CQ

April 1975
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THE RADIO AMATEUR...

must he be the invisible man?

.......see page 20

The Radio Amateur's Journal

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SB-104 SSB transceiver– a new standard for the industry

A revolutionary "new generation" transceiver. It's completely solid-state and totally broadbanded to eliminate preselector tuning. And the output can be instantly switched from 100 watts to 1 watt. The true digital readout offers resolution down to 100 Hz and outstanding tuning accuracy. Receiver intermodulation distortion has been minimized and there are very few active devices ahead of the highly selective crystal filter. Adjacent channel overload is negligible, yet sensitivity is better than 1 µV (.6 µV typical) and front-end overload is dramatically reduced. The "104" is 12 VDC-powered for mobility and the optional HP-1144 fixed station supply fits inside the SB-604 speaker cabinet. An optional noise blanker can be installed in the "104" and an optional 400 Hz crystal filter improves CW selectivity.

Kit SB-104, 31 lbs., mailable **669.95***
Kit SBA-104-3, 400 Hz CW crystal filter, 1 lb., mailable **34.95***
Kit SBA-104-1, Noise blanker, 1 lb., mailable **24.95***
Kit SBA-104-2, Mobile mount, 6 lbs., mailable **34.95***
Kit HP-1144, Fixed station power supply, 28 lbs., mailable **89.95***

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The SB-104's "silent partner." 1200 watts PEP or 1000 watts CW from less than 100 watts drive. It's rated at 400 watts input for slow-scan TV and RTTY. The high-efficiency Eimac 8873 triode is double-shielded to reduce stray RF and a massive heat sink replaces noisy fans and blowers. The "230" assembles in just 15 to 20 hours with no alignment.

Kit SB-230, 40 lbs., mailable **319.95***

SB-634 station console combines 5 convenient accessories

The "634" performs 5 important functions — a 1 minute digital ID timer with visual or visual a audible indicators an RF wattmeter that reads 200 or 0-2000 watts with ±10% accuracy, an SW bridge, a hybrid phone patch that can be us manually or with VOX control, and a 24-hour di tal clock that runs independently of all other fur tions. It's a must for every well equipped static

Kit SB-634, 14 lbs., mailable **179.9**

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Highly visible 1½ x 2" CRT detects problems th can reduce the effectiveness of your signal — nc linearity, insufficient or excessive drive, poor c rier or sideband suppression, regeneration, pa sitics and CW key clicks. It monitors SSB, C and AM signals from 80 to 6 meters. Push-p drive for keystone free trace; automatic sy sweep generator with 3 ranges from 10 Hz to kHz. Can be used as an ordinary oscillosco from 10 Hz to 50 kHz.

Kit SB-614, 17 lbs., mailable .... **139.**

SB-644 remote VFO

Designed exclusively for the SB-104. It provid split transmit and receive control and you are frequency-limited in any way — transmit at c end of the band, receive at the other. The "64 even has two crystal positions for fixed-frequen control. The "644" has a linear dial, but the ex frequency is displayed on the "104's" digital re out. The display automatically changes wh switching from transmit to receive.

Kit SB-644, 10 lbs., mailable .... **119.**

SB-604 station speaker — response-tailored to SSB

Designed to match the SB-104 in styling and p formance. The "604" uses a 5x7", 3.2-o speaker. And there's room inside for the HP-1 power supply. With connector cable and plug.

Kit SB-604, 8 lbs., mailable .... **29.**

DESIGN NOTES

Larry Houghton
Chief Engineer — Communications

A New Approach to Kitability

One of the major design-goals of the SB-104 project was to make the transceiver as easy to build and service as possible. Words like "kitability," "buildability" and "serviceability" take on new importance when you're designing a transceiver as complex as the SB-104. No matter how good the electronic design may be, its usefulness is diminished if it can't be built and serviced by a typical ham.

Our ham group's mechanical designer, Jim Smiley, coordinated the layout and packaging of the SB-104 and most of the other new SB products. If you have an opportunity to examine a 104, I think you'll agree that Jim's efforts have turned a complex piece of equipment into a relatively easy and enjoyable kit-building experience.

Under chassis wiring is in a single plane, easily accessible for soldering and trouble-shooting measurements. Top and bottom cabinet shells are mounted after the kit is complete. Each shell can be independently removed for access to either upper or lower chassis. This approach to kitability takes full advantage of the SB-104's circuitry for a confidence-building alignment and check out procedure, and for money-saving, do-it-yourself service.

About two-thirds of the construction time is spent building fifteen, G-10 epoxy printed circuit boards.

Of these, ten plug into sockets in the chassis, snugly held in place with vertical card guides. The seven large boards can be extended out of the unit for alignment and fault isolation. All boards except the high-level transmitter circuits are diode switched. This allows their physical placement to be independent of switch shafts, eliminating shaft alignment problems. Inter-board connections are handled by two precut wiring harnesses.

The SB-104 features a single, full-sized aluminum chassis. Four panels containing pre-mounted circuit board guides and seven intercard shields are easily mounted to the chassis. When front and rear panels are attached, the resulting structure is strong yet light in weight. This construction technique minimizes tolerance buildup both laterally and front-to-back for improved sheet metal fit.

Larry R. Houghton
K8ZVF

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AM-310

CQ

APRIL, 1975 VOL. 31, NO. 4

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

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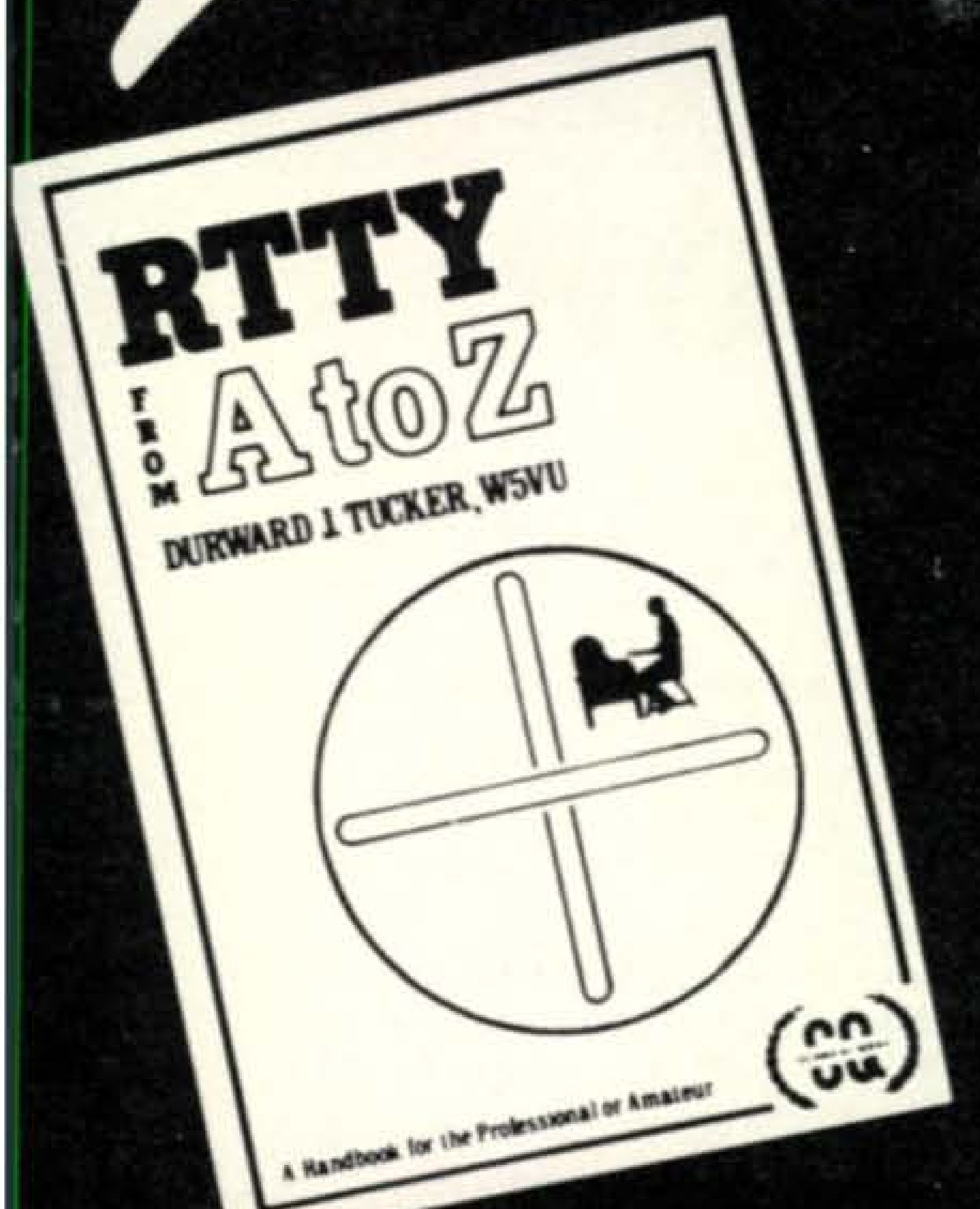

RTTY FROM A to Z

DURWARD J. TUCKER, W5VU

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Announcements

● **Kingston, NY** – The Overlook Mountain Amateur Radio Club is holding its annual banquet on Saturday, April 5, 1975. For more information Contact: Robert W. Schwenk, WB2BXL, 141 Clifton Ave., Kingston, NY. ● **Raleigh, North Carolina**– The Third Annual Raleigh Radio Society Hamfest will take place on Sunday, April 20, 1975, at the Crabtree Valley Mall, Highway 70W. Fleamarket, and prizes will be offered. For reservations and information write: George Richards, WA4EKJ, RARS Hamfest, P.O. Box 17124, Raleigh, North Carolina, 27609. ● **Dayton, Ohio** -- "FM BASH", an annual affair will again be held on the Friday night of the Hamvention, April 25, at the Imperial House No. Admission is free with snacks and entertainment. For more information contact: K8SNJ, 725 Parkview, Dayton, Ohio 45403. ● **Grand Rapids, Michigan** – The Annual Communication Show and Swap 'n Shop will be held April 24-26, 1975 on the Mall. Contact: Bob, WN8PTM, P.O. Box 2402, Grand Rapids, Michigan. ● **Mesilla Park, New Mexico** – The 11th Annual "Whiteys Bean Feed" will take place at La Mesa N.M. near Las Cruces, N.M. on Saturday April 26, thru Sunday April 27, 1975. Swapfesting, Prizes, Beverages, and a Chili Bean Feed will be on hand. For information contact: K5HZH, 1020 Circle Drive, Las Cruces, N.M. 88001.

● **Columbus, Georgia** – The Columbus Georgia Hamfest sponsored by the Columbus Amateur Radio Club will be held April 19-20, 1975. For information and reservations, contact: Gary L. Kindred, 293 Nightingale Drive, Columbus, Georgia, 31906. (404)689-4494. ● **Fresno, California** – The Northern California DX Club announced that the 26th annual Fresno International DX Convention will be on April 19th and 20th, 1975, at the Fresno Hilton, Menlo Park, CA 94025. ● **Neenah, Wisconsin** – The Three – F's invite you to the Northeastern Wisconsin Swapfest on Saturday May 3rd, 1975, at the Labor Temple. Food and Beverages available. For advance tickets and information, contact: Mark Michel, W9PJT, 700 Kinzie Court, Menasha, WI 54952. ● **Westminster, Maryland** – The Potomac Area VHF Society will hold their annual hamfest on Sunday, May 4, 1975, at the Agricultural Center in Westminster, Maryland. For information contact: k3DUA or WA3NZL, 25116 Oak Drive, Damascus, Maryland 20750. ● **St. Petersburg, Florida** – The SPARC will hold their annual Hamfest at Lake Maggiore Park, Sunday, May 4th, 1975. For information contact: Stan Kahn, K4JBL 6670 Poinsetta Avenue South, St. Petersburg, FL 33707.

● **Dekalb, Illinois** – On May 4th at 8 am The Dekalb County Hamfest will be held at the Notre Dame School off Route 23. For details write to: Howard Newquist, WA9TXW, 508 W. State, Sycamore, IL 60178. ● **Greenville, South Carolina** – The Blue Ridge Radio Society's annual Hamfest is May 4th, 1975 at the Recreation building in Cleveland Park, Greenville. For information write: Don Rose, 11 Ivanhoe Circle, Greenville, SC 29607.

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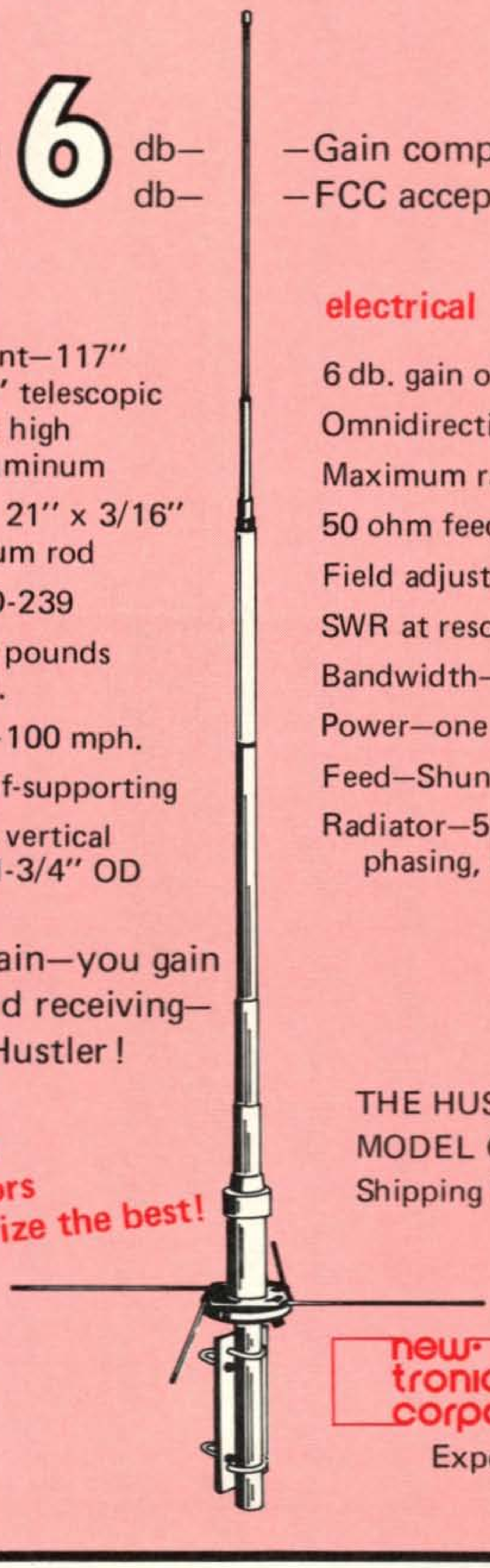

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2W	70W	70D02	$270
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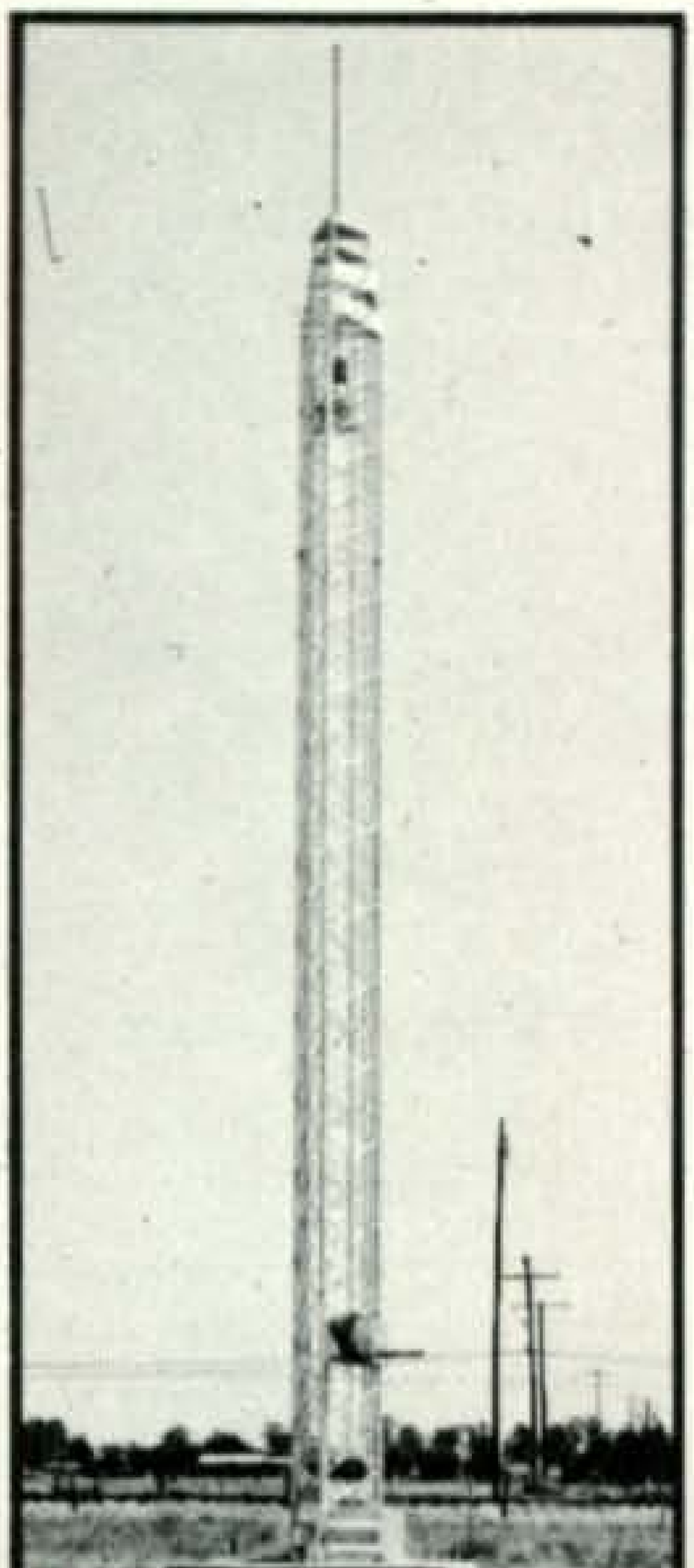

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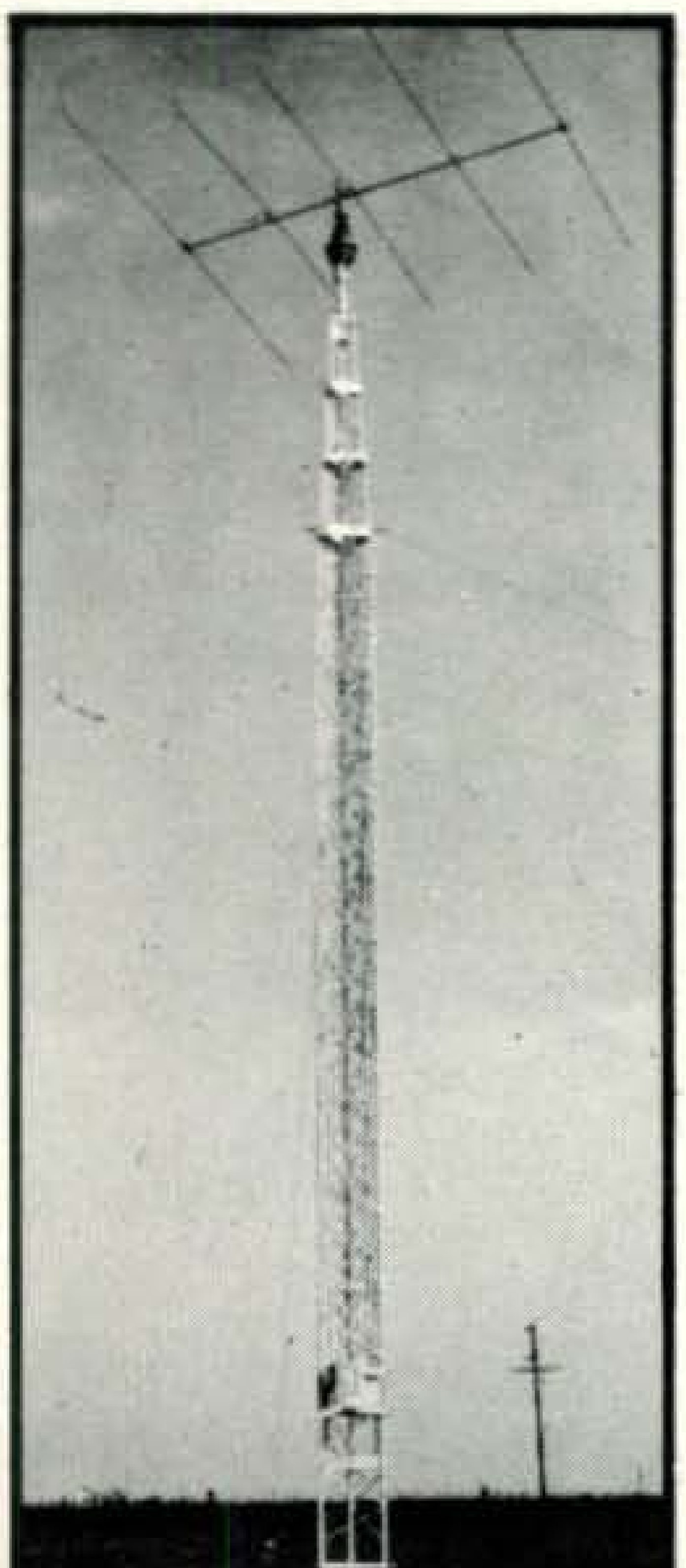

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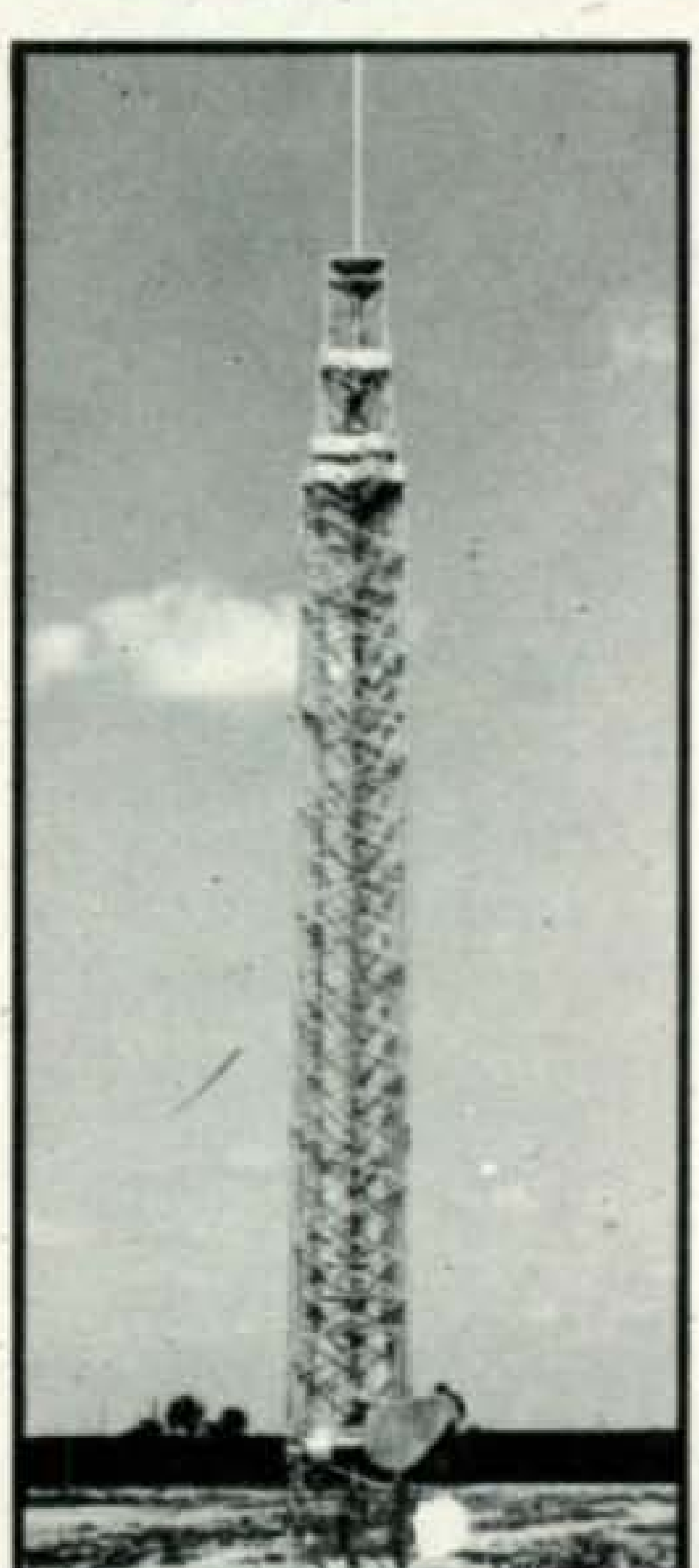

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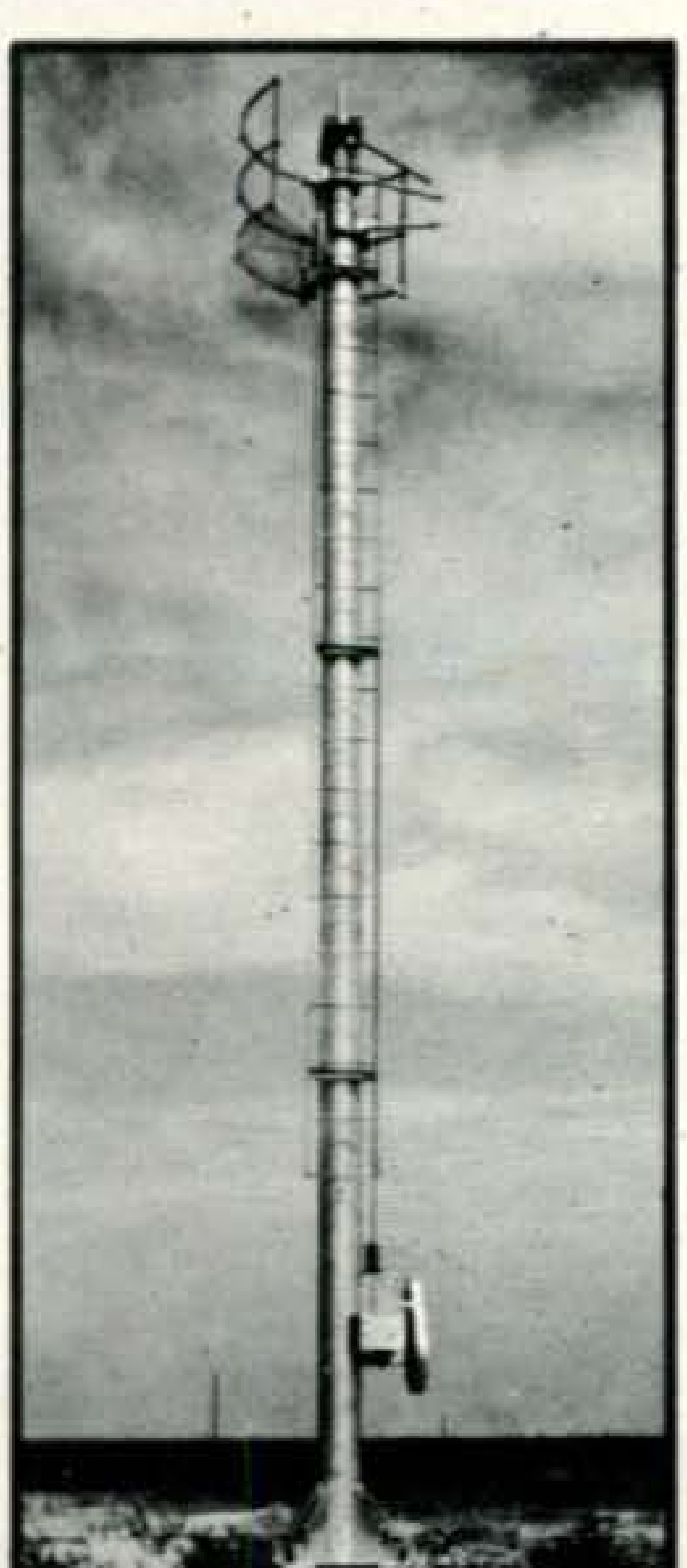

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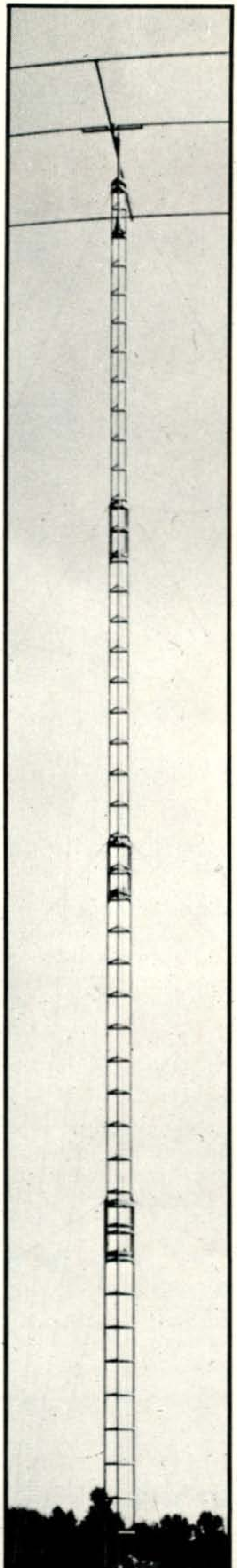

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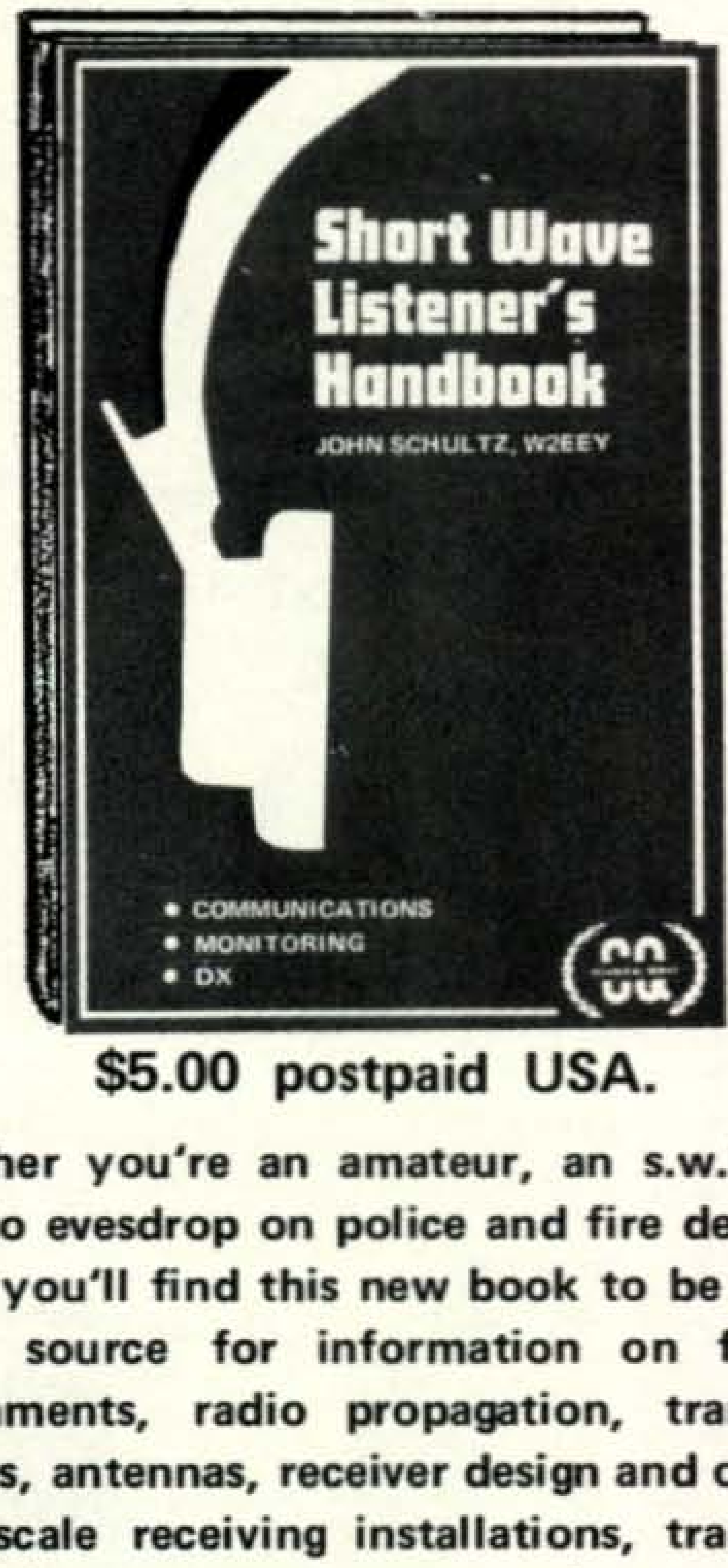

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Inexpensive Surplus 160/80 Meters VFO Controlled CW Transmitter

BY JAMES L. WEEKS,* W6FNG

CQ's George Jacobs and other propagation experts continue to forecast erratic patterns of skip for some time yet. This writer was hard put last winter to maintain some evening c.w. skeds on 80 meters with stations in the 25 to 150 mile range because the long skip had come in as early as 4:00 P.M. 160 meters is the answer! But where does one find a good, inexpensive 160 meter rig these days? Used Johnson Ranger transmitters are hard to come by and still command a healthy price. Faced with a need to have something on the air this winter and possessing a limited budget, a ready-made answer was found in the surplus Navy T-18/ARC-5 Command transmitter. These sets are still advertised by Fair Radio and can be found in various flea market sales and ham ads. Depending upon the contents of your junk box, you can have a 160/80 meter c.w. rig, v.f.o. controlled, bandswitching, 25 watts input for a price of from $10 to $30. Construction time for this project will vary from one to two evenings of work commensurate with the individual's experience, tools and understanding XYL.

As originally built, the T-18/ARC-5 covers 2.1 to 3 MHz. The Army had no equivalent frequency coverage in its Command Set series. All that needs to be done is to bring the v.f.o. down to 1.75 MHz so you can hit 3.5 MHz. You then use the final r.f. amplifier straight-through on 160 and as a doubler-amplifier on 80.

The Modification

Referring to fig. 1, the following 6 steps are about all that is basically required. Any further embellishments that the individual constructor wishes to add are left to his own ingenuity.

1. Remove the shield can covering T_{53} and C_{60}. Rotate C_{60} to almost full mesh. Temporarily run 150 volts B+ to the oscillator tube V_{51} and one leg of 24 volts a.c. to pin 2 of V_{53}'s socket with the other leg to ground. This will put the v.f.o. into operation. Set the main dial of the v.f.o. to read 2.1 and then vary C_{60} until you hear a signal at 1.75 MHz on your receiver; then lock C_{60}. After you put the shield can back on T_{53} and C_{60}, you will need to bring the v.f.o. back to 1.75 MHz by adjusting the trimmer on top of C_{60} and the slug coming out of T_{53}.

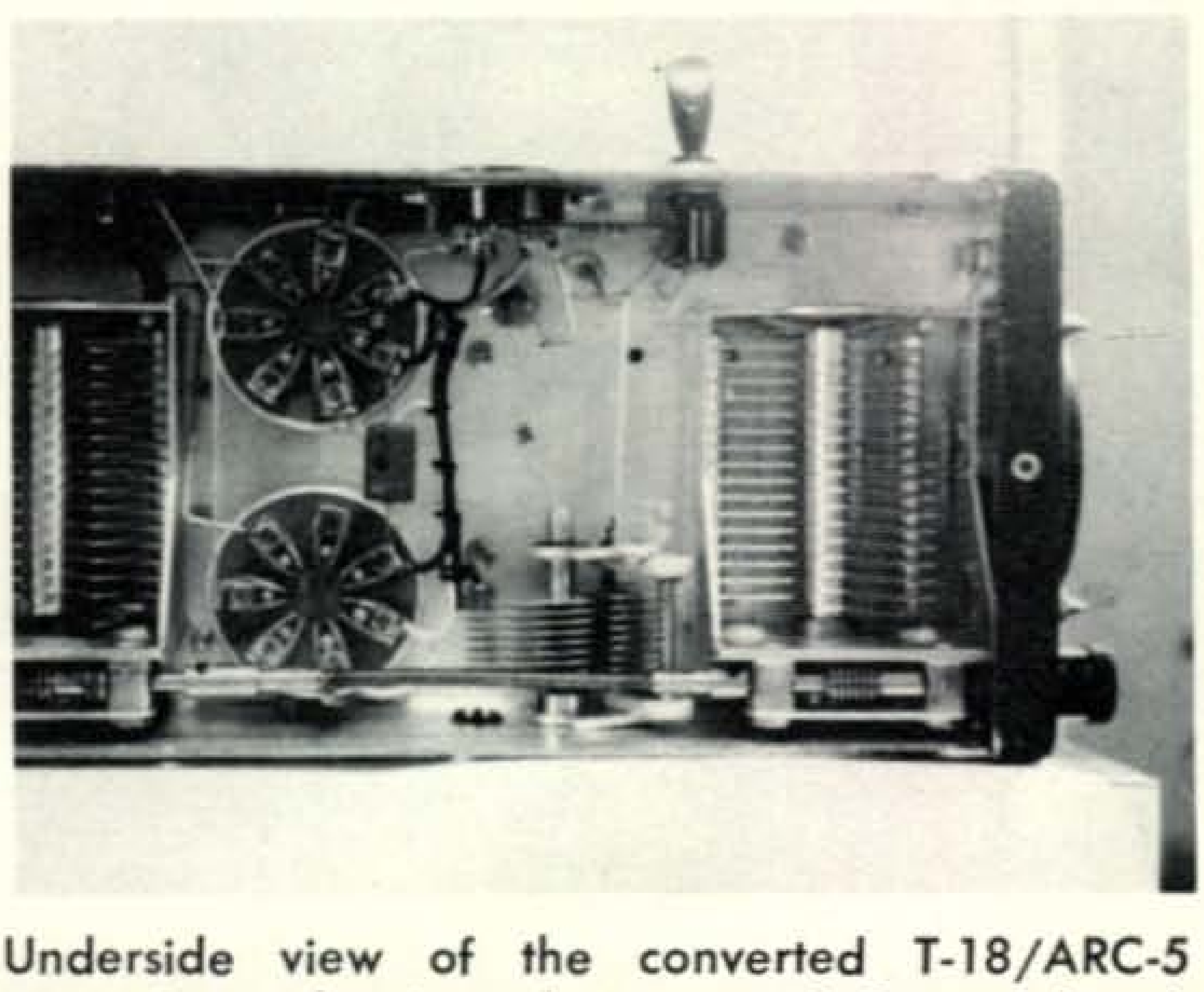
2. Completely remove C_{67}. This capacitor is held in place by several machine screws from topside, screws which hold down other components. After C_{67} is removed, make sure the other components are re-fastened.

3. Install at least a 200 pf variable capacitor on the side of the chassis in one of the holes in front of where C_{67} was taken out. Call this C_1. C_1 tunes the final r.f. amplifier to resonance.

4. Remove relay K_{53}. In this area of the chassis cut a suitable hole and install a socket (we utilized an octal socket) to be used for bringing the several operating voltages into the set. Note that K_{53} switched B+ to the oscillator plate and also placed a ground on the cathodes of the two 1625 final r.f. amplifiers; so you will have to reconnect the oscillator B+ to this new socket and the 1625 cathodes permanently to ground.

5. Across from C_{65} mount an ordinary s.p.s.t. toggle switch. Call this S_1.

6. C_1 is connected in parallel with C_{65} through S_1; *i.e.* — for 160 meter operation of the final r.f. amplifier, S_1 is closed, which parallels C_{65} and C_1. For 80 meter operation, S_1 is opened,



Underside view of the converted T-18/ARC-5 transmitter, showing placement of C_1 and bandswitch S_1

*P.O. Box 307, Wrightwood, CA 92397.

[1]The T-18/ARC-5 is also available from G&G Radio Electronics Co., 45 Warren St., Dept. Q-A, N.Y., N.Y. 10007. See their ad and the Fair Radio ad elsewhere in this issue.

and C_1 alone tunes the final amplifier as a doubler to 80 meters.

That is about all there is to it. The photo shows how we arranged the wiring and components in our unit. You may choose an entirely different approach, since the wiring is not critical at these frequencies. You will need to wire up B+ (400 volts), B+ (150 volts) and B– (ground-chassis) and the filament voltage to the socket you installed in Step 4, above.

Power and Voltages

A 400 volt, garden-variety d.c. power supply equipped with a VR-150 is required. The supply should be capable of handling at least 100 ma with reasonable regulation. Details for such a supply are omitted here since almost any handbook will cover this subject more than adequately. The filaments in the set are left as originally wired for 24 volt operation. The B+ 400 volts feeds the plates of the 1625's, and the regulated B+ 150 volts (which is keyed) feeds simultaneously the oscillator plate and the screens of the 1625's. Keying is very stable and without chirps or clicks. Since the keying leads are carrying 150 volts, a suit-

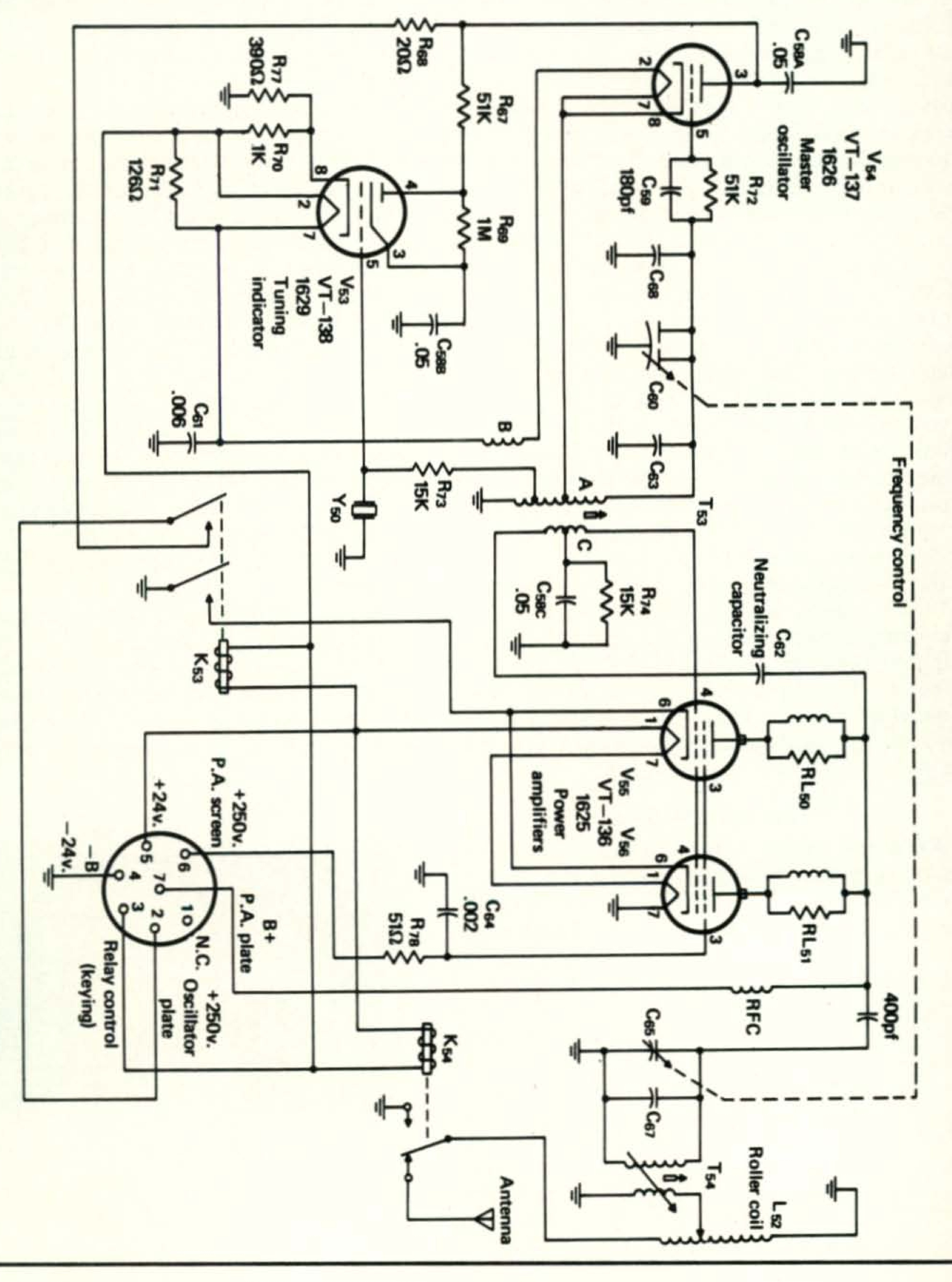


Fig. 1—Unmodified schematic of the T-18/ARC-5 Navy transmitter. Original coverage is 2.1-3.0 MHz, but simple modifications allow coverage of the 160 meter and 80 meter bands.

able keying relay is suggested purely as a safety measure.

What Antenna?

A suitable antenna for 160 meters operation can present a real problem for the urban-dwelling ham. Fortunately, the T-18/ARC-5 has a built-in tuner consisting of a variable pick-up coil inside of T_{54} and an associated rotary loading coil L_{52} as shown in fig. 1. This arrangement is quite simple and effective. Originally, this loading coil was used on aircraft having from 50 to 100 feet of wire working against ground, the aircraft's metal frame, so try some various lengths of wire and see what combination you can get to take a load. The longer the wire the better. Make sure you have a good ground! In our set here, L_{52} had been damaged previously; so we removed it and fed the output of the pick-up coil in T_{54} direct into a homebrew matchbox having an input impedance of 50 to 70 ohms. This matchbox looks out to our regular antenna which is 130 feet of wire, end fed. If you use L_{52}, antenna relay K_{54} should be by-passed.

A Last Word or Two

Some readers may question the absence of a plate meter in the final r.f. amplifier. A simple absorption-type r.f. indicator gives us adequate evidence of resonance in the final and maximum adjustment for antenna loading. Remember—a reading of 2.1 on the v.f.o. dial means the oscillator is on 1.75 MHz — 25 kHz below the 160 meter band! So when using this rig on 160, make sure the v.f.o. is on 1.8 MHz, which is about 2.195 on the v.f.o. dial.

Notwithstanding heavy summer QRN, this little rig has done quite well here on 160 with a marginal antenna. Contacts of 150 miles are consistent, and, when used on 80, where the antenna is much more efficient, the rig has given a very good account of itself.

Have some reliable, short-haul communication on 160 this winter! ■

EDITOR'S NOTE: A similar conversion appeared several years ago in *QST* for Feb. '63, p. 34. The article, entitled "Putting the ARC-5/T18 on 160 and 80 Meters," by Lewis G. McCoy, W1ICP, is worthwhile reading for the prospective builder.

My Audio Transducer

BY GAYL SABONAITIS,* WA1OPN

THE audio transducer, which is shown in the picture herein, consists of a 2-inch wide diaphragm in the center of a magnetic core, as a regular pm speaker would have. It is made from a regular P.A. system. The voice coil is removed and the cone is left intact. For protection, it can be placed in a strong metal box. It is connected to the receiver or whatever gives off code such as an oscillator or tape recorder. It is connected to the earphones jack and the audio response is very strong at the low frequencies.

I listen to the code tactually by feeling the cone with my fingertips. It is a matter of memorizing the code because that is the only way to learn how to copy it tactually. Therefore the deaf ham has the same problems as hearing people in learning how to copy code. Deaf hams must learn to interpret what they feel just as hearing ones have to learn to interpret what they hear.

I have been a ham for three years and have always used the audio transducer as I am totally deaf and have only light perception. Yet I can copy code at 25 w.p.m. and send at 18 to 20 w.p.m. As a deaf ham I encountered the same problems that a hearing ham would face such as learning code, theory, operation of gear, etc. Therefore I never discuss my physical handicap on the air because my problems as a ham have always been the same as hearing hams' problems. The transducer has enabled me to pass both Novice and General class code tests. At present, I am a General class ham, but I am getting ready to be an Advanced class ham soon. ■

*Perkins School for the Blind, Watertown, Mass. 02172.

The author shown on the air.

Amateur Radio—The "Invisible Man"

A Discussion of FCC Docket 20282

BY WILLIAM I. ORR,* W6SAI

"I am an invisible man," cried the hero of Ralph Ellison's novel. "Invisible, understand, simply because other people refuse to see me."

* * * * *

"Well, it has finally surfaced! After months of alarums and excursions from the wings, FCC Docket 20282 has finally arrived, center stage. *QST* says the Docket entails "sweeping changes in licensing procedures", *CQ* calls the changes "far reaching," and *Ham Radio* magazine calls it an "historic Docket." So, as the British speed limit sign states, *you have been warned.*

It is the duty of every thinking radio amateur to obtain a copy of FCC Docket 20282 and read it in detail. The FCC allows and encourages comments to be filed from interested parties (original and 14 copies) until June 16, 1975. This allows plenty of time for digestion, introspection, the thought process and finally, for comment. Those amateurs that fail to register their opinion with the FCC can have very little criticism of the eventual disposition of this massive "restructuring" of the Amateur Radio Service.

The opinions expressed in this article are those of the writer and are offered to help *you* start thinking; there is no demand that you agree or disagree with the following observations and opinions.

This commentary is divided into two parts: This, the first part, deals with today's real-life situation in regard to the Amateur Radio Service and what can be done about it. The second part will deal with Docket 20282. The route is strewn with booby-traps and mine fields, but let us begin. "The longest journey starts with but a single step."

Amateur Radio Today

On the surface, amateur radio seems placid, events moving smoothly along, with most hams content in their day to day activities. Why, then, does the FCC suddenly decide "the time is propitious for a review of our entire licensing structure?" *Does the FCC know something we amateurs do not?*

*48 Campbell Lane, Menlo Park, CA 94025.

According to Docket 20282, the FCC has before it some 35 petitions seeking amendment to the Rules for the Amateur Radio Service. The FCC avers that "the type of amendments requested by the petitioners cover a broad scope of thoughts and ideas" and "does not believe it is desirable to deal with the petitions on a peacemeal basis, since many are interrelated." The introduction to the Docket concludes, "the following represents our best forecast of the direction we should move in this matter."

After this introduction, there follows a dense forest of verbiage, charts and diagrams that lay out in detail the Notice of Proposed Rulemaking.

Why Docket 20282?

Well! It seems to me that such an extensive effort on the part of the FCC is not wholly triggered by a mere 35 petitions, some of which are self-serving and others which eminate from the "U.S. Citizens Radio Council" or the "United CBers of America," whose solicitude for amateur radio is mindful of the instincts of the Dalton Boys when they rode up to the bank in Coffeyville, Kansas.

No, there must be more pressing motives behind Docket 20282, as the reasons given in the introduction seem to be inconclusive. A little thought indicates the following topics may be the real *raison d'etre:*

1—*Amateur radio remains static.* No pun intended: at best, the population of radio amateurs is not growing. *Communication News* (January, 1975) indicates the number of amateur radio licenses outstanding stands at 279,505 for 1974 and forecasts only 281,000 licenses for 1975. Other unofficial figures indicate an *overall loss* of about 300 amateurs per month during the past half-year.

2—Recent utterings from the FCC indicate concern in this area and point out that *healthy growth is the name of the game.* The comparison between the Amateur Radio Service and the Citizens Radio Service in terms of growth is startling and unsettling: amateur radio remains static and the CB Service grows at a rate of about 100,000 licenses a year (plus God-knows how many unlicensed CB pirates!) Licenses CBers now number about 1,000,000.

3—So there you have it in a nutshell. The FCC has stressed, time and time again, the frequency concept of *use it or loose it*. Vast, unused spaces exist (or did exist) in the v.h.f. amateur bands. *Bluntly, if the Amateur Service is not growing, or not using its allocation to the fullest, and some other service is expanding, there will be pressure to take frequencies away from the dormant service and give them to the growing service*. This is an electronic concept of the survival of the fittest (or the biggest!). A case in point is the pending "raid" on the amateur 224 MHz band by the Electronics Industries Association, and the Office of Telecommunication Policy of The White House which believes these frequencies may be better put to use by the CBers than by radio amateurs.

The fact that 35 petitions for rulemaking stand before the FCC is not of great import and does not, in my opinion, constitute the only reasons for the so-called "restructuring" of amateur radio. The fact that amateur radio is not growing (which I readily concede) and that the amateur v.h.f. bands are not fully utilized (which I will comment upon in a later article) seem to be important reasons behind the FCC Docket.

Why is Amateur Radio Not Growing in Numbers?

Very simple! Because not many persons are motivated enough to become radio amateurs! And why not? Many reasons come to mind, and I list the most obvious:

1—Why should a would-be communicator pass a complicated examination and learn the code so he can talk over the radio when he can easily become a CBer with less effort? Moreover, as is well known, a daring fellow can become a big-time CB operator without the fuss and bother of a CB license. And the pirate can assign his own call, too! True, the outlaw CBer does run the minimal risk of being apprehended by the FCC, but this merely adds a little zest to the game.

Because CB radio has degenerated into a bastard and competitive form of amateur radio, having many of amateur radio's faults and few of its virtues—and since CB radio is a multi-million dollar market—CB radio expands at the detriment of amateur radio. Many prospective radio amateurs have been seduced into the CB ranks where they either flourish, or eventually say, "the hell with it" and give up entirely. In either case, amateur radio loses. The number of CBers that rise into the ranks of amateur radio, this writer believes, are few.

Thus the prime problem of amateur radio is CB radio and, until the FCC solves the bigger problem, the chances of solving the problem of amateur radio remains remote.

2—The attitude of amateurs, amateur organizations and even the FCC itself is not comforting or encouraging to the would-be amateur.

You don't believe me? True, the ARRL has a collection of excellent publications for the newcomer and Novice and runs articles dealing with Novice antennas and equipment. *CQ* has a first-rate Novice column. But the general attitude of radio amateurs and their society towards the Novice and the pre-Novice enthusiast is generally one of lassitude. How many non-amateurs or Novices do you see at a big convention? How many school kids can afford to register at an ARRL convention? How much attention do amateur publications devote to the interested non-amateur, the Novice and to the preparation for the Novice and General exam? How much attention (other than coveting frequencies) do the CB magazines and clubs give to amateur radio? Do local amateur radio clubs encourage attendance of CBers, Novices and pre-Novices? Do many amateurs speak at local CB clubs, or civic functions, extolling the fun, virtues and self-education aspects of amateur radio?

Unfortunately, all too often the answer to these questions is "no," "maybe" or "perhaps." To the outsider, *the radio amateur is the invisible man,* engaged in a hobby that is a closed club, barred to all but the chosen few who have their FCC ticket, and it had better be at least a General class ticket, at that!

Aside from causing TVI, the radio amateur remains an invisible man to the general public. Occasional press handouts about hams assisting in a disaster, or providing drugs to a sick kid in Outer Baldovia help, but do little in the long run. More about this important point later!

The Hazard of the FCC

The FCC gives a cool shoulder and little comfort to Novices attempting the General class examination. And they don't help the pre-Novice much, either. Nervous and excited, the Novice approaches the local FCC office, generally situated in a 1929-Doric style federal building that bears a grim resemblance to the county courthouse or prison. Once past the cold, marble entrance, he takes the grimy elevator to the ump-teenth floor and hesitantly walks along the dimly-lit hallway to the FCC office. And finally, here he is!

And now the would-be General runs the gauntlet of the FCC office—the Seat of the Mighty, who will shortly pass drastic judgment upon the abilities of the lowly second-class citizen who dares to approach this official repository of Federal Power.

If the Novice is lucky, he is greeted with a smile and his nervousness diminishes. If he is unlucky, he is greeted with indifference or, even worse, a sneer or a snide remark by a misguided official. Luckily, most FCC Field Office people are courteous and cordial, but a small minority are not, and woe betide the Novice who attempts to deal with these surly minions. He is doomed to fail, but not because of his own shortcomings.

The Exam Itself (Or, When Did You Stop Beating Your Wife?)

And now the big moment is at hand. Clutching his receipt for the fee in a moist hand, the Novice is hopefully braced for the examination. Most radio amateurs remember little about the FCC exam they took; they are too dazed to recall details. The actual examination questions, moreover, are a closely-held FCC secret, and none but the examinee is able to see them. It is understood by the writer that a battery of examinations exist so that examinees in the same office on the same day may not necessarily be taking the same set of questions. Fair enough.

The writer, not having access to the examination questions, has informally queried other amateurs from time to time, who have recently taken an FCC examination. A certain thread of consistency runs through their recollection of the examination questions. The concensus is that some of the technical questions are unrealistic (not appropriate) and the multiple-choice answers sometimes ambiguous and poorly worded.

One prominent electronic engineer, after taking the Extra Class examination, said, "I had to answer the exam questions reminding myself to think as a radio amateur, not an engineer. If I replied as a professional engineer, I might have failed the examination. This points up the fact that the questions and answers are not clear-cut, as they should be, in a test of this importance."

Another well-known amateur, who has worked with Novices and Generals, and who has given many Novice examinations, says, "It seems to me that the Novice examination has grown more difficult over the past years. I think it has ambiguous questions, and some questions that are beyond the technical ability of the average newcomer to answer. Also, some questions are irrelevant, quizzing the Novice on subjects of little use to him."

This amateur also told the writer that out of nine carefully tutored high school students that had Novice licenses, only *two* passed the General class examination.

"With a failure rate as high as that, something is wrong with either the examinee, the examination, or the way the exam is given. These kids were good students and excellent Novice operators. The FCC officials scared them out of their wits. The kids were nervous, and the atmosphere in the FCC field office was not conducive to thought. The examination for the General class license was *tough,* but not in the sense of examining their skills. In college, it would be termed a flunk-out test.

"I questioned the kids after they returned from the FCC office and they were bitter and dejected. The exam room was noisy and the examiner was a real tyrant. They don't want to pay another nine dollars to go through another experience like that. I guess it will be back to CB radio for them."

While this may be an extreme, isolated instance, FCC figures indicate that in December, 1974, 2255 Novice written examinations were given and of this group, 1521 examinees passed and 734 failed, for a passing rate of 67.5% of the examinees. In my opinion, this is a very low figure and one hard to explain, other than in the context of the difficulty of the questions asked. Considering the Novice license is a "mail order" examination, with no formal control over the examination conditions, a certain number of Novices are undoubtedly "aided" in taking the exam. This could run the gauntlet from the kindly, old ham who is merely helping the "young fellers who seem confused," to outright cheating on the part of the supervisor of the examination.

In any event, a lowly passing figure of only 67.5% on the Novice examination suggests that this is a good area to scrutinize when it comes to wondering about the poor rate of growth of the Amateur Radio Service.

The figures for the General class license for December, 1974 are even more melancholy. Out of 544 examinees, only 204 passed the test, for a passing rate of 38%. That seems *mighty low* to me! And the question arises: is the low passing percentage the fault of the examinee or the examination?

The writer has heard that steps are underway at the FCC to clarify and modernize the amateur examinations. Excellent! This is one step that must be taken immediately to insure that greater numbers of Novices join the general class, and that greater number of enthusiasts become Novices. There's no reason for a beginner or Novice to be unjustly shunted aside because of poorly worded or obscure exam questions.

Institutions exist whose business it is to prepare, make up (and even administer) examinations of all types for schools and industry and the FCC would do well to invite such *professional assistance* in revising *all* radio amateur examinations so that the exams do not raise an unintentional barrier to the would-be amateur, *and to the amateur desiring to reach a higher level of achievement.*

The Code Test

Hard-nose c.w. speed-kings and some FCC officials will argue that it is as easy to copy 13 words per minute as it is to copy 10 w.p.m. Not so! Most code experts who have taught beginners know of the so-called "plateau" in code reception above 10 w.p.m. and agree that dropping the code test back to the *traditional* 10 w.p.m. from its present speed of 13 w.p.m. will help the Novice to pass the General class examination, thus reaching a higher level of achievement, in accord with the incentive licensing program. *The difference between 5 w.p.m. and 10 w.p.m. is substantial and truly does represent a quantum step in achievement and in skill level.*

Quite frankly, if the new General class licensee enjoys c.w., he'll go ahead and work it, regardless of the code speed of the examination. If he detests the stuff, he won't. So the actual speed of the examination test is subjective, rather than objective, and has nothing to do with the degree of c.w. expertise of the new General, *but the present high barrier of 13 w.p.m. probably has a lot to do with the poor rate of growth of new General class licensees appearing on the horizon!* In my opinion, the General class code speed should be dropped to 10 w.p.m., the traditional speed that has allowed comfortable amateur growth for many past decades. This, then, is another step that can be taken *immediately* to insure a greater number of General class licensees in the future.

The Lowly Novice

Along with inviting the Novice and the beginner to participate in the social life of amateur radio, I think it would be a good idea to provide some form of phone operation for the beginner. After all, the CBer can go on phone immediately upon receiving his license (or even before), whereas the Novice-beginner is restricted to c.w. operation. This is perhaps OK for the high frequency bands, where c.w. is a popular form of communication, but the knowledge of the code is not so necessary in the v.h.f./u.h.f. region, where operating is predominantly by means other than c.w. Possibly the proposed Communicator class license (a so-called "codeless" v.h.f. license) *may* be the answer, as this will provide the beginner the chance to communicate by voice, as a radio ham, should he desire to do so. More about this interesting proposal in the next article.

In any event, precious little thought is given to today's c.w. Novice, struggling to communicate with other lowly, confused beginners like himself. Some Novices enjoy this, and do gain expertise, but many give up, quickly developing a distaste for c.w. along with a growing frustration and inferiority about their ability to become a real amateur. If the Novice had more social dialogue and communication with "real" amateurs, on and off the air, the situation would improve. Sadly, most amateurs in a hobby of communications, tend to be poor communicators, especially with regard to beginners and the outside world. Let us not leave the Novice stuck in a c.w. ghetto, painfully pecking out the code in a welter of QRM. "Real" amateurs can help the Novice to become a General, as will be discussed shortly.

What Amateurs Can Do!

Let's make 1975 the Year of the Novice! Let's set a goal of an *increase* of 5,000 new Novices over the annual rate for 1975, and over 10,000 in excess of the annual rate for 1976. We now have about 20,000 Novices, a pitifully small number. Let's boost this to 25,000 this year and to at least 30,000 by the end of 1976. And let's make sure that a high percentage of Novices become General class licensees! Here's what we amateurs can do *immediately:*

1—*Make it a point to know the Novices* and search out the would-be Novices in your area. Encourage the pre-Novices. Invite beginners and Novices to local radio club meetings so they can meet the gang. *Assign a licensed, General class* (or higher) *amateur to be a "Big Brother" to Novices and pre-Novices.* Let the Novice sit-in at a multiple operation station in a DX contest. Invite him to observe an OSCAR contact. Take him up to see the repeater station on the hill. Get DX stations to listen for Novices on 80 meters. I'll bet some hot-shot 80 meter DX operators such as my old pal Bill, ZS6DW, would be pleased to listen for Novice signals! And other DX'ers will do it, also! Help local Novices with additional code practice, and work them on the air. Encourage them to study the code. Help them with their problems! Get them active on the air and into the swim of things!

2—*Take a CBer to lunch!* Get to know the local CBers. It will not take much time to separate the sheep from the goats. When you find an intelligent CBer (there are plenty) encourage him to step up to amateur radio! Why let a good, prospective amateur fester in the swamp hole of 11 meters when he can enjoy the broad, sunny uplands of amateur radio? Lure him away from CB radio and he'll thank you for it in the long run!

3—*Invite Novices and technically-oriented CBers to local amateur radio clubs and conventions.* Give them a taste of amateur radio at its finest. Encourage them to "meet the

[*Continued on page 62*]

It's taken almost a year of planning, changing and improving, but the EBC 144 Jr. is now being delivered to hundreds of hams across the country. Compare the specs. You'll find that it does more than any other synthesized two-meter rig on the market, and does it better. Not only is the EBC 144 Jr. the hottest receiver on the market, it offers far more flexibility than other synthesized rigs, even those costing more. It's like two tranceivers in one. Set up one repeater on the A thumbwheels, and another on B.

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CQ Reviews: The Venus Scientific Slow-Scan TV Equipment

BY COPTHORNE MACDONALD,* WØORX/VE1

VENUS Scientific Inc. manufactures a line of slow-scan TV equipment designed for operation using the regular 120/128 line amateur standards. Both the Model C1 camera and SS2 monitor are 100% solid-state with the exception of the vidicon pickup tube and 5 inch-diagonal picture tube. The units are designed to permit easy interconnection with the transmitter and receiver in a typical amateur phone station without modifying the station equipment.

The SS2 monitor features include 9 kv accelerating potential on the CRT, "Accu Sync" which is a scope type presentation of the video/sync waveform, and a compact cabinet. The C1 camera features include a mechanical focus mechanism which permits closeup optical focusing with ordinary C-mount lenses, automatic light level compensation, a built-in black/white bar generator, and provision for feeding a fast-scan output signal to a conventional TV set or monitor to aid camera setup.

The SS2 Slow-Scan Monitor

Views of the SS2 monitor appear in the photos, and the block diagram appears in fig. 1. In addition to its primary function of displaying slow-scan pictures, the SS2 also contains the switching circuitry necessary to allow smooth SSTV operation. The input selector switch allows the receiver, camera, or tape recorder output to be selected as the video input signal to feed the monitor. (The slow-scan signal is a frequency shifted audio tone with different tone frequencies representing different shades of grey. It is this "audio" signal which is generated by the camera and transmitted by the station's r.f. transmitter. 1200 Hz represents "Sync," 1500 Hz "Black," and 2300 Hz "White" in this system.)

The slow-scan signal selected by the input switching circuit is amplitude limited in an op-amp limiter stage. The FM Demod stage converts this varying frequency tone into a varying amplitude voltage which is then amplified and used to vary the CRT brightness by varying the CRT grid voltage. This particular demod uses pulse techniques to achieve the frequency-to-voltage conversion.

The limiter also feeds a sync demodulator circuit consisting of a two stage active filter peaking at 1200 Hz, the subcarrier "Sync" frequency. Rectifying and filtering this 1200 Hz output produces H and V rate pulses which trigger the continuously running H and V unijunction sweep oscillators. The driver for each deflection yoke winding consists of an op-amp with complementary NPN/PNP power tran-

*c/o *CQ*. 14 Vanderventer Ave., Port Washington, N.Y. 11050.

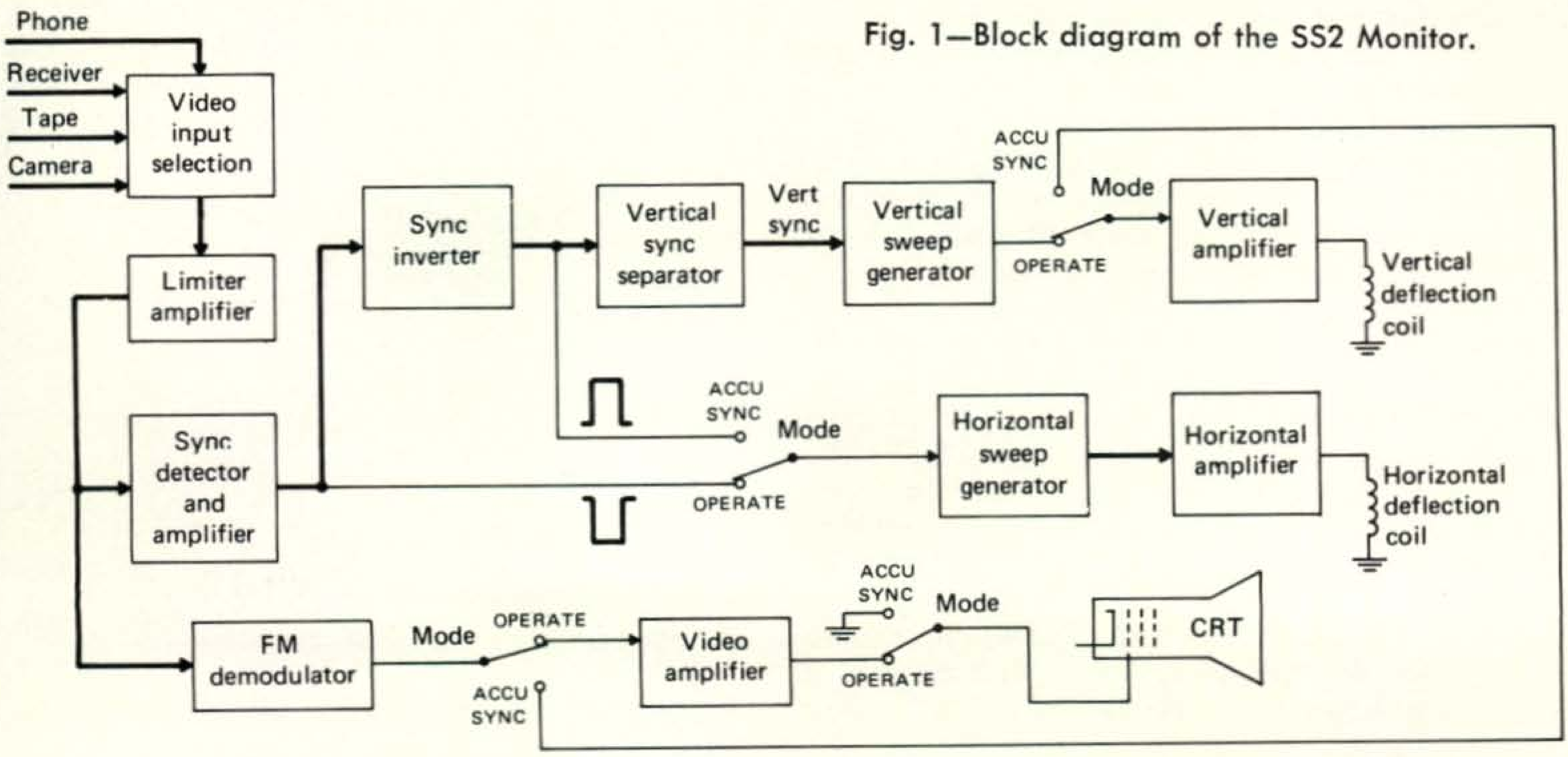
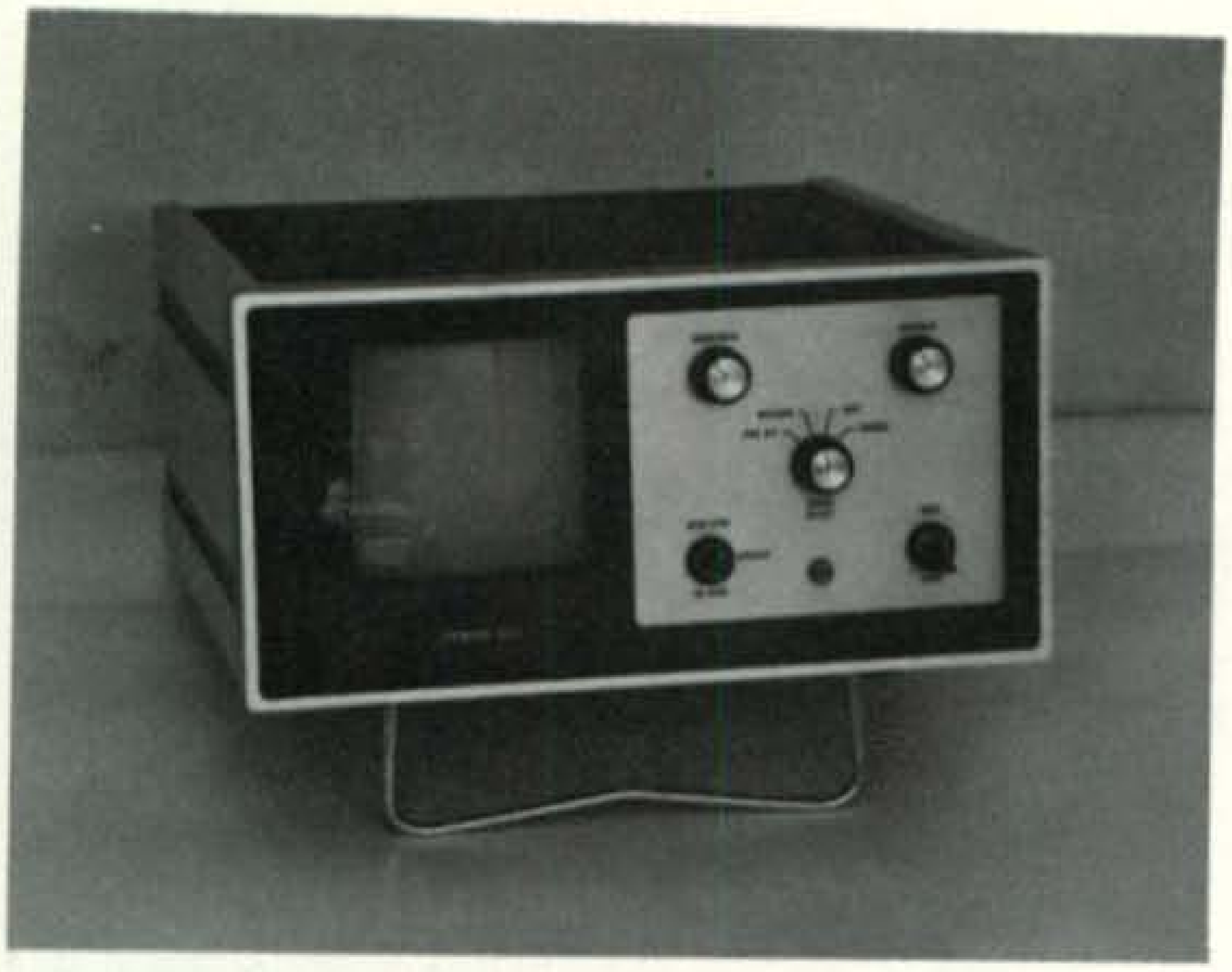


Fig. 1—Block diagram of the SS2 Monitor.



The Venus SS2 Slow-Scan TV Monitor. The bail under the monitor will fold if desired to allow the monitor to sit flat.

sistor pair in a feedback arrangement. This insures linear amplification of the sawtooth voltage from the sweep oscillator. A momentary action switch on the front panel of the monitor allows the vertical sweep to be manually retraced at any time.

The monitor's Accu Sync circuit permits the sync pulses and video to be viewed in "scope display" fashion on the monitor screen whenever the front panel switch is in the Accu Sync position. To accomplish this, the video drive is disconnected from the CRT grid and is fed to the input of the vertical sweep amplifier instead of the vertical sawtooth. The horizontal sweep is also made to trigger on the trailing edge of the incoming sync pulse rather than the leading edge. (This allows the sync pulse to be displayed during the active sweep time.) The pattern is useful for fine tuning the station receiver during SSTV reception. The receiver is simply tuned for maximum observed sync pulse amplitude. (The video portion of the Accu Sync display has somewhat limited utility because the bandwidth of the yoke drive circuit is quite narrow. Fine detail in the video does not show up.)

Most of the monitor circuitry is powered by IC regulated +15 and −15 volt supplies. Venus Scientific has been a supplier of high voltage power supplies for the space program. It's not surprising then that the SS2 uses a 20 kHz oscillator-type supply of their own design to generate the +50, +400, and +9000 volts for the CRT. The CRT filament is always "on" when the monitor is plugged into the a.c. line. This results in an "instant on" feature like that found in many TV sets. The transformer has dual primary windings permitting the monitor to be wired for 115 or 230 volt, 50 or 60 Hz power.

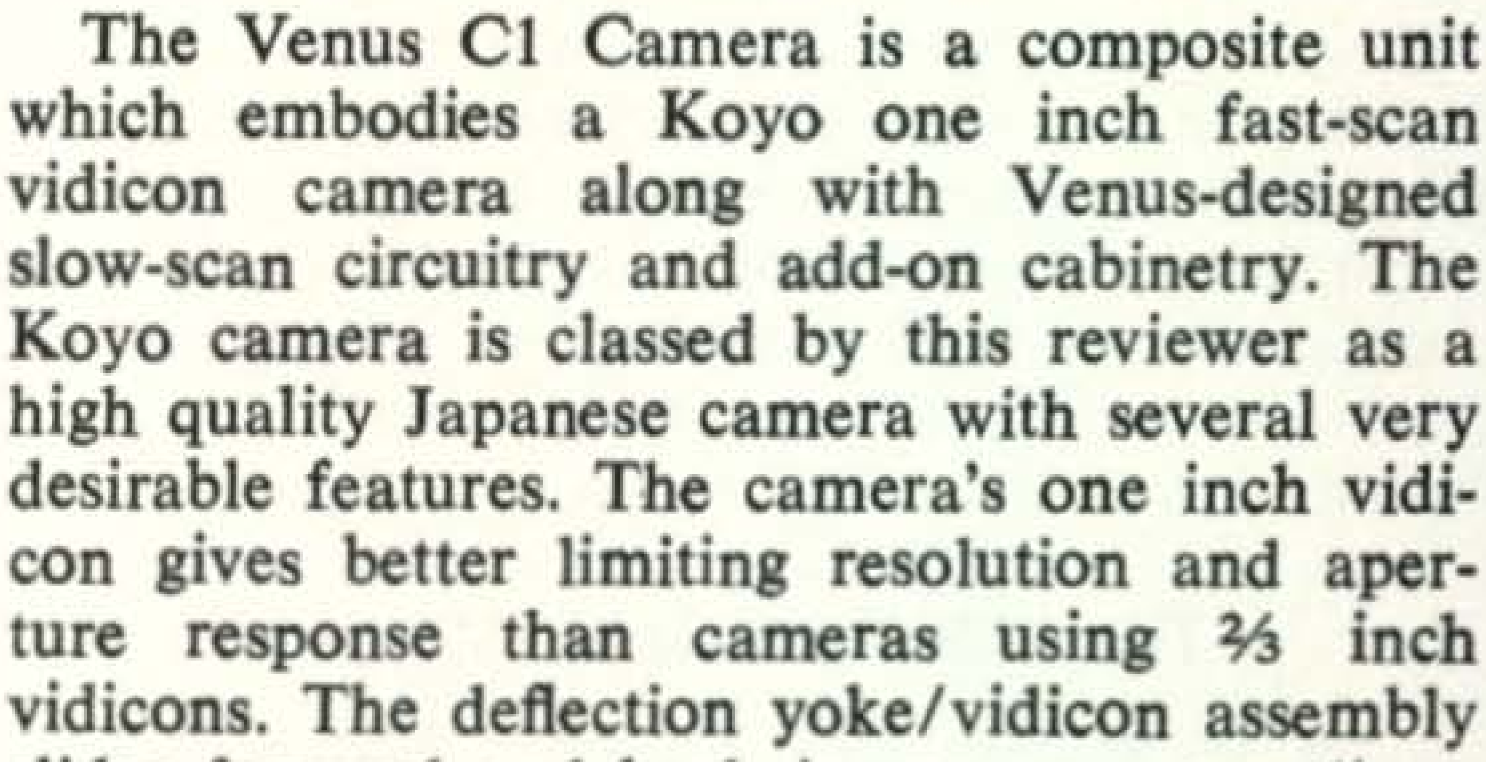
The CRT is a magnetic deflection, electrostatic focus, rectangular screen unit masked to produce a picture approximately 3⅛" square (4 7/16" diagonal). A yellow filter over the face of the tube attenuates the blue flash of the P7 phosphor while passing light from the yellow phosphorescent afterglow. (A viewing hood is available as an optional accessory for use if the monitor must be used in a brightly lighted area.) A protection circuit cuts off the CRT brightness if the horizontal sweep fails.

Other features of the SS2 include its very compact (10¾" W × 5½" H × 13" D) aluminum cabinet with black trim, a name plate which can be personalized with the owner's call letters, r.f. bypassing of the input leads, *LC* filtering of the a.c. line, and the liberal use of integrated circuits.

Available as an accessory for the SS2 is the Model P1 Polaroid Camera Adapter. The adapter permits one-frame time exposures of the monitor screen to be taken with a Polaroid "Colorpac" or "Square-Shooter" camera. The adapter mounts on the front of the Polaroid camera. It contains a closeup lens, and a viewing port which allows the SSTV frame to be viewed before and during the picture taking procedure.

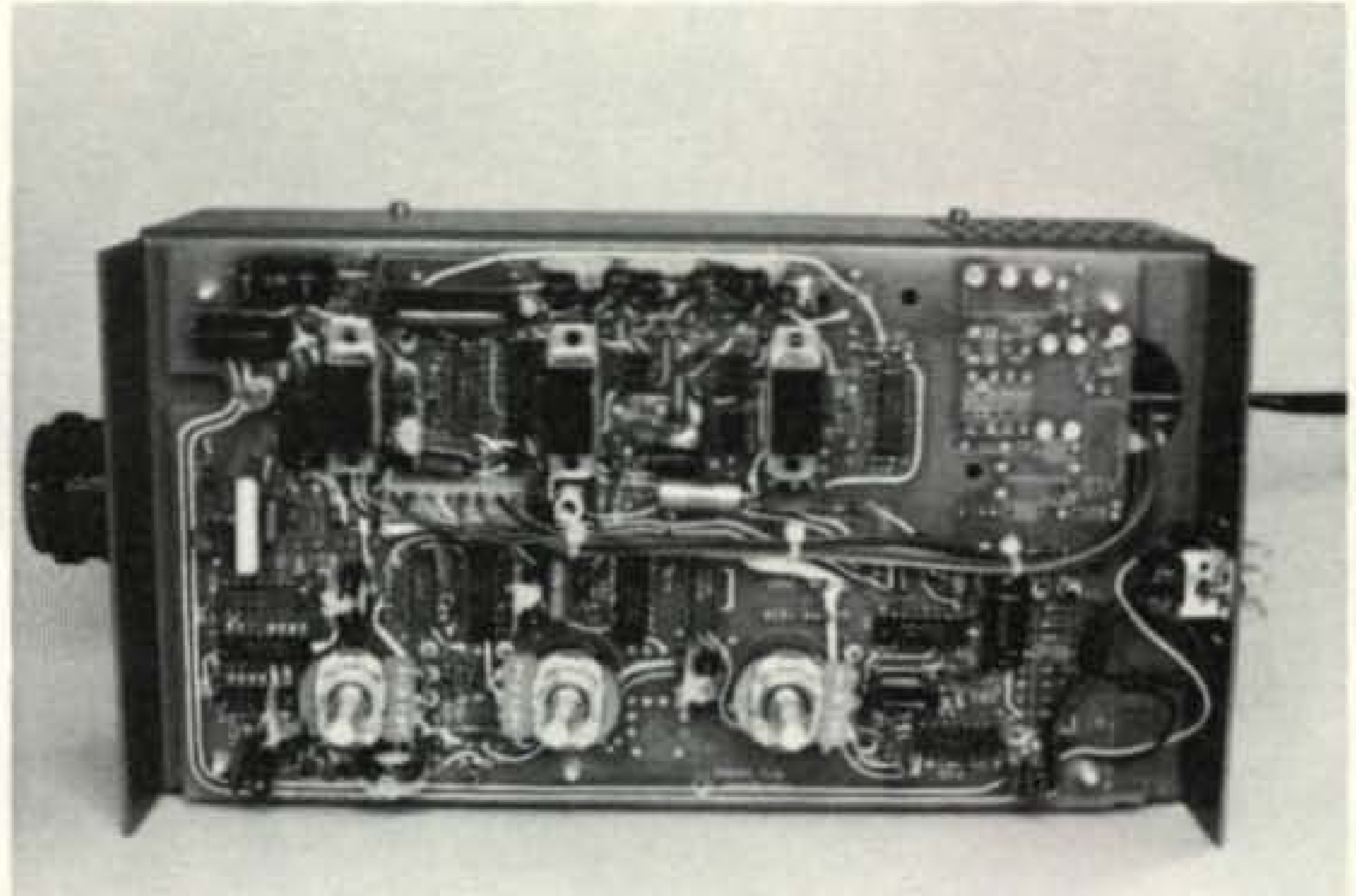
The C1 Slow-Scan Camera

The Venus C1 Camera is a composite unit which embodies a Koyo one inch fast-scan vidicon camera along with Venus-designed slow-scan circuitry and add-on cabinetry. The Koyo camera is classed by this reviewer as a high quality Japanese camera with several very desirable features. The camera's one inch vidicon gives better limiting resolution and aperture response than cameras using ⅔ inch vidicons. The deflection yoke/vidicon assembly slides forward and back in response to adjustment of an optical focus knob at the rear of the camera. This construction permits the use of an inexpensive lens, while still permitting close-up focusing on small objects. The camera sensitivity adjusts automatically to partially compensate for changes in light level. This is accomplished by a circuit which detects the peak video amplitude and automatically adjusts the vidicon target voltage. The camera will



Top view of the SS2 monitor with cover removed.

Fig. 2—The Venus C1 Camera in position for slow-scan TV pickup.



The C1 Camera with cover removed showing the slow-scan circuit board.

supply either of two different fast-scan outputs. One is baseband video which can feed a fast-scan video monitor. The second is an r.f. signal on any desired channel from 2 to 6, to feed a standard TV set.

The complete C1 camera appears in fig. 2. In this view the fast-scan camera has been rotated 90 degrees from its normal position. This is a basic requirement dictated by the sampling scheme which converts the fast-scan camera output to slow-scan. With the C1 camera mode switch in the Slow Scan position, the camera line sweep is nominally 15750 Hz, and the frame sweep is 15 Hz. This gives a raster with about 1048 scan lines. The slow-scan video signal is generated by "sampling-and-holding" the fast-scan video signal in accord with the sampling pattern shown in fig. 3. The first slow-scan line is made up of 1048 samples from the 1048 individual fast-scan lines. The second slow-scan line also has 1048 samples, but from slightly further down the fast-scan lines. And so on. This "baseband" slow-scan viedo is mixed with sync and is used to shift the frequency of the subcarrier oscillator which generates the camera output signal.

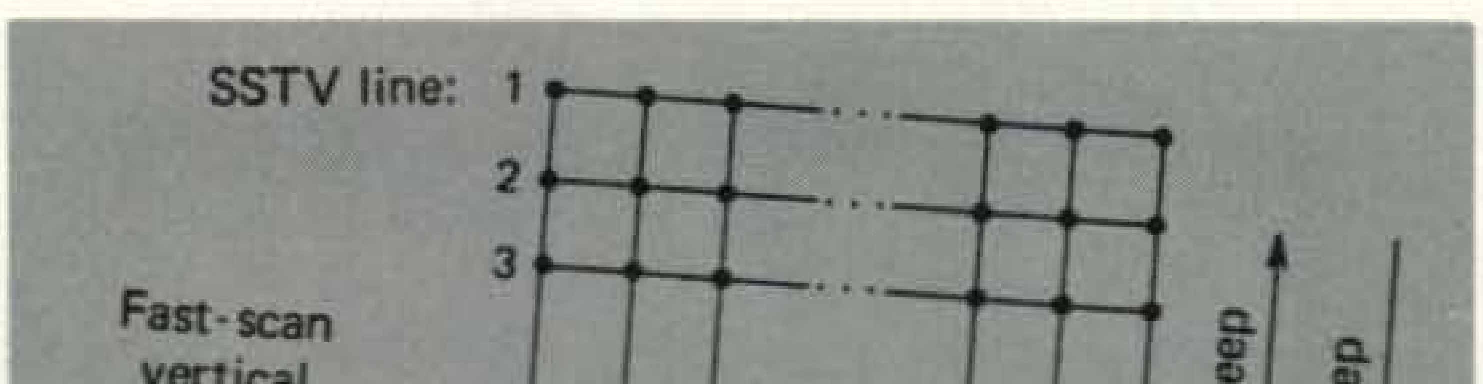


Fig. 3—Diagram showing the slow-scan sampling scheme. (See text.)

The fast-scan viedo is available at an output jack in the Slow Scan mode, but since the frame rate is 15 Hz, the picture won't synchronize if viewed on an unmodified TV set. By switching the mode switch to the Fast Scan position, the camera's fast-scan frame rate changes to 60 Hz and the fast-scan video can be viewed on an ordinary TV set. In other words, at any given time the camera will put out a standard fast-scan TV signal or a standard slow-scan TV signal, but not both simultaneously. As you would expect, the picture appears sideways on the fast-scan TV set if the camera is producing upright slow-scan pictures. (If you have a TV set or monitor which you use *only* for monitoring purposes, you could simply rotate its deflection yoke 90 degrees to get an upright fast-scan picture.) Even with these limitations the fast-scan monitoring capability really speeds up positioning the camera, focusing it, and adjusting the lights.

Venus has designed several desirable features into the slow-scan portion of the camera. A switch on the camera allows the video polarity to be reversed. For example, black letters on a white background can be made to appear white-on-black. The camera contains a built-in black/white bar generator. This feature allows rapid and accurate setting of slow-scan monitor brightness and contrast controls, and speeds up camera adjustment. The camera also contains a continuously variable frame length control permitting selection of any frame length from quarter to full. The remaining operator controls are Contrast which sets the peak-to-peak amplitude of the baseband video, and Brightness which adjusts its d.c. level.

Like other sampling cameras, the Venus C1 does not freeze motion. Motion during the 8½ second frame time will result in a distorted, though "in-focus" image. (Sitting still enough to produce good pictures of people is not really very difficult.)

The camera is supplied with a 25 mm f/1.8 fixed iris lens. The camera has rubber feet and

[*Continued on page 64*]

antennas

BY WILLIAM I. ORR,* W6SAI

"What are you doing," said Pendergast as he slouched down on his spine in my favorite easy chair. "Working on your income tax return?"

"Thanks a lot," I replied. "I don't do *that* until the last possible moment. And this isn't the last possible moment."

"Well," Pendergast replied, "Let's talk about something *nice*. Have you gotten any interesting letters about your *CQ* column?"

"Plenty," I replied. "Especially the column on vertical antennas. I'm still getting feedback on that one. Also 'invisible' antennas are a hot subject. And 80 meter antennas are coming into interest, as the sunspot cycle drops. Lots of interest in 80 meter DX antennas."

"Suppose you let me hear some of the letters," suggested Pendergast.

"Why not?," I replied. "Here's a short note from Joe, WA7GSM, who has an interesting 80 meter antenna. It is a modified Quad loop (fig. 1) whch is slung from a single 45 foot pole. Each antenna corner is about 25 feet off the ground and the feed point is 8 feet off the ground . . . sort of a squashed diamond arrangement. Joe uses a commercial 4-to-one balun at the feedpoint and a 50 ohm coaxial line. He says the diamond seems to present a feed point impedance of about 250 ohms. The s.w.r. runs about 1.5 at 4 MHz, dropping to unity at 3.8 MHz."

"Well, according to that, Joe should be able to use the diamond loop all the way down to 3.5 MHz," said Pendergast.

"It would seem that way," I replied, "Although he didn't give any s.w.r. readings below 3.8 MHz."

"Loop antennas are very forgiving," said Pendergast. "I like to use them in preference to single wires, which sometimes can be very nasty."

"Here's another interesting letter from Roger, K8ZKF, telling about his experiences with various antennas. He came to the conclusion that a 20 meter ground plane, ground mounted with 12 radials, was comparable to a dipole at about 30 feet. Out to about 1200 miles, the dipole seemed best in its broadside direction, but past 1200 miles, the ground plane seemed a bit better. He felt in all cases, however, the dipole was better for receiving than the vertical."

"Probably because the vertical antenna is more susceptible to man-made noise than the horizontal," interrupted Pendergast.

"Roger's conclusion is that the biggest mistake hams make with a vertical antenna is to use it as a limted space antenna. For best results, the vertical needs plenty of room around it, and plenty of radials if it is close to the ground."

"I agree," said Pendergast." Look at this letter you got from Bob, HL9UB in Korea. He's within shouting distance of HL9TC, Dick, and they have been running comparisons on phone patches to the United States. Bob started out with a tri-band vertical antenna with the base atop a 30 foot pole. It had four radials for 40 meters and six radials for 20 meters, all sloping down as guy wires. Both Bob and Dick ran the same power. Well, HL9UB's vertical antenna ran about one S-unit worse than the three element Yagi beam at HL9TC, which was 40 feet high. Also, the vertical antenna was noisier on receive than the beam. Eventually, HL9UB raised his ground plane so the base was about 65 feet in the air and found that he and HL9TC were running about equal, as far as signal strength reports went. He says, 'I admit that there are antennas which are better than a vertical, but for limited space, easiness on the eyes (from a landlord's point of view), and overall performance a *high* vertical antenna with *lots of radials* is tough to beat!' "

"Well, HL9UB should QSO Jack, K2JFJ, some time," said Pendergast. "Jack likes a five band ground plane and has worked a staggering

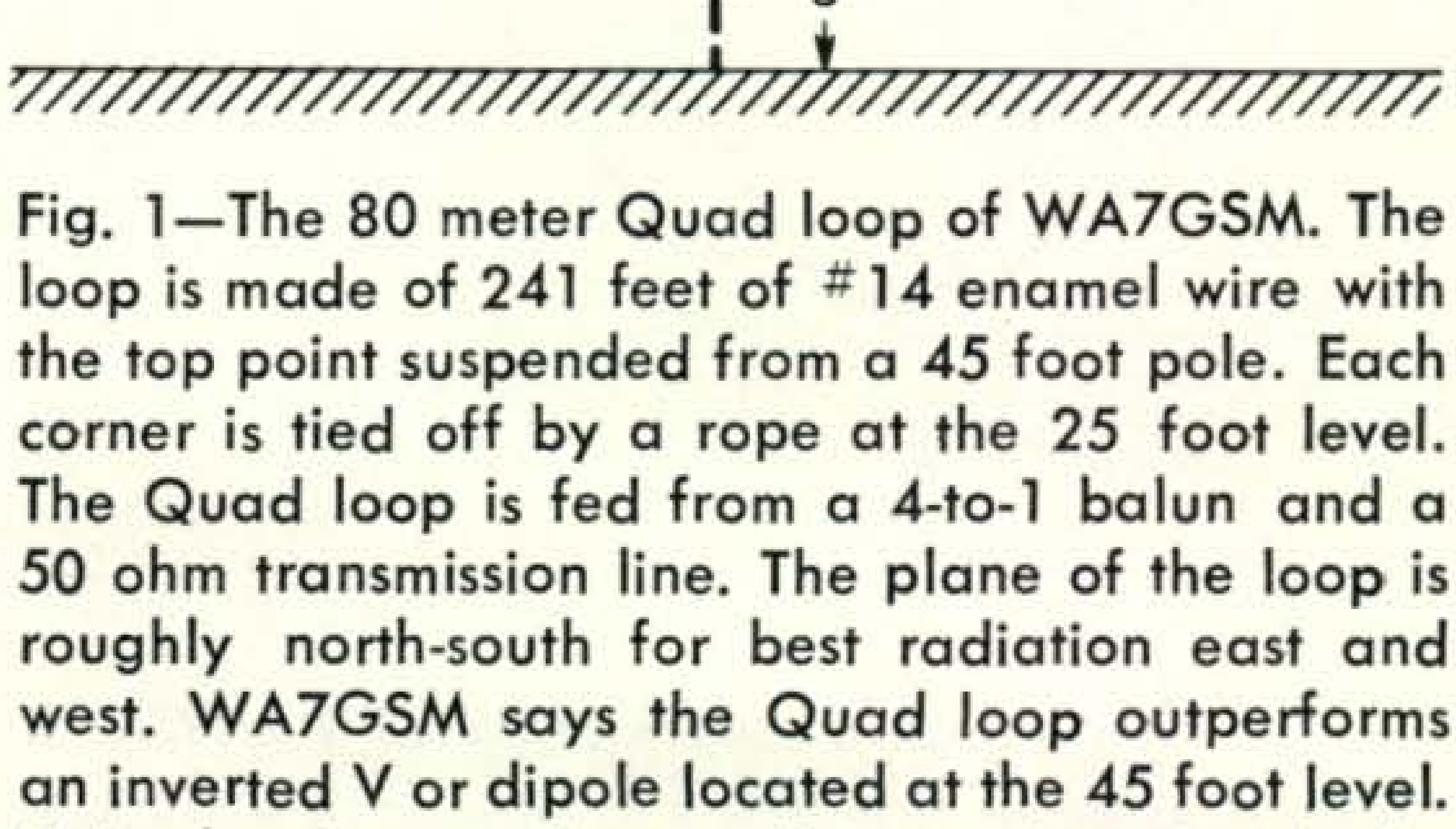


Fig. 1—The 80 meter Quad loop of WA7GSM. The loop is made of 241 feet of #14 enamel wire with the top point suspended from a 45 foot pole. Each corner is tied off by a rope at the 25 foot level. The Quad loop is fed from a 4-to-1 balun and a 50 ohm transmission line. The plane of the loop is roughly north-south for best radiation east and west. WA7GSM says the Quad loop outperforms an inverted V or dipole located at the 45 foot level. He's planning to place a 40 meter loop inside the 80 meter one, and feed it with the same balun and transmission line.

*48 Campbell Lane, Menlo Park, CA 94025.

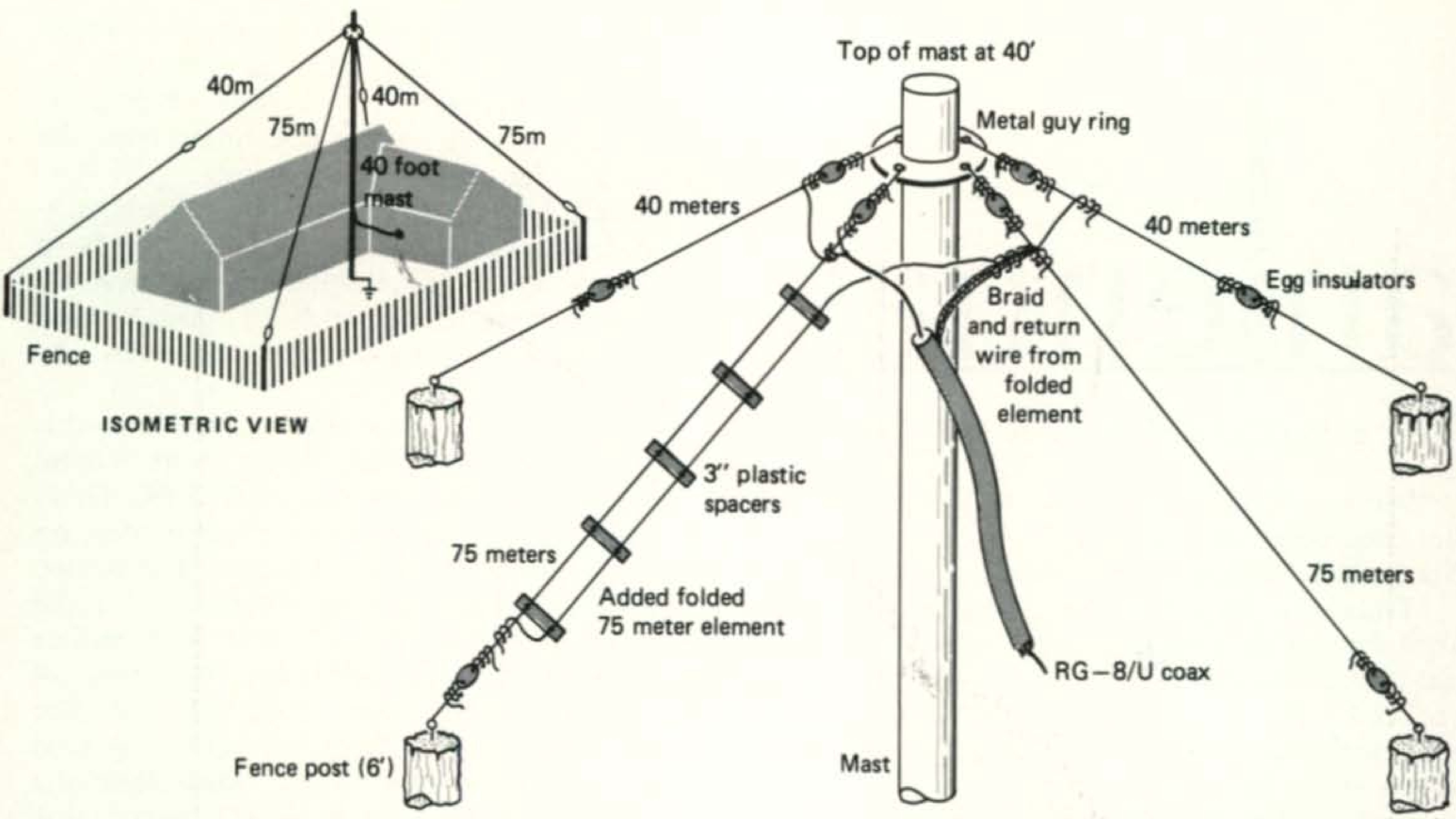


Fig. 2—The W5TNX double inverted-V for 40 and 80 meters. To raise the feedpoint impedance of the 80 meter antenna, the fed-portion is made folded (as shown at left). The center conductor of the coax line is attached to one 40 meter wire and to one of the folded wires of the 80 meter section. The braid of the coax is attached to the other 40 meter wire, to the other 80 meter wire and also to the return wire of the folded 80 meter section.

amount of DX with 150 watts. Anyone who can pull UK7LAJ out of a pile-up on 20 meters with that amount of power must have something going for him. Look at the copy of his log book." Pendergast tossed a thick pile of papers to me that read as if K2JFJ was running a one man DX contest. "Listen to what Jack has to say." And Pendergast read, "My 5 band vertical was intially installed as a ground mounted vertical with 13 radials, buried just beneath the grass. About 17 feet away was a

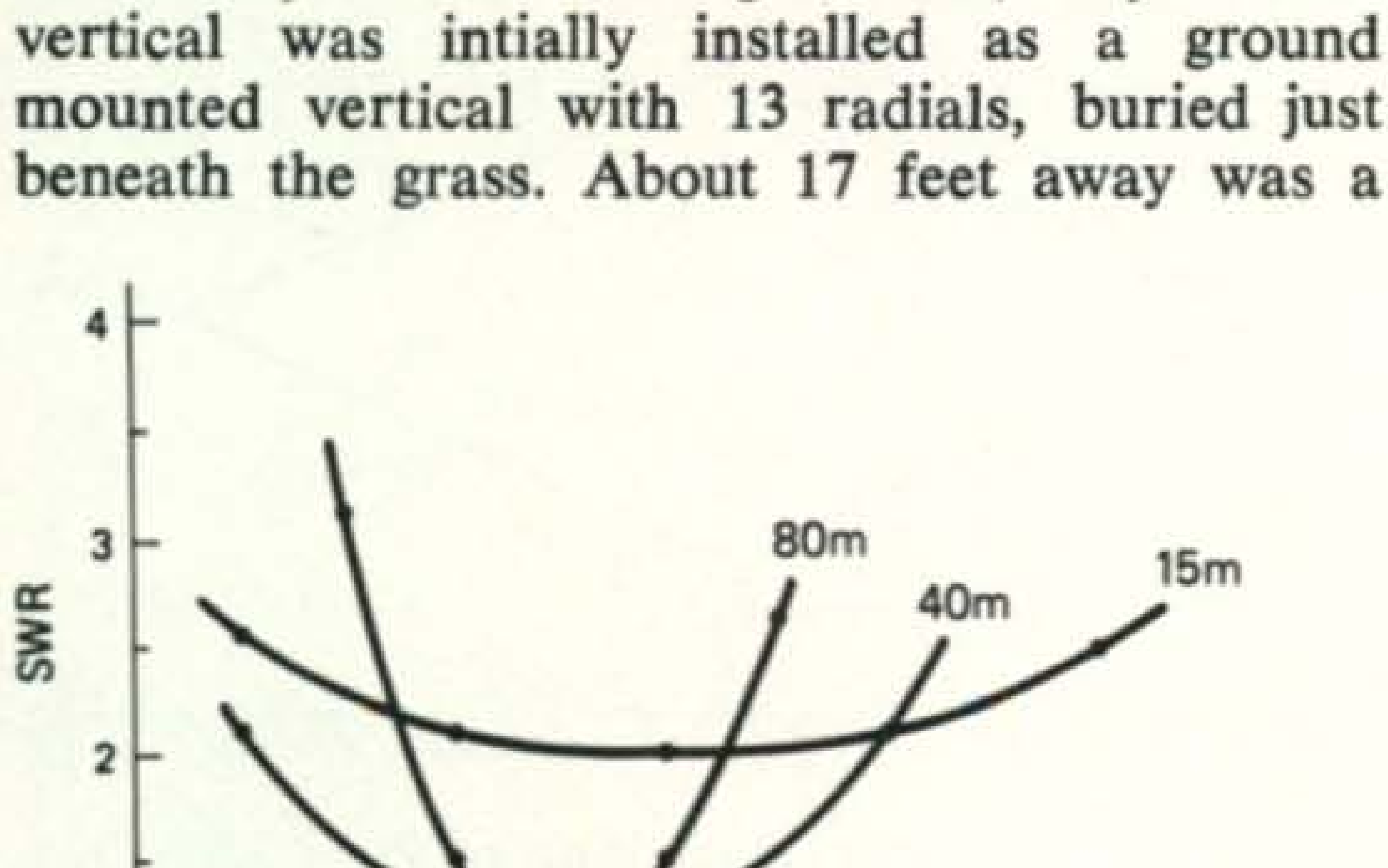


Fig. 3—Representative s.w.r. curves for the W5TNX triband, inverted-V antenna system. Overall length of the 80 meter portion is 120 feet (60 feet per leg). Overall length of the 40 meter portion is 65 feet (32 feet, six inches per leg).

four foot cinder block retaining wall with a 4 foot high chain link fence atop it. Since antenna performance didn't seem too good, I raised the vertical on top of a 20 foot steel pipe and increased the number of radials to twenty. There were 5 radials for 10 meters, 6 for 15 meters, 4 for 20 meters, 4 for 40 meters and one for 80 meters. The radials, instead of being buried, now acted as guy wires for the antenna, sloping down from the 20 foot level. In my opinion, the performance DX-wise improved greatly, as well as the ground wave performance for local rag chews.

"Last year I installed a three element triband beam on a 30 foot tower. Needless to say, the beam outperforms the vertical on comparative tests to Europe. However, when band conditions are top-notch, the reported difference between beam and vertical is sometimes very slight."

"Well, there you are," I said. "It seems that a vertical antenna won't beat a good beam, but if the vertical is high in the air, and has a sufficient number of radials, it will give a good performance and will work plenty of DX. Things tend to get tricky when the vertical is mounted close to the ground, as ground losses and the proximity effects of nearby objects tend to mask out antenna performance." I turned to Pendergast. "Does that sound like the definitive word, as far as vertical antennas go?," I inquired.

"The case is closed," cried Pendergast, "That is, until the next bunch of mail comes in. But I believe that your statement that a vertical antenna is one that radiates equally poorly in all directions is no longer valid."

I ignored the thrust and returned to the pile of mail. "Here's an antenna I like," I said. "It is designed by Jim, W5TNX, who uses it on 75, 40 and 15 meters, in addition to MARS work just outside the top end of the 75 meter phone band (fig. 2). Basically, the antenna consists of two inverted-V dipoles, cut for 75 and 40 meters and supported at the center by a telescoping 40 foot TV mast. The wire elements are cut for the 75 and 40 meter bands and are used as supporting guy lines for the mast. Strain insulators insulate the wires from the mast guy ring and the 50 ohm coaxial line feeds one leg of each dipole while the braid attaches to the other legs. The cable is taped to the mast. The 40 meter dipole operates as 3 half-waves on 15 meters."

"Well, what's so tricky about that?," demanded Pendergast.

"This," I replied. "The antenna exhibited a high value of s.w.r. on 75 meters, probably due to low feed point impedance, as compared to the 50 ohm feedline. Jim raised the feedpoint impedance of the 75 meter system by making *half of a folded dipole,* as shown in the drawing. The resulting s.w.r. curves for the three bands are shown in fig. 3. The exact value of center impedance for either antenna can be varied slightly by raising or lowering the tips of the antennas."

"A good idea," said Pendergast. "The 75 meter antenna resembles a folded unipole, with a single radial wire."

"An apt comparison," I admitted.

"Here's a fun letter from Dave, W3DBA," said Pendergast, rummaging around in the stack of mail. "He's using a drainpipe for an antenna."

"A drainpipe," I exclaimed. "Do you mean a *downspout?*".

"Right," replied my friend. "Dave lives in an apartment where antennas are *verboten.* He's on the ground floor, and the drainpipe, or downspout, is 3 stories tall—about 28 to 30 feet. He tunes it with a homebrew transmatch antenna tuner for operation on 40 through 10 meters. He has a set of 3 haywire radials for each band running close to the apartment wall, near the ground. So far he's worked WAS on 40 meters, and 45 countries including JA and ZL on 20 meters. The shack is in a corner room, near a window, and he runs the radials along two outside walls of the building. Dave says he's pretty well pleased with the results, but sometimes he calls and calls with no results. He says when WWV sends N (normal propagation conditions) he does pretty good, but when WWV sends U (unsettled), he doesn't

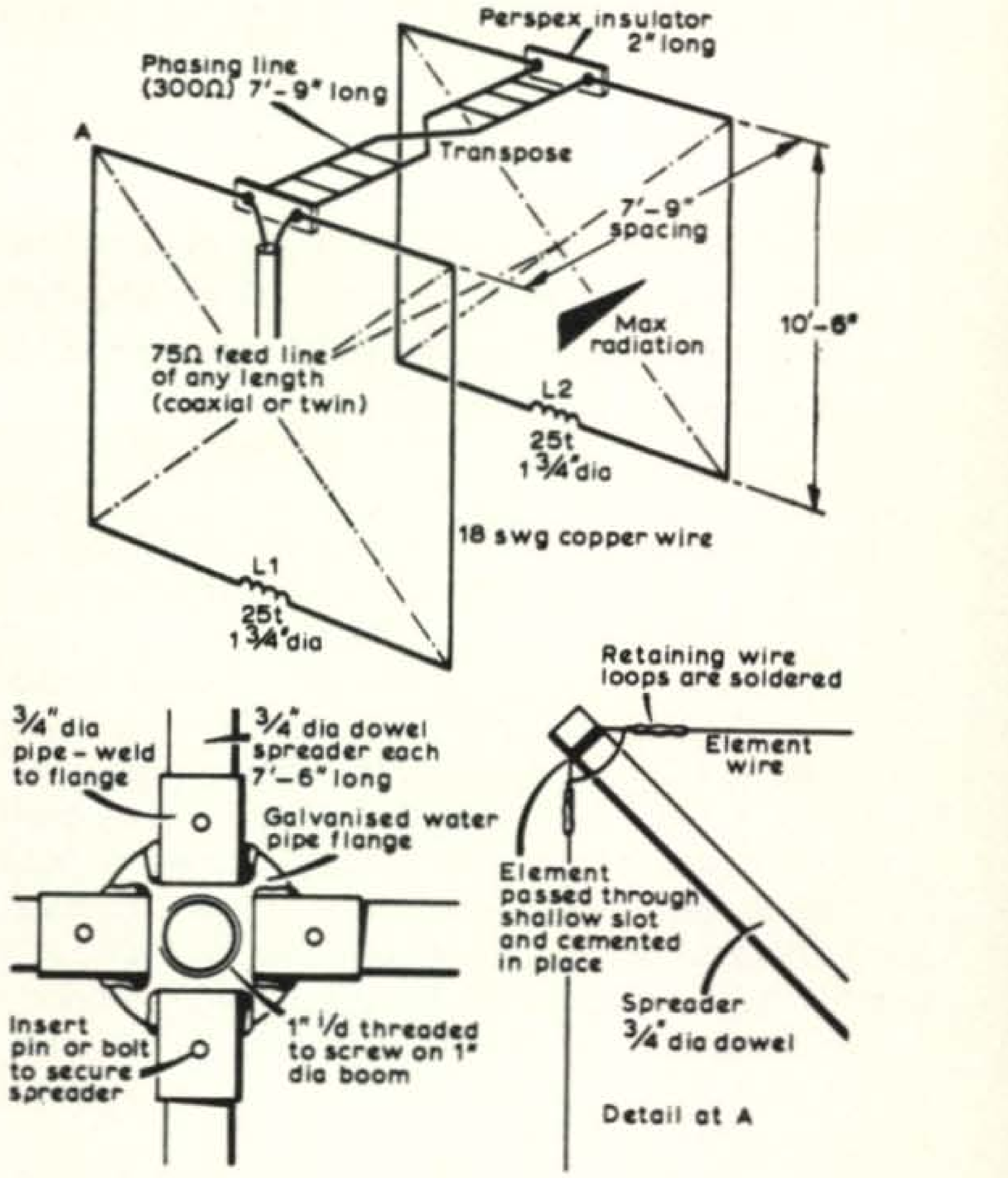


Fig. 4—The G3PHO mini-Quad for 20 meters. Both square loops are driven through a 300 ohm open-wire line (transposed). The rear loop is fed with a transmission line at the top center of the element. Loading coils are placed at the center of the bottom wires of the loops. (Drawing courtesy of *RSGB* and *Radio Communication*).

get out very well at all."

"Maybe WWV has put the hex on him," I replied.

"I can sympathize with Dave," said Pendergast. "When WWV transmits U5, I can't punch my way out of a paper bag." After a pause, Pendergast picked up a small magazine with a bilious purple cover and said, "Did you see the neat mini-Quad antenna in the January issue of *Radio Communication,* the RSGB publication?"

"No," I replied. "The magazine just arrived and I haven't had a chance to look through it."

"Well," said Pendergast, "You had better read your mail quickly. I see a great article by Pat Hawker, G3VA, called *Technical Topics.* He discusses a mini-Quad antenna which was designed by G3PHO, who used it when he was operating as ZL2BDA (fig. 4).

Pendergast continued, "To quote *Radio Communication . . ."* Among the attractions are that it can quite easily be made by one person, is much less conspicuous than a full-size Quad, has a performance at long distances which is claimed to be distinctly better than verticals and dipoles and, indeed, as good as the 14 MHz

[*Continued on page 70*]

An Introduction to Active Filters

BY DON KESNER,* W7EIJ

The active filter is solidly established as a valuable tool for the amateur, yet too few of us have more than the faintest notion of how to go about designing one. The "cookbook" approach described here puts the active filter comfortably into the ham's bag of tricks.

THERE have been an overwhelming number of active filter designs proposed and built in the last twenty years. Of these, perhaps three or four stand out in simplicity or filter parameter stability. Of the simple, single amplifier variety there are positive and negative feedback types. Although high-pass, low-pass, and band-pass configurations are possible with each, we'll only examine the ones that seem to show the most advantages. These include positive feedback circuits for low-pass and high-pass filter sections (figs. 1 and 2) and negative feedback for bandpass (fig. 3).

Schematics shown in figs. 1 through 3 are called "second order" sections, and may be cascaded to form higher order filters with improved rejection characteristics. Used alone, a single low-pass section has a normalized attenuation curve rolling off at a rate of −40 db/decade beyond the 3 db cutoff frequency (fig. 4). Another approximation to the slope is −12 db/octave, which means a factor of 4 decrease in amplitude for each doubling in frequency. For example, a section with f_c (cutoff frequency) at 1000 Hz would attenuate a 2 kHz signal to ¼ the d.c. or low frequency gain, and a 10 kHz signal would be 1/100 (−40 db). High-pass sections show a similar, but reversed characteristic (fig. 5) with a slope of +12 db/octave or +40 db/decade.

*2182 E. Concorda Dr., Tempe, AZ 85282.

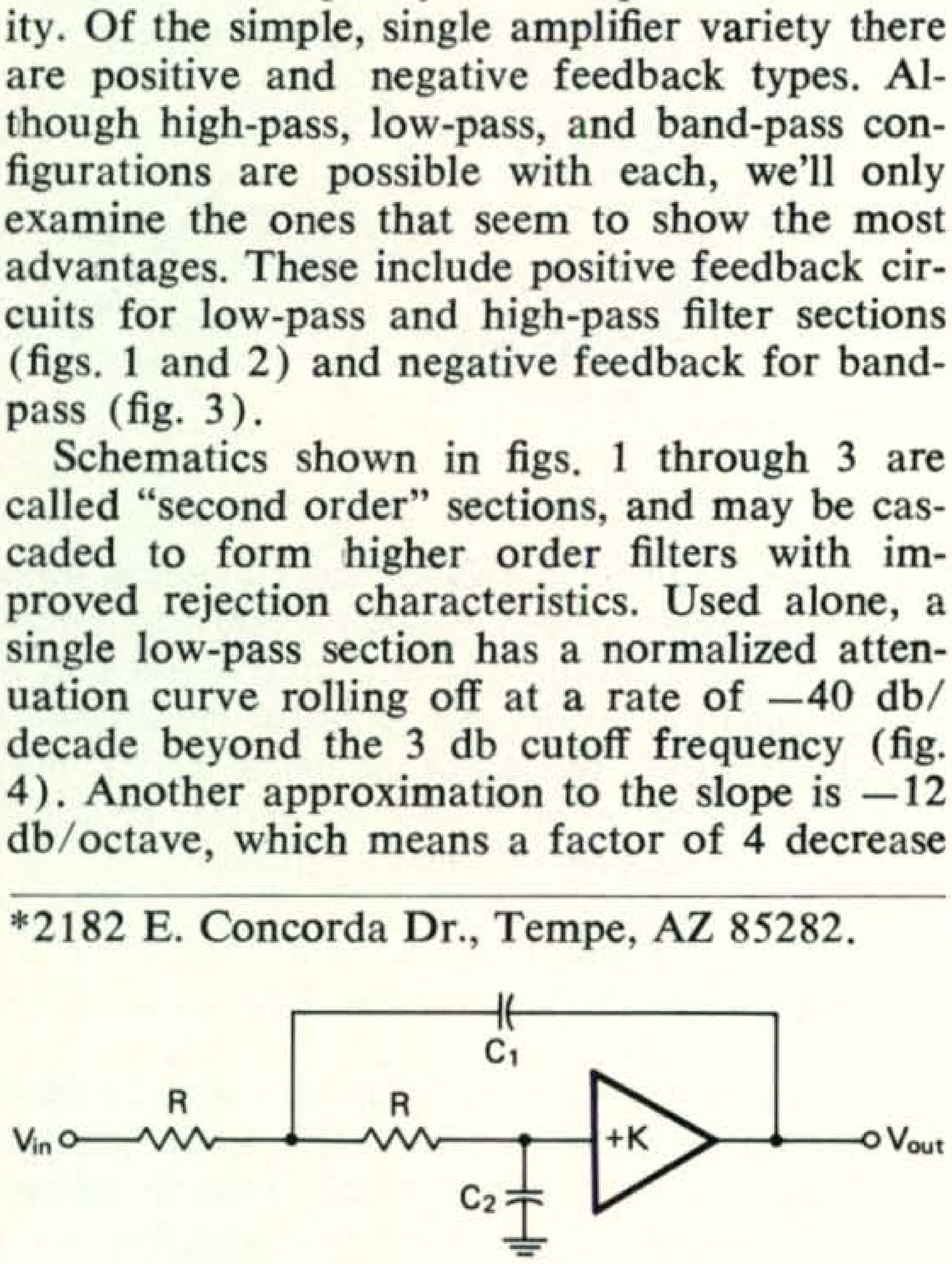


Fig. 1—Two pole low-pass active filter.

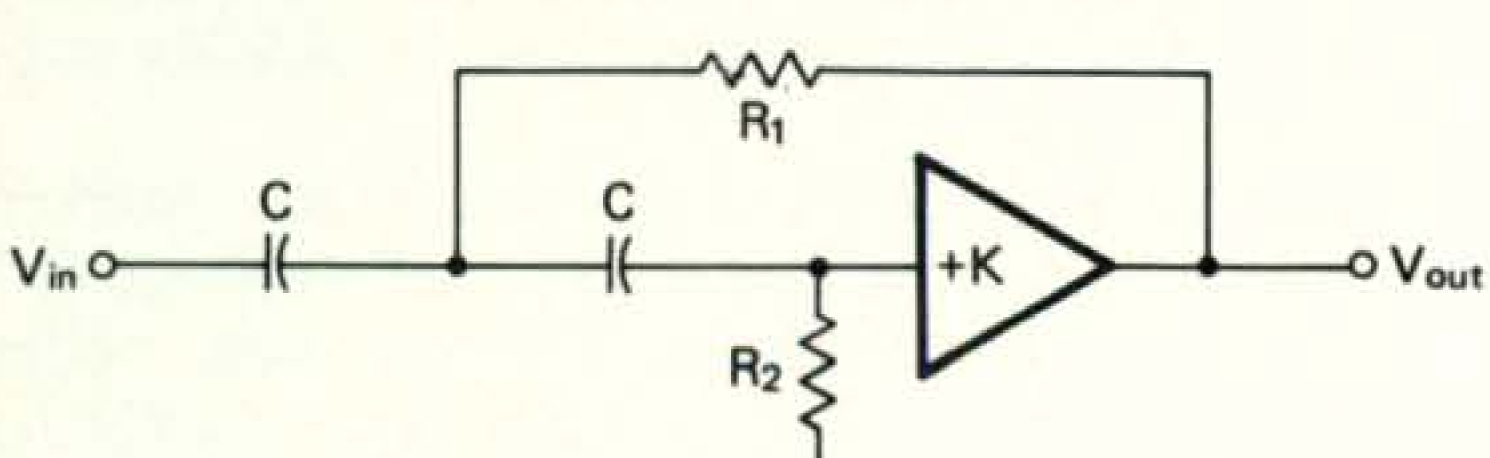


Fig. 2—Two pole high-pass active filter.

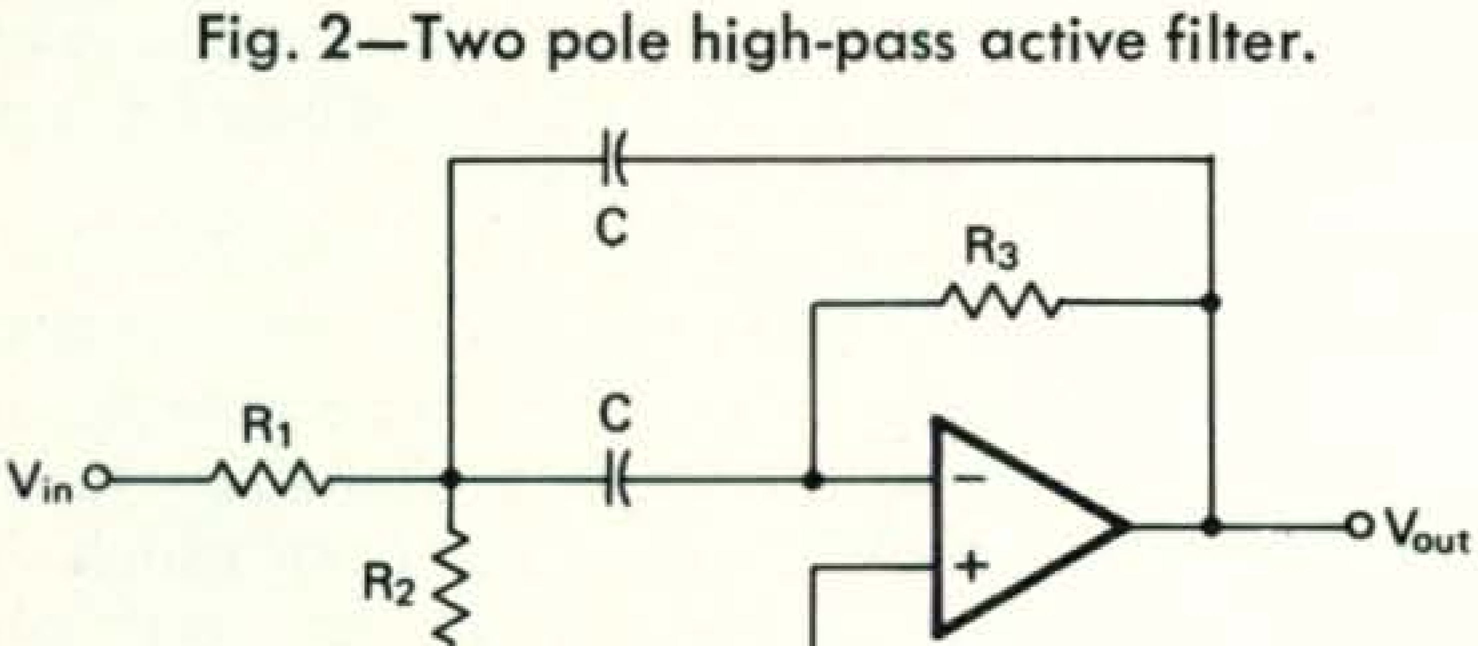


Fig. 3—R-C active bandpass filter.

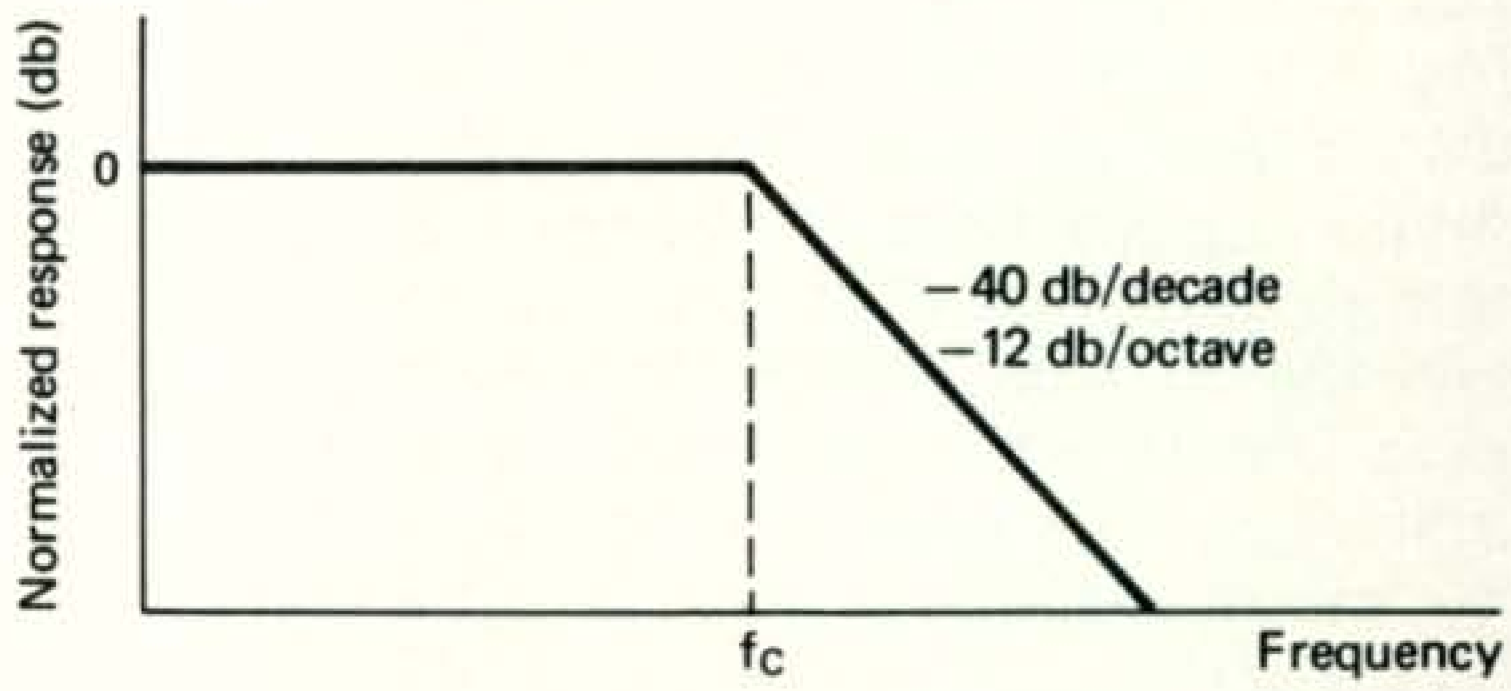


Fig. 4—Normalized low pass filter response vs. frequency.

Initial Design Steps

Bandpass sections have response characteristics dependent on Q (fig. 6) although in the lower and upper frequency limits the slope approaches 20 db/decade. Small bandwidths (high-Q's) are handy for selecting one frequency out of a group, but high-Q single section resonators tend to ring on impulses and "stretch" data ones and zeros into each other. All that means is that faster modes of transmission (such as RTTY and 35-w.p.m. c.w. operators) require a lower Q or wider bandwidth filter than one designed to receive my fist. An added disadvantage is stretching of unwanted noise pulses that tend to mask the real signal.

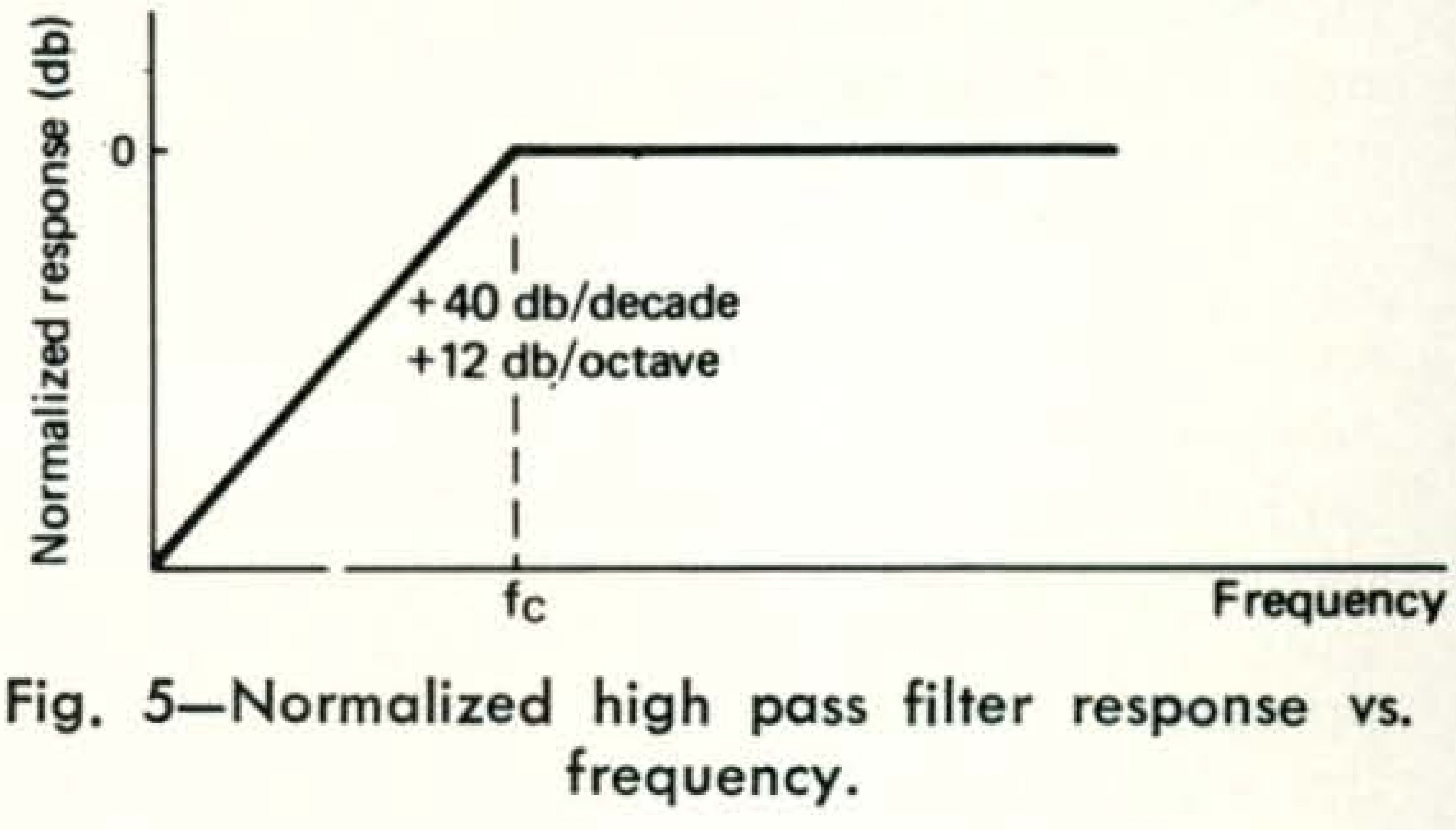


Fig. 5—Normalized high pass filter response vs. frequency.

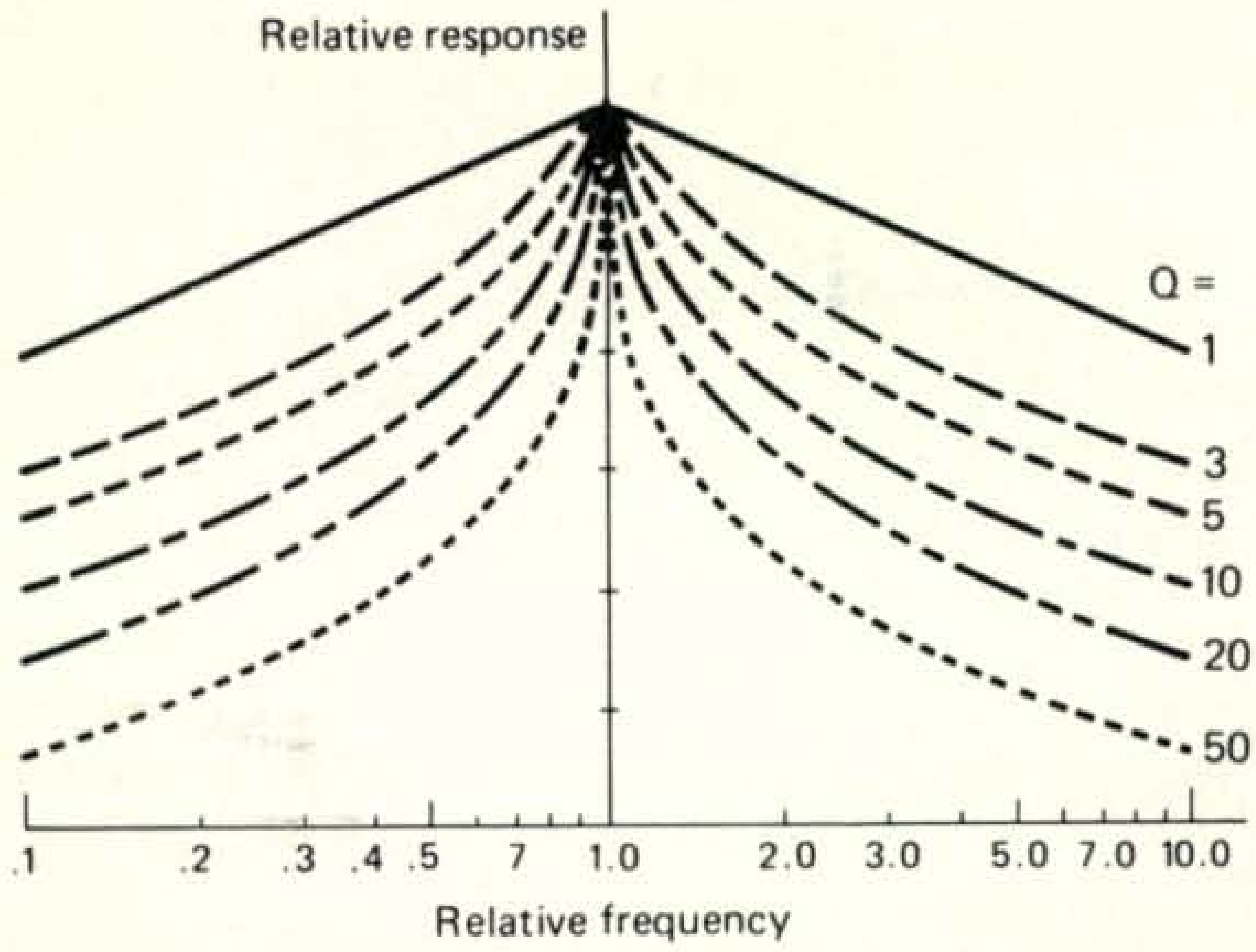


Fig. 6—Relative response vs. frequency of bandpass filters for different Q's.

Adjustment of the center frequency is desirable for hour after hour operation to minimize operation fatigue, or as an alternate means of tuning and tracking a slowly drifting signal. The design utilized here is capable of center frequency variation without affecting bandwidth.

Both the low-pass and high-pass sections are designed by choosing one component and calculating the other. In the case of our low-pass design, it is a matter of choosing resistor value R and computing C:

$$C_2 = \frac{1}{2\pi f_c R}\left[.35 + \sqrt{\frac{K}{2} - .375}\right]$$

$$C_1 = \frac{1}{R^2 C_2 (2\pi f_c)^2}$$

For amplifiers with a gain of "1" these equations simplify to:

$$C_2 = \frac{.71}{2\pi f_c R}$$

$$C_1 = 2C_2$$

The case for unity gain is particularly important, since it can be realized with an emitter follower stage if desired.

Calculations for component values in the high-pass section are very similar to those above with R's and C's interchanged:

$$R_1 = \frac{1}{2\pi f_c C}\left[.35 + \sqrt{\frac{K}{2} - .375}\right]$$

$$R_2 = \frac{1}{C^2 R_1 (2\pi f_c)^2}$$

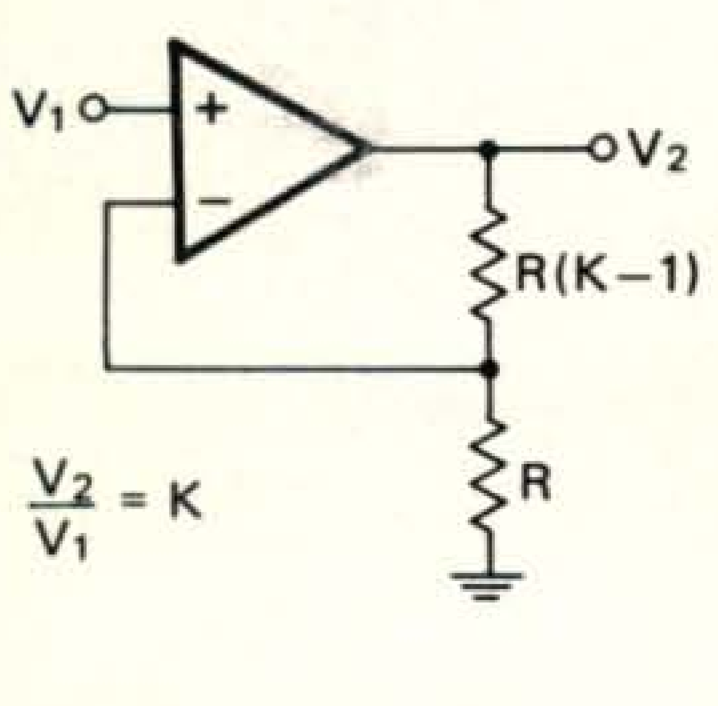


Fig. 7—Non-inverting gain with op amps.

If $K = 1$, these both simplify to:

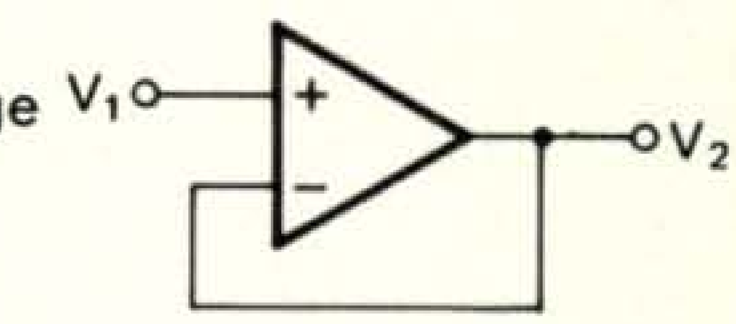
$$R_1 = \frac{.71}{2\pi f_c C}$$

$$R_2 = 2 R_1$$

After a convenient value for C has been chosen, as well as pass-band gain K, values for R_1 and R_2 may be calculated.

Before covering the bandpass section some consideration should be given to choice of the amplifier configuration to secure a gain of K. By far, the simplest and most stable means of achieving a positive gain is by an operational amplifier with its accompanying feedback network (fig. 7). The absolute value of resistors R and $R(K-1)$ may vary from several thousand ohms to a megohm or more, as long as the ratio remains $K-1$. Note that for designs requiring unity gain, the $(K-1)$ term goes to zero and one of the resistors becomes a short. In these cases, the remaining resistor only serves as a load on the amplifier output; hence, it may be removed (fig. 8).

Fig. 8—Unity gain stage (buffer).



Active Filter

The bandpass configuration shown in fig. 3 is simple and useful for relatively mild Q's (<10) in the audio band using inexpensive operational amplifiers. Calculation of component values begins with selection of capacitor C, and inputs such as center frequency (f_0), center frequency gain $A(f_0)$, and circuit Q. Calculations for resistors R_1, R_2, and R_3 is as follows:

$$R_3 = \frac{2Q}{2\pi f_0 C} = \frac{Q}{\pi f_0 C}$$

$$R_1 = \frac{R_3}{2A(f_0)}$$

$$R_2 = \frac{R_1 R_3}{4Q^2 R_1 - R_3}$$

Computations for R_2 can possibly show a negative value if a high value of gain and low-Q are simultaneously required. When this rare circumstance arises, lower the gain in this stage and pick it up in a later amplifier.

Examination of the defining equations for frequency, gain, and bandwidth reveals that resistor R_2 may be changed to alter frequency without disturbing the other two parameters. New values for R_2, given different center frequencies (f_0), can be calculated by the following formula:

$$R'_2 = R_2 \left[\frac{f_0}{f_0'}\right]^2$$

Coupling into and out of this section is simpli-

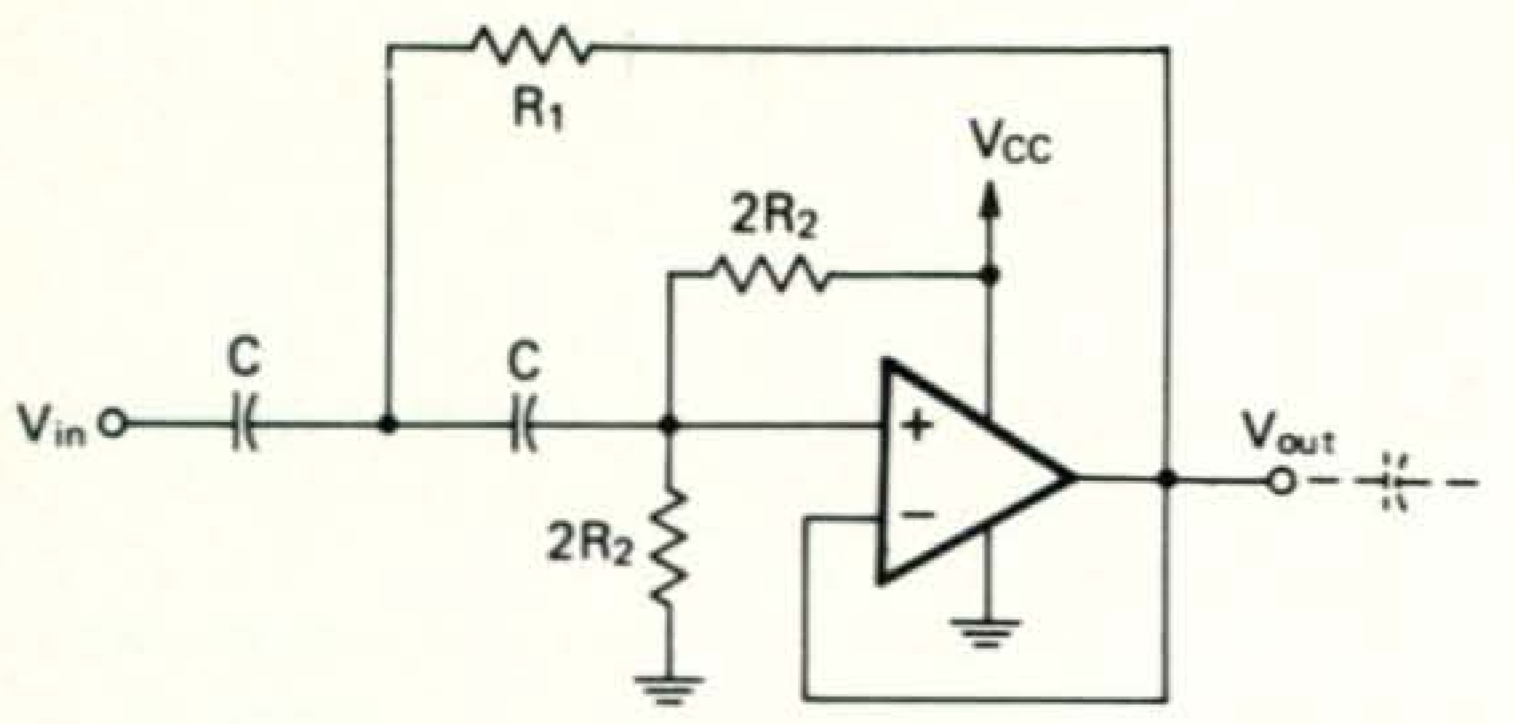


Fig. 9—Single supply operation of the high pass filter of fig. 2.

fied due to the location of section capacitors. No input coupling need be provided for the sake of the filter but keep in mind that the R_1 - R_2 network is a d.c. load to whatever source it is connected. Output isolation usually accomplished by an additional coupling capacitor.

Single Supply Operation

Operational amplifiers are ordinarily used with two supplies of opposite polarity in order to function about a ground reference. These supply voltages may vary from 5 to 15 volts, and they can have considerable ripple without detrimental effects. However, single supply operation is possible by "biasing" the input stage to a level equal to one-half the supply voltage level. This is particularly attractive for the high-pass section, where it only amounts to splitting R_2 into two components each equal to twice the calculated value (fig. 9). In order to isolate the output from any unintentional d.c. shorts to ground, capacitive coupling is suggested.

Level shifting for single supply operation in the bandpass case amounts to connecting one op amp pin to a voltage equal to half the supply value. A simple method is a bypassed resistive divider from V_{cc} (fig. 10).

Design Examples

Two of the most popular filter frequencies encountered in voice communications are 300-Hz and 3000-Hz. This is a low-pass/high-pass combination that minimizes frequencies outside the band necessary for transmission of voice information. If split power supplies are available, a combination of figures 1 and 2 could do the job (fig. 11). For the sake of illustration,

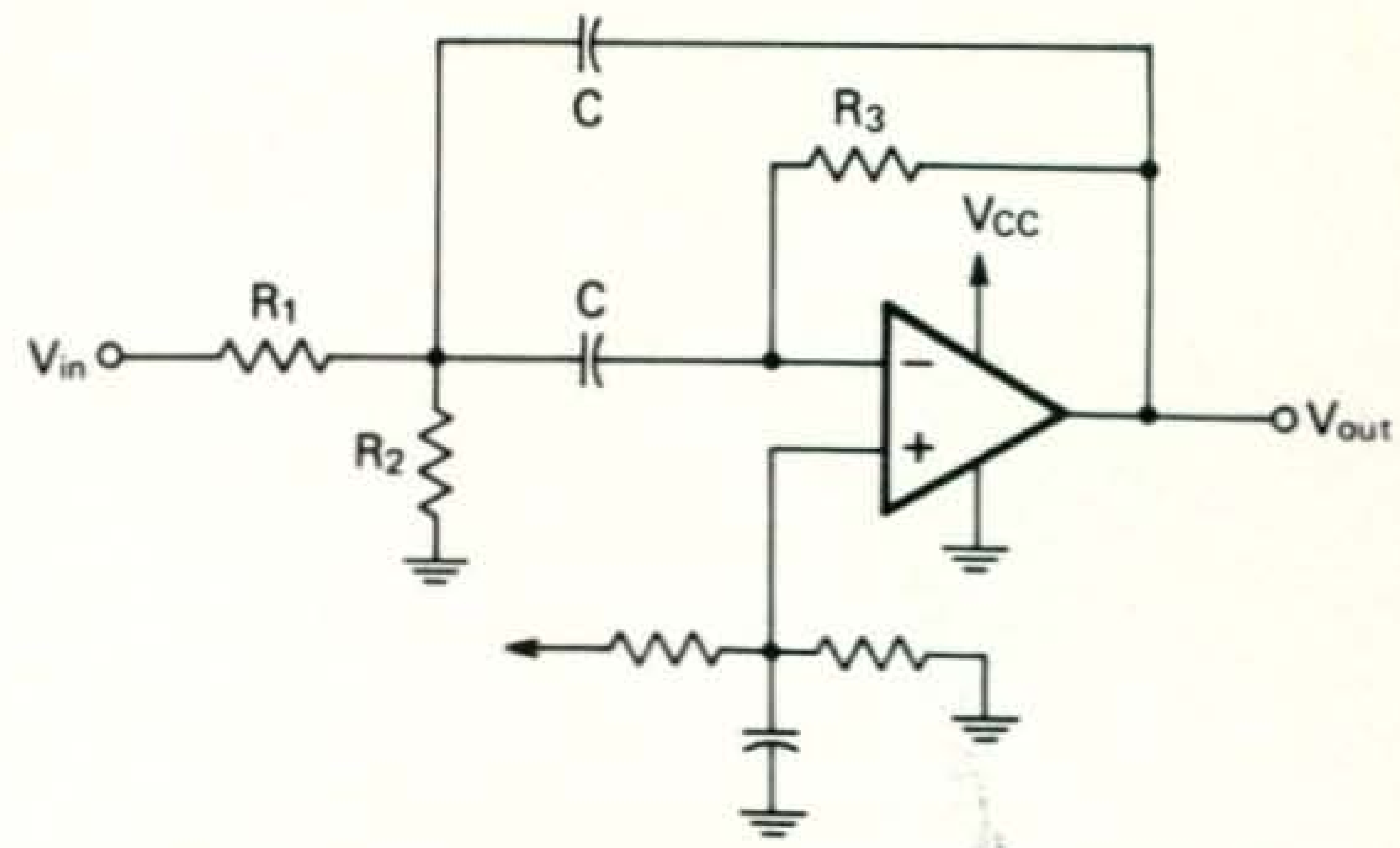


Fig. 10—Single supply operation of the bandpass section of fig. 3.

we'll use a passband gain of 10; splitting it up between the two stages as gains of 2 (low-pass) and 5 (high-pass).

Design of the low-pass filter proceeds as follows:

$$K = 2$$
$$f_c = 300 \text{ Hz}$$
$$\text{Let} \quad R = 10\text{K}\ \Omega$$
$$C_2 = \frac{1}{2\ (3.14)\ (3000)\ (10000)} \cdot (.35 + \sqrt{1 - .375}) = .006\mu\text{f}$$
$$C_1 = \frac{1}{(10000)^2\ (6\times10^9)\ (6.28 \times 3000)^2} = .0046\ \mu\text{f}$$

And the high pass specification is similar:

$$K = 5$$
$$f_c = 300 \text{ Hz}$$
$$\text{Let} \quad C = .01\mu\text{f}$$
$$R_1 = \frac{1}{(2)\ (3.14)\ (300)\ (10^{-8})} \cdot (.35 + \sqrt{2.5 - .375})$$
$$R_1 = 96\ \text{K}\Omega$$
$$R_2 = \frac{1}{(10^{-8})^2\ (96000)\ (6.28 \times 300)^2} = 29\text{K}\ \Omega$$

Since most amateurs don't stock resistors and capacitors in the computed values, we'll round them off to useable quantities:

Low-Pass
$R = 100\text{K}\ \Omega$
$C_2 = .006\mu\text{f} \quad (.005 + .001)$
$C_1 = .0047$

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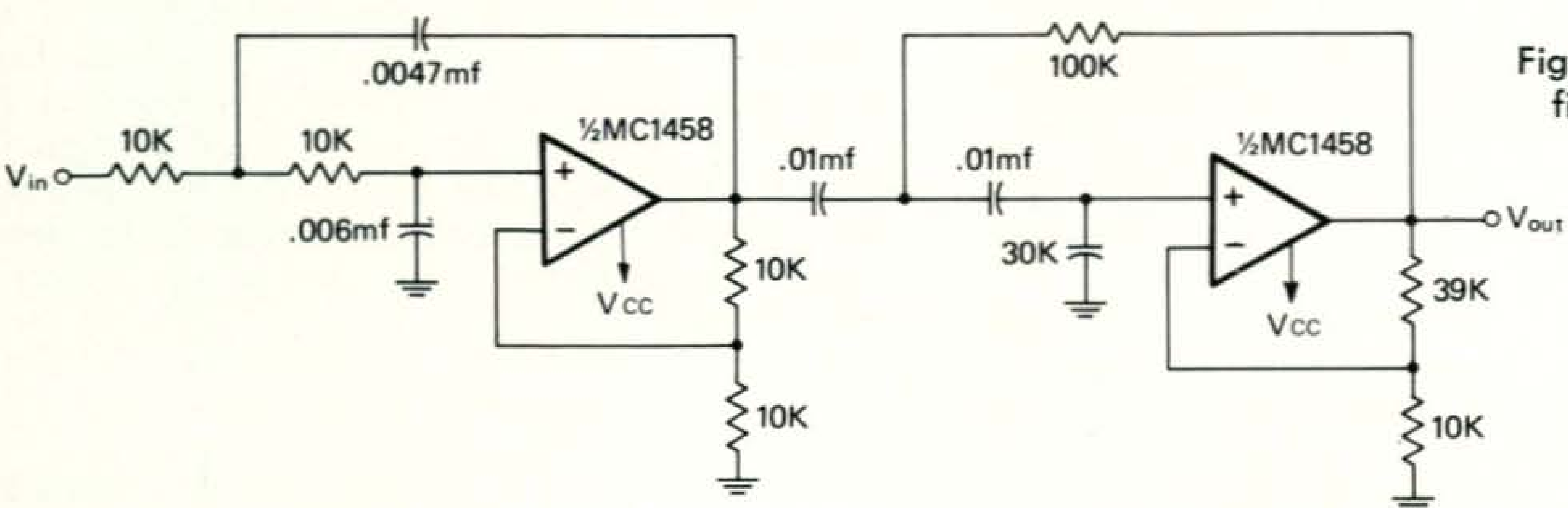


Fig. 11—Cascading filters with split supplies.

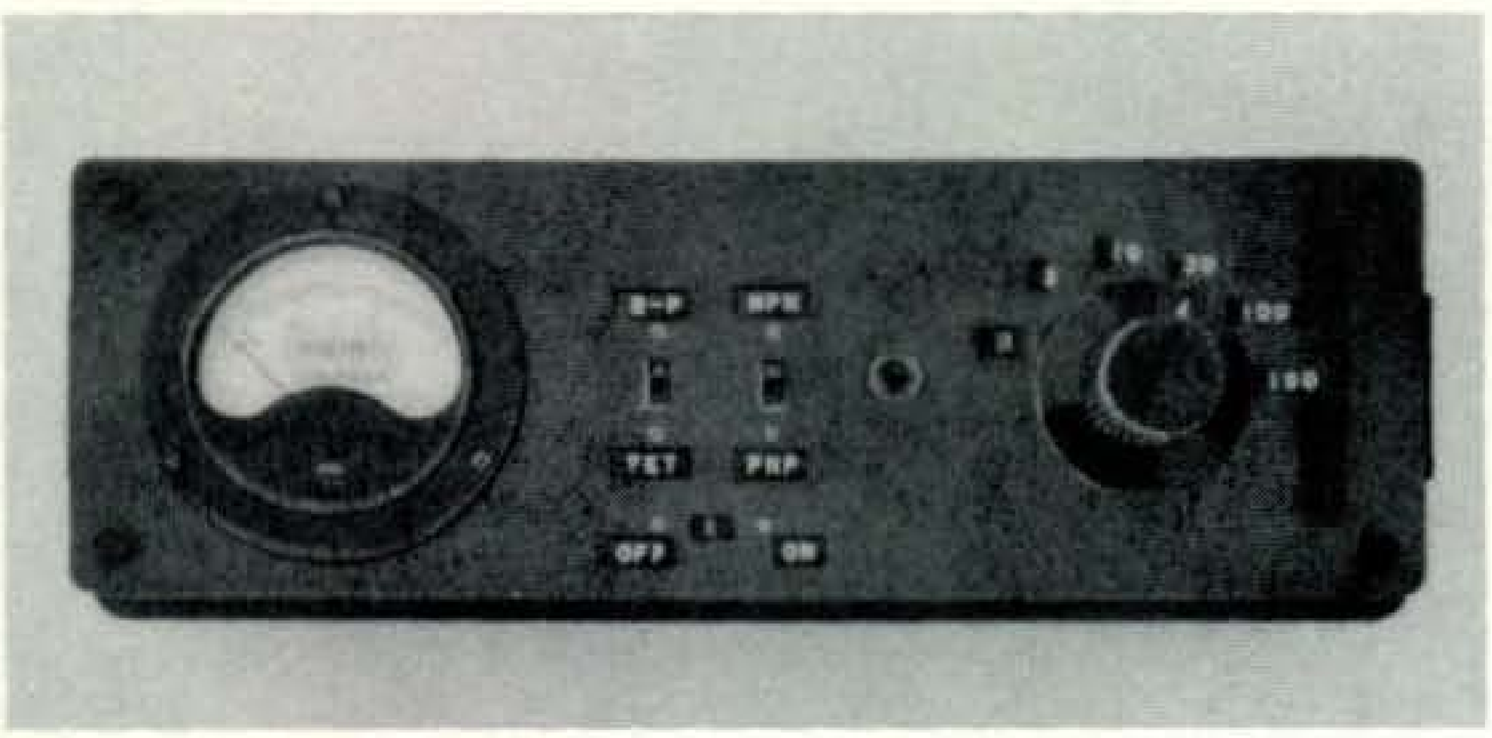
An R.F. Transistor Testor

BY FRED BROWN,* W6HPH

If you do any solid-state experimenting you have probably accumulated a cigar-box full of miscellaneous transistors of all descriptions including some un-marked or undecipherable types. This gadget lets you determine in a matter of seconds whether an unknown transistor is audio, r.f., or v.h.f. It will test either NPN or PNP bipolar transistors at the flick of a switch and is just as adept at testing junction FET's. Construction time would normally be one or two evenings, and if junk-box parts are made use of, the cost can be held to a few dollars.

The principle of operation is very simple: the transistor to be tested is placed in a frequency-switchable oscillator circuit and the relative strength of oscillation is indicated on the meter. Since any transistor that can oscillate at a given frequency will also be able to amplify at that frequency, measurement of the highest oscillation frequency (F_{max}) is also a measure of the highest amplification frequency. Normally, of course, transistors are used at frequencies well below F_{max} since at even one fourth this frequency a maximum power gain of only 12 db is available. Thus only a rough indication of the upper frequency limit is needed; in this instrument the frequency ratio between switch positions was made about 3 to 1. Continuous frequency coverage could have been provided, but at the expense of unnecessarily complicating the instrument. With six switch positions an over-all frequency range of 190 to 1 is covered.

*1950 Sunset Drive, Vista, CA 92083



Front view of the r.f. transistor tester showing control locations. Slide switches are used for On-Off, Bi-Polar/FET, and PNP/NPN selection, while a 6-position rotary switch is used for frequency selection. Between the slide switches and the frequency switch is a socket for the transistor under test.

Circuit

As can be seen from the diagram, the transistor to be tested is placed in a rather conventional tuned-collector oscillator circuit which can be switched in frequency by means of S_4. The transistor is biased by means of resistors R_1, R_2, and R_3. The values of these resistors were chosen to make the collector current fall between 1 and 1.5 ma almost irrespective of transistor current gain, or whether the transistor is a Germanium or Silicon type. Practically any transistor worth its salt will have substantial power gain at one mil collector current. Junction type FET's are accommodated by simply switching out the forward-bias resistor, R_1. The large values of the three biasing resistors prevents damage to any transistor that should happen to be plugged in the wrong way or operated with the wrong polarity. The polarity-reversing switch, S_2, permits measurement of either NPN or PNP (or N-channel or P-channel) transistors.

The r.f. voltage on the emitter (or source) of the oscillator is coupled to the 1N914 diode by the 500 pf capacitor and the rectified voltage is indicated on the 0-1 ma meter.

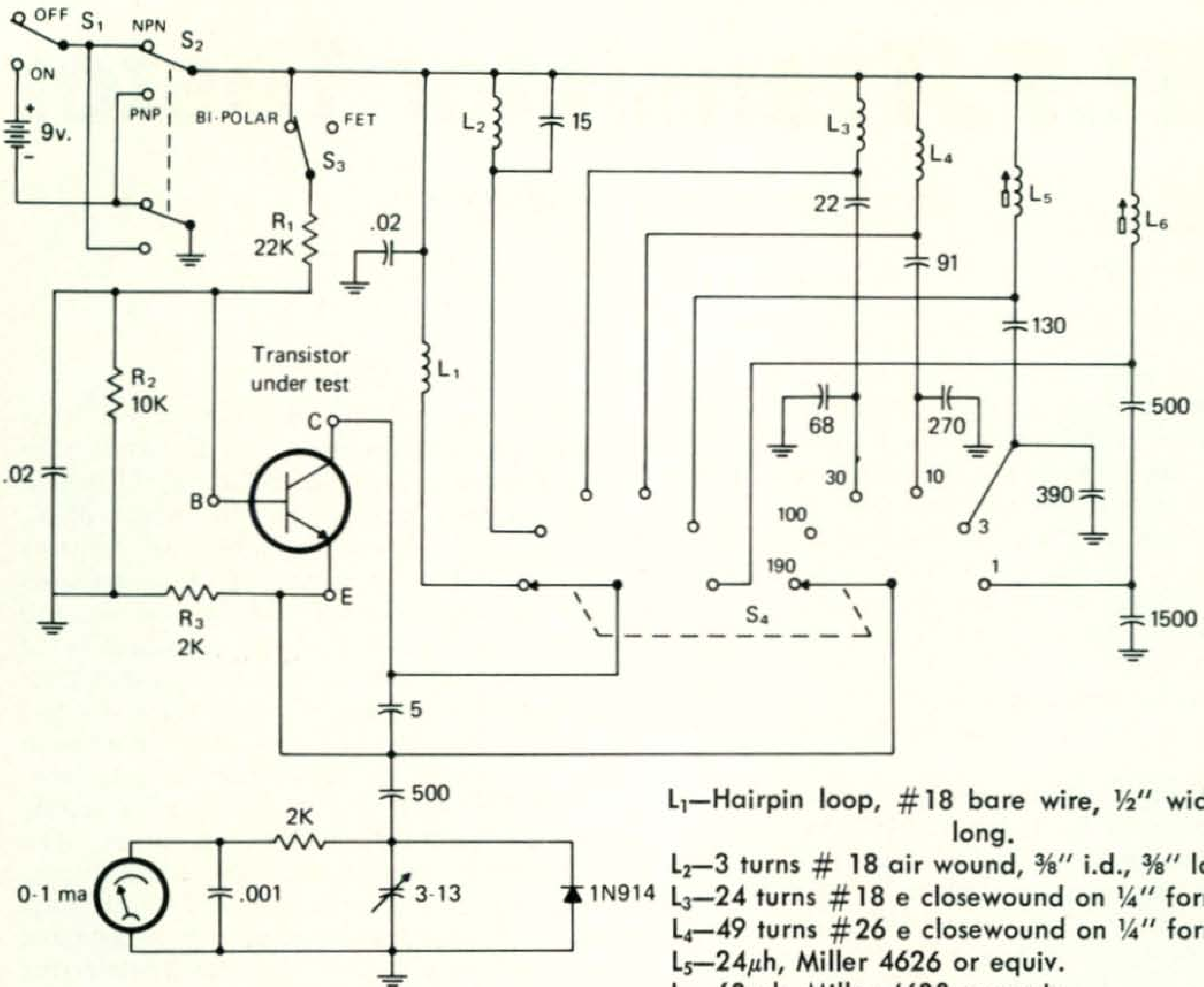
Feedback on the two highest frequency positions is provided by the 5 pf capacitor connected between the collector and emitter. On the four lower frequencies additional feedback capacitors are switched in between collector and emitter and between emitter and ground.

Construction

This particular unit was built in an empty film box measuring about 3 by 3 by 9 inches. With careful layout you could get by with a box about half that volume. It is important that r.f. leads be kept short so the transistor socket should be mounted close to the frequency selector switch.

This plastic box provided no chassis "ground" so a 3 inch square piece of tin plate (cut from a tin can) was placed under the top panel. This plate extends over to the transistor socket and all "ground" connections are soldered directly to it.

For good v.h.f. performance the .02 mf base bypass capacitor and the 5 pf feedback capacitor should have leads no longer than ½ inch. The .02 mf disc capacitor between the supply voltage and ground should also have short leads and should be mounted at the low end of L_1.



L1—Hairpin loop, #18 bare wire, ½" wide, 1⅝" long.
L2—3 turns # 18 air wound, ⅜" i.d., ⅜" long.
L3—24 turns #18 e closewound on ¼" form.
L4—49 turns #26 e closewound on ¼" form.
L5—24µh, Miller 4626 or equiv.
L6—62 µh, Miller 4630 or equiv.

Fig. 1—Schematic of the r.f. transistor tester. All capacitors are disc ceramic. Values less than one are in mf, values greater than one are in pf. Resistors are ¼ watt.

The highest frequency coils can be mounted directly on the switch terminals. Lead lengths on the 1 mHz and 3 mHz coils are not important and they can be mounted anywhere convenient.

Adjustment

When construction is completed, place a known-to-be-good bipolar transistor in the socket and set the NPN-PNP switch to the appropriate position. It's probably best to start at a low frequency position of the frequency selector switch. When the unit is turned on the meter should indicate about half scale. If it doesn't, check the d.c. voltages on the transistor. The collector voltage should be 9 volts and the emitter voltage about 2.5 volts with respect to ground. The base to emitter voltage will be about .6 volts for a silicon transistor and .2 volts for a germanium transistor. If you don't measure these values you either have a bum transistor or you have made a wiring mistake somewhere.

When the circuit is oscillating as indicated on the meter, you can check the oscillator frequency. This is probably best done with a general-coverage communications receiver, but remember to beware of images and harmonics. If the frequency comes out too low you can raise it by removing turns from the appropriate coil. If the frequency is too high, you can lower it by shunting the coil with a small capacitor.

Your communications receiver will permit frequency checks up to 30 mHz. For the 100 mHz position you can use an f.m. radio to check frequency. The 100 mHz frequency can be easily adjusted by spreading or squeezing the coil, L_2.

To check the highest frequency position you can use a TV set, 190 mHz will wipe out channel 9. The hairpin loop, L_1, can also be adjusted by squeezing or spreading. On this highest frequency switch position adjust the 3 to 13 pf trimmer across the 1N914 diode for maximum meter reading.

With careful construction you might be able to shorten L_1 to the point where the highest frequency is 300 mHz rather than 190. It is questionable that this would be wise, however, because transistor lead lengths plus socket inductance would make the test unfair at such a high frequency; even 190 mHz is pushing things a bit.

With a good v.h.f. transistor the meter should read about the same on each position of the frequency-selector switch. If the meter reads too high on one switch position it can be low-

[*Continued on page 66*]

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

I WANT to first thank all of my readers for the overwhelming response to the recent series on Field Effect Transistors in this column and wish to add that work on the first of the converters, the 6 meter version, is almost done. As promised, complete assembly details will be provided as soon as all tests are completed. It is very encouraging for this author, an "old homebrewer from way back . . ." to know that many amateurs do wish to build at least part of their station and many more are even avid experimenters in this age of "appliance operation."

This month will be devoted to several often requested receiver updating circuits and will hopefully be of interest to many readers. A large number of amateurs, particularly newer ones and youngsters without a great deal of funds are "stuck" or so they feel, with older receivers that were OK in the 1950's and early 60's but simply do not have the sensitivity for todays operating requirements.

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

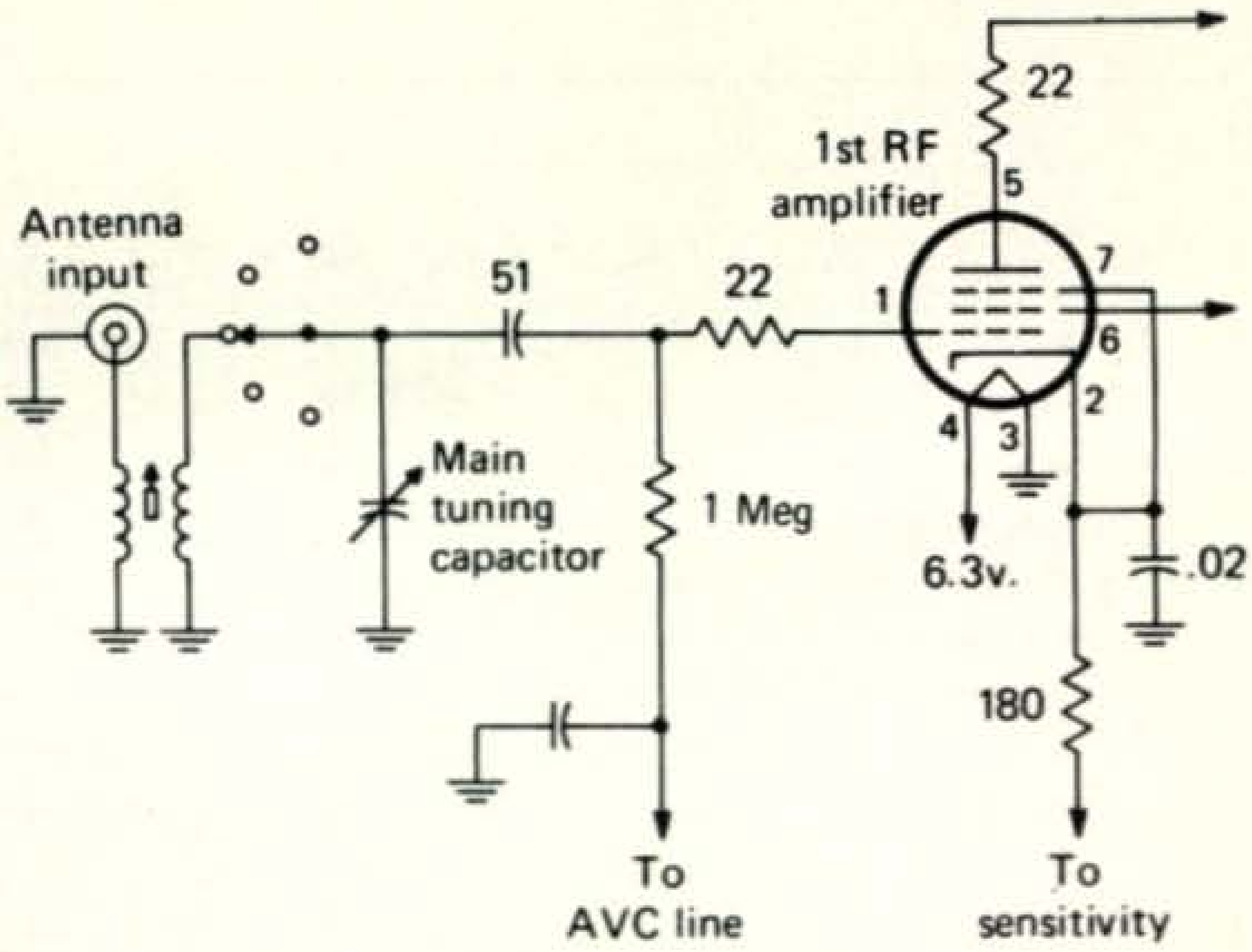


Fig. 1—The 1st r.f. amplifier stage, typical of many 1950-1960 receivers. The values given are for the SX101.

These receivers in many cases are solid, stable units and available at real bargain prices today. As an example, the fantastic Hallicrafters SX101A (I own one of these) can be bought for as little as $159 from one *CQ* advertiser, Amateur Electronic Supply, 4828 West Fond-du-Lac Avenue, Milwaukee, Wisc. 53216. Other similar bargains abound—just read the ads. These receivers, with a little bit of work, can be made to compete with almost anything available today at three times the price, if one can wait the few minutes for the unit to warm up.

Without attempting to complete conversion however, we would like to pass on the scheme

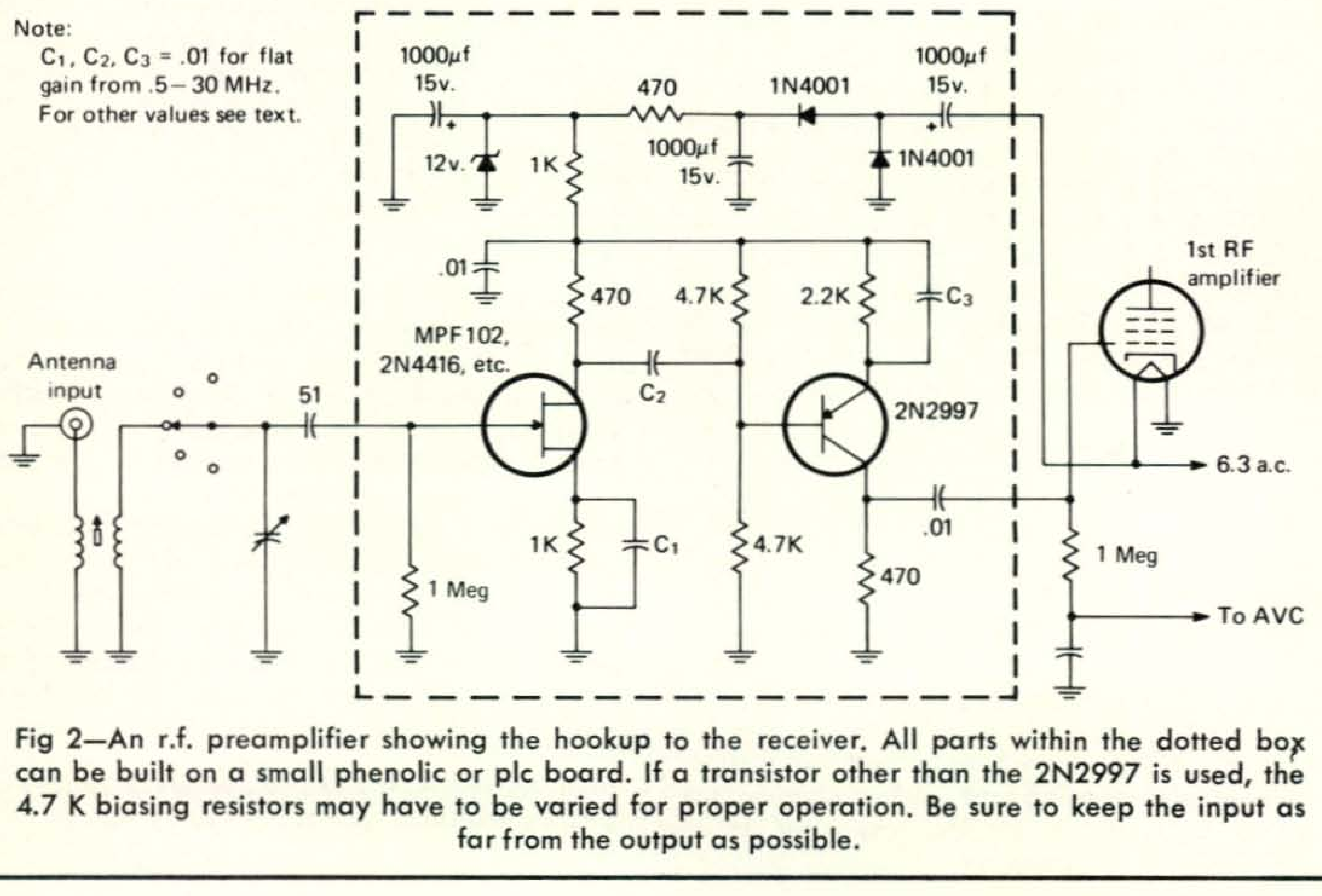


Fig 2—An r.f. preamplifier showing the hookup to the receiver. All parts within the dotted box can be built on a small phenolic or plc board. If a transistor other than the 2N2997 is used, the 4.7 K biasing resistors may have to be varied for proper operation. Be sure to keep the input as far from the output as possible.

Final I.F.	C_1	C_2	C_3	R_1	L_1 (Miller 44000 Series or Similar)
455 kHz	680 pF	3 pF	.005	22K	135-240 μHy
2 Mhz	300 pF	3 pF	.005	22K	16-30 μHy
4.5 Mhz	120 pF	3 pF	.003	22K	7-14 μHy
5.5 Mhz	100 pF	3 pF	.003	22K	5-8 μHy
10.7 Mhz	100 pF	4.7 pF	.01	3.9K	1.5-3 μHy

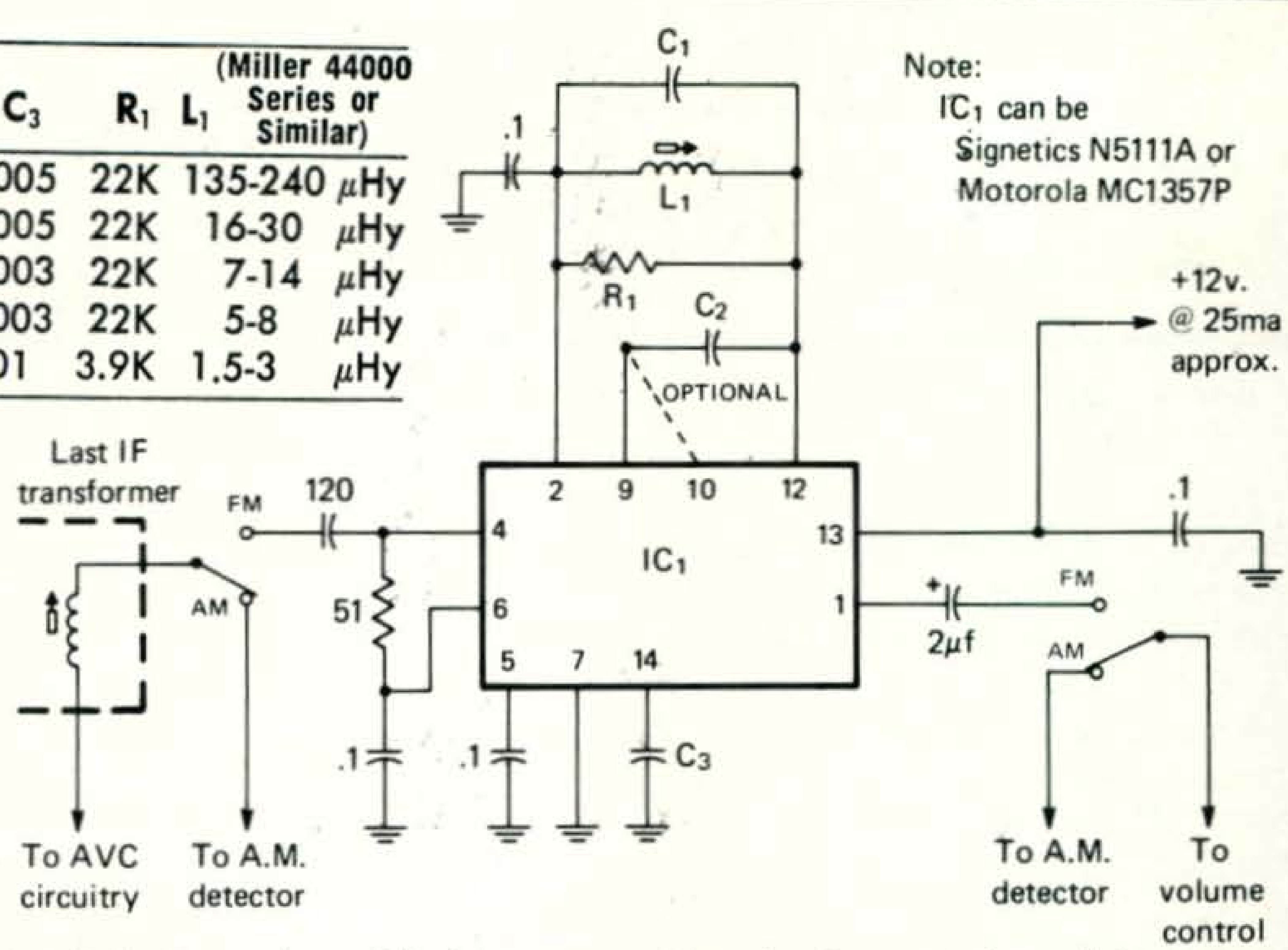


Fig. 3—An f.m. detector circuit that can be added to any communications receiver. Inbetween i.f. frequencies can be handled by slight variations of L- and C-. A connection to pin 10 instead of pin 9 is recommended in the Motorola literature for better performance.

that we have used to increase the sensitivity of the SX101 and several other similar receivers. Since the input stage is typical of many receivers of that vintage, the information following can be suitably adapted for the unit you have. Fig. 1 is a schematic of the 1st r.f. amplifier stage of the receiver. Fig. 2 is an easy to build pre-amp that can be connected as shown to boost sensitivity. The values of C_1, C_2, and C_3, can be varied to suit the receiver being used. Making them all .01μF will result in about 20 db of gain (10×) from .5 to 30 MHz. If this overloads your receiver (on the lower frequency ranges) try making all values smaller. For the SX101, which suffered from inadequate gain on 15 and 10 meters only, a value of 100pF for C_1, 470pF, for C_2 and 100 pF for C_3 resulted in a bandpass response that resulted in no loss of gain up to 15 meters, and all the sensitivity one could use on 15 and 10. Also, the FET used in the amplifier produced a nice low noise figure for the receiver. Because of the variations in receivers etc., the values are best set up with a sweep generator if one is available, otherwise a half hour or so of "playing with values" should give acceptable results. Incidently, the input of the pre-amp was close enough to the actual load presented by the 1st amplifier tube input circuit that no realignment was required.

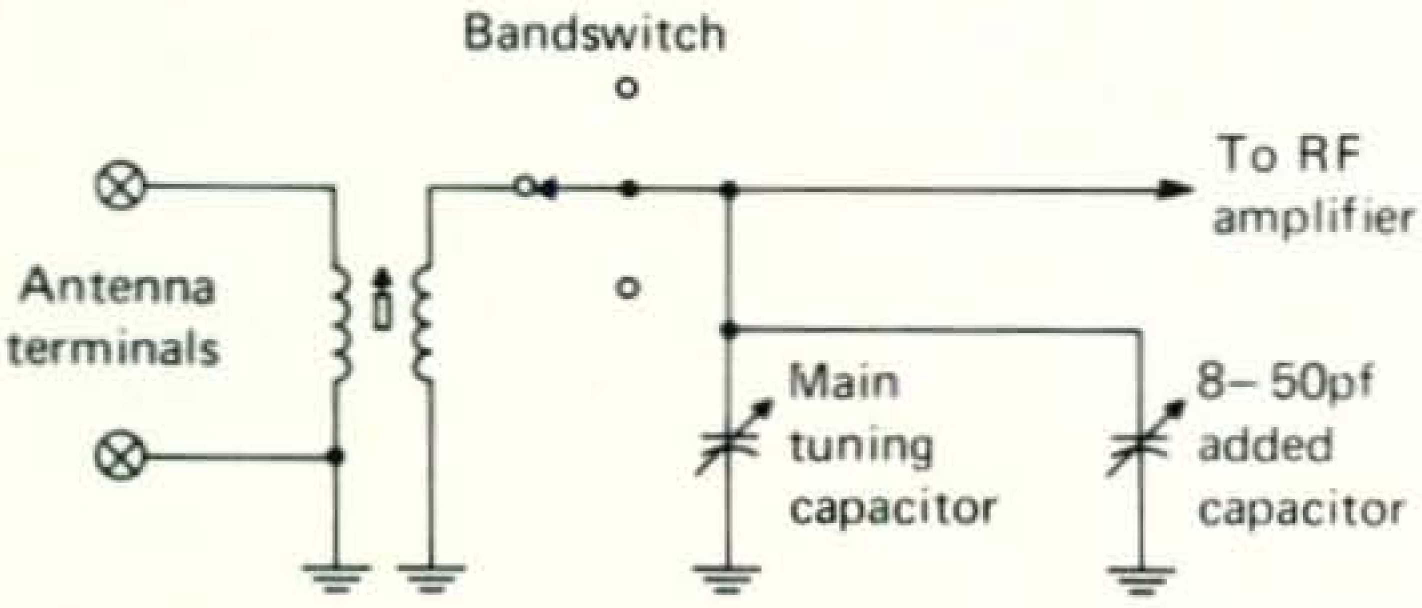


Fig. 4—A method of adding an antenna trimmer to receiver's not having one. When aligning the receiver, be sure to set this capacitor to ½ capacity.

Another handy circuit for updating or making older receivers more versatile is an f.m. detector. With the widespread increased use of f.m. and with the use of the station receiver as the tunable i.f. amplifier in most cases, this addition is quite welcome. Fig. 3 is a schematic of the f.m. detector we favor most. The circuit is simple to construct and even simpler to align. Just adjust the slug-tuned coil for maximum recovered audio when receiving an f.m. signal and you're in business.

Another useful addition to an older communications receiver that can often mean another 1-2 "S" units of gain is a small, front panel adjustable 8-50 pF variable capacitor, connected across the secondary of the receiver's antenna coil and section of the main tuning capacitor connected to this point as per fig. 4. This "antenna tuning" capacitor serves to touch up the tuning of the r.f. stage when various antennas are connected to the receiver. Often these antennas reflect different impedances to the tuned circuit than those the receiver was designed for resulting in loss of gain.

An old Hallicrafters S-85 receiver without an antenna trimmer gained 2 full S units on 15

[Continued on page 62]

QRPp

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG

V.F.O. Design Notes

In addition to the v.f.o. circuits shown in the last column, two others have proven to be reliable performers. Fig. 1 shows a series tuned Clapp oscillator designed by DeMaw.[1] His preference for this circuit is based upon its use of a relatively high C and L combination compared to the Colpitts and other circuits. High inductance insures less Q degradation because of leads etc, while the high capacitance effectively masks changes in junction capacitance which occur during the oscillation cycle and affect frequency stability. Another reliable circuit is the parallel tuned Seiler. The MFJ QRPp v.f.o. which recently appeared employs this circuit for excellent stability and good output. It is shown in Fig. 2. Some further points follow.

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(1) When using an FET oscillator, it is necessary to insert a clipping diode from gate to ground as shown in Fig. 1. The diode clips the positive r.f. peaks of the cycle during which excessive harmonic energy is generated. Bias is stabilized, harmonic currents reduced, and junction capacitance is kept lower, thereby minimizing effects on frequency. The clipping diode does not affect operation of the oscillator otherwise.

(2) Choice of components for the tuned circuit is important. As noted last month, polystrene capacitors or NPO's are best choices. With respect to inductances, slug-tuned forms which utilize a slug connected to a screw shaft are usually sources of problems and should be avoided. The types in which the slug itself screws in and out are reliable with respect to slug stability (Miller 23A014-2). Toroid cores are affected by temperature considerably, but if proper care is taken by winding the toroid with the largest wire for the given size inductor, and winding it tightly, no problems should be encountered. Variable capacitors for tuning circuits are often the source of difficulty due to intermittent bearing contact. APC types are usually very reliable.

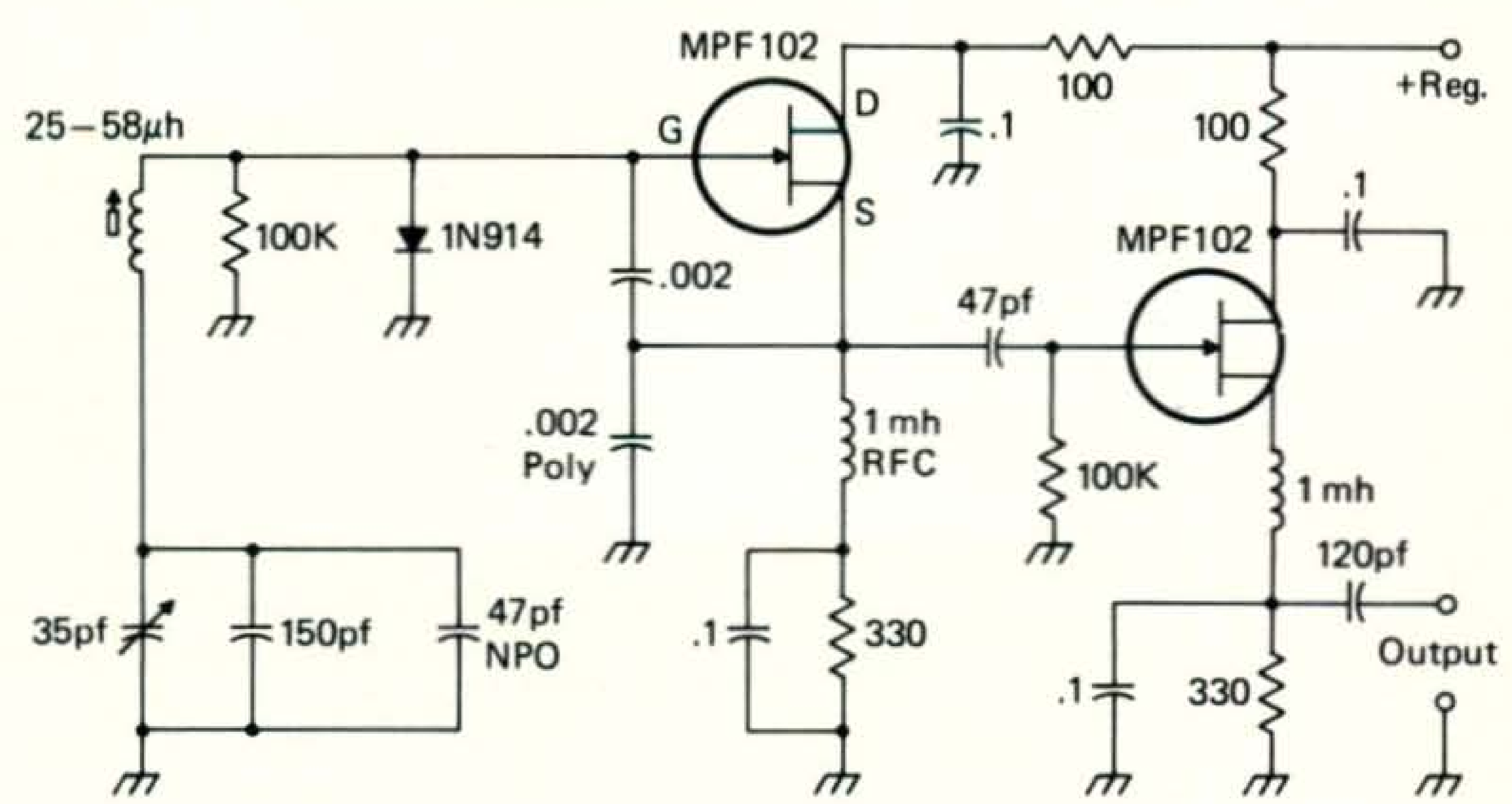

Fig. 1—A 1.8 MHz v.f.o.-buffer (Clapp oscillator).

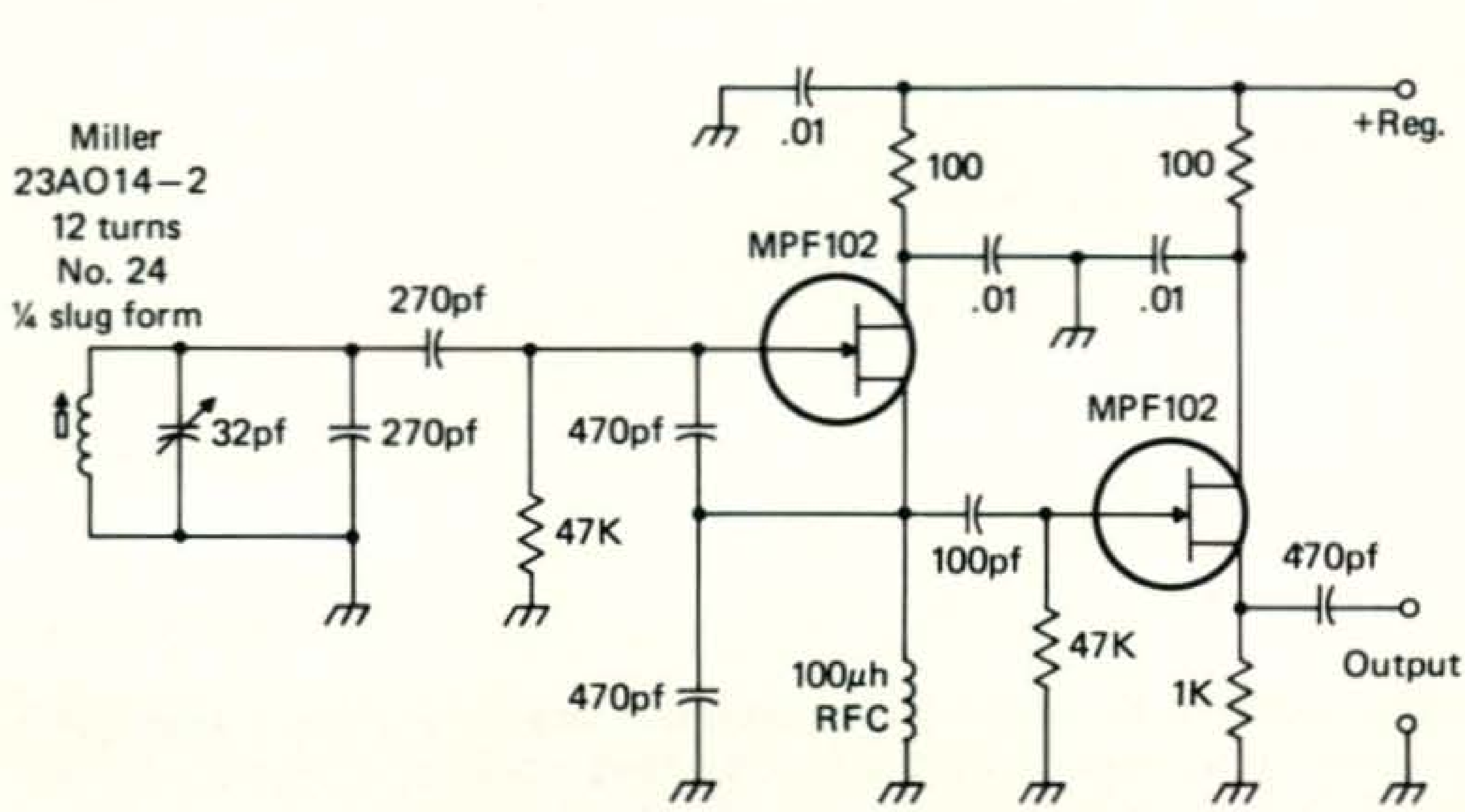

Fig. 2—The MJF QRPp v.f.o. (Seiler oscillator) for 7 MHz.

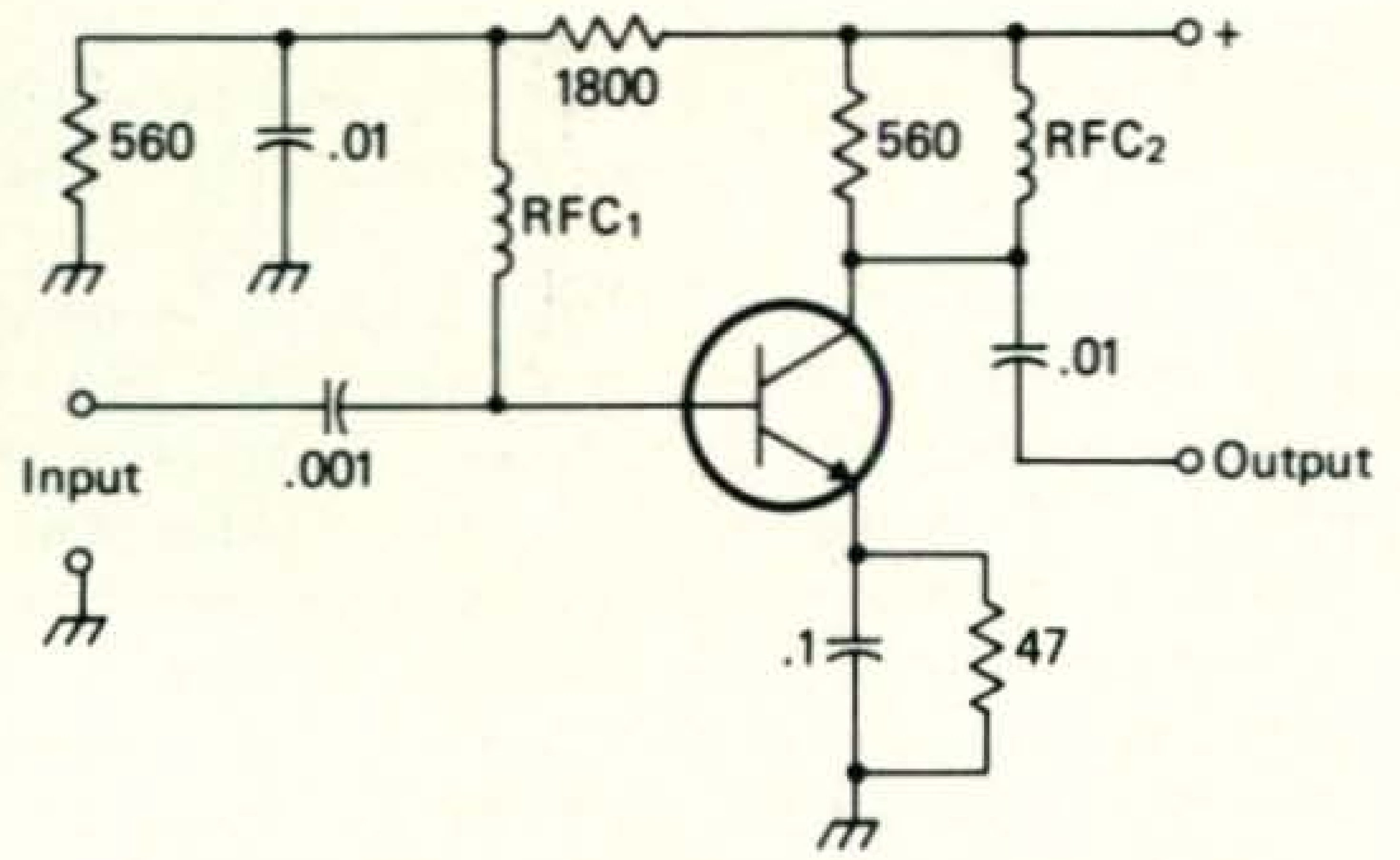

Fig. 3—A buffer-power amplifier to insert after the first buffer stage. RFC_1 - 120 μh and RFC_2 - 27 μh. The test lash-up worked with larger values, but not with values considerably smaller.

(3) A lot of time can be saved by calculating the capacitance and inductance required for a given frequency. The formula for determining the LC constant for a given frequency is: $LC = \frac{25,330}{f^2}$. Both the inductance and capacitance can change in a differing ratio for a given frequency. The LC constant remains the same for the given frequency. In order to determine the amount of capacitance change with a given inductance in order to achieve a desired bandwidth, the above formula is used to find an acceptable LC combination for one end of the frequency spread, then, with the inductance remaining constant, the LC constant is recalculated for the other end of the desired bandspread with the inductance remaining the same. Calculations will provide fairly accurate practical values.

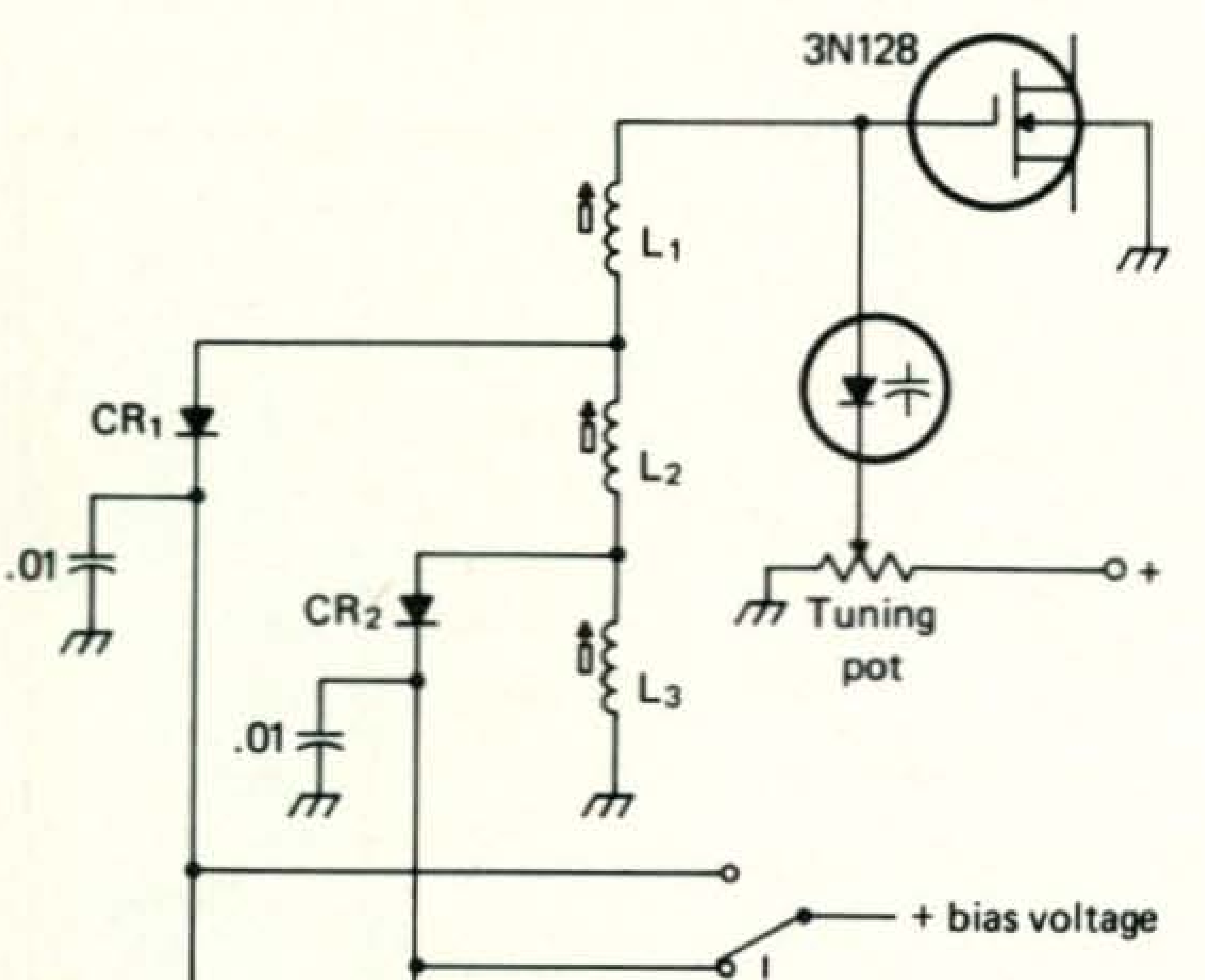

Fig. 4—PIN diodes as shorting switches in a tuned circuit. Negative voltage on diode causes it to conduct, routing r.f. current thru the diode to the capacitor and thence to ground. The capacitor acts as r.f. bypass removing r.f. from the external lead.

$L_{1, 2, 3}$—Form total series L for lowest frequencies; L_1 and L_2 for next highest; L_1 alone for highest. In switch position shown, CR_1 is forward biased, causing it to short out L_2 and L_3. For 5 inductors, a rotary switch with one shorting wafer is used to keep reverse bias on diodes not shorting out inductances.

(4) Output from the oscillator stage is taken from a low impedance point (source or emitter) through a small coupling capacitor (50 pf or less). No attempt is made to match the buffer input to oscillator output; instead a deliberate mismatch is brought about to achieve isolation from the later stages. As a result, buffer output is usually below input (in terms of V_{rms}). Fig. 3 shows a power amplifier-buffer stage designed by Lee and used in an all-band v.f.o. which incorporates several state of the art ideas that have not been duplicated in other designs.[2] While Lee claimed an output of 2 V_{rms} into a 50 ohm load (5 V_{rms} on 80 and 40) and 20 V_{rms} open circuit, a quick haywire version tried here using a 2N3866 revealed the following gain: with a 0.74 V_{rms} input, an output of about 1.7 V_{rms} was developed across 50 ohms, about 17 V_{rms} across open circuit (at 12 V_{cc}). Large 1 mh r.f. chokes were used instead of the exact values specified by Lee. Heatsinking is required for the amplifier transistor. It certainly appears worth incorporating into future v.f.o. designs.

(5) The use of variable capacitors for tuning the v.f.o. should be discontinued in favor of the use of varactor diodes. In addition to the fact that small variables are becoming harder to find, practical installations require that r.f. leads from the oscillator leave the v.f.o. board in order to reach the variable tuning capacitor. In contrast a varactor diode can be mounted right on the oscillator p.c. board, and only a d.c. lead carrying the bias for the varactor leaves the board. (See the April, 1974 QRPp Column for use of varactor diodes as v.f.o. tuning elements).

(6) The use of PIN diodes as bandswitching elements in the v.f.o. tuned circuit can eliminate another source of frequency instability—intermittent switch contacts connected to the inductances used in the v.f.o. Lee's approach is shown in Fig. 4. Another approach that might work, although I haven't tried it yet, is to use the PIN diode as an isolating switch rather than a conducting switch. See Fig. 5.

All-Band V.F.O. Schemes

Generating a v.f.o. signal for 80-15 meters is a difficult design problem when all things are considered. The choice of scheme used is important. The simplest approach is to simply switch a separate inductance in for each band, and operate straight-through on the fundamental frequency. Practice has shown that this scheme

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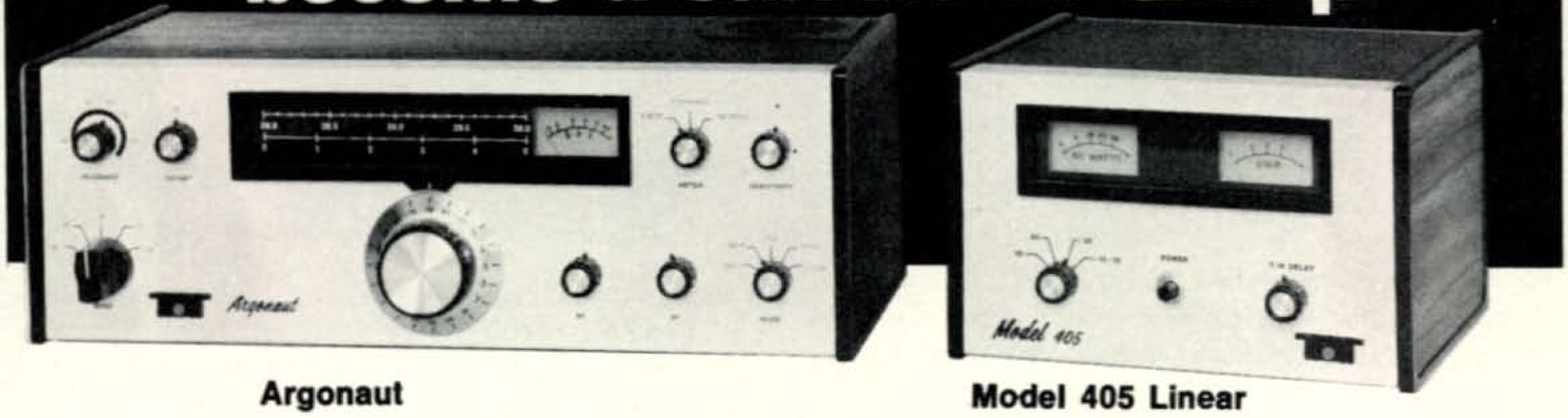

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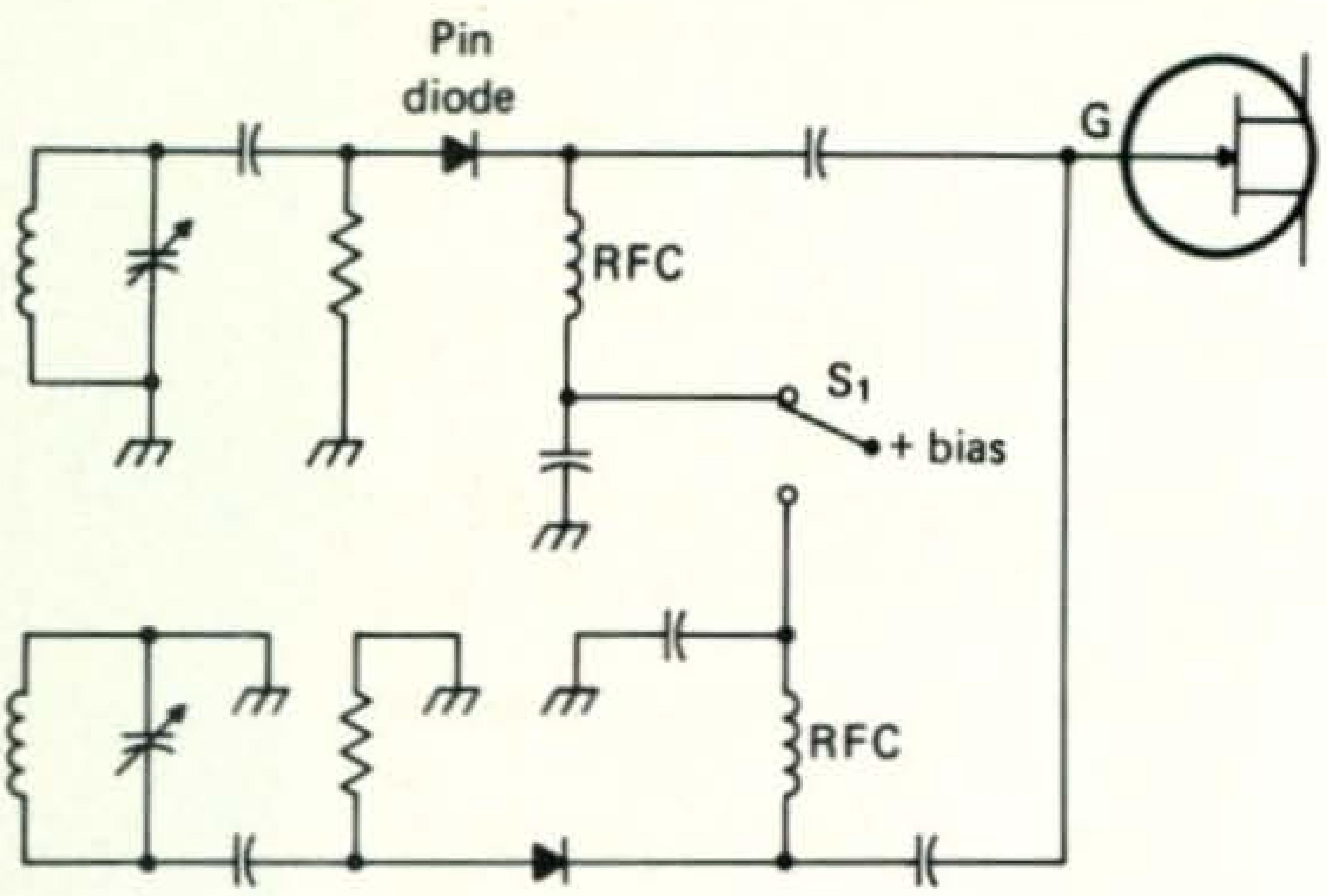

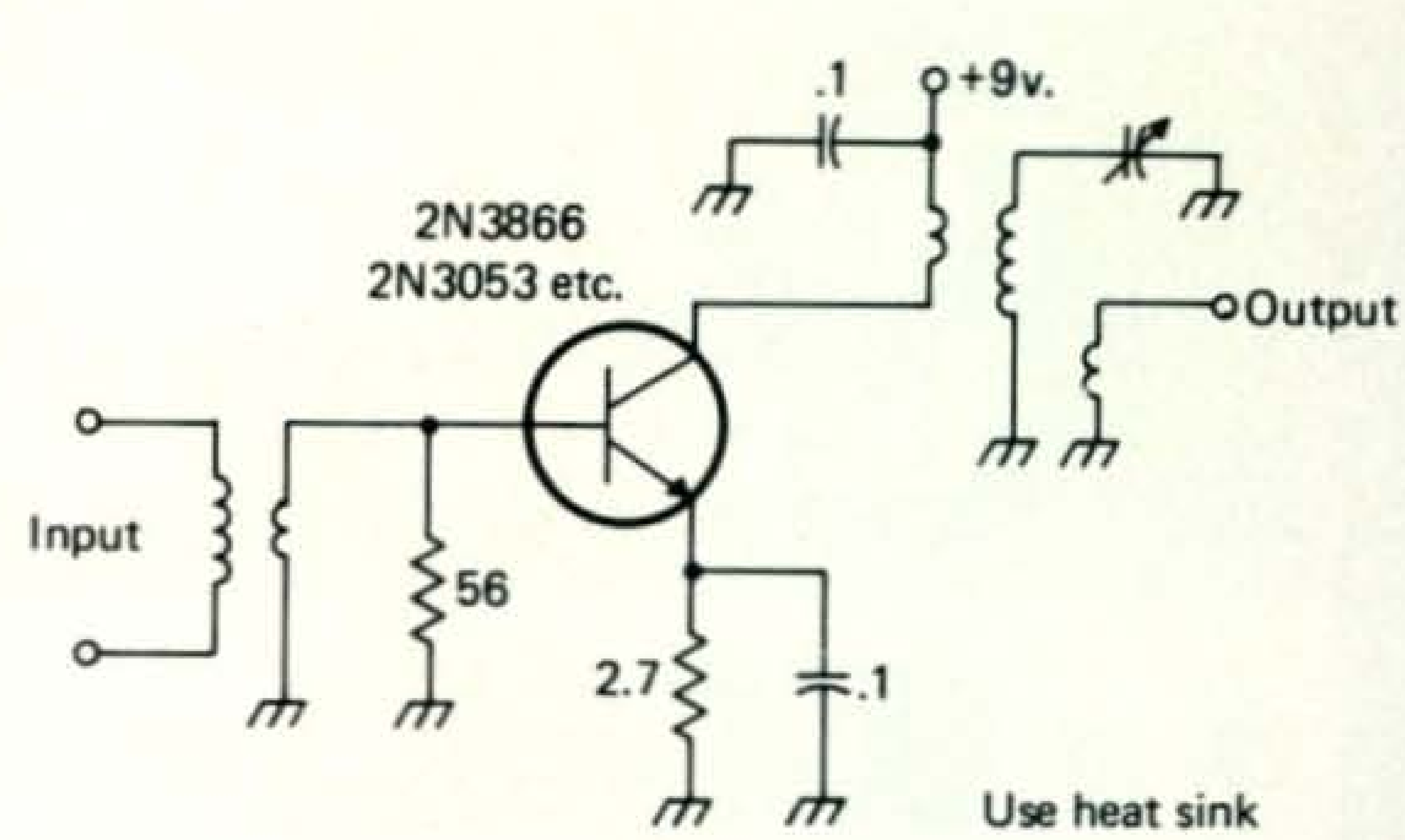

Fig. 6—A frequency multiplier stage.

Fig. 5—Proposed method of using PIN diodes as isolating switch in a pair of tank circuits. S_1 turns off one side, leaving the other connected to the gate of the oscillator.

invites unwanted interaction between v.f.o. and r.f. stages, in addition to problems caused by the necessity of using a mechanical switch for this very critical part of the transmitter design. Operating the v.f.o. on the half-frequency (i.e., 3.5 MHz for a 7 MHz signal) eliminates the r.f. interaction quite effectively, but the switching problem remains. A Class C frequency multiplier will provide healthy harmonic outputs, but requires considerable drive and draws a lot of current. See Fig. 6 for such a circuit. The buffer-amplifier of Fig. 3 should provide adequate drive in this case. The interstage coupling can be by means of a primary-secondary inductance connected to the output capacitor of Fig. 3.

Ultimately, a heterodyne scheme is perhaps the best answer to the all-band v.f.o. problem. TenTec's scheme is a good one that can be simplified so that two tuned circuits will allow one to achieve output on 80-10 meters, but with a sacrifice of the linearity of tuning achieved by TenTec through the use of five separate v.f.o. inductances. The two tuned circuits are designed to cover 5.0-5.4 MHz and 6.0-6.37 MHz. A multiplier stage converts the basic v.f.o. frequency to the proper multiple to heterodyne against a 9 MHz crystal for output on the desired band. A further refinement would be the use of varactor diodes as fixed padders to change from the high range of each tank circuit to its low range. See Fig. 7.

Well, space stops us here. Hope there are some useful ideas above for your design.

QRPp Net

The QRPp Net is turning into a success that might be its undoing. We've had up to 13 check-ins from WA to MAS, and contacts have been made across the country. Tuesday evenings, 2200 EST, 3540 kHz. Procedure: NCS calls CQ QRP NET and takes a list of check-ins for first ten minutes. Then each station is recognized in order for purpose of exchanging reports with others on the list. Also, standard

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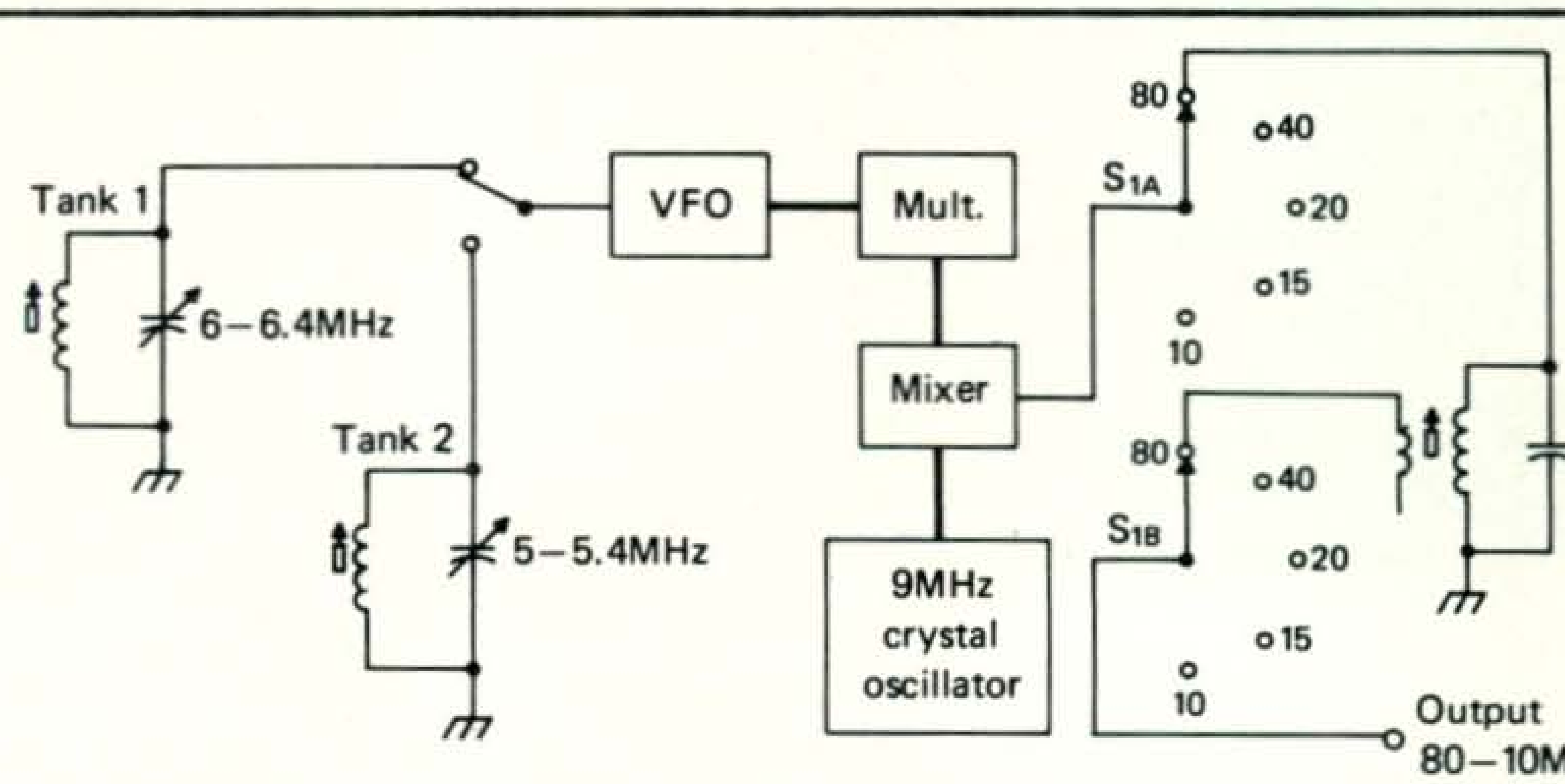
Fig. 7—A heterodyne scheme devised by TenTec, but simplified to two tank circuits for 80 - 10 meters.



VFO range		Mult.					Output frequency
Tank 1	5.0 –5.1	X 1	→	5.0– 5.1	+ 9	=	14.0–14.1 MHz
	5.3 –5.38	X 3	→	16.0–16.15	– 9	=	7.0– 7.15MHz
Tank 2	6.0 –6.2	X 2	→	12.0–12.4	+ 9	=	21.0–21.4 MHz
	6.25–6.35	X 2	→	12.5–12.7	– 9	=	3.5– 3.7 MHz
	6.33–6.37	X 3	→	19.0–19.1	+ 9	=	28.0–28.1 MHz

NOVICE SHACK

BY HERBERT S. BRIER,* W9EGQ

The Best Amateur Band For You

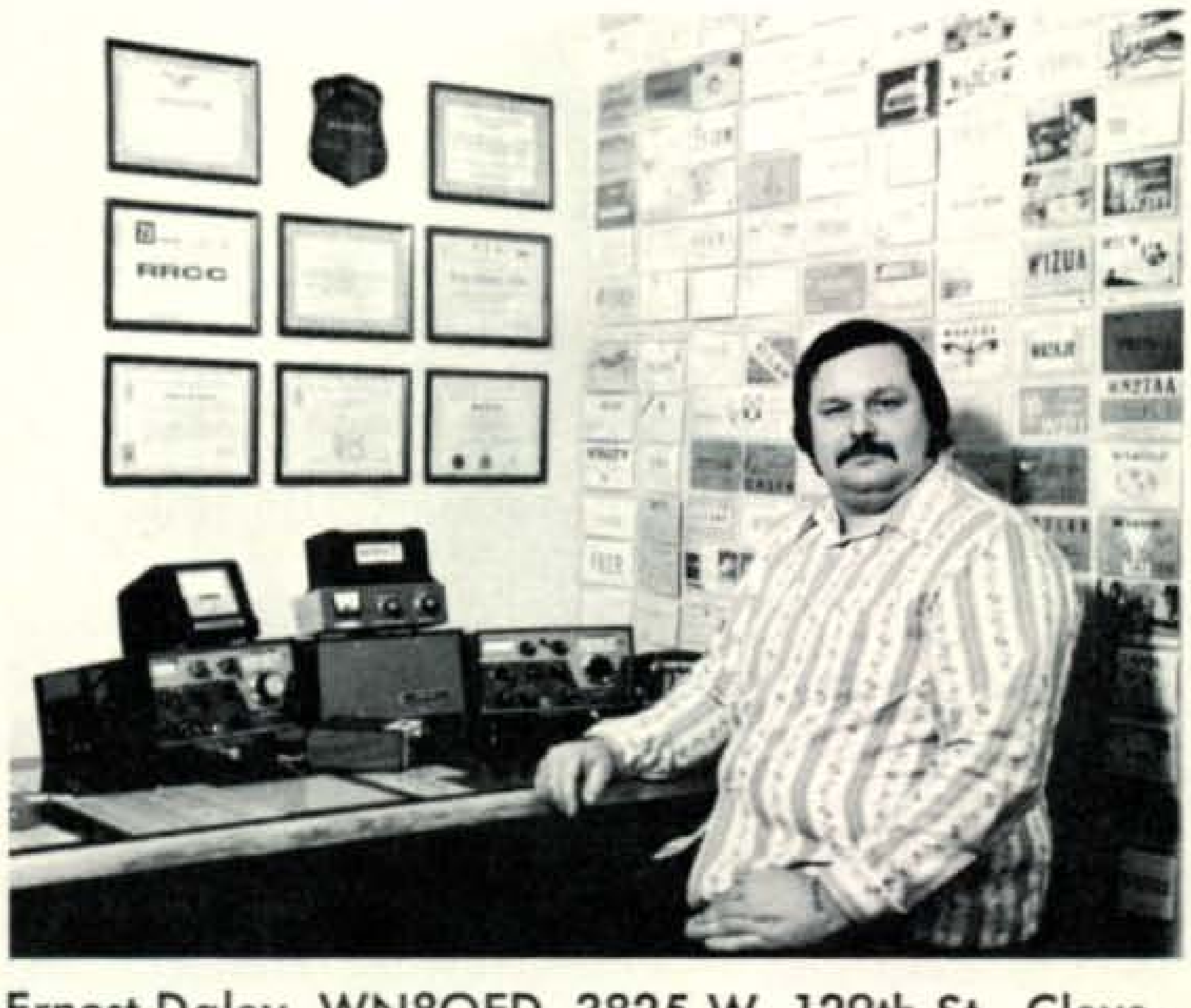
Even if you have the best of equipment, highly-efficient antennas and unlimited operating time, choosing the bands to operate on is not as simple at it may appear at first glance. The types of contacts you prefer—leisurely rag-chewing or constantly looking for new challenges, for example—and a general knowledge of propagation conditions on the different bands at different times are also important. The last requirement becomes even more important when your equipment may be older than you are or you are forced to operate with a makeshift antenna surrounded by buildings and utility wires. Under such conditions, selecting the band and the time to operate can make the difference between your contacts being plentiful and being very few and far between. Let us review the characteristics of the different Novice bands to learn why this statement is true.

Eighty meters (3.7-3.75 MHz—Novice): By and large, the 80 meter band is open for communications over distances from 50 to 200 miles in the daytime with signal strengths and distances increasing dramatically up to 3000 miles or more at night, especially during the cooler months of the year. Summer night-time signals are also strong but are sometimes overwhelmed by even stronger static. Static is not much of a problem in the daytime, however, except during local thunderstorms.

An important characteristic of 80 meters for operators forced to use low power and an inefficient antenna nestled between buildings, trees, and power lines is that it is still possible to make many contacts by concentrating your operating between the hours of 10:00 P.M. and 4:00 P.M. The hours before and after sunrise are particularly good, because signals are usually strong and interference is not too great. You can also make a surprising number of contacts in the daylight hours, even though the signals are usually weak and the distances covered are moderatae.

Forty meters (7.1-1.15 MHz—Novice): The 40-meter band is undoubtedly the most reliable band for daytime contacts up to distances of 750 miles or so. Low horizontal or inverted-V dipole antennas (less than 35 feet high) often do as well as higher antennas over these distances. The situation usually changes radically, however, as the sun goes down and signals from distances beyond 1000 miles predominate, which are usually much easier to work with a high horizontal or inverted-V antenna than with a low one. Conversely, 40- (and 80-) meter antennas often "get out" more poorly than low horizontal antennas over shorter distances but outperform the latter over longer distances—if you can avoid the super-power foreign broadcast stations infesting the 40-meter band from sunset to midnight and beyond.

Fifteen and Ten meters (21.1-21.2 and 28.1-28.2 MHz—Novice): At least until next fall, the 15-meter band will be essentially a daytime band. It will usually open up for signals from the east in the morning and close with signals from the west fading out in the evening. Also if you are located in the northern half of the United States, most of your contacts will be in a generally southerly direction. In fact, often



Ernest Daley, WN8QED, 3825 W. 129th St., Cleveland, Ohio 44111, is this month's winner of the Novice Shack Photo Contest. Ernie likes 10 and 15 meters best but drops down to 40 meters when the high frequencies are dead. The Drake T-4 transmitter/R-4 receiver, a Hy-Gain TH6DXX tri-band beam and a 40-meter dipole, combined with good operating, have worked all continents (64 countries) and all states. When you work WN8QED, ask him about his certificate collection, which includes a 15-wpm code proficiency certificate. Why don't you enter the Monthly Novice Shack Photo Contest by sending us a clear photograph (preferably black and white) of yourself and station and some information about your amateur activities. Even if you do not win, suitable pictures will be published as space permits. The address: Novice Shack Photo Contest, Care of Herbert S. Brier, W9EGQ, 385 Johnson St., Gary, Indiana. 46402.

*385 Johnson St., Gary, Indiana 46402.

A rare bird—a Wyoming amateur in his native habitat. Read about Doug, WN7WXQ, ragchewer and all-around amateur in "News And Views."

the only signals to be heard will be from the Gulf states or from Central and South America. These remarks apply with even more force to the 10-meter band, which will probably be dead more often than not at least until next fall.

With the comparatively shortness of 15 and 10 meter ½-wave antennas (22 and 16½ feet, respectively), it is seldom a problem to find room for antennas for these bands. Getting them high enough—at least 35 feet—for consistent results is more of a problem.

"Short Skip"

Supplementing the "normal" 10- and 15-meter propagation conditions described above, there will be fairly frequent semi-predictable "short-skip" openings on both bands for the next several months. Consult W3ASK's PROPAGATION COLUMN for the most likely times. These openings are the result of suddenly developing highly-ionized patches in the E region of the *ionosphere,* which refract (reflect) signals, that would normally escape into outer space, back to the earth 300 to 2000 miles from the transmitter. One interesting characteristic of "short skip" propagation is that simple antennas often do as well or better than high-gain beams when it is present. In fact, the main disadvantage to "short skip" openings in the Novice bands is that so few Novices can be heard in the 10- and 15-meter Novice bands when the adjacent phone bands are literally jumping with strong signals.

News And Views

Moe, WN3VLA, in Maryland, lets it all out: "It is not often that I become upset, but I have finally reached the end of my rope. I have spent six hours answering CQ's from Novices and a few DX stations. Each time, a General called at the same time. Needless to say, 75 watts is no match for their kilowatts. As narrow as the Novice bands are, can't the big boys give us a chance to practice and get our fists in shape before getting our General tickets? Thanks. Moe, WN3VLA."

Phil King, WB2IYZ, 5 Monmouth Ave., Rumson, N.J. 07760, became a Novice at the age of 12; after 23 months, he became a General. Equipment is Heathkit DX-60B transmitter and v.f.o., Hallicrafters SX-115 receiver, and HT-37 s.s.b./c.w. exciter, 80-meter dipole, 40-10 meter diople, and 3-element 15-meter beam on a wooden boom. He is having a "blast" building a 1-KW amplifier. In spite of being an incorrigible ragchewer who hates DX pileups, Phil has worked 46 states and 17 countries. But his big thrill is playing chess on the air, and he solicits skeds with other chess-playing amateurs. His favorite frequency is 21,400 kHz.

Raymond Hague, WNØCBN, 4529 N.E. 38th St., Des Moines, Ia. 50317, obviously lives in the wide-open spaces. He has a 462-foot transmitting antenna; a 400-foot receiving antenna; a 15-meter, 3-element beam; and a HY-Gain 14-AVQ vertical. He transmits with a Hallicrafters SX-32 cranked down to 75 watts and a 16-year old Heathkit DX-60 and receives on a Hallicrafters SX-101. Ray is a Senior in High School and president of the H.S. radio club (WBØMCW looks like the call). Thirty-two states, and four countries are entered in Ray's

[*Continued on page 62*]

How To Pass A Multiple Choice Test When You Don't Know The Answers

AUTHOR UNKNOWN, ORIGINAL MANUSCRIPT PARAPHRASED BY WILLIAM I. ORR,* W6SAI

THERE is a "Peanuts" comic strip that shows a little girl sitting at her school desk, examining the test paper just handed her. "An essay test!", she exclaims, "I'm doomed! Why couldn't the teacher have given us a multiple choice test? I hate it when you have to know what you're writing about."

How much do you have to know to pass multiple choice tests? Less than you might expect! You can "psych" out any multiple choice test by means of a few common-sense rules, plus the knowledge that the persons who devised the test were (in most cases) human.

Remember that the people who construct the tests work from a few basic principles. First, they try to bury the corect answer among the alternate choice distractors, which are wrong. *The first rule, then, is*:

The correct answer tends to be the third choice if there are five alternatives and the second or third choice if there are four alternatives.

One student claims he got through college merely by choosing the third alternative answer on all his multiple choice tests!

The second rule is: An alternative answer which is much longer or shorter than the others tends to be the correct answer.

Often the examiner makes an answer very long to include possible exceptions, as for example, answer (C) in this question. "America was discovered by (A) the Canadians, (B) the Germans, (C) either an Italian sailing for Spain or the Vikings, (D) the Ukranians, (E) the Chinese." Answer (C), of course, is the most correct choice.

On the other hand, the examiner may leave off just one word from a sentence and make that word the correct alternative, as in answer (C) in this question. "Biology is the study of (A) plants, chemicals and falling bodies, (B) cells and protoplasm, (C) life, (D) numbers and their geometric applicabilities, (E) the heavens and earth." The shortest answer is correct.

The third rule is: When the stem and the alternative do not make grammatical sense when read as a complete sentence, that choice is wrong. For example, only answer (C) completes a grammatically complete sentence in this question. "The opposite of an optimist is a (A) optometrist, (B) reactionaries, (C) pessimist, (D) fatalists, (E) altruist."

The fourth rule is: Alternatives which include the words "all," "always," "none," or "never" tend to be wrong. The corollary of this rule is: Alternatives which include the words "most," or "some" tend to be correct.

The reason for this double rule is that very few things in life happen *always* or *never*. Your examiner will not leave himself open to such contradictions.

The fifth rule is: Look for clues in other questions. One question might be "Who invented the cotton gin?" Three quetions later there might be the phrase "Whitney's cotton gin . . . ." Hopefully, bells will ring and you will go back to the other question.

The sixth rule is: If, among several alternatives, two are exactly the same except for one word. one of them is usually the correct answer. This rule still leaves the examinee with a fifty-fifty choice, but at least the options are much narrower than among a whole group of alternatives. For example, answer (C) is correct in the following question: "Supplementary angles are (A) two angles which are opposite each other, (B) two angles which are formed by a transversal cutting parallel lines, (C) two angles adding up to 180 degrees, (D) two angles adding up to 90 degrees." The examinee, following rule number six, has only to choose between answers (C) and (D).

The seventh rule is: "None of the Above" is usually the wrong answer. The examiner uses this phrase as an alternative when he cannot think of any others.

The eighth, and final, rule is: *If you are sure that two alternative answers are correct and another alternative is "All of the above" that is usually the correct answer.*

And a final word to the wise: Find out before the examination if it is worthwhile to guess. If the examiner says there is no penalty for guessing, answer every question. If there is a penalty for guessing, guess only when you can eliminate a few choices as being obviously wrong. ■

*48 Campbell Lane, Menlo Park, CA 94025.

DX

BY JOHN A. ATTAWAY,* K4IIF

THE old sunspots are about to do us in on the high frequency bands, but there is still plenty of opportunity to work DX during contest weekends. March was a DX and Contest operators dream, with the second weekends of the A.R.R.L. phone and c.w. contests scheduled for March 1-2 and March 15-16 respectively, followed by *CQ's* major spring effort, the *CQ* Worldwide WPX S.S.B. Contest the last weekend of the month. Even though ionospheric conditions were poor, the large number of stations on during these weekends should have enabled you to work some good ones.

We note from W3ASK's propagation column that the sunspot cycle will continue to deteriorate in 1975 from a smoothed sunspot number of near 30 in January to a dismal low of 15 by the end of the year. An upturn is not expected until mid-1976. While this bodes ill for nighttime openings on 15 and 20, most especially 15, it should be possible to take up the slack on 40 and 80 meters which will produce some good DX openings during the hours of darkness.

Good propagation conditions on 40 and 80 will create an excellent opportunity this year for top flight low frequency DXers to win the first single band WAZ plaques on the low frequency bands. Four plaques are available as follows: 80 meter c.w., 80 meter phone, 40 meter c.w. and 40 meter phone, for the first to confirm and achieve WAZ using each of these bands and modes. Eligible contacts should have been made Jan. 1, 1973 or later. To date all single band WAZ awards issued have been an 20 meter c.w. or phone. The poor sunspot conditions will continue to work against the 15 and 10 meter DXers so 40 or 80 may be the next bands to come through.

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

The rig at I8LEL includes the Drake line to a TH3-MKIII and an inverted vee for 40 and 80. Plenty of punch to qualify this OM for a WAZ certificate to add to the wallpaper.

The CQ DX Award Program

2×SSB	C.W.
383 SP5BSV	172 W4FKB
384 YU2OB	173 WB5DIZ
385 W4DPS	174 K9WEH
386 K3SXQ	
387 W5NVU	

Endorsements

C.W.: K9WEH-200, W4KFB-150, WB5DIZ-3.5/7 MHz
2×SSB: SP5BSV-275, K3SXQ-250, YU2OB-200

Complete rules and application forms for the *CQ* DX Award program may be obtained by sending a business size, self-addressed stamped envelope to DX Editor, P.O. Box 1271, Covina, CA 91722.

Regular WAZ

While the above comments apply to single band WAZ, our premier DX award for over 20 years has been regular WAZ, and we have not printed the rules for regular WAZ since the June, 1970 issue. Many of you have already received this award, so please bear with us for the following reprint of the rules for those unfamiliar with WAZ:

WAZ Rules

The WAZ Award will be issued to any licensed amateur station presenting proof of contact with the forty zones of the world. This proof shall consist of proper QSL cards to be checked by the Assistant DX Editor or verified at one of the authorized checkpoints for *CQ* DX Awards. Most of the major DX clubs of the USA and national amateur radio societies abroad can be authorized checkpoints if they clear in advance with K4IIF. If in doubt consult the DX Editor. Any legal type of emission may be used providing communication was established after Nov. 15, 1945.

1. The Official *CQ* WAZ Zone Map will be used in determining zone boundaries.

2. Confirmations must be accompanied by a list of claimed zones showing the call letters of the station QSOed and the mode. The list should also show the applicant's name, call letters, and complete mailing address clearly.

3. All contacts must be made with licensed, *land based,* amateur stations working in authorized amateur bands.

4. All contacts submitted by the applicant must be made within a 250 mile radius of the original location.

5. Any altered or forged confirmations will result in permanent disqualification of the applicant.

6. Continued use of poor operating ethics will result in disqualification of the applicant.

7. In addition to the conventional certificate for which any and all bands and mode may be

The WAZ Program

Single Band WAZ

20 Meter Phone

5 WB9EBO
6 W7JST

20 Meter C.W.

5 W4WSF

S.S.B. WAZ

1246 SP3BQD
1247 W8CNL
1248 W2RBZ
1249 JAØGRF
1250 W1BAL

C.W.—Phone WAZ

3799 WA3EFI
3800 GM3LYI
3810 I1TLA
3802 I1CPD
3803 OZ2NU
3804 WB4SJG
3805 JA1VP
3806 I2YAE
3807 WBØLEX

Phone WAZ

503 OE1PC

Complete rules for the Single Band WAZ Program appear on pgs. 57-58 of the December, 1972 issue of *CQ*. Complete rules for regular S.S.B., C.W.-Phone and Phone WAZ are found in this issue. Application blanks and reprints of the rules for all WAZ awards may be obtained by sending a self-addressed, stamped envelope to the Assistant DX Editor, P.O Box 205, Winter Haven, FL 33880.

used, specially endorsed and numbered certificates are available for phone and single sideband operation. The phone certificate requires that all contacts be two-way phone and the s.s.b. certificate requires that all contacts be two-way s.s.b.

8. If, at the time of the *original* application, a note is made pertaining to the possibility of a subsequent application for an endorsement or special certificate, only the missing confirmations required for that endorsement need be submitted with the later application.

9. Include with the application $1.00 or 10 International Reply Coupons to defray the cost of the certificate.

10. Decisions of the *CQ DX* Awards Advisory Committee on any matter pertaining to the administration of this award shall be final.

11. All applications should be sent to the Assistant DX Editor, P.O. Box 205, Winter Haven, Florida 33880.

12. Zone Maps and/or WAZ applications are available from the DX Editor or from *CQ* for a self-addressed stamped envelope or self-addressed envelope and 1 IRC.

The following list of zones is presented as a guide. Any questions will be decided by the zone map.

Zone 1. Northwestern Zone of North America: KL7, VE8-Yukon, the VE8-Northwest Territories District of Mackensie and, Franklin, and the islands west of 102° including Victoria, Banks, Melville, and Prince Patrick.

Zone 2. Northwestern Zone of North America: VO2-Labrador, that portion of VE2-Quebec north of the 50th parallel, and a portion of the Northwest Territories-VE8 east of longitude 102°. The latter includes part of the District of Franklin and the islands of King William, Prince of Wales, Somerset, Gathurst, Devon, Ellesmere, Baffin, and the Melville and Boohtia Peninsulas.

Zone 3. Western Zone of North America: VE7, W6 and the W7 states of Arizona, Idaho, Nevada, Oregon, Utah, and Washington.

Pat Morton, LU1BAR/W3 has chased DX from 2 hemispheres. With that neat rig in the background she has plenty of success.

Zone 4. Central Zone of North America: VE3, VE4, VE5, VE6, the W7 states of Montana and Wyoming, WØ, W9, W8 (except W. Va.), W5, and the W4 states of Alabama, Tennessee, and Kentucky.

Zone 5. Eastern Zone of North America: FP8, VE1, VO1, that portion of VE2-Quebec south of the 50th parallel, VP9, W1, W2, W3, the W4 states of Florida, Georgia, South Carolina, North Carolina, and Virginia, and the W8 state of West Virginia.

Zone 6. Southern Zone of North America: XE and XF.

Zone 7. Central American Zone: FO8-Clipperton, HP, HR, KS4, KZ5, TI, TI9, VP1, TG, YN, and YS.

Zone 8. West Indies Zone: CM/CO, FG7, FM7, HH, HI, KG4, ITP4, VP2, VP5, VP7, KC4-Navassa, PJ2M/FS7, PJ2E, PJ2S, and YVØ-Aves.

Zone 9. Northern Zone of South America: FY7, HK, PJ2, PZ, VP3/8R, VP4/9Y4, and YV.

Zone 10. Western Zone of South America: CP, HC, HC8, and OA.

Zone 11. Central Zone of South America: PY and ZP.

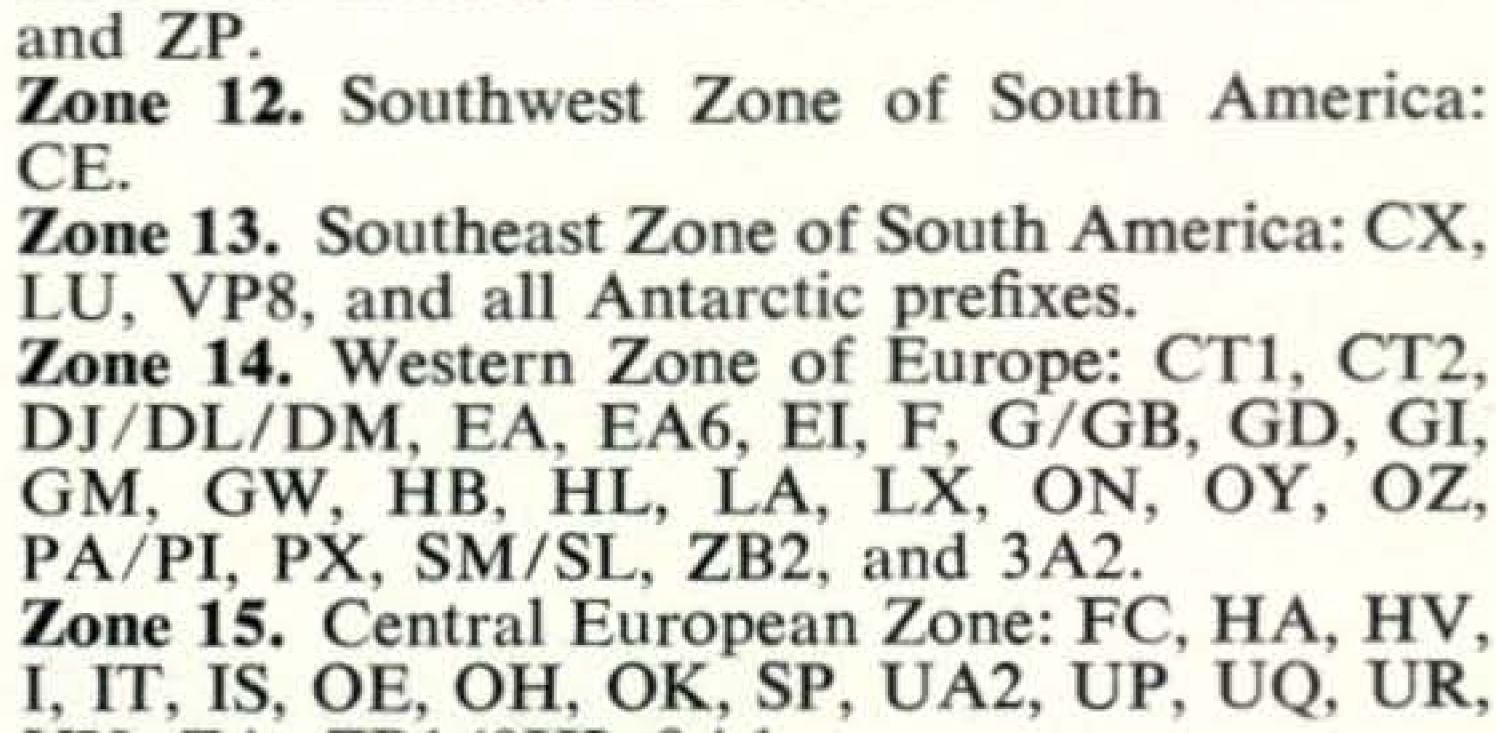
Zone 12. Southwest Zone of South America: CE.

Zone 13. Southeast Zone of South America: CX, LU, VP8, and all Antarctic prefixes.

Zone 14. Western Zone of Europe: CT1, CT2, DJ/DL/DM, EA, EA6, EI, F, G/GB, GD, GI, GM, GW, HB, HL, LA, LX, ON, OY, OZ, PA/PI, PX, SM/SL, ZB2, and 3A2.

Zone 15. Central European Zone: FC, HA, HV, I, IT, IS, OE, OH, OK, SP, UA2, UP, UQ, UR, YU, ZA, ZB1/9HI, 9A1.

Zone 16. Eastern Zone of Europe: UA1, UA3,



Chuck, WA9SLD, has added WAZ, the premier DX award, to his DXCC, WAC and other prominent DXing accomplishments.

Tony, WØIPU, at the operating position of PJ8AS during his recent visit to Saba, Netherlands Antilles. QSL to 918 Ninth Ave., South, Hopkins, MN 55343.

UA4, UA6, UA9-Bashkir & Chkalov, UB5, UC2, UN1, and UO5.

Zone 17. Western Zone of Siberia: UA9-Sverdlovsk, Chelyabinsk, Komi, Jurgan, Molotav, Omsk, Tyumen, plus UH8, UI8, UL7, and UM8.

Zone 18. Central Siberian Zone: UA9-Novosibirsk, Tonsk, Kamerovo, and Altai; UAØ-Keasnoyarsk, Irkutsk, Chita, Bruyate Mongolia, and Dickson Island.

Zone 19. Eastern Siberian Zone: UAØ-Khabarovsk, Amur, Yakutsk, Primorsky, Sakhalin Island, Wrangel Island, and the Soviet Kuriles.

Zone 20. Balkan Zone: JY, LZ, OD5, SV, TA, YK, YO, ZC4/5B4, and 4X4.

Zone 21. Southwestern Zone of Asia: EP, HZ, MP4, 9K, VS9 (except Maldives and Socotra), YA, YI, 4W1, UD6, UF6, UG6, and AP-West Pakistan.

Zone 22. Southern Zone of Asia: AC3, AC5, CR8, 4S7, VU (except Andaman and Nicobar Islands), 9N1, and AP-East Pakistan.

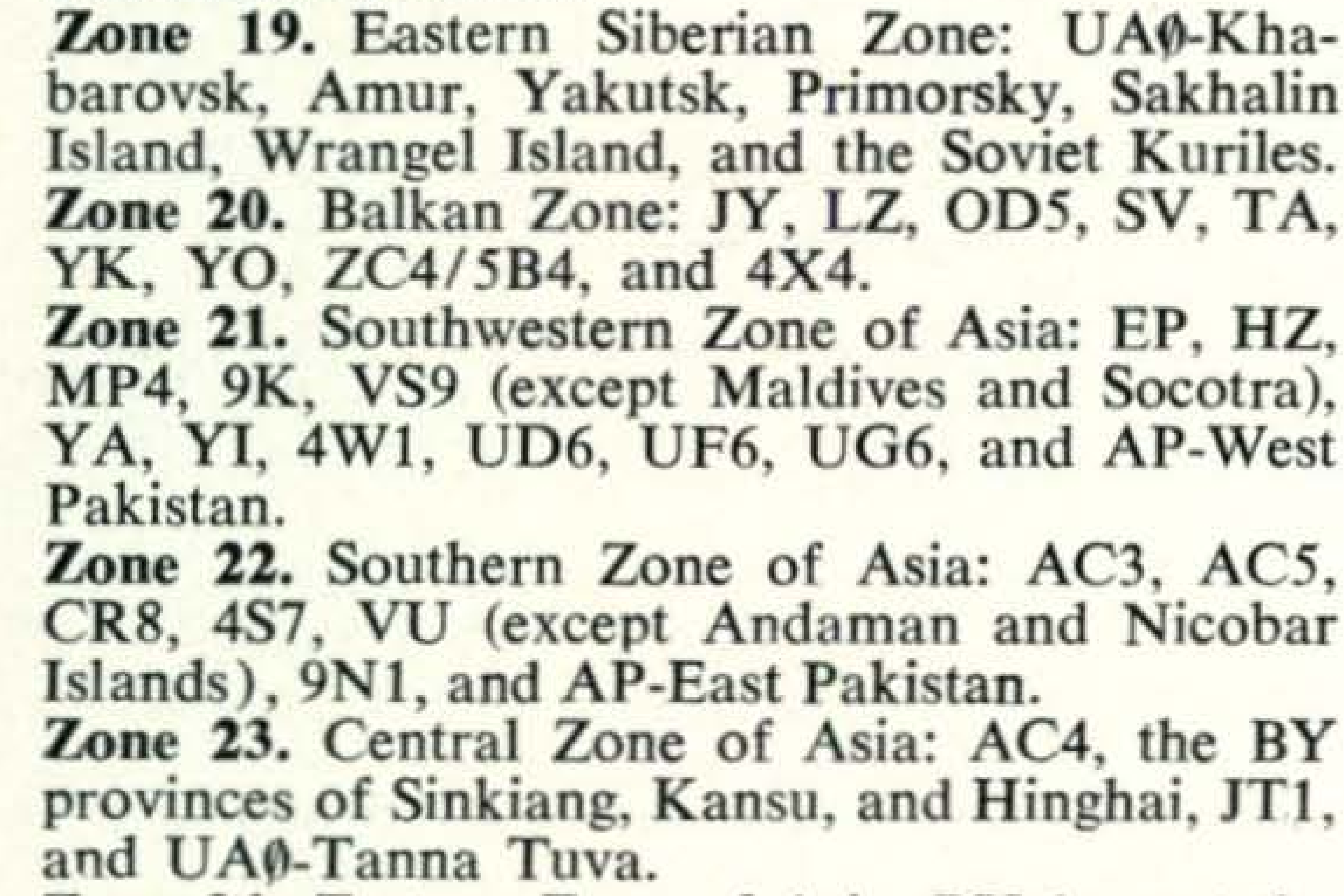
Zone 23. Central Zone of Asia: AC4, the BY provinces of Sinkiang, Kansu, and Hinghai, JT1, and UAØ-Tanna Tuva.

Zone 24. Eastern Zone of Asia: BY (except the provinces in Zone 23), BV, CR9, and VS6.

Zone 25. Japanese Zone: HL/HM, JA/KA, and KR6.

Zone 26. Southeastern Zone of Asia: HS, XV, XW, XZ, 3W8, and VU2-Andaman and Nicobar Islands.

Zone 27. Philippine Zone: DU, KC6, and KG6.



"Duke," W6HJ, is a recent WAZ winner. The rig at W6HJ includes an HT-37 driving an HT-45 to a triband beam at 38 feet. There is also a Ranger I, Swan 500CX and a Drake R-4A receiver. Duke has been an amateur for over 50 years.

Zone 28. Indonesian Zone: CRØ, VR4, VK9 (except Nauru, Norfolk Is., and Christmas Is.), VS1, VS4, VS5, ZC5, 8F, and 9M.

Zone 29. Western Zone of Australia: VK6, VK8, and VK9-Christmas Is.).

Zone 30. Eastern Zone of Australia: VK1, VK2, V3, VK4, VK5, VK7, and VKØ-Macquarrie Is.

Zone 31. Central Pacific Zone: KB6, KH6, KJ6, KM6, KP6, KW6, KX6, VK-Nauru, VR1, VR3, and ZM7.

Zone 32. New Zealand Zone: FK8, FO8, (except Clipperton), FU8/YJ, KS6, VK9-Norfolk Is., VR2, VR5, VR6, ZK1, ZK2, ZL, and 5W1.

Zone 33. Northwestern Zone of Africa: CN2, CN8, CT3, EA8, EA9, 3V8, and 7X.

Zone 34: Northeastern Zone of Africa: ST, SU, and 5A.

Zone 35. Central Zone of Africa: CR4, CR5-Guinea, EL, TU, TY, TZ, XT, ZD3, 5N2, 5U, 5V, 6W8, 9G1, and 9L1.

Zone 36. Equatorial Zone of Africa: CR5-Sao Thome, CR6, EAØ, TJ, TL, TT, TN, TR, 9Q5, 9U5, 9J, ZD7, and ZD8.

Zone 37. Eastern Zone of Africa: CR7, ET2, ET3, FL8, 6O1, 6O2, 5H3, 5Z5, 5Z4, and 7Q7.

Zone 38. South African Zone: ZD9, ZE, and ZS.

Zone 39. Madagascar one: FB8, 5R8, FR7, VQ8, VQ9, and VKØ-Heard Is.

Zone 40. North Atlantic Zone: LA-Jan Mayen, LA-Svalbard, OX, TF, and UA1-Franz Joseph Land.

The UA9 and UAØ Zones are sometimes rather hard to determine. However, the DX column in the January, 1975 issue, p. 55, has a handy table to use in locating stations in these zones.

Activity from the Rare Zones

DXers competing for the first single band WAZ plaques on 40 and 80 meters had their shots at some good ones during the winter months. Roger, ST2AY, made many rare zone 34 contacts on 80 meter s.s.b., 3790-3800 kHz, during the early evening hours. He also helped out on 40 meter s.s.b., operating around 7080 kHz. During the *CQ* Worldwide C.W. contest last November he made a number of contacts with the U.S. east coast on 160 meters, rare country *and* zone.

Among the happy stateside DXers to work ST2AY on the lower frequencies was K4MSK who scored at 0215 GMT with Roger on 3798. WA2LTQ reported him at 0320 GMT.

Forty and 80 meters also yielded some good catches from the Asian zones. Among these were UAØTO in zone 18, 3620 kHz at 1440 GMT on the west coast; UKØZAB, zone 19, on 7003 kHz at 0450 GMT; UAØFBF, zone 19, on 7007 kHz at 1400 GMT on the west coast; UAØFGM, zone 19, 3620 kHz at 1300 GMT regularly on Tuesdays; UWØFB, zone 19, 3505 kHz at 1440 also on the west coast; UAØLH, 3506 kHz at 0835 GMT; and UWØIX, zone 19, on 3605-3610 Wednesdays 2100 GMT heard and worked in Europe. Zone 23 was supplied by UA9VH/JT1 on 3612 kHz at 1430 GMT and heard on the west coast.

If you work stations in any of the rare zones on 40 and 80 meters, *CQ* would appreciate your dropping a note showing time, frequency and mode to Assistant DX Editor K4IIF, P.O. Box 205, Winter Haven, FL 33880.

Rare and Special Prefixes for WPX

C5A—This is the new prefix for Gambia, formerly ZD3.

C6A—Those strong C6A- stations are using the new prefix for the independent Bahamas. VP7 will probably be heard no more.

CY6—VE stations in Calgary are using this prefix to celebrate their City's centenary.

EA8—A number of stations have been active from the Canary Islands including EA8JF on 20 meter s.s.b., EA8JJ on 20 meter s.s.b. and EA8EX on 15 meter c.w.

FB8—FB8WB on Crozet Island frequents 20 meter c.w., 14040-045.

IVØ—Several stations in Rome are using the IVØ prefix to celebrate the Holy Year, 1975.

KT4—KT4VMI operated from Virginia Military Institute. QSL to W4COP.

PA7—PA7ØØASD commemorates the 700th anniversary of Amsterdam. QSL to P.O. Box 400, Rotterdam.

S2—Bangladesh stations heard in recent months include S21JA, 14195-14205, mornings from 1230-1300 GMT and S21CW up on 14320 at 1200 GMT.

VU7—VU7GV in the Andaman Islands has been quite active on 20 meter s.s.b. during the morning hours. His frequencies have generally been in the range from 14235-245.

3B9—Roddy, 3B9DL, operated from Rodriguez Island on 14040 crystal controlled during a recent DXpedition. He works for the cable company on Mauritius and may be able to return to 3B9 in the future. His QSL Manager is WA5ZWC.

3C1—3C1XJB operating from Panama during the *CQ* 160 Meter Contest was Gene Sykes, W4BRB.

4S7—Sri Lanka, formerly Ceylon, has been activated by 4S7PB on 20 meter s.s.b. His favorite frequencies include 14320, 14205 and 14255. The best times have been 1200-1330 GMT, but he has also been worked around 1900 GMT, and at 0000 GMT he was QSOed on 3794 kHz, a great catch for someone seeking single band WAZ. on 80 meters.

6V8—6V8FID was a commemorative station active from the Senegalese International Trade Fair in Dakar. QSL to Box 971, Dakar, Senegal.

7SL2—Two special stations, 7SL2AN and 7SL2AO used this prefix through the end of 1974.

QSL Information

A5XB—via K1DRN
A9XK—to WB2FVO
PZ5FB—to W2FCR
VK2BZM/9—c/o VE3GUS

The WPX Program

Mixed

468 JA6SVP
469 I1EIS
470 K8YQW
471 W8IEC
472 WA1NZT
473 YU2CAW
474 SM5CMP

C.W.

1376 K9HLW
1377 I1EIS
1378 GW3SB
1379 DK4HD
1380 K8YQW

2×SSB

830 I8LEL
831 I1EIS
832 WA1RDH/VQ9
833 W9OEQ
834 LA3UQ
835 W4ZAA
836 JA6WHS
837 SM7RS
837 SM5CMP

WPNX

77 WN4EBN

VPX

78 WN3UDS
84 JA4-1410

Endorsements

Mixed: W4CRW-1100, W4WSF-1050, WØSFU-750, SM5-CMP, G3KDB-700, KØPMZ, WB2HNO, W6KYA, W9EVD-600, I1EIS, I4BFY-500, W9OEQ, YU2CAW-450
C.W.: W2AIW-1000, W9FD-950, SP3DOI-750, W4KFB-600, WB4KZG-500, K9HLW-350
2×SSB: WB4SIJ-700, I8LEL, W7CUJ, SM5CMP-500, W6LQC, DL9XW-450, I1EIS-400
VPX: W4-10646-600, JA4-1410-450
160 Meters: WA2EAH
80 Meters: SP5BB
40 Meters: WB5DIZ, WA6JVD
20 Meters: WA2EAH, JA4-1410, OE1-101171
15 Meters: WA6JVD
10 Meters: WB4KZG, WB2FMK, W4ZAA
Asia: JA4-1410
Europe: I1EIS, JA4-1410, GW3SB, DK4HD, LA3UQ
North America: I8KDB, WB2FMK
Oceania: JA4-1410, WA2EAH
South America: KØPMZ

Complete rules for WPX may be found on page 67 of the February 1972 issue of *CQ*. Application forms and reprints of the rules may be obtained by sending a business size, self-addressed stamped envelope to WPX Award Manager, P.O. Box 1271, Covina, CA 91722.

C31DV—c/o G3ZXK
C31HO—via G3NWL
C31IH—to K6BR
C31IL—c/o WA9INK
C5AR—via G3LQP
C6ABC—to VP7BC
C6ABK—c/o P.O. Box 8688, Nassau, Bahamas
C6ANP—via VP7NP
C6ANX—to VP7NX
CG3GCO—c/o VE3GCO
CR6OR—via W0GX
CT2BN—to WA9PZU
EL1E—c/o WB0ARU
EL4D—via WA5ZWC
ET3FF—to Frank R. Frost, P.O. Box 1365, Addis Ababa, Ethiopia
FL0JN—c/o I8JN
FM7WE—via K4CFB
FO8DH & FO8DO—to F6BXL
HH2WF—c/o WA2JDT
HI8XKP—via W0GX
KG4DS—to WB8LUI
KS6FF—c/o W6KLJ
KX6BB—via K3NEZ
KX6MV—to WA6HRS
OD5JT—c/o OH2MT
PJ9JT—via W1BIH
VK9XW—via VK6RU
VP1FF—to W0ELT
VP2EEB—c/o K6SE/2
VP2MSU—via WB5IZN
VP2MOP—to VE4OP
VP2VZ, VP5AA & VP5BT—c/o WA5QYR
VP5WW—via WB4EYX
VR1AA—to K3RLY
YU1AJE—c/o W1CDC
ZD3R—via G3LQP
ZD7FT—to VE1AIH
ZD8TM—c/o W3KT
ZS6ME—via W5OPX
3D2GK—to K7DVK
3E1KC—c/o W0GX
4X4UR—to VE3MR
5H3KG—via I1IMC
5V7WT—to F9GL
5Z4RT—c/o DJ9ZB
6W8DY—via VE4SK
6W8FP—to WA3NCP
6Y5BF—c/o W9NFC
6Y5DE—via VE2LG
7P8AT—to JA2KLT
7Q7DW—c/o G3AWY
9G1LZ—via G3LZZ
9K2DC—to W3HNK
9L1JT—c/o W3HNK

73, John, K4IIF

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

*Apr.	4-6	Novice QSO Party
*Apr.	5-6	Florida QSO Party
*Apr.	5-6	Polish C.W. DX Contest
Apr.	6	WAB HF C.W. Contest
Apr.	12-13	Common Market Contest
*Apr.	12-13	Swiss (H-22) Contest
*Apr.	12-13	County Hunters SSB
*Apr.	12-14	Virginia QSO Party
*Apr.	19-20	Bermuda Phone Contest
Apr.	19-20	WAEDC RTTY Contest
Apr.	19-21	Zero District QSO Party
†Apr.	26-27	PACC DX Contest
May	3-4	Bermuda C.W. Contest
May	3-5	Connecticut QSO Party
May	10-12	Georgia QSO Party
May	11	WAB LF Phone Contest
May	10	World Telecomm. Phone
May	17	World Telecomm. C.W.
†May	10-11	USSR M-CQ DX Contest
May	17-18	YL ISSBers QSO Party
May	17-19	Michigan QSO Party
June	1	WAB LF C.W. Contest
June	6-9	CHC/FHC/HTH Contest
June	28-29	ARRL Field Day
July	12-13	Ten-Ten Net QSO Party
July	19-20	Space Net VHF Contest
July	20	WAB VHF Contest

*Covered in last month's Calendar.
†Not officially announced.

Worked All Britain Contests

The "WAB" contests are 12 hour affairs from 0900 to 2100 GMT on the dates listed in the Events Box. (Announcement received too late to list the March 16th HF Phone).

There are three classifications, single operator, multi-operator single transmitter and s.w.l.

The following rules are for overseas stations, outside the British Isles. Contacts made in the contest may be applied for the WAB awards.

The Low Freq. Bands are 1.8, 3.5 & 7 MHz. The High Freq. 14, 21 & 28 MHz.

Exchange: RS(T) and QSO no. Stations in the United Kingdom will also give their county and WAB area number.

Scoring: Each contact is worth 5 points. The same station may be worked on different bands for QSO points, but not a multiplier. The multiplier is determined by the number of different United Kingdom areas worked.

Final Score: Total QSO points times the WAB area multiplier.

Awards: Certificates to the leading station in each country for each classification, 2nd and 3rd place where warranted.

Logs go to: R. L. Senter, G4BFY, 10 Toll Bar Avenue, Bottesford, Nottingham NG13 OBB, England, and received by the following dates: HF Phone May 5, HF CW May 26, LF Phone June 30, LF CW July 22 and VHF Sept. 8th.

Common Market DX Contest

Starts: 0001 GMT Saturday, April 12
Ends: 2400 GMT Sunday, April 13

This is a new one organized by the U.B.A. (Union of Belgium Amateurs). The object being to work stations in the 9 Common Market countries of Europe. Belgium, Denmark, England, France, Ireland, Italy, Luxemburg, Netherlands and West Germany.

All bands, 10 thru 160, both c.w. and phone. Three categories, Single Operator, single band and all band, Multi-operator, all band only.

Following rules for stations outside the Common Market.

Exchange: RS(T) plus QSO no. starting 001.

Scoring: Contacts with each Common Market station 5 points. The multiplier is determined by each prefix of each Common Market station worked on each band.

Final Score: Total QSO points times the sum total multiplier from each band.

Awards: Certificates to the top scorer in each country in each category, additional awards if returns justify. Trophies to the leading single operator in each continent.

A summary sheet is requested showing the scoring and the usual signed declaration. Compute your score and check log for duplicate contacts. The 3% disqualification rule will be inforced. Include one IRC for copy of results.

Mailing deadline is June 30th to: U.B.A. Contest Committee, Att: Timmerman Omer, ON5TO, Boterbekeweg 8, 8200 Brugge, Belgium.

Bermuda Contest

Phone: April 19-20 C.W.: May 3-4
Starts: 0001 GMT Saturday
Ends: 0200 GMT Sunday

Rules were given in details in last month's Calendar. However, there is one major change that merits repeating. This year the multiplier is determined by the number of VP9 stations you work on each band, *not* the Parishes as in previous years.

The Bermudians will continue to give their Parish in the exchange. The Worked All Bermuda Award now requires QSL cards from all nine Parishes.

Parish abbreviations: DEV, HAM, PAG, PEM, SAN, SMI, SOU, STG, WAR.

*14 Sherwood Road, Stamford, Conn. 06905.

Logs must be *received* no later than June 30th and go to: Radio Society of Bermuda, Contest Committee, P.O. Box 275, Hamilton 5, Bermuda.

WAEDC RTTY Contest

Starts: 0000 GMT Saturday, April 19
Ends: 2400 GMT Sunday, April 20

The DARC and the DAFG are the sponsors of this the 7th annual RTTY contest. Only 36 out of the 48 hours contest period are permitted for single operator stations. The 12 hour rest period may be taken in one but not more than 3 periods anytime in the contest.

Both single and multioperator single transmitter, all bands 3.5 thru 28 MHz.

Exchange: QSO no., and RST report.

Points: Contacts within one's own continent 1 point, with other continents 3 points. Non-Europeans get 5 points for each EU contact. Europeans 3 points for the same contact.

Like in the phone/c.w. contest the QTC feature is also used. Each QTC exchange is worth 1 additional point. (See July 1974 CALENDAR for details and European country list.)

Multiplier: Is determined by number of countries worked on each band. The ARRL and WAE list are the standards. In addition call areas in the following countries will also be considered a multiplier. JA, PY, VE/VO, VK, W/K, ZL, ZS, UA9, UAØ.

Final Score: Total QSO points, plus QTC points multiplied by the sum total country multiplier worked on each band.

Awards: Will be made in 3 classes: 200 watts or less input, over 200 watts, and s.w.l.'s.

In each country and call areas shown above. Continental leaders will also be honored and additional certificates where warranted. There are also plaques for continental winners.

Mailing deadline for logs is June 10th to: WAEDC Contest Committee, P.O. Box 262, D-8950 Kaufbeuren, West Germany.

Zero District QSO Party

Starts: 2000 GMT Saturday, April 19
Ends: 0200 GMT Monday, April 21

This one organized by the TRA ARC of Iowa State Univ. covers a lot of territory and should create a lot of activity.

Stations outside the Zero District will work Zero stations only, but Zeros may work both in and out-of-district stations. Same station may be worked once on each band and mode, mobiles in each county change.

Exchange: QSO no., RS(T) and QTH. County and ARRL section for Zeros, ARRL section only for all others.

Scoring: *For Zeros:* Total QSOs multiplied by (ARRL sections + Zero counties + DX countries worked). *For Non-Zeros:* Total QSOs multiplied by (Zero counties + Zero sections).

Frequencies: 3570, 7070, 14070, 21070, 28070, 3900, 7270, 14300, 21370, 28570. Novice, 3725, 7125, 21125.

Awards: Appropriate certificates to leading scorers in each section.

Mailing deadline May 20th to: TRA Amateur Radio Club, WAØTKK, Wilson Hall, Iowa State University, Ames, Iowa 50010.

PACC DX Contest

Starts: 1200 GMT Saturday, April 26
Ends: 1800 GMT Sunday, April 27

It's the world working the Netherlands in this one. All bands 1.8 thru 28 MHz, both phone and c.w. (c.w. only on 160). The same station may be worked only once, either phone or c.w., on each band for QSO and multiplier credit.

Exchange: RS(T) plus a QSO number starting with 001. PA/PI/PE stations will also include their province. (ie: 579001/GR).

Scoring: Each completed QSO counts 3 points. The multiplier is determined by the provinces worked on each band.

Final Score: Total QSO points multiplied by the sum of provinces worked on each band.

There are 12 provinces, DR, FR, GD, GR, LB, NB, NH, OV, UT, YP, ZH, ZL.

Awards: Certificates to the top scorers in each country and call areas in W/K, VE/VO, CE, JA, PY, VK, ZL, ZS. (also s.w.l. awards).

Include a summary sheet with your log, showing the scoring and other pertinent information, your name and address in Block Letters, and a signed declaration that all rules and regulations have been observed.

Contest contacts may be credited for the PACC 100 Award in lieu of QSL cards, providing the log of the station claimed is received. Send application with 5 IRCs to VERON Traffic Bureau, Box 1166, Arnhem, Netherlands.

Mailing deadline for logs June 30th to: L.V.D. Nadort, PAØLOU, Contest Mgr., Bospolderstraat 15, Nieuwerkerk a/d IJssel, Netherlands.

Connecticut QSO Party

Starts: 2100 GMT Saturday, May 3
Ends: 0200 GMT Monday, May 5

The Candlewood ARA again is the sponsor of this activity. Stations may be worked once on each band and each mode for QSO credit.

Exchange: QSO no., RS (T) and QTH. County for Conn.; ARRL section for others.

Scoring: Each contact counts 1 point, 2 if its with a novice. Conn. stations multiply total by number of ARRL sections and VE provinces worked. Others use Conn. counties for their multiplier. (max. of 8).

DX contacts count for QSO points but only one additional multiplier. W1QI/1 will be active on all bands both modes. Contacts with him are worth 5 points, each band and mode.

Frequencies: c.w.—3540, 7040, 14040, 21040, 28040. Phone—3925, 7250, 14300, 21375, 28540. Novice—3725, 7125, 21125, 28125.

Awards: Certificates to highest scorer in each ARRL section, VE province and Conn. county. (min. of 6 QSOs). In addition, a special WACC certificate will be awarded to each station who works all 8 Conn. counties. (Conn. to Conn. contacts are permitted.) There is a Trophy for the Club with the highest aggregate score.

Mailing deadline for logs June 2 to: Candlewood ARA, c/o Donald Crosby, W1EJM, 10 Royal Road, Danbury, Conn. 06810.

World Telecomm. Contest

Phone: 0000-2400 GMT Saturday, May 10
C.W.: 0000-2400 GMT Saturday, May 17

The Brazilian Ministry of Communication announces its 6th annual contest commemorating "World Telecomm. Day." (May 17th).

Its a world wide contest, make as many contacts as possible with stations in other ITU Zones. Operation is limited to single operator stations, fixed or maritime, 10 thru 160 meters. Use a separate log for phone and c.w.

Exchange: RS(T) plus your ITU Zone.

Scoring: QSO points as follows:

	10/15/20	40	80/160
Same country	0	0	0
Other countries same Zone	1	1	2
Other Zones same continent	2	3	4
Other continents	3	5	6

Final Score: Total QSO points multiplied by different ITU Zones worked. The same station may be worked on each band for QSO points but Zones is counted only once.

Awards: Diplomas to the three highest scores in each country. Gold, silver and bronze medals to the three world high scores. Separate awards for phone and c.w.

The ITU Trophy goes to the country with the highest aggregate score determined by the average of the scores of the top 5 contestants. The Trophy remains in the possession of the national association of that country affiliated with the IARU, for one year. It is retired by the country winning it 3 times in a 5 year period.

Mail logs before June 30th to: Ministerio das Comunicacoes, DENTAL, 70,000 Brasilia DF, Brazil.

Georgia QSO Party

Starts: 2000 GMT Saturday, May 10
Ends: 0200 GMT Monday, May 12

This is the 14th annual QSO party for the Columbus ARC. The same station may be worked on each band and mode for QSO points, and Ga. to Ga. contacts are permitted.

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

Scoring: Each QSO counts 2 points. Ga. stations multiply total by number of different states and VE provinces worked. Out-of-state use Ga. counties for their multiplier. (max. of 159) DX may be worked for QSO points but not for multiplier credit.

Frequencies: c.w.—1810, 3590, 7060, 14060, 21060, 28060. s.s.b.—3900, 3975, 7245, 14290, 21360, 28600. Novices—3718, 7125, 21110, 28110. Try 160 at 0300Z, 10 on the hour and 15 on the half hour.

Awards: Certificates to the highest scorer in each state, province, country and Georgia county. Also to the top Ga. and out-of-state Novice. There are also Plaques for the top Ga. and out-of-state stations, and top mobile and portable outside own county.

Make up your log in the usual sequence, include a summary sheet with the scoring and the usual signed rules declaration.

Mail before June 9th to: Columbus ARC. Att: John T. Laney III, K4BAI, P.O. 421, Columbus, Georgia 31902. Include large s.a.s.e. for copy of the results.

Editor's Notes

That was an error in the listing of the dates of the CHC/FHC/HTH QSO Party in last month's Calendar. The correct dates are June 6-9.

The new Common Market contest could have used better judgement in picking its dates. Having it on the same week-end as the long established H-22 contest is not going to make a good impression for its initial appearance.

In the WAEDC results last month, DK1FW should have been listed as the European Phone trophy winner.

No official announcement from the USSR M-CQ officials as yet. It would be safe to assume you can follow the same pattern as previous years.

We had a good one for our 160 Contest this year. DX conditions especially on Saturday night were excellent. The "DX Window" was loaded with EU DX, so many in fact that they were QRMing each other. The "Window" was relatively clear of state-side c.w. QRM, except for an occasional "red faced" W/K or VE who forgot to throw his transceive switch to the separate transmit position, which was excusable.

However I cannot accept the QRM caused by a very small group of phone men who insisted they had a legal right to operate where they pleased. Its not a question of their rights but their lack of amateur cooperation. Their intent is quite obvious when they brazenly call themselves "The Window Shade Net." Theirs must be a very limited circle of amateur friends as I cannot believe that the vast majority of 160 operators perscribe to that thoughtless attitude. 73 for now, Frank, W1WY

Propagation

BY GEORGE JACOBS,* W3ASK

THE Swiss Federal Observatory reports a mean sunspot number of 18.7 for January, 1975. This is the lowest level of solar activity reported since *December, 1965*. It results in a 12-month running smoothed sunspot number of 36, centered on July, 1974. A smoothed sunspot number of 22 is forecast for this month, as the cycle continues to decline slowly towards a minimum.

During April, *20 meters* should be the optimum band for DX propagation conditions during most of the daylight hours, and well into the evening hours as well. Considerably fewer openings are expected on *15 meters,* but some fairly good DX should still be possible towards southern areas, especially during the late afternoon hours. Very few *10 meter* DX openings are expected this month, but an occasional one should be possible from all USA time zones to South America, and from the western states to the South Pacific. Be sure to check *10 meters* during the ABOVE NORMAL conditions forecast for April 15 and 19-20.

After sunset, optimum DX propagation conditions should be shared between both *20* and *40* meters. Good openings to many parts of the world are forecast for both bands between sunset and Midnight, and on *40 meters* from Midnight to sunrise. Some fairly good *80 meter* DX openings should also be possible during the hours of darkness and at sunrise, and there is a fairly good chance for an occasional DX opening on *160 meters* during the same time period.

Seasonally favorable propagation conditions over long paths between the northern and southern hemispheres, for example, to Australasia, South America, southern Africa, etc., should continue during April on all h.f. bands.

Thunderstorms become more numerous during April in the northern hemisphere, and this should result in a considerable increase in the level of static on all h.f. bands, especially *40, 80* and *160* meters.

V.H.F. Ionospheric Openings

Chances for v.h.f. ionospheric openings during April look pretty good.

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

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For April, 1975

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date *April*				
Above Normal: 15, 19-20	A	A	B	C
High Normal: 5-6, 13-14, 16-18, 21-22, 24, 28	B	B	C	D
Low Normal: 3-4, 7, 9-10, 23, 25, 27	B	C	D	E
Below Normal: 1-2, 8, 11-12, 26, 29	C	D	E	E
Disturbed: 30	D-E	E	E	E

Where *expected signal quality is:*

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

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the Charts with a *propagation index* of (3) will be poor on April 1-2 (D), fair on April 3-4 (C) and good on April 5-6 (B), etc.

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

Lyrids, a major meteor shower is due April 21-23. It should peak during the afternoon of April 22, when an average of 15 good-sized meteors are expected to enter the earth's atmosphere every hour. This should considerably increase the chances for v.h.f. meteor scatter-type openings.

Sporadic-E propagation normally begins to increase during April, and it should continue to do so through the spring and summer months. This should result in an increased number of short-skip openings on both the *10* and *6 meter* bands. Most openings will fall between the 750 and 1300 mile range, but some may extend out to 2000 or more miles. During periods of intense sporadic-E ionization, openings on *2 meters* may also be possible over distances between about 1200 and 1400 miles. As its name infers, sporadic-E openings may occur at any time of the day or night, but there is a tendency for them to peak between 8 A.M. and Noon and again between 5 and 9 P.M., local time.

Some auroral-type ionospheric openings should be possible during the radio storminess predicted for April 29-30. Openings may also be possible during the periods of BELOW NORMAL h.f. conditions expected April 1-2, 8, 11-12 and 26.

Trans-equatorial, or TE, openings on *6 meters,* while always difficult, tend to increase during the spring months. During April, check for them between 9 P.M. and Midnight, local daylight time, on long north-south paths which cross the geomagnetic equator at approximately a right angle. TE openings favor locations in the southern part of the country, with progressively fewer openings possible in the central and northern sections.

DX propagation predictions for each amateur band between *10* and *160 meters* for the period *April 15 through June 15, 1975* appear in the *DX Charts* on the following pages. A day-to-day forecast of *general* propagation conditions expected during April is given in the *Last Minute Forecast* appearing at the beginning of this column. *Short-Skip Charts,* which appeared in last month's column, contain short-skip predictions for April, for band openings between 50 and 2300 miles. Beginning this month, and continuing through the summer and fall, the times shown in the *Propagation Charts* will be *local daylight time* (EDT, CDT, MDT and PDT). If your locality is not on daylight time, be sure to *subtract* an hour from the time shown in the *Charts.*

73, George, W3ASK

April 15—June 15, 1975
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

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

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

How To Use The DX Propagation Charts

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

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates 80 Meter openings. Openings on 160 meters are likely to occur during those times when 80 meter openings are shown with a *propagation index* of (2), or higher.

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

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

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

4. Time shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 P.M., etc. Appropriate *daylight* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate Chart 7 hours in the PDT Zone, 6 hours in the MDT Zone, 5 hours in the CDT Zone and 4 in the EDT Zone. For example, 14 in Washington, D.C. is 18 GMT and 20 in Los Angeles is 03 GMT, etc.

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

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

Peru, Bolivia, Paraguay, Chile, Argentina & Uruguay	12-15 (1) 15-17 (2) 17-18 (1)	08-09 (1) 09-11 (2) 11-14 (1) 14-15 (2) 15-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-10 (1) 14-16 (1) 16-17 (2) 17-18 (3) 18-21 (4) 21-22 (3) 22-00 (2) 00-04 (1)	20-21 (1) 21-04 (2) 04-06 (1) 23-05 (1)*
McMurdo Sound, Antarctica	*Nil*	*Nil*	07-09 (1) 16-20 (1) 20-23 (2) 23-00 (1)	01-05 (1)

Time Zones: CDT & MDT (24-Hour Time)
CENTRAL USA TO:

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

Time Zone: PDT (24-Hour Time)
WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	*Nil*	*Nil*	06-08 (1) 08-10 (2) 10-13 (1) 13-16 (2) 16-19 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	*Nil*	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 22-00 (1)	20-23 (1)
Eastern Mediter-ranean & Middle East	*Nil*	*Nil*	07-09 (1) 13-15 (1) 18-19 (1) 19-21 (2) 21-22 (1)	20-23 (1)

[*Continued on page 61*]

THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll
All Counties
#119—James L. Willingham, KØARS, 12-26-74.

THE "Story of The Month" for April, as told by Wilbur is:

Wilbur F. Wilhelm, WA6OTV.
(All Counties #116, 1-14-74)

"I was born in Colfax, Washington on September 29, 1922 and grew up on a farm in Eastern Washington. In 1943 I received a degree in Mechanical Engineering from Washington State University at Pullman, Washington.

"My amateur radio activity started in 1960 with my son when we got our Novice licenses together. We operated a complete home brew station. On receiving our General licenses we built a single side band exciter and an 813 linear, that is still in use.

"I read about County Hunting in *CQ* and started listening to the 20 meter Net. The bug got me and I made my first 20 meter Net contact with K9KKK mobile. Along the way the press of work often kept me off the air for months at a time. In any event, I finished my last County, Fallon, Montana on 29 December 1973 with the special assistance of Ron, K7-LTV. Naturally I have many others to thank for making it possible to work all those Counties.

"I have been employed by the Rocketdyne Division of Rockwell International for nearly 25 years, working on large rocket engines.

"My son, Neil WA6OTW/2, went on to get a PhD in Electrical Engineering and is teaching at the University of Rochester in New York.

"With All Counties worked, I have gone back to some neglected home brew projects, but I'll check into the Nets from time to time."

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

USA-CA HONOR ROLL

2500		1500		500	
WA3TUC	180	WA4AUL	254	WA2GLU	1028
2000		W2SDU	255	DJ9CJA	1029
WA3TUC	212	1000		KØCMF	1030
W2SDU	213	K0CMF	344	W3LUD	1031

The Sweethart Net Award.

Awards Issued

Jim Willingham, KØARS became #119, All Counties!

Paul Bugen, WA3TUC, added to his collection, USA-CA-2500 endorsed All SSB, All Mobiles; plus USA-CA-2000 endorsed All SSB, All 14, and All Mobiles.

Bob Margolin, W2SDU qualified for USA-CA-2000 endorsed All Mobiles, All SSB and USA-CA-1500 endorsed All 14, All Mobiles and All SSB.

Ken Distel, WA4AUL was issued USA-CA-1500.

Ken McGee, KØCMF applied for USA-CA-1000 and USA-CA-500, both endorsed All 14, All 2×SSB and All Mobiles.

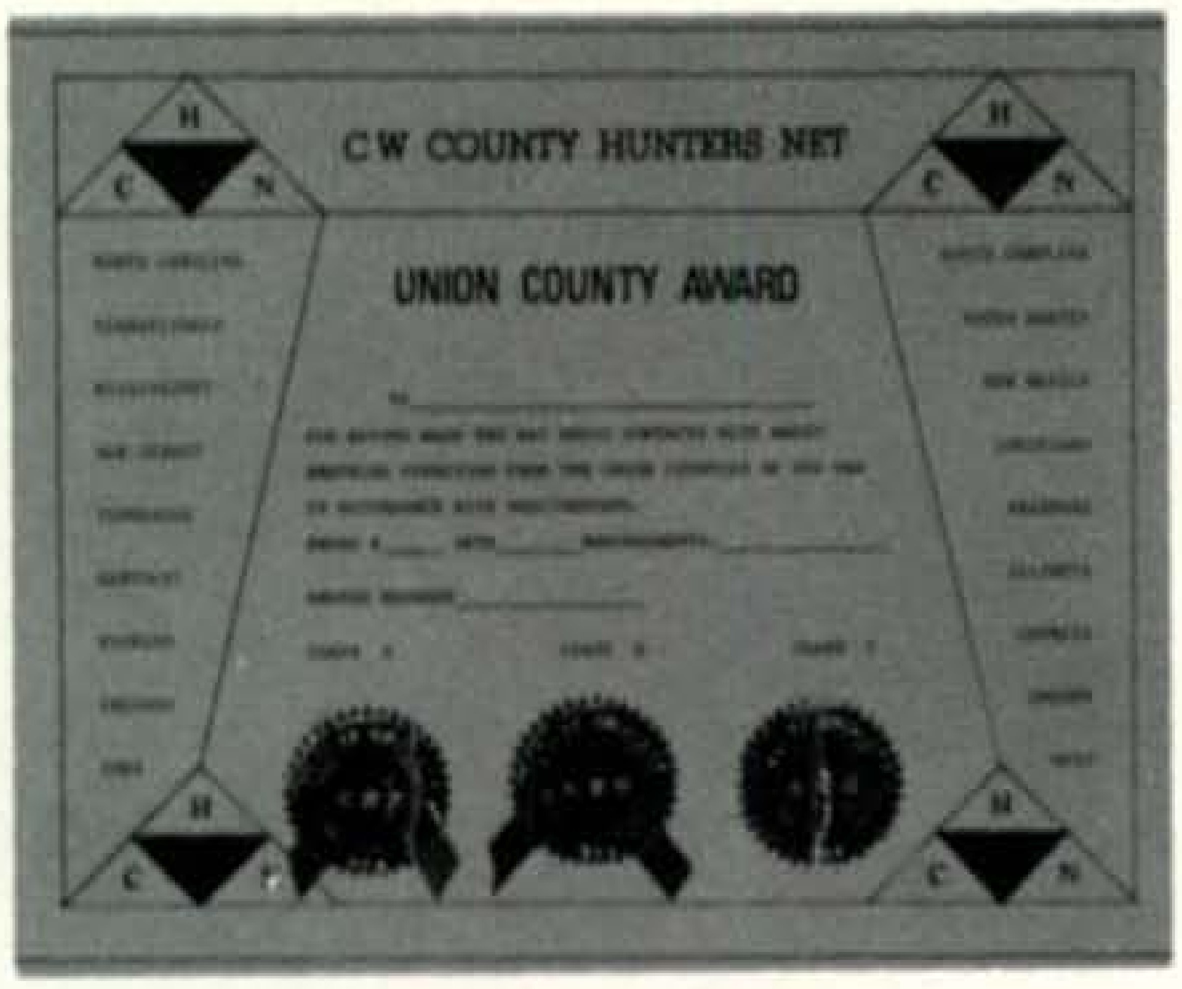
"Bob" Meyer, DJ9CJA was happy to get USA-CA-500 endorsed All 2×SSB.

Mixed USA-CA-500 Awards went to:
Howard Siegel, WA2GLU, and
Royal Gibson, W3LUD.

Awards

The Sweethart Net Certificate: To become a member and get the Certificate, you need to check into their a.m. or s.s.b. Net 2 times or work any 5 holders of the certificate. It is free, although you should send 30¢ in stamps to cover mailing costs. Kindly send stamps and log data on stations worked to: Jim Hart, WA-3NCQ, 1718 Langley Road, Essex, Maryland 21221. The purpose is to stimulate activity on 10 meters, the Net Meetings are: a.m.-Tuesdays & Fridays 0100 UTC 29.000 MHz, s.s.b.-

Mystic, Conn. Mini-Convention Group.

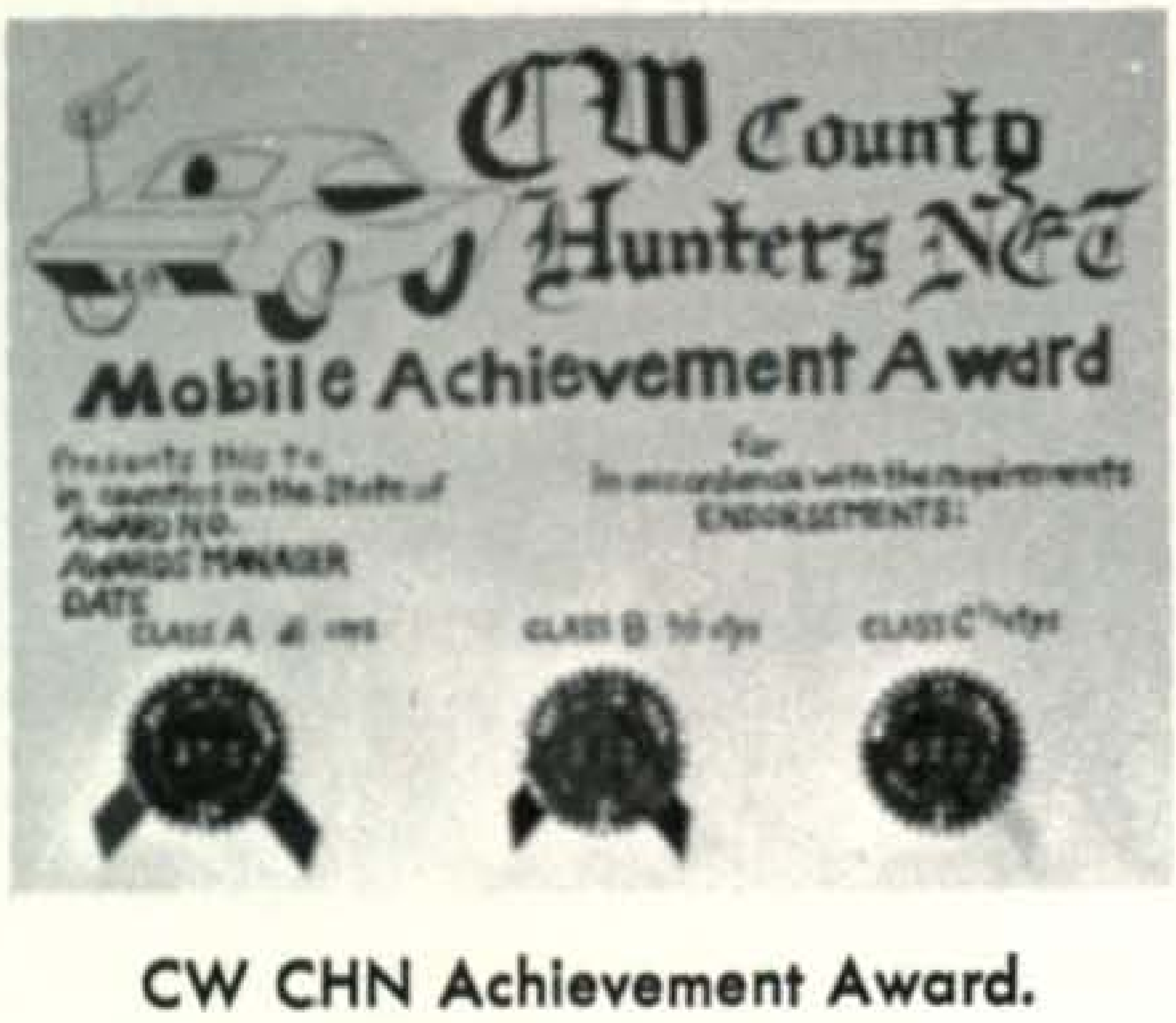


CW CHN Union County Award.

Wednesdays & Thursdays 0100 UTC 28.775 MHz. No Sweethart is not in error—it is so called as Jim suggested they use G.P. Antennas and the fellows liked them and called them Sweetheart but changed the spelling to conform to Jim's last name, HART . . . The Sweethart Net of Maryland—DC Chapter of the 10-X International Net of Southern California, Inc. hopes to hear from you.

The C.W. County Hunters Net Awards Program: The following three Awards are printed and ready for immediate issue, with more to follow soon. CHN Award Rules: Fee—Basic Award $1.00, Endorsements—Band-Mode or Mixed. Seals & Endorsements are free at time of issue, thereafter SASE—List & Basic Award number. No date limits, all confirmed contacts count Mobile-Portable-Fixed. Honor System: No signers needed but Awards Manager reserves the right to request any or all QSLs at applicants expense, should any questions arise. Send list of required information to Awards Manager, George Levensalor, W1DPJ, 339 Buck Street, Bangor, Maine 04401. Officers of CW CHN are: President, K1ZFQ; Vice President, WA5KQD; Contest Chairman, W9MSE; Awards Mgr. & Treasurer, W1DPJ.

The United States of America Counties Award By Call Areas: Actually *12* separate Awards for confirmed contacts with radio amateurs operating in Counties of the *12* U.S. Call Areas: One through Ten, then Alaska & Hawaii. Class A: All Counties in Call Area. Class B: 2/3



CW CHN Achievement Award.

Counties. Class C: 1/3 Counties. Anyone holding All *12* Class A, will be issued a Trophy Free.

CHN Mobile Achievement Award: Issued in 3 different categories:

#1. For Working Mobiles in Counties of any one *State*.

#2. For Mobiles Giving out Counties of any one *State*.

#3. For Working same Mobile in Counties of any one state.

Bonanza: Two In One: The applicant gets Award for working same mobile and the Mobile gets Award Free as gift of applicant for giving out Counties to same station. Class A: All Counties of a *State*. Class B: 2/3 Counties. Class C: 1/3 Counties.

CHN Union County Award: For Working the Union Counties of the USA. Class A: All 18. Class B: 2/3 Counties. Class C: 1/ Counties.

Notes

Here is some data via courtesy of Clet, W1DIT and Marv, WB2SJQ.

"At the Mystic, Conn. Mini-Convention over the weekend of 18/19 October, we had 24 County Hunters registered. At the banquet, those hams and their families took 30 places at the dinner table. We had 3 Cliff Corne'ers: W1EQ who had another Sat. night Dinner to attend, WB2SJQ and WA1CXE. WB2SJQ chaired a round table session on Net operations Saturday afternoon. W1DIT showed slides of several National Convention gatherings and photos of some choice county lines in Florida and North Carolina.

"Robert York Chapman, W1QV, New England's retiring ARRL Director was our after-dinner guest speaker. Marv Hagan, WB2SJQ concluded the evening with a short message on the importance of County Hunting in the lives of shut in fellow amateurs.

"Mrs. Dunn and I are pleased that so many Hams came around to the New England County Hunters Mini-Convention. It was a pleasure to host the affair." Signed, Clet, W1DIT.

Again Paul Bugen, WA3TUC came through with a fine photograph of the afore-mentioned Convention: *Front* row: WA3VLB, K1LBK, WA3TUC, WB2SJQ, WA2TGN, W1WHQ, K1-GSK. *2nd* row: WA1CXE, W1QV*, WA3-TUC*, WA1ERZ*, K1VSJ*, K1QWK*, K1-GSK*, W1WHQ*, W1DIT*, *3rd* row: W1QV, K1VSJ, W2QKJ*, WA3VLB*, WA1ERZ, WB2-TAA, W1LQQ, W2JGY, W1DIT. *Back* row: W2QKJ, WA1LZS, K2RAR, K2TPS. *-Indicates YF or OM. W1EQ missed foto.

Speaking of slow mail service, I had an Award mailed with *extra* 1st class postage on it from Montana on Nov. 31 and due to it *not* being marked 1st Class, I got it January 4th.

Ran out of space, write and tell me—How was your month? 73, Ed., W2GT

SURPLUS sidelights

BY GORDON ELIOT WHITE*

No, it's not an April Fool—the U.S. military is *still* selling the AN/ARC-5 and SCR-274-N Command Sets in its surplus sales. I saw both receivers and transmitters of the WW II vintage in several Defense Property Disposal Service bid lists in the last couple of months. It may be 30 years since V-J Day next August, but old surplus never dies, it keeps on turning up.

So I am writing this column, as I did the March effort, both with a certain sense of Deja Vu and to give a little Command Set background to those amateurs who didn't happen to read Surplus Sidelights five years ago.

As everyone should know by now, the Command transmitters were even more ubiquitous in amateur usage than were the receivers, from about 1947 until the f.m. craze began a few years ago. They were simple, of clean design, easy to work on and to modify, and relatively easy to treat for TV interference.

CQ published an entire book on the subject of Command Sets and their modification, back in 1957, now long out of print. It covered the high-frequency sets, with a brief look at the Western Electric v.h.f. units, in 136 pages, and did not even touch the later AN/ARC-60. A.R.C. Type 12, or AN/ARN-30 units.

In that era the h.f. transmitters from the Command series were so common and plentiful that at least one manufacturer, Central Electronics, Inc., of Chicago, bought up a few thousand and converted them to a commercial set. Central threw away the aluminum outer case and put the unit in a steel box of almost the same dimensions. An a.c. power supply was hung on the rear, and a band switch was added to give coverage of 160, 80, 40, 20, 15 and 10 meters. A new dial was provided, although the old antenna coupling control was allowed to protrude through the panel just like the Army had it. The tuning knob was replaced by a control crank taken off the receiver control head. The "eye" calibrating tube was taken out, along with one of the 1625 power amplifiers, and a modulator section wired in.

Mostly, however, amateurs just converted ARC-5's and the BC-army versions on their own. It was easy, and fast to get on the air, and they lent themselves to mobile operation by just wiring them up as the Army did for airplanes. Some minor changes were generally made, like converting to 12 or even six volts, for auto use, and better modulation was generally incorporated, but thousands upon thousands of amateurs got on the air that way, and still do.

The object of all this attention was a very straightforward four-tube transmitter, with, originally, a three tube modulator. The transmitter had a v.f.o. with a 12J5 master oscillator exciting a pair of 1625 power amplifiers. Modulation was originally screen-grid, using another 1625 in the BC-456 unit, and was later changed in the ARC-5 series to plate modulation, in the MD-7.

The transmitter itself really only needed three tubes, since the 1629 was an "eye" tube, used in conjunction with a calibration crystal, to check the unit for tuning accuracy (under radio silence conditions) at specified points in its band. The original crystal unit was packaged in an octal-based, tube-like holder.

The key to its postwar popularity was the fact that the engineers at tiny Aircraft Radio Corp., in Boonton, N.J., did a really first-class job of designing a compact, stable, re-settable transmitter that held its tuning under combat conditions. Those attributes made it an equally good amateur unit.

Amateurs quickly learned to convert the calibration crystal to control the master oscil-

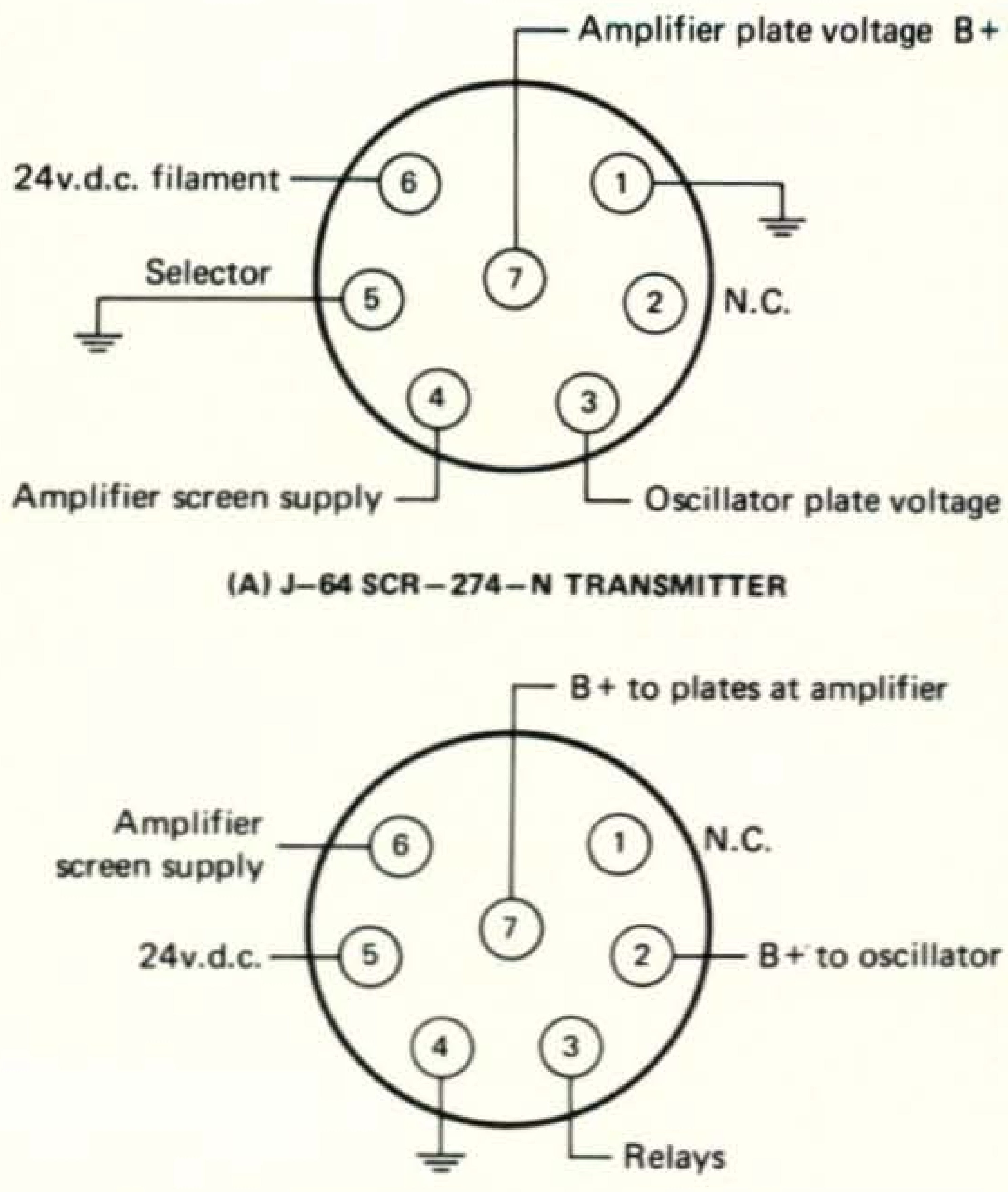


Fig. 1—Rear-panel connections, Command sets. (A) is for the SCR-274-N transmitter and (B) is for the ARC-5 transmitter.

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

lator, and went on from there. Power was boosted from the military 40 watts to well over 100, modulation was boosted, meters were incorporated, etc., etc.

All these changes were duly recorded in *CQ* over the years, and published and re-published in various anthologies, including *Surplus Conversion Handbooks* which are still available from this magazine.

The original Army and Navy manuals are still available in the military, and from amateur dealers such as Quaker Electronics, Hunlock Creek, Pa. 18621, and Sam Consalvo, 7218 Roanne Dr., Oxon Hill, Md. 20021.

I am sitting here working from an original operation and maintenance handbook for the SCR-274-N dated February 15, 1943, stamped "for airplane type B-24-J, AAF serial No. 42-50699." That alone should bring on nostalgia for some readers now about 50, who were the 18-year olds who flew the Liberators and the Fortresses in that war.

But even for the military, high-frequency radio was on its way out in 1943 for short-range use. The coming thing was Very High Frequency, and the SCR-522, a chinese copy of a British set, was king of the air waves in 1944.

The last h.f. command transmitters were turned out in 1945, but enough were stockpiled to supply the invasion of Japan which never happened, so that is why the military still unearths more of them every year as a base or two is closed and the last warehouse cleaned out.

Aircraft Radio Corp. turned to the hoped-for civilian market after WW II, producing a v.h.f. set which was just the thing for light Army aircraft and helicopters when the Korean War came along. The T-11 and T-13 were miniaturized units covering 116-132 and 132-148 MHz. They may still be around, but have been phased out of aircraft work because of a "type acceptance" rule instituted by the FCC some years back.

I covered the T-11, T-13 sets in depth in *CQ* for September, 1968 p. 110. They were low-powered, a watt or two, and used five crystals for frequency control. Well-equipped aircraft had several transmitters, ganged together to cover a whole range of frequencies. A unique "whistle-through" tuning arrangement allowed the pilot to set his tuneable v.h.f. receiver to the transmitter frequency by pushing on the control crank. I well remember handling one of those sets for the first time in a single-engine Army Beaver, in West Germany in the late 1950's. It was pretty hot stuff after the NARCO Superhomer and the GE transmitter I was used to flying with in my little Cessna 140.

For those who have good libraries, I have covered the Command sets in several issues of *CQ*, including Jan. 1967 p. 100, Sept. 1968 p. 110, Sept. 1971 p. 90, and several references in the October 1965 and Nov. 1964 magazines.

ARR-52 Update

I have received some mail on my ARR-52 article (Oct. 1974) and would like to add a few things to what I said in that column:

The r.f. amplifier is found in a special #1 module, outside the individual receiver unit. (there were multiple receiver units in the set, which was built to pick up signals from anti-sub sono-buoys). A letter from Andy, K6BBQ, notes "the antenna connection feeds directly into the first mixer." This is not quite correct. The antenna fed into the pre-amp module and thence into the receiver module.

Harold, WØLFA, writes that he modified the ARR-52 by taking the slug in the center of the adjustments out. He drilled the hole out to take a shaft and coupler to the band switch, eliminating the electrical crystal switch on the ARR-52. ■

Propagation [*from page 56*]

West Africa	*Nil*	11-15 (1)	06-08 (1) 12-15 (1) 15-16 (2) 16-17 (3) 17-19 (2) 19-21 (1)	20-23 (1)
East & Central Africa	*Nil*	12-14 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-18 (1)	20-22 (1)
South Africa	*Nil*	10-13 (1)	06-08 (1) 13-14 (1) 14-16 (2) 16-17 (1) 22-00 (1)	19-22 (1) 20-22 (1)*
Central & South Asia	*Nil*	19-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-21 (2) 21-23 (1)	04-07 (1)
Southeast Asia	*Nil*	19-21 (1)	07-08 (1) 08-10 (2) 10-11 (1) 22-23 (1) 23-00 (2) 00-02 (1)	04-07 (1)
Far East	*Nil*	20-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 19-22 (1) 22-00 (2) 00-02 (1)	02-03 (1) 03-06 (2) 06-08 (1) 03-07 (1)*
South Pacific & New Zealand	14-16 (1) 16-19 (2) 19-20 (1)	11-13 (1) 13-16 (2) 16-21 (3) 21-22 (2) 22-23 (1)	04-08 (1) 08-11 (2) 11-17 (1) 17-20 (2) 20-21 (3) 21-00 (4) 00-01 (3) 01-04 (2)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 01-02 (1)* 02-05 (2)* 05-06 (1)*

CQ Check-In

If you bought it through CQ tell us. We are interested in your reaction to our advertisers; what did you buy; from whom; which ad or review prompted the purchase? Please send us a QSL and let us know.

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

Novice [*from page 44*]

logbook. Incidentally, his 15-meter beam was converted from a CB antenna a friend discarded. Conversion cost, $1.00. Ray will send details on request.

How long does one remember the code? **Fred Bryant,** Apt. 215, 548 Dallas Road, Victoria, B.C. V8V 1B3, Canada, learned it in the Signals in 1920, and hadn't heard it for years and years, but he planned to take the Canadian amateur exam with a group of fellow students on March 13. The group meets in each other's homes and send code to each other, copy W1AW code-practice transmissions, and study theory. I hope Fred tells us how the test went.

Doug, WN7WXQ, North Star Route, Torrington, Wyo. 82240, asks, "Who says there are no Hams in Wyoming? Where the devil is Delaware for my WAS?" Doug puts the state on the amateur map by having 49 states confirmed and has applied for his Worked All Continents (WAC) certificate. He transmits on a Hallicrafters HT-37 s.s.b./c.w. cranked down to 75 watts and receives on a National NC-190. Being a ranch boy sometimes makes hamming difficult, but Doug says it offers lots of room for antennas—if Mother can be persuaded. He has six, so far. Dipoles for 80 and 40 meters, Mosley TA-33-Sr, 3-element tribander for 10, 15, and 20 meters, 7 element, homebrew beam for 2 meters for the future, and a CB antenna. Doug's picture appears on these pages.

As usual, we remind you that the NOVICE SHACK is your column. Send your "News And Views," newspaper clippings, suggestions for topics for discussion, and pictures to the address on the first page of the column, and we will do the rest. You do not have to be a Novice to contribute, by the way, as long as the item is of interest to the young of heart.

73, Herb, W9EGQ

QRP [*from page 42*]

QRPp calling frequencies and times are (daily) 2200 EST, 3540 kHz; 1800 EST, 14065 kHz. Let's use these frequently.

Dayton QRPp-vention

I'll be at Dayton to conduct a QRPp forum on Sunday, April 27 from 1400-1600 EST. Don't miss it! It will be a good time to meet other QRPp'ers and exchange ideas. Check in at the *CQ* stand for an eyeball with me and others of the staff. We'll be very interested in hearing what ideas you're working on for the QRPp Transmitter Design Contest—it's the really big event for QRPp in as long as I can remember!

73, Ade, K8EEG

References

[1] DeMaw, "More Basics on Solid-State Transmitter Design," *QST* (November, 1974), p. 22.

[2] Lee, "A Varactor-Tuned Oscillator for 80 Through 10 Meters," *QST* (November, 1970), p. 21.

Math's Notes [*from page 38*]

meters and 1½ S units on 10 meters when one was installed. This control is usually peaked while receiving a signal and only needs repeaking when making large changes in operating frequency. A slight realignment of the trimmer on the main tuning capacitor may be necessary when making this modification.

There are many other such circuits that can be added to older receivers to improve their performance and if the interest is there, we will be glad to pass along additional information in subsequent columns. Please let us know for only by your letters do we choose the various topics to be discussed in future columns.

73, Irv, WA2NDM

Invisible Man [*from page 23*]

gang." Be selective and pick the best. Amateur radio needs no "Purple Phantom" or "Ozark Charlie" refugees from 11 meters. Get the best. Bring these hesitant newcomers into the full stream of amateur activities.

4—*Introduce the general public to amateur radio.* Ever thought of setting up a Field Day station in a large shopping center? Let Joe Citizen see amateurs on the air. And it is a good place to hand out brochures about amateur radio. College and high school radio clubs can plan amateur radio activities at sporting events. Maybe, with luck and a little effort, you can become part of the halftime activities at a football game and appear on national television!

5—Volunteer! Volunteer and publicize amateur radio in your own town. Provide amateur communication at local sporting events, stock car races, parades. Generate a good image for amateur radio as a good means of fun-communication, as well as an exciting and intelligent pastime. Try to get your local TV station to show the ARRL film about amateur radio. Get exposure for amateur radio. Don't be the "invisible man."

6—Keep a sharp eye open for talent among the neighborhood kids and the friends of your own children. Some of tomorrow's amateurs may be in your very neighborhood. And some of your adult friends may be prospective amateurs, too. If you deliver traffic, include literature about amateur radio along with the traffic. Even a case of TVI, in some instances in the past, has turned the complaintant into a radio ham!

In summary, the "invisible man" has to achieve some visibility and credibility, and has to *work* to increase the numbers of amateurs. More interested parties mean more Novices and more Novices mean more amateurs!

What the Magazines Can Do!

Let 1975 be the Year of the Novice! Include articles aimed at the Novice. The ARRL has good Novice articles and *CQ* has a continuing Novice column. A good start in the right direction. Include tips on learning the code and increasing code speed. List organizations that provide free code classes and that help would-be amateurs. Encourage amateurs to work Novices. Additional Novice/General QSO contests of various types would be a big help. Publish more pictures of Novice stations and include more magazine space for their activities. *Encourage Novices to join the mainstream of amateur radio.* Provide reduced price 1-year subscriptions for Novices for the amateur journals.

CB magazines! Include serious, informative articles on amateur radio and information about obtaining an amateur license. Run a question and answer column on amateur radio.

What the Distributors Can Do!

CB stores can sell radio amateur magazines, books and handbooks. Possibly an exhibit of an amateur station in action might be a good idea. Some prize could be given to CBers who achieve their Novice status (more Novices mean more sales—right?). Amateur distributors can help local amateurs in their task by providing space for evening code practice classes and by talking to serious CB drop-ins about amateur radio. Before you sell the CB'er that old 150 watt a.m. transmitter or an FT-101 for 11 meters, take time to talk to him about ham radio!) Many dedicated amateurs work in electronics stores and can help induce CBers and other interested persons to consider amateur radio. Many CBers hesitate to approach aloof radio amateurs and the local radio distributor can help close this gap.

What the FCC Can Do!

Let the FCC take the psychological pressure off the prospective General, the Novice and the pre-Novice. Let the FCC Field Offices show a more pleasant face and less forbidding aspect. Review both Novice and General class examinations to make sure proper questions are asked and the ambiguities and fuzzy questions are removed. Get *professional* help in this important matter. *Above all, make the code test less forbidding. Don't eliminate it, as this opens the door of amateur radio to the "Purple Phantom" and "Ozark Charlie,"* but make the code test more realistic. Don't try and make every Novice into a latter-day T.R. Mac Elroy. *Drop the General class code speed to 10 w.p.m., the traditional speed!* Explore the possibility that instead of demanding perfect copy for a matter of minutes, an examination on the *content* of the transmitted message may be more to the point.

We Can Do All of This Now!

No reason to wait for the disposition of Docket 20282 to get this program rolling. Quite possibly, if more Novices come into the ranks each year, some of the more controversial sections of the Docket may have no reason for existing. Action on Docket 20282, in any event, will take a year or more. The suggestions in this article can start taking place *now*, with little change in FCC rules, and with a concerted effort on the part of radio amateurs, clubs, the ARRL, ham magazines, distributors and the FCC.

Let's set a goal of a grand total of at least 30,000 Novices in 1976 (there are about 20,000 now). And let's make sure that the great percentage of Novices become radio amateurs — *General class radio amateurs,* that is!

With a little determination, this should be possible, and we don't need any gut-busting effort on the part of the FCC, or any of us, to bring about this influx of new blood into our great hobby and Service. By doing somebody else a favor, you'll be helping amateur radio and yourself. In these times, what greater bargain could you ask?

* * * * *

While, as stated earlier in this article, the overall problem of amateur radio cannot be solved until the CB problem is solved, there's still a lot of actions that can be taken to better a bad situation. I suggest we get off dead-center and do something about the problem.

The next article in this commentary will discuss Docket 20282. ■

CQ Reviews Venus [*from page 27*]

¼"-20 tripod mounting sockets on two sides, allowing the camera to be used as a normal fast-scan TV camera if desired. The SS2 monitor supplies ±15 volts to some camera circuits. If the SS2 is not used in conjunction with the camera, ±15 volts must be supplied from some other source. The camera can be ordered to operate from either 60 Hz or 50 Hz power sources.

SS2 Monitor Performance

Venus has made several production changes in both monitor and camera since starting production. The comments on performance refer to the units as they are currently being produced.

The CRT phosphor displays good afterglow brightness and persistence characteristics, with an acceptable ratio of "afterglow" to "writing line" brightness. (The "writing line" tends to desensitize the eye. Therefore, it is desirable to get as much "afterglow" brightness as possible with as little "writing line" brightness.) Screen size is a matter of personal preference and intended use. For the situation in which the monitor is on the operating table 2 or 3 feet from the operator, this reviewer finds the SS2 screen size ideal.

In the design of the f.m. demod and video circuitry Venus has made slightly different performance tradeoffs than usual. While most video discriminators tend to compress the grey scale at the white end, the Venus f.m. demod actually tends to expand the white end, while introducing some compression at the extreme black end. Venus has also chosen to restrict the video bandwidth. The overall result is a monitor which displays somewhat better grey scale performance, less noise or "snow" under marginal s./n. conditions, and somewhat less picture "sharpness" than most other monitors. There is no visible "dot" pattern if the received subcarrier signal has low second harmonic distortion.

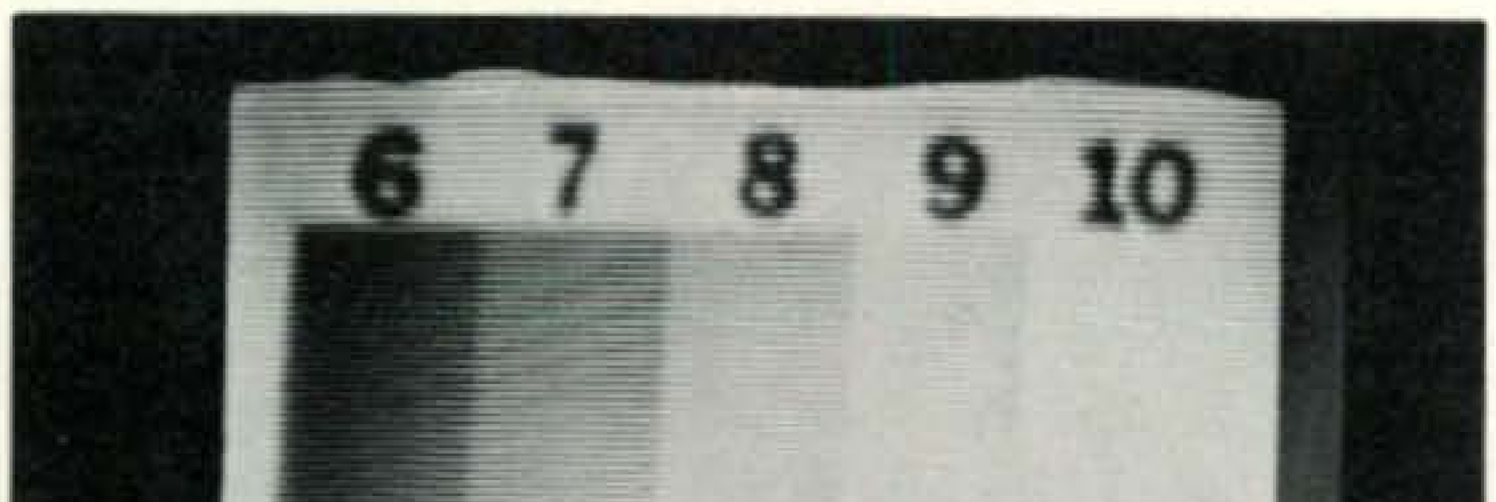


Fig. 4—One frame time exposure of monitor screen While camera views a grey-scale test pattern.


Polaroid "Colorpac" camera and Venus P1 Polaroid Camera Adapter as used with the SS2 Monitor.

The sync circuits perform well under good to fair signal-to-noise conditions, and recover rapidly after bursts of QRM. The Accu Sync display is a very useful aid to receiver tuning. It can also be helpful for diagnosing troubles in received signals, and adjusting the station camera for proper black-to-white swing. A video input signal amplitude of 40 millivolts r.m.s., or greater, is required.

Early production units did not employ full d.c. coupling in the Accu Sync and video circuits. This gave rise to shifts in brightness levels from picture to picture. Venus reports that d.c. coupling is being employed in current and future production.

Camera and Overall System Performance

Vidicon cameras require a fairly high light level for good performance. The light level experienced in a modern office represents a good minimum working level. The automatic sensitivity control system in the camera is not a substitute for adequate light on the scene. When the light level is above the minimum, however, the a.g.c. action of this circuit definitely reduces the amount of "adjusting" required as the camera is panned around.

The built-in mechanical focusing mechanism, coupled with the fast-scan monitoring capability, makes focusing very simple and fast. Since there is some backlash in the mechanism, it is convenient to use it to obtain a "coarse" adjustment, and then to perform the "fine" adjustment with the lens' focus ring.

The basic camera's resolution capability is excellent, and the sample-and-hold circuit preserves the aperture response in the conversion from fast to slow scan. This reviewer's only real complaints are the lack of an adjustment to insure exactly equal length positive and negative subcarrier alternations, and the characteristics of the output low pass filter. In some

early units the subcarrier amplitude at 2300 Hz was as much as 10 db lower in level than at 1500 Hz. Venus reports that this difference will be held to about 3 db in current and future production.

Limiting resolution of the system is in excess of 125 lines, though the relative response at this resolution level is quite low, due primarily to the SS2 design tradeoffs already mentioned. The overall grey scale performance is indicated by fig. 4. (The camera was viewing a grey scale chart which used logarithmic grey scale steps.)

The mechanical construction of both units is solid. The Venus-manufactured PC boards are epoxy-glass; the Koyo boards are phenolic. No equipment failures were experienced during several months of operation. The SS2 instruction manual was well designed and is quite complete. The C1 was supplied with "interim instructions" and a Koyo manual. Venus has been good about passing along information concerning production changes to previous purchasers.

The price of the SS2 Monitor is $349.00. The C1 Camera is $469.00 complete with lens. The P1 Polaroid Camera Adapter is $34.50. Also available is a line of test tapes and other accessories. The company's address is: Venus Scientific Inc., 399 Smith Street, Farmingdale, NY 11735. —WØORX/VE1

Transistor Tester [*from page 36*]

ered by increasing the emitter-to-ground capacitor on that position. If it reads too low it can sometimes be raised by adjusting the capacitance ratio of the two feedback capacitors involved. The values shown in the diagram should be near optimum, however.

If you check with a receiver you will notice the oscillator frequency will be slightly different when a different transistor is substituted. This is mainly due to different transistor internal capacitance values; and, in fact, is a way to compare transistor capacitances. The lower the oscillator frequency, the greater the internal capacitance (mainly collector to base, or C_{ob}). The effect is particularly pronounced on the highest frequency position of the frequency switch where a high-capacitance transistor can move you from channel 9 all the way down to channel 7.

FET's can be checked by placing S_3 in the FET position; S_2 is then placed in the NPN position for N-channel FET's and in the PNP position for P-channel FET's. ■

Active Filters [*from page 34*]

High-Pass

$C = .01\mu f$

$R_1 = 100K\ \Omega$

$R_2 = 30K\ \Omega$

Gain determining resistors R and $R(K-1)$ may be selected from a set of values having the proper ratios of 1 and 4. Identical resistor values assume a unity ratio, but the best that can easily be achieved of the latter is 3.9 (*e.g.*, 10K and 39K using 5% resistors). A complete schematic of this voice band filter is shown in fig. 11. For those interested in single supply operation, the circuit of fig. 12 is more attractive.

Response of this filter (fig. 13) in the direct coupled mode (split supplies) shows good rejection for frequencies above and below the intended range of interest. Although there is some deviation from an ideal cascaded filter response, the error is not significant for most amateur work.

Bandpass sections are primarily demanded for c.w. reception where the receiver is not equipped with sufficient i.f. selectivity. A single resonant section is often enough to give a significant improvement in S/N for weak stations barely reproducible at a bandwidth of several kHz due to adjacent interference. In fact, single section filters (bandpass) are at their best for adjacent stations due to their limited skirt rejection but fast rolloff around the center frequency. For example, a filter with f_0 at 1000

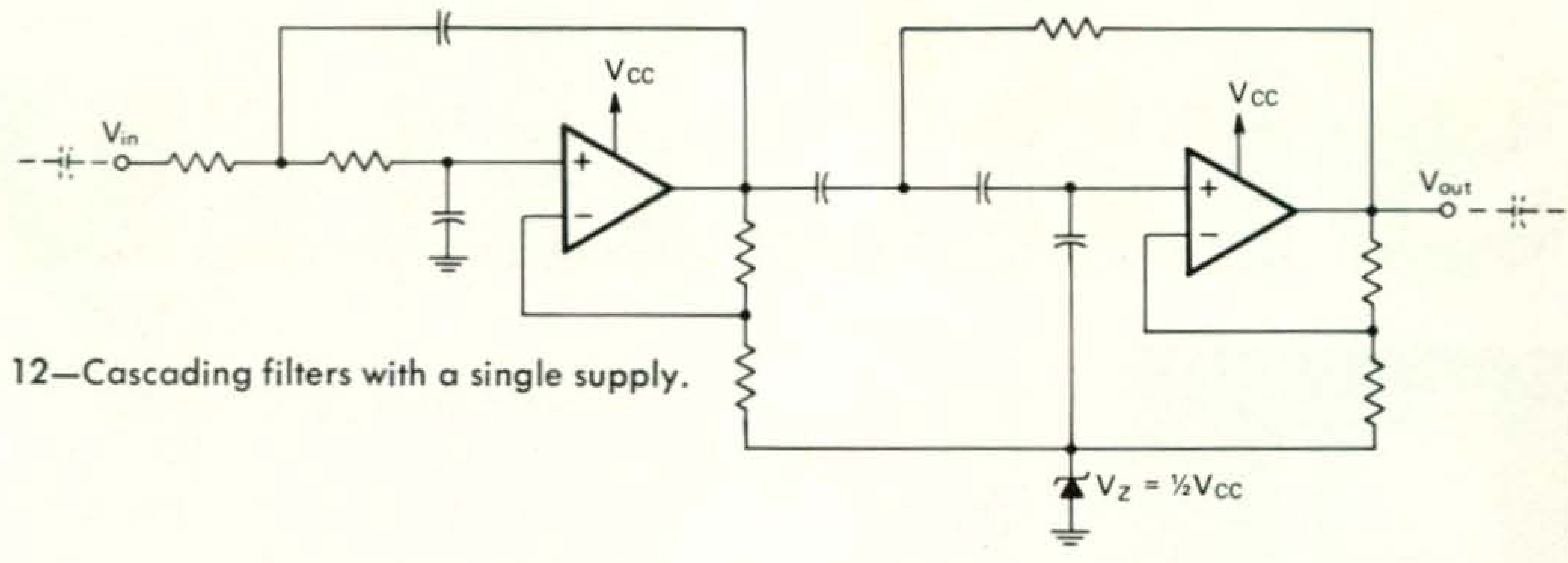


Fig. 12—Cascading filters with a single supply.

Hz and a Q of 10 gets down to −20 db relatively quickly (at about 650 Hz) but doesn't reach −40 db until 100 Hz.

Design of bandpass sections is very straightforward. Choose a value for the capacitors, insert center frequency, gain, and Q as follows:

$$f_0 = 1000$$
$$Q = 10$$
$$A(f_0) = 100$$
$$\text{Let} \quad C = .01\mu f$$
$$R_3 = \frac{10}{(3.14)\ (1000)\ (10^{-8})}$$
$$= 318\text{K}\ \Omega \quad (5\%\ \text{value},\ 330\text{K}\Omega)$$
$$R_1 = \frac{318 \times 10^3}{2\ (100)}$$
$$= 1590\ \Omega \quad (5\%\ \text{value},\ 1600\Omega)$$
$$R_2 = \frac{(1590)\ (318000)}{4(100)\ (1590) - 318000}$$
$$= 1590\ \Omega \quad (5\%\ \text{value},\ 1600\Omega)$$

Dual supply operation of a bandpass filter is shown in fig. 3 and the single V_{cc} version in fig. 14.

It was noted earlier that center frequency f_0 could be altered without affecting bandwidth. If, for example, we wished to retain the above example as the primary filter frequency and yet change "f_0" from 500 Hz to 1500 Hz on certain occasions (rather than retune the receiver), R_2 may be changed. Nominally, R_2 was calculated to be 1590 ohms, but the stated frequency swing means that R_2 must vary from:

$$R_2' = R_2 \left[\frac{f_0}{f_0'}\right]^2$$
$$= 1590 \left[\frac{1000}{500}\right]^2$$
$$= 6400\ \Omega$$

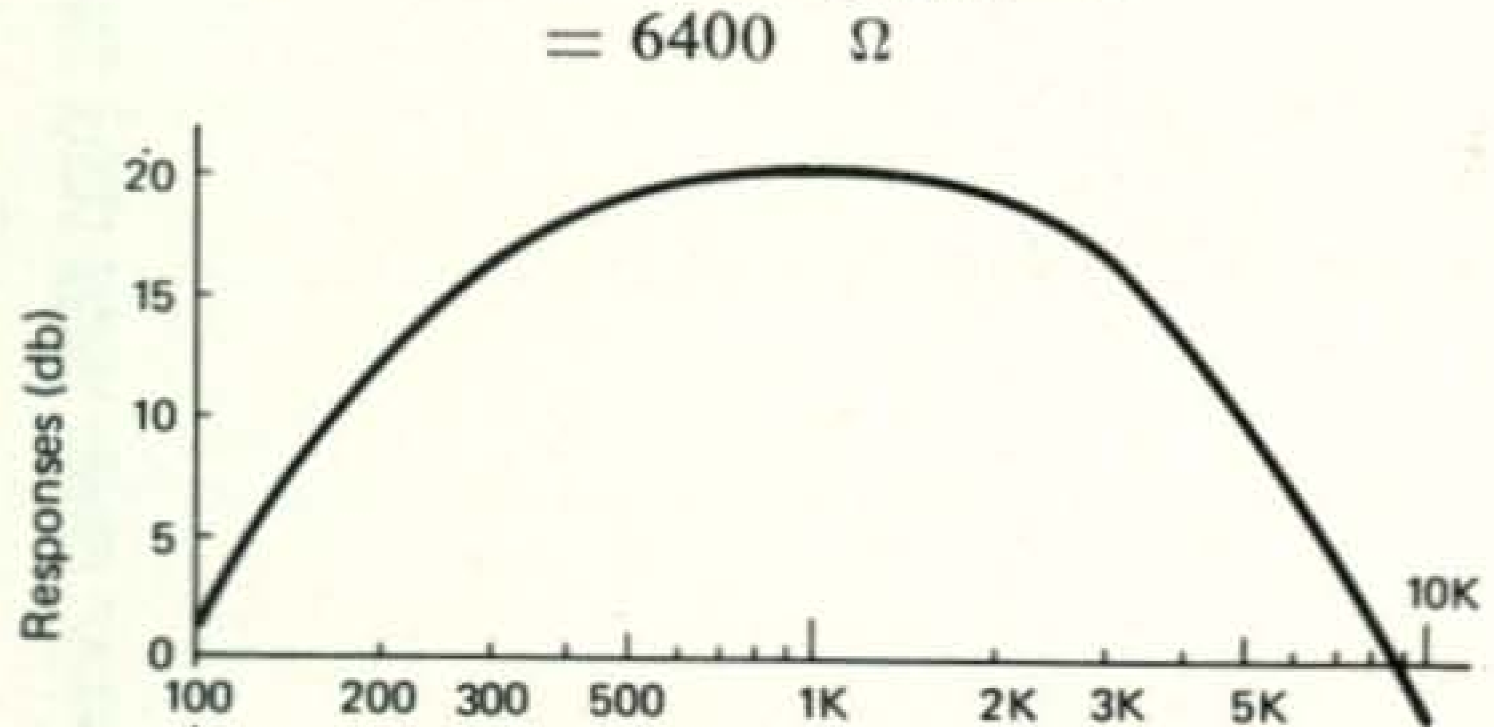


Fig. 13—Response of audio bandpass filter.

to a lower value of:

$$R_2' = 1590 \left[\frac{1000}{1500}\right]^2 = 707\Omega$$

This resistance change may be either in steps (by a switch) or continuously (with a potentiometer).

In an effort to improve speaker S/N ratios in inexpensive communications receivers, audio filters are often added to the audio amplifier chain to eliminate unwanted interference. These filters have traditionally been derived from classical *L-C* theory with the availability of inexpensive 88 mh toroids making the size and weight practical. However, there is another alternative readily available to accomplish the same function with a set of advantages that should be considered.

By their very nature, active *R-C* filters require a power source not needed by their *L-C* counterparts. Actual power consumption is quite minimal ranging from less than 1 to 30-mw depending on supply voltage and amplifier used. Battery power is certainly possible if no low voltage is available, but most amateur installations have a source of 6 to 30 v.d.c. for auxiliary purposes. One outstanding advantage of using the active device is voltage (or power) gain and isolation.

Most active filters can drive headphones directly, and have moderate to high input impedances (10K-100K). Self-isolation also enables individual sections to be cascaded without interaction when complex filters are needed. ■

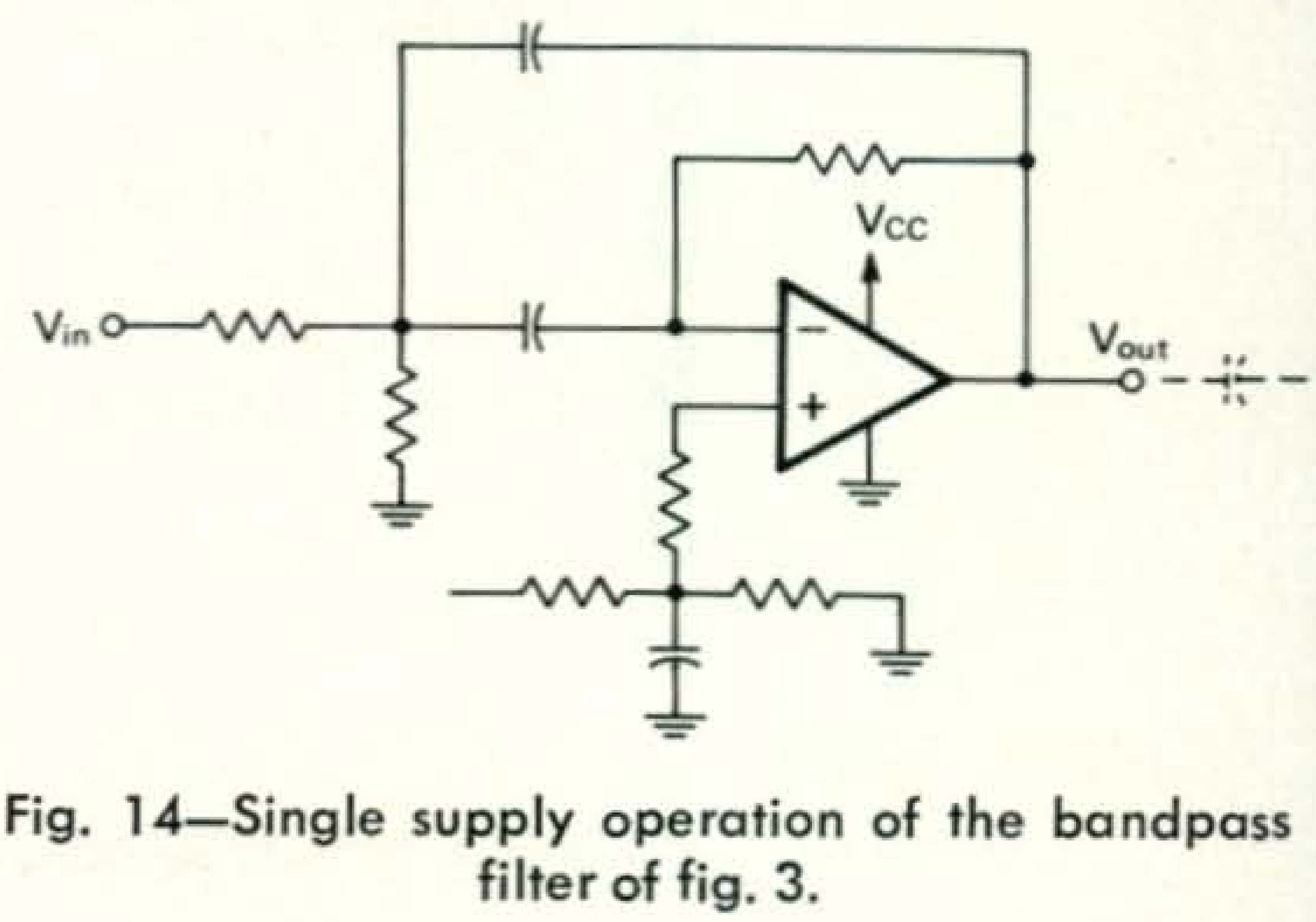


Fig. 14—Single supply operation of the bandpass filter of fig. 3.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Antennas [*from page 31*]

performance of most of the popular triband beams. On the other hand, it is admitted that the front-to-back ratio will be less than for a full-sized Quad (typically 18 to 20 db at low angles, less at higher angles). It should also be noted that as for all compromise and loaded aerials it is necessary to tune and adjust the aerial carefully for optimum performance.

'The following constructional hints are taken from G3PHO's notes:

1—Spider. Cross arms and boom assembly should be as strong as possible and able to withstand high winds. But do not use metal arms, since metal in the field of the loops can cause undesirable effects.

2—Loading coils can be wound up PVC (polyvinyl chloride) tubing, preferably threaded on a lathe for 12 turns per inch. After final adjustments, spray them with clear *Krylon* to keep out moisture.

3—Tune with s.w.r. bridge and grid-dip oscillator. Connect 75 ohm feedline to beam and erect aerial as high as possible consistent with easy access to the coils. Adjust the coils until g.d.o. indicates resonance at 14 MHz for forward element and 14.25 for rear element without adding or removing turns, by using 3-inch lengths of ferrite rod dipped in epoxy cement and sliding the rods in until the correct resonances are achieved, then leave well enough alone until the glue sticks firmly."

"That looks like a nice little mini-Quad," I commented. "My only suggestion, if U.S.A. hams build it, is to switch from 75 ohm feedline to 50 ohm line. It's not easy to get an s.w.r. meter for 75 ohm line, and RG-8A/U or RG-58/U are sometimes easier to buy than

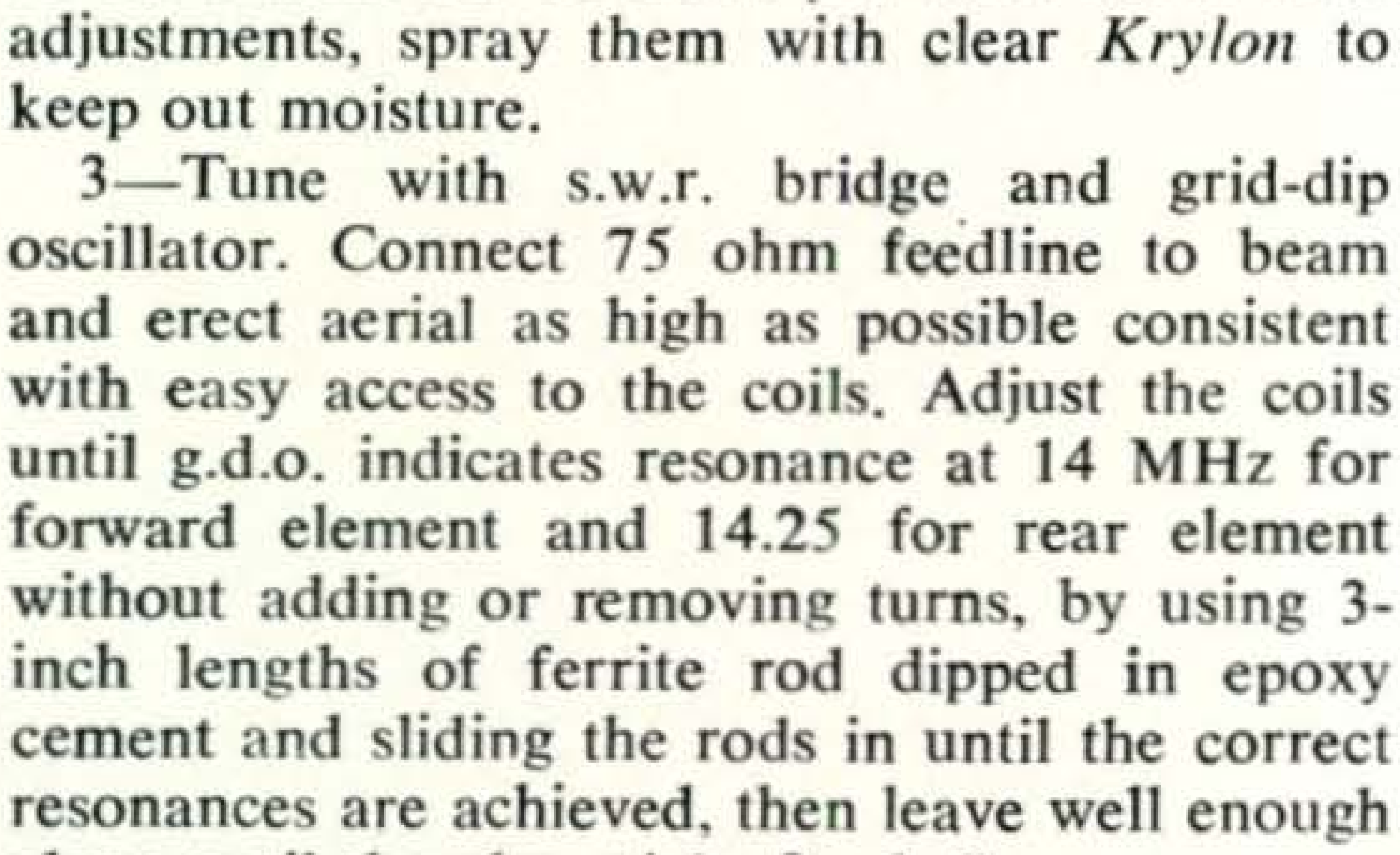

Fig. 5—The inexpensive 80 meter dipole antenna of Clyde, W5OCO. Dipole is supported at the center and takes the shape of a diamond. Antenna is fed at the apex with RG-8/U coax line. Each leg is 60 feet long, with the outer 20 feet bent back and tied to the mast about 6 feet above the ground. A second dipole could be erected at right angles to the first to give omnidirectional coverage using two feedlines and a switch at the operating position.

the 75 ohm line (RG-11/U or RG-59/U). In either case, operation of the antenna is not dependent upon line impedance. it certainly looks like a good design for a small size beam antenna."

"Yes," agreed Pendergast. "A lot of fellows who hesitate to erect a full size Quad antenna may be attracted to this compact design. Hurrah for the RSGB and G3PHO."

"I get a lot of good antenna ideas from *Radio Communication*. I said. "If you can read English, it's a great magazine."

"What do you mean, *if* I can read English," retorted Pendergast.

"We speak American, that's what," I said. "In any event, you can look at the pictures."

Pendergast yawned elaborately. "Anything else before I leave?," he asked.

"One final letter from Clyde, W5OCO. He describes his compact 75 meter antenna, slung from a single pole and tied off to some nearby bushes (fig. 5). Very small and compact. He also remarks about a buddy of his who strung a long, long wire along a picket fence—about 3½ feet above ground and used that for his ham antenna."

"That just goes to show that you can't keep a good ham off the air," said Pendergast, as he carefully placed the letters on the operating desk.

"That's right," I replied. "I agree its hard to be loud on a city lot, but it can be done."

"Anything of interest coming up in the next month or so?," asked Pendergast.

"Well, yes," I said. "During the past winter season, there's been some amazing DX work going on on 80 meter s.s.b. Fellows on the west coast have been working into deep Europe and the near East via the *long path!* The openings are quite short, just for 30 or 45 minutes around sunrise on the U.S. west coast. That means the signals travel a sunrise-sunset path across New Zealand, up across Arabia, and through eastern Europe into Finland. The path is very narrow, no English or French stations heard to the west, and no Russian signals to the east. The path seems to go right through Czechoslovakia and up into Finland. Signals are *very* weak and it takes a *good* antenna, a *good* location, a *good* operator, a very quiet band and some degree of luck. I'd like to hear from some of the fellows working the DX, and I'd like to discuss their antennas and their opinion of the propagation path. The usual rules: for each letter used, a free copy of one of my handbooks."

"80 meters to Europe the long path, hey?," said Pendergast. "That must really separate the men from the boys!" ■

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WANTED FOR $$$CASH — Back in 1957 the Lionel Train Company made a small set of toy trains specifically designed for girls. It had a pink locomotive and several other cars, all in pastel shades. The set wasn't very popular, hence not too many sold. However, I need this set for my collection, and am willing to pay up to $400 cash for a complete set in mint condition. If you have this item, please write: Dick Cowan, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

URM-25 10Kc to 50Hz, URM-26 4MHz to 405 MHz and TS419 900 to 2100MHz GC, $175 ea. Sierra low freq. rec zero to 155Kc $75 GC. TS-382 Audio osc. $75 GC. Bill Williams, P.O. Box 7057, Norfolk, VA 23509.

SRRC HAMFEST: June 1, see Announcements section "CQ" Send SASE for info. Write: G.E. Keith - W9MKS/W9QLZ, RFD 1, Box 171, Oglesby IL 61348.

FOR SALE: Old magazines and books R9, Nov., 1934, Dec. 1935. "Radio" Magazine Dec. 1933 through Dec. 1935. R9/Radio (merge issue) Jan. 1936, no. 205 through March 1942, no. 267 (no. 207, March 1936 missing). Books - 1936 "Radio" Antenna Handbook (Hawkins, Smith), 1936 "Radio Handbook (Jones), 1937 Jones Radio Handbook, 1938 "Radio" Handbook (Jones) 4th ed., 1938 "Radio" Handbook (Smith) 5th ed., 1941 "Radio" Handbook (Smith, Dawley) 8th ed. hardcover. Magazines and books as package, $60.00 A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave. Port Washington, NY 11050.

WANTED: SB-640 Heath External VFO in excellent condition. Paul, K8CJX, 22960 Valley View, South field, MI 48075.

SELL: Double teleprinter tables, $17.50; also Kleinschmidt components, gears, etc. write: S.M. Gston, WB5HGQ, 2117 Westlake Drive, Plano, TX, 75074.

ROCHESTER, NY: Western New York Hamfest date is Saturday, May 31st, at the Monroe County Fairgrounds. Hotel headquarters is the Rochester Marriott. FCC exams at the Hamfest. Information? Write: WNY Hamfest, Box 1388, Rochester, NY 14603.

INDIANAPOLIS HAMFEST, Sunday, July 13, 1975, Marion County Fairgrounds. Admission, $2/person, Children under 12 years, free. Forums all day, ladies' and children's activities. Free coffee& donuts until 10:00 am. Inside Flea Market, $2./w vehicle, free without vehicle. Free outside flea market. Commercial booth available. $25.00. For information or tickets write: Indianapolis Hamfest Association, Inc. P.O. Box 1002, Indianapolis, IN 46206.

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WANTED: Manuals and/or schematics for AN/URM32A, Central Electronics Sideband Slicer B, and Northen Radio IF Monitor, Type 111, Model 1. K.E. Hesler, 602 Taft Ave., Charleston, IL 61920

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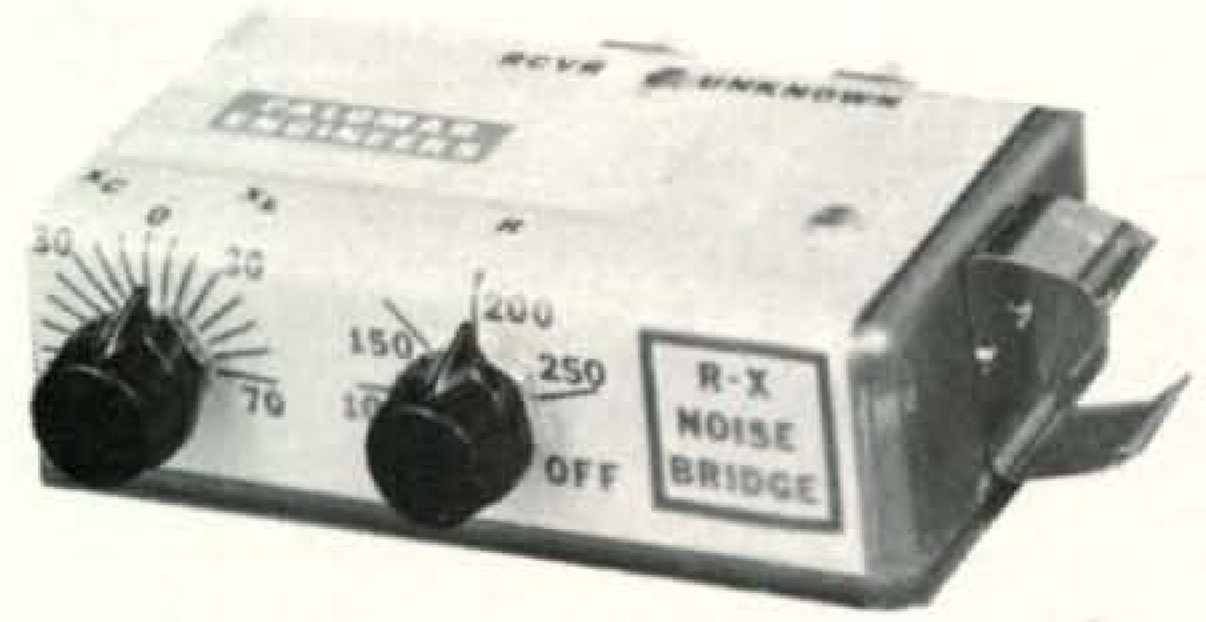

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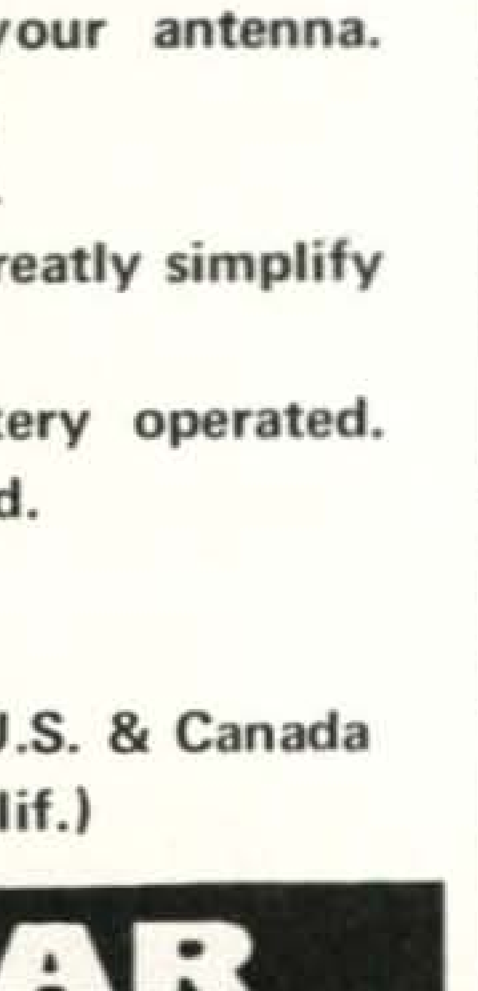

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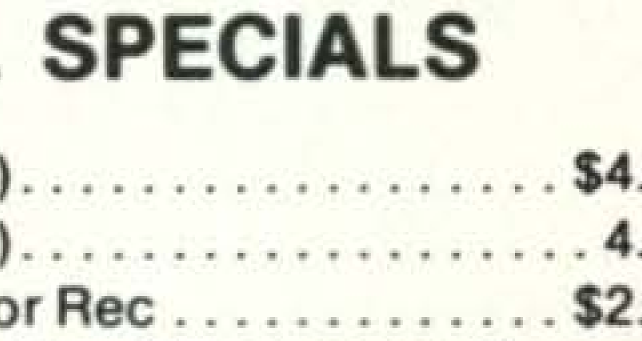

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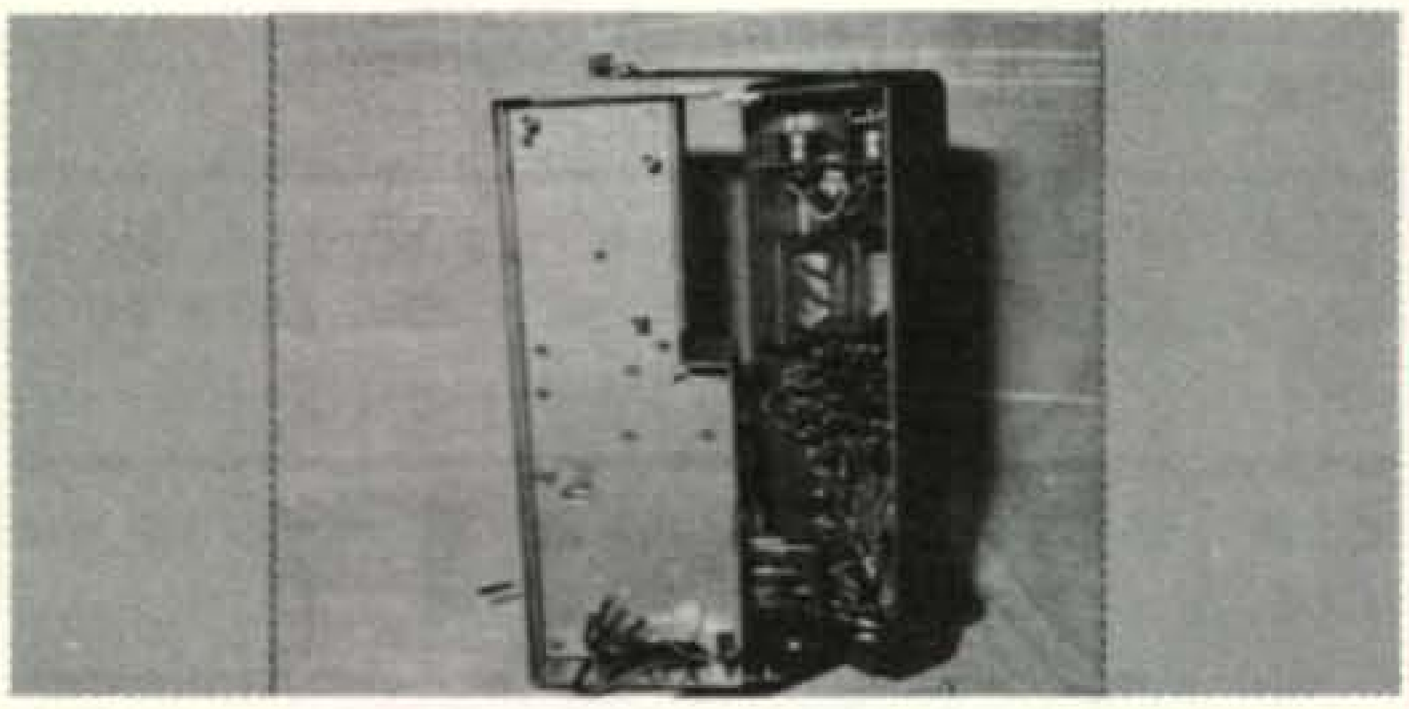

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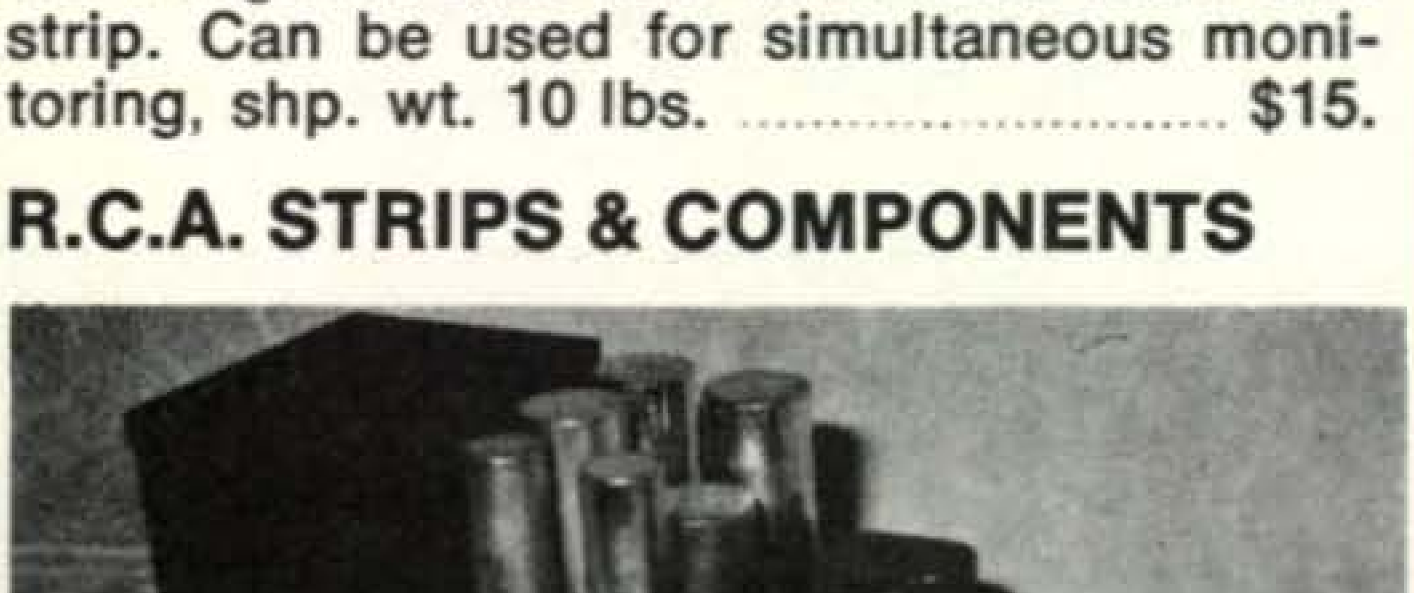

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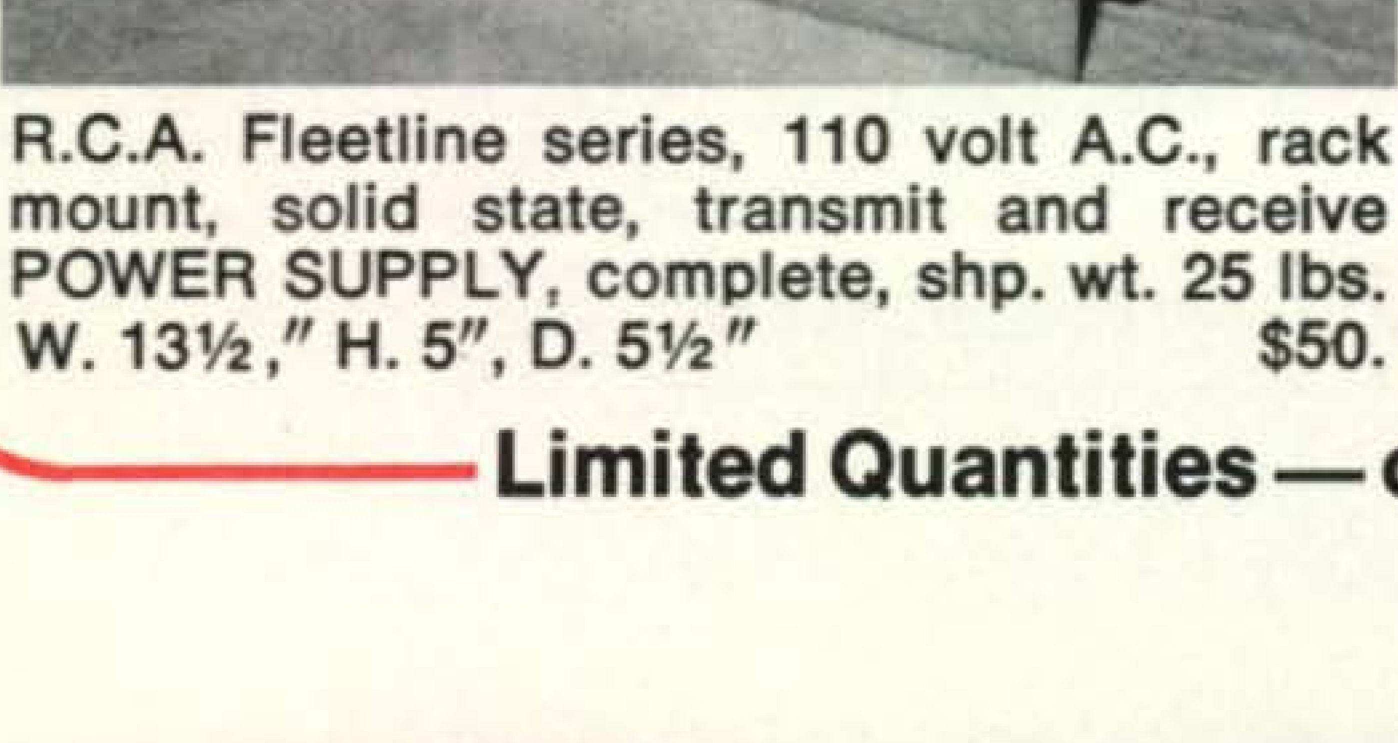

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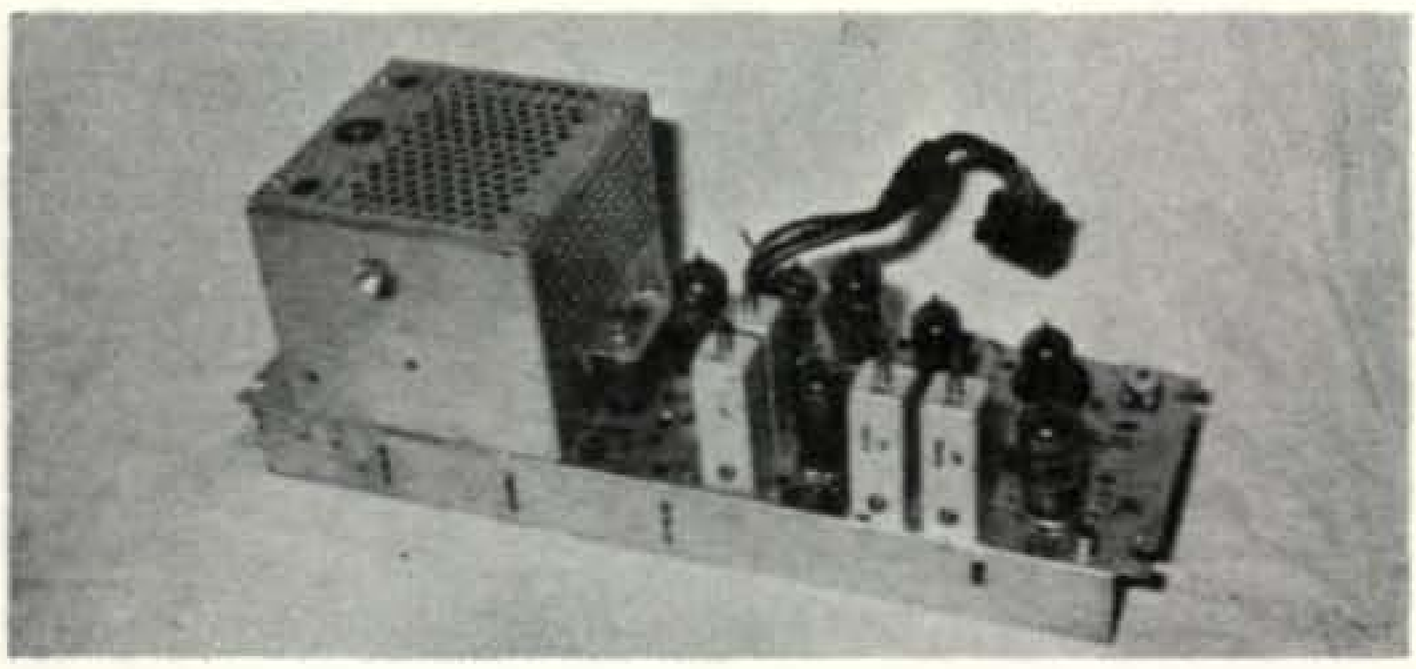

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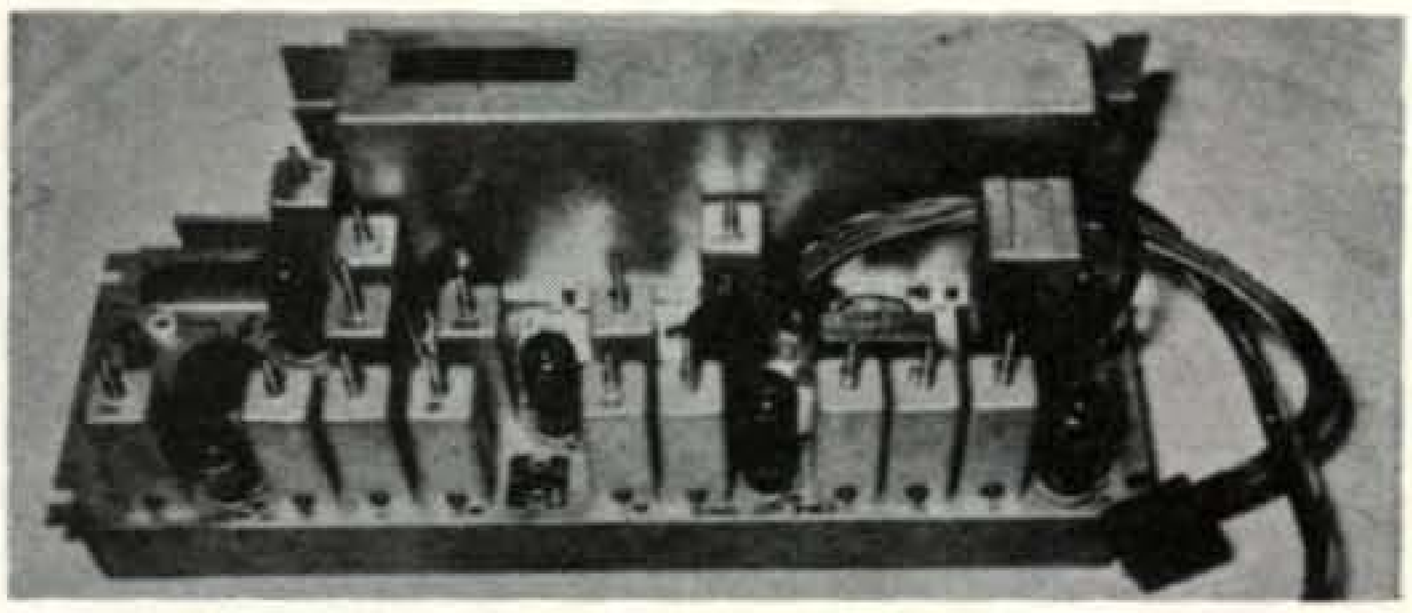

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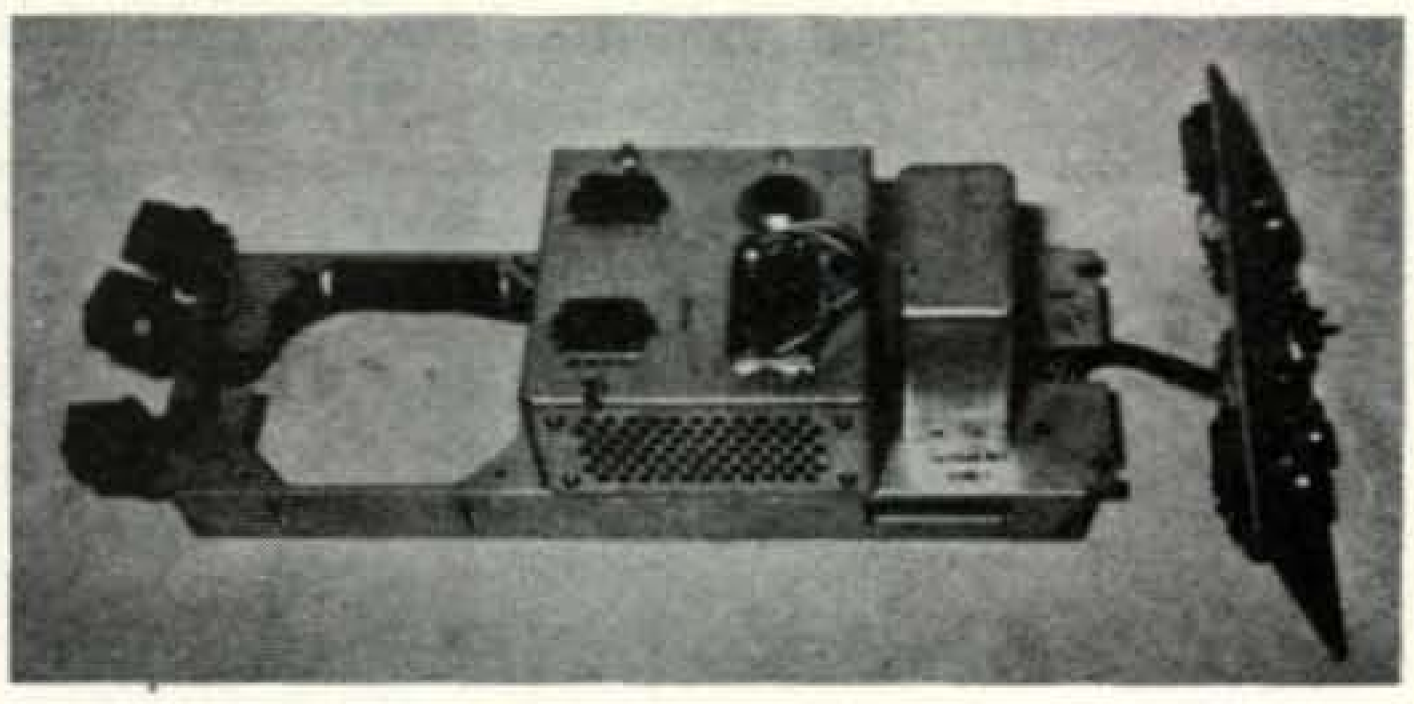

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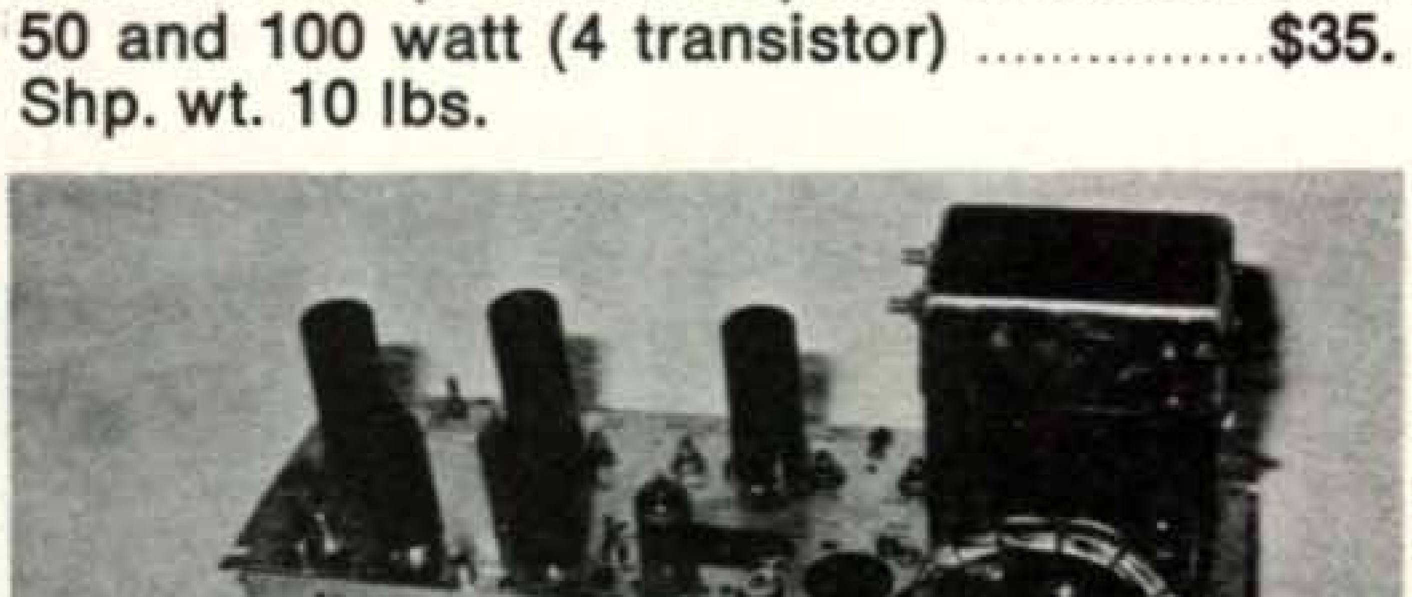

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