CQ

April 1974
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The Radio Amateur's Journal

08240

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

The SB-102 is the value leader because you build it yourself to save on initial investment and service. Simple circuit board/wiring harness construction gets it all together. Order your hot runner now — the famous Heathkit SB-102 SSB/CW Transceiver. Combine it with the SB-220 Linear for the ultimate long-distance runner.

Kit SB-102, 24 lbs. **385.00***

Kit SB-600, 8 ohm matching speaker with mounting space for AC supply, 7 lbs. . **19.95***

SBA-301-2, 400 Hz CW crystal filter, 1 lb. **22.95***

Kit HP-23B, AC supply, 19 lbs. **51.95***

Kit HP-13B, DC supply, 8 lbs. **69.95***

SBA-100-1, mobile mount, 6 lbs. **15.95***

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SB-220 features include a built-in solid-state 120/240 V power supply; circuit breaker protection; zener diode regulating operating bias to reduce idling current for cooler running and extended tube life; a large quiet fan; ALC to the driving unit to prevent overdriving; front panel switch selected monitoring of grid current; relative power and high voltage. The SB-220 offers a clean, compact design with the liberal use of internal shielding for extra strength and component isolation. Its green table-top cabinet complements all your SB-series gear.

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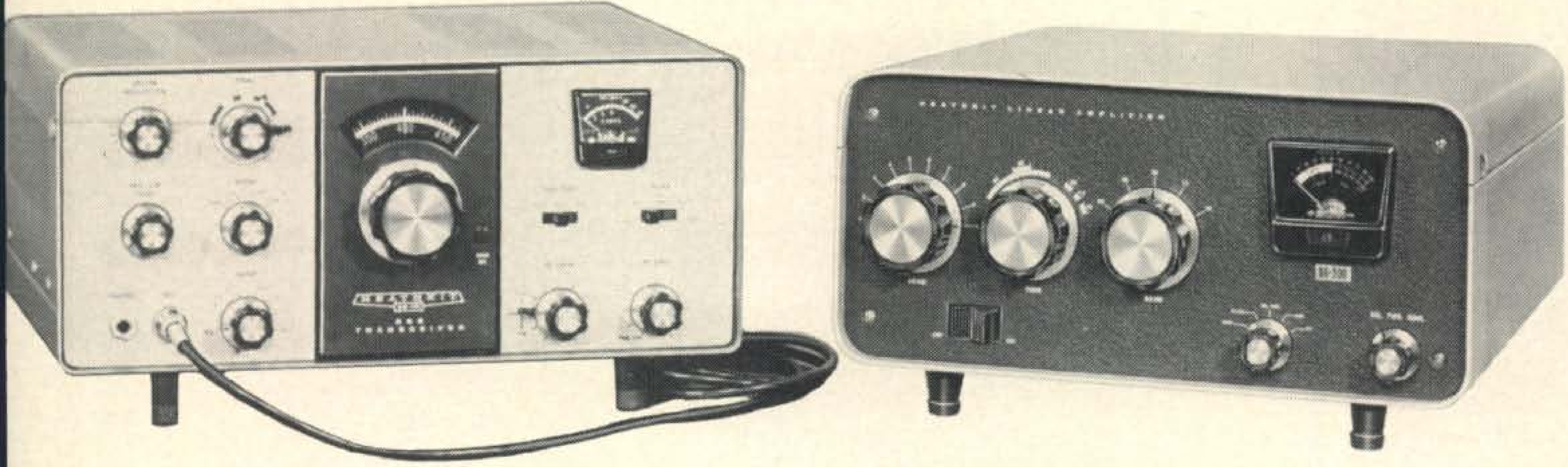

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- Power Output: 125 Watts P.E.P. (Nominal) into 50 ohms
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- Selectivity: 2.0 kHz
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- CW Sidetone
- Audio Frequency Response: 500-2500 Hz Nominal
- AALC: 12 db Compression
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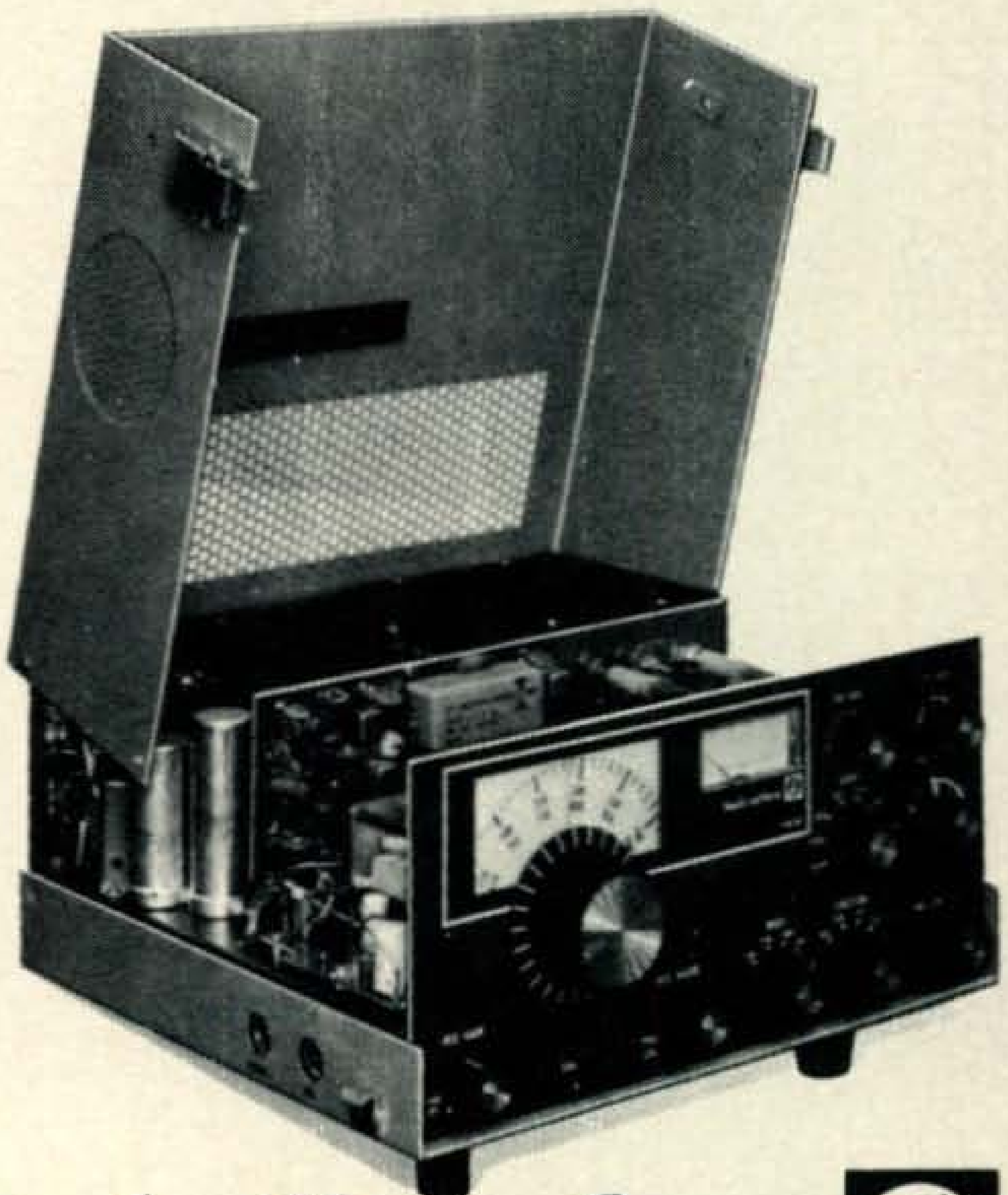
- Crystal Calibrator: Provides 25 kHz Calibration Signals
- Optional Accessories: MR-300 Mobile Installation Kit; HA-60 Blower Fan Kit, works on AC or 12VDC



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ZERO BIAS

The recent million-dollar TVI lawsuit brought against W2OVC by his good neighbors raises several interesting questions for all amateurs. It also brings to mind a possibility which — while not preventing similar suits in the future — could at least lessen the legal and financial burden for the individual amateur.

As this is being written, W2OVC's legal defense has already cost some $2000 of his own limited funds. It will probably cost more before the case is decided — hopefully, and most likely, in favor of Len.

One observation we make is that as with so many areas of American life, a price has been placed on an intangible and un-priceable commodity. In this case the price is $1,000,000 for allegedly preventing W2OVC's neighbors from watching Lucy re-runs on the boob-tube. The entire concept of demanding monetary compensation for an alleged inconvenience or annoyance is, we feel, hardly less immoral than a kidnapper demanding ransom in exchange for permitting his victim to live. W2OVC's neighbors are, in effect, trying to hold his hobby and way of life in ransom for a million dollars.

Now, lest we be overwhelmed by that million dollar price tag, let us remember that for all intents, anyone can bring suit against anyone else for any sum of money and for any reason. The disposition of a suit, however, is ultimately decided in the courts which are most often wise and fair in their judgements. Reasonably speaking, if you brought suit against your next door neighbor because his orange automobile clashed with your pink house and thus lowered the value of your property and disturbed your peace of mind, you'd be wise not to spend your anticipated settlement money before you went to court! So the fact that someone sues you for a large sum of money for alleged damages should not in itself frighten you. However, regardless of how groundless a suit may be, it must be defended against, and that costs money. Such is the plight of W2OVC, a retiree living on a fixed pension.

The amateur press has for years harped on the same note: ARRL should defend amateurs in matters of individual lawsuits related to amateur radio, *i.e.*, tower cases, TVI suits or zoning matters. ARRL does provide advice and information which can assist an attorney in defending his ham client, but for various valid reasons the League does not and cannot play legal council to all amateurs. We feel, however, that the time might just be right for someone — ARRL, for instance — to investigate the possibility of insurance for hams.

Doctors have their mal-practice insurance; home-owners have their home-owners liability insurance; motorists have their auto liability and collision insurance; and publishers have their libel insurance. Why should radio amateurs not be able to have extremely low cost insurance to protect them from the sometimes crushing financial burden of a legal defense?

It is our feeling that if a large and responsible organization such as ARRL were to approach several large insurors with the prospect of writing a policy offering, let's say, $5000 of legal defense insurance for even only 10,000 amateurs, the insurance companies would quickly come up with a reasonable and affordable fee schedule. As an active amateur, I would not hesitate to invest 25 inflated dollars a year in return for the peace of mind which would come from knowing that if I were slapped with a ham-related lawsuit, I could afford to engage the best legal defense that the insurance company's $5000 could buy. And $25 per year is probably much higher than the actual figure would be.

Carrying the idea a step further, I also foresee the possibility of amateurs being able to purchase additional coverage at additional cost to cover whatever settlement may be determined by the court. For instance, for an extra $25 I'd be willing to buy $25,000 liability coverage for the off-chance that I might lose a TVI or tower case and have to ransom my hobby for up to $25,000.

I'm not proposing that we force ARRL into the insurance business. What I am proposing is that ARRL carefully examine the possibility of providing one more service to amateurs which will cost little of the League, but bring enormous potential benefits to American amateurs. ARRL may not be able to help W2OVC an awful lot at this point, but they certainly could help future beleagered amateurs.

73, Dick, K2MGA

OUR READERS SAY

New Licensing Structure

Editor, *CQ*:

I am a subscriber to your fine magazine and I was delighted to read your "Zero Bias" comments on page 5 of the February, 1974, CQ Magazine.

I hold an Advanced Class license and spend all my time on fone because I enjoy this mode best of all but it kills me to hear the DX fone on the 75 Meter Extra Class section and not be allowed to work it. I am definitely in favor of the prospective Amateur Extra-Phone requirements as mentioned in your editorial and have also made my feelings known to Mr. Walker.

Jim Carroll, W1YYL
Lynn, MA.

Editor, *CQ*:

Just had to drop a quick comment on the Proposed "license shake up." Beautiful! It's about time FCC made a proposal that aided instead of hindering, the growth & interest of Amateur radio.

Maybe after the mess on 11 meters, the repeater rules, and the try concerning the antenna height restrictions, they are changing their way of thinking. The combining of the Tech. and Novice licence is the best of the lot, as the Technicanis the most isolated license of the group. I do not, however, hesitate to take a very pessimistic view of the trend to make cw operation obsolete; but so be it, if that's what the amateur fraternity wants.

Samuel Hawley, WA7TDU
Klamath Falls, Ore.

Editor, *CQ*:

I read your report in Zero Bias of the February CQ concerning a re-structuring of the Amateur licensing rules. Personally, I think it is about time and while there is a lot of talking to do in this reguard the following are my initial suggestions:
Extra CW: 20 w.p.m. Extra theory - all amateur privileges.
Extra Phone: 15 w.p.m., Extra theory - all amateur privileges on phone, Advanced privileges on cw.
Advanced: 10 w.p.m., Advanced theory - all current Advanced class privileges.
General/Conditional: 10 w.p.m., General theory - all current privileges. Conditional exam administered by (1) Regionally appointed person or club, or (2) if this is not available, another amateur of at least General status.
Technican: 5 w.p.m., General theory - all present privileges plus cw on Novice bands and 10 meter phone. All lower class privileges.
Communicator: No code, Novice theory - voice, crystal controlled on v.h.f. or u.h.f. above 220 mHz, Max. 25 watts.

I raise another question not really mentioned in your article; should the Novice and Communicator license be renewable? I suggest that perhaps they should be renewable. If the increased privileges are not enough to give incentive to moving to higher licensed, then perhaps something else is wrong.

I believe we should also seriously consider identifying the class of license in the call letters as an added incentive.

As you mention, much discussion will have to go on but I would hope amateurs would not be too status-quo-oriented and these changes would not take too long to accomplish.

William C. Hunter, WBØJEY
Loveland, Colo.

Citizen's Banders

Editor, *CQ*:

I just finished reading this months "Zero Bias" and could not help but notice your reference to those "Citizen's Band anarchists."

I think its time amateur radio operators took a good look at themselves, as the majority of the newer amateurs did in fact come from this lawless band. The fact that those same 11 meter bandits, now amateurs, find fault with the Citizen's Band only leads me to believe that the FCC must be issuing wings and hallows along with the liscenses. To top it all off some (note some) amateurs are still not satisfied with five bands and capable of global communications find it necessary to QSY to 11 meters, fire up their rigs and add more QRM to an already over populated band. I do not believe the CBer's are at full fault for their lawlessness when amateur radio, the big brother to CB radio, can find some of its own fraternity operating on 11 meters.

I want to add one thing. If we do not try to change the FCC's plans for the new communicator license we'll be saddled with just another "citizen's band." The radio and antenna manufactures will love it but how about us...

Larry Cornell
Menominee, Mich.

Youth Officers

Editor, *CQ*:

As one of your readers overseas I will drop you a line with a question. In my daily sked with Raymond, W4QXT, in Ralwith, N.C. we discussed several times matters of interest in connection to my daily job as youth-officer of the city of Apeldoorn-Holland. During my vacation in L.A. California, I visited some of my colleagues in Ontario and Riverside (Calif.). We exchanged interesting subjects about the youth-policy in both of our country's and during this year I am writing a study about: Some aspects of youth-policy in the U.S.A. compared to the situation in the Netherlands.

I wonder if these are hams in the eastern part of the U.S.A. who are community-relation-officers or even youth-officers in their city! If there are, please let them drop me a line so that we can make skeds in which we can exchange information about our subjects of interest, besides the subjects of hamming!

Renger J. de Ruiter, PAØDES
Rhapsodiestraat 8
Apeldoorn, Holland

Announcements

Towson, Maryland

The Greater Baltimore Hamboree will be held at Calvert Hall College, Putty Hill and Goucher Blvd, Towson, Maryland, on Sunday, April 7, 1974 at 10 a.m. Food, Flea Market, and Prizes. Registration: $2.00. Contact: Joe Lochte, 5400 Roland Ave., Baltimore, Maryland, 21210.

Woodstock, NY

The annual banquet meeting of the Overlook Mountain Amateur Radio Club will be held on April 20th, 1974. Advertising brochures from leading manufacturers, dinner and door prizes to all participants. Contact: Charles R. Cross, K2HA 42 Overlook Dr. Woodstock, NY 12498.

Raleigh, North Carolina

The Raleigh Amateur Radio Society of Raleigh North Carolina is sponsoring a Hamfest. The Fest is on Sunday April 21, 1974 at the Crabtree Valley Mall (Highway 70 West).

Boston, Massachusetts

STOLEN EQUIPMENT: Clegg FM27B transceiver, serial no. 27103-2891. Stolen from automobile on Desoto Road, West Rotbury on the evening of February 17, 1974. Any information, please contact: Stan Laine, WA1ECF, 807 East St., Dedham, MA 02026.

Las Cruces, New Mexico

The Mesilla Valley Radio Club of Las Cruces, New Mexico, invites you to its "Annual Bean Feed and Swap Fest", April 28th, 1974 at La Mesa Park. There will be prizes, food and family fun! Contact: Len Ullom, W6HZH/5, 1020 Circle Dr. Las Cruces, NM 88001.

Windsor, Illinois

The Moultrie Amateur Radio Klub announces its 13th Annual Hamfest at the American Legion Pavillion in Wyman Park, Sullivan, Illinois on the 28th of April 1974. Space for indoor or outdoor markets, rain or shine! For more info., contact—Dean Fling, Pres. MARK inc., 519 S. Elm, Windsor, IL 61957.

Dixon, Illinois

The 8th Annual Hamfest of the Rock River Radio Club of Dixon IL, will take place on April 28, 1974 at the Lee County 4-H Fair Grounds. Swap & Shop, rain or shine! Tickets, $2.00 at the Gate and $1.50 in advance. Contact: Karl Carlson, Box 99, Nachusa, IL 61057. W9ECF.

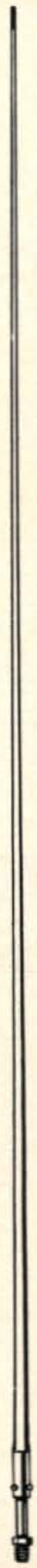
Toronto, Ontario

The Nortown Amateur Radio Club will be holding its annual Banquet and Ladies Night at the Town and Country Dining Lounge, Saturday, April 27, 1974. Contact: Murray D. Lampert, VE3FXA, P.O. Box 356, Adelaide St., Toronto, Ontario.

Hollywood, Florida

The Hollywood Amateur Radio Club of Hollywood, Florida, will sponsor a Hamfest and Flea Market on May 4, 1974. It will be at the Chaminade High School cafetorium, 500 N. 51st. Ave, Hollywood, FL 33021. Contact: Mrs. Alice Stracuzzi, WN4ZTC, 2726 Johnson St., Hollywood, FL, 33020.

Savoy



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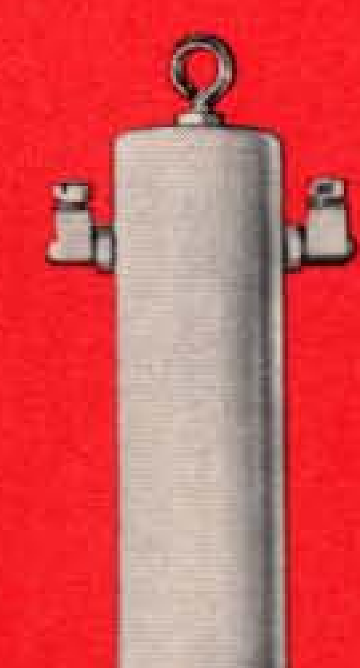

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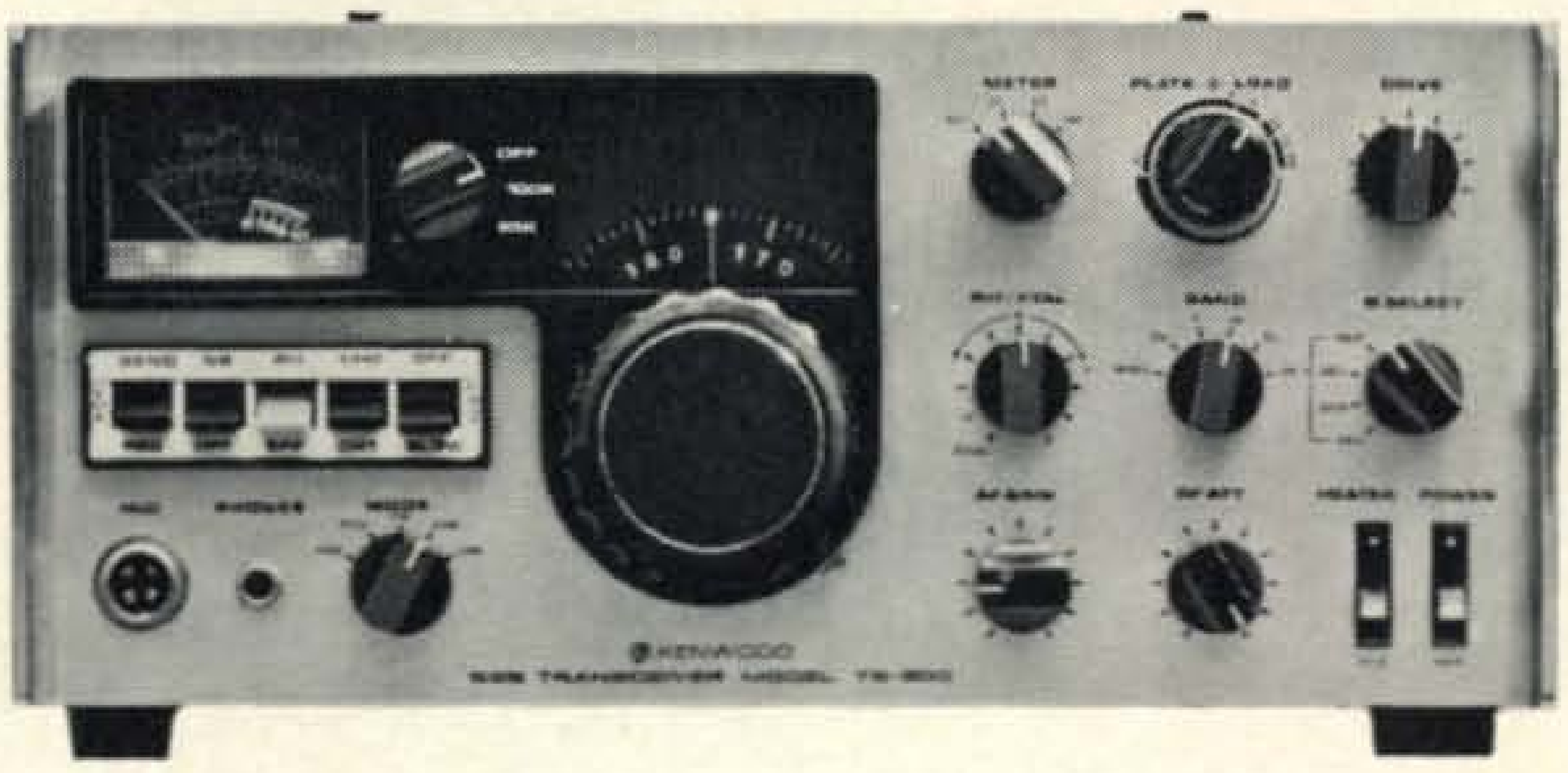

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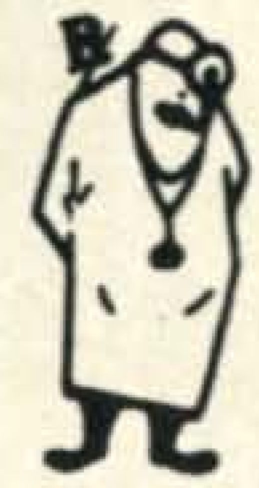
Q AND A

BY CHARLES J. SCHAUERS,* W6QLV



Electric Fence QRN

"I have taken all of the measures I could to try to eliminate interference caused by an electric fence which keeps cattle in a given area. Although battery powered, the unit puts out an intermittent signal that can be heard on the higher bands especially in dry weather. Any new suggestions?"

One approach which seems to work is to use ferrite beads at the output lead (one wire) of the electric fence unit. These beads are obtainable from Amidon Associates, 12033 Otsego St. No. Hollywood, Calif. 91607. A 10 meg resistor from the hot line to ground will also help.

AX-190 AGC

"The a.g.c. action of my AX-190 receiver seems to be bad. I'm not a hot-shot technician but sure I can find the trouble with a little assistance. The pre-selection is 'soggy.' On real loud signals I have some blocking. What do I look for?"

No a.g.c. system is perfect. Check the two back-to-back diodes in the "overload r.f. circuit." Next check transistors Q_1 and Q_2. For good action the pre-selector must be carefully tuned at the proper point.

Speech Processor (KWM-2)

"Please recommend a speech processor for my KWM-2 that works and little set butchering is necessary."

Sure. Write DX Engineering, 2455 Chico Ave. S. El. Monte, Calif. 91733.

FTDX-560 Improvements

"I just acquired a used FTDX-560 and find that it works okay, but I understand

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

Morse and RTTY from one keyboard?

Meet the two and only.

The HAL DKB-2010 Dual Mode keyboard is one of the most sophisticated products ever offered to the radio amateur. It's an all solid state keyboard that allows you to send either RTTY or CW — with more ease, more versatility than anything you've ever seen before.

In the RTTY mode, you can transmit at standard data rates of 60, 66, 75 or 100 WPM, as well as an optional 132 WPM, 100 baud. In addition to the complete alphanumeric keys, you get 17 punctuation marks, 3 carriage control keys, 2 shift keys, a break key, 2 three-character function keys, a "DE-call letters" key and a "Quick brown fox . . ." test key.

In the CW mode, you can send at speeds anywhere between 8 WPM and 60 WPM. You can also adjust dot-to-space weight ratios to your liking. For CW, you have all alphanumeric keys, plus 11 punctuation marks, 5 standard double-character keys, 2 shift keys, a break-for-tuning key, error key, "DE-call letters" key, plus 2 three-character function keys. Output interfacing is compatible with cathode keying or grid-block keying. A side tone oscillator and built-in speaker allow you to monitor your signal — with adjustable volume and pitch controls.

The DKB-2010 also has a three-character memory buffer which operates in either the RTTY or CW mode, allowing you to burst type ahead without losing characters. A 64-character memory buffer is also available as an option. Key function logic in either mode is governed by LSI/MOS circuitry. All key switches are computer grade.

The DKB-2010 is available assembled or in kit form. Should you choose the kit, you'll find construction easy — the unit consists of three assemblies: power supply board, logic PC board, keyswitch PC board, and pre-assembled wiring harness.

Any way you look at it — as an easy-to-build kit, a complete assembly, as a CW keyboard, or an RTTY keyboard, the HAL DKB-2010 is a real breakthrough for every amateur. It adds a whole new dimension to the exciting world of amateur radio. Once you've used the DKB-2010, you'll wonder how you ever got along without it!

Prices: $425 Assembled; $325 Kit

HAL Communications Corp.
Box 365, Urbana, Ill. 61801
Telephone: (217) 359-7373

☐ Enclosed is $______(Assembled)
$______(Kit)
Call letters______
☐ Charge Master Charge #______
☐ Charge BankAmericard #______
M/C Interbank #______
Card Exp. date______
☐ Please send me the HAL catalog.

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Name
______
Address
______
City/State/Zip

All prices include U.S.A. shipping.
Add $10 for air shipment.
Illinois res. add 5% sales tax. C

that an article describing certain improvements has come out. In what magazine is the article?"

The information in the article will help you make your 560 better, *i.e.*, more output power, better audio and more receiver gain on 10 and 15 meters and better c.w. selectivity. Write *CQ* and ask for the July 1972 copy—page 16. The cost is $1.00.

SB-303 Problem

"I'm happy with my SB-303 receiver, but lately when on 15 meters I get an oscillation that sounds like a.f. feedback. What should I look for?"

This is a tough one to answer because not sufficient information has been supplied on which to base a diagnosis. If only the a.f. sections of the set are involved then you would get the trouble on all bands, but this evidently is not so. Therefore, the oscillation must be of r.f. origin. Bad by-pass capacitors (in a specific circuit area) can be suspect. Poor switch contacts in the 15 m. position, poorly soldered coils etc., could cause the trouble you have.

FTdx 570 Power Supply

"I have an FTdx 570 which has given me fine service, but there is a short in the power supply somewhere because it blows fuses as fast as I put them in. I am not a good technician but know my way around with test instruments on par with the average ham. How do I go about locating my trouble?"

First check the most simple causes of trouble! Check the a.c. line cord, plug and a.c. switch. Next, disconnect the electrolytic capacitors mounted near the power transformer one at a time and test these. Then check the diodes underneath the power supply section. Check the high and low voltage output lines for a short to ground. A shorted by-pass capacitor could blow a fuse. Shorted tubes should be suspect so test these. Check the fan circuit.

Swan 1200 Linear PC'S

"I own a Swan 1200 linear and it seemed to work fine until I changed antennas from a dipole to a vertical. Two of the parasitic chokes burned up and the other two were cooked. I suspect that the v.s.w.r., had something to do with this. I have replaced the final tubes twice in this amplifier. What do you think?"

choose from the finest line of amplifiers ever offered

2K-ULTRA
... THE "ULTIMATE"

There has never been an amateur linear amplifier like the new 2K-ULTRA. Small and lightweight, yet rugged and reliable . . . all that the name implies. The ULTRA loafs along at full legal power without even the sound of a blower. Its anode heat is silently and efficiently conducted to a heat sink through the use of a pair of Eimac 8873 tubes. In fact, all of its components are the very best obtainable. The price . . . $895.00

TEMPO/2001

Small but powerful, reliable but inexpensive, this amplifier is another top value from Henry Radio. Using two 8874 grounded grid triodes from Eimac, the Tempo 2001 offers a full kilowatt of output for SSB operation in an unbelievably compact package (total volume is .8 cu. ft.). The 2001 has a built-in solid state power supply, a built-in antenna relay, and built-in quality to match much more expensive amplifiers. This equipment is totally compatible with the Tempo One as well as most other amateur transceivers. Completely wired and ready for operation, the 2001 includes an internal blower, a relative RF power indicator, and full amateur band coverage from 80-10 meters.. . . $545.00

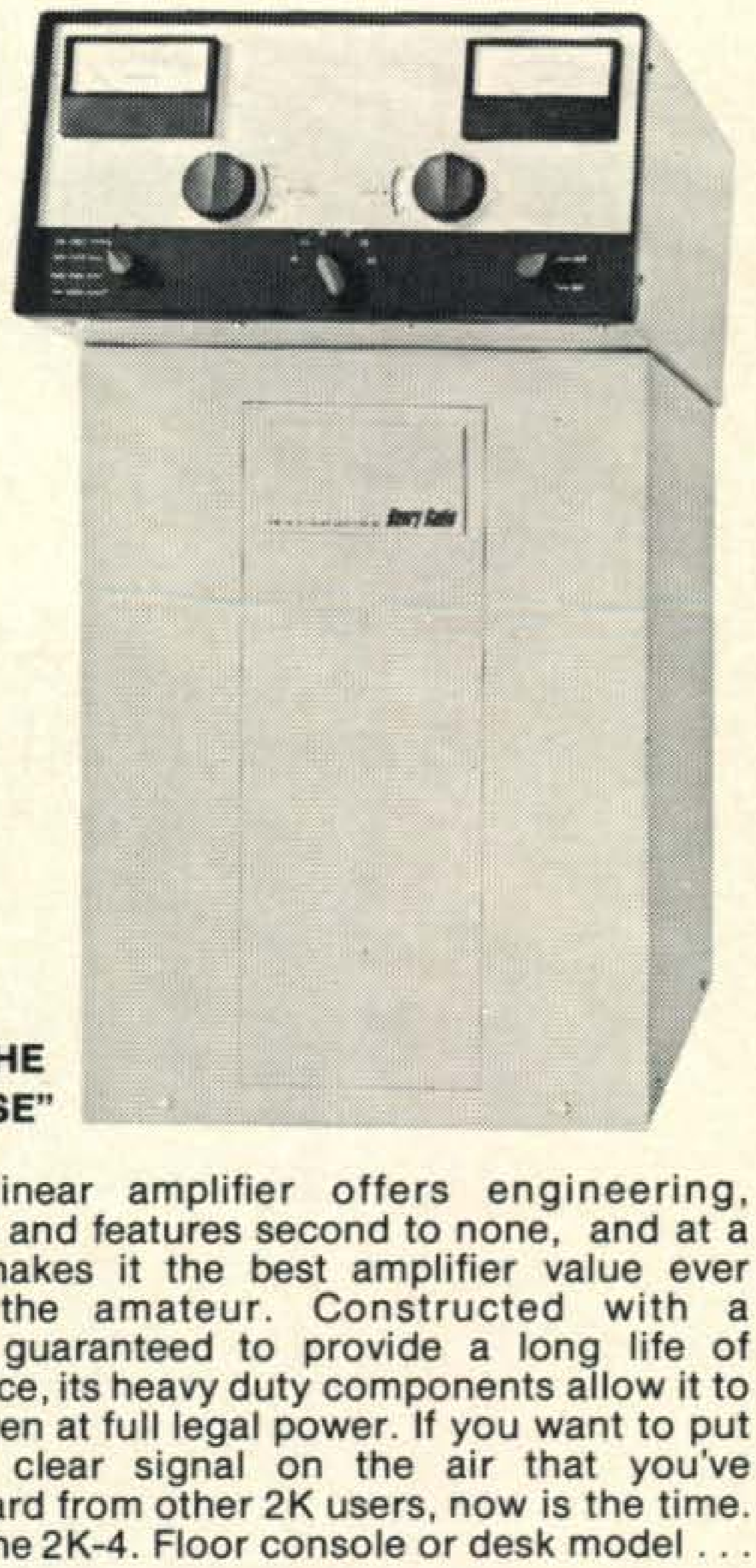
TEMPO/6N2

The Tempo 6N2 joins the Henry Family of fine HF amplifiers, bringing the same high standards of performance and reliability to the 6 meter and 2 meter bands. Using a pair of advanced design Eimac 8874 tubes, it provides 2,000 watts PEP input on SSB or 1,000 watts input on FM or CW. The 6N2 is complete in one compact cabinet with a self-contained solid state power supply, built-in blower and RF relative power indicator. Price . . . $695.00

3K-A COMMERCIAL/MILITARY AMPLIFIER

A high quality linear amplifier designed for commercial and military uses. The 3K-A employs two rugged Eimac 3-500Z grounded grid triodes for superior linearity and provides a conservative three kilowatts PEP input on SSB with efficiencies in the range of 60%. This results in PEP output in excess of 2000 watts. In addition, the 3K-A provides a heavy duty power supply capable of furnishing 2000 watts of continuous duty input for either RTTY or CW with 1200 watts output. Price . . . $1150.00

Prices subject to change without notice.



2K-4 . . . THE "WORKHORSE"

The 2K-4 linear amplifier offers engineering, construction and features second to none, and at a price that makes it the best amplifier value ever offered to the amateur. Constructed with a ruggedness guaranteed to provide a long life of reliable service, its heavy duty components allow it to loaf along even at full legal power. If you want to put that strong clear signal on the air that you've probably heard from other 2K users, now is the time. Move up to the 2K-4. Floor console or desk model . . . $895.00

Henry Radio

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931 N. Euclid, Anaheim, Calif. 92801 714/772-9200
Butler, Missouri 64730 816/679-3127

When you replaced the tubes I hope that these were matched types. Today, there is such differences in tubes (gm characteristics) it is hard to believe! When PC's go out it indicates a problem with neutralization. Unmatched final tubes do present a number of problems for it is not unusual for one tube to draw more current than the one it is sitting by. High v.s.w.r. can shoot PC's. The "average" dipole (depending on a number of factors) has an "impedance" of a *nominal* 72 ohms; the ham vertical can vary in impedance from 30 to 60 ohms. When you have high circulating tank current (current that is not absorbed by an antenna system) you can have PC problems.

Fan Mounting

"I wish to mount a fan in my transceiver to cool the final stage. Is there any one way to do this?"

Most transceivers do not have sufficient space available to mount a fan and it must be mounted on the outside looking in.

There are three ways you can mount a fan to cool a linear amplifier because space is generally available. A fan can be mounted to pull cool air from the outside and blow it over final tubes; it can be mounted underneath the tubes blowing up or it can be mounted so that it will suck out the heat generated. Most transceivers do need cooling if one sticks to the s.s.b. mode, on the other hand, sustained a.m., c.w. or RTTY operation may require using one. The blow-in mounted fan takes the heat out of the final compartment and blows it throughout a set, so one must be careful so that the mounting will not create a heat problem in other stages. A "smoke test" will show you where the air goes. Pulsating hot air can affect solid state v.f.o. operation in some cases.

Zener For VR Tube

"It is worth the effort to use a zener in place of a VR tube?"

With original construction I would say yes, but if you are contemplating the modification of a circuit just for this purpose, I would say no.

Calrad VOM

"I have a Calrad VOM. It worked fine but then I could not zero the ohmmeter. What do I look for?"

Check the connections on the OHMS ADJUST pot. Make sure that your range switch is clean. Check or replace the batteries.

73, Chuck, W6QLV

A Solid State Scaler for Frequency Counters

BY DONALD PECK,* W3CRG

THE appearance of solid state, digital counters which operate into the v.h.f. range has brought into the surplus and hamfest market the older EPUT counters (such as those built in the '50's and '60's by the Berkeley Division of Beckman Instruments) at very reasonable prices. However, for the amateur, the typical range of 100 kHz is of limited utility. The problem was solved in the case of W3CRG by building a scaler for the specific purpose of extending the range of a Model FR-67/U counter to 10 mHz with a 1 mHz option. It would be possible to extend this range to 100 mHz by the simple addition of another decade counter. Some old vacuum tube type scalers occupy 10 inches of rack space, but this solid state unit can be held in the palm of the hand.

*4809 Guilford Rd., College Park, M.D. 20740.

How It Works

An r.f. signal is coupled to the scaler through a coupling capacitor to the base of emitter follower Q_1. Capacitor prevents any negative bias from cutting off the transistor. The emitter follower provides matching from a high input impedance to a low impedance, isolates the following clipper stage, and drives the clipper. The sensitive clipper operates class B and presents a square wave of 4 v. P-P to the decade counter. The count mode divides the signal by two and then by five for a count down of ten. The combined effect of the two counters is to divide the signal first by ten and then by ten again for a net effect of division by one hundred. B+ is decoupled from the power supply by C_4, a .001 mf capacitor. The counters are above ground by 0.7 v. developed across a 12 ohm resistor

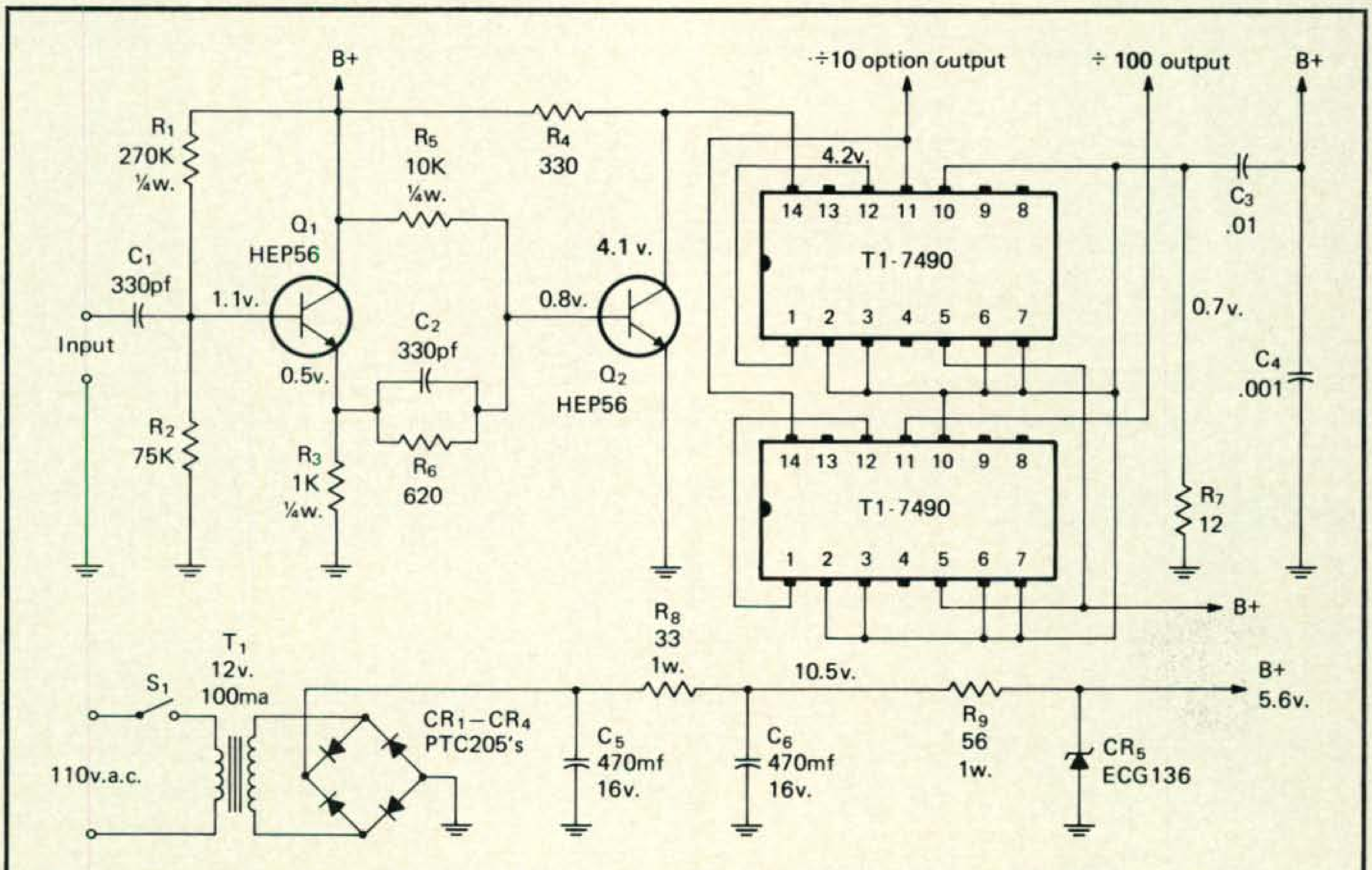


Fig. 1—Schematic of the solid state frequency scaler to extend the range of older-type frequency counters. Resistors are ½ w. unless otherwise noted.

and filtered by a .01 mf capacitor. This restores the proper d.c. level and allows the counters to see a signal logic of +4 v. P-P and 0 volts. The power supply is well filtered and regulated with a zener diode. The 2.5 amp. diodes will easily stand any surges. The zener diode clamps the B+ at 5.6 volts. RC filtering is used because the total load current is only about 100 ma.

Design Considerations

The HEP 56 was selected because it has a cut off frequency of 750 mHz. The 7490's are rugged industrial high-speed decade counters which work well in this circuit and provide the option of different divisors. The transistors are operated class B for maximum sensitivity.

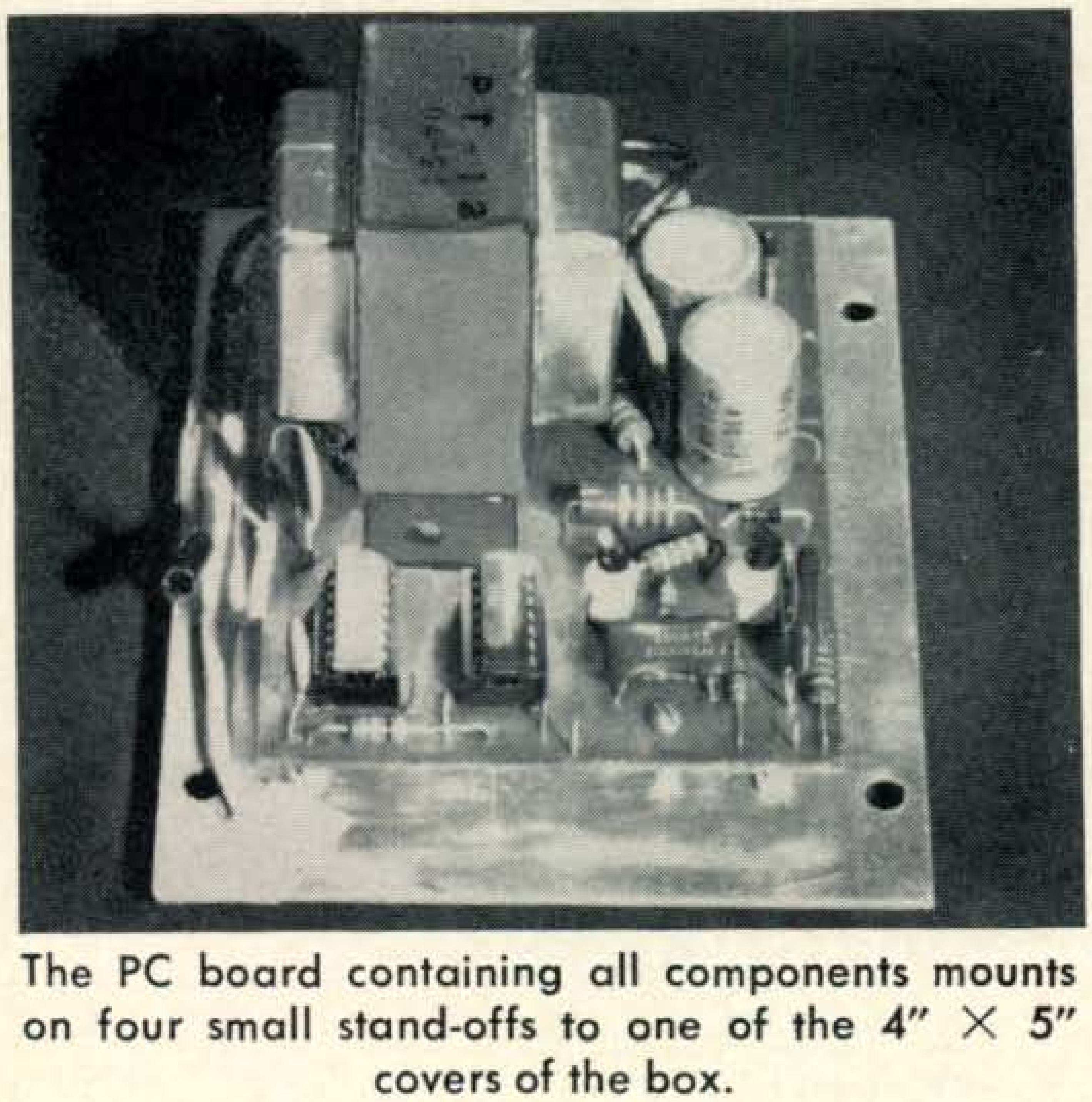
The high level input circuit is designed to accept a voltage range of from 1 v. P-P to 14 v. P-P. Any voltage less than 1 v. P-P will compromise the validity of the count and any voltage greater than 14 v. P-P may damage the transistor.

The power supply was designed to deliver approximately 60 ma to the scaler and 40 ma to the zener diode. The d.c. voltage with a 1 mv ripple is adequate for the power needs of the scaler.

The complete unit is enclosed in a 3″ × 4″ × 5″ aluminum utility box to protect the counter from stray r.f, signal which can cause a false count.

Fabrication

This unit should be called "the junk box scaler." The transformer is a common type



The PC board containing all components mounts on four small stand-offs to one of the 4″ × 5″ covers of the box.

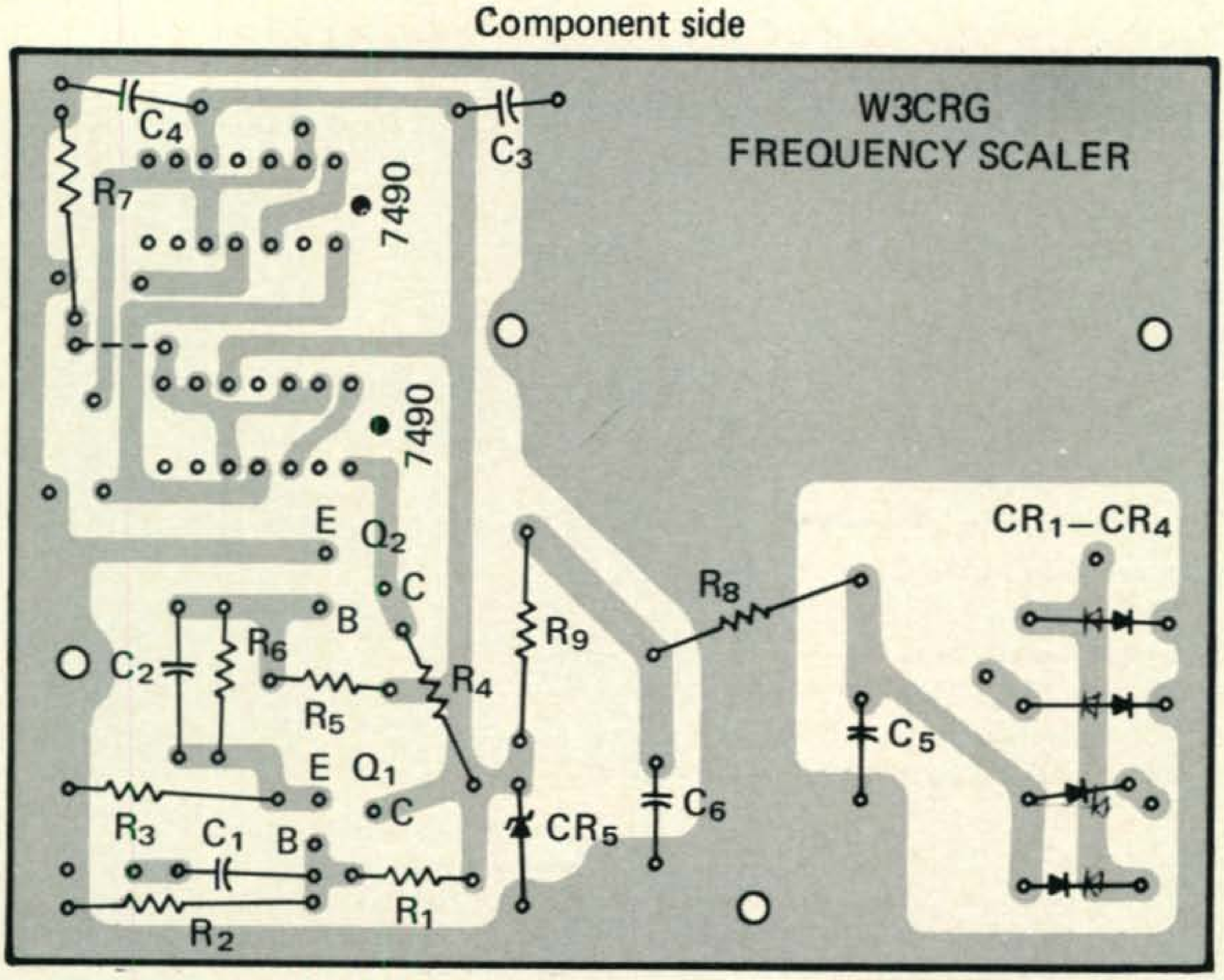
The scaler is completely self contained in a 3″ × 4″ × 5″ aluminum cabinet, with its own power supply.

used in solid state stereo receivers. Any transformer that can supply 12 v.a.c. and at least 100 ma will do the job. If another output voltage is used the values of the resistors in the power supply will have to be adjusted to maintain 60 ma for the load and 40 ma for the zener diode.

The HEP 56 is made by Motorola and is available at local suppliers. The 7490's are decade counters available from Allied Radio Shack, part number 276-1808. Sockets should be used with the solid state devices because it is difficult and dangerous to the component to solder them directly to the PC board. If sockets are used, care should be exercised to avoid putting the component in backwards.

Since the transistors are critically operated in class B, the value of the bias resistors should be adhered to strictly. Half watt resistors are used except where limited space requires quarter watt resistors and heavier current flow requires one watt resistors. The values of the capacitors are not critical, however, silver mica capacitors are used for coupling to maintain a high Q.

Another critical component in the scaler circuit is the zener diode. The decade counter circuit need exactly 5.6 volts for the most reliable performance. The zener resistor R_9 must be selected to insure proper zener action. The particular ECG 136 zener diode, made by Sylvania, may not develop the required 5.6 volts. The first zener diode used developed 5.2 volts and a second zener diode had to be tried to develop the required 5.6



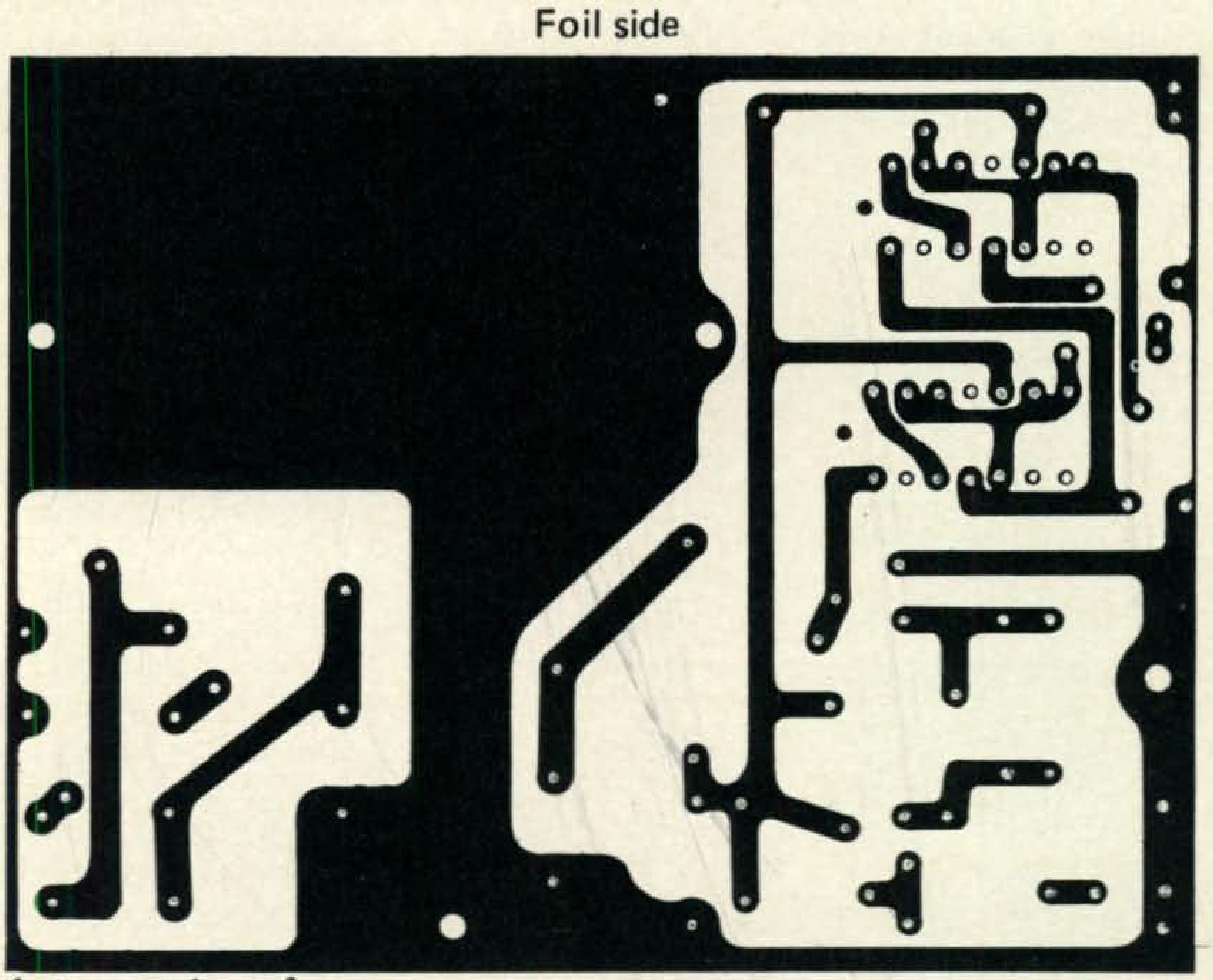


Fig. 2—Same-size foil layout and parts placement for the W3CRG frequency scaler.

volts. It is possible that a number of zener diodes will have to be tried until a hand picked one will give 5.6 volts.

A printed circuit kit is used containing all the materials needed to prepare the PC board[1]. This kit has the advantage of an instruction manual.

The scaler is attached to the 4″ × 5″ bottom plate of the aluminum box with four standoffs. Two of the standoffs are also attached to the transformer to reduce the strain of the heavy transformer on the PC board. Ventilation holes should be provided in the side of the box to dissipate heat developed by the power supply.

[1]Catalog number 22-296, $4.95, G. C. Electronics, Division of Hydrometals, Inc., Rockford, Illinois 61101.

Applications

An 80 meter test signal of 3 v. r.m.s. and a 40 meter test signal of 2 v. r.m.s. were applied to the scaler input from the Heath HG-10 v.f.o. Operation was observed for about one hour with resulting consistant readings. To test the accuracy of the scaler, a 3505 kHz crystal was installed in the Heath HW-16 transmitter and the signal was monitored at the v.f.o. input jack. A consistant reading of 3505. 3 kHz was observed. To test the divide-by-ten option, (a signal of approximately 200 kHz was obtained from an RTTY hetrodyne driver. The signal measured 200.86 kHz and with the scaler attached, the driver was adjusted to 200.00 kHz. The frequency range of the scaler was checked with an r.f. signal generator and the counters toggled over the entire range up to 10 mHz.

To extend the frequency range to include 20 meters and higher it may be necessary to substitute a decade counter with a higher toggle frequency such as the 7476. To increase sensitivity a preamplifier could be added. For general applications where the input voltages may exceed the limit of the transistor, dual limiting diodes should be used. If a preamp were added, the scaler could be connected to the output of the r.f. amplifier stage of a receiver and the frequency to which the receiver is tuned could possibly be read out on the counter, the nature of the signal permitting.

The scaler is best used to monitoring a v.f.o. It could be used to check r.f. signal generator frequencies within its frequency limits. With modification the scaler could be used for general applications. At any rate, it is a useful addition as a frequency monitor to the radio shack. ■

OSCAR News

BY RANDALL SMITH,* VE2BYG

At this writing (second week in February), OSCAR-6 seems to be breathing a little bit cooler as the maximum sunlight per orbit has gone by, and the satellite seems to have weathered its second "hot period" of its 1½ year lifetime without any noticeable damage. The satellite continues to operate six days a week. It is available for communications every Tuesday, Friday and Sunday (GMT days) during *morning* north-to-south passes and on Mondays, Thursdays and Saturdays (GMT days) during the evening south-to-north orbits. The satellite is off and *not available* for communications on Wednesdays.

*P.O. Box 73, Alouette, Quebec, GOV 1AO, Canada.

CQ is proud to have Randy Smith contribute this OSCAR News column. VE2BYG is no stranger to those using the OSCAR-6 satellite. He is one of the most active radio amateurs in satellite communications, if not the most active. Among his 4,000 OSCAR-6 QSOs are 1,000 trans-Atlantics, and he has worked 49 states. Unfortunately Hawaii is out of range of Randy's Quebec QTH. Randy is also a primary ground-control station for controlling the satellite when it is within range of North America, and it is his voice that is often heard giving official AMSAT bulletins on the 29.49 mHz downlink frequency. —W3ASK

This schedule will hold providing that there is a ground-control station available to turn the satellite on and off at the appropriate times. This is done regularly for North America by both myself and VE3QB, who operates an automated command station. But it is a problem in other areas of the world. For example, for the past several months there has been no ground-control station available to control the satellite during the evening passes that are in range of Europe and Africa. While OSCAR-6 is well commanded when within range of Australia, there is no command station for Japan and the Far East.

Inquiries from AMSAT have been sent to prospective ground-control stations, but negative replies seem to be the order of the day. Volunteers having appropriate equipment, and more important the available time, should contact AMSAT Headquarters immediately.[1] Unless radio amateurs from other continents take a more positive step in trying

[1]AMSAT—the Radio Amateur Satellite Corp., P.O. Box 27, Washington, D.C. 20044.

Here's CN8BO who's put Africa within range of North America through OSCAR-6. On Jan. 12, Garry worked W1NU for the first African-USA QSO through the satellite. Look for him regularly on a downlink frequency of 29.508 mHz. Garry's stateside call is K7VAT.

to set up a world-wide command system for OSCAR-6, Asia, Europe and Africa are going to continue to suffer by not having the satellite operating when within range.

You don't have to communicate through OSCAR-6 to provide useful data concerning the satellite. Listeners to the satellite's beacon frequency of 29.45 mHz are urged to send telemetry reports and reception reports of CODESTORE to AMSAT. A timer aboard the satellite is suppose to auptomatically switch between telemetry and CODESTORE transmissions every 14 minutes. AMSAT would like reports verifying if this timer is working accurately, and if it is switching properly every 14 minutes.

OSCAR-6 seems to be providing a "new life" for many of the old-time DX leaders. A quick look at the DXCC Honor Roll for the conventional h.f. bands shows at least twelve very active OSCAR-6 users who have previously reached the cherished 325 countries level. Seems like they have turned to OSCAR when they ran out of new countries to work. More and more notable low band DX'ers can now be heard on OSCAR-6, enjoying a friendly contact.

While the satellite's repeater sounds like a contest weekend on the low bands when it is on and within range, there is still plenty of room for increased activity. While most stations exchange reports as fast as possible, more and more stations are beginning to have short rag-chews, and K1HTV and KØDDA have been heard passing traffic every week for the past six months. If nothing else this should prove that communicating by satellite is not as hard as one may think.

The use of too high a power level still remains the biggest problem of OSCAR-6. The question asked by many is "How can I tell when I am overloading?" It's easy, just listen to the signals next to your own signal. Don't use the intermodulation from OSCAR-6 or the beacon on 29.45 mHz as indicators, but listen to the people next to you. It is much easier to tell on c.w. than s.s.b. Hardly an orbit goes by without someone overloading the repeater. To find the offender, look for the strongest signal and put your carrier next to his. If your signal drops in strength when the strong signal appears, then you have found the culprit. On s.s.b. it is much more difficult, but if the signal is strong and tends to be on the wide side, the odds are that it is overloading. If the s.s.b. signal is exceptionally strong, the same method can be applied as used for c.w. Keep your effective radiated power below 100 watts and you'll have no trouble working through the satellite and you don't have to worry about overloading the repeater.

A note from G3IOR tells us that he has been doing some very interesting studies on horizon and sub-horizon signals from OSCAR-6. By measuring the time delay of the signal he finds that a very sudden decrease in delay takes place as the satellite dips below the horizon.

G3IOR's method for observing delay is quick and simple. According to Pat, all that

This neat OSCAR-6 monitoring station belongs to WN6SFT/WL7 at Elmendorf AFB, Alaska.

is needed is a tape recorder and a receiver to copy your own signal direct on 2 meters. Tape simultaneously your direct transmitted signal at one tone and listen to your 10 meter downlink at another tone so as to differentiate the two signals for taping. Play the tape back at a slower speed, preferably four or more times slower. The time delay can then be heard, and if you are interested in measuring this delay, feed the recorded signals into an oscilloscope.

G3IOR also informs us that he and G3WPO are putting out a bulletin called *OSCAR NEWS*. It's full of up-to-date info about schedule changes, special tests, expeditions, etc. The bulletins are free, but please send G3IOR[2] three self-addressed envelopes (business size) with adequate postage at the rate which will be required to send the bulletin via airmail from Britain. If you don't have British stamps available, send the appropriate number of IRCs.

Here's where you'll find some of the latest DX operating through OSCAR-6.

CN8BO—Downlinking around 29.508 mHz. QSL via K7VAT.

CT1ON—Strong s.s.b. signals downlinking at 29.490 mHz.

CT2BG—Active on c.w. downlinking at 29.940 mHz. QSL via WA2BCK.

FC6ABP—S.s.b. and c.w. downlinking on 29.492 mHz.

FCØAWD—S.s.b. downlink at 29.502 mHz.

GM3EOJ—Active on c.w., downlinking between 29.475-29.503 mHz.

GM3EUV—Active on c.w., downlinking between 29.475-29.503 mHz.

GM3ZVB—Active on c.w., downlinking between 29.475-29.503 mHz.

RA9MBN—Active on slow c.w., downlinking between 29.485-29.505 mHz.

RA9MWW—Active on slow c.w., downlinking between 29.485-29.505 mHz.

SV1AB—C.w. and s.s.b. downlinking between 29.490 and 29.500 mHz.

TF3SF—Very active downlinking between 29.483 and 29.492 mHz.

UR2BU—Very active on c.w. between downlink of 29.495 and 29.502 mHz.

UR2EQ—Very active on c.w. between downlink of 29.495 and 29.502 mHz.

[2]Pat Gowen, G3IOR, 17 Heathcrescent, Hellesdon, Norwich, Norfolk, England, NOR58N.

JA1VDV/JAØ shown operating through OSCAR-6 from his mobile station in snow covered mountains north of Tokyo. Several stations were worked using 10 watts and the 7-element horizontal Yagi. A 10-meter wire dipole was used for receiving.

Honors go to W6OAL for being the first radio amateur to command OSCAR-6 from an aircraft. Located over the mid-Pacific, he turned the satellite on in time for it to be used by Japanese amateurs during a scheduled orbit when no other ground-command stations were available.

The most interesting QSL card that I have received so far for an OSCAR-6 QSO is the one from OH2RK. It has a small orbit calculator on its front, which can be used anyplace in the northern hemisphere for tracking OSCAR-6. I've checked it out against a computer readout for my QTH, and allowing for interpolation errors, the QSL calculator proved to be accurate to within 1 minute. If you want one of those you'll have to work OH2RK through the satellite!

Work is progressing well at AMSAT on what is hoped will eventually be OSCAR-7. It still looks good for a summertime launch date.

That's it for this month. Any information concerning OSCAR-6 activities should be sent directly to the author for future publication.

73, Randy, VE2BYG

A Coax Fed Trio For 160, 80, 40, and You

BY W. H. DeWITT,* W2DD

DURING the past few years coax feed has become the dominant mode for getting the r.f. up into the antenna. And despite the superiority of single band beams, tri-banders have really taken over the 10/15/20 meter scene. Why? Mainly because of the convenience of having three band capability rolled into one antenna, but also because of greatly reduced cost and mechanical problems. Last but not least, three bands and one feed line! There's just that *one* piece of coax and no antenna tuners. These thoughts came to me the other day when I was contemplating what to do about a 160 meter antenna. "Short path" from my shack to the tower is about 60 meters. There are three coax lines running out there to accomodate various antennas. Why not use one of those lines—the one that feeds the 40 and 80 meter antennas?

For the past several years I have been using a pair of inverted V antennas for 40 and 80. They are tied together at the feed point (apex) and fed through a 1:1 balun with a single coax line. Results have been very good. The system works because only the antenna for the band in use presents a 52 ohm feed-point match at the balun and the r.f. "ignores" the high impedance of the other antenna. This relationship will still hold with the addition of the 160 meter dipole.

Adding 160 meter capability without a new feed line really appealed to me! After that first burst of enthusiasm for one of my own ideas, I began to worry about radiation resistance, *Q*, feed point impedance, and all that kind of good stuff. But then, as most ham radio characters are wont to do, I decided that lack of knowledge shouldn't be too inhibiting when you're anxious to get on 160.

With some lurking concern for the theoretical aspects of antenna design and what the addition of some more wire around the place might do to the performance of my 40/80 meter combination, I went at it. First, I measured off about 272 feet (oops—approx. 83 meters!) of my best electric fence wire. Then, gathering up a couple of insulators, some solder, and a gas torch, I headed for the tower. In the tradition of the Northeast, it was a perfect day for antenna work. Wind gusts to 30 knots (you convert it!), —10 degrees C., and snowing! Weather like that is said to ensure good results.

Nothing matches the sheer joy of soldering in a snowstorm. But there were only two connections to be made, so my "pleasure" was shortlived. In a few moments I had the two wires tied in at the feed point, anchored at the far ends to some steel snow fence posts, and the whole copper-clad trio up in the air with hardly any noticeable kinks. Back to the shack for the moment of truth!

During the dozen or so years that I have been using the 40/80 pair of inverted Vs, I have made periodic s.w.r. checks to assure

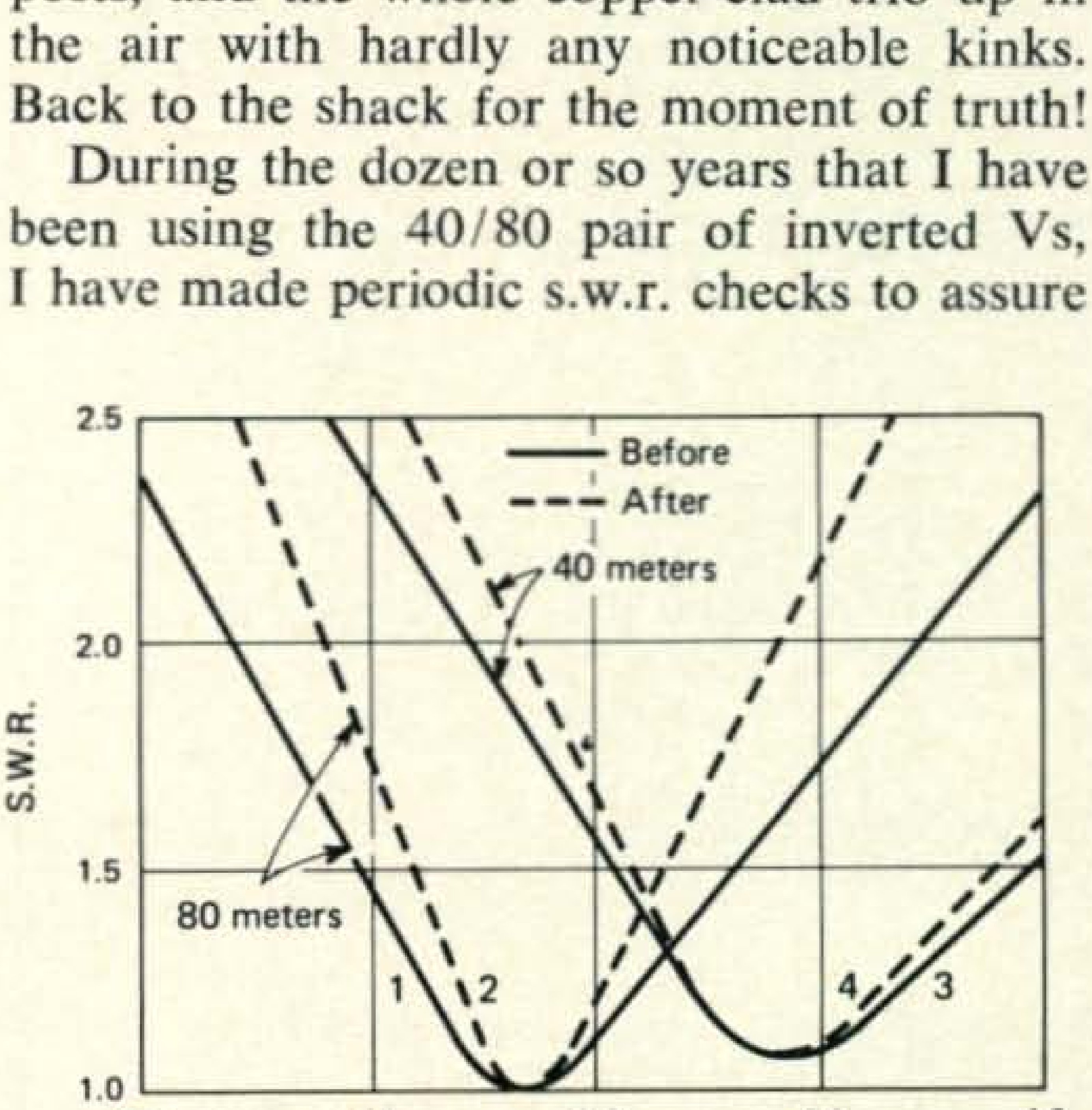


Fig. 1—Before and after s.w.r. curves for the 40 and 80 meter Inverted antennas at W2DD. Curves 1 and 3 are the before curves for 80 and 40 respectively; curves 2 and 4 are the same antennas after the installation of a 160 meter dipole on the same feedline.

*2112 Turk Hill Road, Fairport, N.Y. 14450

myself that the antennas were still OK. It's a simple task to determine the resonant frequency of your antennas by plotting the s.w.r. versus frequency as shown in fig. 1. In a few minutes you can get readings at 25 kHz intervals and draw a response curve that tells the story. With the earlier curves (Numbers 1 and 3) at hand, I had a good reference for comparison with any new data. But first we should take a look at the resonant frequency of the new antenna.

To be honest, it did take another thrilling ten minutes in the snowstorm to hit the right length. A lucky guesstimate dropped the resonant point right on 1810 kHz where I wanted it. See fig. 2. But what had happened to the good old 40/80 pair? Had I messed them up by adding the new antenna? Back to the s.w.r. again!

In about fifteen minutes I had the new s.w.r. curves plotted. Referring to curves 2 and 4 of fig. 1, you can see that the resonant frequencies of the 40/80 pair remained unchanged. However, the bandwidth within which they operate at a desirable s.w.r. has been narrowed a bit. Prior to adding the new antenna the range of frequencies for operation at an s.w.r. of 1.5:1 or better was 180 kHz for 40 meters, and 165 kHz for 80 meters. After adding the new antenna, the ranges were reduced to 160 kHz and 113 kHz respectively. (There is nothing magical about the value of 1.5:1; it was simply chosen as an example.) Perhaps the explanation for the change noted is that the Q of the old antennas has somehow been raised by the presence of the new one. Hopefully some of our readers will offer comments on this point

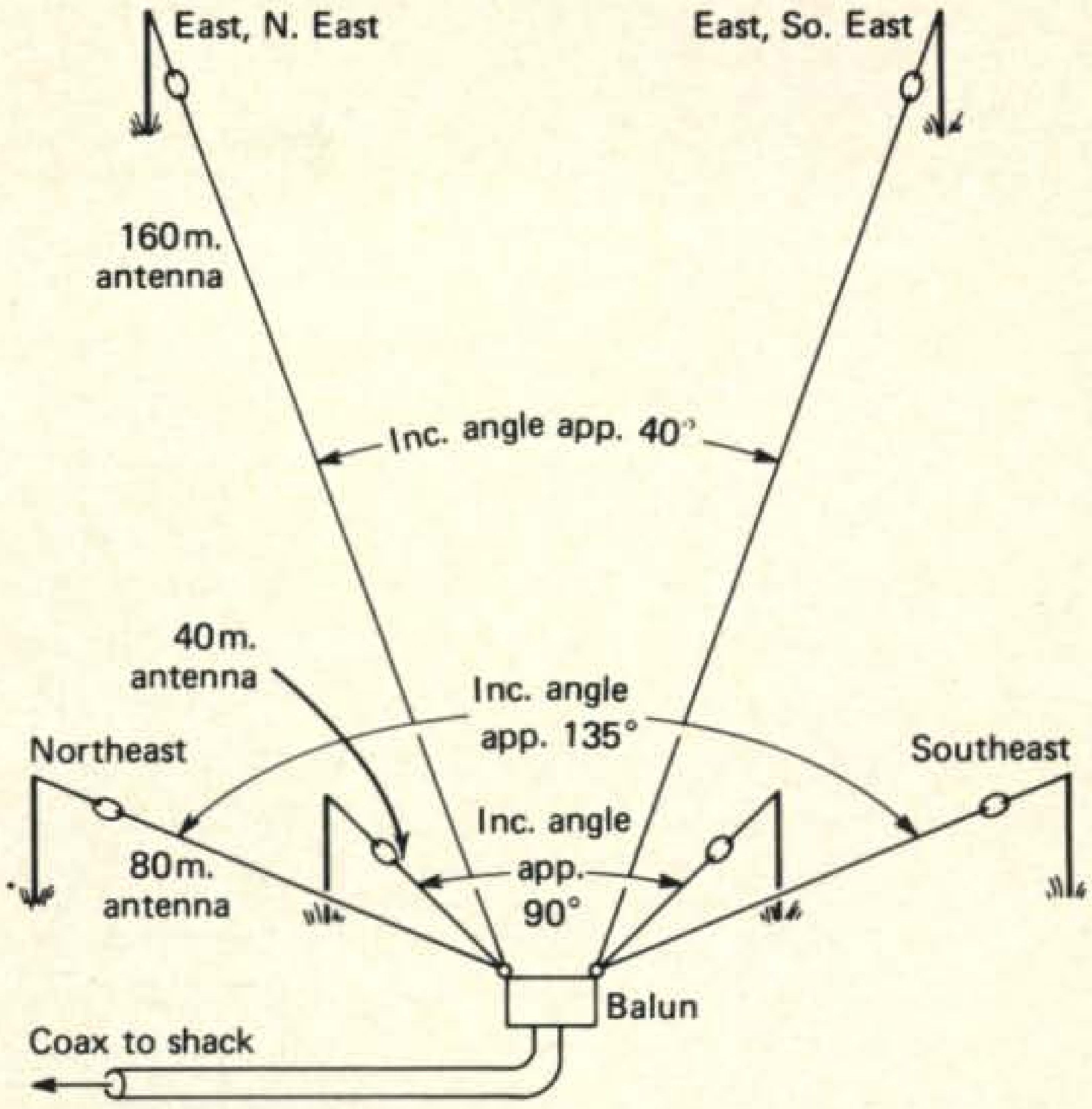


Fig. 3—Physical layout for the Coax Fed Trio for 160, 80, 40 and You. The balun is located 11 meters above ground. The far ends of the 160 and 80 meter antennas are 2 meters above ground; the 40 meter antenna ends are 4 meters above ground. Use *Handbook* values to determine antenna lengths.

—on which I submit to being very un-expert. However, I can say firmly that the performance on the 40/80 antennas is still very good on the basis of both WX and DX contacts. Is W2DD lucky or smart? Please, no written answers!

Now let's go in to fig. 3 which shows the physical layout of this coax fed trio. If you are an antenna designer, you're probably shaking your head—and if you are a more or less typical (?) ham, you're no doubt thinking, "I wouldn't do it *that* way—and why didn't he use a larger included angle on the 160 meter antenna?" Or some variation thereof!

My old yellowed-pages antenna manuals say that most antenna theory is based on the performance of a conductor suspended in free space over level ground. And then there are special rules for verticals etc.! But what do I have to contend with? My house is level (I think) but once you go out any door, you are either going up or down. And just to keep everything in proper perspective, we have 150 trees within 300 feet of the house. Not exactly level ground, and not exactly free space! Why bring that up? The point is that every ham has his own set of conditions to deal with when it comes to putting up antennas. Nothing could be farther from my thoughts than to suggest duplicating the in-

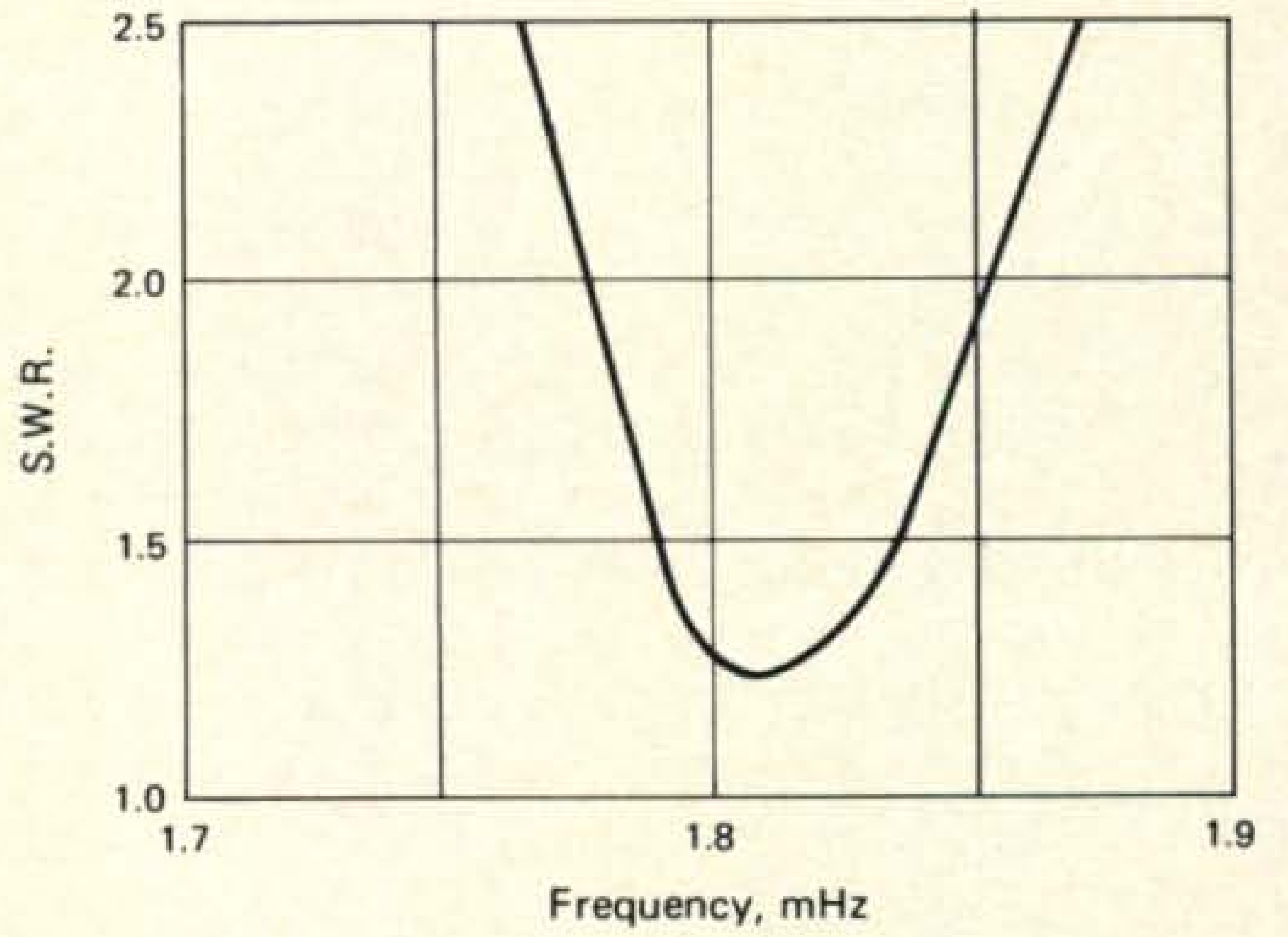


Fig. 2—S.w.r. vs. frequency for the 160 meter dipole fed by the same feedline used to feed 40 and 80 meter antennas.

stallation at W2DD (where MY trees, MY shrubs, and MY WIFE control where the wires do/do not go)! However, what I do suggest is that if you want a reasonably effective antenna for the low bands—with one feed line and no antenna tuner, try this trio. Put up the wires, make some measurements, see what the s.w.r. curves look like. If they look good, get some on-the-air checks. If the results aren't good on paper or on the air, make a few adjustments and try again. I make no claim that good s.w.r. values alone will insure effective results with any antenna, but it's highly unlikely that you'll get good results with a non-resonant coax fed antenna.

My experience with this little exercise left me with many unanswered questions. For example: What effect would increasing the included angle of the 160 meter antenna have? What would be the effect of having all three antennas in the same plane? If I raised the trio up closer to my beam to give it added height (it's about 9 meters below the beam) —would that ruin the performance of the operation by using loading coils and getting the far ends of that antennta higher off the ground? Perhaps the FCC could use these questions for some new class of license!

Incidentally, you may be wondering about that balun I mentioned earlier in the article. I installed a W2AU balun between the coax and the original 40/80 pair several years ago. S.w.r. curves run before and after installing the balun were identical—as they should have been. After installing the 160 wire, my tests included both W2AU and Palomar Engineers baluns. Again, the s.w.r. curves were identical. Use the balun of your choice, but make it a good one.

In about one month's operation, the results obtained with the Coax Fed Trio have been most encouraging. It does a good job on 160, and I can still work just about anything I can hear on 40 and 80. It is certainly not the answer to a DX Hound's dream, but it does get out. Using a Yeasu FT-101 Transceiver many 200-300 mile contacts have been made on 160 in the daylight hours. Nighttime contacts on that band seem to be limited only by what districts are available and how well I can stay awake! I haven't really worked at 160 DX, but I did work HKØBKX in a bit of a pile-up. On 40 and 80, DX has included G, DL, HZ, KX6, ZL etc. So summing it all up, I hope that the Coax Fed Trio For 160, 80, 40, and Me, will become the Coax Fed Trio For 160, 80, 40, and You. ■

ASCOM Speech Processor

A new Speech processor, the model M-260, is being offered by ASCOM Electronics Products, for amateur use in mobile or fixed stations. The speech processor provides high gain, with effective speech compression for full modulation without distortion. Variations in voice levels and distance from microphone are automatically compensated. Gain is adjustable to match the gain of the transceiver. A panel mounted LED lights when gain is set too high. For complete info write to ASCOM at 12435 Euclid Ave., Cleveland, Ohio 44106 or check A on page 110.

Cepco Touch-Call Decoder

The new Cepco Touch-Call Decoder provides an inexpensive means for selective calling and remote control with f.m. equipment. While designed primarily for detection of one 4-digit Touch-Tone sequence, flexible control circuitry accomodates other control ideas. Use of phase-locked loop tone decoding and on-board voltage regulation assures stable operation. Input sensitivity is adjustable. Connections to the f.m. rig are to the speaker only; & 12v. and ground complete external connections.

Programing is by means of internal jumpers. For more information circle E on page 110.

New Amateur Products

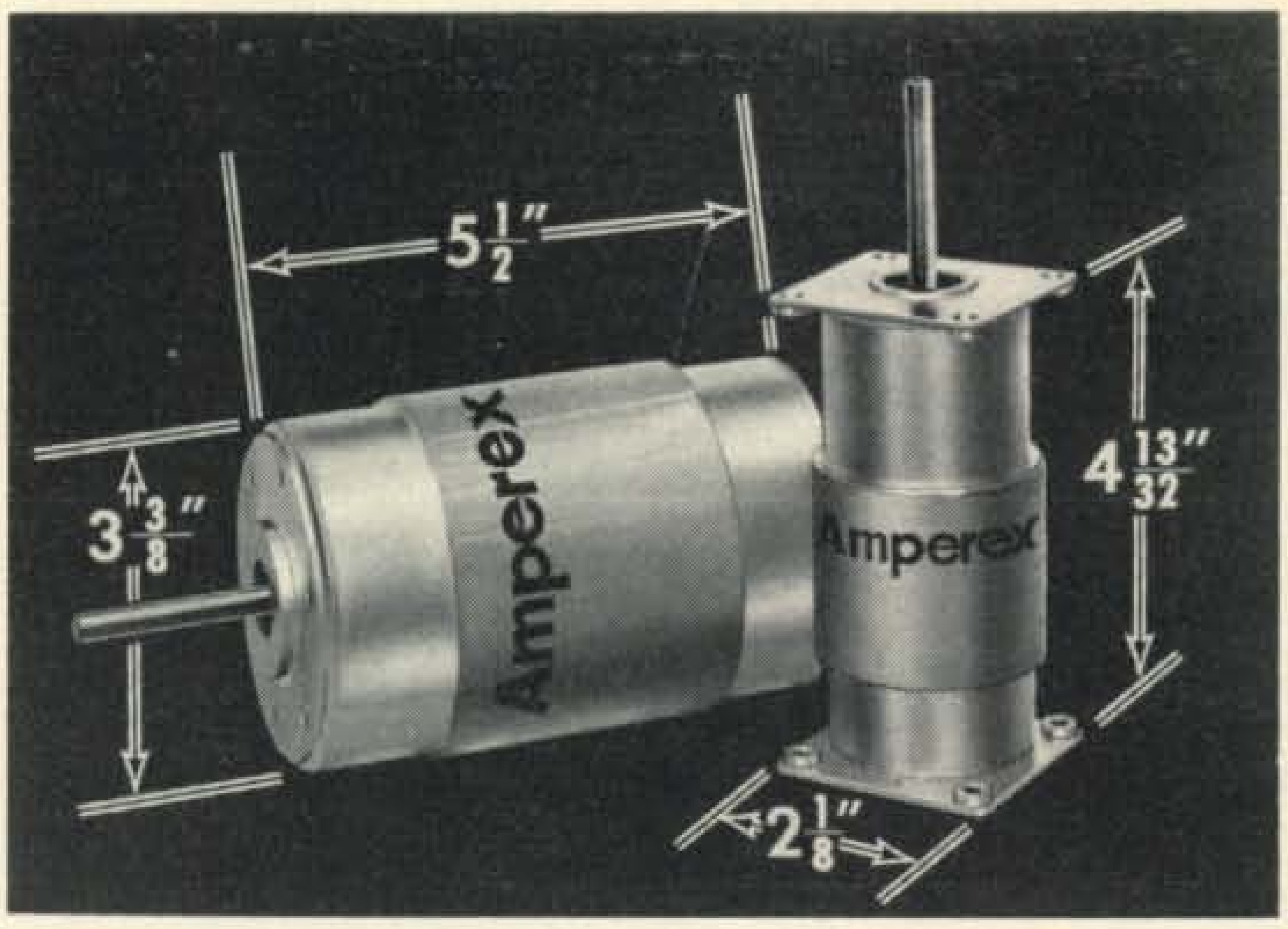
Curtis Keyboard Features 64 Character Buffer

An advanced keyboard keyer by Curtis provides a full standard typewriter keyboard including a space bar and shift key. The KB-4200 has a 64-character buffer which permits the operator to type well ahead of actual code transmission enabling 100% accurate code spacing as on code tapes. All spacing is automatically transmitted at exactly standard intervals regardless of operator typing characteristics. Speeds of from 1 to 99 w.p.m. are set by thumbwheel switches in 1 w.p.m. increments. Lamps and a meter indicate the condition of the buffer as to space remaining. The 53-key keyboard includes all standard letters, numbers and symbols as well as SK, BK, AR, and ERROR. The price is $499.95. For full details, write Curtis Electro Devices, P.O. Box 4090, Mountain View, CA 94040 or circle C on page 110.

Amperex Variable Vacuum Capacitors

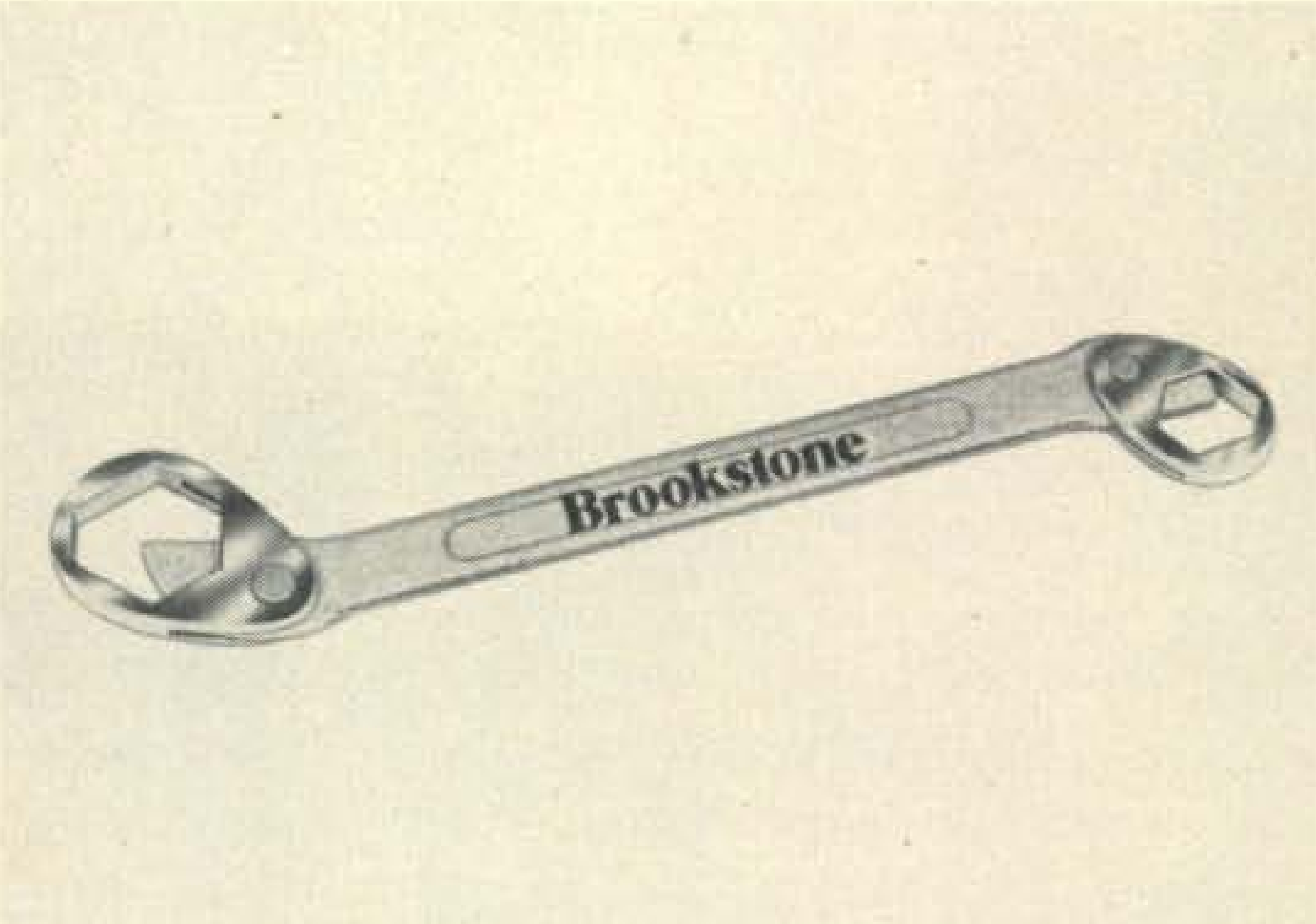
Amperex announces the availability of two new, high voltage variable vacuum capacitors featuring substantially reduced size and broad linear tuning range.

The types CBC10/1K and CVCO8/2C are both rated for 15 kv peak voltage at 60 Hz. The CVC10/1K is 5½" long (not including shaft) and 3 3/8" dia. and has a tuning range from 10 pf to 1,000 pf while the CVCO8/2C measures 4 13/32" x 2 1/8" dia. and tunes over the range of 8 pf to 200 pf. Both capacitors feature integral mounting flanges at



both ends for simplified electrical and mechanical connection.

For further information, contact Richard C. White, Product Manager, Amperex Electronic Corp., Hicksville, NY 11802, or circle D on page 110.



Brookstone Self-Adjusting Wrench

This ingenious tool takes the place of an entire set of wrenches. It automatically adjusts itself to all nuts and bolts 3/8" to 7/8" across flats, including metric. Operates like a ratchet wrench - no need to remove and regrip with each stroke. Grips at least three surfaces without rounding or damaging corners, and grip increases as turning gets tougher. Removes or tightens damaged or rusted bolts that ordinary wrenches won't even fit. The 8½" Multi-Wrench is made of chrome vanadium steel, is chrome plated and sells for $9.10, postpaid. Write for free 68 page catalogue of Hard-To-Find Tools to Brookstone Company, 5438 Brookstone Bldg., Peterborough, NH 03458, or circle B on page 110.

ANTENNAS

BY WILLIAM I. ORR,* W6SAI

PENDERGAST had not spoken a word for three or four minutes. This, for a phone man, was certainly unusual. He just sat in his favorite chair with a pile of leaflets in his lap, gazing out the window at the steel crank-up tower and the 3 element rotary beam gracing his back yard.

"Feeling ill?" I asked solicitously.

Pendergast shifted uneasily about, the leaflets in his lap slipping to the floor.

"No," he mumbled. "Just thinking." He paused, then said, "I got beat out in a pile-up this morning on XV5AC by Hardcore. Not only that, he got S9 plus 20 decibels and then I only received S9 plus 10 decibels. I think I'll go out and cut my throat with a rusty razor blade."

"That's too bad," I said kindly. "Clean living didn't pay off, did it?"

Pendergast sighed deeply. "I know how much power he's running, too. Same as I. It just must be that his 2 element Quad is better than my 3 element Yagi. I guess, I'll have to take down my beam and put up a Quad if I want to compete anymore. The Quad boys have the edge on DX."

"And that's why you are looking through all those advertising brochures about Quads," I conjectured.

"Yes," replied Pendergast. "If I can get 10 decibels gain from a 2 element Quad, there's no reason I should keep my 3 element. . . ."

"*Hold it,*" I interrupted. "Who says you are going to get 10 decibels gain from a 2 element Quad?"

Pendergast rummaged through the leaflets on the floor and handed one to me.

"Here it is. Read it for yourself," he replied.

I took the brochure and looked at the glowing description of the Quad antenna. Sure enough, in small print at the bottom of the page was the remark, "10 decibels gain!"

"See," said my friend as he took the leaflet back and slipped it in his pocket.

"Congratulations," I replied. "It looks to me as if Hardcore has "psyched" you out and you are easy prey for the obvious flimflammery of this advertisement. Remember, a lot of antenna claims are developed in the advertising department, rather than the engineering laboratory. All you have to do to verify this fact is to read the antenna advertisements in the CB magazines. This advertisement is a shrinking violet compared to some of them that I've seen."

Pendergast's glum look brightened a bit as I continued, "It's possible to apply a yard-

Mako entertains the repeater.

THIS month W6SAI introduces the readers of *CQ* to the jolly antics of *Mako*, the Japanese YL radio amateur, as seen through the eyes of JA3QVM, the popular cartoonist of *CQ-Ham Radio*, the Japanese amateur publication. Mako, her cat, bird and pet mouse will show amateurs in W-land some features of amateur radio in Japan. 88 to Mako!

Mako and her friends.

*48 Campbell Lane, Menlo Park, CA 94025.

stick of measurement to any antenna, for all antennas operate by the same rules of nature. Antenna gain is achieved in one direction at the expense of radiation in other directions and the theory of operation of beam antennas is well known. If you want a good book on the whole subject, I recommend the *Antenna Engineering Handbook*, by Henry Jasik, published by McGraw-Hill Book Company."

"Is it better than your *Beam Antenna Handbook?"*, asked Pendergast, slyly.

"They are different types of books," I replied stiffly. "In any event, my rule-of-thumb is that the gain of any antenna is proportional to the size of the antenna, proportional to the price, and the difficulty encountered in putting it up. In other words, big antennas have big gain; little antennas have little gain.

"In addition, just because a particular antenna type has a good theoretical gain figure, it is often risky to assume that a particular version of the antenna made by a specific manufacturer or by the amateur himself exhibits all of the possible gain. I remember, a few years ago, there was a VHF antenna measuring contest in California at which some of the manufactured VHF antennas exhibited a negative gain—they had more gain off the back of the array than off the front.

"In other words, designing and mass producing a good, efficient beam antenna to be assembled by an appliance operator—present company excepted— is no easy task."

Pendergast reddened slightly but said nothing. So I continued, "The larger antenna manufacturers have extensive antenna ranges and run exacting tests on their products. Even then, they are under constant competition and pressure from garage-shop operators whose advertising scruples and engineering knowledge are more elastic and who are not adverse to exaggerate the virtues of their product. This makes it tough for everybody; the reputable manufacturer is at a disadvantage because of his costs of test and development and because his true gain figures look poor when compared with the inflated gain figures of some of his competitors. And the poor ham is completely confused as to the actual performance of either manufacturer's products."

After a moment, Pendergast said, "All well and good. But how does the poor old trusting amateur determine the excellence of an antenna? How do you establish true antenna gain? Why is Hardcore beating me out on the DX? What do I do now?" The questions tumbled out as Pendergast got up and paced back and forth in front of the operating desk.

"Well, some time ago I formulated some rules that apply to this problem. They are quite non-scientific, more of a result of experience, and a miscellaneous collection of tests and opinions. They have worked for me and I use them all the time as ground rules."

"Tell me, tell me," said Pendergast. "Maybe I can shoot Hardcore down after all."

The Seven Ground Rules of Antenna Performance

"Here's the story," I said. "The yardstick of performance for any meaningful discussion of antenna gain is the *isotropic antenna.* In theory, all antennas are compared against this antenna (fig. 1). In order to get the idea of the isotropic radiator, imagine an antenna to be placed at the center of a large, hollow sphere. Better still, imagine a light bulb at the center of the sphere. If the light is distributed uniformly over the interior surface of the sphere, the source is said to be isotropic. An antenna, then, that distributes radio energy uniformly over the entire inner surface, by definition, is an isotropic antenna. Any antenna which causes a greater concentration of radiated energy in one portion of the sphere, robs radiation from another part of the sphere. Such an antenna, for a given power level, is said to exhibit power gain over the isotropic antenna. The isotropic radiator, therefore, is used as a basis of comparison for any antenna placed inside this sphere of reference."

"What is an isotropic radiator?," asked Pendergast. "I've never seen one."

"They are hard to find," I admitted." Practical antennas exhibit patterns which do not entirely illuminate such a sphere. An approximation of an isotropic radiator might be a very short section of a dipole, say one-hundredth wavelength long, with uniform current along its length.

"Power gain is defined as the ratio of the maximum antenna intensity in a given direction to the maximum intensity in the same direction produced by a reference antenna with the same power input. If the isotropic antenna is taken as the reference level, a half-wave dipole has a power gain of 2.1 decibels over the reference. This is true since

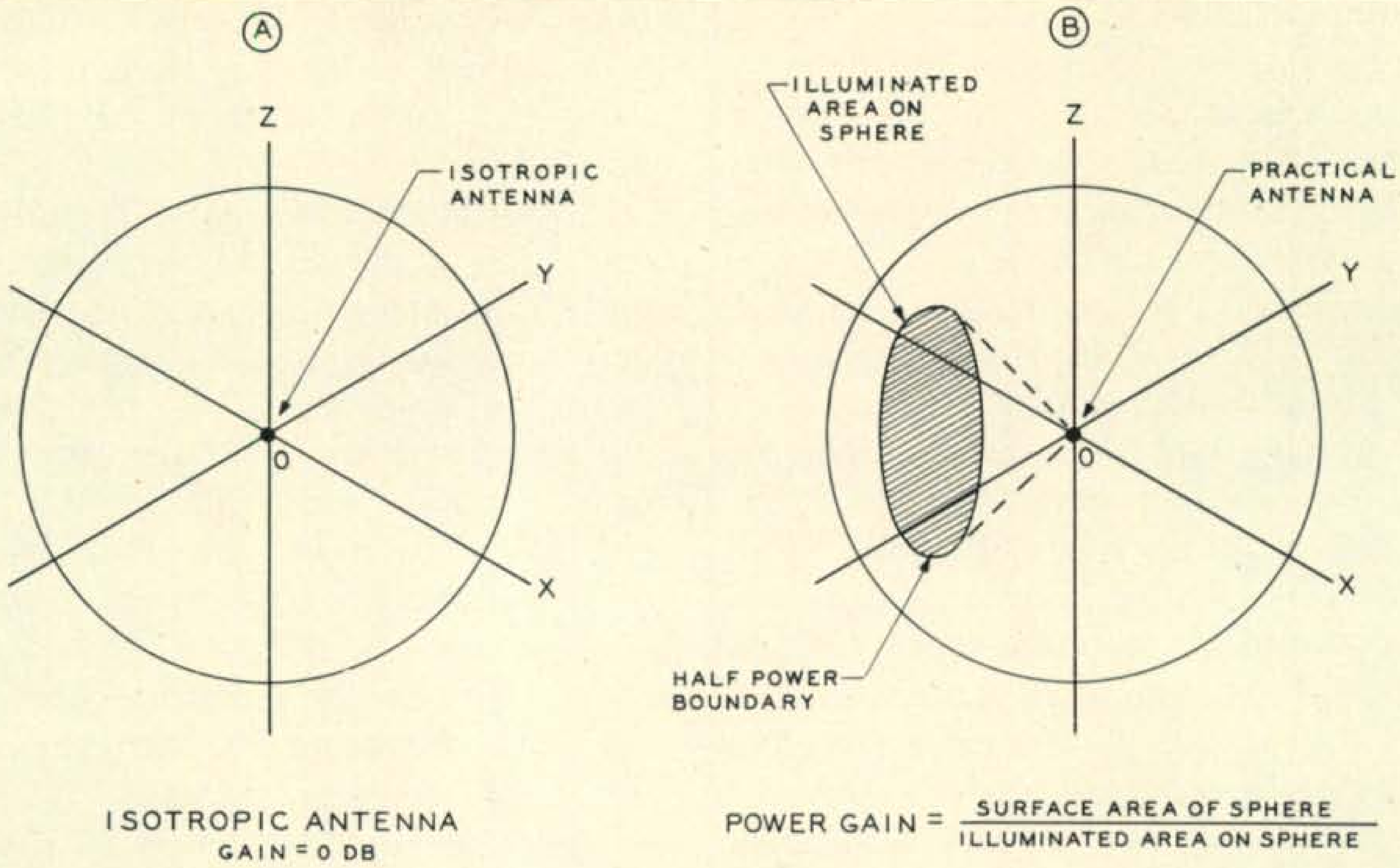


Fig. 1—The isotropic antenna is a point source which uniformly illuminates the interior surface of a sphere. An antenna which concentrates radiation into a certain area of the sphere's surface, and which produces greater intensity than that produced by an isotropic radiator fed with equal power, is said to exhibit power gain. Thus, power gain is inversely proportional to the fraction of total interior surface area which receives the concentrated radiation. Practical antennas illuminate the sphere unequally and all of them exhibit power gain over an isotropic radiator. The area of illumination is not sharply defined in real-life antennas, as shown here, but gradually falls away from the center of the area. By definition, the boundary of the area is determinde by the line at which the radiation intensity has fallen by half (3 decibels). This boundary is called the half-power point.

a dipole has a definite radiation pattern—the familiar figure-8 pattern—and does not fully illuminate the reference sphere. The ground plane antenna is in the same category, providing a power gain of about 0.3 decibel over the isotropic reference.

"In addition, the power gain provided by a single parasitic element, when placed near a dipole, is known. The power gain of a single Quad loop has been measured, and the power gain provided by adding additional parasitic elements is known. It is possible to sum up all of this in seven ground rules, and I hereby present you with these rules, free, gratis and at no charge." I handed Pendergast a small card.

Pendergast slowly read the "ground rules", which were as follows:

Rule #1—The fundamental comparison antenna is the isotropic radiator and its gain is unity (zero db).

Rule #2—The gain of a half-wave dipole is 2.1 decibels over isotropic.

Rule #3—The gain of a single Quad loop driven element is 4.1 decibels over isotropic.

Rule #4—The gain of antenna array which has a single parasitic reflector or director element is 5 decibels over the gain of the driven element itself.

Rule #5—Additional parasitic directors provide additional gain in a decreasing manner. One additional director element (over the first director) provides 2 decibels additional gain. Each additional director thereafter adds about 1 db additional gain.

Rule #6—When both parasitic reflector and director(s) are used in an array, the reflector gain figure is reduced to about 3 decibels.

Rule #7—Antenna gain measured in the vertical plane cannot be counted again in the horizontal plane, and vice versa.

"Where in the world did you dream up these rules?," asked Pendergast.

"They were codified by W2LX and myself. Nothing formal about them, but they seem to summarize the situation pretty well. Let's try an example. The 3 element Yagi is made up of a dipole, a reflector element and a director element. Making a compari-

The most popular three band beam in the world!

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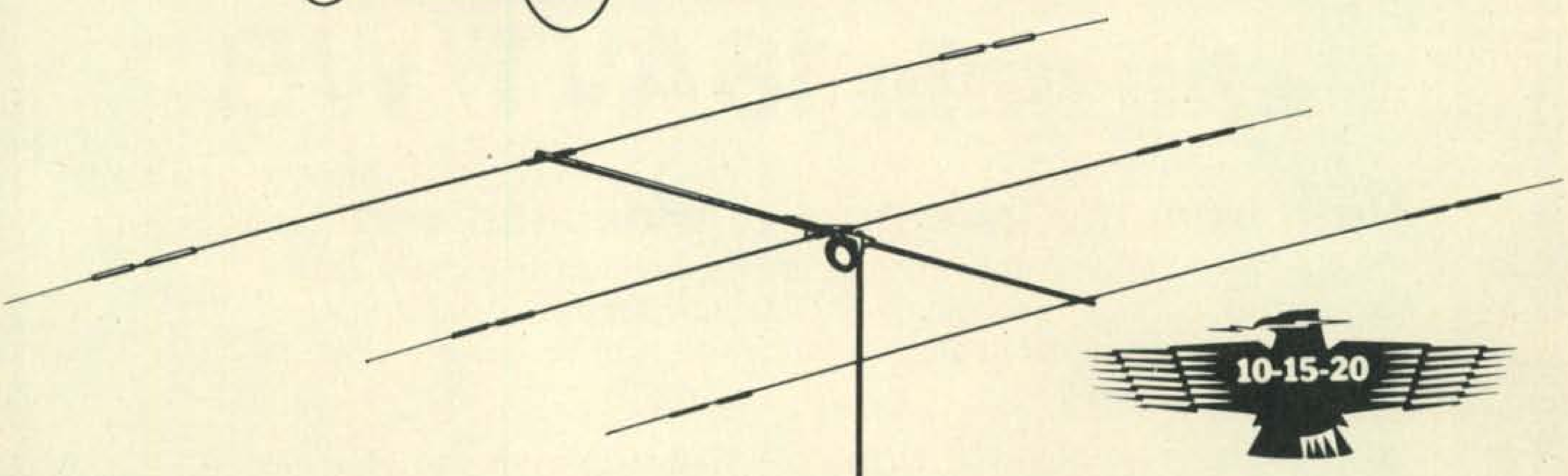

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Other tri-band beams to choose from:

- 6-element Super Thunderbird TH6DXX — **Model 389 $199.95**
- 3-element Thunderbird Jr. TH3JR — **Model 221 $119.95**
- 2-element Thunderbird TH2Mk3 — **Model 390 $109.95**

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son against an isotropic radiator, then; the dipole gain is 2.1 db (by rule #1), the director gain is 5.0 db (by rule #4) and the reflector gain is 3.0 db (by rules #4 and #6). Total gain is thus the sum of these figures, or 10.1 db, compared to an isotropic radiator. For comparison against a dipole, 2.1 db is subtracted for a gain figure of 8.0 db. That sounds just about right."

"Very fine," said Pendergast. "Now, how about a two element Quad?"

"OK," I said, "Here we go. The Quad loop element gain is 4.1 decibels (by rule #3) and the director gain is 5.0 decibels (by rule #4). Total gain over isotropic for a 2 element Quad is thus 9.1 decibels. Gain of the 2 element Quad over a dipole is 2.1 decibels less than this, or 7.0 decibels."

"In other words, you are telling me that a 2 element Quad has about one decibel less gain than a 3 element Yagi?," asked Pendergast.

"Approximately," I said. "You can check these figures against those published by Dr. Lindsay, WØHTH, in the May, 1968 issue of *QST*. He measured a 2 element Quad and a 3 element Yagi on an antenna range at 440 mHz and concluded that the gain of the Quad was 8.2 decibels over isotropic. My figures indicate a gain of 9.1 decibels. Lindsay measured the 3 element Yagi at 8.8 decibels over isotropic. My figures indicate a gain of 10.1 decibels. I indicate a difference of gain of about 1 decibel between the two arrays; Lindsay measures it as closer to 2 decibels."

"Well, what the Hell," said Pendergast. "I won't fight a duel over one decibel. How do you two fellows compare on a larger array, such as a 4 element Quad?"

"Let's see," I replied. "According to the ground rules, the 4 element Quad has a loop element gain of 4.1 decibel (rule #3), a reflector gain of 3.0 db (rules #4 and #6), a first director gain of 5.0 db (rule #4) and a second director gain of 2.0 decibel (rule #5) for a grand total gain of 14.1 decibels over isotropic".

"And WØHTH says?," asked Pendergast.

"Lindsay shows a power gain of 11.5 decibels over isotropic for his 4 element, 445 mHz Quad model."

"Aha!" cried Pendergast. "You two jokers are in disagreement by more than 2 decibels! The question is, which one of you is right?"

"You'll accept a discrepancy of one decibel, but not two?," I asked.

Pendergast hesitated, as I reached for my bound volume of *QST*. "Listen to this. Dr. Lindsay says (quote) In conclusion, it might be stated that one type of antenna is not necessarily better than the other (unquote). What do you think of that?"

Pendergast was so excited he jumped up out of his chair and shouted, "You're not helping me solve my problem at all!"

"Sorry about that," I replied. "Let's look a little farther into the subject. Here's a very interesting article by Bob Fitz, W4RBZ, in the October, 1966 issue of *QST*. Bob had a 4 element Quad and a 4 element Yagi mounted on two separate 80 foot poles and he ran comparison tests between the antennas over a long period of time."

"Well, what were his conclusions?," asked Pendergast, settling back in his chair.

"Very informative," I said. "In the article, Bob states (quote) In general, there was practically no difference in signal strengths on the short-haul contacts, and there was seldom any difference on medium-haul contacts . . . however, on the very long-haul contacts to the Far East, Asia and the South Pacific, the Quad had a fairly consistent 2 to 3 decibel edge (unquote). Bob summarizes results in a table which shows 100 test contacts. Of the 100 reports, 38 reported no difference between the antennas, 17 reported the Yagi stronger and 45 reported the Quad stronger."

"That proves it," said Pendergast. "The Quad is a better performer than the Yagi."

"Before you rip your antenna down, there's another comparison that you should be aware of. John Parrott, W4FRU, compared a four element, commercial triband Yagi, with a boom length of 24 feet and a 2 element Quad. Tests were conducted on 20 meters. John came to the conclusion that a good 2 element Quad was equal to, or better, than the 4 element triband Yagi. He also came to the conclusion that a wide spaced Quad was better than a close spaced Quad, according to the reports he received. He wrote this up in *QST*."

"It still sounds to me as if the Quad is a better antenna than the Yagi," said Pendergast.

"That's what makes a horserace," I replied. "Strong evidence exists that, element for element, the Quad does exhibit a bit more gain than the Yagi. Against that, the Quad is harder to build, more unwieldly, has more

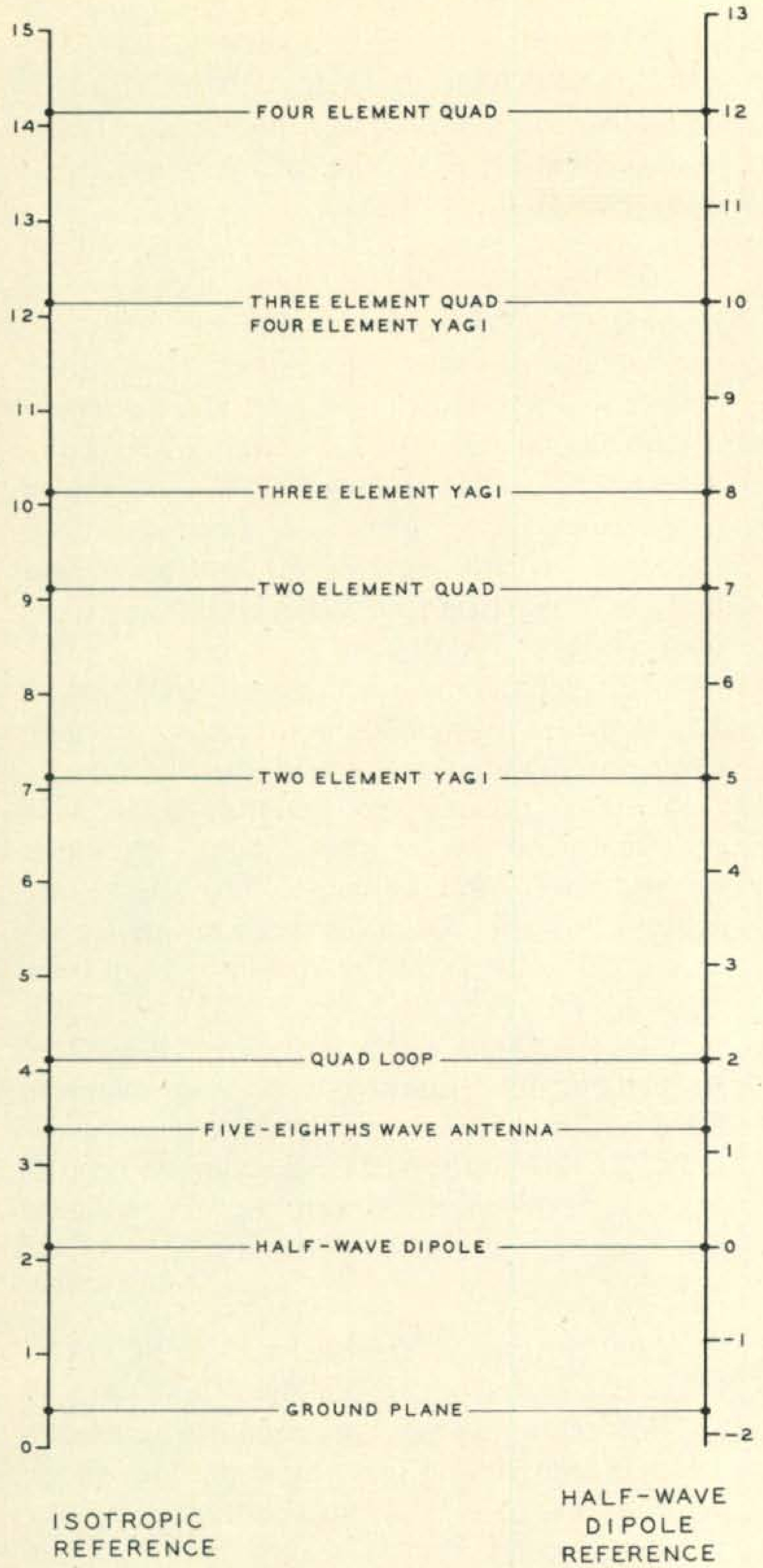


Fig. 2—The Gain Ladder shows relative power gain (in decibels) of popular antennas expressed against isotropic and dipole references. Left-hand vertical rail indicates antenna gain compared against the isotropic and the right-hand rail indicates gain compared against a half-wave dipole. (Drawing copyright, Radio Publications, Inc).

wind resistance and may be more expensive to construct and maintain."

"According to your ground rules, it should be possible to estimate the gain of almost any antenna," said Pendergast.

"That's right. In fact, I generated a so-called gain ladder (fig. 2). The left hand rail indicates antenna gain compared against an isotropic radiator and the right hand rial indicates antenna gain compared against a dipole. The antenna at the top of the ladder has the highest gain, with gain decreasing the farther down the ladder a particular antenna is positioned. Foremost in gain, and the occupant of the top of the ladder is the 4 element Quad. It outranks the popular 3 element Quad and 4 element Yagi by about 2 decibels and shows a power gain of 14 decibel over a ground plane! The 2 element Quad beats out the 2 element Yagi and is only about one decibel below the 3 element Yagi.

"While the gain ladder may not be the last word in accuracy, it agrees in general with the ground rules and gives you a quick picture of the relative gain figure of most of the popular amateur antennas. Compare the published gain figures of your pet antenna against this tabulation. According to this ladder, the 2 element Quad has a gain of about 7 decibels over a dipole, and by no stretch of the imagination could it have 10 decibels gain, as your advertising leaflet avers."

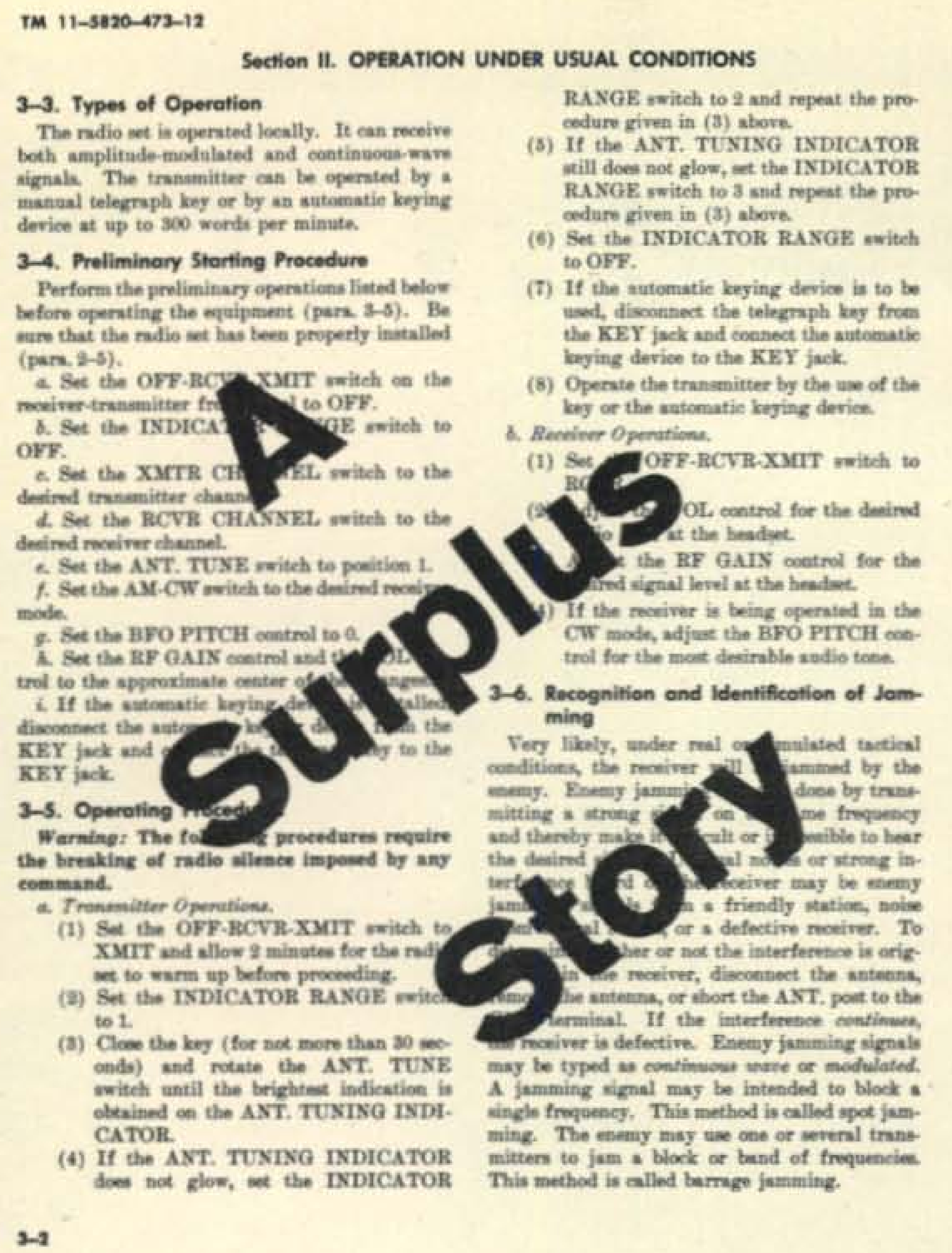
Pendergast pulled the leaflet from his pocket and carefully crumpled it up into a ball and tossed it in the general direction of the wastebasket.

"OK, I am convinced," he laughed. "I won't believe this hot-air artist. And maybe it isn't such a good idea to go from a 3 element Yagi to a 2 element Quad. Perhaps Hardcore was merely lucky when he beat me out in the pile-up. The only answer to my problem, as I see it, is to take down my 3 element Yagi and put up a four element Quad! How does that strike you?"

"A great idea," I admitted. The gain ladder shows that you will pick up 4 decibels power gain. Don't forget, you'll get that gain on both receiving, as well as transmitting. It sounds like a worthy project."

"Are you planning to write this up in your antenna column?," asked Pendergast.

"Why not?," I replied. "Perhaps WØHTH, W4FRU or W4RBZ have more to say on the subject. If I hear any more, you'll be the first to know." ■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Section II. OPERATION UNDER USUAL CONDITIONS

3-3. Types of Operation

The radio set is operated locally. It can receive both amplitude-modulated and continuous-wave signals. The transmitter can be operated by a manual telegraph key or by an automatic keying device at up to 300 words per minute.

3-4. Preliminary Starting Procedure

Perform the preliminary operations listed below before operating the equipment (para. 3-5). Be sure that the radio set has been properly installed (para. 2-5).

a. Set the OFF-RC XMIT switch on the receiver-transmitter fr to OFF.

b. Set the INDICA GE switch to OFF.

c. Set the XMTR CH EL switch to the desired transmitter chann

d. Set the RCVR CHANNEL switch to the desired receiver channel.

e. Set the ANT. TUNE switch to position 1.

f. Set the AM-CW switch to the desired recei mode.

g. Set the BFO PITCH control to 0.

h. Set the RF GAIN control and t trol to the approximate center of

i. If the automatic keying de lled disconnect the auto the KEY jack and y to the KEY jack.

3-5. Operating

Warning: The fo procedures require the breaking of radio silence imposed by any command.

a. Transmitter Operations.

(1) Set the OFF-RCVR-XMIT switch to XMIT and allow 2 minutes for the radi set to warm up before proceeding.
(2) Set the INDICATOR RANGE switc to 1.
(3) Close the key (for not more than 30 seconds) and rotate the ANT. TUNE switch until the brightest indication is obtained on the ANT. TUNING INDICATOR.
(4) If the ANT. TUNING INDICATOR does not glow, set the INDICATOR RANGE switch to 2 and repeat the procedure given in (3) above.
(5) If the ANT. TUNING INDICATOR still does not glow, set the INDICATOR RANGE switch to 3 and repeat the procedure given in (3) above.
(6) Set the INDICATOR RANGE switch to OFF.
(7) If the automatic keying device is to be used, disconnect the telegraph key from the KEY jack and connect the automatic keying device to the KEY jack.
(8) Operate the transmitter by the use of the key or the automatic keying device.

b. Receiver Operations.

(1) Set OFF-RCVR-XMIT switch to RC
(2) OL control for the desired at the headset.
the RF GAIN control for the red signal level at the headset.
) If the receiver is being operated in the CW mode, adjust the BFO PITCH control for the most desirable audio tone.

3-6. Recognition and Identification of Jamming

Very likely, under real or mulated tactical conditions, the receiver ammed by the enemy. Enemy jamm done by transmitting a strong on me frequency and thereby make it ult or ssible to hear the desired al no or strong interf eceiver may be enemy jam a friendly station, noise or a defective receiver. To her or not the interference is originating in the receiver, disconnect the antenna, the antenna, or short the ANT. post to the terminal. If the interference *continues*, receiver is defective. Enemy jamming signals may be typed as *continuous wave* or *modulated*. A jamming signal may be intended to block a single frequency. This method is called spot jamming. The enemy may use one or several transmitters to jam a block or band of frequencies. This method is called barrage jamming.

3-2

A Surplus Story

BY GERALD SAMKOFSKY,*
K4RHU (Ex-W2YSF)

As the Vietnam War ended, many were the thoughts of a gigantic stockpile of electonic "goodies" which might soon fill the market place. Actually, little of this will be released to the public. Rather it is being shifted to other military installations.

In the early 50's, I was working as a purchasing agent for the C Electronics Co. (Concord Radio). I can still recall the trailers loaded with ARC 5's, ARC 3's, bulky radar and LORAN units and the impressive BC-610's . . . yes those were the happy days of "Government Surplus." And I was there on Radio Row!

At times I would ponder just what surplus came out of World War One.... at that time I never knew I was to see what might be termed "The World's First War Surplus Electronics."

It all came about as a result of our ads in the various radio magazines asking for even more surplus than we could obtain from normal channels. One day an elderly gentlemen came to my office and announced he had a quantity of electronic material to sell. He suggested having many transmitters, a complete communications truck, etc. He wanted to dispose of all items quickly, he said, as he was about to take a world wide sailing trip on his yacht.

If I had been hesitant in accepting his offer to take me to see these electronic goodies, his beautiful, blond daughter was enough reason to suggest we meet in a few days for this purpose.

July 3rd, 1954 was a steaming, hot day in New York City. My trip was to be to Asbury Park, New Jersey (an ocean resort city) and again, if only to escape the city heat, I was well content to make this 50 mile trip.

Three hours later and well baked in our car (thousands of other motorists were also escaping from city heat) we arrived at our destination. Our jovial host and his beautiful daughter had us in good spirits soon with plenty of cooling drinks and the promise of enjoyable company.

My host suggested we visit the warehouse where the transmitters were stored. A trip across town and we were face to face with numerous racks of early under-water tracking units... impressive to see, useless as saleable surplus.

ıdismayed at my lack of interest in these units, my host knew I would be "delighted" to see the communication truck. Again a trip across town to a parking lot filled with various vehicles which had seen better days. Where was that communication truck? Nowhere did I see the familiar olive drab, nor even navy blue! Where was the vehicle which was to fill me with delight? But wait... what was that strange-looking object hidden in a corner behind several Packards, a Pierce Arrow and a La Salle.... were my eyes fooling me... or was this in fact a communications truck! But if so... from what war! The truck was probably the first one made by Henry Ford. The roof of this venerable vehicle sported a pair of "bat wing" leather speakers. Now, awe stricken, I slowly walked up the little stair in back of the truck . . . I opened the door and immediately stepped back 40 odd years into the past!

Here was early equipment to please the most exacting connoisseur of radio antiques! Racks sported 8″ brass encased Western Electric panel meters, equally aged W.E. 203's, 204's, VT1's sat in regal dust behind

[*Continued on page 92*]

*4803 Brenda Drive, Dover Estates, Orlando, Fla. 32806.

Slow Scan TV

BY COPTHORNE MACDONALD,* WØORX

PRODUCT data sheets are the raw informational input for the designer. This is especially true of semiconductors and other high technology components which have many technical parameters. Gathering this information is easy if you happen to work in the engineering department of an electronics company. If you work in another field, and designing is just a hobby, it will take some extra effort.

One of the easiest ways to get a few transistors, complete with data, is from your local TV parts distributor. He probably carries the Motorola "HEP," RCA "SK," or some other line of replacement transistors. He will also have booklets that give *some* data on the devices, but not always everything you want to know.

By writing to the large semiconductor companies you can get "short-form catalogs" that list their standard products with abbreviated data. A second letter should get you any reasonable number of data sheets on individual devices. (See address list.) Semiconductor Specialists is a distributor that concentrates on semiconductors. Their "Stock and Price List" is a valuable companion when sifting the data for low cost, high performance components. (Write to: P.O. Box 66125, O'Hare International Airport, Chicago, Ill. 60666.)

High Gain AC Amplifiers

While op-amps are usually the best device choice for high gain a.f. voltage amplifiers, individual transistors are also satisfactory where the gain doesn't exceed 30 or so. The design procedure starts with the same steps that were used for the Low Gain Amplifier described in the March column. The major difference is that two series-connected resistors are used in the emitter circuit, and one of them is bypassed for a.c. With this arrangement the d.c. gain is kept low to maintain stable bias conditions. The a.c. gain is higher because the negative feedback only acts in the unbypassed resistor. See the design box for the additional steps required.

I might mention that the *entire* emitter resistor can be bypassed in those situations where you want the highest possible a.c. gain. Our simplified equations for input impedance and a.c. gain no longer work under these conditions because all the a.c. feedback outside the transistor has been removed. Gain and input *Z* can be calculated using the complex equations in transistor circuit design textbooks, with the device manufacturer's "h parameter" data. For most small signal transistors the input *Z* will be of the order 1K or 2K ohms, and the gain will typically be between 50 and 200. The distortion can be appreciable under these operating conditions if the input is more than about 50 millivolts p-p.

Some Variations

So far we have dealt only with NPN transistors, for two reasons. First, most hams are accustomed to working with a positive supply voltage. A second reason is that silicon NPN transistors are generally a little less expensive than equivalent PNP units. All of the design techniques work equally well with PNP transistors if the power supply polarity is reversed. PNP transistors also have a place, from time to time, in positive supply circuits. An example is shown in fig. 1. Here two emitter followers are cascaded to provide

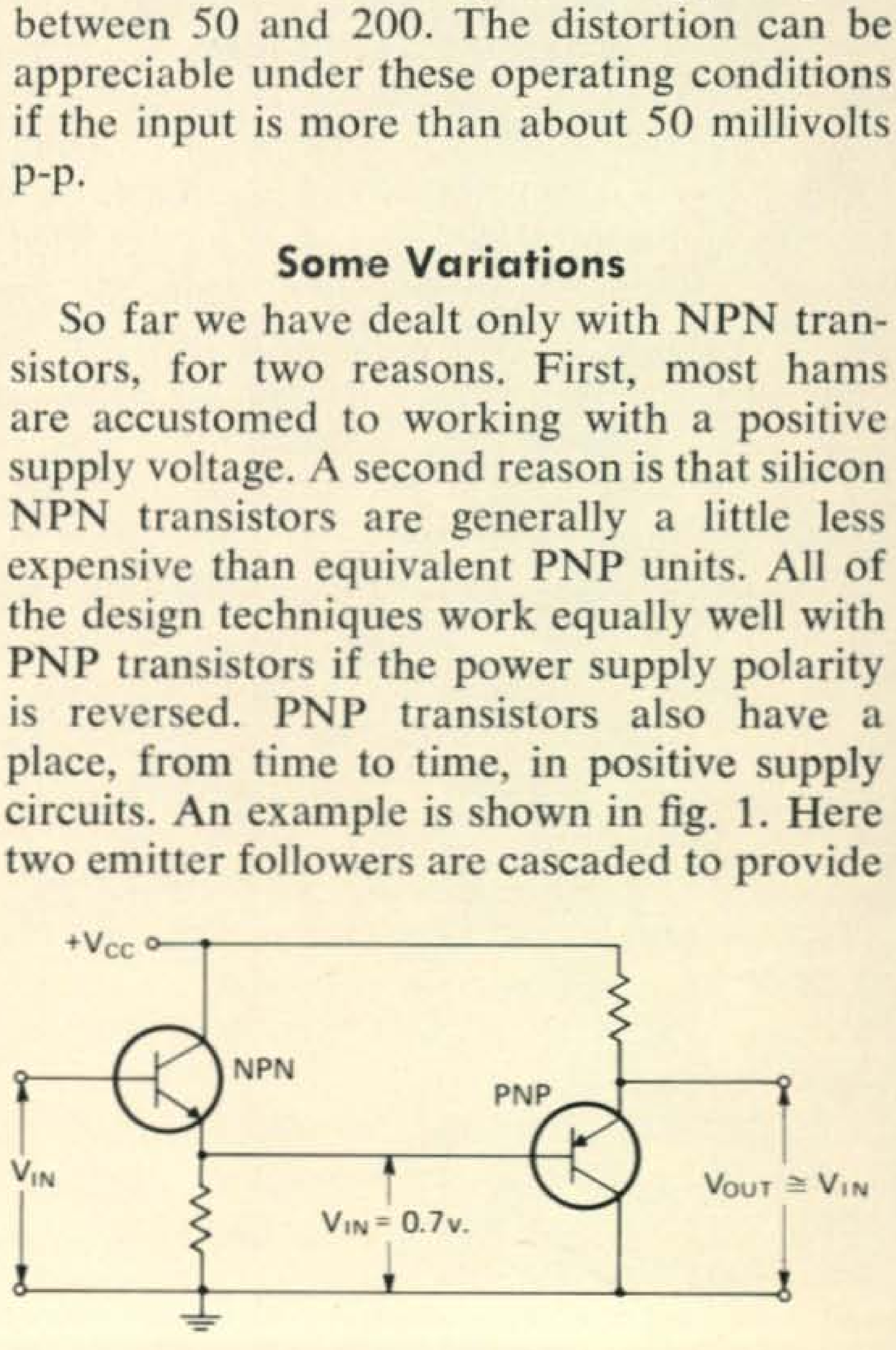


Fig. 1—When NPN and PNP emitter followers are cascaded, the base-emitter voltage drops cancel out.

*P.O. Box 483, Rochester, Minn. 55901.

a high order of impedance transformation. By cascading an NPN and a PNP unit as shown, the 0.7 volt base-emitter voltage drops cancel out, and the output d.c. level will be very close to the input d.c. level. The variation of base-emitter voltage with temperature (about 1.5 millivolts/degree C) also tends to cancel out with this configuration.

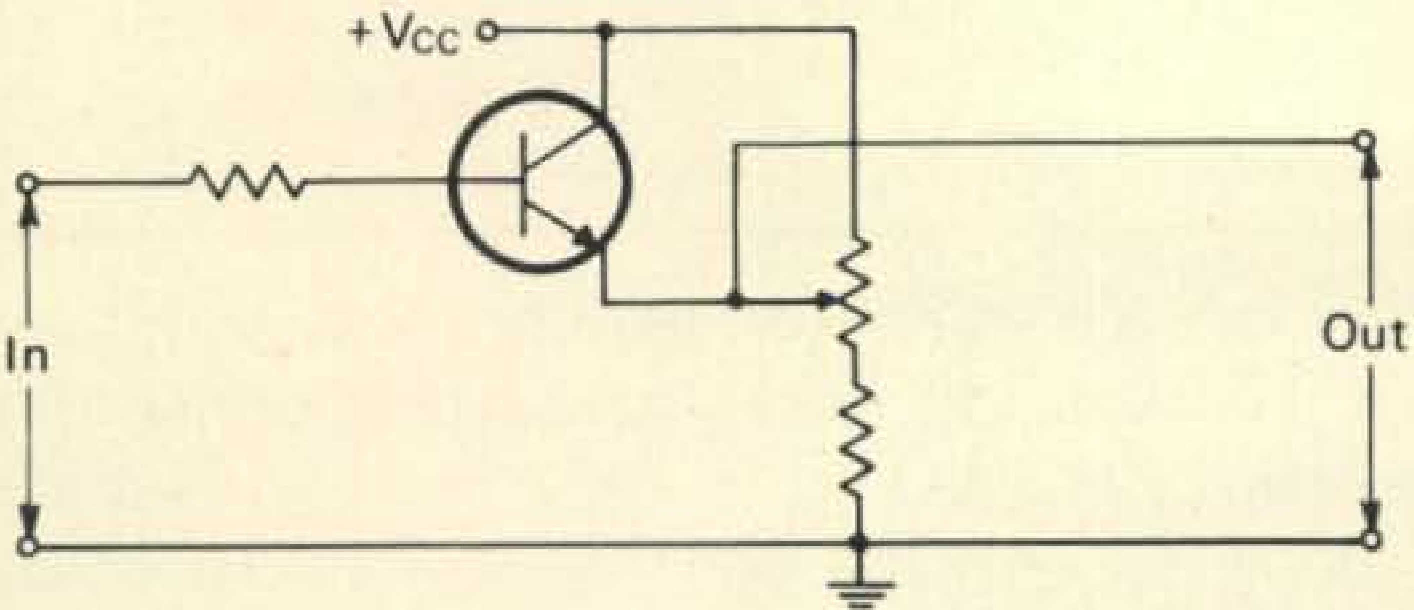


Fig. 2—Emitter follower with adjustable clipping level. The output cannot go above V_{cc} nor below the voltage at the tap on the divider.

Another useful circuit appears in fig. 2. Here an emitter follower is connected to a positive point on a voltage divider, rather than a resistor going to ground. The emitter follower does its buffer amplifier thing over most of the input voltage range, but clips voltage excursions below a certain threshold. The output can never drop below the voltage at the tap on the divider, even if the base voltage goes more negative. Positive excursions may also be clipped. The emitter voltage cannot rise above the collector voltage. (The resistor in the base lead limits the base current when input excursions go more positive than V_{cc}. It has negligible effect at other times.) This type of circuit is very useful for clipping black and white video excursions before feeding the video to a subcarrier modulator.

Transistors As Switches

In the transistor circuit of fig. 3, what will the collector voltage be if point A is grounded? What will it be if point A is first connected to $+V_{CC}$? In the first case, the base voltage will be zero, and since no base current flows, the collector current will be cut off. With no collector current flowing, the collector voltage will be +12 volts. What if point A is connected to +12 volts? The base current will be $\frac{(12—0.7)}{22K}$ or about 0.5 milliamps. Multiplying this base current times the transistor h_{FE} of 400 gives a calculated collector current of 200 ma. "But wait, even if the collector came all the way down to ground potential, I_C could nôt exceed 12 milliamps." Right you are. The collector current is limited by the 1K collector load resistor to a maximum of 12 ma at which current the transistor "saturates." In designing circuits of this type the usual procedure is to pick a value of collector resistance or saturated collector current, and then calculate the minimum value of base current required by dividing I_C at saturation by the minimum beta. It is then customary to select an actual I_B of 5 to 10 times this value as a safety factor in assuring a "solid" switching action. Making $I_B = \frac{1}{10} I_C$ is a good rule of thumb which will allow the use of transistors with betas as low as 50. The actual collector voltage is not really zero volts. It depends upon the transistor type and the I_B/I_C ratio, but is typically within a few millivolts of zero at I_C levels of a few milliamps.

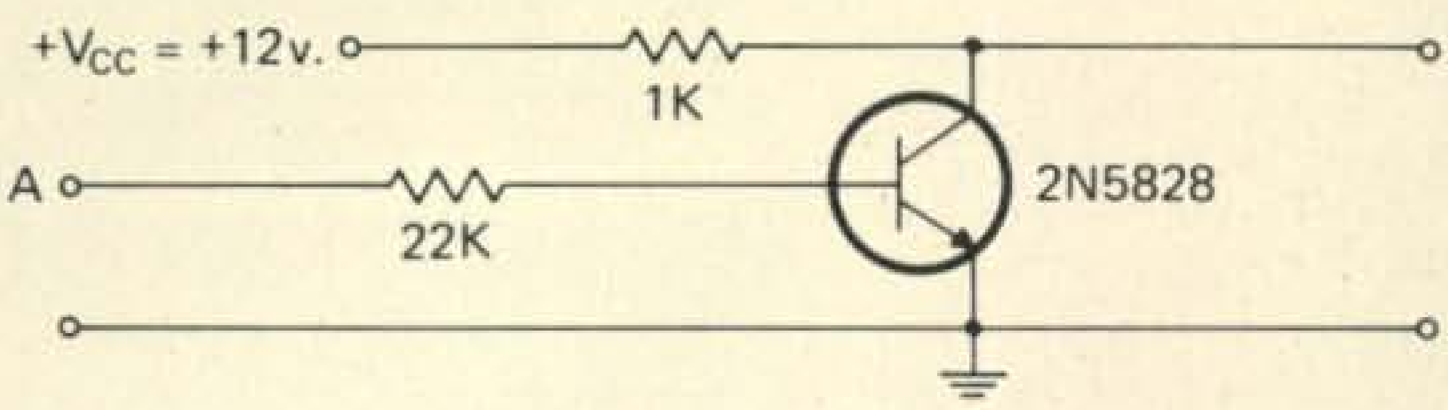


Fig. 3—A transistor switch.

Sawtooth Waveform Generation

With the wide variety of digital integrated circuits on the market today, no one is going to design any *extensive* switching or logic circuitry with discrete transistors. There are certain places in slow-scan circuitry, how-

Major Semiconductor Manufacturers

Fairchild Semiconductor Group, 464 Ellis St., Mountain View, CA 94040

General Electric Co., Semiconductor Products Dept., Electronics Park, Syracuse, NY 13201

Motorola Technical Information Center, 5005 East McDowell Rd., Phoenix, AZ 85008

National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, CA 95051

RCA Solid-State, Box 3200, Somerville, NJ 08876

Signetics, 811 East Arques Ave., Sunnyvale, CA 94086

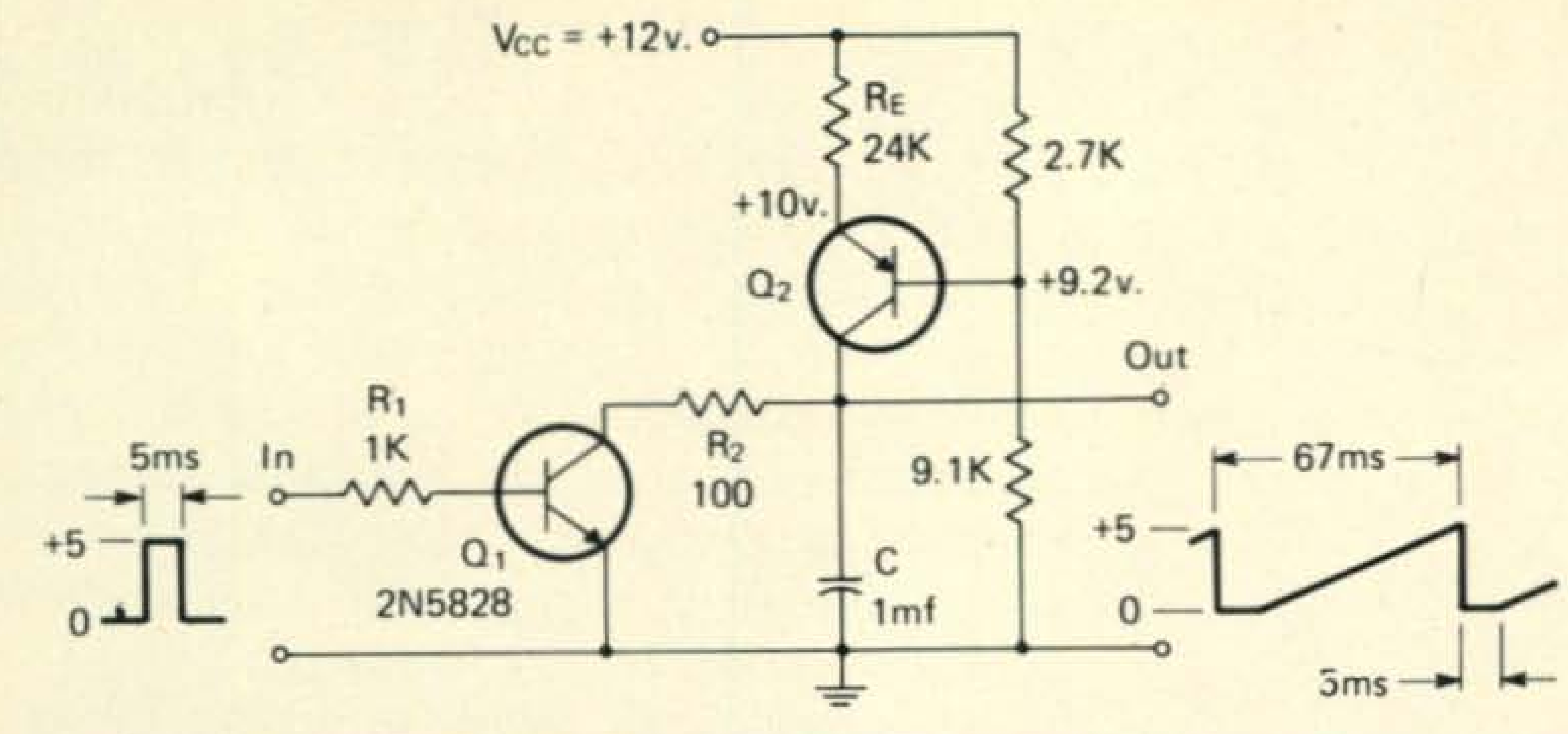
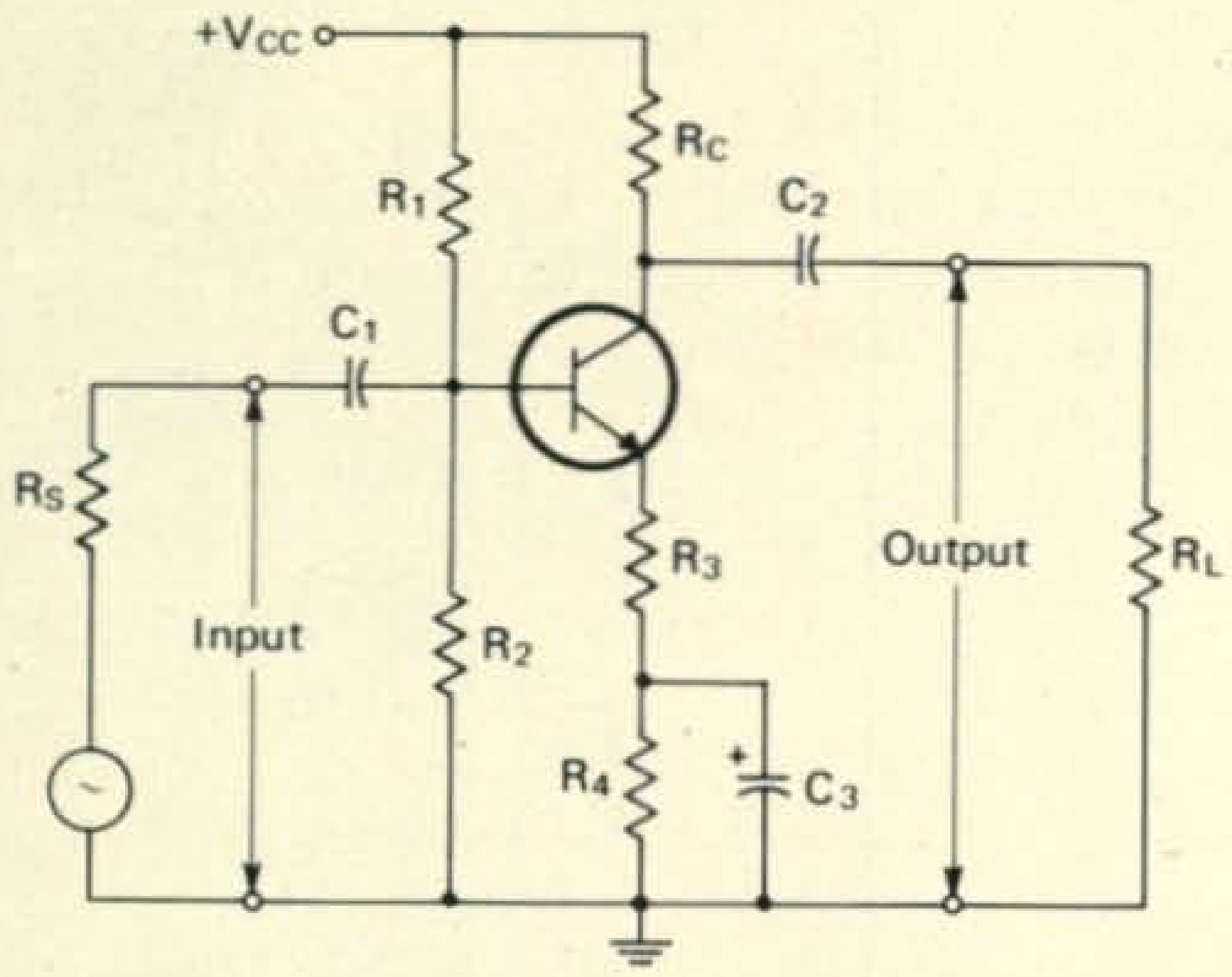


Fig. 4—Sawtooth waveform generator using Q_1 as a capacitor discharge switch, and Q_2 as a constant current capacitor charging source.

High Gain A.C.-Coupled Amplifier Design



1. Using the low gain voltage amplifier design procedures given in the March '74 column, design an amplifier with a d.c. gain of 2 or 3.
2. Select the desired a.c. (A_{AC}) in the range from the d.c. gain value up to about 30.
3. Find the total a.c. collector load, R_{AC}:

$$R_{AC} = \frac{R_C \times R_L}{R_C + R_L}$$

4. Calculate R_3: $R_3 = \frac{R_{AC}}{A_{AC}}$
5. Calculate R_4: $R_4 = R_E - R_3$ (Where R_E is the R_E value in low gain amplifier design of step 1 above.)
6. The a.c. input impedance of the stage is equal to R_1 in parallel with R_2 in parallel with ($h_{FE} \times R_3$)
7. For good low frequency response select C_1, C_2, and C_3 so that the reactance of each at the *lowest desired frequency* is appreciably lower than the corresponding resistances shown below:
   Make the reactance of C_1 much less than (a.c. input $Z + R_S$)
   Make the reactance of C_2 much less than ($R_C + R_L$)
   Make the reactance of C_3 much less than R_3

ever, where transistor switches are very useful. Discharging sweep generation capacitors is one.

Sweep generation is based on the basic principle that if you feed a constant current into a capacitor, the voltage across that capacitor will increase linearly with time. The basic equation is:

$$V = \frac{IT}{C}$$

Where: V is the *change* in voltage across the capacitor.
I is the current in microamps.
T is the time during which the current flows (in seconds).
C is the capacitance in microfarads.

The equation can of course be rewritten as:

$$C = \frac{IT}{V}, \quad I = \frac{CV}{T}, \quad \text{or} \quad T = \frac{CV}{I}$$

There are several ways to get a constant current. The simplest in many cases is to connect a "charging resistor" to a source of voltage at least 20 times the maximum peak-to-peak sawtooth voltage. Another approach is used in fig. 4. Here a PNP transistor is biassed to produce a constant collector current that is independent of collector voltage over a fairly wide range of voltage.

Let us assume that we would like to generate a voltage sawtooth of 5 volts p-p. The available retrace drive pulse is 5 milliseconds long. The overall active sweep duration is to be 62 milliseconds, and the sweep capacitor is a 1 mf Mylar film capacitor. We want to calculate the charging current:

$$I = \frac{CV}{T} = \frac{1 \times 5}{.062} = 80.6 \text{ microamps}$$

Since the constant current transistor (Q_2) has its base biassed to put 2 volts across the emitter resistor, the value of that resistor

[*Continued on page 92*]

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A Sloping Quad For 80 Meters

BY JOSEPH D. LIGA,* K2INA

WITH the decreasing effectiveness of the 10, 15, and 20 meter bands due to the gradual drop in the sunspot cycle, more and more amateurs are migrating to 80 meters. To many, it is the natural thing to do when the upper bands close down at night. Not only does it provide excellent short and intermediate skip operation, 80 meters is a good DX band as well at this time.

For the newcomer or the old timer returning to 80 meters, the antenna becomes a challenge. Dipoles extended to about 120 feet require considerable room and the problem of "sky hooks" at either end becomes perplexing. Many amateurs have erected Inverted V antennas with excellent results. No doubt, there are more Inverted V antennas being used on 80 meters than all other antennas combined.

My return to 80 meters graduated from the dipole to the Inverted V, with the apex on a tower at 45 feet and just below the 20 meter beam. Results were good and I enjoyed numerous contacts throughout the U.S. with a few Caribbean and South American contacts. However, the European and African DX stations were seldom within grasp. I had to envy the signals put out by W7RM and W2HCW with their rotary beams at 170 ft. and 120 ft. respectively. All too often, I could not even hear the DX stations that they gave Q-5, S-9 signal reports to.

My exposure to the 80 meter quad was through a contact with W9LZX, who used what he called a "lazy" quad, which was draped on bushes and low trees around his campsite. His 45 watts input with the quad a few feet above ground registered 20 db over S-9 on my Collins receiver. A signal level hard to believe, and this contact lasted an entire hour, during which time his signal never dropped below an S-9. After this contact I was determined to put up a quad even if it had to be a "lazy" quad draped on the bushes around the house.

The first quad went up much easier than I anticipated. It was cut for 3.8 mHz using the standard quad formula:

$$\text{Total Length of Quad (feet)} = \frac{1005}{\text{Freq. (mHz)}}$$

For 3.8 mHz, the length rounded out, came to 264 feet, or 66 feet on each leg. For a comparison with a basic antenna, the quad is simply a folded dipole in the form of a square and has similar broad band characteristics. The impedance at the feed point is a function of the height above electrical ground as with any antenna, as shown in the table, for various heights above electrical ground for a horizontal quad.

Impedance In Ohms	Height In Wavelength Above Electrical Gnd.	Height In Feet At 3.8 mHz
300	1.0	259.0
288	.75	194.25
300	.5	129.5
380	.4	103.6
350	.3	77.7
288	.25	64.7
230	.2	51.8
160	.15	38.85
104	.1	29.5
72	.075	19.4
50	.05	12.95

The sloping quad can be fed at the center of any of its 4 legs or at a corner. Best results

*1 Stirrup Lane, Eatontown, N.J. 07724

can be obtained with the point of feed at the highest point of the quad above ground. This places the high current point at the highest level above electrical ground. It can be fed with open wire, twin lead, or coaxial cable. However, with coax feed, a 2:1 or 4:1 balun should be used for the best impedance match.

It must be noted that the impedances listed in the table for various heights above electrical ground, are for a horizontal quad. The impedance for a sloping quad will fall somewhere in between the highest and lowest points of the quad. A standing wave or impedance bridge would serve well for this purpose.

The radiation characteristics for a horizontal quad are similar to those of a folded dipole at the various heights above electrical ground. For the average amateur, heights from .15 to .25 wavelength on 80 meters are common. At these heights, the radiation from a horizontal quad would be mostly straight up, or at approximately 90 degrees from the horizontal. A sloping quad at the same average height will have a radiation pattern tilted somewhat in the direction of downward tilt.

The radiation effects are similar to the sloping dipole used so effectively on 40 and 80 meters. The purpose is to tilt or slope the radiation pattern in the desired direction. The greater the tilt, the lower the radiation angle and consequently, the longer the skip distance. The ideal would be a vertical quad with an extremely low angle of radiation in the two directions bisecting the plane of the quad.

At this QTH, the original installation was a horizontal quad at an average height of 55 feet above ground level. It was fed at one corner with RG-8/U coax and the s.w.r. was over 5:1, indicating an impedance of approximately 260 ohms at the feed point. Although the transmitter (Collins KWS-1) could be effectively loaded into such a high s.w.r. on the 52 ohm coaxial line, I contemplated an open wire line or at least a 4:1 balun using RG-8/U. Numerous contacts at both short and intermediate distances (up to 1500 miles) proved the horizontal quad superior to the Inverted V at 45 feet which had an s.w.r. of 1.2:1. This simply proved the point made in the articles by W2DU in *QST*,[1] that a high s.w.r. with low line loss results in minimal loss of power. The important consideration is the capability of the transmitter to be loaded into the transmission line.

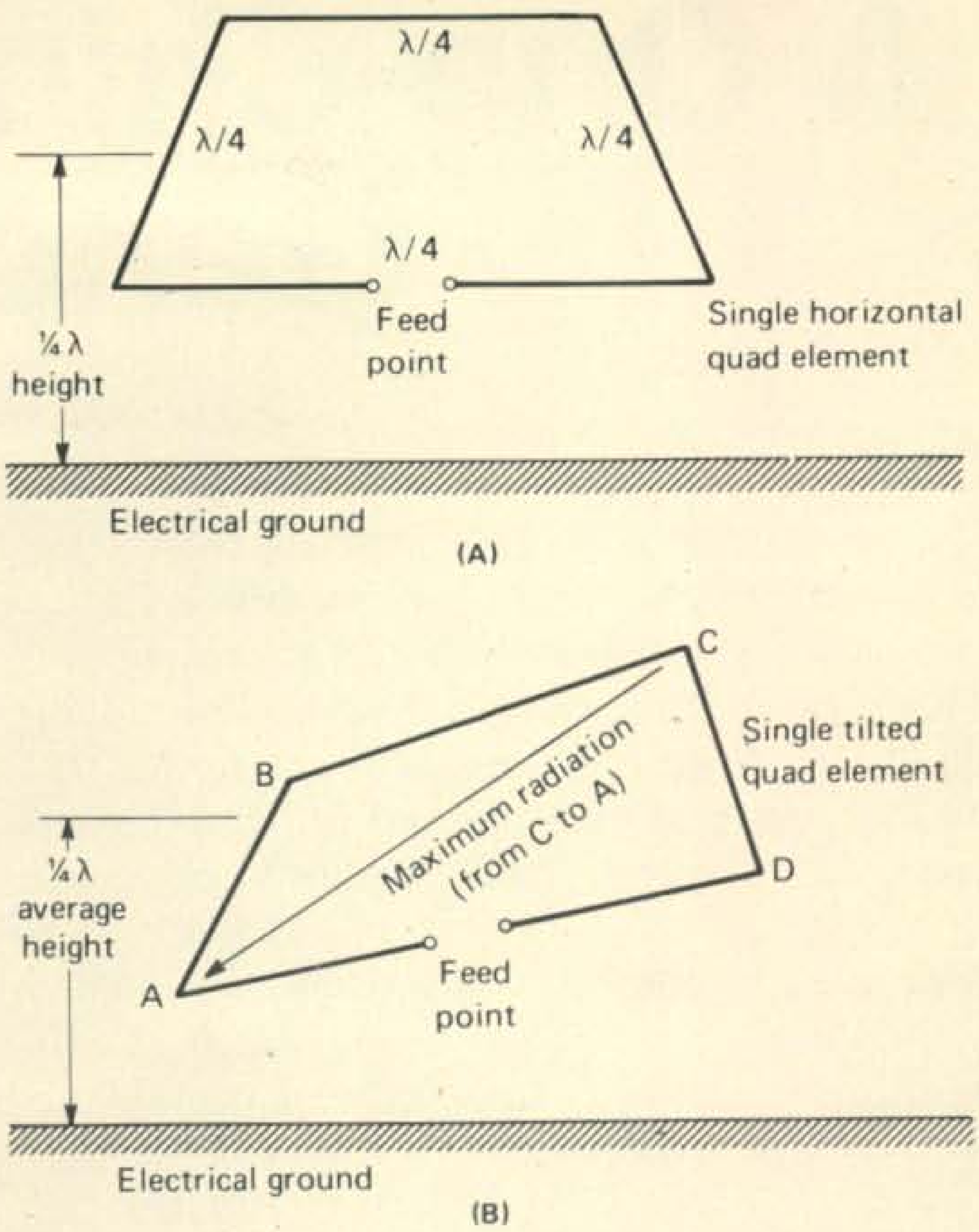

Fig. 1—(A) A single full-wave quad element in the horizontal position at one quarter wave elevation will exhibit a radiation pattern similar to a dipole at the same height. Greatest radiation will be at 90° to the horizontal. (B) By sloping the quad element somewhat in the desired direction of maximum radiation, a substantial lowering of the angle of radiation is achieved, in addition to gaining a significant amount of directivity. In actual situations, the average height of the antenna above ground will often be less than ¼ wave, resulting in unpredictable, though manageable feedpoint impedances.

Being an ardent fanatic for low s.w.r., I began experimenting with the height of the quad to obtain a lower s.w.r. More by accident than design, I found that by lowering the western end of the quad to 25 feet, the s.w.r. dropped to slightly less than 2:1. Referring to fig. 1 (B), corner A is at 25 feet, corners B and D at 45 feet, and corner C at 60 feet.

Using the Inverted V at 45 feet as a control antenna, I checked the signal level with numerous stations and found the sloping quad outperforming the Inverted V by more than an S-unit, especially to the west and southwest. In order to verify this signal enhancement to the west and southwest, I again

[*Continued on page 93*]

[1]Maxwell, M.W., W2DU, "Another Look At Reflections," *QST*, Apr., June, Aug., 1973.

A One-Chip, Two Tone Generator

BY HANK OLSON,* W6GXN

In previously published articles, the author has outlined the use of relatively complex two tone test generators for s.s.b. testing.[1,2,3] These generators used a number of operational amplifier IC's to create ultra pure sine waves and add them together. The results were quite good, and certainly adequate for even the most critical of amateur s.s.b. testing. The interest (as judged by reader response) was more from small s.s.b. manufacturers interested in "proof of performance" tests (at small test equipment cost) than from the individual amateur. Apparently, what is needed for amateur two-tone testing is a *very* simple generator, with reduced purity but which is still adequate to test amateur s.s.b. transmitters. The unit to be described uses only one IC and produces 1000 Hz and 660 Hz with all harmonics and cross products down 40 db or more.

The circuit of the one chip generator is shown in fig. 1. Note that the circuit is built around the Raytheon 4136D quad op. amp. Two of the op. amps are used as simple Wien Bridge audio oscillators—one at 1 kHz and one at 660 Hz. Each of these Wein Bridge audio oscillators uses a pair of ordinary silicon signal diodes as a non-linear stabilization

*1751 Croner Ave., Menlo Park, CA 94025

[1]Olson, H., "Two Tone Test Generator Delivers High Purity Output," *EDN/EEE* March 15, 1972, p. 50.

[2]Olson, H., "S.S.B. Two-Tone Test Oscillator," *Ham Radio,* Apr. '72, p. 11.

[3]Olson, H., "A Two-Tone Test Generator," *73 Magazine,* Jan. '73, p. 53.

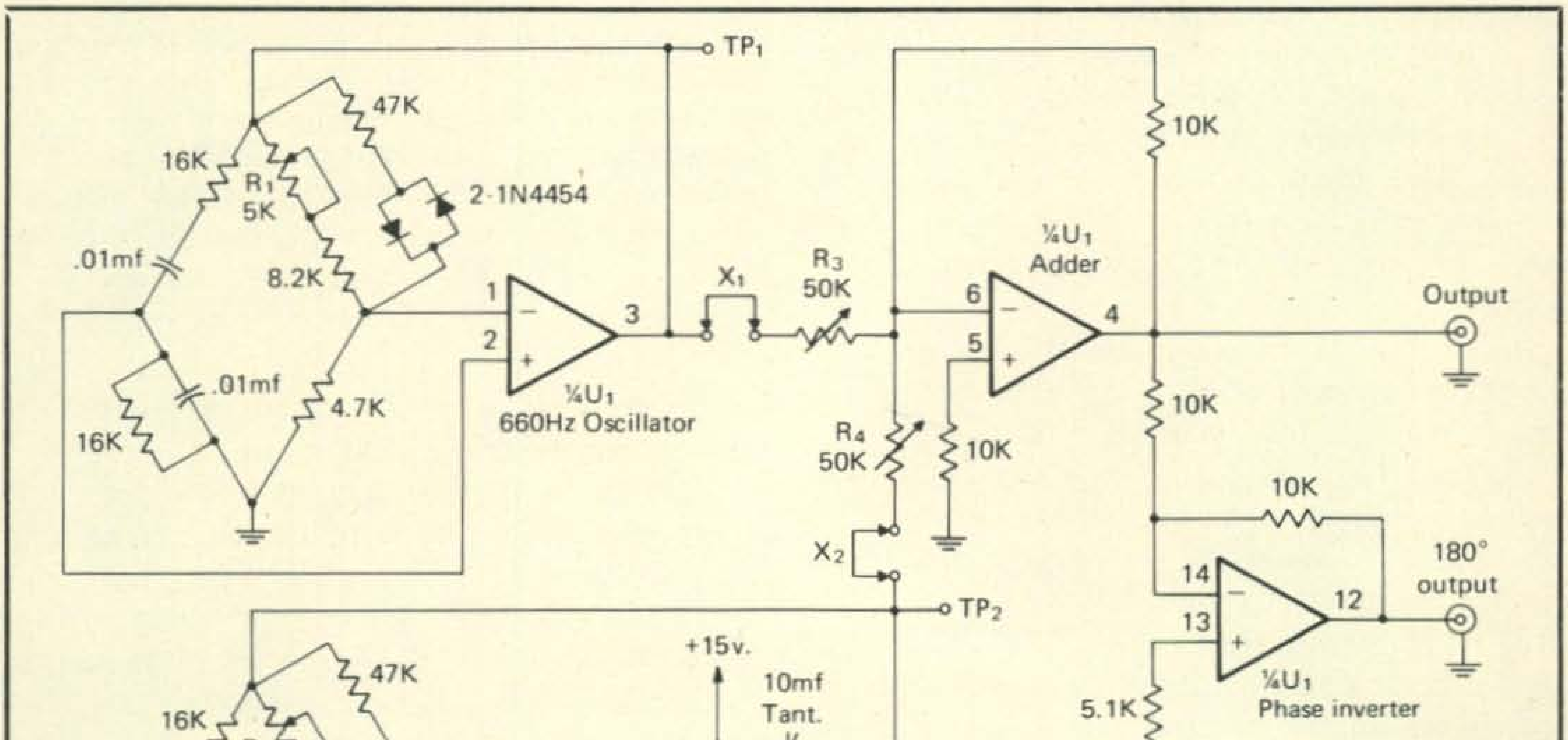

Fig. 1—Circuit of a one chip two-tone generator for s.s.b. testing. IC U_1 is a Raytheon 4136D *quad op amp.*

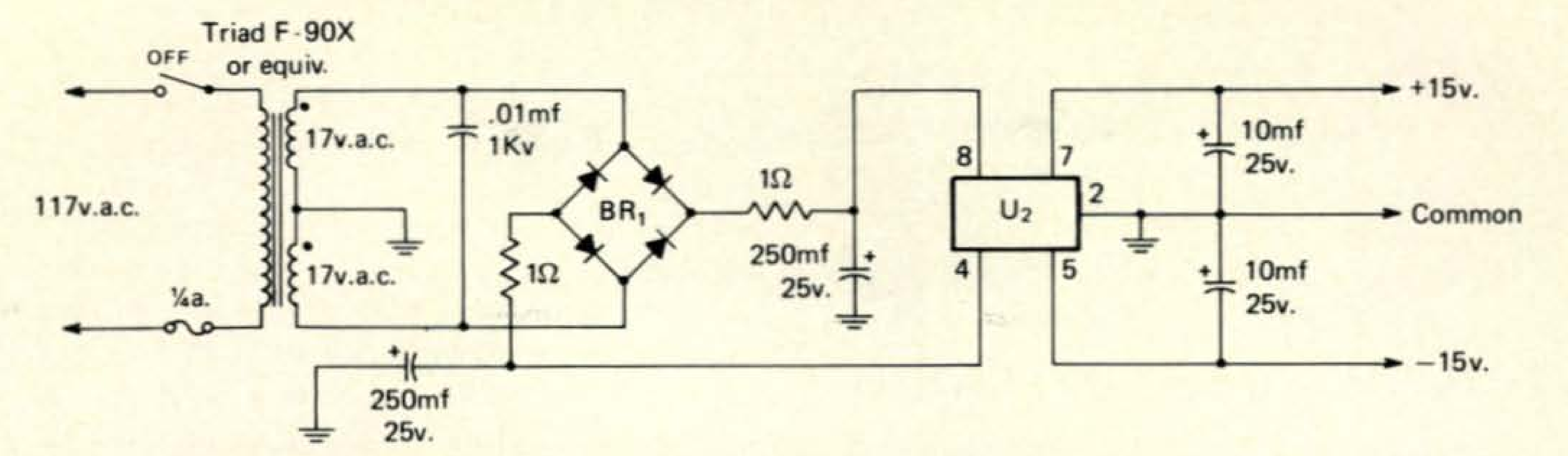

Fig 2—Simple regulated power supply delivering plus or minum 15 volts for the single chip two-tone generator. BR_1 is a Motorola HEP176 or MDA-920-2. U_2 is a Raytheon 4195DN.

element. The use of common diodes as stabilization elements avoids the requirement for special lamps or thermistors for this purpose.

A third section of the quad op. amp. is used to *add* the two sine waves together. This *adding* is often called "mixing" in the audio field, but it produces no crossproducts (because it's a completely linear process). Because "mixing" conotes a modulation process to amateurs and others using r.f., the author prefers to use the word "add" here.

The last op. amp. of the quad is used as a simple inverter with a gain of one. This provides us with a push-pull or balanced output, in case the particular transmitter under test requires a balanced line input.

The two tone test generator was built on a small piece of multi-hole circuit board and mounted in a 4″ × 4″ × 2″ utility box, such as the Bud C1793. The wiring of the circuit board is uncritical, but the two 10 mf tantalum capacitors should be fairly close (2 in.) to the IC pins, so as to effectively bypass them to chassis ground. The three power leads (ground, +15 volts, and —15 volts) exit through a grommet in the rear of the box. Since the two-tone test generator uses less than 10 ma (when driving a high impedance transmitter audio input), it can be operated from a pair of small transistor batteries such as Eveready 411's or Burgess U10's, or, a regulated supply may be used. One is shown using one of the new line of Raytheon multiple linears, the 4195DN, in fig. 2.

To adjust the two-tone generator, the four pots should all be set at mid value. Plus and minus 15 volts should be applied, and TP_1 observed with an oscilloscope using a high impedance probe. The 1 kHz sine observed at TP_1 should be set to 12 volts P-P by means of R_1. Then the 660 Hz sine wave at TP_2 should should be set to 12 volts P-P by means of R_1. Then the 660 Hz sine wave at TP^2 should similarly be set to 12 volts P-P by means of R_2. Next, the 660 Hz input to the adder should be opene dat X_2 and R_3 adjusted to give 12 volts P-P of 1 kHz at either output terminal (to ground). The 660 Hz is then reconnected to the adder and the 1 kHz disconnected by opening X_1. The 660 Hz output is similarly adjusted to 12 volts P-P at either output (to ground). Finally, the 1 kHz is reconnected to the adder. The output should be a signal consisting of 1 kHz and 660 Hz linearly added together, with no clipping at positive or negative extremes. The output of the two tone test generator will drive 1K to ground from either terminal or 2K balanced. ■

QRPp

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG/0

I AM certain that many missed contacts are the result of an operator's ignorance of the extremely important relationship between the transmit and receive frequencies of transceivers such as the HW-7 and TenTec PM-series.

In transceivers of this type, the same v.f.o. controls both transmit and receive frequencies. However, the transmit and receive frequencies are never exactly the same because transmitter loading inevitably "pulls" the v.f.o. signal during key-down periods. Depending upon the transmitter design, coupling to the v.f.o., and tuning, the transmitted signal will be up to 3 kHz or so away from receive frequency zerobeat. For successful operation of such a transceiver, it is absolutely essential that the operator know the exact frequency shift relationship between transmit and receive frequencies.

The only way to determine this relationship is to listen to the signal from the transceiver v.f.o. during key-up and key-down periods on a separate receiver. First, the transmitter is tuned to full output under normal operating conditions (*i.e.*, connected to the antenna normally used). Then the independent receiver is tuned onto the tranmit frequency. The key is then depressed, and the v.f.o. signal is located. Note the actual amount of frequency shift between key-up and key-down. Also, note whether the transmitted signal is *above* or *below* the receiver zerobeat frequency. This will aid in properly tuning onto a signal which you intend to call.

*213 Forest Ave., Vermillion, SD 57069.

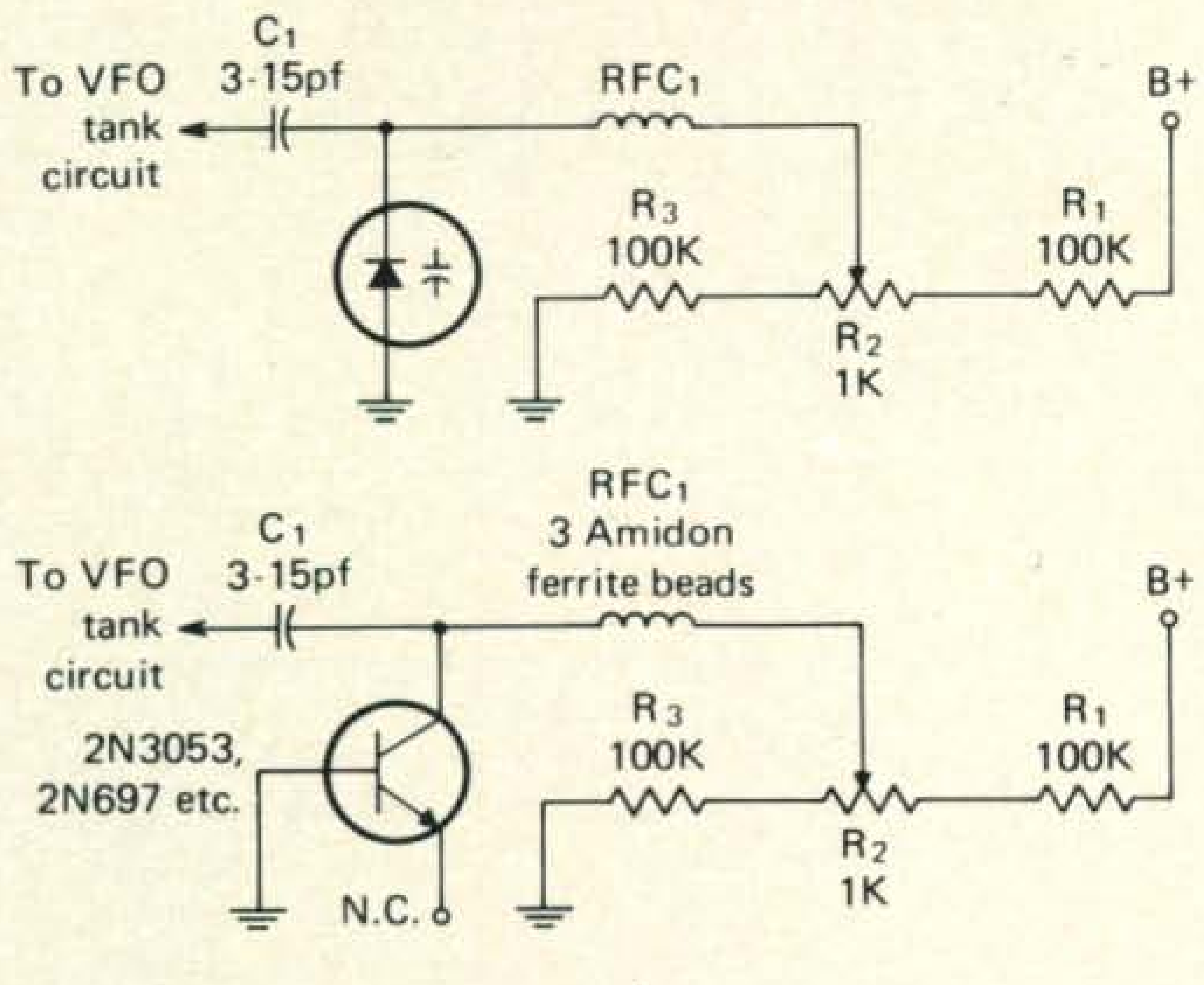

Fig. 1—Basic incremental tuning circuits using either a Varacter diode or the collector-base junction of an NPN transistor. R_3 and R_1 may require adjustment for appropriate amount of frequency shift.

An example will make the approach clear. Suppose that you wish to call a signal at 7040 kHz. You have determined that the T/R relationship of your transceiver is +1.750 kHz. That is, when the receiver is tuned to 7040 kHz, the transmit signal appears at 7041.75 kHz. The proper approach, then, is to tune from below the desired signal. In order to put your transmit frequency exactly zerobeat with the desired signal, you would tune the receiver to within roughly 1.75 kHz of the desired signal, or to 7038.25 kHz. Now if you tune onto the desired signal from above, and stop at 7041.75 kHz, the transmit signal will appear 1.75 kHz above that at 7043.5 kHz, or over 3 kHz away from the desired frequency! No chance of making a contact that way!

Hence, it is vitally important to know the T/R frequency relationship for your transceiver on each band of operation. It will probably be different for each band and antenna, and the direction of shift may change sign also.

Incremental Tuning

The major disadvantage of transceive operation is that tuning around with the receiver changes the transmitter frequency. Thus, if you have to change receiver frequency to avoid QRM, it is likely that the fellow at the other end will lose you, since your transmitter frequency will change accordingly. Some form of incremental tuning is therefore essential. Incremental tuning allows one to change the receiver frequency without affecting transmitter frequency. For a description of adding incremental tuning to the HW-7, see W6KVD's note in *QST*, June (1973), p. 48. The basic circuit is shown in fig. 1.

This method uses a device whose effective capacitance is controlled by a bias voltage. Either a device made especially for the job—

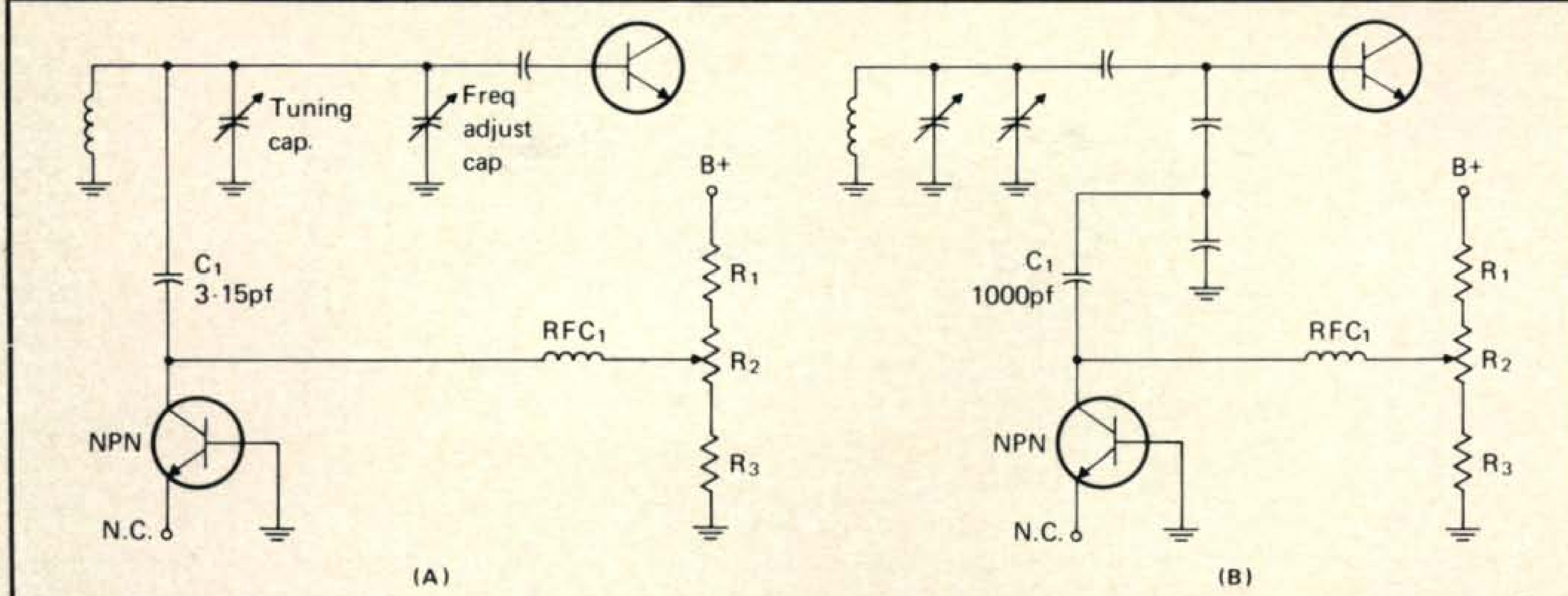

Fig. 2—Methods of inserting incremental tuning circuits in an existing v.f.o. The circuit of (A) will provide the greatest amount of frequency shift.

a Varacter diode—or its equivalent, the base-collector junction of an NPN transistor, may be used in the circuit. Depending on the amount of frequency shift desired, the coupling capacitor C_1 can be from 3-15 pf. If only a ±2.5 kHz shift is desired, a 5 pf capacitor is adequate. RFC_1 can consist of three Amidon ferrite beads, or a regular r.f. choke if one is on hand. Its purpose is to isolate the tuned circuit from the B+ lead. Several methods of connecting C_1 into the v.f.o. tuned tank circuit are shown in fig. 2. Figure 2A will give the greatest frequency shift, while fig. 2B will produce less shift, and probably be the wisest in this application. If it is used, C_1 should be increased to 1000 pf or so.

Some means of switching the incremental tuning circuit in and out of the v.f.o. is necessary. Luckily, all that is needed is a switch that removes B+ from the Varactor diode or transistor. When the circuit is wired in, some small readjustment of the frequency setting capacitors will be necessary. The procedure is simple. Once the incremental tuning circuit is wired in and set to its mid-frequency point, it is turned off. Then the v.f.o.

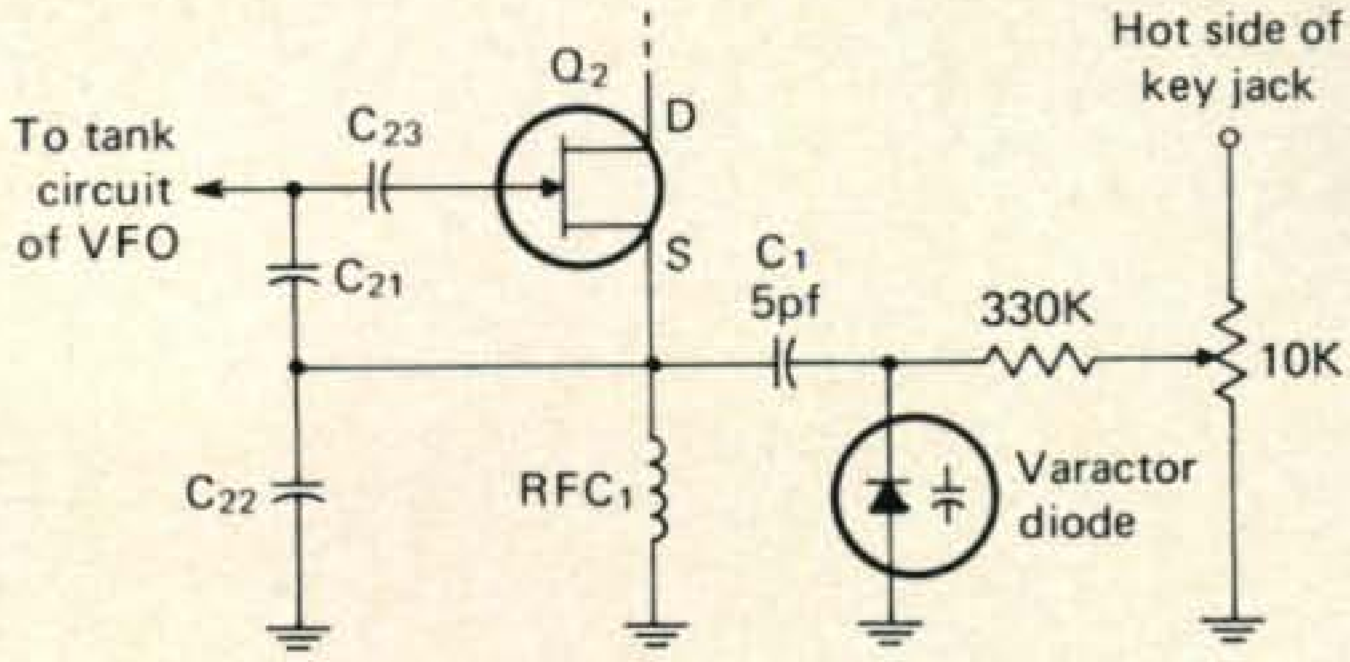

Fig. 3—W6KVD's technique for adding incremental tuning to the Heathkit HW-7 transceiver. (From *QST*, June, 1973).

frequency setting capacitor is adjusted so that the effect of the added circuit is compensated for. That is, the dial pointer is made to match up with the proper frequency indicated on the dial. The entire procedure should take about a half-hour. The pot which controls the incremental tuning circuit is then mounted on the front panel. A switch used to turn B+ on and off is likewise included. W6KVD's technique (fig. 3) is effective, and can be duplicated if desired.

News and Views

With the mail piling up, it is high time that I turn over the forum to some of the QRPp gang for their valuable contributions.

WB2IWH writes: "Although I am not a QRPper in the true sense of the word, I must say that if

This neat QRP setup built around the Argonaut has garnered 39 countries on s.s.b. for Jim Morris, WA6KGB. That WAS-QRP certificate on the left needs only two more states for the final WAS endorsement. And of course, *The Milliwatt*—the QRPp man's journal—can be seen on the right edge of the desk. Jim has been exclusively QRPp for sometime now and encourages more of the fellows to try QRPp s.s.b.

Third Annual QRPp QSO Party Results

Call	Power (Watts)	Score	QTH	Call	Power (Watts)	Score	QTH	Call	Power (Watts)	Score	QTH
K8EEG/0	.5/2/5	82938	SD	W8PCS	1	7360	OH	WA1MBK	3	525	CT
W4VNE	1.8	74800	VA	PAØGG	2	6720		WA6BQI	1.8	500	CA
W5JLY	1.8	38540	TX	K4FS/M4	1	5270	FL	W6JEO	3	360	CA
W5TVW	3	18630	LA	W9YH	2-5	4700	IL	WA7VVS	2	240	AZ
W2UAC	1.8	18170	NY	W7JKG	2	4550	WA	W2IP	2	140	NY
K8BHG	3	15150	WV	WA3RJS	2	4200	MD	Stations using over 5 watts			
WB2CMO	2	14400	NJ	WB2JNE	.45/2/5	4095	NY	W8GP	10	4141	MI
W2AXZ	2	12420	NJ	WØMHK	2-3	3040	IA	W8HZA	60	2940	WV
W4KFB	2-3	11900	KY	W9GF	4	2340	WI	W3FLA	50	1525	PA
W7IBL	2	9620	OR	W4ZRJ	5	2145	VA	VE2PJ	10	884	
W3TOS	2-5	9190	MD	VE3JO	4.5	2015		WB8NTY	90	300	OH
WB5BOT	2	9030	NM	WØDSP	1.8	1760	IA	W8IBX	200	252	MI
W2NCI	3	8855	NY	W2JDC	2	1620	NJ	WB9MBH	10	232	IL
WN7VNG	2	8820	WA	W7ZC	5	1120	UT	W3HKS	120	120	DE
W4AWS	4.5	7958	FL	WAØYED	1.8	900	CO	W3ARK	150		PA
W4QN	1.9	7700	FL	W1ECH	3	765	CT				

hamdom came to a showdown between the QRPpers and QROers, I'd stand behind you 100%. I run a TR-4C *sans* linear and a 4BTV vertical ground mounted. Just for fun, once in a while on 40 and 20 c.w. I load the Drake for maximum output and then with the use of my wattmeter, I cut back the power to where it shows 5 watts going out and a trifle coming back. So in essence I am running no more than 5 watts. I get a real kick out of latching on to a QSO this way. I worked into Sweden once this way and this contact will always be outstanding in my mind. The trouble with ham radio these days is that with all the power crazy people on the loose, ham radio is no longer *amateur* radio but rather *professional* radio. I'd love to see the FCC buy back all the linears they allow and permit only a maximum of 500 watts PEP. Only then would the competitive element return. I'm not impressed with someone who has worked 300+ countries running 2 gallons and a beam. But show me a QRPper who has a dozen countries worked and I'll show you a real ham. Whenever I am on c.w. trying to work some DX, I will always pass up a DX QSO if I also hear someone either come back to me saying that he is QRPp or someone calling CQ QRP."

de WN6SQG: "Ive recently acquired an HW-7 and am finding out that QRPp is indeed 'what it's cracked up to be'!"

de W5TVF: "I currently own an Argonaut and the little Mountaineer rig that I built from W7ZOI's description. My best low power DX is 400 miles on 0.015 watt! I never cease to be amazed at the good contacts and reports to be had with flea power. In recent months, I have twice called the roll of the Kansas Weather Net with the Argonaut, operating on 3920 kHz in the early evening QRM. Naturally I had a number of stations remark that my signal was down, but all on the net heard me. There were more than a few who thought I was kidding when I told them they were listening to five watts PEP!"

de K7HMP/LA: "Operating from Oslo, Norway as K7HMP/LA with a TenTec Argonaut, bare-

[*Continued on page 92*]

QRPP WAS Standings

WAS—50 States

K1CSD (2w.)	W4VNE (1w.)
K8EEG/Ø (0.7w.)	W4UM (2w.)
WØQZR (5w.)	K8BHG (.98w.)
WØIYP (1w.)	K4FPF (2w.)
W6IUE (5w.)	K2BG (2w.)
W6IUE (3w.)	WA8DDI (1w.)
K8BHG (3w.)	W5TVE (5w.)

40 States

49 WA7PCZ (4w.)	43 WB8FGZ (2w.)
48 WA6KGB (2w.-s.s.b.)	43 WB4WRF (5w.)
48 W9PNE (5w.-160m.)	42 WA8VPD (2w.)
47 W4ZRJ (5w.)	42 K6SGD (2w.)
46 W9PNE (0.2w.)	41 W6BRT (3w.)
46 W3AVM (5w.)	41 W1GWM (3w.)
46 KØOEL (0.27w.)	41 WAØUPO (2w.)
45 W7BBX/4 (0.5w.)	40 WA2KTW (5w.)
45 W3VQ (5w.)	40 W4HIH (2w.)
44 WA8KNE/6 (1-5w.)	

30 States

39 W4WHK (4w.)	35 WN4DWB/8 (2.5w.)
39 W7DJU (2w.)	34 WA3HBT (2w.)
37 W5JLY (2w.)	32 WA8YTL (2w.)
37 KØFRP/6 (2w.)	31 WB4TNB (1w.)
36 W8ELL (2w.)	31 W6JEO (2w.)
36 WBØCJU (2w.-s.s.b.)	30 ZE7JV (5w.)
35 K2VIV (5w.)	30 WB2CMO (5w.)

20 States

29 K8EEG/Ø 5w.-160m.)	22 K4BNI (2w.)
26 WB5BOT (2w.)	20 W3QBO (2w.)
25 WB9FJJ (5w.-160m.)	20 WA1JGG (2w.)

10-20 States

18 W2ECW (2w.)	16 WA3GHC/TF (2w.)
18 W2TFL (0.5w.)	15 KOBFT (2w.)
18 WA3QBF (2w.)	15 W5JUC (2w.)
17 K4SSW (2w.)	11 WB2FHS (2w.)

QRPP DXCC Standings

151 K4OCE (5w.)	25 W3AVM (2w.)
103 K4FS m 5w.)	25 W9SCH (5w.)
92 K8EEG/Ø (5w.)	21 K6SGD (5w.)
80 W4VNE (1w.)	21 K6FIL/2 (1w.)
80 W5TW (5w.)	18 W4ZRJ (5w.)
66 ZE7JV (5w.)	17 W3QBO (2w.)
65 WB4WRF (5w.)	16 W4UM (3w.-40m.)
55 K2BG (5w.)	15 K2VIV (5w.)
54 WØOZR (1-5w.)	15 WØIYP (1w.)
54 W1JUB (6w.)	15 WA7PCZ (4w.)
50 WA8DDI (1w.)	14 WA3HBT (5w.)
49 G8PG/GW8PG (5w.)	11 W4ZRP (2w.)
46 K6GKU (5w.)	11 W6JVA (2w.)
43 K1CSD (2w.)	11 WA8KNE/6 (5w.)
41 WA3GHC/TF (2w.)	10 WA2KTW 5w.)
39 WA6KGB (2w.-s.s.b.)	10 W6IEU (5w.)
37 WA6ABP (0.8w.)	10 WB4TNB (1w.)
36 WBØCGJ (2w.-s.s.b.)	8 W6BRT (3w.)
36 W3HGX (5w.)	7 WA1GZH (5w.)
31 WB8FGZ (2w.)	7 KØFRP/6 (2w.)
30 W8ELL (2w.)	6 K4BNI (2w.)
30 K8BHG (3w.)	5 WB5BOT (5w.)
28 VE3BMV (2w.)	5 WA8VPD (1.8w.)
26 K6SGD/EI7CJ (5w.)	5 W1GWM (3w.)
26 W9PNE (0.2w.)	

NEW PRODUCT ANNOUNCEMENT!

WE'RE BRINGING YOU MORE in '74!

But we really couldn't have done it without *you*. It was your positive response to our 2-meter rigs that justified R & D of the new GTX-600, a 6-meter FM transceiver, and the new GTX-100, a 1¼-meter unit. Both include all the preferred features you liked on the popular GTX-200: independent selection of 10 Transmit and 10 Receive frequencies, switch for lock-in of pre-selected pairs, rear panel external speaker jack, backlighting, high-sensitivity receiver pre-amp, 8-pole second IF filter, netting trimmer for each transmit crystal, roomy single-circuit-board design, honest price and more.

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GTX-100 1¼-Meter FM *(Available March 1, 1974)* — $\$269^{95}$ *(Incl. 223.5 MHz)*

GLH-100 P.A./Siren — $\$159^{95}$ *(horn optional)*

GTX-200 2-Meter FM — $\$269^{95}$ *(Incl. 146.94 MHz)*

GTX-10 2-Meter FM — $\$209^{95}$ *(Incl. 146.94 MHz)*

GTX-2 2-Meter FM — $\$259^{95}$ *(Incl. 146.94 MHz)*

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General Aviation Electronics, Inc., 4141 Kingman Dr., Indianapolis, Ind. 46226

'JUP on FM

BY NORM STERNBERG,* W2JUP

IT seems to me that the last time I glanced at the table of allocations and considered the various modes of operation permitted to the US amateur fraternity, there was a large bunch of the ham bands that were authorized for both phase and frequency modulated voice operation. But lately, everything I hear and much of what I read would lead the unsuspecting operator to believe that f.m./p.m. is all summed up in the magic label "Two Meter FM." To this I say a hearty "balderdash!" What is this mystic charisma associated with "Two Meter FM?" How does it happen that so many of the newcomers to our order leap up from the Novice ranks to the General class, and plunge themselves into the swirling bubbling world of the two meter repeater? Is it Convenience? Is it Practicality? Is it the Instant Rice Box? Is it the flexibility of the BankAmericard? Is it Ham Radio?

Seems to me that the last time I thought about the philosophy of amateur radio, there was more to it than "plug it into the cigarette lighter, hang an antenna on it . . . and lo! and behold! Instant Yak! There was more to it than "How am I making the machine?"

Review the facts with me, if you will . . . Unless the Feds have changed the rules again in the last few days, f.m./p.m. voice techniques are permitted on 80, 40, 20, 15, 10, 6, 2 and on up unto the vertitable laser areas. True, on the so-called "D.C. Bands," that is, below 29.0 Megs,[1] the law requires that we use what was formerly known as "narrowband f.m.," occupying no more spectrum space than a standard a.m. signal, (whatever

*2 Regal Lane, Levittown, NY 11756

[1]Clever cop-out avoids use of detested "Hertz" type expressions.

The Ultimate F.M. Transceiver

Here it is, the FMer's dream, a fully synthesized transceiver that'll cover the entire two meter band, PLUS a built-in scanning receiver that'll locate any repeater frequency in your area that's in use.

And get a load of these other features that make the "Dream Machine" the ultimate rig:

- Operates on FM, AM or Modulated CW
- Built-in DC and AC power supplies
- Frequency Range of 143.5 to 148.5 MHz in 5 KHz increments
- Autoscan in 5 KHz steps across entire band, with adjustable speed and frequency limits.
- Synthesizer flexibility that offers choice of 600 KHz up or down, 1 Meg up or down, simplex, frequency split, or any nonstandard split (programmable) all from a single function switch.
- Receiver Sensitivity of 0.35 Mv for 12 db SINAD on FM
- Dual power output of 20 watts or 5 watts across entire band
- Adjacent channel rejection (30 KHz) 100 db minimum
- Image spurious and intermodulation (EIA) 80 db minimum
- 10 pole, 13 KHz crystal filter
- Receiver Superhet, single conversion
- Frequency stability of 0.0005%
- Built-in tone burst and PL encoders and decoders
- Built-in touch tone pad
- Full LED Digital readout
- Built-in S Meter also serves as VSWR bridge, power output meter, battery indicator, deviation indicator and discriminator meter.
- Audio output 4 watts @ 10% THD
- Speaker built-in to left side of cabinet for maximum mobile reception
- Headphone jack for noise-free mobile operation
- Independent selectable priority channel
- Built-in Auto CQ
- Temperature range from -20^{o} to 170^{o} Fahrenheit
- Size: 4" H x 8" W x 10" D Weight: 10 pounds
- One million channels (1000 Rec. x 1000 Trans.)

The EBC-144 "DREAM MACHINE"

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that means). So what else is new? I will lay it on you this way—it appears to me that we (me included) are being a little bit narrow-minded, as well as narrow-banded!

(Small pause here whilst I put Shostakovitch on the Boom-box!) I'm sure lots of you more ancient types (me included) can remember a character on the old Milton Berle TV shows, a clever cat named Sid Stone, who used to do the "pitchman" bit as part of the Sponsor's Message[2]. Well, Sid used to roll up his somewhat soiled sleeves and each week say, "Tell ya what I'm gonna do!" And then into the Message. . . .

"Tell ya what I'm gonna do" . . . each month upon these pages, I'm gonna talk about f.m. Let me put that another way. We are gonna write about what I would like to call "angle modulation systems." That will take care of all the purists and give us the widest latitude. We might even include sort of a menu. . . .

> F.m. and p.m. . . . what do they really do?
>
> Audio and f.m. . . . the most misunderstood parts!
>
> Repeaters . . . whither goest the FCC?
>
> Operating techniques . . . why sound like a jerk?
>
> Power output . . . what does that "linear" really buy you?
>
> Antennas for f.m. . . . 6.2 db over a wet noodle?
>
> Forgotten bands . . . use 'em or risk losin' em!

We might even get around to reviewing some of the newer gear as it plods down the road to eventual retirement in the junk box.

Let me hasten to lay upon you some of the things that we will not do! This will not be a repeater directory, simply because there are other guys doing that service already. This will not be a gossip column about what repeaters are conflicting with what. Let the other guys handle that area also. The emphasis will be on f.m./p.m. as it applies widely, and to everyone, not just the guy with the degree in EE. Why? Simply because there is so much in f.m. that there really can be something for everyone. And, on occasion, I might even run the risk of stepping on some toes and incurring someone's wrath by daring to voice an editorial opinion on events in amateur radio of concern to the f.m. operator. In short, during these next months, I will write words and express ideas that I honestly believe to be of interest to the f.m.er. As a matter of fact, if you should have some favorite question or secret doubt hidden away in your soul, get out your quill and inkpot, drop me a line, and between snorts of Old Tennisshoe, I shall mull over your problems.

[2]I run a couple of Broadcast stations. These two words are part of my religion and must be in capital letters.

Audio

Let's look at audio for a bit. Why?, you ask! Well, brother, face the ultimate fact that in the end analysis, all you are really trying to do with your f.m. gear is simply move *your* audio from point A to point B. It would appear logical that when you are gonna handle the product, you should know what it is that you're trying to move.

For too many years a zillion guys like me have earned their keep trying to run radio systems wherein the Feds required that we go out "flat" to umpteen kilohertz. Well, in Entertainment Radio, that is the name of the game. We gotta give them a nice clean pipe to slosh the Progressive Rock through . . . nicely smooth within 2 db from 30 to 15,000 hertz, the nominal range of human hearing. Now, that's swell for Shostakovitch and the Stones. But in our case of amateur radio, what we want more than anything else is Communication efficiency . . . the maximum intelligence in the minimum bandwidth! Even in the Apollo spacecraft systems (a.m., f.m. and p.m.), the voice channels are sharply restricted to the range 300 to 3000 Hertz. Why? Because of the nature and characteristics of the human voice.

More than forty years ago, Bell Laboratories (all hail and face East) demonstrated quite accurately that for the most efficient transmission of the human voice, the power content below 300 Hertz was almost totally wasted. And take their word for it . . . most of the energy contained in human male speech is in the lower frequencies, the A-E-I-O-U vowel sounds are rich in pure power. But, damn it all, they *alone* contribute little to intelligibility. Most of the sounds that are required for articulation and identification of phonetic concepts are found in the middle high frequency area, say, around 1500 to 4000 Hertz. Just think for a short minute about the phonetic abbreviations that the communications industry found so necessary around the time of the Second World War.

Why do we have trouble distinguishing between the letters S and F? Between T and V? Because the basic identity difference is in the high frequency sounds . . . the sibillants and fricatives[3]. If you chop the system's performance so that the hissing sounds of S are not passed sufficiently, then it becomes nearly impossible to tell an S from an F. But, you can cut it at 3000 Hertz, economize power and bandwidth and still get the message through. The average Telco landline doesn't go above 2600 Hertz, and you rarely find yourself using phonetics when smooching with the girlfriend on the phone. Yes, friends, the days of the "broadcast quality" ham rig are but a memory . . . you can't justify the waste of power and spectrum space. As long as the passband from 300 to 3000 Hertz is relatively uniform then the human voice will be neatly fit through the pipe, nicely recognizable and sometimes even good to listen upon. But, what will happen if the passband is not uniform within our prescribed limits? Suppose for the moment that we reduce or attenuate the lower part of the passband, say from 1000 Hertz down. What happens? Nothing, in terms of intelligibility . . . but the result does take on an unpleasant, strident character which is simply not nice to listen to.

Now, let's be honest! Strident sound is not illegal . . . but it does show a certain lack of what I like to call "concern with what we sound like." I, for one, don't like to listen to a net or a ragchew when the other guy sounds thin and tinny, which, believe it or not, are the professionally accepted terms describing audio which is signficantly poor in the lower frequency energies.

Suppose now that we leave the lower frequencies alone and kinda dump the high end down. Now, we may well find that we can't tell an S from an F, or a P from a T, or a B from a V! The general sound will be dull, not crisp, and more difficult to understand. Still not illegal, but who the hell wants to have to keep asking "Whad he say, Wha?" Once again, a less-than-professional approach to a relatively simple task . . . that of transmitting intelligence in an efficient manner. Audio that is tubby and dull is not the nicest thing in the art to listen to.

The facts are these . . . for efficient transmission of the human voice, the passband from 300 to 3000 Hertz should be uniform

[3]Old vaudeville team used to play the Keith circuit.

within plus or minus six db, which acoustically represents the half-power points. Not hard to achieve at all. Us poor slobs in the f.m. broadcast racket have to prove the entire system, from microphone input to transmitter output flat from 30 to 15000 Hertz within plus or minus two db. That, sometimes ain't all that easy. And the Feds require that we plot the curves, too!

What about distortion? Well, first off, let's see what distortion really is . . . the whiz kids of the engineering world tell us that distortion is simply the alteration of the waveform of the original signal. Sometimes it is accidental—sometimes it is deliberate. I can think of the fuzz-box used by the Rock group guitar bangers, for example. All it does is make square waves out of the original sine waves produced by the strings. I also recall that in the Apollo spacecraft v.h.f. systems which were a.m. radios as a matter of fact, we use what is seriously referred to as "infinitely clipped speech"—simply dumping the audio into a horrendous set of clipper-limiters and once again making square waves out of sine waves . . . but in both of these examples, the distortion introduced in the result is done by design and not by accident. In the case of the fuzz-box, the cat playing the guitar wants a particular effect, that produced by a very high percentage of distortion. In the case of the Apollo radios, the need is to guarantee the maintenance of very high average modulation levels to cut through unusually severe conditions. Both cases have their merits.

But in f.m. for the amateur radio enthusiast, distortion is not justifiable . . . it is almost always the product of bad design married to improper operation of the equipment, or failure of the equipment. We can start to look for distortion right at the source . . . the human voice! Some guys just happen to have voices that *are* distorted! This distortion usually is the result of a highly asymmetrical waveform produced in the throat. To be truthful, I love to have guys working at the broadcast station as announcers who *have* this rather strange type of voice, because when they work on a.m. particularly, their voices produce amplitude modulation which is highly unsymmetrical and result in a gloriously high amount of positive modulation—much higher than the negative modulation. This really helps give the station's signal more "punch" in the boondocks, and the Feds permit us to go up to 125% modulation on positive peaks!

Microphones are sometimes guilty of introducing distortion, especially carbon button types, when the button gets old and the carbon granules become "packed" together and lose their original agility and freedom to vibrate. The cure is frequently as simple as a good sharp rap on the table or a bang on the steering column. When all else fails, check the d.c. bias on the carbon button. Sometimes the button's resistance changes and the bias voltage is no longer correct. The two most frequent causes of distortion in f.m. operation are excessive modulation or deviation of the carrier frequency for the particular receiver in use, or operation not centered about the center frequency of the demodulator of the receiver in use. Let me briefly explain . . . .

Take heed, all ye, of Sternberg's First Hypothesis of Angle Modulation. . . ."There is no such thing as overmodulation in the system!" This is true, because the point of 100% modulation in any of these systems, from the viewpoint of the transmitter, has nothing to do with the transmitter! It is strictly a function of the passband or width of the i.f. amplifiers in the receiving setup. If you swing the transmitted carrier beyond the capability of the i.f. passband, then the result is the clipping of those modulation excursions that go outside the passband, and the result is our old friends, the square waves with the distortion inherent in them. The magic words are "Modulation Index," which we can get to another time.

Off-frequency operation will produce asymmetrical distortion of the post-detected audio because the signal coming down the i.f. slot is not properly centered around the center frequency of the detector, and the carrier swings end up off the linear portions eof the so-called "S-curves" of the usual types of f.m. p.m. detectors. And, that brings us to Sternberg's Second Hypothesis of Angle etc., etc.—"Any time you get into a non-linear bag, you gotta get worms." In the usual types of detectors such as the Foster-Seeley, the Ratio Detector, the Travis, and others, off-frequency operation of the incoming signal frequently produces asymmetrical clipping of the audio and the further off the center frequency the input signal goes, the worse the distortion becomes. One of the few

[*Continued on page 91*]

Simple, Super-Regulated, 12 Volt Supply

BY ALEX M. CLARKE,* K4JYM

THE problem of trying to get a 12 volt d. c. power supply sufficiently stiff to keep the chirp out of our QRP[1] rig led to the purchase and construction of several small power supplies.[2] Simple LC or Pi type filters just won't do the job in the 12 volt range, and direct zener regulation isn't practical. The zener-pass transistor combination, similar to the Heath supply for the HW-7, should have worked, but caused hum in the receiver, as well as allowed some buzz and chirp in the transmitted signal.

About a year ago, Fairchild introduced the μA 7800 series of voltage regulators, which are rated at one ampere output current, in discrete voltages from 5 to 24 volts. These gadgets are thermally protected, short circuit proof, and contain 17 transistors, all in a convenient-to-heat-sink TO-220 or TO-3 package.

The ad looked so good that we wangled a freebee and wrote off for the poop sheet[3] (so did Irv Math—see his column in *CQ*, April 1973). The little supply we ended up with worked so well, we had to let the rest of the QRP (okay, f.m.'ers, too) gang in on it.

The schematic for the whole thing is shown in fig. 1, but just a word or two about the necessary parts.

You can use 24 volts in a full wave supply, and reduce the size of *Cf*, but don't, it causes the 7812 to dissipate too much heat, and the thermal protection circuit will either shut you down or limit the current you can draw. Further, the working voltage of the capacitors you use should be 1.4 times the r.m.s. voltage rating of the transformer. 25 volt capacitors are cheaper than 50 volt ones.

Although we calculated that 1500 mf would be sufficient in a filter to deliver 0.5 amperes, 2000 mf turned out to be necessary in our case. The current output (with no ripple) is proportional to the filter capacitor, so 1 ampere out would require 4000 mf, etc.

The voltage can be varied upwards about 0.6 v. per diode by putting silicon diodes from lead 3 to ground. This creates a minor heat sink problem, but we got around that by using a piece of mica sheet, ½ inch square, between the regulator and ground and a nylon screw, bolting the 7812 by its

*7707 Hollins Road, Richmond, Virginia 23229

[1]Clarke and Strickland, "Quick and Easy QRP," *CQ*, Jan. 1972, p. 38.

[2]*Radio Amateurs' Handbook*, ARRL, 1972, p. 119.

[3]μA 7800 Series Three Terminal Positive Voltage Regulators," Fairchild Semiconductor, 313 Fairchild Dr., Mountain View, CA.

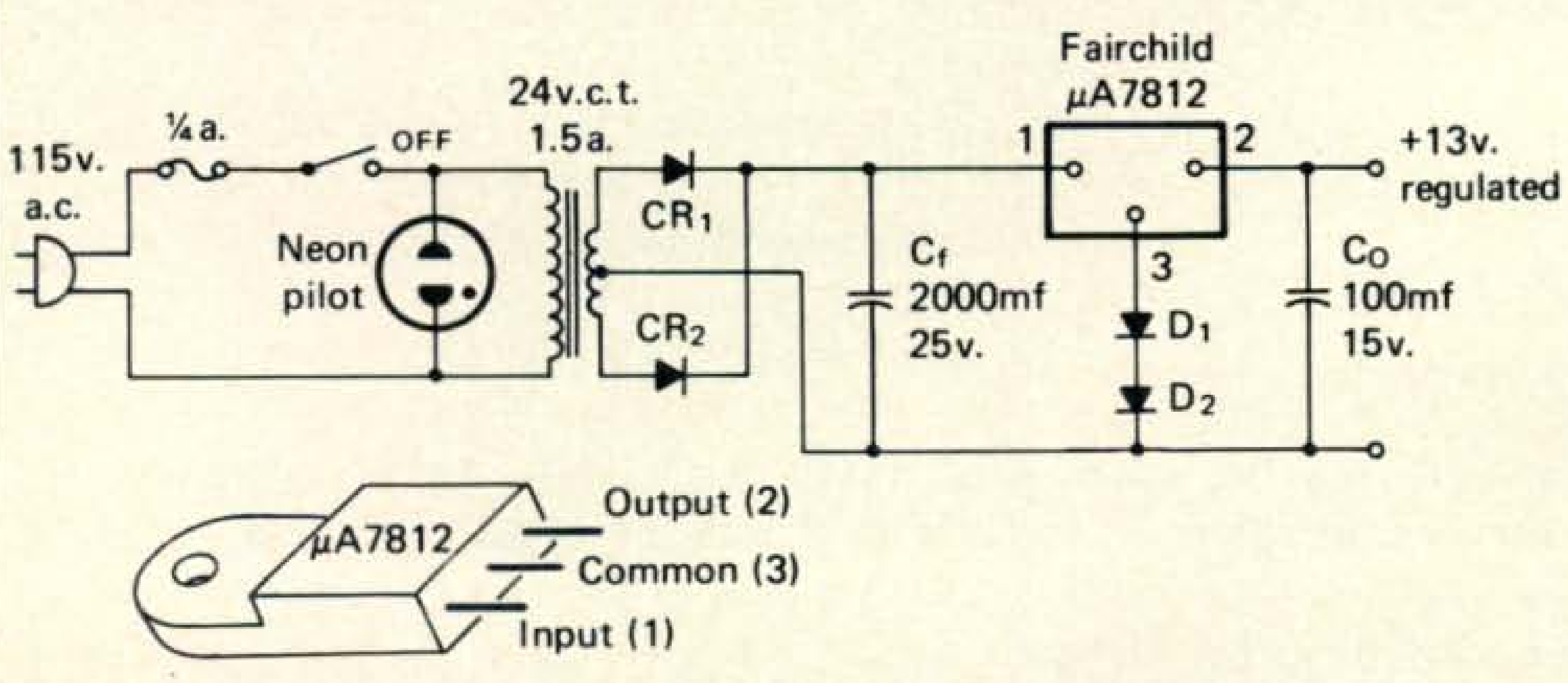


Fig. 1—Circuit of the simple super-regulated 12 volt power supply using a Fairchild μA-7812 regulator chip. CR_1 and CR_2 are 3 a. 50 piv diodes; D_1 and D_2 are silicon diodes with a forward voltage drop of 0.6 v. each.

TO-220 tab to the chassis.[4] An "experiment" with a 24 volt transformer made the chassis in the neighborhood of the regulator heat up some, demonstrating the need for a proper heat sink. Mica washers used to mount TO-3 power transistors are readily available, and could be used for mounting the regulator. Be sure to use an insulating thermal joint compound between the regulator tab and the mica, and the mica and the chassis.

Our unit was built inside a 2″ × 4″ × 6″ aluminum chassis. Three RCA phono jacks were provided for the output, as well as a set of binding posts.

All of the parts, except the regulator and nylon screw are available at local parts distributors (or Radio Shack). The regulator can be ordered from Circuit Specialists, who advertise in the ham magazines (and really seem to be interested in the onezy-twozy orders).

[4]The Motorola equivalent, MC7812, comes packaged with the proper mounting hardware.

Performance of our unit is really extraordinary. Using a Tektronix 545 scope with a type 1A1 plug-in, we found less than 10 millivolts ripple at 0.5 a. load, and checking with a H-P 34702A Digital Multimeter, the no load to 0.5 a. load voltage change was less than 10 millivolts.

The particular 7812 we used regulated at 11.9 volts, so we put two diodes from the common lead to ground to bring the voltage up to about 13 volts.

Just the thing for a "base station" supply for that QRP rig, or a natural for a 10 watt f.m. transceiver. ■

CQ-75

BY ALBERT KAHN * K4FW (ex-W8DUS)

Pete was one of those hams who never had much to say. At club meetings, he just went along, never got into any discussion. On the air, his conversation was confined to weather, rig and antenna.

DX and cw were Pete's life for years. Mention a new country though, and he would light up like Times Square on New Years Eve.

The big surprise to all of us was when Pete went on ssb and put up a 75 meter dipole. A new way of life, new friends, a whole new world. "Just going to see what it is like," he told the gang at the radio store. "It got sorta lonesome just sitting and listening for a new one."

Pete got on ssb with a nice signal. First thing he did was call CQ.

"Hey," a voice came back, "This frequency is in use, please move." Pete moved.

"CQ," Pete called again. "CQ 75."

Another voice answered, "You are on the Union League Net. Either get off or join the group."

"How do I join?," Pete inquired.

"We can take your application," said the voice, "although our membership limit has been reached, we might put you on the waiting list."

Pete persisted, "How do I join?"

"Write to Box 349, Elvira, Nebraska, and request an application. Have it signed by three members who will propose you tothe membership committee. You will be investigated for moral character and family background. Be sure to fill in the part about your education and social clubs that you belong to. If the membership committee acts favorably, your name will be submitted to the Net membership. In the meantime, stay off this frequency."

"Thank you," said Pete, and threw his notes in the waste basket.

There must be some way to get on phone, thought Pete. Other hams have QSOs. Perhaps I could join someone. He lined up a QSO.

"Break, break," said Pete. "Some joker is breaking," one ham said to the other. "QRM is pretty bad, I should QRT anyway."

Last time I heard Pete, he was back on cw calling CQ Asia on a dead band. He sounded happy. ■

*Old Cartertown Road, Gatlinburg, TN 37738

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

We have been asked on several occasions to present some practical information on timing systems for automatic identifiers or for other sequence control applications. The topic for this month, as a result, will be simple, time delay circuitry utilizing unijunction transistors and IC's that can be duplicated by almost anyone with reasonable technical ability. Hopefully, the circuitry presented here can be modified to meet specific need or serve as a starting point for more elaborate requirements.

Figure 1 is a schematic of a very simple time delay circuit. When switch S_1 is closed, capacitor C_1 begins charging through the 1 megohm potentionmeter. Eventually the capacitor charges to the firing point of the unijunction transistor causing it to conduct. This forces C_1 to discharge as shown, which triggers the SCR into conduction pulling in the relay. Contacts on the relay are used to control the external timed circuit. To reset this circuit, it is necessary to simply open S_1.

Now, if S_1 were a carrier operated relay (energized when a repeater's transmitter were energized), the auxiliary contacts of the "timed" relay could be used to shut-off the transmitter after a pre-set period of time.

The circuit shown in fig. 1 is only good for

*5 Melville Lane, Great Neck, N.Y. 10023.

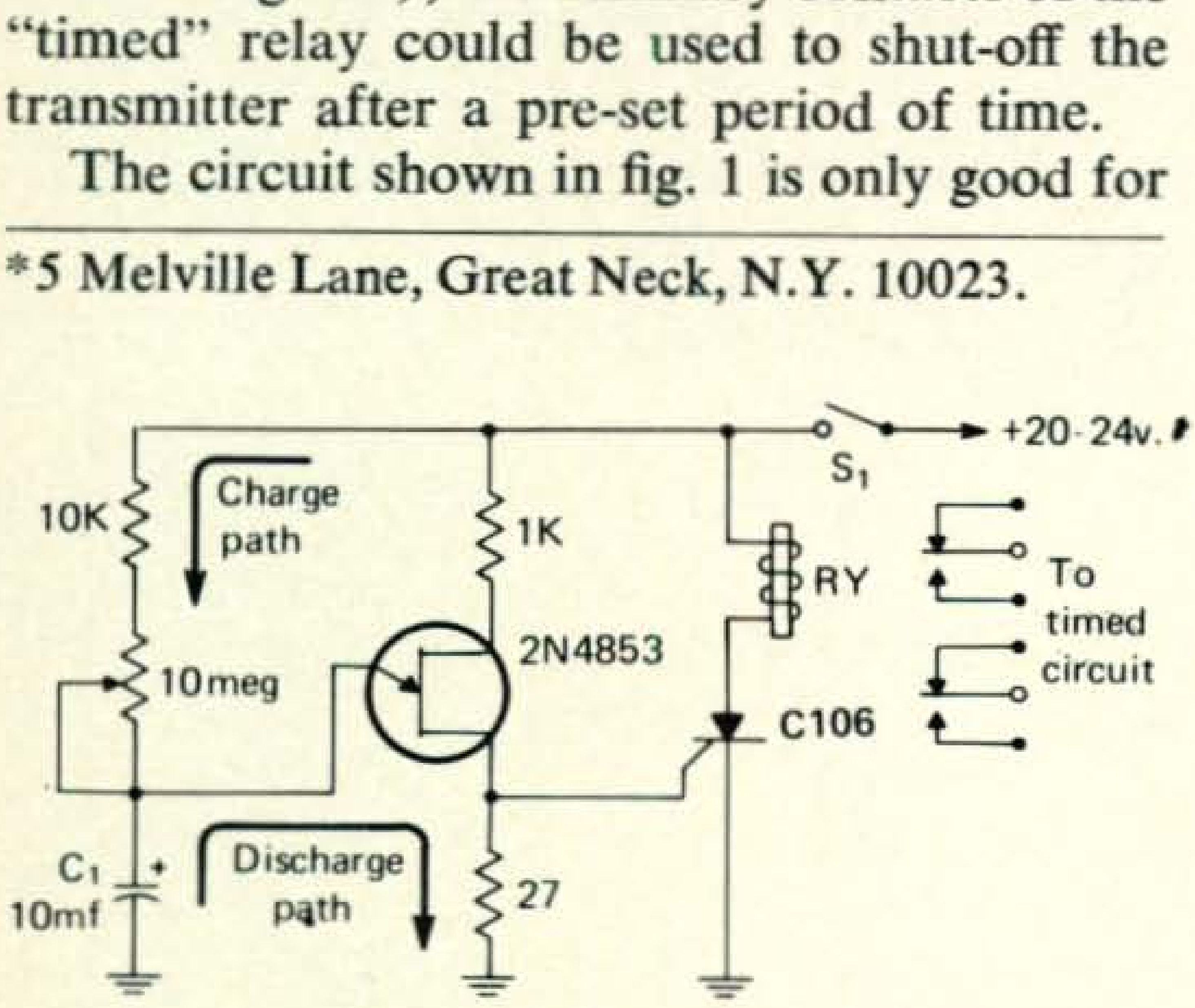


Fig. 1—Simple time-delay relay. The time delay is roughly 1-2 seconds for every 10K of resistance in the charging path.

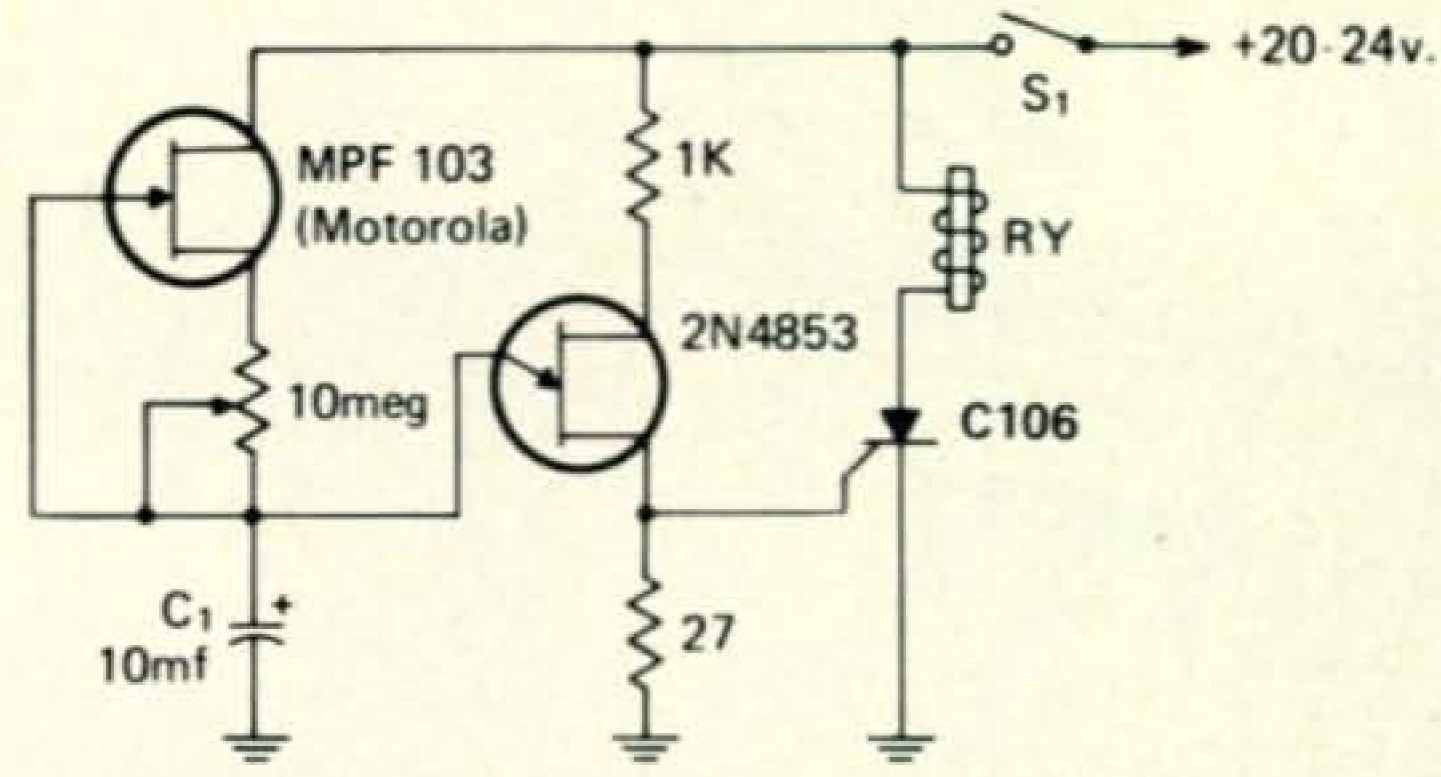


Fig. 2—Long duration timer. See text for details.

time durations of up to approximately 1.5 minutes. If longer intervals are desired we have to modify the circuit slightly. Figure 2 shows a simple modification that will allow time delays of up to 10 minutes to be achieved. In this case, a junction FET transistor has been added to the charging current of C_1 transistor causes the charging current of C_1 to be constant regardless of the degree of charge on the capacitor, therefore resulting in a longer charging time and longer time delay.

Figure 3 is a unique circuit which should solve many more complex timing problems. The two 2N4123 transistors, Q_1 and Q_2, form a conventional flip-flop while the unijunction transistor, Q_3, is connected as a time delay circuit. Operation of this circuit is as follows:

When power is applied, one of the flip-flop transistors conducts placing its collector at zero (or near zero) potential. This of course causes the other collector to rise to B+ and the unijunction timing capacitor, C_1, begins charging through one of the potentiometers and its respective diode. When the capacitor reaches the firing voltage, the unijunction conducts and its output pulse triggers the flip-flop changing its state. The sequence of events now repeats but this time C_1 charges through the other potentiometer-diode circuit.

By proper selection of the value of C_1 and the value of the two potentiometers several interesting circuits can be made from this basic combination as follows:

1. With the circuit exactly as shown, it becomes a square wave generator with one potentiometer controlling the time duration of each half cycle of the square wave (see waveform #1).

2. With one potentiometer replaced by a fixed resistor, the circuit becomes a pulse generator with the other potentiometer control-

[Continued on page 91]

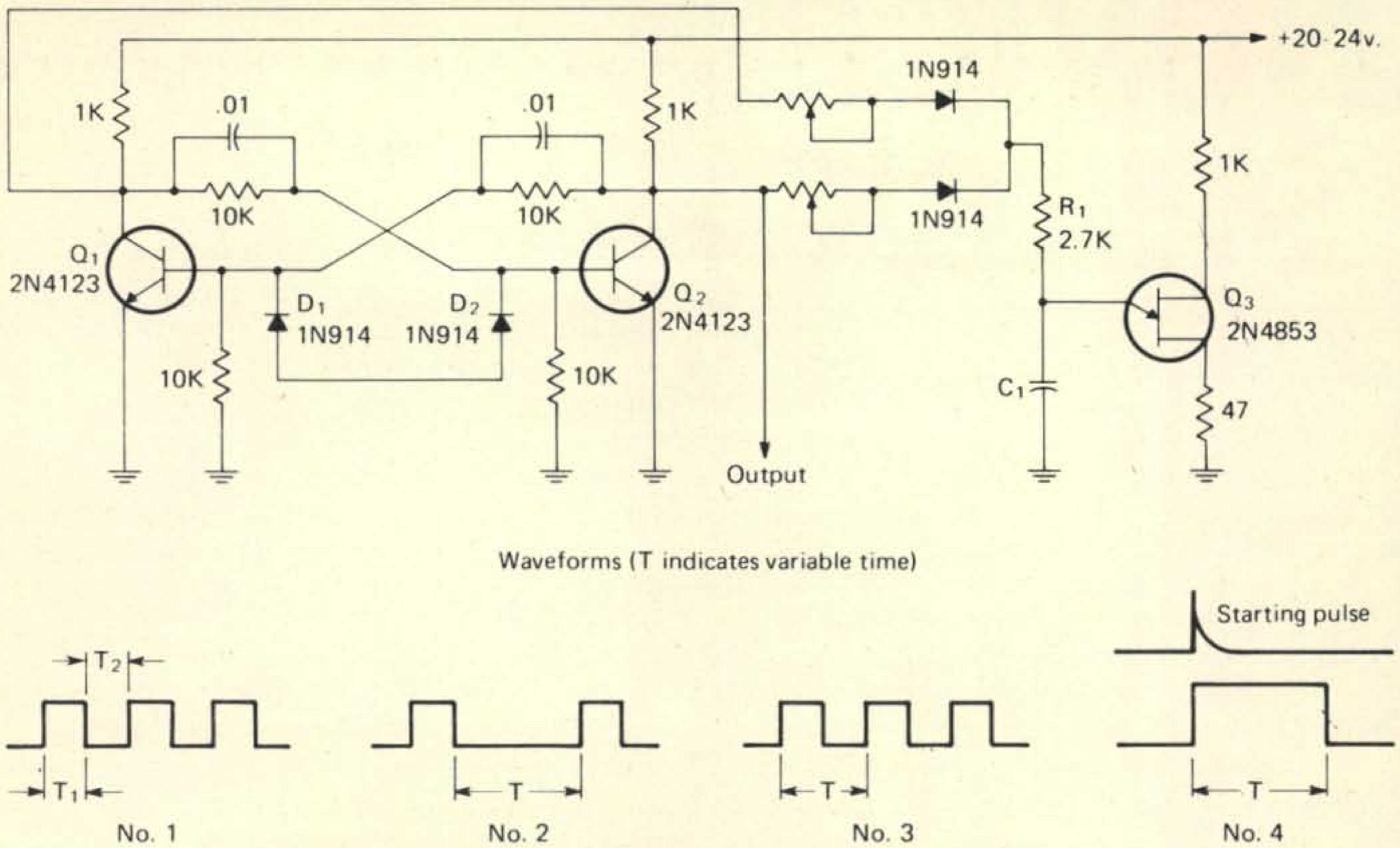


Fig. 3—Versatile timing circuit discussed in the text.

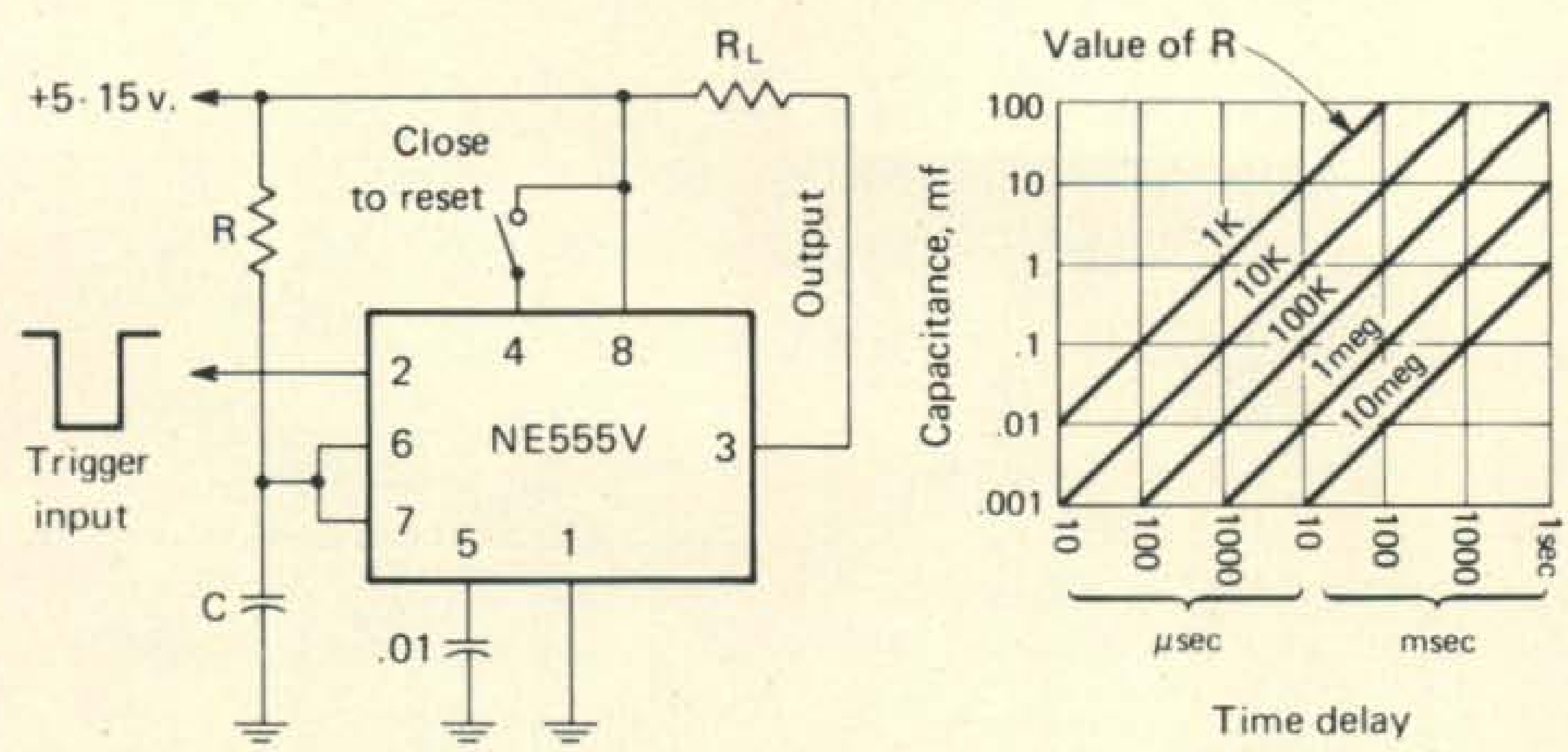


Fig. 4—Signetics NE 555V IC connected as a time delay relay.

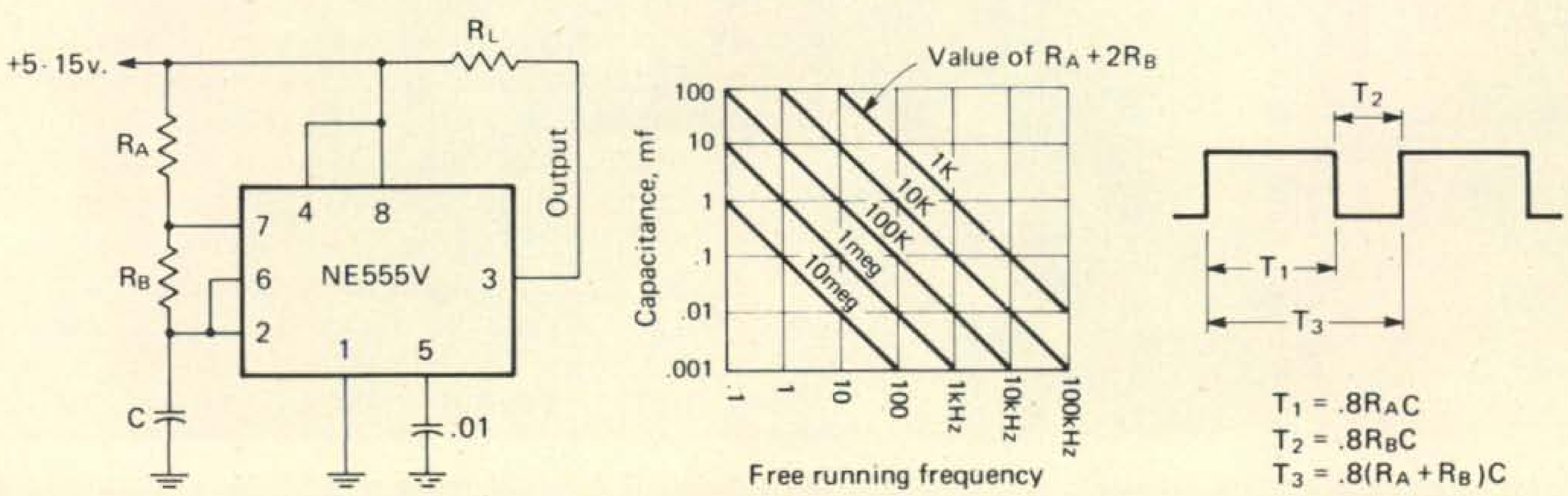


Fig. 5—Free-running hookup of the NE 555V.

NOVICE SHACK

BY HERBERT S. BRIER, *W9EGQ

THE standard RST (Readability, Strength, Tone) method of giving amateur signal reports illustrated in Table 1 was introduced about 40 years ago. Although some of its definitions show their age, it is still an excellent system, and avoiding a few common mistakes in using it increases its usefulness. For example, a readability of R3 or better is defined to mean 100-per cent readable. The practice of some operators to interpret the "R" report as a percentage scale is confusing to everyone.

The Federal Communications Commission amateur regulations specify that all amateur signals on frequencies below 144 mHz should be as steady and pure as the state of the art permits —T9X, in fact. It is highly doubtful, however, that any FCC monitoring station would issue an official discrepancy report to any amateur simply because his signal contained a slight trace of power-supply ripple. The majority of U.S. amateur signals easily meet the FCC quality requirements; nevertheless, it is risky to assume that your signal is above reproach, because you get T9 tone reports consistently. Too many operators give such reports to every station they work without regard to their actual signal quality. This habit is often painfully obvious on the DX bands, where the occasional foreign station with a signal that sounds like a pig pen at feeding time still gets T9 reports! Such inaccurate tone reports do no one a favor. Rough signals occupy more than their share of frequencies, and giving them better quality reports than they deserve may result in their owners receiving a violation notice from the FCC.

*385 Johnson St., Gary, Indiana 46402

Steve Momot, K3HBP, Wilmington, Delaware, is the first Delaware contact for almost every station he works. More about him in the text.

Signal Strengths And S-Meter Readings

The following story, true except for the name, dramatizes what is wrong with many signal reports issued today. Rob complained that his new s.s.b./c.w. transceiver lacked sensitivity on "receive" as shown by the low S-meter readings it gave. After tuning it through the 80 through 15 meter bands with a multiband receiving antenna and observing that most incoming signals read between S6 and S9 on the meter with a good number of stronger signals pushing the meter past the S9 mark while a number of weak but readable signals hovered below S5, I consulted the instruction manual. It stated that the S meter was adjusted to read S9 for a 50-microvolt signal at the transceiver input terminal. A rough check on 40 meters with the equipment available indicated that, if anything, the meter was a shade more generous than that. But Rob was not satisfied.

Swinging an accusing finger between the loudspeaker and the S meter, he demanded. "How could I give the owner of that signal an S8 report? Why, it would be 40 over 9 on my old receiver." After a discussion of "honest" S meters versus "friend-making" S meters, we cranked its sensitivity control up until the meter read 30 db over 9 on signals that formerly read S9, and Rob went away happy.

When the RST reporting system was set up, the strength reports were strictly by ear. An S1 signal was the weakest one that the operator could hear in his headphones; and an S2 signal was just perceptibly louder; and so on, up to "extremely strong" S9 signals. Many tests have shown that the minimum volume change that can be positively noticed by the human ear requires a 2:1 change in signal amplitude, which represents a 4:1 change in signal power. Thus, the difference between an S1 signal and an S9 signal represents a power change of over 65,000 to 1! In the absence of noise, a modern communications receiver can deliver a readable c.w. output signal with an input signal of less than 0.1 microvolts. An 0.25 to 0.4-microvolt s.s.b. signal would be readable under the same conditions. If an S1 signal has a strength of 0.1 uV., an S9 signal should have an amplitude of 26 uV; and if the S1 signal has an amplitude of 0.25 uV., the S9 signal should have an amplitude of 100 uV. Obviously, the original calibration of Rob's S meter was reasonably consistent with the RST strength table. The real question is whether a 50-μV signal is really an "extremely-strong" signal on the amateur medium-frequency

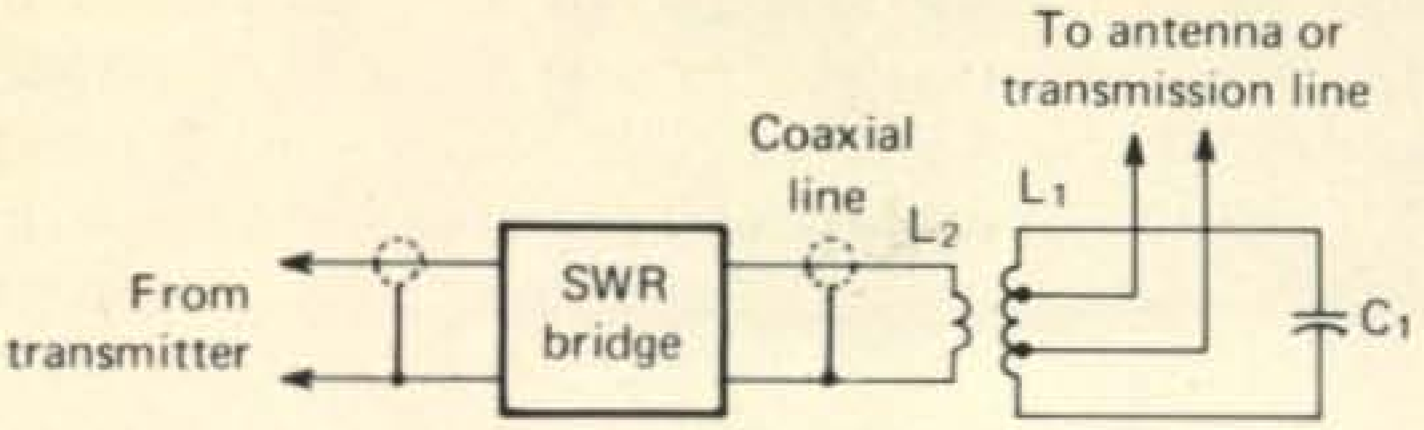


Fig. 1—A 21-28 mHz antenna coupler for a square dipole (December, 1973, column) or other antennas. Adjust position of taps on coil L_1 and the capacitor C_1 for lowest s.w.r. indication on the bridge. For use with single-wire or coaxial-fed antennas; ground the rotor, the capacitor (and the coax braid) and tap the antenna or center conductor on coil L_1.

C_1—50-100 pf variable.

L_1—6t. #12 or 14, 2½" d., 1" l.

L_2—2t. #16, 2½" d., at center of L_1.

bands, when under normal conditions, so many signals are stronger than that. What do you think?

Actually, it is in the area above S9 on the S-meter scale that things get a little ridiculous. Up to the S9 mark, each calibration mark represents a power change of 4:1. Above S9, however, each division represents a 10-dB power increment, usually up to 60 db above S9. A power change in dB (decibels) is equal to 10 times the logarithm of the power ratio and is easily computed or looked up in a dB table. But for our purposes, it is only necessary to know that 10 dB represents a 10:1 power change, and 6 dB represents a 4:1 power change. Consequently, a 10 dB over S9 signal is 10 times as strong as an "extremely strong" signal, a 20 dB over S9 signal is 100 times as strong, and a 60 dB over S9 signal is a million times as strong as our mythical extremely-strong signal. Every amateur a millionaire!

In spite of its inaccuracies, the S meter can be a useful tool. If an antenna or transmitter adjustment produces a change on the S meter of the cooperating station, the adjustment has undoubtedly affected your signal. But, only if you know the particular S meter and the operator reading it, can you tell how much the effect really is. Also, while a single S-meter report does not mean a great deal, keeping a record of the reports over a period of time can give you a reasonable picture of the radiation pattern of your antenna.

Incidentally, the inflated signal-strength reports that many amateurs give may help some amateurs who are puzzled over their difficulties in making as many contacts as they think they should in view of the good reports they get when they do make a contact. Unless there is some unsuspected defect in their operating procedures, the chances are good that their good reports are based more on imagination than on fact.

To put the above discussion in focus and to give you a true indication of the value of transmitter power, the following comparisons may be helpful: If a 75-watt transmitter gets an S7 report, raising its power to legal amateur maximum of 1000 watts will boost the signal to S9, while dropping the power to five watts—the flea-power "kw"—will drop the signal strength to S5.

RST Signal Reporting System

Readability

R1—Unreadable
R2—Barely readable; occasional words readable
R3—Readable with considerable difficulty
R4—Readable with practically no difficulty
R5—Perfectly readable

Strength

S1—Faint; signals barely perceptible
S2—Very weak signals
S3—Weak signals
S4—Fair signals
S5—Fairly good signals
S6—Good signals
S7—Moderately strong signals
S8—Strong signals
S9*—Extremely signals
S9*—Extreme signals

Tone

T1—Extremely rough, hissing note
T2—Very rough a.c. note, no trace of musicality
T3—Rough, low-pitched a.c. note; slightly musical
T4—Rather rough a.c. note, moderately musical
T5—Musically modulated note
T6—Modulated note; slight trace of whistle
T7—Near d.c. note; smooth ripple
T8—Good d.c. note; just a trace of ripple
T9—Purest d.c. note

*Some operators substitute the letter "N" for the "9". When the signal have the stability of crystal control, the report may be followed by "X". "C" indicates a keying chirp; and "K" indicates a keying click. Sample report: RST579X means your signal is perfectly readable, is moderately strong, and has no trace of ripple or instability.

Table I—RST signal reporting system.

More on the ½-wavelength Square Antenna

Gerald Jones, WN9NEY, asks how to reduce the standing-wave ratio (s.w.r.) on the transmission line feeding the ½-wavelength square antenna described in the December, 1973, column when the loading coils are used. The coils increase the efficiency of the antenna appreciably, but they also increase the line mismatch from low to high. One solution to the problem is to feed the antenna via an air-insulated, parallel-conductor transmission line and an antenna coupler or "transmatch," such as sketched in Fig. 1. Alternatively, the coupler may be placed right at the antenna, between the antenna and a coaxial transmission line. The latter arrangement is particularly convenient in an outdoor installation, in which the coupler is easily reached for adjustment.

Incidently, as far as we know, the first amateur mention of 1/2-wave loop antennas was by the late John Reinartz in *QST* for October, 1937.

News and Comment

Ed Kirchhuber, K4JK, 3958 Tanglebush Lane, Huntsville, Ala. 35810, encourages more experienced amateurs to join him in working Novices. Doing so helps the Novices from falling into bad operating habits caused by only working other Novices. Ed spends a part of almost every operating day working Novices, and he has just earned his Novice WAS (Worked All States) award to prove it. As we have stated before, working Novices in the 50 states is a real achievement, for any class of licensee, especially if he holds his transmitter power to the Novice 75-watt limit. . . . From the LERC Amateur Radio Club Bulletin: the club's next 10-week Novice class will start June 3, and the next General-class course starts August 19. Pre-registration, the sooner the better, is required for eithcer. Write to LERC Tmateur Radio Club, 2814 Empire Ave., Burbank, Calif. 91504.

Stephen J. Momot, K3HBP, 14 Balsam Road, Wilmington, Delaware 19804, got his start in amateur radio via help received through one of our earlier columns and offers to return the favor for any of today's newcomers. Steve's station is now a Tempo-One transceiver feeding either a Hy-Gain-14AVQ vertical antenna or a 15-meter, homebrew bamboo quad. He is trying to work Novice WAS and needs Hawaii, WH6; Alaska, WL7; New Mexico; South Dakota; and Nevada. Ninety percent of the stations he works tell him he is their first Delaware contact, and he has just received another 1000 QSL cards to take care of the demand. . . . Speaking of old timers, one of the first to welcome the return of the NOVICE SHACK to *CQ* was Ev Taylor, W6DOR/W7BYF, 2921 Loyola Dr., Davis, Calif. 95616. Ev used to write many articles describing equipment of interest to new amateurs. These days, he spends most of his spare time grinding crystals for radio amateurs.

Will we read your letter or see your picture in the next Novice Shack? Black and white pictures are preferred, but color pictures are also welcome. Send mail to: Herbert S. Brier, W9-EGQ, Novice Shack, 385 Hohnson St., Gary, Ind. 46402.

73, Herb, W9EGQ

DX

BY JOHN A. ATTAWAY,* K4IIF

Parlin Wins 20 Meter S.S.B. Plaque

THE DX Department is pleased to announce that the first Single Band WAZ Award on 14 mHz s.s.b. has been won by Robert G. "Bob" Parlin, WØSFU, of Minneapolis, Minnesota. This is only the second single band award to be issued in this new series, the first being on 14 mHz c.w. by W8WZ as announced in the January, 1974 issue. As it is the first on 14 mHz s.s.b. it win's Bob a handsome plaque.

The first contacts by WØSFU in his quest for Single Band WAZ took place on Jan. 1, 1973, starting date for the new awards when he worked KØMAS in Zone 4 and 6Y5AH in Zone 8. His final contact was on July 2, 1973 with KJ6DI in Zone 31. In Zone 23 he worked JTØAE on April 9, 1973, while his Zone 18 and 19 contacts were with UA9VB, April 9, 1973 and UWØIE, March 18, 1973, respectively. In tough Zone 34 he snared ST2SA on April 3, 1973. Those early April days were great for the rare zones.

Both 20 meter plaques have now been won, but still up for grabs are 8 other plaques destined for the first winners on c.w. and s.s.b. on 10, 15, 40 and 80 meters.

A Personal Note

It's said that happiness is going up the ladder, not down, but after 7 years as DX Editor I have stepped back to Assistant DX Editor and frankly I'm enjoying myself. Though increased responsibility on my job prevents me from spending the time necessary to do the DX Editor's job, I am privileged to continue management of WAZ and to write an occasional column without these relentless monthly deadlines and it's delightful. Jerry Hagen, WA6GLD, is now top man and I feel sure the DX world will give him the same warmhearted support it has given me. One day, perhaps Jerry and I will swap back again. Meanwhile, the many letters wishing me well are deeply appreciated.—John, K4IIF

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

Bob Parlin, WØSFU, winner of the first Single Band WAZ Award for 14 mHz s.s.b.

DX Hall of Fame

After a lapse of several months, the CQ DX Awards Advisory Committee has been called on to consider further nominations to the DX Hall of Fame, and by a unanimous ballet have selected the late E. T. (Ernest) Krenkel, RTEM, of the Soviet Union to membership.

Ernest Kronkel was a "legend in his own time" among radio amateurs of all nations, and could be considered the father of amateur radio in the U.S.S.R. First licensed in 1926, Krenkel introduced short wave radio to the arctic from station PGO (Polar Geographical Observatory) in 1927. PGO's 300 watts made regular QSO's

The WAZ Program
Single Band WAZ

20 Meter S.S.B.

WØSFU......1

S.S.B. WAZ

1161......K5CIT/KH6	1166......K7DVK
1162......OK3YCE	1167......SM7DBD
1163......JR1BFT	1168......SM4CAN
1164......VE7BJR	1169......DU2EL
1165......KH6CCL	1170......W6AFI

C.W.—Phone WAZ

3638......K4ZYU	3648......SMØOY
3639......OK3KGQ	3649......SM7JZ
3640......SP6TQ	3650......SL3BG
3641......SP6BFK	3651......SM3BZW
3642......LA7QI	3652......DJ1YF
3643......WØDAD/KH6	3653......DLØMC
3644......K7DVK	3654......PAØABM
3645......SM5AYY	3655......LU2EN
3646......SM6BDW	3656......JH1BAY
3647......SM7BBV	

Phone WAZ

493......DL9DY

Complete rules for the Single Band WAZ program are shown on pgs. 57-58 of the December, 1972 issue. Complete rules for regular WAZ may be found on pgs. 64-66 of the June, 1970 issue. Application blanks and reprints of the rules for 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.

with the amateurs of most countries. In 1930 he remained on Franz Josef Land for the entire winter during which he worked many countries, and in addition maintained regular contact with Admiral Byrd's expedition to the antarctic, the first arctic-antarctic short wave radio contacts. After that winter he became very active with his home call EY2EQ.

During the early '30's Krenkel participated in several other exploratory operations in arctic waters, and in February, 1934 he was aboard the ill-fated *Cheluskin* which was crushed by ice. He remained aboard the stricken ship for 2 months to maintain radio contact with land based rescue stations which permitted the rescue of the entire crew. Krenkel was the last man to leave the

Geoff, VS6DA, operates the DX bands plus 6 and 2 meters from this neat layout in Hong Kong. Geoff is a Captain for Cathay Pacific Airways. *(Photo via W5KZN)*

ship, and in recognition of this exploit he was awarded the Order of the Red Star and the *Cheluskin's* call letters, RAEM, were awarded to him for his own personal call for life.

RAEM's major contributions to DX were in 2 areas. First, there were the many contacts he made personally from Franz Josef Land and other rare arctic locations including his efforts as QSL Manager for the Soviet Arctic stations. This activity literally spanned several decades. Secondly were his efforts in securing rare UA QSL's for amateurs all over the world. A note to Ernest would usually bring results when all else had failed.

Among other amateur radio accomplishments, Krenkel was instrumental in the establishment of the Central Radio Club of the U.S.S.R. and headed that organization until his recent death. During his 45 years as an active amateur he made more than 50,000 QSO's with amateurs of all continents. He took an active part in the work of the IARU (International Amateur Radio Union) and participated in IARU conferences held in Malme, Opatia and Brussells.

The WPX Program

Mixed	C.W.
420—WB2FMK	1295—W1OPJ
421—EA3JK	1296—JH1PEZ
422—I4CSP	1297—K4YBE
423—SP6PZB	1298—JA1JKG

S.S.B.	WPNX
781—JR1BFT	67—WN8PFG
782—WA1JMP	68—WN9IVC
783—OZ5EV	69—WN4BPM
784—JY3ZH	
785—DJ6XG	

WPX Endorsements

Mixed: 1000—WA6MWG, 900—W3GJY, 800—JA1AG, 700—W2MB, W3YHR, 650—KN7NHG, 500—VK4KX, W6ANB, 450—WB2FJX, I4CSP.

C.W.: 750—YU1SF, 700—SP3DOI, WA6MWG, 650—JA1AG, 550—DJ3LR, 500—WA2HZR, 350—JA1JKG.

S.S.B.: 1000—IØAMU, 750—I8AA, 650—XE1J, WB2NYM, 600—WA2EAH, 450—K2AAC, W6TTS, 400—DJ6XG, 350—JR1BFT, JY3ZH.

WPNX: 150—WN4VGZ.

VPX: 450—WDX5FEB.

40 Meters: WA2EAH.

15 Meters: IØAMU, XE1J, JR1BFT.

10 Meters: XE1J.

Africa: SM4—3434, WB2NYM.

Asia: WB2NYM.

Europe: OE1—101171, JH1CXQ, W7KOI.

Oceania: WB2NYM.

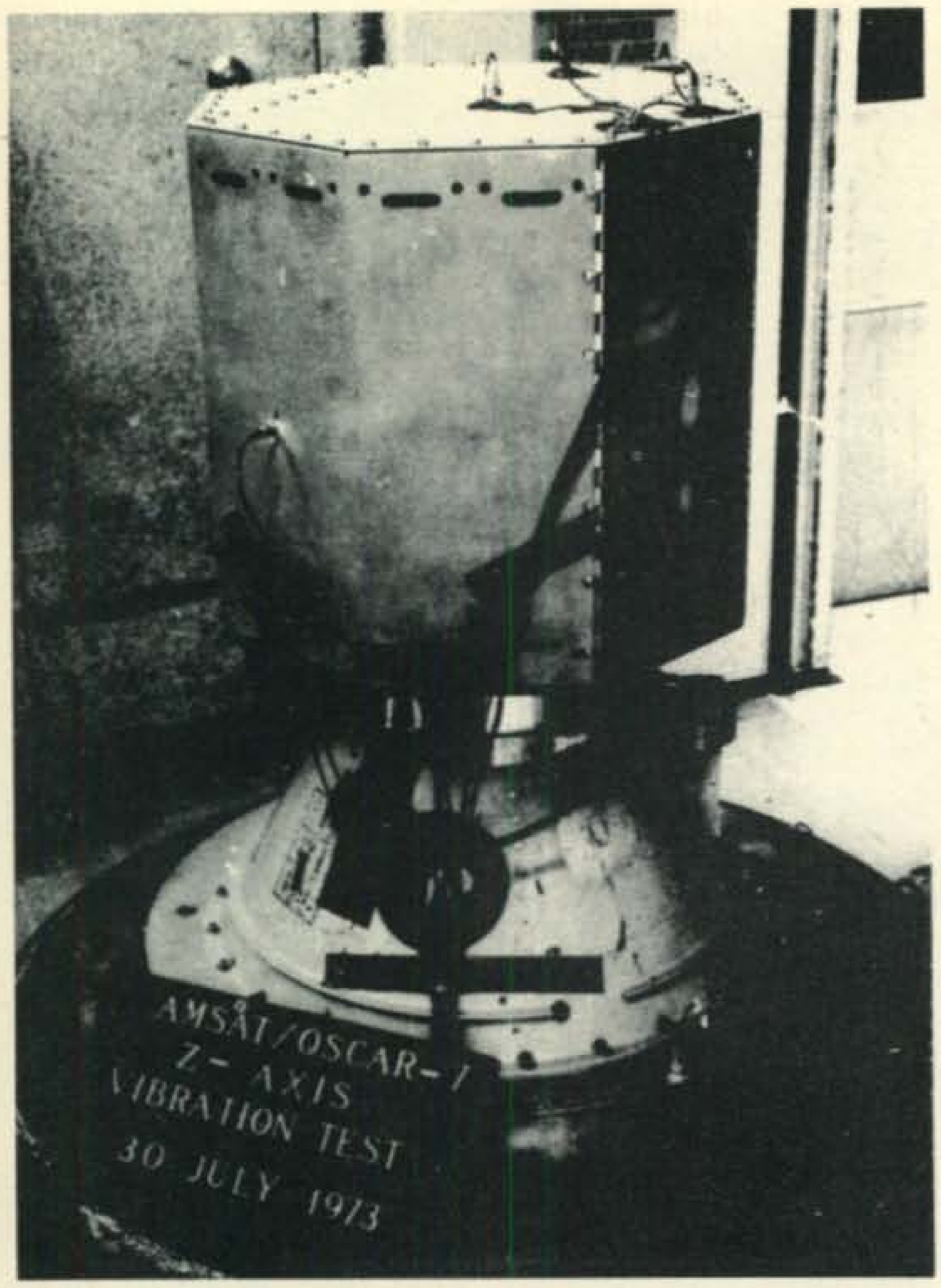
South America: WB2NYM.

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

De Extra

The "Wave of the Future" in DX?—The rapid increase in DX operation by satellite is of

This is Rubens, PY2OB, who has one of the outstanding DX signals from Santos, Brazil—helped along by a six-element beam atop a high apartment building. Photo by W2LEJ on a recent visit to PY-land.



This photo depicts a prototype of Oscar 7. The Oscar 7 satellite which followed has provided many DX contacts for the new breed of VHF-DXers. *(Photo via VERON VHF Bulletin)*

great interest. According to a recent article in *Long Skip,* published by the Canadian DX Association, OSCAR 6 was used by 1400 amateur stations during its first 10 months of operation. About half of these were U.S. stations. At that time, the 40 pound spacecraft had completed 4500 orbits and was providing contacts up to 5000 miles with its 1 watt repeater which transmits 10 meter output from 2 meter input. Many regular users have reported contacts with dozens of countries on 3 continents. Amateurs in 64 countries have reported using the satellite.

In the spring of 1974 OSCAR 7, with a projected lifetime of 3 years, will be launched. This new spacecraft will be an international effort in

Left to right: Tom French, KG6JBG, Tom Newberry, WA9HHJ, and Joel Chalmers, K1MTJ at the shack of the club station on Guam. *(Photo via KG6JBG)*

the best spirit of amateur radio and DX. The telemetry encoder and command decoders will be from Australia; structure, power systems, antenna and 432—144 mHz repeater from Germany; the 435 mHz beacon will be Canadian and a 144—28 mHz repeater and other systems will be from the United States where the satellite will be launched.

If you haven't given satellite operation a try, just listening on 29.450-550 is a start. In some ways its the same ball game, but in many ways it isn't. You will have a lot of new concepts and terms to learn including switching stations, switching schedule, ascending orbits, descending orbits, telemetry, Doppler, etc.

For interested DXers, the *DX* and *VHF bulletins* published by V.E.R.O.N., the Netherlands Amateur Radio Society, are very helpful. Subscribers should contact V.E.R.O.N. at P.O. Box 1166, Arnhem, The Netherlands. *CQ* provides an endorsement to the CQ DX Award for countries worked via satellite. For complete details contact DX Editor Jerry Hagen, WA6GLD, P.O. Box 1271, Covina California 91722.

Rare and Special Prefixes

CV—Special prefix used by stations in Uruguay for contest operation.

DF2—DF2GX was heard on 14217 at 1535 GMT.

DM8—DM8HAM operated from a GDR ham meeting in Leipzig.

DT2—DT2AND reported on 14040 at 1315 GMT.

FB8—FB8WA is a new operator on Crozet Island.

HG5—HG5A, 7003 kHz at 1825 GMT in Europe.

HG8—HG8U heard on 14072 at 1615 GMT.

HKØ—HKØAA from Baja Nuevo in December by WAØVPK, WBØANT, WAØMHJ, KZ5PW and HK3BAE. QSL to WAØVKP, 4117 Thomas Ave., Minnetonka, MN 55343.

HW—Special prefix used by French amateurs to celebrate the first 50 years of transatlantic communication by amateurs. French station 8AB worked U.S. station 1MO in November, 1923.

KF2—KF2NYS operated from the New York State Fair. QSL to WA2AYC.

KH4—KH4NCA, on Dec. 15-17, 1973, commemorated the 70th anniversary of the Wright Brother's flight in 1903 by operating from Kitty Hawk, N.C. QSL to K4CIA.

ON5Ø—Several Belgian stations used the ON5Ø prefix during the *CQ* contest to commemorate the 50th anniversary of amateur radio in Belgium.

P2A-P2Z—New callsign block allorated to Papua and New Guinea by the ITU.

S6A-S6Z—New callsign block allocated to Singapore by the ITU.

WPX HONOR ROLL

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

MIXED

W4LRN 1275	ON4QX 930	I6SF 862	IØJX 803	PY4AP 735
F9RM 1053	W8ROC 929	W9FD 860	W6ISQ 803	KØBLT 733
VE3GCO 1030	W3GJY 918	WØAUB 856	WAØKDI 790	WA6EPQ 713
WA6MWG 1015	YU1AG 906	YU2DX 855	K6SDR 780	PAØVB 706
W8LY 1013	W6TCQ 904	W4IC 850	JA1AG 765	W6NJU 706
W2NUT 982	K1SHN 893	G3DO 849	SM7TV 752	WA2EAH 700
W3PVZ 982	DL1MD 892	WB4KZG 830	K2ZRO 751	W9ZTD 700
DJ7CX 960	W4BQY 889	W4BYU 824	K8UDJ 750	WAØCPX 693
W4CRW 948	W4WSF 877	K2AAC 823	CT1LN 749	W8GMK 683
PAØSNG 943	DL1CF 872	W9WHM 811	WA5LOB 749	WA6JVD 668

C.W.

W8LY 1001	W9FD 802	K2AAC 716	WA6JVD 657	W6TCQ 604
W8KPL 955	WB2FMK 770	K1SHN 715	SM5BNX 652	VE4OX 600
DL1QT 900	K7ABV 755	YU1AG 715	W4IC 652	OK2QX 600
W2HO 885	G2GM 749	OK2DB 693	K2ZRO 635	
ON4QX 835	W4BYU 744	VO1AW 681	K1LWI 629	
W2AIW 813	DJ7CX 730	I6SF 676	W8GMK 628	
VK3AHQ 809	WA6MWG 719	W6ISQ 666	W3ARK 620	

SSB

W4NJF 1100	I8KDB 873	G3DO 765	W6RKP 725	WA6TAX 615
F9RM 1000	HP1JC 851	IT9JT 762	OK1MP 715	CR7IK 613
IØAMU 957	I0ZV 827	W3DJZ 761	W6TCQ 709	I4LCK 608
CT1PK 930	PA0SNG 824	I4ZSQ 753	YU1AG 689	
W9DWQ 917	WØYDB 819	W4IC 750	ZL3NS 685	
DL9OH 911	DL1MD 805	WA5LOB 747	I8YRK 662	
K2POA 883	F2MO 780	K1SHN 737	WB6DXU 656	

SJ9—SJ9WL operated during the *CQ* contest froc the Norwegian-Swedish border area. QSL to the SM bureau.

ZP4—ZP4AB reported on 14300 at 1515 GMT.

4L0—4LØK was a special station commemorating the 70th Anniversary of the birth of E. T. Krenkel, RAEM, founder of the Central Radio Club of the U.S.S.R. and a member of the *CQ* Hall of Fame. QSL to Box 88, Moscow.

The CQ DX Award Program

C.W. DX

139—VK4KX
140—WA1JMP
141—SM7EH
142—K7NHG
143—W8KPL

S.S.B. DX

314—W7BRU
315—WA1JMP
316—GI3ZSC
317—VE7HP
318—W2CNQ
319—K7NHG
320—SM6CWK
321—K4MQG

Endorsements

C.W.: 300—ON4QX, W8KPL, 200—VK4KX, 150—SM7EH, K7NHG

S.S.B.: 310—K4MQG, 300—W2CNQ, SM6CWK, 275—VE7HP, 250—W4WSF, 200—W6YVK, W7BRU, 150—WA1JMP.

28 mHz: K4MQG

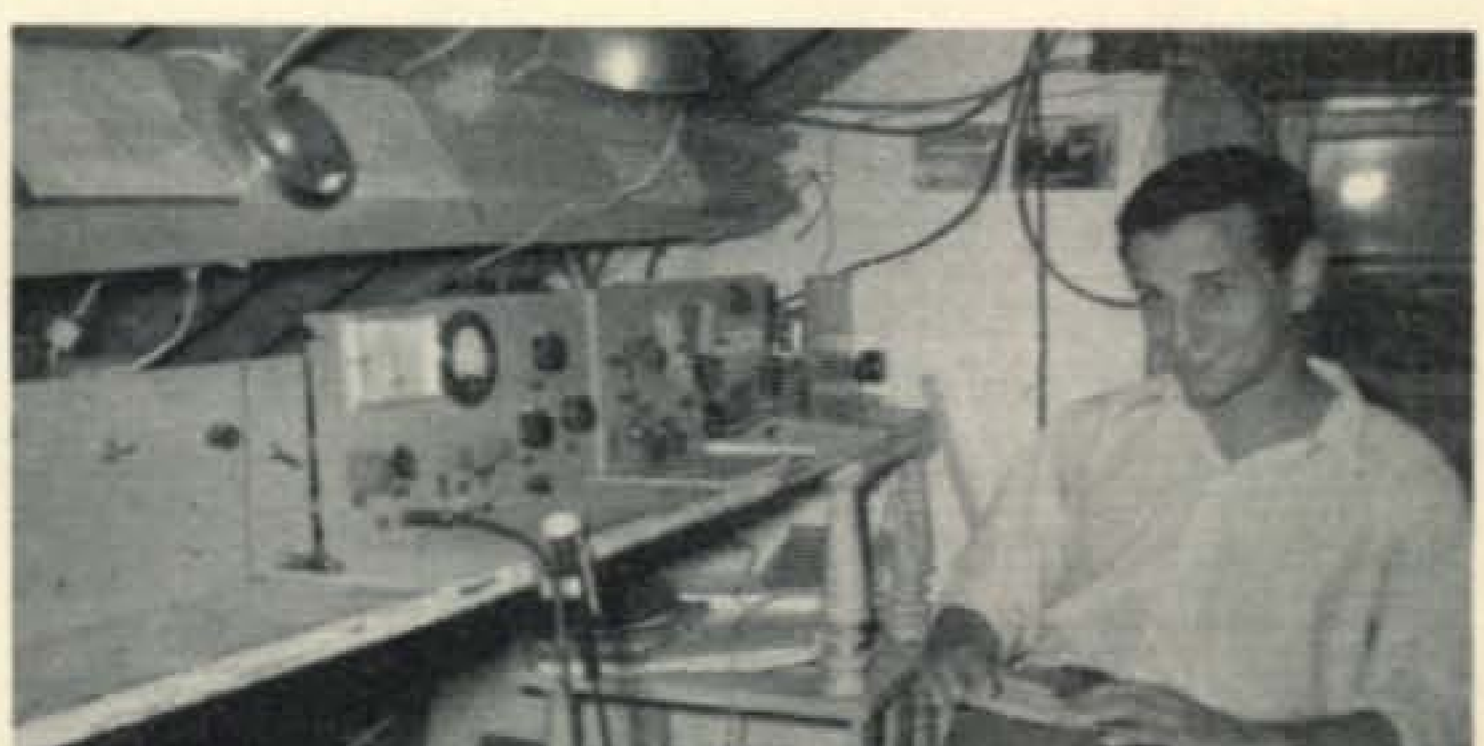
3.5/7 mHz: K4MQG

Complete rules 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.

The Northern California DX Foundation

The Northern California DX Foundation (NCDXF) is a new organization recently formed for the purpose of encouraging activity and growth in all phases of amateur radio. Specific areas of interest include the assistance of DXpeditions to rare countries, counties, v.h.f. locations or whereever 2-way communications may be out of the ordinary or of unusual interest; sponsorship, financial or otherwise, of those who can make significant contributions to

[*Continued on page 90*]



Jorge H.A. Da Costa, CT2BA, of San Carlos, Terceira, Azores. Jorge's rig includes a homebrew transmitter with a BC-348 receiver. *(Photo via Jake, CT2AZ)*

THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll
All Counties

#114—Earl H. Harrison, K9UTI, 1-10-74.
#115—Avis E. Miracle, W8WUT, 1-10-74.

USA-CA HONOR ROLL

3000		2000		500	
K9UTI	135	W8WUT	197	W2SDU	986
W8WUT	136			K9PBV	987
2500		1500		WA4AUL	988
K9UTI	168	W8WUT	239	K3VQO/	
W8WUT	169			K3WAZ	989

THE April, "Story of The Month," as told by "Lou":

Myron L. Braun, K8IQB
(All Counties #98, 3-8-73)

"Although I was born in Elyria, Ohio, in 1923, little of my early life was spent there. In 1924 I was adopted by another family and I lived in the Lorain, Ohio area during school time. My summers were spent in the Texas-Mexican border area, around and south of Del Rio, Texas.

"In the early 1900s my step-father was associated with John Nance Garner (Cactus Jack later became Vice-President), as a newsboy on the Southern Pacific trains. In 1937 our home was made in Bellevue, Ohio, where I still live in the same house.

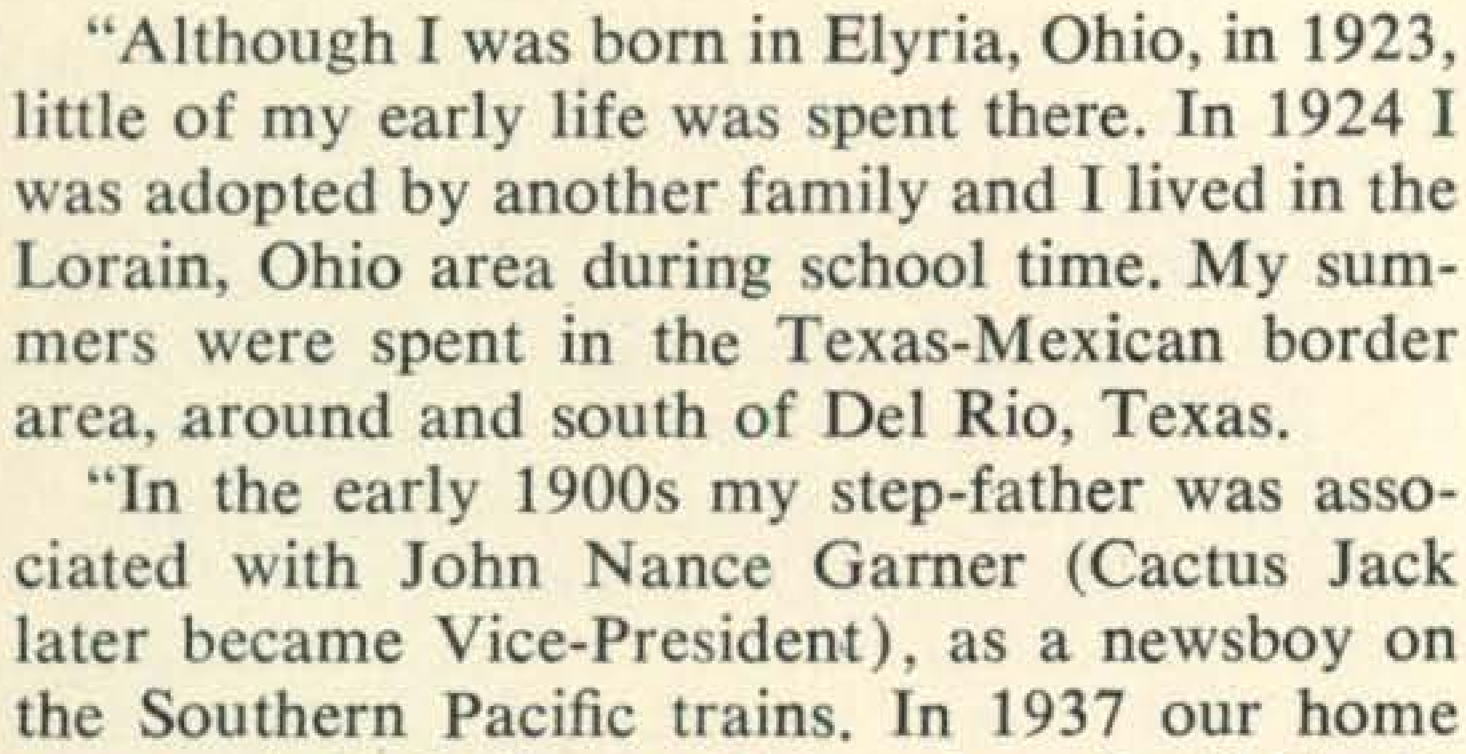
"In 1938, a friend and neighbor took me down to his office at the railway depot and got me started on railway telegraphy. Being still in High School, I could not pursue this as avidly as I would have liked, but I got into quite some difficulty with the city administration, when they promptly notified me that a "private telegraph line" across a city street (and on city light poles, no less) was, to put it mildly, extremely illegal. Quick removal of same, would stop prosecution. At the same time, of course, I was considered 'really lazy' cause everytime the lawn needed mowing, it was more fun to have one or both ears glued to one of those old shortwave receivers, or be working on fixing up somebody's radio.

"After graduating from High School in 1941, a course in engineering was begun at Ohio State University, but was interrupted when all of a sudden I found myself on a Royal Air Force emergency strip at the eastern most point in all of Great Britain. In late 1942, the 'Yanks' took over some of the Air Force duties in England and an American uniform was put on, although the Air Sea Rescue work remained the same under the new management.

"After getting away from the service in February 1946, and going in and out of the V.A. Hospitals for a period, I at last went to work on the railway and am still there. My hamming did not seriously resume until 1957, when I started working on the code again.

"In early 1963, K8CIR, K9UTI, W5EHY, and several others got together with me in the 7223 slot, forming what we then called a "loosely knit net for mobiles." This was the beginning of the County Hunters Net, such as it was. We were all on forty for a few years and then I started working on my DX records and eventually wound up where I am now, with some 180 + countries. For several years I worked on this and then met some of the County Hunters who were rag chewing on 15, where I renewed some really old acquaintances and thereby got working on

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



Lou Braun and equipment of Lou & Dorothy at K8IQB/WA8QQM.

20, on the net. There were then two Nets on 20 and they were cooperating rather closely, at that time, and you could get counties on either or both of these nets, but the cooperation did not last long, but I did stay on 20.

"During much of the time I was on the different nets, the XYL, Dorothy, WA8QQM, was very patient—even though she wanted to do some operating, but she stood by while I continued to get 'just one more county.'

"All the county hunting I did would not have been possible without the mobiles and the splendid cooperation of the so very many who contributed their all to the net and the net controls. Especially, I would like to express my gratitude to WA9PRE who went on that long trip for me and wound up the whole ball of wax.

"My future plans?? Well, I have liked to build s.w.r. bridges, power supplies and many other small items so useful around the shack. This I plan to do again, and this would not be possible unless I go to some of the many auctions where I pick up the various and assorted items of junk and parts, which go to make up these kits and units.

"Oh yes, the XYL *may* get to use 'our' rigs a little more now. I certainly am going to continue to talk and visit with some of the kids (like me), who are on the Nets and help out where I can."

Our records show that Lou first applied for USA-CA-500-#222, endorsed, Mixed, All SSB, All 7, All 14, All 75 and All Mobiles on April 14, 1963 and finished them *All* March 8, 1973.

Awards Issued

Earl Harrison, K9UTI finally got around to applying for USA-CA-2500, 3000 and for them *all*, endorsed All Phone. Earl has been an inspiration to County Hunters for years and has passed out a lot of counties while mobile.

Avis Miracle, W8WUT had much fun over the years County Hunting, also giving out many counties while mobile. She finally decided she must work them *all* and did so, even though she had some problems (like we all do) getting QSLs. Avis cleaned them up and was issued USA-CA-1500 & 2000 All 14, All S.S.B., All Mobile; USA-CA-2500 All S.S.B., All Mobile; USA-CA-3000 All Phone and Mixed All Counties.

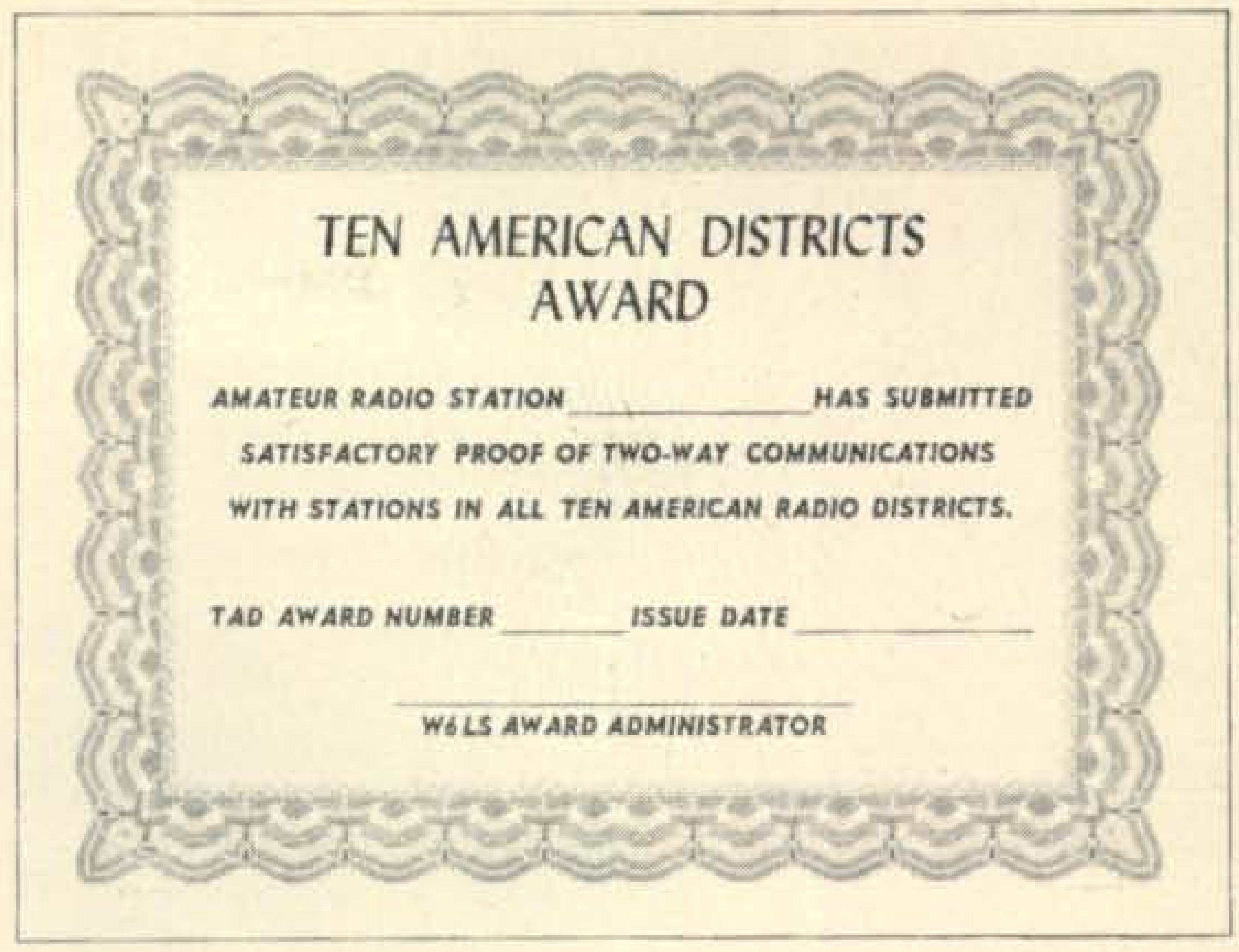
Bob Margolin, W2SDU was issued USA-CA-500 endorsed All 14, All S.S.B., All Mobiles.

Mixed USA-CA-500-Awards went to:

Gari J. Berliot, K9PBV,
Kenneth Distel, WA4AUL,
Joseph Hemler, K3VQO/K3WAZ.

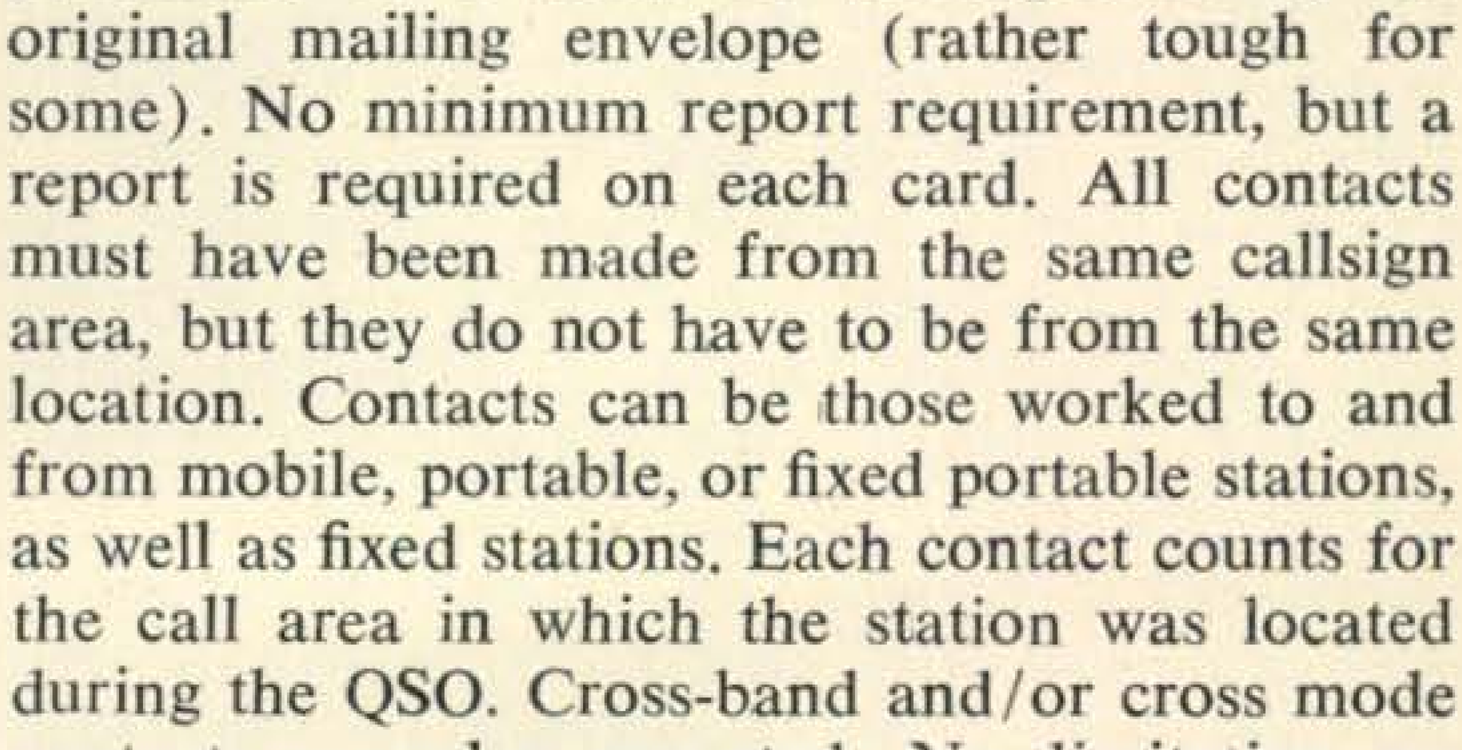
Awards

Ten American Districts Award: The Lockheed Amateur Radio Club (W6LS) is pleased to announce the availability of the TAD Award. This award is intended to be an added incentive to those who have not yet worked all states, such as American Novices and DX Amateurs. The

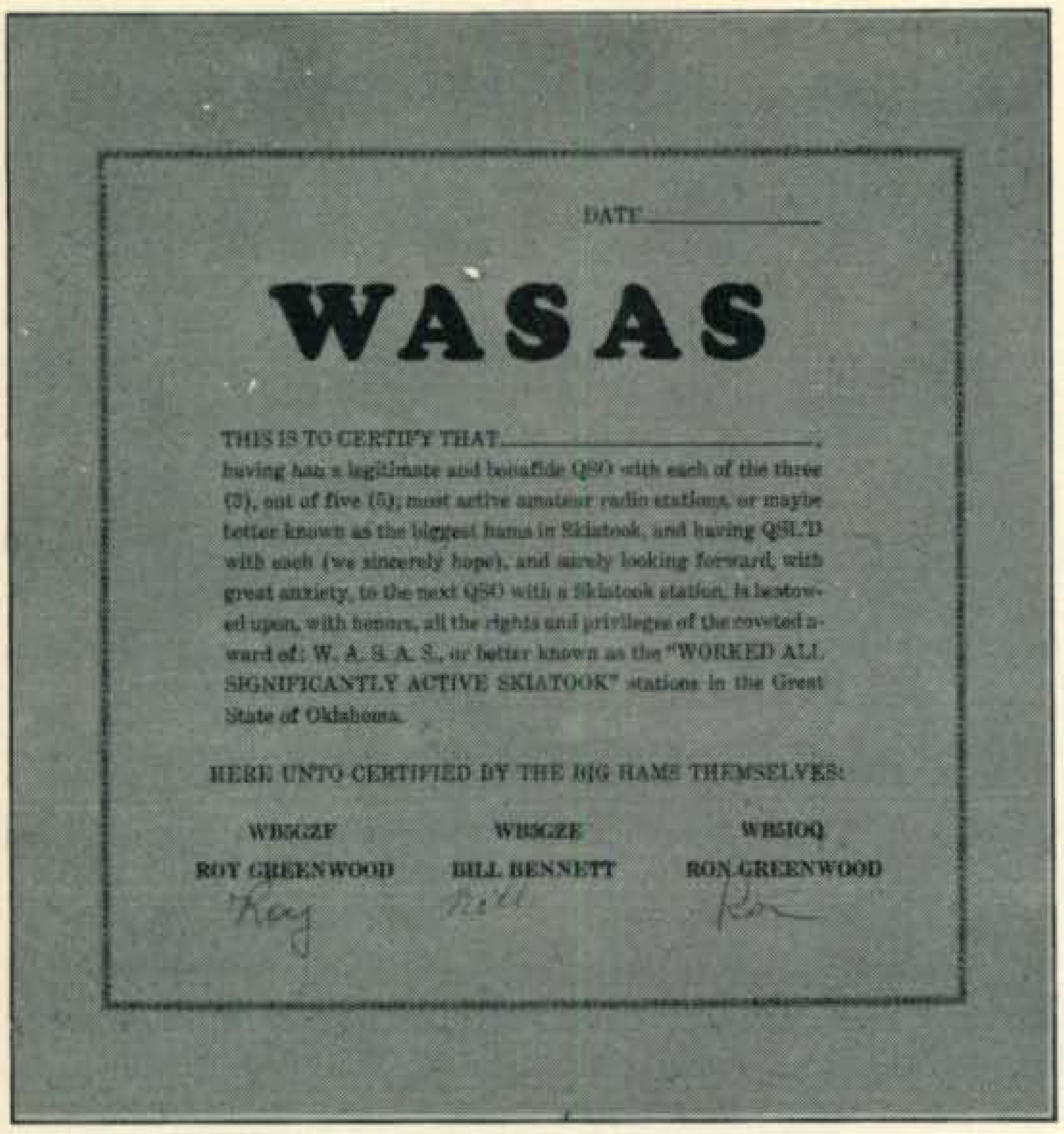


Ten American Districts Award.

TAD award is available to all American and DX licensed amateur and amateur clubs. Confirmation cards must be submitted as proof of two-way contacts with each of the ten USA amateur radio call districts (1 thru Ø, and Hawaii counts as the 6th, and Alaska counts as in the 7th district). Each QSL must show bureau marking of postmark, or it must be accompanied by its original mailing envelope (rather tough for some). No minimum report requirement, but a report is required on each card. All contacts must have been made from the same callsign area, but they do not have to be from the same location. Contacts can be those worked to and from mobile, portable, or fixed portable stations, as well as fixed stations. Each contact counts for the call area in which the station was located during the QSO. Cross-band and/or cross mode contacts are also accepted. No limitation on dates of QSOs. There are no stickers or endorsements for one-band, code, voice, RTTY, SSTV, QRP or any other operating distinction. If interest warrants such stickers, they will be made available at some future date. If your call sign changes, previous contacts do count as long as you made them from the same radio callsign area. Application must be accompanied by the QSLs and one dollar to pay award and postage costs. IRCs can be used to pay such costs. All



Slovensko Diploma.


DATE ______

WASAS

THIS IS TO CERTIFY THAT ______, having has a legitimate and bonafide QSO with each of the three (3), out of five (5); most active amateur radio stations, or maybe better known as the biggest hams in Skiatook, and having QSL'D with each (we sincerely hope), and surely looking forward, with great anxiety, to the next QSO with a Skiatook station, is bestowed upon, with honors, all the rights and privileges of the coveted award of: W. A. S. A. S., or better known as the "WORKED ALL SIGNIFICANTLY ACTIVE SKIATOOK" stations in the Great State of Oklahoma.

HERE UNTO CERTIFIED BY THE BIG HAMS THEMSELVES:

WB5GZF	WB5GZE	WB5IOQ
ROY GREENWOOD	BILL BENNETT	RON GREENWOOD
Roy	Bill	Ron

WASAS Award.

correspondence should go to Lockheed Amateur Radio Club, 2814 Empire Avenue, Burbank California 91504, U.S.A.

WASM-RTTY: This Worked All SM RTTY Award is offered by Sveriges Sandarematorer (SSA). It may be claimed by any amateur in the world. All applicants shall work two different stations in each of the eight Swedish call areas (SM1, 2, 3, 4, 5, 6, 7, Ø) on two different amateur bands (total 16 contacts) using RTTY. Contacts may be with SM, SL and SK call signs. All stations worked have to be land based. All contacts must be after January 1, 1967 and may be made using any authorized amateur band and must be two-way RTTY. Applicants must submit documentary proof, QSL cards or other written evidence. The cost is 10 SKR or 2 US dollars or equivalence in other currency. Send to: SSA RTTY Manager, SSA, S-122 07 Enskede 7, Sweden. This data from the *SARTG News*, edited by Lennart, SM6AEN.

WASAS Award: This *W*orked *A*ll *S*ignificantly *A*ctive *S*kiatook Award being mor ehumorous than serious, should be printed in the April issue. Although Skiatook, Oklahoma has put 2900 people, there are 5 hams there. Roy, WB5GZF; Bill, WB5GZE; and Ron, WB5IOQ are active 80 thru 10 meters—the other two amateurs are on 2 meters. So when you work those three, send along a request and s.a.s.e. to Ron Greenwood, WB5IOQ, Rt. 2, Box 45-B, Skiatook, Oklahoma 74070.

Slovensko Diploma: This multi-colored certificate is issued by the OK3 DX Club to any licensed radio amateur station for confirmed contacts on the amateur bands with different districts of Slovakia (OK3, OL8, OL9 and OLØ call areas) since 1 January 1946, regardless of mode or frequency. Stations in HA, OE, SP and UB need 35 different districts. Stations in the rest of Europe need 20 different districts. DX stations need 10 different districts. TWO-WAY contacts with any fixed, portable, mobile, regular, special and occasional station transmitting on the territory of Slovakia are valid. Applications must include a list showing call signs, dates of contacts and locations of stations worked, certified according to QSL cards by amateur radio society/club or by two licensed radio amateurs, subject to sponsor having right to ask for any card as a check. (Note—this is GCR list, as explained under my Notes). Applications together with 5 IRCs must be submitted to: Center Radio Club, P.O. Box 69, 113 27 Praha 1, Czechoslovakia.

Districts of Slovakia (Slovensko)

Banska Bystrica	Liptovsky Mikulas	Spisska Nova Ves
Bardejov	Lucenec	Stara Lubovna
Bratislava*	Martin	Svidnik
Bratislava-vidiek**	Michalovce	Topolcany
	Nitra	Trebisov
Cadca	Nove Zamky	Trencin
Dolny Kukin	Poprad	Trnava
Dunajska Streda	Povazska Bystrica	Velky Krtis
		Vranov
Galanta	Presov	Zvolen
Humenne	Prievidza	Ziar nad Hronom
Komarno	Rimavska Sobota	
Kosice*		Zilina
Kosice-vidiek**	Roznava	
Levice	Senica	

*City District
**County Dist.

(For identification of any stations district, send data, IRC to OK3BG, via Central Radio Club).

Notes

After receiving some flak from ARRL regarding the certificate purportedly issued to W1AW for working five Naval Research Lab stations, pictured on page 71, Nov. '73 *CQ*, a check was made. Fortunately or unfortunately (depends on where you stand) some of the personnel behind this program have retired and changed QTHs, so there was some delay in getting the facts. And yes, ARRL was correct, no such Award was actually issued to W1AW—sorry we confused you. A sample Award was prepared, using the famous W1AW call, and by error it was sent to me. As thousands of U.S. stations have worked W1AW, I was not surprised that 5 of the 120 club members of NRL had worked W1AW, but all admit it was in error.

As I get letters from time to time asking what is GCR, here is the data. GCR means General Certification Rule: A sponsor accepts certification by one Radio Club Official, or two General class (or higher) licensed amateurs, or a Notary Public or similar official authorized to certify documents, to the effect that claimed QSLs are in hand. The sponsor reserves the right to require any or all cards be submitted in case any ques-

[*Continued on page 91*]

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Convenient and economical are the words for CQ's beautiful maroon and gold binders. Individual issues can be removed quickly and easily without damage to the magazine. Save precious time as reference copies are within immediate reach in this handy binder. $5.00

The New RTTY Handbook
A treasury of vital and "hard-to-get" information, this book is loaded with valuable equipment schematics, adjustment procedures, etc. A boon to beginner and pro. A special section on getting started, written by Byron Kretzman, W2JTP, a well-known authority in the field. $3.95

Antenna Roundup I
Edited by Art Seidman, a 160 page mass of antenna information directed at answering a multitude of questions surrounding the mysterious antenna. $3.00

Antenna Roundup II
Ten big theory articles backed up by 82 detailed and illustrated construction projects from VLF to microwave, long wires to 17 element beams and Sterba Curtain arrays. $4.00

Shop & Shack Shortcuts
A volume packed with hundreds of hints & shortcuts collected by Don Stoner, this will help anyone to dress up his shack, improve shop techniques and increase efficiency and equipment. $3.95

Antenna Handbook I
All new information on transmission line theory, Attenuation, Impedance, Standing waves, Resonant and nonresonant lines, current distribution, free space 3 dimensional patterns of long wires of all practical length and much, much more by Ken Glanzer. $4.00

The New DX Handbook
Don Miller's 200 pages of valuable technical information and operating aids, most of which has never been published before and can be found in no other volume contains Great Circle Bearing Charts. $5.00

CQ Anthology II
1952-1959 250 pages of more recent but still hard-to-get important articles from glorious yesteryear. $3.00

Surplus Conversion Handbook
Compiled by Tom Kneitel, WB2AAI, this contains 192 pages of conversion articles, covering almost every piece of surplus gear worth the effort to convert to ham use. $4.50

Electronic Circuit Handbook I
Written by Tom Kneitel, WB2AAI, this details 150 of the most often needed circuits in 11 great chapters. Invaluable for beginners and old-timers alike. $3.00

Electronic Circuit Handbook II
Tom Kneitel's own sequel to Vol 1, this volume delivers 159 additional circuits that will appeal to all amateurs. Each circuit is fully described in text with complete schematics. $3.00

RTTY From A To Z
This new RTTY Classic has been produced to fill the gaps in RTTY knowledge among amateurs and professionals alike. 16 chapters and 224 pages. This book is a must in your technical library. $5.00

USA-CA Record Book
The official application and Record book for the coveted United States of America Counties Award issued by CQ. Contains room for simple entry of all data required to apply, plus rules and endorsement application. Two copies recommended: one for application, one for your records. Per copy price: $1.00.

DX Country Chart
Handsome wall-size chart (25" x 31") listing every amateur radio country in the world alphabetically by prefix, and giving continent, form of government, area, population, zone and class of country. A must for every active amateur and a bargain at $1.25.

- ☐ CQ Anthology II $3.00
- ☐ CQ Binders $5.00
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- ☐ Antenna Roundup I $3.00
- ☐ Antenna Roundup II $4.00
- ☐ USA-CA Record Book $1.00
- ☐ DX Country Chart $1.25
- ☐ Shop & Shack Shortcuts $3.95
- ☐ Electronic Circuits Handbook I $3.00
- ☐ Electronic Circuits Handbook II $3.00
- ☐ Surplus Conversion Handbook $4.50
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- ☐ New DX Handbook $5.00
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Propagation

BY GEORGE JACOBS,* W3ASK

WHILE considerably fewer DX openings are forecast for 10 and 15 meters, DX conditions are expected to improve considerably on 20 meters during April. A seasonal increase in short-skip openings on all h.f. bands due to sporadic-E propagation is also expected during the month. A major meteor shower will occur during April, which should enhance v.h.f. ionospheric propagation.

During April, 20 meters should be the optimum band for DX propagation conditions during most of the daylight hours, and into the evening hours as well. Considerably fewer DX openings are expected on 15 meters, but some fairly good ones should still be possible towards southern areas, especially during the late afternoon hours. Very few 10 meter DX openings are expected during the month, but an occasional one should be possible during the afternoon hours to South America, and from the western part of the country to the South Pacific.

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 the sunset and sunrise periods. Some fairly good 80 meter DX openings should also be possible during the hours of darkness and the sunrise period, and there is also a 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 an increase in static levels on all h.f. bands, especially on 40, 80 and 160 meters.

V.H.F. Ionospheric Openings

Chances for v.h.f. ionospheric openings should increase during April as a result of a major meteor shower and seasonal improvements in sporadic-E and trans-equatorial scatter propagation.

*11307 Clara Street, Silver Springs, Md. 20902

LAST MINUTE FORECAST

Day-To-Day Conditions Expected For April, 1974

	Rating & Forecast Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date April, 1974				
Above Normal: 2, 4, 13-14, 25, 29	A	A	B	C
Normal: 1, 3, 5, 8, 11-12, 15, 22-24, 26-28, 30	B	C	D	E
Below Normal: 6-7, 9-10, 16, 19-21	C	D	E	E
Disturbed: 17-18	D	D	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals.

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

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

2. With the *propagation index*, use the above table to find the expected signal quality associated with the particular opening for any day of the month. For example, all openings shown in the Charts with Propagation Charts with a *propagation index* of (4) will be good on April 1, excellent on April 2, good on April 3, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, or subscribe to MAIL-A-PROP, P.O. Box 86, Northport, N.Y. 11768.

Lyrids, a major meteor shower is due between April 21 and 23. It should peak for a few hours after sunrise on 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 begins to increase during April, and will 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 miles 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 approximately 1200 to 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.

Trans-equatorial, or TE openings on 6 meters, while always very 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 USA, with progressively fewer openings in the central and northern sectors.

Some auroral-type ionospheric openings should be possible during the radio storm predicted for April 17 and 18. Some may also be possible during the below normal h.f. conditions expected on April 6-7, 9-10, 16 and 19-21.

Sunspot Cycle

The Swiss Federal Solar Observatory at Zurich reports a monthly mean sunspot number of 29 for January, 1974. This results in a smoothed sunspot number of 37, centered on July, 1973. A smoothed sunspot number of 22 is forecast for April, as the present solar cycle continues to decline slowly.

DX propagation forecasts for each amateur band between 10 and 160 meters for the period April 15 through June 15, 1974 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 forecasts for April, for band openings between 50 and 2400 miles.

73, George, W3ASK

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 call aeras 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. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 P.M., etc. Appropriate *daylight saving* 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 in the MDT Zone, 5 in the CDT Zone and 4 in EST 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.

April 15—June 15, 1974

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 & Central 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 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)*

*Predicted times of 80 meter openings. Openings on 160 meters may also be possible during the times when 80 meter openings are shown with a forecast rating of (2), or better.

Northern & Central 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)*
Peru, Bolivia, Paraguay, Brazil, 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 Mediterranean & Middle East	*Nil*	*Nil*	07-09 (1) 13-15 (1) 15-18 (2) 18-19 (1) 22-00 (1)	20-00 (1)
West & Central 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 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 (1) 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)*
Northern & Central 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, Chili, 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:

Western 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 Mediterranean & Middle East	*Nil*	*Nil*	07-09 (1) 13-15 (1) 18-19 (1) 19-21 (2) 21-22 (1)	20-23 (1)
West & Central 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 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)

[*Continued on page 90*]

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

April 1 to June 30		YL "Jolly Flower" Contest
Apr.	6-7	Space Net VHF Contest
*Apr.	6-7	SP DX C.W. Contest
*Apr.	7	WAB L.F. Phone Contest
*Apr.	12-14	Novice QSO Party
*Apr.	12-15	County Hunters SSB Contest
*Apr.	14	WAB L.F. C.W. Contest
*Apr.	20-22	Zero District QSO Party
Apr.	20-21	WAEDC RTTY Contest
Apr.	20-21	QRP ARC Spring QSO Party
Apr.	20-21	Bermuda Phone Contest
Apr.	27-28	Florida QSO Party
Apr.	27-28	PACC DX Contest
Apr.	27-28	Helvetia 22 Contest
May	4-5	Bermuda C.W. Contest
†May	11-12	USSR C.W. DX Contest
May	11-13	Georgia QSO Party
May	11	YL ISSBers C.W. Party
May	11	World Telecomm. C.W.
May	18	World Telecomm. Phone
May	18-19	YL ISSBers Phone Party
May	18-19	Tennessee QSO Party
May	18-20	Connecticut QSO Party
May	25-26	One Land QSO Party
May	25-26	New York State QSO Party
May 31- June 3		CHC/FHC/HTH QSO Party
June	2	Minnesota QSO Party
June	9-15	Mass. Amateur Radio Week
June	15-16	All Asian Phone Contest

*Details last month's Calendar.
†Not officially announced yet.

YL "Jolly—Flower" Contest

Starts: 0000 GMT Monday, April 1
Ends: 2400 GMT Sunday, June 30

This is the 2nd edition of the International Italian YL "Jolly—Flower" Contest.

Exchange: Report, call and name.

Scoring: Requirements for the "Jolly—Flower" award. Italian stations must contact at least 1 Jolly station plus two other Italian YLs. Europeans, 1 Jolly station plus another Italian YL. All others work at least on Jolly station.

Awards: The first 100 meeting above requirements will receive an artistic lithograph featuring a flower, signed by the author a well known Venetian painter. All others will receive certificates.

*14 Sherwood Road, Stamford, Conn. 06905.

It is requested that you confirm all your Italian YL contacts with a QSL card. However it is not necessary to send QSL cards with your application, just your log.

In order to defray some of the expenses of the awards it is requested that you include IRC's as follows with your application. Italian stations 12 IRCs, European 15 and all others 20 IRCs.

Contacts made in the contest may be applied for the WIYL award. Write to I2CYB for details.

Logs and all communications go to: Carla Benatti, I2CYB, P.O. Box 155, 46100 Mantova, Italy.

Space Net VHF Contest

Starts: 6:00 P.M. Saturday, April 6
Ends: 6:00 P.M. Sunday, April 7
(Local Time)

The Apollo series of Space Net VHF contests proved so popular that WB2MTU has started a new series. This one will highlight Skylab #1. Rules for the new series are the same as before.

Use any of the v.h.f. bands, 50, 144, 220 and 432 mHz, but no repeaters.

Exchange: RS(T) and Zip Code number. Non-US use P.O. name.

Scoring: Two points per QSO on each band. Multiplier is sum of different Zip Code and P.O. areas worked. (Counted only once). A bonus of 10 is added to your multiplier.

Final Score: Multiplier + 10 × QSO points. The same station may be worked in each band for QSO points but the multiplier is counted only once.

Awards: To 1st and 2nd place winners in three classes based on power used. 1-25, 25-100 and over 100 watts input. There are also awards for multi-operator stations, clubs and Novices. All stations submitting a log will receive an attractive certificate.

Logs and requests for additional information go to: Space Net VHF Contest, Att: A. W. Slapkowski, WB2MTU, Box 909, Sicklerville, N.J. 08081

WAEDC RTTY Contest

Starts: 0000 GMT Saturday, April 20
Ends: 2400 GMT Sunday, April 21

The 6th annual RTTY contest is again sponsored by the DARC and managed by the DAFG. Only 36 hours out of the 48 hour 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 multi-operator stations permitted, 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. However non-Europeans get 5 points for each EU QSO. Europeans get only 3 points for same contact.

Like the phone/c.w. contest the QTC feature is also used. Each QTC exchange is worth one additional point. (See July 1973 Calendar for details and European country list.)

Mulitplier: Is determined by number of countries worked on each band. The ARRL and WAE country list are the standards. In addition the call areas in the following countries will also count as 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 countries worked from all bands.

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

In each country and each call area shown above. Continental leaders will also be honored and additional certificates where warranted.

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

QRP ARC Spring QSO Party

Starts: 2000 GMT Saturday, April 20
Ends: 0200 GMT Sunday, April 21

This is the annual Spring QRP Party sponsored by the QRP ARC International open to both members and non-members.

Exchange: RS(T) and state, province or country. Members give their QRP numbers, non-members their power.

Scoring: For members, 3 points per QSO, 4 points if with an area other than W/VE. Non-members, 2 points per QSO, 3 if out of W/VE.

Multiplier: Total of states, provinces and countries worked on each band. A station may be worked once on each band.

There is also a power multiplier: 1.5 for 25-100 watts, 2 for 5-25 watts, 3 for 1-5 watts and 4 if under 1 watt.

Final Score: QSO points × area multiplier × power multiplier.

Frequencies: C.W.—3540, 7040, 14065, 21040, 28040. s.s.b.—3980, 7280, 14330, 21430, 28600. Novice—3710, 7160, 21120.

Awards: Certificates to all reporting participants in each state, province and country. Also to the highest over-all scores and the lowest power station showing at least three genuine skip contacts.

Report the equipment used and a declaration that all rules have been observed.

Logs go to: Jim Hadlock, K7JRE, 3701 S.W. Morgan St., Seattle, Wash. Deadline May 18th.

Bermuda Contest

Phone: April 20-21 C.W.: May 4-5
Starts: 0001 GMT Saturday
Ends: 0200 GMT Sunday

This is the 16th year the Radio Society of Bermuda has sponsored the activity. Presentation arrangements for the Trophy winners is no small factor in making this a popular event.

Stations in the U.S. and Canada may work the U.K. and VP9s only. The U.K. stations work W/K, VE and VP9s. Phone and c.w. are separate contests with separate awards, for single operators only.

Exchange: RS(T) and QTH. State for W/Ks, province for VEs, county for the U.K. and Parish for the VP9s.

Scoring: Each complete QSO counts 3 points. The multiplier is determined by the number of Bermuda Parishes worked on each band. (A max. of 9 per band, 3.5 thru 28 mHz)

Parish abbreviations: Dev, Ham, Pag, Pem, San, Smi, Sou, Stg, War.

Awards: Certificates for the highest scoring station in each call area of the U.S. and Canada, and each U.K. country.

The overall winner in each section of the contest, in North America and the United Kingdom, will be awarded a Trophy. Presentation will be made at the Society's Annual Banquet to be held in Bermuda on Friday, October 18th. Transportation and accommodations for a week's stay at one of Bermuda's leading hotels is provided by the Society.

Trophy winners are ineligible for a period of two years, regardless of the section won.

Trophy winners in the 1973 contest were W3AU and G3SSO on phone and W7TML/1 and G3RZI on c.w.

Check log for duplicates, compute your score and sign a declaration that rules and regulations have been observed. Print name, call and address on each log.

Logs go to: Radio Society of Bermuda, P.O. Box 275, Hamilton 5, Bermuda. And must be received no later than June 29th 1974.

Florida QSO Party

Three Periods: (GMT)

1500 to 2000 Saturday, April 27
0000 to 0500 Sunday, April 28
1400 to 2359 Sunday, April 28

This is the 10th annual Party sponsored by the amateur radio magazine *Florida Skip*.

Phone and c.w. are separate contests. The same station may be worked on each band for

QSO points. Floridians may work in-state stations but for QSO points only.

Exchange: RS(T) and QTH. Conuty for Florida; state, province or country for others.

Scoring: 1 point per QSO. Fla. stations use states (49), provinces (12) and DX countries (12) for their multiplier. Max. of 73. (Limit 12 DX). Others use Fla. counties. (max. of 67).

Frequencies: C.W.—1808, 3580, 7080, 14080, 21080, 28080. Phone—1818, 3980, 7280, 14318, 21380, 28580.

Awards: Certificates, both phone and c.w., to the top single operator scorer in each state, province and DX country, and each Florida county. There are also 5 Trophies as follows: High single operator, c.w. and phone, in Florida and out-of-state. And to the Club having the highest aggregate score.

A summary sheet is requested showing the scoring and other pertinent information. Also name and address in BLOCK LETTERS, and a signed declaration that all rules and regulations have been observed. Include a 10¢ stamp for the issue with the results.

Mailing deadline is May 30th to: *Florida Skip* Contest Committee, P.O. Box 501, Miami Springs, Florida 33166.

PACC DX Contest

Starts: 1200 GMT Saturday, April 27
Ends: 1800 GMT Sunday, April 28

Use all bands, 1.8 thru 28mHz, both phone and c.w. The same station may be worked only once, either phone or c.w., on each band for QSO and multiplier credit. (c.w. only on 160)

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

Multiplier: Is determined by the provinces worked on each band. There are 12 provinces, Dr, Fr., Gd, Gr, Lb, Nb, Nh, Ov, Ut, Yp, Zh, Zl.

Final Score: Total QSO points × sum of provinces from all bands. (12 from each band)

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 the scoring and other pertinent information, your name and address in Block Letters, and a signed declaration that rules have been observed.

Contest contacts may be credited for the PACC 100 Award in lieu of QSL cards, provided the log of 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. Bispolder Str. 15, Nieuwerkerk a/d IJssel, Netherlands.

Helvetia 22 Contest

Starts: 1500 GMT Saturday, April 27
Ends: 1700 GMT Sunday, April 28

Dates of this activity have been fixed at two weeks after Easter each year. Many of the rare Cantons are activated so this offers an opportunity to build up your total for the attractive H 22 Certificate.

Use all bands 1.8 thru 28 mHz. The same station may be worked on each band and mode for QSO and multiplier credit.

Exchange: RS(T) plus a contact number starting with 001. Swiss stations will also include their Canton. (ie: 579001/ZH)

There are 22 Cantons: AG, AR, BE, BS, FR, GE, GL, GR, LU, NE, NW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH.

Scoring: Each QSO counts 3 points. The multiplier is the sum of Cantons worked on each band, a possible 22 from each band.

Final Score: Total QSO points multiplied by the sum of Cantons worked on all bands.

Awards: Certificates to the top scorers in each country and VE and W/K call areas.

Logs: Indicate a Canton in a separate column the first time it is worked on each band. Check your log for duplicates and include a summary sheet with the scoring and other information. Your name and address in Block Letters and the usual rules observation declaration.

Mail your logs within 30 days to: USKA Traffic Mgr. HB9AHA, in Moos Seengen, Switzerland.

Georgia QSO Party

Starts: 2000 GMT Saturday, May 11
Ends: 0200 GMT Monday, May 13

This is the 13th annual QSO party for the Columbus ARC. The same station may be worked on each band and mode for QSO points. Ga. to Ga. contacts are also 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, 7260, 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 station, 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 10th to: Columbus ARC, Att: John T. Laney III, K4BAI, P.O. 421, Col-

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YL ISSBers QSO Party

C.W.: 0001 GMT to 2400 GMT May 11
Phone: 0001 GMT May 18 to 2400 May 19
C.W.—24 hrs., one 6 hr. rest period.
Phone—48 hrs. two 6 hr. rest periods.

Rules for this one are rather lengthy. It is suggested you write to W7EOI for more details and party log forms.

The same station may be worked on different bands for QSO points, but the multiplier is counted only *once*.

Categories: DX/WK, YL/OM teams and single operator. (Non-members use latter)

Exchange: Name, RS(T), SSB no., country, state, partner's call if any. Non-members send "no number."

Points: Two points for contacts with members, 1 point if its a non-member.

Multiplier: DXCC countries, US states, DX/WK teams, YL/OM teams.

Frequencies: C.W.—3565, 7080, 14070, 21070. Phone:—3873, 7273, 14333, 21373, 28673. Listen for DX on 3775, 7090.

Awards: Certificates to the 1st, 2nd & 3rd place winners in each country and state. Trophies and plaques to the 1st, 2nd & 3rd single operator world high scores, and DX/WK and YL/OM teams. And world single c.w.

Pairing of DX/WK teams must be cleared by W7EOI. YL/OM teams must be related pairs. Write to W7EOI for more information.

Logs must be postmarked no later than June 30th and go to: Lyle W. Coleman, W7EOI, 412-19th Street S.W., Great Falls, Mont. 59404

World Telecomm. Contest

C.W.—0000—2400 GMT Saturday, May 11
Phone—0000—2400 GMT Saturday, May 18

The Brazilian Ministry of Communication announces its 5th contest commemorating "World Telecomm. Day." (May 17th)

Operation is limited to single operator stations, fixed or maritime, 10 thru 160 meters.

Exchange: RS/RST plus your I.T.U. 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 × different ITU Zones worked. Same station may be worked each band for QSO points but Zone counted once.

Log entries in this order: Time in GMT, station worked, exchange sent/received, band, continent, zone and QSO points. Separate log for c.w. and phone. Include summary sheet and declaration.

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

The I.T.U. Trophy goes to the country with the highest aggregate score determined by the mathematical 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 if won 3 times in a 5 year period.

Mail logs before June 30th to: Ministerio das Communicacoes, DENTAL, 70000 Brasilai, DF, Brazil

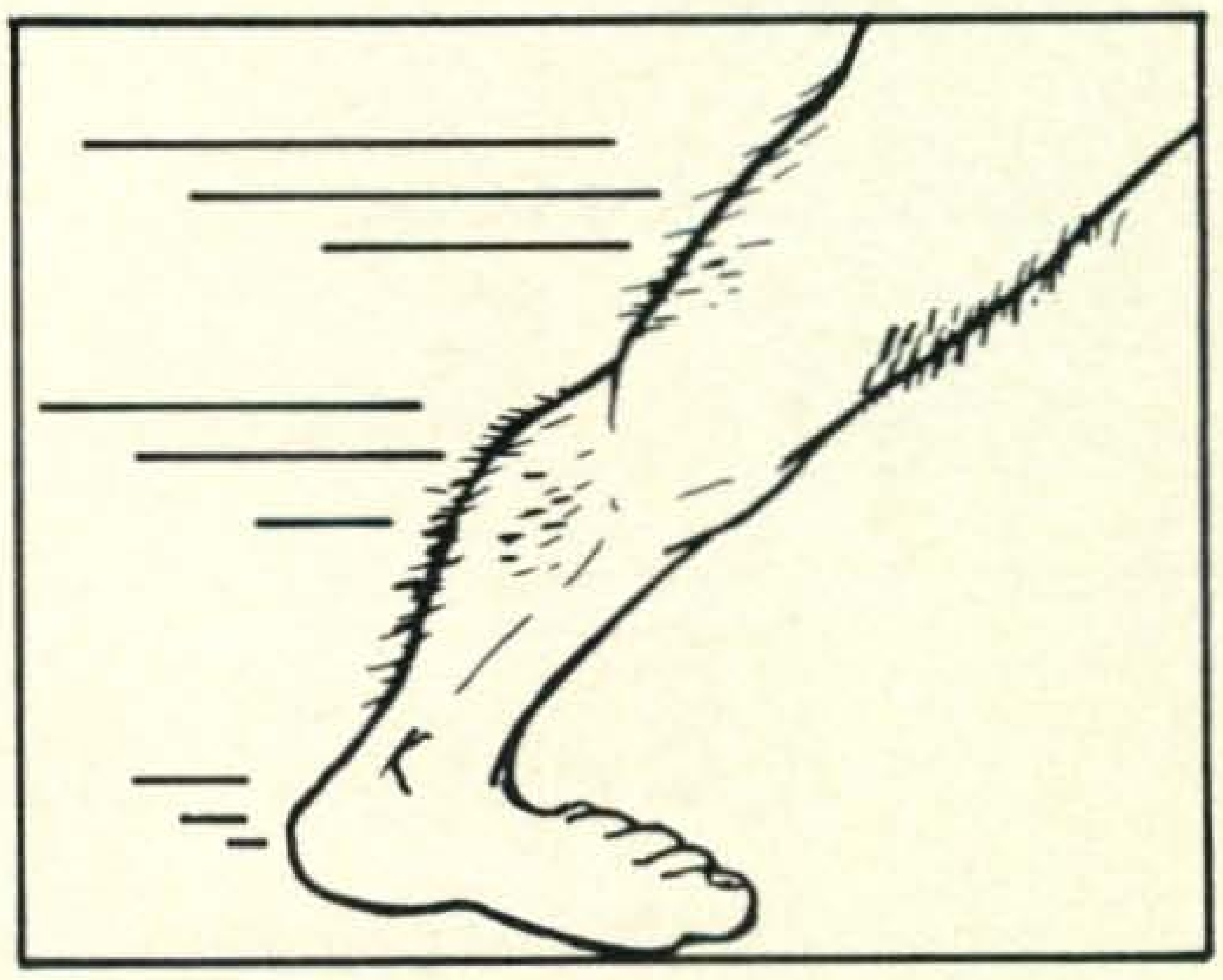
Editor's Notes

A glance at the "Events Box" shows a pretty heavy schedule for the months of April and May. Some week-ends with as many as three and four events going at the same time. There is no direct conflict if a v.h.f. contest is scheduled on the same week-end as a c.w., phone or RTTY contest. Different modes and different frequencies, so the most that can happen will be a decrease in participation.

However I question the scheduling of two similar contests on the same week-end. The PACC has always used the last week-end in April. The H 22 varies each year, two weeks after Easter. The latter claims that they received permission from the IARU for this year's date. It would seem to me that someone at the IARU used poor judgement or is lacking in knowledge concerning contest matters.

As for State QSO Parties they are as unpredictable as the weather. But then they don't have much choice, they have to take what's left. But here again they could be a bit more selective. Two adjoining states with parties on the same frequencies on the same dates? Lots 'a luck.

73 for now, Frank, W1WY



An action shot of Frank Anzalone "streaking" through Stamford on his way to the Post Office.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

THE Stelma DAC-V (pronounced "dak-five") is a first class test unit for RTTY use. It will do almost anything required in checking a typing unit, keyboard, transmitter-distributor, regenerative repeater, demodulator, keyer, or a complete RTTY system from keyboard to skywave and back. It is easy to use, reliable, sturdy, trustworthy, loyal, friendly, etc. etc.

It is about the most interesting item I have ever found in surplus, running a close race with the fine Collins' R-390-A receiver for utility and reliability. It is undoubtedly expensive if you get it from a dealer, since it has commercial possibilities still, but a good many have turned up surplus. Although I cannot tell you where to look for one today, knowledgeable scrounging will probably turn up more.

As the picture indicates, the DAC-V is a rack-mount set consisting of several interconnected items. The heart of the set is the DD-5 Digital Distortion Analyzer. In the usual setup the DD-5 is located on the upper left, with a 'scope (DSS-5) on the right and at the bottom left the time base generator (TBG-5) and on its right the test pattern distortion generator (PG-105). The power supply (PS-3) is located behind the distortion analyzer in a special frame which holds the entire set into a standard-width relay rack, or on a 'scope cart for roll-around use.

The distortion analyzer has a really large meter, calibrated in percent distortion, from zero to fifty percent. No funny jiggling, hard-to-interpret 'scope traces, no flashing lights, nothing to misunderstand, just a simple indicator which shows directly the distortion percentage the set is receiving. This, alone, is a great advance over even the DXD's rotating light (*CQ* March '74) and it is a couple of orders of magnitude better than Stelma's TDA-2 'scope, the TDMS, and all the rest.

If you want flashing lights the DD-5 has neon bulbs to indicate that a signal is being received, whether the transitions are early or late, and whether the power to the set is on.

The controls are easily understood, and there are input 'phone jacks for a regular 60 milliampere teleprinter loop (Low Z input) or low-level signals (high Z in). A knob on the DD-5 selects neutral, polar, or high-impedance signals, 20 or 60 ma; Other controls must be set for speed (Baud rate) and code (unit interval) and a toggle switch set for polarity of the loop. Either synchronous or stop-start signals may be examined with equal accuracy.

*1502 Stonewall Rd., Alexandria, Va. 22302

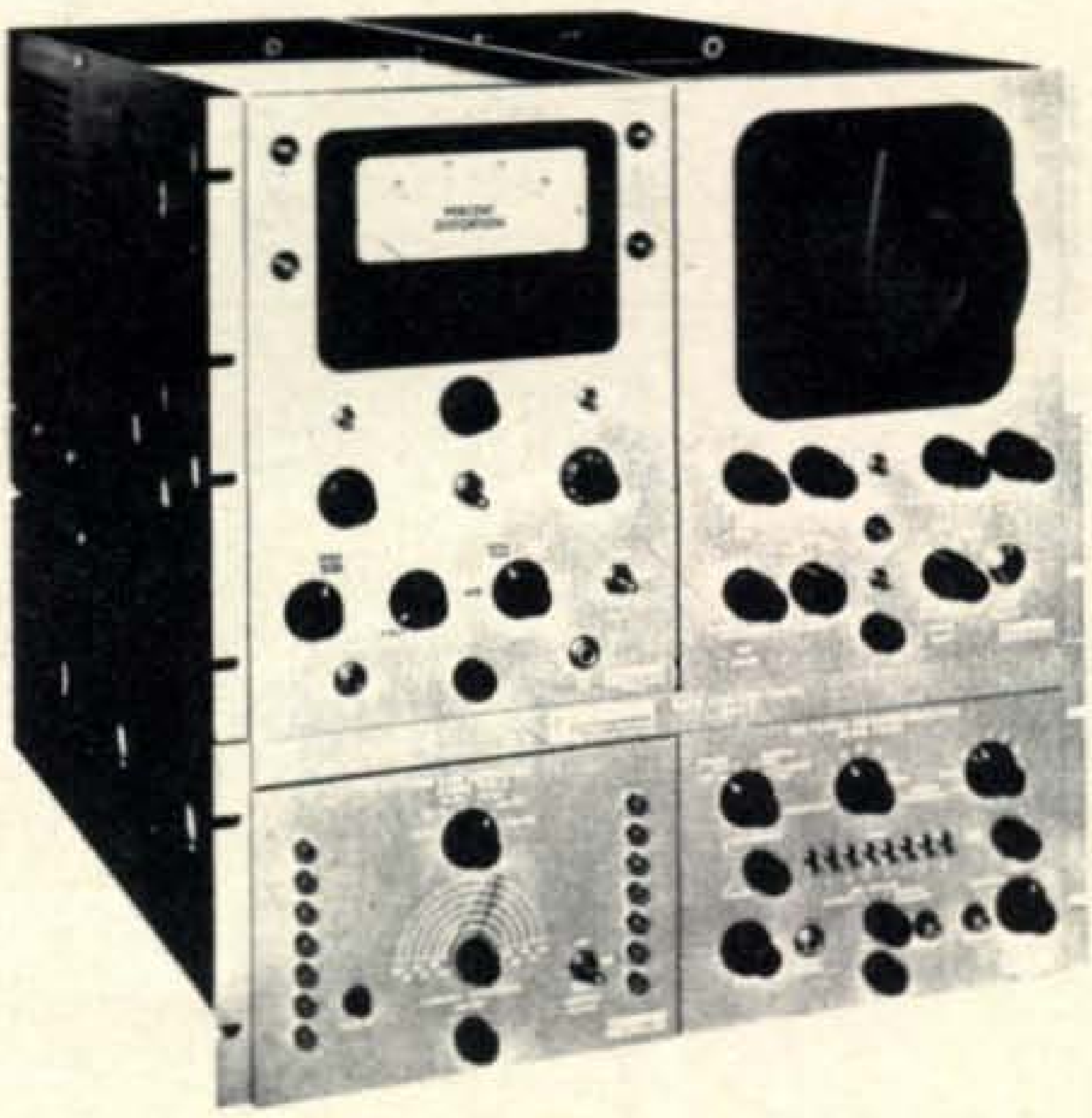
Usually the space-mark transition is examined, but mark-space may also be selected for testing. Average, total, early or late peaks may be chosen, anywhere in the individual character—just set the appropriate knob. Generally "all" transitions are checked, on the "average" setting.

The final control adjusts the reset of the percent distortion meter. In "auto" the meter "locks up" on the peak distortion read, and does not return to zero, to take another reading until a timing circuit—say 30 seconds—releases it, The Manual reset position is an override to the timer, and the center "off" position allows the indicator to follow the distortion percentage as it varies.

It's pretty interesting to watch an incoming high-frequency RTTY signal as the propagation it encounters affects the quality. Most h.f. signals are instantaneously pretty awful, and it gives you renewed respect for the engineers who designed printers able to copy badly distorted characters as well as they do.

The DSS-5 is a fairly straightforward 'scope, with the usual intensity gain and focus controls. It has controls to select the sweep-rate, and receives sweep timing from the DD-5 if desired. This allows the operator to "see" one character in its nominal square-wave form. You can look at one character, or even one transition within a character to analyze it.

As anyone who has put a loop signal on a 'scope knows, it's not terribly easy to get one character to stabilize, in phase, for long enough to work with it. The DAC-V 'scope will hold a repeated "R" from your keyboard all night, or will show the distortion on an incoming signal



The Stelma DAC-V RTTY test set.

without running back and forth interminably. (If you *like* running up and down you can use the manual positions)

You can slow the thing down, get single characters, let it run free, use it triggered, etc. etc.

The display is very nice and bright, and may be expanded to more than fill the five inch CRT screen. It makes an RTTY character all but sit up and talk. Fig. 1 is an "R" character in Baudot code as it would be displayed with approximately 25 percent Marking distortion. You can see breaks in the signal, poor rise times, and almost everything there is to see about a Teletype bit.

First time I used a DAC-V it showed me spikes on my signal which had never appeared on my DXD or anywhere else that I could see them. I traced the problem to a bad filter capacitor in the loop supply and solved a distortion problem that could not have been identified by any other available method.

The PG-105 pattern generator can transmit a single character, selected on a field of miniature toggle switches representing from five to eight code segments, or a "Quick Brown Fox" message.

The last seven characters in the message may be coded for any Baudot letter, figure or function by removing or adding resistors on the last message board in the PG-105. On a fresh, uncoded board, resistors are in place for all of the 35 codable bits, and as supplied, give spacing bits. To get marking, remove the appropriate resistor.

The really-beautiful use of the DAC-V is the programmable distortion which you can derive from the pattern generator. The "distortion" control on the upper left offers spacing bias, marking bias, or switched distortion—marking to spacing alternatively—in the test signal. The other two upper control knobs on the PG-105 allow you to set in precise amounts of distortion in 1% steps from zero to 50%.

You know just how much distortion you are putting in, and you can check this by reading the DD-5 analyzer and the 'scope. No guessing.

With this you can run up to, say, 45 percent switched distortion and see if a printer is adjusted correctly; some will accept heavy marking bias (longer mark pulse than spacing pulse) but break into garble with just a touch of spacing bias. Switched distortion is really the test of a well-adjusted receiving selector, be it on a tape reperf, a typing unit, or even a cathode-ray-tube readout. It approximates the fortuitous distortion that propagation problems introduce on h.f. circuits about as well as any test set can.

Other pattern generator controls include mark-hold, free-run and stepped positions for the test message or selected single character. Synchronous-stop-start and code level controls will be little used by most amateurs, who deal with five-level start-stop signals almost exclusively. The DAC-V can put out eight-level characters, but only singly; the "FOX" message is coded only for five-level Baudot, and it will not generate ASCII eight-level.

It is possible to take the message boards out of the DAC-V and re-code the test message from Baudot to ASCII, but without buying the ASCII boards you would have to operate the set in synchronous mode and code in the start and stop pulses for each character. The start-stop pulses are generated independently in the normal Baudot configuration, and putting them in the message boards will reduce the test message length by 55 percent. You can't go back to BAUDOT without switching printed circuit boards, either.

On the back of the pattern generator is a switch to select the type of keying for the test signal, either through a miniature Sigma 72 mercury-wetted-contact polar relay or a transistorized keyer. I generally use the relay, as it is reliable and not subject to being burned out quite as readily if I goof on voltages on my test loop.

The relay itself is located in the rear of the time base module, while an adjustment for relay bias is on the rear of the pattern generator. You simply turn the screwdriver adjustment until the distortion analyzer indicates that zero distortion is being sent from the pattern generator.

The time base unit (TBG-5) has a variable frequency oscillator which provides timing signals to the analyzer and the pattern generator. It may be equipped with up to eleven additional crystal-controlled fixed-frequency oscillators, for precise control on specific Baud rates. I have crystal oscillators for 45.5 Baud (60 w.p.m.) and 75 Baud (approximately 100 w.p.m.) in my set.

I use the set primarily to put distorted signals into receiving equipment to see just how close to the theoretical maximum (49.99999%) they will accept while still printing garble-free copy.

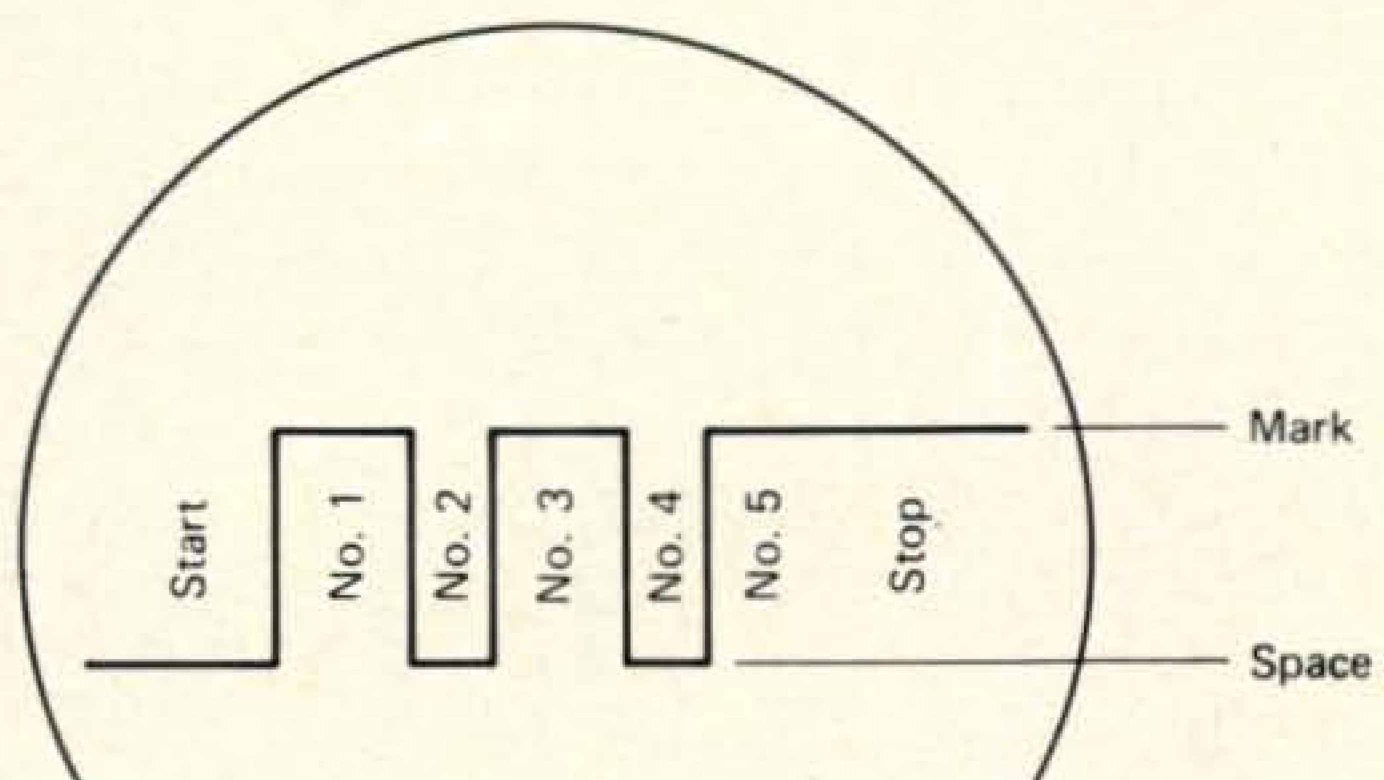


Fig. 1-A CRT display of the Baudot character "R" with 25% Mark bias.

(Beyond 50 percent distortion an R becomes a Y, and distortion readings become meaningless)

I often put an incoming signal on the 'scope to see what it looks like, and you can learn a lot about receivers, T-D's and h.f. propogation from watching the electronic garbage flow across the CRT.

It is very useful to look at your own T-D and keyboard on the 'scope and the analyzer, allowing adjustment in a few seconds without worrying about mechanical measurements to the thousandths of an inch. If it looks good on the 'scope, it is good, even if your equipment is beat up enough that the adjustments in the book don't make it right.

Reader Mail

Had a nice letter from WA2JTN, who was at the Miami hamfest last winter. Al wrote to mention that he found a good surplus in Orlando, Florida on the way home. Skycraft Parts, run by Sam Skinner, is at 1821 Tallokas Avenue, near Interstate 4 and Kaley Avenue in Orlando. Mail address Box 15503, zip 32808.

Skycraft, Al says, is "a fantastic place." They have all sorts of things from N.A.S.A. chiefly, much late solid state equipment and parts. Prices, he reports are reasonable and Sam was very helpful. ■

Propagation [from page 80]

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)*
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)*
Northern & Central 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) 21-02 (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)*
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)

DX [*from page 73*]

amateur radio particularly through public service or advancement of the state of the art; and provision of financial assistance to worthy individuals in the pursuit of courses of learning which can benefit amateur radio.

A prominent NCDXF goal is the establishment of scholarships which may be funded by gifts and identified in an appropriate manner to perpetuate the name of the donor. Gifts to the NCDXF are tax deductible and may be in the form of either cash or securities. The latter may be donated at owners cost so that the capital gains tax will not apply.

Membership in the NCDXF is open to all interested persons or groups who contribute funds or equipment or render other services to the Foundation. This is a well conceived organization. Much careful planning has gone into putting it together. The Board of Trustees are all very prominent men who have been active in DX affairs for many years. Included are Lee Shaklee, W6BH, President; Jack Troster, W6ISQ, Vice President; Don Schliesser, W6MAV, Secretary; Vince Chinn, K6KQN, Treasurer; Hugh Cassidy, WA6AUD; Merle Parten, K6DC; and James Maxwell, W6CUF. The *CQ* DX Department feels that this is an outstanding group worthy of the support of anyone interested in its aims.

QSL Information

A4FXD—Via G3XEC
A51PN—To W1JFL
AP2BS—c/o Punjab Boy Scout Assn., P.O. Box 65, Lahore, Pakistan
CR3AB—Via CT2AZ
CR3AH—To W4VPD
FB8XA & FB8XC—c/o F2MO
HC1CW—Via K7NHV
HC8GI—To KZ5SD
HH2WF—c/o WA2JDT
HS3AGL—Via K4UBR
HS4AGZ—To K5LBU
IH9AA—c/o I6PLN
KA1BL—Via KØSVW
KC6HC—To H. M. Chamberlain, P.O. Box 932, Kolonia, Ponape, E. Caroline Is. 96941
OX3BE, OX3BU, OX3BX, OX3KW, OX3SE, OX3WX
OX3XD—co/ OZ8KW
PJ8AR—Via W3HNK
PJ8WW—To W9IGW
PJ9GIW—c/o K4BAI

SV1DB/A—QSLs for s.s.b. contacts April 21-25, 1973 may be obtained from DL7FT or G5BCX based on time of operation as follows:

April 21, 1627–1800 GMT; April 22,0900-1110 & 1515-1615 GMT; April 23, 0800-0907, 1335-1430, & 2205-2300 GMT; April 24, 0710-0930 & 2030-2300 GMT; and April 25, 0520-0700 GMT—Via DL7FT.

April 22, 1344-1403 GMT; April 23, 0910-1005 & 2100-2205 GMT; April 24, 1431-1535 GMT and April 25, 0706-0800 GMT—Via G5BCX, Al Fance, Birchdene, The Lagger, Chalfant, St. Giles, Bucks., England.

TA1KT—To DL0UJ
TA1TS—c/o WA0ETC
TU2AZ—Via DL7MQ
TU2DR—To VE3BXA
TU2EF—c/o WA6CEB
VP1KD—To K4ELK
VP2SQ—c/o W2MIG
VR4BS—Via ZL4NH
WB4BVQ/8R1—To WA6MWG
XG1J—c/o XE1J
ZB2CF—c/o WA2MVQ
ZD3X—Via OH2NB
ZD7FT—To VE1AIH
ZL4NJ/A—c/o ZL3IT
ZS2MI—Via ZS6LW
3B6CF—To JAØCUV/1
4L8A—c/o P.O. Box 88, Moscow, U.S.S.R.
4W1PM—Via IT9AF
5R8CO—To F8US
5T5LO—c/o K9KXA

XU1AA—Via P.O. Box 59, Phnom Penh, Khmer Republic (Cambodia)
YJ8BL—To W6NJU, 7632 Woodland Lane, Fair Oaks, Calif. 95628
6Y5BF—Via WA6AHF
8R1CB—To W2MIG
9L1JT—c/o WA4ZYQ
9U5CR, 9U5RB, and 9U5CM—Via ON5TO
9Z4AA—To W6CUF

Late QSL Information

EL2DG, EL2DS & EL2NS —Via WB4SRX, 236 Clover Lane, Louisville, KY 40207
FG7XZ—To WB4SRX
HS4AGN—Via W5LUJ
SY5MA—To W4KA
VA7WJ—Via VE7WJ
VK0JM—Not Via VK3XB
VE3AII/SU—To VE1AL
WJ5SKY—c/o WB5IQB
5C0CN—Not via K1GTE (John has received many cards, but has no knowledge of this station.)

73, John, K4IIF

Awards [*from page 76*]

tions arise or if he desires to check the honor system. All this normally means a person does not have to trust his valuable cards to the mails and also saves much postage costs.

I wanted to quote some valuable data re NET operations and intentional QRM from the January issue of *MARAC Newsletter* but I have run out of space. . . How was your month? 73, Ed., W2GT.

FM [*from page 60*]

types of detectors which is not too subject to this kind of mish-mash is the so-called "pulse-counting discriminator," not usually found in ham gear.

So, when the subject is distortion, and the prevention thereof, then we must come to a couple of rapid conclusions—relative to the receiving equipmént that you will be feeding. If you know that the other guys receiver might have a 7 kiloHertz i.f. filter, then keep your deviation, modulation, carrier swing, call it what you will, down to less than 7 kiloHertz. If your repeater group has the i.f.s in the input receiver really tight to a 10 kiloHertz passband, then for God's sake, don't go bombing the thing out with your rig having 15 kHz peak deviation. You will become, if nothing worse, unpopular and unloved. Make sure that you are on frequency with the receiver in use. You don't have to be traceable to the National Bureau of Standards. If you are within 1 kiloHertz or 1000 cycles of the receiver center frequency (as published) then you will be cool, as long as your deviation is not excessive for that receiver. Don't knock yourself out playing the futile game of "frequency-countersmanship," which is my pet name for that idiotic weekend pastime I hear so often when all the frequency mavens (experts) are putting everyone else within 23 cycles of the correct frequency. The truth is that you don't have to be that close, and they probably can't coutn you that accurately, and that the crystal in your rig probably won't stay there for two hours.

Philosophy For The Month

The time has arrived to cut through some of the "mystique" of f.m. It's been around too damned long to continue to be as misunderstood as it appears (in my opinion) to be. There are no real mysteries in f.m. other than those I intend to speak upon next month —"The Great FM Super-specialized Vocabulary Game," or "How I Learned To Sound Like The Village Idiot By Listening to My Local Repeater!"

73, Norm, W2JUP

Math's Notes [*from page 65*]

ling the pulse repetition rate (waveform #2).

3. With both potentiometers replaced by fixed resistors of equal value of R_1 replaced with a potentiometer, the circuit becomes a symmetrical square wave generator with the potentiometer controlling the frequency (waveform #3).

4. With D_1 disconnected from the unijunction output and the appropriate charging circuit disconnected from the collector of Q_1, the circuit becomes a monostable multivibrator. A positive input pulse to the free end of D_1 (through a 1K resistor) will now trigger the circuit for a time duration controlled by the remaining potentiometer (waveform #4). An inverted output is available in all of these schemes from the collector of Q_1 if desired.

There is one other timing device that I would like to discuss at this time and that is a relatively new device, the 555 timer integrated circuit first made available by Signetics Corporation, Sunnyvale, California.

This chip contains all of the circuitry necessary to perform just about all of the timing functions that one can think of and, the basic chip is inexpensive. Signetics version, the NE 555V is 79¢ in 100 quantities. Intersil, Inc., Cupertino, California has one for 95¢ in 100 quantities and National Semiconductor, Santa Clara, California has their LM555 for $1.25 each in 100 quantities. Other manufacturers will no doubt follow in the very near future.

Figures 4 and 5 show the two basic hookups for the 555. Also given in the figures are a convenient chart for determining suitable values. Figure 4 is the basic timer with a negative trigger pulse initiating the cycle. Note that a reset switch must be activated to start a new timing cycle. In fig. 5, the 555 is used as a simple rectangular wave oscillator with components as shown. Making RA or RB variable in this circuit will vary the various times as shown on the diagram.

Additional circuitry and details can be obtained from the data sheets of the manufacturers of the various 555's as indicated above.

See you next month.

73, WA2NDM

A Surplus Story *[from page 41]*

the wooden panels while apparently hand wound transformers containing a wealth in copper rested in a dark corner. An equally venerable generator also rested on one side. The operating table sported a pair of receivers... one a Kennedy, the other a Wireless Specialty. A massive key on a marble base occupied part of the table, too. I knew I was in the company of a great past... but remember, I was a level-headed purchasing agent for a leading mail-order firm... not a curator for a museum. In plain language nostalgia didn't pay my salary and I shuddered to think what my boss would say if I came back driving that grandfather of all "mobiles." Indeed, I doubted that the early Ford was capable of traveling the 50 miles back home under its own power!

With that, I thanked my host for the time he had spent with us. I also thanked the beautiful daughter. But in parting, my host imparted a piece of information which will forever haunt me and which one of our readers may help clear up!

"Son," he said, "don't you know this is the very truck which Teddy Roosevelt used when he made his Brazilian exploration trip in 1913!" ■

QRP *[from page 52]*

foot, battery power, and dipole, during the period October 6-24, 1973, I worked the following on 20 m. s.s.b.: UB5EO, F9KI, UB5OD, UK5GAA, EI8CA, G3VER/A, DF2GX, W2BOK, OE9WGI, EA3JE, UO5GR, SP9DUW, HB9ATF, and YU1AOD, plus a number of duplicate countries."

de W0IYP: Thought you might like to see my CD Party activity for January 12-14, 1974. I used 1 watt output, vertical and dipole on 80, vertical and yagi on 40, and a 3 element quad on 20 and 15 meters at 75 ft. In six hours of operation: 185 QSO's, 60 sections, 45 states. I found that I could call CQ on all bands and get an answer, but of course I had to call others too! Tried the same on s.s.b. last weekend with poorer results—seems that weak signals and QRM cause much more grief for receiving stations on s.s.b."

That's about all the space for this month. Wish we could run more of the comments we've received—but keep the mail coming to let us know what is going on. We're especially interested in reports from various sections of the country (and world?) on the turn-outs during the weekly QRPp QSO parties which should be under way by the time you read this. Hope to meet many of you on the air during the parties.

The results to the Third Annual QRPp QSO Party are included elsewhere. Also, we are including the final 1973 standings for QRPp WAS and DXCC. A note is in order about the listings. Our basic purpose is *not* to set up competition to see who can outrace who to the top. The purpose is to give a broad picture of the results all kinds of QRPp'ers—contest fanatics and easy-goin' ragchewers alike—have been experiencing. The listings will be updated about twice a year, so get your standings in around the end of June.

73, Ade, K8EEG/Ø

SSTV *[from page 44]*

should be: $R = \frac{E}{I} = \frac{2 \text{ volts}}{80.6\ \mu a} = 24.8K$

We would pick the closest 5% value, 24K, or make R_E variable so that the sawtooth output amplitude can be trimmed to exactly the desired value.

The design of the discharge circuit comes next. The discharge transistor is of course cut-off during the active sweep period. The only requirement here is that the transistor leakage current be much less than the 81 μa charging current. If R_1 is only a few K ohms, the leakage should not be much greater than I_{CBO}. Let's assume that the I.C. driver delivering the 5 ms pulse is capable of delivering up to 5 ma to the base of Q_1. If we use a 1K resistor for R_1, we'll be on the safe side with a current of

$$\frac{(5 - 0.7) \text{ volts}}{1000 \text{ ohms}} = 4.3 \text{ ma.}$$

To discharge the capacitor in 5 milliseconds or less, the discharge current through the Q_1 collector must average 1 ma.

$$(I = \frac{CV}{T} = \frac{1 \times 5}{.005} = 1 \text{ milliamp}).$$

It is apparent at this point that almost any

NPN transistor will discharge the capacitor in less than the required time since the base current of 4.3 ma times any reasonable beta value would produce a very high discharge current. Let's assume that we have some 2N5828s on hand, and decide to use one here. The only precaution we need to take is limiting the peak transistor current to its rated maximum of 100 ma. Since the possibility exists of the voltage across the capacitor rising to +10 volts if the drive pulses should fail, R_2 should be calculated for this worst case condition.

$$R_2 = \frac{10 \text{ Volts}}{0.1 \text{ Amp}} = 100 \text{ ohms.}$$

As a final check, we should make sure that the time constant, $R_2 \times C$, is well under our 5 millisecond retrace time. $R_2 \times C = 100 \times 10^{-6} = 100$ microseconds, which is quite satisfactory.

A word on the selection of the PNP transistor Q_2. The current through the base divider was arbitrarily picked as 1 milliamp. Since this is higher even than the emitter current, the base voltage will "stay put" even if the Q_2 beta h_{FE}) is not very high in short, almost any silicon PNP transistor would be satisfactory.

Dayton Hamvention

Just a reminder that the annual slow-scanner's pilgrimage to Dayton occurs in April. This year, for the first time, it will be a three day affair with the exhibits opening at noon on Friday, April 26. The Amateur Television Forum is scheduled for 1400 on Saturday afternoon, and there are sure to be some interesting talks on SSTV. And anyone who thinks that amateurs are no longer able to contribute to the advancement of the radio/video arts are invited to see this year's ham-designed SSTV equipment exhibit! For additional information write: Dayton Hamvention, P.O. Box 44, Dayton, Ohio 45401.

Vy 73, Cop, WØORX

Sloping Quad [*from page 47*]

raised the western corner of the quad. The resulting signal reports dropped off in that direction as well as the received signals. On lowering the western corner, the signals improved as anticipated. Contacts with many west coast stations, as well as Canton Island (KB6) and New Zealand, proved without doubt that the sloping quad outperformed the horizontal quad to the west and southwest.

Having an Inverted V which I no longer used, I decided to convert it into a sloping quad to favor the northeasterly direction to Europe. In order to avoid interaction between the two quads and staying within the limits of our acre of land, the second quad slopes from 45 feet to 20 feet in a northeasterly direction. The enhancement of signals to the north and northeast was confirmed on contacts to New England, Canada, and Europe. Comparative reports when switching between the two quads showed a 10 db greater signal into Europe with the second quad. The same 10 db difference was noted on contacts to the west. It is interesting to note that on receiving, the difference between the two quads hardly ever exceeded 6 db. However, I could now hear signals that were buried in the noise when using the Inverted V.

After 8 months of use, I have not changed my 52 ohm feed line or installed a balun to reduce the impedance mismatch and improve the s.w.r. I doubt that I will ever make the change because of the ease that the transmitter loads into the 2:1 s.w.r. on each of the antennas. For convenience, I feed the antennas at corner D in fig. 1(B), although feeding at a higher point would probably improve my signal reports.

Installation is relatively simple if adequate trees are available. I used monofilament fishing line and a 3 ounce weight to throw the line into the trees. It was a simple matter to pull up the nylon lanyard and then the antenna to the desired height. The antennas are made of 12 gauge standard electrical wire with plastic insulation. The plastic insulation serves no purpose other than making it easy to slide the insulators along the wire. I used circular insulators at the corners with rubber tape stays at the 66 ft. points to prevent the insulators from sliding. I would recommend wire no smaller than 18 gauge.

Small lot owners should not shy away from this antenna. It can easily be accomodated on a lot 70 × 70 feet. In fact lengthwise, it takes far less space than a full dipole for 80 meters. The sloping quad antenna is normally a single band antenna, however with an antenna tuner, such as the Johnson Matchbox, and open wire line, it should perform well on all bands. Without a tuner, and with a 3:1 s.w.r., I have used both quads on 40 meters with good results ■

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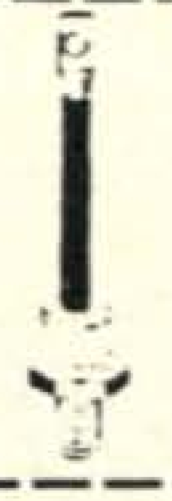

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FOR SALE: Best offer, Clegg 22'er Transceiver, full of Xtals, A-1 condition. K3YMN, HL Snyder 2185 Sampson St., Pittsburg PA 15235.

METRIC CONVERTERS: Very useful in the ham shack. Pocket converter changes U.S. unites to Metric System. $2.50 each. WA2DFC, F. Lampert, 10 Greenview Dr., Pequannock, NJ 07440.

HALLICRAFTER HT-32, Mint w/manual-factory schem. conversion to HT-32A-New Power Xformer & side band Xtal, $210. W1JSS, 9 Winter Terrace, Westwood, MA (617) 762-5252.

FOR SALE: Heath sixer, good condition, manual, xtal, A.C. cord, $20. JG Swaney, 10534 California Ave. Aurora, OH 44202.

Your non-commercial swap-n-sell ads run FREE in TRADIO. Send ads to TRADIO, in care of Wichita Amateur Radio Society - P.O. Box 4391 - Wichita Falls, TX 76308.

WANTED: Used Electronic text books; back dated magazines. Donald Ryan, Star route, South Plymouth NY.

SELL: HP-803, 417B-$150 for both FOB my QTH. D.D. Callaghan 233 Mohawk St., Tiffin, OH 44883.

FOR SALE: DX-100 xmtr $80. Ameco TX-62 xmtr $90. Both in good condition. no shipping. F. Kurz, W9VTQ, P.O. Box 347, Zion IL 60099.

FOR SALE: KWM-2 & 516F-2 A.C. supply, $695. 312B-4, $165. 30L-1, $339. All excellent condition. Also, mint HQ-129X, $88. Ship F.O.B. W4MDB, Box 99115, Louisville, KY 40299.

FOR SALE: New A-BEC Electric wheel chair-wholesale, $730. 12 volt rechargeable battery. Billy Mobray, K5YBQ, Keyes, OK 73947. (405)-546-2391.

SELL: Galaxy FM-210 with matching A.C. power supply, 25w. Amp., Mike, xtals, $200,PPD. W. Burding, N. Bay Ave. Eastport, NY 11941.

Richmond High School desperately needs any ham equipment, that will be donated to its ham club. WRITE: D. Bacom, WN6TPJ, San Pablo CA 94806.

24 Hour Clocks -- a necessity for DX or traffic work. Battery or electric. Steve Antosh WB6BNM, 1524 N. Oklahoma Ave. Shawnee, OK 74801

HT37, NC300, DB20, Paragon 144, Comdel Processor, 700 w. SSB rig, many parts. List free. No shipping. W8QX, Box 452, Birmingham, MI, 48012.

FOR SALE: Heath 6-meter transceiver HW-29 and vibrator power supply VP-1-12 complete w/manuals xtal and mike. K3LVO, 436 Nimitz Ave. State College, PA 16801.

WANTED: Hallicrafter S-36, FOR SALE: Swan 270B with DC supply; Drake 2B with accessories. WB2AHR, 76 Main St., Matawan NJ 07747.

FOR SALE: 2 meter FM. Gladding 25, w/AC supply. 25 watts out. New condition, Paid $325, will sell for $199 (includes 8 xtals). K2ZCU2383 West Side Dr., N. Chili, NY 14514. (716) 594-8114.

SELL: SX117 $225, TTY model 19ASR $100, 14 ROTR$25, MainLiner TTL/2 $100. M.Sorochka 9501 243rd St., Bellrose, L.I., NY (212) 488-3166.

FOR SALE: New (still in box) Hy-gain Hy-quad, $135. New (still in box) TR-44 Rotator & 75ft-new cable, $65. WANT: Hi/Lo Police Scanner. WB9DWG, Box 593-Mundelein, IL 60060.

Manual for RACES (Radio Amateur Civil Emergency Service) $2.00 ea. Ted Goulden WA5VRE RR 2, Box 276, Yukon, OK 73099.

LAB Primary Phase Standard w/5" Scope $50.00, Wanted: 18 HT Hy-Tower, SB620 Scanalyzer, R6KZT 2255 Alexander Ave., Los Osos, CA 93401.

WANTED for Club - used electronic courses, books & magazines, etc. E. Ezekiel, 4312 Shaviv, Herzlia 46-221, Israel.

SALE/TRADE Mod 15 Rtty w/man incl TU, $50. Heath 0-10 5" scope, $35. OFFERS' Want: Genl Cov rcvr. K6KRV 3604 Christensen Ln, Castro Valley, CA 94546 (415)581-4143.

R-E TV Typewriter Builders: Am compiling and sending list of your names and ideas. SASE. Ken Prouty, WB0JFR, MSR Bx 42B, Nekoma, ND 58355.

XYL says sell. 28 type Reperf. 15 Printer TDs Tape UR8/A conv. Test set x-tra parts. Best offer. Takes All. No ship. Phil, WB5DXQ (918)465-3547.

Collins 75S-3C, 32S-3, KWM-2A, 30L-1, and 516 F-2 wanted. Sell Drake R-4B, T-4XB, MN-4, MS-4, $850.00 just factory overhauled. 75A-4 $395.00, pair of 4-1000A's custom built linear w/tubes and 2 vacuum variables $700.00 Tom 1321 Merimac Cove Memphis, TN 38134.

"GALAXY V: with ACP/s, Remote VFO, spkr console $240.00 plus shpg. Write for details and photo. K5UAE/6 584B Michelson Rd., Monterey, CA. 93940."

40m. BEAM WANTED. State price, condition and description. WB6VZi 16451 Tribune St., Granada Hills, CA. 91344.

TEN-TEC Argonaut wanted, for cash. P. Kalkstein, Phillips Academy, Andover, MA 01810.

FOR SALE: Mint National NC200 SSB Transceiver w/AC supply $250.00, Hallicrafter Mint SX100 W/speaker $125.00, FR4/u, Freq. Meter $40.00, Homebrew Linear W/P.S. (1600W) $50.00, ARC5 Rec & Trans $8.00 ea., surplus 2M Transceiver $20.00. T. Coddington WB6AWC 7825 Scotts Valley Rd., Lakeport, CA 95453.

SELL: Heath HD-10 Electronic Keyer, Mint condition, $27.00; WANTED: Drake MN-2000. A. Johnson, K1 IIK, Box 77, West Dover, VT. 05356.

SELL New RCA 6146's for $5.00 ea., postpaid & boxed. W4AIS, 306 Thornwood Dr., Taylors, S.C. 29687.

RTTY Anyone? Have FRA, CRV-35122 TU, with manual (Cost Gvt $1,560.) will trade for Ant. Tunner or? WB2EZU, GUZ 585 Chapman Pkwy, Hamburg, NY 14075.

SELL: Dow Co-Ax relay, 117 v.a.c. with aux outside contacts $10.00, 4-400A $25.00 plus postage, W6BLZ 528 Colima St, La Jolla, CA 92037.

Johnson 6N2, 7854 final, 250 wts am-cw blower, H.D. P/S & modulator Ameco 621 VFO all relays P.T.T. Vanguard FET 2mt. Conv. and P/S $160. Rich Whiten WB2OTK 67 Vassar Rd., Poughkeepsie, NY (914)462-5233.

FOR SALE: Lafayette Receiver, Model KT-320 30 to 1.6 MHZ. $25.00. Martin Rexsen, W2FEI 493 Oxford Rd., Cedarhurst, LI, NY 11516 (516)295-5411.

TRANSFORMERS REWOUND' Jess Price, W4-CLJ, 507 Raehn St., Orlando, FL 32806. (305) 425-7251.

WANTED: Dept. of Army, Tech. Manuel, TM11-2229. Good condition, price or trade. P.L. Lemon, 3154 Stony Point Rd., Santa Rosa, CA. 95401.

FM-Swan FM2X w AC PS, 3 factory channels. Mint cond. $175.00, J.O'Sullivan, 1180 Ruxton Rd., York, PA 17403.

SELL OR SWAP: SSB receiving converters CV-591A/URR. Units are used, complete & incomplete with manual. Clem K8HWW, 33727 Brownlea, Sterling Hts., MI 48007.

WANTED: Radio Receiver for ships working frequencies, APPX.-400KHZ thru 550 KHZ. WB4VAP Clarence W. Mulligan, 150 Coral Circle, South Daytona, FL 32019.

SELL 2 meter F.M.1C21 includes AC&DC, mike, 16XTALS, SWR Meter - Discriminator plus Dycom Super D80 Amplifier all only $325.00. Marty (215)884-6010.

SELL OR TRADE: Choice U.S. Mint Plate Blks, F. Day covers and sheets. Want Gud all Band Transceiver SBE or Swan. L.B. Fuqua W4WBD, Box 6, Eddyville, KY 42038.

SB-303, expertly wired, factory aligned. Mint. $275.00. Dan Ringer, WA8HMU0, 1415B Spruce Dr., Grand Forks AFB, ND 58201, 1-701-594-2228.

SELL: New-TR switch $10.00; 0.1 watt 2m FM Xmitter $30.00; Dycom VHF RF probe 44.00. Used-Heath twoer $25.00 W5QNQ, 2025 O'Donnell, Las Cruces, NM 88001.

4CS1000A/8168 with ceramic sockets and chimneys; all new and in original sealed pkgs. $75.00 per set. Heath Kit 1B-102 Frequency Scaler; mint condx, GUD to 175 MHZ $75.00. Alfred J. Parker, 314 So. Western Ave., Springfield, OH 45506.

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Heath GR-78 Portable Solid State General Coverage Receiver $75.00 K2MVR (201)429-8880.

FCC 1st class or amateur. Study Guides - send for list. CRD Associates Box 291 Klistern Springs, IL. 60558.

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WANTED: Used good 40 m and/or 75 m elements for Hustler mobile antenna. W5HY, Box 4334, Midland, TX 79701.

SELL: DX60B, Mint, $50.00 plus shipping. WB2BRQ, 12 Top-O-Hill Rd., Wappingers Falls, NY 12590.

FOR SALE: $10.00 ea. FOB. Vureau std. cir 74 Hard cover 1920 Radio Inst. & Measurements & Vac. tubes in Wireless. Bucher. 1917, Wireless experimenter manual. Bucher 1920. Douglas, 2254 Pepper Dr., Concord, CA 94520.

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HEATH GRA-70-6 TV Remote control assembled but unused. Asking $50. Offer? John Piercy, 13036 Clarion, Oxon Hill, MD 20022.

FOR SALE OR TRADE: (for Ham gear) 23 ch. CB xcvr ARS-Realistic TRC-24 w/complete base, mob. and port. accessories. WBHTJ, 38 Wayside, Scarsdale, NY 10583.

WANT: Model 32 Teleprinter in good condition or any teletype copying 100 WPM press. PO Box 185, Pismo Beach, CA 93449.

FT101 late model, mint condx w/cw filter, fan & 160M xtal. Telex Head Phone/Boom Mike-$30. D. Sachnoff, 9429 Ohio, Omaha, NE 68134.

WANTED: 4 sockets for VT-129/304 TL tubes. Send price to: Clinton H. Holder, 906B Inlow, College Station, TX 77840.

SELL-Hammarlund HQ-140-X 10 thru 80 M rcvr mint condx with manual $50 you ship. Ivan A. Leo WB4ZYM R 6 Box 859 Brooksville, FL 33512.

SALE: THOR6, w/ACP.S./modulator, $300.00; Eico VTVM w/H.V. Probe, $35.00; Precise Elec 201, Sig. TRCR (high gain) $35.00;Ameco CB-6 Conv. $25.00 All FOB. R. Wendel-WB2YYX, 160-20 Grand Crntral Pkwy, Jamaica, LI, NY 11432.

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TRADE: CREI Advanced Electronic Course for HW32 or Samkofsky K4HRU 4803 Brenda Dr., Orlando, FL 32806.

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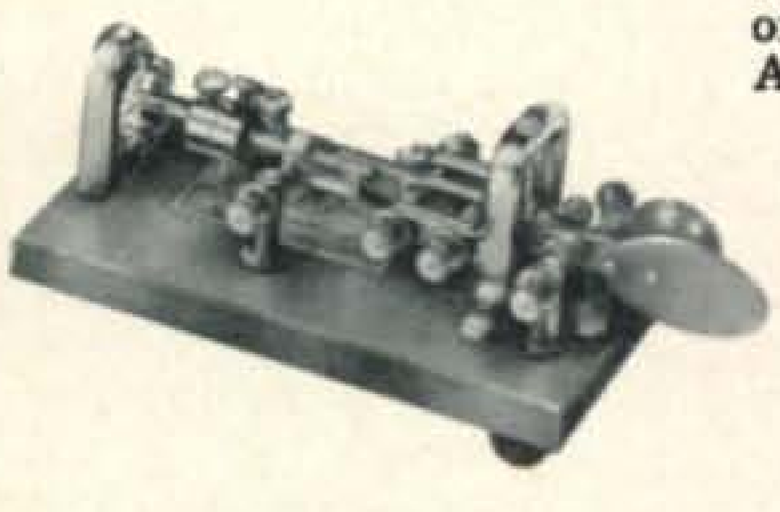

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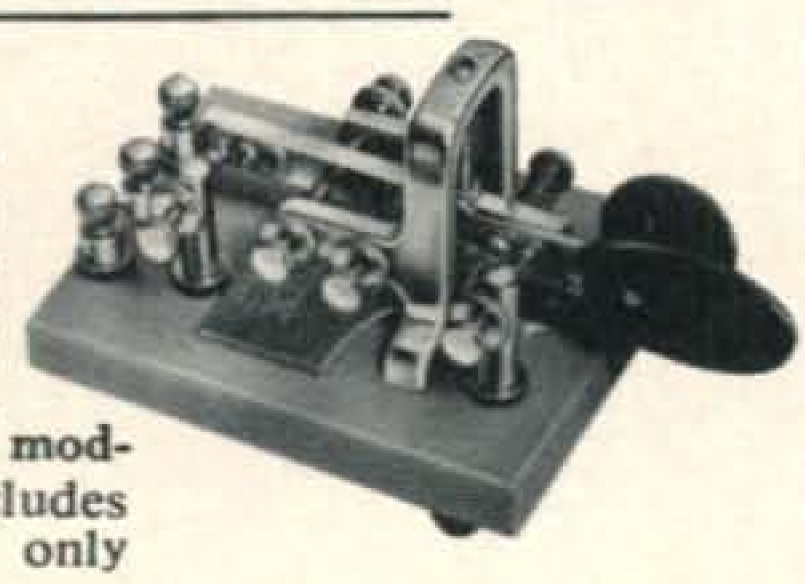

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WANT: Heath HR-10b, HRA-10-1, DX-60b, HG-10b, HM-102, HN-31&SB-600. Wll py bet $150--$200. Mst be in gd to exll cond. You ship. S.L. Ballinger, 11 Lown Ct. Poughkeepsie, NY 12603.

WANTED: Heath Digital Clock & Indoor-Outdoor thermometer. Tom Dornback, K9MKX, 2515 College Road, Downers Grove IL 60515.

WANTED: Dept. of the Army, Tech. Manuel, TM 11-2229. Buy or trade. P.L. Lemon 3154 Stony Pt. Rd., Santa Rosa, CA 95401.

SELL: New-TR switch $10. 0.1 watt 2 m FM Xmitter $30. Dycom VHF RF probe $4. Used-Heath twoer $25. W5QNQ 2025 O'Donnell, Las Cruces, NM 88001.

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WANTED: Rcvr tuning cap. for Knight TR-108, C-8, Part no.286104. State your price. WB2OZA, 716 Calhoun Ave, Bronx NY 10465. (212) 824-2630.

SELL: Hammurland HQ-170, $140; Heath HW-16, $85; DX-100, $85. In good condition. Want: HW-12, HP-23. Bill Henderson, P.O. Box 4, Talala, OK, 74080.

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MISC. parts etc. to Sell or Give for postage only. S.A.S.E. for list to: J. Howell, RR 6, Box 239, Bedford IN 47421.

FOR SALE: Hammarlund HX-500 SSB Transmitter, with manual. Like new condition. $185.00. W0NGU, P.O. Box 754, Fort Collins, COLO 80521.

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SALE: Eico 584, Battery Tstr., $9.50; 495 scope volt call, $17.50; 950 RCL, $27.50; Knight CB C-555(Kit), $17.50. All FOB. B. Wendel, WB2YYX, 160-20 Grand Central Pkwy, Jamaica LI, NY, 11432.

FOR SALE: Drake 2C,2CQ, $190; 2-NT, $75; Gonset II, $35.00. G. Ichikawa, WA2CPQ (607)687-1207.

FOR SALE: ECS8 Vacuum Variable, 2 to 8 mmf. Ideal for neutralizing capacitor, $17 postpaid. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

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WANT skeds for 5BWAS and 160M. K5MHG16, 419 Westbourne Dr., Los Angeles, CA 90048.

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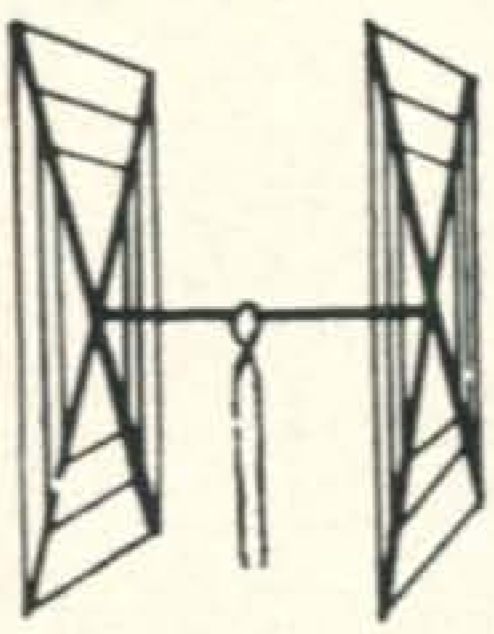
WHICH ANTENNA WINS THE CONTEST ?

In open competition against thousands of commercial and home-brew antennas, WA1JFG won the New England championship with a Gotham beam, by a margin of 5,982 points! WB2JAM won the sectional award for the Sweepstake contest in 1969 and 1970 with a Gotham 4-element 15 meter beam! Hundreds of unsolicited testimonials from grateful hams are our proof that Gotham antennas give you the best design, and the best materials. Forget our low prices - rely on the results of open, competitive contests. Ask yourself: Why do Gotham antennas win?

QUADS

Worked 42 countries in two weeks with my Gotham Quad and only 75 watts...



W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished): 52 ohm coaxial cable

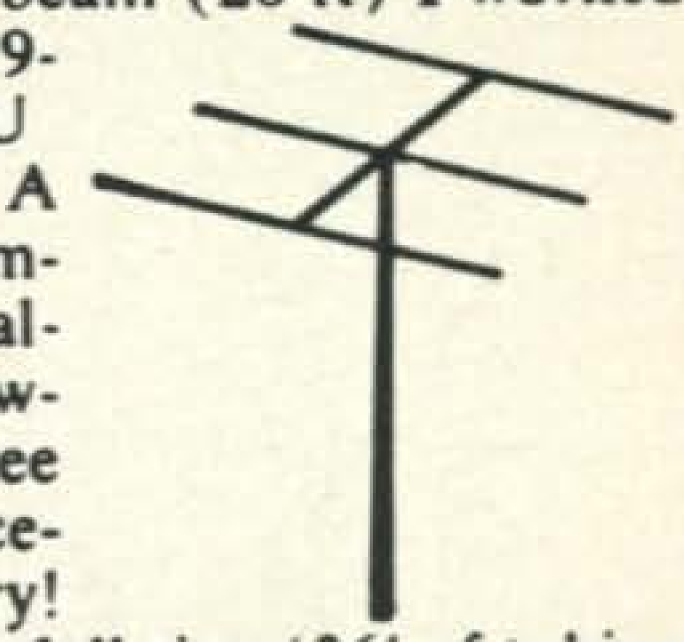
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$41.00
10-15 CUBICAL QUAD	36.00
15-20 CUBICAL QUAD	38.00
TWENTY METER CUBICAL QUAD	31.00
FIFTEEN METER CUBICAL QUAD	30.00
TEN METER CUBICAL QUAD	29.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$25	4 EL 10	24
3 EL 20	31*	7 EL 10	38*
4 EL 20	38*	4 EL 6	24
2 EL 15	21	8 EL 6	34*
3 EL 15	25	12 EL 2	31*
4 EL 15	31*	*20' Boom	
5 EL 15	34*		

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, TI2FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts! *FLASH!* Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$18.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$20.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$22.95

"SASE for FREE literature and beam and quad gain formulas.

"HOW TO ORDER: Send money order (bank, store, or United States) in full. We ship immediately by best way, charges collect. DEALERS WRITE."

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Amateur Net $499

ALL BAND, SOLID STATE COMMUNICATIONS RECEIVER

- ☐ **Features:**
- ☐ Total spectrum coverage: 160, 80, 60*, 40, 31*, 25*, 20, 19*, 16*, 15, 13*, 11*, CB*, 10A, 10B, 10C*, 10D*, 6*, and 2* Meter bands
- ☐ Provision for all mode reception and filters: SSB, CW**, AM**, RTTY, and FM**
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- ☐ Fixed channel crystal control provision

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ANOTHER FIRST FROM YAESU!

(*optional plug-in crystals) (**optional filters available)

Available soon from your dealer

Price and specifications subject to change without notice

NEW!
YO-100

Amateur Net $199

Station Monitor Scope

- ☐ **Features:**
- ☐ Compatible with most all transmitters and transceivers
- ☐ Provision for all mode monitoring:
  SSB
  CW
  AM
  RTTY
- ☐ All essential functions front panel adjustable
- ☐ Built-in 1500/1900 Hz Tone Generator
- ☐ Vertical input — 3180 kHz — with 455 kHz and 9 MHz optional

For the cleanest signal on the band, add this versatile accessory to your station today.

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