placed above each vertical strip marking the headings to match those on my CDE Antenna Rotator indicator. If desired markers could be placed every five degrees. See fig. 6 for details.

To use the device you simply turn the globe until the location of the DX station is directly under the modified frame or lubber line. The heading shown is transferred to the rotator indicator. See fig. 7.

If you are interested in approximating the distance between the home QTH and that of the DX station, read the number of degrees from the modified mount and multiply by 60 to obtain the distance in nautical miles. If you want statute miles, multiple by 69. A calibrating chart can be pasted onto the frame somewhat like the one in the *Antenna Handbook*.

Now you have a "quickie." Turn the globe, read the heading and start calling while your antenna is swinging around. A little practice and three seconds should be your average time. ■

Q & A [*from page 78*]

Model OL-23A S/N 245.

W. J. Crossman, WA2QFK, 711 N. James St., Rome, N.Y. 13440 is looking for a manual on the Squires-Sanders 150 mHz Monitor Receiver Model FM Alert.

If any reader can help out in this respect, please contact the party of concern. Thanks.

73, Bill, W2AEF

Contest Calendar [*from page 74*]

All bands may be used, but cross-band or net contacts do not count.

Exchange: QSO nr., RS/RST and your ARRL section or country.

Scoring: One point per QSO, multiplied by total number of ARRL sections and countries worked. A station may be worked only once in each contest.

There is also a power multiplier of 1.25 for stations running 150 watts or less input. (300 watts p.e.p. for s.s.b. stations) Multiply final score by above factor.

Phone and c.w. are separate contests and require separate logs.

Awards: Certificates to the highest scoring YL and OM in each US and VE call districts and

in each country. There are also 4 Trophies for the Top YL and OM in the contest, both on phone and c.w., and 2nd and 3rd certificates for the runner-ups.

You are expected to score your log and sign the usual declaration that all rules and regulations have been observed.

Mailing deadline is April 2nd and logs go to: Betty Marsh, KL7FJW, 2411 King Road, Fairbanks, Alaska 99701.

CQ World Wide WPX SSB Contest

Starts: 0000 GMT Saturday, March 25
Ends: 2400 GMT Sunday, March 26

Rules are the same as last year. Following are a few highlights:

1. QSO point values.

(a) 3 points for contacts between stations on different continents.

(b) 1 point between stations on the same continent but different countries.

(c) No points between stations in the same country, but allowed for multiplier credit.

(d) **Exception:** Contacts between stations within the North American boundries will count 2 points.

(e) Contacts on the 40, 80 and 160 meter bands will have **double** the above values.

2. Prefixes are used as the multiplier. But a prefix may be used only once in the contest. (Not once on each band)

3. There is a time limit for single operator stations. Only 30 hours out of the 48 hour contest period may be used for contest credit. The non-operating time can be taken in up to 5 periods totaling 18 hours anytime in the contest period. There is no time limit for multi-operator stations.

4. The North American boundaries extend all the way from Greenland down to Panama, including Central America and the Caribbean.

5. The non-operating time must be shown on the log and included in the Summary Sheet.

Complete rules in next month's issue.

Logs and summary sheets are available from *CQ*, include an addressed envelope and sufficient postage to cover your request.

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

Editor's Notes

I had expected to be able to report how it feels to operate from a Contest Expedition station, but our anticipated operation from VP5 during the phone week-end did not materialize. John, K4IIF the licensee of VP5JA had to call off the trip because of professional obligations which prevented him from leaving home.

However I did put in a few hours, mostly checking the bands to see how things were progressing, as W1WY/4 from WB4VQO's in Sarasota Fla. Got a chuckle out of the many in-

quiries from the fellows. "What are you doing in W4?" and "Who's minding the store up North?"

Activity was high and conditions seemed pretty good, except on 10 where signals out of Europe were rather scarce.

However a swell pool and a beautiful boat to go sailing in the Florida sunshine, are not recommended on a contest week-end. Anyway I'll get enough contest when I start checking your logs this winter.

The list of claimed scores are only a few of the higher early bird logs received.

73, for now, Frank, W1WY

Propagation [*from page 70*]

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

New Transformers [*from page 23*]

pling efficiency, etc. have not been given rigorous consideration. The method does, however, provide a usable guide and has been used by this author many times. On occasion, it has been necessary to add or subtract a few turns from those calculated, but in most cases, this has not been necessary. While some may discuss economics of rewinding these small transformers, it is worthwhile from at least two viewpoints—(1) you get exactly the transformer you want and (2) it is educational and a heck of a lot of fun! ■

FANTASTIC BARGAIN

SAVE $40.00

on the COBRA PF-1 professional Police/Fire Monitor NOW $79.95

This fabulous top-performing monitor radio regularly sells for $119.95. But House of Power has acquired a fine lot of PF-1s, brand new in factory-sealed cartons with full manufacturer's warranty, and we're passing the savings on to our customers.

You save a full $40 by ordering your PF-1, while they last, at just $79.95. Why pay more when the Cobra PF-1 gives you top quality at this incredibly low price? Just look at these features:

Now you can hear about all the exciting events in your town as they happen. Traffic jams, robberies, dangerous criminals at large. Exact details of the latest fire. Hazardous storm warnings . . . before it's too late.

It's amazing! The new Cobra PF-1 monitors government AM and FM VHF channels and lots more. Does it better than any other radio. All at a price you can afford.

Unlike other monitors, you receive all frequencies on both high and low bands as easy as tuning a radio. And in addition to manual tuning, push button crystal control is available at a preselected frequency of your choice on each band — a feature usually offered only in the most expensive radios. Crystals available from all electronics distributors.

So why settle for less? Exclusive noise limiting circuits reduce ignition interference and insure quiet operation. And the ultimate in new solid state circuit design gives you top reach, selectivity and dependability.

Even the exterior is modern . . . perfect for any decor or auto interior.

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Order Today.

The supply is limited.

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P. O. Box 306, Merrick, N. Y. 11566

And here's an added bargain. A beautiful Cobra telescoping whip antenna that regularly sells for $8.95 yours for just $4.95 with your PF-1 monitor. This antenna is designed to mount directly on the PF-1 antenna terminal.

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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 & Copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, L. I., New York. 11050.**

HEATHKIT: SB301 and SB401 with desk mike & all manuals. Excellent condition and less than two years old. $475. College expenses. WB4NMY, 4803 Russell St., Richmond, Va. 23222.

SELL: TR-6, MS4, 9NB, AC-4 Excellent. Will ship. First $475.00. Money order takes. WAQULX, 5435 Linden, Lincoln, Nebr. 68516. (412) 488-0386.

FOR SALE: Two'er with Preamp. Panel Meter, mobile PS and Mount, $50. WA7EMM, 79 Newcomer, Richland, Washington. 99352.

SELL OR SWAP: New tubes — Eimac 4CX1000; Eimac 4X250B and RCA 4X150A. Make offers. Will reply to all. W2ASI, 15 Kensington Oval, New Rochelle, N. Y. 10805. (914) NE3-7077.

HEATH HW32 with mike and PS, $115, without PS $90, will ship. T. J. Kelly, W6NFQ, 5874 La Jolla, California. 92037.

AUDIO FILTERS: Knock down that background noise. KOJO SSB, AM, and CW filters do the job. Write for free brochure and see how serious DX boys hear them. KOJO, Box 7774, 741 E. Highland Avenue, Phoenix, Az. 85011.

VACUUM VARIABLES 30 pf-15KV, 100 pf-15 KV, 250 pf-5 KV; $25 ea. 1000 pf-3 KV geared motor and limit switches - $40; 4CX25OR new - $22 each. KH6DU, 1021 Noio Street, Honolulu, Hawaii 96816.

SELL: Collins 30S-1, excellent cond. Trades considered. Bill Winstead, Rt. 3, Box 396, Phil., Miss. 39350.

SELL: Slotted-line test set TS-56A/AP 340-690 mc excellent cond. with instruction book and metal carrying case - $20. Transmitter T-23/ARC5 100 - 156 mc, brand new with tubes - $15. H.V. transformer, new freed type TF1AO2YY Primary 115v 60 cycles, secondary 2000 VCT - 700 ma. Wt. 24lb Filter choke, new freed type TF1AO4YY 1.8 Hy. 700 Ma. 11 ohms working volts 1600 wt. 10 lb. Transformer and 2 chokes - $18. Tube tester Weston Model 686, mutual conductance lab type has 7 meters to read individual element voltages and current 26 inches high, 8 inches deep for 19 inch rack mounting - $15. TTY receiving tape printer 14AL - $20. All items FOB or pick-up. C. Lewis, 9 Conrad Place, Dover, N.J. 07801.

SELL OR TRADE: NRI complete communications course ($330 new), only $125 less kits. Bob Dufon, 4114 Northcote, East Chicago, Ind. 46312.

USED type 813 tubes - $7, 2/$12.50 ppd. Two Navy TCS Xmtrs. Dave Christel, 219 Shady Ln., La Crosse, Wisc. 54601.

QSLS - Second to None. Same day service. Samples - 25 cents. Ray, K7HLR, Box 331, Clearfield, Utah 84015.

GALAXY V AC35 PS with voltmeter and ammeter Electrovoice 719 mike. Hallicrafter's HK-1B keyer with PS and vibrokeyer. Knight P2 SWR meter. Superex headphones. Unbelievable condition. Complete with manuals and orig cartons. Best offer. Bohdan, 379 Adams Avenue, West Hempstead, New York 11552. 516/489-5899.

JOIN QRP ARC Int.: Send SASE for info. Corresponding Secretary, Earl R. Lawler, W5JLY, Rt. 2, Box 24K, Burnet, Texas. 78611.

NOVICES: Need help for general ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information. Amateur License, Box 6015, Norfolk, Virginia. 23508.

QSL PHOTO STAMPS, Glossy free samples. B & C ENTERPRISES, P. O. Box 49C, Luray, Va. 22835.

MARINE ELECTRONICS of HALESITE Sales & Service — Pearce-Simpson, Konel, Sonar, Citizens Band, 76 New York Avenue, Halesite, L. I., New York. 11743. (516) 427-7199.

GREENE... guaranteed water-tight center insulator-with or without BALUN... a tough item to beat... flier free... Greene Insulator, 3 Pilgrim Dr., Bedford, N. H. 03102.

LAMPKIN Type 105-B Micrometer. Frequency meter with engineering data sheets, like new— hardly used, in original carton, $150. Hallicrafters HT-37, mint condx, $200. Hallicrafters SX-111, $145. GE FM businessband transceiver with 27.390 MHz crystals installed, good condx, $60. Marine Electronics, 76 New York Avenue, Halesite, L. I., New York. 11743. (516) 427-7199.

BENDIX VHF/UHF throughline wattmeter 0-400W and VSWR, 1st 1/3 scale expanded 0-100W, w/ manual $45. Gonset 2M 225W Linear, $95; 500W $225, trade VHF/UHF List SASE. W4API, Box 4095, Arlington, Va. 22204.

BIG 160M Signal-Globe King 500A, Globe VFO, Central Electronics 20A, 2—BC458 VFOs, 2 new 4-250 tubes. $375. R. Shelar, 5471 Norquest Blvd., Youngstown, Ohio. 44515.

ELEXCO largest exclusive ham dealer in the Gulf South. All major product lines in stock. New and re-conditioned equipment. Before you buy, sell or trade check our high trades and low prices. ELEXCO, 608 Papworth Avenue, Metairie, Louisiana. 70005. (504) 834-9000.

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ROCHESTER, N. Y. is again Hamfest, VRF meet and flea market headquarters for the largest event in the northeast, May 13th. Write WNY Hamfest, Box 1388, Rochester, N. Y. 14603.

QSL's: Quality and Economy. Samples. K2IQH, Box V, Sherburne, New York 13460.

YOUR HAM CALL in 3" plastic letters - $1.25 per set P/P any basic color. Mount on any surface. Eshelman Products, P. O. Box 487, Cave Junction, Oregon 97523.

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DRAKE 2C, 2CS, 2CQ, 2NT, Heath SWR meter-Also xtals for international SWBC bands and three transmitting xtals. Excellent condition, like new, with manuals. Dream novice station, ideal for any brass pounder. First check for $340 gets free shipping. Write Mark Wilcox, Box 1357, Brown University, Providence, Rhode Island 02912.

FOR SALE: New 6 meter equipment - never on the air - one-third off list. Drake TR-6 XMTR with noise blanker - RV-6 Remote VFO-MS-4 speaker - Raytrack Horizon VI L Linear Amplifier - sell complete package $900. J. F. Gillis, Box 608, East Falmouth, Mass. 02536. 617/548-5175.

SELL: YAESU FTDX400 Transceiver, $350. Kenji Sakai (EX JH1XDY) c/o NISSHO-IWAI AMERICAN CORP., 9th Floor, 80 Pine St., New York, N. Y. 10005.

SELL: HX-10, $180.00; HQ-170C, $150.00; Speaker, $20.00; Package $330.00. Kilowatt linear, $100.00; Supply, $85.00; Package $145.00. M. C. Mayerl, 312 S. Lafayette, Shawano, Wisconsin. 54166.

FOR SALE: Hallicrafter receiver Model X62A. Price $200.00. Also a Heathkit two-meter Amateur Transceiver Model HW30. Price $25.00. Mrs. W. F. Douglas, 2321 Rudolph Rd., Eau Claire, Wis. 54701.

HEATH HW-100 80-10 meter SSB/CW transceiver, HP-13A DC supply, HP-23A AC supply, SBA-100-1 mobile mount. GH-12A Microphone, all cables and manuals. $300. Robert Dixon, W8ERD, 311 E. Kelso Road, Columbus, Ohio. 43202. (614) 267-6695.

PHILADELPHIA APARTMENT HI-RISE, Near City Line. Two bedrooms, TH6DXX up 200 feet. Take over lease, under $300 per month. Jerry Emdur, (215) HO 7-2411.

HEATH compact twins 80-10 meters. Cheyenne MT-1 transmitter 90 watts AM/CW. Comanche MR-1 receiver AM/SSB/CW. UT-1 AC supply, MP-1 DC supply, mobile mount, microphone, all cables and manuals. $125. Robert Dixon, W8ERD, 311 East Kelso Road, Columbus, Ohio. 43202. (614) 267-6695.

NEWSPAPER of Amateur Radio: Free sample copy. Worldradio, 2509 Donner, Sacramento, Ca. 95818.

FUTURE NOVICE YL, going it alone, desperately needs help filling empty shack. Your old manuals, books, CQ's, Call books, Junk Box discards gratefully received. Can pay postage. 4634 Field, Arvada, Colorado. 80002.

WANTED: Help a novice get started. Would like to buy an inexpensive equipment suitable for novice operation. Terry L. Frum, 633 Astor Ave., Morgantown, West Virginia. 26505.

FCC "TESTS-ANSWERS"... Original exam manual for F.C.C. First and Second Class License —plus— "Self-Study Ability Test." Proven! $9.95. Satisfaction guaranteed. Command, Box 26348-H, San Francisco, Ca. 94126.

FOR SALE: HEATH TRAIL BIKE, Model GT-18, with accessories. Delivered at Daytona Beach. $210.00. WA4SYH, P. O. Box 1941, Daytona Beach, Fla. 32015. (904) 252-7730.

WANTED: Verified contacts with novice operators in Vermont, Wyoming, and Virginia for Novice WAS. Jack Ratzlaff, VE7ANB, Box 250, Summerland, B. C., Canada.

21ST Annual Dayton Hamvention will be held on April 22, 1972 at Wampler's Dayton Hara Arena. Technical Sessions, Exhibits, Hidden transmitter hunt, Flea market and special program for the XYL. For information, write Dayton Hamvention, Dept. C., Box 44, Dayton, OH. 45401.

JOHNSON THUNDERBOLT — Linear Amp, $250. or best offer. Will also trade for VHF Amp. R. Delaney, Box 3446, Ellsworth AFB, S. Dakota. 57706.

CONVERT your HO-10 Scope to a Drake Dandy. Scope front matches Drake 4 line in color and styling. Easy to install, guaranteed satisfaction. Send $6.00 certified check or MO to Lewis, K9UMQ, 6903 Waterfront, Ft. Wayne, IN 46815.

NCX5 MKII, AC supply, VX501 - $395. Two Rohn 25 towers 100 and 80 ft. Write for details. K1CSJ. Dan morgan, 82 Peabody St., Middleton, Mass. 01949.

RF COAXIAL SWITCHES - DC-1 GHZ, 2 kw-500W Electrically operated, free literature, Link, 1000, Monroe Tpk., Monroe, Conn. 06468.

WANTED: Used B&K Model 1077,76 TV analyst and other B&K test equip. Good condx and reasonable. Joe Wegner, Jr., Box 262, Glendale, CA 91209

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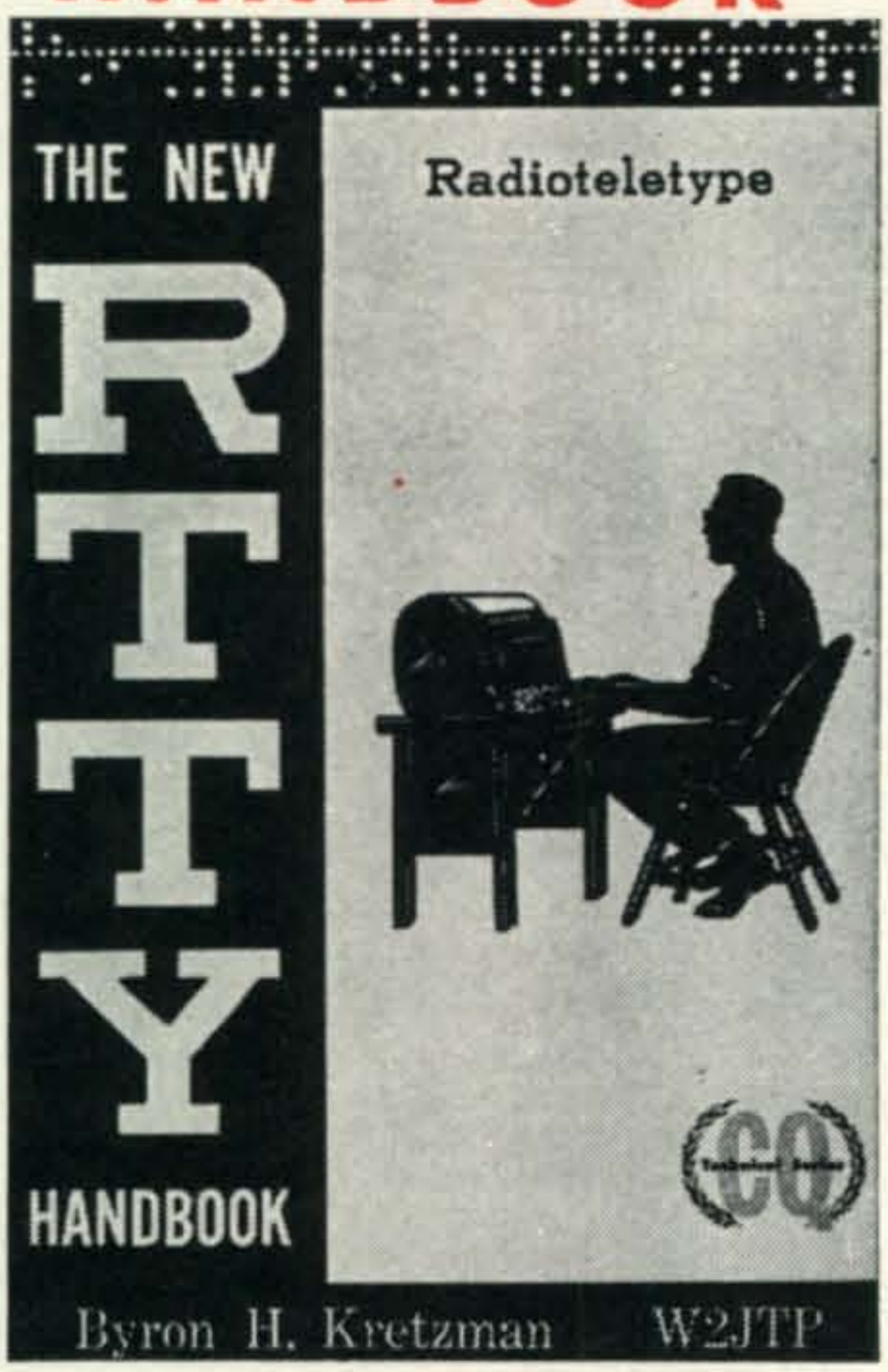

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2-Meter FM IC-20 Brand new, solid state, .12 channel, Xtaled for four, 1&10 watts, module construction, with mike, m-mount, & cables. $225; K7-HHE, 15112 SE 44th, Bellevue, Wa. 98006.

FOR SALE: Collins R390 Digital Receiver, $500; Swan500 Transceiver, factory updated, $350. Globe deluxe VFO, $15. Vibroplex original $15. Approx. ten years CQ & QST, best offer. L. E. Nichols, W2-LXT, 254-17 Morgan St., Little Neck, N. Y. 11363. Phone: (212) 229-2962.

SWAN TV-2 XVERTER. 14 MHz I.F. Brand new. $199.00. W2ERV, 14 Bernice Drive, Freehold, N. J. 07712. (201) 431-2367.

SELL: GR Distortion Meter 732B; DC PS 24v50A reg., German DL-QTC magazines; Conrac 14" TV Monitor; Beckman DCU's 705&707; IEE Digital readouts. K. Paquee, 53 Jerome Ave., Trumbull, Ct. 06611.

NORTH DAKOTA STATE SCHOOL OF SCIENCE has just started an amateur radio club. Funds cannot be appropriated for us, so we must turn to the public, the amateur who has an old piece of equipment just lying around in the shack — like to donate to the club? The postage will be paid for by us. Send all letters to WB0BIN, Tiny Dablow, Box 1073, North Dakota State School of Science, WA-HPETON, NORTH DAK. 58075.

SALE: Heathkit SB-102 and HW-32A with A.C.—D.C. supplies. Bob, WB4ORP, 715 Ridgelawn Pl., Tullahoma, Tenn. 37388.

ELMAC PMR-8, like new, $40.00. Used very little, no supply or manuals. W6GSF, Box 282, Concord, California. 94522.

WANT: Hamband crystals and lightweight tower. W1DL, J. M. Hoffer, 24 Cherry Road, Framingham, Mass. 01701. (617) 872-5084.

COLLEGE RADIO CLUB needs donation of back issues of CQ for club library. Your donation will be appreciated. Surface postage refunded. Larry E. Price, W4DQD, P. O. Box 2067, Georgia Southern, Statesboro, Ga. 30458.

WORKED SOUTH AMERICA CERTIFICATE: Work all 13 countries. Send $1 and confirmation list to: HCITH, 4050 Drummond, Houston, Texas. 77025.

WANTED: QSLs for my QSOs between 1955 and 1965. Lost all cards while in Army. Will pay postage. K4EVY.

Munston "Nassau" marine radio telephone with 5 marine channels installed, manual included — $60. Western Electric Push-to-talk telephone-type handsets, brand new, original price $35 ea — asking $15 ea. Marine Electronics, 76 New York Ave., Halesite, L. I., N. Y. 11743. (516) 427-7199.

TELREX beams, new, orig. pkg. 6el. 20m, 10el. 10m 3el. 40m all for $1000. New cost $2000. E. Flinn, Jr., Box 100, Carrollton, Ga. 30117. (404) 834-2000.

WANTED: R390, R390A, R389, R220, 51S1, Racal. SWRC, P. O. Box 10048, Kansas City, Missouri. 64111.

NU SIGMA ALPHA international amateur radio fraternity. Memberships now available. Includes wall certificate, ID card, newsletter, and more. Send for free brochure. Box 310, Dept. C, Boston, Mass. 02101.

FOR SALE: R-390 cabinet and manual - $450, Gonset 3 - 6M, 3065 linear - $100. Paul Haczela, 8 Yale Place, Armonk, N.Y. 10504. 914/273-9067.

SB200 Heath Kilowatt - $150. W6KJG, 1120 Furlong, Belmont, CA 94002. 415/593-7369.

TECH MANUALS - $6.50 each: TS-34A/AP, TS-497B/URR, R-274/FRR, OS-8C/U, URM-25D, LM-21. Hundreds more. W3IHD, 4905 Roanne Drive, Washington, DC 20021.

WANTED: Collins 30K-1 or KW-1. Sam Thompson W6HDU, 6809 Iris Circle, Hollywood, CA 90028.

SELL: Drake 2NT Transmitter excellent— Heath VF-1 VFO Fair condx— 20 novice crystals— $120. package or will sell separately. WB4VKW, Box 668, Moulton, Ala. 35650.

SELL: HEATH APACHE & RME-4350, $175. Q5r fully aligned and converted, $15. WA9ANW, 4N180 Ridgewood, Bensenville, Ill. 60106.

SURPLUS RADIO CONVERSION MANUALS 1, 2, 3 CQ Surplus Conversion Handbook, 69 ARRL Handbook, $2.50 each postpaid. WB4OJJ, 1644 Reece Road, Salem, Va. 24153.

EARPHONES FOR SALE - F.O.B. 5 Brandes Superior. 5 Trimm regular. 1 Trimm lightweight. 2 Western Electric 509W. 1 WE lightweight - above $5 a set. 4 Cannon Chiefs - $4 a set. Douglas, 2254 Pepper Dr., Concord, CA 94520.

WORLD TIMER: New concept shows time and date world wide. Durable plastic - 8 1/2 x 11" - $3.75 plus .25 postage. World Time, Inc., 253 N. Fraser, Mesa, Ariz. 85203.

NOVICE MAG - new publication for novices. DX, nets, construction proj., and more. $3 per year - 10 issues. .40 cents single copy. 1240 - 21st St., Hermosa Beach, CA 90254.

URGENTLY NEEDED: Equip. for independent missionary support net to handle message for 30 Bible translators in Liberia, W. Africa. Need Tower, 70 ft. or more, linear-SB-220 or similar, 15/20 meter quad or beam. Donated equip most appreciated or send absolute lowest price. Also need Novice and other used equip to prepare translators before they go to the tribes. We are interested in any extra equip you have - even on a temporary loan basis. We will pay shipping. Please help. Ambassadors for Christ Net, Box 366, Concordia Seminary, Springfield, Illinois 62702.

RUBBER ADDRESS stamps - $2.00. Signature $3.50. Free catalog. Jackson's, Box 443F, Franklin Park, Illinois 60131.

FOR SALE: Hammarlund HQ-180 very good condition - $210. W. Tracy, 202 Old Mill Rd., Middletown, Conn. 06457.

BENDIX RF WATTMETER throughline type, one 0-400W, other 0-40W, VHF/UHF frequencies, cost $125, doesn't need $30 "slugs" PPD Postal Money Order - $45 each. W4API, Box 4095, Arlington, Virginia 22204.

FOR SALE: one mint HW-100 assembled, ready $300. One HP-23 AC supply, ready $50. Package deal. K4LRX, 2146 Vanguard Ave., Henderson, Kentucky 42420.

WANTED: NC-183D; AC, E, B and C coils for HRO-50T, also S-meter and speaker. Sam Thompson, W6HDU, 6809 Iris Circle, Hollywood, CA 90028.

SW3 - DX40 - Globe 90 - SX100 - BC348 - BG221 ARC5 - T18, T19, T20, T21, T22 - BC453 - BC454 BC455 - BC456 - BC457 - HA32 - Eico 753. Box 8352, Savannah, GA 31402.

HT-46 Transmitter for sale. 5 bands, 185W PEP, SSB-CW, built-in power supply. $175. K1DCB, 132 Winthrop Avenue, Quincy, Ma. Tel. (617) 472-0769

KNIGHT T-175 6-10-11 meter Linear Amplifier $50 W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, N. Y. 11050.

WANTED: 10-15 mtr, small Mini Beam made by Mini Products or similar beam for Apt. house roof. Peter Feely, W2BAO, 15 Locust Hill Ave., Yonkers, N. Y. 10701.

FOR SALE: Hallicrafters HT-37, $170, SX-101, $150; SX62A $125; HW-16 & HG-10B VFO $110. 35 ft. tower, Hy-Gain TH-3, AR-22 Rotor, make offer. Colin Till, 90 Midwood Ave., Allendale, New Jersey. 07401. (201) 327-2621.

28KSR Floor Console Cabinet with LESU all wiring and cables and RO base. Sell or trade all or parts. D. C. Harrington, 1620 Gardena Ave., Fridley, Minn. 55437.

2 METER ANT. TUNER, $3.00, with monomatch & meter, $7. 2M Collinear Art., $6. Old tubes, 47s @ 1.25. De For. Audio 410, RCA UX-281, 39/44 .80. WB2OBO, 516-FL4-7152.

SCARCE UNBUILT PLASTIC MODEL CAR Kits. Send for list. W2JBL, 123 Davis Ave., Hackensack, N. J. 07601.

SWAN TRI-BAND BEAM, $50; AR22 Rotor, $20; Johnson 250-23 Matchbox $40; Johnson TR switch $17; Knight KG30 Wideband Scope $50. Heath Antenna Bridge, $12, all manuals. F.O.B. WA6-YTR, Box 241, Calimesa, Calif. 92320.

QSL MANAGER SERVICE: Volunteered by W2KF, for DX Stations. Write to W2KF, 309 Cherry Hill Blvd., Cherry Hill, N. J. 08034. U.S.A.

WANTED: Ham-Failfans in the Midwest to exchange photos, information. Write Tim Colbert, WA8MLV, 1008 Englewood Drive, Parma, Oh. 44134

WANTED: 2 and G Meter Linear, 2 Meter Linear or 6 Meter Linear. Will pay shipping. Bob Delaney Box 3446 Ellsworth AFB South Dakota 57706

LINEAR BUILDERS: 30 Amp Filament Chokes for Grounded Grid Linears. Perfect for pair 4-400A's, 813's or single 4-1000A, 3-1000Z, ect New, like in ARRL Handbooks. $5.00 each. 2 for $9.50 Postpaid. V.R. Murrell, K4HHA, 712C. Rich Road, Newport, Tenn. 37821.

WANTED: M33 or other 8 level TTy, S. Lipoff WB9DCJ, Apt 311, 6954 N Greenview St. Chicago Ill. 60626.

DX60B— New, never on the air. Best offer. WA8-CKB, 10755 Thornview Drive, Sharonville, Ohio. 45241.

SP-600 $260 or trade for good all band xcvr, Globe King 500C $185, HX-20 W/AC supply $140. All exc cond. K0RFX, 854 Skyline Drive, Junction City, Kansas. 66441.

WANTED: Heath Phone Patch and Wattmeter, plus Instructograph and CQ, QST, and 73 binders. Tom Dornback, K9MKX, 2515 College Rd., Downers Grove, Ill. 60515.

G.E. 50/W base station on 146.94mc like new, $110; Link 30-50 MC F.M. xceiver mod 2365 w/ control $35. W. Davis, K6KZT, 4434 Josie Ave., Lakewood, Calif. 90713.

FOR SALE: Lafayette HA-35A, w/12V power 6Mts $50.00; Eico 950A RCL $17.50; EMC208 tubetester. $20.00. All FOB. Wendel, WB2YYX, Jamaica, New York.

HAM TRANSFORMERS Rewound. Jess Price, W4CLJ, 507 Raehn St., Orlando, Fla. 32806

WANTED: Old Collins Model 4A or 32B radio transmitter of 1930's. W7KE, 1109 S 2nd, Hamilton, MT 59840.

FM 210 CRYSTALS. Sentry 146.34 and 146.22 Transmit. 146.82 Receive. $4.00 each. W1EWC 1 Clark Circle, Bedford, Mass. 01730.

HARVEY WELLS ANT Z MATCH $55.00: DOW TR SW $20.00: BC211 W/AC PWR $55.00 SR160 W/AC PWR $175.00 Art Ford 9 Haveymer Ln Commack NY 11725.

FOR SALE: Cabinet Racks with doors over 6 feet of 19" Panel space. $30.00. W4JSC Rt. 2 Bx 952 Odessa, Fl. 33556 (813) 920-5094.

SELL: HQ129X -FB, You pick up Local preferred-$65.00. WA2HPB Mark, 1801S.. Clinton Trenton N.J. 08610. (609) 396.8503.

HAM AD: Want clean ARRL Hand-book 1960 Ed. Will pay $2.00 postage incl. M. Bae Box 95 S. Branch N.J. 08881.

FOR SALE: Excellent Two & Six Meter Transceiver, Polycom PC-62B with AC & DC cords, instruction book and base microphone. $100. Earl D. Fox, W4DWR, 318 Montcastle Drive, Greensboro, N. C. 27406. Phone (919) 275-6092.

SELL: Johnson Navigator, Factory wired, excellent condition, with manual and Extra Set, brand new tubes. Will ship. $65. Want new— Tronics Hustler 4-BTV also new— Tronics Hustler Standard Resonators for 10-15-20-40-80 meters. Earl W. Carsner, 6652 Electric Ave., La Jolla, Calif. 92037.

BUY OR SWAP FOR SIGNAL-ONE, KWM2, Drake, Heath, or Yaesu. W0BNF, Box 105, Kearney, Neb. 68847.

$1300 KW rig for $550. Mint SR-150, P-150, HT-45, P-45, relay and cables. Package only. Gordon, 960 10th St., Number 10, Santa Monica, California. 90403.

SALE: Ideal General, QRP, Novice Station: Knight T-50, Knight VFO, NC-57 Receiver, Heath QF-1 Q Mult. $100. R. Shelar, 5471 Norquest Blvd., Youngstown, Ohio. 44515.

WANTED: Manual or Diagram for Navy OS-4 scope RBW-2 Panadaptor, & Potter Inst. Co. Model 830 Counter. W4LRR, 234 Elden Drive N.E., Atlanta, Ga. 30342.

SELL: New Model 19 RTTY, 2 model 15 RTTY plus tables, real cheap. Sly, 217 Santa Mariana, La Puente, California. 91746.

BC-342 rcvr 1.5-18 MHz w/manual and matching LS-3 speaker. AC pwr. $95.00. SILBERT, Wh. Sul. Springs, N. Y. 12787.

BC-348 less power supply, $40; RME 4300 $50. Heathkit GD-1A Grid-dip meter, $15; W2RUK, 7 Charles St., Auburn, N. Y. 13021.

SELL—TRADE: Collins KWM-1 Transceiver, $195 or trade for SB200, Collins 312B-4. WA3HMQ, Box 2775, Harrisburg, Penna. 17105.

SELL: REL (1925) Wavemeter 10-100 meters, type B, No. 142, Vernier Dial, Calib. Chart, like New! Sell or swap. W2ASI, 15 Kensington Oval, New Rochelle, New York. 10805. (914) NE-3-7077—

FOR SALE OR TRADE: Linear Amplifier Pair 4—125's less high volt supply— Spring wound and tapes Instructograph, $20. Trade final for SX-25-28 -sx43. TVI'd. Carl E. Jacobson, Cochrane, Wis. 54622. W9SQM, Tel. (608) 248-2516.

WANTED: Heathkit AR-3 Receiver Cabinet, No. 91-15A, QF-1 Manual to copy. WB4OJJ, 1644 Reece Road, Salem, Va. 24153.

FOR SALE: Pick up only, Heath DX-100B xmtr, AM/CW, 160 thru 11 mtrs, 180 wts, as is, $45. Brand new 811A tube with socket. $5. 3904 San Juan St., Tampa, Fla. AC813-837-4155.

SELL: 80M—HW12 with HP23 supply— almost brand new. $110. W2AOZ, 11 Hedge Ln., Merrick, N. Y. 11566. (516) 378-7221.

FOR SALE: Drake L-4B, MN2000 with TV1000 LP- $700. TR-4, RV-4, AC-4 and DC-3, $600. SPR4, MS4, cal and N.B. $475. K2ABQ, Walton, (516) 781-3996.

WORKED ANY OF THESE? WC4GSC, KF4-GSC, WE4SUN, KY4CD. QSL to: Larry E. Price, W4DQD, P. O. Box 2067, Statesboro, Ga. 30458.

FOR SALE: Complete 2 meter station in very good shape. TDQ Tran., Collins 75A1 rcvr, Converter 2 meters, 8 meg osc for transmitter. All $200.00. M. Rerghley, 742 Driftwood, Fallbrook, Calif.

SELL: Loktal tubes for 2-way radio. Most types @ $1.00 ea. W4JGO, 643 Diamond Rd., Salem, Virginia. 24153.

SELL OR SWAP FOR 2-meter FM Xceiver. Star SR700 rcvr. AM-SSB-CW 80-10 meters, excellent. Eldico TR75TV cw transmitter with 8—80 meter xtals. $125.00 for all. Joe, WA2CKM, 1816 Park View Ave., Bronx, N. Y. 10461.

SELL OR SWAP: Heath HP-13A $60; HRA-10-1 $9; SBA-100-1 $12; IT-27 $6. Hustler: MO-2 $11, RM-15 $8; RM-20 $9; RM-40 $11; RM-75 $13; BM-1 $5. All postpaid/guaranteed. WA1JFG.

FOR SALE: to close estate of W0ZGB, QST's from 1936—June '71. All in mint condition. 25 cents ea. Write Mrs. Arthur Musgrave, 420 Neosho St., Emporia, Kansas. 66801.

SELL: GR-64, $15.00; GD-125, perfect, $7. Both postpaid and with manual. WB4SPT, 240 Colony Rd., Jupiter, Fla. 33458.

PHOTOGRAPHER: College newspaper editor, reporter, age 20, collegejunior, seeks summer employment in related field. Diverse background. Jon P. Zaimes, 933 Sanderson Hall, West Chester, Pa. 19380.

FOR SALE: Heath HW-18-3 160 mtr SSB/AM Xcvr with A.C./P.S. and 5 xtals. $155.00. You ship. WB9DWG, Box 314, Whitewater, Wis. 53190.

MICROPHONES: Shure 404C Mobile-Controlled Magnetic, $12.50; 201 Mobile Ceramic, $8; 245S Uniplex Unidirectional, $15; 448A Noise Cancelling, $34; 440SL with stand, $20. Electro-Voice, 674 Variable-D Hi-Z Dynamic Cardiod, $45; 630 Hi-Z Dynamic, $25; 619 Hi-Z and one Lo-Z Dynamic, $20 each; 600E Mobile Dynamic, $16; W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, N. Y. 11050.

SW3 Receiver with four sets of coils. Sell for best offer over $75.00. Dick Nebel, W2DBQ, 31 Whitehall Blvd., Garden City, New York. 11530.

HEATH HW-18 160M Crystal-controlled SSB Transceiver for sale, $75. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, N. Y. 11050.

SELL: Gonset Communicator G-50 for six meters. LP Filter. $100. W2NX, 29-29 213th Street, Bayside, New York. 11360.

KNIGHT R100A Receiver with S-meter, crystal calibrator and product detector as per CQ, July, 1969, $65. W2AEF, CQ Magazine, 14 Vanderventer Avenue, Port Washington, N. Y. 11050.

40 YRS accumulation of ham stuff gotta go! Equipment & parts. What do u need? W6PYR, 4028 China Court, Hayward, Calif. 94542.

KNIGHT T-150 Transmitter — $50. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, New York. 11050.

BRASSPOUNDERS: 80 mtr operating conditions can be checked by listening to the Society of Wireless Pioneer Net which operates 8 PM Pacific Time on 3555 khz Thursdays. Send East Coast reports to: P. O. Box 530, Santa Rosa, California. 95402.

OIL CAPACITORS: 175 MFD at 6000 VDC. Discharge type for lasers, linears, or photo flash. $60 each. 140 lbs. 22"H x 13"w x 6"D. Marty, WB6-NWW, (213) 597-2631.

LAMPKIN 105B $100, HE45B $50. Need TS497B or measurements 80. WA5CMC, 2309 Bullington Wichita Falls, Texas. 76301.

WANTED: Other hams to buy stainless steel ground rods and share freight cost with me. SASE for details. Locals only. K2MFY, 2 Nutley Ct., Plainview, N. Y. 11803.

CRYSTALS: HC-6 Holders 1.742, 1.845, 1.848, 7.011, 7.038, 7.061, 7.069, 8.025, 8.064, 8.107, 8.121, 8.300, 8.380, 8.392, 8.438, 55 cents each or 10 for $5.00. K8LJQ, 351 Mower Rd., Pinckney, Michigan. 48169.

WANTED: Coils or winding data for 160 meter coils in Meissner Signal Shifter, Model 9-1018 WA3APN, Milton E. Artz, 526 Schwylkill Ave., Reading, Penna. 19601.

WANT: Old Vacuum tubes pre-1923. Like DeFores Spherical Audion Triode with Candelabra Screw Base. W9LGH, R. W. Schnedorf, 610 Monroe Ave., River Forest, Illinois. 60305.

JOHNSON CHALLENGER 80-6 mtrs AM/cw transmitter $50. WB2FJO, Arthur Schur, 1878 Schenectady Ave., Bklyn, N. Y. 212-252-7605. Will not ship. 11234.

FOR SALE OR TRADE: Drake 2NT 80-10 mtr 100 watt CW xmtr. Sell for $110 or trade for Ameco TX62 xmtr & VFO. You pay shipping. (513) 278-2802. Novice xtals $1.50 each.

PHOTOGRAPHER, college newspaper editor, writer, reporter, age 20, college junior seeks summer employment in related field. Diverse background. Jon P. Zaimes, 933 Sanderson Hall, West Chester, Penna. 19380.

SR160 no power supply, good condx. Make offer. J. Perkinton, W9MPN, 2209 Black Ave., Springfield, Illinois.

SELL: Eico 753, Knight TR-106, 2M FM stuff. Swap - Hustler RM-40/RM-15 for RM-75/RM-20. W2ELV, 6 Tuscarora Ave., Geneseo, N.Y. 14454.

WANTED: Collins 75A1 Receiver, condition not important. E. Sjolander, Jr., Box 262, Ashland, WI 54806.

SELL: NCX-500, AC-500 in perfect cond. $285. W2GCW, 192-15A, 69th Ave., Flushing, NY 11365

SELL: Hallicrafter SR-500 xceiver, 630D mike three 8236 spare finals, linear systems commander power supply - 12V DC - 117AC, Trickle charger- $400. K6AAK, 2036 Grandview Dr., Camarillo, CA 93010.

WANTED: To buy or borrow - Central Electronics 20-A multiphase exciter manual. D. Moose, Box 7071, Greensboro, NC 27407.

SELL: Ameco CN144 converter and PS for 2 meters. Crystal incl. to cover 28-29 MHz for 145-146 MHz. Used only 15 hrs. $30. W3DJD, 205 Ellinger, Fort Washington, PA 19034.

CANADIAN - Drake 2B, 2AC, %BQ - $250. Heath HX20, HP20 - $175. Many accessories - selling out. VE3COR, 4 Somerdale Sq., Scarborough, Ont

FOR SALE: Tristao Galv 70' crank-up, w/1/8" gal guys and tilt plate - $150. Hughes memoscrope- $175 PU. W2YCW, 45 Lawnviews Ave., Hicksville, N.Y. 11801.

WANTED: radio mags prior to 1925. Hdbks, callbooks, catalogs, early radio equip. Erv Rasmussen, 164 Lowell, Redwood City, CA 94062.

WANTED: FR400DX recv. Sell Irving 6M transverter 6146B Final $50, T175 6M Amp - $75, mint Heath HX30 6M transmitter SSB/AM/CW - $125. W4API, Box 4095, Arlington, VA 22204.

SELL: Pesh LA-400C linear 800W PEP, 400W,CW. In mint condx, wid ant relay manual. $50. WA3LPK, 2300 Louise Ave., Baltimore, MD 21214.

SELL: Collins 30S1 linear - $800, 51S1 General coverage recv - $800. Both mint, manuals. W9MJH, 3700 Van Buren St., Gary, Ind. 46408.

FOR SALE: 2M FM base sta Motorola 16V recv, and 30D transmitter, crystals incl - $75. 2M FM mobile sta Motorola 43V transc, crystals - $125. Paul Gates, Box 7197, Flint, MI 48507.

WILL PAY top dollar for 200V - 160 M coils or info for winding. K8NGV, 26496 West Six Mile, Detroit, MI 48240.

PRINTING MACHINE: Vari-color Model 80 Duplicator with stencils, ink, etc., $25. Will trade for Ham Gear, What do you have? James Shank, 21 Terrace Lane, Elizabethtown, Penna. 17022.

CQ MAGS 1947-1970. Will sell complete or in one year units. Best offer. U pay shipping. W8WUM, 400 E. Elm St., Mason, Mich. 48854.

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FOR SALE: Drake 2B, 2BQ, w/xtal cal $160. F. G. Valentini, 100-02 160th Avenue, Howard Beach, L. I., New York. 11414. WA2CFY.

PHOTOGRAPHER, college newspaper editor, writer, reporter, seeks summer employment in related field. Age 20, college junior. WA3BGN, Jon P. Zaimes, 933 Sanderson Hall, West Chester, Pa. 19380

AKAI X-360D Tape Deck $400 FOB. Brand New. D. L. Smith, Overlord, Apt. 14, Seneca Falls, New York. 13148. 568-2608, Area 315.

RTTY PICTURE TAPES error free. Send stamp for list of over 250. K2AGI, 5 Hansell Rd., Murray Hill, New Jersey. 07974.

SALE: 3 Ultra-Sonic Intrusion Alarm Detectors below distributor cost. $80.00 each. J. Kramer, WA9DJR, 5631 So. Oak Pk. Ave., Chicago, Il. 60638.

CLOSING OUT: 32S3, 75S-3-C, 30L1, Millen 2kw transmatch, all like new; NC-303 w/calb., etc. T. Webb, Box 6, Morganton, N. C. 28655.

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RTTY INFORMATION for the Amateur interested in RTTY. F. DeMotte, P. O. Box 6047, Daytona Beach, Florida. 32022.

HW-16, $95; HG-10, $35; Instructograph with extra tape, $30. All mint. WB6LYA, 4211 Beresford Way, Pasadena, Calif. 91103.

FOR SALE: Plans and specifications for 45' crank-up tower, self-supporting, easy to build. Send $2 to D&D, 1007 Janlee, Burkburnett, Tx. 76354.

FOR SALE: Old CQ, QST, 73 and others. 25 cents each. Send SASE for list. W0BK, 1022 N. Rockhill Rd., St. Louis, Missouri. 63119.

SELL: Johnson Courier 500 W. Amplifier $80; Plate Xfmrs 3600-0-3600 at 1 amp with 120/240 v. primary All fob. W0AIH, 814 4th St. S, Virginia, Minn. 55792.

CLEANING HOUSE: Many bargains RTTY, FM, TX, RX, etc. Send for list. WA2GLR, 76-70 St., Brooklyn, New York. 11209.

FOR SALE: HX-10, $175, Dytronics $720; Var. B.P. F.Lt. in thru 10Khz. Adjust select. $75. You ship. W2YCW, Hicksville, N. Y.

SELL: 3 element Hy-Gain Trap Tribander, $40. 40 foot self-supporting tower (windmill-type) $50. Will pay cash for good R-390A. K8CCV, (216) 799-5686.

WESTERN UNION NAVAL OBSERVATORY CLOCK, $50.00. Goodman, 5826 S. Western, Chicago, Illinois. 60636.

WANTED: Donations of equipment etc for college radio club - tax deductible. W1SPK, Trustee, Box 327, Middlebury, VT 05753.

EICO 460 scope - $95. Knight-kit 652 RF sweep generator w/cables, man - $40 ppd, perfect condx. H. Marhoff, Box 569, Largo, FL 33540.

FOR SALE: Motorola V51GGT-1110A, 6M 50W FM mobile tcvr w/head, mike, spkr, cable - $150. You ship. KL7GRF, Box 1196, Petersburg, AK

WANTED: Heath GW-52 CB walkie-talkie, State condition and price. L. Roux, W6GRR, 2535 Pacific Dr., Bakersfield, CA 93306.

WANTED: Desk mike, good working condition. Shure 444 or HDP-21A, also Swan DC supply 14-C Richardson, 1109 Dakota SE, Albu. NM 87108.

WANTED: 600L amplifier, also ST6 teletype converter. L. Humphries, 41 Kildonan Dr., Scarborough, Ont., Canada.

MECHNAICAL filters - 455 Khz. 300 Hz, $22.95 2.1 Khz - $18.95. J.A. Fredricks, 314 South 13th Ave., Yakima, WA 98902.

TRADE XTALS: have 7050, 7140, 7175 and others. Want other CW xtals. A.M. Fox, Box 895, Greeley, CO 80631.

WANTED: Old Crosley "Musicone" Magnetic cone speaker. W7KE, 1109 S. 2nd, Hamilton, Mt. 59840.

WANTED: Instructions or help to convert Heath HG10 VFO for FSK. E. L. Lawson, 16707 Garfield Ave., SP1605, Paramount, Cal. 90723.

WANTED: OSC, BFR, DBLR, 1st & 2nd MXr Driver & Final Coils for 200V, including 160M.—K1KSH, G. Lunney, 236 Prindle Ave., Ansonia, Conn. 06401.

SALE: Bound issues of CQ, 73, QST, Ham Radio and Popular Electronics. W4BEX, 1828 Highland Avenue, Eau Gallie, Fla. 32935.

TDQ 2 Mtr Xmtr, TVI Proof, Pick-up only. Best offer. J. A. Springer, 5731 Cannon Lane, Alexandria, Virginia. 22303.

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SELL: EICO 625 Tube Tester, like new, $25.00. New 300-300 Hammarlund HV Xmtg Cap, $10; Small craftsman metal Turning Lathe, $30, or make offer. WB2OBO, (516) FL4-7152.

SELL OR SWAP: SX-101A, 3" refractor telescope, test gear. Want $ or Heath Analog computer. SESA, WA8CKT, 662 W. Lincoln St., Caro, Mi. 48723.

FOR SALE: HT32 $200; SX111, $125; SBE34, $250 plus shipping. All excellent condx. Herb Adler, WB5DJA, 110 Sheraton Pl., Denton, Texas. 76201.

TRADE HAM GEAR or Buy Old Bibles, Christian Books. WB4OJJ, 1644 Reece Rd., Salem, Va. 24153.

CLEANING SHACK: WRL 6&% VFO, $5; Collapsable vertical ant 40-10 mtrs, $10; 2 mtr Squalo $5; 6&2 mtr vertical $5; 6 meter vertical, $5; Code oscillator $7; Turner 350 Mil $5; 6 mtr Halo $5; floor mobile mount (Universal) $5. J. G. Swaney, 10534 California, Aurora, Ohio. 44202.

HEATH SB-401 xmtr, perfect, with crystal pack and manual, $230. Extras with local deal. W5GXH, Jim, 6 Maple St., Bedford, Ma. 01730. (617) 275-9126.

SALE: Knight 600A w/manual, $30; Want: Heath SB-600, 610, 620, 630, HP-25A, Cash or Trade. What you need? Harold Dalton, Box 641, Easley, South Carolina. 29640.

JACKSON V.T.V.M.—V.O.M., combination. Mint condition with all cables, $25.00. W6MNO, 8661 Wintergardens, Number 56, Lakeside, Calif. 92040.

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LET'S TRADE: My list of CQ, QST, 73, and Ham Radio for yours. Also will buy. Chuck Morrison, WA3QJP, 803 Forston, Washington, D. C. 20012. (301) 439-4761.

FOR SALE: Allied A-2567 23 channel CB Rig 12v and 117v power supplies inside rig. Used less than 6 months. Like new. Price $150.00. Will ship M. H. Carey, 815 E. College St., Pulaski, Tenn. 38478.

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Available FREE to See: Reasonably priced, Swan 250 w/117XC, w/14X AC/dc pwr. supp.; Pair 4-400A amplifier; SB610, SB620. Vince, WA2RSK, at 212 — 892-0339. (after 6 P.M. Mon—Thursday).

WANT: FR DX400 Yaesu Receiver. New or perfect. Will trade 75A-4 even on new Yaesu. G. Vilardi, WA2VTR, 14 Oakwood Terr., Spring Valley, New York. 10977.

FOR SALE: 75A4 — Perfect OKC-3 KC-1.5 KC latest collins modification. Pickup or deliver within 50 miles only. Manual Vernier Dial, $380. WA2-VTR, 914-356-5762, evenings.

DX [*from page 66*]

WM3—WM3ARW QSLs should go to WA-3ATP.
WO6—WO5BSA, operated by WA6GLD and W6EIF, made over 1300 QSOs during the Boy Scout Jamboree in Orange County, California.
XX6—This was another special contest prefix. QSL XX6FL to CR6LA.
YNØ—Four Nicaraguan stations had special permission to use this rare prefix during the *CQ* Contests. Those were YNØFI by YN1FI, YNØFP by YN1FP, YNØHSM by YN1-HSM, and YNØVMD by YN1VMD.

QSL Information

The following volunteer to serve as QSL Managers for DX stations: W2KF, 309 Cherry Hill Blvd., Cherry Hill, N.J. 08034.
CR3ND—Via CT1BH
CT2BB—To W3GNM
CT3AS—c/o R.S.G.B.
EA7DJ/EA9—Via K3RLY, Box 125, Simpsonville, Md. 21150.
EA8GZ—To VE7BWG
EL2J—c/o WB2WOU
FØACO—To K1IXG
FMØIX—Via W7VRO
FY7AE—To WA4WTG
FYØKP—c/o DJ5AY
FYØNA—Via FØNA or to Box 107, Kourou, French Guiana
HBØXUA—To DK1UJ
HC6MJ—c/o DJ3JR
HI8XGM—Via W3HIZ
HKØAA—To K3RLY
HS2AGJ—Russ Curry, Box 5763, APO San Francisco, CA 96330
HZ3TYQ—V. Crawford, Box 1721, c/o ARAMCO, Dharhan, Saudi Arabia
JY9EAC—c/o SM5EAC
KG4EQ—Via WA9SXQ
KG4FD—Carrie Bootsma, Box 33, FPO, New York, N.Y. 09593
KX6IQ—P.O. Box 693, APO, San Francisco, CA 96555
LX2CQ—To DK1YK
OB8V—c/o W9GFF
OY1R—Via W2KF
SP3DOI—To W2KF
ST2SA—c/o K3RLY
TU2DD—Via K2QHT
TZ2AC—To DJ6QT
VA2UN—Via W2GHK
VE7IR/XU—To VE7BWG
VP1BH—c/o VE2AKZ
VP2DAE—To K3RLY
VP5RF—Via G3RWU
VPØLK—To WB2RLX
VQ9WES—c/o WA3OTV
VR1AA—Via K3RLY
VS6DR—c/o W2GHK
VS9MF—To G3VAO
WA2PQX/TF—c/o WA2JZX, 317 Kensington Ct., Copiague, N.Y. 11726
YB3AAY—Via W3BRB
YBØAAO—To DJØRR
YN3AAA—c/o DL3OH
ZK1CD—Via ZL2FA
3AØFN—To DL4VA
3D6AX—c/o WA5IEV
3F1IE—Via W2GHK
4C1QB—To W5QBM
4M1A—c/o YV1LA
4M4CDK—Via YV5CDK
4S7AB—Sunil Abeyesundere, 14 Fonseka Terrace, Havelock Road, Columbo 6, Ceylon
4X4 & 4Z4—The following stations may be QSLed via WB2WOU, 306 Hooper Ave., Toms River, N.J. 08753: 4X4CW, 4X4CY, 4X4GV, 4X4QL, 4X4SK, 4X4SO, 4X4UL, 4X4VG, 4X4WP, 4Z4AQ, 4Z4GV, 4Z4HF, 4Z4HG, and 4Z4IX.
4W1AF—To DJ9ZB
5B4IS—Via OZ5RW
5L2J—To WB2WOU
5R8AB—c/o G3WRN, 9 Portal Close, Barnham, Thetford, Norfolk, England
5VØYH—Via VE3GHL
5Z4LW—To K8UDJ
5Z4NE—c/o VE6AKV
6D1AA—Via W2GHK
7P8AZ—To VE2JH
7Q7AA—c/o K4CDZ
7X2HS—Via W2KF
9G1WW—To W5EGH
9M2WM—c/o WA6AHF
9V1PM—Via G3WRN
9V1QJ—To WA5UHR

73, John, K4IIF

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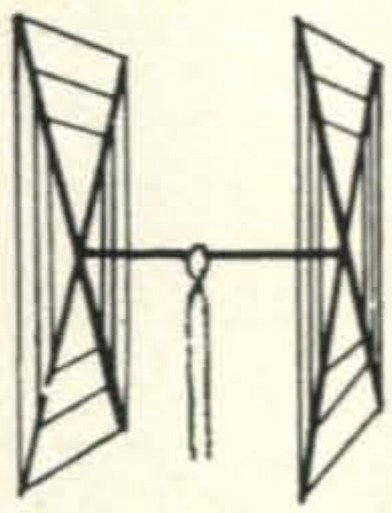
Worked 42 countries in two weeks with my Gotham Quad and only 75 watts...



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:

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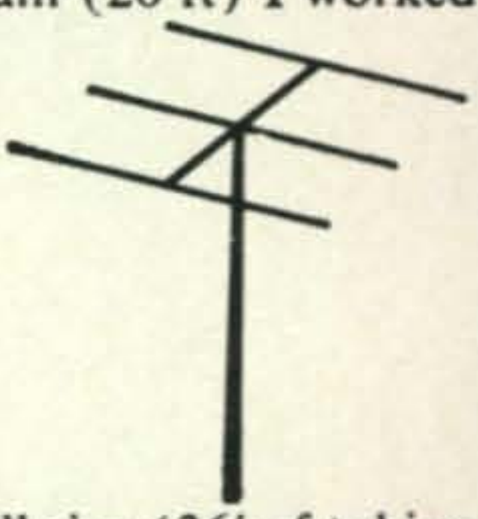
(all use single coax feedline)

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
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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!

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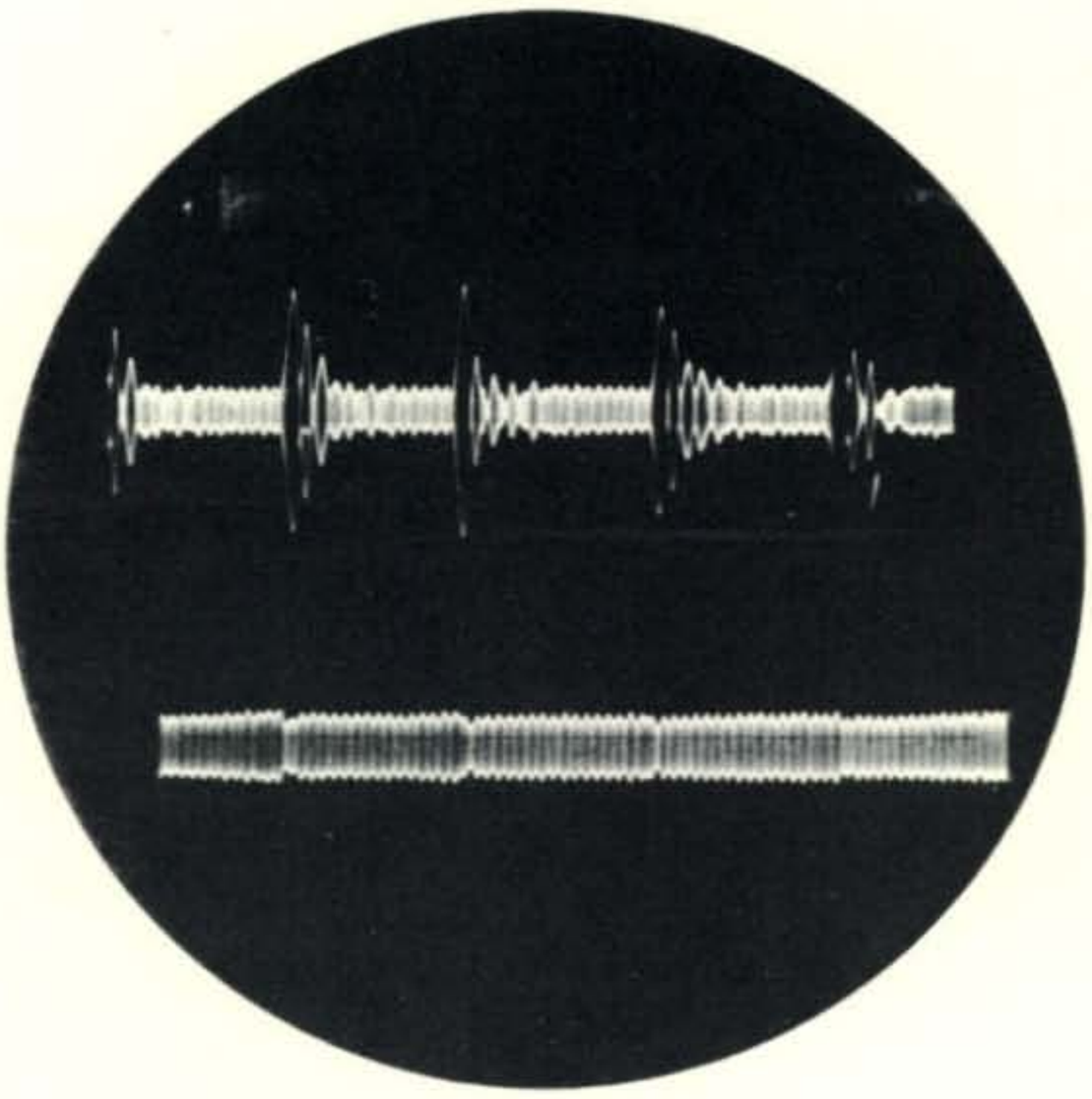

Is the FTdx 570's noise blanker reason enough to spend $550 for this new rig?

You bet it is. Here's a complete rig, including a noise blanker — on other rigs you pay about $100 extra for the blanker alone. On other rigs, you read the glowing specs and they sound fine. Of course, to get them on the air you pay extra for such essentials as a power supply.

Well, the FTdx 570 includes a built-in power supply and 25 and 100 KHz calibrator. And built-in VOX. Plus a special WWV receive band on 10 — 10.5 MHz. And a clarifer — a receiver-offset tuning feature that lets you move ±5 KHz from a preset transmitter frequency. There's even a built-in cooling fan and a built-in speaker.

Last but certainly not least is the power: 560 watts PEP SSB, 500 watts CW input power.

The whole transceiver is guaranteed for one year. No other rig, preassembled or kit, gives you anywhere near the value or performance you get in the FTdx 570.

We have a brochure on the 570 that really gets down to the nitty-gritty on the subject. Send for it. Better yet, send for the rig itself. Don't you owe yourself a bargain?

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