CQ

July 1972
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NEW! SSTV Column
By Cop Macdonald . . . See page 24

Flea Market: 1972 Dayton Hamventio

The Radio Amateur's Journal

08240

New digital readout

Provides precise readout of frequencies on all Heathkit receivers & transceivers

New Heathkit SB-650 Digital Frequency Display...another "first" from the hams at Heath.

179.95*

- Resolution to within 100 Hz ±1 count
- Compatible with all Heathkit SB Receivers and SB and HW Multiband SSB Transceivers
- Six bright readout tubes display MHz, kHz and hundreds of Hz
- Full 80 through 10 meter coverage

You asked for it and Heath produced it. An exciting piece of ham gear to bright-light frequencies... readable from up to 30 ft. away The new SB-650 digital frequency display reads the three frequencies of a heterodyne circuit; then computes and displays the actual signal received or transmitted. All within a tight 100 Hz accuracy. Six bright digital readout tubes show you exactly where you are as you tune across the 80 through 10 meter bands, from 3 to 40 MHz. The SB-650 lets you read kHz to five places...plus tenths of a kHz.

And talk about compatibility. The SB-650 is designed to team up with all Heathkit SB-Series Receivers and Heathkit SB- or HW-Series Multiband Transceivers. When it's in combo with a transceiver, the "650" calculates and displays both transmitted and received frequencies. To make installation easier, the SB-650 manual fully describes and illustrates all inter-connections necessary for the specific Heath gear you own.

The addition of a Digital Frequency Display will in no way degrade your station's performance — and when teamed with budget equipment, such as the Heathkit HW-101, the SB-650 can give you pinpoint tuning accuracy to rival transceivers costing hundreds of dollars more!

The all solid-state circuitry uses 35 ICs and six transistors. An IC voltage regulator protects the devices from failure due to overvoltage, a common problem with discrete regulators. A built-in memory assures non-blinking operation, and there's a special circuit to minimize last-digit jitter.

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The SB-650 Digital Frequency Display. It's got to be one of the most "up-and-coming" pieces of ham gear ever offered. It's another trend-setting "first" you can count on...from the hams at Heath.

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SB-650 SPECIFICATIONS — Frequency Range: 3-40 MHz (80-10 meters). **Frequency Display:** 6 display tubes (kHz to 5 places, plus tenths of kHz.) **Maximum Viewing Distance:** 30 ft. **Maximum Input Signal:** 5v rms. **Accuracy:** 100 Hz ±1 count. **Compute Time:** 160 msec. **Sensitivity:** Adjustable. **Input Impedance:** 2000 ohms. **Internally Generated Spurious Frequencies:** Approx. 0.25 uV equivalent signal level. **Crystal (clock) Frequency:** 1 MHz. **Crystal Aging Rate:** Approx. 10 ppm/yr. **Ambient Crystal Stability:** Approx. 10 ppm from +10 to +65° C. **Ambient Operating Temperature:** 0° - +40° C. **Ambient Storage Temperature:** −55° to +80° C. **Power Source:** 120/240 VAC, 50/60 Hz, 10 W. **Dimensions:** 3½" H x10" W x 10" D.

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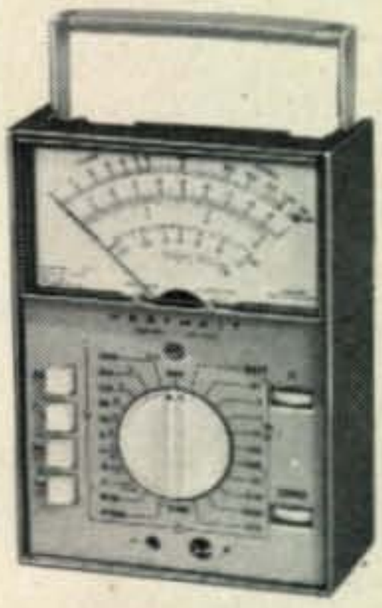
3½ digit readout, quality digital components and easy calibration give lab-grade accuracy. Measures 100 uV to 1000 VDC in 5 ranges; 100 uV to 500 VAC, 5 ranges; 10 current ranges, 100 nanoamps. to 2 amps, AC & DC; 6 resistance ranges, 0.1 ohm to 20 megohms. 1000 megohm input on 2 V range, 10 megs on others. Overload protection. Automatic decimal. Overrange indicator. Calibrator included.

Kit IM-102, 9 lbs., mailable **$229.95***

NEW Heathkit Solid-State FET VOM — $79.95*



Dual FET portable multimeter with lab grade accuracy, 10 megohm input and the ranges you really need. 9 DCV & ACV ranges, 0.1 to 1000 V., ±2% accuracy. 6 DC & AC current ranges, 10 microamps. to 1 amp. 7 resistance ranges, x1 (10 ohm center) to x1 Megohm. 9 dB ranges, −40 to +62. 1% precision dividers. 4½", 100 uA, ruggedized taut-band meter, diode & fuse protected. Battery check switch.

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You should be talking with a Hallicrafters.

JULY, 1972 VOL. 28, NO. 7

CQ

The Radio Amateur's Journal

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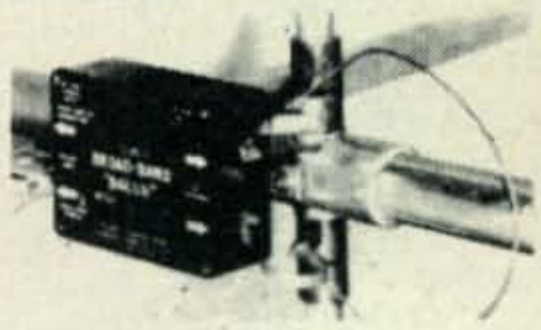

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A Question of Ethics

Along with the growing popularity of *CQ's* DX Contests has come a growing feeling of bewilderment about why people do some of the things they do. We're fairly well in agreement about what makes an amateur suspend all normal social behavior for one or more contest weekends a year. Contests are fun. They present a challenge to people who sometimes lead unchallenging lives. They give a man a yardstick against which to measure his own ability and the quality of station he has assembled. But, most of all, they're fun.

There are a small number of amateurs, though, to whom contests present more than the usual challenge. Winning fairly over good competition is not thrilling enough for these few, just as big game hunting on foot is not good enough for some "hunters" who prefer to stalk their game from an airplane or helicopter or snowmobile. Some amateurs cheat.

The essence of good competition is good rules, uniformly and vigorously enforced. We believe that the rules for *CQ's* contests are well conceived, having evolved over many years of trial and error. But even if the rules were not as good as they are, they would still be the rules by which the game must be played. There is no justification for any participant to assume that the rules may be stretched for his convenience or gain.

Some amateurs cheat, but why? That's really our question, particularly because it's usually so obviously unnecessary. Our experience shows that over the years the overwhelming majority of amateurs disqualified from *CQ's* contests because of log irregularities did not need the extra points or multipliers gained through "creative logging" in order to post a winning score. In other words, had they played the game by the rules they would have been winners twice over: first, by surpassing all competition, and second, by doing it "fair and square." What perverse satisfaction is there to winning by treachery. And what pride can be felt from being caught in the act?

It's sad to note that quite often the man with the creative log is what we call a "big guy." Our assumption is that the big guys are occasionally driven to creative logging by a desire to excel at any cost. We wouldn't be calling them "big guys" if their super-competitive spirit hadn't already driven them to assemble skills and equipment to warrent the title. Perhaps the real culprit is that compelling need to excel which society tells us is desireable. Good isn't good enough; best is better. Overkill.

It's all so unnecessary. And ill-advised. The *CQ* Contest Committee is a smooth-operating, highly skilled group of amateurs who can sniff out a bad log a mile away, and using painstaking verification procedures, prove beyond any reasonable doubt the validity of a claimed contact. They get lots of practice: over 4000 logs a year are scrutinized by them!

So if contesting is your thing, play it straight when it comes to *CQ's* DX contests. It's much more fun in the long run. For the 99½% who play the game by the rules, take comfort in the fact that such great care is taken to maintain the integrity of our contests. "Caring" is what it takes to keep great contests great.

A New Addition

On page 24 of this issue is the first product of what we hope will be a long association with an author of considerable talent: Copthorne Macdonald, WA2FLJ. Cop is the man responsible for the current popularity of an exciting new mode for amateurs: Slow Scan Television. It was his pioneering work which laid the foundation of the Slow Scan system, and it was his fine articles in *QST* which led Slow Scan to the point it is at today.

We think you'll find Cop to be a thor-

[*continued on page 96*]

Only an **MC-4** can "top" a **Drake TR-4**

the optimum Sideband Transceiver

(Sometimes even the MC-4 ends up on the bottom . . .)

Adding an MC-4 Mobile Console, with its excellent wattmeter and built-in speaker, is the only way to improve a Drake TR-4.

BUILT-IN TR-4 FEATURES

- **Full Frequency Coverage** on all amateur bands 10 through 80 meters. No additional crystals required.
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TR-4 SPECIFICATIONS: • **Frequency Coverage:** Full coverage on all amateur bands 10 thru 80 meters, in seven 600 kHz ranges: 3.5 to 4.1 MHz, 7.0 to 7.6 MHz, 13.9 to 14.5 MHz, 21 to 21.6 MHz, 28 to 28.6 MHz, 28.5 to 29.1 MHz, 29.1 to 29.7 MHz. • **Solid State VFO:** Has linear permeability tuning. Tunes 4.9 to 5.5 MHz for all ranges. • **Dial Calibration:** 10 kHz divisions on main tuning dial and 1 kHz divisions on the tuning knob skirt. • **Frequency Stability:** High stability solid state VFO tunes same range on all bands. Drift is 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. • **Misc:** 20 tubes including voltage regulator; two transistors; 8 diodes; 100 kHz crystal calibrator built in; Dimensions: 5½" high, 10¾" wide, 14⅜" deep. Weight: 16 lbs . . . **TRANSMITTER:** • **Single Sideband:** 300 watts P.E.P. input power, VOX or PTT. Two special 9 MHz crystal filters provide upper or lower sideband selection on any band, without the necessity of shifting oscillators. • **CW:** Power input 260 watts. Carrier is shifted approximately 1000 cycles into one sideband, and mixer and driver are keyed. Grid block keying is free from chirps and clicks. Automatic transmit/receive switching when key is operated. CW sidetone oscillator for monitoring. • **AM:** Controlled carrier AM screen modulator is built-in. 260 watts P.E.P. input. Low carrier power increases 6 times to 50 watts output at maximum modulation. This system is compatible with SSB linears. VOX or PTT. Diode detector used for receiving on this mode. Product Detector can be used by switching manually . . . **RECEIVER:** • **Sensitivity:** Less than ½ microvolt for 10 dB S/N • **I. F. Selectivity:** 2.1 kHz at 6 dB, 3.6 kHz at 60 dB. • **Antenna Input:** Nominal 50 ohms. • **Audio Response:** 400 to 2500 cycles at 6 dB. • **Audio Output Power:** 2 watts. • **Impedance:** 4 ohms.

MC-4 SPECIFICATIONS: • **Frequency Coverage:** 1.8-54 MHz • **Line Impedance:** 50 Ohm resistive • **Accuracy:** ± (5% of reading +3 watts) • **Power Capability:** 300 watts forward or reflected • **Controls:** Front panel 2-position switch selects forward or reflected power • **Speaker:** 3" x 5" oval, 2.98 ounce ceramic mag.

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OUR READERS SAY

Progress Isn't Everybody's Bag

Editor, *CQ:*

Sometimes in all of our lives, something rubs us the wrong way. Contrary to how many feel I wish to state the following.

In the April issue of *CQ*, the appointment of W2TUK as ARRL president was announced. This article was so typical of those found in ham magazines today. Push. Push. Push. Progress. Progress. Progress. I did not realize that ham radio was in such a crude state. Transistors, FETs, digital this, mini-that—plug it in and work the world . . . of course on five bands.

For God's sake, maybe some of us *Just happen* to prefer tubes over transistors. Maybe some of us *just happen* to keep ham radio as a hobby rather than a profession, to be lead only by a select few, who do not impress me in the least with their "accomplishments," and seem to think themselves that they are some kind of big deal diety. Maybe some of us *just happen* to not want read-out, broadband, no tuning required, envelope clipping transceivers. Maybe some of us *just happen* to still use cycle, kilocycle and megacycle, etc. I won't even go into how dumb the whole idea of Hertz, kiloHertz and megaHertz, etc is. Maybe some of us *just happen* to regard the higher class licenses in much the same way as we regard any other crutch used to satisfy any screaming egomaniac.

To those toes I have stepped on, I do not mean to be iconoclastic, however not all of us accept your ways either! And to the people belonging to those toes, if you cannot accept an opinion from the other side I do not care if you are ever in my log anyway. One can sit back so long until he wants to say his piece, and as a life-time subscriber of your magazine, I have said mine.

Vern A. Weiss, II, WA9VLK
Kankakee, IL

The Grandfather Clause

Editor, *CQ:*

WBØDRV's drivel ignorance is colossal. The so-called Grandfather Clause specifies April 1917 as the date of qualification, which happens to be 55 years ago, not 25 as he stated.

Many of the OT's have been active hams since the 1920's and are now in their 60's or 70's (years old) and these pioneers of ham radio are now physically unable to pass the code test of the Extra class license because their mind does not operate that fast. That is, they cannot write the test on paper, although most of them can rag chew at 30 to 35 w.p.m. with no strain. These pioneer hams are not asking for any handout, rather they would like to be able to use the frequencies that they have used for the past 45 to 50 years, and now find themselves legislated out of by the FCC.

If the "Grandfather Clause" were set forward to, say, 40 to 45 years ago, some sort of equity might prevail. Who knows, maybe WBØDRV might be a Grandfather someday.

Roger Mace, W6RW
Los Angeles, CA

Auxiliary Police

Editor, *CQ:*

I would like to take this opportunity to thank *CQ* for your continuing interest in the NYC Auxiliary Police. *CQ* has shown this interest by inserting our copy in the Ham Shop each month.

The NYC Auxiliary Police is a community program of defense, safety and security. Each Auxiliary Policemen (A.P.) is trained by the NYCPD in first-aid, self-defense, and other subjects relating to police work. The A.P. wears the uniform of NY's finest and has a numbered metal shield. He patrols his own neighborhood and works with police to make his community safer and more secure. Each S.P. is equipped with a police v.h.f. f.m. walkie talkie to communicate any suspicious activity that he encounters while on patrol. A.P. patrol in pairs and are only required to attend one meeting a week, usually in the evenings from 7-11 P.M.

The NYC Auxiliary Police program is an excellent means for a ham to help his community and receive invaluable police training at the same time. In a short time there will be an Auxiliary Police communications network, requiring many trained radio operators.

The NYC Auxiliary Police is an effective community attack against crime and we would like to commend *CQ* on their civic interest in our program.

Arthur Schur, WB2FJO
Lt. Commanding Officer

P.S.: Seven hams have replied and two have enrolled.

Too Much F.M.?

After reading "Too Much FM?" in your April *CQ*, I would like to say I agree with the writer 100%.

Let's see more homebrew and less repeater and f.m. articles in *CQ*. Not everybody is an f.m. fan, but most hams have at least some interest in inexpensive "how to" articles.

Ray Sims, WN9IZE
Champaign, IL

Radio Control Frequencies

Editor, *CQ:*

Would you kindly remind your readers that the frequencies: 53.10, 53.20, 53.30, 53.40 and 53.50 mHz have been recognized by the FCC to be Radio Control Frequencies for those licensed radio amateurs who engage in remote control of model boats or airplanes.

It seems that interference on these frequencies

[*Continued on page 96*]

Announcements

KL7CDQ, KH6DXG

We are trying to locate T. R. Murray, exKL7-CDQ, exKH6DXG. If anyone knows his whereabouts please have him contact the CQ Editorial Offices.

Stolen Equipment

On Wednesday, March 22, 1972, sometime between 8:00 P.M. and 8:30 A.M. the next morning, the Collins 62 S-1 transverter, serial number 10728, belonging to the MSU Amateur Radio Club (W8SH) was stolen from the ham shack. Anyone with information regarding the whereabouts of the missing equipment is requested to contact the Electrical Engineering Department, Michigan State University, East Lansing, Michigan, or the MSU Department of Public Safety. (Phone 517-355-2221) or your nearest state police post.

On March 29th a 75 meter HW-12A was stolen from the car of Frank L. Wayland, K3-GJL which was parked in front of his home at 374 Hibbs Ave., Glenolden, Pa. 19036. He has a distinctive mark on the unit that he can identify. A reward is offered. Anyone with information please contact Frank directly.

Milwaukee, Wisconsin

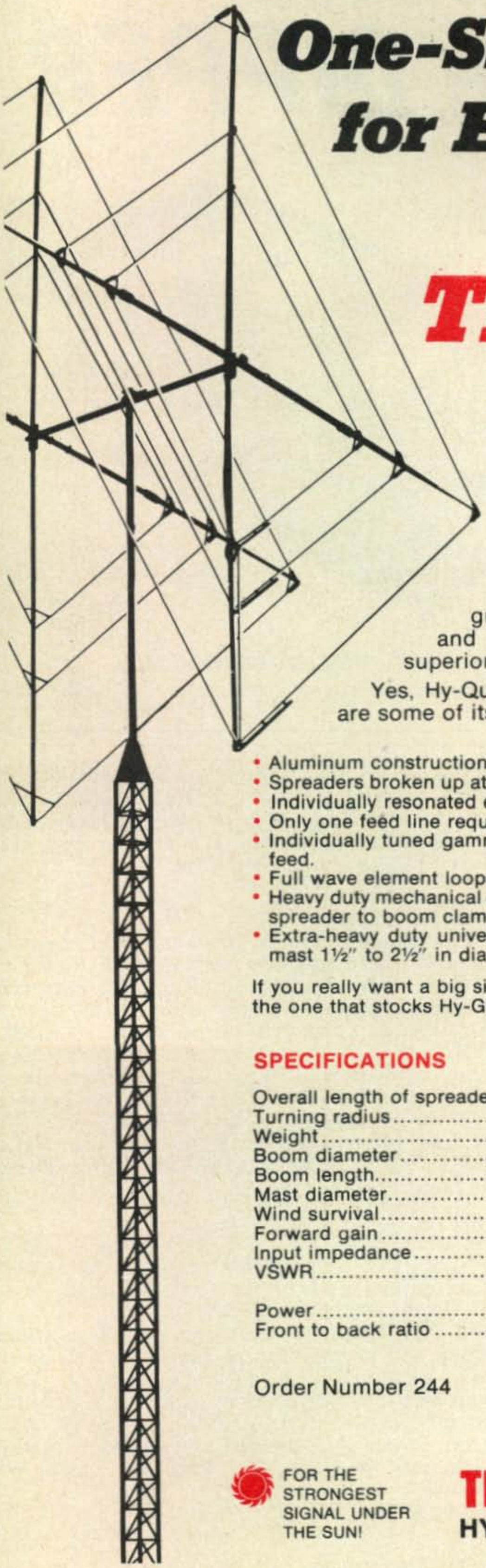
The South Milwaukee Amateur Radio Club will hold it's third annual "Southeastern Wisconsin Swap-Fest" on July 15th, at Shephard Park (American Legion Post 434), 9327 So. Shephard Ave., Oak Creek, Wisconsin. The activities will start at 7:00 A.M. and run until 5:00 or later. There is plenty of parking and a picnic area, as well as hot and cold sandwiches and liquid refreshments available on the grounds. Admission is $1.00 a person, and includes a "Happy-Hour" with free beer and soda. For more information, write to: A.R.S. WB9EQA, William N. LeCourt, 1900 West Kimberly Ave., Milwaukee, Wisconsin 53221.

Chicago, Illinois

Radio Expo '72 will be held at the Lake County Illinois Fairgrounds Saturday & Sunday, July 8 & 9. Free flea market, overnight camping, technical movies and seminars. 50,000 square feet of communication equipment exhibits, many door prizes. Tickets, good both days, $2.00 at the gate, $1.50 in advance, under 12 free. For flyer contact: Radio Expo '72, 230 E. Ontario St., Chicago, Ill. 60611.

Thermopolis, Wyoming

The annual Wyoming Hamfest is being held the third weekend in July, Saturday and Sunday, (15th & 16th) at The Holiday Inn, Thermopolis,



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Yes, Hy-Quad is the only quad that is complete; and here are some of its features:

- Aluminum construction that is made to stay up.
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- Heavy duty mechanical construction of swaged aluminum tubing and die-formed spreader to boom clamps.
- Extra-heavy duty universal boom-to-mast clamp that tilts and mounts on any mast 1½" to 2½" in diameter.

If you really want a big signal, buy one at the best distributor under the sun. He's the one that stocks Hy-Gain.

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Overall length of spreaders	305"
Turning radius	13' 6"
Weight	42 lbs.
Boom diameter	2"
Boom length	8"
Mast diameter	1¼" to 2½"
Wind survival	100 MPH
Forward gain	8.5 db
Input impedance	52 ohms
VSWR	1.2:1 or better at resonance on all bands.
Power	Maximum legal
Front to back ratio	25-35 db depending upon electrical height.

Order Number 244 Ham Net **$129.95**

FOR THE STRONGEST SIGNAL UNDER THE SUN!

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P.O. Box 5407-FG, Lincoln, Nebraska 68505

Wyoming. There will be prizes, a Saturday night banquet, ragchews, MARS meetings, two meter talks etc. Talk-in freq. 3920 and two meters. For early registration contact: Joe Ernst, W7VB, 502 Ryan, Thermopolis, Wyoming 82443.

Chatham, Illinois

The Quad-Co. ARC will sponsor the 15th Annual Hamfest of the "Breakfast Club" on July 15 & 16 at Terry Park, 3/4 mile east of Palmyra, Ill. Mobile talk-in on 3973 kHz. Plenty of activities for the whole family. Pre-registration until July 7th is $1.00; $1.50 at the gate. Write "Hamfest" c/o Quad-Co. ARC, Box 81, Chatham, Ill. 62629.

Ontario, Canada

ONTARS, the Ontario Amateur Radio Service, sponsored by R.S.O. Inc., operates daily, all year, from 7 A.M. to 6 P.M. local time on or about 3775 kHz. It is a public service net for the express purpose of handling traffic, but check-ins from stations without traffic are most welcome. A cordial invitation is extended to American amateurs to use this service.

Jackson, Mississippi

The 1972 Jackson Amateur Radio Club, Inc. Banquet and Hamfest will be held at the Hotel Heidelburg in downtown Jackson. The banquet begins at 7:30 P.M. Saturday, July 29. The price will be $6 per person. The Hamfest begins at 8:30 A.M. Sunday, July 30 in the Heidelburg Victory room. The main prize will be a Tempo I transceiver with a.c. Supply. All events are informal—come as you are. For more information, reservations, or prize tickets write Charles Rogers, WA5FII, Chairman, Jackson Hamfest, P.O. Box 8371, Jackson, Ms. 39204.

Terre Haute, Indiana

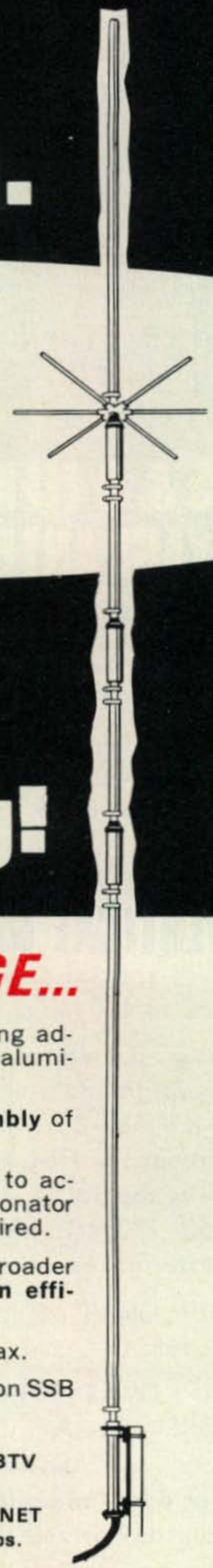
The Wabash Valley Amateur Radio Association will hold its 26th Annual VHF Picnic on Sunday, July 30, at Turkey Run State Park near Marshall, Indiana. Registration at the door is $1.50 each. There will be prizes, bingo for the XYLs, big flea market, and plenty of good ham fellowship. Talk in for the Picnic is on 52.525 and the Terre Haute Radio Club repeater will be in operation on 52.920/52.525. For further information write the Wabash Valley ARA, VHF Picnic Committee, Terre Haute, Indiana.

Oshkosh, Wisconsin

The 1972 Experimental Aircraft Association Convention will be held at Wittman Field, Oshkosh, Wisconsin from July 30 thru Aug. 6th. All flying amateurs are invited to attend. They will be monitoring 146.94 as well as the Wis. s.s.b. net all during the convention. There will be a prize donated by Amateur Electronics Supply which will be for full information on the Convention and the EAA write to Elmer C. Erickson, W9KKK, 455 Birch St., Omro, Wis. 54963.

[*Continued on page 98*]

Everyone has something.



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Q AND A

WILFRED M. SCHERER, W2AEF

SB-220 A.L.C. with Swan 500

QUESTION: Can you give me any information on how to hook up the a.l.c. from the Heath SB-220 Linear Amplifier to a Swan 500? In building a pad to go between the Swan and the 220, do I have to use carbon type non-reactive resistors or can I use wire-wound ones to reduce the 300 watts from the 500 down to 100 watts?

ANSWER: The a.l.c. circuit from the SB-220 may be connected to contact 7 on relay K1 of the Swan. 500/500C. During transmit, this will bridge the SB-220 a.l.c. circuit with that of the 500.

An r.f. pad should be made using non-inductive carbon resistors. You'll have to parallel a lot of them to get the power rating required. A simple method, suggested for another exciter as described in the April Q & A Column, is to reduce the exciter's output by cutting its p.a.-screen voltage in half. This can be done by means of an additional switch and appropriate resistance.

High Gain Signal Tracer

Trouble shooting often can be facilitated through the use of a signal tracer. The following data one such a device with high gain has been submitted by Arvid Evans, K7HKL, 1005 Howard, Boise, Idaho, 83706. Many thanks, Arv, this should be helpful to some of our readers:

"Motorola's data sheet no. DS-9137-R1 says: 'The MC-1306P IC is a monolithic complementary power amplifier and preamplifier designed to deliver 1/2-watt into a loudspeaker with a 3 mv (r.m.s.) typical input.'

Q & A is a free technical assistance program offered by **CQ** to its readers. We ask your cooperation to enable us to assist as many amateurs each month as possible. Always include a self-addressed stamped envelope with your question. Only one question per letter, please. Before writing to ask where a published article appeared, try to find it yourself by consulting the annual indexes of the various amateur magazines. Mail questions to: **CQ** Q & A, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

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Swan's 270B SSB transceiver features: 260 watts P.E.P., flat audio response, a solid state VFO, sideband selector, shifted carrier CW, improved AGC and ALC, outstanding sensitivity—plus its own built-in power supply and loudspeaker.

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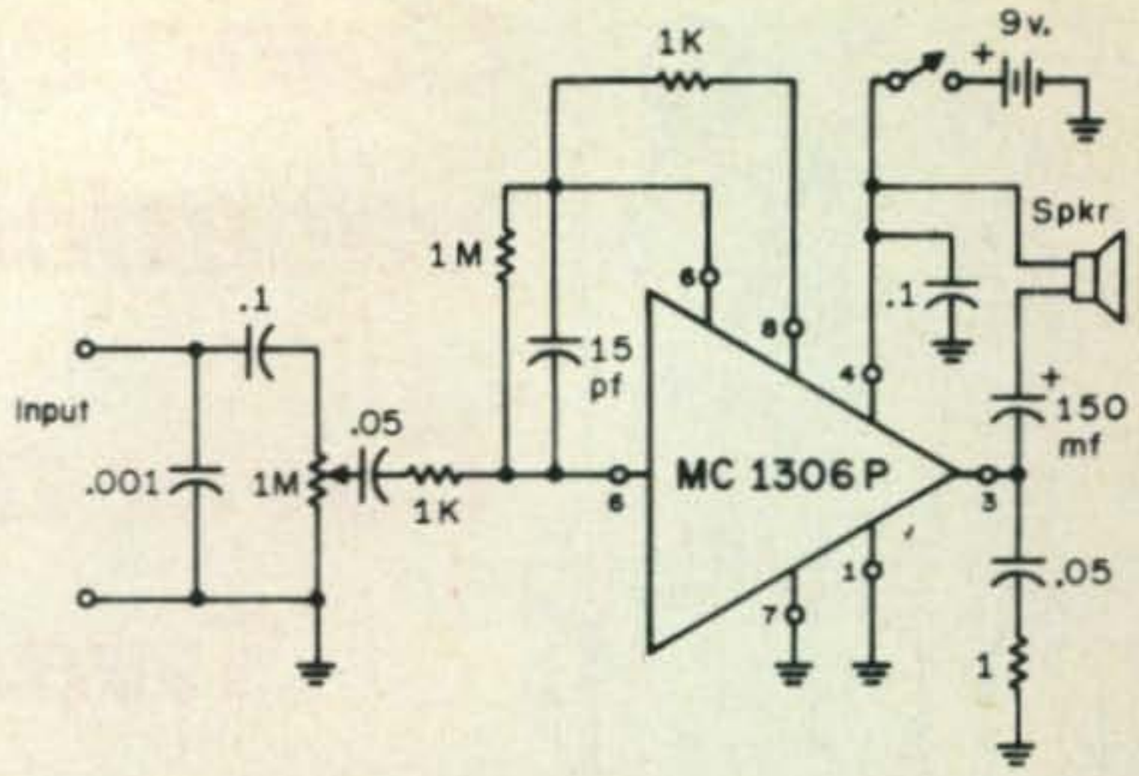


Fig. 1—Circuitry for high-gain signal tracer using a Motorola IC no. MC-1306-P. Input is for a.f. signal. For r.f. tracing of a modulated signal (a.m. or s.s.b.) use a demodulator probe at input.

"The zero-signal current drain with this IC is only 4 ma with a 9-volt supply and the price is only 88¢ in small quantity. If your junk box is like mine, that means the possibility of a high-gain signal tracer for less than $1.00.

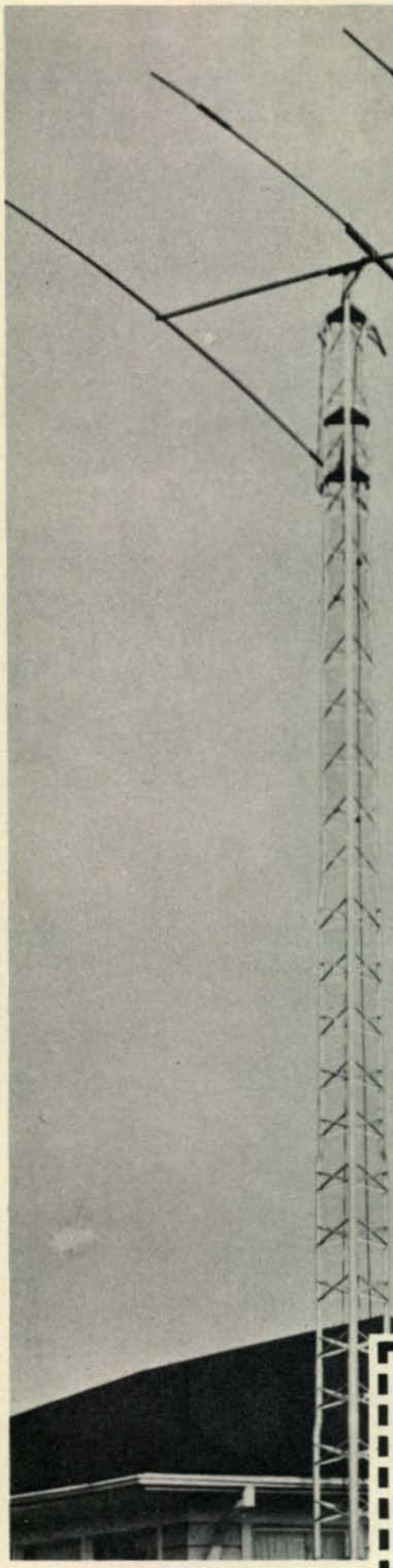
"The circuit I used for this is shown at fig. 1. Do not omit the .001 mf capacitor across the input, otherwise a local BC station will be S-9. For tracing r.f. I use a demodulator probe from my scope or v.t.v.m."

Power Supply Failure in Apache

QUESTION: I am having a problem with the plate supply in my Apache since I inadvertently tuned up with the antenna disconnected and ruined the two 5R4 rectifiers, but did not hurt the 6146's. I tried two more 5R4's, but they arced all over the place before expiring. The resistance of the plate transformer measures about 120 ohms which I don't think indicates any defect there, but there is no voltage on the secondary at all. The schematic says there should be 900 v.a.c. I thus suspect the transformer but want to be sure before getting a new one. Have also noticed that the arcing of the rectifiers has been going on intermittently for several months and the tube socket at pin 8 of one of the rectifiers is burned black. What is your analysis of the problem?

ANSWER: The rectifier-tube failures evidently were coincidental with the unloaded tuneup situation, since the one tube socket was already burned indicating a possible basic failure at the socket. Once a socket has burned black at a pin, it usually will sub-

[*Continued on page 90*]



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Further Enhancing The Yeasu FTDX-560 Transceiver

BY RICHARD A. YOEMANS,* W2DMK

With a minimum of work and expense, the already excellent Yeasu FTDX-560 transceiver can be improved to give more power output, better audio, more receiver gain on 10 and 15 meters, and sharp selectivity for c.w. work without the optional 600 Hz c.w. filter.

THE following modifications to the ever-so-popular Yeasu FTDX-560 transceiver being enjoyed most extensively in ham-dom these days are a matter of individual tastes. Some amateurs may not feel the need for some or all of them, but collectively they improve the already-excellent performance of the rig.

The basic transceiver, dollar-for-dollar, is a terrific value with many extras that would rate an additional charge with many competitive manufacturers. Over all design and construction techniques are excellent, exhibiting many fine features not generally found in the price range of $450.

To be honest, the author was rather apprehensive about modifying the nice shiny piece of gear. The feeling soon passed after the newness began to wear off, about 2 weeks plus or minus a day.

Any modifications had to avoid defiling the overall appearance of the equipment, both inside and out. Doing so would detract from the pride of ownership, and the resaleability of the transceiver.

Areas that were covered in modifications are:

1. Improved h.v. power supply regulation.
2. Output power increased by 28%.
3. Speech amplifier gain improvements.
4. Adding tape recorder take off points.
5. Addition of r.f. preamp for improved 10 and 15 m. performance.
6. Addition of a regenerative filter.

Power Supply Regulation

The h.v. power supply regulation was found to be fairly good considering the varying current demands involved: from 50 ma (static current) to a full load of 550 to 600 ma. Trying to reduce voltage drop under load, we tried paralleling the filter capacitors C_{601}, C_{602} (80 mf at 450v. each) with two 250 mf at 450 v. electrolytics. This increase in capacity was justifiable as the regulation on s.s.b. improved by 6-7%. This proved advantageous as the next modification requires further demands on the h.v. supply.

It should be mentioned if one has a 220 volt line available in the shack it should be used. The modified transceiver draws close to 1000 watts from the a.c. line in the TUNE position. Fortunately, the manufacturer incorporated a tapped 115-230 volt primary on the power transformer, a nice feature.

Power Output Increase

Having had some experience with a variety of sweep tubes over the years including one of the later ones, the 6KD6, we realized the transceiver wasn't seeing its full output potential.

Desiring to increase output power by a profitable percentage and not to just dissipate more input power as heat, we decided to increase the screen voltage to final stage from 150 volts to a regulated 210 volts. This is accomplished by removing the existing +150 volt line from screen grids of 6KD6's and installing two 0B2 voltage regulators on a small aluminum angle bracket mounted on the back of cabinet between the power transformer and r.f. cage, with an appropriate dropping resistor mounted under chassis or on a bracket nearby. Voltage is then taken from the 300 volt source.

*4 Park St., Binghamton, N.Y. 13905

Front view of the modified FTDX-560 shows the c.w. audio filter peak control mounted between the meter and v.f.o. dial. Other filter components are mounted on a small piece of p.c. board behind the panel. At the rear of the cabinet (center) may be seen the two 0B2 voltage regulators mounted on an aluminum bracket. The 0B2's stabilize the new 210 volt screen supply for the power amplifiers.

A stock, fresh-out-of-the box, FTDX-560 will deliver maximum output power between 550 to 600 ma cathode current; beyond this point extra power input to final stage is worthless and could damage the final amplifier tubes. At the rated current the output power into a 50 ohm dummy load is about 270 watts. With the screen grid modification, the maximum output power occurs at 850-900 ma. The efficiency of final stage drops beyond this point. The average output power is increased to approximately 390 watts or by about 28%.

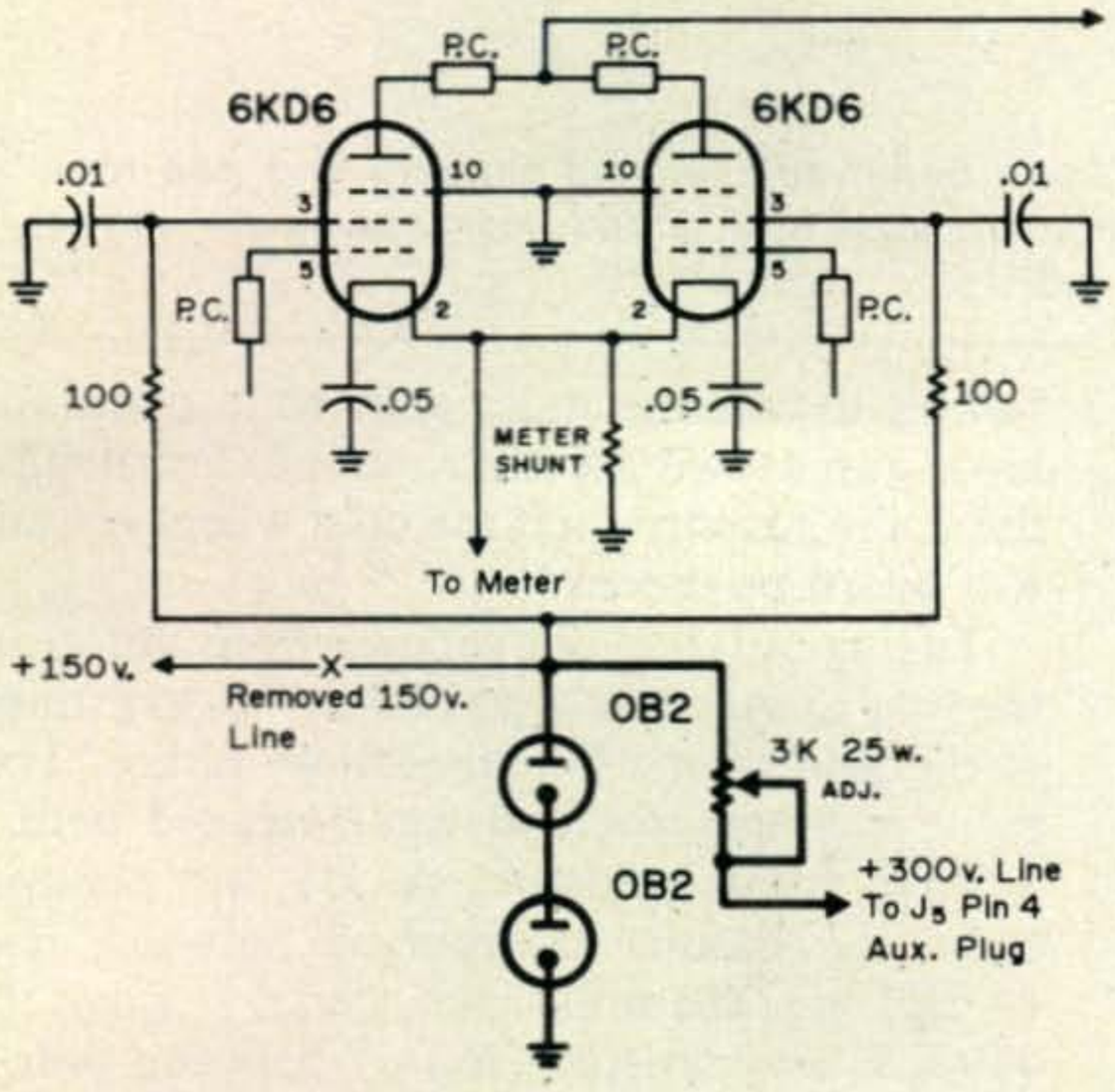

Fig. 1—Modification of the screen supply for the power amplifiers of the FTDX-560 will produce a significant increase in power output. The original unregulated 150 volt screen supply is replaced with 210 volts regulated taken from the transceiver's 300 v. l.v. line. Grid bias is also changed as described in the text.

True, the db difference on an S-meter at some distant spot would not really be too significant, yet the extra talk power of 28% is worth the investment of a little time plus the outlay of approximately 4 bucks.

It was fortunate, too, that the meter reading cathode current to final stage is calibrated to 1 amp.—so no shunting of the meter was required to extend its range.

Attention was paid to the tubes in the r.f. cage to detect any signs of "red plating," but this condition did not exist. RTTY service at this power level is not recommended.

The transceiver has been operated continually for over 30 hours during DX contests both on c.w. and s.s.b. with no apparent signs of overheating. The power transformer shows a slight temperature increase compared to a stock unit. This system has been in use with the original tubes for over 8 months with no decrease in power output.

Another modification must be made in the bias supply after the screen voltage has been increased: R_{513}, a 4.7K 1w. resistor on the power supply diode board should be changed to a 1K 2w. This will bring the bias control in range so proper static current may be obtained at about 1/4 rotation of the pot, or can be fully cut-off if desired. Good linearity is found at a static current of 40 ma.

The selection or choice of the 6KD6 tubes is important. Other than the manufacturer's direct replacement it was found that General E!ectric and Motorola types worked well. Sylvania tubes proved to be bad news. Their overall design was different, employing 2 tubes in parallel in the same envelope and not connected internally. If plugged into a stock FTDX-560 the tubes will not deliver rated power input, and will prove difficult to neutralize. The tube sockets require jumpers to

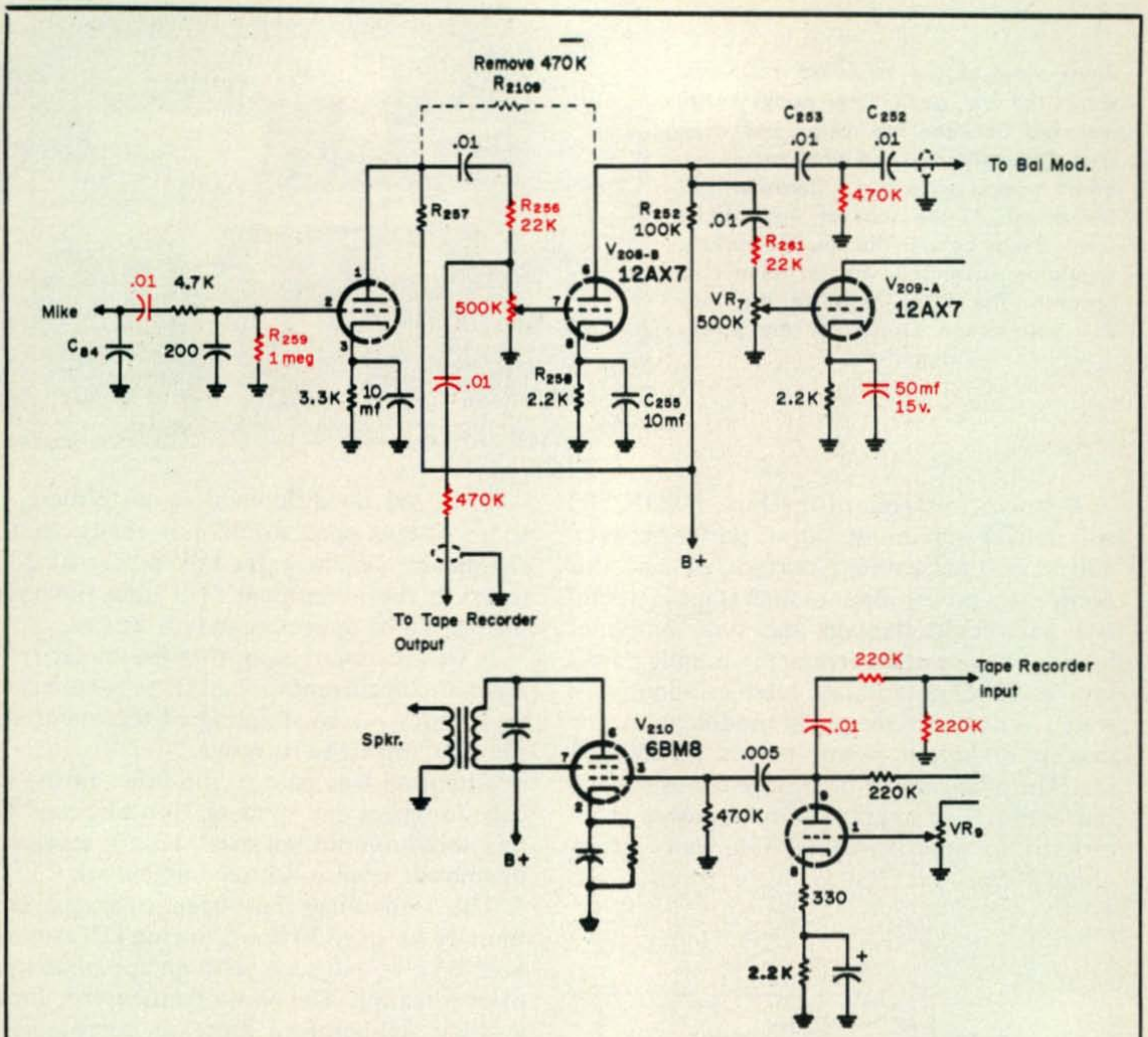

Fig. 2—Changes to the audio circuitry provide more audio gain without clipping and add tape recorder take-off points on receive and transmit. Changed and added components are shown in red.

parallel both sections of the tube. Even after this was done, the tubes were found to be erratic. It is our understanding at this writing that Sylvania has discontinued the design for more than one reason.

Speech Amplifier

It was apparent immediately after putting the transceiver on the air that the speech amplifier lacked sufficient gain. Many microphones were tried with a wide range of output voltages, but to no avail. To talk the plate current to half the recommended tune plate current or 250 to 300 ma was almost impossible. The a.l.c. meter reading was extremely low compared to nominal readings given in the instruction manual.

Prior to purchase, many stations we had chatted with using the 560 complained of having to run the mike gain wide open and having to crowd the microphone. Personally, the audio response left me cold whenever one was heard on the air.

Taking all the above into consideration, the first change made was R_{259} 47K to ground at the grid of the first speech amplifier. This value was too low and was replaced with a 1 meg 1/2w. resistor. A .01 mf ceramic capacitor should be inserted between R_{266} (4.7K) and the mike jack. Next, remove the 470K 1/2w. resistor (R_{2109}) between pins 1 and 6 of 12AX7 speech amplifier. If desired, merely clip one end free from the board. The transceiver was then put on the air and tests made with local ham buddies, along with tape recordings.

Speech quality was much fuller, though it still didn't sound natural. The gain control

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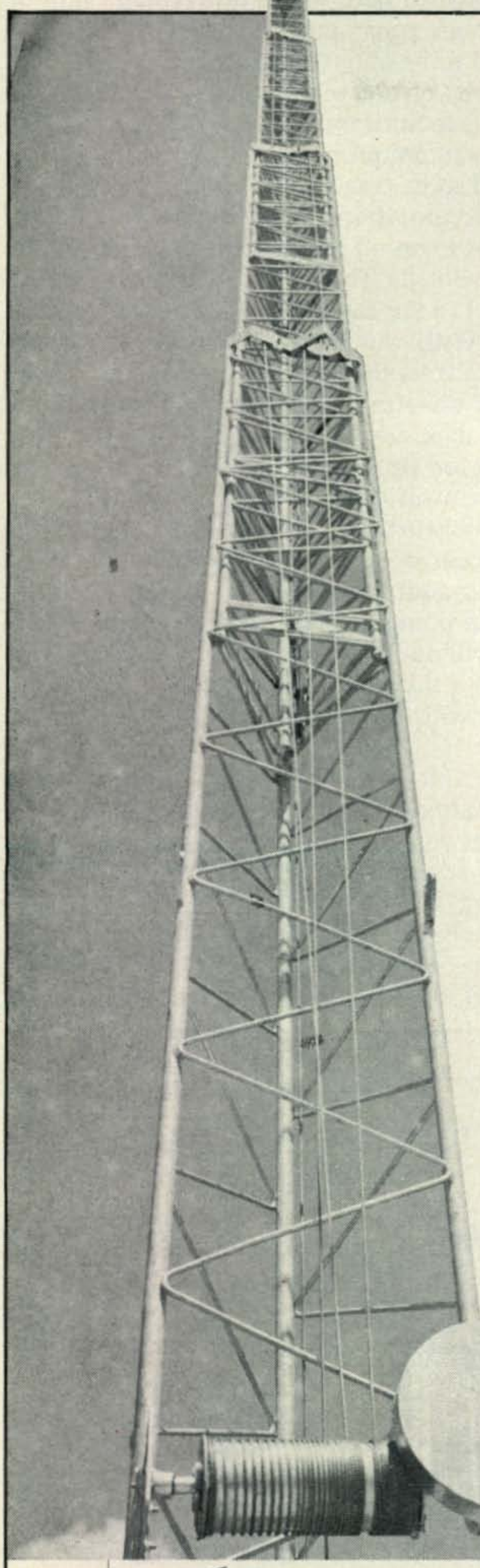

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became more responsive inasmuch as it now could be turned down about half way with proper a.l.c. being indicated. The scope showed an outstanding display of a Christmas tree even when audio gain was turned up to over-drive the final stage.

Hearing the tape recordings and comments, we were far from elated. Further investigation showed that the microphone gain control VR_6 was not at the right location in the speech amplifier. The original circuit employs two stages of audio, then the gain control into the 7360 balanced modulator. This system has always been found by the author to exhibit some clipping. But, running the first and second stages wide open eliminates the need for an extra stage of voltage amplification for proper sensitivity of the circuit. It was decided to make the changes and worry about the vox gain problems later. The mike gain pot was then rewired between first and second speech amp stages as shown in fig. 2. This entailed running two shielded wires from the mike gain pot over the top of the p.c. board to the appropriate points on the board. The green and blue wires are removed from the pot, tied together and then to ground through a 470K 1/2w. resistor.

Prior to on-the-air test, we found that the vox gain had to be run almost full on. R_{256} and R_{261} were then changed from 100K to 22K 1/2w. C_{260} in the cathode of V_{209} vox amplifier was omitted on later production runs, but the p.c. board is drilled and marked for this capacitor. A 50 mf 15 volt electrolytic was installed here which brings stage gain up by a high percentage. The vox gain setting proved to be about same as before any modifications. Note that no vox operation will take place until mike gain is set to at least 3. This was no problem as mike gain setting proved to be best from 5 to 6.

After modifying the speech amplifier, the a.c. line to on-off switch on front panel should be re-routed. The original lead dress runs parallel to the cable harness containing audio lines. With the increased audio gain, hum pick-up from this line is quite apparent on the speech waveform. Also vox will activate at a lower than normal setting. Route the two-conductor zip cord around to bottom of the cabinet away from the printed board.

While working in this immediate area, the idea occurred to tap the speech amplifier and receiver audio stages for direct tape recorder take off points as shown at fig. 2. The values used will not drastically load down the stages to which they are wired. Reproduction is excellent with a medium-priced cassette tape recorder.

The unit was fired up once more with the cooperation of a few local boys. A new set of tapes was run for comparison.

The results were what we had sought. No clipping was detected. The new tapes immediately indicated the improvements. Spontaneous comments from nearby and DX stations indicated the audio was excellent.

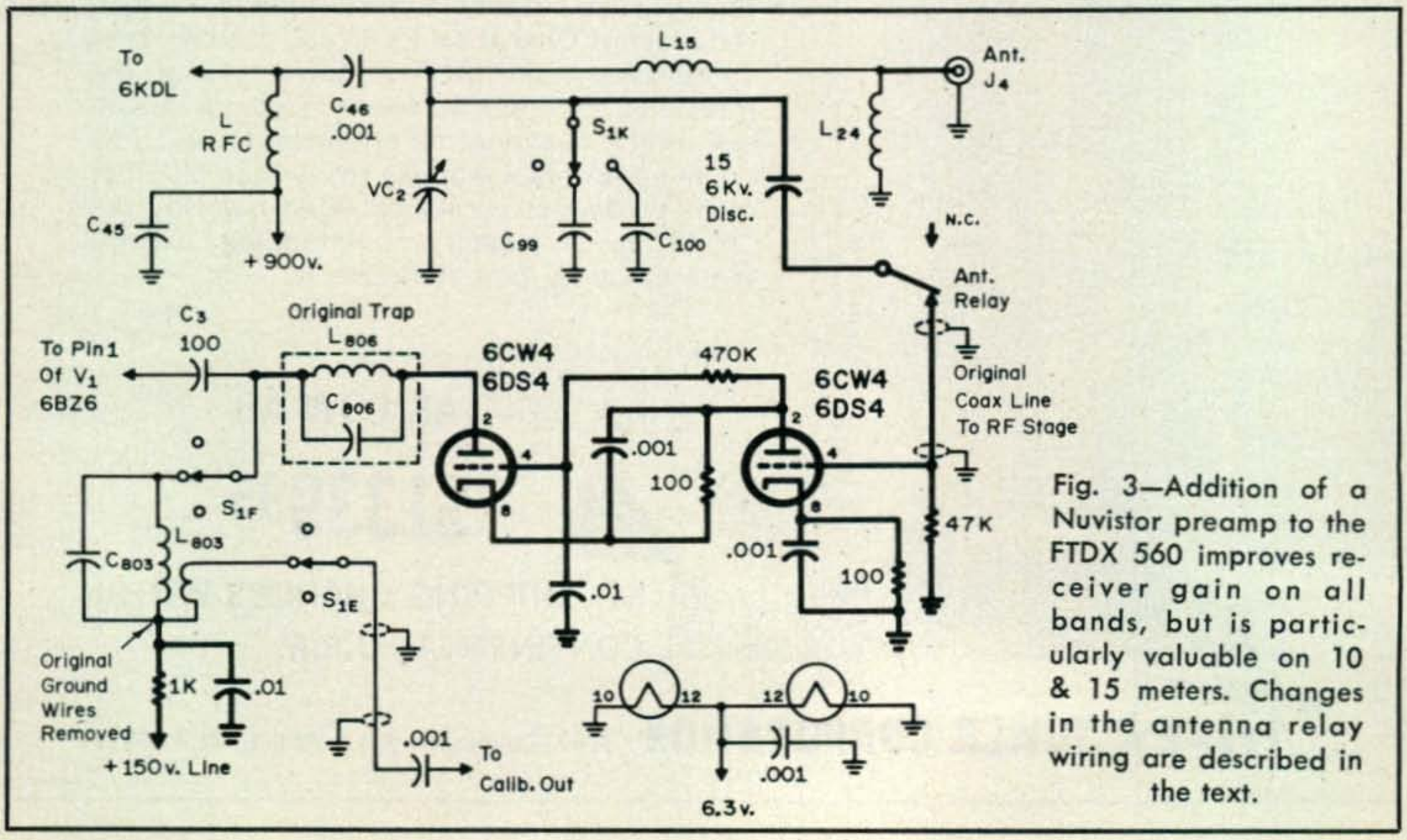

Fig. 3—Addition of a Nuvistor preamp to the FTDX 560 improves receiver gain on all bands, but is particularly valuable on 10 & 15 meters. Changes in the antenna relay wiring are described in the text.

Receiver Preamp

Though the receiver has fairly good sensitivity, over-all, the 10- and 15-meter bands are lacking in sensitivity; not unusual with most receivers or transceivers.

An outboard pre-amp could have been built, but after some deliberation, it was decided to build-in a preamp using a pair of Nuvistors in cascade. To keep it simple, no additional coils or switches are used.

The antenna relay is rewired slightly. The output lead going to J_4 (ant. connector) is directly tied to the output side of tank coil and L_{15}, is completely removed from the transmit side of antenna relay. The receive side is left as is. The armature or pole of the relay is then cleared of any wiring originally tied to J_4. Now place a15 pf 6KV disc capacitor between the relay pole and the wiper of S_{1k} of the bandswitch (keep the leads short).

The Nuvistor preamp is mounted on a small angle bracket. The r.f. coil for 10 mHz WWV, L_{807}, originally occupied this space. L_{807} is brought forward to the front of the receiver r.f. stage shielded compartment. Leads are amply long.

The original yellow coax line from the antenna relay is removed from the wiper of band-switch S_{1e}. Also, the outer braid connection of this same coax line is removed from the r.f. coil printed circuit board. Remove the ground buss at the same point. The outer shield of the coax is then soldered directly to the chassis; the inner conductor is soldered to the grid of first Nuvistor preamp. To the point where the grounds were lifted from the r.f. coil board, a .01 mf 1 kv disc and a 1K 1/2 w. resistor are soldered. The other end of the capacitor is tied to the chassis. The other end of 1K 1/2 w. resistor is soldered to the junction of L_1 (250 μh choke) and C_9 (.01 mf cap.). This in turn furnishes the +150 volts for operation of the preamp. Filament voltage is taken at the 6BZ6 r.f. stage.

Trap coil L_{806} is disconnected from the circuit and its two leads replaced with insulated hook-up wire. One lead goes to the plate on the second 6DS4. The remaining wire is soldered to the wiper of S_{1f}. The coax lead from the crystal calibrator is connected through a .001 mf disc capacitor to S_{1e} wiper.

No signs of instability were found on any band even with no antenna connected to transceiver. Average gain is between 20 to 30 db. This extra gain isn't really any advantage on 80/40 meter bands and if it becomes objectionable shunt L_{801}, and L_{802} with 4.7K 1/2 w. resistors. With short, direct wiring, proper tracking is realized over the full 500 kHz segment of each band. The r.f. coils L_{801} through L_{806} should be re-peaked at the center of each band. It should not be necessary to peak the mixer coils. Trap L_{806} should not require adjustment.

Since the transmitter tank circuit becomes the first tuned circuit of the pre-amp, you can almost load the transceiver by peaking the antenna load and plate tuning while watching the S-meter.

Unfortunately, we are unable to give any correct figures on signal-to-noise ratio or sensitivity, but we *can* hear signals ON 10 and 15 meters that were non-existent before. About five S-units can be realized on these bands, or approximately 30 db. Some noise increase is noticeable. In the event the gain is too great or background rush appears too high, drop the plate voltage to the preamp until the rushing noise subsides somewhat.

Regenerative C.W. Filter

This simple regenerative amplifier stage is well worth the time and slight effort involved.

For those who did not purchase the optional c.w. filter with their unit, this addition is a must if one enjoys c.w. operation, because the s.s.b. filter's band-pass is rather broad for c.w. The regenerative audio filter described has variable gain and produces a single signal effect just prior to oscillation. The circuit was taken from the *Radio Amateur's Handbook* for 1970.

Circuit, it is straight-forward so there is no point to a detailed description of the circuit. Most any audio stage can be made to feed back to produce regeneration. At a point just before oscillation occurs, gain becomes extremely high with a very narrow band-pass. Using a variable control such as a pot, the regeneration and band-pass can be varied as needed.

Figure 4 shows two pots in series at the emitter of the transistor. The one at ground is the coarse range control (10K $^1/_{10}$ w). The second or vernier is part of a d.p.d.t. switch control assembly.

In the original article, it is stated that the filter exhibits a 40 cycle band-width at 800 cycles, which is just fine for c.w. work. The filter is switched between the product detector output and the volume control.

Between +9 and 12 volts are required for the filter. This voltage can be tapped from the +9.1 volt line supplying the v.f.o. It's well regulated and easy to locate at the bottom of the v.f.o. shielded case where the feed-through capacitors are mounted. The whole circuit can be built around the switch and pot assembly if desired, because it uses a minimum of parts.

By removing the manufacturers' emblem between the two front panel windows on the front bezel, (remove two screws), the emblem mounting hole may be reamed or drilled to ¼" diameter to accommodate the shaft of the control. Fortunately, the front panel is used for other models made by the manufacturer, so there exists a 5/16" diameter hole directly behind the emblem. If one can procure miniature 200 ohm control with a d.p.d.t. switch, the task is simple. In our case, we could not, so a small bracket was shaped to mount the control to the front panel.

This pretty well sums up the changes incorporated and it is the author's wish that in some way they will be beneficial to a few members of our fraternity . ■

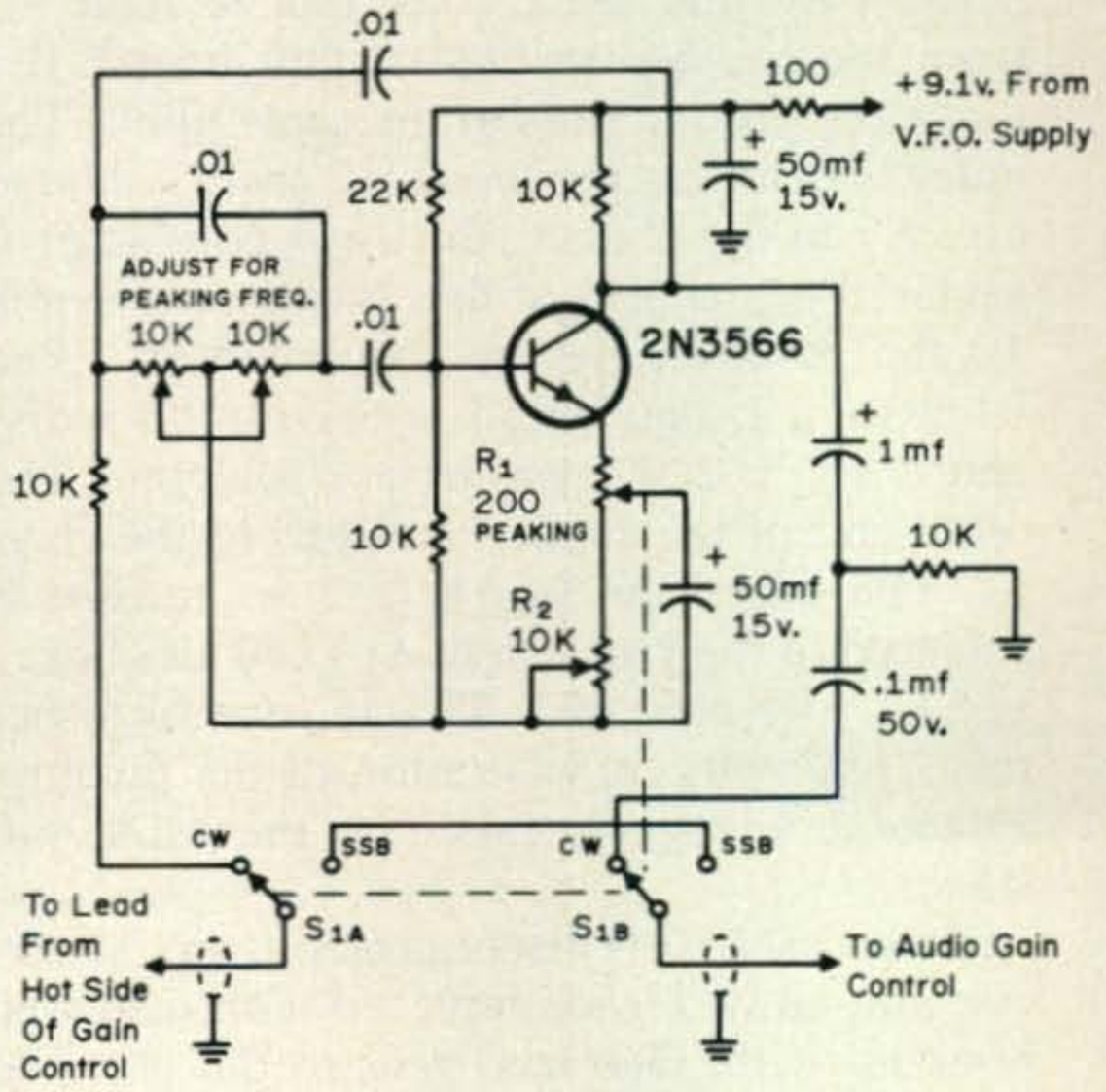

Fig. 4—Regenerative audio filter for c.w. operation with the s.s.b. filter is switched between the product detector and audio gain control. All resistors are 1/2 w. or less; all capacitors are in mf. Construction may be on a small piece of p.c. board mounted near the front panel peaking control R_1 which should be an audio taper pot. Q_1 is not critical and other similar types may be substituted.

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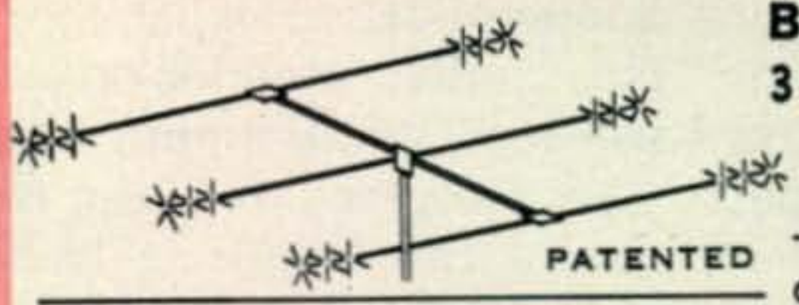

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Bands	10-15-20 Meters
Power Rating	1400 Watts P. E. P.
Total Boom Length	11′
Turning Radius	7′-10″
Total Weight	23 lbs.
Single Feed Line	52 ohm
SWR at Resonance	1.5 to 1.0 max.

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Total Weight	6 lbs.
Height	11′
Single Feed Line	52 ohm
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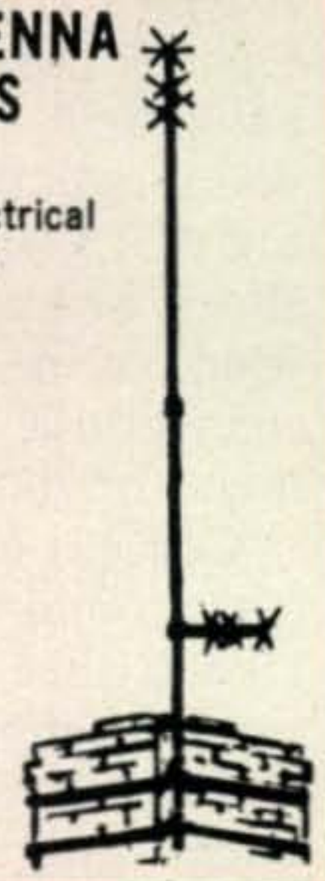

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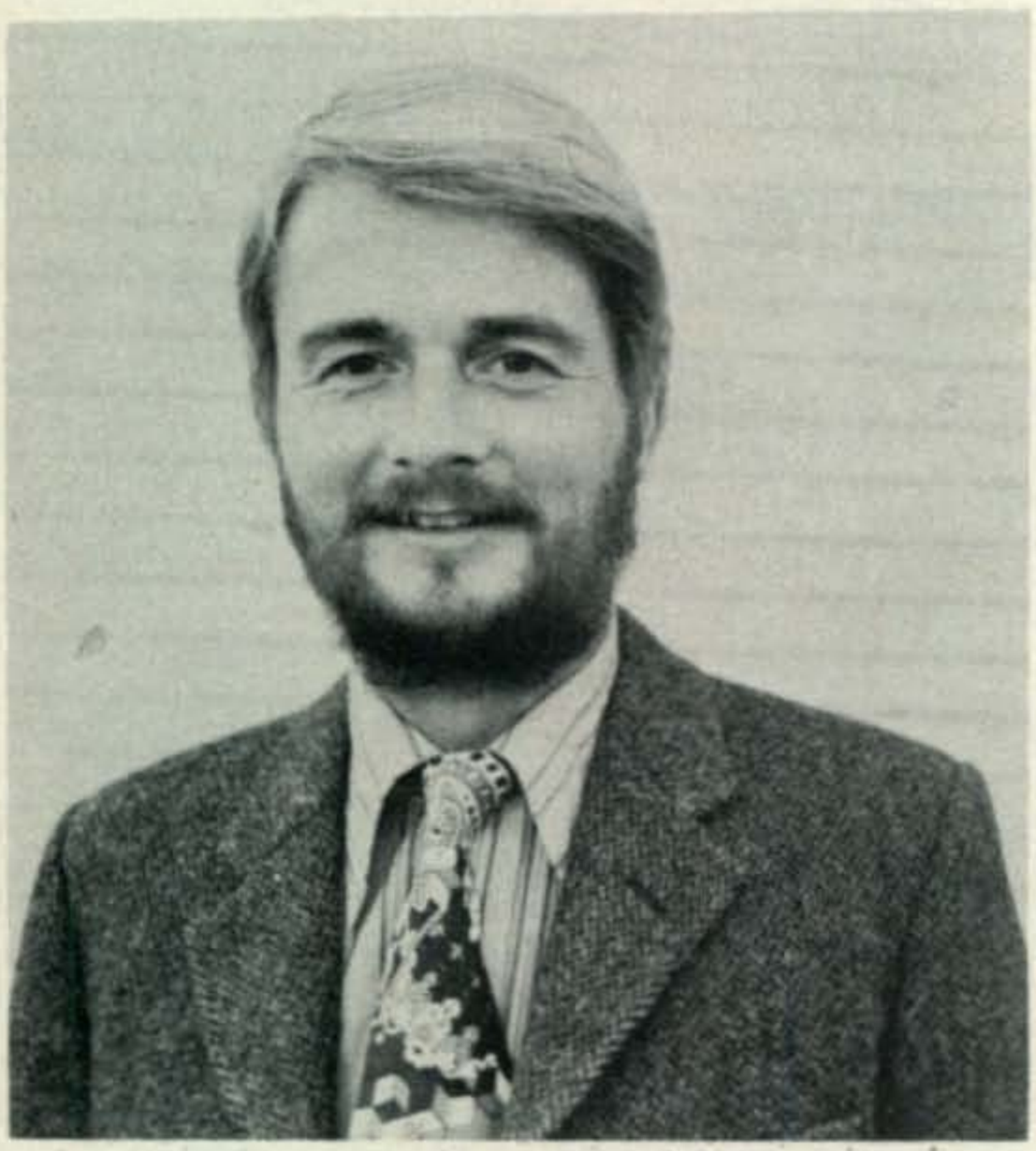
Slow Scan TV

BY COPTHORNE MACDONALD,* WA2FLJ



Cop Macdonald, WA2FLJ

COP MACDONALD, "Mr. SSTV," is the guy who started it all. In 1957, while a student at the University of Kentucky, he became aware that it was technically possible for hams to transmit pictures all over the world with standard h.f. gear. That year he designed the first amateur slow-scan TV system, and the next year was awarded national first prize by the AIEE (now IEEE) for a paper describing the system. During the next ten years he designed equipment, wrote articles, conducted tests, and fought for an FCC rule change to permit SSTV in the h.f. bands. In 1968 the efforts of Cop and a handful of other pioneers were rewarded when the FCC changed the rules to permit SSTV in segments of all bands from 3.5 mHz on up.

Cop has just returned from a 13 month trip around the world with a strong conviction that time is running out for the world's people to grasp the nature and extent of their present predicament. He hopes that amateur SSTV through its audio/visual capability and worldwide spread will prove a help in accomplishing this.

IT's good to see you! If you are currently a slow-scanner, or just interested in finding out something about slow-scan TV, this is the place. Every month we will present an in-depth analysis of some technical topic of major concern to slow-scanners. Our aim is to help you understand what makes slow-scan whistle; help you design, build and operate your own SSTV equipment; and get the most out of your commercial gear.

In addition to each month's technical feature we will have a Q and A section where reader questions of general interest will be answered. You are invited to submit not only your questions, but your comments about which technical topics interest you most, and your own solutions to problems. Are you especially pleased with your new flying-spot scanner optical layout? How about the camera and lighting arrangements in your shack? Have you come upon a monitor modification that keeps your sync locked under conditions of poorer signals and greater QRM? Share your solutions, and please send enough information: sketches with dimensions, schematics with part values, sources of supply for critical items, and photos where they are necessary to help us understand. The primary aim of this column is to present tools that can help you get on the air with SSTV, and make the most of this new communication experience once you're on. This limited column space which you and I will have every month is a precious resource. It is too precious I feel, to fill up with accounts of John working Ivan (which make John and Ivan feel good, but don't help the rest of us much). Periodically I plan to include a list of SSTV nets, but for the most part, operating news will be restricted to those items which help to raise our consciousness of the possibilities of the mode. If you are doing something different and interesting and meaningful on the air with SSTV I *do* want to tell about it here. (This will not only make you feel good but may help us all.)

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

Ham radio has never reached its potential for the kind of mind-expanding communication that is possible when people from different places openly exchange ideas and experiences with each other. Perhaps part of the reason is that we were always dealing with a faceless voice at first. Perhaps, also, we hams were people who *preferred* a little distance in our communication. But "times they are a' changing." In SSTV we have a new dimension in our hardware capabilities — sight. The changing times have also given us many new and pressing reasons to get beneath the patter about Wx, rig, and RST and into sharing bits and pieces of each other's minds — which is what real human communication is all about, isn't it? I hope that we're smart enough, and inwardly free enough, to use this new tool to bring greater depths of people-to-people communication to ham radio. The potential is there.

Basic Principles

What is Slow-scan TV? I have several answers to that question and my choice depends on the technical sophistication of the questioner. To the non-technical person I say that it is a technique for converting pictures into sound, transmitting the sound by ham radio, and converting the received sound back into a *picture*. (This usually brings the response "gee whiz!," "wow!," or "far out!" depending on the generation of the questioner.) To more technical people I answer that SSTV is a narrow-bandwidth image transmission scheme using TV techniques for image pick-up and display, and audio facsimile techniques for transmission. (This usually brings the response of "ohhh" or "mmmm" and a nod of the head. Obviously this reply has no magic in it.)

The narrow bandwidth is not magic either.

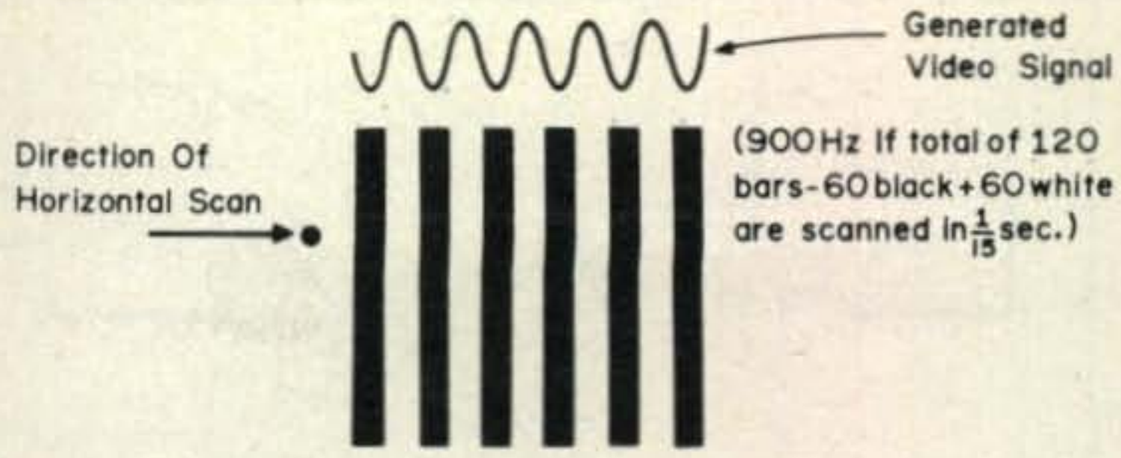


Fig. 1—Maximum video frequency generated is proportional to the number of picture elements and scan rate.

A conventional TV picture contains roughly 250,000 individual picture elements or "dots." Any of these dots may be lighter or darker than the one next to it, and correspond to a positive or negative alternation in the video signal. The relationship of pattern to video for a fine pattern of vertical bars is shown in fig. 1. With the most detailed patterns, each picture element correlates with one alternation, or ½ cycle of the maximum video frequency. In conventional TV, 30 complete pictures are transmitted each second to preserve the illusion of motion. The maximum video frequency is thus approximately $30 \times 250{,}000/2 = 3.75$ mHz.

In amateur slow-scan TV we have a less detailed picture: 120 lines vertically by 120 lines horizontally. Our picture thus has 14,400 picture elements. Instead of scanning 30 pictures per second, we take 8 seconds to scan one picture—⅛ picture per second. The maximum video frequency in SSTV is therefore $\frac{1}{8} \times 14{,}400/2 = 900$ Hz, less than 1 kHz.

This video signal could be transmitted directly were it not for the poor low-frequency response of ham transmitters, and the QSB problem. Since the slow-scan video signal could contain very low frequencies, an audio subcarrier is used. To minimize the effects of QSB and noise, this subcarrier is *frequency*

	Transmission From 60 Hz Areas	Transmission From 50 Hz Areas
Number of Scan Lines	120	120
Picture Width: Picture Height	1:1	1:1
Vertical Scan Direction	Top to Bottom	Top to Bottom
Horizontal Scan Direction	Left to Right	Left to Right
Vertical Scan Time	8 Sec.	7.2 Sec.
Horizontal Sweep Freq.	15 Hz	16.67 Hz
Vert. Sync Burst Duration	30 ms	30 ms
Horiz. Sync Burst Duration	5 ms	5 ms
Sync Subcarrier Freq.	1200 Hz	1200 Hz
Black Subcarrier Freq.	1500 Hz	1500 Hz
White Subcarrier Freq.	2300 Hz	2300 Hz

Fig. 2—SSTV standards.

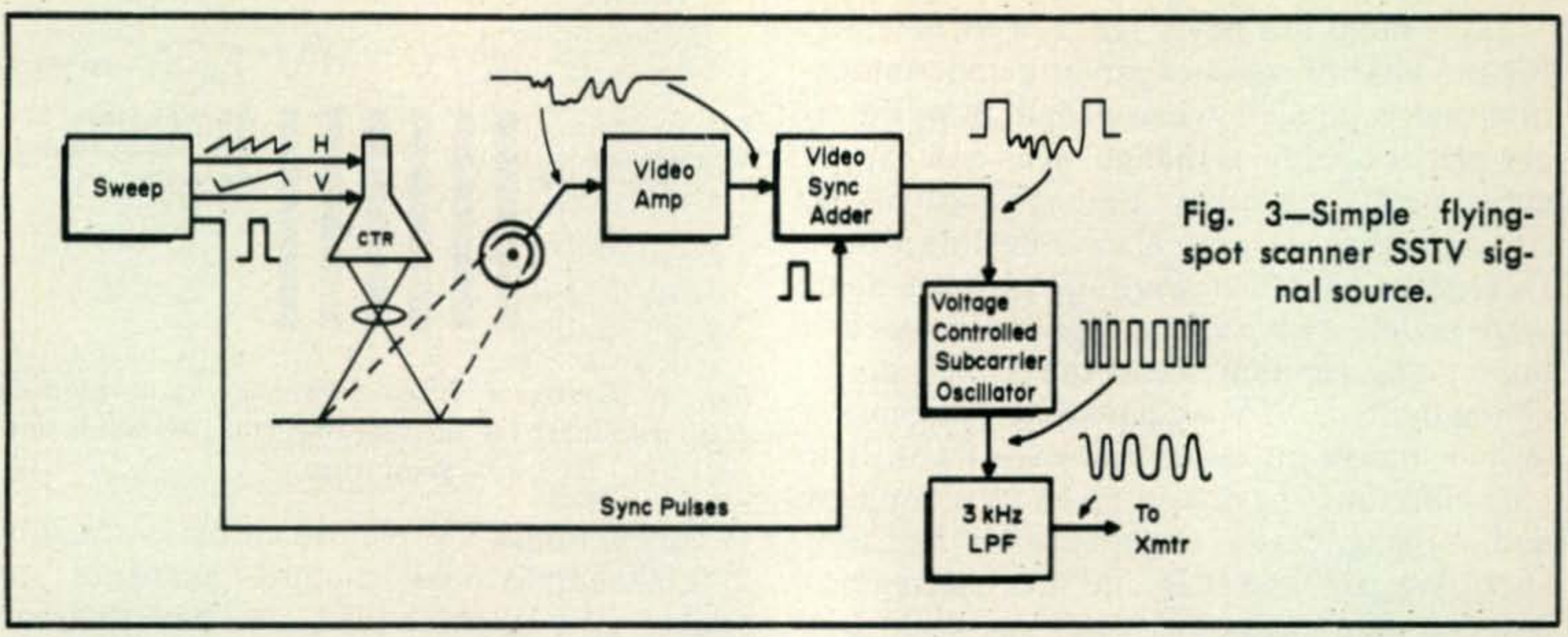


Fig. 3—Simple flying-spot scanner SSTV signal source.

modulated by the 0 to 900 Hz baseband video signal. The slow-scan standards are summarized in fig. 2.

In conventional TV, the eye/brain provides image storage during the 1/30 second between scans. In SSTV some external device is necessary to store the received image. In current amateur practice this storage is provided by the afterglow of a phosphor such as P7, developed for radar display use during World War II. The brightness slowly decays after scanning and the 8 second frame time is about the maximum that is satisfactory. (Even with this frame time the light level in the room must be quite low for good contrast unless some sort of viewing hood is used.) The more sophisticated storage tubes are plagued by poor resolution, poor gray-scale rendition, or high cost—and usually a combination of these. Should there be a cost/performance breakthrough in storage devices, brighter screens and longer frame times would be possible.

Picture Generation

There are several ways to generate SSTV signals. Camera tubes such as the Image Dissector, the Plumbicon, and special slow-scan vidicons can be scanned directly at slow-scan rates. Most conventional vidicons perform poorly when slowly scanned. In a sampling type camera, however, conventional vidicons can produce good quality pictures. In a sampling camera the vidicon is scanned at a rate of approximately 15 frames per second. By proper choice of scan rates and direction of scan, and by sampling and holding individual picture elements in the fast-scan picture, a slow-scan signal can be generated.

The simplest SSTV source is a flying-spot scanner. Such a device is illustrated in fig. 3 The sweep circuits cause a small focused spot on the face of a short persistence phosphor CRT to trace out a slow-scan raster. This moving spot is focused by the lens shown onto an opaque image source such as photograph or drawing. When white areas of the picture are scanned much of the light is reflected. Little light is reflected when black areas are scanned. A portion of the reflected light is intercepted by the multiplier phototube where it produces an output signal proportional to the light intensity. This signal is the 0-00 Hz baseband video signal I men-

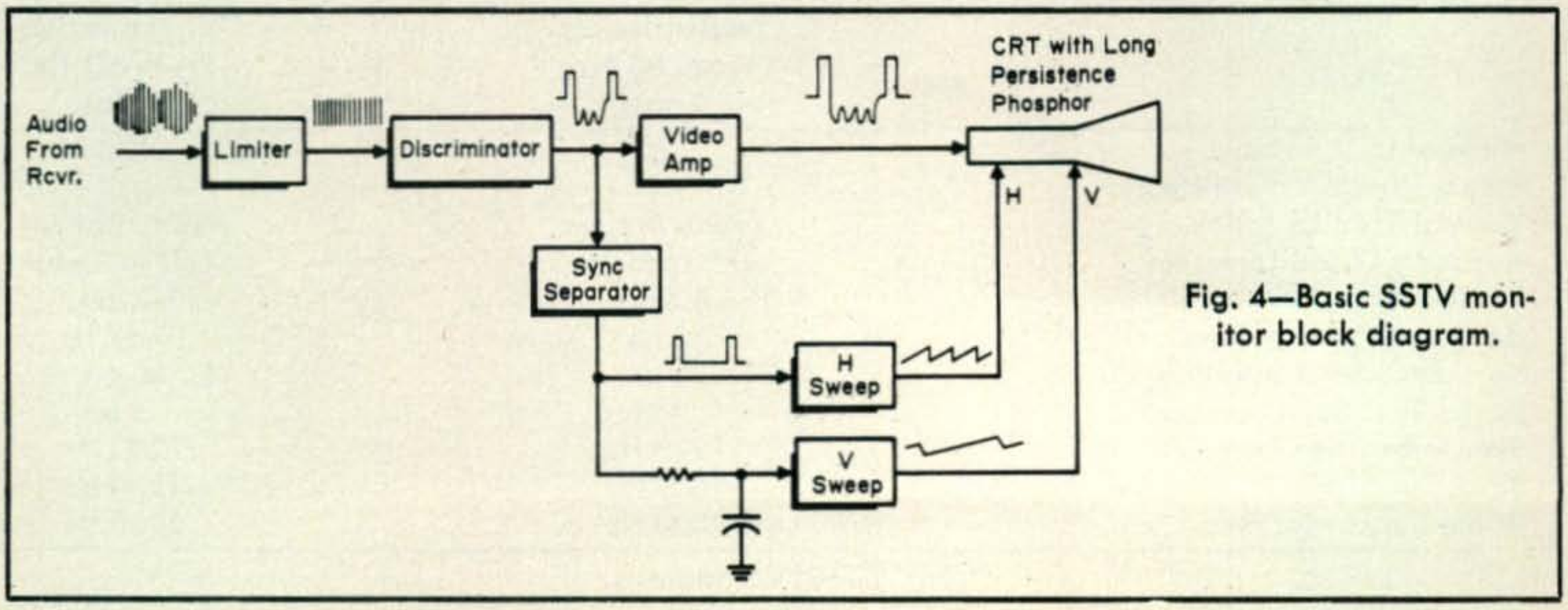


Fig. 4—Basic SSTV monitor block diagram.

Authorized Frequencies For SSTV					Authorized Modes For SSTV		
Band	Extra	Advanced	General	Technician	SSB Xmission of SSTV	Simultaneous SSTV and Voice	AM Xmission of SSTV
3.5	3.800- 3.900	3.825- 3.900	None	None	OK	OK	No
7	7.200- 7.250	7.200- 7.250	None	None	OK	OK	No
14	14.200- 14.275	14.200- 14.275	None	None	OK	OK	No
21	21.250- 21.350	21.275- 21.350	None	None	OK	OK	No
28	28.5 - 29.7	28.5 - 29.7	28.5- 29.7	None	OK	OK	No
50	50.1 - 54.0	50.1 - 54.0	50.1- 54.0	50.1- 54.0	OK	OK	OK
144	144.1 -148.0	144.1 -148.0	144.1-148.0	145.0-147.0	OK	OK	OK

Fig. 5—Summary of FCC SSTV authorizations below 148 mHz.

tioned earlier. Sync pulses—often a "free" by-product of sweep generation—are added to the video. This combined signal is then used to shift the frequency of the audio subcarrier in accordance with the standards. It should be noted that when grey material is scanned, the subcarrier will rest at some frequency between the 1500 and 2300 Hz black and white limits. This is in contrast to RTTY practice where the subcarrier is switched between two selected frequencies and never rests at an in-between frequency. A low-pass filter is used to remove undesired harmonics of the subcarrier frequency. The output signal, a frequency shifted sine-wave audio tone, is fed directly into the audio input of the s.s.b. rig. The final on-the-air signal is a frequency shifted r.f. carrier that is bandwidth limited to less than 3 kHz overall by the sideband filter in the rig. Since the subcarrier *amplitude* does not vary, the transmitter final is subjected to continuous key-down conditions which can result in rapid overheating of tubes and power transformers in many modern rigs. The remedy is reducing power through reduction of drive to the final, reduction of screen grid voltage, or reduced loading, whichever is appropriate in the particular rig.

Picture Reception

The output of the s.s.b. receiver is an approximation of the original slow-scan signal. It is amplitude limited in an audio frequency limiter stage, as shown in the block diagram of fig. 4. The limiter output drives one of several types of frequency discriminator circuits. The discriminator output is a replica of the original 0-900 Hz baseband video signal. Sync is separated from the video in one of several ways; vertical sync being separated from horizontal with an *RC* integrator. The sync signal controls the horizontal and vertical sweep of the long persistence phosphor CRT. The video signal is amplified and used to modulate the electron beam current and thus the brightness.

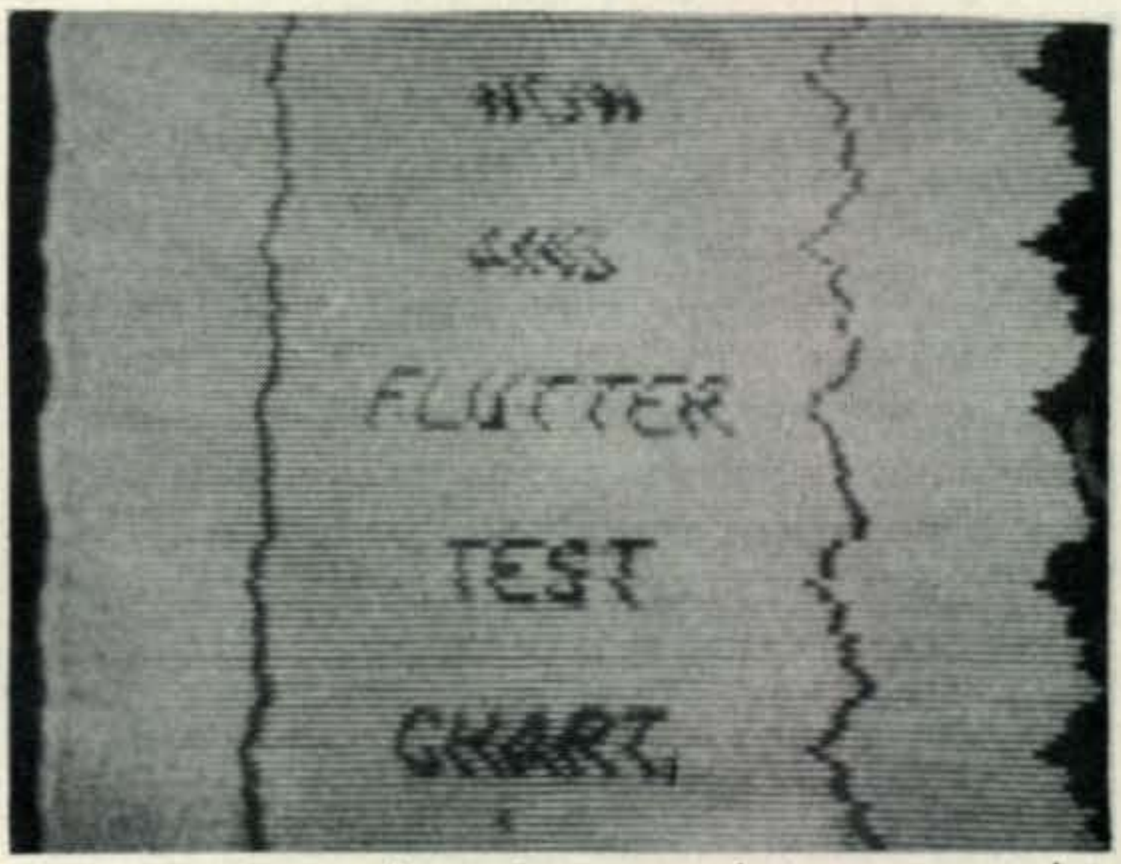
With no QRM, a reasonable received signal level, and freedom from multipath propagation, received pictures can be just as good as if the monitor was connected directly to the video generator. Pictures can be quite useable with moderate QRM, weak signal levels, and lots of multipath.

Q & A

Q. In which bands can a General class ham use SSTV?

A. The SSTV regulations for the bands below 148 mHz are summarized in the table of fig. 5. General class licensees are permitted to operation in portions of the 28, 50, and 144 mHz bands. SSTV is also permitted for all classes of license except Novice on all frequencies in the 220 mHz and higher bands. Note that the transmission of SSTV by an a.m. transmitter (two transmitted SSTV sidebands) is permitted only on 28.5 mHz and above, but that simultaneous transmission of

[*Continued on page 96*]



Extreme picture distortion cause by tape recorder with severe "wow."

F. M.

BY GLEN E. ZOOK,* K9STH/5

If you haven't noticed, there is a different address for this columnist, 410 Lawndale Drive, Richardson, Texas 75080. This due to moving the rigs (and the furniture too) to one of the higher hills in the area (great for v.h.f.). Of course a larger house helped pacify the XYL. The trials and tribulations of house hunting form the basis for this month's tirade.

House Hunting and the Amateur

House hunting whether to buy or rent presents some serious potential problems for the active amateur radio operator. Deed restrictions and local zoning laws may make antenna installation a definite legal battle. Neighbors without outside antennae for TV sets are almost a sure bet for TVI. Of course things like lot size, placement of the house, and ground elevation also enter into the decision.

One of the first things to look for when canvassing a neighborhood for possible purchase is other antennae. Television antennae are the most tolerated by builders and homeowners. In some areas with underground utilities even television antennae visible from the outside are prohibited! If television antennae are seen, then look for amateur and CB antennae. If none are present, then proceed under a yellow warning flag. Some additions allow television antennae but frown on towers and large amateur type antennae. Of course there are legal precedences to get around such restrictions, but why buy a law suit. For example, one addition in which I considered purchasing a house (in another suburb of Dallas) had no less than 28 deed restrictions. Some of these were the usual no junk yards, limiting the minimum size of the houses, outside construction materials, and the like. However, other restrictions spelled out things like "mail boxes and supporting poles and stands shall be of a design approved in writing by the Architectural Committee" (rural delivery area); "Trucks with tonnage in excess of 3/4 tons and any vehicle with painted advertisement shall not be permitted to park overnight on the streets, driveways or otherwise within the Addition at any time" (many company cars have at least the name on the side). Another restriction said that any additions to the structure must be approved. This restriction was interpreted by the developer (also the "Architectural Committee") as including towers and antennae. A telephone conversation with the person revealed that the "Architectural Committee" would approve a tower, but that the neighbors did not like them. Also, amateurs were to be persuaded not to move into the area!

Fortunately such restrictions in the Northern part of Dallas Metropolitan area are at a minimum. However, such may not be the case in other areas. The trick is finding out just what the deed restrictions and zone regulations say about the property. The seller should have a copy of the restrictions attached to his deed. If the area is a new development the sales personnel should have the information. If not, then a call or trip to the city or county engineers office can usually turn up the restrictions. This office can also provide information on zoning and other requirements for towers and similar supporting structures. Also, a talk with the developer of the area can be highly enlightening.

Sometimes there is a need to make an offer on a certain piece of property and the deed and zoning information is not available. In that case a clause should be inserted into the contract which will allow return of the deposit and rescinding of the contract if there exist anything which may limit towers, antennae, and the like. The clause which I used was looked at and slightly modified by "Skip" Reymann, W5SWY, for inclusion in this column. Since he is not only an active amateur (on v.h.f. mostly), Skip is also the legal council for AMSAT, thus active in many facets of the law and amateur radio. This clause can be copied and kept on hand until needed.

"If there exist any conditions, limitations, covenants, regulations, or restrictions of any type applicable to the property which is the subject of this contract, which might prevent or restrict purchaser from pursuing his hobby of amateur radio, including, but not limited to erection of antennae and antennae supporting structures and towers, purchaser may at his option rescind this contract, and any funds paid by purchaser shall be returned except as otherwise expressly agreed in writing". Long and legal sounding, but may help save many dollars in the long run.

Of course the statement can be used in rental and lease agreements. Just change "purchaser" to lessee or tenant where necessary. Also, always consult a good attorney if you have any questions. If your attorney just happens to be a fellow amateur, all the better, for he already understands your problem.

Well, quite a bit of space was taken by this house hunting tirade, but since buying a house is probably the largest single outlay of cash an amateur makes in his lifetime, it is worth some preparation.

*410 Lawndale Drive, Richardson, Texas 75080.

Technical Talk

Even though numerous types of equipment are available ready to go for the amateur v.h.f f.m. bands, many f.m'ers are still purchasing retired commercial gear. Although some of the equipment shows little effects of usage, most require some level of reworking either electrically or physically. The electrical portion of getting a unit going has been covered at great length before. However, nothing has appeared in the column about serious physical reworking of the equipment. Thus, this month's "Technical Talk" will cover the physical reconditioning of equipment.

When a unit is obtained it usually is covered with several layers of dirt, grime, and other materials. Paint is scratched or gone from years of hard use, and corrosion or rust is almost always present at one or more places. Cables and wiring may have cracked, frayed, or crystallized insulation. Sockets and connectors may be loose and relays in need of burnishing. Making the unit look good again may seem just too much to ask. Well, it is not that hard. Of course this columnist is involved in this type of efforts every day, but, the items required to do a good job of making a unit look good can be found around any house.

The first thing is to get rid of the dirt and grime. Don't be afraid of water. If handled correctly use of water and water based solvents will do less damage than any other method of cleaning. If steam cleaning is available use it. For example Motrac and Micor units are cleaned every day with 100 pounds pressure steam with no damage! Use a good, but mild detergent. Some dishwashing solutions may just do the trick. If steam cleaning is not available (you did stop by the neighborhood car wash!) then a couple of trips through the XYL's dishwasher are in order (while she is out shopping, of course). If a dishwasher is not available the unit can be cleaned with a sprayer attachment on the garden hose. Pull the tubes from the sockets and remove relay covers and the like before cleaning. Make two or three passes if necessary to get the unit clean. This is especially true of tube-type receivers in the area surrounding the audio output tube.

Next, the unit must be dried. Commercially we dry the equipment at 180 degrees F for 8 hours with a circular air flow. Since up to 20 units are dried at one time a large oven is required and one was specially built for the job. However, the amateur cannot justify the expense for just one radio! Thus, the kitchen oven must suffice. Just set the oven temperature for about 180° F, set in the unit, and prop open the door about an inch or two to allow the moisture to easily escape. Usually the unit can be left right side up, allowing large concentrations of moisture to run out the bottom of the i.f. cans, etc. Keep an eye on things and turn the unit if necessary. It will take from 2 to 6 hours to dry a tube-type unit. Solid state units usually take a bit less time.

After the unit is dry, inspect the wiring and replace badly frayed or crystallized sections. Clean relays and tube sockets with a good tuner cleaner or similar solvent. Burnish the relay contacts if pitted. Corroded chassis areas may be attacked with emery paper or a stainless steel wire brush. After removing the corrosion, spray with clear Krylon or similar lacquer. Depending on individual tastes the panel and case can either be removed and refinished or done while on the unit. However, it is usually best to remove the panel and case to do a good job.

Finally replace the tubes, install crystals, and smoke test.

Plastic cases can be refinished by cleaning with a water based cleaner and sprayed with clear Krylon. This makes cases look almost new. Recessed lettering can be redone with artists' water colors. These colors come in a thick, paste-like form in a tube. The paint can be put on with the fingers and wiped off with a clean, soft cloth. The paint remaining in the letters can be covered with Krylon to keep it put.

Control heads and microphones can be repainted and bad wiring repaired. Coiled cords on microphones are often stretched and will not have much spring left. This can be overcome by an old field trick. Simply rewind the cord back on itself. That is, reverse the direction of each turn. You will have to let the microphone dangle if it is attached to the control head and start at the control head end. However, it really works, and can be done several times before the cord must be replaced.

Power connectors can be made tight again by turning the male portions slightly with a pair of pliers. Just a slight twist will make connections tight again. Also, cleaning of the female portions helps quite a bit. Pin connectors on the control head end can be tightened up by slightly flattening. This makes for a more secure physical connection to the pin jacks on the rear of the control head.

Dryed out speakers can be loosened up at times by the application of a silicone spray. Rips and tears can be mended with rubber cement. Grille cloth can be replaced with scraps from the XYL's sewing.

Dry transfers or decals can be used to relabel controls or the paint fill-in technique can be used. Pilot lamps should be replaced as should fuses. Power connectors to the battery should be replaced or cleaned. Antenna connectors can be brushed or cleaned in one of the various silver dipping cleaners (dip in and wash off immediately). Fuse connectors should be cleaned (figure out what 1/4 ohm at 30 amps does to the voltage at the unit).

Other little tricks will show themselves as cleaning progresses. Just remember, don't be

LOCATION	CALL	PRIMARY Input	PRIMARY Output	SECONDARY Input	SECONDARY Output	TONE	AUTO PATCH	OPR. TIME	NOTES
ALABAMA									
Phoenix City L	WB4QFR	146.280	146.880			1800			
CALIFORNIA									
Redwood City C	K6QFO	147.310	145.490	51.900	51.350	18005			
FLORIDA									
Panama City L	WB4QER	146.340	146.760			2000	X		
ILLINOIS									
Batavia D	WA9WVA	146.040	146.580						
Chicago D	WA9DZO	146.100	146.850						
Chicago D	WA9ORC	146.160	146.760						
Elgin D		146.190	146.790						
Genoa D	WB9ADW	146.130	146.730						
Hinsdale L	WB9INL	146.730	146.010			2000	X		9,24
Joliet D	WA9EAT	146.280	146.987						
Oak Lawn D	WA9EAE	146.460	146.880			2000	X		9
Waukeagan D	WA9LIV	145.950	146.550						
INDIANA									
Evansville C	W9ZPP	52.920	52.575						
Schereville D	WB9ADO	146.400	146.910						
MASSACHUSETTS									
Boston L		146.010	146.610						
Salem L	W1RJS	146.280	146.880						
Waltham L	WA1KGS	146.040	146.640						
Weston L	WA1KHB	146.220	146.820						
MARYLAND									
Baltimore L	WA3DZD	146.160	146.760	146.340					
Baltimore L	WA3DZD	146.220	146.820						
Cheverly L	WA3KWG	146.010	146.610				X		9
Frederick L	W3IJF	146.130	146.730						
Rockville L	WA3EWJ	146.040	146.640						
Salisbury L	WA3KWE	146.220	146.820						
Wheaton L	WA3PVP	146.070	146.670						
Harve de Grace D	WA3PPN	146.250	146.850						
MICHIGAN									
Interlochan C	WB8CQQ	146.340	146.940						
NEW HAMPSHIRE									
Derry L	K1MNS	146.250	146.850						
TENNESSEE									
Memphis C	K4BN	146.340	146.940						
TEXAS									
Houston C	WA5YTZ	146.220	146.820					X	
Longview C	WA5LDL	146.340	146.940						
Longview C	WA5YVP	146.280	146.880						
VIRGINIA									
Manassas L		146.370	146.970						
WEST VIRGINIA									
Parkersburg C	WB8CRO	146.040	146.640					X	
WISCONSIN									
Milwaukee L	W9VZR	29.440	29.600			2100			
—									
ALBERTA									
Calgary L		146.340	146.940						

Update of Repeater Directory Information.

afraid to clean the unit. In the long run a clean unit will last much longer than a dirty one, with less problems, too!

As a bit of personal protection, units commercially reconditioned by the author's company have new cables, mic cords, etc. The tricks outlined are for amateur use in making the units look good again, not for serious commercial operations.

Repeater Update

Since the publishing of the first Repeater Directory in the March, 1972, issue, many additional reports have been received. Most of these reports have come from areas which did not report the first "go round." A few made corrections or changes to the initial listing. Format is identical to the March listing, with coding, placement, etc. remaining constant.

Q & A

Q. When I release my mic button after transmitting sometimes I get a squelch burst. Why?

A. There are two possibilities. The first is that you are hearing the tail of the repeater which you are using. This is due to a time lag after you stop transmitting and when the repeater stops transmitting. If the burst is heard while working simplex, then the problem may be due to the receiver coming on before the transmitter shuts down. In equipment using relay switching this can be caused by dirty, pitted contacts or by the contacts being out of alignment. Cleaning and readjustment is the cure.

Q. Since shortened antennae are supposed to be poorer than full sized ones how come I see so many loaded low band whips?

A. Theoretically a full sized antennae is better than a physically short one. However, performance of a mobile antenna is greatly affected by its placement on the vehicle. The top of the vehicle is usually considered the best place and a bumper the worst, with other places in between. Since most low band whips, including 6 and 10 meter amateur bands, are too long to mount on top the vehicle they are mounted on the rear fender or bumper. This makes the antenna much more directional and greatly affects the input impedance. On the other hand, the performance of a loaded antenna (provided it is not extremely shortened) placed in the center of the roof is sufficiently greater to overcome the inheritant losses of the loaded design.

Q. I am thinking of getting on 220 mHz, but won't I cause a lot of TVI to Channel 13?

A. You may have some trouble with TVI, but it has been my experience on 220 mHz that the problem is the other way around. TV oscillators and birdies cause much more interference to amateur receivers than do amateur transmitters to television receivers. This is one case where you can usually complain to your neighbors!

Finale'

Photographs are at a low again as is news. Of course the summer weather has everyone outside, not writing and taking pictures. However, the good weather is time to get going on those repeater repairs. So, just take along a camera and shoot a few. Remember the new address when writing. Also, please put your return address on the letter. I have several questions waiting for an answer, but no return address! Also, SASE hurries things up a bit. Best of luck and see you in August. ■

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CQ Reviews: Tempo 1002-3 2M Amplifier

BY GLEN E ZOOK,* K9STH/5

THE rising popularity of the relatively low powered 2 meter solid-state f.m. transceiver has presented problems in some areas due to the low power output of the unit. Often the receiver hears the repeater and direct stations much farther than the transmitter can work them. Thus a rising need for higher power has come about. This market need has been met by several manufacturers. One of those manfacturers is TPL Communications, Inc., who build the Tempo line of v.h.f. f.m. power amplifiers. These amplifiers, marketed by Henry Radio of Los Angeles, come in various power levels. A sample of the Tempo 1002-3 120 watt class amplifier was obtained and run through its paces. Basically the amplifier is rated at 120 watts output with a 10 watt input signal at 13.8 v.d.c. A sensing circuit is provided to automatically switch the amplifier in and out during transmit and receive cycles.

Technical Details

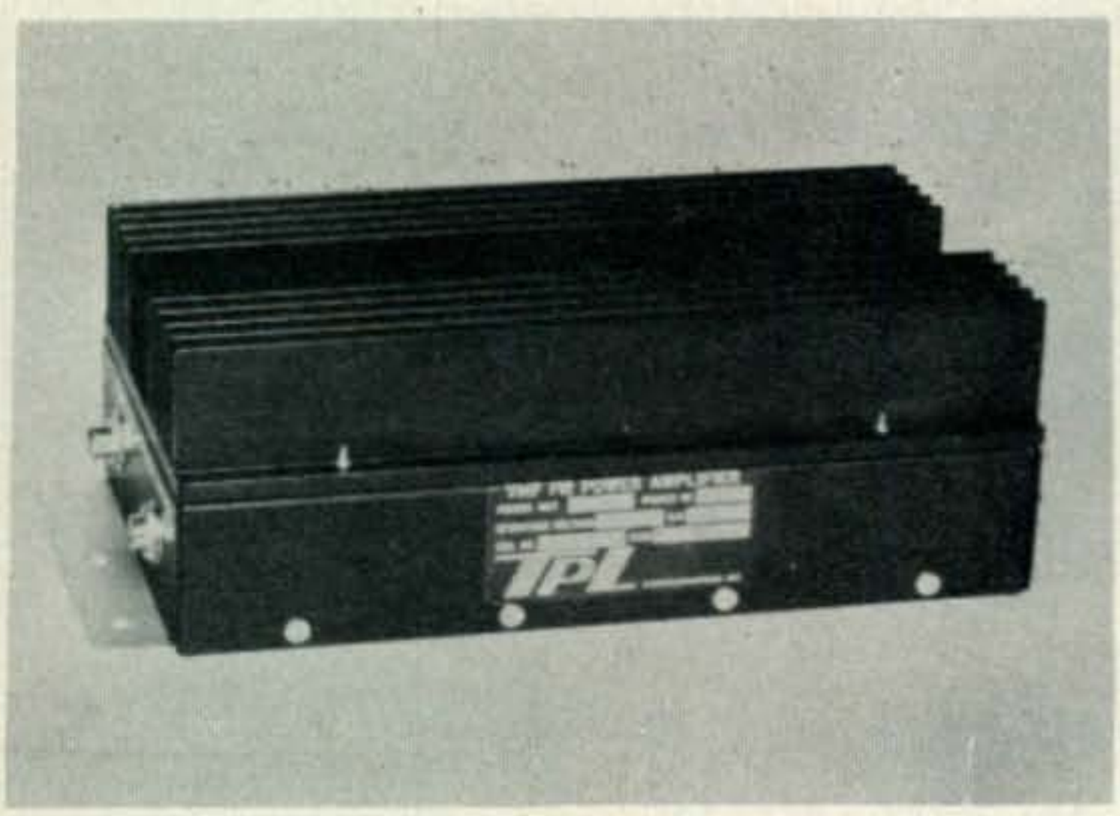
The Tempo 1002-3 amplifier is fully solid-state, 2 stage, class C, power amplifier designed for operation in the amateur 2-meter band. Construction is on epoxy board material. Basically the unit consists of a single TRW PT8780 transistor driving three similar transistors. Driving power (from 2 to 25 watts) is applied through a tuned circuit to the base of the driver transistor. A sampling circuit consisting of a 1N34 diode and a 2N2222 transistor control switching of the amplifier in and out of the line. During receive operations the driving unit is connected directly to the antenna. When the driving unit is keyed, a sampling circuit applies a low level r.f. to the 1N34, which, in turn, turns on the 2N2222. The 2N2222 then pulls in the relay used to switch the amplifier in and out of the line. Although it sounds a bit complicated, all takes place in a fraction of a second.

One thing which may be noted by amateurs not familiar with v.h.f. printed circuit board techniques is the absence of coils in the Tempo 1002-3. This is due to the fact that the inductors are laid out as part of the circuit board itself. This is a form of "strip-line" construction which is very effective at v.h.f. Plenty of v.h.f. bypass capacitors are used to keep the amplifier stable.

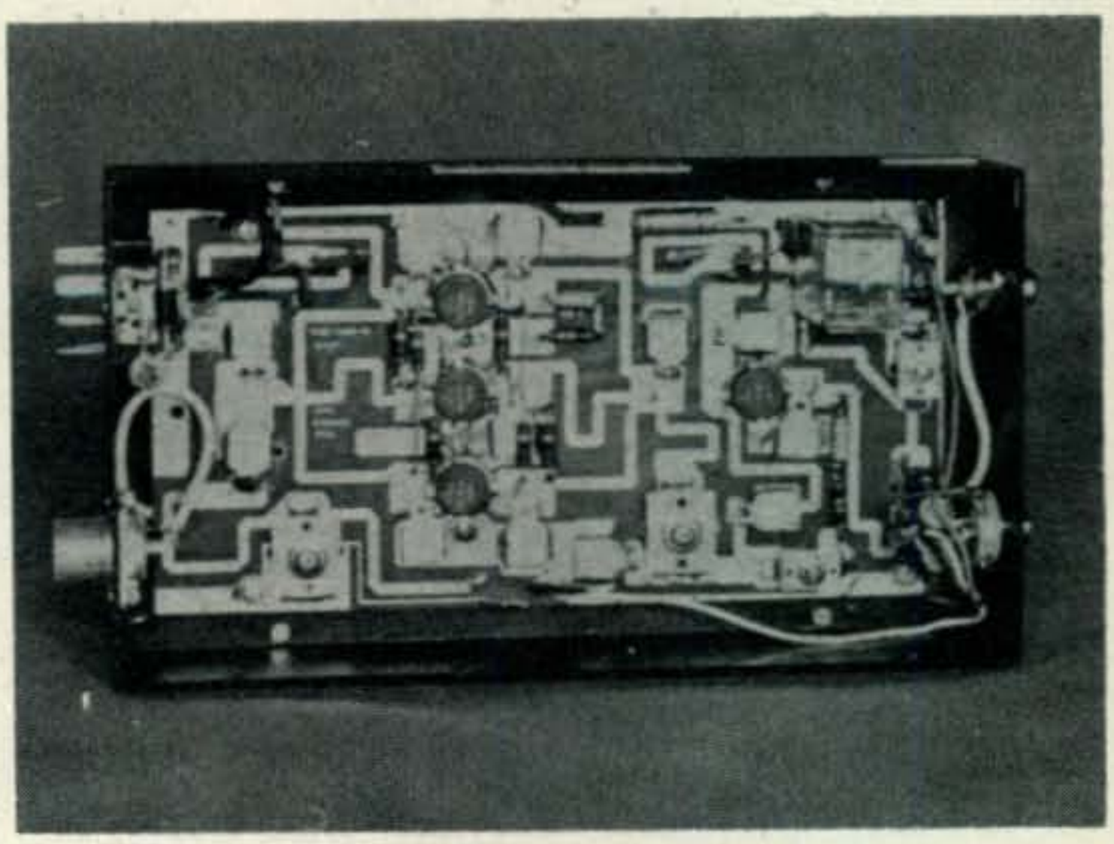
Specifications and Performance

The Tempo 1002-3 amplifier was tried out using two different exciters. The first was a Motorola H33FFN1141 5 watt output handi-talkie (actual measured output 5.5 watts into

*FM Editor, *CQ*.



The Tempo class C f.m. power amplifiers are all similar in appearance. The 10 watt drive input/120 watt output unit reviewed is pictured here.



Board layout of the Tempo amplifier is quite attractive. Note inductors laid out on the epoxy circuit board and generous use of v.h.f. bypass capacitors.

Tempo 1002-3 Amplifier

GENERAL SPECIFICATIONS:

Size: 9⅜" × 4½" × 3"

Power Requirements:
15-17 amps, 13.8 v.d.c.

OPERATION:	*Claimed*	*Achieved*
5 w. drive	100 w. output	105 w. output
10 w. drive	120 w. output	128 w. output
25 w. drive	130 w. output	not checked

Bird 6154 wattmeter). With this drive the output of the 1002-3 was about 105 watts out or about 12 db gain (almost 13, in fact). The attenuation on receiving due to the extra antenna switching was less than 1 db. The second exciter used was a Ross & White RW-Bnd running about 12.5 watts output. At this level the 1002-3 put out almost 130 watts with 13.8 v.d.c. supply voltage. Just about 10 db gain. Again the receiving attenuation was less than 1 db.

Construction and Workmanship

As stated previously the Tempo 1002-3 amplifier is built on epoxy circuit board material. Components appear to be of US manufacture. Workmanship is quite good, with nice bright solder joints and clean of resin residue. Hand wired portions of the amplifier are quite acceptable, although not quite as good as the circuit board workmanship.

General Comments

All in all, the Tempo 1002-3 amplifier appears to be a good investment for the amateur looking for more power output on 2 meter f.m. The unit is well constructed and the sample unit operated quite well. The instruction sheet provided gives tune-up instructions, schematic, and pictorial information for servicing. The layout is quite spacious, so repair, if necessary, should present no major problems. Components should be easily available. The power gain of approximately 10-13 db is quite attractive and the total efficiency of the unit (output/input) is about 50% with about 240 watts of d.c. power required for the 120 watts r.f. output power. This is figured from the requirement of 17 amps and 13.8 volts at 120 watts output. The Tempo 1002-3 amplifier is available from Henry Radio, 11240 West Olympic Blvd., Los Angeles, California 90064 for $220.00.

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CQ Reviews: The Bird Ham-Mate Directional R.F. Wattmeters

BY WILFRED M. SCHERER,* W2AEF

THE Bird ThruLine Directional R.F. Wattmeters are known for their high quality, accuracy and ruggedness. As a consequence, they have long been standards in the electronic field and industry for use with production, operating and laboratory work.

Unfortunately, the price tag for most of these instruments is relatively high, putting them out of reach for the average amateur-radio operator who is then just left to envy those who can afford one of the Bird jobs. Happily, however, the Bird people have now come out with several lower-cost models under the nomenclature of Ham-Mate. These are specifically designed and priced for the radio amateur without sacrificing the quality and performance found with the more expensive Bird units.

The Ham-Mates indicate forward or reflected power in two ranges for each function. The power ranges for the Model 4350 are 0-200 and 0-2000 watts, those for the Model 4351 are 0-200 and 0-1000 watts. Both models are designed for operation over a frequency spectrum of 1.8-30 mHz.

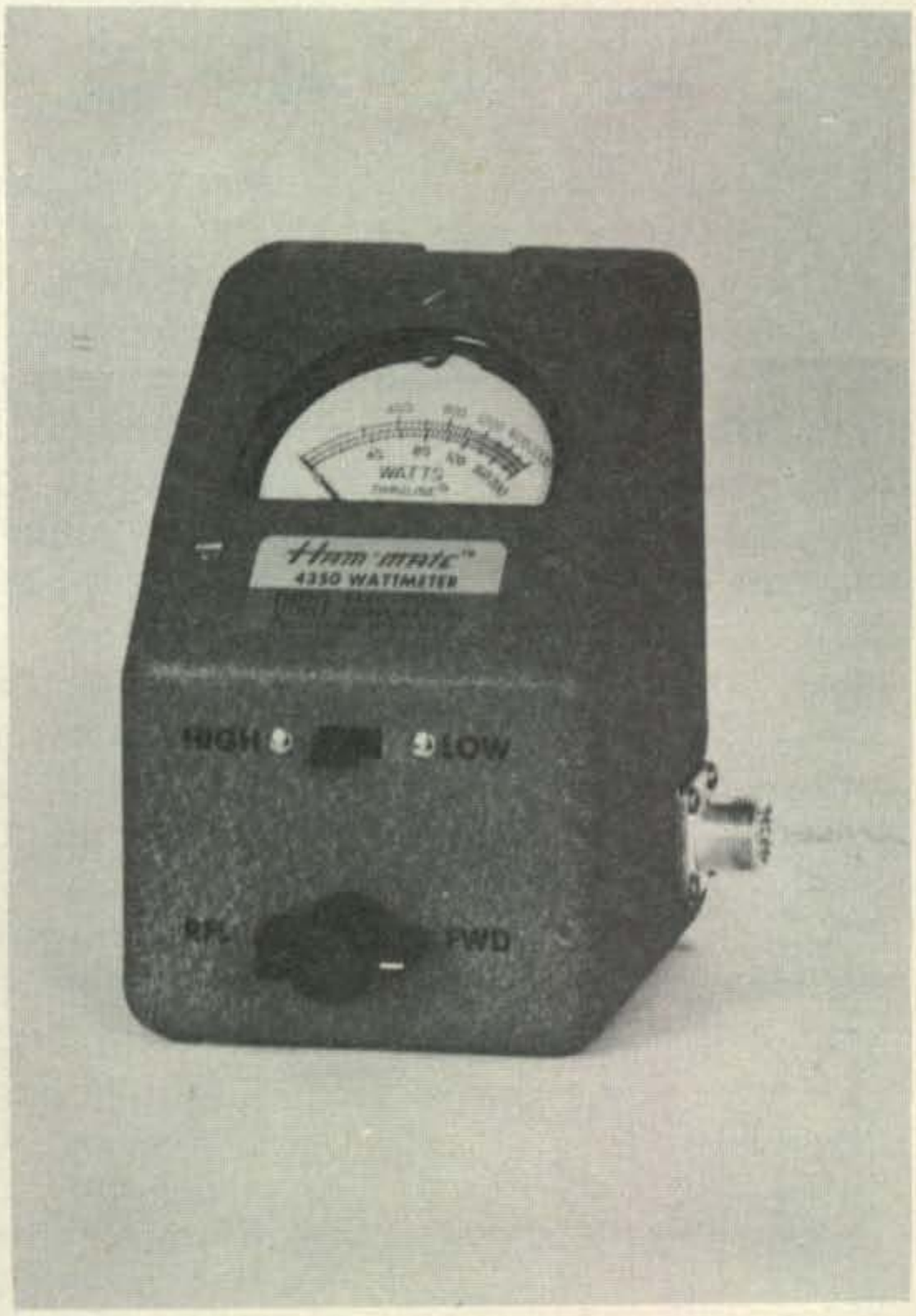
*Technical Director, CQ.

A third one is the Model 4352 with power ranges of 0-40 and 0-400 watts over a frequency range of 50-150 mHz. This model should be a particular boon to the v.h.f. operator, inasmuch as to the best of our knowledge there is no other low-cost device like it available to the radio amateur for use in this frequency spectrum.

All models are designed for 50-ohm operation, have a maximum insertion v.s.w.r. of 1.1:1 and provide an accuracy rated at ±8% of full-scale. A highly important additional characteristic is the directivity on which hinges the instrument's capability to distinguish between the forward and reflected powers. The directivity of these Bird units, as is that of their ThruLine professional models, is rated at 20 db minimum (or a ratio of 100:1) in respect to detecting the reflected power from that under measurement.

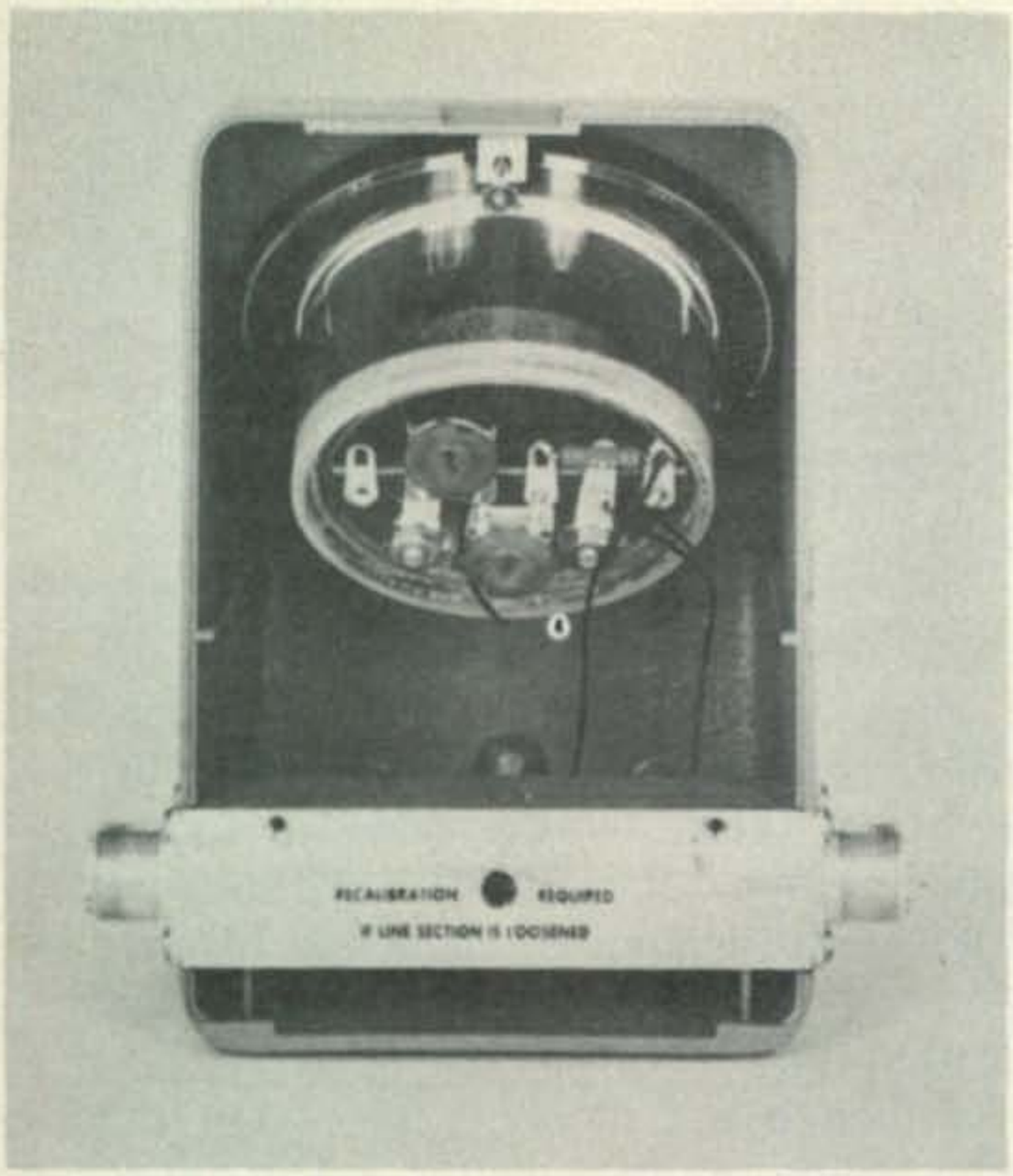
High accuracy is thus ensured when the v.s.w.r. on the transmission line is to be determined. This, by the way, is found by referring the forward- and reflected-power readings to a nomograph in the manual by which the readings are converted to the related v.s.w.r.

Although the object is to obtain a zero reflected-power reading for a 1:1 s.w.r., an s.w.r. of up to 1.5:1 or 2:1 often is tolerable. In such cases frequent reference to the nomograph may be avoided by keeping in mind that any reflected power equivalent to within 4% of the forward power indicates an s.w.r. of 1.5:1 or less. Similarly a reflection within 11% is indicative of 2:1 or less (for easy



The Bird Ham-Mate directional r.f. wattmeter.

*Technical Director, *CQ*.



Rear interior view of a Bird Ham-Mate. The rigid transmission-line section is at the bottom with a small access hole at the center for adjusting the balancing capacitor. The range-adjustment resistors are the round elements at the back of the meter case.

mental calculation a figure of 10% may be close enough).

Principle of Operation

Although the principle of operation for the Ham-Mates bears some similarity to that of the through-line or Monimatch type of s.w.r. bridge or reflectometer commonly used by radio amateurs, there are basic differences in the Bird units that, unlike these reflectometers, make their operation independent of frequency within a given frequency range, ensuring better directivity and making it possible to calibrate the instrument directly in actual watts rather than providing only relative indications. In addition, no sensitivity control is required to be set with different power levels or frequency for calibration when s.w.r. indications are desired.

Referring to fig. 1, the sensing setup for the Ham-Mates primarily is a resistor in series with a small loop coupled to the center conductor of a rigid section of 50-ohm transmission line. These elements can be rotated 180 degrees by the forward- and reflected-power control knob so that the mutual conductance between the loop and the line conductor is either positive or negative and thus reacts accordingly to the forward or reflected wave. A small capacitance, C_1, together with the resistor comprise a voltage divider with the capacitor used to adjust the circuit balance.[1]

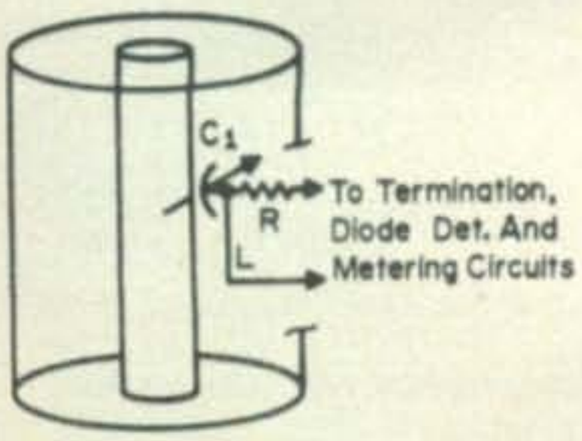


Fig. 1—Circuitry for basic principle of operation for the Bird Ham-Mates. Explanation is given in the text.

The r.f. voltage from the sensing circuit is directly proportional to the voltage on the line (that of either the forward or reflected wave, depending on the position of the loop). It also is directly proportional to the frequency; however, by terminating the sensing circuit output in a capacitance, the overall output voltage is independent of frequency since the capacitive reactance is inversely proportional to frequency.

Frequency independence and directivity also are enhanced by the fact that the physical size of the loop is only a very small fraction of the operating wavelength, making the whole affair essentially a lumped-constant arrangement rather than one based on distributed reactances.

Construction

The Bird Ham-Mates are rugged jobs contained in a cast-aluminum case that has a sloping upper-half where the meter is positioned for easy observation from many viewing angles. The low-power scale for the Model 4350 is calibrated in 5-watt increments, the high-power one in 50-watt steps. For the Model 4352 the steps are 1 and 10 watts for Lo- and Hi-power ranges respectively. A slide switch at the front selects either range. Reflected- or forward-power readings are selected by a knob that is rotated to the nine- or three-o'clock position as the case requires. Input and output connectors are the SO-239 type. The dimensions for all models are 5¾" × 4" × 3⅝" and the weight is 1¾ lbs.

The rigid transmission-line section with the sensing elements is installed at the lower-rear interior of the case. It cannot be removed for remote insertion in a transmission line, as can the detecting unit in some other devices,

[1] A mathematical explanation (involving the J-operator) on just how the operation is derived may be obtained by writing to the Bird Corporation for their bulletin "Watts New From Bird," vol. 2, No. 2.

inasmuch as this will disturb the normal operation of the unit. On the other hand, the instrument has provisions for wall-mounting, so that it may be more readily placed at a location convenient to the transmission line while still allowing the meter to be easily observed.

Should there be any need for re-calibration at any time, instructions for such are provided in the manual for use in conjunction with test facilities of known accuracy. These involve removing the rear cover of the Ham-Mate case, adjusting the balancing capacitor through a small access hole in the line section along with adjustment of two variable resistors installed at the back of the meter itself.

Performance

The models we had for evaluation were the 4350 and 4352. Checked against our own r.f-power standards known to an accuracy within 2.5% of reading, both models were well within the ±8% F.S. rating; in fact, on the various frequency bands and at all the major calibration points the readings were at least twice as good as the rating, bringing them within even the ±5% specification for the Bird professional ThruLine Wattmeters.

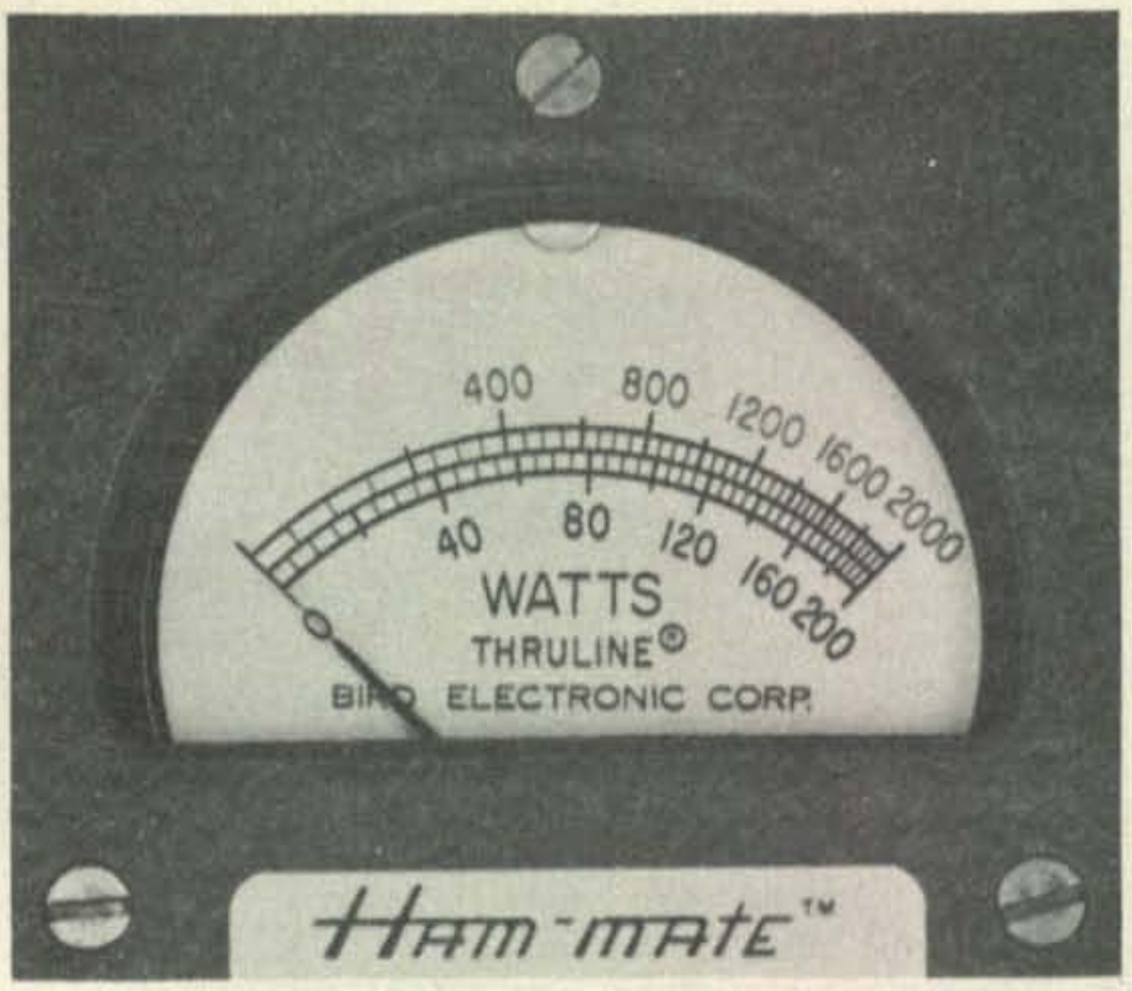
It should be noted, however, that the tolerance rating is based on a percentage of the full-scale range. Thus for the ±8% F.S. rating, *any* point on the 200-watt range could be in error by ±16 watts (.08 × 200), while on the 2000-watt range it could be +160 watts. Since the accuracy of the Ham-Mates was found to be actually better than rated, the deviation in actual watts was accordingly considerably less.

With operation into a mismatched load, the Ham-Mates were less subject to errors than found with some of the other devices used for the same purpose and under the same conditions. This is primarily due to the superior directivity experienced with the Bird jobs.

One thing you have to get used to is that the meter movement is highly damped, requiring 2-3 seconds for the pointer to settle at full reading. Thus, when you're tuning up a rig for maximum output or when adjustments are made for a minimum reflected power or s.w.r. (such as may be the case when setting up an antenna-matching device), the operation must be conducted somewhat more carefully and slower than usual.

So, to find out what "happiness is," get yourself a Bird Ham-Mate as Ben Bryant, W8IGQ, indicates in the Bird ads! All models are priced at $79.00. They are products of Bird Electronics Corporation, 30303 Aurora Road, Cleveland (Solon), Ohio 44139.

—*W2AEF*



Meter scale for the Model 4350 Ham-Mate.

New Amateur Products

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Two sets of miniature screwdrivers, called "Mini-Drivers" are now available from Xcelite. They are ideal for fine work on meters, relays and sub-miniature components. The drivers range in blade size from .040" to .100" with an overall driver length of 2⅛". Set M-50 contains five Mini-Drivers for slotted screws; Set M-60 contains, in addition, a size 00 Phillips driver and a slip-on "torque amplifier" handle. The sets are packaged in see-through plastic pouches and are available at all Xcelite dealers. Circle L on page 110 for more information.

2 Meter Coverage With The ARN-30

BY WILLIAM R. SCHOPPE, JR.,* WB2FWS

A VERY innocent-looking advertisement has been appearing in the ham magazines lately, describing a military surplus receiver. This particular ad caught my eye since it mentioned the possible use on the 2-meter band. I usually shy away from surplus gear because they frequently require extensive modifications and don't provide the coverage you prefer to have. But because my present equipment covers only 2 mHz of the 2-meter band unless I change crystals, I felt it would be great if I could tune the whole band at one time. This proved the case as you shall see.

The specific gear of which I speak is the ARN-30, a 108-135 mHz tunable receiver, priced at $14.95. It provides with minor modifications, the frequency coverage to enable copying aircraft and their ground stations, with only the addition of a small power supply, a speaker and filament changes. As I mentioned, surplus gear usually scares me but I figured that with a price of such moderate proportions, it might just be worth the time and effort. As you will see, I was correct and very pleased with the results. Matter of fact, were I selling the equipment, I would stress the 2-meter conversion rather than the present aircraft coverage. When modified as described it will make a good secondary receiver or even a primary one if you've none at all.

This article will try to impart some additional information which was not included in the original Gordon White article from *CQ*[1] included as a reprint with shipment of the receiver.

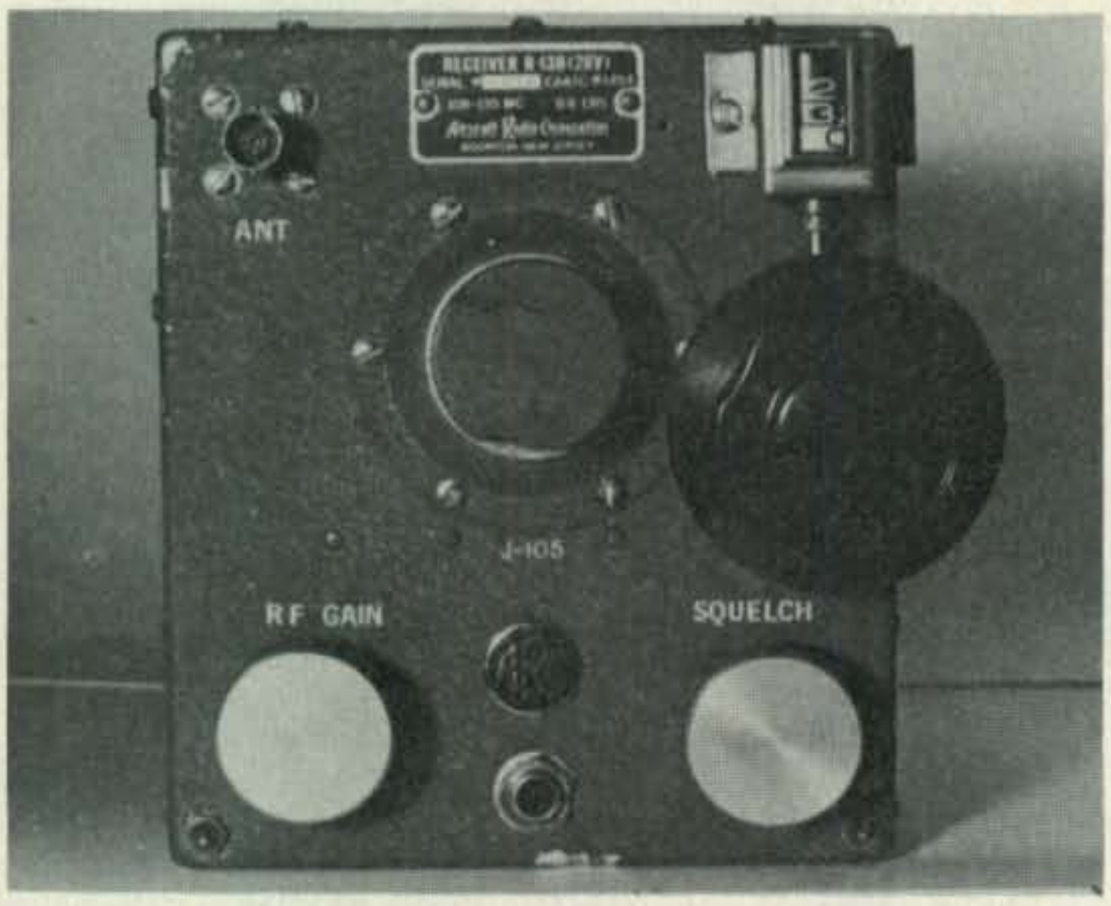
Preliminary Preparation

Once you have obtained the receiver, check for any shipping damage. The unit I got was in pretty good shape, considering its age and use by the military. Included in the box is a copy of the actual schematic and a copy of the *CQ* article of March, 1967. Carefully read it and look for the appropriate information pertaining to the receiver shipped to you. There are several mode's and types.

Next, remove the entire upper shell which covers the tubes and i.f.'s. Check to see if all the tubes are seated properly and in the correct sockets. The tube layout is printed on the removable access cover of the upper shell. Leave nothing to chance, it will only cause you grief later on. Remove the bottom plate and examine the underside to familiarize yourself with the wiring and also to see if anything is amiss in that area.

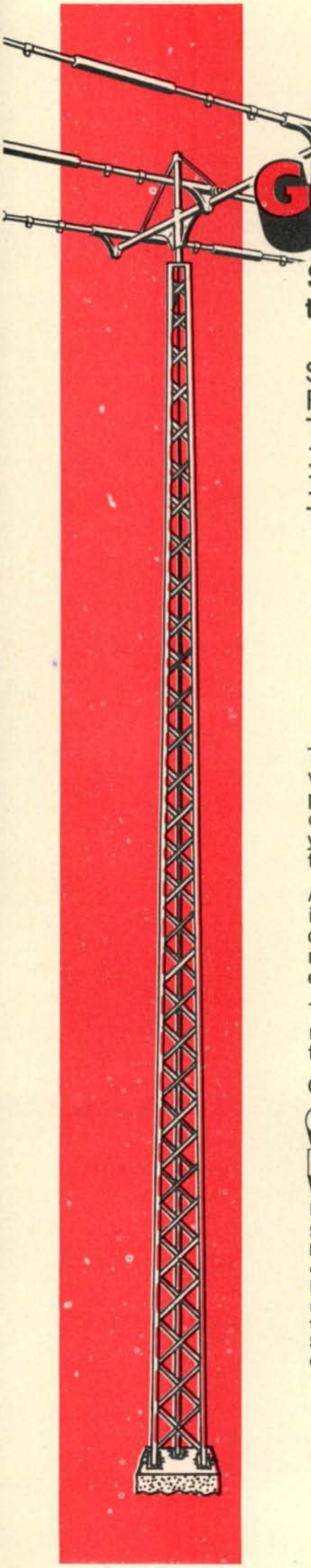
Referring to the upper part of the chassis itself, carefully remove the preselector cover. It is a small shell-like cover just in front of the 9002/3 miniature tubes. It is a little difficult to get at the screws but it can be done. With cover now off, you will notice that there are two sets of variable capacitors. The four large ones are ganged together and move

*31 Penny Dr., Huntington Station, N.Y. 11746.



The R-13B/ARN-30 receiver is easily converted to a general-purpose 2-meter receiver. Original frequency coverage is 108-135 mHz. Conversion consists of re-tuning the r.f. coils and trimmers, and adding r.f. gain and squelch controls. At the bottom center of the panel is the phone jack. A veeder root counter coupled to the tuning shaft provides a logging scale.

[1] "Surplus Sidelights," *CQ*, March 1967 p. 90



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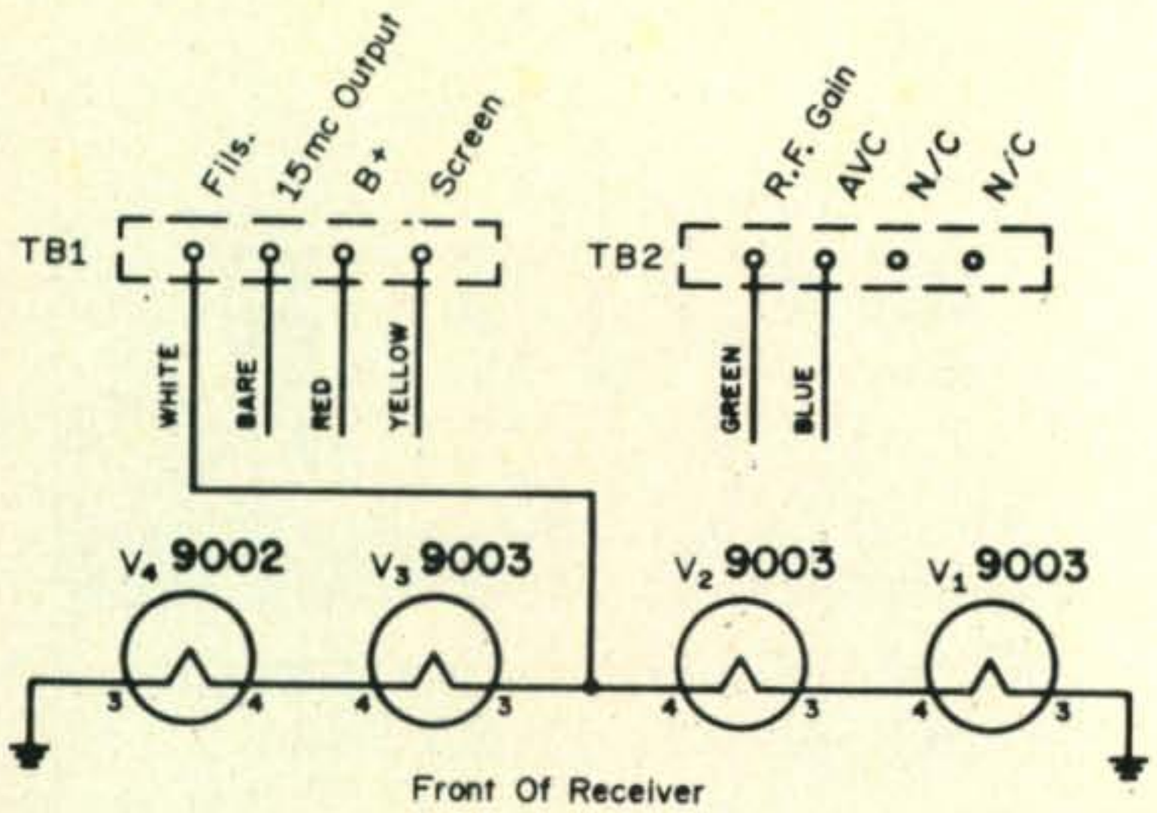

Fig. 1—Filament re-wiring for the 6 v. tubes in the preselector. The 12 v. filaments of the other tubes in the set are simply wired in parallel.

when the shaft on the front is rotated. The four tiny ones are separately adjustable and are perpendicular to the large ones. These will be the ones to be adjusted later in the alignment section.

Mechanical Modifications

There are a few mechanical changes to be made, none too difficult. One of the most important of these is briefly mentioned in the reprint. On the underside of the preselector section you will notice four cylindrical covers. They contain or cover the coils with brass slugs in them. It will be necessary to carefully drill access holes in them for the alignment. Try to center the bit you use and, if possible, use a flat bottom drill bit and a motor speed control. It is obviously important not to damage the coils. When finished, remove any chips or shavings from the area.

On the lower front portion of the receiver, drill three holes and mount the controls stipulated in the reprint, *i.e.*, audio gain, r.f. gain and squelch, with approximately even spacing. Be careful not to damage any wiring while drilling or enlarging the holes.

The audio gain control can either be included or not, at the builders discretion. In this case it was found to be unnecessary as mentioned later and so was replaced on the front panel with a phone jack.

Since no provision is made for a speaker, it will be necessary to provide one on the unit. I salvaged a small one from a transistor radio and mounted it on the access cover, where the tube layout is printed, by first punching a hole with an octal socket punch. When the speaker is finally installed on the upper cover and replaced on the receiver, it sounds pretty good.

The audio output is 500 ohms, so you'll need a matching 500 to 8 or 4 ohm output transformer. I mounted mine on the back of the upper cover and then drilled a hole through the chassis near the dynamotor mounts for the wire to pass through to the audio source.

The only other mechanical change I made was to drill out the pins holding the threaded collar around the splined shaft on the front panel. Then I attached a shaft extender and, because I had one in my junk box, a veeder root counter with its accompanying gears. By doing this, I could set up a logging scale for later reset capability. Of course, any regular shaft could be used with a spinner knob.

Power Requirements

The *CQ* reprint states that a 250-280 v.d.c. supply would be adequate for the B+ but I wasn't sure what the current requirements would be. I checked the tube charts and found that a 75-100 ma capability would work okay. Also, unless you are using a dynamotor or some other 28 v. supply, you'll have to rewire the filaments. I had neither, so I rewired the 6 volt filament 9002/3 tubes shown in fig. 1 and wired the remaining 12 volt ones in a parallel configuration. A separate 12.6 v.d.c. filament transformer was then used and worked very well.

The whole power supply could probably be compactly assembled and mounted where the dynamotor was but I chose to make it separate for use on other projects. If you do use a separate supply, you'll have to devise a plug to connect to the socket on the back of the receiver. This could prove dangerous since the receiver socket is a female and would require a male from the power supply. This is not good engineering practice but is necessary in this case. Just be careful to keep power off when connecting up and paint it red or something to remind you there is B+ present.

Once you have made these wiring changes, the only thing left to do is wire the controls on the front panel and the speaker. These connections are outlined in figs. 2 and 3.

The r.f. gain control is a 50K pot connected from pin 3 of the rear-mounted 7-pin power socket to ground. While an audio gain control could be added it was found to be unnecessary, and so was omitted.

The squelch modification described in the original article is simply the addition of a

25K pot in series with the cathode resistor of one half of V_{108}, a 14F7.

Alignment

Turn on your power supply once all changes have been made to ascertain that you are at least getting some audio noise from the speaker. Connect an antenna to the BNC connector on the front of the receiver and while tuning across, listen for aircraft or ground control stations talking to each other. They generally make very short transmissions and at first you'll have some trouble catching the conversation but with some slow and careful tuning and listening, you'll hear quite a bit of activity. At one end of the tuning range you'll also hear some music which means you are down below 108 mHz.

If these aircraft frequencies are your pleasure, go no further, but if it's 2 meter activity you want you'll have to move the frequency coverage from the original 108-135 mHz to about 121-148 mHz.

If you have a signal generator or some other signal source, all to the good, but barring that, pick a time when 2 meter activity is high in your area to try alignment. Mr. White, in his excellent article, suggests that squeezing or spreading turns on the coils may get you on frequency but I felt that would incur the difficult job of opening up the whole preselector. Instead, I found that some change was possible by turning *all* the brass slugs *clockwise·almost* as far as they would go, using an insulated alignment tool. Then, starting with the first variable capacitor, which is opposite the 9002 oscillator tube, I slowly moved the plates to a minimum capacity position until I suddenly heard a 2-meter mobile working through a repeater. The method I used is probably a rather unorthodox way of alignment but I went right down the line of variables and peaked them on that signal. Later checking revealed I was covering to about 140 mHz. I also discovered that by completely *meshing* the variables and turning the brass slugs all the way *counter-clockwise*, I could copy most of the regular f.m. band down to about 90 mHz. Imagine, a little work and $14.95 for about 90-148 mHz coverage! Not a bad investment.

The f.m. signals are easily copied by the well known "slope detection" method. This type of reception is not the recommended way to do it but is widely used for occasional n.b.f.m. reception.[2] When tuning using this

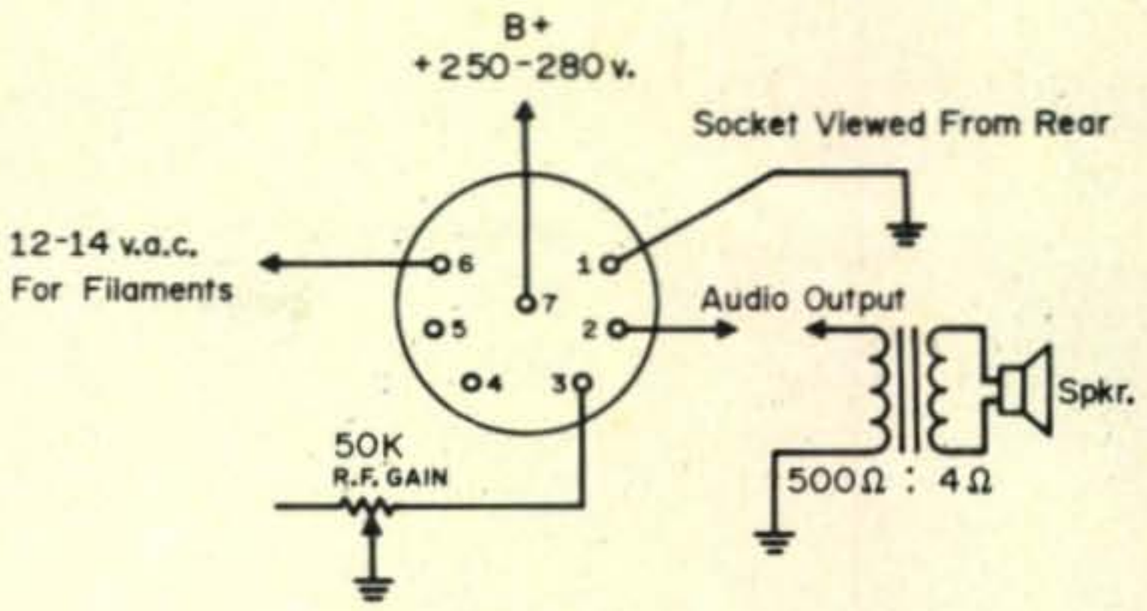

Fig. 2—Connections to the rear-mounted 7-pin power socket. The r.f. gain and audio output connections are made internally; the others are made to an external power supply via a plug.

method, you will get fairly good copy in two places. There will be good audio as you approach the channel and some garbling as you pass thtrough it, then clear audio again. I have been monitoring the f.m. mobiles and repeaters for some months now and have noticed fairly good reception and selectivity with the receiver.

Addenda

If you feel like really going overboard, you could include a solid state product detector and/or a b.f.o. to enable you to copy s.s.b. or c.w. stations now active on 2 meters. Schematics of these devices have appeared in *CQ* from time to time and should not be difficult to build into the receiver.

With all the new and great "state of the art" devices around and readily available today, it may seem odd to delve back into the past to remodel any old gear but it was worth

[*Continued on page 90*]

[2] The f.m. detector described last month in *CQ*, ("Math's Notes," p. 49, June), is a good one and is easily powered by rectifying and filtering the 12 v. filament supply.

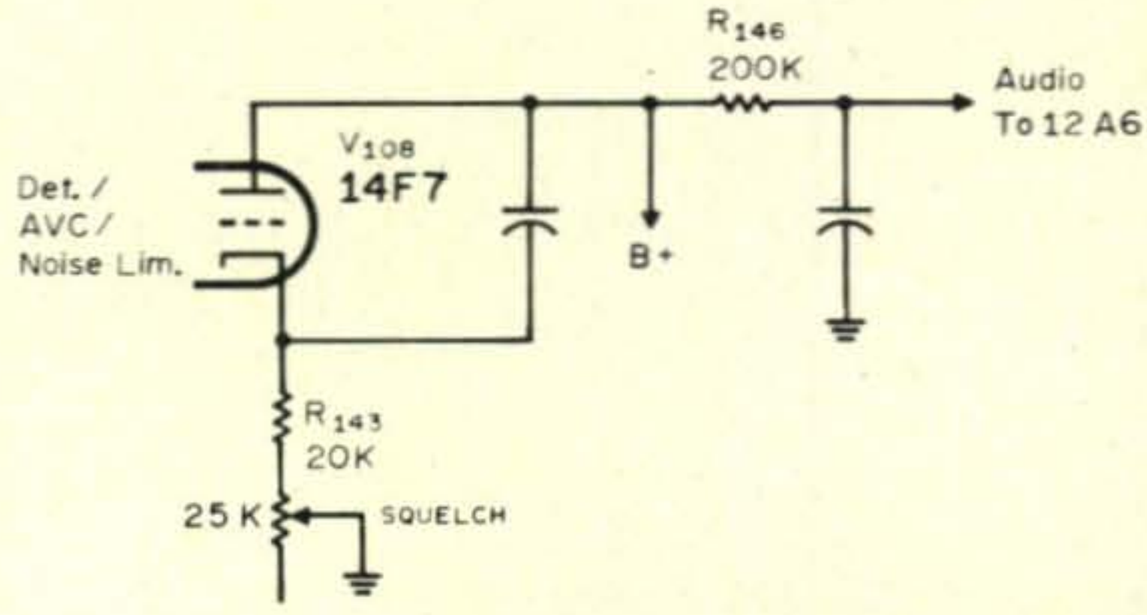

Fig. 3—Addition of squelch to the ARN-30 requires only a 25K pot.

a winning pair....the "Kenwood twins"

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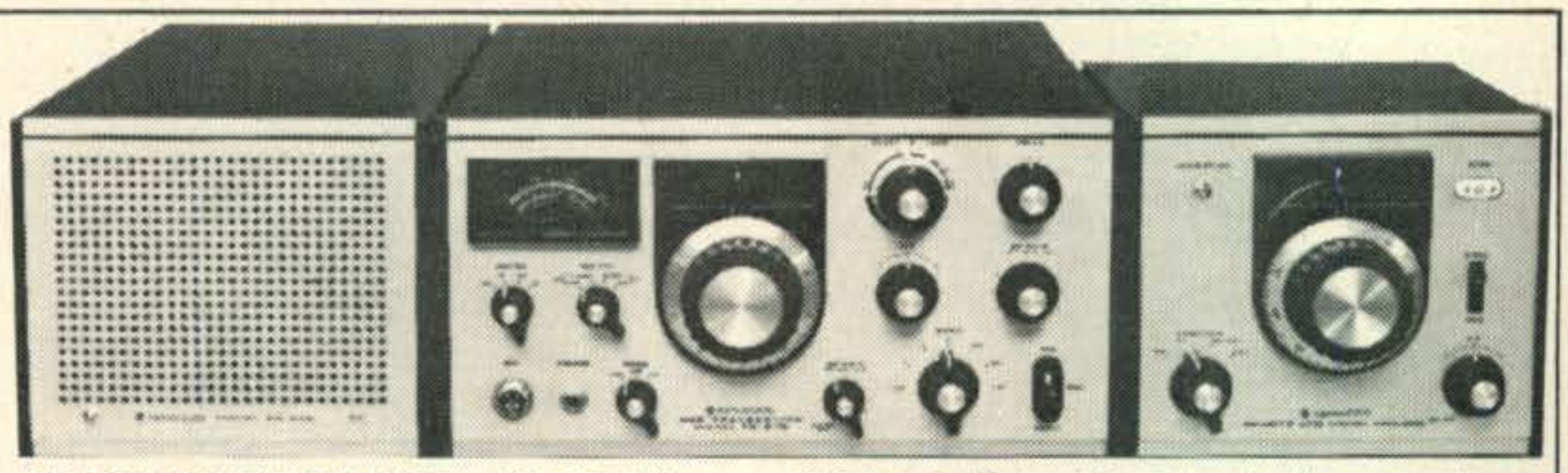

The Kenwood TS-511S is a five band SSB and CW transceiver packed with power and performance . . . offering features never before available in its price range. For example: built-in VOX, crystal calibrator, noise blanker, receiver incremental tuning, 1 kHz frequency readout, 8 pole filter, stable FET VFO, dual conversion and accessory CW filter.

FREQUENCY RANGE: 10, 15, 20, 40 & 80 meters (Amateur Bands) ▢ MODES: LSB, USB, CW ▢ INPUT POWER: 500 watts PEP, 300 watts CW nominal. ▢ SENSITIVITY: 3.5-21.6 mHz band; 0.5 uv S/N 10 db 28.0-29.7 mHz band; 1.5 uv S/N 10 db and less than 100 cps frequency drift per 30 minutes after warm-up ▢ SELECTIVITY: SSB more than 2.4 KC (at 6 db) with 2 to 1 slope ratio CW more than 0.5 KC (at 6 db) ▢ A.F. OUTPUT: more than 1 watt (10% distortion) ▢ TUBE & SOLID STATE COMPONENTS: 10 Tubes, 1 IC, 37 Transistors, 4 FET, 52 Diodes ▢ PRICE: $415.00

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Henry Radio

I Got This Crazy Spelg Prblm

BY AL D'ONOFRIO,* W2PRO

I GOT this lil problem . . .
The boss sez tt my c.w. lingo is cuming thru in my field rpts agn, es 2 watch it. He wunders why I dont tri logging more time at the motel bars, lk all the others, sted of wrkg my QRP on 40 c.w. every nite.

Honestly, B4 all this crazy incentive license biz, I used to 100 pc s.s.b., es my field rpts bk home were so-so OK, least the brass nvr gave me ani hvy QRN abt em. Bt nw tt Im wrkg c.w. 100 pc, es really wrkg vy hard at QRQ so tt I can copy 25 solid, to nail dwn tt xtra, all I get fm the home ofc is tt my sales look great, bt ur spelg stinks, so watch it.

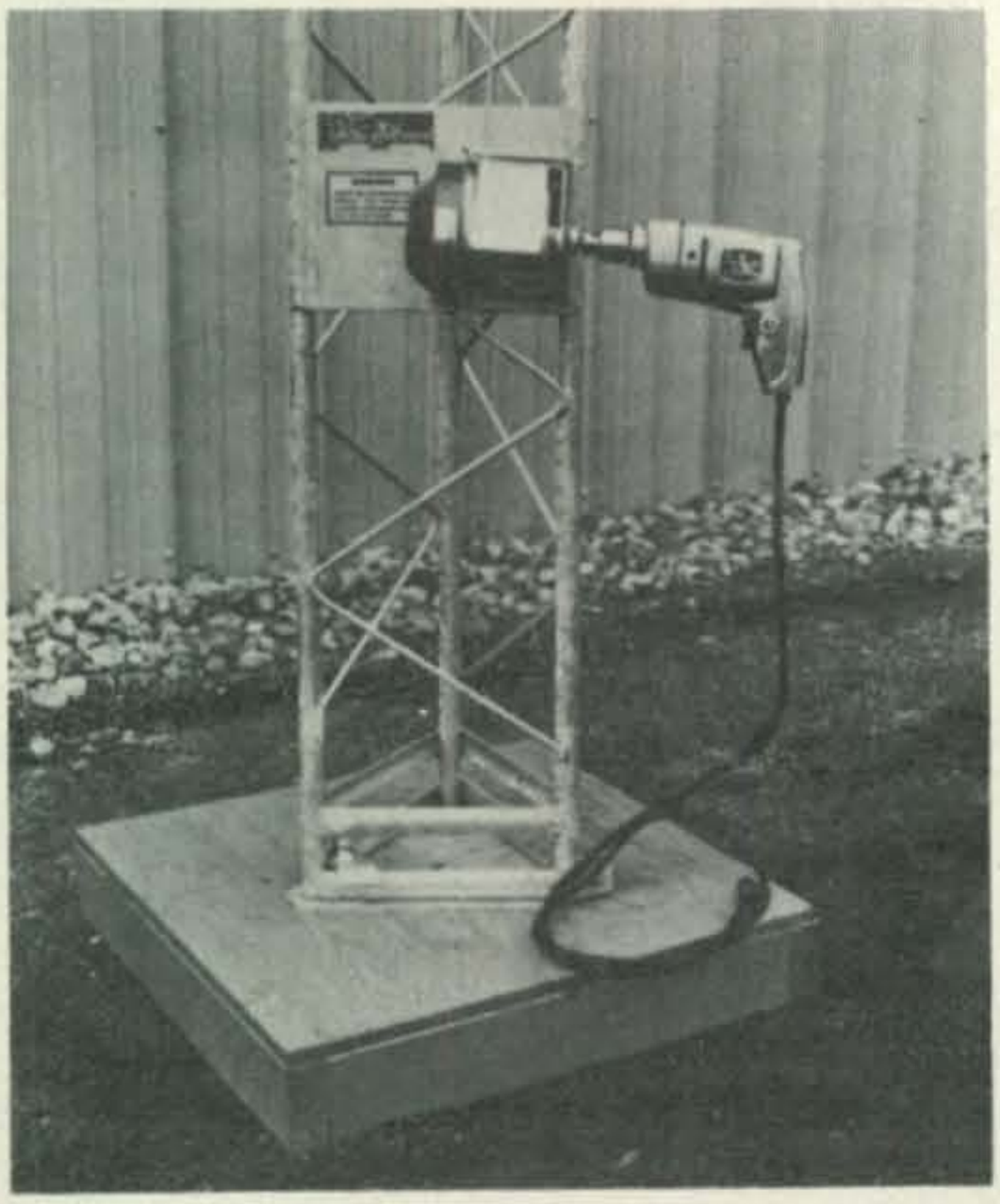
The boss is rt tho, the more time I spnd wrkg cw, the lousier my spelg gets. Its me, I knw. Its jut tt I gt 2 emotionally involved in the whole tng sumtimes. Its sum kinda subconscious QSYing of my subliminal desires breaking forth, sed this vy intelligent guy on 40 last nite. U knw, its truly amazing, I hv no trble getting ani kind of advice on ani subject u name, anitime, when u start wrkg 40 regularly. Es another guy, also vy intelligent, cfmd the earlier opinion, es sed nt 2 worry abt my spelg trbles, es tt it wud go away, bt B4 he cud continue he got gud es zomped by sum SA chirp generator clg CQ DX.

Ive bn tnking, those 2 guys were probly rite. U knw, I recall way bk when I ws in skool, taking elem German 100—I hadda tk a language—anyway, abt half way thru the term I started writing funny whenever meine teacher asked me to write on the papier the German translation of whatever she was saying in Deutsch. I dont knw what used to happen inside mein brain, bt sumhow Id brk into writing half English und half German und half c.w.—hold it, tts 2 many halves sumplace.

[*Continued on page 92*]

1537 Central Park Ave., Yonkers, N. Y. 10710

New Amateur Products



Triex Tower Winches

Two new electric winches for raising and lowering Tri-Ex crank-up towers are now available. One derives its drive power from the average 3/8" electric drill, while the other uses a self-contained 12 v.d.c. reversible motor. The 12 v. model is intended for use from a 12 v. storage battery (optional) charged by an optional 110 v.a.c. charger. Braking with either model is immediate, and both can hold a load indefinitely. For prices and more details write: Triex Tower Corp., 7182 Rasmussen Ave., Visalia, CA 93277, or circle A on page 110.

Alpha Tone Encoder

Alpha Electronic Services, Inc., 8431 Monroe Ave., Stanton, CA 90680 is producing a miniature tone encoder suitable for repeater access use. The tiny device consists of two thick-film chips. The model ST-85J is available with several instruction kits to facilitate easy installation in a variety of radios. The encoder is available in audio frequencies from 20-3000 Hz and also sub-audible frequencies for special applications. Stability is ±0.5% over −30°C to +100°C. Circle C on page 110 for more information.

Hallicrafters FPM-300 Transceiver

Hallicrafters recently introduced a new low-priced all-band s.s.b./c.w. transceiver for amateurs. Designated the FPM-300 the unit is all solid state with the exception of the driver and final stages. Single signal-conversion is used throughout, with premixing of crystal and v.f.o. to achieve the needed injection frequencies. The mixing system is the same as used very successfully in the SX-146/HT-46 station by Hallicrafters a few years ago, and results in excellent sensitivity with low noise. Power supplies for a.c. and d.c. operation are self-contained as is vox, and the 100/50/25 kHz calibrator. The 250 watt p.e.p. transceiver weighs only 25 lbs. and measures 5½" × 12" × 11". Price is $595 complete, less mic and antenna. For full specifications write the Hallicrafters Co., Amateur Radio Department PR, 600 Hicks Rd., Rolling Meadows, IL 60008 or circle K on page 110.

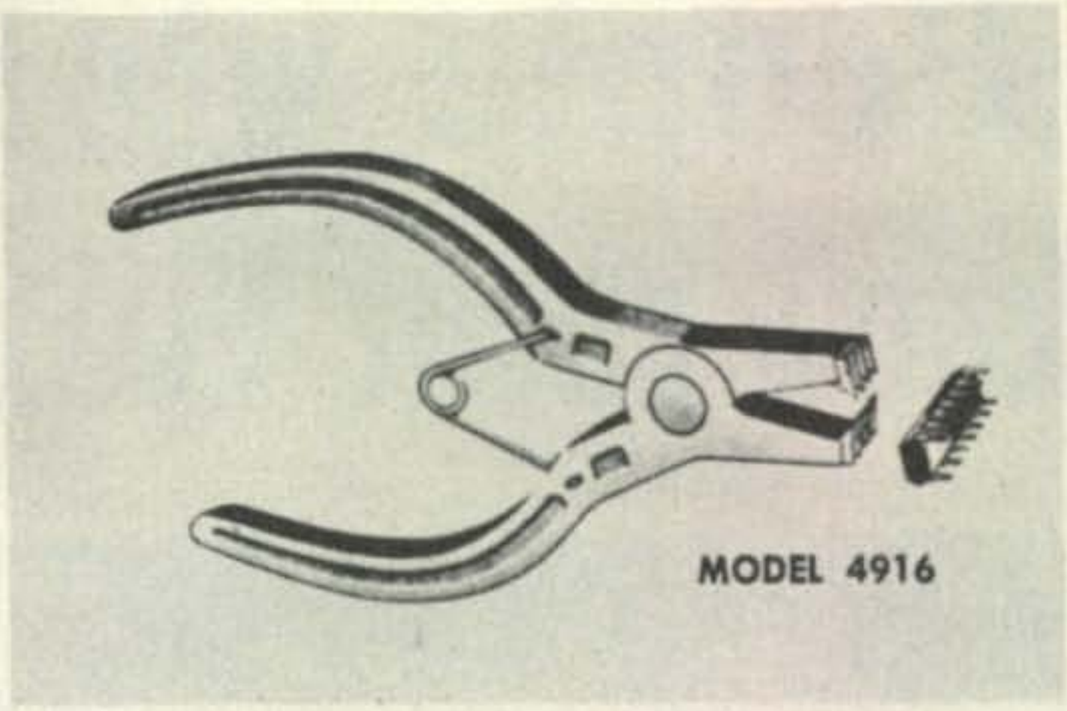
Gilfer Pre-Selector

Gilfer Associates has introduced a new pre-selector for use in the 3.9-22.5 mHz range with receivers lacking sensitivity or single conversion receivers with poor image rejec-

tion. Although primarily intended for short wave listeners the Model A-20 should find wide amateur application, too. Noise figure is under 2.0db with not less than 18db gain. Passband is not less than 200 kHz wide at the 3db points, and the input is tunable over the entire range. The price is $49.95. For more information write Gilfer Associates, P.O. Box 239, Park Ridge, NJ 07656 or circle E on page 110.

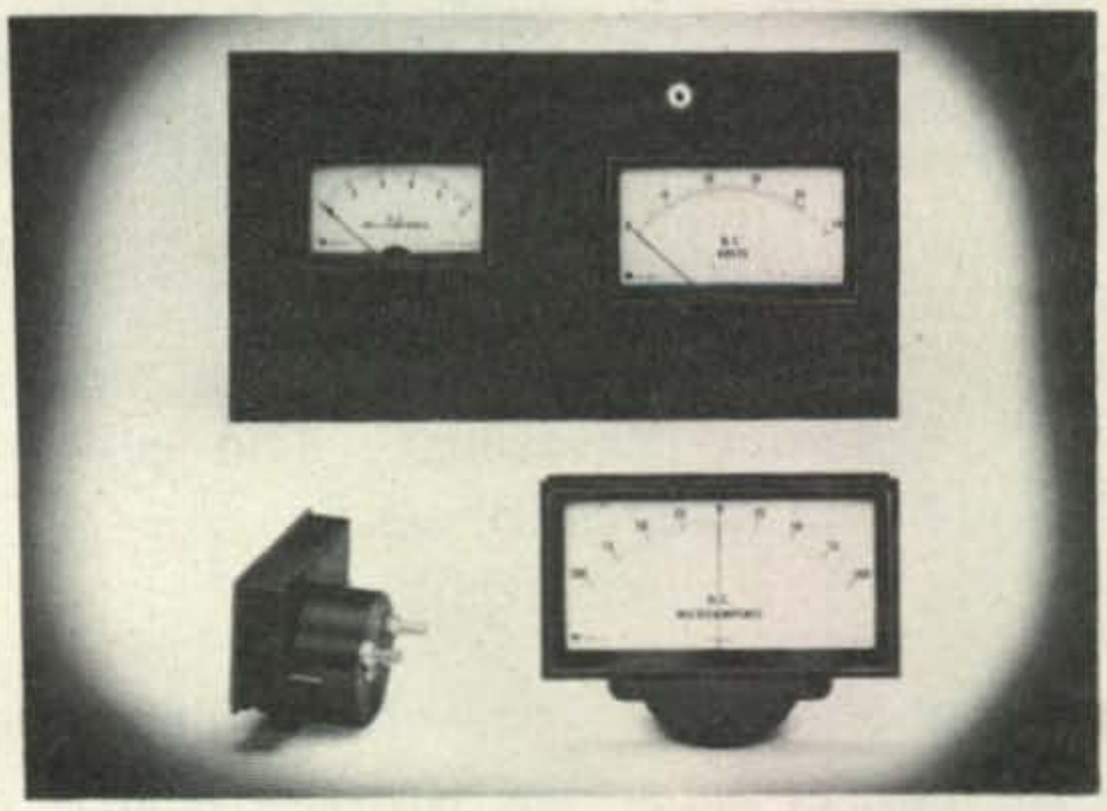
Sonar 2 m. FM Handi-Talky

The newly introduced Sonar model 2307 2 m. f.m. transceiver provides 1.6 watts output on each of five switch-selected channels in the 144-148 mHz band. The all solid-state package (no relays!) uses ceramic and crystal bandpass filters for 85db adjacent channel rejection with 30 kHz spacing. The hot receiver gives 20db quieting with 1/2 μv input. Battery life per charge on a drop-in Nicad re-chargeable pack is 8-14 hours. The unit is priced at $450. Various optional accessories extend the flexibility of the 2307. For spec sheet write: Sonar Radio Corporation, 73 Wortman Ave., Brooklyn, NY 11207 or circle B on page 110.



Starnetics IC Remover

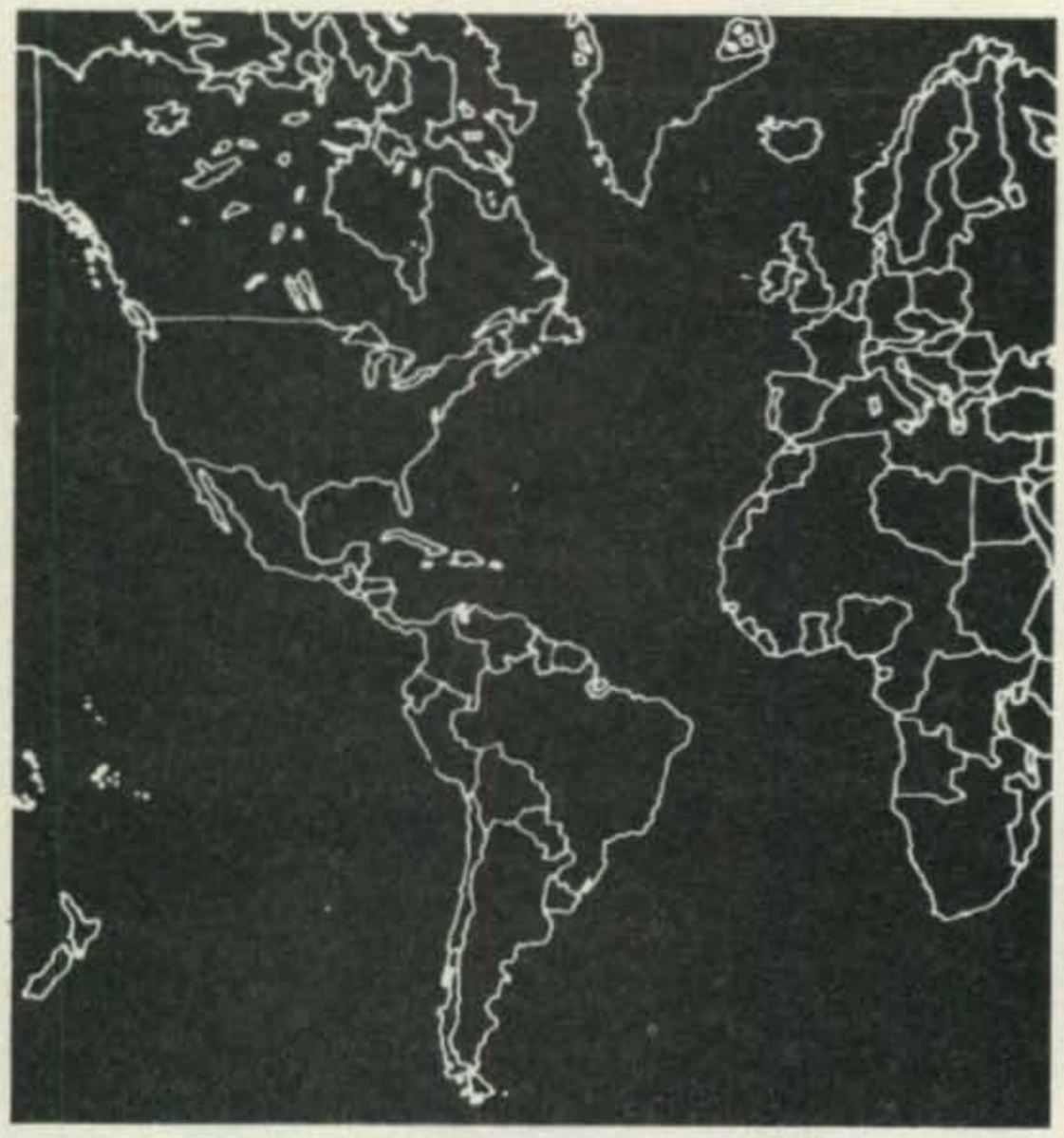
For those amateurs using IC's to any great extent, there's a new tool designed to make life a bit simpler. Starnetics Company, P.O. Box 9308, North Hollywood, CA 91609 has introduced a plier-like puller for IC's, which can be used in de-soldering IC's or removing them from IC sockets. The insulated tool prevents damage to either IC or circuit board, and may be used without hesitation on live circuits. For further information write Starnetics or circle F on page 110.

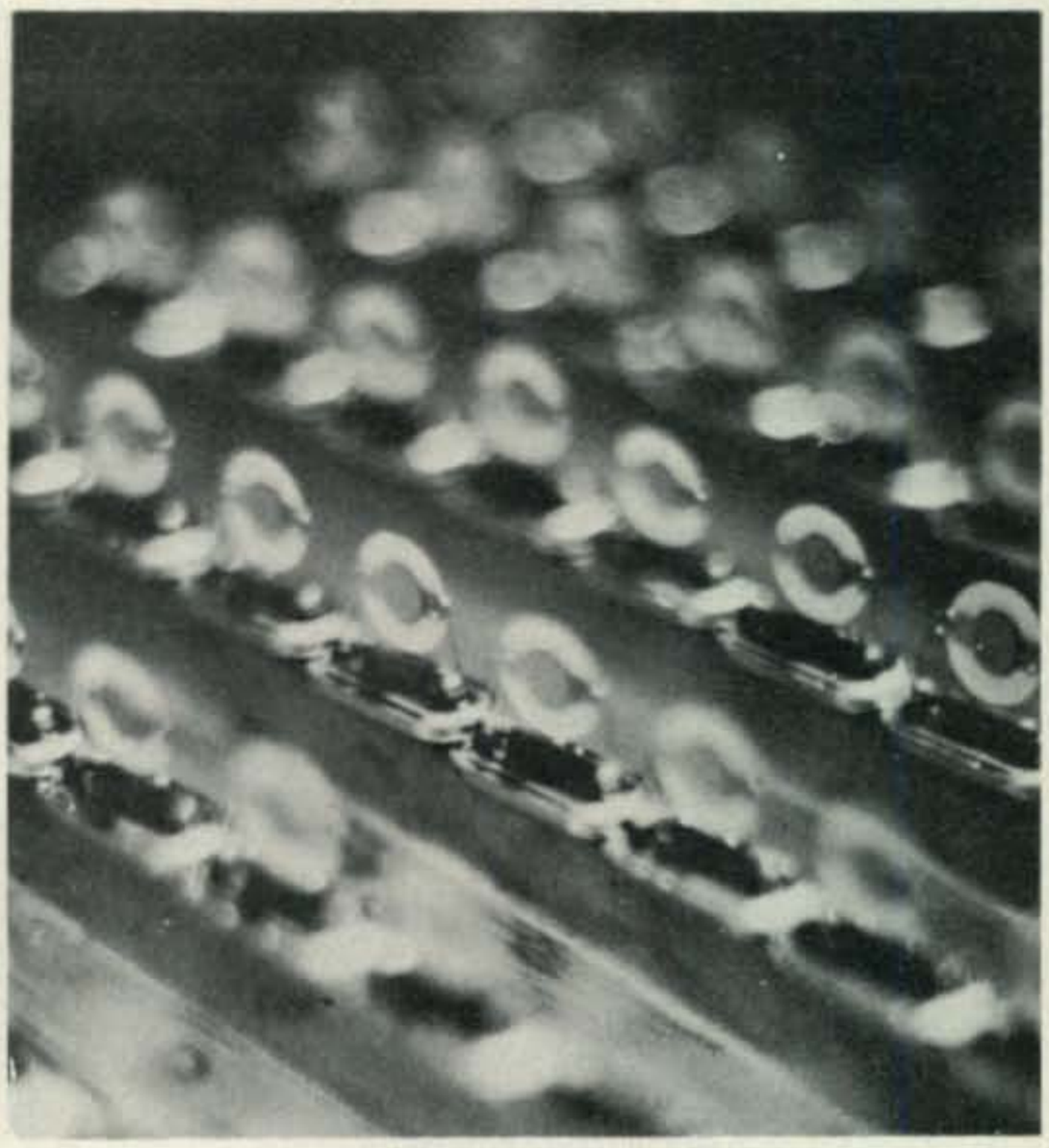


Triplett GL/B Meters

For the builder who wants his equipment to bear the mark of professionalism, Triplett has introduced a series of behind-the-panel mounted meters with glass windows and built-in bezels. The handsome meters are available in 3½", 4½" and 5½" sizes and a complete line of ranges and functions. To mount, a rectangular hole is cut in the panel to the manufacturers specifications, and a small round hole is drilled for access to the meter adjust screw. The meter is tilted through the hole from the front, and a two-hole support bracket bolted on the back. Prices are no higher than other fine quality panel meters. For a catalog sheet, write the Triplett Corporation, GL/B Dept. PR, Bluffton, Ohio 45817 or circle J on page 110.

People who know about quality know about Sentry





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How Not To Erect a 56′ Tower

BY ALAN MARCUS,* WN9FRM

I'M the smartest guy in the world. I can always come up with a way of doing something nobody else could conceive. Erection of a tower for my tri-band beam was to be no exception.

So what if I'm a new novice. I've got four months of c.w. practice under my belt, and any damn fool can put up a tower. And last week I set out to prove it.

First, I priced a new 40′ self-supporting tower, and I can tell you I wasn't about to pay the 88 bucks the dealer demanded. I'd buy a used one, and I wouldn't pay more than five bucks for the whole dang thing. Well I waited for the opportunity to buy one, and I waited, and waited and waited some more. But I had it figured right. One day a small tornado blew into town, and a local realtor firm lost their 60′ tower. Here was my opportunity. I asked the realtor how much he wanted. He started to say he'd give it away, that nobody in their right mind wanted an old twisted tower, but he suddenly changed his mind. "How much will you give me?" he said. My quick response was that I might consider giving him five bucks. He took a couple of days to check with an antenna specialist in town, and then sold me the tower. The specialist had told him that the tower was worthless.

Now I had only one problem; how to get the tower apart. I had just had a minor operation the day before, so I didn't feel much like struggling with 240 lbs. of tower. I enlisted the assistance of my two children, John 11 and Carol 9. Tools in hand, we began our assault on the crooked structure before us. The first few bolts came out with little effort, but some of the sections wouldn't separate. I pounded with a 16 oz. hammer, I jumped, kicked, bounced, twisted and swore; all to no avail. And for some reason, I couldn't get the 20′ tower sections into the trunk of my Chevy. The sweat poured off me. My kids couldn't budge the 10′ sections, but the three of us managed to slide both the 10′ and 20′ piece toward the car.

After a second attempt to force the 20′ sections into the trunk, I sat down and was ready to cry. I couldn't take it with me. There was only one alternative. I would chain all of the sections together and lock the chain with a padlock. The three of us dragged the tower sections to the center of the lot so that we could chain them together. I headed for the car, but just then a local contractor and his passenger agreed to take the tower to my house for one dollar. The two men managed to pull one of the 20′ sections apart and balanced the other section in the pickup's bed. They drove the four blocks to my home, and I paid the dollar service charge. I now had six dollars invested in my tower.

My wife, the two kids and I managed to work the remaining 20′ pieces back and forth until, after about an hour's work, we were able to reduce the tower to 10′ sections. Exhausted I could go on no longer. That night I dreamt of nothing but antennas, and early the next day I was back working on my tower. First, I had to remove the bent sections. My hack-

How much will you give me? He said.

*1920 Park Valley Drive, Columbus, Ind. 47201

My wife, the two kids and I managed to reduce the tower to 10′ sections.

saw blade was dull, but I managed to remove three feet from the base section. I vowed that I would not work so hard again, and went to seek a better method of sawing. I bought a metal cutoff blade for my circular saw at the local discount store. It set me back $2.95. It worked like a charm, and I removed most of the peg-type ends of each section. The pegs were badly bent, and I decided to replace them with 1″ pipe. I was down to the last three pegs when the saw sighed its last. The cost of replacing the gears was $8.95. I now had $17.90 invested in my $5.00 tower.

I invested $3.05 in two new hacksaw blades and 20′ of used 1″ pipe that I could use for pegs. New nuts and bolts to replace the rusted ones in the tower cost $6.50. My investment now totaled $27.45. I drilled holes in the pipe and through the ends of each section. I encountered no difficulty. The rest of this job would be simple. I re-examined the tower to make sure it was straight. Two sections seemed to be too bent to be usable. I had to get a new top section. That was of vital importance. The new top section cost $20.00. My investment was now $47.45. The fact that I had to drive 100 miles to pick up that section hadn't slowed my ambition a bit.

Now to erect the tower. I could simply stack it. But how do you hold onto ten foot, 40 lb. sections, climb a tower and locate the sections in the correct position? I had a better idea. I would hinge the base. Commercial hinges cost far too much for my meager budget. I would make one. And for weeks I had all my friends designing hinged sections. But the problem was solved when the realtor asked if I wanted the one section he still had; the section with the hinged ends. He gave me that section for nothing, and all my problems were solved.

I planned to hinge the tower away from the side of the garage. Then I could pull on a rope and pull the tower right up into place. I had one difficulty. It was only 40′ from the garage to the street, and my tower now measured fifty-six feet without the mast. I would have to hinge the tower parallel to the garage. But how could I ever pull the tower to an upright position? A winch was the answer. I would buy a boat winch, hook the cable over a short extension of the tower, and crank the whole thing up with little effort.

I made a trip to a distant store and bought what looked to be a good winch. It was only $10.25. My investment was now $57.70, but I would have a crank-up, fold over tower for a fraction of the price of commercial jobs. I took one tower section and the winch to a local welder so that I could mount all parts together securely. The welder, remarked, "Well, I'll do it if you want, but it ain't going to work." He informed me that he had been in various phases of the metal industry for 30 years and that if I tried to raise my tower in the manner I described, the tower would fold in the middle and/or it would take a twenty-mule team gang to crank the winch. I thanked him politely and returned to the proverbial old drawing board.

A friend at work convinced me that tower sections could be stacked with the aid of a 15 foot pole that would hook in the side of the previous sections. A pulley at the top allows one person to lift a second section above the first and position it for assembly. The welder agreed to make the device, and my pocketbook was dented again. This time the total was $6.00 including materials. My investments now totaled $64.20.

Next I went to purchase a pulley and 60 feet of 3/8″ nylon rope. This set me back $4.39. It wasn't until I arrived home that I realized that I really needed 120 feet.

Thirty bolts and nine drill bits later, I was ready to erect my tower. I bought a pick and dug out a cubic yard of dirt from the side of the garage. I cemented a twisted bottom tower section in the cavity, but by this time it certainly felt as though the hole was filled with money. I had spent $103.48 on the tower, but I was still ahead of the game. A new tower, cement and a tool to raise the sections would have cost at least $144.00.

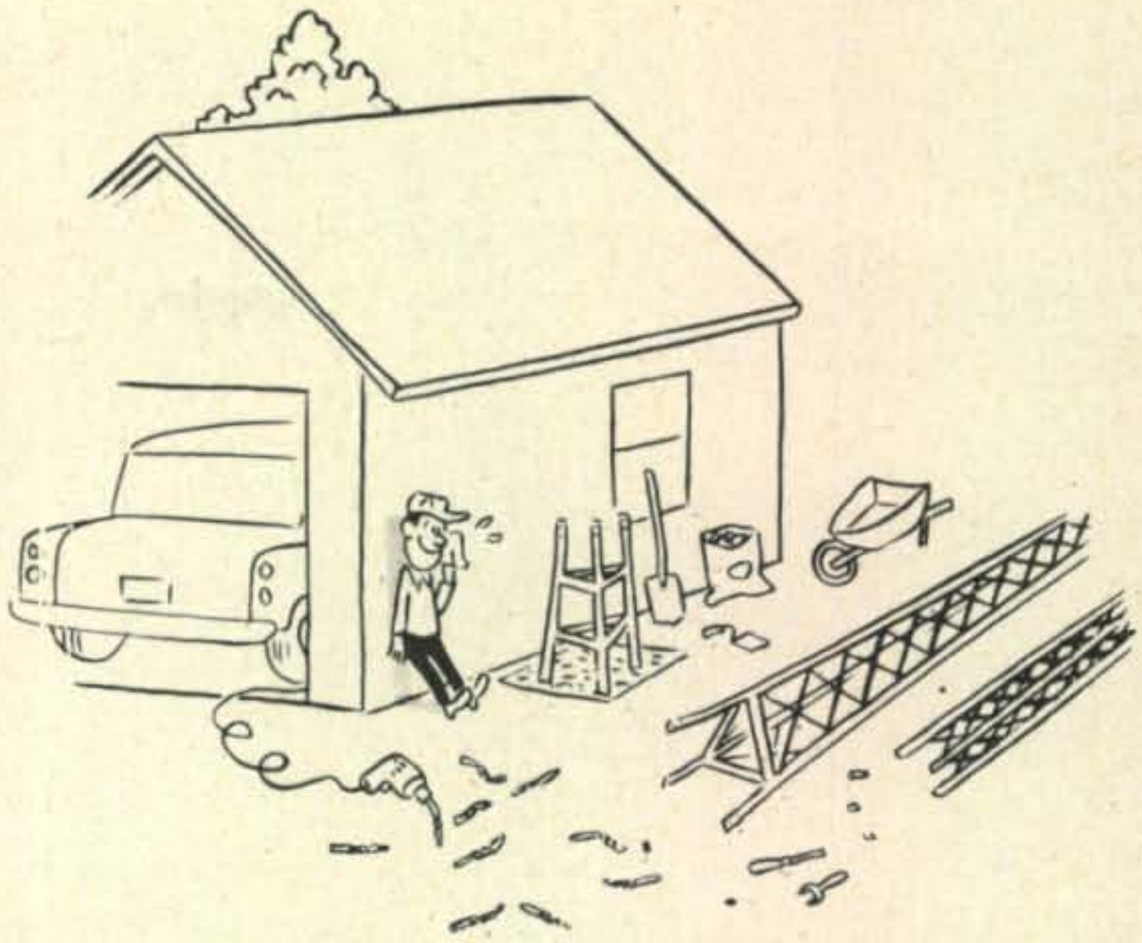
I bolted the first two sections of the tower together. My wife and I raised them into position and lowered them into the base. So far—easy. With difficulty, I managed to put the pulley device on the side of the tower. My 11 year old son, John, WN9FRN, and his friend, Ken, pulled on the rope and lifted the

next section to the top of the tower. Just then, the pulley device gave way in the middle and began to bend toward the ground. John and Ken eased off the rope and we carefully lowered the section. Then it was back to the welder to get my pulley rewelded.

With the hook rewelded, I renewed my assault on the tower. A friend, Bill Walsh, WA9QOS, stayed on the ground, pulled the rope and hoisted the next tower section in the air. The small diameter nylon rope jumped the pulley and left 40 lbs. of tower dangling in the air. Bill couldn't pull it up and it wouldn't come down. I was on the roof, and I couldn't quite reach the pulley. Bill traded places with me—he's a 6'3". He managed to remove the rope from the pulley and we lowered the section onto the garage roof. Using a larger diameter rope, we again hoisted the section and lowered it into place. With a sigh of relief, we bolted the section in place. Realizing the difficulty experienced at only 25', we began to ponder the wisdom of erecting a 56' tower. We realized that we could have hinged the tower at roof level, walked the top of the tower up and have someone on the ground, with a rope, pull the tower upright. Since neither of us wanted to climb any higher than 25', we decided to try the hinge idea. It would have been too difficult to pull the existing sections apart. So, using a hacksaw, I cut the tower off at roof level, and we let the cut piece fall to the ground. We had spent the day erecting 10 feet of tower, and cutting down 12, and the section we let drop was now too bent to use. Oh well, we still had 46' of tower left.

I inserted the hinge posts into what was left of the tower and bolted them in place. After discussing the plans with numerous friends, I was ready to add the last thirty feet of tower. Saturday, August 21, was to be the big day. I arranged to have eight husky men meet me at my home for a tower raising party. Naturally, you can't just ask people to spend all day working at your home without even offering them so much as a drink. So I bought a case of beer and a case of coke and invited everyone to a party.

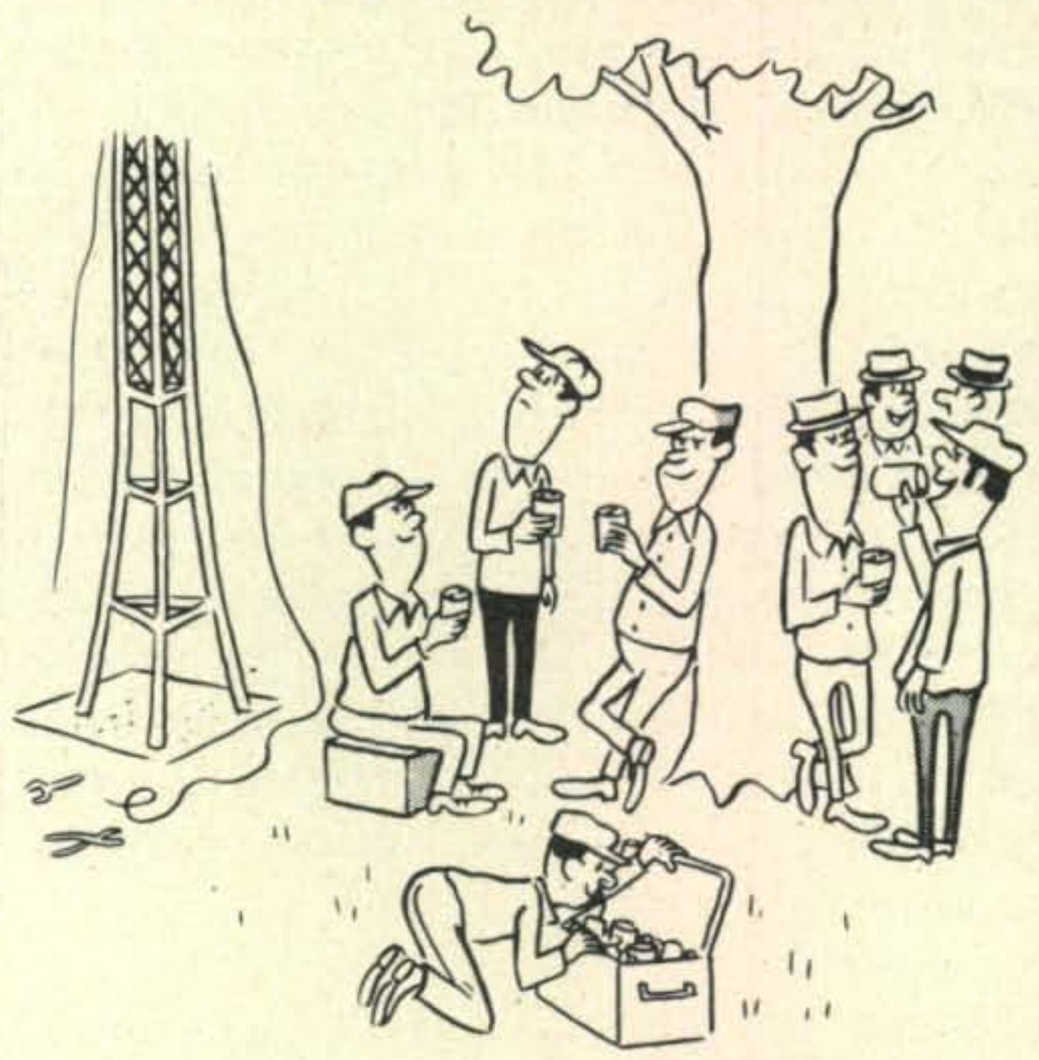
One o'clock was the time for our party to begin. At ten after the hour, I was the only one present. At 1:15 my first assistant showed up. We hoisted the tower section and antenna elements to the roof, and began to bolt the tower together. At 1:30 a second assistant arrived. We taped the coax and rotor leads



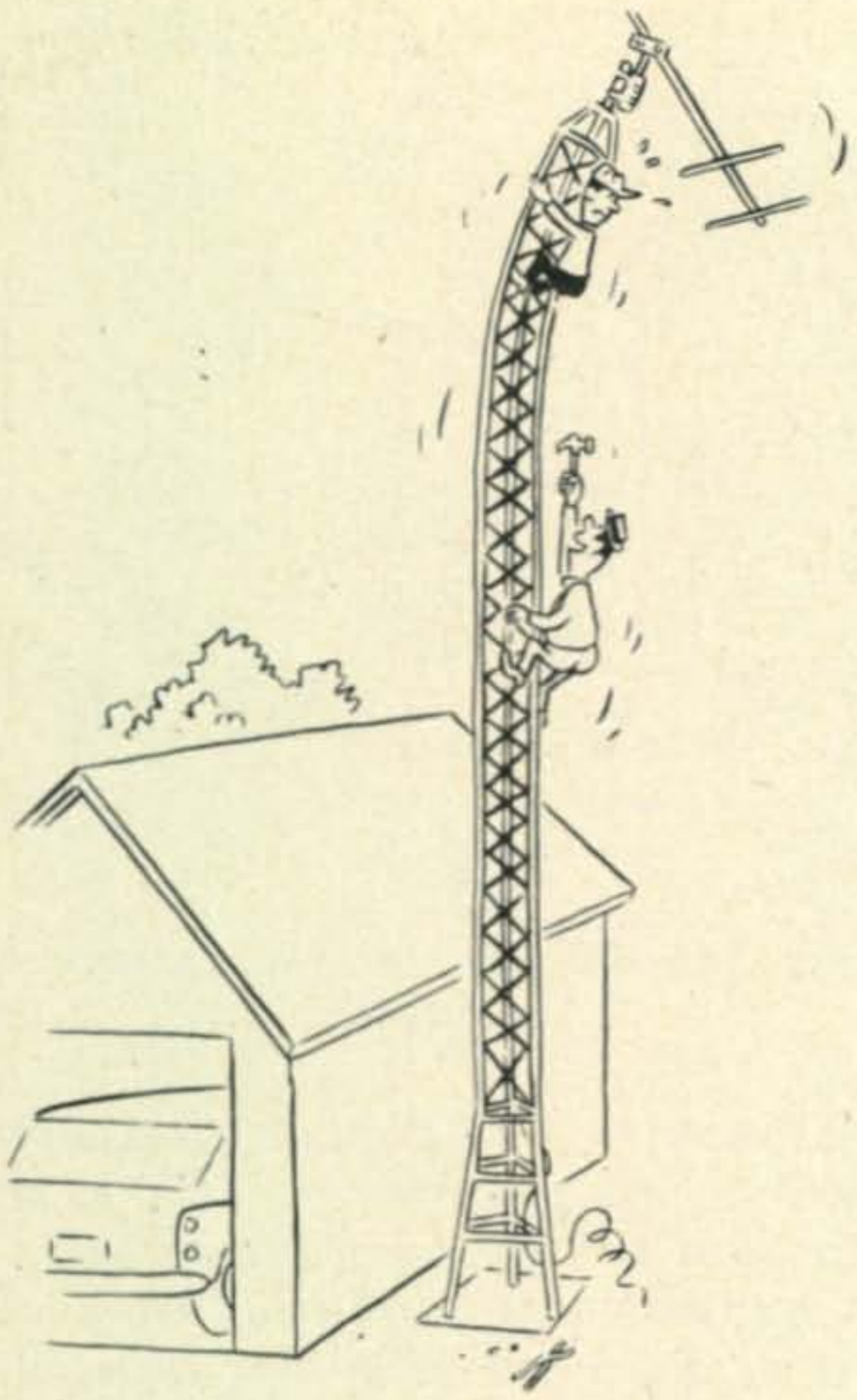
30 bolts and 9 drill bits later I was ready to erect my tower.

to the tower. At 1:45 assistant three arrived; we tied ropes to the tower. At 1:50 assistant four arrived and we stopped for a beer.

At approximately 2:00 P.M., we decided that if we drank too much beer we wouldn't be able to raise the tower at all, so we readied ourselves for the big task. Four of us stood on the roof ready to raise the tower. The most portly member of our motley crew stood on the ground ready to pull the rope. On my signal three of us on the roof lifted the end of the tower while the fourth person shoved an extension ladder under the tip of the tower. We pushed, and up she went. That is she went up to a 30° angle. At that time the antenna became loose and rotated so that the elements were sticking in the roof shingles. We couldn't budge the tower another foot up-



At 2:00 p.m. we decided that if we drank anymore beer we wouldn't be able to raise the tower at all.



It seemed as if the tower was swinging 20 ft. in each direction.

ward, and we couldn't let it down without breaking my tribander antenna. We rested the tower on the ladder and thought. Just then, Carl Merris, another friend, arrived. I yelled as loud as I could, "Carl, come fast!" He scampered up the first 16 feet of tower and climbed on the roof. We all pushed as hard as we could. The tower slowly rose into position. I quickly shoved a bolt into the hinge, and our tower was up. But the antenna was not quite horizontal, and someone had to climb the tower to insert the final bolt.

Guess who was lucky enough to get to climb the tower? It seemed that the group was saying unanimously—it's your tower, you climb it. But I'm no fool, I had my trusty safety belt ready. Climbing the tower wasn't as bad as I had anticipated. I reached the top and caught my breath. I turned one side of the boom and with difficulty, inserted a bolt through the clamp. For some reason, I couldn't get the bolt through the hole in the other side of the boom. I pounded the bolt with the back of a bail set. But I couldn't get the bolt in.

Big John Hodel, a 220 lb. friend, decided I needed help. I heard him say, "Al, you need a hammer," and immediately the tower began to shake. I get seasick easily. John's weight of 220 lbs., and mine of 170 didn't help matters. It seemed as though the tower was swinging 20 feet in each direction. I learned later that it actually moved less than 2". I took the hammer from John and yelled for him to get off the tower. He slowly got down and my left leg began to shake uncontrollably. I placed more weight on my left foot and the shaking stopped. I couldn't get the bolt in the hole, and it appeared that I had been trying for hours. The rest of the gang was yelling at me, "Hey, Al don't forget to change hands every fifteen minutes or you'll fall." "It your life insurance paid up?" "Did you remember to make a will?" "The tower's crooked, I think we better take it down again." "Are you sure you wouldn't really rather have a vertical whip instead of a tribander?" None of these comments did much to relieve my slightly giddy feeling.

I decided to forget the bolt. After all, my life was worth more than half an antenna. I descended very rapidly and with a sigh of relief stepped onto the roof. I paused for fifteen minutes to catch my breath and descended to the ground—mission accomplished. I stepped back to survey my proud accomplishment and discovered that the longest element was out of line with the rest of the elements, but I didn't care.

I hooked up the cables and tried the rotor. It worked fine. I tried the antenna for reception and promptly picked up Australia. A fellow ham tried the transmitter and had a QSO with Oklahoma. My new antenna was a success. It did seem rather odd that I had my strongest signal from Hawaii when the rotor was pointing north, but I was getting something. And I got it all for only $220.00 That, of course, did not include the price of the beer.

You may think my escapade was far from economical. You're wrong. I plan to sell my story to a magazine for $1,500.00, thus netting $1,280 profit.[1] And if you need some advice from an antenna consultant, my services come for only $25.00 per hour. ■

Editor's Note

NOTE:[1] WN9FRM did not achieve his anticipated $1280 profit, but was rescued from his $76 deficit by *CQ's* extreme generosity to a budding author.

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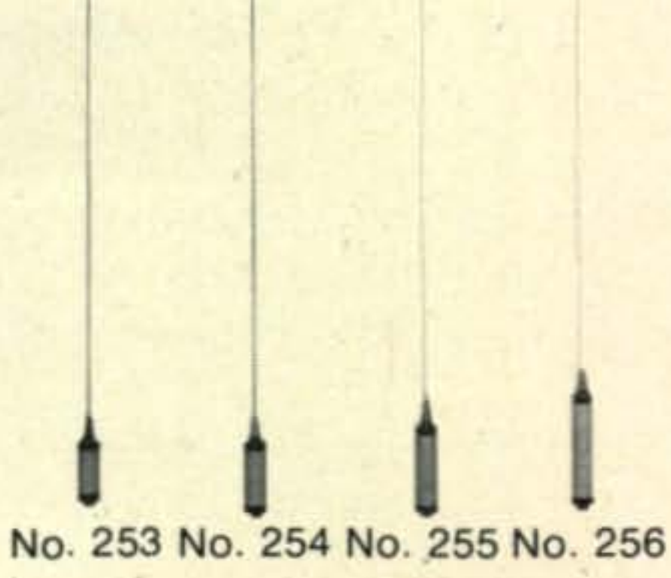
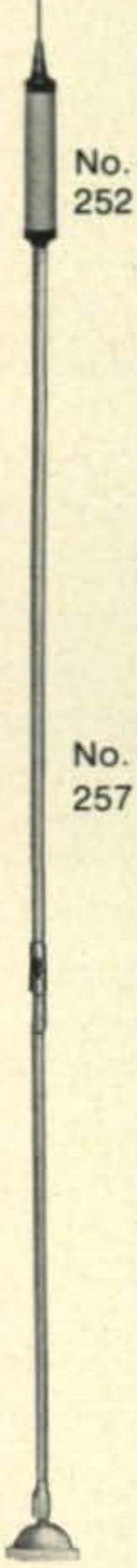


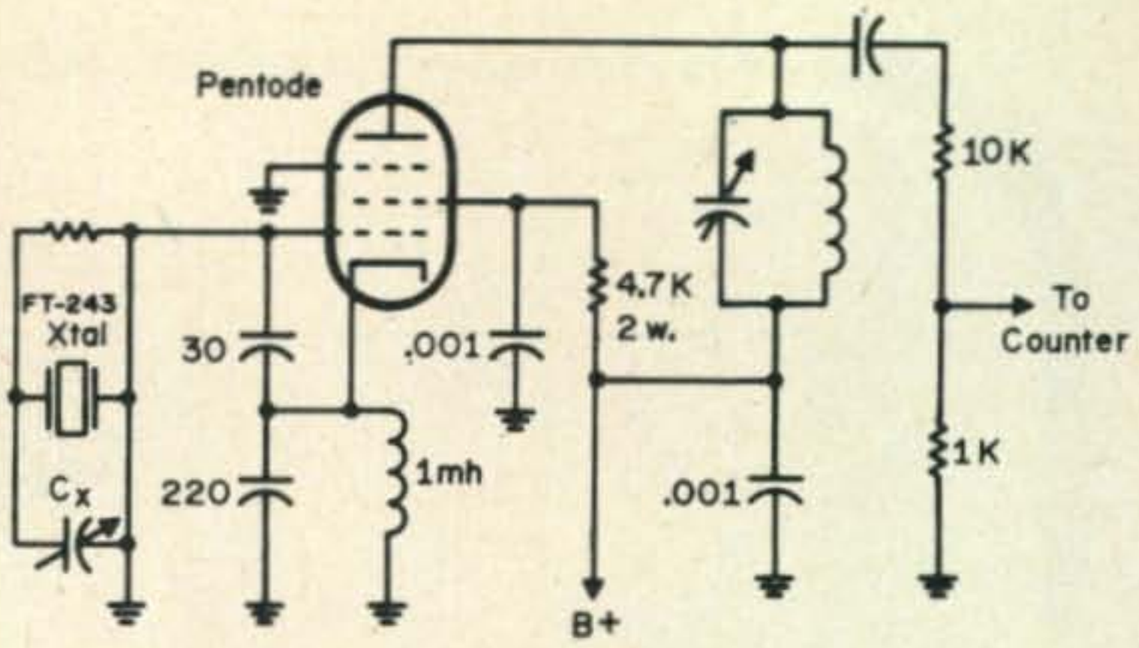


HY-GAIN ELECTRONICS CORPORATION

P. O. Box 5407-FG Lincoln, Nebraska 68505

MATH'S NOTES

BY IRWIN MATH,* WA2NDM



Cx	Oscillation Frequency	2 Meter Output
10pf	8132.7 kHz	146.389 mHz
20pf	8131.0kHz	146.358 mHz
32pf	8130.0 kHz	146.340 mHz
50pf	8129.3 kHz	146.327 mHz

Fig. 2—Test oscillator discussed in the text, with table of Cx vs frequency change.

With the recent (and frequent) changes in f.m. repeater operating frequencies, the two meter enthusiast soon begins collecting a large assortment of "useless" crystals. The prevention of just such a collection, without resorting to an expensive frequency synthesizer, is the subject of this month's column.

Figure 1 is the electrical equivalent circuit of a typical quartz crystal such as those used in oscillators for communications work.

R_1, L_1, and C_1 represent the physical characteristics of the quartz itself while C_0 signifies the shunt capacitance of the electrodes contacting the quartz and the holder. It can be seen that these components form both a series resonant circuit, L_1 and C_1, and a parallel resonant circuit, L_1 in parallel with C_1 and C_0. What makes the crystal different from standard LC resonant circuits made with standard components, however, is its inherent stability. Typical equivalent values of the components of fig. 1 indicate inductances of thousands of henrys for low frequencies, ranging to several henrys at frequencies in the neighborhood of 10 mMz or so. The value of the capacitances on the other hand are very low, only a few picofarads. This leads to a very high L to C ratio and consequently, crystals exhibit an extremely high Q. In fact, normal communications crystals usually exhibit Q's on the order of several hundred thousand while special units for frequency standard applications may have Qs of several million.

What all of this means to the radio amateur is that the crystals can be thought of as a conventional tuned circuit with a very high degree of stability. By adding inductance or capacitance to this tuned circuit, then we can change its resonant frequency. Before everyone runs out and buys loads of components, however, it should be understood that there is a limit to how far a crystal can actually be "pulled" in frequency, and for most common units this limit is approximately ±0.1%. While this amount of adjustment will not make a wide range of v.f.o. possible, it will be perfect for adjusting the frequency of the common "stock" crystals to be found in most surplus dealers catalogs. As an example, figure 2 is a schematic of a typical 8 mHz crystal oscillator with a variable capacitor. C_x, added in parallel with the crystal. Also shown is a chart of the variation in frequency with change in capacitance of C_x, both at 8 mHz and at the 2-meter band after 18-times multiplication. It is interesting to see the amount of shift produced by a simple trimmer! One should realize, however, that the trimmer is in parallel with the other stray capacitance in the circuit as well as the input capacitance of the tube and it may not be possible to achieve the variation shown with all oscillators. In addition, when adding a parallel crystal trimmer to an oscillator as shown, one can only lower the effective frequency.

Another way to vary the frequency of a crystal oscillator is with a series component. Figure 3 shows three such combinations. In 3(A), a variable inductor of 10-30 μh has been added in series with an 8 mHz crystal and will *lower* the fundamental frequency up to about 3-5 kHz. In fig. 3(B) a 50 pf

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

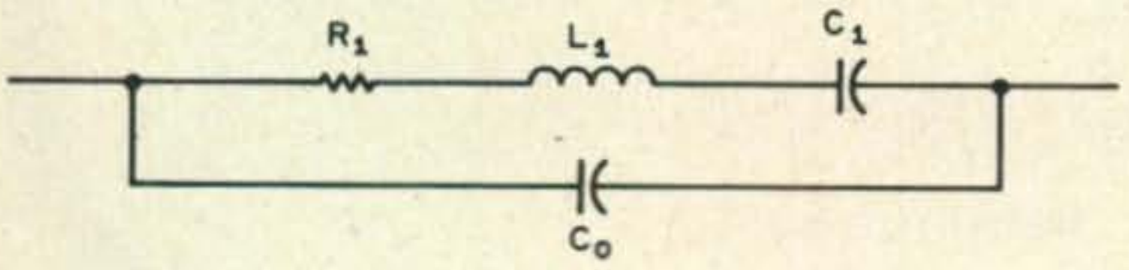


Fig. 1—Equivalent circuit of a quartz crystal.

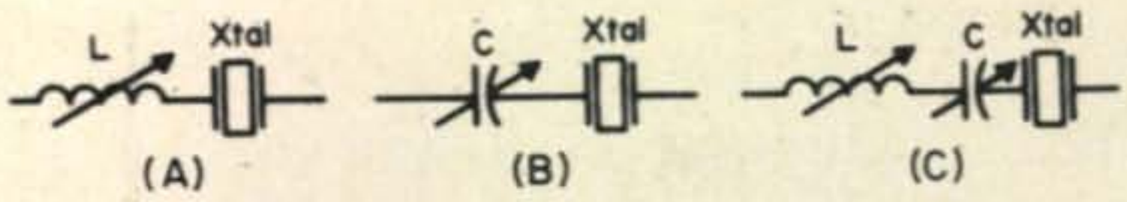


Fig. 3—Methods of "pulling" the frequency of quartz crystals. (A) Series inductance can lower the frequency by as much as 3-5 kHz. (B) Series capacitance can raise frequency by 3-5 kHz. (C) A combination of both allows frequency changes in either direction.

trimmer has been added in series with the crystal and will *raise* the fundamental frequency by about the same amount. Finally, in 3(C), both are in series, giving an adjustment range above and below the crystal frequency. Exact adjustment ranges will be a function of the crystal used and must be determined by experimentation.

Figure 4 is a schematic of a transistorized 8 mHz oscillator I have used on numerous occasions. It is perfect for use with crystals of all activities and can form the basis of an inexpensive 2-meter frequency source. Q_1 is the oscillator with feedback from collector to base through the crystal. A rotary switch has been incorporated to switch crystals and/or frequency pulling components, and various combinations of these are shown. It should be noted that the same crystal is used in the first switch positions to generate three different frequencies.

Q_2 and Q_3 act as buffer amplifiers and essentially isolate the final output from the oscillator. For additional stability, the oscillator transistor operates from a zener-diode-regulated 5 volt supply.

With only 4-5 crystals, one should be able to "synthesize" the entire 500 kHz from 146.0 mHz to 146.5 mHz, most of the common repeater input frequencies. By the same reasoning, another 4-5 crystals would cover the output frequencies in a similar scheme for the receiver local oscillator.

All of the previous information will be of use if one has crystals that do not have to be "moved" more than ±.1% as already stated. If any crystal is loaded with too much external capacitance or inductance, however, it will simply stop oscillating. If more variation is needed, the only remaining technique is to physically alter the crystal.

This procedure is not as difficult as it may seem, especially when easily disassembled crystals such as the FT-243 or FT-241 styles are used. I have raised the frequency of several 8 mHz crystals by the simple procedure of carefully opening the holder, removing the quartz blank, and grinding it in an abrasive made up of Ajax or Bon Ami cleanser and water on a flat glass plate. Care must be taken to grind the crystal evenly to prevent loss of activity. A few strokes in the loose cleanser/water mixture should be good for a couple of kHz. After grinding, the crystal blank should be cleaned first with clear water, then with pure alcohol. As soon as the blank dries, the holder can then be re-assembled and the new frequency determined. To lower frequency of a crystal *a few hundred Hz*,use a standard No. 2 pencil and make a short line ¼" to ½" directly on the blank. This method will not allow large variation downward as the activity of the crystal is impaired by the extra mass of the graphite on the quartz.

The best way to practice crystal grinding or loading is to obtain a few surplus crystals and experiment. A technique is then easily achieved.

Two low cost sources of crystals for ama-

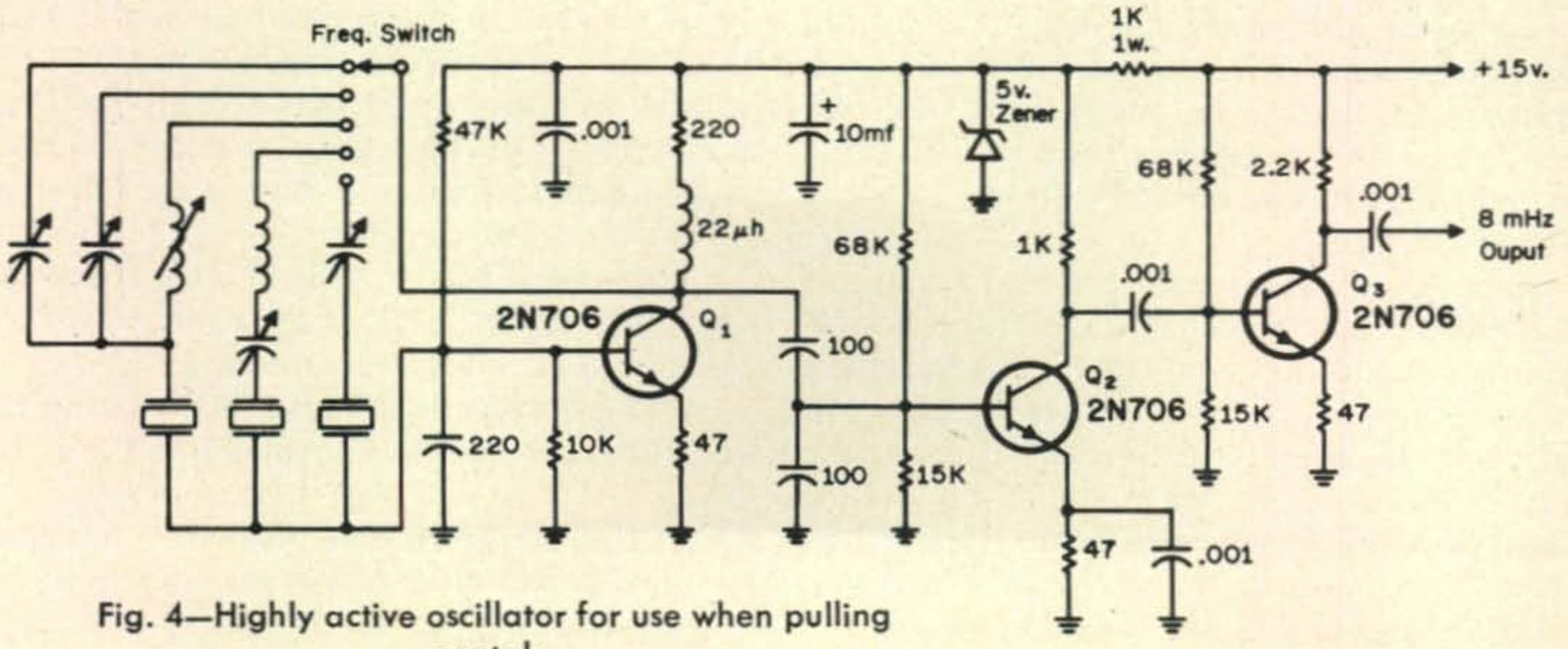


Fig. 4—Highly active oscillator for use when pulling crystals.

teur and experimental work follow:

JAN Crystals, 2400 Crystal Drive, Ft. Myers, Florida, 33901, is an excellent source of all kinds of crystals from 16 kHz to 105 mHz. Typical prices for *any* amateur crystal in FT-243 holders, specifically ground to an accuracy of ±1 kHz (perfect for pulling) are $1.50 each or 4 for $5.00. There are also hundreds of stock crystals in FT-243 or FT-241 holders for 75¢ each, 3 for $2.00; HC6/U or HC18/U holders for $1.75 each, 3 for $5.00, and many more. An emergency 24 hour source is also offered. Write for JAN's informative catalog.

ARROW SALES, 7049 West Archer Ave., Chicago, Ill., 60638, also has a load of inexpensive crystals on page 8 of catalog 149. FT-243 stock crystals are only 10 for $5.50 and they also have CR1's and HC6/U's, many of which are good for amateur use. Also in this catalog are a host of other items of interest to the experimenter.

A couple of other sources offering crystals at attractive prices, but with a smaller variety than the two just mentioned are:

John Meshna, P.O. Box 62, E. Lynn, Mass., 01904, offers 10 assorted crystals for $1. Also of interest to the 2-meter buff is an RCA control head for only $2.25. Write for this great catalog.

Frank Electronics, 407 Ritter Road, Harrisburg, Pa., 17109 has FT-243 crystals for 75¢ each, many in the ham bands, and

Fair Radio Sales, 1016 E. Eureka St., Lima, Ohio, 45802, one of the most well equipped surplus houses we know of, is selling mixed FT-243 units at 5 for $1.00. They aiso have a 110 volt 60 Hz crystal oven for HC6/U crystals for only $1.95. Ask for #HUG 945550.

In closing I just want to mention a new "package" we just heard of being offered by Tri-Rio Electronics, 2614 Lakeside Drive, La Crosse, Wisconsin, 54601. These people are offering six small 2 ×3 inch P/C boards with components that look as though they came out of some sort of computer. The switch, however, is that a schematic of each board as well as re-designs for a code practice oscillator, tachometer, crystal calibrator, 3-7 mHz regenerative receiver, and 1 watt audio amplifier is included with the package. It is an excellent buy at $1 plus 25¢ postage and should be purchased by anyone who even contemplates some form of home construction.

See you next month. 73, Irv, WA2NDM

TOPTOUR UPDATE

March *CQ* described in detail the ham European vacation program organized by the Top Tour Ham Club in cooperation with Swissair. At that time, there were five Top Tour Ham Club locations: one in Germany, one in Austria, two in Switzerland and one in Liechtenstein.

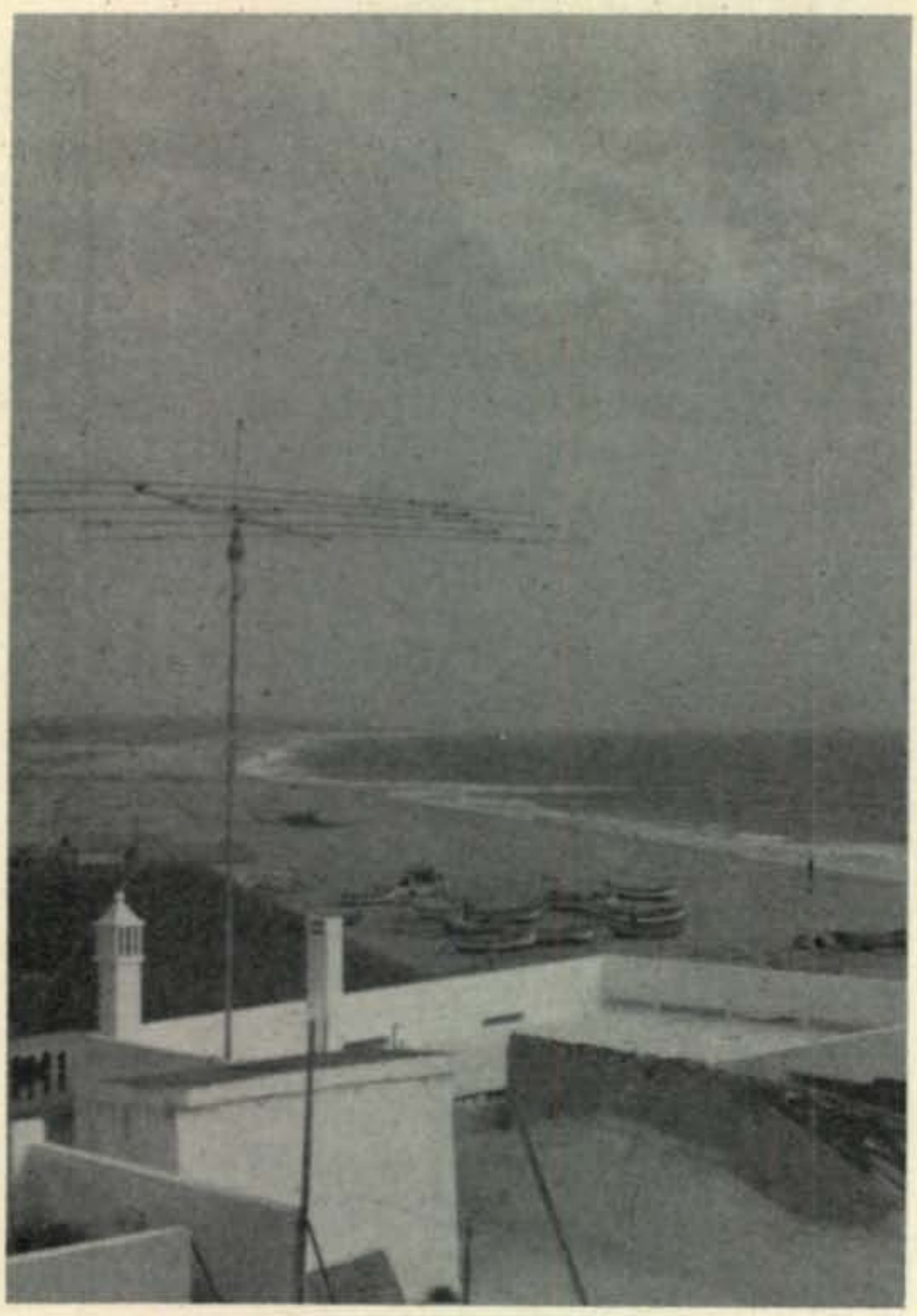
Since then, some changes and additions have been made which should interest prospective European vacationers this Summer.

The biggest news is the opening of a new club station at Armacao de Pera on the southern coast of Portugal. The club house is located on the beach with a fine view of the Atlantic, and the local fisherman. The house contains four double-occupancy rooms and one single, with several baths, two kitchens, guest recreation room, roof garden and large shack in an enclosed sea-side porch. Four rooms overlook the ocean, and two have balconies. The backdrop is hilly landscape with almond, citrus and olive groves, all-in-all, a very picturesque setting.

The shack is the typical Top Tour Club rig with FTDX-560 transceiver, 5-element beam and ground plane antenna.

CT1 calls can be obtained for visiting Club members through the normal Top Tour channels.

In the southernmost part of Switzerland is Lugano, which offers a varied atmosphere which has all the best features of Italian



Armacao de Pera, Portugal is the location of this quaint scene. It's also the location of one of the two new Top Tour Ham Club stations. It's situated right on the beach on the southern coast of Portugal.

climate and hospitality in a precise and immaculate Swiss city. Lugano is warm enough to enable palm trees to survive, and yet is within viewing distance of the Alps! It is here that Top Tour Ham Club has located still another station at the King's Hotel. The high-rise building is topped by a five-band ground-plane, and the rig is the usual FTDX-560.

Overlooking Bregenz, Austria, the new Top Tour QTH for this area is the Berghof Fluh perched on a mountainside overlooking Lake Constance.

Sub-tropical is the only way to describe the Swiss city of Lugano, the southernmost city in the country. Located south of the Alps, dipping deep into Italy this Top Tour location offers the best of Swiss and Italian hospitality.

The hotel has its own fine restaurant, bar, meeting rooms, garage and reserved room for the shack. From Lugano its only a short trip by train or car to the Italian cities of Como and Milano, or north to central Switzerland through the St. Gotthard Pass which can only be described as spectacular.

A change in the Top Tour location in Bregenz, Austria moves the club station from a hotel in the heart of the city to an ultra-modern mountain-side motel overlooking the city. The new location is the Berghof Fluh located 750 meters above sea level (about 2500'). As the photo shows, the new QTH is quite beautiful, and full services are offered to guests.

Indications from both Swissair and Top Tour Ham Club are that interest in the tours is high among US amateurs, and that the club stations are proving to be popular attractions. As additional locations are added, we will continue to keep you posted about what each QTH has to offer. Without exception, the seven existing stations are situated in spectacularly beautiful locals in Europe's best vacation areas.

For pricing information and other details on these and other Top Tour Club Stations, write to Top Tour Ham Club, P.O. Box 47, CH-9470 Buchs, Switzerland or to Swissair, 608 Fifth Ave., New York, N.Y. 10020, Attn: Peter Luethi.

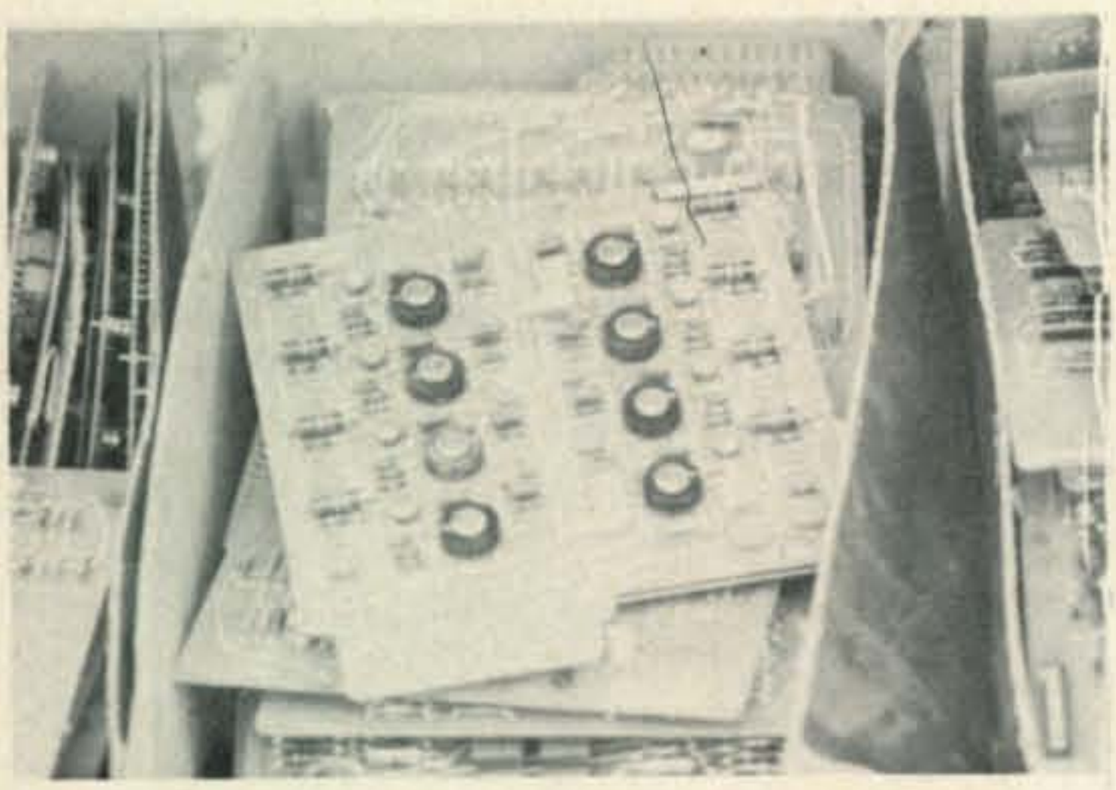
Dayton: 1972

DAYTON is a fair-size metropolis in its own right, but each April brings a temporary surge of population comprised largely of the species known as "hams." Marking a time-honored celebration of the arrival of Spring, some 5500 of the rare and unusually sociable breed descend on several acres of suburban Dayton for the annual Dayton Hamvention. The site is one to bring tears of appreciation to the eyes of a mobile antenna manufacturer as thousands of vehicles of all shapes arrive, each bearing the mark of the amateur on wheels.

As usual, *CQ* was there, and the wandering f1.4 eye of the camera recorded the event. Making its re-appearance was the 5 acre flea market which seems to get bigger and more interesting each year. The show inside drew its share of visitors, too, with swarms of hams filling the aisles to capacity.

[*Continued on page 96*]

Hmm! The wire alone cost more than a buck and a half.



Flea markets play no favorites. Solid state or vacuum tube, it all winds up being peddled for salvage.

Don C. Miller, W9NTP receives the "Ham of the Year" award from Dayton Mayor James McGee.

The flea market just grows and grows.

Chew the rag all day or win the contests...

the CX7A makes them both easier.

There are a couple of different ways to look at signal/one's CX7A. You might compare it to a car.

For the rag-chewer's convenience and ease of operation, it's strictly in the Rolls-Royce category.

For the competitive-minded amateur, it's like driving a Ferrari.

That's because the CX7A was designed with uncompromising quality. With more features than you can imagine. The rig equals a room full of gear, all neatly enclosed in a compact, desk-top unit.

It lets you do things no other rig lets you do. And do all of them better. Sitting at the console of the CX7A you're in command of the amateur radio universe.

Whether you're a Rolls-Royce type or a Ferrari-minded guy.

See the remarkable CX7A at your signal/one dealer's. Or write for a detailed brochure. For $2,195, you'll be the coolest rag-chewer in town.

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OSCAR-6 Launch Delayed

BY GEORGE JACOBS,* W3ASK

THE Radio Amateur Satellite Corp. (AMSAT) has announced that the planned late July or early August launch of the OSCAR-6 amateur radio satellite has been delayed until the late fall or early winter of this year. The delay is due to unforseen circumstances with the primary NASA mission. While the delay is a disappointment, it's the price that must be paid for a piggyback ride into space.

When eventually launched by NASA, OSCAR-6 will contain the AMSAT-OSCAR-C (A-O-C) 2-to-10 meter repeater which has been described in the past two issues of *CQ*.[1, 2] The delay will allow additional time for radio amateurs to prepare equipment for participation in this space project.

There is a possibility that the delay in launch will require a change in the primary mission with which OSCAR-6 will ride piggyback into space. If this should be the case, updated and revised orbital data will appear in an appropriate issue of *CQ* well in advance of launch.

Speaking of orbital information, an excellent article by W. Browning (G2AOX) appeared in the April, 1972 issue of *Radio Communication*[3] (p. 212), entitled: "Keeping Track of OSCAR (Part 4)." The article describes a relatively simple geometric procedure for plotting a satellite's orbit, and the data should prove of considerable value during the OSCAR-6 experiment. Bill Browning has received world-wide recognition for the highly accurate predictions he provided during previous OSCAR satellite missions.

It also will be possible to obtain OSCAR-6 orbital information on a subscription basis from a computer program run by the Independent Tracking Coordination Program (ITCP), 824 Connecticut Ave., N.W., Washington, D.C. 20006. Once a month, subscribers will receive satellite pass times for their location for the next month. The time will be given, along with required antenna elevation, azimuth and satellite range information for passes within range of the subscribing station.

Called ZIPSAT, these orbital predictions will be available to subscribers in the USA and Canada for either the daytime or nighttime passes at $36 per year (10¢ a day). Overseas subscribers will be charged $41 because of additional air mail postage charges. For shorter periods, orbital data for either daytime or nighttime passes will be provided for three months at a charge of $10 to subscribers in the USA and Canada, and $12.50 for overseas subscribers. Contact Norton Goodwin directly at ITCP for further information.

Other OSCAR News

Work continues on three continents towards the completion of various systems of the AMSAT-OSCAR-B (A-O-B) package. Among them is a four channel, f.m., 145-to-435 mHz repeater being assembled and tested in Australia; a EURO-OSCAR 432-to-145 mHz repeater being put through its final testing in Germany, and a 2-to-10 meter repeater (similar to A-O-C) being assembled in the United States. Present plans call for A-O-B's launch, aboard OSCAR-7, sometime during late 1973.

Project SYNCART (Synchronous Amateur Radio Translator) also is still in the cards, although several years off. AMSAT has proposed to provide NASA with a 145-to-435 mHz 20-watt linear translator for integration into NASA's ATS-G spacecraft. ATS-G is planned to be placed into a geostationary (synchronous) orbit during 1975. It will contain a 30-foot parabolic antenna for its primary mission, but which also will be made available to SYNCART. If this experiment materializes as planned, it would provide an opportunity for radio amateurs to communicate through a very long-life satellite, hang-

[*Continued on page 92*]

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

[1] Jacobs, G. "Summer Launch Planned for OSCAR-6"; p. 40, *CQ*, May 1972

[2] Jacobs, G., "Getting Ready for the OSCAR-6 Satellite"; *CQ*, June 1972

[3] Published by the Radio Society of Great Britain (RSGB), 35 Doughty Street, London, England, WC 1N 2AE.

The Blink-O-Nil

BY R. JAYARAMAN,* VU2JN

THIS article describes a solid-state relayless load compensator to prevent light-blinking in the house when keying a transmitter on c.w. Probably this is not a project of much application in the US (except possibly during field-days) because some W6's have told the writer that their line voltage never varies by more than 3 volts whether the Californian Kilowatt is key up or down (amazing!). But in other parts of the world where distribution transformers in a city are located a mile apart and poorly made aluminum-copper street connections are the rule rather than the exception, even 150 watts input into a transmitter can drop the line voltage by as much as 4%. In such situations, the "Blink-O-Nil" can spell the difference between survival and disaster for the poor ham living in a crowded multi-flat or residential building.

However, regardless of the need for the "Blink-O-Nil," the circuit, which is novel in some respects, should prove interesting. Although the unit described here is intended for use with 150 to 250-watt transmitters, the same principles apply in the disign of a "Kilowatt Blink-O-Nil."

Being a "non-essential project," the following design criteria were decided upon right at the outset:

1. The solitary SCR and the assortment of transistors which were available in the writer's junkbox were to be put to the best possible use.

2. No transformers or fresh power supplies would be used, nor would the overworked existing power supplies be strained further. That meant switching the compensating load directly across the mains with all the attendant "shocking" complications.

3. The "Blink-O-Nil" would be r.f.-actuated and automatic, with no connection to the T/R switch or any other equipment in the shack.

4. The compensating load would be two ordinary 100-watt bulbs. Yes, ironically enough, the "Blink-O-Nil" does blink while in operation! That merely "brings to light" the fact that the bulbs cost a mere one-eighth the cost of a comparable resistor in India. Hams in more fortunate circumstances can very well substitute a 200-watt power resistor, after initial testing with a bulb-load. The writer has simply left the "Blink-O-Nil" in a niche below his operating table and has not had to even touch it during several weeks of trial operation.

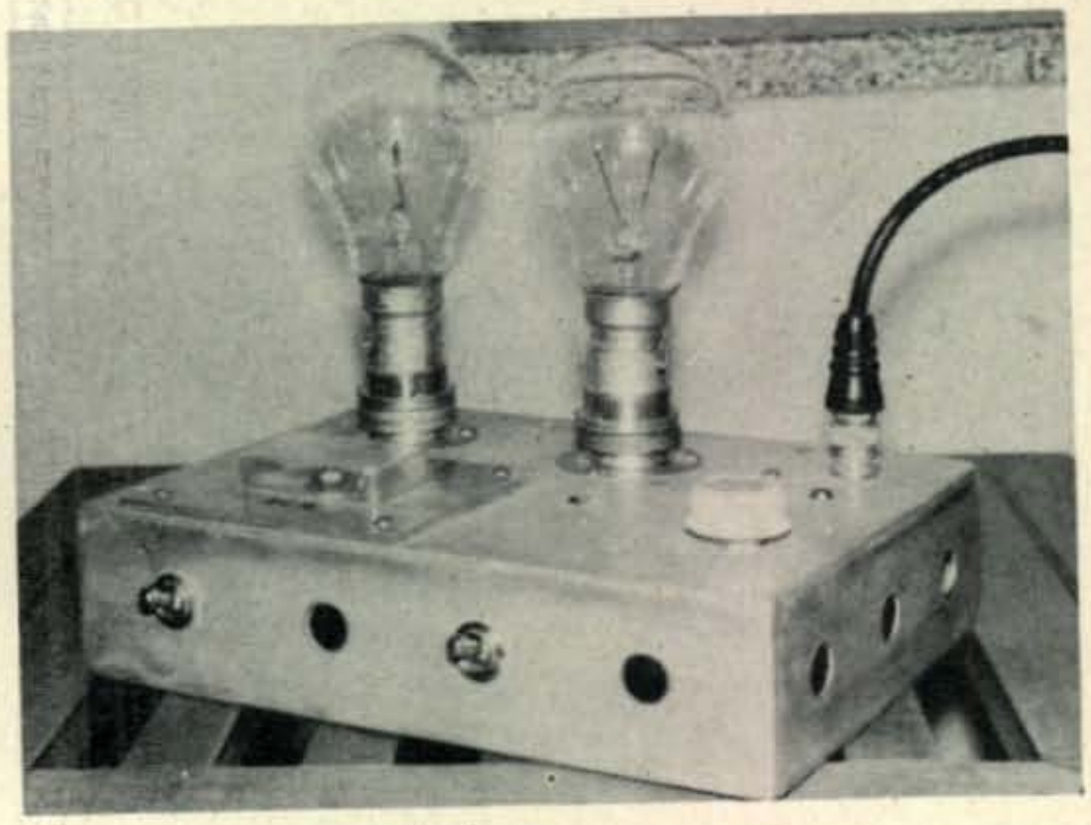
*Research Scholar, Department of Civil Engineering, Indian Institute of Technology, Madras-36, India.

Principle of Operation

During c.w. operation of a transmitter, the "Blink-O-Nil" automatically comes into action and keeps the compensating load on whenever the r.f. output of the transmitter is below a threshold level and off when the r.f. output goes above a certain level. About 3 seconds after removal of r.f., the unit shuts itself out. Its principle of operation is as follows:

The mains voltage is rectified by a silicon bridge rectifier, and applied to the compensating load through an SCR (fig. 1). With S_1 on and S_2 off, the SCR will start firing the load at a particular setting of the 500-ohm potentiometer[1]. With this simple triggering

[1]The reader is assumed to be conversant with the techniques of triggering SCR's.



The Blink-O-Nil built by the author was constructed on a used chassis using as many junk-box parts as possible. If desired, the two light bulbs may be replaced by a suitable power resistor as described in the text.

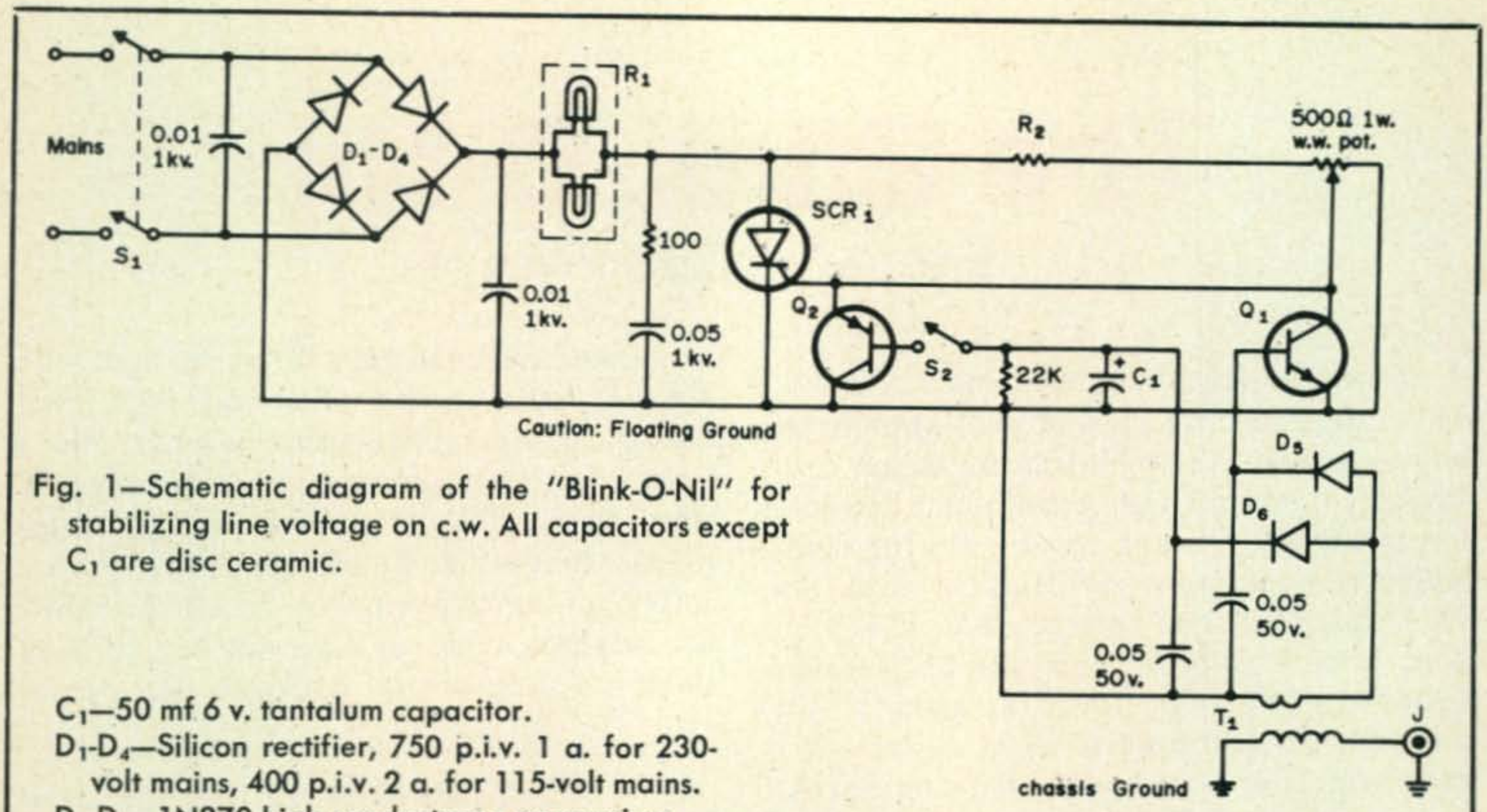


Fig. 1—Schematic diagram of the "Blink-O-Nil" for stabilizing line voltage on c.w. All capacitors except C_1 are disc ceramic.

C_1—50 mf 6 v. tantalum capacitor.
D_1-D_4—Silicon rectifier, 750 p.i.v. 1 a. for 230-volt mains, 400 p.i.v. 2 a. for 115-volt mains.
D_5-D_6—1N270 high-conductance germanium diodes.
Q_1—High-gain NPN germanium transistor (see text).
Q_2—High-gain PNP silicon transistor (see text).
R_1—Two 100-watt bulbs or 200-watt power resistor (250 ohms for 230-volt mains, 60 ohms for 115-volt mains).
R_2—39K 2w. for 230-volt mains, 20K 1w. for 115-volt mains.
SCR1—GE C11B or equivalent.
T_1—2:1 r.f. current transformer: Pri. 16t. #28 closewound; Sec. 8t. #26 closewound over pri. with insulation paper in between, wound on ⅝ in. dia. coil form.

arrangement, the duty cycle of the load can theoretically be varied from 50 to 100%.

Across the gate and cathode of the SCR are placed two transistors for controlling the SCR —an NPN germanium transistor Q_1 and a PNP silicon transistor Q_2. Although the collector-emitter voltage of the transistors is continually varying and drops to almost zero whenever the SCR is on, we may assume, for the sake of this discussion, that the transistors operate under a steady collector voltage. With both the switches S_1 and S_2 on, Q_1 is off but Q_2 is driven into conduction. It shunts the gate-cathode resistance of the SCR, thus preventing it from triggering. If a positive control voltage of about 0.5 volt, derived from the r.f. output of the transmitter, is now applied to the base of Q_1, it also starts conducting and shunts the gate-cathode resistance of the SCR further, thus keeping it off. Meanwhile r.f., rectified positively by another diode, charges the 50 mf capacitor C_1 to about 0.5 volt. This positive voltage raises the base potential of Q_2 to a value just sufficient to turn it off. If the r.f. output of the transmitter is now removed, both Q_1 and Q_2 go off and the SCR fires, thus lighting up the bulb-load. The only discharge path for C_1 is the 22K base bias resistor of Q_2, giving a time-constant of 1 second. Actually, after removal of r.f., Q_2 remains off for about 3 seconds and then again turns on, thereafter preventing the SCR from triggering. This lag of 3 seconds is adequate to cover usual pauses in sending code, except at slow speeds.

The SCR used by the writer is a GE C11B, which though rated at 200 volts and 7 amps, is giving good performance in the circuit.

For proper functioning of the "Blink-O-Nil," the two transistors should be high-gain specimens, handpicked from a lot. The requirements are:

	Type	I_{ceo} at V_{ce} = 6)v.	Current gain β at V_{ce} = 6 v., I_c = 10 ma
Q_1	NPN germanium	< 100 μa	> 150
Q_2	PNP silicon	< 1 μa	> 200

The writer is using a 2N388 for Q_1 and a 2N3638 for Q_2.

When it fires, the SCR gives rise to some r.f. noise. The r.f. bypasses shown in the circuit reduce the noise to a tolerable level. How-

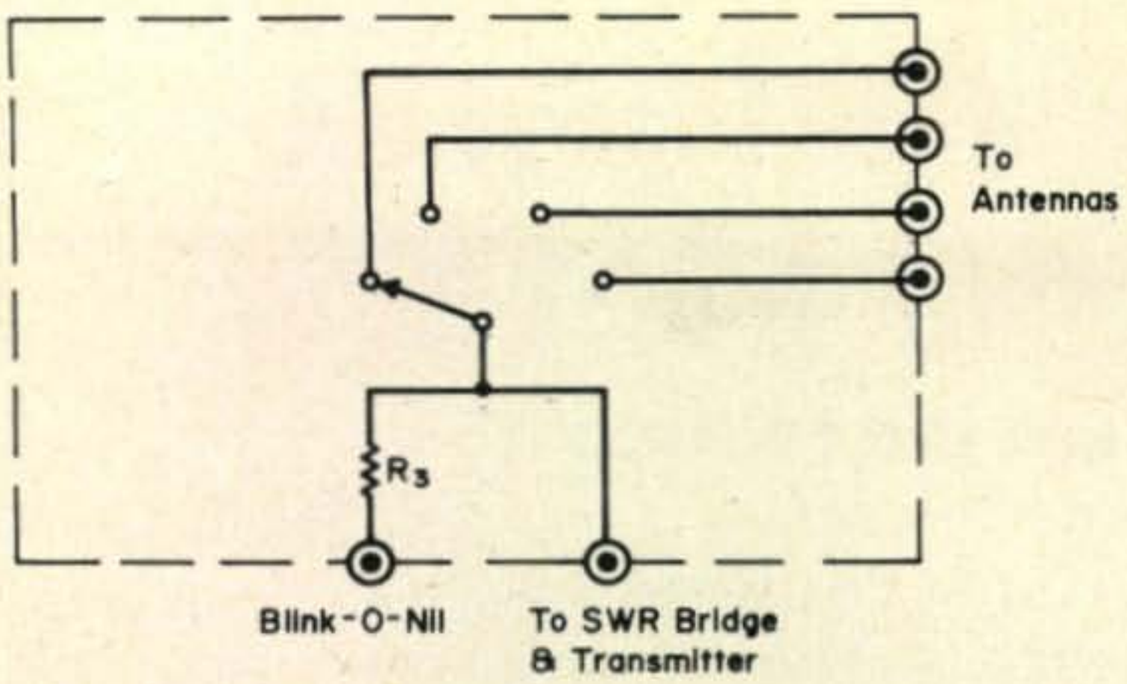


Fig. 2—Antenna switch box. R_3 is made up of two 8.2K 2w. 5% composition resistors in parallel.

ever complete suppression of the noise can be achieved only by thorough shielding of the unit and power-line filtering.

R.F. Pick-up

R.f. pick-up from the antenna-line is made frequency-independent by feeding r.f. through a good-quality resistor R_3 to a small r.f. current transformer T_1 which effectively isolates the floating ground of the circuitry from the chassis ground of the r.f. line. The coil T_1 has a turns ratio of 2:1 and should have very good primary to secondary insulation. It may noted here that the only point in the circuit connected to the chassis is the "cold" end of the primary of the coil.

The value of the resistor R_3 depends on the transmitter power as well as the antenna impedance, and should be evaluated experimentally. The writer is using two 8.2K 2w. Allen-Bradley resistors in parallel. These resistors should be located *physically close to the antenna line* so as not to upset the line s.w.r. Serious tuning difficulties will arise if the resistor is located in the "Blink-O-Nil" and a cable is branched from the antenna line to the unit. (A three-foot long cable branched from a 50 ohm line raised the s.w.r. on 15 meters from 1.5 to 3.0!) The best place to locate the resistor is the antenna switch-box (fig. 2).

The positive control voltages required for operating the two transistors Q_1 and Q_2 are derived by rectifying the r.f. by means of 1N270 high-conductance germanium diodes, followed by 0.05 mf r.f. bypasses. One of the voltages goes directly to the base of Q_1, while the other charges a 50 mf capacitor and is applied to the base of Q_2. Since the charge/discharge cycle is at the fractional volt level, this 50 mf capacitor should be of very good quality, preferably a tantalum capacitor.

Construction:

The entire unit is built on a 8" × 6" × 2" aluminum chassis. The simple open construction and the number of extra holes in the chassis testify to the fact that this is an experimental project.

The SCR is mounted on a 3½" × 3" × ⅛" aluminum plate bolted to the chassis. In order to be sure that there would not be any shock hazard, the writer has used two 2-mil mica washers on either side of the chassis, and a PVC tubing over the stud of the SCR. On the top side of the chassis, the SCR is capped by the transparent lid of a small utility box.

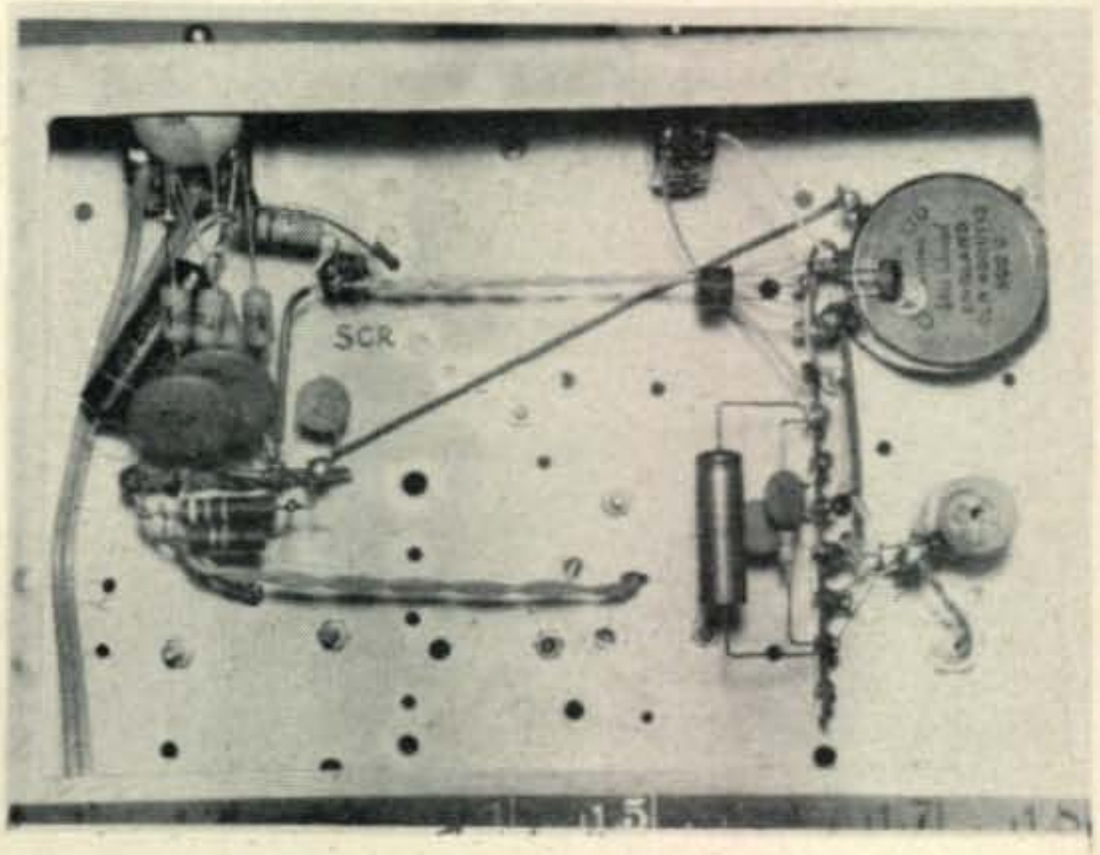
R.f. pick-up is through a BNC chassis connector. The coil is located close to the connector.

Adjustment:

At least during the initial adjustment of the unit, a 200-watt light-bulb load is necessary, even if the builder intends to use a 200-watt power resistor. The adjustment of the "Blink-O-Nil" is somewhat critical though not difficult.

Switch on S_1 alone and turn the 500-ohm potentiometer till the bulb lights up. Switch on S_2 and make sure that the bulbs go off. Now slowly advance the pot as far as possible, so that the bulbs still remain off with S_2 on. Now switch off S_2 and with the bulbs on, measure the r.m.s. voltage across the bulbs with a d.c. voltmeter. This value should be at least 80% of the mains voltage, indicating a dissipation of nearly 70% of the wattage of the bulbs. If not, a transistor with still higher gain should be used for Q_2.

[*Continued on page 94*]



Underside of the Blink-O-Nil. Parts placement is not critical. The SCR is mounted and heat-sinked above the chassis with its leads accessible from below.

The 10°-90° Antenna For 75 and 40 Meters

BY KEN "JUDGE" GLANZER,* K7GCO

THE capabilities of this antenna were first demonstrated to the author by W7IIP (now W8IIP). With a flip of a switch, either of two angles of radiation, 10° or nearly 90°, with vertical or horizontal polarization respectively are available. It might be called both a DX and Local antenna. A significant amount of gain can be had at distances of 2000 miles by using the antenna in the DX position due to a lower angle of radiation. (The DX refers to any location beyond 1000 miles.) Actual on-the-air tests, however, have found the DX configuration to be superior to the Local position at least 60% of the time for the distances up to 1000 miles.

The antenna is ideal for net control stations who must copy stations and be heard at all distances. Mobile stations are often difficult to read since the net control usually has a horizontally polarized antenna. Ideally, the net control's antenna should radiate a signal of equal strength in all directions. This antenna permits a choice of widely different receiving and transmitting conditions that greatly aid net operation. It is also an exceptional Field Day and contest antenna on the low frequencies.

*202 S. 124th St., Seattle, Wash. 98168.

In the DX configuration, the antenna is essentially an upside down ground plane (no radials to bury), voltage fed, radiating vertically polarized waves at a much lower angle of radiation (approximately 10°) than it would if the ground plane were right side up. In the Local configuration, the antenna is a conventional horigontal dipole radiating horizontally polarized waves at a high angle of radiation (nearly 90°) if a quarter wave high.

The "10°-90°" works as follows: in the Local position, the circuit is as in fig. 1. The currents in an open wire feedline are 180° out of phase with each other and, as a result, the field around one wire cancels the field around the other wire insofar as radiation from the feedline is concerned. If the horizontal dipole is one quarter wavelength high, the principal lobe is straight up or 90° from the horizontal. In the DX position, one wire of the feedline is connected to the other wire as shown in fig. 2. Now, the currents in the feedline are in phase and, therefore, there *is* radiation from the feedline which acts as the antenna. The flat top currents are opposing and most of the fields cancel. This is how the upside down ground plane or top loaded vertical is formed. The angle of radiation is

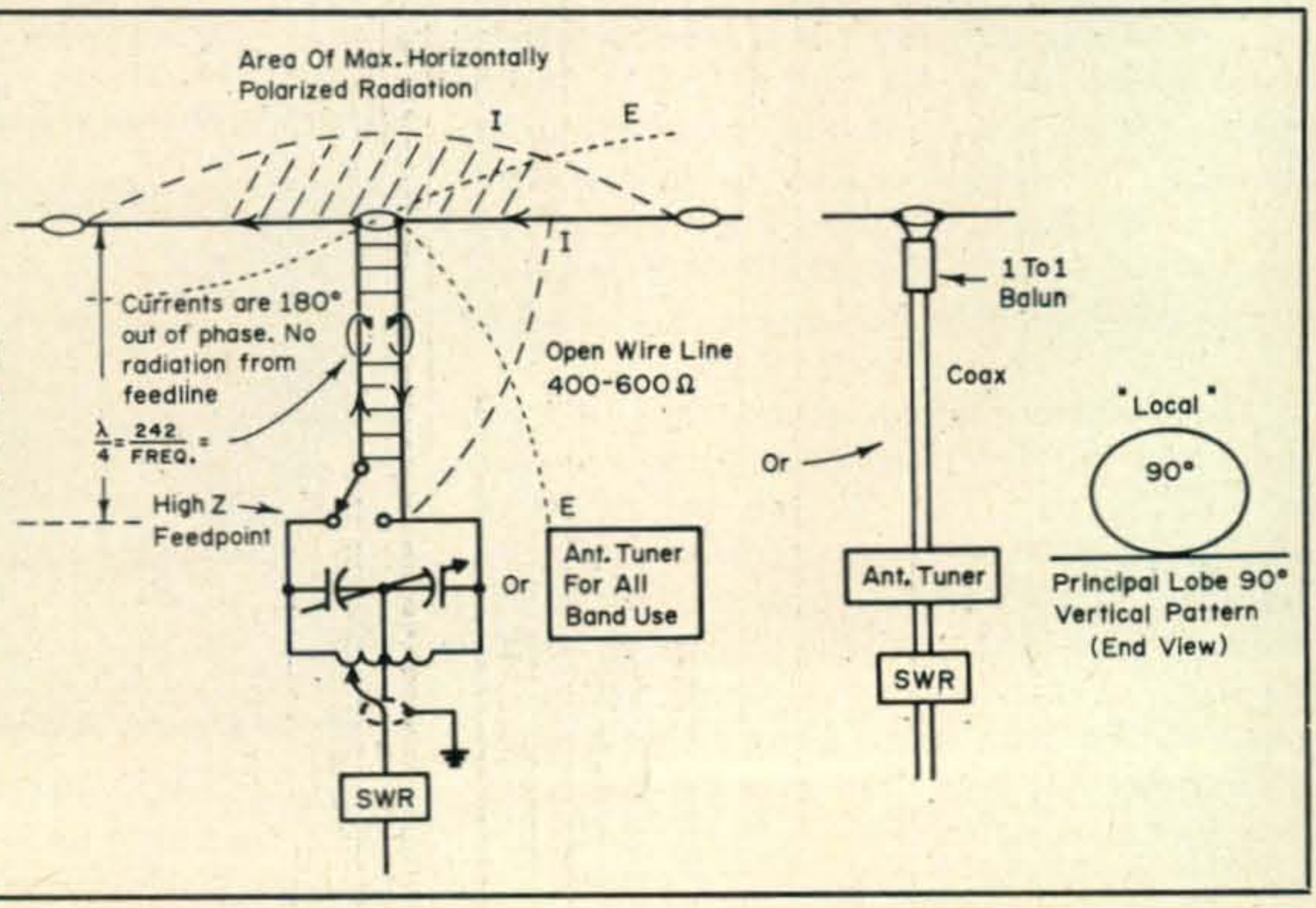


Fig. 1—Basic 10°-90° horizontally polarized antenna configuration for high angle local use. The radiation pattern is shown at right.

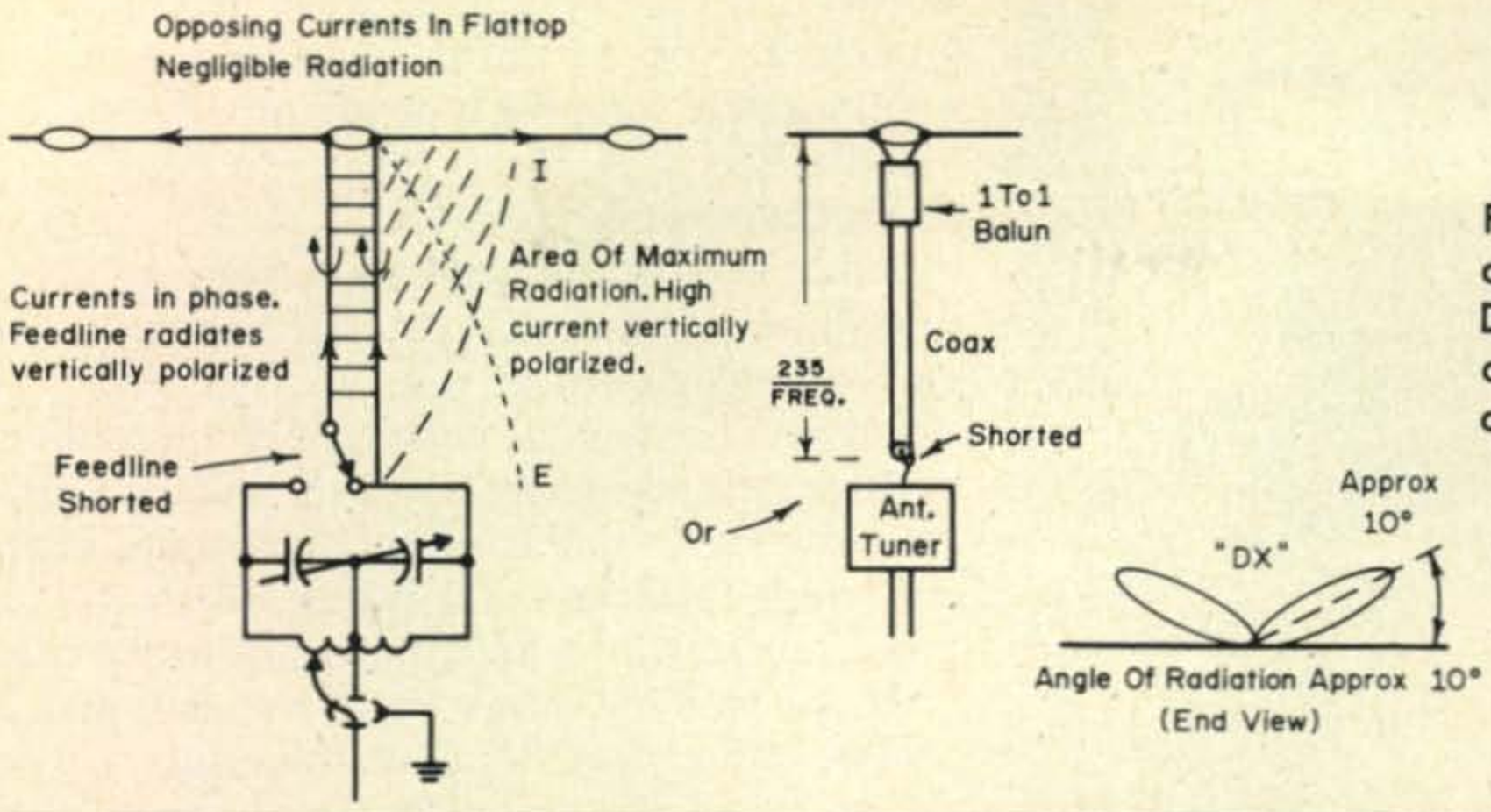


Fig. 2—Antenna vertically polarized in the DX position. The angle of radiation is on the order of 10°, excellent for DX operation.

about 10° which swamps your local area for 30 to 40 miles. The reflected sky wave comes down again at a distance of about 1000 miles or so depending on band conditions, and the state of the ionosphere.

The general construction of the Local and DX antenna is to install a horizontal dipole in the position to be used, and to temporarily feed it with 52 ohm coaxial line; preferably with a half wave of coax and a balun. Insert an accurate s.w.r. meter in the line and determine the resonant frequency of the antenna. The 3 or 5 wire cage dipoles are highly recommended for greater bandwidth needed to fully cover the 80 and 75 meter bands with a minimum of retuning. If the frequency of the lowest s.w.r. is lower than the intended operating frequency, cut off equal amounts of wire from each side of center of the dipole to raise the resonant frequency (the frequency of the lowest s.w.r.). To lower the resonant frequency, add equal amounts of wire to each side of the dipole. One and a half feet of wire added to or subtracted from each side of the dipole will change the resonant frequency about 100 kHz when tests are being made around 3.9 mHz. This procedure insures that the horizontal portion will be resonant and a resistive feedpoint at your operating frequency. In general, the formula length=468/freq. will be quite close for a single wire. The coax is then disconnected and the dipole is ready for the open wire feedline.

The length of the open wire line is calculated from the formula length = 242/freq. for a quarter wave. The open wire can be grid-dipped by tying the open end with heavy cord to a tree and shorting out the end to be grid-dipped. Pull it tight and suspend in the air. The grid-dip meter is held near the hand held shorted end of the quarter wave feedline and tuned for a dip on the meter. It is a good idea to have an assistant find the grid-dip signal in an accurately calibrated receiver rather than to rely on the calibration of the grid-dip meter. The grid-dipper's signal at resonance will be very close to the frequency used in calculating the feeder length. This procedure also assures that the input end of the feedline will present a resistive impedance to the antenna tuner. The actual impedance value will be high as the quarter wave feedline will transform the antenna impedance to a value around 3000 oms. For example, if the antenna impedance is 70 ohms, a 450 ohm quarter wave feedline will present an input impedance of 2900 oms. This is easily matched by the antenna tuner. 450 ohm ladder line is commercially available.

A remote antenna configuration is shown in fig. 3. An antenna relay connects the feedline for the desired 10° or 90° configuration instantly. If 72 ohm line is used, the arrangements in fig. 3A, will be required.

When the 52 ohm tap on the coil is found, the open wire feedline is the right length, and the antenna is resonant. No retuning will be necessary when the antenna relay is switched from the Local to the DX position. In some installations some pruning of the feedline may be necessary. In all cases the feedline should drop down vertically from the antenna for at least one half its length. The high current radiating portion is at the top and is the most important as it is the main radiating portion and works into a lower reflecton factor. If the supporting poles are so situated that it is impossible for the feedline to reach the shack, a "dog house" tuning box can be constructed as shown in the photo. A selsyn motor or a

Partially assembled "dog house" for remote antenna tuner. Transmitter is used for initial tune up of antenna. The s.w.r. bridge is then transfered into the shack. Use Viscolene builder's plastic to cover box.

1 to 5 r.p.m. reversible motor can be used to tune the variable antenna capacitor across the band. The antenna tuner can be located in the shack if the antenna position is such that the feedline can end at the transmitter. In the shack the Drake antenna tuner is made to order for this operation as it will tune the antenna over the entire band with ease and will quickly tune the antenna on all the other bands also. It is highly recommended.

If the antenna is cut for 75 meters it can be used on 40 meters operating as two half waves in phase horizontally polarized or as a half wave length vertical that is particularly effective. The variable capacitor will have to be retuned on 40 meters when the antenna relay is switched from Local to DX because of the different reactive loads presented to the antenna tuner. If the antenna is cut for 3.6 mHz and the feedline is half-wave resonant at 7.25 mHz, rather than 7.8 mHz, this effect will not be so severe. If the feedline terminates in the shack, the whole antenna can be used on the 160 meter band by shorting both feed wires together and by connecting the wires to the transmitter as illustrated. If the antenna is initially cut for 40 meters it will be two half wave lengths in phase or a half-wave vertical in the DX position on 20 meters.

The major cause of fading is polarization shift. The polarization can and will actually change from minute to minute due to ionosphere changes. The signal level may actually be the same or even higher yet dips of up to 6 S units can and do occur when the polarization doesn't match that of your antenna. So you may have to keep your hand close to the "Local-DX" switch. Many times the polarization that receives the strongest signal will also transmit the strongest signal the other way, but not always. This has proved to be one of the most effective antennas this writer has used on the low frequencies. Second story locations for the shack permit or require higher supporting poles for proper orientation of the feedline. ■

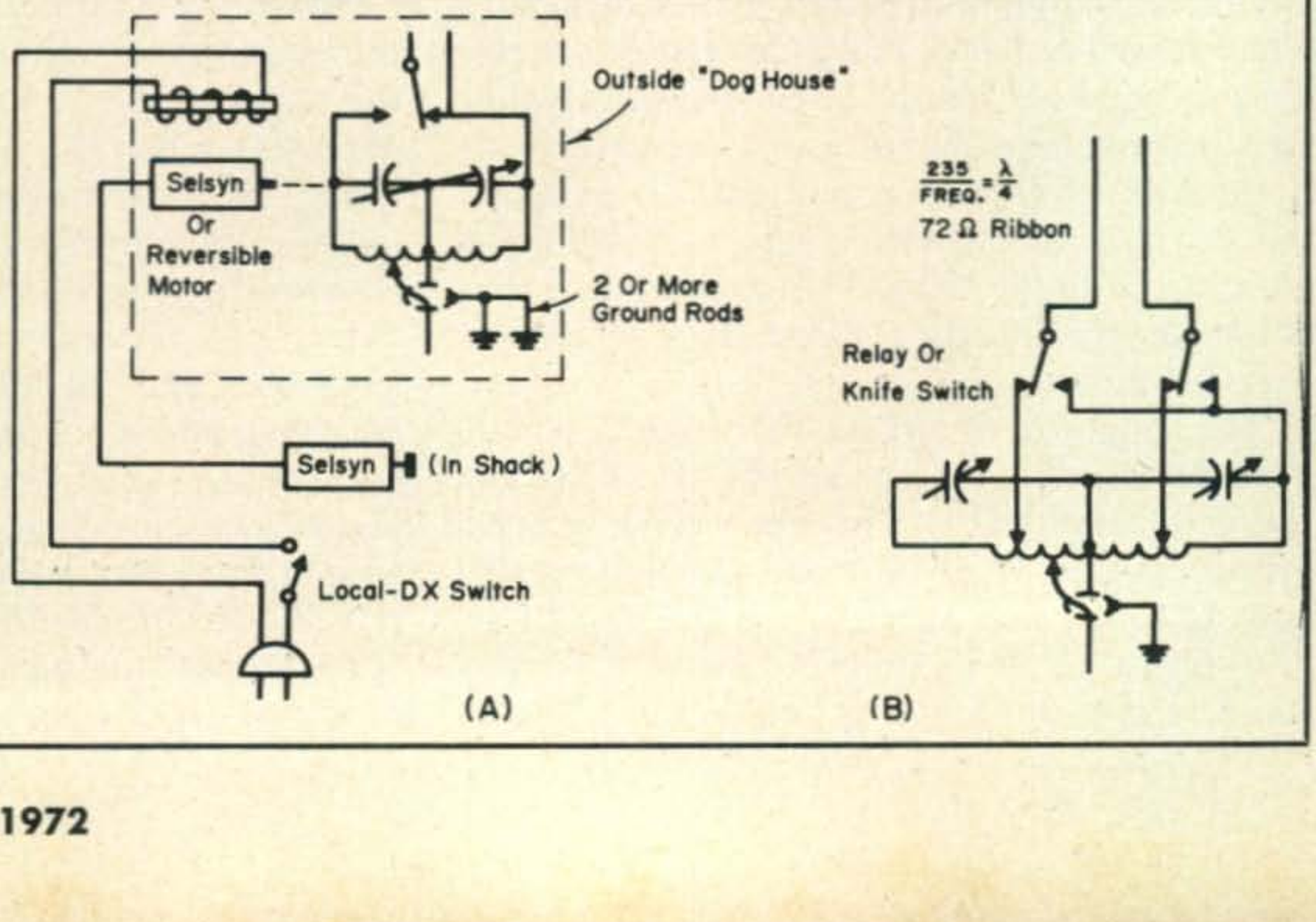


Fig. 3-(A) Antenna tuner for the 10°-90° antenna with switching system for selecting angle of radiation. The tuner is mounted in a "dog house" at the station end of the transmission line, and tuned remotely by means of selsyn motors or a low speed reversible motor. (B) switching circuit for 72 ohm ribbon.

The last tube-tester you'll ever have to buy!

It's strange, but while tubes are on the way out—tube-testers are needed more than ever. That's because the home electronic sets today use sophisticated tubes in sophisticated circuits—and simple Shorts and Emission tests don't take into account the actual operation of the tube. Now B & K offers the Model 747 Dyna-Jet Solid State 100% *Dynamic Mutual Conductance* Tester—the last tube-tester you'll ever have to buy.

Triodes, nuvistors, tetrodes, pentodes and all other multi-element tubes can now be tested under AC operating conditions for 100% *dynamic mutual conductance.* Intermittents, low gain and other tube problems that would be obscured in an emission test, show up in this tester's dynamic mutual conductance tests.

A special Dynamic test has been designed into the B & K Model 747 to test high-voltage regulators. This test puts one signal on the regulator grid and another on the plate—actually operating the tube with the correct plate current. Too much or too little current can either destroy the tube or produce an unreliable reading.

Diodes, low- and high-voltage rectifiers are tested with proper voltages and loads to determine their emission capability.

And, of course, you'll still want to test for shorts, leakage and gassy tubes. The B & K Model 747 makes this easy with a one-button "Shorts" test and a one-button grid-leakage and gas test. And it "quick tests" 82% of the tubes you'll test. And gives you functional pin-straighteners to fit any tubes you'll ever run into. And to help you predict a tube's reserve, the 747 has a built-in "Life" test. Filament voltage is reduced 10% when the "Life" test switch is set on.

All-in-all, the B & K Model 747 Dyna-Jet Tube-Tester has all the features you've wanted—all the features you'll ever need in a tube-tester. And it's small, lightweight and very good-looking.

See it at your B & K distributor, and you'll see why it's the last tube-tester you'll ever have to buy!

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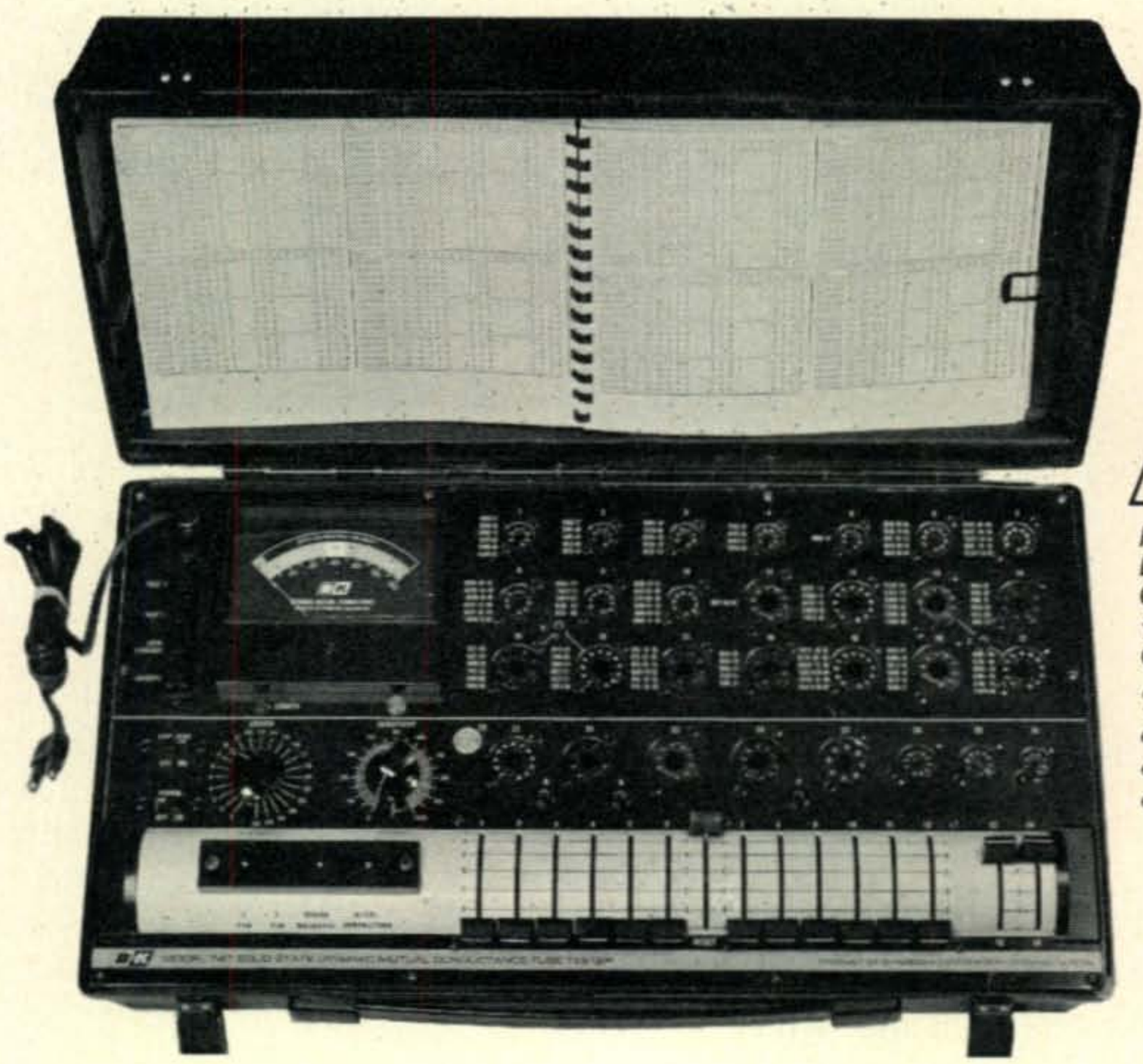

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Noise and Noise Generators

Part III

BY JOHN J. NAGLE,* K4KJ

The previous two installments of this three-part series discussed the nature of receiver noise and how to measure it, and the design of noise generators. This concluding installment will describe various methods of using noise generators.

HAVING studied noise generators from the establishment of their necessity to the development of a practical instrument, this month's concluding article will get down to practical applications of the device.

Using the Noise Generator

The use of the noise generator is simple and direct. The noise generator is connected to the antenna terminals of the receiver under test, as shown in fig. 10.

This connection should be as loss-free a connection as possible since any losses in this connection will add directly to the noise figure reading. The receiver a.g.c. is disabled so that the receiver gain will be constant and independent of the noise level. The b.f.o., if any, is turned on, to help linearize the second detector. If the b.f.o. voltage at the second detector is several times the noise voltage, the second detector will be reasonably linear and the noise power at the audio terminals can be used as a measure of the receiver noise power output. Otherwise, if accurate results are required, the noise power at the output of the last i.f. amplifier should be used, as described later; this is usually less convenient. If absolute accuracy is not of primary importance, the audio output may be used since the error will be relatively small.

Assuming that the audio output can be utilized, perhaps the most desirable way of measuring the audio power output is to terminate the receiver output terminals in a resistor equal to the rated output impedance in series with a low range r.f. thermoammeter. This will give a true indication of the receiver output power. If a thermoammeter is not available, an a.c. voltmeter across the terminating resistor is an acceptable substitute.

In operation the audio gain control is set to some convenient value of audio power with the noise egnerator OPERATE/REVERSED switch in the REVERSED position; the switch is then switched to the OPERATE position and the noise diode filament voltage increased by means of the adjustable transformer (or variable resistors) until the receiver output noise power has doubled, *i.e.*, when the output current (or voltage) has increased to 1.41 of its initial value. The diode plate current is then noted and substituted into Eq: (3).

$$\text{Noise Factor} = 20\,RI \qquad (3)$$

where R = the load resistance in ohms
I = the diode anode current in amperes.

When R = 50 ohms, Eq. (3) becomes

$$\text{Noise Factor} = I \text{ (ma)} \qquad (4)$$

This equation says that the noise factor is equal to the diode anode current in milliamperes in a 50-ohm system. To obtain the noise figure, Eq. (3) or (4) can be substituted into Eq. (2).

A second method that eliminates the second detector and is frequently used is shown in fig. 11. This method is preferable when the i.f. output is available. With this arrangement the receiver is first adjusted to some convenient level with the direct connection as shown. The 3 db attenuator is then switched

*12330 Lawyers Road, Herdon, Va. 22070

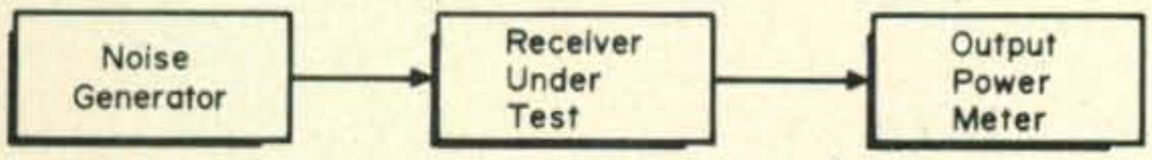


Fig. 10—Block diagram of test set-up for measuring a receiver noise figure.

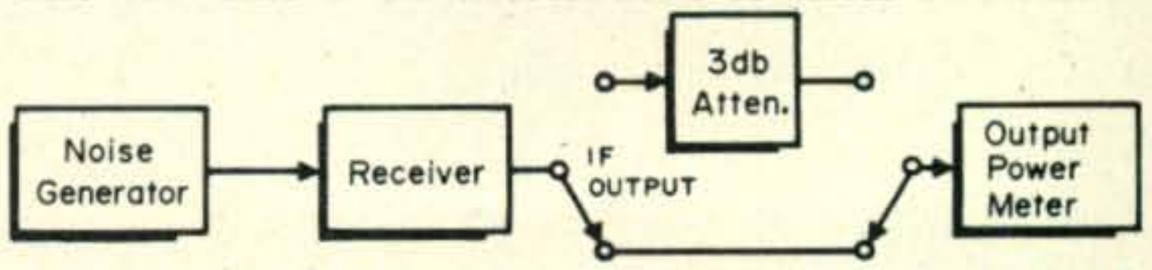


Fig. 11—Block diagram of alternative method of measuring receiver noise figure from i.f. output.

into the circuit. This reduces the noise power output by one-half. The noise diode filament voltage is then increased until the noise output meter returns to the previous level and the noise figure or factor is calculated as before. This method has an advantage when the power output meter calibration is not known or not believed accurate, since it is not necessary to accurately measure power. It is only necessary that the power meter repeat itself and that the attenuator be an accurate 3 db. Even more important is the fact that nonlinearities of the second detector (and there generally are some) are reduced.

The attenuator can consist of only three resistors in the form of a T or Pi network. The design equations are given in most radio handbooks.

Balanced Input

The noise figure measurement of receivers with a balanced input can be done in any of three methods described below. The first, and perhaps the simplest, is to use a balun between the noise generator and receiver. A well designed and constructed balun will introduce a negligible error in the measurement.

Second, if the noise generator will be used exclusively with balanced input circuits, the noise generator can be designed with a balanced output. The basic circuit is as shown in fig. 12. The design principles are similar to those for single ended case.

A third method is to construct an unbalanced noise generator with a load impedance one-half the nominal impedance of the receiver under test. The noise generator is connected between one receiver input terminal and ground and a resistor equal to the noise generator load resistance is connected between the other receiver input terminal and ground; as shown in fig. 13, the receiver noise figure is measured as above. The noise figure

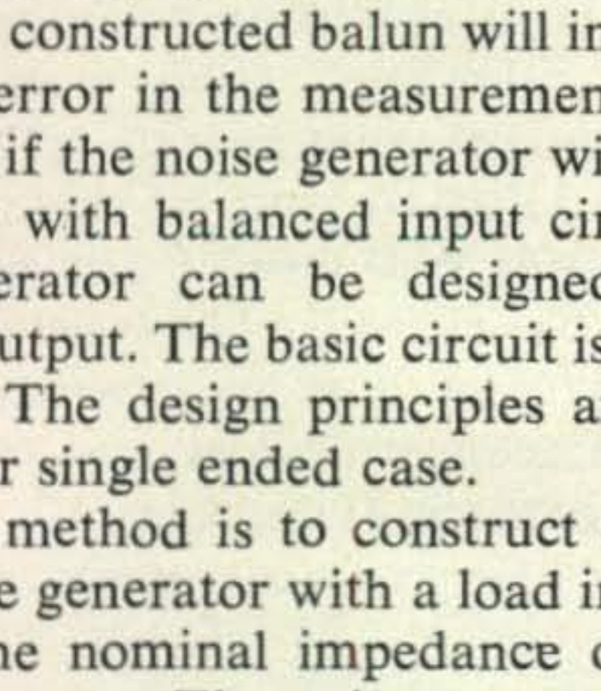


Fig. 12—Basic schematic of a noise generator with a balanced output.

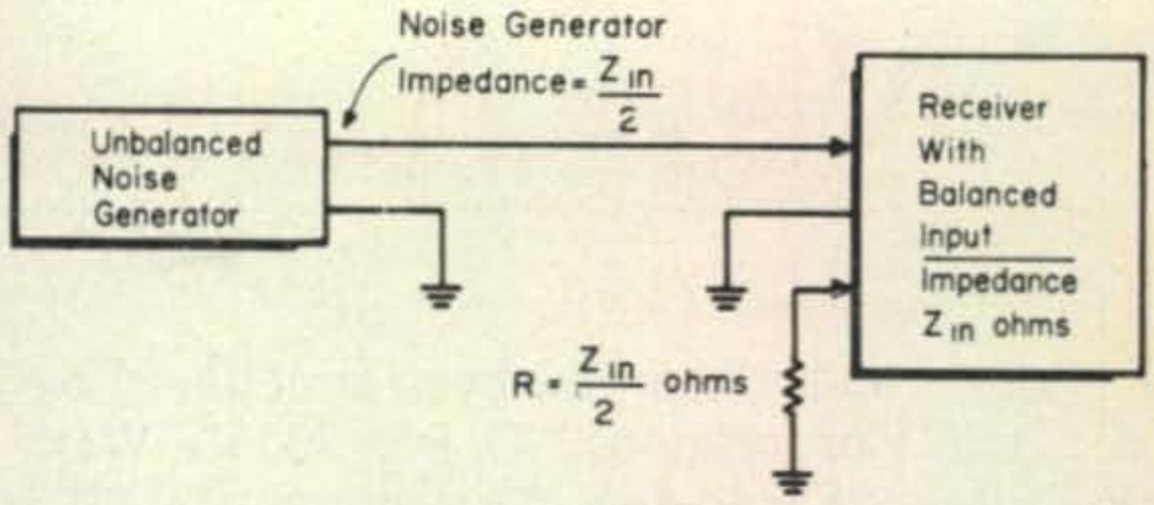


Fig. 13—Block diagram for measuring the noise figure of receiving with a balanced input using an unbalanced noise generator.

thus obtained is reduced by 3 db (or the noise factor reduced by one-half) since one-half the output of the noise generator is dissipated in the resistor. To compensate for any unbalance that might be present, the terminals to which the noise generator and the resistor are connected should be reversed and the measurement repeated. The average of the two noise factor measurements can be converted to db to obtain the receiver noise figure.

An Initial Receiver Test

The conventional noise figure measurement procedure, as described above, is not easily adaptable to providing a continuous indication of noise figure; it is necessary to go through the entire procedure each time a measurement is made. Continuously reading noise figure measuring equipment is commercially available, but its expense puts it beyond the reach of most amateurs. It would be convenient, therefore, to have a continuously indicating procedure by which the receiver noise figure could at least be brought into the neighborhood of a minimum before the noise generator is used.

The following procedure, while not strictly a part of the noise generator or its operation, has proved convenient in making initial adjustments on a receiver front-end to minimize the noise figure. In situations where this procedure can be used, it has saved a great deal of time and effort. It may even, in some instances, enable one to obtain a minimum noise figure without using a noise generator at all! This procedure is not original with the author, but I have long since forgotten where I first learned it. Since it is so convenient to use and since I have never seen it in print, it is included here.

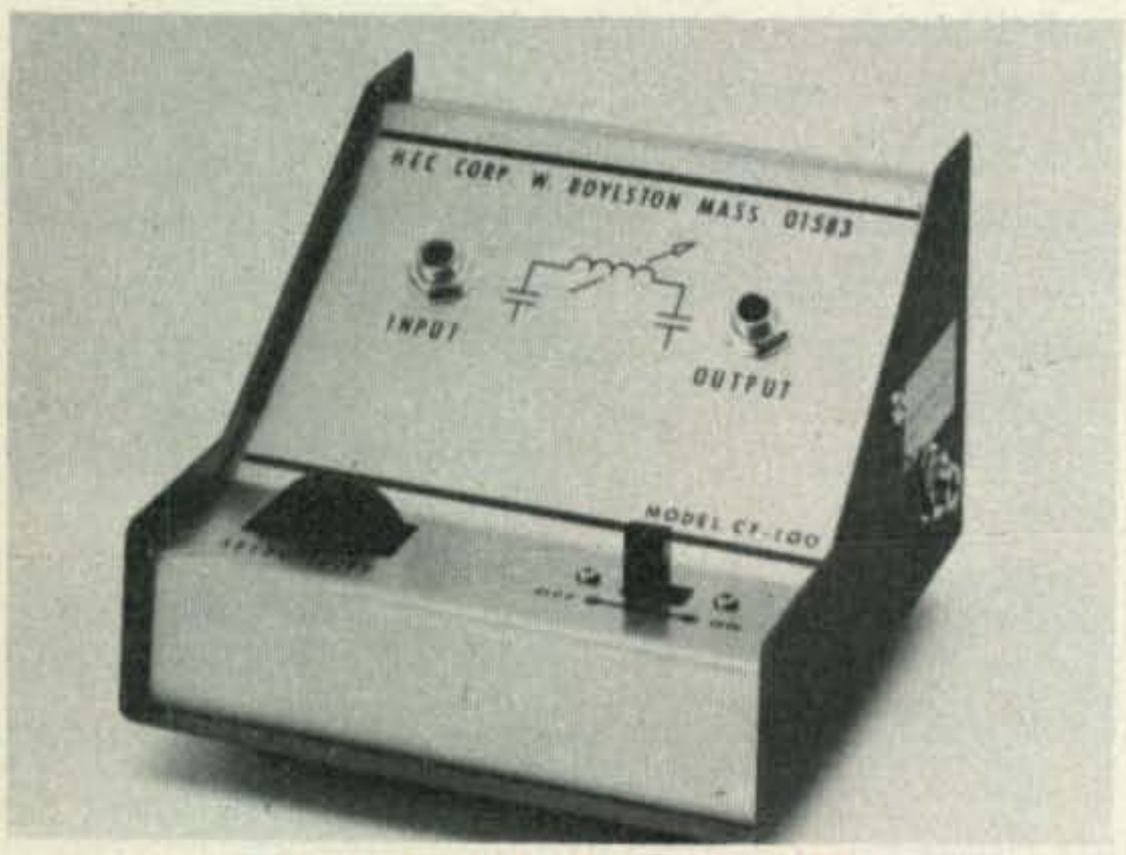
First, it requires a receiver with a good a.g.c. system, and second, a c.w. signal gener-

[*Continued on page 92*]

New Amateur Products

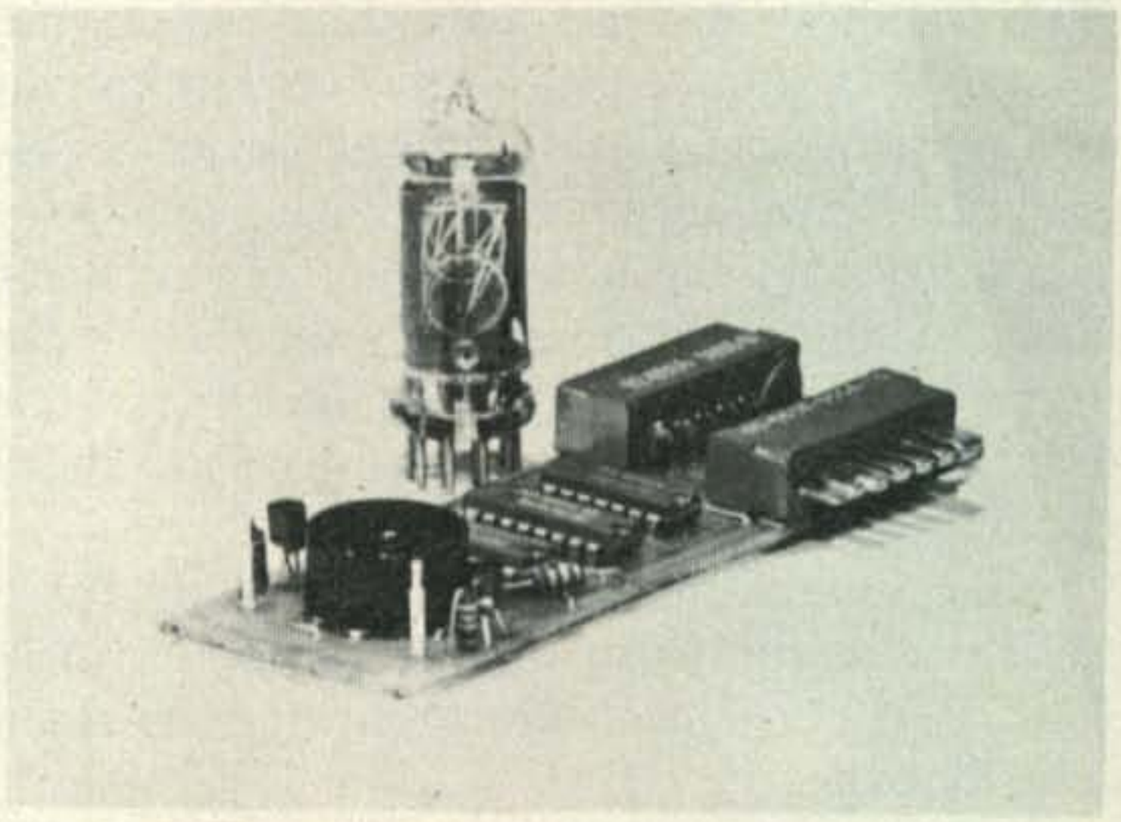
HEC "Chatter Filter"

A new audio filter has been announced by the HEC Corporation, P.O. Box 335VI, West Boylston, MA 01583. Designated the CF-100, the laboratory-quality instrument is a sharp selectivity audio filter of variable bandwidth. Obvious applications are reducing noise and adjacent-channel chatter on s.s.b. or c.w., and improving signal-to-noise ratio on SSTV. The unit is low-priced. For further information circle D on page 110.



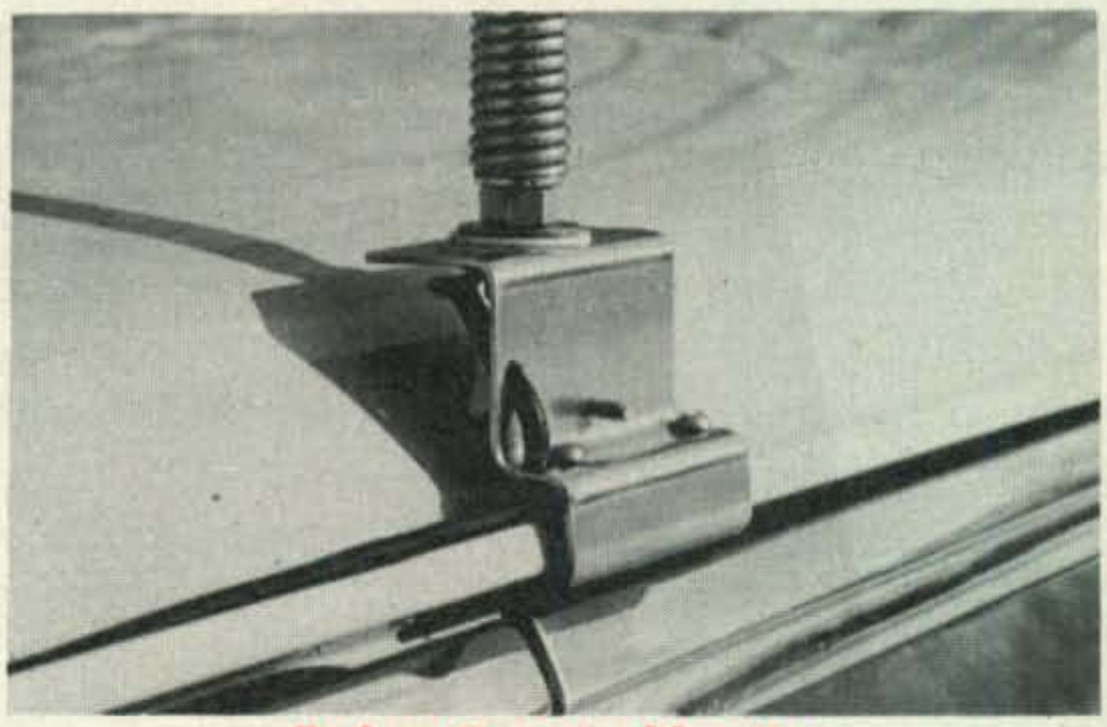
Astatic Mic Preamp Kit

Astatic has introduced a series of mic preamp kits for installation in their famous G-stand grip-to-talk bases and UG-8 stand. The preamp is designed for use with transistorized transceivers where sufficient mic gain is not available to fully modulate the rig. The transistorized preamps are powered by an internal 9-volt battery which is supplied, and have a screw-driver-adjust gain control to prevent accidental changes. Also available are factory assembled units in either the G or UG8 stands. For further information write the Astatic Corporation, Conneaut, Ohio 44030 or circle I on page 110.



Compton Counter-Readout

A line of inexpensive high-speed counter-readout modules is being marketed by Compton Electronics, P.O. Box 5326, Compton, CA 90224. The modules are of the TTL type and are designed to plug into each other side-by-side to obtain any number of digits for a particular application, with no soldering. Maximum counting rate is 10-18 mHz for model DEC-10, and 32 mHz for model DEC-1. Using one DEC-1 and any number of DEC-10's, full 32 mHz capability can be had at low cost. For an interesting catalog showing accessory devices and prices, write Compton or circle H on page 110.



Rejsa Gutter Mount

With the advent of small, easily installed mobile transceivers, the need has grown for easily installed mobile antennas. Rejsa Engineering Co., 7632 Plymouth Ave. No., Minneapolis, MN has introduced an all stainless steel gutter mount for use with any lightweight mobile antenna requiring the standard 3/8-24 stud. The mount is priced at $7.95 and is installed in minutes. Write to Rejsa or circle G on page 110 for more information.

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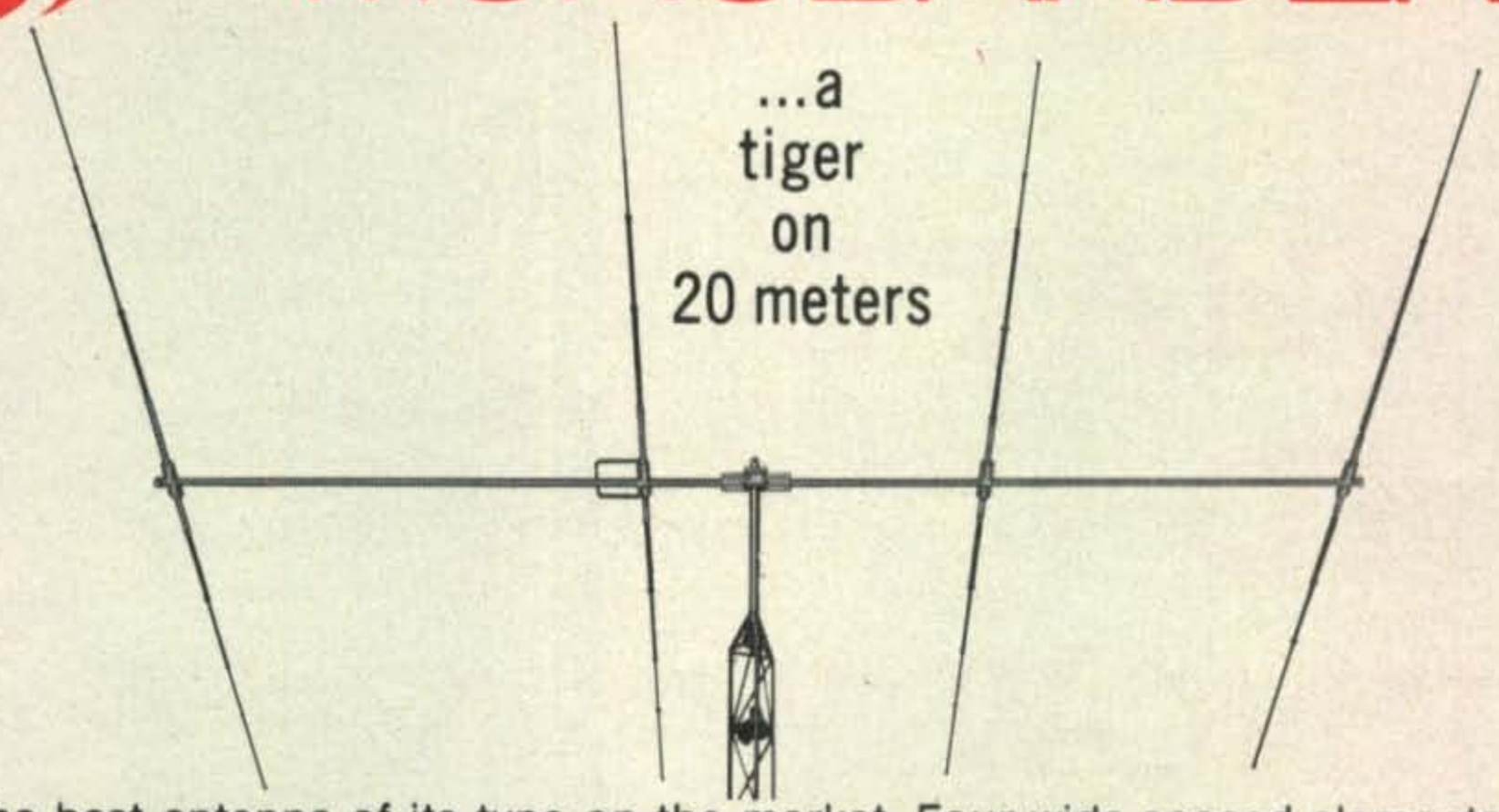
HY-GAIN 204BA MONOBANDER



The best antenna of its type on the market. Four wide spaced elements (the longest 36′6″) on a 26′ boom along with Hy-Gain's exclusive Beta Match produce a high performance DX beam for phone or CW across the entire 20 meter band.

- 10 db forward gain
- 28 db F/B ratio
- Less than 1.05:1 SWR at resonance
- Feeds with 52 ohm coax
- Maximum power input 1 kw AM; 4 kw PEP
- Wind load 99.8 lbs. at 80 MPH
- Surface area 3.9 sq. ft.

The 204BA Monobander is ruggedly built to insure mechanical as well as electrical reliability, yet light enough to mount on a lightweight tower. (Recommended rotator: Hy-Gain's new Roto-Brake 400.) Construction features include taper swaged slotted tubing with full circumference clamps; tiltable cast aluminum boom-to-mast clamp; heavy gauge machine formed element-to-boom brackets; boom 2″ OD; mast diameters from 1½″ to 2½″; wind survival up to 100 MPH. Shipping weight 51 pounds.

See the best distributor under the sun...the one who handles the Hy-Gain 204BA Monobander.

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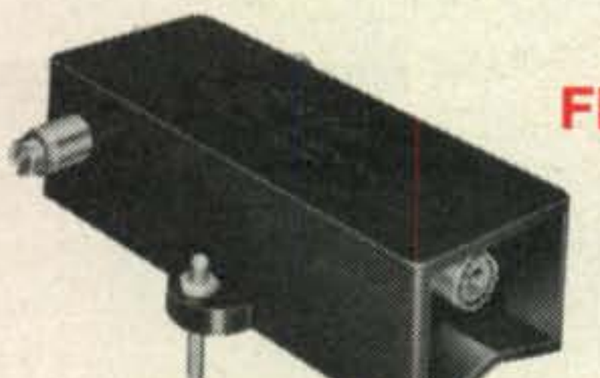
Model 203BA (3-element, 20 meters).....**$139.95**
Model 153BA (3-element, 15 meters).....**$ 69.95**
Model 103BA (3-element, 10 meters).....**$ 54.95**



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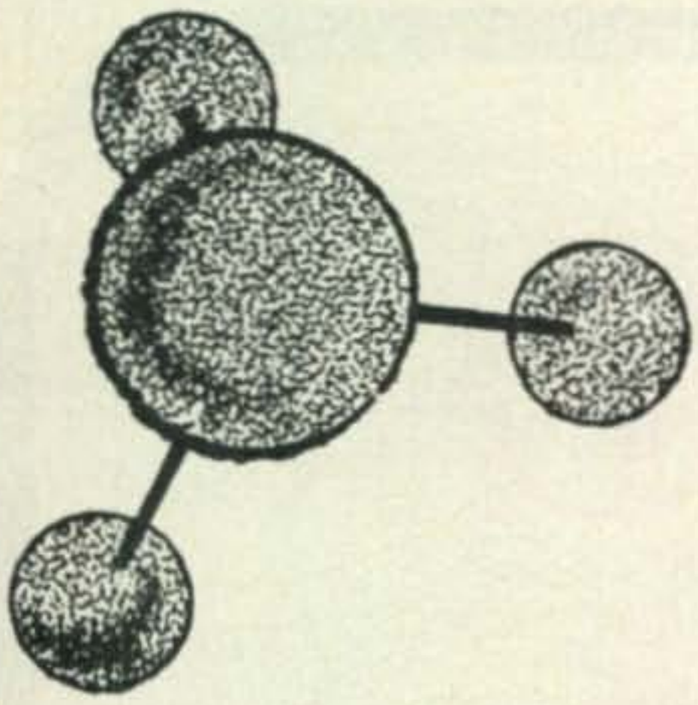
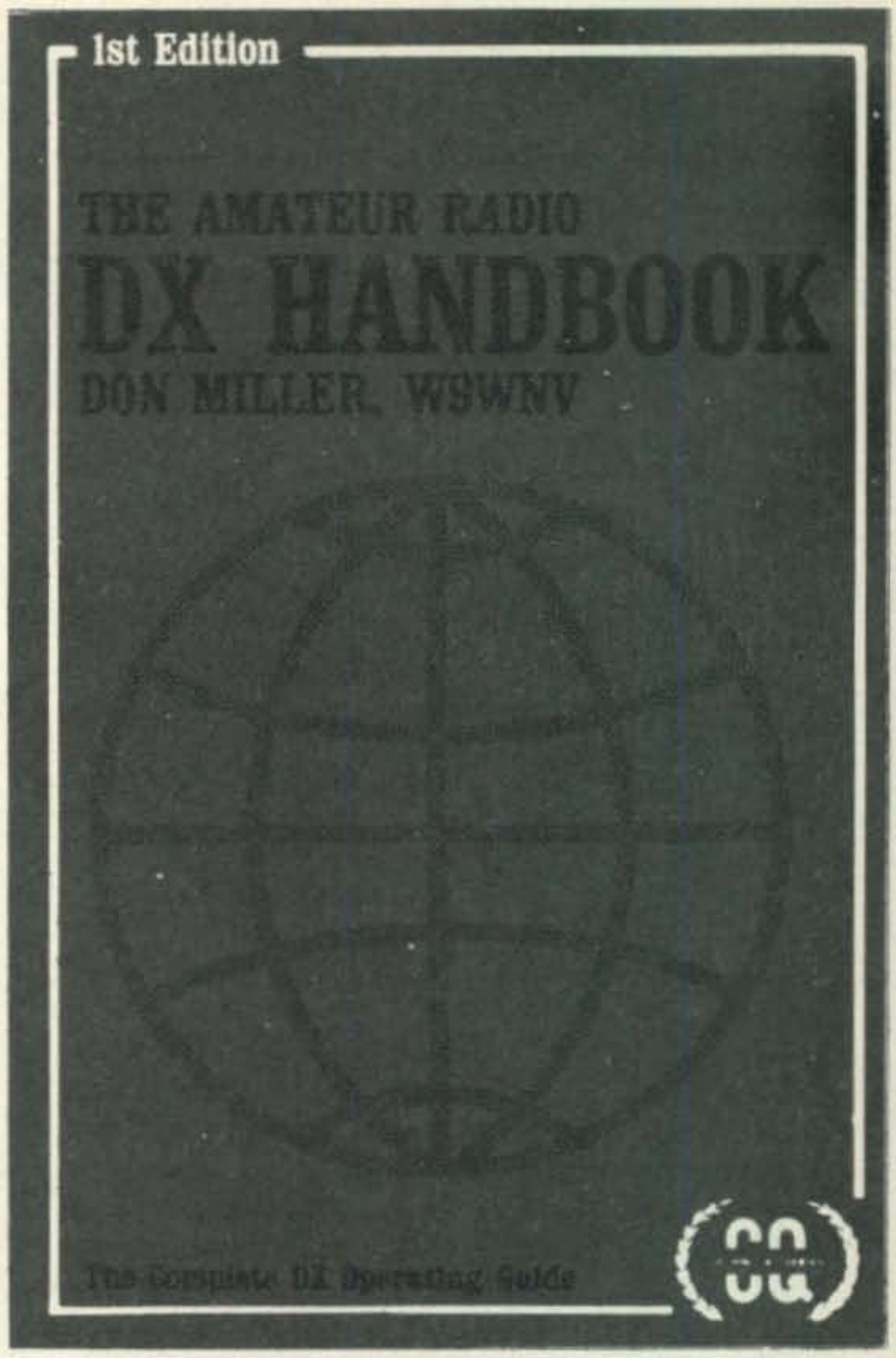


WHAT'S TO KNOW ?



There's a lot to know if you want to be a topnotch DXer, or just work the rare ones consistenty. *The Amatetur Radio DX Handbook* gives you what you need to know, how to use it, and how to make the most of your operating time. Start today to find out what you've been missing by ordering a copy or picking one up at your local distributor.

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DX

BY JOHN A. ATTAWAY,* K4IIF

YOUR *CQ* DX Awards Advisory Committee has been busy this month evaluating proposals for changes in the WAZ program. As WAZ has been the most difficult and respected of all major DX awards during most of its quarter-century of existence, one doesn't change anything about it without a lot of deep thought.

The questions resolved this month first came up in December when a proposal was made which involved the initiation of a five band WAZ award. After some debate, the Committee returned this proposal to the DX Department with a negative recommendation. However, despite the adverse vote, a good case was made for rewarding a man who mastered the zone list on a limited range of frequencies. As a consequence, disappointed adherents of the 5-band award quickly lined up behind a suggestion for monoband certificates and asked for a formal vote of the Committee. A ballot covering four key points, was circulated to each Committeeman in March.

The first of the four questions on the ballot was, "Are you in favor of monoband WAZ certificates?" The Committee voted 12 yes and only 3 no. Comments by some of the members included: "The guy who makes it on 40 and 80 deserves a lot of credit."—*W9DWQ*. "Should generate a tremendous amount of interest."—*K5AAD*. "Fine, of course, but a 5-band WAZ would be the ultimate challenge."—*W7YBX*.

The second question asked, "Should there be separate s.s.b. and c.w. certificates for each band?" Again the vote was 12 for and 3 against with the following comments: "Should be s.s.b., c.w., and mixed for each band."—*W4WSF*. "I strongly oppose a general certificate which encompasses all modes." —*K1DRN*. "Let's say *phone* and c.w. There's a lot of good a.m. DX on the bands."—*W3GRD*. "A wood plaque for WAZ on 3 bands with metal plates for later endorsements on

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

Silent Key

Mario Santangeli, I1ER an active amateur for over fifty years died on April 26, 1972 at San Remo, Italy. He was a pioneer in the development of amateur radio and a contemporary of Marconi. His most recent involvement was in the field of space communications.

The WAZ Program

S.S.B. WAZ

983.....JA2TY	987.....W2HNZ
984.....ZL4CR	988.....CT2AK
985.....K4MG	989.....K4BYM
986.....JA3AAW	990.....YV4WT

C.W.—Phone WAZ

3350.....YV4HA	3356.....K4VOX
3351.....VE2MW/W2	3357.....YU2ZR
3352.....W6BII	3358.....W1JFL
3353.....DK4PH	3359.....WB2DJM
3354.....K7NHV/8	3360.....OK1NH
3355.....W3LXN	3361.....OK2BIP

Phone WAZ

475.....W5PWW	476.....ZL2AFT

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

One of the most famous voices on the DX bands is Eva, PY2PE. She and Alex were recently entertained by Andy, WB2CKS. Eva is in the foreground. Standing left to right are Jim, K1LHT, Andy, and Alex, PY2PA. *(Photo courtesy K1LHT).*

On the left is Walt, WA2GZC, QSL Manager for right, Norman, 9G1DY of Accra, Ghana. Walt hopes to operate from the Canary Islands in November.

the other 2 bands would be very nice."—*W7YBX*.

Question 3 was, "Should all band WAZ be a prerequisite for monoband WAZ?" The Committee rejected this proposition by a 12-2 vote with 1 no opinion.

The fourth and final question provoked more comment and discussion than any of the others. It asked, "Should the competition for single band certificates start from scratch on Jan. 1, 1973, or should all QSLs back to November, 1945 be counted?" The outcome was 9 for starting in 1973, 5 for counting back to 1945, and 1 undecided. Here are some of the comments: "Back to '45, too much hulabaloo with QSL's already to foist another card demander into the pot."—*W4NJF*. "Many have commented that they would have preferred to have the new *CQ* DX Awards start from scratch."—*K4OCE*. "Starting in 1973 will generate more interest and that is the name of the game."—*W9-DWQ*. "Start in '73. Give the old timers an incentive to jump in again."—*K4AEB*. "Count them all. Re-QSLing will cost a fortune."—*W4WSF*. "If a person could qualify for a new award without making a single new contact, why bother! The award should go into effect in 1973."—*K1DRN*. "Awards should be retroactive. Why take away from people who have earned their accomplishments?"—*W3GHD*. "Kick it off in '73 and maintain an Honor Roll. The DXers will come out of the woodwork."—*W7YBX*.

The DX Department is now putting a single band WAZ program together and will make a formal announcement in a later issue. We plan to follow your Committee's recommendations and will start the program in 1973, with separate modes incorporated into the final package.

The CQ DX Award Program

C.W. DX

90.....K8YQW 91.....W1SWX

S.S.B. DX

203.....ZL2AFT 204.....OD5BA
205.....WB4JYB

CQ DX Award Endorsements

C.W.: ON4QX—300, W1SWX—200 and Low Band, YU1AG—Low Band and 28 MHz.

S.S.B.: SM5SB—310, KH6BB—300, WØSFU—275 and OD5BA—200.

Special Commendation: The Low Band Endorsement for W1SWX on c.w. consisted of 206 countries confirmed on the 3.5 MHz band only. This is a remarkable achievement.

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

Prefixes

The world continues to reorganize politically and nations continue to commemorate special events. Consequently, prefix chasing is still the fastest moving game in DX. Looking for new countries is like investing in the stock market, while the prefix hunter is more kin to the commodity speculator. In the prefix race you've got to be mighty fast to keep up. Here are just a few of the good ones who came along this spring. Some are already gone, never to return.

CQ DX Award Honor Roll

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

CW

W6ID	319	DL3RK	303
K6EC	318	ON4QX	301
W8LY	310	W6ISQ	296
VK3AHQ	308	WA6EPQ	294
W4OPM	308	W4BQY	291
K6LEB	308	W6NJU	291
W4IC	307	K1SHN	286
WØAUB	306	WA8DXA	279

2XSSB

TI2HP	321	I1ZV	304
W9ILW	321	W6KZS	304
DL9OH	320	W6FW	302
WA2RAU	320	W9QLD	302
W2TP	320	K4HJE	301
K2FL	319	KH6BB	301
W3NKM	319	G3RWQ	300
K6LGF	319	IT9JT	300
W6REH	319	OZ3SK	300
IØAMU	318	K1SHN	300
K6YRA	318	K4RTA	300
SM5SB	316	YS1O	300
G3FKM	315	ZL3NS	300
W3DJZ	315	F9MS	299
W4OPM	315	VE3GMT	295
W6EUF	315	XE2YP	294
I8KDB	314	WB2RLK	292
W6KTE	314	WA6MWG	292
W9DWQ	314	ZL1AGO	290
W6YMV	313	WØYDB	289
WA2EOQ	312	HP1JC	285
W4IC	312	W9KRU	284
W6NJU	312	WAØKDI	282
ZS6LW	312	OE2EGL	280
W9JT	311	K8GQG	280
XE1AE	311	WAØCPX	278
VE2WY	310	WA3IKK	276
G3DO	309	WØSFU	276
VE3ACD	308	DL1MD	275
I1AA	307	G3WW	275
K6EC	306	K9LUI	275
F2MO	305		

A35—This is the new prefix for Tonga Island, formerly VR5. QSL A35FX to ZL1-AFZ.

A51—A51TY was formerly AC5TY. A51 is the new Bhutan prefix.

FWØ—This rare Wallis Island prefix was activated by Karl, VE8RA, using the call FWØAB. QSL to VE6TP.

JTØ—Rare prefix and rare zone are combined by Pavel, JTØAE, who is very active on c.w. Preferred frequencies are 14030 and 21010.

This very nice trophy was presented to John Cummings, W2CTN, by Scott's QSL Service. It is 12 inches high and consists of a key on a polished wood base mounted on a silver column. W2CTN is a member of the CQ DX Hall of Fame. *(Photo courtesy WA5UHR)*

He will be there about 3 years. QSL to OK1-AQW.

KD6—KD6USA was licensed for Armed Forces Day operation, May 19-21, from El Monte, CA.

PJ8—QSL PJ8DX via K2FJ (ex-W2TMI).

SVØ—SVØWJJ and SBØWII operated from Rhodes during weekends. QSL to WA1HAA.

U5Ø's—A number of new prefixes were available this spring from the Soviet Union. To commemorate the 50th anniversary of the USSR, 5 special stations were QRV on all bands from *each* of the Soviet Republics. From Feb. 23-March 1 the calls used were UA5ØA, B, C, D, and E. Other prefixes and dates included: March 1-8, UB5Ø; March 8-

Eva, WA2BAV/TU4AB and George, WB2AQC/TU4AC just prior to their West African DXpedition in April.

At the home of Paul, 3B8AD, on Mauritius are front row left to right: the XYL of 3B8CS, Claude, F9MS, and the XYL of 3B8AD. On the back row are 3B8-AD, Jacques, 3B8CA, and Raymond, 3B8AR. F9MS operates CQ's REF checkpoint in France.

15, UC5Ø; March 15-22, UI5Ø; March 22-29, UL5Ø; March 29-April 5, UF5Ø; April 5-12, UD5Ø; April 12-19, UP5Ø; April 19-26, UO-5Ø; April 26-May 3, UQ5Ø; May 3-10, UM5Ø; May 10-17, UJ5Ø; May 17-24, UG-5Ø; May 24-31, UH5Ø; and May 31-June 7, UR5Ø. QSL all of these stations via Central Radio Club, P.O. Box 88, Moscow, USSR.

UK —UKØKAA is on Wrangel Island in the Arctic Ocean.

WC4—QSL cards for station WC4BCC should be sent to K4REL.

WG3—WG3SFC was issued for use at the Goddard Space Flight Center during the Apollo 16 flight.

WJ4—WJ4AZF was operated from the Norfolk Azalea Festival, April 25-30, by the Virginia Century Club. QSL to W4OPM.

WP6—WP6JPL was issued for use at the Jet Propulsion Laboratory during the Apollo 16 flight.

Ed Blaszczyk, W3KVQ/2, is also KX6EB. QSLs for Ed's KX6 call should go to P.O. Box 997, APO San Francisco, CA 96555. While Ed is away this year, his XYL is handling 9N1MM cards. They should continue to be routed by 2308 Branch Pike, Cinnaminson, NJ 08077.

WS3—WS3VOA was a special call commemorating the 30th anniversary of the Voice of America.

3D2—Now that Fiji is independent this prefix replaces VR2. An active station is 3D2-FM whose QSL Manager is W7YBX.

5J4 & 5K4—5J4LR and 5K4RR were operated April 8 and 9 from the World Orchid Conference by the Columbia Radio Club. QSL to Apartado Aereo 51900, Medellin, Columbia

DXpeditions

As this month's column is in preparation at least a dozen important DXpeditions are in various stages of planning. The time lag between column assembly and distribution prevent us from giving any advance information, but we will report the plans as they now stand with the hope that they will be of some interest in retrospect.

Africa—At presstime, EA7II and other Spanish DXers pre planning a 2-month trip across 28,000 km of Africa from a starting point in Fernando Poo.

Andorra—C31EA was scheduled for mid-April by G3TVY, G3VUI, G3YVT, and G4AFJ.

Caribbean 160—W2BP was making a special 160 meter DXpedition to VP2MAD, VP2D-(a 160 first), FGØADT/FS7, VP2L-, VP2S-, and VP2G-. Al is handling the cards himself via his home address, 101 Collins Ave., Pleasantville, N.J. 08232.

Kamaran Island—An operation from this very rare spot was being hinted by ET3ZU and company for sometime in May.

Mellish Reef—Efforts to activate this one as a new country continue, and may bear fruit about June 1 if a proposed trip by VK3ZT, VK4FJ, VK4XY, and VK4KS is successful. WB6IXC was collecting contributions at presstime.

Monaco—A 7-day effort as 3AØGA was scheduled for April by DJ6OZ, DJ9ON, DJØYD, and DK3SN. If you worked this station you can QSL via DJ9ON.

Navassa Island—A 3-day operation, c.w. and s.s.b., as KC4DX was scheduled for mid-May by six W4-landers. QSL to Charles Cone, W4GKF, Box 11555, Atlanta, Georgia 30-305.

Oceania—During May KH6AG was scheduled to be on from KX6, KC6-Ponape, KC6-Truk, KC6-Yap and KC6-Corall.

Revilla Gigedo—The XE group ran a very tight ship on this one. 6D4J made 800 con-

tacts on 80 and 40 (QSL to XE1J), 6D4EB made over 3000 contacts with 105 countries on 20 (QSL to XE3EB), and 6D4FFC made 2500 contacts with 150 countries on 15 and 10 meters (QSL to XE1FFC).

San Felix—W9IGW/CEØ made an all band operation, c.w. and s.s.b., in early April. Operators were W9IGW and K9KNW. QSL to K3RLY.

Spratly Island—Rumors are rampant that the International DX Association will have an operation from this very rare country sometime in August.

West Africa—WB2AQC and XYL WB2BAV were scheduled to visit 6W8, ZD3, 9L1, EL, TU, 5V, 5U7 and TJ in April and May. QSL to 34-24 76th St., Jackson Heights, N.Y. 11372.

DX Clubs and Officers

Much of the credit for the high level of interest in DX must go to the many fine DX clubs across the country, and especially to their hard working officers. This month we would like to recognize some of the leading clubs and their officers.

Canadian DX Association: President—VE3HD, Vice Presidents—VE3BIZ and VE3MJ, Recording Secretary—VE3FOR, Secretary—VE3DBT, Directors—VE3DXN, VE3KZ, and VE3GMT, Bulletin Editor—VE3DID, *CQ* DX Committeeman—VE3GMT, Total Active Membership—356.

Florida DX Club: President—W4BJ, Vice President/Publisher—W4HOS, Secretary/Treasurer—WA4MSU, Bulletin Editor—K4KQ, *CQ* DX Committeeman—K4IIF, Total Active Membership—38.

Frankford Radio Club: President—WA3ATP, Vice President—W3GPE, Secretary—K3JLI, Treasurer—WA2BLU, Awards Manager and *CQ* DX Committeeman—W3GHD, Total Active Membership—77.

Kings County Radio Club: President—W2MBU, Secretary and *CQ* DX Committeeman—WB2NDI, Treasurer—WB2YPN, Total Active Membership—117.

North Alabama DX Club: President—K4BBF, Secretary/Treasurer—WB4BQJ, *CQ* DX Committeeman—K4AEB, Total Active Membership—17.

North Carolina DX Association: President—K4ARP, Vice President—WB4KZG, Secretary/Treasurer and *CQ* DX Committeeman—K4OCE, Total Active Membership—46.

Northern California DX Club: President—WB6UJO, Vice President—K6KQN, Secretary—WA6ISX, Treasurer—K6AUC, Bulletin Editors—K6AUC and K6HIH, *CQ* DX Committeeman—K6AHV, Total Active Membership—about 120.

Northern Illinois DX Association: President—W9RER, Vice President—W9YYG, Secretary/Treasurer and *CQ* DX Committeeman—W9DWQ, Total Active Membership—32.

Potomac Valley Radio Club: President—W3IN, Secretary—W4YZC, Treasurer—W3ZNH, Activities Manager—W3BQV, *CQ* DX Committeeman—W4WSF, Total Active Membership—about 150.

The WPX Program

S.S.B. WPX

677.....ZL4CR
678.....DJ4LN
679.....F6AFA
680.....W1DQK
681.....DK3EG

C.W. WPX

1164.....VE3BHZ
1165.....I1BLF
1166.....W7MKW
1167.....OK1KZ

Mixed WPX

328.....K2LQQ/TF
329.....K4VOX
330.....JA1FDQ

VPX

41.....G11362

WPX Endorsements

S.S.B.: W6RKP—600, WB2RLK—600 and DJ4XA—500.

C.W.: ON4QX—850, WB2FMK—750, YU1AG—750, DJ4XA—550, WA6IVD—550, SP3DOI—550, DK3DT—500, W7VSE—450 and I1BLF—400.

Mixed: W4LRN—1200, W9DWQ—1050, YU1AG—900, K2OO—850, K8UDJ—750, DJ4XA—700, JA4XW—600, W4HHN—550, K2DNL—550 and W1EQV—550.

VPX: G11362—450.

160 Meters: W4WSF and K8UDJ.

80 Meters: IØAMU and SP3CB.

40 Meters: IØAMU and K4ZCP

20 Meters: DJ4XA, W6RKP and W4HHN.

15 Meters: DJ4XA and K4ZCP.

10 Meters: DJ4XA, IØAMU, WA6TAX and K4ZCP.

Africa: W4WSF and DJ4XA.

Asia: DJ4XA.

Europe: W4HHN, DJ4XA, DJ4LN and SP3CB.

North America: W4HHN, W8PQD and YU1AG.

Oceania: YU1AG.

South America: DJ4XA, W6RKP and YU1AG.

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

Brian, VE6MC, caught Darlene-of-the-many-DX-calls in this photo snapped at the Edmonton, Alberta DX Club Meeting. The gent on the right is Nick, VE6SB. *(Photo courtesy VE6MC)*

Southern California DX Club: President—WB6UDC, Vice President—W6APW, Secretary—W6JPH, Treasurer—K6SVL, Directors—W6DGH, WA6ZCQ and WA6ZZK, Bulletin Editor—W6EJJ, *CQ* DX Committeeman—W6NJU, Total Active Membership—100+.
Twin Cities DX Association: President and *CQ* DX Committeeman—WØYDB, Secretary/Treasurer—KØWWX, Total Active Membership—33.
Virginia Century Club: President—W9MIJ/4, Secretary/Treasurer—W4ZMH, *CQ* DX Committeeman—W4NJF, Total Active Membership—27.
Western Washington DX Club: President and *CQ* DX Committeeman—W7YBX, Vice President—WA7JCB, Secretary—W7APN, Treasurer—K7CVL, Trustees—W7PHO, W7KH, W7OF, W7AQB, W7LVI and K7HJN, Total Active Membership—128.

QSL Information

The following amateur offers his services as QSL Manager for any DX station: WN3QWA—126 Holly Drive, Lansdale, Pa. 19446.

BV2AA—QSL via K4ASI
BV2AB—To JH1AWN
CR4BS—Box 101, Praia, Cape Verde Islands
CR5XX—c/o WA3HUP
CR6LF—Via W3HNK
CR9AK—To CT1BH
CT15Q—Via WA5UHR
DA1JD—c/o WB6PNB
EA8GZ—Via VE7BWG
EL2CY—To WA1KYW
EL2CZ—c/o K6TWT
FGØADT/FS7—Via W2BP
FK8CD—to VE6TP
FL8DA—P.O. Box 481, Djibouti, French Somaliland
FM7AA—c/o WA8TDY
FR7ZU/E—Via F9MS
FWØAB—To VE6TP
GC3EML—c/o K9KLR
HBØXJJ—Via DL7HZ
HM4GF—P.O. Box 25, Chonju City, South Korea
HU2CEN—Via WA8TDY
JD1ACF—To JA1OAF
JD1ACH—c/o JA3GZN
JD1ACH—Via JA3GZN
JD1YAA—To JA1WU
JTØAE—c/o OK1AQW
K3WEU/6Y5H—Via W3HK
KC4DX—To W4GKF
KC6LG—c/o Box 156, Yap, W. Caroline Islands 96943
KG6SI—Via WA6AHF
KG6SW—To W7YBX
KJ6BZ—2194 Comm. Sqdn., Box 962, APO, San Francisco, CA 96305
KJ6CW—c/o KH6HIF
KS4BH—Via K3RLY
KX6IY—To WB5EEN
MP4BIN—c/o WA5UHR
MP4MBB—Via G3LQP
MP4TDN—To K1DRN
LA8YB/4W—c/o LA3BI
LAØAD—Via W2GHK
OY1R—To W2KF
PJ9JT—c/o W1BIH
PY1ZAL—To K4OD
ST2SA—Via K3RLY
SVØWJJ—To WA1HAA
TJ1AW—c/o K4MPE
TN8AV—Via VE2AVU
TU4AB—To WA2BAV
TU4AC—c/o WB2AQC
UM8FZ—Via W5OYH
VP2AR—c/o WA8TDY
VP2DAE—To K3RLY
VP2EEE—c/o W5RER
VP2KF—Via VE3DCY
VP2LAT—To WA9UCE
VP2MAD (160)—c/o W2BP
VP2MU—Via VE3HD
VP2VAM—To VE3GMT
VP8ME—c/o WA5FWC
VQ9N—Via W61AE
VQ9R—To G3LQP
WRZGC—Via W7YBX
VS9MB—c/o G3KDB
VS9SM—Via JO0CUV
VU2AAA—To W3FDU
VU2OMR—c/o K5LIW
W4IZ/KV4—Via K4DSN
WA6FSC/HR1—To VE6AKV
WC4BCC—c/o K4REL
WJ4AZF—Via W4OPM
WT3REE—To W3FVU
XF4OQ—NOT via VE3AAQ
XT2AF—c/o VE2DLQ
YBØAAN—Via K7DVK
YJ8BD—To I0IJ
YJ8BL—c/o W6NJU
YJ8DZ—Via ZL4NH
YK1OK—To P.O. Box 35, Damascus, Syria
YS2CEN—Via WA8TDY
ZB2A—c/o WA9YNE
ZD9BR—Via W6EJT
ZD9GA—To ZS2RM
ZF1BR—Via W9ABA
ZK1CD—c/o ZL2FA
ZL1ND/C—Via ZL2AFZ
ZL4PM—c/o W8OZA
ZP5AQ—To U.S. Embassy, APO, New York, N.Y. 09881
ZS3AW—c/o DL8LP
3D2FM—Via W7YBX
4X4UF—To WA4WTG
5B4IS—c/o OZ7IS
5H3AW—Via DL5KL
5H3MM—To SM5CEU
5N2AAU—c/o WA9UFV
5R8AP—Via WB4GQH
5W1AM—c/o W7YBX
5W1AU—Via W6KNH
5X5NK—To DJ3JV
5Z4LW—c/o W8KCJ
6D4EB—Via XE3EB
6D4FFC—To XE1FFC
6W8DY—c/o VE4SK
7P8AB—Via W3LGU
7Q7AA—To K4CDZ
7X2BK—c/o W5LUJ
8P6DR—Via G3JUL
8R1G—c/o WA4UDE
9G1WW—To W5EQH
9H3B—Via VE3MR
9H3C—c/o W2FXA
9J2RO—Via WA1HAA
9M2WM—To WA6AHF
9Q5EL—c/o W8WBT
9U5DS—Via W2LGU
9V1QJ—To WA5UHR
9V1VW—c/o W9FIU
9Y4T—Via VE3CBG

Ken, K2FJ, passed out a bevy of rare ones during his February trip to the Caribbean. Here he is operating VP2VAN from Franchmans Cay in the British Virgin Islands.

Propagation

BY GEORGE JACOBS,* W3ASK

THE present sunspot cycle appears to have reached another plateau between May and September, 1971 the cycle remained practically constant, varying between a smoothed sunspot level of 65 and 68. These are the latest months for which smoothed sunspot data is available.

Although the cycle probably has begun to decline again, this plateau should result in a somewhat higher level of solar activity this summer, and perhaps for the remainder of the year, than was previously expected. Originally a solor level in the low 40's was forecast for the summer months. It now seems almost certain that the actual level will be nearer to 50.

With long hours of daylight and the sun high in the northern sky, h.f. propagation conditions are generally more stable during July than at any other time of the year.

Twenty meters is expected to be the optimum band for long distance propagation during the month. The band is expected to remain open around-the-clock to one area of the world or another, with peak conditions forecast for several hours after local sunrise, and again during the late afternoon and early evening hours. Fifteen meters is forecast to open fairly frequently during the late afternoon hours, especially on more or less north-south paths. Some fairly good 10 meter openings are also expected during the afternoon hours, to southern and tropical areas.

During the hours of darkness, 40 meters is expected to open to many areas of the world, but seasonally high static levels may often make DX reception difficult. High static levels are also expected to result in somewhat poorer DX conditions on 80 meters, although some long distance openings are forecast during the hours of darkness. Not many DX openings are predicted for 160 meters during July, because of seasonally high levels of static and solar absorption.

Peak Short-Skip Conditions

Short-skip propagation conditions, up to distances of approximately 1300 miles, are expected to be optimum during July, as a result of a seasonal peak in sporadic-E propagation. During the daylight hours, considerable short-skip openings are forecast for 10 and 15 meters over distances ranging between approximately 500 and 1300 miles, with some openings extending out to beyond 2000 miles. Around-the-clock short-skip openings are expected on 20 meters, over distances ranging between 300 and about 2300 miles. Conditions on 20 meters should peak during the late afternoon and early evening hours.

Good daytime short-skip openings on 40 meters are predicted over distances between approximately 100 to 750 miles, with good nighttime openings expected between 250 and 2300

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for July, 1972

	Rating & Forecast Quality (4)	(3)	(2)	(1)
Above Normal: 6, 13, 15, 18-19, 23, 26-27	A	A	B	C
Normal: 1-2, 5, 7, 9-10, 12, 14, 17, 20, 22, 24-25, 28-29	A	B	C	D
Below Normal: 3-4, 8, 11, 16, 21, 30-31	C	D	D	E
Disturbed: None	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 2 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 parenthesis 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 high 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 short skip Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 800 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase 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 short skip Charts are valid through Aug. 1972. These Charts are prepared from basic propagation, data published monthly by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado.

miles. Conditions on 80 meters are also expected to be good during the daylight hours, for openings up to approximately 300 miles. During the hours of darkness, openings should be possible up to the short-skip limit of 2300 miles. While no 160 meter short-skip openings are expected during the daylight hours, some openings should be possible up to a distance of approximately 2300 miles during the hours of darkness.

This month's column contains Short-Skip Propagation Charts valid for July and August, 1972, as well as Charts centered on Hawaii and Alaska. The Short-Skip Charts contain propagation forecasts for circuits varying in distance between approximately 50 and 2300 miles. For specific times of DX openings over greater distances, refer to the DX Propagation Charts for July which appeared in last month's column. For an assessment of day-to-day conditions expected during the month, see the "Last Minute Forecast," which appears at the beginning of this column.

V.H.F. Ionospheric Openings

Intense sporadic-E ionization expected during July is likely to result in numerous 6 meter, and occasional 2 meter short-skip openings. Fairly frequent 6 meter openings should be possible, over distances between approximately 500 and 1300 miles, with some openings extending out to as much as 2300 miles. While short-skip openings can occur at just about any time of the day or night on 6 meters, statistics indicate that conditions peak a few hours before noon and again during the early evening hours.

During intense sporadic-E openings, as the skip distance is observed to be *decreasing* on 6 meters, the MUF will be increasing. When skip stations are heard on 6 meters as near as about 500 miles, check 2 meters for an opening in the same direction. Generally, when the 6 meter skip distance falls below 500 miles, 2 meter openings should be possible between distances of about 1000 and 1300 miles.

July is usually a poor month for Trans-Equatorial (TE) propagation, and few if any openings are expected. If you live in the southern third of the USA, and are very patient, check the 6 meter band for an occasional TE opening to South America between 8 P.M. and midnight.

Check throughout July 28 for meteor scatter openings on the v.h.f. bands. The *Delta Aquarids* shower is expected to take place on that date, with a predicted meteor count of approximately 20 an hour.

Some v.h.f. short-skip openings resulting from auroral activity may be possible during July. Check the "Last Minute Forecast" appearing at the beginning of this column for periods that are predicted to be disturbed or below normal. These are the dates on which auroral v.h.f openings are most likely to occur during the month.

Sunspot Cycle

The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 84 for March, 1972. This results in a 12-month smoothed sunspot number of 66, centered on September 1971. A smoothed sunspot number of 49 is forecast for July, 1972.

Total Solar Eclipse

A total eclipse of the sun will take place over North America on July 10. Totality will occur over a very narrow band extending from Alaska, across northern Canada, and over Quebec and Nova Scotia. A period of totality, lasting between 2 and 3 minutes, will occur over Alaska at approximately 1900 GMT, over northern Canada at 1930 GMT, over Quebec at 2030 GMT, and over Nova Scotia at approximately 2040 GMT. Elsewhere in Canada and the USA, the eclipse will be partial.

H.f. radio signals traversing the ionosphere along the path of the eclipse will be affected by the sudden cessation of solar radiation as the moon passes between the sun and earth. For a few minutes daytime propagation will take on the characteristics of nighttime conditions. Signals on 10 and 15 meters will decrease rapidly, and may fade out entirely for a few minutes at the time of totality. Signals on 20, 40 and 80 meters may increase noticeably during this time.

CQ Short-Skip Propagation Chart

July & August, 1972

Band Openings Given In Local Standard Time
At Path Mid-Point Using 24-Hour Time System

Band (Meters)	Distance From Transmitter (Miles) *50-250*	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	07-09 (0-1) 09-13 (0-3) 13-17 (0-1) 17-21 (0-2) 21-23 (0-1)	07-09 (1) 09-13 (3) 13-17 (1-2) 17-21 (2-3) 21-07 (1)	07-09 (1-0) 09-13 (3-0) 13-17 (2-1) 17-21 (3-1) 21-07 (1-0)
15	*Nil*	07-09 (0-2) 09-13 (0-3) 13-17 (0-2) 17-19 (0-3) 19-21 (0-2) 21-07 (0-1)	07-09 (2) 09-13 (3) 13-17 (2) 17-19 (3) 19-21 (2) 21-23 (1-2) 23-07 (1)	07-09 (2-1) 09-13 (3-2) 13-17 (2) 17-19 (3) 19-20 (2-3) 20-23 (2-1) 23-07 (1-0)
20	09-00 (0-1)	06-09 (0-2) 09-15 (1-4) 15-20 (1-3) 20-00 (1-2) 00-06 (0-1)	06-09 (2-3) 09-16 (4) 16-21 (3-4) 21-00 (2-3) 00-06 (1-2)	06-09 (3-2) 09-15 (4-2) 15-16 (4-3) 16-21 (4) 21-23 (3) 23-00 (3-2) 00-06 (2-1)
40	07-11 (1-2) 11-16 (2-4) 16-20 (3-4) 20-22 (1-2) 22-07 (0-1)	07-09 (2-4) 09-11 (2) 11-16 (4-2) 16-17 (4-3) 17-20 (4) 20-22 (2-4) 22-02 (1-4) 02-07 (1-3)	07-09 (4-1) 09-16 (2-1) 16-17 (3-1) 17-20 (4-3) 20-02 (4) 02-05 (3-4) 05-07 (3)	07-17 (1-0) 17-20 (3-2) 20-05 (4) 05-07 (3-1)

80	06-11 (3-4) 11-15 (4-3) 15-21 (4) 21-04 (3-4) 04-06 (2-3)	07-09 (4-1) 09-11 (4-0) 11-15 (3-0) 15-17 (4-1) 17-19 (4-2) 19-21 (4-3) 21-04 (4) 04-06 (3) 06-07 (3-2)	07-09 (1-0) 09-15 (0) 15-17 (1-0) 17-19 (2-1) 19-21 (3-1) 21-02 (4) 02-04 (4-3) 04-06 (3) 06-07 (2-1)	07-17 (0) 17-19 (1-0) 19-21 (1) 21-03 (4-3) 03-04 (4-2) 04-05 (3-2) 05-06 (3-1) 06-07 (1)
160	17-18 (1-0) 18-19 (1) 19-21 (3-2) 21-23 (4-3) 23-05 (4) 05-07 (3-2) 07-08 (1) 08-09 (1-0)	18-19 (1-0) 19-20 (2-0) 20-21 (2-1) 21-23 (3-2) 23-03 (4-2) 03-05 (4-3) 05-07 (2-1) 07-08 (0-1)	20-21 (1) 21-00 (2-1) 00-03 (2) 03-05 (3-2) 05-06 (1) 06-07 (1-0)	20-22 (1-0) 22-00 (1) 00-05 (2-1) 05-06 (1-0)

ALASKA

Openings Given in GMT†

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	*Nil*	00-02 (1)	12-15 (1) 22-01 (1) 01-03 (2) 03-05 (1)	07-10 (1)
Central USA	*Nil*	21-00 (1) 00-03 (2) 03-04 (1)	13-16 (1) 23-00 (1) 00-02 (2) 02-04 (3) 04-05 (2) 05-07 (1)	08-12 (1)
Western USA	01-04 (1)	17-23 (1) 23-04 (2) 04-06 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-23 (1) 23-01 (2) 01-03 (3) 03-05(4) 05-06 (3) 06-08 (2) 08-10(1)	07-09 (1) 09-13 (2) 13-14 (1) 09-12 (1)*

HAWAII

Openings Given in Hawaiian Standard Time‡

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

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

†To convert to Local Standard Time in Alaska, *subtract* 8 hours from the GMT times shown in the Chart in the PST Zone of Alaska; subtract 9 hours in the Yukon Zone and 10 hours in the Alaskan Standard Time Zone. In other USA time zones, *subtract* 5 hours from GMT to obtain EST; 6 hours to obtain CST, 7 hours to obtain MST and 8 hours to obtain PST. For example, 20 hours appearing in the Alaskan Chart is 20 GMT; which is equivalent to 15, or 3 P.M. EST, noon PST; 10 A.M. in the Alaskan Standard Time Zone, etc.

‡To convert from HST shown in the Chart to Local Standard Time in other USA Time Zones, *add* 2 hours in the PST Zone; 3 hours in the MST Zone; 4 hours in the CST Zone; and 5 hours in the EST Zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 Noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in New York, and 22 GMT.

*Indicates predicted 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.

THE dwards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll
All Counties

#73—Robert A. Blakemore, Sr., WA3APO, 4-10-72.

USA-CA Honor Roll

3000		1000		500	
K8EUX	90	WA9WIF	262	DJ5GG	883
K2JVX	91	WA5KQD	263	K2LQQ	884
WA4LMR	92	WA2GPT	264	WA5KQD	885
WA3APO	93	WBØDPD	265	K5MHG/6	886
				WDX9KGQ	887
2500		500		WA5EEM	888
WA3APO	127	WA9WIF	882	WA8FVD	889
				WA2GPT	890
				WBØDPD	891

THE July, "Story of The Month" by Skip himself, is:

J. S. "Skip" Skaptason, WAØWOB
(All Counties #67, 12-1-71)

"With my very short career (?) as a ham, there is little to tell. But the period since I received my ticket (I never was a Novice, which was a mistake) is the same as my time on the County Hunters Net. I took my FCC test before Margaret and I went to Florida to conduct some winter work. One night I dreamt my call had been issued and was WAØWOW, next morning a call back to Kansas City showed my dream was almost right. Returned to Kansas City and put a Swan 350 in the car on the front seat, drove to a hill top near home, tuned around, found a hole, called CQ somebody and the somebody that answered was W4YWX/M4. Paul asked me to tune that frequency enroute back to Florida and I have been on the County Hunters Net ever since and probably always will be. By the way . . . my second mobile contact was K6KPS and he also gave me a 5x9 report. We gave out 51 counties returning to Florida, among them a tri-county line in Mississippi which was in the boondocks and pointed out to us by the local deputy sheriff. Since that trip, Margaret no longer expects normal behavior while on a trip.

"Since that trip, we have given out counties in 46 states (Nevada and Montana are yet to come) for a total of more than 1400 different counties. Look for us from the last two states as soon as we can get to them.

"While I have worked all the counties . . . I still don't know why. Guess the reason is basically to give us something to do while we visit on the air with the greatest bunch of people I have ever known. Because my work required nationwide travel, I have had the opportunity to 'eyeball' many of the gang and some have become regular stops in my travels. We were returning from the job in Florida when the Jacksonville gathering was held. That turned out to be the first mini-convention and out of that came the first July 4th ICHN convention.

"The Mountain Home Convention, put on by K5KDG, was where I met the Kansas City gang of County Hunters. WØSJE and I with our wives rented suite 303 at the Holiday Inn and that was where the subsequent conventions were really started. It was after that convention that the KC group began working to develop a vehicle to further our mutual interests. MARAC (Mobile Amateur Radio Awards Club) was the result.

"Room 303 was a riot. The early birds came at 9 A.M. and the late ones left at 3 A.M. We would

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

Skip, WAØWOB

accumulate so many empty containers during those hours, we would carry them around to other parts of the motel, to save our reputation! As long as we can perpetuate the camaraderie of the 303 room, the dedication to helping the other guy which is the hallmark of the operators on the 20 meter County Hunters Net, we will continue to have the best of all the good things on ham radio.

"There is another aspect to the 20 meter net that I never hear mentioned. Emergency service is the common claim of amateur radio. Nowhere is there a better qualified group of hams, experienced in the use and care of mobile equipment, than on our net. I dare say there is no place in the 48 states more than a couple of hours away from one of our regular mobile operators. Most of the nets claiming emergency operation capability, would fall far short of our group in an emergency where power and antennas were at the mercy of tornado or hurricane or other disaster.

"One more thing before I quit this rambling . . . re XYLs . . . At our regular MARAC meetings, most bring their XYL. Did you notice how many XYLs come to the County Hunters Conventions? The most common reaction of the XYLs at their first visit to a convention is their surprise at the enjoyment they find for themselves. Hams are notorious for NOT including the 'better half' in his ham activities. Its just another plus for the County Hunters that so many wives are included. Maybe they are finding out that County Hunting is more fun with the XYL included. In my own case Margaret is my logger, or my driver; fixes me a cold drink and a snack while I'm running a county line and then when we get home, handles 99% of all the QSL replies. If it wasn't for her, County Hunters would still be waiting for replies from our first mobile trip to Florida back in January 1969.

"I've written a lot of stuff but never about myself . . . the other guy is more important and I'd sooner write about him."

Well Skip did a fine job and I can only add just a couple items. He waited until he had them *all*, and on December 1, 1971 was issued USA-CA-500-#876, All 20 SSB Mobiles, 1000 #257, 1500 #178, 2000 #145, and 2500 #122 all endorsed All 20 SSB Mobiles. And also 3000 #88 and All Counties #67, both endorsed All SSB.

At home, Skip uses a 32S-3 and 30L-1; 75S-3 with a 312B-4 and a TA-36 up 40 feet. For mobile work he has a Drake TR4 and Hustler antenna. In addition to all those County Awards, all his work with MARAC (he is MARAC #2), he is member of ARRL, ISSB #7743, Kentucky Col. #783, HARLO 270, OGS #636 and Old Town. #221.

On November 25, 1970 I had the pleasure of meeting Skip and Margaret at the home of Win, WA2QNW. On May 23, 1971, Helenmae and

Fine Group at Mini-Convention at WA2QNW.

I enjoyed meeting Skip and Margaret at the home of Jerry, W2KXL.

Awards Issued

Bob Blakemore, WA3APO, in addition to making All Counties, All SSB; also received USA-CA-3000, All 14 mHz, All 2×SSB, and 2500 All 14 mHz, All 2×SSB, All Mobiles.

Howard E. Perkins, K8EUX (Foto/Story *CQ*, 12-67) after a long pause, sent for USA-CA-3000.

Jay Siegel, K2JVX, applied for USA-CA-3000, All 14 SSB.

Bob Anderson, WA4LMR (All Counties #71, All SSB, 2-19-72, as listed last month) naturally qualified for USA-CA-3000 All SSB.

Dan Broadbooks, WA9WIF, was issued USA-CA-1000 endorsed All A-1, and USA-CA-500, endorsed All A-1 and All 7 mHz.

Gordon Baker, WA5KQD, took time to acquire USA-CA-1000 and 500, both endorsed All A-1.

Beatrice Dietz, WA2GPT, acquired USA-CA-500 and 1000.

The MARAC, Inc. station, WBØDPD (trustee, Bob, KØAYO) also qualified for USA-CA-500 and 1000, both endorsed All Mobile, All SSB.

USA-CA-500 Awards endorsed All A-1 went to: Gunther Philipp, DJ5GG; Roger Pender,

Diploma Caciques De Venezuela

K5MHG/6; and to Leo Ginbey, WA5EEM.

USA-CA-500 Awards endorsed Mixed were won by: Clinton Wise, K2LQQ; Bob Nelson, WDX9KGQ (1st to s.w.l. in some time); and Ron Zurawski, WA8FVD.

Awards

Diploma Caciques De Venezuela: This large, beautful award will be issued for QSOs starting 1 April 1967 0000 GMT with YV4 stations from Valencia. Be sure to request their Cacique number.

1. YV stations need 15 different contacts with Caciques, 10 on 40 and 5 on 80, a.m. or s.s.b.

2. Amateurs from Zones 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 need 10 different contacts with Caciques on any bands, a.m. or s.s.b.

3. Amateurs from Zones 14, 15, 33, 35 and 36, need 6 diffedent contacts with Caciques on any bands, a.m. or s.s.b.

4. Amateurs from all other Zones need 2 different contacts with Caciques on any bands, a.m. or s.s.b.

Send log data showing Cacique numbers, certified by your radio club or association (GCR) with $1.00 (or equivalent in IRCs) to: Diploma "CACIQUES DE VENEZUELA", P.O. Box 627, Valencia, Venezuela.

Worked All ZP Award: Issued to all licensed amateurs for confirmed contacts with one station in each of the nine (9) ZP call areas after May 15, 1952. Send QSL cards or certified list with 5 IRCs to: Radio Club Paraguay, P.O. Box 512, Asuncion, Paraguay. No band or mode restrictions.

The ZP3 Award: Issued for contacts with ZP3 stations as follows: Zp applicants must work 10 different ZP3s. LU, CX, CE, PY and CP applicants work 5 ZP3s. All others work 2 different ZP3 stations. No band or mode restrictions. Send QSL cards or certified list and 5 IRCs to: Radio Club Paraguayo, P.O. Box 512, Asuncion, Paraguay.

The ZP100 Award: Issued to any applicant for working at least 100 different ZP stations. No band nor mode restrictions. Send the QSL cards or a certified list with 5 IRCs to: Radio Club Paraguayo, P. O. Box 512, Asuncion, Paraguay.

Notes

Regarding the Canadian WAVE/WACAN Awards—complaints continue to arrive about the *SLOW* processing of these awards and the refusal of the Nortown Amateur Radio Club to answer any mail regarding same.

On April 1st, a Mini-Convention was held at the new QTH of Win and Joyce Tames (WA2QNW), 62 Valleyvale Drive, Old Bridge, N.J. Among those present were: Frank, WA1CXE; Ray, W1DHL; Tom, WA1LZS; Bill, WA1NPM;

[*Continued on page 90*]

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

July	1-2	Venezuelian Contest
July	15-16	Space Net VHF Contest
July	22-23	Colombian Contest
July	29-30	County Hunters C.W. Contest
Aug.	12-13	European C.W. DX Contest
Aug.	12-13	Maryland/D.C. QSO Party
Aug.	19-20	S.A.R.T.G. RTTY Contest
Aug.	19-20	New Jersey QSO Party
Aug.	26-27	All Asian DX Contest
Aug.	26-28	Delta QSO Party
Sept.	9-10	European Phone DX Contest
Sept.	16-18	Washington State QSO Party
Oct.	7-8	VK/ZL/Oceania DX Phone
Oct.	7-8	RSGB 21/28 mHz Phone
Oct.	8-9	LU American Contest
Oct.	14-15	VK/ZL/Oceania DX C.W.
Oct.	21-22	RSGB 7 mHz C.W. Contest
Oct.	**28-29**	**CQ WW DX Phone Contest**
Nov.	3-6	IARS CHC/HTH/FHC QSO Party
Nov.	4-5	RSGB 7 mHz Phone Contest
Nov.	12	Czechslovakian Contest
Nov.	**25-26**	**CQ WW DX C.W. Contest**

Space Net VHF Contest

Starts: 6:00 P.M. Saturday, July 15
Ends: 6:00 P.M. Sunday, July 16
(Your Local Time)

This contest is being held on the anniversary date of the Apollo 11 moon mission, man's first landing on the moon in 1969. Activity will be during the 24 hour contest period, your local time, on any of the v.h.f. bands. The 50, 144, 220 and 432 mHz bands. All modes may be used but not repeaters.

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

Scoring: Two points per QSO. Multiplier is sum of different Zip Code areas worked. There is also a bonus of 10 you add to your multiplier.

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

Awards: Will be made for 1st and 2nd place winners in three classes based on power used. 1-25 watts, 25-100 watts, and 100 to 1 KW. There are also awards for multi-operator stations and club participation. Write to address below for additional information on the Space Net Program. All stations submitting a log will receive an attractive Participating Certificate.

Contest logs must be postmarked no later than August 5th and go to: Space Net VHF Contest, Att: A. W. Slapkowski, WB2MTU, Box 909, Sicklerville, N.J. 08081

Colombian Contest

Starts: 0001 GMT Saturday, July 22
Ends: 2359 GMT Sunday, July 23

This is Colombia's annual contest commemorating the anniversary of its independence.

Work HK's as well as other DX, on all bands 10 through 80, on c.w. and phone.

Exchange: The conventional RS/RST report plus a three figure QSO number starting with 001. HK's will include their district number too.

Scoring: *Stations in the Americas:* HK QSO's count 3 points, others 1 point.

Stations in other continents: HK contacts 5 points, 1 point for others.

The multiplier is derived from the sum of HK districts and different countries worked on each band. Final score, total QSO points times the sum of the multiplier from all bands.

Awards: Certificates to the top single operator and multi-operator stations, both single and

Ted Heithecker, W5EJ Chairman of the 1972 QCWA QSO Party reports this as the most successful party in the Association's 25 year history. Well over 200 entries were received, more than double last year's output. Following are the number of members worked and scores of the 25 Top stations.

W3IN	317	21,376	KV4AA	147	6,594
K6FE	278	17,691	W5EJ	138	6,235
W6FQ	216	13,740	W9GIL	116	6,110
W6IL	209	12,432	W2SF	112	6,076
W4NH	199	11,440	W8GP	133	5,640
W4YK	190	10,200	K2EP	116	5,588
W8KW	191	9,259	W2MEI	131	5,400
W9CAS	175	8,372	W5HS	118	5,250
W1WY	166	8,225	KV4AB	112	5,220
W6QIL	158	7,872	W3ABC	123	5,160
W5HT	149	7,536	W2AMB	126	5,148
K4NE	147	6,665	WØCY	99	5,123
W9ACU	142	6,600			

Don McClenon, W3IN therefore is this year's winner of the National Headquarter's QCWA Plaque.

Results of QCWA QSO Party

*14 Sherwood Road, Stamford, Conn. 06905.

multi transmitter, in each country. There are also awards for the continental and world leaders.

Include a summary sheet with your log, check your log for duplicates and save your name and address in BLOCK LETTERS.

Mailing deadline is September 30th to: Independence of Colombia Contest, P.O. Box 584, Bogota, Colombia.

County Hunters C.W. Contest

Starts: 0000 GMT Saturday, July 29
Ends: 2400 GMT Sunday, July 30

The C.W. County Hunters Net plans to have many mobile and portable stations active from many of the rarer counties.

The same station may be worked on each band for QSO points. Portable and mobile stations changing counties may also have repeat contacts. Stations on county lines exchange only one number but each county is counted as a multiplier.

Exchange: QSO no., category (F-fixed, P- portable, M-mobile) RST, state, province or country and county, (for U.S. stations)

Scoring: QSO's with fixed stations 1 point, with portables or mobiles 3 points. Multiply QSO points by number of U.S. counties worked.

Frequencies: 3575, 7055, 14070, 21070, 28070.

Awards: Certificates three categories:

F—Highest fixed or fixed portable in each state, province or country, 300 or more points.

P—Highest score in each state by a portable operating from a county that is not its normal QTH, 300 or more points.

M—Highest scoring mobile in each state operating from 3 or more counties, with a minimum of 15 QSO's per county.

There are Trophies for the Top single operator Portable and Mobile in the United States.

Stations with 100 or more QSO's must include a check sheet of counties worked.

Mailing deadline is Sept. 1st to: C. W. County Hunters Net, c/o James E. Hoffman, K1ZFQ, 42 Gresham St., Milford, Conn. 06460. Include a large s.a.s.e if results are desired.

European DX Contest

CW.—Aug. 12-13 Phone—Sept. 9-10
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

This is the 18th year the DARC has sponsored this very popular European contest.

All bands may be used, 3.5 thru 28 mHz. Two classifications, Single operator, all band and Multi-operator, single transmitter. Only 36 hours out of the 48 hour contest period may be used by single operator stations. The 12 hour rest period may be taken in one but not more than 3 periods.

Exchange: A five and six digit serial number, RS/RST plus a QSO number starting with 001.

Points: One point per QSO, and one point for each QTC reported.

Multiplier: For non-European stations, number of European countries worked on each band. In addition the multiplier on 3.5 may be multiplied by 4, on 7. mHz by 3 and on 14/21/28 mHz by 2.

Europeans will use the latest ARRL country list and call areas as follows: JA, PY, VE/VO, VK, W/K, ZL, ZS, UA9/UAØ.

Final Score: Total QSO points, plus QTC points, multiplied by sum total multiplier from all bands.

QTC-Traffic: This feature is often overlooked. Additional QCO point credit may be realized by reporting a QTC. It is a report of a confirmed QSO that has taken place earlier in the contest and later sent back to a European station.

The general idea being that after a number of European stations have been worked, a list of these stations may be reported back during a QSO with another station. An additional 1 point can be earned for each QSO reported. A QTC can be only sent from a non-European to a European.

A QTC contains the time, call and QSO number of the station being reported. i.e.: 1300 DK2BI/134. This means that at 1300 GMT you worked DK2BI and received number 134. A QSO can be reported only once and not back to the originating station.

Only a maximum of 10 QTCs to a station per band is permitted. You may work the same station several times to complete this quota. Only the original contact however has QSO point value.

Keep a uniform list of QTCs sent. QTC 3/7 indicates that this is the 3rd series being sent and that 7 QSOs are being reported.

Awards: Certificates to the higest scorers in each country and call areas mentioned above. Continental leaders will also be honored. And also stations having at least half the score of the continental leader.

Disqualification: Violation of the rules of the contest, or unsportsmanship conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed sufficient cause for disqualification. Decision of the Committee is final.

It is suggested that you use the official DARC log and summary forms. A s.a.e. with sufficient IRCs to cover your request should be sent to address below. Figure 40 QSOs to the sheet if you make your own. And use a separate sheet for each band. (W/K and VE stations can send their requests to W1WY)

Mailing deadline for logs is Sept. 15th for C.W. and Oct. 15th for Phone. DARC European Contest, D-895 Kaufbeuren, P.O. Box 262, Germany.

European Country List

C31 — CT1 — CT2 — DL, DM — EA — EA6 — EI — F — FC — G — GC Guer — GC Jer

[*Continued on page 90*]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

THE most often-asked two questions in my mail are "where can I get a schematic?" and "Where can I find surplus in my part of the country?" There is clearly a lot of interest in surplus, but technical manuals are very scarce, and there are many sections of the U.S. which are many miles from the nearest well-known surplus electronics store.

Beginning with this column I am going to try to rectify the lack of information on sources of surplus by ferretting out little-known dealers who either do not sell by mail, or who just do not bother to advertise.

The surplus market is constantly changing, and urban renewal is knocking down many a "radio row" in city after city, making even my own files obsolete very rapidly. Therefore I have checked current addresses of dealers across the country, and will begin to list them with this month's issue. Anyone who can suggest a new good surplus outlet is invited to send it along to me to be printed in a subsequent column.

In sending out form letters to surplus dealers, I got a flood of mail returned undelivered, indicating just how often surplus stores move, go out of business, or spring up. Checks with telephone information operators indicated that most of the missing dealers were still in business at new locations, but highway construction, downtown riots, and other socio-economic factors made the search a bit interesting.

Just finding dealers who have not advertised in recent years, if ever, was a challenge. I have access here to almost all the classified telephone books for the U.S. and Canada, but even some well-known stores are not listed under "surplus electronic." They dress themselves up as "International Electronics," or are listed as "Frank's Auto Parts," so your fingers have to do a lot of walking in those yellow pages. It would make a surplus hound's life far simpler if all the electronic surplus stores would list themselves that way in the phone book. I sent out a lot of postcards to addresses that turned out to be discount houses or Army-Navy stores.

The listing of surplus dealers will go on for several months in this column as replies filter in. I do not expect to classify the names by city or state, but to list them at random as they reach me. Hopefully I will be able to find outlets even in such surplus-starved states as Kentucky and North Dakota.

Obviously, dealers are clustered in major cities such as Los Angeles, New York, Miami, Seattle, Chicago and Boston, particularly near major defense depots, large manufacturers, or export markets. There are others though, if you can find them.

I find that there are a few rough classifications in surplus stores handling electronics. First is the general surplus electronics store, selling everything from top-grade oscilloscopes to individual resistors. Next most numerous are component dealers, who concentrate on integrated circuit packs, capacitors, switches, etc., and who only sell a few complete surplus units.

Some dealers emphasize test gear, some Teletype, others scientific or medical equipment, some aircraft parts, some mostly industrial components, a few just f.m. rigs. Some amateur equipment stores handle occasional surplus items.

Here is my first listing:

Oakland, California: George Belling, 825 27th Ave., box 1647, zip 94604. Mail and store trade; power supplies, transmitters, test gear.

E. Weymouth, Mass.: Surplonics, E. J. Cheek, 25 Wharf St., box 159, zip 02189. Mail and store trade. All types electronic surplus.

New York, N.Y.: Barry Electronics, 512 Broadway, N.Y. 10012. Mail and store trade, chiefly in components.

Ft. Myers, Florida: JAN Crystals, 2400 Crystal Dr., zip 33901. Mail order only, all types new & surplus crystals.

Gillete, N.J.: Van's Electronics, 657 Valley Rd. phone 647-3639. Saturday only, or by appointment. Mainly RTTY and FAX. Mail address 302 Passaic Ave., Stirling, N.J. 07980.

Portland, Oregon: Star-Tronics, box 17127, zip 97217 (Kenton Station) mail order only.

New York, N.Y.: Liberty Electronics, general electronic surplus, mail or store, 548 Broadway, zip 10012.

Houston, Texas: R. Jaross Co., 6427 Springer, zip 77017, general electronics surplus, mail and store trade.

Lima, Ohio Fair Radio Co., box 1105, zip 45802. Mail & Store, general electronics, many complete units.

Beverly Hills, Calif.: R. E. Goodheart Co., Box 1220 zip 90213. Test gear, complete components.

New York, N.Y.: G & G Radio, 45 Warren St., zip 10007. Many complete units, command sets, etc.

Scottsdale, Arizona: Circuit Specialists Co., Box 3047, zip 85257. Components only.

San Carlos, California: J & H Outlet, 476 Industrial Way. Components, other surplus items. Mail order reluctantly.

Columbus, Ohio: A.R.C. Electronics, 2187 E. Livingston Ave. Some surplus, primarily new and used amateur gear.

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

Tacoma, Washington: American Surplus, 2916 S. Tacoma Way, zip 98409. General electronic surplus, some RTTY.

St. Louis, Mo.: Gateway Electronics, 8123 Page Blvd. Mail and store trade, military and industrial surplus.

Dayton, Ohio: Mendelson Electronics, 516 Linden Ave., zip 45403. Military electronic items.

Chicago, Ill.: C. B. Goodman, 5826 S. Western Ave., zip 60636. RTTY, chiefly Western Union salvage.

Omaha, Nebraska: Ladd Electronics, 101 41st Street.

Detroit, Mich.: Benjamin Sales Co., 7601 Fenkell Ave. motor brushes, aircraft parts, military surplus units.

Brooklyn, N.Y.: Tallen Surplus, 300 7th St., General military surplus.

Hyattsville, Md.: Aviatronics, 2509 50th Avenue. Aircraft parts, some amateur-interest electronics items.

Alexandria, Virginia: Sasco Electronics, 1009 King St. Military, industrial surplus.

Annandale, Va.: Ritco Electronics, box 156. General electronics surplus.

Chicago, Ill.: Norman Electronics, 7113 W. Higgins Ave. zip 60656. Aircraft electronics and surplus.

Hawthorne, Mass.: B & F Enterprises, box 44, zip 01937. Scientific and electronic surplus.

North Hollywood, Calif.: AN/COM Electronics, 5667 Lankershim Blvd., late-type military surplus.

Cheektowaga, N.Y.: East Coast Electronics, 123 St. Boniface Rd. 14225. Aircraft and industrial surplus, particularly components.

Camden, N.J.: Lectronic Research Labs, 1423 Ferry Ave. zip 08104. General military and industrial surplus. Chiefly mail-order.

Philadelphia, Pa.: Reliance Merchandising, 2223 Arch St. Surplus components.

Carmichael, Calif.: Babylon Electronics, box 85, zip 95608. Chiefly solid-state components.

North Hollywood, Calif.: Frank Dee Aircraft, 11033 Weddington, zip 91603. Aircraft surplus primarily.

Phoenix, Arizona: Honeywell Surplus Center, 313 W. Apache St. Surplus and scrap from Honeywell computer plant.

Framingham, Mass.: Honeywell Surplus Center 208 Worcester Rd. (Rt. 9) excess components, scrap, from Honeywell computer plant.

Albany, Oregon: L & B Sales, box 195, zip 97321. General surplus items.

Monroe, Michigan: Gray Electronics, Box 941, zip 48161. Primarily test equipment.

Houston, Texas: Madison Electronics, 1508 McKinney Ave. zip 77002. Industrial surplus.

San Diego, Calif.: Jones Electronics, 2830 Market St. zip 92102. General electronics surplus.

Rockville, Conn.: Denson Electronics, Longview St., zip 06066. Television and TV accessory gear.

Springfield, Va.: Electronic Equipment Bank,

box 1123, zip 22151. Test gear only.
Indianapolis, Indiana: Esse Radio, 368 S. Meridian St., zip 46225. General electronic surplus.
Kirkland, Washington: Mac's Surplus, 11200 Kirkland Way. zip 98033. No mail order. General military electronics.
Cleveland, Ohio: Jeff-Tronics, 4252 Pearl Rd. zip 44109. Military electronics.
Norfolk, Va.: Harold Burns Co., box 9819 Wright Station, Navy surplus.
Macon, Ga.: Quality Surplus, L. B. Wilson Airport, 31201. Military electronics.
Miami, Florida: Chuck's Surplus, 3115 NW 54th St., zip 33142. General military surplus.
Mableton, Georgia: Mitch's Surplus, box 663, zip 30059. General surplus including electronics.
Charleston Heights, South Carolina: Electronic Superette, 3586 Dorchester Rd. zip 29405. General military surplus electronics.
Signal Mountain, Tenn.: Will Elliott Aircraft, 12 Kell Rd., Rt. 2. Aircraft and electronic surplus.
St. Paul, Minn.: Ax Man Surplus, 1639 University Ave. zip 55104. Electronic components.
Dover, Kentucky: John M. Henderson Surplus, Rt. 1, zip 41034. General military electronics.

Technical Manuals

Hunlock Creek, Pa.: Quaker Electronics, box 215, zip 18621. Technical manuals, crystals and general electronic surplus.
Oxon Hill, Md.: Sam Consalvo, 4905 Roanne Dr. Technical manuals only.
Jacksonville, Florida: Propagation Products, box 242. Technical manuals only.

Contest Calendar [*from page 85*]

— GD — GI — GM — GM Shetland — GW — HA — HB9 — HBØ — HV — I — IS — IT — JW Baer — JW — JX — LA — LX — LZ — M1 — OE — OH — OHØ — OJØ — OK — ON — OY — OZ — PA — SM — SP — SV — SV Crete — SV Rhodes — TA1 — TF — UA1346 — UA2 — UB5 — UC2 — UO5 — UN1 — UP2 — UQ2 — UR2 — UA Franz Josef Land — YO — YU — ZA — ZB2 — 3A — 4U1 — 9H1.

Editor's Note

Our plan of completing the results of the Phone Contest a month earlier than last year just did not work out.

We have always been more than tolerant in making adjustments in logs with scoring errors, but however, when a log has so many errors and questionable contacts that cannot be justified, that's another story.

Time that would have been spent in completing a report for the hundreds of you fellows with clean entries, is being wasted on a hand-full of logs with questionable claims.

We just will not tolerate this kind of operation in our contests.

73 for now, Frank, W1WY

USA-CA [*from page 82*]

Art, K1OAZ; Rich, K1OME; Vic, K1UKY; Jack, WA2AMM; Dick, W2BLM; George, WB2DAE; Warren, W2DWO; Bill, WB2FVO; Bea, WA2GPT; Stu, WA2IJB; Valerie, K2KQC; Jerry, W2KXL; Gene, WA2MGV; Jack, K2OO (exK2CPR, etc.); Bob, W2OST; Clara, W2-RVF; Marv, WB2SJQ; Gene, WB2UVB; Roger, WB2WZE; Penny, WB2ZNN; Helen, WA3GLJ; Hank, K3FFJ; Danny, K8DCR; Max, W9SOM; Jim, KØARS; Ray, VE3CBY and many of their YLs/XYLs. Sorry that I was unable to attend. I am grateful to Marv Hagan, WB2SJQ, for the list, and again indebted to Frank Gerratana, WA1CXE, for the FB photograph of the nice group.

Thanks to Bill, WØHAO for sending a POD 26, DX and USA Callbooks to our down-under County Hunter, Dan, VK5QB. Yes, Dan, VK5-QB is looking for U.S. Counties and needs QSOs and QSLs (c.w.).

Condolences to Bertha, WA4BMC on the sudden loss of her youngest sister.

Hope Joe Slattery, W9DRL and family had a nice trip to England and Ireland.

I continue to receive data on events much too late for publication, my deadline is 90 days before publication.

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

ARN-30 [*from page 41*]

the effort and you certainly can't quarrel with the price. If nothing else, just working with and listening to this gear may stimulate your activity in a band 4 mHz wide and getting more f.m. and s.s.b. every day.

I would like to thank Gordon white, SURPLUS SIDELIGHTS editor of *CQ* for the spadework on the original article from which I got so much help and information. All I have tried to do here is to go into a little more detail than he had room for at the time, and to alert those who are interested in 2 meters but don't have the means to purchase new and exotic equipment before knowing whether the band is what they really desire it to be.

I, for one, will pay more attention to the SURPLUS SIDELIGHTS column from now on! ■

Q & A [*from page 14*]

sequently break down at other times and cause intermittent shorts of the high voltage. The solution here would be replacement of the rectifier-tube socket.

As for the power transformer, if *both* the primary and secondary windings show resistance, there should be output voltage; provided you measure 115 v.a.c. across the primary. Check this with the rectifier tubes

removed. Excessive heating of the transformer or low voltage output may indicate the possibility of shorted turns on one of the widings.

Other causes of your situation may be a bad filter capacitor or a component in the modulator or p.a. that breaks down. To eliminate these sections as a cause, check power supply operation or voltage after the +365 and +750-volt lines are disconnected. If trouble still shows up, check for bad capacitor by disconnecting one at a time and or checking it for low leakage resistance. When the above tests are made, be sure power is off and filter capacitors are discharged, before you disconnect, reconnect the elements or make other changes.

Power Increase With Pacemaker

QUESTION: Have you any conversion data to increase the power of the Johnson Pacemaker to 180 watts p.e.p.?

ANSWER: We have no specific data on increasing the power capabilities of the Pacemaker; however, this probably could be done by substituting one of the TV-sweep tubes (such as the 6KD6, 6HF5, etc.—the choice may depend on physical dimensions) for the 6146 in the Pacemaker p.a. This will present a heavier load on the power supply, but with the s.s.b.-voice duty cycle it might handle it okay. With the sweep tubes the bias will have to be adjusted to hold the resting plate current down for about 20-watts plate dissipation (approximately 25 ma). Tuneup will have to be conducted quickly to prevent tube damage during non-resonant conditions.

Note that this change will give you about 160-180 watts p.e.p. input with a p.e.p. *output* of 100-120 watts compared with 60-watts normal output with the single 6146. This represents a signal increase of about only 3 db which is hardly worth the effort.

Another Transistor Cross Reference Guide

Have you ever had trouble locating a replacement transistor for one that is identified only by the equipment manufacturer's special part number rather than by the transistor-type number? If so, you'll be interested in International Rectifier's *Semi-Conductor Cross Reference and Transistor Data Book* which lists IR's replacements not only for the standard 2N—, etc. types, but also for those

special numbers. For example: we note listings for Heath's transistors which usually are a series in the 417-000 category. Also included are the replacement types for the Japanese 2S— series, etc. For a copy of this book, write to: International Rectifier, Semiconductor Division, 233 Kansas Street, El Segundo, California 90245.

73, Bill, W2AEF

Spelg Prblm [*from page 43*]

Wl aniway, tt wuz a vy confusing bt vy illuminating experience in meiner life, I mean, what mit trying zu learn das Deutsch lanaguage while at the same time trying zu learn the code fur meiner general. Altho I hd to take die course twice to pass, I finally cured myself von das vy bad habit. Just 2 think of it gives me schreckliche goosebumps . . . I thot Id never grow outa it.

Bt getting bk zu meiner real problem, abt dieses bizness of meiner spelg. Do u denken I shud worry abt it, fm one intelligent person zu einander. ■

Oscar-6 [*from page*]

ing almost motionless in space, in view of one third of the earth's surface.

AMSAT's proposal to provide a 10-meter radio amateur communication package for leisure time use by the crew of NASA's first SKYLAB space laboratory has been rejected by NASA but with considerable reluctance. In spite of its broad appeal, and a generally favorable disposition to encourage radio amateur space activities, NASA concluded that the proposed amateur station could not be added to SKYLAB at the present stage of the program. SKYLAB is due to be launched during 1973. ■

Noise Generators [*from page 67*]

ator with very low spurious modulation or noise output. The procedure is as follows:

Connect the signal generator to the receiver input and adjust the generator output to a very low level at the desired frequency. The signal should be barely detectable below the noise and must not be modulated; it should be pure c.w. Place an output indicator across the receiver output. Adjust the receiver gain to a convenient value of output power. The receiver a.g.c. must be on: this last step is just opposite to the usual noise figure measurement wherein the a.g.c. is disabled.

DRAKE JUGE TR-22

$199.95 Amateur Net

6 CHANNEL • 1 WATT
.5MV SENSITIVITY
BUILT-IN ANTENNA
BUILT-IN BATT. CHARGER

INCLUDES: Dynamic Microphone, Over-the-Shoulder Carrying Case, 120 VAC and 12 VDC Power Cords, Speaker/Headphone Plug, and 10 Nickel-Cadmium Batteries

Most crystals between 145.830 and 146.970 (30 kHz channel spacing) in stock. $3.95 each. We will install and set on frequency FREE before we ship your unit. Order today!!

on all in-stock items...

MAIL ORDERS SHIPPED IN 24 HOURS

OTHER DRAKE GEAR IN STOCK:

2C Receiver	$255.00	R4-B Receiver	$475.00
2CS Speaker	22.00	T4X-B Transmitter	495.00
2NT Transmitter	164.00	AC-4 Power Supply	99.95
ML-2 2M FM	329.95	L4-B Linear Amplifier	825.00
W-4 2KW Wattmeter	61.95	MS-4 Speaker for R4-B	22.00

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Adjustments may now be made to the receiver front-end attempting to minimize the output meter reading. As the noise figure is reduced, it may be necessary to reduce the signal generator output level to maintain the signal barely noticeable under the noise and also to readjust the receiver gain to maintain a convenient output level.

This technique is based on the assumption that the a.g.c. circuit will hold the overall receiver gain constant in spite of changes to the receiver front-end. A reduction in the receiver output noise indicates a reduction in receiver noise figure *provided the receiver gain remains constant.* This explains the requirement for the good a.g.c. system and the low spurious output of the signal generator.

Summary

We have briefly discussed the concept of noise factor and various ways of measuring it. We have shown that through the u.h.f. region a thermionic diode was a good choice. We described a method for very simply extending the frequency range of this diode into the u.h.f. region. Finally various ways of using a noise generator in different types of circuits were explained. ■

The Blink-O-Nil [*from page 61*]

Switch on the transmitter and tune it up. Couple the "Blink-O-Nil" to the antenna line, and switch on both S_1 and S_2. When the key is first pressed down, there should not be any flickering of the light bulbs. As soon as the key is released, the bulbs should light up and remain so for about 3 seconds before they go off.

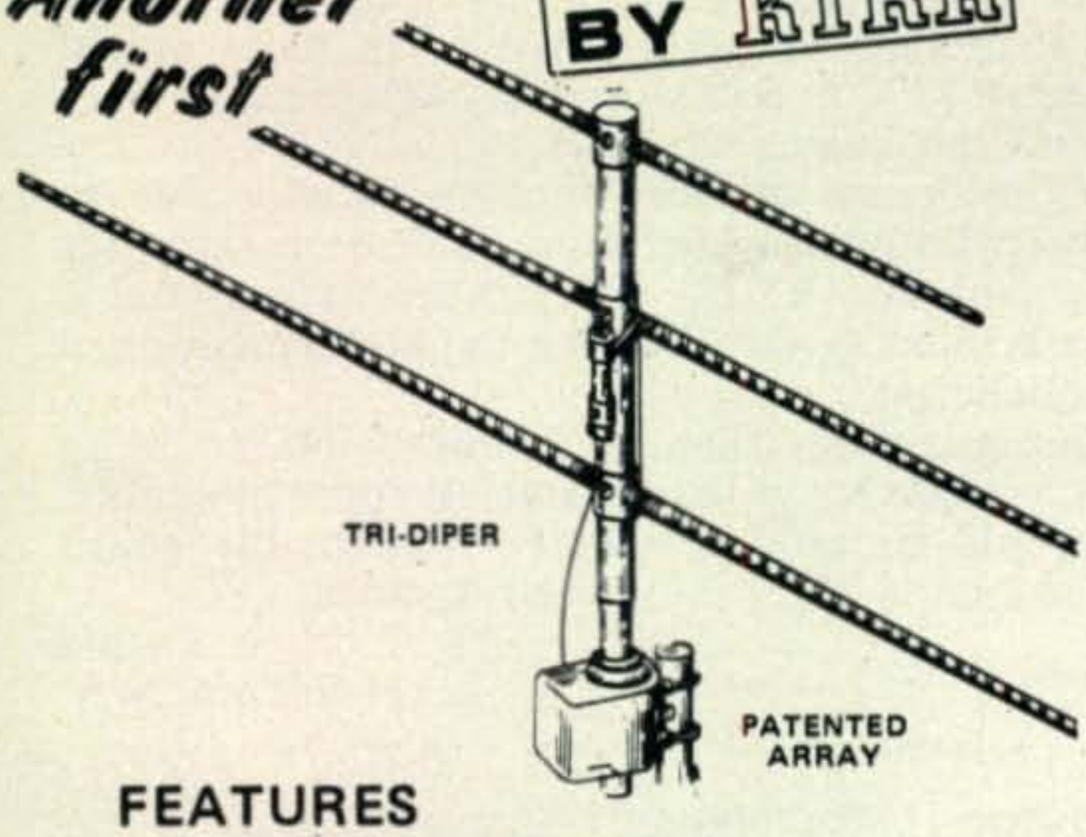
The following is the acid test for the proper functioning of the unit. Send a string of dots at moderate speed using an electronic keyer and make sure that the bulbs extinguish completely whenever the transmitter is on. Next set the keyer to about 40 w.p.m. and send *just one dot.* Immediately the bulbs should light up and stay so for at least one second, indicating that the 50 mf capacitor is getting charged quick enough.

Conclusion

The unit built by the writer is giving excellent service. It is hoped that this gadget will prove useful in many a ham-shack and the writer hopes to hear from hams who actually try it out. ■

Another first

BY KIRK



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* Broad Band Operation.
* Copper conductive elements on fiberglass tubing. No corrosion, elements completely coated.
* Elements 25% to 30% shorter, but effectively equivalent to full length wire dipole.
* Feather weight and giant strength Tri-Diper 10 - 15 - 20 meter, only 7 lbs. Practically indestructible.
* 2 PEP broad band baluns supplied.
* Assembles in 30 minutes.

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Combined 10 · 15 · 20 · 40 meter DIPOLES for the amateur with limited Antenna space.

Now KIRK offers you these strong, wide spectrum, Multi-Band Dipole arrays that operate from one 52-ohm RG-8/U coax feed line. A balun is included to produce a true symmetrical wave form from the unbalanced line to the balanced antenna elements. Their unusual light weight construction enables these arrays to be rotated by a standard T.V. Rotor Ar-22R or equal.

• • • • • • • • • • • • • • • • •

THE TRI-DIPER

3 Elements, consisting of a 10, 15, 20 meter dipole. Mounted on a vertical fiberglass mast 32" long, 2" diameter. A short 1½" mast is furnished to fit into rotor. Longest element - 22' 10".

WEIGHT: 7 lbs. NET PRICE - $119.95

THE DUO-DIPER

2 Elements, consisting of a 20 meter and a 40 meter dipole on a vertical fiberglass mast 24" long, 3" diameter. A short 1½" mast is furnished to fit into rotor. Longest element - 44'.

WEIGHT: 12 lbs. NET PRICE - $169.95

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EXCEPTIONAL QUALITY... VHF FM Transceiver

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Accessory BBLT-144D Antenna: Hustler 3.4 dB gain $27.95

GENERAL • Freq. coverage: 144-148 MHz • 12 channels, 3 supplied • Push-to-talk Xmit • AC drain: Rcv, 6W; Xmit, 50 W • DC drain: Rcv, 0.5A; Xmit, 4A • Built-in Power Supply: AC, 117V 50-60 Hz; DC, 13.5V±10% • Size: 7-7/8" x 2-3/4" x 10-1/4", 8-1/4 lbs.

TRANSMITTER: • Transistorized with 6360 output tube • RF Output: over 10 W • Freq. Dev: Adj. to 15 kHz max. • Freq. Stability: ±.001% or less • Output Imped: 50 ohms.

RECEIVER: • Completely transistorized, crystal-controlled superhet • Intermed. Freq: 1st 10.7 MHz, 2nd 455 kHz • Input Imped: 50 to 75 ohms • Sensitivity: 0.5μV or less/20 dB quieting; 1μV or less/30 dB S+N/N at 10 kHz dev., 1 kHz mod. • Audio Output, 0.5 W • Spurious Sens., > -60 dB.

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SSTV [*from page 27*]

voice in one sideband and SSTV in the other is permitted on all authorized frequencies.

Q. What types of tape recorders can be used to record SSTV?

A. Almost any audio recorder will record and reproduce an SSTV picture of sorts. Most modern ¼ inch reel-to-reel, capstan driven machines, running at 7½ i.p.s. will do an excellent job. Even cassette and dictating machines have sufficient bandwidth. The primary problem with low speed machines is picture distortion due to "wow" or other speed variation in the recorder. The best way to compare machines is to draw up a test pattern with one or more vertical lines near the right hand edge. "Wow" will cause waviness or breakup of the vertical line. The photo shows an extremely bad case.

Q. Some hams use a low-pass filter between the subcarrier oscillator and the transmitter. Is this filter really necessary?

A. Since most voltage controlled oscillator arrangements have high harmonic content, an audio LPF must be used if the rig itself doesn't do the filtering. The usual a.m. or phasing type s.s.b. rig would require a filter; the usual filter type s.s.b. rig would not. Figure 6 shows a filter designed specifically for SSTV use. Response is less than 1 db down at 2500 Hz, yet has an infinite rejection notch at 3600 Hz, the third harmonic of the sync burst frequency. (3600 Hz is the lowest frequency present if the subcarrier square-wave is symmetrical.)

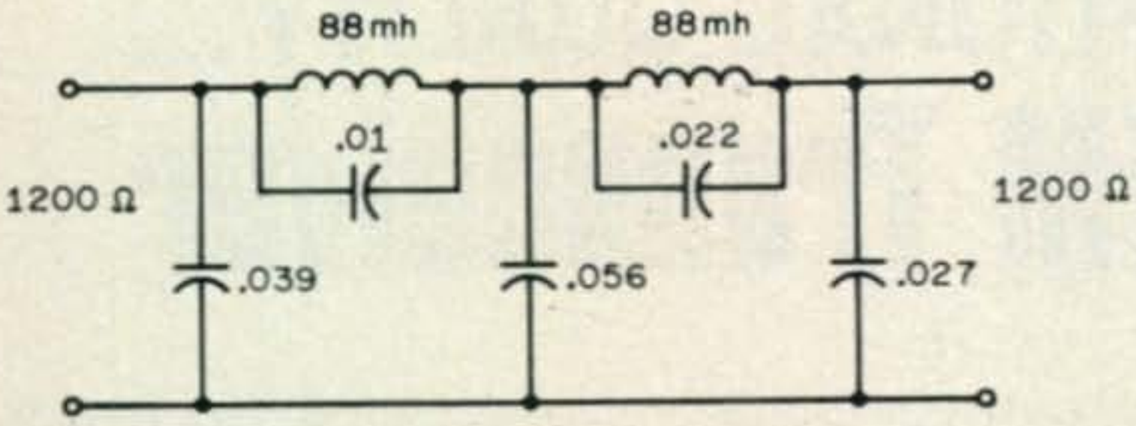

Fig. 6—Low-pass filters to eliminate subcarrier harmonics. The filter is less than 1 db down at 2500 Hz, greater than 30 db down above 3500 Hz. Capacitors are in mf.

73, Cop

Letters [*from page 7*]

is on the increase and has often caused loss of control, something which can be quite a catastrophy, especially in the case of model airplanes which have been caused to crash.

Besides the countless hours spent in building these models, the cost involved in these model planes ($300 to $500) makes interference a very serious problem.

Considering all the frequencies available to hams who operate for communication purposes (c.w., phone, RTTY, etc.) it seems reasonable to ask them to stay clear of the abovementioned frequencies.

Furthermore, since it is impossible to build fancy receivers in the very small space available, it would be appreciated if a reasonable guard band (say 6 kHz) could be respected.

Pierre J. Catala
Needham, MA

Dayton [*from page 56*]

Two-meter f.m. handy-talkies and pack-sets chattered away with mobile talk-in, rag-chewing and some very astute flea market bargain hunting by pairs of f.m.ers. Slow scan TV made a rousing show for itself with displays by Robot Research and J & R Electronics of new SSTV gear, while SSTV pioneer Don Miller, W9NTP carried off the "Ham of the Year" award presented by Dayton Mayor James McGee.

Complaints? Only two: Too long a wait for food; too long a wait for the Johns. But it's hard to imagine getting so many people together for a day and a half of fun without some small problems. It's well worth the trip. Try it, you'll like it. ■

Zero Bias [*from page 5*]

oughly refreshing writer with a masterful knowledge of his subject, but also with a broad view of amateur radio's and SSTV's potential role in the scheme of world life. We urge you to follow his writing each month in *CQ*.

World Radio

Speaking of amateur radio's role in the scheme of things, we cannot recall ever seeing a publication do a better job of putting amateur radio's worth into proper perspective than *World Radio*. If you haven't seen a copy of this tabloid-size newspaper, write to publisher Armond Noble, WB6AUH for a sample copy. After reading it, we'd be surprised if you didn't agree that a copy belongs on the desk of every legislator in the US each month, for no continuing publication tells our story to the layman better. It costs $5 per year and is well worth the money. ARRL could take a PR lesson from WB6AUH.

73, Dick, K2MGA

Announcements [*from page 10*]

McKeesport, Pa.

The Two Rivers Amateur Radio Club of McKeesport will conduct its eighth annual Hamfest on Sunday, July 16, 1972. It will be held at the Clairton Sportsmen's Club, Coal Valley Road, Clairton, Pennsylvania. About 600 people attended last years Hamfest. Numerous activities are planned. For more information contact Alan T. Toth, WA3HHC, 103 Ridge Ave., Apt. 1, Irwin, Pennsylvania 15642.

Barbados, W.I.

The Amateur Radio Society of Barbados will be having a station at the fourth Caribbean Scout Jamboree, which will be held in Barbados from July 27th to Aug. 8th. They will operate daily from 1800 GMT until 0200 GMT, and on Saturday & Sunday mornings from 1300 GMT until 1600 GMT. The call will be 8P6CSJ/4, representing Caribbean Scout Jamboree, and the fourth to be held in the West Indies. A special QSL will be supplied to stations working the Jamboree, on receipt of QSL cards with 2 IRCs to Box 814E, Barbados, West Indies.

Chicago, Illinois

The 15th Annual Hamfest of The Six Meter Club of Chicago Inc. will be held Sunday August 5, 1972 at the picnic grove on U.S. 45, 1 mile north of U.S. 30, 5 miles south of U.S 6, Frankfort, Illinois. Food and drinks will be.available. Swap and shop section privoded. Advance registration $1.50, admission at the gate $2.00. For tickets and further information, contact Al Bagdon K9YJQ, 7804 West 66th Place, Argo P.O., Illinois 60501. Talk-in frequencies will be on 50.40 mHz a.m. and 146.94 mHz f.m.

Sault Ste. Marie, Michigan

The Twin Sault Radio Club will be sponsoring the 1972 Michigan State Amateur Radio Convention on Aug. 5th and 6th. For complete details and schedules write to Tom Maskus, W8OLE, Twin Sault Radio Club, 2700 Minneapolis Street, Sault Ste. Marie, Michigan 49783.

Pittsburgh, Pa.

The 35th Annual Hamfest of the South Hills Brass Pounders & Modulators Amateur Radio Club will be held in Pittsburgh on August 6, 1972, in the pavilion at St. Clair Beach, Pittsburgh, Pennsylvania. For more information write to Frank T. Donahue, W3QNI, 227 Baldwin Road, Pittsburgh, Pa. 15207.

Flourtown, Pa.

The Mt. Airy VHF Radio Club (The Pack Rats) will hold their 17th annual Family Day and Picnic on Sunday August 13th (rain date August 20th) at the Fort Washington State Park, Flourtown, Penna. The Delaware Valley Chapter QCWA will again join with us. All hams and their families are cordially invited. Games and entertainment. Free prizes to the kiddies. Free Soda. Talk-in on 50.25 and 145.2 mHz. No reservations necessary. Two Dollars per family.

HAM SHOP

Advertising Rates: Non-commercial ads are 10 cents per word including abbreviations and addresses. Commercial and organization ads are 35 cents per word. Minimum charge $1.00. No ad (non-subscriber) will be printed unless accompanied by full remittance. Free to CQ subscribers (maximum 3 lines per month). Recent CQ mailing label must accompany ad.

Closing Date: The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publishers of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, New York 11050.**

Wanted: EI-key, Nikey or similar paddie. WA5EEM, Damon Ginbey, 1901 Alegria Rd., Austin, TX 78757. Phone 512/ 454—0752.

SB-101, cw filt, ac ps, gud condx. Cert check for $325. I ship. K1QGC, 20 Harvey Dr., North Granby CT 06060.

For sale: 2m converter (26-30mc if) $10. 200w HB 811 amp - $35. NRI 1st class commercial course - $20. 90w Laf xmtr (needs work) $25. VF-1 vfo - $10. Greco, 14 W. Garfield Av., Atlantic Highlands, NJ 07716

AR22 rotator indicator for sale, $12. Rolf Krogstad, WA0ZTU, 5705 Juniata St., Duluth, MN 55804

Sale - Trade: Temp 1, dc supply, near new - $300. Need! Drake TC-2, SC-2, SCC-1, CPS-1, CC-1. K6SDE, 20621 Canyon View Dr., Saratoga, CA

Trade: Your mint Heathkit SB-102 and ps for my mint Yaesu FTdx-560. Will consider straight sale Pritchard, R 6, Box 74C, Kinston, NC 28501. 919/ 523-5656

6m xceivers, all mint. Allied TR-106 - $70. Polycom 6 - $120. HA-460 - $85. K4LWZ, Rt 1, Box 179B, Edenton, NC 27932

Chess teams - The Penn State chess team challenges any team to a radio match. Contact W3LNW, 504 Waring Ave., State College, PA 16801

Club Sale: 75A2 - $100. DX-100 - $30. Tecraft 6m xmtr, conv, pwr - $50 complete. S-76 gud condx - $35. Eico 720 xmtr - $40. D-104 w/stand $15. SCR-522, rack mtr, pwr, Tecraft 2m conv, ant. rely $50 complete. Misc old tubes. Delivery free 30 miles or fob. Call WB2ZQV, 914/623-2518 or K2CIB 914/ 634-5263

Swap or sell National NCX5 w/ac & calibrator. Swap for 30L1 or SB-220. Sell $350. W0BL, 3915 Shenandoah, St. Louis, MO 63110.

DX-100 clean, all tubes, needs work. Best offer over $15 plus shipping. WN3SFF, 1020 Ethel Ave., Fairview Village, PA 19409

Want to buy anything and everything in Railroadiana - dishes, silverware, glassware, etc. Goodman, 5826 S. Western, Chicago, IL 60636

Wanted: LM freq mtr tuning capacitor w/complete dial assy in gud condx. Gagnon, 903 Cedar, Pocomoke City, MD 21851

Lafayette HA-460, 6m, 49,692/52,000khz. Local preferred. $75. W3FGE.

Wanted: 19" rack cabinet. 5 or 6ft. Tom, K8NGV, 26496 W. Six Mile, Detroit, MI 48240

Sale: Old Radio. Crosley 51.2 tube. bookplate capacitor. Circa 1924. Investment. Conversation piece. $35 postpaid. Worcester, R.D. 1, Frankfort, NY

Wanted: Fiberglass Quad Spreaders, Ham-M, SB-630 & HD-10, keyer. WA0GGU, Rt 1, Gilbert, MN

For sale: Candler high speed code course $10. WA-5KZE, 1108 Radam Cir., Austin, TX 78745

Sierra Z99 wattmeter, 120w direct calibrated to 600mhz cost $250 only $65. Hewlett-Packard automatic noise figure mtr w/all sources, reasonable. Trade VHF/UHF. List sase. W4API, Box 4095, Arlington, VA 22204.

MASTS: 9-1/2' X3" o.d. aluminum alloy, extremely strong & rigid; 20 lbs each $8.75 ea. Kleinschmidt teletypewriter (KSR) vy gd cond $49. Aircraft emergency horn, 28V@5.5A (loud!) $35. Model 14 reperf, vy gud cond $15. Unused: 4CX-250K, $38; 4CX300A $26; 4X150A $17; New 28LPR in original sealed carton $79; RCA4500 vidicon for SSTV, unused, (new: $480), $99. K3MNJ, 8361 Langdon St., Phila., PA 19152. (215) 725—2373.

HALLICRAFTERS SX-24 general coverage receiver modified w/product detector - $50 including matching speaker. W2AEF, CQ Magazine, 14 Vanderventer Av., Port Washington, NY 11050.

Model 28 TTY for sale. One KSR, one RO, one typing reperf, and one TD, excellent condition, all for $350. David Snow, 919 Southampton Rd., Westfield, MA 01085. (413) 568—7205.

SALE: BC-610H, 2 sets coils, no mods, excellent, 800 watts, AM-CW, 160 to 10, w/2 sets vfo's, asking $400, you pick up. Globe King 500A, CE20A, 3 vfo's, 500w, AM, CW, SSB, 160 to 10, asking $350, you pick up, with spare new final. Collins R-391 w/autotune as new with autotune working and CV591A SSB converter & blower in four foot grey cabinet w/mucho spare new tubes $825, firm. Hammarlund KW STN, HX50-A, excellent w/160m factory added, HXL-1, latest model, as new, 2000w PEP, $500 firm. 50 watt GE preprogress 144-174 MC FM xcvr, excellent, with mike, asking $85. All above FOB K8CCV.

GALAXY G35A DC power supply. Never used $60 Osterhaus, 390 Executive Dr., Wheaton, IL 60187.

BURGLAR ALARM decals. Protect your mobile gear. 2 x 3-1/2 yellow/green self adhesive vinyl as used by commercial burglar alarm company. Apply without water to windows, indoor or out. 8 indoor 4 outdoor to a set. Prepaid set of 12/$2, 24/$3, 48/$5. W0LFF, 733 West Benton St., Iowa City, Iowa 52240.

HEATHKITS: HW-101 with CW filter, HP23A, HG12A, HD-10, HN31, AM-102, HyGain 18 AVT/WB antenna - $350. Also, HW-16 and HG-10B - $90 or make offer for any or all. David H. Howe, 282 North Franklin St., Apt. C, Delaware, OH 43015.

For sale: Gonset G-76 xcvr, G-76 DC power supply, HB AC power supply. Shipped prepaid, insured upon receipt of a check for $165. Adelbert Winn, 306 East 4th St., Jamestown, NY 14701.

Sell: Heathkit HW-32A with AC power supply. Receiver troubles. $80. Write WA7LKY, 1617 W. Camelot, Layton, Utah 84041. (801) 773-1238.

VHF—UHF SSB STATION: 1000wts SSB on 432, 200, 144, 50 giving up everything; Drake line, equipment, antennas, much test gear, parts, tubes. Sase, WA1LNJ, D. Schier, 6 Tremont St., Cos Cob, CT 06807.

Drake RV-4, DC 4, AC 4 Swantenna Remote tuned like new. Ernie Baker, 1041 Lafayette Ct., Collinsville, IL 62234.

WESTON Model 489 meter 0-8 and 0-200 v.d.c. - $10. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

TOROIDS, Iron powder "E", O.D. 2.310 - $1.50 each or 3/$$.00. Please include 50 cents postage Fred Barken, 274 East Mt. Pleasant Ave., Livingston, New Jersey 07039.

SWAN 270 AC/DC with mike, excellent condition. $300. Ray Conway, W6WNA, 2012 North 6th St., Burbank, CA 91504.

SWAP Manufacturers Directories, Thomas Register 7 Volumes, each 1,600 pages, McRaes 4 Volumes. Conover-Nast. Need Hammarlund converters SP10 or H10. Kennedy, 791 Greenwich St., New York 10014.

DISCOUNTS! Standard, Sonar, Clegg, Robyn, Mosley, Cush Craft, others. Also Marine gear. Write stating needs. Arena Communications, Dept. C, 1169 N. Military Hwy., Norfolk, VA 23502.

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

Look for K8ZAS on Field Day, the New Delta Cty A.R. Society Club Sta. from Escanaba, MI. C U on the air.

MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO issues at 10 cents each (plus shipping) from Lockheed Ham Club, 2814 Empire, Burbank, CA 91504. Send list and check. Available issues and any refund due will be sent promptly.

EARLY VACATION? Then tear up that ticket to Tahiti. There'll be more fun at the ARRL Hudson Division Convention, October 21 - 22, Hilton Motor Inn, Tarrytown, NY. Exhibits, Lectures, 2-Meter FM, RTTY, Contests, Gabfests, New York Sightseeing, Fun! No charge for a suntan. Info: Dave Popkin, WA2CCF, 303 Tenafly Rd., Englewood, N.J. 07631

TECH MANUALS for Govt surplus gear, only $6.50 each: R-388/URR, R-390/URR, R-390A/URR, TS-497B/URR, R-274/FRR, R-220/URR, TT-63A/FGC, CV-591A/URR. Hundreds more in stock. Send 50 cents in coin (refundable) for 20-page list. W3IHD, 4905 Roanne Drive, Washington, DC 20021.

S.J.R.A. HAMFEST — Sunday, Sept. 10, 1972 at Molia Farm, Malaga, NJ. Expanded swap shop facilities this year. Write to W2KF for information.

KNIGHT R100A receiver w/S-meter, crystal calibrator and product detector as per CQ, July 1969-$65. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

SUPPORT ARHA — YOUR VOICE in Washington, the "other" national ham organization. Get expanded privileges for Technicians and Novice phone. Box 123, Syracuse, New York 13210.

TYPETRONICS needs your unused excess Teletype parts, Models 14 thru 37. Send description and asking price to TYPETRONICS, Box 8873, Ft. Lauderdale, FL 33310. W4NYF. Sase for list of supplies, gears, manuals, equipment for sale.

RECEIVER, National HRO-500 w/matching speaker. Two years old; guaranteed perfect condition. $900 firm. Real professional equipment. (805) 942-3531. James Hathorn, 44862 Lorimer, Lancaster, California 93534.

FOR SALE: Hallicrafters HT-37, mint condition - $200. Hallicrafters SX-111 - $145. Marine Electronics, 76 New York Ave., Halesite, L.I., N.Y. 11743. 516/427—7199.

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

EXCESS USED EQUIPMENT for sale. Signal generators, counters, voltmeters, communications receivers. Write for list: PIEZO TECHNOLOGY, Inc., P.O. Box 7877, Orlando, FL 32804.

Quick Sale — Collins station 75S-3B, 32S-3, 516F-2, 312B-4, Warrior, Johnson Matchbox, Drake High Patch, Drake Low pass filter, all cables, microphone, etc. Ideal station for summer or winter home. All mint condition. Make reasonable offer. Bill Barry, K9USE, 2205 Redding Rd., Muncie, Ind. 47304.

TOROIDS 88, 44, and 22 mhy. Can of five two ($2.00) dollars postpaid. M.L. Buchanan, Box 74, Soquel, CA 95073.

PANEL METERS & TEST EQUIPMENT. Sales, Service and Modification. Contact Henry Morrison, W5RIY, Electrical Instrument & Meter Co., 1602 Missouri, Houston, Texas 77006. (713) 526-6871.

WA1LDA ESTATE: Drake TR-4, remote vfo pwr sup. speaker - $600. New 20M Cushcraft monobander, never used - $65. Contact W1DQM (617) 256—3183.

MOVING, must sell Standard CUA64 free standing crankup Tower with winched hinged base, custom powered crankup winch, rotor shelf - $400. Cliff Dweller 40—75 - $60. SBE 34 - $80. Call (312) 835-1045 Jack Weiss, WA9TBZ, 341 W. Elm Ct., Glencoe, IL 60022.

SB-34, mike, mobile mount, vox - $230. Bill, 7126 Tamarack Dr., Dublin, CA 94566.

NEED: Data, manuals, schematics for: Weston selective analyser Model 665; Knight T-150A trans; Electronics Design vom Model 125AT. Evans, 803 Rosselle, Jacksonville, FL 32204.

WARREN, OHIO ARA's Family Hamfest, Aug. 20. Giant fleamart, swimming, picnicing, all free. Displays, mobile checkin. Camping available. Yankee Lake, Rt. 7, near I-80. Details QSL: W8VTD.

A5 MAGAZINE: The all new ATV publication covering all modes of ham TV. Subscription $2.50 per year. Bi-monthly. P.O. Box 6512-D, Philadelphia, Penna. 19138.

QSL's — Second to None. Same day service. Samples 25 cents. RAY, K7HLR, Box 331, Clearfield, Utah 84015.

SX-101 Mark III with MM2 RF analyzer - $150. Bill, 7126 Tamarack Dr., Dublin, CA 94566.

DAVCO DR-30 receiver - $225.00. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, New York 11050.

CHESS ANYONE? By mail, or radio, Interested? Sase to J.D. Andrews, 24 Cottage St., Melrose, MA 02176

THE NOVICE Magazine - a new publication for novices. DX, nets, construction proj., and more. $3/yr (10 issues). 40 cents/copy. 1240-21st St., Hermosa Beach, CA 90254.

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 was $35 each, will sell $15 each. Marine Electronics, 76 new York Ave. Halesite, L.I., New York 11743. 516/427—7199.

ATTENTION NYC HAMS: Put your know-how of communications to work to help prevent and stop crime in your neighborhood. JOIN THE NYC AUXILIARY POLICE. For info write: WB2FJO, A. Schur, P.O. Box 238, Ryder Stat., Brooklyn, N.Y. 11234.

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

Join QRP ARC Int.: Send sase for info. Corresponding Secy, Earl R. Lawler, W5JLY, Rt. 2, Box 24K, Burnet, TX 78611.

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

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 Ave., Phoenix, AZ 85011.

IMPROVE RECEIVER sensitivity and selectivity with solid state F-100 Preselector. Free brochure. Waban Labs., Box 17, So. Sudbury, MA 01776.

FET VOMS. CD — Ignition Systems. Nationally advertised. Discount prices. Rodgers & Son, Box 3583, Anaheim, CA 92803.

Hallicrafters SX101A - $200, HT37 xmtr - $175. Both $350. McGrath, WA1NDV, 29 Moran Hgts., Fitchburg, MA 01420

For sale: Swan 260 Cygnet like new $265. WB6-VNR (213) 346—5871

Trade: Mint SR160 w/ac and dc supplies plus cash for a late 75S3B. Jim Fleming, 7528 W. Bryn Mawr, Chicago, IL 60631

For sale: GT550, AC ps, vox, cw filter, 25kc, SC-550, original cartons, $350 or best offer. W6MQF, 1450 E. Gardenia, Camarillo, CA 93010

Brasspounders: The Society of Wireless Pioneers now has over 1000 members. If you ever earned your living brasspounding, why not join. $5 per yr. Write P.O. Box 530, Santa Rosa, CA 92651.

Want: manual, schematics, or xtals for Kaar FM-177X xmtr or FM47X rcvr. Tom Adams, WA5QZM 9707 Hansford, Austin, TX 78753.

6M xcvr, TR-106, VFO, beam, stipline filter, 10W, AM. Offer/swap. 8302 Rathburn, Northridge, CA.

Need: Data on Knight TRT-150A, Weston 665 selective analyzer. G. Evans, 803 Rosselle St., Jacksonville, FL 32204

WANTED: Heath SB-640 LMO in good condition at reasonable price. Joseph Albina, FG7XM, 38 Vieux Bourg, Abymes, Guadaloupe, FWI.

New Motorola alternator, 10B and 458 vfo, Meissner sig shifter, Halli 27-143mc recv, other. Sase. Want Gami, Sony conv. U ship. W6NOB.

Galaxy V Mk2, ac/dc supplies, spkr, console, calibrator, excel - $375. W6IWR, 12080 Country Sq. Lane, Saratoga, CA 95070.

Wanted: Heathkit Twoers w/dc supplies. State firm price & condx. U ship. WN2BSB/8, Pete O'Dell, 704 Kaiser, Ravenswood, WV 26164.

Would like to meet VTI or Old Dodge Institute Grads on SSTV. W3MSN. Class of '32.

Wanted: xtal blanks for 80/40 cw bands. FT-243 type holders plus plates & hardware. No lot too lge. State price first letter. W6DOR, 4100 Worthington Dr., North Highlands, CA 95660.

Sonar BR-20, 18w, 11m, am business transceiver, covers 25-50mc - $230 new — sell $75 pp. Hoffman 57 Grandview Ave., White Plains, NY 10605.

Buy, trade, swap: ARRL handbooks in good condition. Your list for mine. Sase. Carl Horton, 3753 Kanawha St. N.W., Washington, DC 20015.

Wanted: Drake 2-C recv. Sell HB 6m xmtr. 100w, 829B w/807 Mod./PS. Bud rack meters $75. K8YNO, 5632 Haughey, Grand Rapids, MI 49508.

Books - Edelman, Experimental Wireless Stations. Bucher - Wireless Experimenters Manual. Henney - Radio Engineering Hdbk., Third Edition. Sase for info. K0JHW, 7061 Idlewild Ave., Jennings, MO.

Wanted: any info on Kahn Model RSSB-59-1A ssb recv. Bob Mahrenholz, K4QQK, 307 Old Fort, Tullahoma, TN 37388

Worked South America Certificate: Work all 13 countries. Send list and $1. HC1TH, 4805 Willowbend Blvd., Houston, TX 77035

Trade: 2m MA/E33 Progress line transceiver (accessories & schematic) for Heath HD-10 keyer. VE5RA 2420 Eastview, Saskatoon, Sask., Canada.

Need 10-12 foot alum rods for 2 el quad & 3 or 4 ft fiberglas rods. HV 80 for system. Also need AR-22 rotor or comparable. WB6MDP, 6510 Surfside Wy, Sacramento, CA 95831

Wanted: Epsilon record ER1003. Life of Nikola Telsa in morse code. Will pay $2 and postage. Ron, VE3CKU, 139 Floradale, Cooksville, Ont.

Sell or swap: Honeywell Brown temperature recorder, 0-300C, -1 to 10 MV. Beckman 7170 EPUT mtr w/1452 printing recorder and 7570-73 amp & plugins 0-1000 mhz. Mod 15 TTY. W9IJ 317/453-5130

For sale: Old Radio, QST, CQ & 73 mags. What need? Price 35 cents each includes postage. Corey, K1JAR, 238 Jenness St., Lynn, MA 01904

Jack Smyser, W6BPO for some 40 odd years and then 9V1QA of Singapore for the last 2 years is now located in Scottsdale, AZ signing W7WN

Ohio Valley Net needs members & checkins. Contact WA8ZNC, R.F.D. 1, Box 137, Bridgeport, OH 43912 or WN8ITV, R.F.D. 1, Box 220-A, Bridgeport OH 43912

Vacuum variable: 20-1000 PF, 7.5kv $40. Oil capacitor: 175 mfd at 6kv - $60. Swan 500 & 117XC - $350. Marty, WB6NWW (213) 597-2631

Wanted: quartz xtal blanks and plates in 7-7.150 & 8-8.150 khz ranges, for FT-243 type holders or mounted in same. Quote price first letter. W6DOR, 4100 Worthington, N. Highlands, CA 95660.

For sale or trade: one complete multi Eimac rig AF68 transmitter, PMR8 recv, M1070 PS, top condition. Robt. True, 208 Main, Madison, AL 35758.

70ft alum tower, 11sq/ft wind load, $300. Details, Terry R. Appleton, W4GSM, Box 1383, Newport News, VA 23601.

Heath: HW-32A, HP-23A, HP-13 - $195. Eico 717 keyer - $40. All postpaid. F. Beyer, 15426 Comstock, Grand Haven, MI 49417.

Swan 350 w/ac&dc pwr supplies, vox & cw sidetone. Best offer over $350. Also TR44 rotator - $35. Will sell mobile dc supply or vox separately. Vince, WA2RSX (212) 892-0339 weekday eves after 6:30

Sell complete Gonset Communicator III station including 6/2 vfo, linear amp, all accessories, mint. K2YAL, 95 Grove St., Lynbrook, NY 11563.

23 Novice code & theory 78 rpm records $10. J.H. Slusser, K6GD, 247 Orange Blossom Ave., La Puente, CA 91746. (213) 336—2242.

Need 10m cw sked w/Ariz, Del, GA, Ida, LA, Miss, Mont, Nev, ND, Okla, Ore, RI, SD, Utah, Wash, WV, Wyo. K5MHG/6, 419 Westbourne, L.A., CA 90048

Wanted: Vibroplex & carrying case - any model, gud to excel condx. Price first letter. WB6LZX, S. El Monte, Los Altos, CA 94022.

Trade FT-101 for Galaxy GT-550 and accessories. Trade SB-620 for compact 2m transceiver. WB4RSK, 8 Purser Pl., Yonkers, NY 10705.

Wanted: OLD electricity, ardio, telegraph, boy's experimenter books, etc. All replies answered. James M. Gunn, Ossipee, NH 03864.

FTDX560, mike, spkr, cw filter, spare finals, in warranty $500. Want HA-20. (914) 769-9331.

Sell: 6v dc/120v ac rotary converter. 80w continuous. Make offer. W8VVD, Box 452, Birmingham, MI 48012

Sell: Heath HR-10 built by pro elect tech. Used very little - $50 or best offer. Edmonds, R6, Iowa City, IA 52240. (319) 351—1517.

CQ BOOK SHOP

Ham's Interpreter

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

CQ Binders

Convenient and economical are the words for CQ's beautiful maroon and gold binders. Individual issues can be removed quickly and easily without damage to the magazine. Save precious time as reference copies are within immediate reach in this handy binder. $5.00

The New RTTY Handbook

A treasury of vital and "hard-to-get" information, this book is loaded with valuable equipment schematics, adjustment procedures, etc. A boon to beginner and pro. A special section on getting started, written by Byron Kretzman, W2JTP, a well-known authority in the field. $3.95

Surplus Schematics

Ken Grayson has loaded this book with schematics for currently popular pieces of conversion gear, making it invaluable to amateurs as a guide to surplus gear. $2.50

Antenna Roundup I

Edited by Art Seidman, a 160 page mass of antenna information directed at answering a multitude of questions surrounding the mysterious antenna. $3.00

Antenna Roundup II

Ten big theory articles backed up by 82 detailed and illustrated construction projects from VLF to microwave, long wires to 17 element beams and Sterba Curtain arrays. $4.00

Shop & Shack Shortcuts

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For sale: TED3 xmtr 225-440 mc 115-220v, A2-A3 operates? Looks FB. $50 - U ship. WB4PTK, Rt 1, Box 244, Troutville, VA 24175.

Wanted: RF signal generator, must cover to 148 mc W3MSN, 5108 Boulder Dr., Oxon Hill, MD 20021.

Mint 1971 DX callbook - $4. Late '70 USA callbook - $4. W2JBL, 123 Davis Ave., Hackensack, NJ

Very interested in buying tube converter 432 mc/s centimeg, Parks, etc. Must be in good condx. T12MQ, M. Quintana, P.O. Box 7-3370 San Jose, Costa Rica

Wanted: 3CX1500A7 transmitting tube. A. Emerald 8956 Swallow Ave., Fountain Valley, CA 92708.

Collins rack mounted 51S-1 recv in brand new condition - $600. Pick up only. Callan, 65 Beechcroft, Brighton, MA 02135

Swan 270, mint, 80-10m xceiver. Built-in dual ac-dc PS $295. MN4 - $60. Both $350. Vaughn, WB4-BZE, Ramseur, NC 27316

Mechanical filters: 455khz, 300hz - $22.95. 2.1khz $18.95. J. Fredricks, 314 S. 13th Ave., Yakima, WA 98902

Sell: SS1R recv, matching spkr, SS1SNS gud condx orig fact cartons $350. Cert chk or MO. James Maxwell, 1233 Leawood St., Memphis, TN 38122.

GE 100/w FM base on 146.94 mc perfect - $110. Wanted: GE/Motorola 150 mc message mate rec, army 45 auto. K6KZT, 4434 Josie Av., Lakewood, CA 90713.

Heath SB-300, SB-600, like new - $185. SX71 rcvr $75. Ampex tape rec. Wyman 4453 Via Pinzon, Palos Verdes Est., CA 90274.

Wanted: 50' alum or steel tower. Local only. Colbert, WA8MLV, 1008 Englewood Dr., Parma, OH.

Sell/swap: 2m TX vfo or xtal - $20. 1.2kw variac new in cabinet $55. Talk-a-phone two units $20. Knight 18w hifi amp xclt $20. HW-20 pawnee xcvr excellent $100. Kramer, 5631 S. Oak Park Ave., Chicago, IL 60638.

Surplus components: resistors, capacitors, tubes, meters, coax fittings, hardware. List large sase. Ken Maas, W9AZA, Burlington, WI 53105.

4000WVDC 3mfd Oil Electrolytics - $4; 1000-WVDC 10mfd & 4mfd - $2.50; new 365pf/section 3 sec. variables - $3.75. Weiss, 117 Central F10, Acton, MA 01720.

Typewriter all caps (Mill), Remington early model operates good - $15. W3FGE.

Hallicrafters S-40 (.550-45mc), tubes, oldies but goodies, RF generator (.160-120mc), misc. Send sase to WN8KLO, 9759 Windcrest Dr., Cincinnati, OH 45231

For sale: RTTY, model 15 KSR, sync. motor & ST-5 terminal unit - $125. Both units fine condx. WA2-RKU, W.H. Moody, R1, Sanborn, NY 14132

QSL Manager service offered to DX stations. Write for details to W2KF, 309 Cherry Hill Blvd., Cherry Hill, NJ 08034

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Wilcox 99C in good operational condx. The best RTTY transmitter available for $1200. Will trade for SSB 200v, etc. You pay shipping. W5WPA, Larry Doyle, Roswell, New Mexico 88201

CX-7: Signal-One, must sacrifice - absolutely perfect condx. Plus Drake L4B, Heathkit SB-610 and HM-15 w/all connecting cables, etc. Call W2EXS, (212) 242—6712

LM-21 freq mtr calibration book, no ac power sup- Trade for Twoer or $25. You ship. Robert Clark, 1644 Reece Rd., Salem, VA 24153.

UR choice: $2.50 ea. Unused panel mtrs, 0-5 RF amps w/thermocouple (Triplett) 2-1/2", 0-200 microamps Weston 301, add shipping. Stamp for list. Samkofsky, 4803 Brenda, Orlando, FL

Wanted: Early vacuum tubes pre-1920 need not be working. Also early Eimac & Taylor tubes. W9LGH, 610 Monroe Ave., River Forest, IL 60305.

For sale: Johnson Viking mobilier trans 75-10m (kit) $50. Philmore CC-1 10 & 11m converter $15. Techcraft Falcom 27mc, 110vac & 12v operation, 5 xtals $50. All fob Wendel, 160-20 Grand Central Pkwy, Jamaica, NY 11432

Need old battery-operated radios & tubes of early 1920 and mercury arc rectifier 3,000v. W9LGH, 610 Monroe Av., River Forest, IL 60305

TA-401C, 220 transmitter conversion sheets. $10 U ship. Robert Clark, 1644 Reece Rd., Salem, VA

6m transceiver, Halli model SR-46A w/built-in 115/12v supplies & HA-26 vfo (cover 2&6 mtrs), including mobile mounting bracket. Clean & FB operating condx - $125. K3TML, 27 Sheldon St., Wilkes Barre, PA 18703

Lafayette Beat-Bander external BFO in Gud cond. Wanted: CQ & QST binders $2 each & postage. Ron VE3CKU, 139 Floradale, Cooksville, Ontario.

For sale: ART 13, 2000 to 18.100kc - $35 w/PS cables, complete $100. WB4PTK, Rt 1, Box 244, Troutville, VA 24175

Go mobile 40. HW22A, HP13, mike, speaker, complete Hustler $200. Cash & carry. Bob, W3EHS, 12 Spring Hollow, Radnor, PA 19087

Wanted: Crystal holders & xtals, Bliley & other large round types or large vertical type w/adjusting screw. W7JI, 235 E. 15th St., Tempe, AZ 85181.

Sell Eicor Dy-motor new 5.5V in, 600V - 175MA out - $8. 3JP1 tube & socket - $3. Fob K5RME, P.O. Box 74, Ingram, TX 78025

30 amp filament chokes for grounded grid linears. Perfect for pair 4-400A's, 813's, etc. New, like in ARRL hdbk. $5 ea or two for $9.50 Postpaid. Murrell, K4HHA, 712C Rich Rd., Newport, Tenn.

Buy or swap for Signal-One, KWM2, Drake, Heath, or Yaesu. W0BNF, Box 105, Kearney, NB 68847.

Must sell: Eico 720 xmtr, 730 mod, 460 scope. HQ129 recv, Knight V44 vfo, & two 4CX300A, 4CX250B eimac, plus more. Need cash. WA2VQW, Mike Mardit, 10 Maple St., Brooklyn, NY 11225.

For sale: complete set of Popular Electronics from Jan 1960. Best offer. Sase. W1IVW.

Sell or trade: 4-1000 amplifier, BC221T, TV test eqpt., Sam's folders 1-700. L. Basham, Cave Junction, OR 97523.

Need manual for Heathkit SB300. Rob Harrington, 3181 South York St., Englewood, CO 80110

Underwood standard typewriter, gray w/green keys. Types perfect w/small 20 x 36 typing desk. Typewriter - $45. Desk - $5. Fob W2MLO, 410 Scranton Ave., Lynbrook, NY 11563

For sale: RCA test equipment for TV. WR39C, WR59C, W056A, etc. Sase for details. Wilbur Dearing, 615 Willow St., Bonham, TX 75418

Wanted: schematic & alignment instructions on Racal HF Rx RA6217A & Panoramic scope RA6366A Buy or copy. Blocksome, 1930 Kui Place, Honolulu, Hawaii 96819

Wanted: E.H. Scott Philharmonic catalogs. Radio magazines prior to 1940. Measurements model 65B or model 80. R. McNeill, Box 472, Yorkton, Sask., Canada.

Sell two model 28 teletype machines, KSR on console, one table type, both w/stunt box - $375 each. W4AIS, 300 Thornwood, Taylors, SC 29687

Wanted: books or phamplets relative to Powell Crosley, Jr., early Crosley radios and WLW Radio. W7KE, 1109 S. 2nd, Hamilton, MT 59840

LM-13 freq mtr, 110v, cal bk - $39. Simpson mod 35 TV ant compass - $5. Vib reed 60H freq mtr - $5 2612 Crestview Dr., Newport Bch., CA 92660.

Sell 100ft extra heavy duty guyed type steel tower in five 20ft approx. 315 lbs sections. $100 U pick up. W5GO, 170 W. Caldwood, Beaumont, TX 77707

Drake 2B, 2BQ, 2AC - $180 firm. Prefer U pick up or ship your expense. R. Vann, 105 Hessian Hill, Pennington, NJ 08534

BC-221 freq mtr to 20mc w/manual & PS. Excel condx - $60pp. WA2FFZ, 335 Blvd., Pitman, NJ.

For sale: Lafayette HE-30 receiver - $35 plus ship. James Wood, 463 Torner Rd., Balto, MD 21221.

HT-37 excel condx $150. R. Timmons, WB2VEG, 241 Lincoln Av., Hillsdale, NJ. (201) 664-2833.

Wanted: SB-610, dial telephone, SBE-33, SBE-34. Harry Burhans, W3HUS, RD 1, Box 103, Malvern, PA. 19355. (215) 827-7374

Swap 200w Eico 753 ssb transcvr w/ps for HW-16. See back pgs ARRL License Manual. Box 1303, W. Palm Beach, FL 33402

Mint S-line 32S-3, new in January, 516F-2, 75S3-B w/200 & 500 cyc filters, 30L-1 linear - $1,550. WA3HMQ, 301 Blacksmith Rd., Campbill, PA

For sale or will trade for RTTY gear: Heath Mohawk receiver. Make offer. W7INR/6, 360 Sharry Ln., Santa Maria, CA 93454

Secore test eqpt, new in orig box, GC-159 - $125. GC-161 - $100. MU-150 - $200. R.A. Coburn, RFD 2, Tinkham Ln., Londonderry, NH 03053.

Sell: Plate transformer 3600-0-3600 at 1 amp $25. 1.7 amp $40. With 120/240v primary. Paul Bittner, W0AIH, 814 4th St. S., Virginia, MN 55792

Sell: SBE-34 perfect with xtal cal, manual, mobile mount, mike - $250. B. Green, 51 Elmira St., Hicksville, NY 11801

Wanted: Swan transceiver in gud condx, less PS at low price. Ralph Dorough, W5DPN, 117 Pecan St., Terrell, TX 75160

Sell or trade: AC line voltage regulator 115v-1kva & Variac 115v-230v, 9 amp-2kva. A. Emerald, 8956 Swallow Av., Fountain Valley, CA 92708

New FM 2m net forming. Meets at 0000 AM,GMT Saturday. NCS is WB8FRQ. Meets on 146.94-146.94 More info write WB8FRQ.

For sale or trade: 3" refractor telescope w/accessories, TV test eqpt, sase. WA8CKT, J. Wagner, 950 Sue Dr., Caro, MI 48723

HP-400B Acvtvm - $25. Gen Radio 605B, .1-30mhz Sig Gen - $100. Sweep gen - Send for list. K.A. Schwieker, 1124 Opelika Rd., Auburn, AL 36830.

Wanted: Double button carbon mike, mounting ring, transformer. W7JI, 235 E. 15th St., Tempe, AZ 85281

For sale: Collins 516E-1, 12v dc supply for KWM-2 $65. W7LJZ, Box 323, Lyle, WN 98635

Like new Swan Cygnet 270B & Shure 404C PTT mike. $350. Prefer local. W3TSV, 133 Wilson Ave., Lot 5, Cheswick, PA 15024

Bargain: cartoned Weston 4-1/2"sq (latest type), 100-0-100 micro-amp panel mtr - $4.50, pair unused 4X150A - $10 & pp. Samkofsky, 4803 Brenda (Dover Est.), Orlando, FL 32807

Tube 813 new - $8. Pullout - $4. 10v transformers - $4.25. 1200v or 1400v CT, 260MA - $12. Lakeshore Phasemaster - $45. W5SYB, 5000 Hall, Amarillo, TX 79109

Wanted: Heath SB-640 VFO-LMO; for sale: Central Electronics 200v - $300. Pickup preferred on both. K3MGO, 12 Larchwood Rd., Wyomissing, PA 19610. 215/ 374—9342

Collins 75A4 excel, all fact modifications. Vernier knob, 3.1-6.0 filters. B&W 360 bandpass filter. Recently overhauled & aligned. $400 or swap toward top grade transceiver. Joe Rotunno. WA2CKM, 1816 Parkview Ave., Bronx, NY 10461

For sale: Westinghouse 3kw RF output, cb modulated AM transmitter Mod-MW-2, 2-30mc. New 10-hours test time. 11 vacuum capacitors. Details sase-$500. Northern Radio FS keyer, PS - $50. RFOsc, with 100kc xtal checker vfo - $75. Plant, W6DKZ, 4160 Holly Dr., San Jose, CA 95127

Mechanical filters: 455khz. 2.1khz, $18.95. 300hz $22.95. J.A. Fredricks, 314 South 13th Ave., Yakima, WA 98902

Cameras Anniv. Graphic 4X5 w/Graphic Optar 135 mm F4.7 Rangefinder & 5 holders & flashgun - $175 Tele-Rolleiflex w/Rollei Penta Prism Hood - $295. W6RW, 8600 Skyline Dr., L.A., CA 90046.

Mint SX146 w/all accessories - $155 or trade on 5-band xcvr and ac PS. WA2LBE, Box 215, Ironia, NJ 07845.

QSL Manager service available for DX stations. Write for details to W2KF, 309 Cherry Hill Blvd., Cherry Hill, NJ 08034

Wanted: Tower from area. Clay Leister, 118 North Washington St., Boyertown, PA 19512

Sell: Hallicrafters SR-46A 6m transceiver w/HA-26 6m & 2m vfo - $110. Also Heath SB-220 cabinet, $12. Heath SB-610 cabinet - $5. Collins 75S3B cabinet - $20. K3TML, 27 Sheldon St., Wilkes Barre, PA 18702

Collins owners: xtals for novice adapter, 2540, 2585, 2590, 2625, 2675, 2738 khz. $2 each pp. K1VTM

Scarce, unbuilt plastic model car kits. Send for list and prices. W2JBL, 123 Davis Ave., Hackensack, NJ 07601

SB220 linear/super condx $349. Fob Dallas. W5RKT, 901A Spring Valley Plaza, Richardson, TX.

Sell: xvtr, ps, antenna, mikes, parts, etc. Send sase for current list. K5ZUV, Box 7502, Miami, FL

Sell or trade: Variac, 110/220v at 56 amps, excel condx $50. Pickup only. Stan, W8QKU, 2748 Meade St., Detroit, MI 48212

Collectors: 73 Magazines, all issues, from first to present. Mint, in binders. Cash or trade. WA6HYB.

Wanted: to buy or borrow. Schematic & operation instructions for Knight-Kit Signal tracer. G. Kluwe, 1810 26th St., N.E., Hickory, NC 28601

Sell: Hy-Gain DB10-15 meter antenna - $50. Swan 500 transceiver, 117XC PS, 410 external vfo - $500 Johnson Thunderbolt KW linear amp - $250. Have manuals. Pick up only. Heckman, W1AA, 45 Andrew Ave., Hull, MA 02045

Need manual Viking I and vfo, Knight T-60. Sell HW16, HW32A exc cond. Best offer over $100. WB4RVD, 6530 Copa Ct., Falls Church, VA 22044

For sale: SB-301 recv w/400 hz cw filter. Excel condx. $230 or trade towards R4-B. K8QXB, RD1, Box 266, Doylestown, OH 44230

Drake TR-6, all accessories, Swan TV2-B, 50mc IF, Swap. Jim, W1VYB, 53 Lothrop St., Beverly, MA.

CQ AUF Deutsch: Anyone interested in a German-speaking net, meet me on 21.340mc Sundays at 11:00 AM, PST. WB6CWW.

DX100B, SB10, Heath Twoer, Hy-gain 2m Long John, SX71, all w/manuals. Name price. WB6OWQ, 326 Sherwood Ct., Modesto, CA 95350

Want: Small digital electronic calculator. Will swap Motorola monitor (Hi-band T-1131A or Lo-band). Excellent condx, has built-in WWV calibration recv. Thomsen, W9YVP, 8280 S. Tennessee, Claredon Hills, IL 60514

Wanted: Drake 2-C recv in top condx. Give best cash price & condx. K3YMN, 2185 Sampson St., Pittsburg, PA 15235

Two Bird coaxwitches. Models 74 and 72-2. Make offer or trade for RG17 coax or what have you. Briggs, W3MSN, 5108 Boulder, Oxon Hill, MD.

Wanted: AN/PRC-41 uhf radio set w/ or w/o bat. case & accessories. Ed Alves, 275 S. Marengo Ave 30 Pasadena, CA 91106.

BC-342 rcvr 1.5-18mhz w/manual & matching LS-3 spkr. AC pwr $85. Silbert, White Sulphur Springs, New York 12787

Novice rig: Allied JR-500S (A-2516) recv/spkr & Eico 723 transmitter. Both in gud condx. Best offer over $70. WN2PMU, 19 Cora Ln., Chester, NJ 07930

Motorola CC3012 25w base station aligned for 147mc - $70. NB or WB filter $3. Motorola 4366 test panel $25. etc. W3AFM.

Oil capacitor: 175 MFD. 6kv. 150 lbs. 22"h x 13" w x 6"d. Westinghouse - $60. Marty, WB6NWW, 213/597—2631

Sell: BC-348-J. Int. 115v PV - $45. Want pre-1925 radios, components, early telegraph eqpt. Spence, 10 S. 771 Clarendon Hills - Apt 201, Hinsdale, IL

For sale or trade: 3 Mite teletype machines, 2 TT-298B/UG and 1 AN/UGC-41 w/complete manual 2 inches thick. Make offer for all. Ed Baker, 1575 Lark St., Hanford, CA 93230

SSTV Robot camera 25123, Robot monitor 29138 25mm fl.9, 25mm fl.4 Macro lens complete - $850. SB620 Hamscan - $100. W3AVJ (717) 286-1151

Trade: Watch Master electronic watch timer for gud transceiver. Kaufman, 3734 S. poplar St., Denver, CO 80237

Wanted: Meter for my DX-100. State price wanted. Raciocot, W1ABW, Bartlett Voc. Hg. School, Box 38, Webster, MA 01570

Will buy, if suited to my experimental needs, your inoperative ham and SWL gear. State condx, price. Erickson, 13 Robt. Cir., S. Amboy, NJ 08879.

Wanted: Ham-band xtals, light weight tower, 813s. Hoffer, W1DL, 24 Cherry Rd., Framingham, MA.

Wanted: SX-100, SX-96, SX-62, HQ-145, Ranger, Valiant, or similar recv and transmitter. Bradley, 61 Glen Park Rd., East Orange, NJ 07017

Hallicrafters S-85 recv, built-in s-meter, manual, excel condx - $45. K2AHZ, 5 Shasta Pass, Fanwood NJ 07023. (201) 889-5520.

Heath IG-57A, wired - $150. Heath IT-18, wired - $22. Want Hi-Lo scanner rcvr. Harold Dalton, Box 641, Easley, SC 29640.

For sale: Drake TR-6 all accessories, $650. Will take gear in trade. Also Swan TY2-B, 50mc if - $225 or swap. Jim Gysan, W1VYB, 53 Lothrop St., Beverly, MA 01915.

4 mfd capacitor unit, 32-1/8 mfd switch steps $8 pp Drake phone patch $25 pp. W9DI, 22 S. Clay St., Hinsdale, IL 60521

Doctors directory listing over 1500 MD, DSS, DVM, & DO who are hams. Published by IARS Doctors Chapter & available for $2 from Dr. Wm. Fulcher, 105 Freshrun Dr., Hendersonville, TN 37075.

Help: Need RF module PC board, part no. U060-104 for Allied Mod A-2515 recv. Any condx. W8CRR, 179 Carol Ave., Grove City, OH 43123

Collins 75S3B, 32S3, 516F2, 312B4, 3021, brand new - $1,825. W2MPP, 8 Winding Way, Denville, NJ 07834

Interested in finding French teachers, students or French speaking hams willing to speak French on ham bands w/high school students. K7SPH, Box 4099, Tucson, AZ 85717

For sale: Heath HW-16, excellent condx, spare final, xtals $85. Barry Kutner, 741 Plain Rd., Westbury, NY 11590

New Ham Radio Club needs good rcvr, CW and ssb xmtr, keyer & key plus any station equip. Long on need, short on cash. W7HZD, 1106 N. 15th Coeur d'Alene, Idaho. Donations appreciated.

Attn Co. Hunters! Do U need Noble Co. Ind? Looking for skeds on 40 - 80 - 15 mtrs. WN9GCU, Bob, RFD 2, Avilla, IN 46710

BC375, like new $35. ARC-1, 2m $35. All good condx. Fob Hempkins, 100 E. Main, Denison, TX.

Canadians: equipment repair & alignment, fully equipped lic'd technician, kits wired, serviced, Fransen, VE6RF, 227 Cottonwood, Sherwood Pk., Alberta, Canada.

Must clean shack, overcrowded w/VHF/UHF, test gear, TV, FM, amplifiers, etc. List, large sase. W4API Box 4095, Arlington, VA 22204

Immaculate Collins S line, less than 1 yr old. 75S3B w/800 &200 cyc filters $500. 32S3 w/516F2 - $550 312B4 - $120. Lots more. G. Woodhouse, 15 Tanners Lane, Levittown, NY. 516/731-6662.

Sell: GE & MA33, Motorola T43GGV, Mot. T43G, 2m - $50 each. WA7HJR, 4819 S. Fife St., Tacoma, WA 98409

GE line voltage stablizers - 1.5KVA, 60 cps, 185 to 220 in - 195 vac out. Have 3 at $89 each or best offer. J. Schrenk, 2707 McDivitt Rd., Madison, WI.

Hammarlund BC-779 rec w/sep supp $50. Free-tower Rohn galv. w/ant. Must take down self. WA2EBS 516/221-2404

Transformers Rewound: Jess Price, W4CLJ, 507 Raehn St., Orlando, FL 32806

Mint SB500 2m xvrtr, 10m if and homebrew HV supply - $110. Homebrew unfinished ssb rig w/ Mccoy filter & Heath lmo. Make offer. Norm Dick, WB2EHB, 3119 Bailey, Bronx, NY 10463.

K1IGF Rpt Groton Conn going 146.07/146.67, April 1. 146.19 xtals, Sentry Comm grade for sale. Also various rigs. K1IGF East Lyme Conn.

Sell Triumph model 841 oscilloscope in perfect electrical & mech condx. $40 ppd. WA3LPK, 2300 Louise Ave., Balto., MD 21214

Wanted: Swan 270B Cygnet for cash, or will trade Swan 117C PS and cash for Swan 412 DC supply. W6BIL, 805 Lincoln, Redding, CA 96001

Cleaning shack - Sell extra electronic parts at give-a-Way prices. W2EZM, Box 323, Maple Shade, NJ 08052

Wanted: Lafayette, HA410 transceiver - state condition and price. John Maver, W6MQK, 1049 N. Holliston Ave., Pasadena, CA 91104

For sale: PC boards, all different, with scads of transistors, resistors, capacitors, etc. on each one. $1 each or 6 for $5 postpaid. Sly, 217 Santa Mariana, La Puente, CA 91746

Back issues: CQ - 55, 56, 58 - 66. QST - 55-60. $8 per year postpaid. James R. Treble, K2GSM.

Heath IM-36 laboratory transistor tester. Will swap for Heath HW-16 or other cw transceiver. Dave Buda, WA2RYC, 25 Meacham St., Belleville, NJ

Attn: Antique radio collectors, send sase (long) and 10 cents for sample copy of Antique Radio Topics. James Fred, R 1, Cutler, IN 46920.

Squires Sanders recv SS1 R, noise silencer & spkr- $375. Jerry Swank, Washington, OH 43160.

Blonder Tongue UHF TV amplifier like new - $15. Also B&K 1076 TV analyzer - $200, TV shop eqpt and stock, Fob L. Basham, Cave Jct., OR 97523.

For sale: KWM2-A, 136B-2, 516F-2 - $950. NCX-500, a.c.p.s. - $300. 75A4 No. 5294, 0.5, 3.1, 6.0, spkr - $450. Craig, 29 Sherburne Ave., Portsmouth, NH 03801.

500 watts from your Swan 240. Replace your finals with these new 8236 tubes. $10 ea. W0FGB/6, 4453 Via Pinzon, P.V.E., CA 90274.

Going 160M? Have Globe King 500A w/2 new 4-250A tubes $95. Also TG-34A code prac set w/tape and manual $15. W1KGH, 10 Herold Rd., Peabody, MA 01960.

Drake 2-C & 2-CQ in perf condx. Used for USA-CA, WAS, WAC, WPNX, etc. $230 shipped. WN4-UCC, 96 Hallmark, Athens, GA 30601.

For sale: Ameco converters. CN-144 (2m), CN-50 (6m), and CB-2 (2m) with PS. All 14-18mc out - $15 each. MO only. W. Burding, WA2APB, North Bay Ave., Eastport, NY 11941.

For sale: Heath HW-16 cw transceiver HG-10B vfo and spkr, all for $90. Ron Benatti, 150 School St., Hamden, CT 06518.

Attention Ham Clubs: Need extra money for your treasury? Find our about fund raising programs to raise xtra funds. Write WA9MZS, Cotariu, 759 Burr Oak Lane, Park Forest South, IL 60466.

Cleaning shack: sell xtra electronic parts at give a-way prices. W2EZM, P.O. Box 323, Maple Shade, NJ 08052.

1000 ft. tower ok: Wyoming ranchland, 10 acres - $20 dn, $20 mo. Owner, Mike Gauthier, K6ICS, 9418 Florence, Downey, CA 90240. Phone (213) 923-0131.

Eico 730 modulator-driver for sale. Used very little. W/manual. U pay ship. $30 or best offer. WA9PQM 1101 W. Ridge Rd., Hobart, IN 46342.

Canadians: Complete amateur equip service, fully equipped lic'd technician, Bob Fransen, VE6RF, 227 Cottonwood, Sherwood Pk., Alberta, Canada

Selling Collins rack mount R-388URR and other receivers. J. Lisaius, 116 Orton Rd., West Caldwell, NJ 07006

Antiques for sale or trade: AK Dials, 3-1/4", brown. Bradleyohn. Bradleyometer. Philco signal generator. Door knob tube 388A. W.E. 101D tube. DeForest tube VT240803. Budny, W9PZS, Rt 2, Hi G, Winter, WI 54896

For sale: Yaesu FTdx 560 with spkr - $325. Ameco 2 & 6 transmitter Model TX-62 - $75. F.M. Wentz, 410 Broad St., Montpelier, OH 43543

Heath Apache xmtr w/SB-10 ssb adptr; Halli's SX-111 rcvr; 10 thru 40 ant; HP-410B vtvm. D. Koby, 190 Frederick, Hoffman Estates, IL 60172

Hammarlund HQ-215 ss recv has xtra xtals & IF filter - $250. Heath IM-36 transistor testor - $45; Heath DX60B - $50. Pick up only. Dave Buda, WA2-RYC, 25 Meacham St., Belleville, NJ 07109.

Want Johnson Ranger, Valiant, Matchbox. H.K. Richards, W2IV, East St., Argyle, NY 12809

For sale: Kodak Pageant 16mm sound movie projector, like new - $400. Kersten, W0BGK, 717 Crest Ave., Ft. Dodge, Iowa 50501

Wanted: Central Electronics Model B sideband slicer or Hammarlund HC-10 converter. Callan, 65 Beechcroft St., Brighton, MA 02135

Wanted: 220mhz gear; Gonset, Tecraft, Ameco, Amplidyne or what have U. Clem, K8HWW, 33727 Brownlea, Sterling Hgts., MI 48077

Try Something New — CW County hunting. For information send sase to WA3NEG, Mike Mutnick, 8205 Brandon Dr., Millersville, MD 21108

CQ's — QST's 1946 to 1960 $1.50 per year. 75A4 - $390. CE-100V - $325. K8EKG, 1020-4th S.W., Massillon, OH 44646

Wanted: Drake 2-C recv. Sell HB, 6m xmtr, 100w 829B w/807 mod/PS. Bud rack meters - $75. K8-YNO, 5632 Haughey, Wyoming, MI 49508

Collectors: extremely rare Hickok Model 4800-S zero-current voltmeter, milliammeter, and capacitance mtr; $25. W5JJ, 5824 N.W. 58th St., Warr Acres, OK 73122

For sale: SB-102 Heathkit xcvr, AC PS, 400 cyc filter, alignment optimum. Ship UPS - $375. MO or certified check. Andros Thomson, WB8GJE, Box 326, Parson, WV 26287

For sale: Swan 250C, Laf HA-750, Hallicrafters SX96 & SX111, Johnson Valiant & matchbox, Regency HR-2A. Ron, WB2RVD (609) 396-8919

THIS MONTH'S BEST BUY FROM ARROW

SBE SB-144

VHF/FM TRANSCEIVER

$239.95

Complete with P.T.T. Dynamic Microphone

Furnished with crystals for:
- Trans. 146.34/Rec. 146.94
- Trans. 146.94/Rec. 146.94
- Trans. 146.16/Rec. 146.76

Twelve channel capability.
All solid-state.
Ten watts output.
1 uv sensitivity for 20 db quieting.
Ceramic 2nd i.f. filter.
Weighs only 4.62 lbs.

SBE does it again! This time with **SB-144**, top performing transceiver for FM operation in the amateur 2 meter band. Following a long-established tradition, **SB-144 outfeatures everything in its class and stands apart as the exceptional dollar value in 2 meter FM gear for the radio amateur!**

Here is the compact, beautifully constructed and conveniently installed transceiver that will give new purpose and meaning to your mobile operation. **SB-144** will open the door to the fun that goes along with rock-solid, "through-the-repeater" contacts. New repeaters are popping up daily so, as you travel, you'll want multiple-channel capability.

SB-144 provides you with an even dozen channels selectable by an instrument-type knob with solid feel and identified by large numerals, softly back lighted. The effect is functional---professional. The full-vision panel meter helps too---shows relative strength on receive---indicates all is well on transmit.

Most competitive units lack these features. There are 12 separate crystal positions for **both** transmitter and receiver allowing that many repeater pair-offs or a combination of repeater and mobile-to-mobile channels. As part of the big value, SBE includes three **sets** of crystals with frequencies chosen to be the most widely used nationally.

Extra power is always a big help. **SB-144** delivers 10 watts of output power and does it with less than 1.9 amps drain from a 12V car battery. The receiver is a "hot" double conversion design with FET front end for high sensitivity and low cross modulation. **SB-144** is an advanced design transceiver and doesn't use tubes---is all-solid-state including FET and four I-C's.

Check out **SB-144** and you will know that it gives you the most for your money. See **SB-144** at your distributor today!

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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.

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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.

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

NO DEALERS OR DISTRIBUTORS, PLEASE!

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The supply is limited.

HOUSE OF POWER

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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ALL PRICES REDUCED - BUY NOW AND SAVE

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Bandswitching Pi-Net Inductor 1KW #850A
WAS $71.18 NOW $49.95
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Frequency Range: D.C.—230 MHz • Load Impedance: 52 ohms • 4 Calibrated Scales: 0-10w, 0-100w, 0-300w, 0-1000w
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Increase your talk power without exceeding FCC legal limits. Clipreamp Model 372 preamplifier and clipper. Solid state design.

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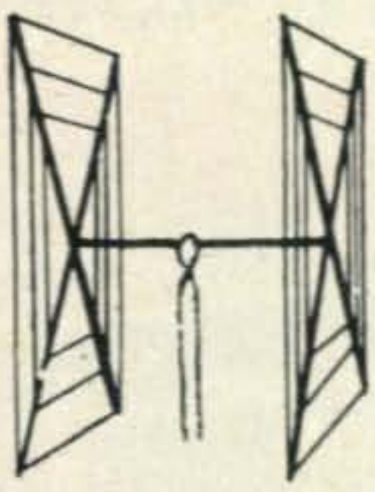
WHICH ANTENNA WINS THE CONTEST ?

In open competition against thousands of commercial and home-brew antennas, WA1JFG won the New England championship with a Gotham beam, by a margin of 5,982 points! WB2JAM won the sectional award for the Sweepstake contest in 1969 and 1970 with a Gotham 4-element 15 meter beam! Hundreds of unsolicited testimonials from grateful hams are our proof that Gotham antennas give you the best design, and the best materials. Forget our low prices - rely on the results of open, competitive contests. Ask yourself: Why do Gotham antennas win?

QUADS

Worked 42 countries in two weeks with my Gotham Quad and only 75 watts...



W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount: uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished); 52 ohm coaxial cable

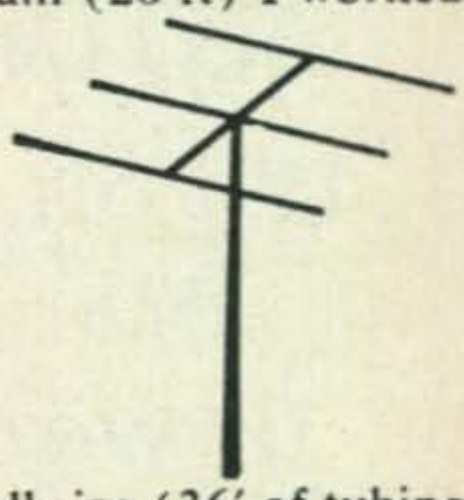
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$37.00
10-15 CUBICAL QUAD	32.00
15-20 CUBICAL QUAD	34.00
TWENTY METER CUBICAL QUAD	27.00
FIFTEEN METER CUBICAL QUAD	26.00
TEN METER CUBICAL QUAD	25.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$21	4 EL 10	20
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2 EL 15	17	8 EL 6	30*
3 EL 15	21	12 EL 2	27*
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5 EL 15	30*		

***20' Boom**

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts!
FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18.95

GOTHAM
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You don't plug the Yaesu FTdx 570 into a power supply, you plug it into the wall. The 570 is ready-to-go, with 560 watts of PEP SSB and 500 watts of CW power built-in.

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You get a rock-stable VFO, and a receiver so sensitive it hears things clearly other rigs don't hear at all. Plus a lot of other features detailed in our brochure. Features that would cost you a fortune if you could find them all in any other rig.

For a little more than the $549.95 price tag, you can order the 570 with a CW filter. Send us the coupon and we'll send you a brochure on the FTdx 570. Include a check for $549.95 and we'll send you the real thing. Do that, and you'll be plugged in to amateur radio operation at its finest.

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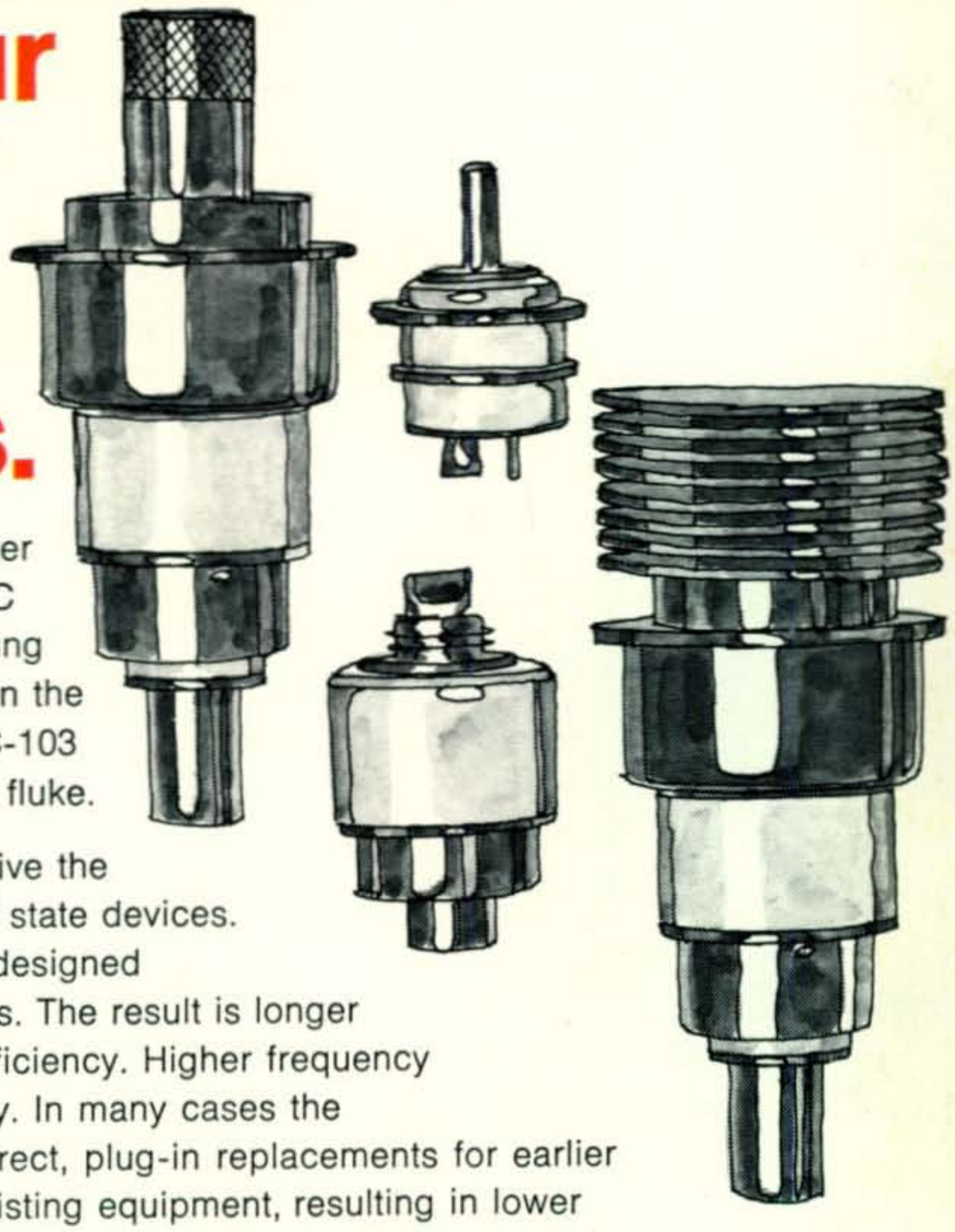
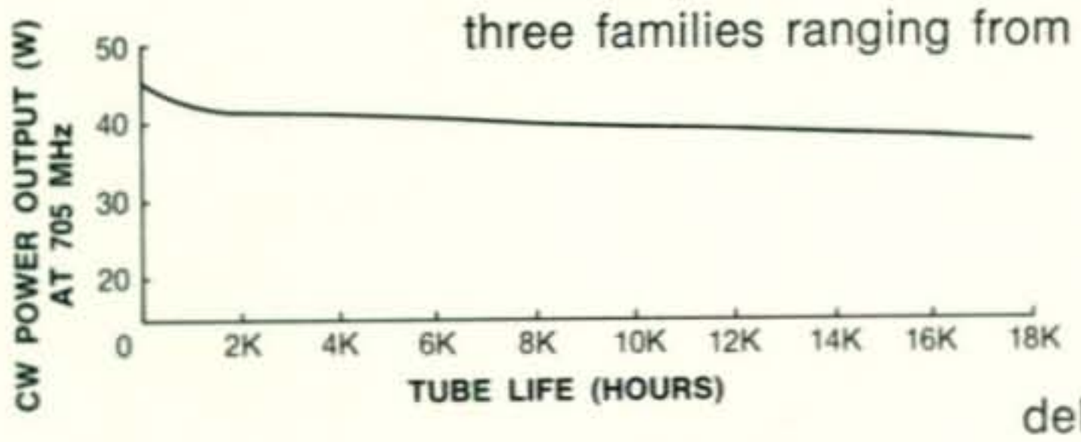
Plug more life into your system with EIMAC planar triodes.



To make a long story short, after 18,000 hours of life test EIMAC improved 7211's were still delivering over 35 watts CW at 705 MHz in the r-f cavities for the Army's GRC-103 Radio Set. And that's no fluke.

Several design improvements give the 7211 life comparable to solid state devices. These improvements have been designed into all EIMAC planar triodes. The result is longer life. Higher power and efficiency. Higher frequency operation. And better linearity. In many cases the improved tubes are direct, plug-in replacements for earlier models in existing equipment, resulting in lower cost per operating hour to the user.



Right now EIMAC has more than 70 planar triode types in three families ranging from the 2C39A types through the latest miniature planar triodes. In CW, EIMAC frequency capability goes up to 5 GHz and powers to 450 watts. For pulse applications, EIMAC has models capable of delivering up to 1 kilowatt peak at 6 GHz.

When it comes to planar triodes for retrofit or new equipment, only EIMAC has full capability. For a copy of our planar triodes applications manual, get in touch with EIMAC, 1678 Pioneer Road, Salt Lake City, Utah 84104. Or your local Varian/EIMAC Electron Tube and Device Group Sales Office.

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