CQ

ICD

February 1970

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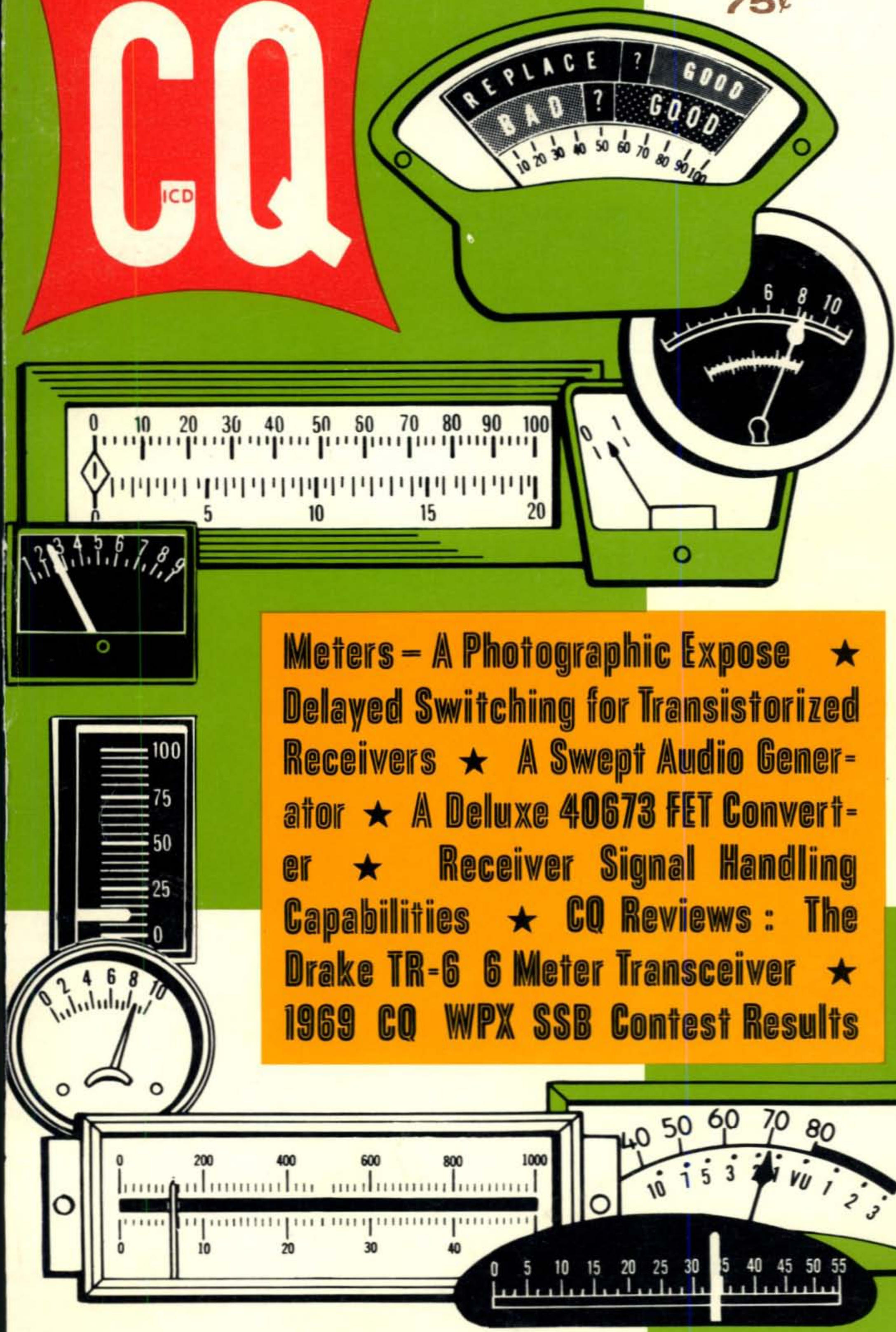


Meters – A Photographic Expose ★ Delayed Switching for Transistorized Receivers ★ A Swept Audio Generator ★ A Deluxe 40673 FET Converter ★ Receiver Signal Handling Capabilities ★ CQ Reviews : The Drake TR-6 6 Meter Transceiver ★ 1969 CQ WPX SSB Contest Results

The Radio Amateur's Journal

To Get A $500 Rig For $250*

Build The Heathkit® HW-100

When the time comes for a new rig, most hams approach the task with enthusiasm . . . until financial reality invades their dreams. An ordinary 5-band transceiver, wired and ready to go, costs around $500. Much of the reason for this price, of course, is that you are paying to have someone else wire your rig.

Heath also sells $500 worth of transceiver — the HW-100 — but our price is a bit more realistic — $250* — and the performance is better! We reason that if you can handle the FCC exam, you can also handle a soldering iron. And because we don't use any of your money to wire your rig, we can use more of it to provide advanced engineering. Check out a realistic $500 rig . . . the Heathkit HW-100 . . . another hot one from the hams at Heath.

Kit HW-100, 18 lbs. **$250.00***
Kit HP-13A, DC power supply, 7 lbs. **$69.95***
Kit HP-23A, AC power supply, 19 lbs. **$51.95***
Kit SB-600, 8 ohm speaker, 6 lbs. **$19.95***

HW-100 SPECIFICATIONS — RECEIVER. Sensitivity: Less than .5 microvolt for 10 dB signal-plus-noise to noise ratio for SSB operation. **Selectivity:** 2.1 kHz minimum at 6 dB down, 7 kHz maximum at 60 dB down (3.395 MHz filter). **Input:** Low impedance for unbalanced coaxial input. **Output impedance:** 8 Ω speaker, and high impedance headphone. **Power output:** 2 watts with less than 10% distortion. **Spurious response:** Image and IF rejection better than 50 dB.
TRANSMITTER. DC Power input: SSB: 180 watt P.E.P. (normal voice: continuous duty cycle). CW: (A1 emission) 170 watts (50% duty cycle). **RF Power output:** 100 watts on 80 through 15 meters; 80 watts on 10 meters (50 Ω nonreactive load). **Output impedance:** 50 Ω to 75 Ω with less than 2:1 SWR. **Oscillator feedthrough or mixer products:** 55 dB below rated output. **Harmonic radiation:** 45 dB below rated output. **Transmit-receive operation:** SSB: PTT or VOX. CW: Provided by operating VOX from a keyed tone, using grid-block keying. **CW Sidetone:** Internally switched to speaker or headphone, in CW mode. Approximately 1000 Hz tone. **Microphone input:** High impedance with a rating of —45 to —55 dB. **Carrier suppression:** 45 dB down from single-tone output. **Unwanted sideband suppression:** 45 dB down from single-tone output at 1000 Hz reference. **Third order distortion:** 30 dB down from two-tone output. **RF Compression (TALC):** 10 dB or greater at .1 ma final grid current. **GENERAL. Frequency coverage:** 3.5 to 4.0; 7.0 to 7.3; 14.0 to 14.5; 21.0 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.0 to 29.5; 29.5 to 30.0 (megahertz). **Frequency stability:** Less than 100 hertz per hour after 30 minutes warmup from normal ambient conditions. Less than 100 Hz for ±10% line voltage variations. **Modes of operation:** Selectable upper or lower sideband (suppressed carrier) and CW. **Dial calibration:** 5 kHz. **Calibration:** 100 kHz crystal. **Audio frequency response:** 350 to 2450 Hz. **Front panel controls:** Main tuning dial. Driver tuning and Preselector. Final tuning. Final loading. Mic and CW Level control. Mode switch. Band switch. Function switch. Meter switch. RF Gain control. Audio Gain control. **Side controls:** Meter Zero control; Bias; VOX Sensitivity; VOX Delay; Anti-trip. **Internal controls:** Carrier null; neutralizing. **Tube complement:** OA2 Regulator (150 V); 6AU6 RF amplifier; 6AU6 1st receiver mixer; 6AU6 Isolation amplifier; 6AU6 1st IF amplifier; 6AU6 2nd IF amplifier; 6BN8 Product detector and AVC; 6AU6 VFO Amp.; 6CB6 2nd transmitter mixer; 6CL6 Driver; 6EA8 Speech Amplifier and cathode follower; 6EA8 1st transmitter mixer; 6EA8 2nd receiver mixer and relay amplifier; 6EA8 CW sidetone oscillator and amplifier; 6GW8 Audio amplifier and audio output; 12AT7 Heterodyne oscillator and cathode follower; 12AT7 VOX amplifier and calibrator oscillator; 12AU7 Sideband oscillator; 6146 Final amplifiers (2). **Diode complement:** 6 Germanium Diodes: Balanced modulator, RF sampling, and crystal calibrator harmonic generator; 9 Silicon Diodes: ALC rectifiers, anti-trip rectifiers, and DC blocking; 1 Zener Diode: cathode bias. **Transistors:** MPF-105 FET-VFO; 2N3393 — Voltage regulator. **Rear apron connections:** CW Key jack; 8 Ω output; ALC input; Power and accessory plug; RF output; Antenna; Spare. **Power requirements:** 700 to 850 volts at 250 ma with 1% maximum ripple; 300 volts at 150 ma with .05% maximum ripple; —115 volts at 10 ma with .5% maximum ripple; 12 volts AC/DC at 4.76 amps. **Cabinet dimensions:** 14-13/16" W. x 6-5/16" H. x 13-3/8" D.

• 80 through 10 meter coverage • Solid-state (FET) VFO • 180 watts input PEP SSB — 170 watts input CW • Switch selected USB, LSB or CW • Crystal filter for sharp 2.1 kHz selectivity • Full coverage on all bands with 500 kHz per band segment • Better than ½ uV sensitivity • Smooth vernier control of frequency with patented Harmonic Drive® dial mechanism • Outstanding frequency stability • Excellent image and IF rejection • Built-in 100 kHz calibrator • Separate offset CW carrier crystal • Triple Action Level Control® for reduced possibility of overdriving & distortion • Built-in S-meter • Quiet, enclosed relays • Run fixed or mobile with HP-23A or HP-13A power supplies • Built-in VOX • Easy circuit board — wiring harness construction

Run Fixed Or Mobile With These Heathkit Power Supplies

HP-13A Solid-State Mobile Power Supply . . . now with a higher DC input voltage range for compatability with newer cars. All solid-state circuitry produces high, low & bias voltages from a 12-16 VDC (negative ground) input. Primary & filament lines are circuit breaker protected.

Kit HP-13A, 7 lbs. **$69.95***

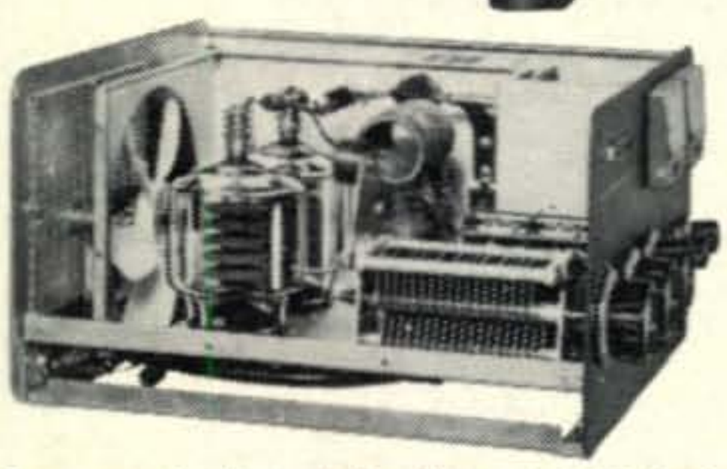
HP-23A Fixed Power Supply . . . provides high & low B+, bias and filament power for your HW-100, from an AC line. Features switch selection of two low B+ voltages, fixed & adjustable bias, plus 6.3 or 12 V filament power. 120/240 VAC operation.

Kit HP-23A, 19 lbs. **$51.95***

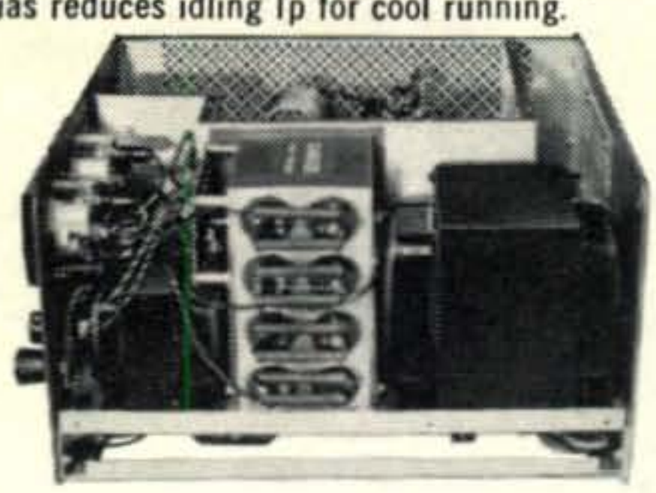
*Mail order prices; F.O.B. factory. **AM-231**

The New Heathkit® 2-KW Linear Is Here
(at last)

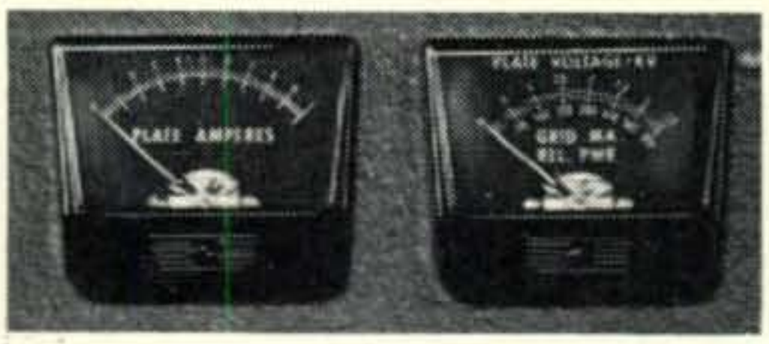
New SB-220 . . . $349.95*



Two rugged, dependable Eimac 3-500Z finals for top performance. Zener regulated operating bias reduces idling Ip for cool running.



Reliable power supply . . . plate transformer on right, capacitor bank in center for excellent regulation, filament & bias circuitry on left.



Continuous monitoring of Ip plus switch selected monitoring of Rel Pwr., Ep & Ig.

It's not just a rumor anymore . . . the SB-220 is here, with a price and performance worth the wait.

The New Heathkit SB-220 uses a pair of conservatively rated Eimac 3-500Z's to provide up to 2000 watts PEP input on SSB, and 1000 watts on CW *and RTTY*. Requires only 100 watts PEP drive. Pretuned broad band pi input coils are used for maximum efficiency and low distortion on the 80-10 meter amateur bands.

Built-In Solid State Power Supply can be wired for operation from 120 or 240 VAC. Circuit breakers provide added protection and eliminate having to keep a supply of fuses on hand. Operating bias is Zener diode regulated to reduce idling plate current for cooler operation and longer life.

Double Shielding For Maximum TVI Protection. The new "220" is the only final on the market that's double shielded to reduce stray radiation. The heavy gauge chassis is partitioned for extra strength and isolation of components. When you put this kind of power on the air, you'd better be sure. With the SB-220, you are.

Really Cool Running. The layout of the SB-220 is designed for fast, high volume air flow, and a quiet fan in the PA compartment does the job. The "220" actually runs cooler than most exciters.

Other Features include ALC output for prevention of overdriving . . . safety interlock on the cover . . . easy 15 hour assembly and sharp Heathkit SB-Series styling.

Tired Of Stumbling Barefoot Through The QRM? Put on big shoes . . . the new Heathkit SB-220. Another hot one from the Hams At Heath.

Kit SB-220, 55 lbs.....**$349.95***

SB-220 SPECIFICATIONS — **Band coverage:** 80, 40, 20, 15 and 10 meter amateur bands. **Driving power required:** 100 watts. **Maximum power input:** SSB: 2000 watts P.E.P. CW: 1000 watts. RTTY: 1000 watts. **Duty cycle:** SSB: Continuous voice modulation. CW: Continuous (maximum key-down 10 minutes). RTTY: 50% (maximum transmit time 10 minutes). **Third order distortion:** —30 dB or better. **Input impedance:** 52 ohm unbalanced. **Output impedance:** 50 ohm to 75 ohm unbalanced; SWR 2:1 or less. **Front panel controls:** Tune, Load, Band, Sensitivity, Meter switch, Power CW/Tune — SSB, Plate meter, Multi-meter (Grid mA, Relative Power, and High Voltage). **Rear Panel:** Line cord, Circuit breakers (two 10 A). Antenna Relay (phono), ALC (phono), RF Input (SO-239). Ground post. RF output (SO-239). **Tubes:** Two Eimac 3-500Z. **Power required:** 120 VAC, 50/60 cycles, at 20 amperes maximum. 240 VAC, 50/60 cycles at 10 amperes. **Cabinet size:** 14⅞" W x 8¼" H x 14½" D. **Net weight:** 48 lbs.

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*Mail order prices; F.O.B. factory.

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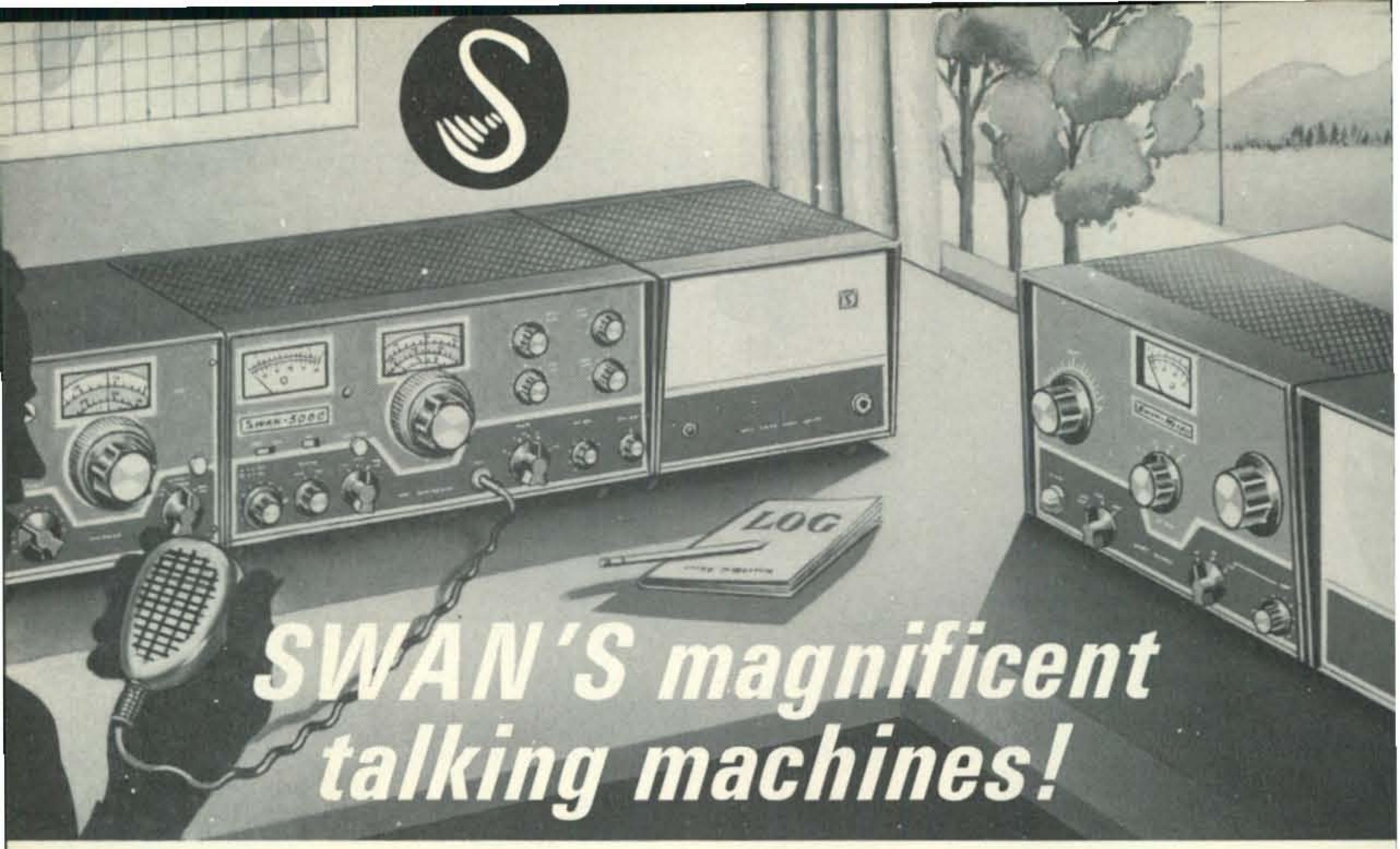

SWAN'S magnificent talking machines!

MODEL 508 VFO—SWAN 500C TRANSCEIVER—117XC POWER SUPPLY—MARK II LINEAR

For several years Swan Electronics has been specializing in value engineering of single sideband transceivers to give radio amateurs the best possible equipment at the lowest possible price. We're pleased to say that we have thousands of satisfied customers all over the world, many who have purchased their third or fourth Swan as we continue the evolutionary improvement of our product. (Trade-in value of a used Swan is well above average.) We would like to say that the station illustrated above is a typical Swan station, but that would be misleading. Actually, the average Swan owner finds the quarter kilowatt or half kilowatt transceiver very adequate for his operating needs. What the picture illustrates is some of the Swan accessories that will add more versatility and greater operating pleasure to your Swan station. For the DX operator, the model 508 external VFO provides separate control of transmit and receive frequencies, or for the MARS and Net operator, the 510X crystal oscillator provides up to 10 fixed channels. For breaking through those weekend QRM pile-ups there's no better cure, legally, than the Mark II Linear Amplifier with its 2000 watts of P.E.P.

TOP OF THE SWAN-LINE THE FAMOUS 500C TRANSCEIVER

520 watts P.E.P. input on 10, 15, 20, 40 and 80 meters. Finest crystal lattice filter with 1.7 shape factor. ½ microvolt receiver sensitivity. Voice quality, performance and reliability are in the Swan tradition of being second to none. **$565**

MODEL 508 EXTERNAL VFO

Provides full coverage of 80, 40, 20, 15 and 10 meters in 8 ranges of 500KC each. Enables you to transmit and receive on separate frequencies. Plugs directly into either the 500C or 270. **$145**

CRYSTAL CONTROLLED MARS OSCILLATOR

For Mars or Net operation. Model 510X. 10 channels. Plugs directly into 500C or 270. Less crystals. **$55**

POWERHOUSE MARK II LINEAR AMPLIFIER

2000 watts, P.E.P. input, 10 through 80 meters. Uses two 3-500Z triodes. Complete with matching power supply. **$660**

MODEL 117XC MATCHING AC SUPPLY FOR 500C TRANSCEIVER

For 117 volts, 50-60 cycles, with speaker and phone jack. **$105**

12 VOLT DC POWER SUPPLY FOR 500C TRANSCEIVER

Model 14-117, designed for mounting under hood. Includes cables, plugs and fuses. Can operate from 117 volt AC by detaching DC module and plugging in 117 volt line cord. **$130**

SWAN HORNET BEAM ANTENNAS

Latest addition to the Swan-Line. High quality, high performance antennas for the amateur bands. Best known are the famous Hornet Tribanders, made in 2, 3 and 4 element models. The TB-1000 series is rated at 2000 watts, the slightly smaller TB-750 at 1500 watts.

TB-1000-4 4 element...$159
TB-1000-3 3 element... 129
TB-750-2 2 element.... 89
TB-750-3 3 element.... 109

SWAN
ELECTRONICS
OCEANSIDE, CALIFORNIA

A Subsidiary of Cubic Corporation

FEBRUARY, 1970 VOL. 26, No. 2

CQ

The Radio Amateur's Journal

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Postmaster: Please send form 3579 to CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050

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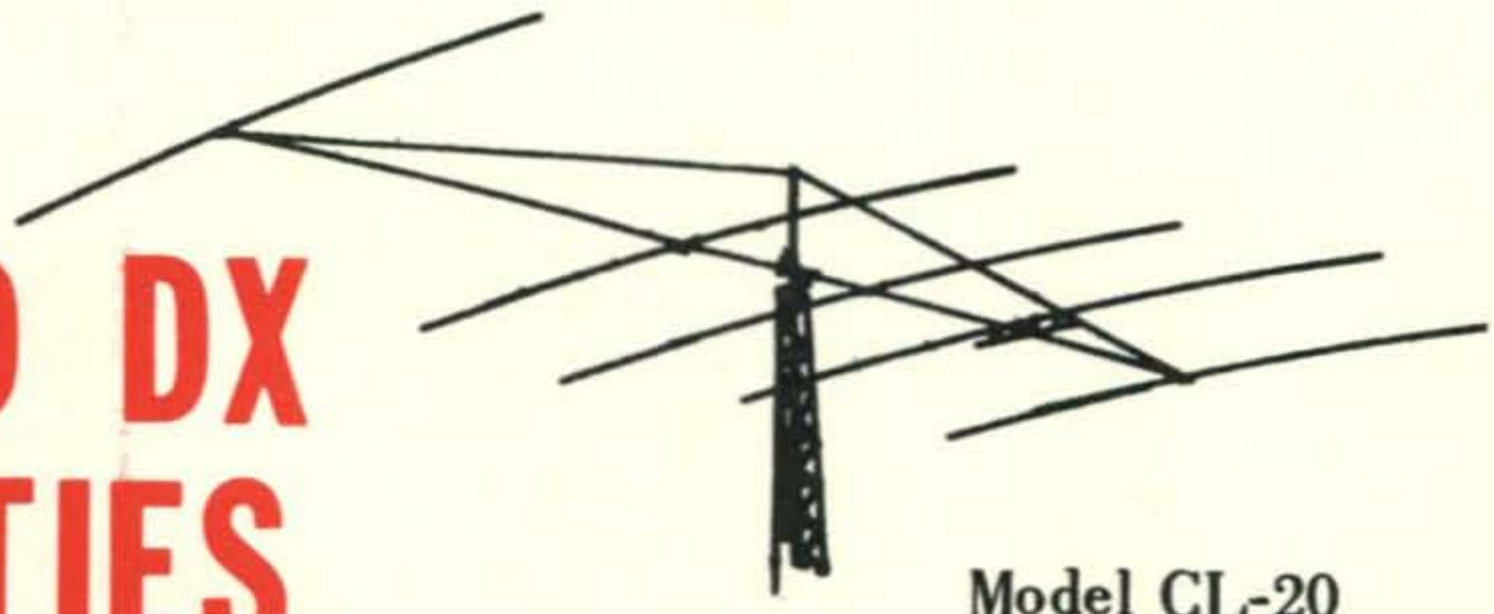
NEW SINGLE-BAND BEAM FROM MOSLEY

The Classic 20 WITH EXPANDED DX CAPABILITIES



Model CL-20

ON 20 METERS

DON'T LIMIT YOURSELF!

When you install a 20 meter beam, there is only one antenna investment you can afford . . . The NEW CLASSIC 20 with expanded DX capabilities, thanks to the new Classic Feed System, "Balanced Capacitive Matching". This new array promises to be the most universally accepted amateur beam ever developed for 20 meters.

TAKE A LOOK AT THE VITAL STATISTICS!

- FORWARD GAIN: 9.8 db compared to reference dipole; 11.9 db over isotropic source.
- POWER RATED: 1 KW AM/CW; 2 KW P.E.P. SSB input to the final.
- SWR: 1.5/1 or better.
- MATCHING SYSTEM: Balanced Capacitive.
- FEED POINT IMPEDANCE: 52 ohms.
- NUMBER OF ELEMENTS: 5. Aluminum tubing; 6063-T832.
- MAXIMUM ELEMENT LENGTH: 38 ft. 1½ in.
- BOOM LENGTH: 46 ft.
- RECOMMENDED MAST SIZE: 3 in. OD.
- TURNING RADIUS: 28 ft.
- WIND SURFACE: 18.7 sq. ft.
- WIND LOAD (EIA Std. 80 MPH): 364.45 lbs.
- ASSEMBLED WEIGHT: Approx. 139 lbs.
- SHIPPING WEIGHT: Approx. 145 lbs. via truck.

Pat. No. 3419872

Mosley is the name. Antennas are our business.
Designed, engineered and manufactured by hams . . . for hams.
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Mosley Electronics Inc. 4610 N. LINDBERGH BLVD., BRIDGETON, MO. 63044

See page 110 for New Reader Service

Now! Direct From W9IOP!

The new 1969 5th Edition of the world famous "SECOND OP" DX calculator

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Whether you are a beginning DXer or a long-time member of the Honor Roll, a "Second Op" can be your best friend in the ham shack. In just seconds it gives you accurate beam headings from the East, Midwest, West, and now the Southwest. You also see time difference, DX zone, country, continent, and postal rates instantly for every prefix. And there's also a handy space to log each prefix worked . . . plus confirming QSL's.

The 5th Edition "Second Op" is all new in every way. Every current country and prefix is listed, plus QSL bureaus and other vital facts for effective and enjoyable DX. Beam headings were programmed and checked by a computer to guarantee accuracy.

Just a $1.50 investment can clean up the paperwork in your ham shack in minutes. Pick up the latest "Second Op" at leading ham radio distributors, or write direct to W9IOP at the address below.

PUBLICATIONS IN ELECTRONICS
2330 Topsfield Road, South Bend, Indiana 46614

See page 110 for New Reader Service

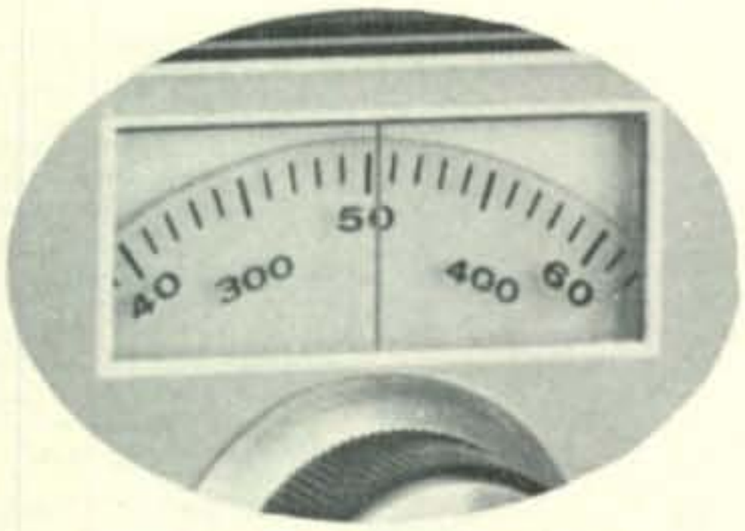
DRAKE

- *Direct Frequency Dialing*
- *Programmable Coverage*

COMMUNICATIONS RECEIVER

- *All Solid State*
- *FET Circuitry*

MODEL SPR-4 ...$379.00 NET



Precision tuning dial . . . tune station frequency directly . . . no searching.

Programmable frequency coverage . . . change crystal and label on dial.

The SPR-4 is a general purpose receiver which may be programmed to suit any interest: SWL, Amateur, Laboratory, Broadcast, Marine Radio, etc. Frequency Coverage: 150-500 KHz plus any (23) 500 KHz ranges between .500 and 30 MHz.

FEATURES: ● **Linear dial** with 1 KHz readout ● **4-pole crystal** filter in first IF ● **4-pole LC filter** in second IF ● **Three bandwidths:** 0.4 KHz, 2.4 KHz, and 4.8 KHz for: CW, SSB, AM ● **AVC time constants** opimized for each mode ● **Superior** cross-modulation and overload performance ● **Power:** 120 VAC, 220 VAC, and 12 VDC ● **Crystals supplied** for LW, standard broadcast and seven shortwave broadcast bands ● **Built-in speaker** ● **Notch Filter.**

ACCESSORIES: 100 Khz calibrator, noise blanker, transceive adapter (T-4XB), DC power cord, loop antenna, crystals for other ranges.

For more information write

R. L. DRAKE COMPANY

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OUR READERS SAY

Reason For Being

Editor, *CQ:*

I wish to heartily second the thoughts expressed by Gregory Winters, K4PVA, in his letter printed in your December 1969 issue.

My "reason for being" in amateur radio is "R & R": Relaxation and Recreation. I am extremely active in affairs of the American Legion at all levels, from local to state, and participate in many other community service and youth activities. I use ham radio as a diversion as well as for emergency purposes. My own feeling is that the vast majority of ham radio operators are in the field for hobby and emergency service purposes.

Setting aside large segments of operating frequencies for the relatively few "professional hams" and snob-type operators seems manifestly unfair. In this age of technological research and achievements by research plants of commercial enterprises and facilities of the United States Government makes the likelihood of "advancing the state of the art" by the amateur radio operator and/or technical tinkerer very minimal. The old days of major electronic breakthroughs by amateurs, regardless of how advanced, are over. Further, with single sideband and other modern communications techniques, high-speed c.w. is obsolete and very much "for the birds." (There...I've said it—the unmentionable—and I'm glad, so now shoot me!...)

Let's bring back the fun to amateur radio, together with the most important factor of increased participation in emergency services and as soon as possible, like yesterday, junk the snob appeal of incentive licensing.

Edward M. Ryan, K2ZNR
New Egypt, N.J.

Editor, *CQ:*

Having just received and read most of your December issue I would like to add the following to "Our Readers Say" by K4PVA.

Since minority groups do not seem to be getting any where today, I suggest all Generals and Techs forget their differences and join together to prod Washington into removing the stumbling block to getting the General license, namely the 13 w.p.m. c.w.

I know many Generals worked hard to get their ticket but if this c.w. requirement was reduced to 10 w.p.m. possibly close to 100% of the Techs would be able to get the General ticket. Many of the old timer's had it so. I also see that Mexico has just instigated a 10 w.p.m. c.w. requirement, so why shouldn't we?

After this is achieved, Techs and Generals together would certainly represent a much larger group—the largest in ham radio. As I said, many Generals will skoff, but consider this, your General ticket is not worth much today, but if we joined together now to get a 10 w.p.m. code requirement approved, it would not be long before we could prod Washington to place all the bands at our disposal. Think about it.

Harold D. Mohr, K8ZHZ
Gahanna, Ohio

Editor, *CQ:*

Relative to K4PVA, Gregory L. Winters' article, "Reason for Being," I have one word—Amen! After spending the past few years of almost constant daily hamming, rag chewing, DXing, phone patching, occasionally working with nets, etc. (all phone), I find since practically half of the phone bands have been taken away, my interest has all but been depleted. I sit back and look at that $4000 worth of gear (you may call me an appliance operator if you so desire), look at the certificates that I earned, look through the juicy DX cards and say to myself—well, let's try once more. So I flip the switch and bang—instant QRM! So I ask myself further, what did *I* do to deserve this?

Sure, I wrote letters voicing my opinion regarding Incentive licensing, (one to John Griggs—So. Calif. Director) but my voice, like those of many others who tired to be heard, apparently were not. As mentioned in my letter to Mr. Griggs, (I like the guy, incidentally), in my opinion the incentive licensing plan was misnamed. It should have been "P.F.C."—Project Frequency Cut! The word incentive of course is a stimulating one, but in this case I cannot bring myself to the point of stimulation over something I once had, and later had it taken away, especially when I didn't have the opportunity to vote yes or no.

I still ask the question, as I asked Mr. Griggs, "What good has the incentive licensing plan done overall?" The statistics I have read show that the majority of hams have not accepted the plan, therefore it is obvious that the cutback of previous allocated frequencies has proven to be more a detriment to amateur radio than an asset; so now, I too, like K4PVA, am now concentrating my full 'hobby time' to assigned MARS frequencies, so at least the Viet Nam boys have gained a damn good phone patch man—hi!

Jack D. Connell, W6VUM
Los Alamitos, Calif.

Slow Scan Television

Editor, *CQ:*

It was with great interest that I read Ingerson's paper "Applications of Information Theory to Slow-Scan Television" (*CQ*, 1969). I feel his presentation will add much to the amateur's understanding of communication systems and to the frequency-time trade-offs possible in the expansion and compression of signal bandwidths.

I am disturbed, however, by Dr. Ingerson's implied "put-down" of the class of slow-scan systems presently in use on the h.f. bands. Inger-

See page 110 for New Reader Service

son states that the simple approach to slow-scan (*i.e.* "...slowing down the time constant of ordinary television, decreasing the number of lines or frames/sec or both,...") leads to pictures that "...are of low resolution, repeat only infrequently, and are generally unsatisfactory for anything but novelty". He then goes on to develop hypothetically a sophisticated narrow-band television system with the following characteristics:

100 × 100 element picture
4 kc bandwidth
4 level gray scale
2.5-second frame period (basic) with continued presentation and updating at 20 to 30 frames per second.

As for the type of information transmitted, Ingerson states that "we would expect that the usual picture be either a slide, call letters...or the operator sitting in front of the camera, talking...". He also points out that a device for the storage of data is the worst problem to overcome; further, with the mention of video tape recorders, one is lead to suspect that financial problems might also be encountered. How, then, does such a system described above "best" the slow-scan system most used today on the amateur bands?

The answer, I believe, is that for general-purpose amateur use, "it doesn't."

Suitably equipped amateurs have for over four years transmitted slow-scan pictures using the standard proposed by MacDonald (1961). Employing sub-carrier f.m., the standard's signals are characterized by the following parameters:

120 line picture
2.3 kc bandwidth
5 level gray scale (limited by the gray-scale rendition of the P7 phospor) 8-second frame period.

[*Continued on page 94*]

Announcements

La Grange, Illinois

The Chicago Suburban Radio Association will hold their Annual Hamboree on March 22nd at East Avenue and 55th Street, Countryside (La Grange), Illinois. Flea market and prizes. For information and directions contact Col. Wilson Thomas, W9KWA, 4017 Vernon Ave., Brookfield, Ill. 60513. Phone: (312) HU 5-0451.

Midland, Texas

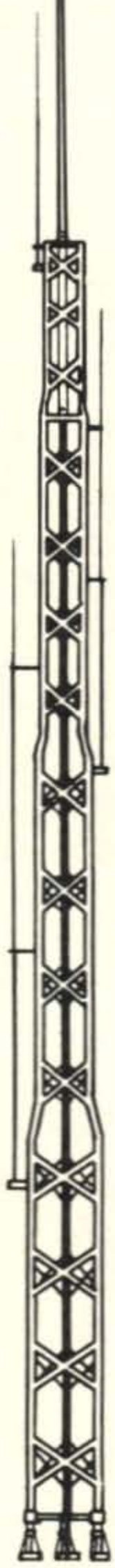
The Midland Amateur Radio Club will hold its Annual St. Patrick's Day Swapfest on March 14 and 15, 1970. For more details, write: MARC, Box 967, Midland, Texas 79701.

Berrien Springs, Michigan

The 3rd Annual Blossomland Amateur Radio Auction will be held Sunday March 15, 1970 at the Youth Memorial Building, Berrien County Fairgrounds, one mile northwest of Berrien Springs, Michigan, on US 31-33 North.

If you want more out of a vertical, then what you need is not an ordinary vertical!

By any standard of measurement, the Hy-Tower is unquestionably the finest multi-band vertical antenna system on the market today. Virtually indestructible, the Model 18HT features automatic band selection on 80 thru 10 meters through the use of a unique stub decoupling system which effectively isolates various sections of the antenna so that an electrical 1/4 wavelength (or odd multiple of a 1/4 wavelength) exists on all bands. Fed with 52 ohm coax, it takes maximum legal power. . . delivers outstanding performance on all bands. With the addition of a base loading coil, it also delivers outstanding performance on 160 meters. Structurally, the Model 18HT is built to last a lifetime. Rugged hot-dipped galvanized 24 ft. tower requires no guyed supports. And, a special hinged base assembly permits complete assembly of antenna at ground level. . . easy raising and lowering. Top mast, which extends to a height of 50 ft., is 6061ST6 tapered aluminum. All hardware is iridite treated to MIL specs. And, for directional control, many amateurs have bought two Hy-Towers and "phased" them. So, if you want the best vertical. . . bar none. . . get down to the best distributor under the sun (he's the one that stocks the Hy-Tower).



The Hy-Tower from Hy-Gain

● FOR THE STRONGEST SIGNAL UNDER THE SUN!

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SCRATCHI

Feenix, Ariz.

Deer Hon. Ed:

Your Hon. Magazine isn't perfect. Oh it's not too bad, but it's not perfect. You know what it needing (besides more subscribers?). It needs a reel simpathetic columist to help your reeders with there problems. Here are sample of what I meening–sort of a Deer Hashi Colum.

DEER HASHI–

I have trouble working DX. I managed to QSO 200 countries in nine weeks, which wasn't bad considering I'm only using 30 watts p.e.p. and my antenna is in a hole. Now, however, things have slowed down and all I can work is about eight or nine new countries a weekend. In truth, it takes sometimes three or four minutes for me to get an answer to my "CQ DX." What should I do? "Just an amateur DX'er"

DEER JUST AN–

Turn professhunal

DEER HASHI–

I've just returned from four weeks spent in Las Vegas where I've been on vacation. In looking through the mail that had accumulated I discovered a pink ticket from the FCC plus two follow-up letters. The last one said that if they didn't hear from me by a certain date, they would revoke my license. The date they mentioned is already passed. Should I operate, or write them, or what. "Very Disturbed"

DEER VERY DISTURBED–

I'd take a chance and go rite on operating. Anybuddy who can afford to spend for weeks in Las Vegas is either quite a gambler or a millyunair.

DEER HASHI–

My memory isn't too good and I have

See page 110 for New Reader Service

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difficulty remembering all the various frequency limits for U.S. hams. The result is that now and then I operate outside the band. I can't affffford to get any more pink tickets. Any suggestions? "Forgetful"

DEER FORGETFUL–

Move to a forren country and be a dee-x stayshun–they seem to be outside the bands all the time.

DEER HASHI–

I'm completely rebuilding my amateur station. Mother insists I not have it in the main house any more as she needs the room it's in to house two more maids. I thought of putting it over the garage, but that would rather crowd the five chauffers now living there. So, I've decided to build my own operating building on the 250 foot cliff overlooking the river. It really won't be as inaccessible as it sounds, as I'm planning on an underground track with a motorized vehicle to connect this building to the main house. My problem is I need someone to supervise the design of the building, to decide how many floors it should have, for example, and to design the antenna system and select the 1000 foot towers, or whatever is needed. I probably wouldn't be able to pay more than $15 or $20 an hour out of my allowance, and the job might only last two or three months. Do you know anybody that might be interested? "Reginald Gilt-Edge III"

DEER REGGIE–

I'm leeving on the next plane.

DEER HASHI–

I'm a normal 16-year-old boy and I'd like to get an amateur radio license. However, my parents forbid it. I've built a rig from information in your magazine, so I'm all set to go. Now, however, all I'm doing is stewing around wanting some excitement. What should I do? "Upset"

DEER UPSET–

If you are a normal 16-yeer-old boy, what are you doing playing around with radio? Go out and find yourself a girl frend, you idiot.

Well' Hon. Ed., how abouts it? You not thinking I having talent for this sort of thing? Of coursely, I mite not do as well if the letters were from reel armchoors. I making up the letters I pretend to answering–or could you tell?

Respectively yours,
Hashafisti Scratchi

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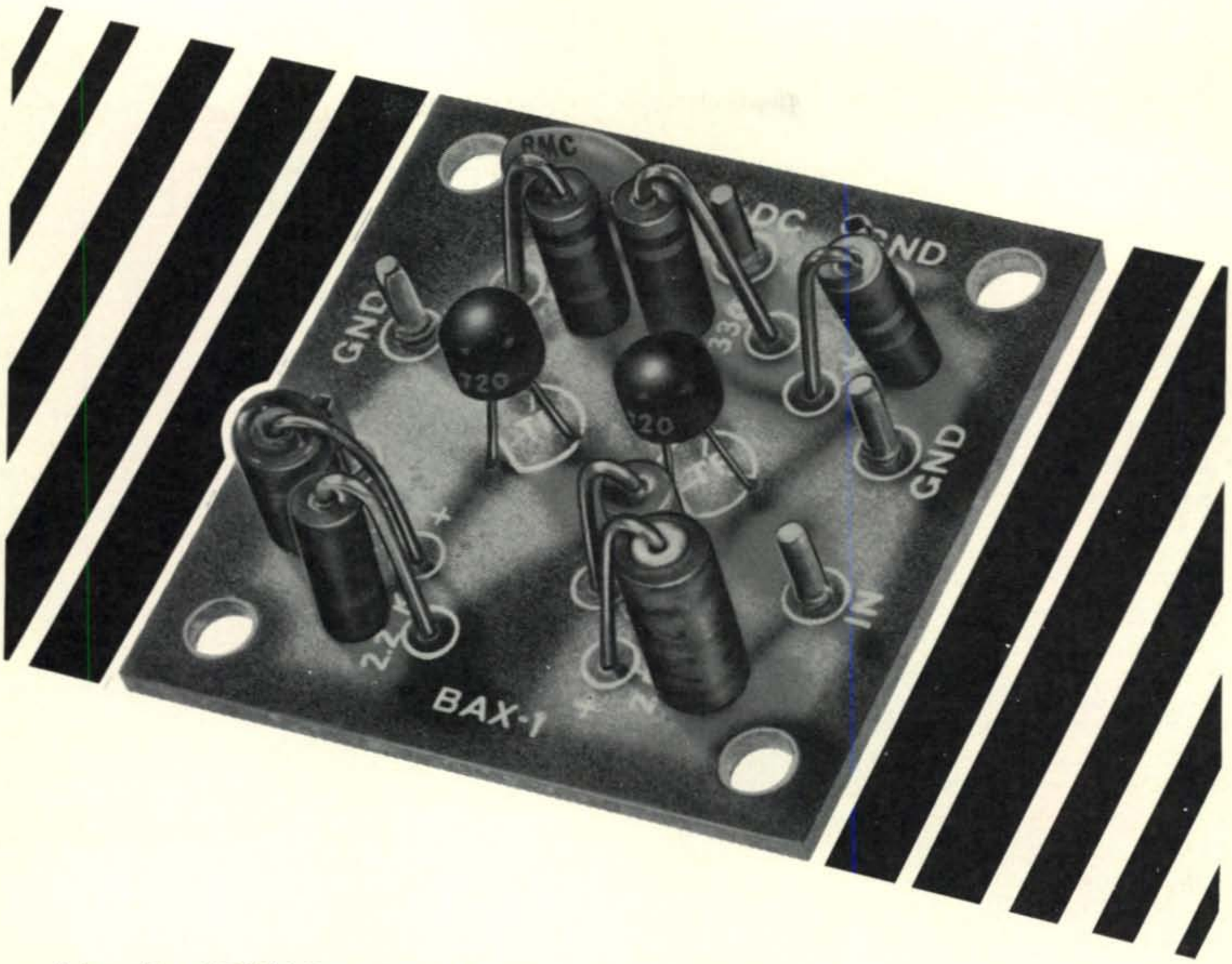

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See page 110 for New Reader Service

METERS

"A PHOTOGRAPHIC EXPOSÉ"

BY MILTON MANN,* W9PRH

WHAT'S inside that meter? Do I have to handle it like a fragile egg? As a ham for almost 20 years I have often wondered about these things. Perhaps you have, too. If so, here, in brief, are some answers?

*Box 413, Evanston, Illinois.

What's In A Meter?

Let us start by tearing down a typical meter, step by step. The VU meter we have chosen (courtesy Simpson Electric Company) contains a few electrical components, which we will ignore, in addition to the standard mechanism.

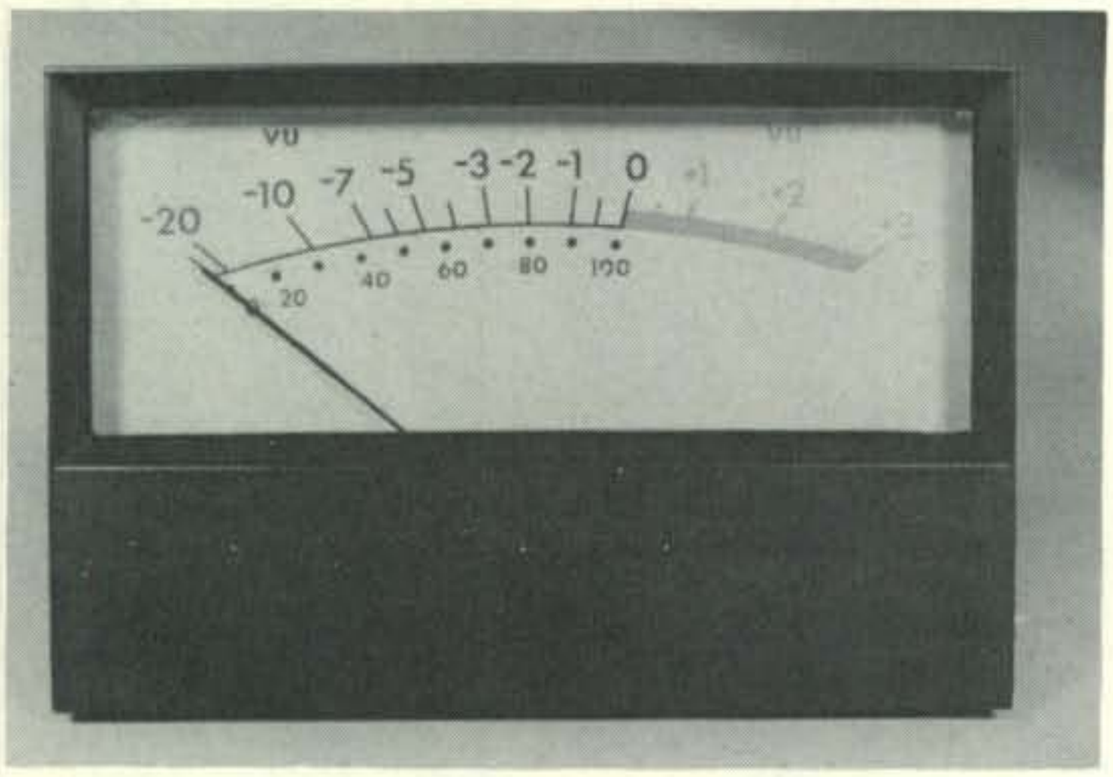

Fig. 1—Our meter, intact.

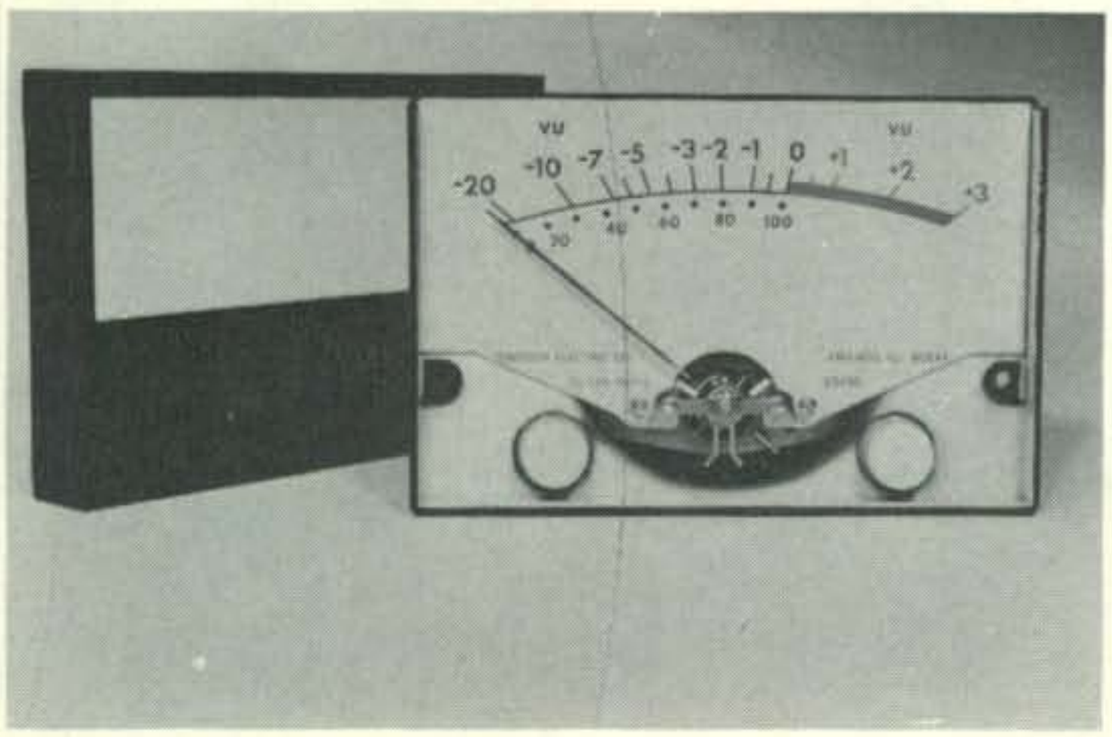

Fig. 2—We have removed the front cover. The front of the movement, the scale, and the scale illuminating lamps are visible. (Three methods of scale lighting are commonly in use. An opaque scale with front incandescent lighting, as shawn here; A translucent scale with rear incandescent lighting; and electro-luminescent scale materials that glow of their own accord when voltage is applied).

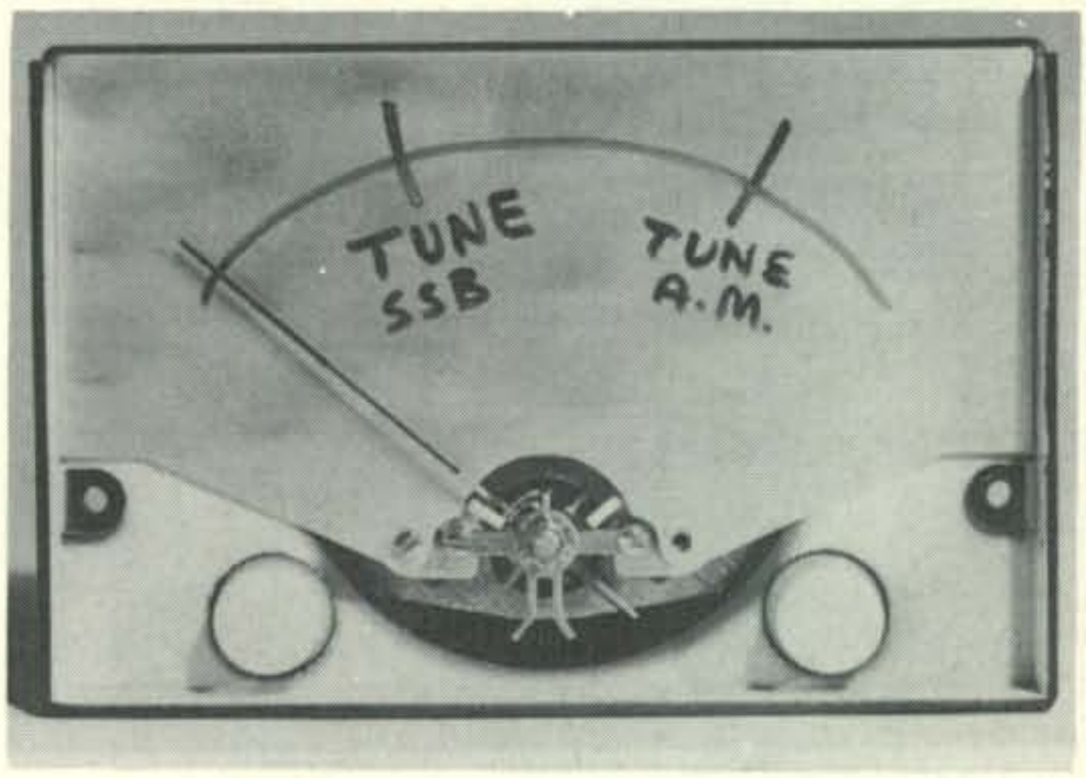

Fig. 3—On most meters it is a simple operation to remove the two small screws holding the scale in place and turn it over. This provides a blank surface on which to draw special scales often convenient in ham operations. (Once you know just what you want almost any meter calibration center can custom make you a single scale with professional appearance).

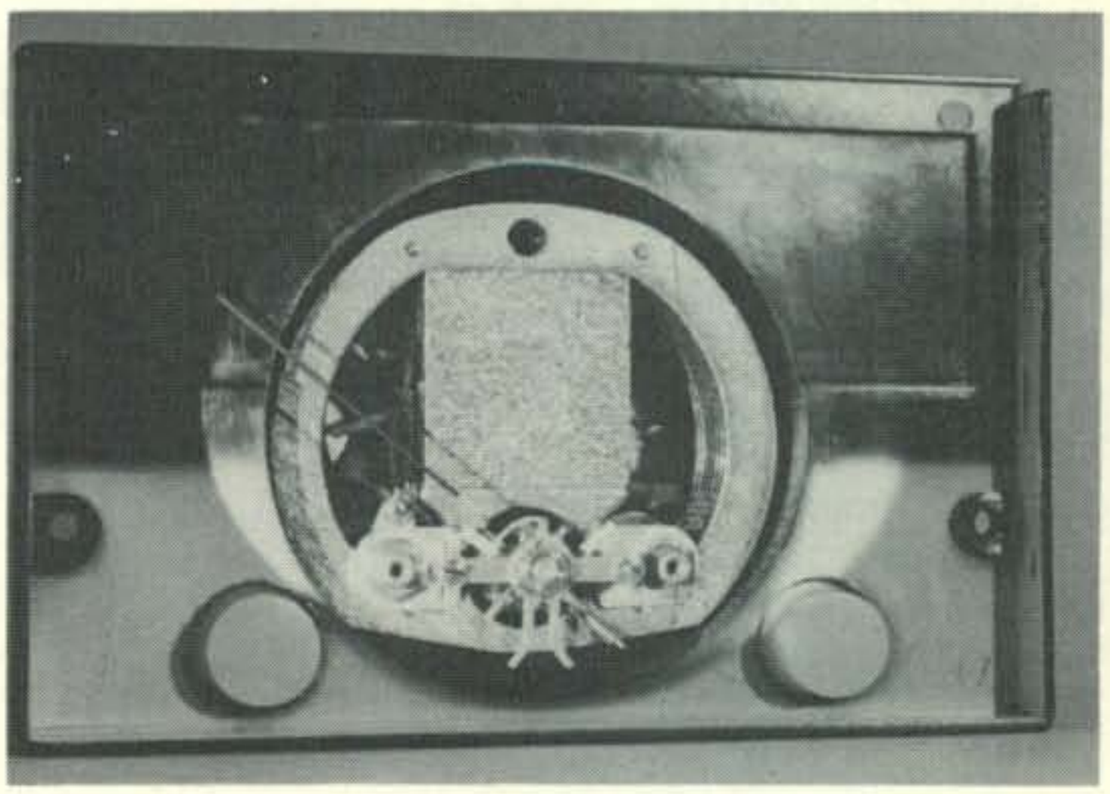

Fig. 4—With the scale removed, the movement, including its magnet, becomes visible.

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Rather than rely entirely on a verbal description of "What's In A Meter," we've chosen the photo-story approach. Figures 1 through 10 describe the step-by-step disassembly of our typical D'Arsonval-type meter. While we've sacrificed a meter for the sake of this article, disassembling a good meter is obviously not a recommended procedure as they rarely go back together sufficiently well as to them work reliably again.

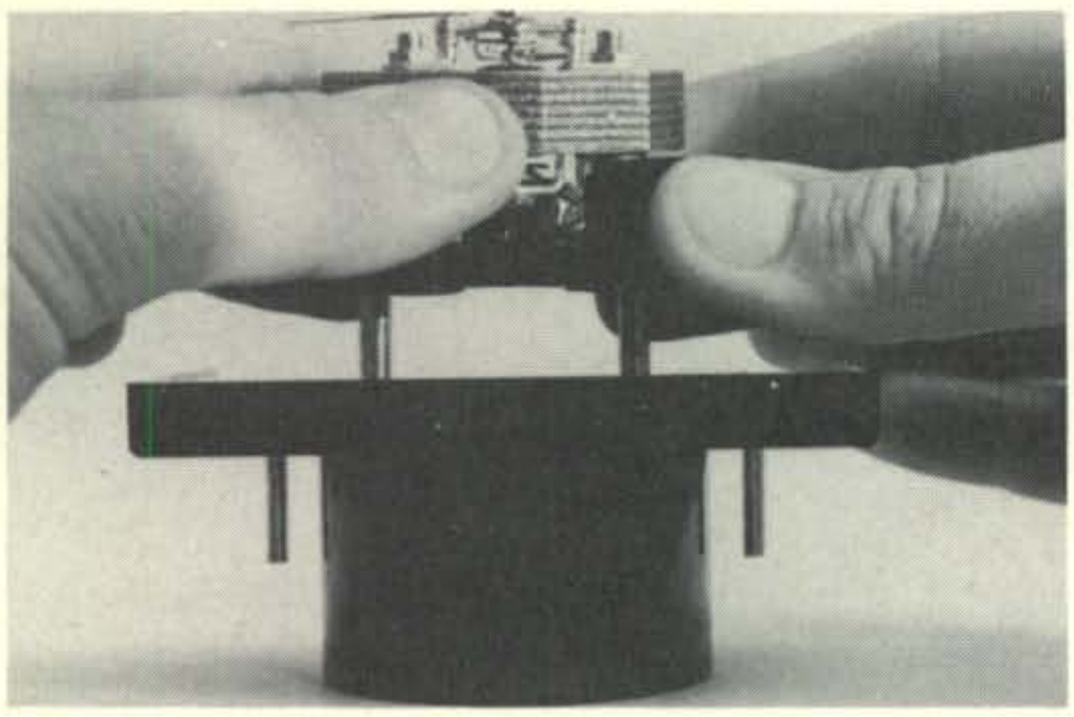

Fig. 5—The movement is carefully removed from its outer case.

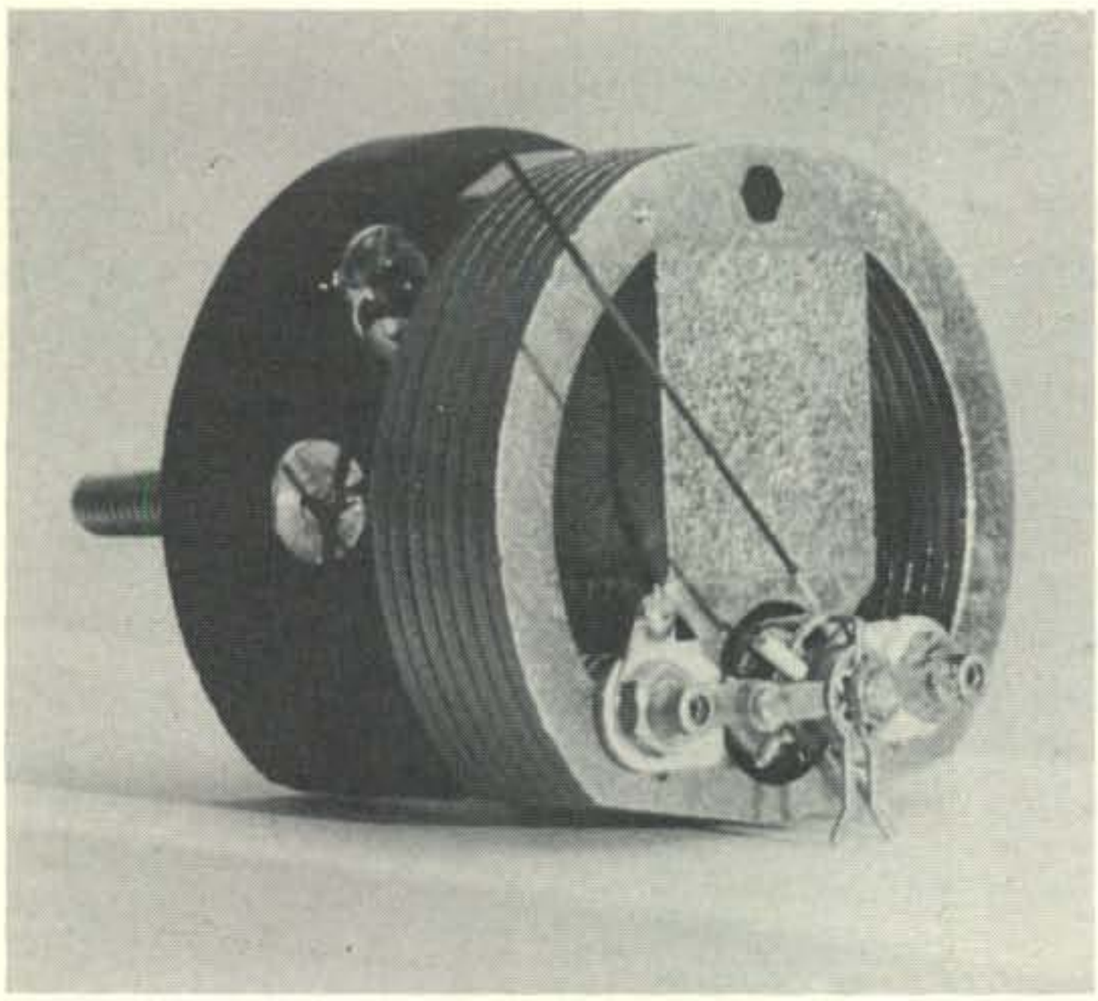

Fig. 6—The spiral spring which holds the pointer at the zero position when no current is applied will now be visible. This is more evident in fig. 8. A similar spring is located at the rear of the movement. In addition to their mechanical job, these springs also carry current to the rotating (moving) coil. In normal use the zero position is adjusted by a setscrew which protrudes from the meter front panel. A plastic pin on the rear of the setscrew moves between the pair of fingers reaching down from the center of the movement, rotating one end of the front spiral spring. Two small bumpers may also be visible in the photograph, their purpose being to limit the distance beyond the upper and lower ends of the scale that the pointer can travel.

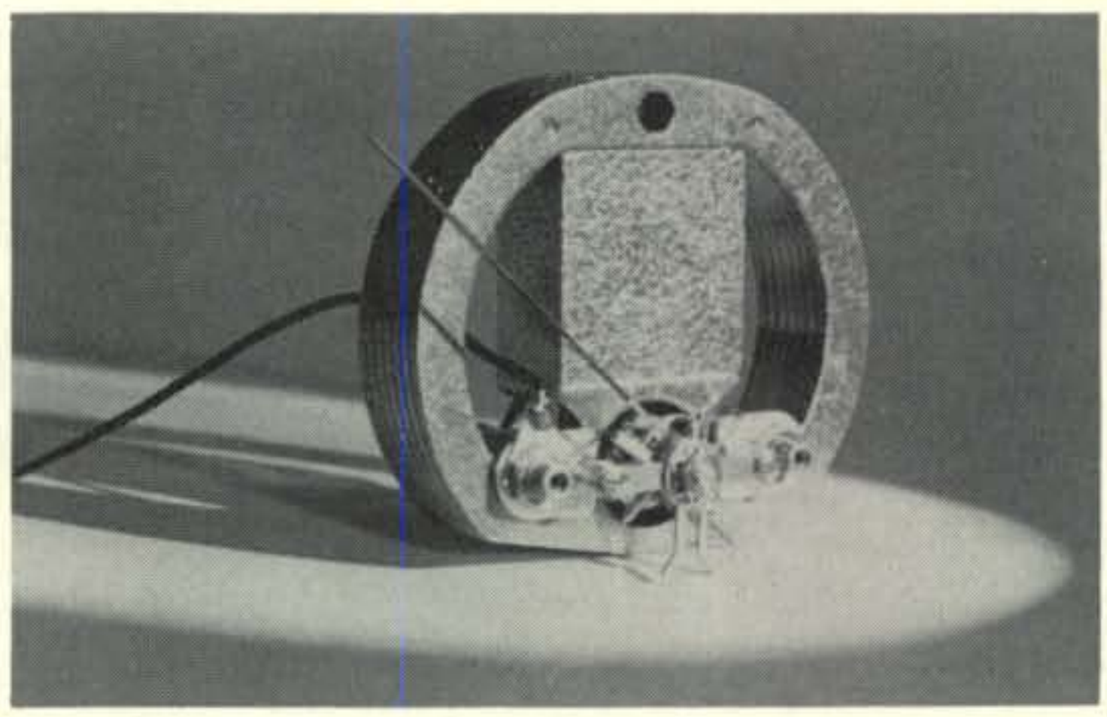

Fig. 7—The back cover has been removed. It is usually held on by two large nuts. Electrical components, such as rectifiers or capacitors, required by a specific meter, are usually mounted on the inside of this cover.

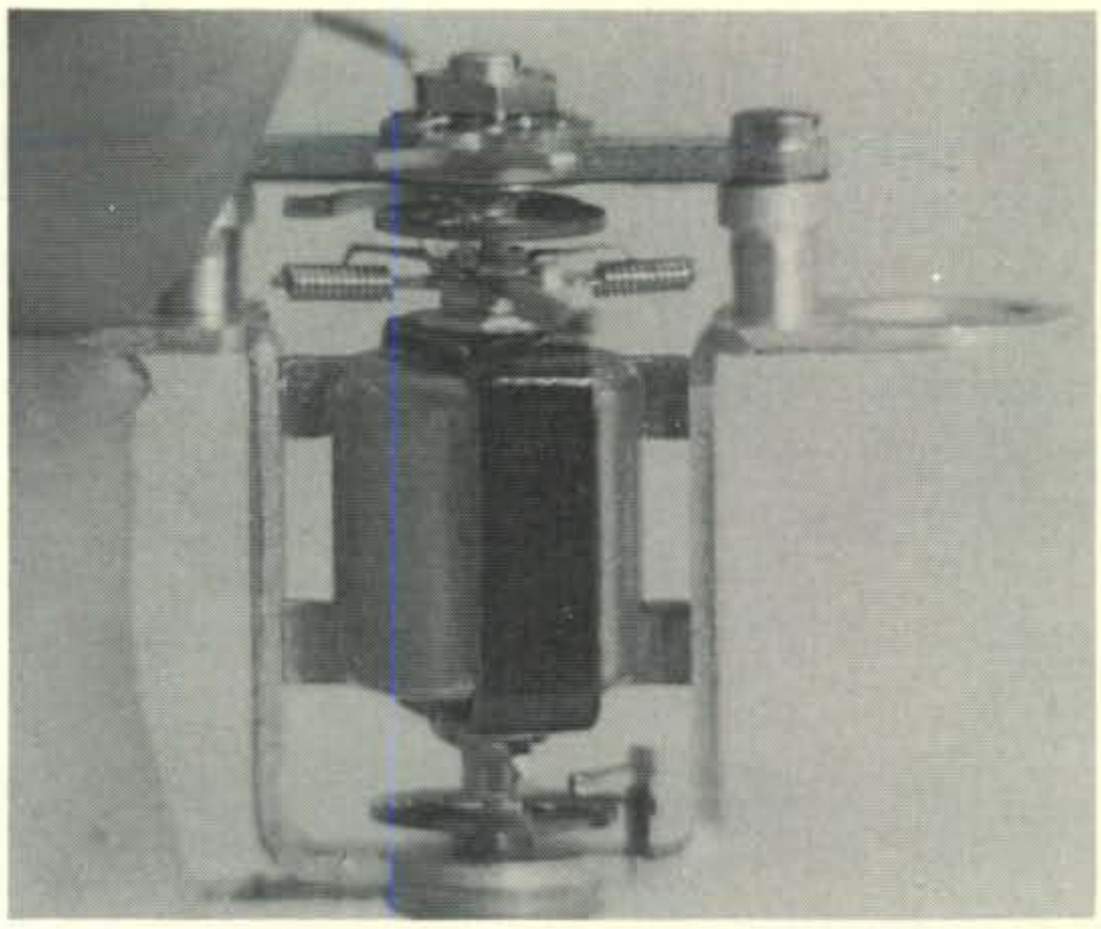

Fig. 8—A profile of the basic movement shows the armature, both end springs, the pivot and jewel bearing assemblies at each end, and the section known as the bridge which supports the front end of the movement.

The fine wire of which the moving coil is wound is soldered to the end springs, through which the electrical circuit is completed. Small, helically wound wires serve as counter-weights to the weight of the pointer. This meter has 3 counterweights. If the position of any one is in error, a change of the plane in which the meter is mounted will cause an undesirable change in the zero position of the pointer.

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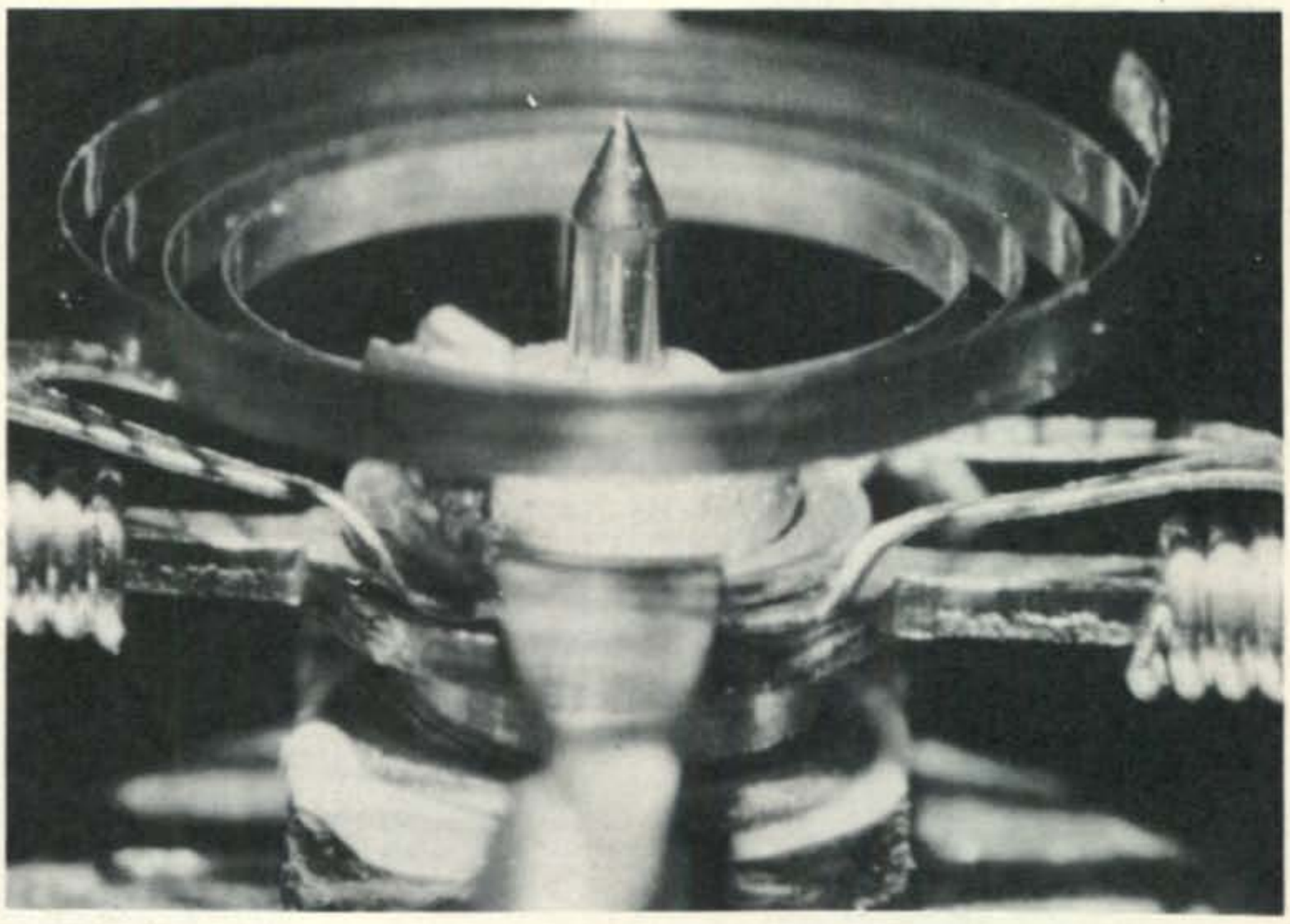

Fig. 9—It is of utmost importance that the moving coil rotate with the minimum practical friction. The most commonly used method is to mount a sharp pivot on each end of the moving coil assembly (armature) and have it ride on a jeweled bearing. Our typical pivot has a radius of 0.0007" which means that it must withstand a pressure against the bearing of almost *200 tons per square inch*. To ease this load while the meter is being handled, a shock absorbing spring is located behind the bearing. This close-up photo shows the pivot point, part of the spiral spring, and a portion of the helical counterweights. (The rough material that may be visible on the pivot is microscopic dust from the photographer's workshop). It is interesting to note that the majority of these tiny pivots are made one at a time, by hand, on jewelers lathes, in order to achieve the necessary precision. An inspector then examines them on an opaque projector which allows him to measure radius and other parameters against large templates.

How Does A Meter Work?

In 1819, Oersted discovered that when an electric current flowed through a conductor, a magnetic field was produced around the conductor. The strength of the field was proportional to the amount of current flowing. It was later found that if the conductor were formed into a coil, the strength of the magnetic field was multiplied by the number of turns in the coil. The magnetic field thus produced was polarized; *i.e.* a nearby compass could detect a north pole and a south pole. And, as we know, opposite magnetic poles repel each other, while similar magnetic poles are attracted toward each other.

In 1882, D'Arsonval used this information to produce his moving coil galvanometer, from which we have derived the name for the most familiar type of meter movement in use today.

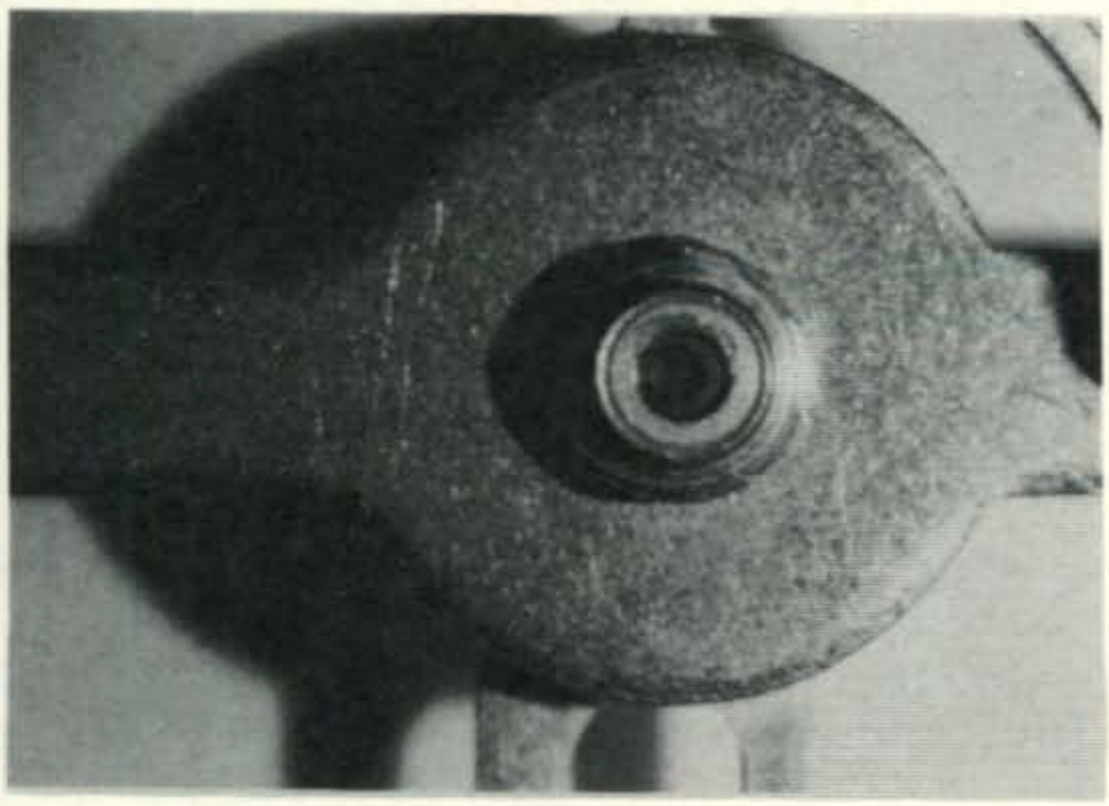

Fig. 10—The load supporting surface of the bearing. Glass is used as a bearing frequently because it has a lower coefficient of friction than sapphire.

Voltage Measurement

As you have seen, the D'Arsonval meter is a current sensing device. To use it for the measurement of voltage we take advantage of Ohm's Law. A resistor in series with the meter will pass current proportional to the voltage connected across our system.

For instance, assume that you have a meter which will read a fuli scale value of 1 milliampere d.c. and you would like to read up to 10 volts DC. Using the formula $R = E/I$ we substitute 10 volts for E, and 0.001 amperes for I, and find that R should equal 10,000 ohms. However, our circuit already includes the resistance of the moving coil, which must be subtracted from 10,000 ohms in order to obtain the value of the required series resistor.[1]

[1]If the meter resistance is 50 ohms, the series resistor would have to be 9,950 ohms, a hard value to come by. Even if available, at ±1%, the error could be greater than the meter resistance and so for all practical purposes the meter resistance can simply be ignored.

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Once connected in this manner our meter system will read a full scale value of 10 volts across a resistance of 10,000 ohms. The current sensitivity is therefore said to be 1000 ohms per volt, or, by using Ohms Law, 1 milliampere. We will find, in fact, that regardless of the full scale voltage that we choose to make our system capable of reading, any simple voltmeter made from a 1 ma meter will always have a sensitivity of 1000 ohms per volt. Likewise, if we use a 100 microamp meter our voltmeter will have improved sensitivity of 10,000 ohms per volt.

The advantage of the higher sensitivity voltmeter is simply that it draws less current from the voltage source it is measuring, thereby providing a truer measure of the voltage that exists when the meter is not loading down the voltage source.

Measuring Meter Coil Resistance

It is possible to measure the resistance of the moving coil in a milliampere meter with an ohmmeter. Some ohmmeters, however, put an undesirably high amount of current through the resistance being measured and therefore the following procedure described in fig. 14 is frequently used in this application:

Measuring High Current

When it is desired to measure currents higher than those which may be passed through our finely wound coil, a shunt is used. A shunt is simply a low value resistance placed in parallel with the meter coil. In practice its resistance value is usually chosen so that when the rated current is flowing, the voltage drop across the shunt is 50 millivolts (for a 50 ohm movement). A series resistance is then used on the meter to provide a full scale voltage sensitivity of 50 millivolts. The resistance of a shunt is determined by again using Ohm's Law, with *E* being equal to the full-scale voltage sensitivity of the meter and *I* being equal to the full-scale current that you wish to measure.

A.C. Measurements

The meters we have discussed are for d.c. measurements. For a.c. measurements a rectifier is usually added to the meter circuit. A rectifier type meter will read the *average* value of the a.c. voltage. However, in most cases, we are interested more in the r.m.s. value of the voltage. Therefore, most meters of this type are calibrated to read the r.m.s.

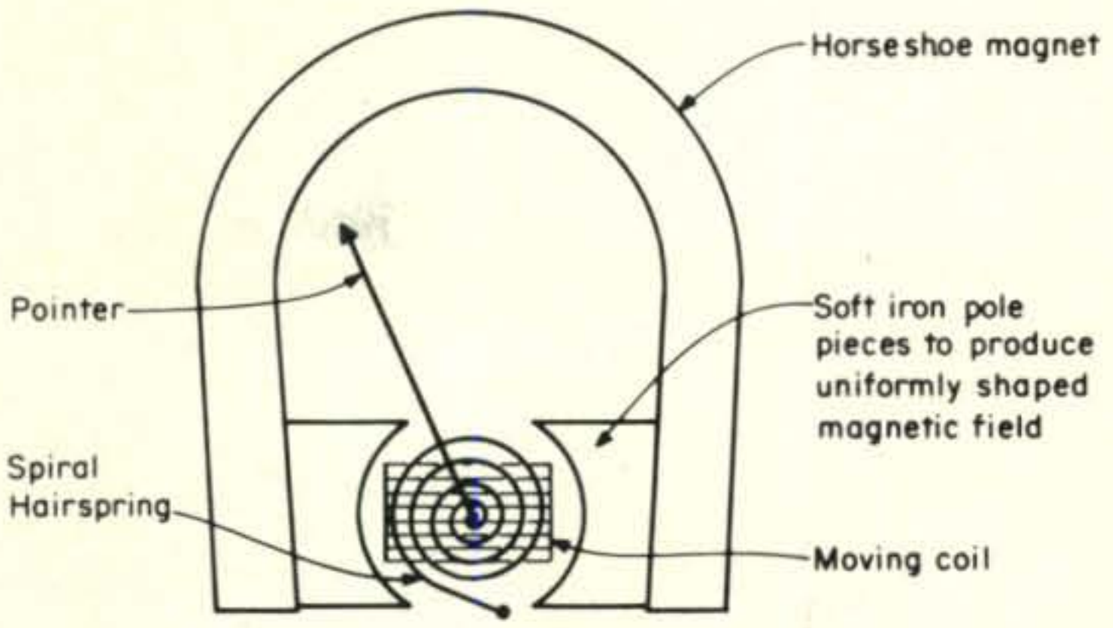

Fig. 11—Basic construction of the D'Aronval moving coil meter. The magnetic field produced by the horseshoe magnet reacts with the magnetic field produced by current in the moving coil, resulting in a rotating torque. This torque is opposed by the spiral hairspring, which causes the coil to stop rotating at some equilibrium position, at which time the current can be determined by the position of the pointer against a calibrated scale.

The current sensitivity of a meter, therefore, is dependent upon the strength of the field produced by the magnet, the number of turns in the moving coil, and the strength of the opposing spring. In actual practice, however, an additional factor, friction, may enter the picture because of the pivots which support the moving coil. In most meters, friction is negligible in comparison to the strength of the magnetic field and the spring, and its effects may be disregarded. But in the low microampere range it becomes significant, leading to the recent popularity of the taut band type of suspension.

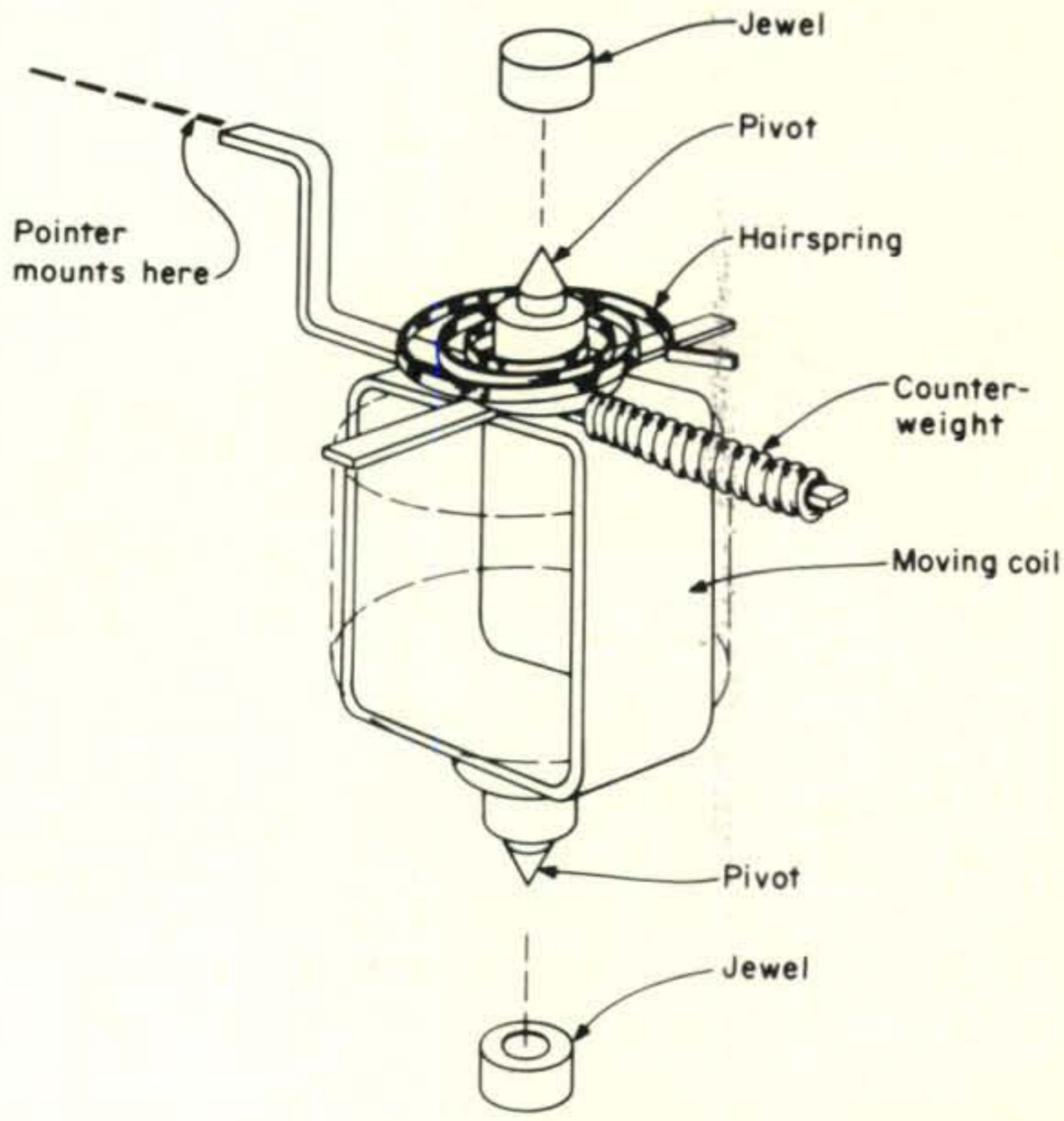

Fig. 12—Line drawing view of the jewels, pivots, hairsprings, counterweights and moving coil.

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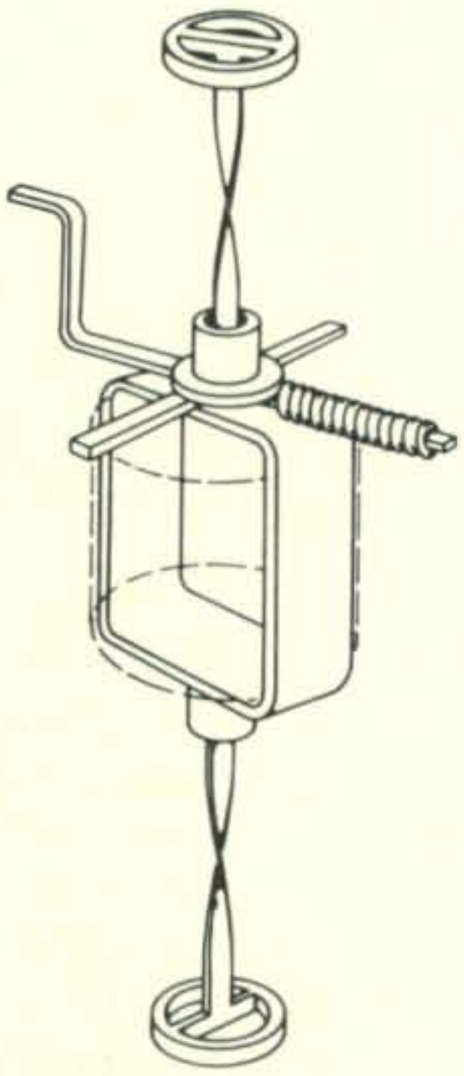

Fig. 13—In the taut band meter shown above the pivots and jewels have been eliminated. The coil is suspended by a thin, taut metal filament. The filament is kept under tension by spiral disc springs at each end. The filament also serves as a conductor, carrying current to the moving coil. The hairsprings are also eliminated as their function is now performed by the torque necessary to twist the taut band.

value of a sine wave voltage. If the voltage is not a true sine wave, the meter will indicate 1.11 times the average voltage, which will not be equal to the r.m.s. value.

The dynamometer movement and the thermocouple converter movement are frequently used when true r.m.s. measurements

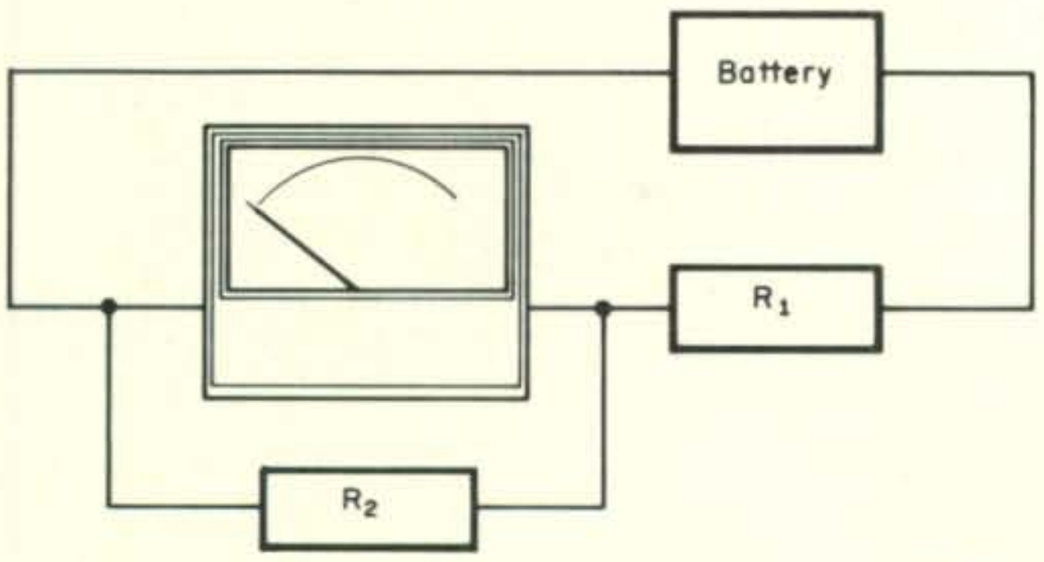

Fig. 14—From your parts box obtain two variable resistors. Resistor R_1 should be a relatively high resistance and R_2 should, ideally, be of the same order of magnitude as the meter resistance. (Sample 1 ma meters that I have tested were usually around 50 ohms.) Before connecting R_2 into the circuit adjust R_1 so that the meter indicates full scale. Then connect R_2 and adjust it until the meter reads at the half-scale. Remove R_2 and measure its resistance with your ohmmeter. It will be *approximately* equal to the internal resistance of your meter.

are required. In the dynamometer, a field coil is substituted for the permanent magnet in the movement. The field coil is connected in series with the moving coil.

In the thermocouple converter, the voltage to be measured is connected across a resistance wire, causing it to heat. A tiny thermocouple, connected to the heater wire but electrically insulated from it, produces a voltage output which is then measured by its meter.

Another type of true r.m.s. reading instrument is the iron-vane meter. Two iron vanes are placed parallel to one another. One is rigid and the other is pivoted. A single current carrying coil surrounds both vanes. When current flows, both vanes become magnetized with the same polarity and therefore repel each other. As the pivoted vane moves it causes the meter pointer to move upscale.

How Should A Meter Be Used

To help achieve the maximum accuracy a meter is capable of, it should be used with the scale in a horizontal position. This places the pivots in a vertical position, assuring that they will rotate about a positive point on the bearings.

Many modern meters have internal magnetic shielding and may be mounted on any type of surface, magnetic or otherwise. However, surplus and other older meters commonly used by hams may have been calibrated for use in a specific type of panel. When so marked, use in other types of panels will impair the accuracy of the instrument.

Most panel meters will take severe short duration overloads without damage. D'Arsonval type meters can usually handle peak currents of 100 times full scale value. The only major exception is the thermocouple type meter which, in many cases, cannot tolerate any overload whatsoever. Even overloads so short that they are not indicated on the meter can burn out the thermal element.

A frequent misconception is about the accuracy rating of a panel meter or multimeter. A "2% Meter" means that the accuracy of *any* reading has a tolerance of plus or minus 2% of the *full scale* value of the range in use.

This means, for instance, that if we are trying to read 10 volts on a 100 volt full scale meter with an accuracy of 2%, the actual voltage might be anywhere from 8

[*Continued on page 100*]

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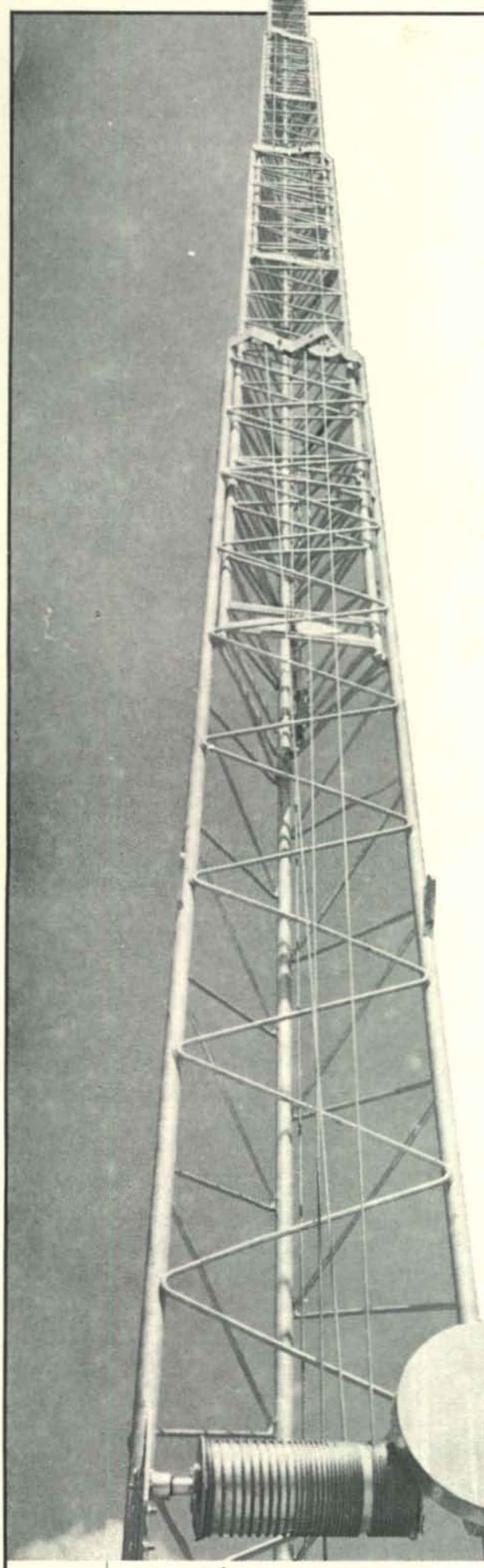
LARGE ANTENNA LOAD



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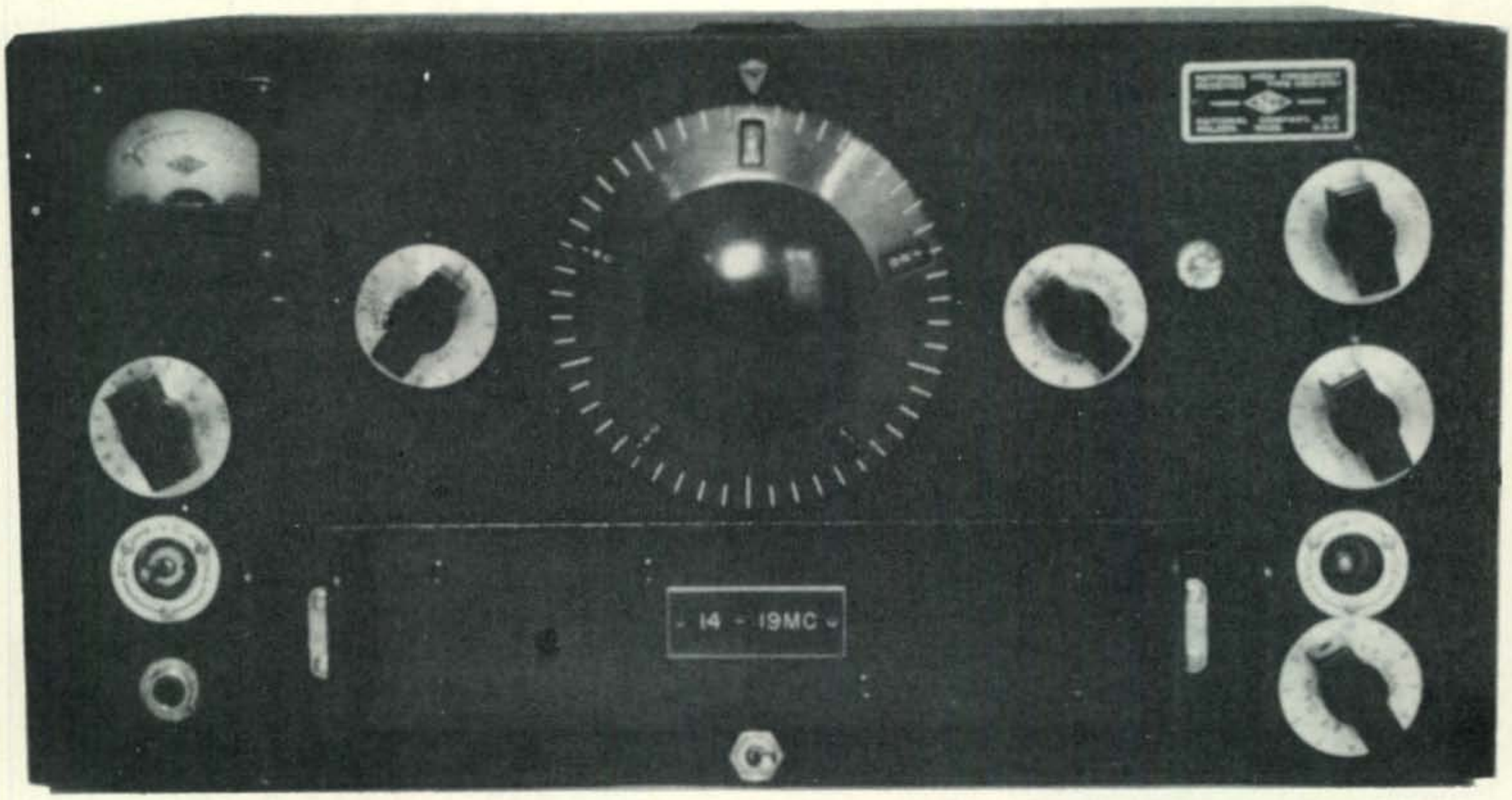

SOUPING UP THE OLD RECEIVER

BY FRED BROWN,* W6HPH

Part II

Part I of this two part article described the modifications necessary to reduce heat. These areas involved changes of tubes and the power supply circuits. Part II deals with the r.f. and i.f. circuitry. The final result is a versatile, high performance communications receiver.

ORIGINALLY this HRO had a good crystal filter, but it suffered the universal defect of all single-pole filters, sharp on the nose and very broad skirts. Consequently, it was replaced with a mechanical filter to give the modern, rectangular, steep-skirted passband so needed for today's crowded phone bands. There are other ways to get selectivity but the mechanical filter is the easiest and in the long run probably the cheapest. It is $20 well spent.

Selectivity Control

I also wanted some control over bandwidth since the receiver is to be used on many different modes: a.m., f.m., s.s.b. and c.w. This meant a selectivity switch for selecting various i.f. filters. Both input and output of the filters must be switched and isolation between these two switch sections must be extremely good. Stop band rejection can be only as good as permitted by coupling around the filter. Also, the unused filter outputs should be grounded by the switch.

Since I had no shorting-type switch, I used an ordinary 3 position, 4 gang ceramic wafer switch with a total of 6 poles (4 used). Figure 3 shows the circuit arrangement for three selectivity positions. Two of the switch poles are used to ground the unused filter outputs. The first and last wafers are used for switching the filter inputs and outputs and extensive shielding (cut from tin-can metal) is used between these two wafers to prevent capacitive coupling around the filters. Also, leads to and from the switch are carefully shielded.

The broad-selectivity position (mainly for f.m.) uses no filter at all, (except for T_2); instead the signal is coupled through the very small capacity of C_1 (two insulated wires

*Pine Cove, Idyllwild, California 92349.

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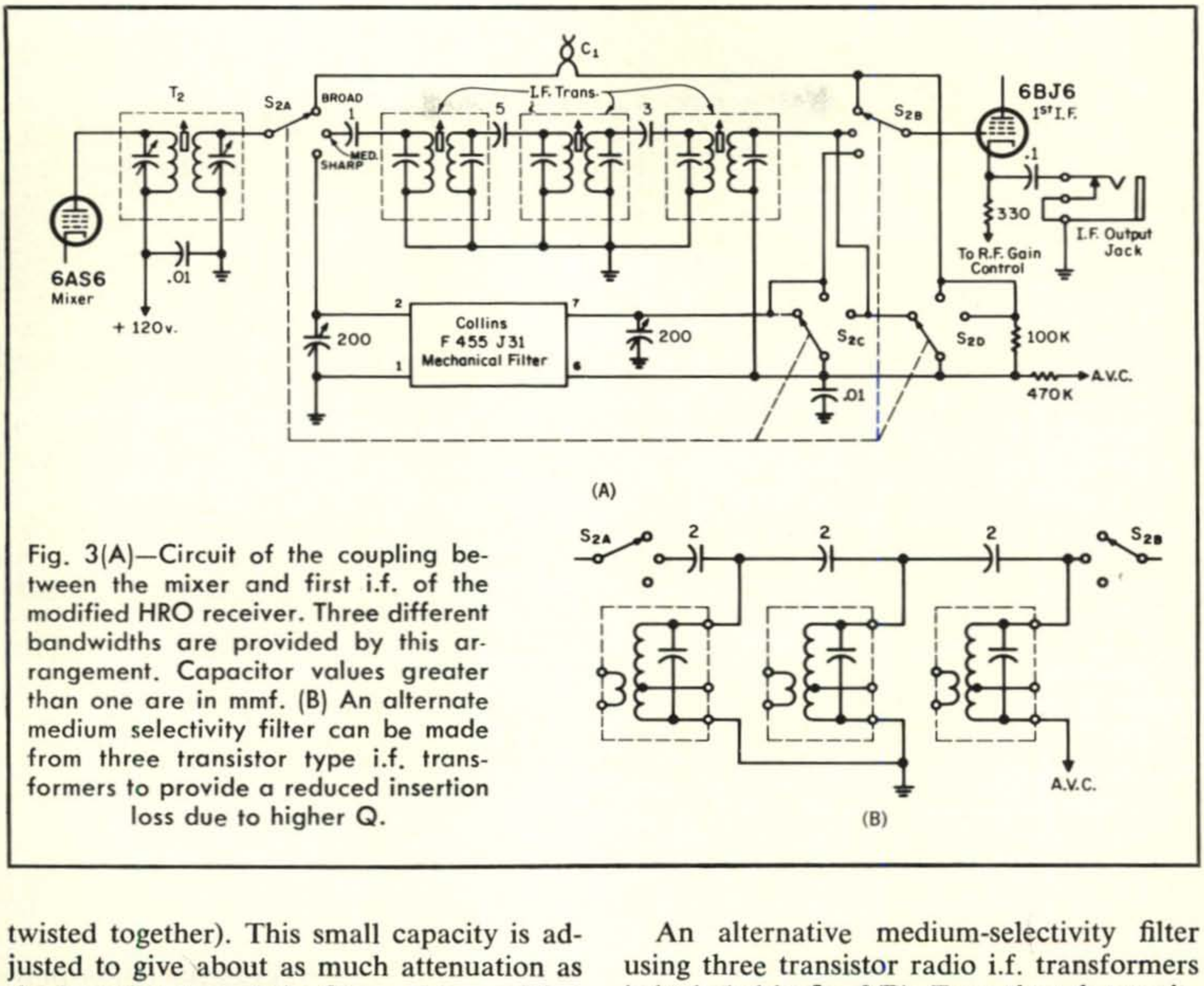


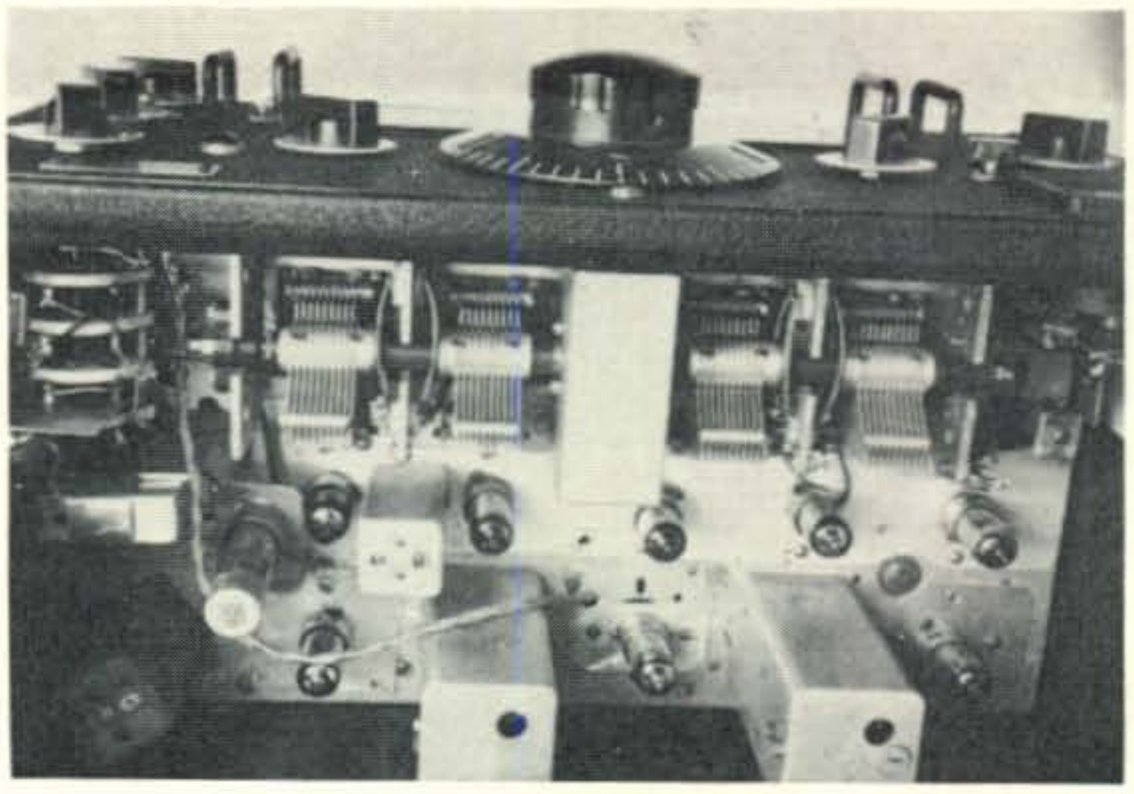
Fig. 3(A)—Circuit of the coupling between the mixer and first i.f. of the modified HRO receiver. Three different bandwidths are provided by this arrangement. Capacitor values greater than one are in mmf. (B) An alternate medium selectivity filter can be made from three transistor type i.f. transformers to provide a reduced insertion loss due to higher Q.

twisted together). This small capacity is adjusted to give about as much attenuation as the insertion loss of the filters, thus avoiding a change of signal level when selectivity is switched.

Transformer T_2 is an output i.f. of the type normally used between a last i.f. stage and a second detector in an a.m. broadcast radio. It has a very broad response curve, making it ideal for f.m. The f.m. signal is normally coupled out of the first i.f. stage cathode[1] to an external i.f. amplifier, f.m. detector and audio system especially designed for f.m. reception. In this way the passband is not sharpened up by the other two receiver i.f. transformers.

The medium-selectivity position (for a.m.) uses three miniature i.f. transformers, capacitively coupled as shown. This arrangement provides fairly good skirt selectivity with enough bandwdth for a.m. phone. The transformers are only 3/4 inches square and three lashed side-by-side make up a fairly small package. The insertion loss of this filter proved to be rather high, about 30 db, which is even more than the mechanical filter.

An alternative medium-selectivity filter using three transistor radio i.f. transformers is included in fig. 3(B). Even though transistor radio i.f.t.'s are much smaller than tube-radio i.f.t.'s, they have a higher Q, especially when not loaded by transistor impedances. Some require an external resonating capacitor of from 50 to 200 mmf and some do not. A filter constructed using three (four or five would have been better) of these trans-



Interior view of the modified HRO receiver. All of the original octal tubes have been replaced with 150 ma miniatures. The selectivity switch can be seen at the right.

[1]Brown, F. W., The I-F Cathode Jack, *Ham Radio*, Sept. '68, p. 28.

See page 110 for New Reader Service

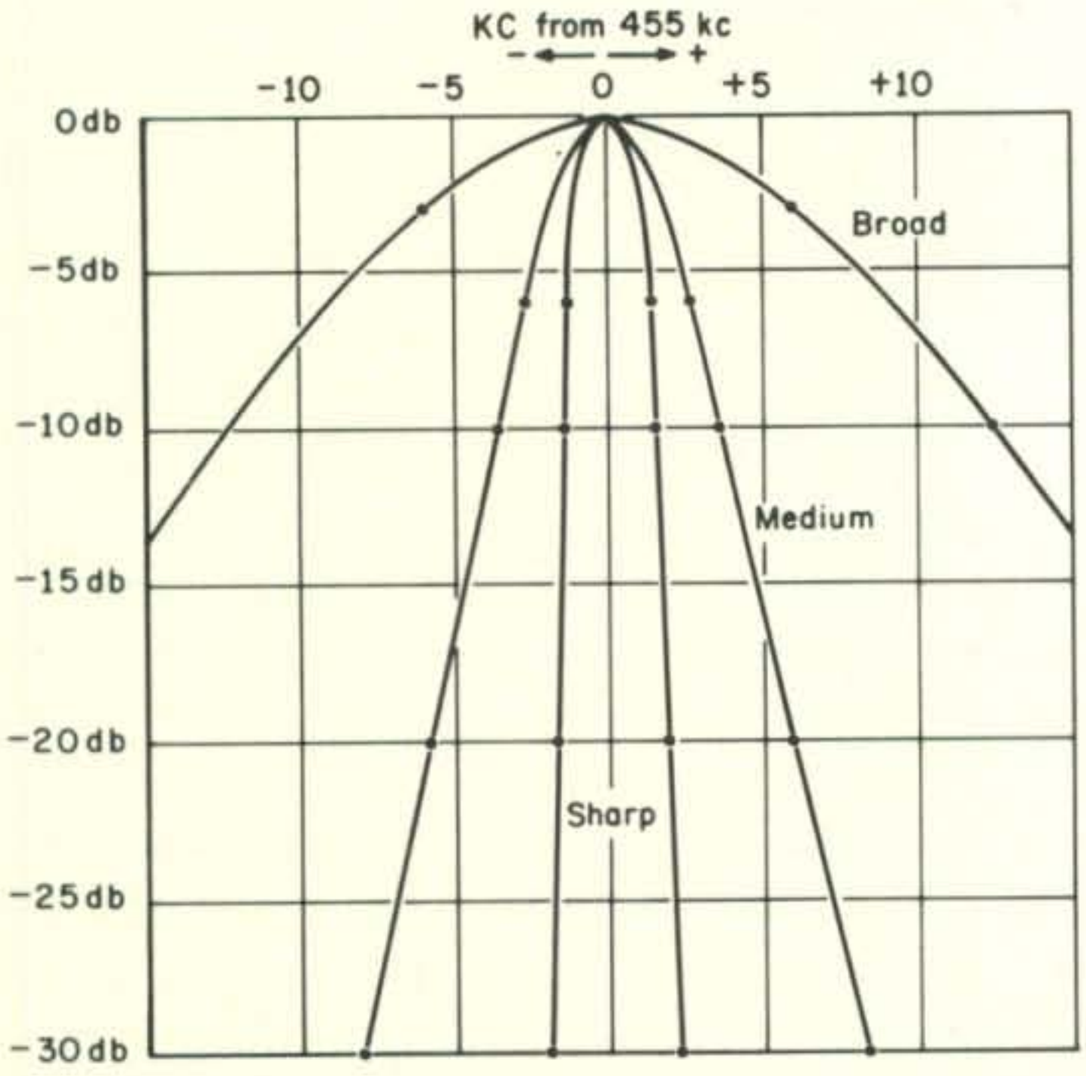


Fig. 4—Response curves for the HRO receiver in the three selectivity positions. These curves are measured from the mixer grid to the cathode of the first i.f. amplifier.

formers had about the same bandwidth as the tube type i.f.t. filter but with much less insertion loss. The skirts were not as good, as is to be expected, since only three tuned circuits were involved instead of six. (See fig. 4.)

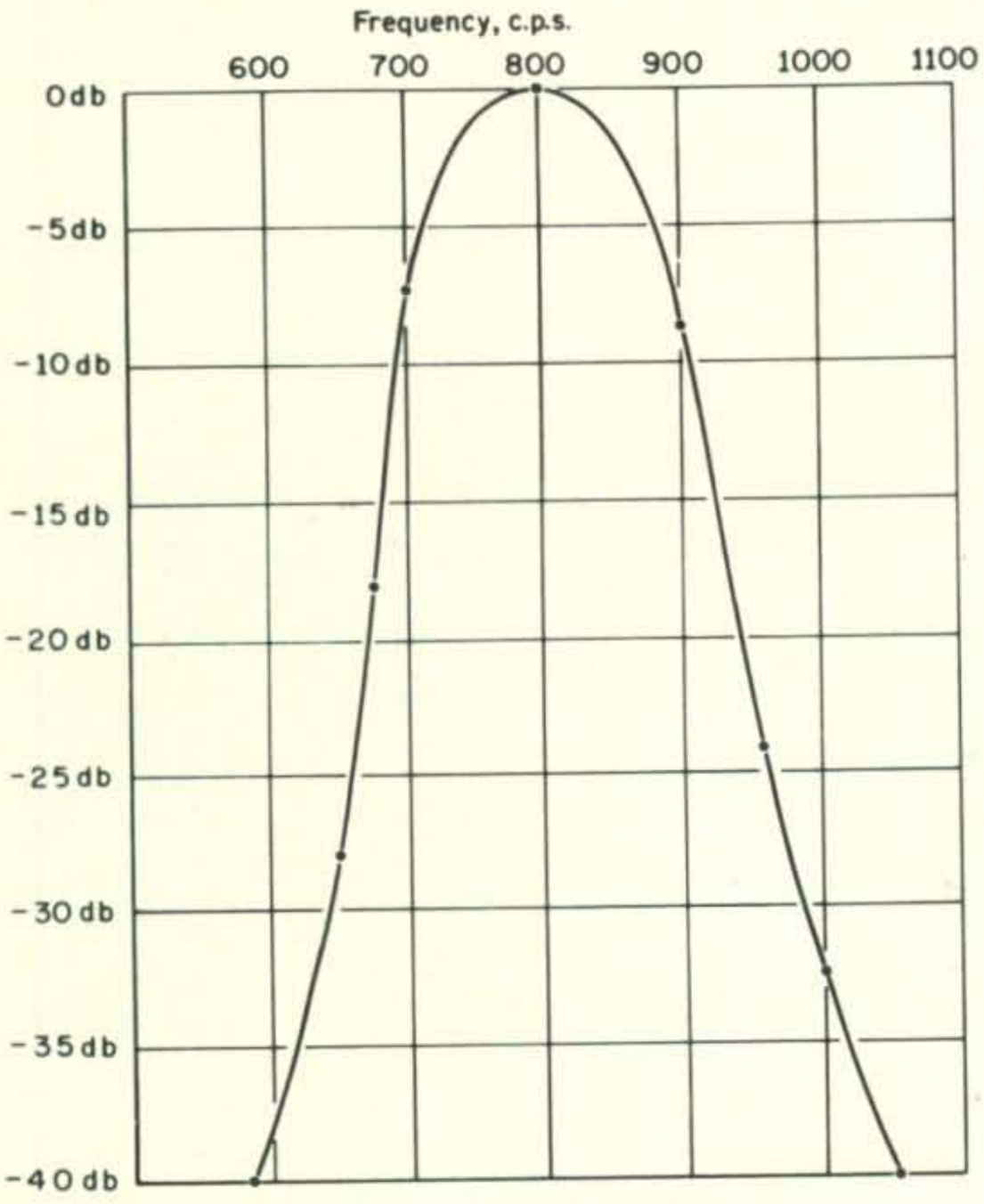


Fig. 5—Frequency response of the audio filter.

Figure 4 shows the response curves for the three selectivity positions as measured from the mixer grid to first i.f. stage cathode. Over-all receiver response will be sharper in the broad and medium positions, of course, since fig. 4 does not involve the last two i.f. transformers.

Audio Filter

For c.w. reception an 800 cycle audio filter can be switched in or out (by S_1, fig. 2) between the first and second audio stages. Performance of this filter in c.w. QRM amazes everyone who hears it, even old-time c.w. men. It literally makes the difference between *inaudibility* and solid copy for a weak signal in heavy QRM. The filter's spectacular performance is mainly due to its excellent skirt selectivity and is especially apparent when used in conjunction with a first-rate product detector.

The bandwidth (fig. 5) is 135 cycles wide at 3 db down and 450 cycles at 40 db. If your filter is not at least this good, and you operate c.w., you are missing a lot. Just what the circuit of the filter is, I can't say. They (I'm using two in cascade) are potted in epoxy and came off an unknown circuit board. However, a filter of this caliber is readily constructable using conventional components and techniques.

Front End

Plug-in coils are both a benefit and inconvenience, but for my purposes the advantages outweigh the disadvantages. On the plus side is versatility—practically any desired segment of frequency spectrum between 100 kc and 40 mc can be covered by means of a special coil set. In fact I bought some extra plug-in coil sets (used, cheap) for just this purpose. Originally I had planned special coil sets to

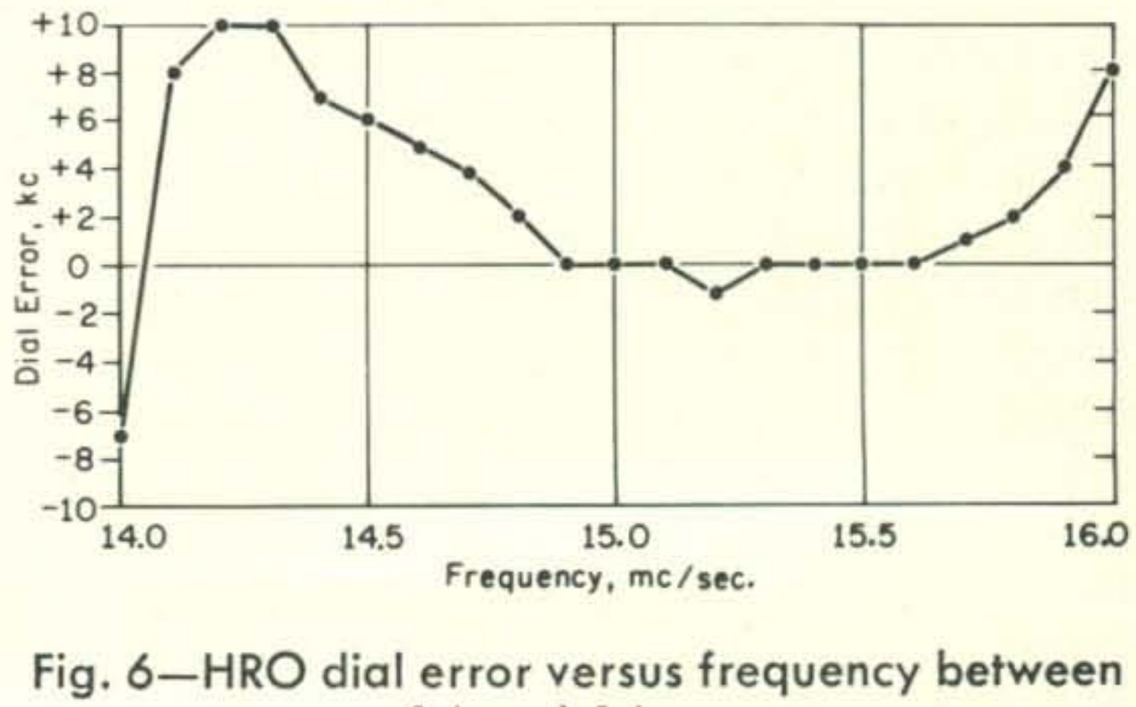


Fig. 6—HRO dial error versus frequency between 14 and 16 mc.

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cover each of the 80, 40, 20, and 15 meter bands in 500 kc segments, so the 0-500 HRO dial would be direct-reading in kc.

Since most of my operating is on v.h.f. and u.h.f., I also wanted a specal coil set to cover 14 to 19 mc, a range useful as a tunable i.f. for crystal-controlled converters. So far, this is the only special set I've made. On this range the dial is direct reading at a rate of 10 kc per dial division; that's a little fast for s.s.b., but it gives plenty of coverage on the 144, 432, and 1296 mc bands.

It turned out to be something of a chore to get the dial to be direct-reading throughout the entire 5 mc range. Figure 6 is the error curve showing the degree of success I met with. Between 14 and 16 mc the error is a maximum of one dial division. Above 16 mc things go to pot but it turns out I seldom use that part of the dial anyway.

Figure 7 gives the circuitry of the local oscillator including component values for the special 14 to 19 mc plug-in coil. Values for the r.f. coils are similar, of course. A 9002 was chosen for the local oscillator because of its exceptionally low inter-electrode capacities, although the more common 6C4 could also have been used.

The warm-up drift curve, starting 1 minute after the receiver was turned on, is shown in fig. 8. This low drift rate is partly due to careful temperature compensation (C_4), and partly to "QRP operation" of the entire receiver. The positive temperature coefficient

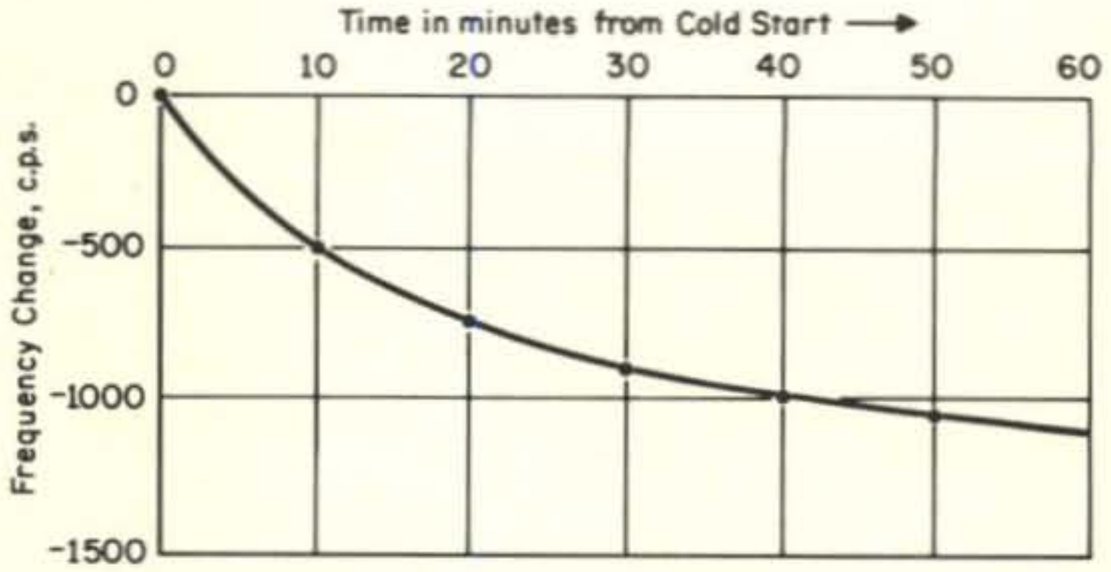


Fig. 8—Warm up drift curve for the modified HRO receiver local oscillator.

(frequency drifts lower) would indicate the oscillator is still slightly under-compensated; *i.e.*, C_4 could be slightly larger.

Antenna Trimmer

Originally the receiver had no antenna trimmer. Since I regard an antenna trimmer as essential I mounted one in the hole that formerly carried the noise limiter control. (All the old noise-limiter circutry has been removed.) At the same distance on the other side of the tuning dial I mounted the audio gain control—this gives the front panel a symmetrical "balanced" appearance.

The original antenna input was for 500 ohms balanced; connection was made to a pair of binding posts. These can be replaced with a coax fitting for the more conventional 50 ohm input. About 2/3 of the primary turns should be removed from the antenna coils for a better match to 50 ohms.

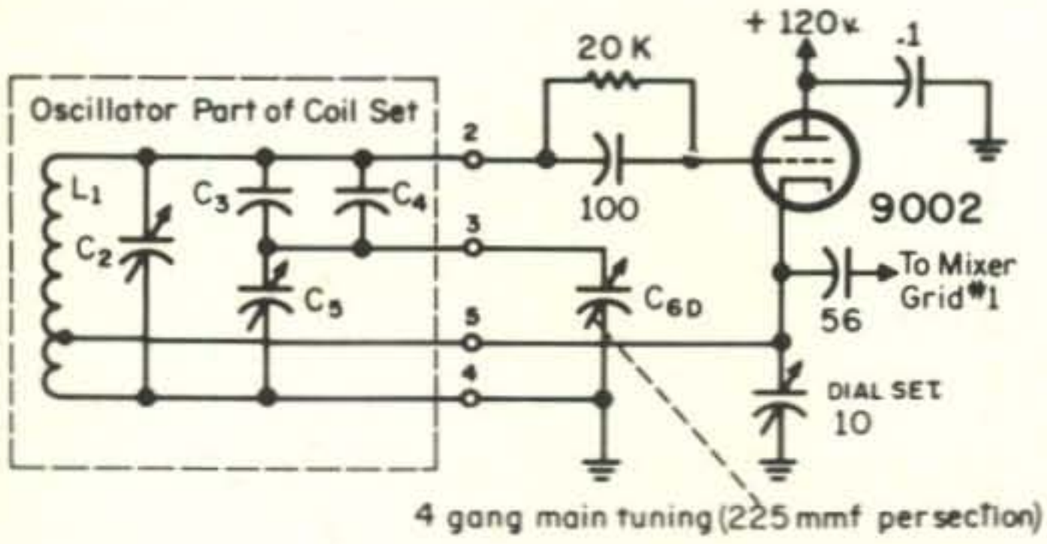
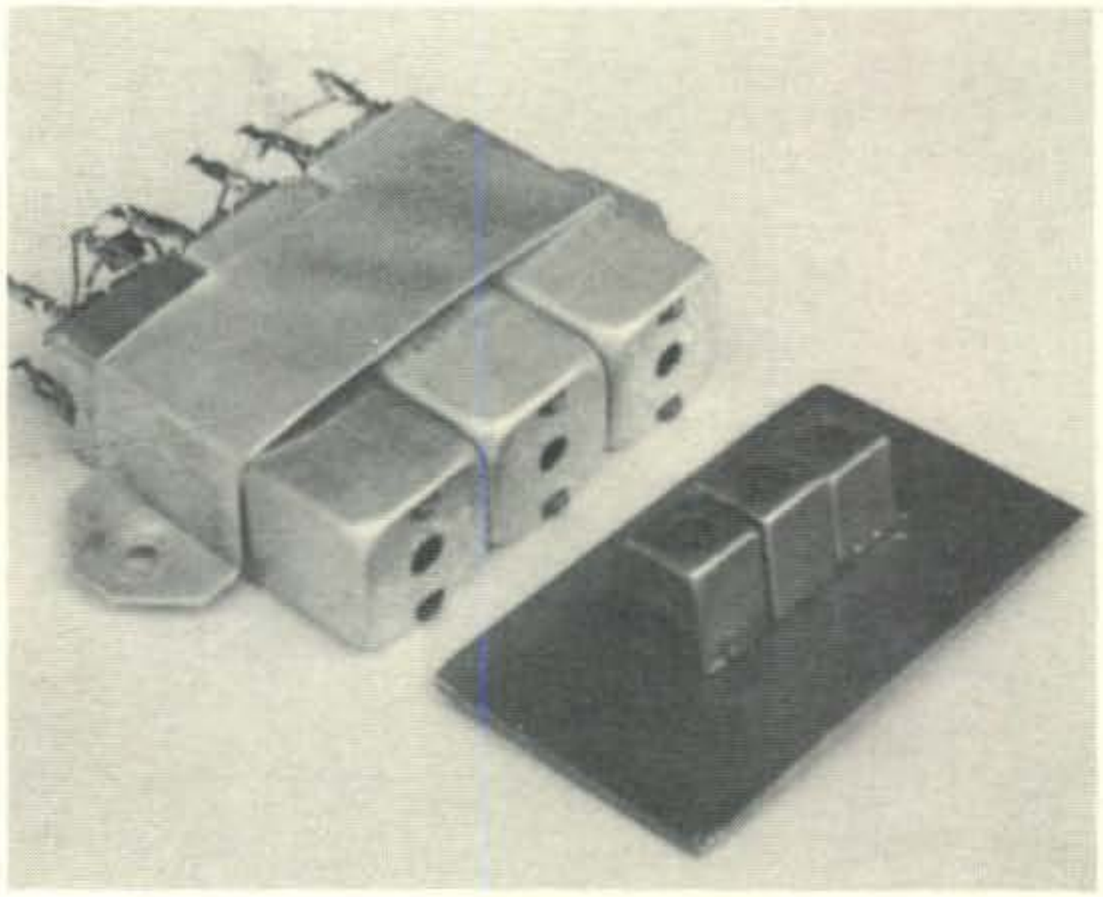


Fig. 7—Circuit of the local oscillator giving component values for the special 14 to 19 mc coil set. In this case, the oscillator operates on the low side of the signal. Capacitor values greater that one are in mmf, less than one in mf.

C_2—Original APC in coil set, about 25 mmf.
C_3—140 mmf 1% dipped mica.
C_4—27 mmf N750 ceramic.
C^5—300 mmf compression mica trimmer.
L_1—4½ turns #20 e., 3/8" long, wound on original 1" diameter coil form. Tapped 1½ turns above ground.



Two medium bandwidth filters that can be used with the HRO are shown above, each made from three i.f. transformers, one with transistor i.f.'s and the other from vacuum tube i.f.'s.

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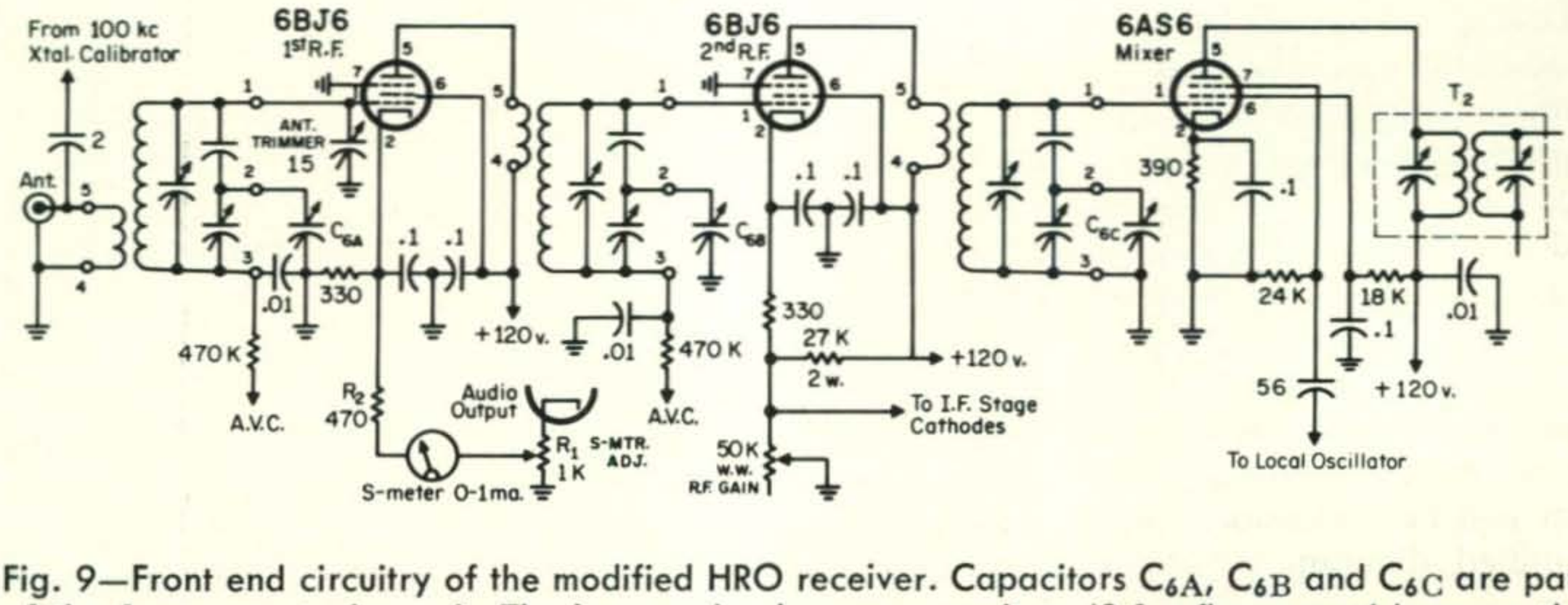

Fig. 9—Front end circuitry of the modified HRO receiver. Capacitors C_{6A}, C_{6B} and C_{6C} are part of the four gang tuning unit. The large value bypass capacitors (0.1 mf) are used because the front end operates down to 100 kc.

Figure 9 is the schematic of the complete front-end. A 6AS6 mixer with suppressor grid oscillator injection provides isolation between the signal and local oscillator tuned circuits and thereby prevents "pulling" during alignment. The 6AS6 has proven to be a better mixer than a 6BE6 in every respect.

Product Detector and S-Meter

The product detector (fig. 10) has been described before; it uses two germanium diodes, and is very easily swtched over to an excellent combination a.m. detector and a.v.c. rectifier.[2] I still say this product detector is second to none of them in s.s.b. or c.w. performance.

The original S-meter circuit used a resistive voltage-divider and suffered two shortcomings: it wasted power (producing more heat), and its zero setting changed with r.f. gain control adjustments. If the S-meter is placed between the first r.f. stage and audio output cathodes both of these defects can be avoided. The first r.f. stage is on the a.v.c. line but not connected to the r.f. gain control; it runs wide open for best noise figure. The zero setting on the s-meter is adjusted by the original potentiometer, R_1, and full-scale deflection is controlled by choosing an appropriate value for R_2.

[2]Brown, F. W., "The Tubeless Product Detector," *CQ*, March 1965, pg. 41.

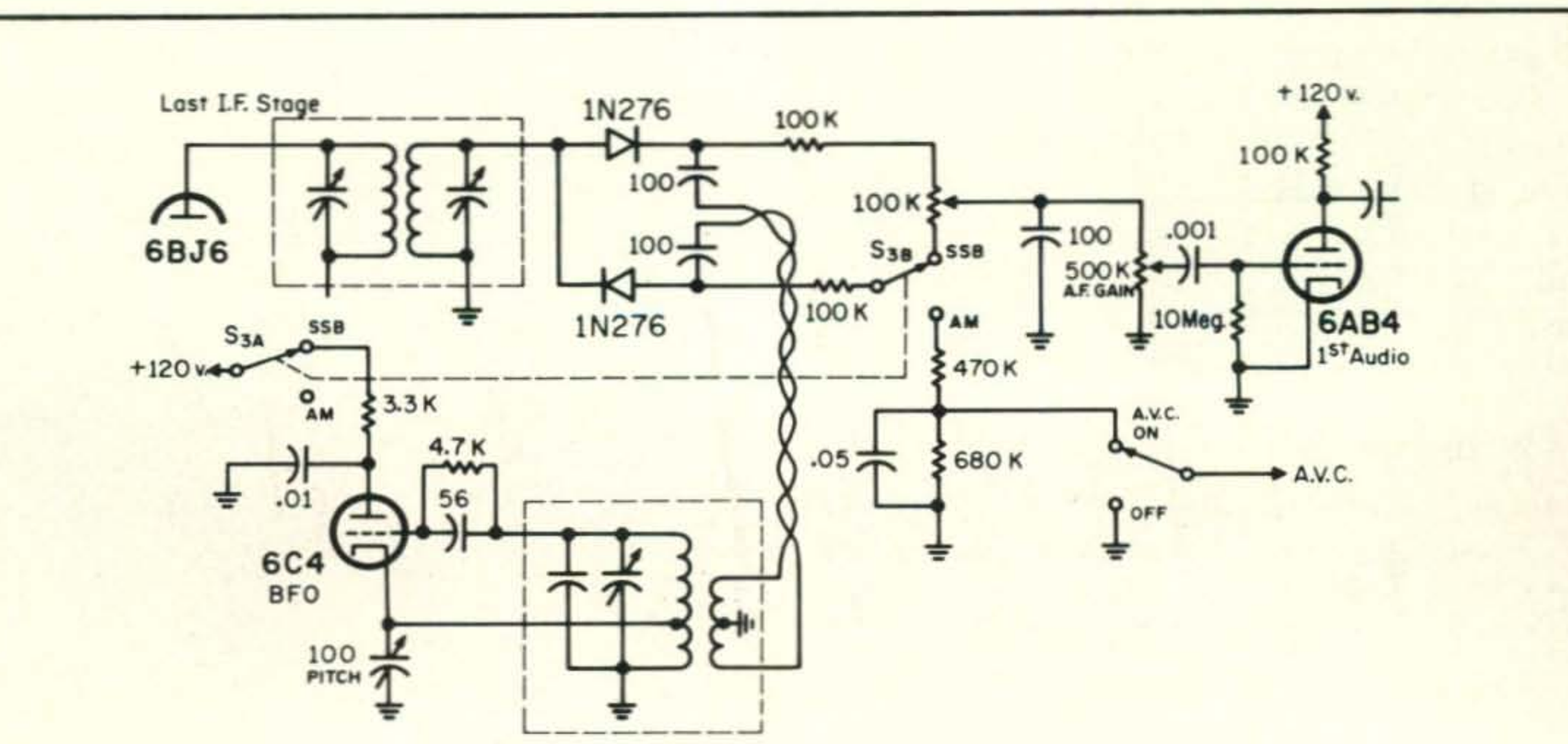

Fig. 10—Product detector and b.f.o. circuitry of the modified HRO receiver. The link on the b.f.o: coil is 20 turns of #30 d.c.c. on each side of the center tap, scramble wound directly over the b.f.o. coil, insulated by a layer of plastic electrical tape.

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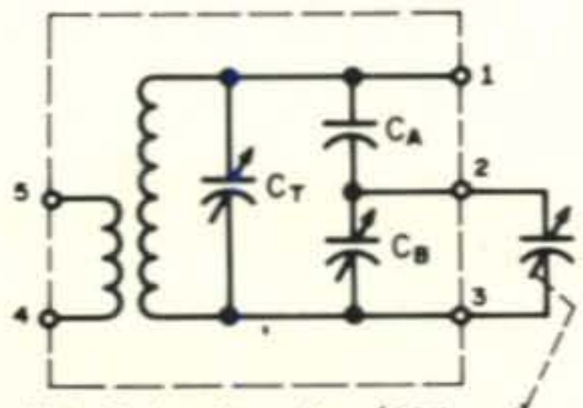
Conclusion

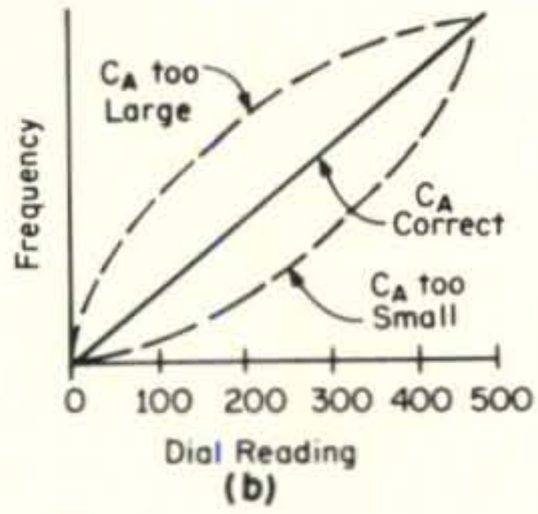
That, briefly, outlines the major changes made in this old HRO-5 as it exists today. It is still not quite an HRO-500, but in many respects it out-performs the very latest higher-priced receivers. And it will continue to be modernized and upgraded as long as it remains my favorite receiver.

Appendix

Briefly, the way these HRO tuned circuits can be made to cover a given frequency segment can be understood by referring to the simplified diagram of fig. 11. Four parameters are available for adjustment: L, C_A, C_B, and C_T. Together they determine the approximate resonate frequency. The tuning *range* is determined by the capacitive voltage divider, C_A and C_B. It is also influenced by the over-all L to C ratio. The greater the ratio of C_A to C_B, the less will be the tuning range. However, for a fixed ratio of C_A to C_B the tuning range can also be reduced by decreasing L and increasing $C_A + C_B$. The value of C_A also determines the shape of the dial *vs.* frequency curve, as shown. Once the approximate values are determined, final setting of frequency and tuning range can be made with the two screwdriver adjustments, C_B and C_T. ■



Main Tuning Capacitor (225mmf)
(a.)



(b)

Fig. 11—Simplified circuit of the HRO plug-in coils. The effect of Ca on dial linearity for a given tuning range is also shown above.

THE SIMPLEST TR SWITCH

BY IRVIN G. KANODE,* WA9CKP

HERE is the simplest TR switch that I know of. This switch requires no controlling devices nor power supply. This switch has been in use at this QTH for the past six months with our 75 watt c.w. transmitter. There is no reason why it cannot be used on higher power transmitters, if the proper diodes are used. For c.w. operation we use it for instant break-in without reducing receiver gain and it should be usable on other modes if there is no feed-back from speaker to microphone. When working the same frequency you can copy your own signal comfortably, and when working off your own frequency, another signal can be heard between your own signals. We built the TR switch, shown in fig. 1, in a small 1″ × 2″ × 3″ utility box, using some surplus diodes found in our junk box. ■

*158 W. Indiana Ave, Nappanee, Indiana 46550.

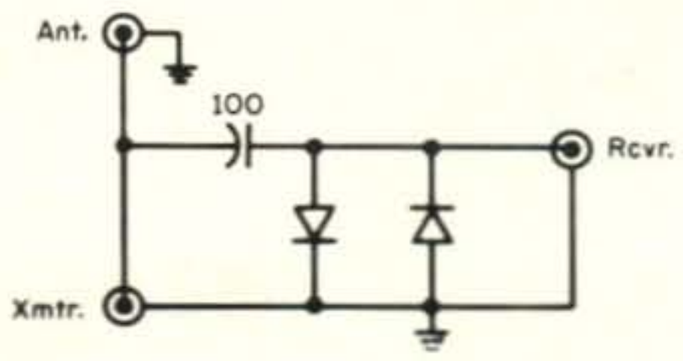


Fig. 1—Circuit of a simple TR switch using a pair of surplus silicon r.f. type diodes.

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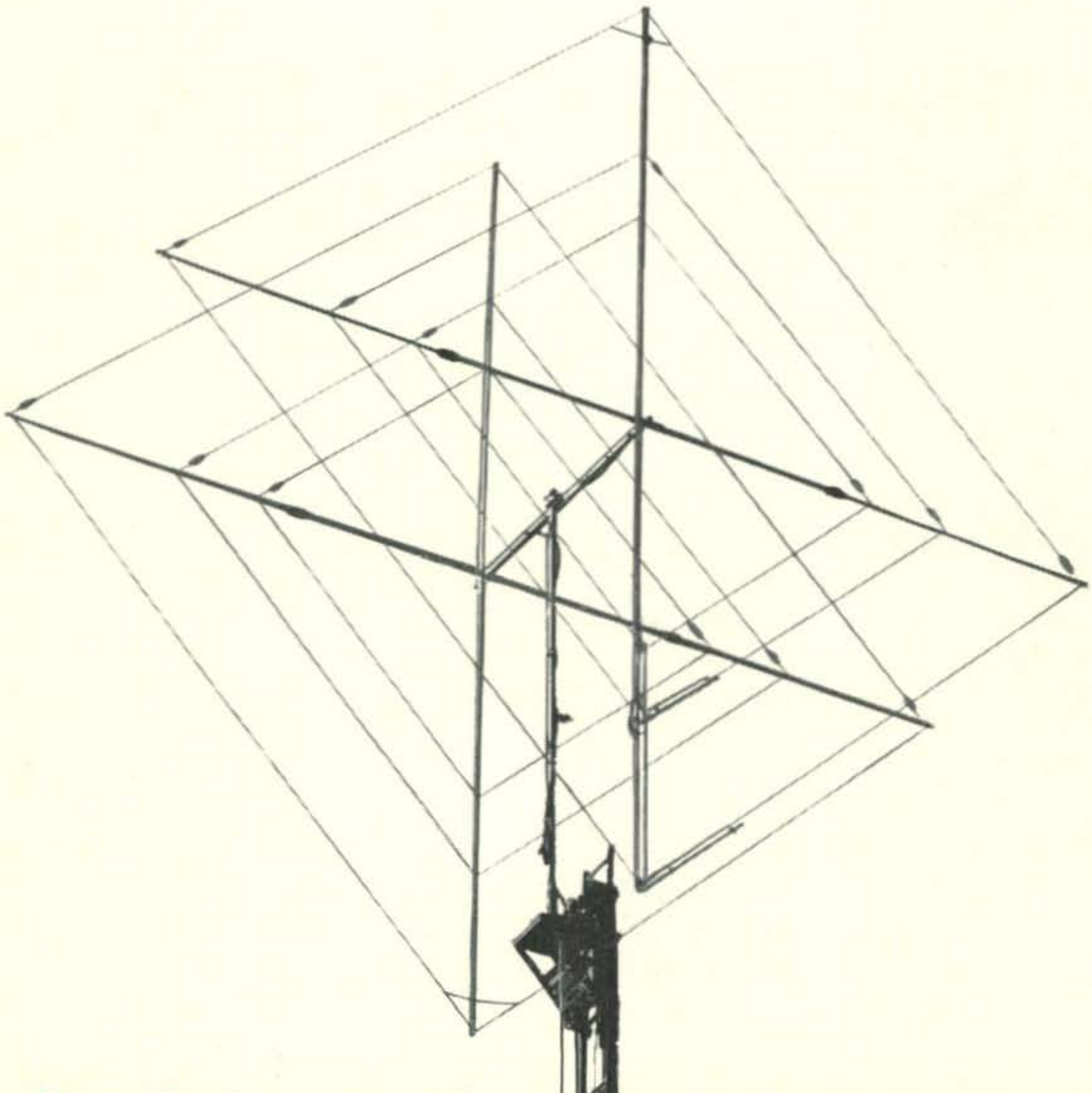

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A SHEET METAL DRILL FOR THIN MATERIALS

BY ALBERT H. JACKSON,* VE3QQ

PERHAPS you have never seen or heard of a "sheet-metal" drill. If so, you have something in common with most radio amateurs and commercial technicians. While frequently employed by skilled machinists, this tool apparantly has remained relatively unknown to the great majority of electronics workers, a fact surprising to the writer because of its general utility and improved performance in thin metals and insulating boards.

The regular twist-drill shown in fig. 1, in sizes greater than 1/4", is notorious for its often dangerous tendency to "grab," and to wander out of position when used with thin materials such as chassis and terminal boards. Resulting holes are likely to be off center and multi-sided, rather than round, and underneath chipping of insulating boards is almost impossible to avoid. These undesirable characteristics are reduced almost to zero by the "sheet-metal" point of fig. 2, and this drill makes a clean hole much like that of a punch, because the center is maintained until the edges have cut through.

*89 Third Avenue, Box 453, Arnprior, Canada.

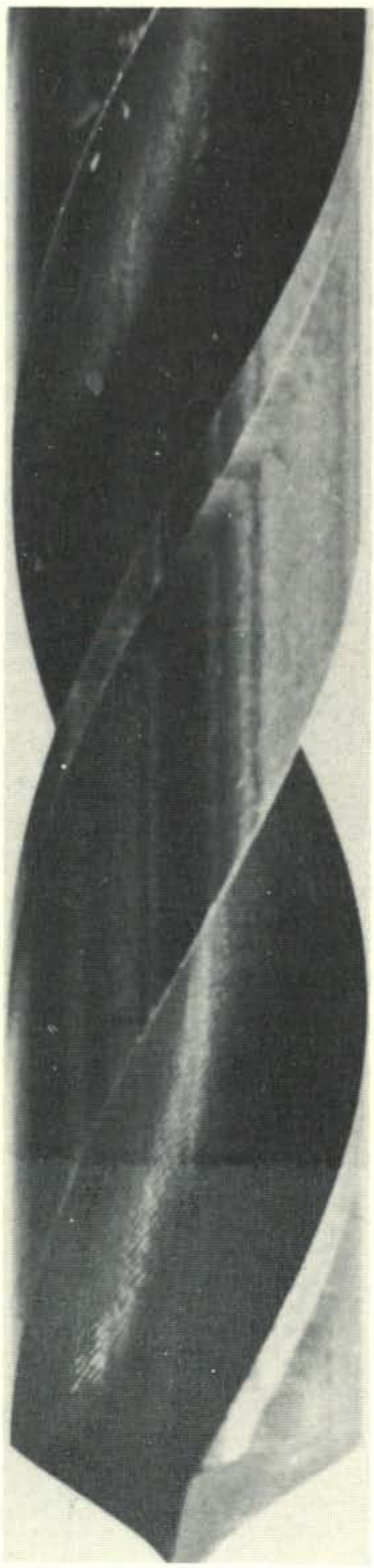

Fig. 1—For comparison, this is the well-known point of the "standard" twist-drill.

Altering the Standard Point

To convert a standard drill to the sheet-metal style, proceed as follows:

(a) Select a drill of "high speed" steel, since this will keep sharp edges much longer than the carbon steel variety.

(b) Employ a power grinder whose stones have nearly square "corners." If the corners are rounded to any extent, use a dressing tool on the stone circumferences to restore the square condition.

(c) Do the initial rough shaping of the bit with a coarse stone, and the finish grinding with a finer one. Goggles, of course, are essential for eye protection.

(d) Holding the drill against the tool rest with the shank at a slight downward and outward angle, notch one cutting edge as indicated in fig. 3 and the photographs. The downward angle should produce a cut-back of about 8 degrees on the heel of the cutting face. The outward position is not too critical, but ensures that the cutting surface will be higher at the circumference than at the hollowed section near the center. Check these grinding positions at the beginning, and maintain them along with the original center

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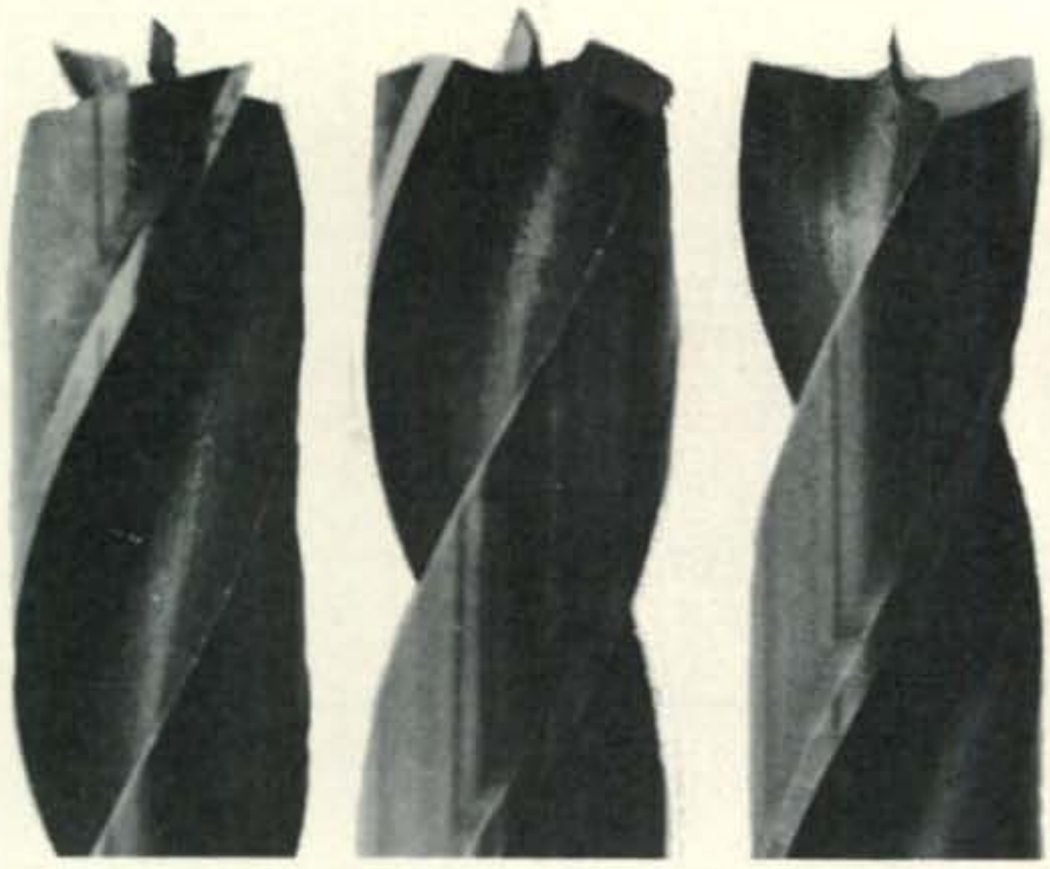

View (A) shows a side view of a 1/2" sheet-metal bit. The same bit turned 45-degrees is seen in (B). The front view, (C), shows the high circumference points. The thickness of the center pivot, at its base, is governed by the "web" of the drill and its base width in this position should be ground to approximately the same dimension.

point and outer cutting edges until the end of this operation. This tends to keep the drill symmetrical, making the final true-up comparatively easy. No rotation of the drill is necessary, except at the last to clear the center of the heel portion. Take your time, and dip the steel in water frequently to prevent burning and loss of temper.

(e) Alter the other side of the bit in the same way, continuing until both sides are identical.

(f) When the edges are finished, true up the center pivot and shorten it to protrude about 1/16" to 1/8" beyond the cutting edges, the longer dimension applying to the larger diameter drills. Grind the pivot tip to a diamond shaped point (four faces) and round off the two trailing corners toward the heel portion.

Using the Converted Drill

The new point will enter sheet material by itself, but is faster when a pilot drill slightly smaller than the center pivot is used first. For a clean hole, sheet metals may be drilled from one surface only, but the non-metals must be done part way from each side, using a pilot hole as a guide.

Use *slow* speeds to avoid burning the cutting points, and larger-than-chuck sized drills with turned down shanks are permissible, since no great pressure is required. Best results are obtained with a drill press, and its use is recommended wherever possible. However, the altered bit can be used in hand-held drills *if* you are careful; be sure to keep the tool perpendicular to the work, and be prepared for a sudden break-through at the finish of a hole. Do not try to use even the slow speed smaller power drills with bits greater than 3/8" in diameter (most common 1/4" electric drills are too fast even for this). If necessary, beg or borrow a 3/8" or preferably a 1/2" type, as needed, for the larger sizes.

Caution!

DO stop the drill to remove the waste "washer" of material which often adheres to the point at the completion of a hole. Knock it off by running a screwdriver or the handle of the chuck key down the fluting of the drill.

DO use a clamp or vise to secure small work pieces. A self-locking vise-grip wrench is ideal for hand holding such items.

DON'T withdraw the drill and attempt to start again in holes deeper than the pivot point. Unless drill and hole are perfectly aligned, the cutting points may grab the edges and jerk the work out of position and perhaps out of control.

[*Continued on page 99*]

Fig. 2—The altered point is clearly shown in this view of the "sheet-metal" drill.

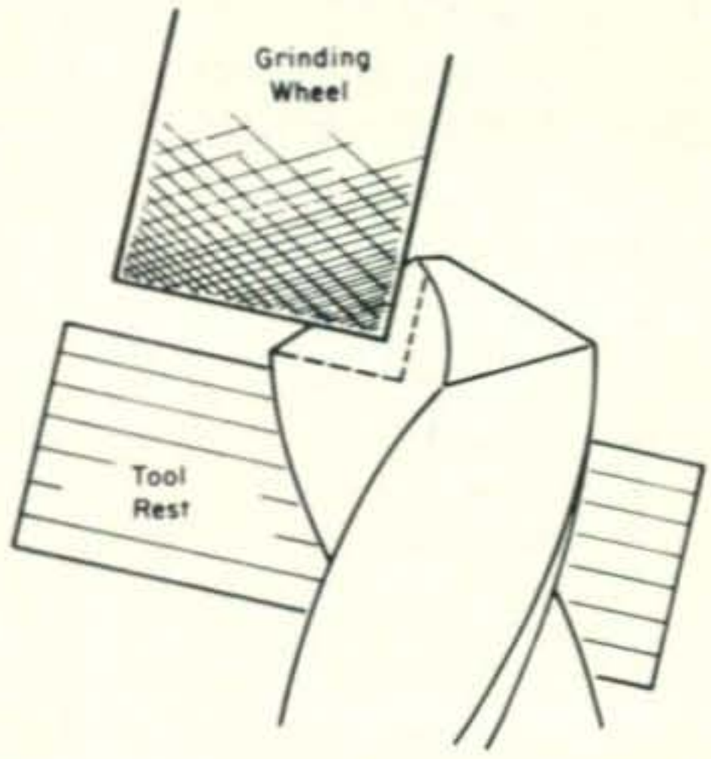

Fig. 3—Pictured here is the method of grinding described in the text.

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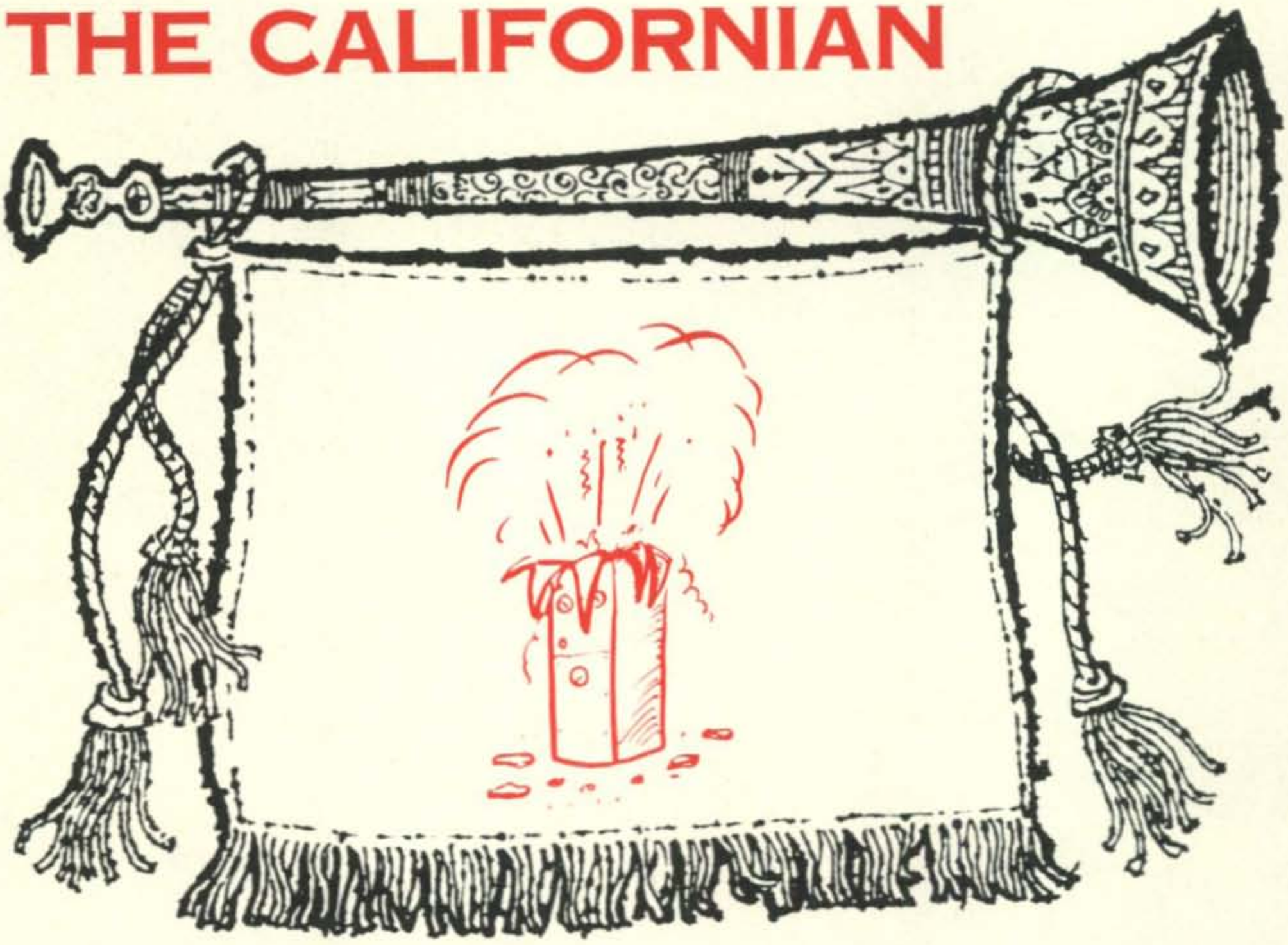

KILOWATT SYNDROME

BY SYLVIA MARGOLIS*

THERE's this question of the ice cream, for instance.

Near the *CQ* offices, there's an ice cream place, which claims to sell ice cream in 133 flavors. The *CQ* Publisher, Dick Cowan, WA2LRO, and the Editor, Dick Ross, K2MGA, took me there when I was in New York in 1967. I counted only about 80 flavors. The others were permutations and computations, some of them extremely unlikely, like whisky-and-mint. I maintain there aren't 133 flavors. The *CQ* people say there are. The resultant discussion has led to a degree of contumely which pinpoints the difference between our two peoples. We British are reserved, undemonstrative, stolid, deeply suspicious of the Californian Kilowatt syndrome, be it regarding flavors of ice cream or signal reports. The Americans find our conservatism smug, stuffy and inhibiting.

There is still a nucleus of stiff-necked British reactionaries who remember the Americans who were stationed in U.K. in World War II as "overpaid, oversexed and over here," a spiteful and quite undeserved phrase. The Americans weren't overpaid. And there are some Americans who are still fighting the wars of 1775 and 1812. "How can you be British and yet so nice?" asked the wife of a W2 whom I met during that 1967 visit. She meant it as a compliment and I took it as a compliment.

Amateur radio is one of the few agencies that can transcend these differences. The radio amateur, to whom the Atlantic is only as wide as 20 meters, has an educated understanding of things foreign. Understanding leads to tolerance. When he visits a foreign country, as a tourist, or on a business trip, amateur radio will open doors for him that are sealed tight shut for ordinary, Hilton-to-Hilton travellers. What ordinary tourists see varies little with latitude or longitude, but visiting radio amateurs can get into the people's homes, into the people's lives. They share this universal passport with, perhaps, only the Rotarians.

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*95 Collinwood Gardens, Clayhall, Ilford, Essex, England.

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The amateur who is resident in a foreign country has it made, too, in these days of reciprocal licensing. Not only can he follow his hobby, but he can become part of the local amateur community and participate in local events.

Britain must have more foreign resident radio amateurs than any other country. There are the U.S. Servicemen, to begin with. Then Britain is one of the academic centers of the world, playing host to thousands of visiting students, pre- and post-graduate, and to visiting professional firemen. And Britain is a Number One Diplomatic Post, with an enormous *Corps Diplomatique*.

Not that this *Corps* is always that *diplomatique*, not where their amateur radio is concerned. On the whole, reciprocal licensing is working very well indeed, encouraging radio amateurs into Britain as tourists, which we badly need. Normal British regulations are in operation—no phone patch, no third party traffic, no operation by unlicensed persons at any time. And the foreigners adhere to these rules. We think only one of the regulations is frustrating. Holders of reciprocal licenses are obliged to use the English language only. This seems ridiculous, considering that few G's who obtain licenses abroad can speak any language other than English and they'd be out in the cold if the Germans or the Dutch were to insist that all operation in their countries should take place in the local language. Most Englishmen maintain that the best way to get a foreigner to understand what you are saying is to holler at him in English.

Nevertheless the language clause remains. The authorities say it exists to facilitate monitoring and administration. And all the recipients of reciprocal licensing abide by that clause, like it or not. Or nearly all. The story of the Kuwaiti Embassy in London is a tale to freeze the blood of us cock-eyed optimists who fought so hard, who finagled, lobbied and nagged to obtain reciprocal licensing 6 years ago.

Within the Kuwaiti Embassy was an amateur station with the reciprocal callsign G5AGS. Splendid beam antennas reared over the splendid Embassy building in splendid Belgrave Square.

Regularly this station communicated on the amateur frequencies with a Kuwaiti station. When the English language was used, they could be clearly heard passing Embassy traffic, forbidden on several counts, both

Result of Sgt. Lane's impact on British amateur radio, Chairman of the Amateur Radio Mobile Society, G3KVF, Vic Frisbee, handing a check for $600 to G2DQU, Brian Rix, part of the proceeds of a hamfest on Bob's home U.S.A.F. Base. Brian Rix, a popular British comedy actor, is still in his last-act costume for the play *Let Sleeping Wives Lie*. The presentation was made on the stage of the Garrick Theater, London.

amateurwise and diplomatic-wise. At other times the licensee chatted blithely in Arabic, forbidden under British licensing laws, or he would permit unlicensed people to operate the station, forbidden ditto.

British amateurs weren't unaware of these infractions, but complaints to the authorities achieved little. The British G.P.O., whilst efficient and eager to prevent British amateurs from doing outrageous things, like allowing the Lord Mayor of London to say the single word *hello* from a tourist attraction exhibition station, GB2LO, needed clean pants just as the thought of reprimanding offenders within a foreign Embassy. We must understand this was Kuwaiti sovereign territory and nothing must be done to offend the representatives of a friendly state and all that jazz. . . .

Finally, though, the message got through to the Kuwaitis, that, to put it diplomatically, Briish radio amateurs were fightin' mad. The Embassy went into a huff, gathered its skirts around it, closed down G5AGS and petulantly withdrew reciprocal facilities from British nationals resident in Kuwait!

In contrast to this *prima donna* performance is the story of 4X4AC/G5AEA. Some foreign residents weave themselves right into the fabric of British amateur radio and in so doing make close friends of the G's, held in respect and affection by everybody who meets them. When you make a friend, though, you

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The DXer in search of a rare one, Bob Lane with the author at a secondhand jewelry stall in Petticoat Lane.

must take on his troubles as well as his joys and you offer a hostage to fortune. Fortune took a hostage from us when Benni Maimon joined the Radio Society of Great Britain.

He was a Lieutenant-Commander in the Israeli Navy and he lived here for two years, during the refit of a submarine which Israel had bought from the British Royal Navy. Benni and his wife attended many R.S.G.B. occasions and became well-known to the members, an accepted and welcome factor in the amateur scene.

At last the submarine was ready to sail home to Israel. Benni sailed with her. She was called the *Dakar* and she disappeared with all hands in the Mediterranean, in January, 1968. In his memory, Benni's friends in R.S.G.B. presented the Society's new Headquarters with a clock. In the reception hall of the building, it bears witness to the friendship that our hobby can engender and sustain, even in tragedy.

By sheer weight of numbers, it's among the U.S. Serviceman that the bulk of the recipients of reciprocal licenses in U.K. are found. There are 60,000 Servicemen resident here. With their families, this amounts to 200,000 people, enough to populate a fair-sized town. Statistically, therefore, there must be at least 100 U.S. amateurs living in Britain, most of them for 3-year tours of service.

Some make contact at once with the G's in their area, which is the way we like it. Local knowledge is often the best way to circumnavigate obtuse zoning laws, when a newcomer wants to put up an antenna tower. And where is there a coven of amateurs without the member who knows somebody who can get a discount on equipment?

A favorite activity of our G5-plus-3's, as we call the holders of G-reciprocal licenses, is to activate an area with a rare prefix, like Jersey or Guernsey (GC) or the Isle of Man (GD.) This happened when two U.S. amateurs, stationed with the U.S. Navy in Scotland, spent a weekend in a rare Northern Ireland area, County Fermanagh.

They used half-wave dipoles on 160, 80, 40 and 20 meters and a 14AVQ on 10 and 15, operating the British transceiver, the KW2000A, which was kindly of them, as well as an NCX-5, with a home-built linear. Howard Epley, of Washington, and Steven Mendelson, of New York, using the call-signs GI5AHS/A and GI5AMS/A ("/A" equals "fixed portable,") hit the local headlines with their DXpedition. Said the *Fermanagh Herald:*

> *"these two Americans did an enormous favor to this county in promoting its very existence to the world...the name of Fermanagh County will echo around the world for many months to come and who knows many tourists may visit us as a result of this inexpensive publicity via amateur radio..."*

The American who has made more impact on British amateur radio than any other is WA6ZIQ/G5AAM, Robert Lane, who was here for three years. He became so well-known and well-liked that he was given the finest compliment an Englishman can offer a foreigner:

"Dashed nice chap. You'd almost take him for British!'

The almost-Briton came here not as a stranger in a strange land. Some of the call-signs he had held, including KG6SF, had given him the distinguished reputation of a fine DX operator. He was holder of a cup for winning the *CQ* World Wide Contest, as F7BL. So he arrived in this country as something of a celebrity. However, he was stationed with the U.S. Air Force in a rather remote corner of England, called East Anglia, the round bulge, half-way up on the right-hand side of the map. Entrenched there, where, they say, the winds blow straight from the Russian Steppes, Bob was able to meet few local radio amateurs at first. East Anglia covers the counties of Suffolk and Norfolk. Rich in history, they are flat, bleak and almost entirely rural and undeveloped, although only 100 miles from London.

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East Anglia is old-fashioned and dour, a little like New England in its attitudes and traditions. The climate is chilly and the driest in England and the people aren't that prosperous. The area is known, in commerce, as "The Salesman's Graveyard." But the wide, empty spaces provide a facility which was first exploited in World War II – they are ideal for the siting of operation airfields. And East Anglia contains several U.S. Air Force Bases, which have brought a prosperity to the region which would have made Tom Paine laugh out loud. Thomas Paine was born in a local village, Thetford, from whence he set out, very fast one night, for the "Colonies." The rest of the story you know.

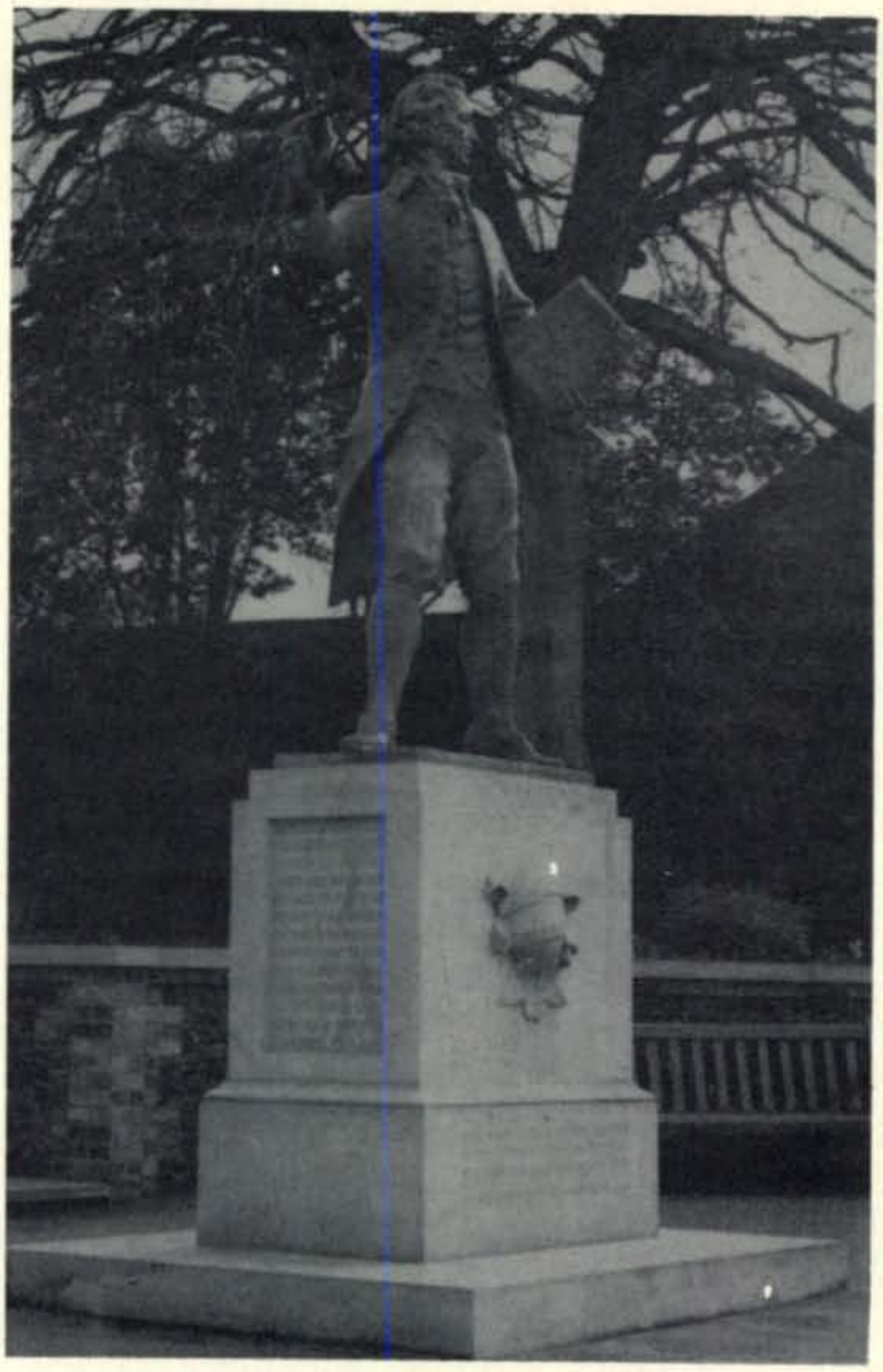
Local people acknowledge the benefits they have derived from the presence of Tom Paine's descendants.

"If the Americans left here, this village would be a distressed area within a month," says a leading citizen of Mildenhall, the picturesque village where one of the largest Bases is located.

G5AAM raised his 120 ft. tower in the small back yard of the little house where he lived with his wife, Edie, and their three boys. Subsequently it was blown down by a 90 m.p.h. gale, which anybody in his right senses would understand had been sent direct from the Russian Steppes, deliberately by a UA1, jealous of Bob's DX rating.

Amateur-wise the QTH was ideal. With no industry around to generate QRM and few amateurs to compete with, Bob was well away. He could have stayed there, isolated, hogging the DX, for this is the way many U.S. Servicemen are content to live out their tours abroad. They won't come half-way to meet the native and, in Britain, you have to come half-way to meet *anybody*. But Servicemen, no matter what nationality, tend to follow a pattern and congregate in their own compounds, with little outside communication. The U.S. Bases are towns entire of themselves. You could be born, go to school, grow up, meet your life partner, be married, beget children and die on one of the Bases, when your body would be shipped back to the U.S. for burial. Every facility and entertainment are supplied and some Servicemen and their families are quite satisfied to leave it that way.

Other Americans, though, take advantage of their roving lives to learn about those countries to which they are sent. Bob Lane



The statue of Thomas Paine in the East Anglian village of Thetford, near which are several U.S. Air Force Bases.

was one of these intelligent extroverts. As a radio amateur, he could get to terms with the natives without that prior 25 years' or so nodding acquaintance which most Britons hold to be the minimum trial period before they will accept a man as a friend.

To meet the G's halfway, he drove 150 miles (which is a helluva long drive on British roads), and first erupted onto the British amateur scene at the 1966 International Mobile Rally organized by the Amateur Radio Mobile Society on a U.S. Base. This is one of the biggest events in the European amateur calendar, attended by several thousand people, with a percentage of the profits always going to charity.

Bob and Edie arrived at Barford on the Saturday afternoon, when the pioneer Committee party were setting up the hamfest. He identified himself and we welcomed him at once as an overseas visitor and a well-known DXer. We offered him a cup of tea in our trailer, tea with milk, very hot, as befitted the warm Summer's day. He drank it without

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batting an eyelid. This was the spirit that got those early settlers, in their covered wagons, across a Continent bristling with hostile Indians.

A popular feature of this annual event is the big Trade Show, the largest communications exhibition in Europe outside of London. Some years these have been nearly 100 exhibitors, housed in an aircraft hangar.

There we were, relaxed in the sunshine, drinking tea and swopping DX boasts, when somebody came running out of the hangar, where the exhibitors were arriving every minute on the minute, to say the electricity had gone off and would someone please mend the fuse.

It wasn't a fuse. There was a complete local power failure, covering several square miles. Being a Saturday, they didn't expect to get the fault traced and repaired much before Monday morning. What was the hurry? People in rural Oxfordshire had been cooking on coal ranges and lighting their homes with candles before ever that new-fangled electricity was invented. They could easily go back from whence they came.

But you can't run an electronics exhibition on candles. The British never, repeat, *never panic*, but this was close to panic. The exhibitors, to whom time was money, were demanding electricity. And, for once, the weather was glorious, promising a record turn-out of visitors next day. We were in it up to our necks. The young Lieutenant, who was our U.S. Liaison Officer, sat back helpless, seeing his promotion disappear along the same route as that electricity which somebody had been careless enough to mislay. Then a quiet voice broke through the babble.

"Lieutenant, Sir, what about a generator?"

The Lieutenant knew of no generator in the area. The Sergeant did, heaven knows how, for his own Base was five counties away.

"How about we go get it, Sir?"

The Lieutenant, the Sergeant and most of the A.R.M.S. Committee piled into cars and went to find the generator. The Colonel at the neighboring Base knew of no generator. Sergeant Lane did and told the Colonel where, on the Colonel's Base, the generator was hidden. The Colonel knew of nobody who had authority to commandeer the generator. The Sergeant had the authority. But where was there a truck powerful enough to tow the generator, which weighed 4 tons? The Sergeant knew where. Who had authority to commandeer and drive this gargantuan truck? The Sergeant had authority.

So they hitched the generator to the truck and started off, guided across the Base by a U.S.A.F. P.F.C., who will never make General. After a few yards there was a gentle crack of tortured concrete and the generator slide gracefully through Her Majesty's runway, (rented, fortunately to the U.S. Government) upon the place beneath, where it rested in a rather irresponsible attitude.

The Sergeant knew where there was a crane capable of reinstating the status to its *quo*. The Sergeant had authority to commandeer and operate the crane. An hour later, escorted by joyously hooting G-mobiles, driven by the Sergeant, the riotous cavalcade proceeded at a majestic 5 m.p.h. back to Barford. It was lucky they didn't meet any other travelling circuses on the way.

We women and children had been left behind to guard the fort. No U.S. Cavalry could have arrived at a beleaguered garrison more welcome than Sergeant Lane's Company. Cheering there was and waving there was and it was all frightfully un-British.

They connected up the generator and it produced so much electricity that all the Base lights had to be kept on day and night to dissipate the surplus. It was July 4 all over again.

Verily Sergeant Lane had made his mark on British amateur radio. The next year he was asked to help with the GB2CC operation at the Diamond Jubilee Rally of the Caravan Club and later at the next A.R.M.S. Rally, this time at the U.S. Base at Alconbury, where Sergeant Lane not only produced a carnival "train" for the children, but drove it all day all over the Base, sixpence a ride, proceeds to charity. Then he suggested that the 1968 event be held at his home Base, Mildenhall.

With his remarkable combination of enterprise, persuasiveness, wide-eyed optimism and omniscience, he was determined that Mildenhall should out-do all previous projects. American know-how, the Californian Kilowatt, were to be added to what had originally been a British idea. It was that way with penicillin and jet flying, so why not with a hamfest?

"THINK BIG!" decreed Sergeant Lane and we thank big. Working in the closest liaison with the A.R.M.S. Committee, most of whom were by now his intimate friends,

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he smashed down every obstacle to get what he wanted. In only one respect did he fail. A leading U.S. equipment manufacturer had given him a firm promise of a transceiver as the major door prize. At the last minute the manufacturer rat-finked out (it's lousy gear he sells, anyway!) Only the prompt and generous action of the Aerotron Corporation, through the auspices of W2GHK, Stuart Meyer, saved the situation.

The U.S. authorities pulled out all the stops to make Mildenhall a humdinger. The biggest draw was, Saints be praised, all-British, the R.A.F. aerobatic team, the *Red Arrows*, acknowledged to be the finest in the world. 8,000 people turned up and we were able to make a donation of £250 ($600), a huge sum by British standards, to that year's chosen charity. The charity we chose was a fund for handicapped children, sponsored by G2DQU, Brian Rix, one of our most popular comedy actors.

A few weeks later we arranged to have Sergeant Lane seconded for temporary duty to the Radio Society of Great Britain, to assist with the setting up of the City of London Festival Station, GB2LO, the biggest and most successful amateur radio public relations venture ever launched.

Thanksgiving, 1968, my family and I were invited to the Lanes for Dinner. "We're giving thanks because we quit England," explained Bob, mellow with turkey, "What do you Limeys think you're giving thanks for?"

"We're giving thanks because you went," said my husband, reaching for a second helping pumpkin pie. Our friendship was like that by then. And if Bob ever won an argument about British inefficiency or warm beer or socialized medicine or no phone patch traffic, I could always retaliate with a triumphant: "GO HOME YANK!"

None of us wanted to admit that February, 1969, was approaching fast. We gave a farewell party for the Lane's before they left. Next day we took them to pick up a painting that Bob had commissioned from an artist who displays his work in the famous sidewalk exhibition at Hyde Park, in London, then to the Sunday Market in Petticoat Lane. It was full of noise and color, tricksters and hustlers, where, we say, you go in at one end and find yourself buying your own watch as you come out at the other end.

Bob is an expert on antique watches, of which he has a collection almost as fine as

Bob Lane with the painting he commissioned of his wife, Edie, and the real Edie. No need to ask where this was taken.

his collection of QSL's. We took him to the quiet corner of the market where they sell jewelry and where every alternate character is a plain-clothes cop. Things that fall off the side of ships and off the backs of trucks appear for sale in Petticoat Lane.

Soon Bob was surrounded by touts of antique watches as if he were KG6SF again, lining 'em up on 20 meters. We watched as their amused tolerance of our Californian Kilowatt turned to wary and grudging respect. We didn't buy a watch, we didn't buy a genuine mink coat for 50 bucks (grew it meself, lady!) We didn't buy a diamond (new variety called zircon, sir!) and we didn't buy the elixir of life, offered in plain wrapper, adults only.

We took them to Bloom's, the most famous kosher restaurant in the world, for lunch and introduced them to the mysteries of *gefillte fish*, *bagels* and potato *latkes*. The minutes were ticking away, like the last minutes of a Contest.

It's un-British to show emotion.

"Go home, Yank!" I muttered, as we said goodbye.

The Lanes flew home. Of course, they don't write. Radio amateurs never write letters. But we know that one day, on 20, or perhaps 15 or 10, a call will come from WA6ZIQ, and we'll say: "WELCOME, YANK!" ■

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SEE THE IC-2F AT SAROC IN LAS VEGAS, February 4-8

Instant Service Nets
WCARS—MWARS—ECARS

BY ED GRIBI,* WB6IZF

HOPE to be seeing many of you at "SAROC Fifth National Fun Convention" at the Stardust in Las Vegas this February 4 through 8. This annual affair is one of the most popular conventions in hamdom. WCARS will hold its fourth Annual Meeting there also.

Whose Frequency?

Thoughtful letter from Dave Mann, K2-AGZ, in ECARS "Monitor" says: "There is no station or net with *a priori* rights to any frequency...We cannot afford to maintain ECARS at the expense of other hams. We cannot afford to preempt the frequency... simply because some of our zealous operators are too immature to have learned the lessons of tact, kindness, and courtesy to others."

This is always a tough, and occasionally, touchy point to get across. Nobody owns a frequency and the worst lid or most obnoxious boor has just as much right to any frequency under FCC regulations as the most devoted efficient public service activity. The only way we can maintain a clear monitored frequency is by intelligent tactful occupation with continuing respect for the rights of others.

Along that line we all have interference problems of varying degrees. It is well to remember several points about interference.

1) Most interference is *not* intentional and can be dealt with by maintaining a relaxed attitude and treating the station you think is interfering with courtesy and tact. Remember, *you* may be the one who is interfering instead of vice versa.

2) In those instances of intentional interference it can't be repeated strongly enough: *ignore it!* Refrain from making any comments. Act as if you don't hear it and go on with business as usual. Most of these types are looking for attention anyway and will fade fast if they don't get it.

3) If you feel the case is blatant enough, clearly in violation of the letter of the Regulations, and is repeated enough, quietly call your nearest FCC monitoring station. But, keep it to yourself. And remember that the FCC finds malicious interference to be one of the toughest to prove. Legal definitions of profanity and obscenity are in a state of flux making those charges also very difficult to prosecute. Therefore, the FCC with their limited budget and staff will look for almost any other violations first. Incidentally, your tape recording of an alleged violation is inadmissable as evidence. But I hope you'll be able to handle the situation without calling the law.

Grab Bag

Julio Ereneta, W6ZOM, of San Diego received a letter of appreciation from the U.S. Weather Bureau on November 14, 1969, for his continuing services in relaying violent storm information from the Wx Bureau to the Pacific Coast of Mexico. I've heard a number of these hurricane advisories passed through the facilities of WCARS and I know they have helped save many lives by getting accurate warnings to the remote areas at the right time.

WA2CFS notes in ECARS "Monitor" that Mr. Sam Ferraro, Washington office of FCC, says that "under any circumstances, emergency (life or death) traffic is permissable by the FCC with *any country*."

During these long winter evenings when 40 is out try 3952 in the west where Western Public Service offers services similar to WCARS. MIDCARS members meet informally on 3915. WA2DDR and WB2EXS would like to hear from ECARS members and others interested in establishing a nighttime operation on the East Coast. Contact Paul Pilzer, WA2DDR, 104 Woodhill Lane, Manhasset, New York 11030.

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*229 Vivian St., King City, Calif. 93930.

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Brief Calling Procedures For 7255 And 7258

This column is devoted to news of the "Instant Services," WCARS and EASTCARS, 7255; and MIDCARS, 7258, and other amateur public service activities. If you need to use these monitored calling and emergency frequencies, here is the proper procedure:

"BREAK-BREAK-BREAK" – *Emergency only*–used for messages having a life and death urgency–such as highway accidents–all stations stand by while control determines method of handling.

"BREAK-BREAK"–Priority or urgent traffic having a specific time limit. Traffic hazards and obstructions are priority.

"CONTACT"–Notifies control that you wish to contact a station just heard.

"INFORMATION"–Notifies control that you have information that may explain or expedite traffic at hand or for any other contingencies.

Your call letters only–The only proper way to break for routine matters–never say "break."

Never transmit more than one brief sentence without dropping your vox or mike button.

Always move all routine messages and contacts at least 4 Khz. off of Service frequency.

WCARS News (from WCARS Sentinel)

W6CEU lives on an island with no telephone in San Pablo Bay, California. His wife became ill and then unconscious in September, 1969. He was able to get Coast Guard on Ship to Shore who dispatched a helicopter. Then he got on 7255, WCARS, where he was immediately able to get a shore based amateur to have a boat dispatched and an ambulance arranged. The combined quick action got his wife to the hospital where she recovered quickly.

WB6ZKK, living alone and with poor eyesight, suffered a serious heart attack. Unable to utilize the phone he was able to key his mike on 7255. WB6OEZ got the details immediately and called for help. In minutes the fire department resuscitator crew arrived closely followed by an ambulance. Cliff recovered nicely.

WA6GJT and XYL, WA6KYW, got their truck stuck precariously over an embankment in the Trinity National Forest. They called for help on 7255 and a wrecker arrived and pulled them to safety 45 minutes later.

XE2MMK, operated by W6HCD from remote San Vicente, Baja California, checked, into WCARS to find a message waiting for an American visiting there that his wife had been taken to a hospital near San Diego. He made the long drive home to be presented with a baby girl.

For information regarding WCARS membership send a card to Wayne Nail, WB6CBW, President, 4924 Omar, Fremont, California 94538.

EASTCARS News (from the Monitor)

WA3GXE put an inquiry message regarding a soldier injured in Viet Nam on 7255, Eastcars frequency. WB4JAW relayed it through Pentagon MARS and an answer was received by anxious parents within two days. Army and Red Cross had been unable to help.

W2PXQ, WA3KKB, WA3CQO, K2UDZ, K3BUZ, W4EXI, WB2YEW, K2SZU, K2HVK, WB4JAW, and WA3HWW were involved in the reporting of six different automobile accidents in late 1969.

Portugese and Brazilian stations checked in on EASTCARS, 7255 in summer, 1969.

For information on joining EASTCARS send an S.A.S.E. to Jim Lightfoot,WA1KRN, c/o Radio Station WBZ, Boston, Massachusetts 02134.

MIDCARS News (from Radio Watch)

I spent seven weeks in Iron Mountain, Michigan, last fall and enjoyed working MIDCARS regularly and EASTCARS occasionally with my suitcase sidebander (see December 1969, *QST*, p. 38). The names and calls are different but many of the conditions, procedures, and above all the friendliness are pretty much the same whether 7255 or 7258.

To join MIDCARS, send a QSL or postcard and twelve 6 cent stamps to: Secretary, Midwest Amateur Radio Service, Box 82, Seaton Illinois 61476.

Gripes or otherwise–got any comments, good, bad, or indifferent on WCARS, MIDCARS, EASTCARS, or otherwise? I'd like to hear from you. Also pictures of activities are welcome.

See you on 7255 or 7258, your nation's two calling frequencies.

73 Ed, WB6IZF

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DELAYED SWITCHING FOR TRANSISTOR RECEIVERS

BY R. JAYARAMAN,* VU2JN

HAMS who have burnt out delicate transistors on the front-end of solid-state receivers or transceivers will no doubt appreciate the desirability of introducing a small time-delay in turning on the receiver, when it is used with a high powered transmitter. This can be accomplished in an elegant manner by solid-state delay circuits. This article deals with some delay circuits that will be of use to the solid state enthusiast.

Basic Circuit

Unlike some simpler circuits, the circuits described here feature complete initial blocking, fast turn-on (after the desired delay interval) and fast turn-off. The basic delay circuit is shown in fig. 1. Its operation is as follows: Immediately after switching on, transistors Q_1 and Q_2 both remain cut off while current flows through resistor R_1 and charges capacitor C_1. As soon as the voltage across C_1 rises above the zener voltage, the zener starts conducting and triggers Q_1 into conduction. Q_2, triggered by Q_1, turns on and remains "bottomed" during operation. Resistor R_3 helps to reduce the initial leakage current through Q_2 to a negligible value. Resistor R_4 limits the base current of Q_2 to a safe value, while R_5 improves the transient response of the zener and the collector-base junction of Q_1, resulting in faster triggering.[1]

To ensure reliable delay and fast turn-on, CR_1 should be not more than two-thirds of V_{IN}. Any desired turn-on delay can be obtained by selecting the proper time constant for the R_1C_1 combination. For a zener current of 5 ma, we have:

$$R_1\ (in\ ohms) = \frac{V_{IN} - V_{CR_1}}{0.005} \text{ and,}$$

$$C_1\ (in\ mf) = \frac{T}{R_1 \cdot \log_e \frac{V_{IN}}{V_{IN} - V_{CR_1}}}$$

where T is the time-delay in seconds.

Since the zener furnishes a reference voltage, it is logical to combine a voltage regulator with the time delay circuit. This can be accomplished by adding a shunt regulator as shown in fig. 2. In fig. 2 transistor Q_3 regulates the output voltage at the zener voltage plus the emitter-base bias voltages of the transistors Q_1 and Q_3. Resistor R_6 should be

*Assistant Professor, College of Engineering, Trivandrum-16, India.

[1]Turn-off is instantaneous since Q_1 and Q_2 get blocked and C_1 can discharge only through R_2.

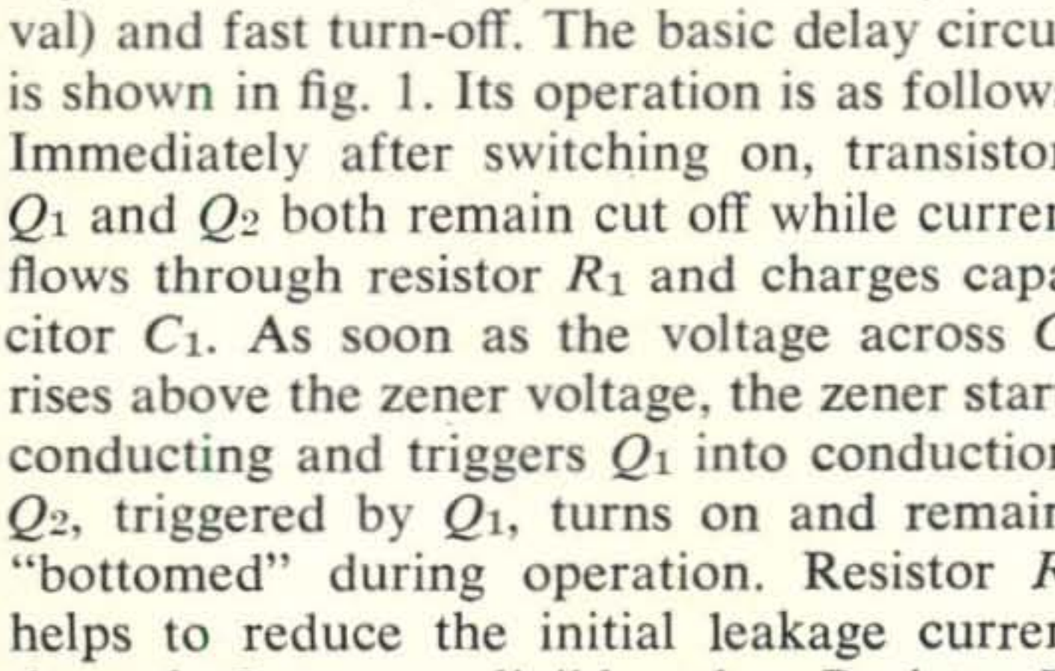

Fig. 1—Basic circuit used to introduce a delay in the applied voltage to the receiver circuit.

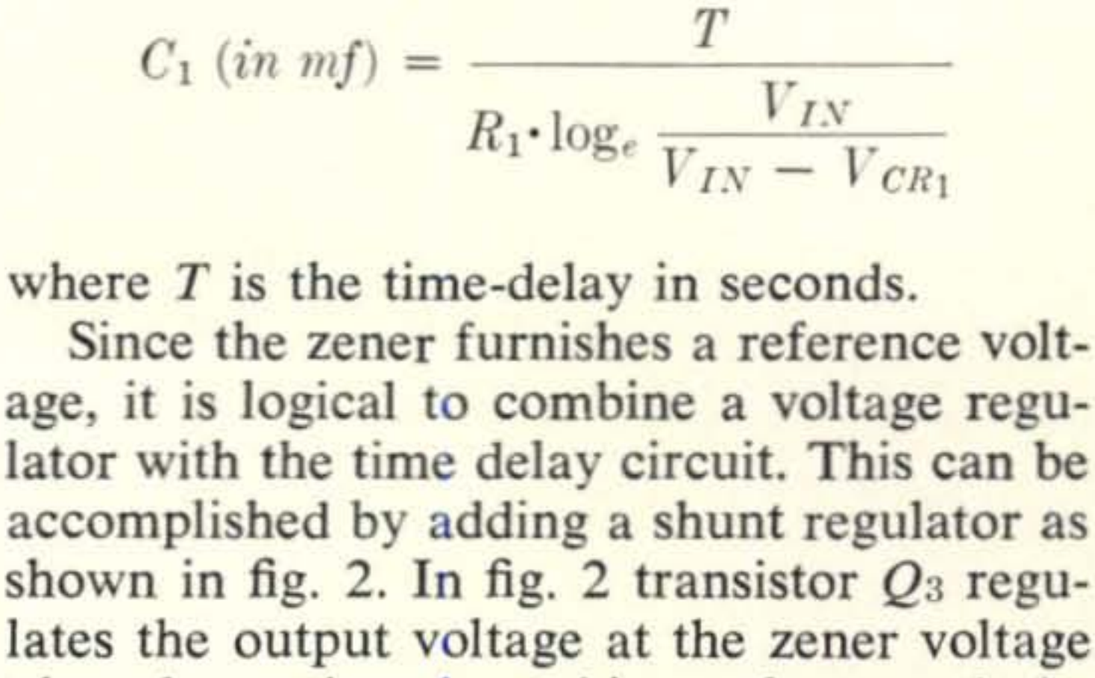

Fig. 2—Addition to a regulator to the basic circuit to maintain a constant output voltage.

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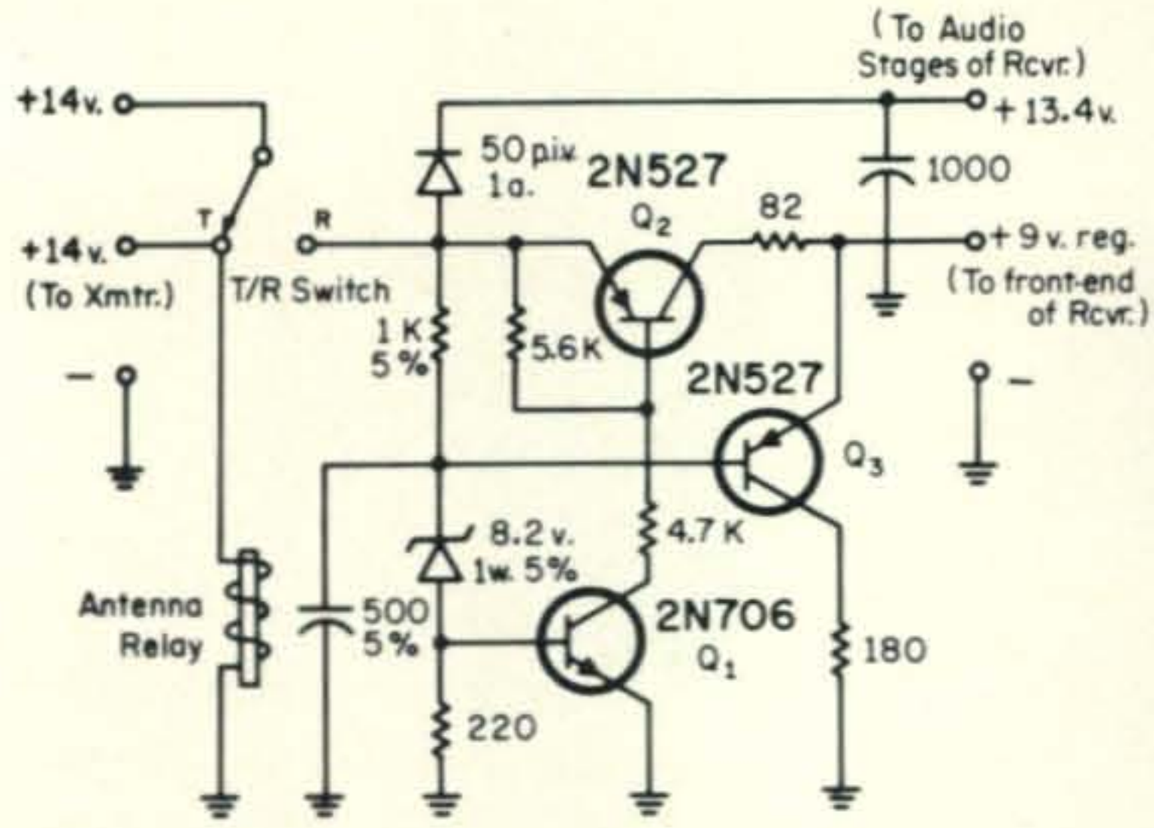

Fig. 3—A practical circuit used to delay the application of voltage to the receiver front end circuit.

adjusted so that with minimum V_{IN} and maximum I_{OUT}, Q_3 still carries a current of about 5 ma. Resistor R_7 helps to reduce the transistor dissipation. Since the base of Q_3 is held at a well-filtered reference voltage, the bias and hence the collector current of Q_3 vary in accordance with the ripple in the input, thus filtering the output voltage. A special feature of the circuit is that C_1, while effectively smoothing the output, cannot discharge through the output during turn-off.

Practical Circuit

A practical circuit that can be used with most solid-state receivers and transceivers is shown in fig. 3. The measured turn-on delay is 0.6 seconds. With an 8.2 volt zener, the

[*Continued on page 98*]

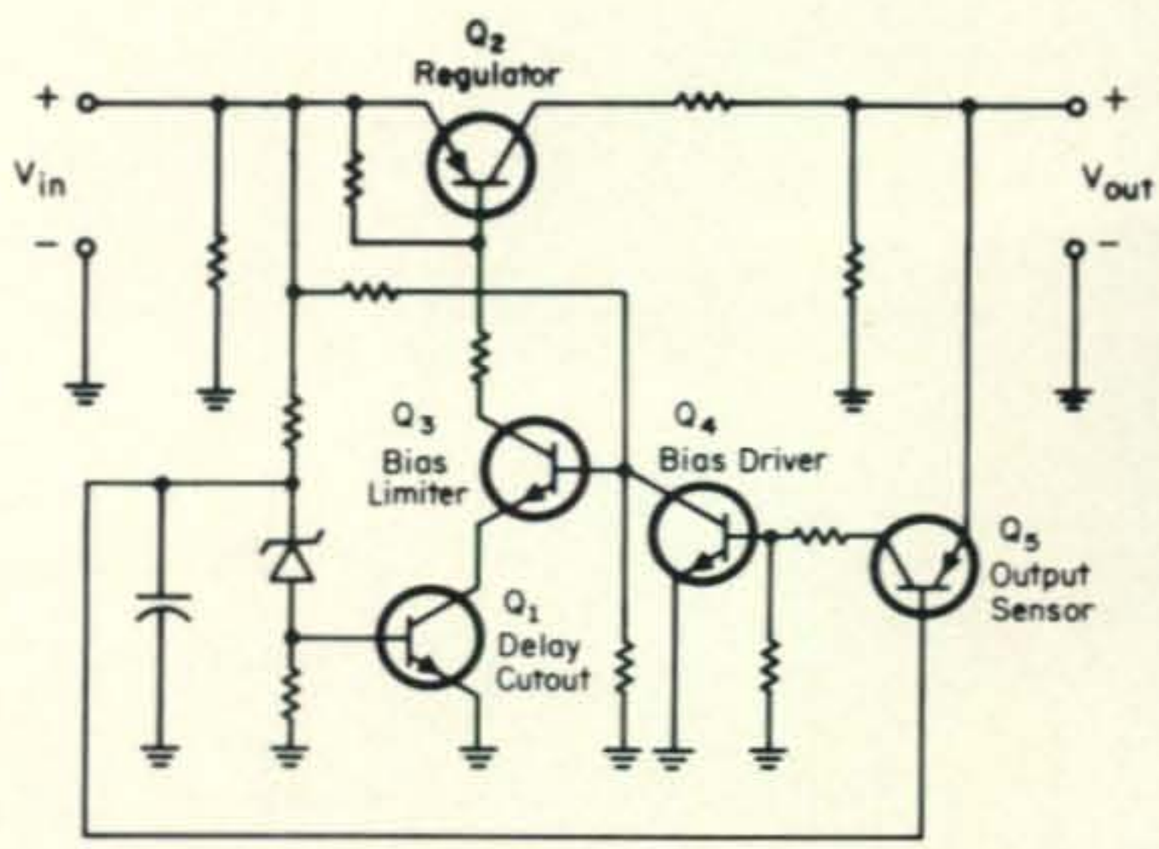

Fig. 4—A basic circuit for delay of high current loads. The transistor types required are discussed in the text.

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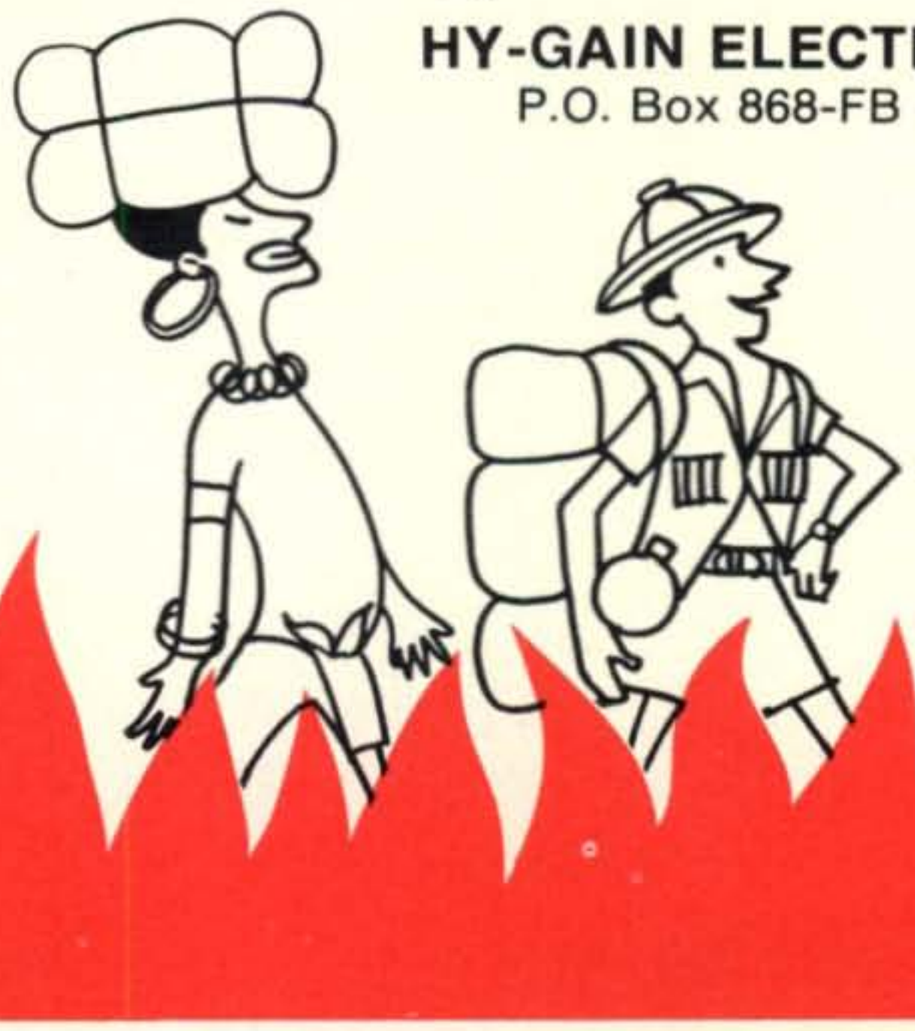

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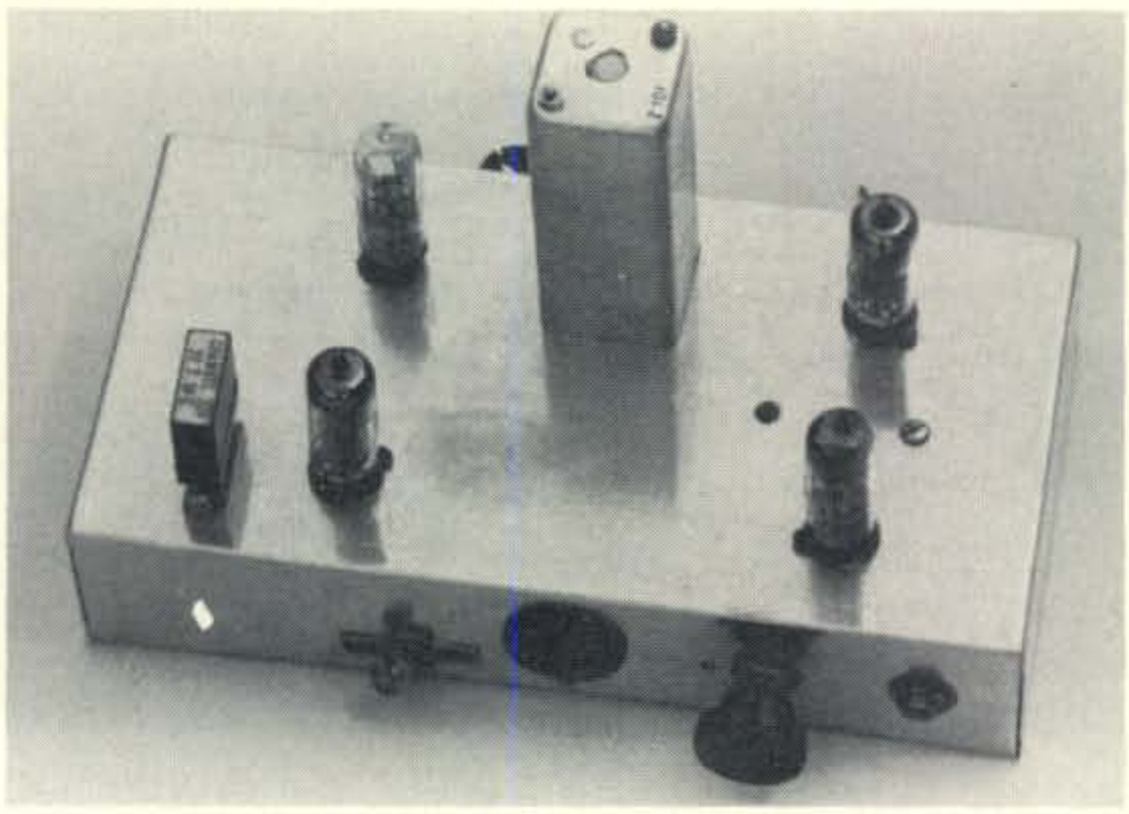

Rear view of the completed audio sweep generator shows the power input plug (male should be used for safety), the sawtooth level control and the sawtooth input jack.

A SWEPT AUDIO OSCILLATOR

BY LARRY WALROD,* VE7BRK

HAVE you ever had the experience of putting a lot of time on a crystal filter to get its response curve as good as possible? Have you connected this carefully made filter to your favorite transmitter circuits and found that the overall response curve did not look nearly as good as you expected it to? Why not try making your final filter adjustments with the filter connected up as it will be used?

Of course, you can use an ordinary audio generator for the signal source in a series of tests to determine the transmitter response curve but you'll find it a lot easier to use a swept audio generator for this purpose due to the fact that you can continuously monitor the whole curve while making adjustments to any particular element of the filter setup.

The author, who professes to be a semiconductor enthusiast, has difficulty explaining how he got going on this project with vacuum tubes. Maybe it was because the proper transformer was already on hand. About half way through this project there was a temptation to start over with semiconductors but there was also a reluctance to waste the work which had already been done.

*P.O. Box 2270, Manila, Philippines.

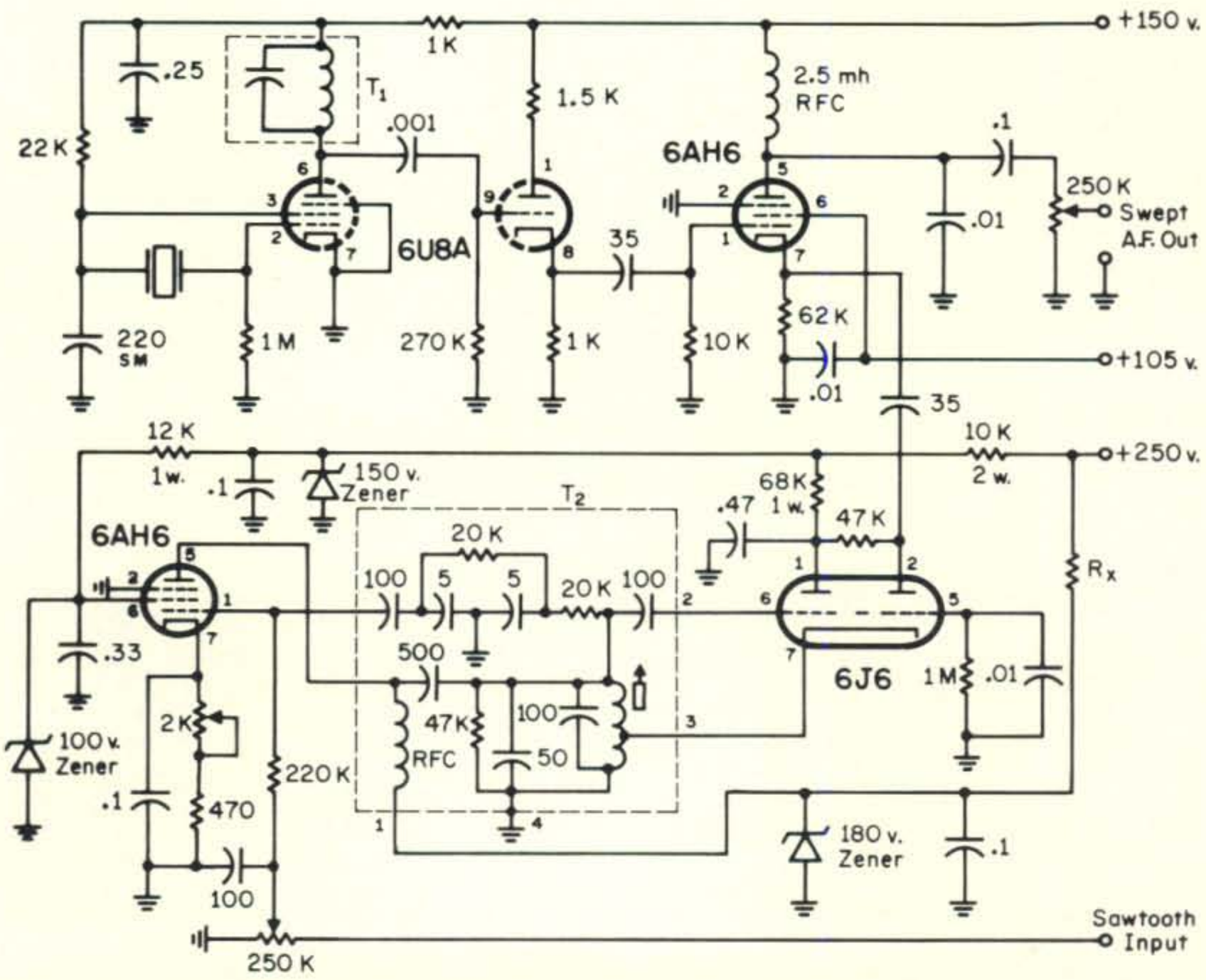

Fig. 1—Circuit of sweep audio oscillator suitable for testing filter response curves. The T_1 tank circuit is formed by one section of a 456 kc i.f. transformer. Transformer T_2 is available from Panoramic Radio Products, 520 South Fulton Ave., Mount Vernon, N.Y. as part #ZN8297. Transformer T_2 must then be modified as shown above.

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Circuitry

The circuitry was borrowed from two previous articles in *CQ* magazine, each on a different subject. The 456 kc crystal oscillator was found in an article named "S.S.B., A.M. and C.W. 80 Through 6 Meters."[1] The sweep oscillator was found in an article named "Basis Spectrum Analysis."[2] The pertinent circuitry is reproduced in fig. 1 to save the reader the trouble of looking up the originals.

A few additions and alterations were used. An 82 mmf in parallel with the original 100 in the sweeping transformer was replaced with a 50 mmf. A 180 volt zener was added in the plate circuit of the sweeping oscillator to further stabilize this oscillator in the presence of line voltage variations. We did not supply regulated filament voltage as suggested in the original article but it would be a slight advantage to do so and anyone interested in this could refer to the spectrum analysis article for details. Small coupling capacitors of 35 mmf were used between the oscillator cathode follower and the mixer to reduce, as much as possible, any interaction between the oscillators. Even so, each oscillator supplies about one volt to the mixer.

In the model we constructed, the crystal oscillator runs at 457 kc while the sweeping oscillator runs at double that frequency. Therefore the second harmonic of one beats with the fundamental of the other to secure the wanted audio output. While we did not try it, we suppose they could both run on the same frequency. We selected this differential thinking that this arrangement would assist in minimizing any oscillator interaction. There is still sufficient audio output to be easily heard in a set of earphones and this is more than ample to drive any circuit which a microphone normally feeds.

Sawtooth Voltage

The swept audio generator must be used with some source of linear sawtooth voltage if it is desired to display the resulting pattern in a linear fashion on a scope screen. A number of scopes have just such an output derived from their horizontal sweep. A scope with reasonably good performance at the r.f. frequencies the transmitter in question generates is necessary and the author finds an Eico 460K satisfactory for this purpose. (For up to 7 mc).

By adjusting the various controls with this unit, the starting point and the range of the audio excursions can be controlled within whatever limits are of interest. It is possible to add sharply tuned series tuned traps to the output of the sweep generator at, say 300 cycles and 3500 cycles so that there will be an indication of your screen when the sweeping signal passes through these points. It should be made possible to switch these traps out of your circuit, though as they will sometime appear on the filter slope and confuse the pattern displayed.

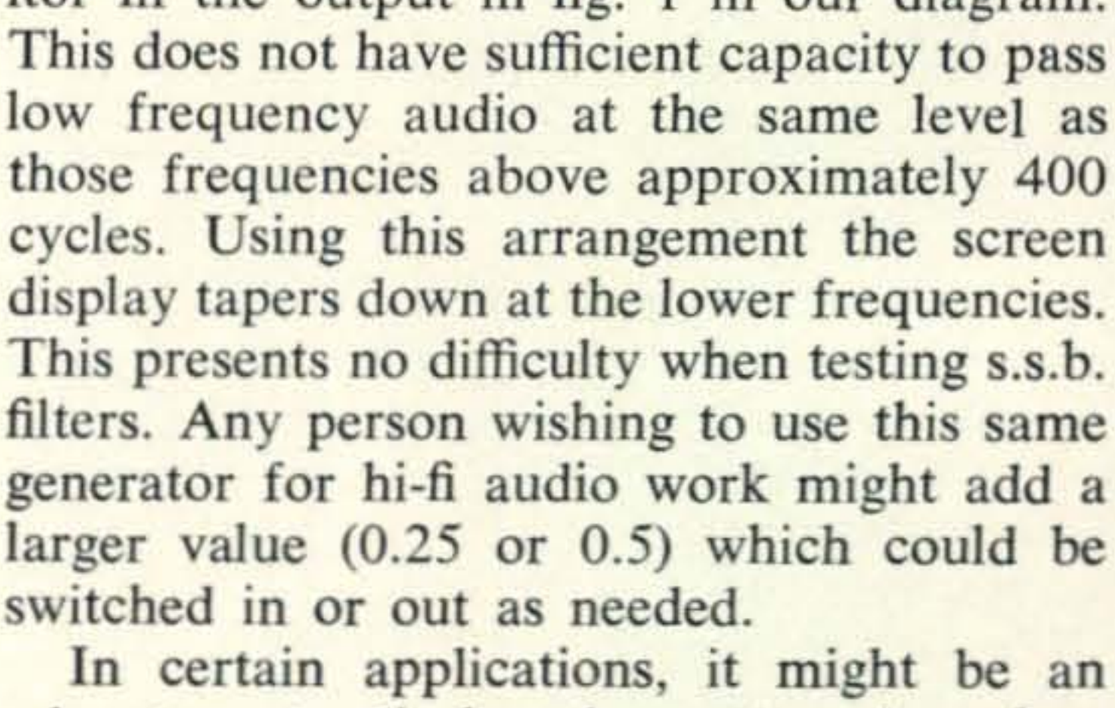
You will notice a 0.1 mf 400 volt capacitor in the output in fig. 1 in our diagram. This does not have sufficient capacity to pass low frequency audio at the same level as those frequencies above approximately 400 cycles. Using this arrangement the screen display tapers down at the lower frequencies. This presents no difficulty when testing s.s.b. filters. Any person wishing to use this same generator for hi-fi audio work might add a larger value (0.25 or 0.5) which could be switched in or out as needed.

In certain applications, it might be an advantage to display the pattern in a logrithmic manner instead of linear. Reference to the spectrum analysis article will give a person some ideas as to how this might be accomplished. ■

[1]D'Angelo, J. "S.S.B., A.M. and C.W. 80 Through 6 Meters," *CQ*, June 1961, p. 26.

[2]Whitmore, C. and Rand, S., "Basic Spectrum Analysis, Part III," *CQ*, October 1961, p. 24.

BY THE WAY...



Leonard M. Eisenberg, President of the National Rare Blood Club, left, talks with Frank Sheldon, Professor of Mathematics at Limestone College, Gaffney, S.C., who is interested in using his amateur radio station to secure members for the National Rare Blood Club.

See page 110 for New Reader Service

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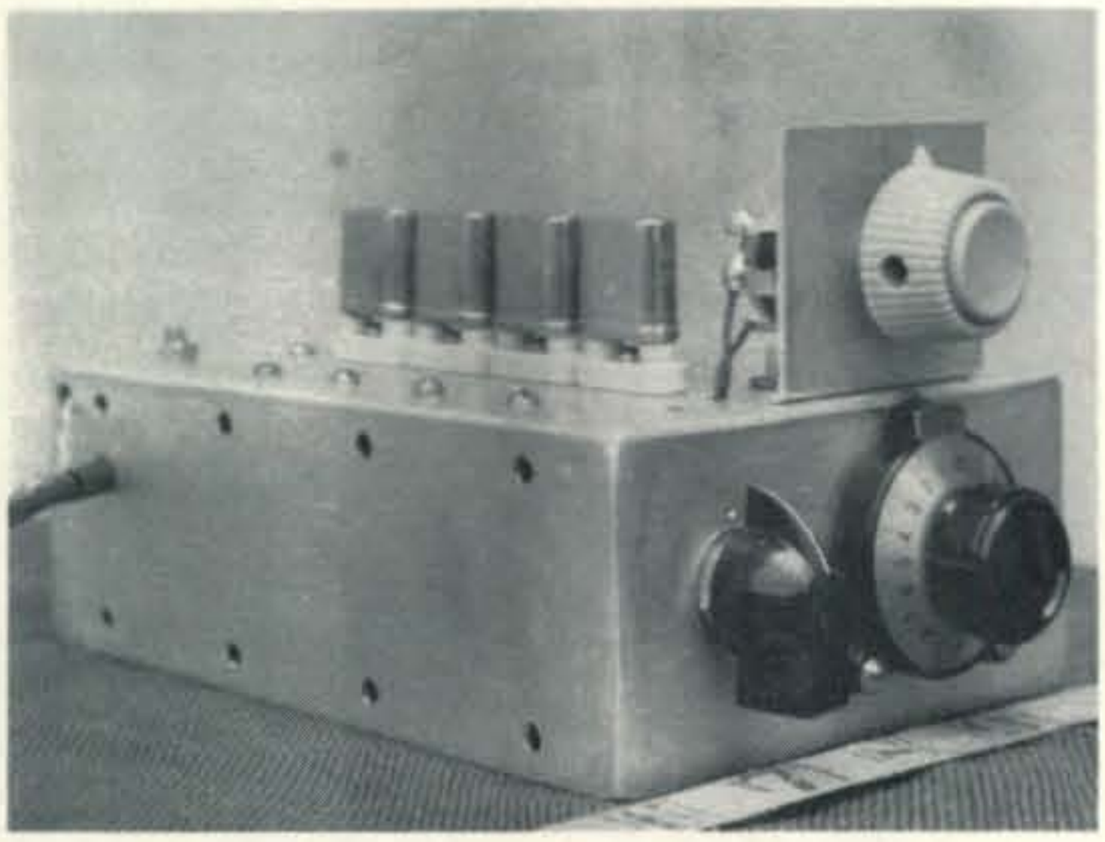

Front view of 40673 converter. The bandswitch and the front-end tuning control are below, while the regeneration control is above. No separate front-panel is provided since the converter shares the front-panel of the complete solid-state receiver. The converter chassis forms part of the 3-in-one chassis of the complete receiver.

A DELUXE 40673 CONVERTER

BY R. JAYARAMAN,* VU2JN

THIS article describes a deluxe all-band converter using the recently-introduced dual insulated-gate field-effect transistor RCA 40673. The converter uses a toroidal antenna coil and three FET's: a 3N128 as the Q-multiplier, a 2N3819 as the crystal oscillator and a 40673 as the mixer.

With its low noise-figure, high transconductance, wide dynamic range and immunity from cross-modulation, the 40673 offers really "hot" performance as a combined r.f. amplifier and mixer. The power gain is as high as 40 db at 30 mc, dropping to 12 db at 400 mc, while the noise figure is better than 3 db at 30 mc. In keeping with the recent trend in h.f. receiver design, the r.f. stage can be dispensed with, without any discernible deterioration in the noise figure.

Both the insulated gates of the 40673 offer extremely high input impedance. The gate No. 1, known as the signal gate, offers a low input capacitance of 6 mmf and a high forward transconductance of 12,000 μmhos, while the very low drain-to-gate feedback capacitance of 0.02 mmf assures stable operation without neutralization. The signal gate is operated at a slightly negative bias of about 0.5 volt with reference to the source.

The gate No. 2, known as the control gate, is operated at a positive bias of about 4 volts with reference to the source. In r.f. amplifier applications, excellent a.g.c. action is obtained by applying a negative a.g.c. voltage to the positively biased control gate. In mixer applications, the control gate carries the oscillator injection with practically no feedthrough to the antenna.

From the amateur's point of view, the most welcome feature of the 40673 is the gate protection afforded by back-to-back zener diodes integrally fused between each gate and the source. These diodes are special low capacitance zeners with a zener voltage of around 10 volts. The diodes protect the gates from electrostatic charges during handling and transients during operation. To the amateur, this means a lot: There is no danger of front-end burn-out due to sluggish operation of the transmit/receive relays, barring of course a "direct hit." Also there is no necessity for the messy job of running a grounding wire around the leads before soldering, and the only precaution recommended is to ground the tip of the soldering iron along with the source terminal.

Circuit and Construction

The converter is built inside a 6" × 4" × 2" aluminum chassis, with the conversion crystals alone occupying the top of the chassis. This converter forms part of a complete solid state double conversion receiver, now under construction. The antenna terminal is a BNC chassis connector, and a d.p.d.t. slide-switch located near the connector per-

*Assistant Professor, College of Engineering, Trivandrum-16, India.

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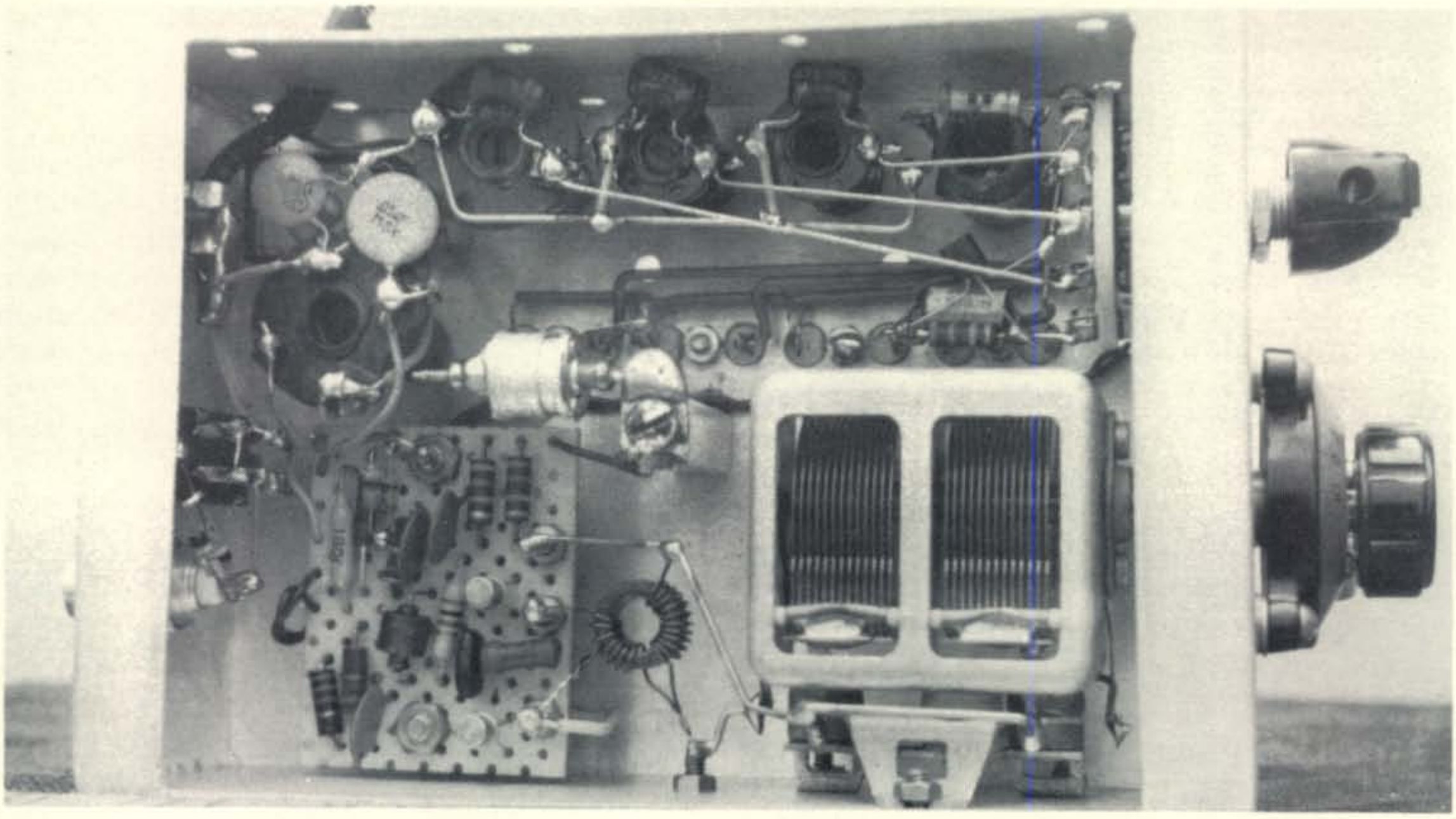

Bottom view of 40673 converter. The layout is worth careful study. The toroidal coil is suspended from its leads. The 2N3819 oscillator stage is wired close to the bandswitch, with the 31.5 mc crystal and tank nearby. The oscillator injector trimmer is mounted on a ceramic standoff. The output tank trimmer is partially hidden by the disc ceramics. Note the offset mounting of the vernier dial to accommodate the front-panel at a later stage.

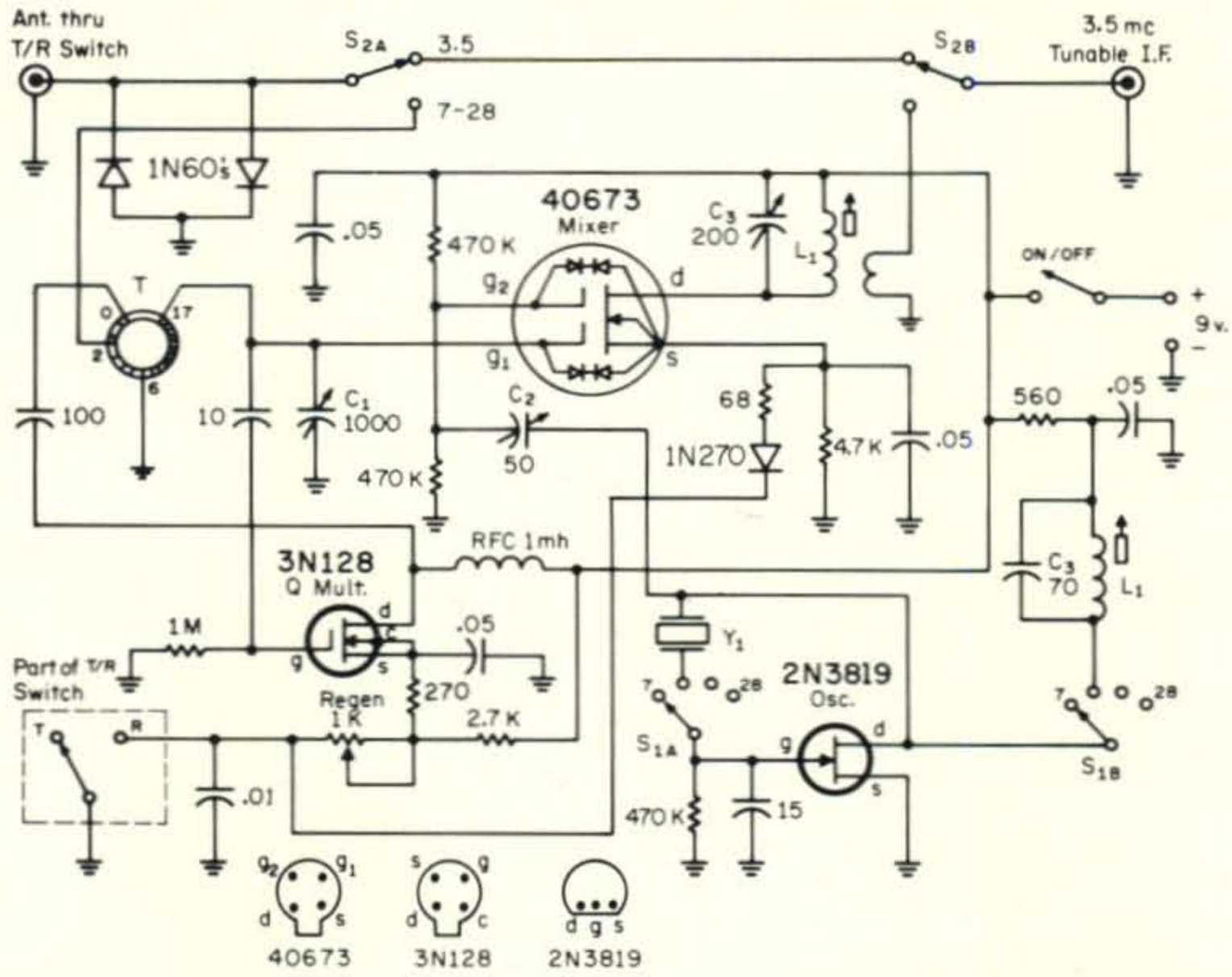

Fig. 1—Circuit of the deluxe 40673 converter. Capacitor values less than one are in mf, greater than one in mmf.
C_1—2 gang 500 mmf tuning capacitor, paralleled.
C_2—50 mmf air trimmer.
C_3—200 mmf mica trimmer.
L_1—12 μh tube type antenna coil in reverse.

Crystal and Coil Chart

Band (mc)	Y_1 (mc)	L_2 (μh)
7	10.5	1.5
14	17.5	0.9
21	24.5	0.6
28	31.5	0.5

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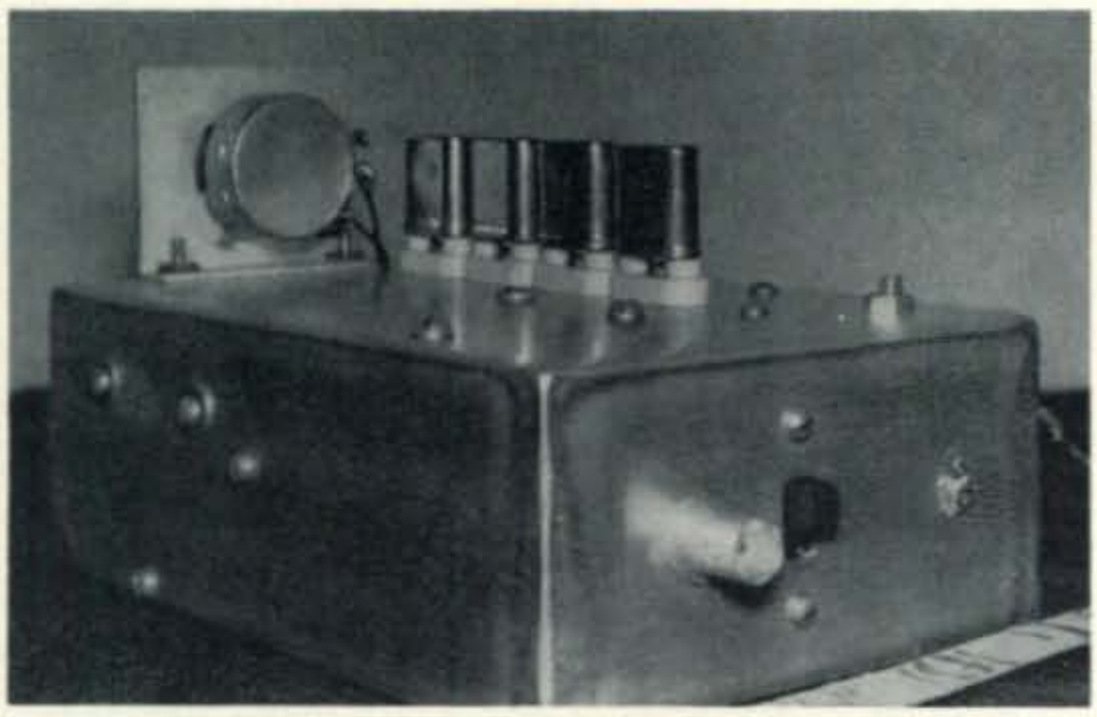


Rear-view of converter shows the antenna connector and bypass switch for 3.5 mc reception.

mits the converter to be bypassed for 3.5 mc reception.

A high-Q toroidal antenna coil tunes from 7 to 28 mc without bandswitching. The writer just did not want to take the antenna circuit to the bandswitch. The toroidal coil is suspended by its leads and spaced at least its diameter away from adjacent metal parts. The 2 gang 500 mmf tuning capacitor is provided with a vernier dial so as to permit precise peaking of the antenna tuning on each band. The vernier dial has 100 divisions and it tunes to 28 mc at a reading of 5, 21 mc at 15, 14 mc at 30 and 7 mc at 72.

Additional front-end selectivity and gain are obtained by the use of a Q-multiplier utilizing the popular IGFET 3N128. An IGFET has been used here so as to offer minimum loading to the tank circuit. In comparison with an r.f. stage, the Q-multiplier has the advantages of flexibility, easy gain control and absence of the tracking problem. The Q-multiplier is designed so that with no antenna and the regeneration control at the minimum position there is no tendency towards oscillation on any of the four bands.

With the Q-multiplier set on the verge of oscillation, the front end gain is terrific, far better than that obtainable with a triode vacuum-tube Q-multiplier. The image rejection is excellent even when operating with a multiband. antenna. A grounding wire should be run around all the leads of the 3N128 during assembly and removed after the soldering is complete.

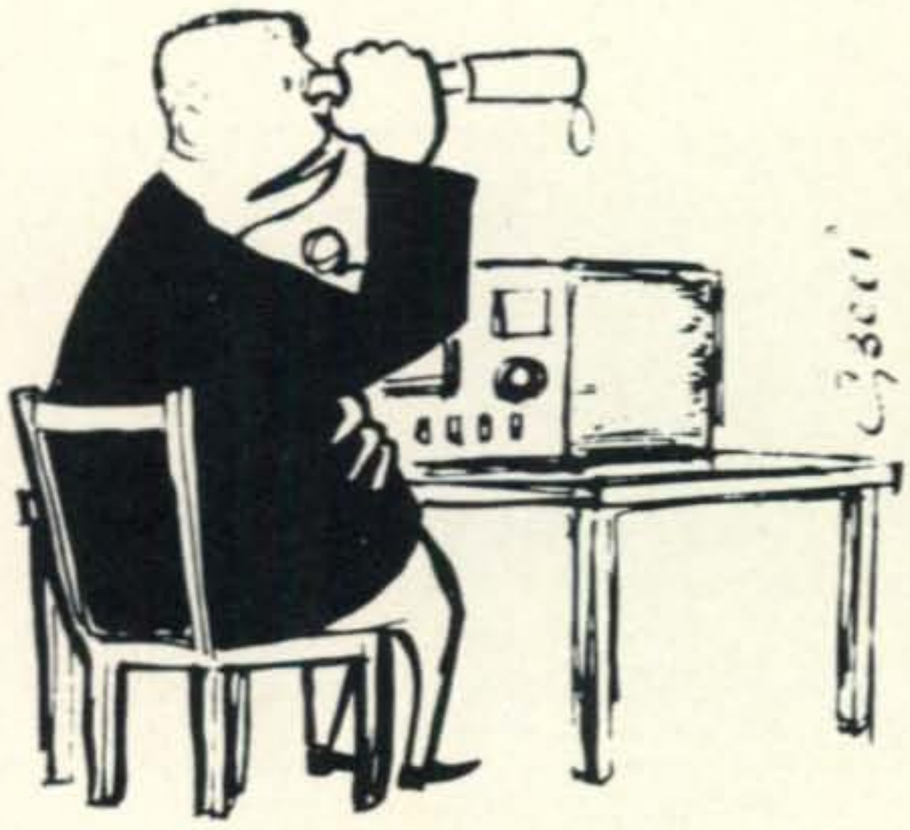
A 2N3819 JFET is used as the crystal oscillator. Appropriate crystals and tank circuits are switched in on each band. The oscillator injection can be controlled easily by adjusting the 50 mmf Philips air trimmer, which is mounted on a ceramic standoff. This is a useful feature, since it permits optimizing the performance of the converter with respect to conversion gain, oscillator stability and noise figure. The output tank is peaked at 3.4 mc.

With a nine volt regulated power supply, the total power consumption is just about 11 ma. In order to realize the optimum noise-figure consistent with low battery drain, the drain current of the 40673 should be adjusted to 4 ma by varying the source bias resistor, if necessary.

During transmit, the receiver antenna terminals are shorted and the Q-multiplier is disabled. Also the source of the 40673 is raised from 0.5 volt to about 1.2 volts by switching out the normal source-bias resistor and leaving a 4.7K resistor in its place. This lowers the mixer gain substantially and enables the mixer to handle a larger signal without overload, for monitoring the transmitted signal. The shunting diodes across the antenna terminals are all that is needed for adequate front-end protection, provided the transmitter has no electrolytics to discharge.

Summary

The performance of the converter leaves one marvelling at the phenomenal advance of solid-state technology. Mixer noise is conspicuous by its absence and faint signals come out of the background beautifully. The writer's 7360 tube converter has now been "retired." The writer recommends this interesting project to all dyed-in-the-wool tube-experimenters and it should suffice to convert even the W-ham who tells the writer, "FETs are no doubt wonderful, but since my hands are rather heavy, I prefer to play with the big bottles!" ■



"Using a remote field strength meter here..."

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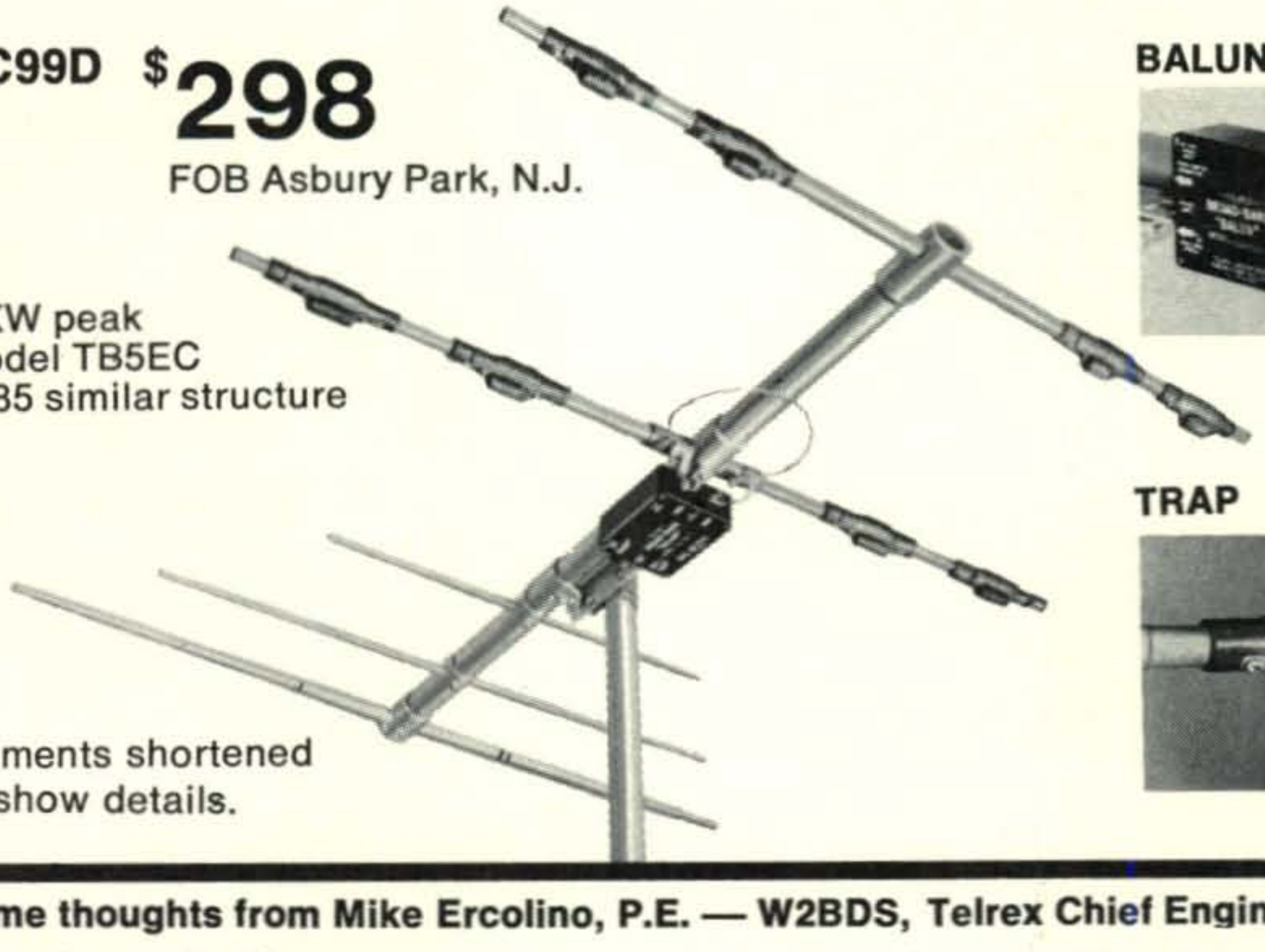

Elements shortened to show details.

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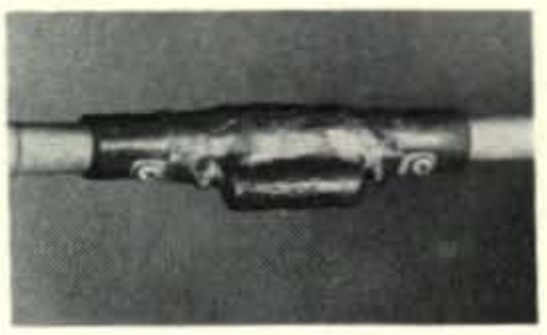

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Receiver Signal-Handling Capabilities

BY WILFRED M. SCHERER,* W2AEF

Part II

Part I of this article described various signal-handling characteristics of radio receivers and their related effects. The measurement of these characteristics will now be taken up.

THERE are a number of different measurement methods used in industry as well as various ways of specifying the results. This is an unfortunate situation which can lead to confusion when it is desired to compare the performance of one receiver against that of another measured and specified in a different manner.

A movement is now under way to standardize these procedures in the amateur-equipment industry, but until such is consumated, the following methods will provide one useful means for comparing the relative merits of one receiver against another.

Test Setup

Most of the measurements related to receiver signal-handling capabilities require the use of two r.f. signal generators, preferably of the same type. They should be capable of furnishing accurately known r.f. voltages in the range of 1 μv to at least 100,000 μv and are best equipped with a step attenuator calibrated in db.

Moderately priced units suitable for the job are the Knightkit KG-686 R.F. Signal Generators which were previously described in *CQ*.[1] Additional outboard step attenuators, such as the Waters Model 371-1[2] or home-built jobs[3] will facilitate the work and are a must if the generators are not so equipped.

A combining network also must be used between the generators and the receiver, in order to present the proper load impedance to the generators and the receiver. It also isolates the generators from one another to minimize the possibility of intermodulation, cross modulation or other effects between the generators themselves.

For signal generators requiring a 50-ohm termination and employed with receivers having a 50-ohm input impedance, such a network is shown at fig. 1.

An additional 6 db pad between each generator and the combining network will further minimize interaction between the generators. The extra padding may be obtained with the outboard step attenuator or with a fixed pad assembled using the values shown at fig. 2.

Test gear setup with Knight Kit KG-686 R.F. Signal Generators, Waters 371-1 Step Attenuators and composite combining network. The a.f. meter is on the left.

---

*Technical Director, *CQ*.

[1]"*CQ* Reviews the Knight Kit Solid-State Signal Generators," *CQ*, Sept. 1968, page 76.

[2]"*CQ* Reviews the Waters Wide Range Attenuator," *CQ*, Nov. 1967, page 40.

[3]Scherer, "A Step Attenuator," *CQ*, Oct. 1964, page 43.

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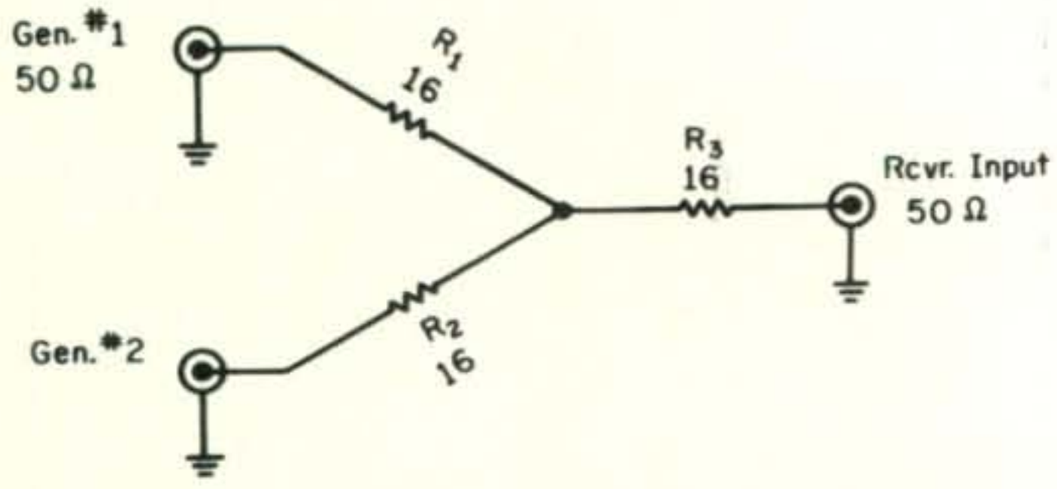

Fig. 1—Combining network for matching two 50-ohm r.f. signal generators to 50-ohm input of a receiver.

A block diagram for the entire setup is shown at fig. 3. The combining network incurs a 6 db loss, which with that of the extra 6 db pad amounts to a total loss of 12 db. The voltage at the receiver input then will be one-quarter that obtained from the signal generator output.[4] For example: 4 μv will be needed at the input to the 6 db pad for 1 μv at the receiver input; 40 μv will be needed for 10 μv at the receiver, etc.

If the input impedance of the receiver is high, such as 300 ohms sometimes found, shunting the input with a 56-ohm ½ watt resistor will provide a close enough match for all practical purposes.

In order to avoid errors and differences that might be caused by various test-gear conditions, it will be best to make side-by-side measurements when the performance of one receiver is to be compared with that of another. Where this is not possible, a record should be kept of the measurements made on each receiver, so that its performance may be compared with that of measurements on other receivers made at another time or elsewhere by other operators.

Procedure

1—R.F. Intermodulation:

This is a two-signal r.f. test similar to a two-tone a.f.-signal test used on s.s.b. transmitters.

1.1—Use two unmodulated signal generators with the setup shown at fig. 3.[5]

1.2—Turn on the receiver b.f.o. and set the r.f. gain at maximum. The a.g.c. may be on or off.

1.3—Set the receiver for a frequency a bit below the center of the band of interest. This will be the lower test frequency.

1.4—Adjust generator #1 to this frequency as heard on the receiver.

1.5—Adjust the r.f. output from the generator, by means of the step attenuator, for 1 μv applied to the receiver (4 μv at input to the 6 db pad).

1.6—Similarly set up generator #2 for the upper test frequency (about 75 kc above that of generator #1).

1.7—With either one of the test frequencies, adjust the a.f. gain of the receiver for a convenient reading near midscale on the a.f.-output meter. This will be used as the reference reading that is indicative of a 1 μv r.f.-input signal. It would be well to check the reference for the same reading at the test frequencies from *both* generators to make sure the same r.f. voltage is applied to the receiver in each case.

1.8—Increase the applied signal from *both* generators by 70 db (removing attenuation).

1.9—Locate the 3rd-order I.M. product on the receiver by tuning it below or above the test-signal frequencies (it will appear at both sides) by an amount equal to the frequency separation between the test signals.

Other signals may appear between these points and are spurious responses due to overload along with signal and receiver-oscillator harmonics. An accurately calibrated receiver will facilitate distinguishing between the I.M. products and other spurious signals.

Another way to identify the signals, is that an I.M. product will appear only when *both* test signals are applied. It will disappear when *either* generator is disabled. On the other hand, other spurious responses will disappear only when the one generator signal, responsible for the response, is turned off.

1.10—Now that the distortion product has been located, peak it with the preselector or antenna trimmer if the receiver is so equipped. Then readjust the attenuation in equal steps at *both* generators, until the same reading is obtained on the a.f.-output meter as was used for the initial reference. This indicates an I.M. signal equivalent to an r.f.-input signal of 1 μv.

1.11—Note the amount of attenuation in db which has now been *equally* removed at each generator output above that required for the initial 1 μv signal.

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[4]The generator output is that which appears on the load side of the step attenuators and that at the input to the 6 db pad. The r.f. levels from the generators may be determined according to the amount of db attenuation used. (see fig. 4).

[5]If the receiver does not have a b.f.o., the generators may be modulated (30% at 400 c.p.s.).

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1.12—Using the above attenuation figure, the r.f. intermodulation characteristic may be recorded as: Requiring two signals *XX* db above 1 μv to produce a 3rd-order I.M. product equivalent to a 1 μv r.f.-input signal.

The frequency separation between the test signals also may be noted, although little difference usually is experienced with separations greater than 50 kc.

Also, by converting the db increase to voltage gain (see fig. 4), the required two-signal test level may be given in microvolts. For example: a level 60 db above 1 μv is equivalent to a voltage gain of 1000 or a test level of 1000 μv. On an honest S-meter requiring 50 μv for S-9 reading, this represents a signal equivalent to S-9 plus 26 db.

2—Cross Modulation:

This is a two-signal test of a different nature.

2.1—Use two r.f. signal generators with the setup shown at fig. 3.

2.2—Turn off the receiver b.f.o. and use the a.m. detector, the r.f. gain at maximum and a.g.c. on.

2.3—Set the receiver for a desired-signal frequency near the middle of a band.

2.4—Modulate generator #1 30% with 400 c.p.s., tune it to the desired frequency and adjust its r.f.-output level for a 10 μv signal applied to the receiver (40 μv at the input to the 6 db pad).

2.5—Adjust the receiver a.f. gain for a convenient reading above midscale on the a.f.-output meter. This will be the reference reading.

2.6—Remove the modulation from generator #1, but leave the generator carrier turned on.

2.7—Modulate generator #2 30% with 400 c.p.s. and adjust its r.f. output for a 10,000 μv signal applied to the receiver (40,000 μv at the input to the 6 db pad).

2.8—Starting at a frequency removed several hundred kc above the desired signal, slowly tune generator #2 (which is the undesired signal) toward the desired signal, until the modulation from generator #2 produces a reading on the a.f.-output meter 10 db below the initial reference or produces a reading .317-times the reference voltage. These points indicate about 10-percent modulation.

As the undesired signal is moved toward the desired signal, care should be taken not to come up with an erroneous indication as

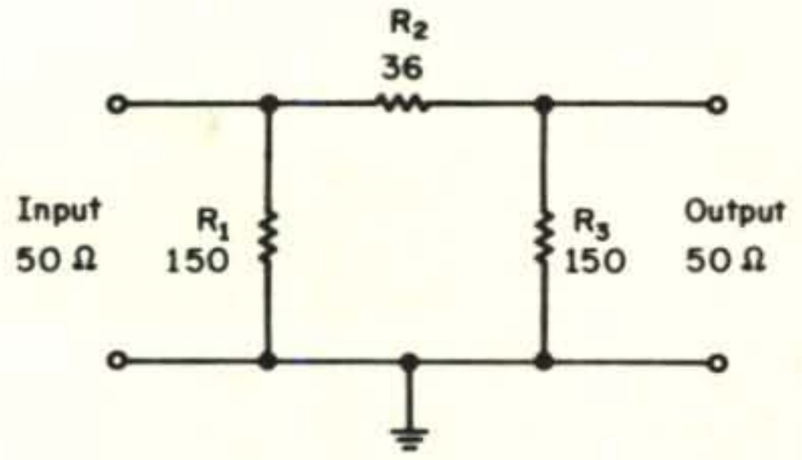

Fig. 2—Circuit and values for 6 db 50-ohm pad.

a result of a spurious-signal response which may crop up with high-level undesired signals.

Such responses usually may be identified by a signal that peaks sharply as the generator is tuned or that can still be heard when the desired-signal carrier is removed.

If a spurious turns up in an area where it may confuse the cross-modulation test, the test should then be made at a slightly different desired-signal frequency.

2.9—Note the frequency separation between the two signals and determine the percentage difference from $\frac{f_2 - f_1}{f_1} \times 100$, where f_1 is the desired-signal frequency, f_2 is the undesired-signal frequency.

2.10—Repeat step 2.8, but this time tune generator #2 starting from *below* the desired-signal frequency.

2.11—Follow step 2.9, but use the equation $\frac{f_1 - f_3}{f_1} \times 100$, where f_3 is the lower undesired-signal frequency.

2.12—Using the larger percentage of step 2.9 or 2.11, the cross-modulation characteristic may be recorded as: 10 percent modulation of a 10 μv desired signal is produced by a 30 percent-modulated undesired signal of 10,000 μv removed *XX%* from the desired-signal frequency.

The required separation between the two signals often differs when the undesired signal is above or below the desired signal. This is largely dependent on the selectivity and alignment of the r.f. circuits in each case. The larger percentage difference should be used, since this represents the minimum separation that can be tolerated in relation to the particular desired-signal frequency.

2.13—The C.M. tests also may be conducted using different undesired-signal levels such as 5,000, 25,000, etc. μv. The tests also should be made on different bands.

Cross-modulation characteristics are sometimes based on 3% cross modulation (20 db below the 30% modulated reference), but

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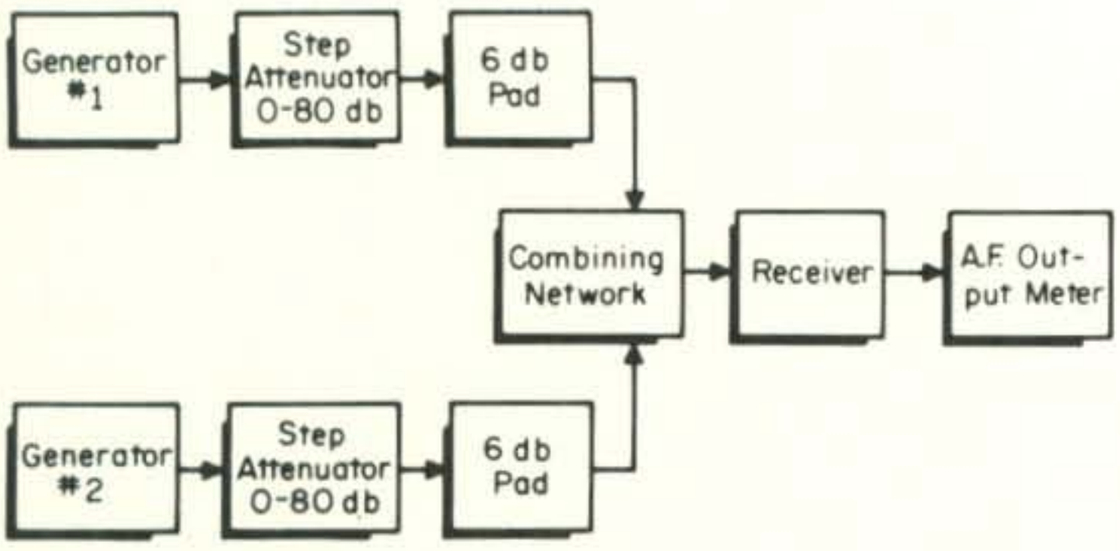

Fig. 3—Test setup for measurement of receiver signal-handling capabilities. The step attenuators may be omitted if the generators are so equipped. The 6 db pads may be omitted if 6 db padding is maintained at the step attenuators.

with some receivers this degree may be too close to the noise level for a good evaluation.

3—Desensitization:

This is another type of two-signal test.

3.1—Use two signal generators with the setup shown at fig. 3, but with the 6 db pad eliminated (bypassed).

3.2—Set the receiver at the desired signal frequency near the middle of a band. The desired signal may be modulated or unmodulated, requiring the receiver to be set for the particular mode. Set the r.f. gain at maximum. Turn on the a.g.c.

3.3—With generator #1 (modulated or unmodulated) tune it to the desired-signal frequency and adjust its r.f. output for a 10 μv signal applied to the receiver (20 μv at the input to the combining network).

3.4—Adjust the receiver a.f. gain for a convenient reference reading above midscale on the a.f.-output meter.

3.5—Adjust the output from generator #2 (unmodulated) for a 50,000 μv signal applied to the receiver (100,000 μv at the input to the combining network).

3.6—Starting at a frequency several hundred kc above the desired signal, slowly tune generator #2 (the undesired signal) toward the desired-signal frequency, until the reading of the desired signal on the a.f.-output meter drops 1 db or 0.9 times the initial reference reading.

3.7—Follow the procedures outlined in steps 2.9, 2.10 and 2.11 (under cross modulation measurement).

3.8—Using the larger percentage found above in steps 2.9 and 2.11, the desensitization characteristic may be recorded as: 1 db desensitization of a 10 μv desired signal is caused by a 50,000 μv undesired-signal removed *XX%* from the desired-signal frequency.

3.9—Desensitization tests also may be conducted using other undesired-signal levels and on each band. Desensitization of 3 db, instead of 1 db, is sometimes used.

4—Adjacent-Channel A.G.C. Takeover:

This test is similar to that employed for desensitization.

4.1—Follow the procedures outlined in steps 3.1, 3.2, 3.3 and 3.4 (under desensitization).

4.2—Set the receiver at a frequency 5 kc above the desired-signal frequency.

4.3—Adjust generator #2 for a low output-signal level (5-10 μv).

4.4—Adjust generator #2 frequency to that at which the receiver is set (5 kc above the desired-signal frequency). This is the undesired adjacent-channel signal.

4.5—Tune the receiver back to the desired signal, again noting the a.f.-output level (this should be the same as previously noted).

4.6—Slowly increase the signal level from generator #2, by removing attenuation, until the a.f. output reading from the desired signal drops 3 db or 0.71 times the initial reference reading.

4.7—Note the signal level applied to the receiver from generator #2 (signal level at input to divider network, divided by 2).

4.8—Follow the procedures outlined in steps 4.3, 4.4, 4.5, 4.6 and 4.7, this time with the undesired signal 5 kc *below* the desired signal.

4.9—Using the smaller undesired-signal level noted in the above steps, the adjacent-channel a.g.c. takeover may be recorded as: an undesired signal of *XX* μv 5 kc removed from a 10 μv desired signal depresses the desired signal 3 db.

4.10—These tests also may be conducted using other undesired-signal levels and/or a 10 kc displacement.

5—Blocking:

This is a single-signal test.

5.1—Use *one* signal generator with its output applied to the receiver through a 6 db pad (no divider network).

5.2—Set the receiver for a desired signal on a band.

5.3—With the signal generator modulated or unmodulated and the receiver set for the required mode (a.m. or c.w.), adjust the signal

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generator for about 10 μv output and tune it to the desired-signal frequency. The receiver a.g.c. should be on and the r.f. gain set at maximum.

5.4—Set the a.f. gain for a low reading on the a.f.-output meter.

5.5—Slowly raise the level from the generator while observing the increase in the receiver a.f. output. As this is done, the a.f.-meter reading may go off scale, in which case reduce the a.f. gain for another low meter reading.

5.6—Continue to increase the generator level to the point, past the maximum attainable a.f. output, where the a.f. level drops 1 db below the maximum just passed.

This indicates the onset of blocking or overload. The applied signal level at which this occurs will be one-half that applied to the input of the 6 db pad.

Many receivers require more than 50,000 μv, before blocking takes place. If the generator output is limited to 100,000 μv, the 6 db pad may be removed, thus doubling the applied r.f. voltage to the receiver (assuming the receiver input impedance is nominally 50 ohms or if a 56-ohm load resistor is used as described earlier.

5.7—Note the applied signal level at which blocking occurs.

5.8—Using the above value, the blocking level may then be recorded as: 1 db of blocking (or compression) occurs with an input signal of *XX* μv.

If the generator output is not sufficient to cause blocking, its maximum output may be used to state that the receiver will *not* block with a signal of at least *XX* μv (the maximum output from the generator as just experienced). Although this is not indicative of the receiver's maximum capability, it may provide a reference for comparisons made with receivers having inferior capability.

Dynamic Range:

Blocking also is indicative of the receiver's dynamic range. The blocking-level figure may therefore be used to express the dynamic range as: up to *XX* μv.

The dynamic range also may be stated in db according to the voltage ratio between the receiver sensitivity and the r.f. voltage required for blocking. For example: if the receiver sensitivity is 0.1 μv for 10 db S+N/N and the blocking level is 100,000 μv, the voltage ratio is 1,000,000. This is equivalent

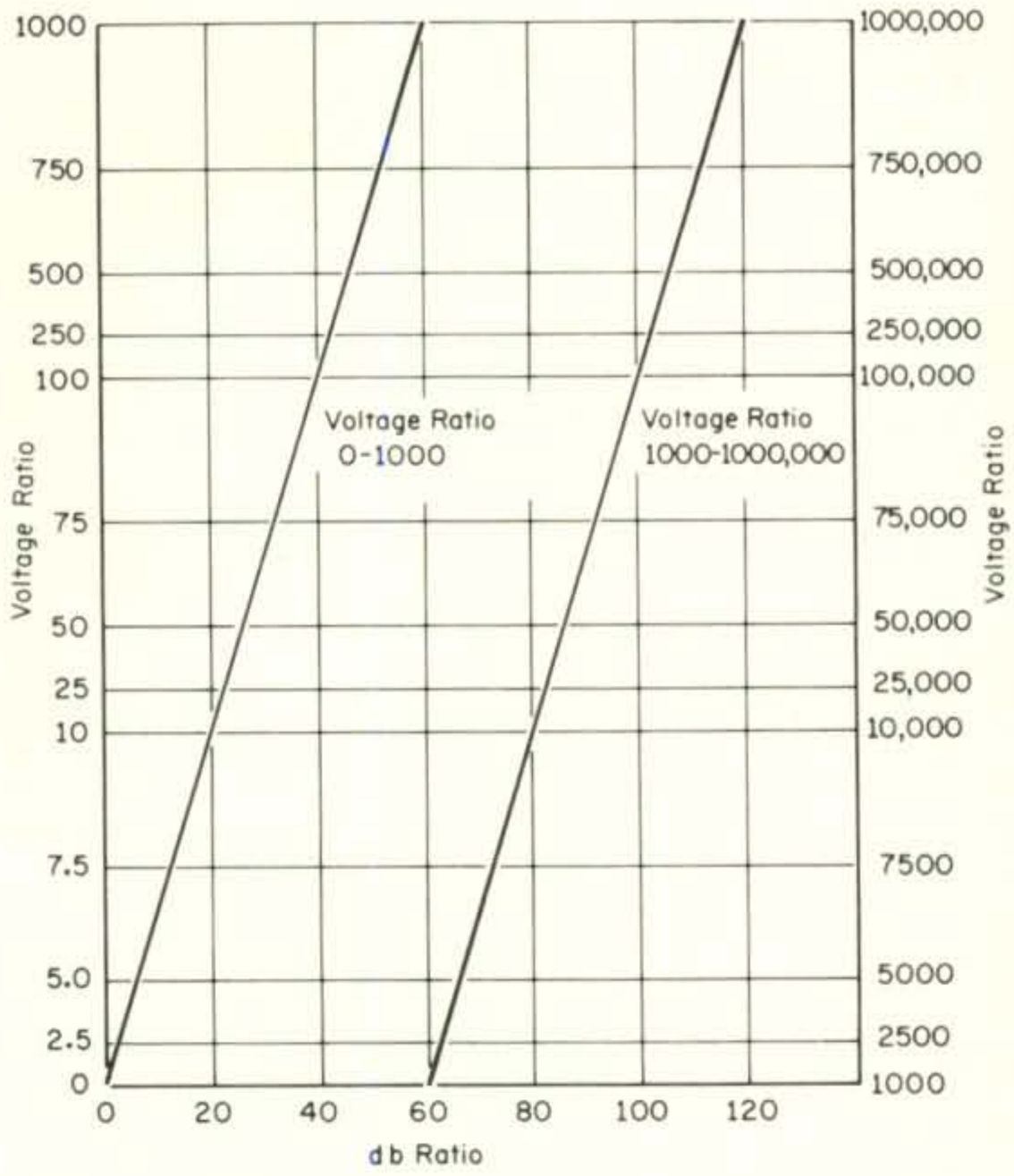

Fig. 4—Graph of db *vs* voltage ratios for determining r.f. levels from signal generators when various degrees of output attenuation are switched in or out.

to a ratio of 120 db for the dynamic range.[6]

6—Spurious Overload Responses:

This is a single-signal test.

6.1—Use the setup outlined in step 5.1 (under blocking).

6.2—Set the receiver for a desired-signal frequency on the band of interest (the test should be conducted on all bands for an overall evaluation).

6.3—With the generator modulated or unmodulated, set the receiver for the required mode (a.m. or c.w.), adjust the generator for 1 μv applied to the receiver (2 μv at the input to the 6 db pad) and tune the generator to the receiver frequency. The receiver a.g.c. should be on and the r.f. gain at maximum.

6.4—Adjust the a.f. gain for a convenient reference reading on the a.f.-output meter.

6.5—Set the r.f. level from the generator for maximum signal and tune it to either side of the receiver frequency, until another response appears.

[*Continud on page 96*]

[6]The range also is often given in dbm, where −107 dbm=1 μv (at 50 ohms), −1 dbm=100,000 μv and +19 dbm=1,000,000 or 1 v. Intermediate points may be determined according to the ratios indicated at fig. 4.

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CQ Reviews:

The Drake TR-6 Six-Meter Transceiver

BY WILFRED M. SCHERER,* W2AEF

THE Drake TR-6 is a sophisticated 6-meter transceiver similar in many respects to the popular 10-80 meter Drake TR-4. Complete coverage of the 50 mc band is available plus additional coverage below the band such as may be desired for MARS work. Operation may be had with s.s.b., a.m., c.w. or RTTY (AFSK or RFSK). The transmitter power runs up to 300 watts p.e.p. input on s.s.b. and a.m., 260 watts on c.w. and RTTY.

Among the host of other features are: linear permeability-tuned v.f.o. with high frequency stability; frequency calibration in 1 kc steps; f.e.t. front-end for the receiver; flat a.g.c. system with fast-attack and fast- and slow-release times; 4 filter positions—one each for u.s.b., l.s.b., a.m. and c.w:; product and envelope detectors; manual r.f. and a.f. gain controls; built-in 100 kc crystal calibrator; amplified a.l.c.; dual meters for S-units, a.l.c. level, p.a. plate current and r.f. output; built-in modulator for controlled-carrier screen-grid modulation of p.a. for a.m.; automatic carrier insertion for a.m.; block-grid c.w. keying with waveshaping; sidetone oscillator for c.w. monitoring; transmitter-frequency offset for c.w.; p.t.t. or built-in v.o.x. operation for phone; v.o.x.-type semi break-in for c.w.; RTTY operation with AFSK plus additional jack for permitting RFSK of v.f.o.; provisions for operating 2-meter transverter accessories with front-panel switching furnished. A true noise blanker also is included in the unit.

The transceiver is powered by an external supply of which there are five different models for use with 115/230 v.a.c., 50-400 c.p.s., 12 v.d.c. or 24 v.d.c.

The TR-6 with just about everything in it but the "kitchen sink" is thus a very flexible job capable of providing about every type of operation, whether at a fixed, portable or mobile location, without requiring a lot of outboard accessories. It is ideal for the 6-meter enthusiast who has many friends still operating on a.m., and yet is one that allows new and more reliable contacts to be made using s.s.b. or c.w.

*Technical Director, *CQ*.

The Drake TR-6 Six-Meter Transceiver.

Technical Details

Referring to the block diagram at fig. 1, double conversion is used in the TR-6. On receive the first conversion is made to a 13.9-14.5 mc i.f. and the second is made to a 9 mc i.f. On transmit, the process is in reverse. The carrier is generated at 9 mc with the first conversion made to 13.9-14.5 mc and the second to the r.f.-output frequencies.

The 1st receiver-conversion and the 2nd transmitter-conversion are made by heterodyning with 8 different 36-39.5 mc crystal-controlled frequencies spaced 500 kc apart. The 2nd receiver-conversion and the 1st transmitter-conversion are made by heterodyning with a 4.9-5.5 mc v.f.o. The 50 mc band is thus covered in 8 segments of 600 kc, each with the same tuning rate and an overlap of 100 kc between segments (the TR-6 is supplied with crystals for 49.9-51.0 mc only—crystals for other segments are optional).

For example: on receive the 1st conversion to a 13.9-14.5 mc i.f. is obtained using a 36 mc heterodyning crystal for the 49.9-50.5 mc

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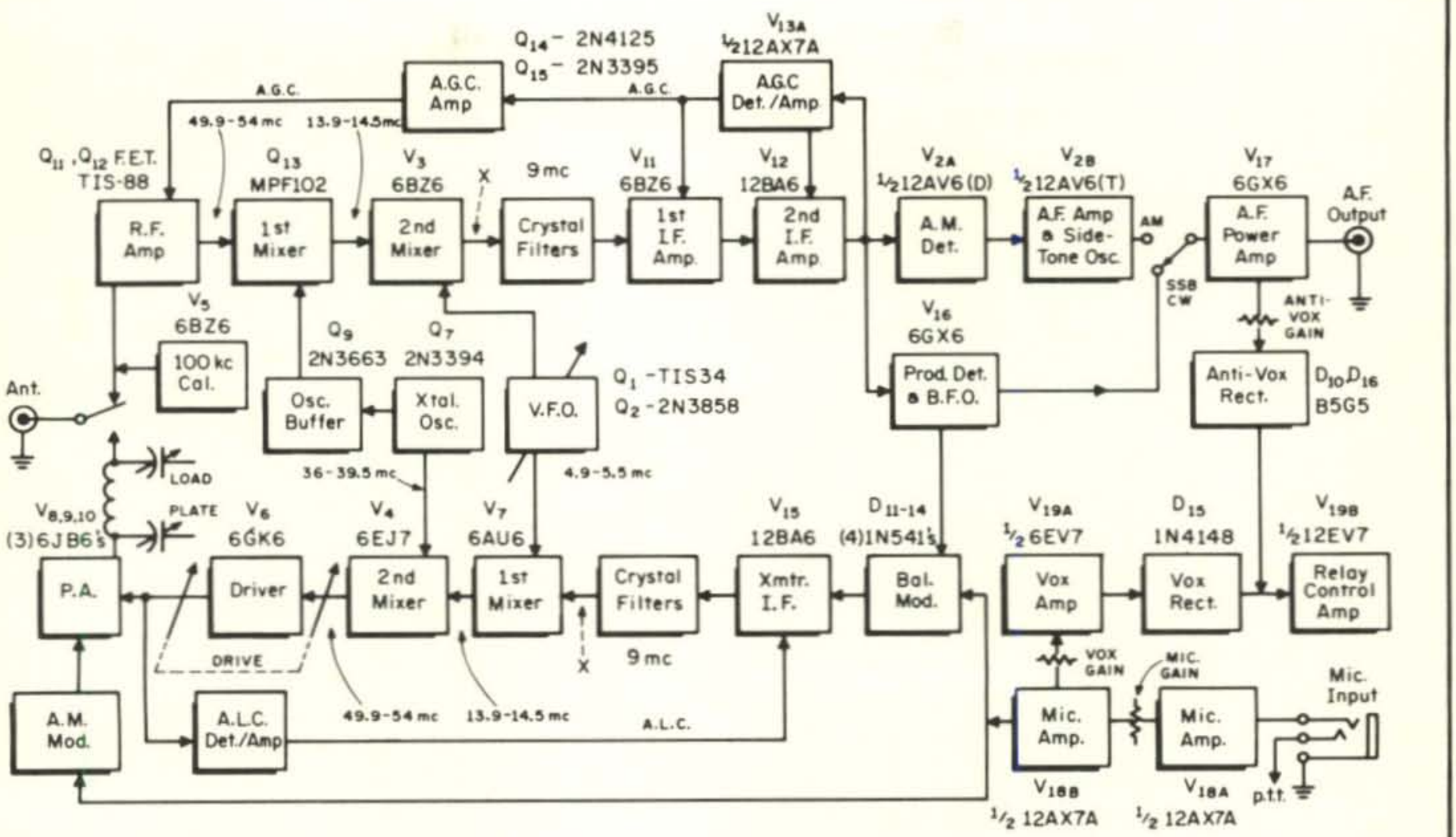

Fig. 1—Block diagram for the Drake TR-6 Transceiver. The filter is common to both receiver and transmitter. See text for details. The blanker is inserted at points marked "X".

segment (49.9—36 mc=13.9 mc and 50.5—36 mc=14.5 mc). Similarly a 36.5 mc crystal is used for 50.4-51.0 mc (50.4—36.5 mc=13.9 mc and 51.0—36.5 mc=14.5 mc), and so on for the other segments. The 2nd conversion to a 9 mc i.f. is the 1st i.f. *minus* the v.f.o. frequency (13.9—4.9 mc=9 mc and 14.5—5.5 mc=9 mc).

On transmit the mixing frequencies are additive, so we have 9+4.9 mc=13.9 mc and 9+5.5 mc=14.5 mc for the 1st i.f. Then, 13.9+36 mc=49.9 mc and 14.5+36 mc=50.5 mc, etc., for the output frequencies.

Circuitry

The TR-6 is a hybrid affair using 19 vacuum tubes, 15 transistors and 14 diodes.

Of special interest in the receiver section is the 50 mc front-end converter which employs 3 f.e.t.'s to provide excellent performance. As shown at fig. 2, two TIS88 f.e.t.'s are used for the r.f. stage in a cascode type circuit. The mixer is an MPF 105 f.e.t. with the heterodyning-oscillator signal injected at the source through a buffer stage using a 2N-3663 bipolar transistor as an emitter follower. Two traps at the converter input minimize spurious responses from TV stations.

A problem involved with f.e.t.'s is that of obtaining good a.g.c. performance. This is accomplished in the TR-6 using a vacuum-tube a.g.c. detector/amplifier plus a two-stage d.c. amplifier using bipolar transistors. The a.g.c. setup also is shown at fig. 2.

The 13.9-14.5 mc i.f. from the converter mixer goes through a 13.9-14.5 mc double-tuned bandpass-coupling circuit to the grid of a 6BZ6 mixer where the v.f.o. signals are injected at the tube cathode.

Upper-or lower-sideband operation is selected by switching in different 2.4 kc bandpass crystal-lattice filters after this mixer. Two additional filters also may be switched in. One has a bandpass of 300 c.p.s. for c.w., the other a 5 kc bandpass for a.m. Only the u.s.b. filter is supplied with the transceiver. The others are optional accessories.

Two 9 mc i.f. stages are employed. The product detector is a 6GX6 which also functions as a crystal-controlled b.f.o. The a.f. output from the product detector is high enough to be fed directly to the a.f.-output stage without the need for an additional a.f. amplifier.

Only one 9 mc crystal is needed for the b.f.o., inasmuch as sidebands are changed by switching filters. The v.f.o., therefore, does not have to be retuned in either case.

A.m. detection is obtained with the duo-

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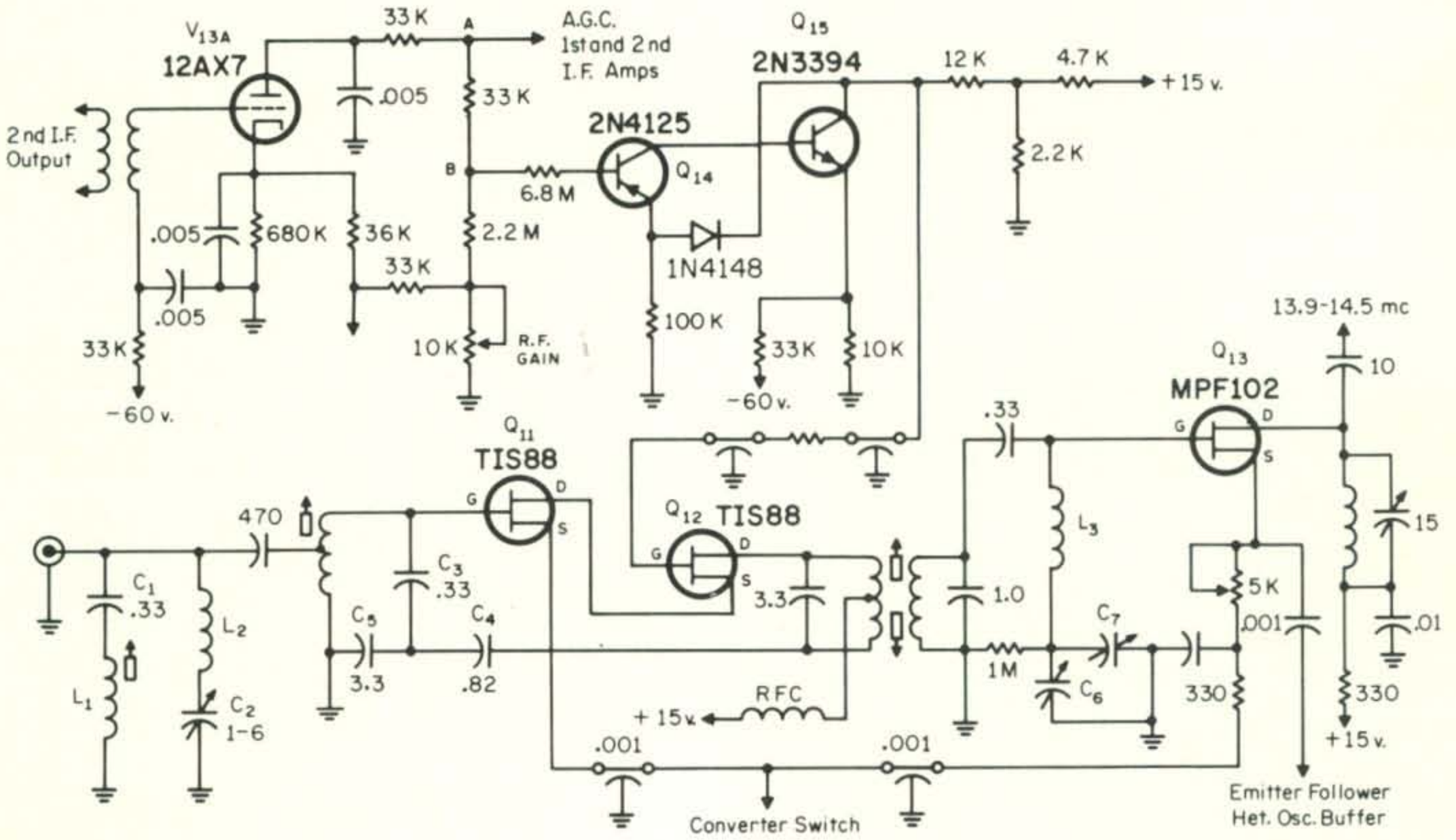

Fig. 2—R.F. Front-end converter and a.g.c. system used in the TR-6. The r.f. amplifier employs a cascode type circuit using two f.e.t.'s. C_3-C_4 are gimmick type capacitors which with C_5 neutralize the setup. C_1-L_1 and C_2-L_2 are 55.25 and 55.75 mc traps for minimizing spurious TV-signal responses. C_6-C_7 and L_3 make up a 14 mc trap which also peaks up the 50 mc signals. Operating voltage is obtained from the cathode of the a.f. power-output tube.

A.G.C. voltage is applied to the gate of Q_{12} which has an initial bias of about plus 5 volts. The r.f. signals applied to the a.g.c. detector/amplifier, V_{13A}, cause point *A* to go negative and thus reduce the gain of the i.f. stages. A negative voltage also developed at point *B* goes to a d.c. amplifier, Q_{14}-Q_{15}, where with a strong signal the negative voltage applied to the gate of Q_{12} (from Q_{15}) swings far enough to cause the gate bias to go from plus 5 volts, through zero and over to a negative voltage, a requisite for wide a.g.c. range with the f.e.t.'s. On transmit a transistor functions as a switch to disable the converter with a bias applied to the source of Q_{11}-Q_{13}.

diode section of a 12AV6, the triode section of which serves as an a.f. amplifier for a.m. preceding the a.f.-output stage. During c.w. operation, the circuitry of the 12AV6 triode is automatically switched around to allow it to function as a phase-shift a.f. oscillator to provide a sidetone for monitoring c.w. keying.

V.F.O.

The v.f.o. employs a TIS34 f.e.t. and uses permeability tuning; that is, instead of changing the frequency with a variable capacitor, the tuning is accomplished by moving a powered-iron core in or out of the tank inductor. This varies the inductance and thus tunes the v.f.o. The inductor turns are spaced to provide a linear tuning rate as the core is moved.

The f.e.t. is tapped across only a portion of the tank in order to improve stability. A 2N-3858 bipolar transistor is used as a grounded-emitter amplifier for the v.f.o. The oscillator signal is capacity-coupled from a tap on the oscillator tank to the base of the amplifier. A Pi-network at the amplifier's collector functions as a low-pass filter to eliminate spurious responses from the v.f.o. It also provides a match to the receiver mixer.

A terminal on the v.f.o. assembly is provided for making it possible to use RFSK in conjunction with external components. Special instructions for this are required from the factory.

The 9 mc tuned circuit for the receiver mixer also is the tuned circuit for the grid of transmitter mixer. For transmit, the v.f.o. signal is injected to the transmitter mixer through a capacitive divider which is part of the 9 mc tuned circuit.

Transmitter

The a.f.-input circuits for the transmitter are quite straight-forward. The balanced

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modulator is a four-diode ring type. A unique feature here is that the carrier-balanced potentiometer is operated by a 10:1 planetary-driven control that provides vernier action. This allows a precise adjustment to be easily made.

As in the receiver section, a 13.9-14.5 mc bandpass-coupling circuit is used between the two transmitter mixers.

The p.a., which employs three 6JB6's in parallel, has a Pi-network tank with adjustable loading for 50-ohm loads having a mixi-mum s.w.r. of 2:1. The transmitter-i.f., driver and p.a. stages are each individually neutralized.

C.W.

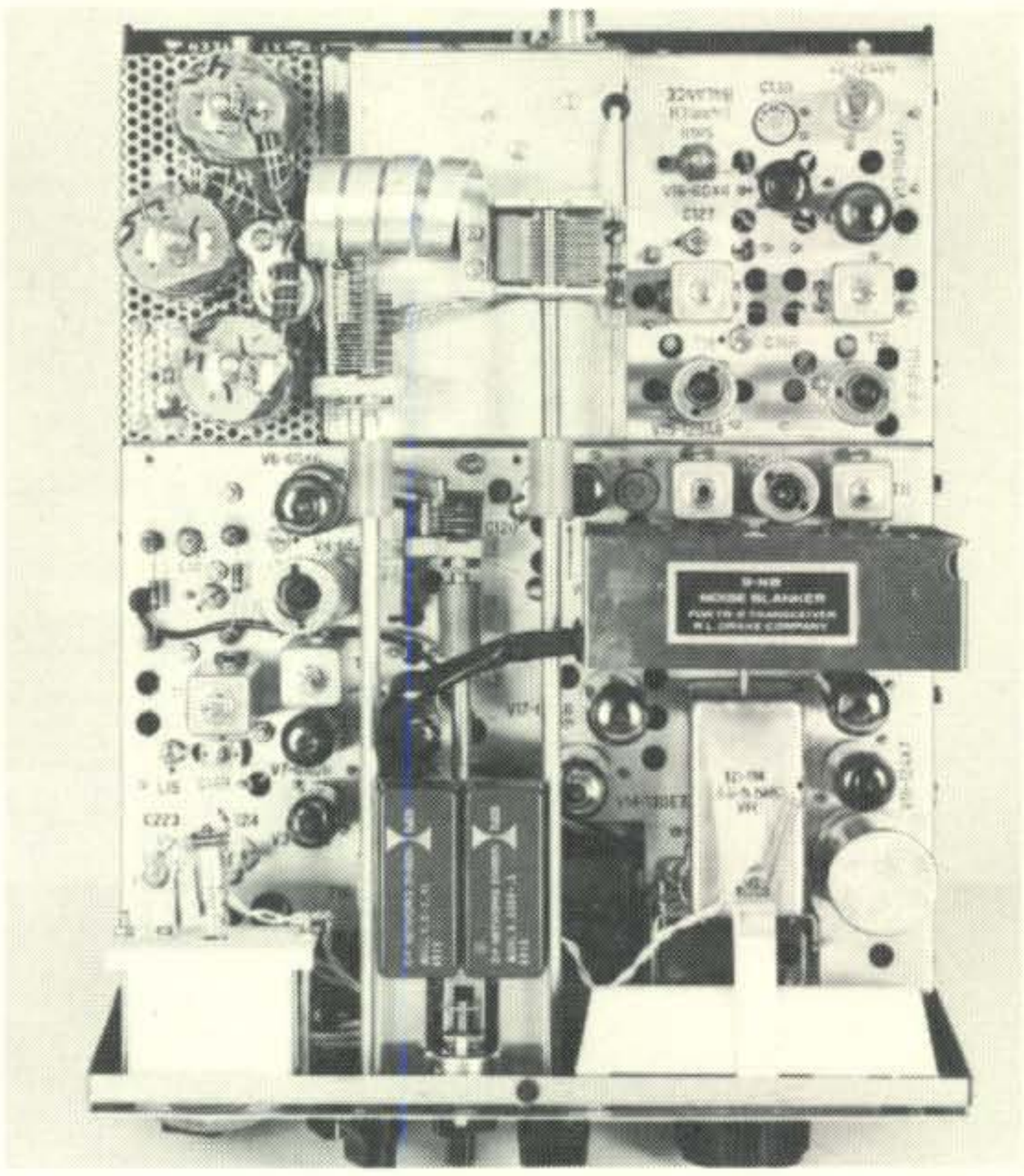
For c.w. and tuneup the s.s.b. modulator is unbalanced by means of a d.c. bias which can be varied by a panel control to provide whatever relative amount of unbalance is required to produce the desired carried level. At the same time a resistor is automatically switched in the p.a. screen-supply line to hold the power level within safe limits during key-down conditions.

In addition, a relay alters the capacitance in the crystal circuit for the 9 mc carrier oscillator, shifting the crystal frequency about 1 kc to place the carrier within the passband of the crystal filter. The relay is actuated by the screen current drawn by the transmitter i.f. amplifier and it therefore shifts the carrier frequency only when the amplifier is activated on transmit. The v.f.o. frequency thus goes back to normal on receive and the setup thereby provides a 1 kc transmitter-frequency offset during c.w. operation.

Grid-block keying is used at the 1st transmitter mixer with waveshaping for minimizing key clicks. The sidetone oscillator also is keyed this way and the a.f. signal therefrom triggers the v.o.x. system to activate the transmitter whenever the key is depressed. The v.o.x. setup is quite conventional. The sidetone level, heard on the speaker or headphones, varies according to the setting of the receiver a.f.-gain control, but any desired ratio between the receiver-signal level and that of the sidetone may be set up by a separate sidetone-level control on the rear of the chassis.

A.M.

On a.m. the s.s.b. modulator is unbalanced with a fixed d.c. bias to provide an initial carrier for operation with a conventional



Top view of the TR-6. A perforated-metal enclosure has been removed from the p.a. (at upper left) to show its components. The tank inductor is made of silver-plated 1/2"-wide strap. The filters are at the lower center of the set. The v.f.o. is in the oblong can seen vertically at the lower right. At a right angle behind it is the noise blanker module.

controlled-carrier screen-modulation system at the p.a. This is done with a separate modulator consisting of the two triodes in a 13DE7. Double-sideband a.m. is thus obtained with high percentages of modulation at all speech levels, thus ensuring an a.m. signal with a good punch without the compromise otherwise incurred with an s.s.b. a.m. signal as usually provided with s.s.b. exciters.

A.L.C.

A.l.c. voltage is obtained in the usual manner by rectifying the a.f. component that appears, during modulation, as a voltage drop across a grid-return resistor in the p.a. that is produced when grid current starts to flow at the onset of overdrive. An a.l.c. detector/amplifier setup, with a triode (1/2 12AX7), as similarly used for the receiver a.g.c., ensures fast a.l.c. pickup, before any significant overdrive takes place. The a.l.c. voltage controls the gain of the transmitter i.f. amplifier. The a.l.c. does not function with a.m.

Physical Details

The TR-6 is styled and constructed in the same way as the TR-4 transceiver and the

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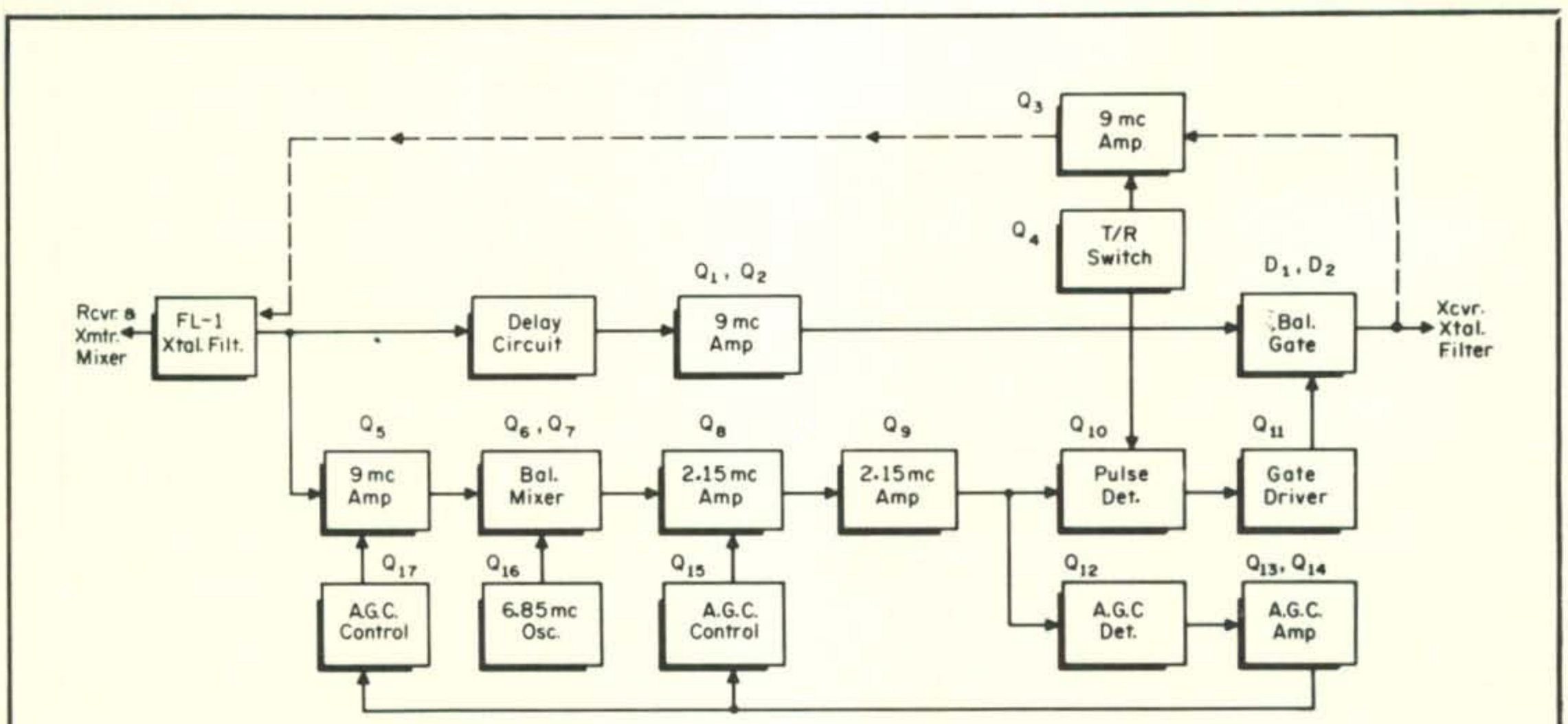

Fig. 3—Block diagram for the Drake Noise Blanker. Both the receive and transmit 9 mc signals go through the unit. The transmit path is indicated by the dashed lines. Other details are given in the text.

other models in the Drake line of gear.

The two edgewise-type meters indicate p.a. plate current on one and receiver S-units or a.l.c. level on the second. Relative r.f. output may be read at the plate meter by pushing in a button which also operates a control to adjust the meter sensitivity for these readings

The v.f.o. is operated by a high-ratio drive mechanism with 25 kc covered by one revolution of the tuning knob. A skirt on this knob is calibrated in 1 kc increments of 0-25 spaced 1/4" apart, making easy readability down to a few hundred cycles. The skirt may be slipped on the shaft to allow precise indexing against signals from the built-in 100 kc calibrator. A larger dial behind a window has reference points for each 25 kc interval on two scales. One scale is calibrated .000-0.5 mc, the other 0.4-1.000 mc. The frequency readout is the sum of the bandswitch setting (in mc), the mc-dial reading and the kc indicated at the tuning-knob skirt A switch at the rear of the set changes the glow of the panel lamps between dim and bright.

A panel switch selects any filter, regardless of the mode of operation. An a.g.c. switch cuts the noise blanker (described later) in or out and provides slow or fast a.g.c. in either case.

On the right side of the transceiver are jacks for headphones, microphone and key; Knurled screw-driver-adjust controls for v.o.x. gain/c.w. release, anti-v.o.x. gain and S-meter zero. There is no separate control for setting the v.o.x. delay with s.s.b. The release time is dependent on the v.o.x.-gain setting; however, for c.w. this control is used for the c.w.-release time.

Provisions also are made for operating 2-meter receiving and transmitting converters (having a 13.9-14.5 mc i.f.) in conjunction with the TR-6. A remote v.f.o. accessory also may be used for split-frequency operation. There also are jacks on the rear that provide for muting an external receiver. Speaker and external-relay control connections are made through the power-cable plug.

Performance

Measurements on the TR-6 produced the following results:

RECEIVER SENSITIVITY: For 10 db S+N/N-0.1 μv on s.s.b. with 2.4 kc filter; 1 μv on a.m. (30% modulation at 400 c.p.s.) with 6 kc filter and less than 0.1 μv on c.w. with 300 c.p.s. filter. SELECTIVITY: 2.3 kc at 6 db and 6.2 kc at 50 db with s.s.b. filter; 6 kc at 6 db and 12 kc at 50 db with a.m. filter; 450 c.p.s. at 6 db and 5 kc at 50 db with c.w. filter.

IMAGE REJECTION: 83 db (primary), 100 db (secondary). I.F. SIGNAL REJECTION: 78 db at 14 mc and over 100 db at 9 mc. INTERNAL TWEETS OR SPURIOUS: Equivalent to 1 μv or less r.f.-input signal found at 49.999, 50.399 and 50.999 mc (on two lower segments—other segments not checked, since crystals for them were not supplied).

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A.G.C. CHARACTERISTIC: 12 db a.f. output change with r.f. input variation of 0.1-1.0 μv (20 db) and only 2 db a.f. change with input signals of 1-100,000 μv (100 db). Blocking was not evidenced at this maximum input. Slow-release of 1 sec. from S-9 or greater signal. Fast release and fast attack not checked (rated at 200 milliseconds and 100 microseconds respectively). S-Meter: S9 reading with 35 μv signal.

TRANSMITTER OUTPUT: 150 watts d.c. (c.w.); 200 watts p.e.p. on s.s.b. and 150 watts p.e.p. on a.m. with controlled carrier. 3rd-Order DISTORTION: 31 db below maximum peak output with two-tone test on s.s.b. UNWANTED SIDEBAND SUPPRESSION: 40 db at 1 kc CARRIER SUPPRESSION: 52 db. A.L.C.: No evidence of r.f.-output flattopping with maximum a.l.c. levels. Since there is no a.l.c. for a.m., flattopping can easily take place with this mode. This can be avoided by maintaining speech levels that keep the plate meter peaks within the specified range.

FREQUENCY STABILITY: Starting cold from a 66° F. ambient, drift during first 15 minutes was 310 c.p.s., 500 c.p.s. the next hour and 100 c.p.s. or less per hour thereafter. With ±10% line-voltage variation, the frequency shifted ±5 c.p.s. No evidence of frequency twittering or microphonics was found when the unit was subject to banging by hand. DIAL CALIBRATION: Within 0.5 kc at 10 kc points when indexed at nearest 100 kc interval.

The TR-6 handles well and is easy to operate. The a.f. quality on either s.s.b. or a.m. is excellent both on receive and transmit. C.w. keying is clean, but a little on the soft side. C.w. break-in is of the usual v.o.x. type with break-in during pauses. Plenty of mic gain is available for either modulating the transmitter or tripping the v.o.x. which works smoothly. As noted from the measurements, the receiver sensitivity is fine. The a.g.c. action is pleasing without impact popping or signal pumping.

The size of the TR-6 is 5 7/16" × 10 3/4" × 14 1/4" (H.W.D.) and it weighs 15 3/4 lbs.

Noise Blanker

It had been intended to review the Drake Noise Blanker as a separate entity, inasmuch as it has been available only as an accessory. It has just been learned that the TR-6 is now supplied with the blanker installed, so a description of this unit is included at this point in the TR-6 review.

The Model 9-NB Noise Blanker is an elaborate solid-state job designed for use at a 9 mc i.f. with the TR-6. There also is the Model 34-NB available for factory installation in the Drake TR-3 and TR-4 Transceivers.

The advantage of a true noise blanker, such as Drake's, over conventional noise limiters or clippers is that the noise is cut out at a point in the receiver before any selectivity is introduced that would lengthen the noise pulses and thus minimize the effectiveness of noise silencing. Furthermore, the noise pulses are virtually eliminated or are considerably attenuated below the desired signal, rather than simply being brought down to the signal level. No distortion of the desired signal is caused by the blanking action.

Before proceeding with the details on the Drake blanker, let it be said that it does a superb job of impulse-noise elimination. The unit installed in our TR-6 provided at least 50 db attenuation of impulse-noise peaks. With noise pulses peaking over S9, switching the blanker on dropped them to less than 1 μv and they did not even budge the S-meter. Under these severe noise conditions not only was the a.g.c. prevented from being captured by the noise pulses, but c.w., s.s.b. and a.m. signals in the low-microvolt region were perfectly readable. Without the blanker in operation, many of these signals were not even heard through the noise. No distortion of the signals was noted, nor was there an over-all

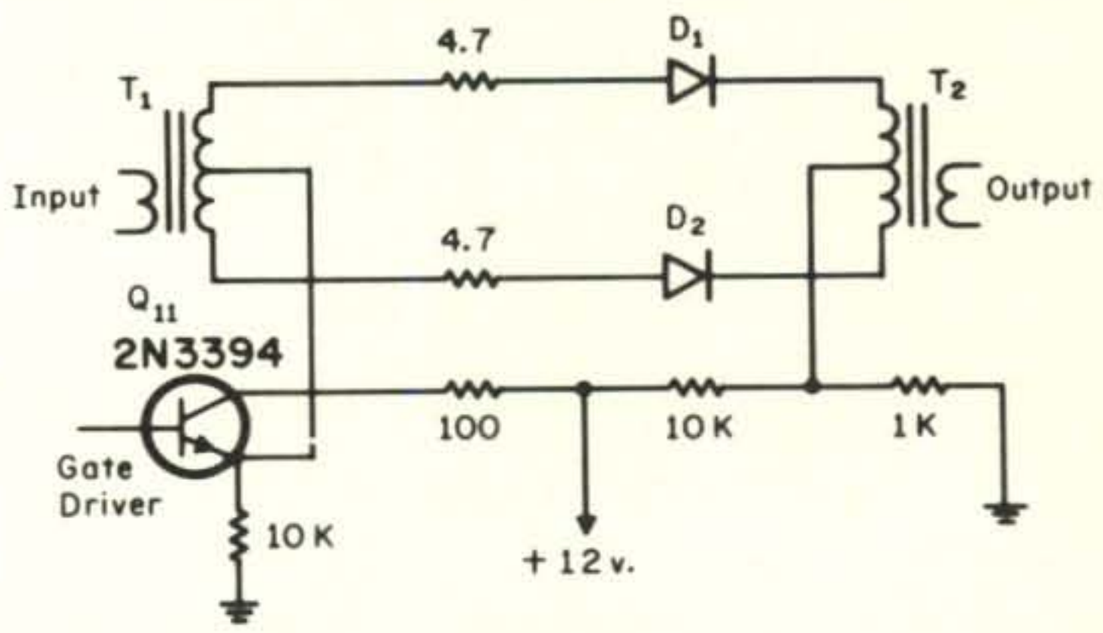

Fig. 4—Balanced gate used in the Drake Noise Blanker. T_1 and T_2 are toroid transformers. The voltage at the emitter of the gate driver also appears at the anodes of the diodes. This voltage is slightly more positive than that at the diode cathodes. It therefore forward-biases the diodes into conduction, allowing the signal to pass from T_1 to T_2. During a gating pulse, the emitter of the gate driver goes less positive (negative going) than that at the diode cathodes. This reverse-biases the diodes into non-conduction, opening both sides of the circuit between the transformers for the duration of the noise pulse. Since this action is balanced, switching noise is not introduced.

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loss in signal level as is otherwise often experienced with such devices.

Principal of Operation

The Drake blanker employs 16 transistors (2 f.e.t.'s) and 4 diodes. Referring to the block diagram at fig. 3, the blanker is installed in the 9 mc line between the receiver and transmitter mixers and the crystal filter of the transceiver.

On receive, the 9 mc output from the receiver mixer goes through a crystal filter, (FL_1), which has a 10 kc bandpass with moderately steep skirts. The filter bandwidth and shape factor are such that they do not cause any detrimental lengthening of noise pulses, yet the filter characteristics are sufficient to prevent strong adjacent signals from overloading the pulse detector in the unit.

The 9 mc signal plus any noise pulses then goes through a delay network, a broadband 9 mc amplifier and to a balanced gate. The 9 mc signal and the noise pulses also go to a noise processor where only the noise pulses are extracted and shaped to produce a d.c. pulse that triggers the gate with each pulse and thus interrupts the signal for the pulse duration. This effectively punches a hole in the signal (which due to its short duration, goes unnoticed) and thus eliminates the original noise signal. The noiseless signal then goes to the crystal filter and the 9 mc i.f. amplifiers of the receiver.

Other Details

At the noise processor, the signal plus noise goes through a tuned 9 mc amplifier (Q_5) and to a balanced mixer (f.e.t.'s Q_6 & Q_7 where the signals are heterodyned with the signal from a 6.85 mc crystal-controlled oscillator (Q_{16}) to produce a 2.15 mc i.f. Feedthrough of the oscillator signal is minimized by the mixer balance.

The 2.15 mc signal is amplified by Q_8 & Q_9 and is fed to the a.g.c. and pulse detectors (Q_{12} and Q_{10} respectively). The time constants of the a.g.c. system are such that only the desired signal is held down, allowing the noise pulses to be accentuated or differentiated for the pulse detector. The detected pulses go to the gate-driver which is a direct-coupled emitter follower that causes a negative-going signal to reverse bias two diodes in the gate and thus open the circuit with each pulse. Switching noise is not introduced, because the gate is a balanced affair that function like a balanced modulator. See fig. 4.

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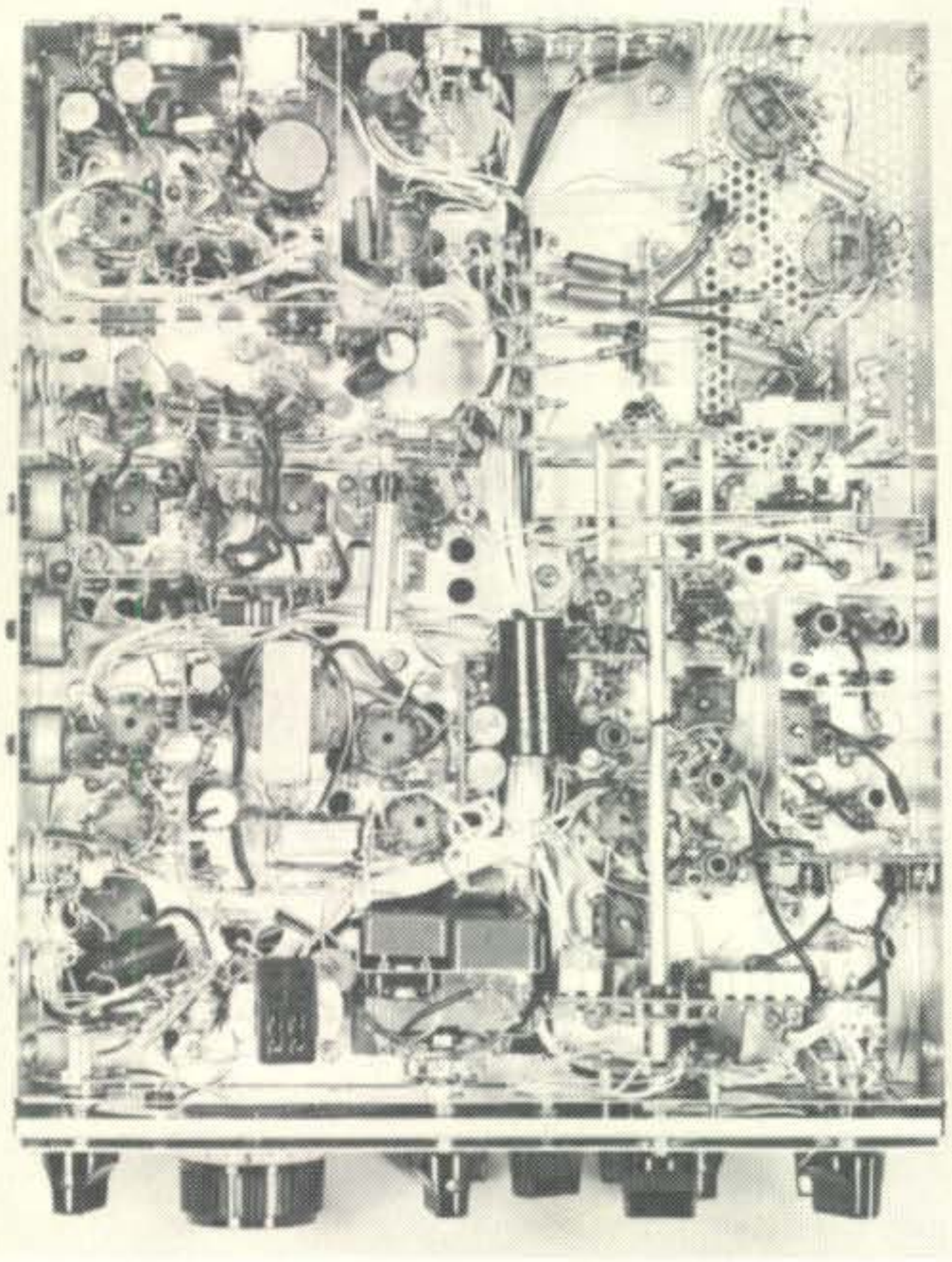

Bottom view of the TR-6. The solid-state sections are built on various small circuit boards mounted vertically below the chassis.

The conversion to the lower i.f. in the pulse processor minimizes the possibility of gate-triggering effects by undesired signals, eliminates 9 mc leakthrough around the blanker and provides a high gain for better gating action.

The delay circuit in the 9 mc desired-signal path is made up of two toroid transformers capacitively tuned and coupled. The delay makes up for that introduced in the pulse-processing section. This delay-compensation, in effect, properly synchronizes the noise-gating action with the noise pulse on the desired-signal path, so that both occur at the same insant for maximum overall effectiveness.

The gain of the desired-signal path is such that there is no change in the overall operating level of the receiver when the blanker is switched in or out.

On transmit, the signal path is from the transceiver crystal filter, through the 9 mc amplifier, (Q_3), the blanker filter (FL_1) and on to the transmitter mixer. Q_4 is a T/R switch that disables Q_3 during receive.

The Drake TR-6 Six-Meter Transceiver is priced at $650 with Noise Blanker installed, u.s.b. filter and crystals for 49.9-51.0 mc coverage. The AC-4 power supply for operation from 115/230 v.a.c., 50-400 c.p.s. is

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Results of the 1969 CQ World Wide WPX SSB Contest

BY FRANK ANZALONE,* W1WY

THINGS did not go so good for us this year (April 1969). Conditions, in general were not at their best—very poor, as reported by the Europeans.

And if that was not bad enough, we had to compete with a new phone contest organized by the boys at Box 88. We had no knowledge of this activity until only a few weeks before our own contest date.

On the plus side were all those exotic prefixes out of Brazil. I do not know who was directly responsible, but permission was granted by the Ministry of Communications that allowed the PY boys (and gals) to use an assortment of prefixes never heard before. This privilage was for the period of the contest only, so all those WPX hunters who were not on during the contest weekend sure missed out on a good one.

I am sure that in no small way this was responsible for a 10% increase in the returns over last year. The members of the LABRE were on in full force, and had even printed their own log forms, summary sheets and check list. Our thanks and congratulations for their excellent showing.

The Top Scores and Trophy Winners listings tell their own story, so I will only touch on a few of the highlights.

Among the all-banders, this year's Top Honors go to KV4FZ. Herb is making a habit of being high man since his move to the Virgin Islands. And the second and third spot by DU1ZAG and ZL1KG respectively proves that it can be done from Oceania. I believe that Brian is now back stateside, so maybe Roy can dig himself out of that third spot he seems to be stuck in the last few contests.

You may have noted the complete lack of Europeans in the Top Ten this year.

To quote LAØAD, Bob Snyder, "I have never experienced such miserable conditions to the USA during a major contest." However he was able to come up with over 300 prefixes with the aid of our friends down Brazil way.

And the weather as reported by G3UML did not help matters either. Gales, lightning, rain and fog that stranded the other member of a planned multi operation on nearby Jersey. So Laurie had to make it a single operation on Guernsey is GC3UML.

The single band Trophy winner, Doc Hollatz VP2MF on 21 mc, is non other than VE3FHO operating from his winter home in Montserrat. Doc has been known to turn in some pretty good scores from Canada too.

Missing this year was LU1DAB, last year's Top single-bander. Jaycee lost his tower and beam in a storm shortly before the contest.

And to further prove that high scores can be made on 15 meters, YV1SA placed third among the single-banders.

*Chairman, Contest Committee.

How would you like to come home and find your 4 el Tri-Band Quad and 70 foot tower in this condition? That's what happened to HS3DR's "DX Getter" seven days prior to the contest. Don was out to give LU1DAB some competition on 10, but was reduced to dipole status and he had to settle for 21 mc. (Talk about irony, DAB lost his antenna about the same time and was out of the contest.

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PY7APS almost made it on 14 mc with his PU7 prefix. Better luck next year Gerson.

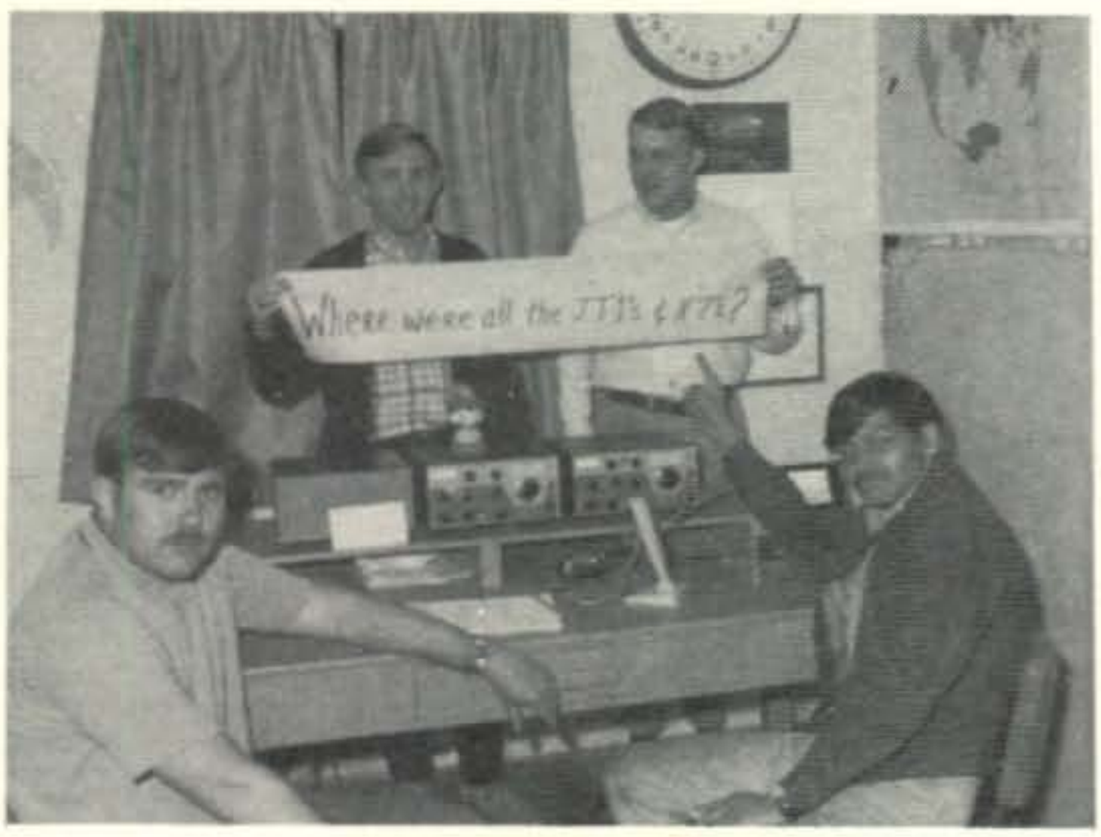
If W4AXE's 6 elements at 125 ft. on 20 meters is an example of Doug's plans for the future, we can expect big things in coming contests. That's a mighty fine state-side score.

Not to forget the YL's, how about that KP4CL score on 14 mc? A few more multipliers would have done the trick, Alicia.

The 40 and 80 meter bands again suffered from lack of activity, due to "no incentive" to work the lower frequency bands. There is no question that our present scoring system, of counting prefixes only once, does not promote an incentive to operate 40 and 80. Therefore we have finally decided to give extra credit for contacts made on 40 and 80. This will be an experiment to see if we can increase the activity on these bands. (See my column in this issue.)

In spite of this lack of activity the top scores on 40 and 80 surpassed last year's figures. Evidently those poor conditions that were reported from Europe, did not exist on the lower frequencies because all the higher scores were made by Europeans. Except YV5BTS on 80. Bill is usually the king of the roost on 3.8 but has been dethroned by LA5KG.

In the multi-operator division practically all the entries were in the single transmitter category. It seems quite fitting that the Trophy should go to a station from Brazil, especially the husband/wife team of Joe and Sonia Rotenberg. I wonder how Joe convinced Sonia to operate on phone, and who took care of the kids and provided the eats.



One of the operating positions at multi 9E3USA. Standing: George W5QHD and Mike W4SYX. Seated: Larry (no call) and Jay K8RWO. The boys seem to be a bit miffed at the lack of cooperation by the JT1's and K7's.

TROPHY WINNERS

WORLD–Single Operator, Single Band. The Jack Chalk, KW6EJ Trophy. Won by: **Dr. K. H. Hollatz, VP2MF.**

WORLD–Single Operator, All Band. The Paul Bavassano, I1RB Trophy, Won by: **Herb Schoenbohm, KV4FZ.**

WORLD–Multi-Operator, Single Transmitter. The Don Miller, W9WNV Trophy, in memory of Ted Thorpe, ZL2AWJ. Won by: **Station PR2CQ.** (Oprs: PY2CQ & PY2SO)

WORLD – Multi-operator, Multi-Transmitter. The Don Miller, W9WNV Trophy, in memory of Chuck Swain, K7LMU. Won by: **Station CE6CA.** (Oprs: CE6CC, CE6EF, CE6EW, CE6EZ)

CANADA–Single Operator, Single Band. The Gene Krehbiel, VE6TP Trophy. Won by: **Dale E. Green, VE7SV.** (14 mc)

OCEANIA–Single Operator, All Band. The Jack Chalk, KW6EJ Trophy. Won by: **Brian Ike, DU1ZAG.**

The CR6BX was also a two operator team with an excellent QSO total but Jorge and Luis were short on their multiplier, especially on 20.

Out in the Far East it was a close one between VS6AD and XW8AX. The boys from the Hong Kong club ran into some rough weather conditions that put them off the air for a time. However I must say that their computerized log sheets were the most accurate entry ever received in this contest.

Only three entries in the multi-multi section, with the Trophy going to CE6CA, a group from the Radio Club Temuco. The boys feel that counting a prefix only once makes the scoring more equitable for all areas of the world.

Everybody got into the act at 9E3USA, the Kagnew Station ARC was out in full force for this one, while at ZD8AR, it was a limited operation, both in manpower and operating time.

Only a few entries could really be classified as Contest Expeditions. The already mentioned GC3UML was one, and W8IMZ-/LX was another. Both found it rough going due to the extreme weather conditions.

Again many contestants requested WPX

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TOP SCORES

SINGLE OPERATOR ALL BAND

KV4FZ 2,312,848
DU1ZAG ..1,509,927
ZL1KG 1,501,470
VP7NA 1,329,216
W3MSK 1,167,475
EP2BQ 1,167,201
PU2ERS 1,113,700
PQ2ASQ 1,005,468
OD5BZ 965,888
PQ2DFR 940,696

SINGLE OPERATOR SINGLE BAND

28 mc

PR2AHJ 606,900
PQ2PC 565,602
KG6AQY 410,418
OA4PF 273,306
VK4VX 202,895
I•C1TH 194,556
KP4CL 724,752
OK5BU 701,188
OH2BH 654,976
VK2APK 627,092

21 mc

VP2MF 959,519
YV1SA 891,096
W3WJD 407,160
CT1OF 369,303
KA2RM 324,576
K1HVV 292,820

7 mc

G3NLY 47,880
DJ6TK 40,479
YV1BI 16,456
I1ZSQ 12,320
OK1VK 9,112
W8IHD 6,114

14 mc

PU7APS 949,200
W4AXE 828,820
OK2PAX 4,004
GM3VTB 2,280

3.8 mc

LA5KG 42,504
YV5BTS 35,182
SMØCER 12,789
OHØNC 11,480

MULTI-OPERATOR SINGLE TRANSMITTER

PR2CQ 2,172,790
CR6BX 2,022,440
UA9KAA 1,742,169
KG6ALY 1,504,800
YU3EY 1,463,760
XW8AX 1,462,926

MULTI-TRANSMITTER

CE6CA 3,341,180
9E3USA 2,398,192
ZD8AR 1,955,060

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

SINGLE OPERATOR

North America

United States

W1KJL	**A**	**89,060**	**256**	**146**
W1PCD	"	59,800	180	115
W1PLJ	"	3,024	40	28
K1CSJ	**28**	**36,882**	**164**	**102**
W1EZM	"	11,392	80	64
K1HVV	**21**	**292,820**	**505**	**220**
W1UOP	"	193,645	367	187
W1WY	"	1,342	22	22
W1PYM	**14**	**106,240**	**244**	**160**
W2PV	**A**	**609,299**	**824**	**283**
W2HCW	**A**	**489,700**	**792**	**236**
VE7BNE/W2				
	"	9,804	74	57
W2MB	"	8,497	52	51
F2VN/W2	"	4,352	45	34
WA2BHJ	"	1,775	26	25
W2YT	**28**	**116,160**	**301**	**160**
W2DKM	"	43,956	156	111
W2QKJ	"	17,250	97	69
WB2YRU	**21**	**281,610**	**529**	**210**
K2DJD	"	222,300	434	195
WB2VGA	"	32,204	132	83
W2CKR	"	3,420	38	36
W2CXM	**14**	**124,916**	**295**	**167**
W2IUV	"	28,038	119	94
WA2WMT/2				
	3.8	**2,048**	**46**	**32**
W3MSK	**A**	**1,167,475**	**1341**	**335**
	(Opr. K3EST)			
WA3BZA	"	176,341	405	187
WA3IHS	"	74,880	200	160
WA3IXF	"	12,300	79	60
WA3JKO	"	3,654	47	42
K3JLK	**28**	**57,912**	**208**	**127**
W3WJD	**21**	**407,160**	**672**	**232**
	(Opr. K4WUY)			
W3KV	"	36,333	141	99
W3SMX	"	11,742	77	57
W3ZKH	**14**	**257,948**	**406**	**236**
WA3CGE	"	105,462	268	162
W4NBV	**A**	**273,581**	**494**	**209**
W4GZD	"	41,382	195	114
W4DS	"	27,772	121	83
WA7JAN/4	"	27,434	135	86
W4NWT	"	22,854	113	78
W4KMS	"	13,869	85	67
W4KJL	"	9,120	59	57
W4WRY	"	2,430	34	30
WB4DJQ	**28**	**88,434**	**235**	**153**
WB4FET	"	23,436	112	84
K4CFB	**21**	**122,616**	**298**	**156**
K0ILI/4	"	82,748	250	137
W4HOS	"	73,000	212	146
WA4CCW	"	31,977	130	99
W4NQV	"	25,143	137	87
W4WSF	"	13,130	81	65
W4AXE	**14**	**828,820**	**1030**	**290**
WB4FJO	"	9,576	72	57
WB4GGA	"	2,918	59	38
W5RER	**A**	**916,039**	**1169**	**277**
K5YPS	"	189,826	418	182
W5OBS	"	146,692	335	169
WA5YAS	"	83,440	272	140
W5LPO	"	47,718	199	99
W5BUK	"	39,900	159	105
W5ULN	"	12,139	95	61
W5QNQ	"	10,214	105	63
W5RIT	"	3,404	46	37
WA5OEA	**28**	**30,780**	**139**	**90**
K1DWQ/5	"	18,012	110	79
WA5TSJ	**14**	**31,827**	**176**	**103**
W6VSS	**A**	**546,184**	**903**	**217**
WB6UDC	"	323,820	704	180
WB6LXS	"	319,809	772	157
K6PIH	"	95,069	323	103
WA6CPY	"	76,636	396	98
WA6DGQ	"	65,863	285	97
WA6BVY	"	14,100	94	60
W6CLM	"	6,165	68	45
WA6JAN	"	5,236	57	44
W6OUL	"	2,688	34	28
K6PUR	**28**	**81,700**	**317**	**95**
WB6ZSU	**21**	**12,586**	**100**	**62**
W6GRV	**14**	**91,784**	**272**	**154**
K6SVL	"	85,146	251	138
K6YRA	"	30,564	145	108
W6DFR	"	1,157	30	13
W7SFA	**A**	**214,643**	**567**	**143**
W7AYY	"	145,860	423	132
W7MSI	"	88,895	328	115
W7BJ	**21**	**24,180**	**160**	**65**
K7ORN	28	6,210	60	54
WB8CDG	**A**	**290,376**	**508**	**218**
W8FRJ	"	34,500	143	92
WA8GGN	"	12,994	105	73
WA8TER	"	9,231	76	51
WB8BBS	"	3,344	60	44
K8HYC	**28**	**141,723**	**339**	**181**
	(Opr. K8EVR)			
K8HZU	"	92,442	271	142
W8HXZ	"	17,324	98	71
W8PCS	"	2,322	31	27
K8MMM	**14**	**395,200**	**'599**	**247**
	(Opr. WA8LRE)			
W8IHD	**7**	**6,114**	**105**	**62**
W9EWC	**A**	**225,792**	**437**	**196**
W9WGQ	"	135,207	305	181
WA9UMH	"	103,272	247	156
W9JJV	"	79,288	240	136
WA9OTH/9				
	"	43,870	197	107
K9WEH	"	20,175	100	75
WA9LMY	**21**	**175,488**	**359**	**192**
WA9UGI	"	21,280	104	76
K9CUY	**14**	**128,440**	**322**	**169**
W9VNE	**7**	**3,100**	**64**	**50**
WØACT	**A**	**68,672**	**255**	**116**
WAØOML	"	10,638	90	54
KØCVA	**28**	**33,957**	**153**	**99**
WAØEMS	**21**	**215,475**	**457**	**201**
WAØMOJ	"	14,898	159	78

Alaska

KL7GPB	**21**	**13,940**	**148**	**34**

Bahamas

VP7NA	**A**	**1,329,216**	**2144**	**258**
	(Opr. W3AZD)			
VP7NH	**14**	**215,320**	**709**	**140**

Barbados

8P6CV	**14**	**7,950**	**66**	**50**

Canal Zone

KZ5KZ	**A**	**116,209**	**670**	**79**
KZ5MA	**21**	**130,985**	**390**	**115**

Canada

VO1CX	**A**	**170,226**	**495**	**147**
VO1HI	**14**	**401,592**	**725**	**232**
VE1AJJ	**14**	**18,585**	**132**	**63**
VE2WA	A	281	10	9
W1EXZ/VE2				
	14	176	10	8
VE3BS	**A**	**281,980**	**464**	**230**
VE3HJ	"	80,266	220	134
VE3BMB	**21**	**50,400**	**194**	**105**
VE3KZ	**14**	**310,392**	**574**	**216**
VE4RP	**A**	**14,208**	**93**	**64**
VE6AGV	**A**	**34,400**	**186**	**80**
VE6GN	**21**	**12,550**	**120**	**50**
VE7IG	**A**	**34,048**	**209**	**76**
VE7OP	**28**	**9,700**	**80**	**50**
VE7AZG	"	1,364	30	22
VE7SV	**14**	**613,053**	**930**	**263**
VE7WP	7	2,989	42	27

Guatemala

TG9GF	**A**	**427,233**	**1285**	**159**

Mexico

XE1HS	**14**	**14,553**	**110**	**63**

Montserrat

VP2MF	**21**	**959,519**	**2002**	**209**

Panama

HP1JC	**A**	**143,258**	**373**	**116**

Puerto Rico

WA4MMO/KP4				
	28	**100,396**	**648**	**76**
KP4CL	**14**	**724,752**	**1226**	**252**

Salvador

YS2CEN	**14**	**371,718**	**730**	**214**

Virgin Islands

KV4FZ	**A**	**2,312,848**	**3144**	**304**

AFRICA

Angola

CR6LF	**A**	**627,405**	**1050**	**245**
CR6JS	**21**	**21,666**	**115**	**69**

Congo (Democratic Rep.)

9Q5IA	**A**	**271,260**	**519**	**180**

Libya

5A4TY	**A**	**29,862**	**128**	**79**

Madeira Is.

CT3AW	**14**	**50,232**	**195**	**91**

Malawi

7Q7WW	**21**	**151,110**	**380**	**138**

Mozambique

CR7CH	**28**	**43,659**	**152**	**99**

South Africa

ZS6BBK	**A**	**444,960**	**840**	**180**

Tunisia

3V8AD	14	1,716	26	22

ASIA

Afghanistan

YA5RG	**A**	**85,537**	**383**	**117**

Cyprus

ZC4IM	**28**	**128,652**	**299**	**151**

India

VU2DK	**A**	**647,247**	**1040**	**237**

Iran

EP2BQ	**A**	**1,167,201**	**1472**	**291**

Israel

4Z4HF	**14**	**425,270**	**707**	**215**

Japan

JA1AEA	**A**	**821,400**	**826**	**370**
JA1NDO	"	304,512	461	244
JA7JH	"	20,868	108	74
JA2INQ	"	7,296	73	38
JA4ERX	"	4,182	50	34
JA8FBM	"	2,574	70	22
JA1IST	"	1,771	32	23
JA3YBQ	"	300	12	10
JA3AVO	"	192	8	8
JAØANO	"	144	8	8
JA6QT	**28**	**86,662**	**263**	**118**
JA2DDN	"	48,139	206	91
JH1BIN	"	33,580	174	73
JA7GDW	"	13,905	123	45

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JA1AAT	"	120	8	5
JA1RJW	**21**	**203,670**	**533**	**155**
JA3KAW	"	66,516	274	92
JA7CVW	"	15,105	116	53
JA9CWJ	"	14,265	108	45
JA2ITH	"	5,742	60	33
JA6KAV	"	5,216	61	32
JA1NEC	"	5,076	57	36
JA2RCQ	"	3,311	45	27
JAØDXG	"	1,596	40	19
JA7BSK	"	432	6	6
JAØCDC	"	385	13	11
JA2PCI	"	119	7	7
JH1AHZ	"	60	6	5
JA1DXE	**14**	**213,150**	**442**	**175**
JA2VB	"	1,428	28	21
JA6AZV	"	476	16	14
JH1MTR	"	442	18	13
JA3TVS	"	75	7	5
JA5CK	"	3	1	1
KA2RM	**21**	**324,576**	**778**	**168**

Lebanon

OD5BZ	**A**	**965,888**	**1358**	**256**
OD5BA	"	325,325	687	169

Pakistan, West

AP5HQ	**14**	**12,600**	**91**	**60**

Ryukyu Islands

KR6NR	**A**	**189,462**	**570**	**202**
KR6JT	**21**	**176,040**	**484**	**163**
KR6KN	**14**	**377,400**	**691**	**222**

Singapore

9V1OE	**14**	**30,083**	**210**	**67**

Thailand

HS3AL	**A**	**485,537**	**1184**	**221**
HS3DR	**21**	**266,660**	**730**	**199**

U.S.S.R.

Asiatic

UWØIX	**A**	**22,204**	**266**	**52**
UAØABV	**28**	**3,564**	**44**	**27**
UA9IF	"	2,921	110	23
UA9EU	**21**	**107,604**	**533**	**122**
UAØSU	"	100,767	430	123
UA9WJ	"	66,456	338	117
UAØSH	"	57,288	423	93
UW9EX	**14**	**58,957**	**191**	**107**
UV9CU	"	25,748	111	82
UA9MT	"	162	10	9

Azerbaidzhan

UD6HB	**A**	**362,558**	**707**	**203**

Georgia

UF6CR	**A**	**229,270**	**454**	**202**
UF6CW	"	119,238	301	167
UF6CA	**14**	**49,504**	**173**	**104**

Kazakhstan

UL7LA	**14**	**43,155**	**167**	**105**

Kirghiz

UM8KAA	**14**	**34,632**	**148**	**78**

Turkoman

UH8BO	**A**	**32,800**	**142**	**100**

Uzbek

UI8KAA	A	270	13	10

EUROPE

Aland Island

OHØNI	**A**	**167,986**	**540**	**182**
OHØNC	**3.5**	**11,480**	**134**	**82**

Austria

OE2EGL	**A**	**429,880**	**760**	**220**

Azores Island

CT2AT	**A**	**163,228**	**594**	**146**

Balearic Island

EA6AR	**28**	**13,680**	**101**	**60**

Belgium

ON5MG	**A**	**255,970**	**447**	**286**
ON4XG	**28**	**8,352**	**60**	**48**
ON5DJ	**21**	**76,950**	**343**	**81**

Channel Is. (Guernsey)

GC3UML	**A**	**653,415**	**1147**	**245**

Czechoslovakia

OK1ADM	**A**	**109,824**	**216**	**192**
OK1AHZ	**28**	**1,122**	**22**	**17**
OK2ABU	**21**	**123,872**	**406**	**112**
OK1HA	"	10,927	80	49
OK1AKL	"	10,206	75	54
OK5BU	**14**	**701,188**	**1015**	**307**
OK1GO	"	120	10	10
OK1VK	**7**	**9,112**	**115**	**68**
OK1MP	"	7,245	111	63
OK2PAX	**3.5**	**4,004**	**77**	**52**

Denmark

OZ3SK	**A**	**298,580**	**546**	**235**
OZ9FV	"	26,190	150	97
OZ1LO	"	22,192	111	76
OZ8EV	"	10,071	73	59
OZ7DX	"	8,003	61	53
OZ3PO	"	4,773	46	37
OZ4LX	"	3,280	60	41
OZ5DX	"	1,452	28	22
OZ4CF	"	1,254	23	22
OZ3KE	"	560	14	14
OZ3Y	**28**	**12,150**	**92**	**50**
OZ1TD	14	35	7	5

England

G3TKK	**A**	**85,722**	**321**	**157**
G3XBY	"	81,810	350	162
G3WTV	"	50,061	217	123
G2AJB	"	15,130	134	85
G3NSY	**14**	**26,631**	**170**	**99**
G3NLY	**7**	**47,880**	**257**	**133**

Faroes Island

OY4OV	**A**	**3,519**	**67**	**51**

Finland

OH4RH	**A**	**115,596**	**393**	**171**
OH5VT	"	67,336	290	152
OH6AC	"	5,782	57	49
OH1UR	"	2,176	43	34
OH8OW	"	2,079	32	27
OH3KX	"	1,428	35	28
OH2BBR	**28**	**87,912**	**300**	**108**
OH3TY	"	19,390	100	70
OH2BHU	"	1,776	30	24
OH2BR	**21**	**55,990**	**213**	**110**
OH3XZ	"	7,440	60	48
OH2BCV	"	3,910	42	34
OH3AA	"	133	7	7
OH2BH	**14**	**654,976**	**920**	**301**
OH2CP	"	128,240	365	140
OH2DN	"	2,470	42	38
OH6RH	7	168	14	12

France

F9MS	**A**	**115,913**	**264**	**203**
F5QQ	**14**	**86,240**	**300**	**160**
F2OQ	"	48,360	285	124

Gibraltar

ZB2BC	**A**	**554,140**	**1215**	**206**
ZB2AY	**14**	**549,780**	**1292**	**170**

Germany

DJ3WE	**A**	**597,380**	**942**	**251**
DJ6GV	"	170,912	476	196
DL1MD	"	128,816	333	166
DK1YK	"	120,884	353	188
DL8PC	"	117,234	298	167
DL6WE	"	97,686	314	162
DL3EJ	"	71,231	247	163
DJ9ZB	"	66,960	246	124
DL9YC	"	4,150	62	50
DJ4PT	**21**	**228,690**	**512**	**165**
DLØTD	**14**	**91,316**	**321**	**149**
DJ5WM	"	22,295	150	91
DJ6TK	**7**	**40,479**	**254**	**131**
DK1OGA	"	4,992	100	64
DJ2RE	"	289	26	17
DL4CQ	**14**	**123,020**	**300**	**190**

Hungary

HA5CQ	**A**	**135,420**	**400**	**222**
HA5AM	**14**	**72,933**	**256**	**161**
HA5DG	"	**8,122**	**85**	**62**
HA1ZH	14	7,198	107	61
HA5BY	"	608	20	19
HA5FQ	"	252	15	14
HA5FE	"	207	17	15

Isle of Man

GD3AIM	**A**	**38,340**	**212**	**142**

One of the few Contest Expeditions in the contest. Here are Bob WA9HYS, Bernie, W8IMZ and Luc, LX1SL reviewing the WPX SSB contest rules prior to W8IMZ/LX's operation from Luxembourg. We hope to hear more from Luc in future contests.

Italy

I1BAF	**A**	**903,165**	**1168**	**285**
I1FLD	"	630,496	1066	244
I1AUM	"	90,897	296	119
I1CZQ	"	27,636	151	94
I1MOL	**14**	**310,992**	**604**	**228**
I1AT	"	47,614	225	133
I1ZSQ	**7**	**12,320**	**121**	**80**

Luxembourg

LX1BW	**A**	**49,140**	**188**	**105**

Netherlands

PAØVB	**A**	**2,356**	**42**	**31**
PAØXKB	**28**	**31,525**	**118**	**97**
PAØHBO	**14**	**578,823**	**827**	**301**
PAØMIR/A	**7**	**1,584**	**41**	**33**

Norway

LAØAD	**A**	**519,110**	**817**	**305**
LA5KK	"	12,152	100	62
LA6U	"	9,660	85	69
LA4LG	"	8,736	80	56
LA6UL	"	5,170	92	55
LA8RI	**14**	**7,440**	**70**	**62**
LA5KG	**3.8**	**42,504**	**293**	**132**

Poland

SP8AJK	**A**	**317,544**	**595**	**262**
SP5CKM	**14**	**12,127**	**98**	**67**
SP5BB	"	2,541	56	33
SP7AWA	"	1,012	44	22
SP9BNY	"	150	15	10

Portugal

CT1MW	**A**	**254,722**	**488**	**202**
CT1LN	"	207,475	510	193
CT1SH	"	27,195	196	111
CT1OF	**21**	**369,303**	**820**	**209**

Romania

YO3ZM	**A**	**64,372**	**336**	**133**
YO2BA	**14**	**8,064**	**72**	**42**
YO3JU	"	1,120	32	28

Scotland

GM3SDZ	**A**	**95,480**	**311**	**155**
GM3VTB	**3.8**	**2,280**	**57**	**40**

Spain

EA1IY	**A**	**54,260**	**200**	**128**
EA3QJ	"	6,000	88	60

Sweden

SM5AD	**A**	**306,021**	**521**	**249**
SM3EP	"	74,080	319	160
SMØMC	"	39,550	190	113
SM3AF	"	30,030	164	105
SM2COL	"	23,064	163	93
SM7TQ	"	9,464	75	56
SM3CXS	"	7,406	61	46
SM2CTY	"	6,728	67	58
SMØBDS	"	4,860	60	45
SM5BXT	"	3,196	46	34
SM7BGF	"	546	25	13
SM7BKH	**28**	**58,082**	**186**	**113**
SM5BHW	"	14,235	80	65
SM5CAK	"	8,789	68	47
SM5CDY	"	4,484	70	38
SMØATN	"	3,724	38	38
SM5AZU	"	1,633	27	23
SM5UY	"	1,300	24	20
SM5API	**21**	**128,897**	**343**	**157**
SM7AZL	"	92,250	252	150
SM7DK/1	"	73,423	253	119
SM7DMN	"	22,480	125	80
SM6DHU	**14**	**69,984**	**264**	**144**
SM6EJA	"	12,851	137	71
SMØCER	**3.8**	**12,789**	**141**	**87**

Switzerland

HB9AKJ	**A**	**267,282**	**566**	**186**
HB9UD	"	134,123	366	137

Wales

GW3VBX	**A**	**8,978**	**108**	**67**

U.S.S.R.

Estonia

UR2IV	28	2,158	32	26
UR2LO	**14**	**18,711**	**200**	**81**
UR2MG	3.8	25	5	5

U.S.A. Leaders & Runners-up

Single Operator

All Band	**W5RER**	**916,039**
28 mc	K8HYC	141,723
21 mc	WB2YRU	281,610
14 mc	K8MMM	395,200
7 mc	W9VNE	3,100
3.8 mc	WA2WMT/2	2,048

Multi-Operator

Single Xmtr	W2SKE	800,676

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This young fellow is Victor Goncharsky, UB5WE top scorer out of the USSR. Victor is 17 and has only been licensed since Aug. '68. His father is Vladimir, UB5WF winner of many contests, so how could he miss.

European

UA1DZ	**A**	**713,745**	**1156**	**255**
UA3FU	"	96,390	327	126
UV3FD	"	68,000	282	125
UA4QM	"	20,836	119	61
UA4SH	"	14,447	130	73
UV3MM	"	1,113	24	21
UA3AVV	**28**	**75,621**	**293**	**91**
UW6LC	"	57,618	248	97
UA3NUE	"	27,613	195	53
UA4LAR	"	2,268	35	27
UA4RZ	**21**	**81,240**	**361**	**120**
UA4LG	"	79,534	342	133
UW1BM	"	46,010	215	107
UA3TU	"	39,780	234	78
UA3TN	**14**	**11,305**	**125**	**95**
UA6RD	"	1,848	34	33
UA3WZ	"	330	15	11
UA3KAG	"	325	21	13
UA1OE	"	91	7	7

Lithuania

UP2CV	**14**	**62,928**	**279**	**171**
UP2LR	"	3,822	75	42
UP2WN	3.8	1,320	33	40

Moldavia

UO5BWG	**28**	**2,548**	**36**	**26**

Ukraine

UB5WE	**AA**	**811,486**	**1091**	**299**
UY5LK	"	513,051	1040	231
UB5GEN	**28**	**36,080**	**186**	**80**
UY5HK	"	4,356	50	33

OCEANIA

Australia

VK1GD	**A**	**782,952**	**1184**	**228**
VK2APK	**14**	**627,092**	**1013**	**211**
VK3QV	**28**	**109,707**	**430**	**87**
VK3SM	**21**	**91,140**	**324**	**98**
VK3HE	"	15,675	102	55
VK4VX	**28**	**202,895**	**581**	**119**
VK4UA	**14**	**47,369**	**246**	**67**
VK4GU	"	14,900	106	50
VK6HJ	**14**	**26,901**	**152**	**63**

Guam

KG6AQY	**28**	**410,418**	**950**	**151**

Hawaii

KH6GLU	**A**	**867,376**	**1649**	**184**
KH6GPM	**21**	**127,296**	**633**	**68**
KH6BZF	"	97,216	518	64
KH6GOL	"	69,897	348	69
KH6FQB	"	19,260	196	36

New Guinea

VK9KS	**14**	**13,950**	**85**	**62**

New Zealand

ZL1KG	**A**	**1,501,470**	**2067**	**249**

Papua Territory

VK9RY	**A**	**46,665**	**282**	**61**

Philippines

DU1ZAG	**A**	**1,509,927**	**1861**	**277**
DU1FH	"	609,863	1091	191

SOUTH AMERICA

Argentina

LU2FAO	**A**	**170,850**	**371**	**170**
LU7MAY	"	61,776	228	104
LU3KW	**14**	**66,285**	**207**	**135**

Bolivia

CP5FB	**14**	**7,458**	**76**	**33**

Brazil

PU2ERS	**A**	**1,113,700**	**1101**	**301**
PQ2ASQ	**A**	**1,005,468**	**1323**	**276**
PQ2DFR	**A**	**940,696**	**1400**	**236**
PU4KL	"	603,848	849	263
PU2CK	"	532,158	813	242
PT1TX	"	449,514	719	226
PT2GE	"	270,291	525	211
PU7AKQ	"	247,269	522	177
PU1CHP	"	211,800	503	150
PQ4HP	"	191,023	400	203
PY2PH	"	151,076	340	179
PS1ASX	"	143,603	338	163
PU2DTV	"	112,464	303	132
PT1BAR	"	100,219	303	139
PS4AYL	"	72,473	239	137
PT2DCA	"	57,953	204	119
PS7VX	"	37,268	250	121
PQ1HQ	"	33,082	273	119
PT1BOR	"	32,969	123	103
PS1DBE	"	25,290	129	90
PQ6OA	"	19,007	162	83
PQ1DEM	"	18,270	96	70
PQ7AKW	"	18,144	141	81
PQ3APH	"	12,198	144	105
PR4AKR	"	8,778	103	57
PS2YC	"	1,804	52	44
PR2AHJ	**28**	**606,900**	**1027**	**204**
PQ2PC	**28**	**565,602**	**925**	**214**
PT7VNY	"	107,124	330	113
PR1AYQ	**21**	**111,510**	**378**	**105**
PU1ATR	"	95,763	265	137
PU1JZ	"	43,989	170	93
PS5GA	"	41,951	173	91
PY2BGO	"	1,440	24	30
PU7APS	**14**	**942,200**	**1230**	**280**
PS3BXW	**14**	**365,165**	**730**	**199**
PY2CAB	"	241,344	509	192
PY2ASO	"	159,036	392	174
PS1CK	"	127,204	344	154
PS4RT	"	125,292	320	159
PU6BM	"	110,366	315	139
PT2BKO	"	62,920	226	130
PS4AJD	"	47,847	227	123
PU1CJL	"	25,200	177	100
PT4KB	"	25,026	169	97
PY4ATG	"	22,250	161	90
PT8FX	"	18,318	126	71
PR2AIE	"	12,798	110	81
PR7GAI	"	10,575	107	75
PY2EMD	"	7,370	73	55
PY2ATV	"	1,885	59	29
PY1HT	"	1,845	67	41
PY2ETK	7	54	6	6

Chile

CE3OZ	**21**	**78,708**	**330**	**84**

Colombia

HK6BMF	**A**	**110,280**	**864**	**120**
HK5BDS	**14**	**247,744**	**711**	**196**
HK4BGC	"	132,614	377	122
	(Opr. W4TXE)			

Ecuador

HC1TH	**28**	**194,556**	**700**	**93**

Guyana

8R1G	**A**	**585,648**	**1030**	**196**

Peru

OA8V	**A**	**791,560**	**1245**	**220**
OA4DX	"	35,784	204	63
OA4PF	**28**	**273,306**	**760**	**123**

Trinidad

9Y4KK	**A**	**188,901**	**448**	**151**
9Y4KR	**7**	**3,272**	**44**	**31**

Uruguay

CX9CO	**A**	**204,288**	**358**	**228**

Venezuela

YV5BPG	**A**	**268,061**	**523**	**181**
YV5JH	"	10,149	72	51
YV1SA	**21**	**891,096**	**1402**	**214**
YV7AV	14	13,255	86	55
YV1BI	**7**	**16,456**	**131**	**68**
YV5BTS	**3.8**	**35,182**	**131**	**98**

MULTI-OPERATOR
Single Transmitter

NORTH AMERICA

KL7AIZ	**243,960**	**1004**	**95**
	(7 Operators)		
VE6ADX	**379,610**	**1025**	**170**
	(VE: 6AEY, 6HN, 6MX, 6NZ, 6VD, 6XJ)		
VE6AID	45,600	256	76
	(VE: 6AID, 6AKV, 6AUT)		
W2SKE	**800,676**	**1100**	**276**
	(W2LEJ & W2SKE)		
WB2ZKJ	464,376	720	264
	(WB2WOW & WB2ZKJ)		
WA2HSX	356,668	565	247
	(WA2HSX, WA2FQG, WB2CKO)		
W4EAL	**268,515**	**498**	**221**
	(Several Operators)		
W4VSV	163,760	372	178
	(9 Operators)		
WB6OLR	**352,809**	**771**	**179**
	(WB6MGP & WB6OLR)		
WB6WIT	325,326	741	177
	(WA6CYX & WB6WIT)		
K8UDJ	**488,540**	**702**	**260**
	(K1ZND & K8UDJ)		
WA0CJU	**120,428**	**332**	**161**
	(K0HAP, K0UYN, W0IVZ, WA0MVO, WA0PMM)		

AFRICA

CR6BX	**2,022,440**	**2454**	**280**
	(CR6BX & CR6GO)		
CR6GA	948,880	1406	232
	(2 Operators)		

ASIA

XW8AX	**1,462,926**	**1951**	**314**
	(XW8AX & XW8CS)		
VS6AJ	**1,322,249**	**2159**	**307**
	(VS: 6AA, 6AD, 6AL, 6AP, 6BF, 6EF, 6FZ, K8MFO)		
HS3RT	**449,640**	**1086**	**180**
	(HS3MJ, HS3RF, HS3RT)		
HL9KQ	**150,414**	**583**	**129**
	(HL9KO & WA8HAC)		
JA1YNX	**86,076**	**332**	**108**
	(Club Station)		
JA5YBW	8,140	95	37
	(Club Station)		
JA3YCZ	6,464	82	32
	(Club Station)		

EUROPE

LZ2KKZ	**708,066**	**1188**	**278**
	(3 Operators)		
G3SSO	**1,095,680**	**1301**	**320**
	G2HDU, G3: FXA, PEO, (SNN, G8KG)		
GB2SM	842,112	1286	272
	(G3: JUL, NYY, PAQ, CRP, VJG, WPK, JLB, YCQ, JEA, UFM, TEX, YFF, OHP)		
G3WYX	786,796	1202	263
	(G3: HTA, RUV, RUX, TJW)		
G3EEO	61,744	297	136
	(Club Group)		
OH2HC	**940,016**	**1241**	**308**
	(OH2: BC, HC, SB)		
OF1VR	265,740	809	215
	(OH1VR & OH1UR)		
OH5UX	194,488	505	184
	(OH5: UX, QX, UY)		
OH6AA	29,391	237	101
	(Club Group)		
DLØWN	**1,260,822**	**1700**	**263**
	(DJ3GY, DJ6: MD, TS, DJ7IK, DJ0JX, DK3DS, DL2HT)		
DL4QF	**1,170,307**	**1370**	**313**
	(DL4: QQ, QP, QM, DL5: QB, QC, DL7AV, WA6QGW/DL)		
DL4USN	724,168	1103	262
	(WA2SAB, WA5VBA, WA8QIY)		
4U1ITU	**311,410**	**652**	**190**
	(HB9AW & HB90P)		
W8IMZ/LX	**253,536**	**581**	**228**
	(DL4FS & DL4ER)		
PAØSNG	**172,178**	**409**	**197**
	(2 Operators)		
LA1K	**308,503**	**903**	**247**
	(LA1: EE, HL, LA2QK, LA3JJ, LA7XK, LA9DL)		
SPØDXC	**5,586**	**89**	**49**
	(Club Group)		
SK6AB	**773,448**	**1077**	**312**
	(SM6: AJV, CAS, CKV, CZZ, DKX)		
SK6AW	565,262	951	274
	(SM4DJE, SM6: CJK, CKS, CMU, CRC, CVE, ESH, EJI)		
SK5AA	413,930	918	265
	(SM5: ACQ, CJW, CKC, CMP, DUL, DXU)		
SK9WL	260,925	758	245
	(SM5: EAC, FC, SM7: CRW, DQC)		
SK3BP	240,856	596	238
	(SM3: BLW, BUS, DNI, EVG)		
TA1MGP	**107,584**	**535**	**164**
	(TA1MGP & TA1RF)		
YU3EY	**1,463,760**	**1886**	**304**
	(YU3EY & YU3TBM)		
GW6GW	**77,575**	**430**	**145**
	(GW3WVG & GW3XNI)		

U.S.S.R.

Club Stations

UA6KOD	**616,896**	**1187**	**252**
UA3KND	428,959	823	251
UA3KWA	22,295	162	91
UP2KPI	**390,730**	**848**	**205**
UP2KTU	248,768	620	208
UB5KIW	**261,138**	**588**	**213**
UB5KKB	10,725	92	75
UB5KKA	2,697	58	31
UA9KAA	**1,742,169**	**1927**	**341**
UW9KDL	58,242	230	102

OCEANIA

KG6ALY	**1,504,800**	**2323**	**220**
	(W0JCW, WA0EVE, WA5TYY)		
KH6SP	**1,132,276**	**2293**	**772**
	(K5LTH, K7ZRZ, KH6GKV, KH6GQU)		
VK9XI	**135,664**	**407**	**122**
	(Club Station)		

SOUTH AMERICA

PR2CQ	**2,172,790**	**2336**	**326**
	(PY2CQ & PY2SO)		

MULTI-OPERATOR
Multi Transmitter

CE6CA	**3,341,180**	**3549**	**340**
	(CE6CC, CE6EF, CE6EW, CE6EZ)		
9E3USA	**2,398,192**	**2727**	**296**
	(W: 3DNA, 4DIW, 4EJP, 4EJQ, 4SYX, 5QHD, K: 7ZBN, 8RWO, WA: 3FRL, 7LIP)		
ZD8AR	**1,955,060**	**2475**	**268**
	(ZD8Z, ZD8HL, ZD8RD)		

Our thanks to the following for submitting their logs for checking purposes:

CX1JM, DJ0PN, DJ0TA, HL9UU, LA9OI, OH2BAC, OH7AA, OZ5JR, PQ5GK, PT3BAD, SM5AQB, SM5GA, SM6CJK, SM7BBV, UA9VX, UR2KAA, UW3IN, VE3CEA, VE7RN, W2EGI, W2UJ, W2ZPG, W3YIK, W6CFG, W6ZS, WA9HYS/LX, WØKOQ, WØUYZ, YV5JO, SP8-1079, UA3-142225, UP2-0386, YV1-143.

See page 110 for New Reader Service

AMATEUR ELECTRONIC SUPPLY RECONDITIONED EQUIPMENT

★ 10 Day Free Trial (Lose only Shipping Charges) ★ 30 Day Guarantee ★ Full Credit Within 6 Months on Higher Priced New Equipment ★ EZ TERMS with convenient REVOLVING CHARGE PLAN ★ Order Direct from this Ad !

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CN-50 (28-32) $ 29

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20A Exciter $ 89
Model A Slicer 24

CLEGG/ SQUIRES-SANDERS
99'er 6m Xcvr $ 69
418 DC Sup./Mod. 75
Zeus VHF Xmtr 289
Interceptor Rec. 289
Interceptor B Rec. 339
Allbander tuner 75
416A AC Supply 75

COLLINS
75A-2 Receiver $219
75A-3 Receiver 269
75A-4 (ser.#601) 325
75A-4 (ser.#699) 325
75A-4 (ser.#1300) 349
75A-4 (ser.#1713) 349
75A-4 (ser.#5399) 499
32V-3 Transmitter 175
32S-1 Transmitter 395
32S-3 Transmitter 575
KWM-2 Xcvr 589
KWM-2 Xcvr with plug-in relay 689
516F-2 AC Supply 115
516E-2 28v DC 95
MP-1 DC Supply 119
302C-3 Wattmeter 80

R. L. DRAKE
1A Receiver $119
2C Receiver 189
2NT Xmtr. 99
SW-4A Receiver 225
R-4 Receiver 275
TR-3 Xcvr 375
T-4X Xmtr 299

EICO
753 Xcvr $129
751 AC Supply 49

ELMAC
AF-68 Xmtr $ 59
PMR-8 Receiver 79
PSR-612 DC Sup. 19

GLOBE/GALAXY/WRL
King 500A Xmtr $225
755 VFO 29
Galaxy V Xcvr 239
GT-550 Xcvr 349
AC-35/220 AC Sup 65
DC-35 DC Supply 69
G-1000 DC Sup 95
AC-400 AC Sup 75
SC-550 Speaker 19
UM-1 Modulator 29

GONSET
Comm I 6m $ 79
Comm III 6m 99
Comm IV 2m 199
GC-105 2m Xcvr 169
6m Linear II 49
6m Linear III 69
901A AC Supply 39
902A DC Supply 39
G-76 Xcvr 125
G-76 AC Supply 75
G-76 DC Supply 49
G-77 Xmtr 45
G-77A Xmtr 59
GSB-201 Mk IV Linear (Demo) 425

HALLICRAFTERS
SX-62B Receiver $275
SX-88 Receiver 389
S-95 Receiver 39
S-200 Receiver 49
SX-110 Receiver 99
SX-122 Receiver 225
SX-130 Receiver 139
HT-32A Xmtr 249
HT-32B Xmtr 299
HT-46 Xmtr 249
P-45 AC Supply 49
SR-150 Xcvr 289
SR-160 Xcvr 169
PS-150-120 AC 75
SR-500 Xcvr 225
P-500AC AC Sup 75
SR-46 6m Xcvr 89

HAMMARLUND
HQ-110 Receiver $119
HQ-110C Rec 129
HQ-110A Rec 159
HQ-150 Receiver 139
HQ-160 Receiver 189
HQ-170C Rec 179
HQ-170AC Rec 239
HQ-170AC (rack) 239
HQ-170AC/VHF 289
HQ-170A/VHF 279
HQ-180XE Rec 289
HQ-205 CB Xcvr 159
SP-600 Receiver 175
S-200 Speaker 15
HQ-205 Speaker 12

HEATHKIT
GR-64 Receiver $ 39
HR-20 Receiver 89
RX-1 Receiver 149
GD-125 Q-Mult. 12
MT-1 Xmtr 39
TX-1 Xmtr 115
SB-10 SSB Adaptor 75
HW-18 160m Xcvr 125
HA-20 6m Linear 99
HW-30 (Two'er) 34
HW-10 6m Xcvr 139
HP-29 AC Supply 29
HP-23 AC Supply 39
MP-1 DC Supply 29
AK-7 Speaker 6

HUNTER
2000A Linear $299

E. F. JOHNSON
Ranger I $ 89
Ranger II 139
Valiant I 139
SSB Adaptor 175
Audio Amplifier 49
6N2 VHF Xmtr 85

JUSTIN
Mobiltrans 40 (as-is) $ 39

KNIGHT
TR-106 6m Xcvr $ 89

LAFAYETTE
HE-45 Xcvr $ 59
HE-62 10m VFO 15
HA-410 10m Xcvr 89
HA-460 6m Xcvr 99
KT-320 Receiver 69
HA-700 Receiver 79

LAKESHORE
P-400GG Linear $ 99

LINEAR SYSTEMS
250AC AC Supply $ 49
350-12 DC Supply 75

NATIONAL
NC-190 Receiver $139
XCU-27 Calib. 15
XCU-50 Calib. 9
NCX-500 Xcvr 299
NCXA AC Supply 75
AC-500 AC Supply 75

RME
DB-23 Preselect $ 29
HF-1020 Converter (as-is) 10

SBE
SB1-VOX $ 15
SB2-MB Mount 9
SB-34 Xcvr 289
SB2-LA Linear 189
SB2-MIC Mike 9

SWAN
260 "Cygnet" $329
400 Xcvr 225
410C VFO 79
TV-2 Transverter (14Mc if) 199
TV-2 (50Mc if) 199
22 VFO Adaptor 15
Mark 6 Linear 395

UTICA
650A Xcvr/VFO $ 89

TECRAFT
Model 50 Criterion 6m Conv (14-18) $39

WATERS
3002 Ph. Patch $50

State 2nd & 3rd choices whenever possible.

NEW CLOSEOUT ITEMS

The items listed below are brand-new and carry the full manufacturers New Equipment Warranty. Some items have been on display, but most are Factory Sealed. Due to limited quantities of the following Close Out items, terms are CASH IN FULL WITH ORDER – NO TRADE!

		Reg.	NOW
AMECO			
TX-86 80-6m Transmitter - kit		$ 89	$ 45
TX-86 80-6m Transmitter - wired		119	60
CLEGG		Reg.	NOW
Allbander		$129	$ 99
Thor AC Supply/Modulator		139	99
418 Thor DC Supply/Modulator		159	119
Classic 614B Conv. (14.0-14.5Mc)		115	75
EICO		Reg.	NOW
HFT-92K AM-FM Tuner	kit	$ 64	$ 45
753 Transceiver	kit	149	134
751 AC Supply	kit	59	54
752 DC Supply	kit	59	54
752 DC Supply	wired	109	89
720 CW Transmitter	kit	89	69
FINCO		Reg.	NOW
A-62 6-2m Antenna		$ 33	$ 28
GALAXY/WRL		Reg.	NOW
RX-2 Special VFO (MARS)		$ 79	$ 59
RV-1 Remote VFO		59	54
2000 Linear w/AC Supply		495	395
Deluxe Console (will work with Galaxy III or V series)		99	75
SC-35 Speaker Console		20	18
CAL-35 100kc Calibrator		20	17
PSA-63 Power Supply kit		24	12
GAVIN		Reg.	NOW
Maverick II 6m Filter		$ 35	$ 25
HALLICRAFTERS		Reg.	NOW
SR-46 6m Transceiver - Demo		$189	$ 99
HY-GAIN		Reg.	NOW
2BDP Trapless fan (15,40,80m) Ant		$ 20	$ 10
SGP-6 6m Ground Plane		14	9
12RMK Roof Mount kit		9	4
DS-1 30-500Mc Discone		39	19
GP62 6-2m Ground Plane		20	14
SGP-10 10m Ground Plane		16	12
MW-6 Cowl mt. 6m Antenna		11	6
JOHNSON		Reg.	NOW
6N2 VFO wired		$ 54	$ 49
Messenger 202 10 watt AM Business Radio (26.62Mc)			100

	Reg.	NOW
LINEAR SYSTEMS		
Adcom 12-150 DC to AC Inverter	$	$ 50
Century 350-6 6v DC Supply	165	99
MORGAIN		
40/20m Dipole	$	$ 5
MOSLEY	Reg.	NOW
A-203C 3 el. 20m Beam	$142	$114
TW3X Jr 20,40,80m Trap Antenna	17	12
TD-3 40-10m Trap Dipole 1 KW	28	24
TD-3 Jr As above, but 300w	19	15
D4-BC-A 75/80m Base loading coil	19	9
NATIONAL	Reg.	NOW
HRO-500 Solid State Receiver	$1675	$1275
REGENCY	Reg.	NOW
AR-136 Flight Monitoradio Rec	$ 79	$ 49
TECRAFT	Reg.	NOW
TR-20/50 6m Xmtr (less supply)	$ 65	$ 49
Model 50 Criterion 6m Conv. (14-18)	54	45
Model 144 Criterion 2m conv. (14-18)	54	45
WATERS	Reg.	NOW
346 "Nuverter" 6 & 2m Converter	$175	$125
370-10 10m Loading Coil	12	8
370-11 11m Loading Coil	12	8
370-15 15m Loading Coil	13	8
370-20 20m Loading Coil	14	9
371-3 Wide Range Attenuator	39	34
358 Compreamp kit for 3001	20	10
354 Electronic vernier tuning for KWM-2	24	12
355 Elect. vernier tuning for KWM-2	22	11
349-27 Channelator MOD kit for S-line	20	10
369 Reflectometer	120	75
337-SI Q-Mult./Notch filter (75S-1)	40	25
340-PT Q-Mult./Notch filter (KWM-2)	59	38
335 Coax selector switch (1 pole-6 pos)	13	10
HAMMARLUND	Reg.	NOW
HQ-100AC Gen. Coverage Receiver	$199	$169
HQ-145AC Gen. Coverage Receiver	339	289
HQ-145AX (with 11 crystal freq.)	379	229
HQ-215 Solid State Receiver	529	429
SWAN	Reg.	NOW
TV-2 2m Xmting Conv. (14Mc if)	$295	$235

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80-15 Meters — 110vac/12vdc

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SB2-MB Mobile Mtg. Bracket..... 12.50
SB2-CW Codaptor..... 42.50
SB2-MIC Microphone..... 14.95

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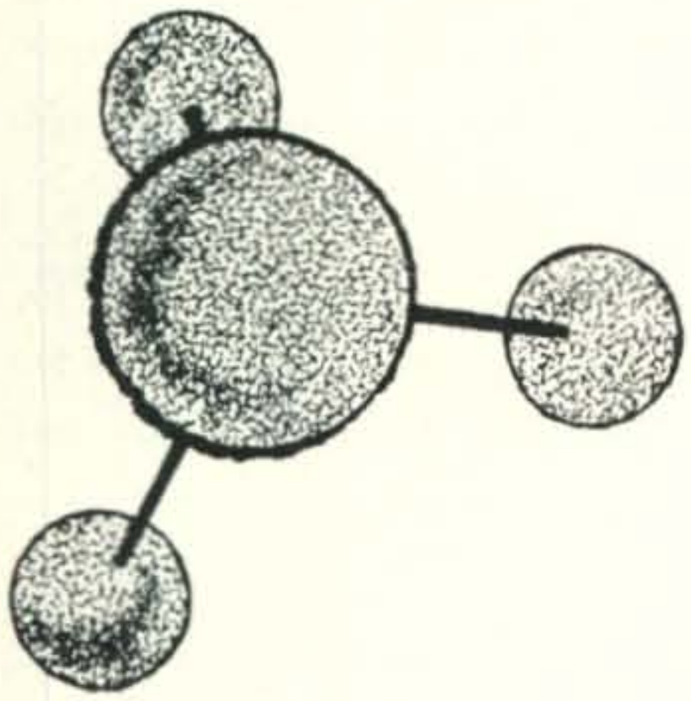
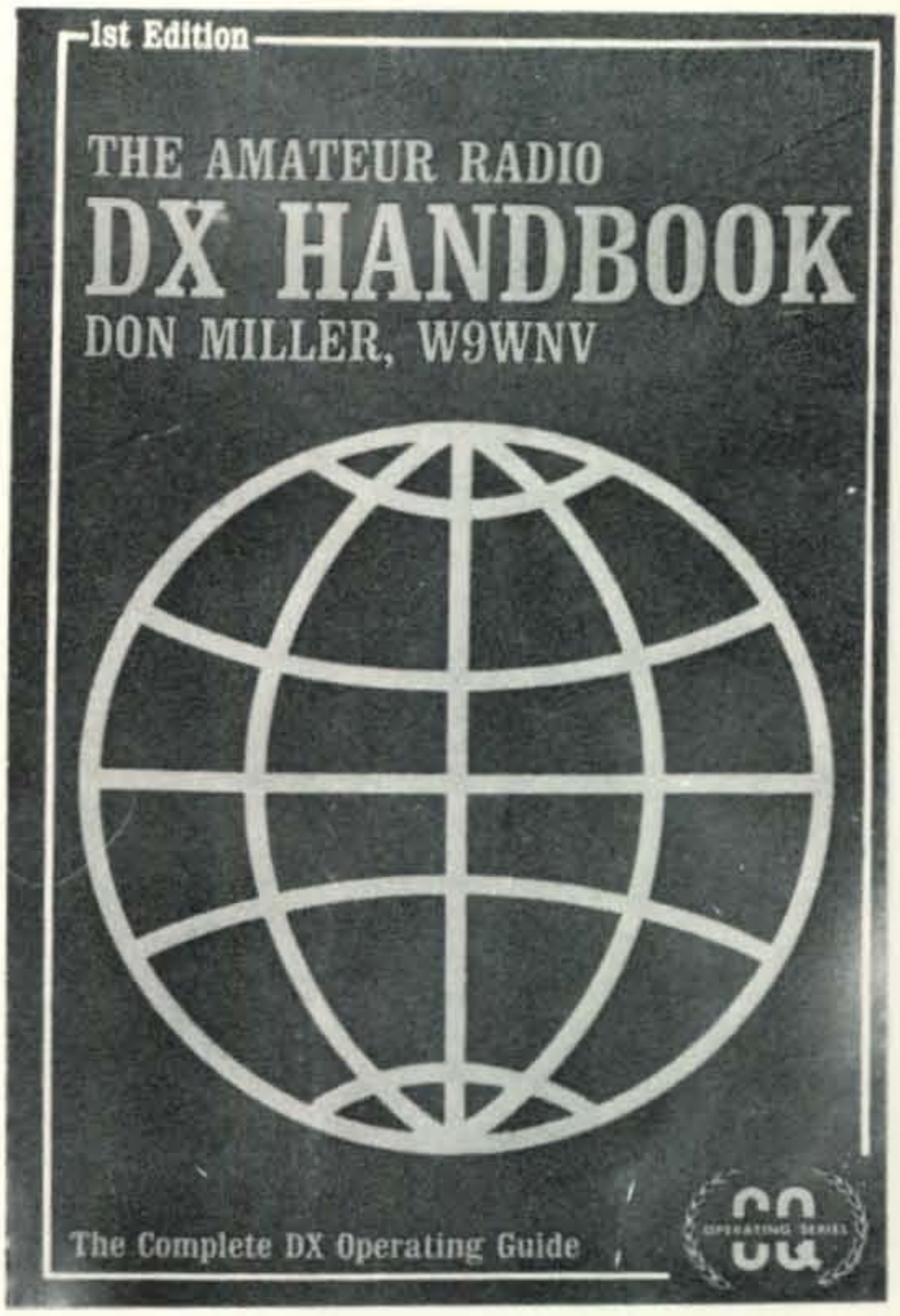


WHAT'S TO KNOW ?



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DX

BY JOHN A. ATTAWAY,* K4IIF

WE'VE found that a pleasant way to spend a cold winter weekend, now that football has vanished from TV, is digging out DX articles from the old issues of *CQ*. Here's some of the happenings DX-wise as reported in the February issues of a few years ago.

Dropping back 6 years to February, 1964, the big DX feature was entitled "Ahoy Aldabra, The Story of VQ9AA," by Gus Browning. It contained a solid three page chronicle of Gus's triumphs in putting Aldabra on the air for the first time in history. This was one of the high points of Gus's fantastic career. An excellent award for some DX club or magazine to sponsor would be a WAG Award, Worked All Gus, for contacting Gus at 100 locations. Endorsement stickers could be issued for each extra 10 and an Honor Roll maintained. This would be an interesting award all the guys could enjoy without worrying about country status of the DXCC committee. It would be timely as well, as Gus plans to be on the go again this spring.

Skipping on back to 1959, the February DX feature was "Zanzibar Hush-Hush" by African DX great Robby Robson, VQERR. It described the first DXpedition to activate VQ1 on s.s.b. The boys were using a ground plane, and their first 5 contacts were K6LAS, W6OBH, W6IAL, W6SJ, and W6UOU.

Dick Spenceley's column in the February, 1954 issue of *CQ* mentioned a lot of goodies. Evan, W6UXX, had just completed a short stint on Cocos Island as TI9UXX and given many of the gang a new one. VK3ACI was disembarking on MacQuarie Island to be the only ham there during 1954. His MacQuarie call was VK1CI. It was also reported that Chak, AC4NC, was putting consistent signals to the Caribbean around 1130 GMT on 20 meters, and that a station with the call ZA1-KAA would shortly be QRV from Albania. There's two we could certainly use today.

Returning even to February, 1949, the cover story of *CQ* (price 35¢, editor Larry LeKashman, W2IOP) was the creation of the Military Amateur Radio System (MARS). The DX column, edited by Herb Becker, W6-QD, featured a photo of FEARL phone DX test winner, JA2KG (ex-J2AHI), whose name by the way is Loyd Colvin, now known as W6KG. Also in the photo is a cute little XYL named Iris. That one should stir up a few memories. The WAZ Honor Roll of 21 years ago contains a lot of calls still prominent in DX affairs today. Among them were the North Jersey DX Associations W2BXA, who incidentally was the first winner of WAZ, W6VFR, W6ITA, W3GHD, W4BPD, W2-IOP, W6AM, W6DZZ, KH6IJ, and W6AOA.

Climb up in the attic and bring down some of those old *CQ's*. There's a lot of good reading for these cold February and March nights. Maybe you can stir up a few memories too.

New Location for W6 Bureau

After many, many years of service above and beyond the call of duty, the San Diego DX Club is no longer managing the 6 call area bureau. The job is now being handled by the Northern California DX club. California DXers should send their envelopes to Box 11, Los Altos, Calif. 94022. WB6KIG reports the transfer of over 100,000 cards from San Diego to the Bay area on moving day.

De Extra

This month we loan the soap box to Trace Levy, Jr., W4FRO, Editor of the Florida DX Report.

S.S.B. DX Honor Roll

WA2RAU 319	XE1NE 309	W8EVZ 293	K9PPX 270
W2TP 318	G8KS 307	K8ONV 293	G3WW 269
W9ILW 318	ZS6LW 307	F2MO 292	W9QLD 269
W3NKM 316	W5KUC 307	W2FXN 292	MP4BBW 267
DL9OH 315	W2ZX 305	K1IXG 288	W8BVF 266
VK3AHO 315	W4SSU 304	SM6CAS 286	G2PL 265
W2RGV 315	W6YMV 303	W2LV 286	WA6GLD 265
WA2IZS 315	OK1ADM 302	W6EUF 286	G2BVN 264
K6CYG/W6EL 315	W2BXA 302	K8RTW 286	W2FXE 264
W0QVZ/W0BW 315	W4IC 302	W9EXY 284	HP1JC 263
TI2HP 314	G3AWZ 301	W3KT 281	W2MJ 261
K6LGF 314	G3DO 301	W1LLF 280	W6PTS 260
W8DE 314	G6TA 301	W6UOU 280	W6WNE 259
WA8AJI 314	WA2EOQ 301	W3FWD 279	PJ2AA 258
W4NJF 313	W3DJZ 301	W4RLS 279	PAØEEM 256
W4QCW 313	G3HDA 300	K4OEI 279	CT1PK 254
I1AMU 312	VE3ACD 300	DL3RK 278	W6BAF 254
W4OPM 312	K1SHN 300	DL1IN 276	K6CAZ 254
K6YRA 311	W9JT 300	K4HYL 276	PAØSNG 252
G3FKM 310	5Z4ERR 298	W7DLR 276	K4GXO 252
KP4CL 310	K2DX 298	PZ1AX 274	VE6TP 251
SM5SB 310	W8BT 298	K9EAB 273	W8ILC 251
	KØUKN 298	K9LUI 273	W1AOL 250
	K8IKB 296	G3NUG 270	

Anyone who has not up-dated his countries total within the past year will be automatically dropped from the Honor Roll in the June, 1970 listing.

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

See page 110 for New Reader Service

The WPX Program

S.S.B.

476.....K4DSN
477.....JA1AG
478.....YO2AFB
479.....DL4QP
480.....DJ4XA

C.W.

980.....K4BBK
981.....JA1AG
982.....K3CRC
983.....OK2BIO
984.....OK1ABB
985.....K3JLI
986.....GI6YM
987.....WA3DSD

Mixed

218.....W1EQV
219.....JA1AG
220.....F3AT

Phone

182.....W1EGT
183.....F2VR
184.....F5JA

Endorsements

S.S.B.: W4NJF–750, HP1JC–600, W4IC–500, W8GKM–500, K2POA (21 Mc)–450, WA6TAX–350, K2JFE–300, K2POA (28 Mc)–300.

C.W.: W8LY–800, K1SHN–600, DJ4XA–500, JA1AG–500, W9FJX–450, K3JLI–350, and W6KHS–350.

Mixed: W4IC–700, DJ4XA–550, JA1AG–550, and F3AT–500.

Phone: W1EGT–600, I1YRK–500, and F5-JA–350.

Europe: DJ4XA, K4BBK, OK1ABB, and SM5ACQ.

Asia: DJ4XA.

Rules and application blanks for WPX and the WPX Honor Roll may be obtained by sending a self-addressed, stamped envelope to WPX Manager, 6563 Sapphire Drive, Jacksonville, Florida 32208.

The WPNX Program

Our new manager Jerry Hagen, WA6GLD, has authorized his first new winners. All you novices get busy and try for *CQ's* DX award for novices only.

15.....WN4KVN
16.....WN4HRA

"*The QSO Manager:* Used to be, all you had to worry about while chasing DX was QRM, QRN, QRNN, band opening, band closing, magnetic storms, and operator eccentricities. To be successful a large percentage of the time you had to have the best equipment and more than modest antennas. As far as c.w. operating is concerned, the game still has the same name. However, up on the phone bands the DXer faces a new and potentially lethal nemesis, the QSO Manager.

"While the QSL Manager has been with us for some time and has certainly proved his worth, the QSO Manager is a newcomer by comparison and those of us who prowl the phone bands regularly must look upon this recent fact of life with mixed emotions. He is a product of the times, and exists as an outgrowth of a technical innovation–the transceiver. I can think of no single development that has contributed more to the chaos of a s.s.b. pileup than the transceiver. One has to hear 2,000 callers plus or minus 10 Hz with speech compressors in gear and finals in overdrive to really appreciate what modern technology hath wrought. Hear the DX station? You can't even hear yourself think!

"If the pursued one sticks around long enough and hasn't given up in disgust he just might come back to someone. Usually its to Mr. BIG SIGNAL. But what happens after Mr. BIG has his QSO? You got it right–the same old pile now becomes somewhat larger. Getting the DX station to work them by call areas thins the pileup out a bit, but the language barrier often stops this plan cold. The DX station doesn't understand the procedure, and to him a W is a K is a WA is a WB and so it never gets to first base.

"So what happens with increasing regularity is the situation referred to as THE LIST. Mr. BIG, or someone who has an 'in' with the rare DX, prepares a list of stations who will work the rare one on sked or the next time he is on. The rare one is fed a series of calls, say 5 or so at a time, and the boys peel off a new one as their time comes around.

Arthur Robinson, G3MDW, Secretary of the Northern Heights Amateur Radio Society of Yorkshire, visits the 160 Meter DX station of W1BB/1. Arthur is an ardent 160 meter booster and has spread the word all over G-land with a tape talk and slides. *(Photo courtesy W1BB).*

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The WAZ Program

S.S.B. WAZ

741.....VE3RE
742.....VE3GMT
743.....LU8FAO
744.....CR6LF
745.....K6AHV
746.....W8JTD
747.....PY7AKW
748.....SP5CJT
749.....5H3KJ

Phone WAZ

430.....WØ0GW

C.W.—Phone WAZ

2804.....WA6IQM
2805.....W8IPA
2806.....WA3IKK
2807.....K3SGE
2808.....VE3DBT
2809.....SM2COR
2810.....SM3ABG
2811.....SM7SX
2812.....WA2HLH
2813.....WA9OVU
2814.....WB2NDI
2815.....W2MBU
2816.....YU3PL
2817.....VE3EDC
2818.....KØHUD
2819.....I1HL
2820.....K2QIL
2821.....G3JFC
2822.....OK1AMI
2823.....DJ5CQ

Complete rules and an application blank for WAZ may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, Fl. 33880.

Simple? Yes it is, as long as you are on THE LIST. But if you ain't, and for some reason you can't get in line to have your TS chit punched—you *will not* get worked.

"Politics? If for some personal reason the MC will not put you on THE LIST you are as good as dead and will have to QRX until some other station shows up from that area. The MC might be nurturing a grudge, protecting his numerical standings, or any of a number of reasons.

"The thing that makes the list system work is its single file order. No breakers please! Anyone breaking ranks or shouting out of turn will bring the wrath of the multitude down on his head. 'Get on THE LIST you bum,' 'Shut it up lid.' 'Back to the Novice band with you creep.' And those are mild compared to some of the comments this writer has heard.

"Like I said, potentially lethal. It can be the most frustrating thing in the world to sit and listen to one you need roll in at 40 over S9 while the list of those on the opposite coast can just tell he's in there and have to be told when to transmit. Tears stain the operating area and your ulcers get oak leaf clusters, but not a new one for you this day. You can have the world's finest equipment, speak 5 languages, and have an antenna farm which would make the VOA blush, but if you ain't on THE LIST you don't work him. You have better odds playing Russian roulette with an automatic.

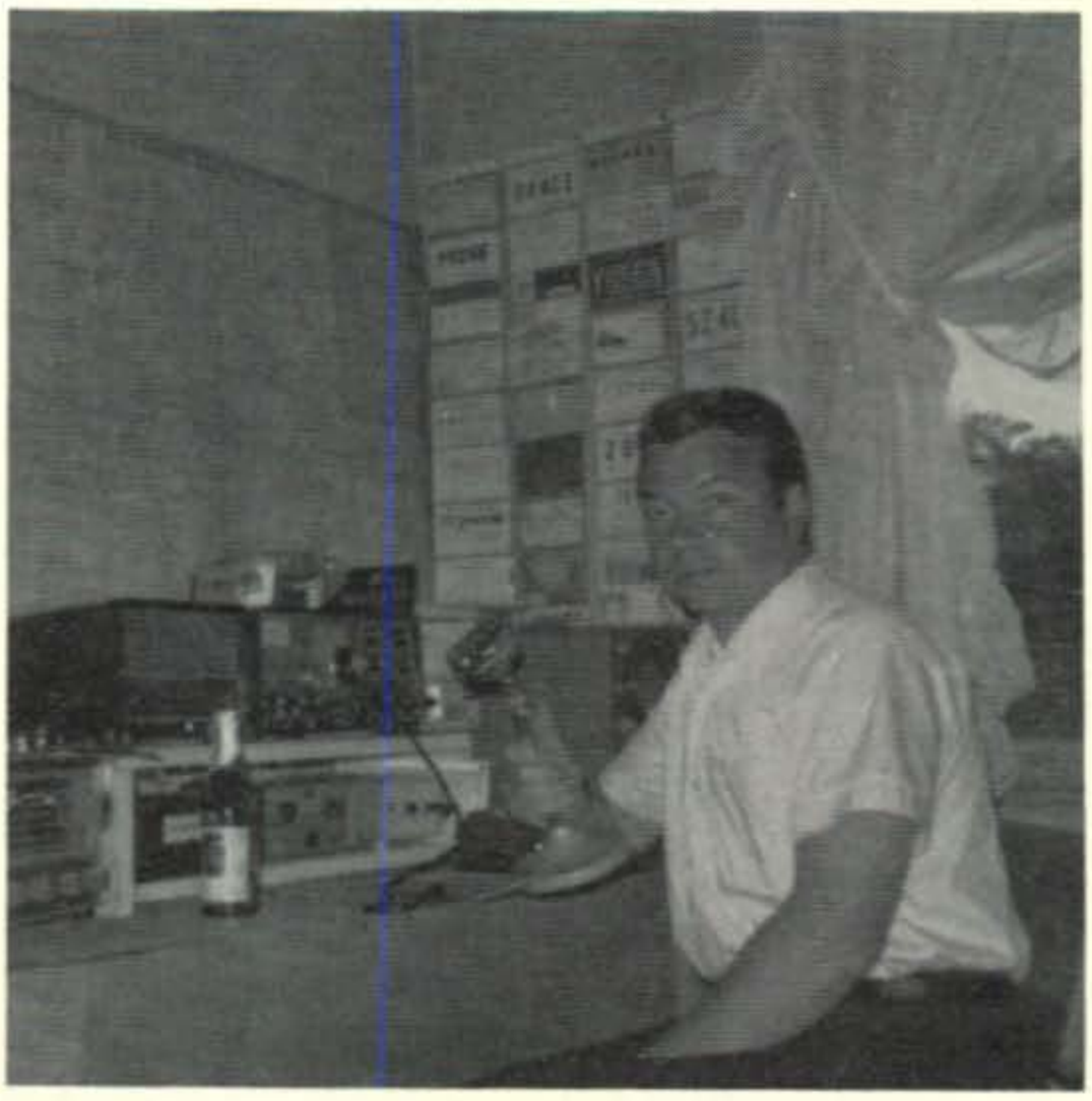
"The solution is to promote more split frequency operation. The best operators have the best chance when the split frequency system is used. Witness the HB9TL transceiver, which has a fixed transmitting frequency but a tunable receiver, used by FR7ZL/T and others. FR7ZL was able to work up to 30 per hour because he could keep order from his perch at 14125 even with a partial language barrier. On one frequency you have mob rule, but split those frequencies and you do away with regimentation and bring back old-fashioned competition. It would be good for amateur radio, and for DXing in particular."

Activity from the Rarest Zones

Zones 19, 23, and 34 seem to be giving the most trouble so here are a few reports which may help:

Zone 18—UAØQP, Dina, worked on 14044 kc c.w., UAØKZD, Lenik, worked on 14027 kc c.w., and UAØKFG worked on 21058 kc c.w.

Zone 23—JT1AG, Dambi, is very active on 20 meter s.s.b. both 0130-0300 GMT and 1400-1500 GMT. Popular frequencies are 14205 and 14210. Give your call letters and phonetics very clearly when working him. JT4KAB, also a good WPX catch, has been heard on 14030 kc c.w. at 1110 GMT. Al, UA9VH/JT1, has been very active around



A top German DXer, Eckart Dunker, DJ7XD, at the station of Henry, WB2ZGI, during his visit to New York last year. *(Photo courtesy WB2ZGI).*

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S.S.B. DX Award

100 Countries

609.....VE3GCS
610.....SM7CRW
611.....LA7JH
612.....WA6TAX
613.....W3TBF/8

Complete rules and an application blank for the S.S.B. DX Awards may be obtained by sending a self-addressed, stamped envelope to W8HDB, 3785 Susanna Drive, Cincinnati, Ohio 45239.

14205 kc between 0200 and 0300 and 1200-1400 GMT. QSL this OM to P.O. Box 639, Ulán Bator, Mongolia.

UAØYR is another s.s.b. catch. He has been reported on 14280 kc at 1250 GMT. UAØYT continues to be the most active c.w. station from Zone 23. The latest report places him on 14053 kc at 1415 GMT, but he is frequently heard any time the band is open to that part of the world. A special stationi said to be in Zone 23 is UKØA, worked on 14212 kc s.s.b.

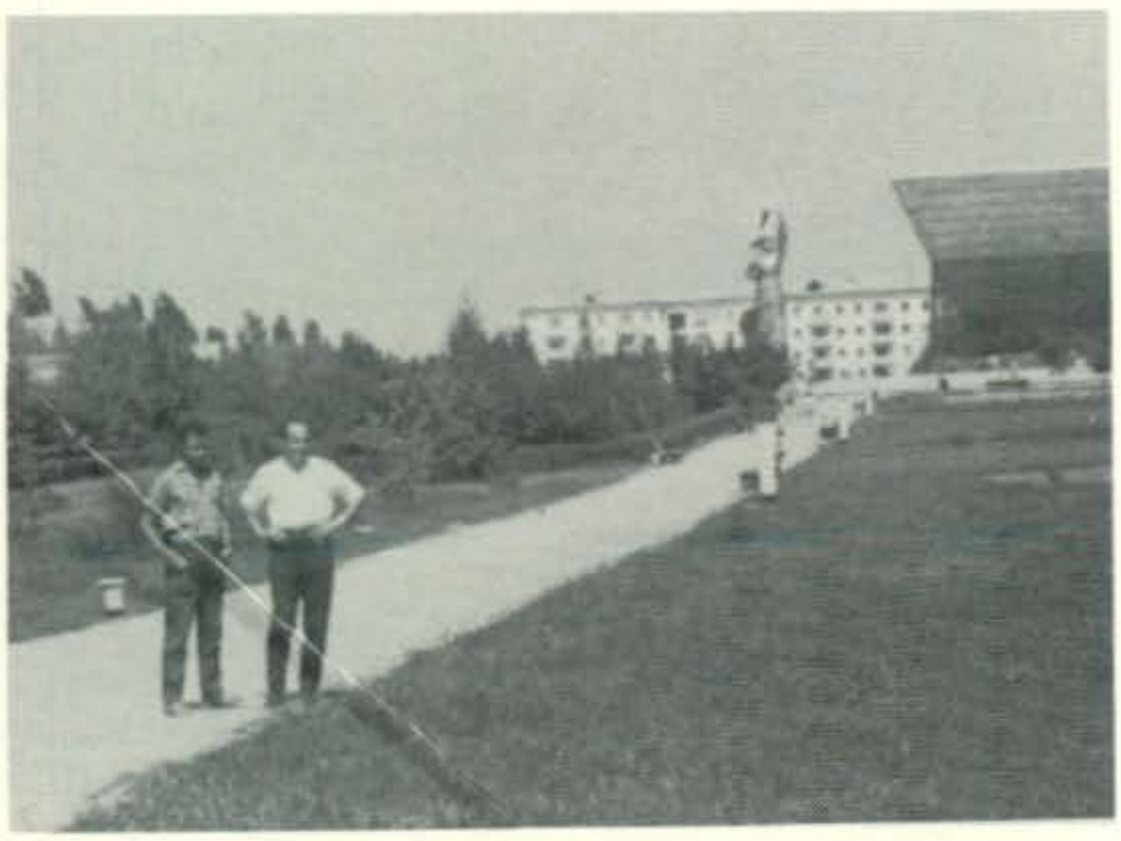
Zone 34–ST stations from the Sudan are rare, but Egyptian stations SU1IM, 14035 kc c.w. at 0300-0400 GMT and SU1MA, 14215 and 21230 kc a.m. at 0600 GMT continue to be moderately active. Activity from Libya is sporadic with 5A3TX a reasonably consistent performer near 21325 kc s.s.b.

Rare and Special Prefixes for WPX

CS and CU–These special prefixes may be used by Portuguese hams during future *CQ* DX contests.

GD5–GD5APJ has been active recently. QSL to F2QQ.

HG8–HG8QF was reported on 28647 kc at 1420 GMT.



Here are two very active eastern European DXers. On the left is Leon, SP5AFL, and on the right is Boris, UA6BV. *(Photo courtesy K4RON).*

JR1–JR prefixes are being assigned to newly licensed Japanese stations. JR1ARK and JR1-BPQ have been worked on s.s.b.

OK5–This rare Czech prefix is frequently activated by OK5ZMV on 20 meter c.w.

OL2–OL2AIO is workable by European DXers on 160 meter c.w. 1836 kc at 2250 GMT has been reported.

U4–U4L is a special traveling station in the USSR. He is active on both 15 & 20 meter c.w. and s.s.b.

U5–U5ARTEK is quite active. A recent report shows 14217 kc at 1240 GMT.

UK –UKØA is a special station reported QRV 14212 kc s.s.b.

VQØ–VQJ-400 was reported to be the special call of a station at the agricultural show in Honiara, Soloman Islands on Nov. 21-22, 1969.

3CA-3CZ–This is the new ITU series for Equatorial Guinea, formerly EAØ, Spanish Guinea.

3W8–Don, 3W8R, in Saigon has been heard around 14205 kc.

70 (7 Oscar)–This is the prefix for the new Republic of South Yemen. Raju, VU2NR, has plans to be on the air with a 70 call during the next year.

Rare Countries on S.S.B.

EA6, Balearic Island–Mateo, EA6BG, likes 21300-310 kc around 1300 GMT. QSL to W1RLV.

FR7, Reunion Island–Guy, FR7ZG, was reported on 14201 kc at 1730 GMT.

HC8, Galapagos–HC8GS frequents 14170 kc around 2300-0000 GMT. A QSO list is usually prepared by VE3IG.

OD5, Lebanon–Bob, OD5BZ, is quite active. QSLs should go via W8ZCQ.

SVØ, Rhodes–SVØWE and SVØWG are active from Rhodes in the Dodecanese. QSL to Box 6X, Voice of America, Rhodes.

TR8, Gabon–TR8MC is active on 20 meters, 14220 ±5 kc, at 2100 GMT. TR8AD has been worked on 21280 kc at 2130 GMT.

TU2, Ivory Coast–Dieter, TU2CS, likes 20 meter s.s.b. Look for him at 14200-210 around 2300 GMT. QSL to Box 1900, Abidjan, Ivory Coast.

VK9, Cocos-Keeling–VK9KY puts in good signals on 14200 kc at about 1300 GMT. QSL to VK2SG.

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VKØ, Heard Island–VKØHM comes through on 14200-210 kc about 1400 GMT. QSL to WA6EAM.

VP2, Anguilla–Mike, VP2EQ, is active from this rare island. QSL to WB2ZMK.

VP8, South Georgia–VP8JV, Bryan, is on s.s.b. daily from 2300 GMT. 14217 kc at 2300 GMT is a likely time and place.

VS5, Brunei–Listen for Erich, VS5PH, on 21330 from 15-1600 GMT (QSL to DL3RK) or VS6PM who skeds K6KA on 28690 kc at 2300 GMT on Tuesdays.

VS9, Maldive Islands–VS9MB activates 21 mc s.s.b. on weekends.

9M2, Malaysia–9M2DX, Tara, was reported on 14215 kc at 0000 GMT.

The Potomac Valley Radio Club

Our thanks to E. B. Redington, W4ZM, for this interesting story.

The concept of a radio club in the Washington area devoted to contests and operating activities was first discussed by amateurs at the Pentagon's Army Signal Center following the resumption of amateur radio in 1945. The result of those discussions was the creation of the Potomac Valley Radio Club (PVRC).

Not too many of these original founders are still with us. However, a few have withstood the erosion of time. Among them are W4KFC, W3GRF, and W3IN (ex-W3EIS).

PVRC is unique among amateur radio clubs in that we have no dues and membership is for life. Our alumni are scattered over the entire globe. Our active membership in the metropolitan Washington area now numbers about 65.

Our club meetings are singularly devoir of deadly, low-winded harangues over parliamented procedure and money matters. Instead we spend our time planning strategy for up-coming contests, entertaining our many visitors from DX-land, and discussing political or legislative activity affecting amateur redio.

We successfully campaigned for and elected W4IA as Roanoke Division ARRL Director in the early 50's, and repeated with W4KFC in this job in 1967. Two of our members, W4FF, have been Virginia SCM, and K3JYZ has held this position in the Maryland-DC section.

In addition to participation in all major contests as a club, we also enter many others as individuals. Among these are the All Asian

Phil Wight, VS6DR, visiting the club station at the University of Moscow during his recent visit to Russia. Thats Phil on the left wearing the tie. *(Photo courtesy VS6DR).*

contest, WAE, state QSO parties, CD parties, and countless others. In our 22 years of contest activities we have won many cups and top awards in the CQ Worldwide Phone and C.W. Contests, as well ase 16 Sweepstakes gavels and 6 ARRL DX Test gavels.

Once a year we hold a PVRC Reunion wherin all local members and alumni members contact as many of us as they can. This amounts to a junior sized Worldwide Contest since as many as 120 have participated from Taiwan to Germany and Alaska to the Canal Zone.

In addition, we hold a number of club activities of a social nature. These include our annual Christmas Party and our joint spring meeting with our friendly enemies the Frankford Radio Club. We support all national and division ARRL Conventions and the lesser local hamfests. Although PVRC is basically a contest minded group, we also participate heavily in the NTS and in other matters of general amateur interest.

PVRC meets on the first and third Mondays each of month, September through May, and amateurs visiting the Washington area are always welcome to meet with us. A telephone call to any of our local members will guarantee transportation to the meeting.

QSL Information

A2CAD–To W8TAN.
CN8DW–Via W6GZI.
CR8AI–Route via Darwin, Australia or to Portuguese Bureau.
EA6BG–W, K, VE to W1RLV, Europeans to DL7FT.
EA8GK–To K6GAK, 1088 Benjamin Place, El Cajon, Ca. 92020. (Send only a stamp, QSLs are too large for standard envelopes.)

[*Continued on page 94*]

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Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Jan. 30–	Feb. 2	Old Old Timers QSO Party
Jan. 31–	Feb.1	French C.W. Contest
Feb.	7-8	ARRL DX Phone Contest
Feb.	14-15	YL-OM Phone Contest
Feb.	14-15	QCWA QSO Party
Feb.	14 & 21	RTTY Flash Contest
Feb.	21-22	ARRL DX C.W. Contest
Feb. 28–	Mar. 1	French Phone Contest
Feb. 28–	Mar. 1	YL-OM C.W. Contest
Feb. 28–	Mar. 1	Operation's Day
Feb. 28–	Mar. 2	Vermont QSO Party
Feb. 28–	Mar. 15	IARC Propagation CW/RTTY
Mar.	7-8	ARRL DX Phone Contest
Mar.	14-15	Virginia QSO Party
Mar.	21-22	ARRL DX C.W. Contest
Mar. 28–	Apr. 18	IARC Propagation Phone
Apr.	4-5	Florida QSO Party
Apr.	**11-12**	**CQ WW WPX SSB Contest**
Apr.	18-19	Helvetia XXII Contest
Apr.	25-26	DARC WAE RTTY Contest
May	16-17	YL International SSB

ARRL DX Contest

Phone: February 7-8 and March 7-8
C.W. February 21-22 and March 21-22
Starts: 0001 GMT Saturday
Ends: 2359 GMT Sunday

This is the 36th running of this contest, and at two week-ends for each mode that's covering a lot of time.

All the DX stations will have their beams pointing to the USA and Canada and see how many W/Ks and VEs they can knock off.

The fellows on this side will send a signal report and their state or province. The DX stations will also send a signal report plus a 3 digit number indicating their power.

All the details and sample log forms appeared in the December issue of QST. Log forms, summary sheet and check off sheets are available from ARRL.

Mailing deadline for all reports is April 10th and they go to: ARRL Communications Dept., 225 Main Street, Newington, Conn. 06111.

YL-OM Contest

Phone: Feb. 14-15 *C.W.* Feb. 28-Mar. 1
Starts: 1800 GMT Saturday
Ends: 1800 GMT Sunday

Its the YL's working the OM's in this one. Use all bands, crossband or net contacts do not count.

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

Scoring: One point per contact, multiplied by total number of ARRL sections and countries worked. There is also a power multiplier of 1.25 for stations running 150 watts or less input. The same station may be contacted only *once* for QSO or multiplier credit.

Awards: Certificates to the high scoring YL and OM in each ARRL section and country. There are also 4 Trophies for the Top YL and OM in the contest, both on Phone and C.W.

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

Logs must be mailed no later than March 23rd and received by April 13th. This year they go to: Audrey Beyer, K5PFF, 6202 Reed Road, Houston, Texas 77017.

QCWA QSO Party

Starts: 2400 GMT Friday, February 13
7 P.M. EST Friday, February 13
Ends: 2400 GMT Sunday, February 15
7 P.M. EST Sunday, February 15

This year's party is sponsored by the Arizona Chapter. Only contacts with other members will count for the QCWA certificate and Plaque awarded by National Headquarters.

This is primarily a party to renew old acquaintances and see how many members can be contacted over a week-end. This year look for overseas members. To make it more interesting a simple scoring system has again been added.

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

Scoring: One point for each member contacted, multiply total by sum of states, Canadian

*14 Sherwood Road, Stamford, Conn. 06905.

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provinces, maritime mobiles and DX countries worked. (Repeat QSOs on more than one band do not count, nor do contacts with non-members.)

Frequencies: c.w.–3580, 7080, 14080, 21080, 28080. s.s.b.-a.m.–3980, 7280, 14280, 21380, 28580. RTTY–3595-3600, 7095-7100, 21070-21075, 28070-28075.

Awards: The QCWA Certificate to the leading stations and the QCWA Traveling Plaque to the overall winner. (To be retired by the station winning it three times.)

Mailing deadline is March 15th and this year logs go to: Harry Manning W7GDT, 1895 Grandview Road, Prescott, Arizona 86301.

Giant RTTY Flash Contest

Two Periods:
1500-2300 GMT February 14
1500-2300 GMT February 21

This is the second RTTY flash contest sponsored by *CQ Electronica* magazine of Bologna, and so called because of the short duration of the contest.

All bands, 3.5 thru 28 mc may be used. The ARRL country list and CPR zone boundries are the standards for scoring.

Exchange: RST and Zone number.

Points: Contacts with stations in own zone, 2 points. Contacts with other zones, score points as listed in Zone Exchange Point Table. The same station may be worked once on each band for QSO and Multiplier credit.

Multiplier: One for each country worked on each band. Own country cannot be counted.

Final Score: Total QSO points multiplied by the sum of countries from each band.

Awards: Gold medals and subscriptions to *CQ Electronica* to the leading scorers, stations using less than 100 watts, and s.w.l.'s

Use a separate log sheet for each band. Indicate time in GMT, call, number sent/received, country and exchange points.

Logs must be received by March 20th and go to: Prof. Franco Fanti, I1LCF, Via A. Dallolio 19, 40139 Bologna, Italy.

World RTTY Championship

The "*CQ Electronica*" magazine is also awarding a Plaque to the World RTTY Champion. Scores from the several RTTY contests, beginning with the 1969 BARTG contest, DARC, Sweepstakes, Alex. Volta and ending with the 1970 Giant Flash contest, will be totalled according to your position in those contests. It is not necessary for you to send in an entry. Check with Prof. Franco Fanti I1LCF if you think you might be eligible for an award.

Operation's Day

Starts: 1300 GMT Saturday, February 28
Ends: 0100 GMT Sunday, March 1

The cold winter weather we are now experiencing brings back pleasant memories of our trip through the balmy Caribbean islands last summer. Here are the XYL's of KP4CK, Alicia; W1WY, Anne; and KP4CB, Mary. Of course Alicia is better known in her own right as KP4CL.

The boys of the Colonie Central High School Radio Club will activate their club station WA2-DNR during the above period. A special QSL card will be sent to every contacted station.

The activity will be found in the center of the generals' portion of the phone and c.w. bands. And also on the following novice frequencies: 3725, 7175 and 21150 mc. Some 2 meter operation is also planned.

Send your QSL card to Colonie High School Radio Club, 100 Hackett Avenue, Albany, N.Y. 12205.

Vermont QSO Party

Starts: 2300 GMT Saturday, February 28
Ends: 0300 GMT Monday, March 2

The Central Vermont ARC again offers this opportunity to work one of the rarer states in its annual QSO party. The same station may be worked on each band for QSO and multiplier points.

Exchange: QSO nr., RS/RST and QTH. County for Vt., ARRL section for all others.

Scoring: Vermont stations, 1 point per QSO, multiply total by number of ARRL sections and countries worked.

Others, 3 points per QSO, multiply total by number of Vt. counties worked on *each* band. (max. of 14 per band. A very good rule, other states with a low low country total, take note.)

Frequencies: 3685, 3932, 3909, 7060, 7265, 7290, 14060, 14290, 14325, 21060, 21375, 28100, 28600, 50.260, 50.360, 144 thru 144.5, 145.8 and Novice frequencies.

Awards: Certificates to the top scorers in each ARRL section, 1st-4th places in Vermont and a special certificate for multi-operator stations. There are two Trophies, one for Vermont

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Claimed Scores
1969 CQ WW DX C.W. Contest

Single Operator
All Band

KH6RS	1,617,935
OH5SE	1,419,186
W3GRF	968,240
W6RR	915,204
W9LKJ	848,804
VK2BKM	817,884
HC2GG	795,405
W7IR	661,584
W7DI	483,832
W3MFJ	414,640

28 mc

4Z4BG	177,935
W3FU	69,064
K4KJN	58,230
JA9CAF	34,569
K8BPX	15,120
G2BW	13,550

21 mc

W4ZCY	193,050
ZL1IL	117,218
K6PUR	115,342
K2DDK	54,184
K4ORQ	49,056
W1MDO	48,540
JA4GAR	36,698

14 mc

SM4CMG	254,600
W1PYM	82,700
W5EQT	79,968
K6IH	45,390
W3KA	24,264
W2AIR	23,970
9V1PM	15,665

7 mc

W2DXL	94,374
VE3BMB	9,200
WA8CAL	9,150
LA3UF	3,116
WA8QJK	756

3.5 mc

K3UZE	17,442
W4SHX	15,435
W6ANN	6,688
W1SWX	4,680
OH5YF	170

1.8 mc

VE3BS	492

Multi-Operator
Single Transmitter

W9EXE	930,510

Multi-Operator
Multi-Transmitter

K8UDJ	1,748,939
K4BVD/6	1,332,943
XW8CR	1,329,120
WA3ATX	489,022

and the other for the Top out-of-state station.

Stations working 13 out of the 14 Vermont counties will also receive the "Worked Vermont" certificate.

Mailing deadline is March 31st to: CVARC, c/o E. Reg. Murray, K1MPN, 3 Hillcrest Drive, Montpelier, Vermont 05602. Include a s.a.s.e. for copy of results.

IARC Propagation Contest

CW/RTTY: Feb. 28 to March 15
Phone: March 28 to April 19
Starts: 0001 GMT. Ends: 2400 GMT.

The IARC calls this the "contest with a purpose." The objective being to work as many stations in as many different CPR Zones and IARC Countries as possible. (Country and Zone lists are available from the IARC)

Exchange: RS/RST plus your CPR Zone.

Points: Contacts between fixed stations 1 point, fixed to mobile 2 points, mobile to mobile 4 points.

Multiplier: One for each new Zone and one for each new country worked on each band and mode. The following will also count as multipliers, each state in continental USA, each province in Canada, and each Republic of the Soviet Union. (Own Zone may be worked for multiplier credit *only)*

Scoring: Multiply total points by the total countries and zones.

Awards: Certificates to winners in each category in each Zone. All entries with 100 or more contacts will receive a CPR Certificate of the appropriate class.

All bands may be used, 1.8 thru 28 mc. The same station may be worked as often and as long as you wish. When a contact exceeds 6 minutes, make a new log entry and take QSO credit for each additional 6 minutes.

Mailing deadline is June 1st and go to: L. M. Rundlett, IARC Contest, 2001 Eye Street, N. W., Washington, D.C. 20006.

SWL logs go to: Stewart Foster, G-10173, 68 Goldsmith Walk, Lincoln, Lincs. ENGLAND.

The IARC address for Country and Zone lists is P.O. Box 6, 1211 Geneva 20, Switzerland.

CQ World Wide WPX SSB Contest

Starts: 0000 GMT Saturday, April 11
Ends: 2400 GMT Sunday, April 12

Following is a brief rundown of the rules for the benefit of our overseas friends. They will be the same as last year with one new addition. As an experiment we are going to give *double* QSO point credit for contacts made on 40, 80 and 160 meter bands.

Basically the rules for this contest are the same as the well established WW contest in October, with the following exceptions:

1. QSO point values.

(a) 3 points between stations on different continents.

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

(c) 0 points for contacts between stations in the same country, but allowed for multiplier credits *only*.

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

(e) New addition: Contacts made on the 40, 80 and 160 meter bands will have *double* the above QSO point value.

2. Prefixes are used as the multiplier. (Not zones and countries) And a prefix may be counted only *once* in the contest.

3. There is a time limit for single operator stations. Only 30 hours out of the 48 hour contest period may be used for contest credit. The non-operating time can be taken in up to 5 periods, totaling 18 hours, anytime in the contest.

It is hoped that the increased QSO point credit will now give an incentive to operate the lower frequency bands. Complete rules in next month's issue.

Editor's Notes

Condition's for the c.w. week-end were not up to last month's phone contest. I also get the feeling that more and more the trend is to s.s.b. All those frequency restrictions have not helped either.

The listed claimed scores is only a cross-section of the few "early bird" logs received. Now to get to work on them.

73 for now, Frank, W1WY

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THE awards PROGRAM

BY ED HOPPER,* W2GT

THE February, "Story of The Month", about that mobileer, Bill Hilyerd, K4LRX after these commercials.

A USA-CA-3000 award, endorsed All A3A went to John Knaak, W5OYG. Mixed USA-CA-3000 awards went to K. D. Wilson, W7GKN/W6DIX; George Caron, W1EQ; and Dave Short, W5PWG (presently DL5-DA).

Corwin Arndt, WAØLRQ qualified for USA-CA-2500 endorsed All A3A. Mixed USA-CA-2500 awards were issued to: "Moby Dick" Brege, K8ODY and Jack Prichard, W9CNG. Mike Lintner (*H*ome *G*rown *V*egetables) WA3HGV stopped mobiling long enough to apply for USA-CA-2500; and All 14 mc A3A 2000, 1500, 1000, and 500.

Byron Lindley, WA3FED finally found time to send for: All A3A USA-CA-2000; All 14 mc A3A with Mobiles 1500, 1000 and 500.

Mixed USA-CA-2000 awards were sent to: Garry Hammond, VE3GCO; Tom O'Brien, WA6UZG; and Joe Slattery, W9DRL.

A USA-CA-1500 award endorsed All A3 also went to VE3GCO; and a USA-CA-1500 award All 2×s.s.b. found its way to Joe Ripp, WA9SKB. Mixed USA-CA-1500 awards were issued to WA6UZG and W9DRL. Geo. (Alex) Alexander, W4OWE qualified for All A-1 1500 and 1000 awards.

John Nelson, W6JHV received USA-CA-1000 and 500 awards and John had the thrill, while mobiling in Sweetgrass County, Montana, of giving county #3079 to Phil Carlson, WAØEVO. Glad to hear from Stokley Benson, WAØFRM who desired a USA-CA-1000 award.

The first award to Austria was won by Eugene Goffriller, OE3EGL and it was endorsed All Mixed 2×s.s.b. Bertha Swenson (Bless those Gals), KØITP requested a USA-CA-500 award endorsed All A-3.

SPECIAL HONOR ROLL
ALL 3079 COUNTIES

1. K9EAB	8-14-65	8. K8IWI	5-2-69
(Deceased 11-1-69)		9. K8KOM	5-13-69
2. WØMCX/WØBK	11-9-65	10. WA5AEB	5-21-69
3. K8CIR	10-10-66	11. WAØEVO	6-26-69
4. W2QHH	10-4-67	12. W2JWK	8-14-69
5. WØJWD/WØBL	10-13-67	13. K4LSP	8-29-69
6. WØGYM	4-4-68	14. W8UMR	9-13-69
7. K1QZV	11-2-68	15. W4YWX	10-1-69
		16. W7KOI	10-7-69

William L. Hilyerd, K4LRX

Bill is 28 years old and married, but with no junior ops as this is being written, Hi.

In 1956, at the age of 15, an interest in ham radio was born. Working with 30 watts, a BC-454 receiver and long wire antenna, 15 meters only, all states were worked then DX chasing brought 175 countries, WAZ and other awards.

Mobileer Bill Hilyerd, K4LRX.

*103 Whitman St., Rochelle Park, N.J. 07662.

See page 110 for New Reader Service

USA-CA HONOR ROLL

3000

W5OYG 30
W7GKN/W6DIX 31
W1EQ 32
W5PWG 33

2500

K8ODY 59
WAØLRQ 60
W9CNG 61
WA3HGV 62

2000

WA3FED 84
VE3GCO 85
WA6UZG 86
W9DRL 87
WA3HGV 88

1500

WA3FED 118
VE3GCO 119
WA9SKB 120
W4ØWE 121
WA6UZG 122
W9DRL 123
WA3HGV 124

1000

WA0FRM 181
WA3FED 182
W6JHV 183
W4ØWE 184
WA3HGV 185

500

OE3EGL 754
WA3FED 755
W6JHV 756
KØITP 757
WA3HGV 758

Bill works as a broadcast engineer for WEHT TV, Channel 25 in Evansville, Indiana, mostly on the night shift at the transmitter, where he has been for the past two years.

Prior to this, Bill was on active duty in Uncle Sams Army; which was preceded by 5 years in the Kentucky Education TV System. He holds a First Class Radio Telephone License and a degree in Electronics Technology.

Being attached to an Army Reserve Unit in Louisville, Kentucky, Bill does a lot of traveling and mobiling and has given out over 40 Kentucky counties.

Bill often remarks that he is mobile in a sardine can, the reason being that the car is an Opel Kadett L, 60 horse power, 4 cylinder mini-brute. Crowded in with him are his maps, books, log books and HW-32. The antenna is a hustler.

Bill got interested in County Hunting about two years ago and has been *gung ho* ever since. In addition to giving out so many rare Kentucky counties, he has also succeeded in collecting well over 1500 counties for himself.

Letters

Don Schmidt, WAØJRZ and Vic Clarence, WØGYM, write: "The County Hunter Convention of November 15 at Omaha, Nebraska is now history. Over 20 amateurs were in attendance including: WAØWOB, WØSJR, WØGYM, KØTVY, WAØKGD, VE3DXZ, VE3DTO, WAØDCQ, WAØSHE, WAØPJX, KØIFL, K9KKX, WAØKQQ, K8DCR, WØYLN, WAØMQM, WAØYQA, WØRMG, and WAØJRZ. Some arrived Friday, in fact we worked 75 meters with mobiles like WAØDCQ, WØSJR and WAØWOB until 2 a.m.

We had a small dinner on Saturday evening with a small chat session later. We all had a very good time and are looking forward to the National Get-Together in June at Knoxville, Tennessee.

Many things were discussed and we are hoping to soon issue an Award for working a certain number of the County Hunters who have reached the 3079 goal. Hope you will list the 16 who have already qualified including their number and date of qualifying.

Wet are open to suggestions regarding the AWARD, especially a suitable name."

Bill Todd, K4ISE, writes: "Here is some data regarding the meeting of the East Coast Chapter of the Independent County Hunters Association. Had hoped to send a foto, but have not received one.

The group met in Fayetteville the weekend of 14-16 November, with headquarters in Room 303 of the Holiday Inn. Long distance travelers included George, W1EQ and George, K8VSL. Others attending included Gil, W4IZR; Paul, W4YXW; Vic, W4EXI; Kent, W4KRE; Steve, K3LXN; Dick, WA4OIV; John, K4ZLE; Andy, K4BXU; and Bill, K4ISE. Several XYLs and harmonics also made the trip. Door prizes were donated by Black and Decker Mfg., Co., Eastern Radio Supply Inc., and Southeastern Radio Supply Co., Inc., all of Fayetteville.

Thanks for data on *303 Award* in December 1969 *CQ*, more data will be given out over the air via the Net.

The 1970 National Convention for the Independent County Hunters Association will be held in Knoxville, Tennessee the weekend of July 4-5, more details later."

Awards

Lincoln Century Award: This award is issued by the Lincoln Short Wave Club to any Amateur or s.w.l. No date limit for contacts. Endorsements AOMB/M. Top Class and Multiple Endorsement Rules Apply. Cost is 7/6; $1.00 U.S.; or 10 IRCs. Issued in 5 Classes. Class E for 100 points; D for 200 points; C for 300 points; B for 400 points; and A for 500 points. Points: Stations worked (or heard) in the *City* of *Lincoln*, England, or in any other town/city called *Lincoln*—20

Lincoln Century Award

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points each station. Stations worked (or heard) in the County of *Lincolnshire,* England, or any *Lincoln* County of the U.S.A.—10 points each station. Lincoln Short Wave Station G3IXH—30 points. Note—v.h.f. contacts count *double* points. Send fee with GCR list of QSLs (with exact QTHs of all *Lincoln* stations) to: Stewart Foster, 68 Goldsmith Walk, Lincoln, England. (Note—U.S. hams and s.w.l.s can obtain this award purely with stations in Lincoln towns/counties of the U.S.)

San Antonio Radio Club Award: This certificate is issued by the San Antonio Radio Club of Texas, for contacting stations in San Antonio. No time, mode or band limitations. 1. DX stations (including KH6, KL7) contact 5, including 2 members of SARC. 2. U.S. stations contact 10, including 3 members of SARC. 3. Bexar County stations contact 25, including 10 members of SARC. 4. Contacts with the Club station W5SC will count double. 5. Certificates endorsed all one mode/band or mixed; each counts as separate award. MER rule applies. 6. Charge 50 cents to W-K stations; no charge to DX stations. 7. QSLs not required, but San Antonio stations must have received applicant's QSL. 8. Also available to s.w.l.s on heard basis. Send GCR list and full log data to San Antonio Radio Club Awards Manager, 100 N. Winston Lane, San Antonio 13, Texas.

Worked All Britain Award: This major award has been instituted in Britain by the Channock Chase Amateur Radio Society and compiled by G3ABG, the Award Manager. Amateurs outside the United Kingdom contact 300 of the 3970 Areas of Britain in 30 of the 98 UK Counties for the Basic Award. QSOs since 1-1-46 count and any bands or modes may be used. (Band/mode endorsements are available). Contacts using previous calls will also count if log data is available. UK Areas are based on the National Grid 10 kilometer squares into which Britain was mapped by the Ordnance Survey System. A special *"Worked All Britain" Record Book,* 144 pages, is available from John Morris, G3ABG, Awards Manager, 24 Walhouse Street, Cannock, Staffs., England. The Record Book costs $1.50 (postage paid), it contains a complete list of the reference numbers of the 3970 Areas and a gazetteer listing all the towns and large villages in each Area. The Book also contains check sheets and an application for

San Antonio Radio Club Award

claiming the Award. The Record Book is NOT returned to Britain. The Basic W.A.B. Award is a certificate based on the Union Jack flag with red, white and blue seals for the higher Bronze, Silver and Gold Awards (for 1000 Areas). QSLs must be available but only a GCR List is sent with the application. WAB/LF, WAB/HF and WAB/VHF Contests are planned very soon. G3ABG will supply the AREA Nr. of any UK amateur on receipt of an IRC. Any profits from this Award will be donated to the Radio Amateur Invalid & Bedfast Club and the RSGB QSL Bureau. No individual will be paid for his services. By popular demand the **Heard All Britain Award** is also being issued, the same Record Book is used, but as it is a big problem to get 300 QSLs from UK stations for USA s.w.l.s, applicants for H.A.B. Award need not have the QSLs for the UK stations actually heard competing in W.A.B. Contests. Ron, G4CP is W.A.B. Contest Manager and is making elaborate plans for the first Contest.

Notes

Greatly enjoyed a visit by Nob, JA1EL (Awards Chairman of *CQ Ham Radio* of Japan), and Gun, JA1BMI/W2.

A belated *Thanks* to Hans Bahr, DJ2UU

Worked All Britian Award

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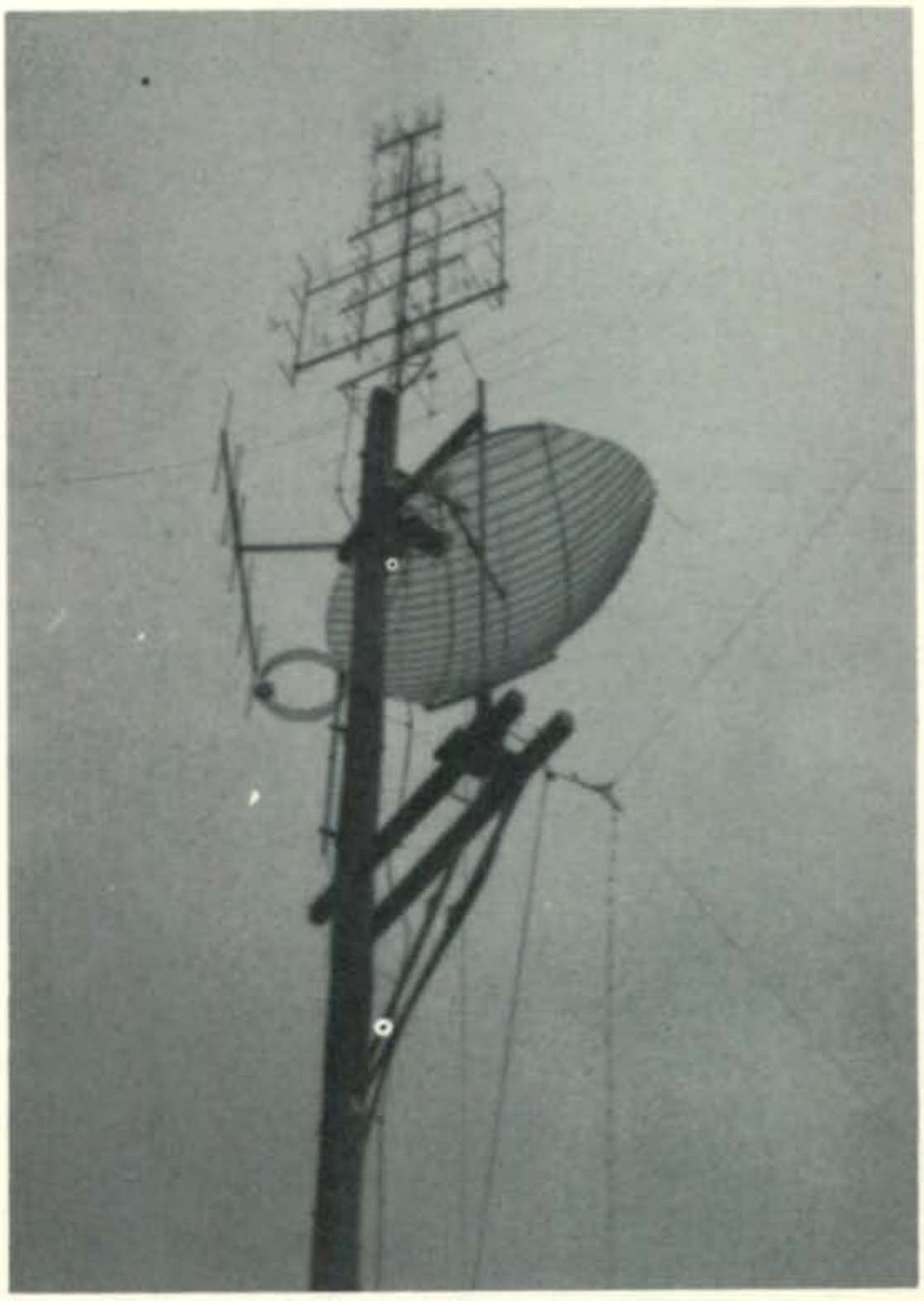
VHF TODAY

BY ALLEN KATZ,* K2UYH

WE spent an interesting few hours not too long ago rereading some old VHF COLUMNS. It was startling to see the enormous changes that have occurred in v.h.f. radio during the past few years. With propagation, knowledgewise, the changes are particularly significant. It was not that long ago that the existance of E Skip on two meters was questioned. Neither was it known four years ago if aurora propagation extended to 432 mc. In Frank Jones' *VHF Handbook* it is stated that the possibility of aurora being useful on 432 mc is highly unlikely. Aurora contacts are now made fairly often on 432 mc. Although extended trophospheric propagation has been believed to exist on 1296 for some time, it was only this past summer that reports of contacts via this mode started to appear.

*66 Skytop Road, Cedar Grove, N.J. 07009.

Some of K2ACQ's 432 mc QSL cards. Doug now has 23 states on 432 mc. What next, M.S.?



The W9JIY antenna system as of April 4, 1969. From top to bottom; 64 element colinear for 1296; 32 element colinear for 432 mc; 12 element colinear for 144 mc; 5 element yagi (vertical) for 146 mc; Halo for 50 mc; 7¼' dish for 1296; center fed dipole for the lower bands with tuned feeders for 75 through 10 meters. The top antenna is 70' high, the center of the dish is 43' high. The 432 mc colinear and the dish use 1¼" Helrax. The dish is screened with 1/4" hardware cloths. It uses a single element quad with plane reflector for feed.

Meteor scatter is another "questionable" v.h.f. propagation. In 1955 the applicability of meteor scatter for 144 mc communication was still being debated. Only last year the first 220 meteor scatter contacts were made. Now the possibility of 432 mc meteor scatter has become a subject of debate.

432 MS?

The existance of MS propagation on 432 mc (along with the already known auroral effects) could turn 432 mc DXing from a mainly seasonal activity (summer and fall) to a year around sport. The results of commercial and military radar studies, however, make this prospect look quite dim. These studies show echo rates to decrease very sharply with frequency. It is interesting to

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note that the above mentioned radar results do not correspond to the observations of amateurs who have tried meteor scatter on 220. Talks with K2CBA, who made one of the first 220 mc MS contacts, revealed that MS signals on 220 were not that much weaker that those on 2 meters.

Our conversations with Jud prompted us to do some research on meteor scatter theory. We discovered that meteor scatter is a rather complicated phenomena and that all the experts do not agree on what is happening.

Brown and Lovell suggest that the intensity of meteor reflections are inversely proportional to the frequency cubed for constant gain antennas.[1] This means for antennas of constant aperature (size), since an antenna's gain is proportional to the square of the frequency, the strength of MS signals should increase linearly with frequency. In general the size of amateur antennas used on the u.h.f. bands are smaller than their v.h.f. counter parts. Thus in practice, one would expect slightly weaker MS signals on 432 when compared to signals on 220 or 144 mc. The signal duration predicted, however, is inversely proportional to the square of the frequency. Hence, a meteor burst on 432 mc should be 1/9 the duration of the same burst on 144 mc—if Lovell and Brown's assumptions are correct. This all means that burst duration, not signal strength, should be the limiting factor on 432 mc. Most of the short bursts used for exchange of information on two meters would be lost on 432 mc. Only long over dense bursts would be of value at 432.

Eshleman suggests contrictary conditions.[2] He predicts that for constant gain antennas signal strength should decrease as the 6th power of frequency. Consequently, even with constant sized antennas, signal strengths on 432 mc would be 10 db weaker than those on 2 meters. As for signal duration, he indicates that it should increase linearity with frequency—that is bursts should be longer on 432 mc than they are on 220 and 144 mc.

By either model, the oblique angled reflections used for point-to-point amateur

[*Continued on page 99*]

[1]Brown and Lovell, *The Exploration of Space by Radio,* pp 135-167, John Wiley and Son, New York, (1958).

[2]D. H. Menzel, Ed., *The Radio Noise Spectrum,* pp 49-78, Harvard Univ. Press, (1960).

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A MUST FOR EVERY DXER

DX AWARDS LOG

This fabulous book sells for $3.95 anywhere in the U.S. and is available for immediate delivery from the CQ Technical Library. However, with any subscription to CQ you can obtain a copy of the *DX Awards Log* for just $1.50 (a $2.45 savings). To obtain your DX Log at the discount price it must accompany a subscription order to CQ, but that order can be for renewals or extensions as well as for new subscriptions.

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The *DX Awards Log* required over two years preparation in order to contact radio clubs throughout the world for the latest data on awards currently being offered. It is the most complete and up-to-date source for such information. It will be invaluable to the "wallpaper collector" as well as any amateur of SWL making DX contacts.

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Propagation

BY GEORGE JACOBS,* W3ASK

As a result of declining sunspot activity and seasonal changes in h.f. propagation conditions, considerably fewer 10 meter DX openings are forecast for February. Some good openings are still expected to occur, however, during the daylight hours.

The 15 meter band is expected to be the best band for world-wide DX propagation conditions during the daylight hours. Excellent openings are predicted to almost all areas of the world, with generally strong signals and little fading or noise. The band should open shortly after sunrise, and remain open to some areas of the world through the late afternoon and early evening hours.

Good DX openings to almost every corner of the world are also forecast for 20 meters from dawn through the evening hours. To some areas of the world, 20 meters is expected to remain open through the hours of darkness as well.

Fairly good DX propagation conditions are expected on the 40 meter band from late afternoon, and continuing through the hours of darkness until shortly after sunrise. Signal levels should be high during many DX openings on this band.

A seasonal increase in static levels is expected to result in somewhat poorer DX propagation conditions on 80 meters during February. Some fairly good openings, however, are forecast during the hours of darkness.

An occasional DX opening may also be possible on the 160 meter band during the hours of darkness and the sunrise period, especially on nights when static levels are low.

Beginning during early February and continuing through March and early April, a noticeable seasonal improvement usually takes place in high frequency propagation conditions between the northern and southern hemispheres. This should result in somewhat better openings during February between the USA and South America, Africa, Australasia, Oceania, parts of Asia and the Antarctic than was observed during the earlier winter months. This improvement is expected to be noticeable on all h.f. bands between 10 and 160 meters.

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

LAST MINUTE FORECAST

Feb. 1 through March 15, 1970

	Forecast Rating & Quality			
Days	(4)	(3)	(2)	(1)
Above Normal: Feb. 4, 8, 12, 24-25. Mar. 4, 8, 12.			B-C	C
Normal: Feb. 3, 5-7, 9-11, 13, 15-18, 20, 22, 26, 28. Mar. 3, 5-7, 9, 11, 13.	A-B	B-C	C-D	D-E
Below Normal: Feb. 1-2, 14, 19, 22, 27. Mar. 1-2, 10, 14-15.	C	D	D	E
Disturbed: February 21.	D	E	E	E

How To Use These Charts

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

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

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

On the "Short-Skip" Chart where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

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

4—This month's DX Propogation Charts are based upon a transmitter power of 250 watts c.w.; 500 watts s.s.b., or 100 watts d.s.b., into a dipole antenna a quarter-wave above ground on 160 and 80 meters a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

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

6—The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9, and 0 areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid from February 15, 1970 through April 15, 1970 and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences And Aeronomy of the U.S. Dept. of Commerce, Boulder, Colorado.

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Sunspot Cycle

A monthly mean sunspot number of 88 was reported for November, 1969 by the Swiss Federal Solar Observatory, the world's official keeper of sunspot numbers. This results in a running smoothed sunspot number of 103 centered on May, 1969. A smoothed sunspot number of 92 is forecast for February, 1970 as the present sunspot cycle appears to be declining at a slightly faster rate.

V.H.F. Ionospheric Openings

Auroral displays generally occur more frequently during February than during the earlier winter months. During such displays there is a tendency for ionospheric or radio storms to develop. While these storms may disrupt propagation conditions on the h.f. bands, they often also result in unusual short-skip openings being possible on the v.h.f. bands. Such openings, generally over distances ranging up to approximately 1300 miles, take place on 10, 6 and 2 meters by way of reflection from the ionized regions produced by the auroral displays. Check the "Last Minute Forecast" appearing at the beginning of this column for those days that are likely to be disturbed or below normal during February. These are the days on which v.h.f. auroral-type openings are most likely to occur.

No significant meteor showers are expected during February, and few, if any meteor-type v.h.f. ionospheric openings are likely to occur during the month.

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

An occasional 6 meter F-layer opening may be possible between the southern area of the USA and points in the southern hemisphere during the noon and post noon hours during February. Some trans-equatorial (TE) openings are likely to be possible during the evening hours, between approximately 8 and 11 p.m., local time, on 6 meters.

This month's *Propagation Charts* contain band opening predictions for major DX paths for the period February 15 through April 15, 1970. A short-skip propagation forecast for February appeared in last month's column. Instructions for the proper use of the *Propagation Charts* appear directly below the "Last Minute Forecast" at the beginning of this column. ■

February 15–April 15, 1970

TIME ZONE: EST (24-Hour Time)

EASTERN USA TO:

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

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

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

TIME ZONES: CST & MST (24-Hour Time)

CENTRAL USA TO:

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

TIME ZONE: PST (24-Hour Time)

WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Europe & North Africa	08-11 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-14 (1) 19-21 (1)	00-06 (1) 06-09 (2) 09-11 (1) 11-13 (2) 13-15 (3) 15-17 (2) 17-22 (1) 22-00 (2)	19-20 (1) 20-22 (2) 22-00 (1) 20-22 (1)*

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Q AND A

BY WILFRED M. SCHERER,* W2AEF

Manuals

To those who forwarded manuals or offered zerox'd copies thereof in response to the appeal in last month's column, we express our thanks on behalf of those needing such data. More information is still needed, however, on the Morrow units.

Mr. A. R. Damrauskas, W9GXH, Customer Relations Manager, Hallicrafters, 5th and Kostner Ave., Chicago, Illinois 60624, who also forwarded some requested data on the SP-44 Panadapter, informed us as follows:

"A stock of most of the manuals for most of our models is maintained in our Service Department and you can advise your readers that they can write for the availability and price. The model number should be provided. The cost ranges from $.50 to $3.00 per manual, depending upon the extent of the literature. This is to cover our printing and handling costs."

Drift and Mic Gain in HW-100

QUESTION: I am having some problems with a Heath HW-100 transceiver. First, the warm-up drift on the v.f.o. is about 4 kc from a cold start, stabilizing in about one hour. Having to constantly retune during this time is irrating. Is this amount or drift normal for this rig?

Secondly, what can be done to increase the output from the speech section? The mic gain must be turned to near maximum to obtain normal output.

ANSWER: From our experience, the above amount of drift in the HW-100 is not a normal condition. A problem like this is difficult to diagnose by "remote control," assuming that the assembly has been correctly made with the proper component values, the cause of the trouble may be one of the following:

Defective f.e.t., Q_{941} (osc.); defective 6AU6/(osc. amp.), defective zener Q_{942} (regulator), Defective or wrong components at C_{944}, C_{945}, C_{946}, C_{947}, C_{948}, C_{951}, C_{953}. If the problem exists in only the l.s.b. position, C_{945} or CR_{941} (switching diode) might be the suspects.

If you have to tune lower in frequency (dial reading) to keep a signal tuned in, the conversion scheme in the HW-100 is such that the v.f.o. is drifting lower in frequency. Compensation with an additional negative temperature-coefficient capacitance (about 3 mmf) might help at one of these points, particularly at C_{951}.

The v.f.o. trimmer, C_{950A}, is a compression type. If the adjustment is screwed up too tightly, the problem could exist here. A realignment with the adjustment screw backed out a way may therefore be needed.

Make sure the hetrodyning crystal-oscillator circuits are properly adjusted. The trouble could be here. This might be checked by noting if the same drift occurs on all bands. Also, make certain the regulator tube, V_{18}, is operating properly (it should show pinkish glow and hold the potential to plus 150 volts. Make sure Q_{941} and Q_{942} are not resting against the chassis or other components.

As for the mic gain, this also is normally okay, and since you have indicated that the transmitter output is normal (although the mic gain must be turned to *near* maximum), why worry about it as long as the r.f. output from the transmitter is adequate. The gain should be sufficient as long as the meter starts to kick the a.l.c. reading a bit.

If you still think you have a problem here. check your wiring and the component values, particularly in relation to the mic amplifier, V_1. If you have enough gain to trip the v.o.x., V_{1A} should be okay and the trouble might be at V_{1B}. Try another tube here.

The preselector-tuning changes slightly between the receive and transmit positions, therefore peak the preselector for maximum output on transmit, rather than maximum signal on receive. A way to correct this condition has been described in *QST*, Nov. 1968, p. 50 under Hints & Kinks, SB-101 Improvements (also applies to HW-100).

Also make sure these circuits are properly aligned, that the mic is okay and properly matches the speech-amplifier input. If you still want more gain, the use of an external

*Technical Director, *CQ*.

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pre-amp should do the trick. Such jobs are the Waters Compreamp, the Raytrack Compressor, etc.

60 kc I.F. Transformers

QUESTION: Is there a 60 kc i.f. transformer on the market that I can buy, or is there a way to pad a transformer down to 60 kc? I tried padding a 100 kc transformer to 60 kc and no matter what I did, the closest I could get was 63 kc.

ANSWER: We do not know of any stock transpossible to pad a 100 kc job down to 60 kc formers for 60 kc. The nearest jobs are Miller ones for 48-52 kc and 90-110 kc. It should be using a total capacitance across each winding of about three-times that used for 100 kc.

Q-5'er with HQ-160

QUESTION: Have you any data on using a BC-453 Q-5'er with the HQ-160 receiver?

ANSWER: We have no specific data on using the Q-5'er with the HQ-160; however, it should be possible by connecting the Q-5'er antenna input at the secondary of T_4 (grid of the 1st i.f. amplifier). This will allow the HQ-160 notch filter to still be used in the normal manner; otherwise the Q-5'er could be connected to the hot side of the primary or secondary of the first 455 kc i.f. transformer T_3. If the required signal level is too low, hook the unit to the output of the 1st 455 kc i.f. instead (plate of V_5 or grid of V_6). Connections should be made through a small value coupling capacitor (5-22 mmf).

SX-28 Receiver Modifications

QUESTION: Can you refer me to articles on modifying the Old Hallicrafters Super Skyrider Model SX-28? I wish to update the receiver for s.s.b. operation.

ANSWER: Data on modifying the SX-28 receiver will be found in the following article which covers sensitivity, selectivity, stability, 15-meter bandspread, product detector and a.g.c.:

Briskman, "Updating the SX-28," *CQ*, May 1959, p. 48. "Corrections," *CQ*, July 1959, p. 20.

Substitute for XR-50

A number of readers have requested information as to a source for the National XR-50 coil forms. Unfortunately, these items are no longer in production. Where they are specified in construction articles, a suitable substitute with the same winding diameter (1/2") is the Miller #43A000 CBI.

Heath SB-620 Scanalyzer with HW-100 & SB-101 Transceivers

The Heath SB-620 Scanalyzer normally is to be connected through a small-value coupling capacitor to the plate of the receiver-mixer tube associated with the receiver v.f.o. Somewhat better performance with the Heath HW-100 and SB-101 transceivers may be had by connecting the SB-620 input to the unused winding (terminals 2-3) on T_{201} which tunes the plate of the second receiver mixer, V_{12A}.

To do this, install a phono jack next to the a.l.c. jack (on the HW-100). Connect a short piece of shielded cable (such as RG-58 or RG-59) between the jack (with the cable shield grounded at the jack) and the unused termminals that pop up through the unsoldered holes at the bottom of the printed-circuit below T_{201}. Solder the cable shield to one terminal and the inner conductor to the other terminal. A slight realignment of T_{201} may be needed during operation. The installation may be similarly made in the SB-101.

This modification eliminates the drop in pip level on the SB-620 (due to the low impedance of the receiver filter) when the signal is tuned in; however, the pip level may still drop somewhat due to a.g.c. action. See the discussion on this in the Q & A Column for October 1969, p. 72.

Servicing Solid-State Receivers

For those interested in servicing solid-state equipment, C. McCormick, K8DFR, of Lansing, Michigan, has suggested a book entitled "How to Install and Service Auto Radios" by Jack Darr. He says the title of this publication is somewhat misleading as far as solid-state gear goes, inasmuch as it does contain a lot on servicing transistorized receivers—particular information which many other books have missed. Thanks Mac.

High-Power R.F. Attenuators

QUESTION: I wish to use a 100-watt output exciter to push a linear amplifier that requires only 30-watts drive. Have you any data on how to construct a suitable r.f. pad for use between the two units to limit the drive to the required level?

ANSWER: For the particular application above, a pad with 4-5 db of attenuation should do the job. Data on building such a pad may be found on the following articles:

Glanzer, "T-Pads for R.F. Circuits," *CQ*, July 1964, p. 31.

Marriner, "Designing High-Power R.F. Attenuators," *CQ*, Feb. 1965, p. 49.

73, Bill, W2AEF

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SURPLUS sidelights

BY GORDON ELIOT WHITE*

I HAVE occasionally commented upon the methods that the federal government uses in disposing of the surplus equipment that I mention in this column. I made some facetious remarks about the so-called surplus system last fall, and got some surprising letters from readers, mostly equally unhappy about the waste and confusion, and one highly irate that I would "slander" the Defense Supply Agency, demanding an apology.

I cannot in good conscience apologize for what I have written about federal disposal policy, but in this column I will set forth in a more responsible and serious form some of the things that I have witnessed in ten years of close observation of salvage.

Let me start out on the positive side. I reported that certain Military Affiliate Radio System (MARS) groups had been given special priorities in drawing equipment, while others could not get essential gear for pressing, legitimate needs. Since that column was put on paper there has been a high-level self-examination in MARS, a general tightening of the rules for equipment issue, and an attempt to see that underprivileged MARS groups get an equal chance at obtaining decent gear.

That Congressional watchdog of federal spending, the General Accounting Office, got wind last year of the sort of thing I had reported. Some MARS groups, particularly in Air Force MARS, were drawing all sorts of excess equipment—"binoculars, and other high-value material that had no relation to communications" one Pentagon MARS official told me. There were documented instances of MARS members acquiring test equipment from military stocks with a higher priority than the Central Intelligence Agency, a civilian agency, could muster. Some of the goodies went for personal use, and some, possibly millions of dollars' worth of costly test gear and high-value, late model communivations material—were sold to surplus dealers in violation of MARS regulations. Some MARS members came to feel that they were entitled to anything that showed up on excess propery because of their service to the MARS program.

Shortly after the G.A.O. investigation started, the chief of Air Force MARS voluntarily clamped a freeze on surplus equipment distribution that lasted seven months. In the interim the procedures were tightened up, and now no one but Air Force MARS officers can authorize requisitioning of military gear, and none can be drawn except for demonstrated need.

The early "point" system by which MARS members were given surplus gear as "reward" for signing into the net regularly is dead, along with its less formal successors.

At the same time, regulations for Army and Navy MARS have been coordinated with the Air Force, which as the first MARS group, and the largest, has had all the advantages. Presumably Navy and Army MARS members will get equipment they need if it is available.

This is a commendable step, though it does cut off the flow of goodies from some people who did a lot of work for the Air Force MARS program. Though they have been hurt a little, the self-policing within MARS may have saved the whole program from disaster. I was told by several very senior Pentagon MARS people that they could not quarrel with the G.A.O. recommendations, which were still confidential as this was written. Those suggestions merely reflected pertinent federal law which, MARS people admitted, had been "rather carelessly treated" by a lot of MARS personnel.

One of the finer points turned up during the G.A.O. investigation was the remarkable point that there is no legislative authority for the civilian volunteer side of MARS. The military stations come under regular Pentagon authority, but not the civilians. It is questionable, as this is written, if MARS has any right at all to draw equipment at a priority level higher than the Boy Scouts.

Interestingly enough, the Civil Air Patrol, which has not been highly-regarded by many MARS people, saw the legal problem some time ago and got legislation through Congress giving the C.A.P. a federal charter as a non-profit organization, and status as the Air Force Auxiliary, with authority to have military personnel assigned to it, and to be issued certain military equipment.

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It now appears that MARS will have to do the same thing. Drafts of a MARS Charter were being circulated in Washington late last year, and if Defense Secretary Melvin Laird approves it, a bill may be introduced in the Senate by Sen. Barry Goldwater, *AFA7-UGA* this session.

Now these steps, commendable as they may be, do not really help the local MARS volunteer who was not getting equipment for his station necessary to participate in the Thailand-Viet Nam message program. They have probably made it harder to get gear, no matter how legitimate its need. There is still a problem of large quantities of usable communications and test gear being scrapped by the armed forces at no benefit to the government, MARS, or anyone except possibly some fortunate scrap dealers, and even precious few of those.

I heard, for example, from WB4JKE/NØCB, Virginia Area Coordinator of Navy MARS, who was distressed that the office of the Chief of Navy MARS had turned down the issue of "non-reportable" material from Dahlgren, and Pautuxent River Naval bases, to Virginia MARS members. The equipment apparently was left out in the weather and eventually ruined.

This is all too common in salvage operations of the military, despite the protestations of the Defense Supply Agency, which is responsible for excess material of all the services. I saw a 200,000 pound "lot" of electronic gear scrapped at Brandywine, Maryland, near Andrews Air Force Base last fall. It contained model 28 Teletype gear, Hewlett-Packard, Textronix, Collins, and other high-value equipment that was in at least fair condition when it arrived at the salvage depot. Dumped into huge steel lift-van containers, open to the weather, it was awash in water after a few weeks, and was worthless except as scrap by the time it was sold. By an educated guess the cost of the pile was at least $2 million, and its surplus value as usable material, even in used but dry condition, was more than $90,000. Its scrap value was about $6,000.

At the same time a 15,000 pound lot of electronics was sold at Fort Meade, Maryland, after exposure to the weather for several weeks. It went as scrap, though it contained model 28 and 35 Teletype equipment, and a number of SP-600 receivers, and other valuable and useful items. It brought the government $540.00.

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As this is written, the Federal Bureau of Investigation, and the Army Criminal Investigations Division (C.I.D.) are looking into the sale of up to 5,000 pounds a day of new and slightly-used electronic, medical, and laboratory equipment from Fort Belvoir, Virginia, as scrap, for a quarter of a cent a pound.

The Belvoir equipment, consolidated from Vint Hill, an ASA monitoring station, Walter Reed Hospital, the Pentagon, Fort Myer, and other Washington locations, never hit the junkpile. It went out the door to a dealer in auto parts, who had bid on "light steel scrap." That scrap was seldom touched, and a steady stream of Teletype, Kleinschmidt, Ampex, Collins, and other expensive material was shoveled out.

I do not have any information to indicate that the operation was criminal, that any bribes were passed, but while a flood of valuable equipment was being sold as scrap over an 18-month period, only a half-dozen items were reported on D.S.A. bid lists for sale, and apparently MARS and other screening organizations got equally short shrift.

This is hardly isolated. I have seen disposal operations in dozens of states, and almost every scrap pile contains valuable electronic items. Even more common material goes out the door. I found pallet after pallet of pencils, paper clips, paper, and other items that were obviously being bought daily—in a Navy disposal area in Washington. These were not stale stock, or an insignificant quantity. I told D.S.A. about it and they snatched them back, but when I first told Cameron Station what I had seen they refused to believe me.

Even material which is under special conservation orders often gets thrown out. A Navy friend confided to me two years ago at the height of a silver shortage, that a 40,000 pound load of silver nitrate had been bulldozed under Fort Belvoir. Sent there by the Navy for reclamation, the nitrate went in a trash pit, where it sat until I asked enough questions of the Pentagon to get it exhumed.

The disposal of billions of dollars in usable property is bungled simply because, to date, the excess lists are not computerized at the property disposal level, but are run off on the handy mimeograph machine and circulated in a bulky form that is hard to use. Computers *are* used at some points in the excess system, but have not reached the P.O.D.'s.

I have seen a warehouse full of automotive parts—common items such as jeep wheel bearings, all in new condition, being disposed-of at the salvage office at Hill Air Force Base, Utah, not 50 miles from the Army Ordnance vehicle repair depot at Tooele, because of the cumbersome system of telling the right hand what was in the left. If ever there was a case for a computer system of matching resources to needs, the excess property "system" has one.

I have the papers in my desk now, on a part for a URR-13 receiver that the Navy needed at Dahlgren. The salvage officer came to me first to ask if I knew of such a part in his stocks. Failing that, could I get him one?

Though the receivers have been common in surplus disposal, the Navy faced a 16-week down time for an emergency voice circuit for lack of that part until I found the item in a local surplus store.

For a while, the Navy held a monthly sale in Washington of items off the scrap heap. Though the sales, held in an otherwise unused shed generated $300,000 a year, they were terminated in an economy wave.

Some schools have benefited from the distribution of surplus property to non-profit organizations, though the effect has been highly uneven. States surrounding Washington, for example, send tractor-trailer trucks here to pick up bulk loads of technical gear. There is little logic to the selection, and the material is dumped in the state capital where shop teachers may paw through it for their classes.

The fate of expensive test gear and other material is usually about what you would expect. I was invited by a teacher acquaintance to one session where seventh grade students tore up a Tektronix 535 oscilloscope for the resistors in it.

Other schools unabashedly select federal surplus for sale to surplus dealers to benefit the school treasury. The end may be a good one, but it certainly violates the specific intent of the law.

This is but a sketchy outline and a quick glimpse of some of the ways that vastly expensive, useful equipment is handled by the military. The results benefit hardly anyone, certainly not the amateur. Even the surplus dealers would probably fare better through a logical bid-sale system. Legitimate MARS operations are denied necessary gear, and the average surplus hound is a loser, along with the federal Treasury, which fails to realize millions and millions of dollars. ■

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Letters [*from page 8*]

The horizontal resolution is at least 100 elements. The pictures are definitely not of low resolution as can be seen from the photographs shown in MacDonald (1964), Miller (1969) and Taggart (1969). Further, it is my opinion after four years of SSTV operations that the 8-second frame period is quite satisfactory. For the P7 cathode ray tubes employed, the top of any given scan has almost faded by the time a new frame is to begin, and the effect of a picture "wiping" on the face of the CRT detracts little from the system capability. Finally, the material we've transmitted not only included slides, call letters and pictures of the operator, but also included pictures of stations and equipment and schematic diagrams.

That the above discussion be construed as a put-down of Dr. Ingerson's ideas would be erroneous. My intent is to remind the interested amateur that even using the simplest bandwidth —compression techniques, it is possible to construct and operate a versatile slow-scan television system suitable for use in the h.f. bands. Much of the present system's acceptance and success is due, of course, to the availability of that inexpensive storage device, the long-persistence CRT.

I sincerely hope that the amateur community will explore the suggestions put forth by Dr. Ingerson, as it is quite possible for the amateur to make real contributions in the field of video communications. One has only to look at the work done in memory cathode ray tubes (MacDonald, 1960), pseudo-random scan TV systems (Deutsch and Simpson, 1968), scan-conversion systems (sampling cameras, Miller, 1969) and color SSTV (Taggart, *et al,* 1969) to realize that video communications present a most fertile field for investigation.

Theodore J. Cohen, W4UMF
Alexandria, Va.

CQ Reviews: [*from page 63*]

priced at $99.95. The Model 34-NB Noise Blanker is available as a factory installation in the Drake TR-3 and TR-4 10-80 meter transceivers at a cost of $129. This includes complete realignment of the transceiver. The manufacturer is R. L. Drake Company, Miamisburg, Ohio 45342. —*W2AEF*

DX [*from page 75*]

FB8WW—c/o K2MGE, 14 Bernice Drive, Freehild, N.J. 07728.
FY7YR—Via VE3BYN.
GC5AGA—c/o K4IL.
GD3TXF—To G3TXF, Holt Cottage, Kingston Hill, Surrey, England.
HB9AKJ—c/o WA3HUU, 384 Union St., Uniontown, Pa.
HP9FC/MM—Via VE1ASU, P.O. Box 51, St. John, N.B., Canada.
HQ2GK—To VE1ASJ.
HR1KAS—c/o VE1ASJ.
HR2GK—Via VE1ASJ.
IT1ALO—P.O. Box 20, Messina, Sicily.
JX2BH—NOT via VE1ASJ, send to Norwegian Bureau.

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KC6BY–To WB9ALM.
KC6CT–c/o W9VW.
KG4DO–Via VE1ASJ, P.O. Box 51, St. John, N.B., Canada.
KX6DC–To WB6SJS.
MP4TCZ–P.O. Box 176, Sharjah, Trucial Oman.
OD5LX–c/o K4TSJ.
OY9LV–Via W3HNK.
PJ9VR–To VE3GMT.
SVØWI–c/o K3EUR.
TI8PE, TI9TI, TI9CI–Via WA5GFS, P.O. Box 462, Chickasha, Ok. 73018.
VP2EQ–To WB2ZMK.
VP7NF–c/o VE1ASJ.
VP8JT–Via VE1ASJ.
VP8KM & VP8KR–To K7RDH, 340 N. 5th. Ave., #66, Phoenix, Ariz. 85003.
VQ8CX–c/o G3KEF.
VUØMAH–P.O. Box 6538, Bombay, India.
W1NU/VP9–c/o W1NU, 69 Flax Road, Fairfield, Ct. 06430.
YO7BI–P.O. 107, Craiova City, Rumania.
ZB2BR–To W6GZI.
ZC4AK–Via WA2CMV.
3B2AW–To VE1ACU, 36 Sherwood Drive, East St. John, N.B., Canada.
3V8AA–c/o F5OJ.
3V8AL–Via W4WHF, 255 Suntan Avenue., Sarasota, Fl. 33577.
3V8NC–To G3TXF.
5U7AL–c/o Mr. Fred Powell, AID Mission to Tunis, American Embassy, Tunis, Tunisia.
7Q7WW–Via K8BPO.

73, John, K4IIF

WPX Contest [*from page 65*]

credit for contacts made in the contest. Once again I must remind you fellows that application for WPX awards must be made to the WPX Awards Manager, Howard Kelley, K4DSN, 6563 Sapphire Drive, Jacksonville, Fla. 32208. However we will in turn confirm your list if claimed prefixes from your contest log if it is order.

Of necessity this story has been kept very short because of limited space. We would require a full issue of *CQ* if we were to include all the stories submitted by you fellows. However we do appreciate your detailed reports and suggestions.

We had a new member on the Committee for this one. Bernie Welch, WA2LLK. (You know him better as DL4FS and a multitude of other European calls) Bernie is back stateside now after a five-year tour in Europe, and we hope to make him a permanent member of the Contest Committee. Bob Entwistle, W1MDO and Andy Malashuk, W1GYE were also around to give a hand. (Bob got married recently so I do not know how long he will be available. Hi!)

That's about it for this one. Next one will

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be coming up April 11th and 12th. Rules same as last year with the one change, additional QSO points for contacts on 40 and 80. See this month's CALENDAR.

73 for now, Frank, W1WY

Receiver Signals [*from page 55*]

6.6–Reduce the level from the generator to the point that produces the same a.f.-output reference as obtained with the 1 μv signal.

6.7–Note the r.f. level increase in db above 1 μv required for the above result.

6.8–Repeat steps 6.5, 6.6, and 6.7, but with the generator tuned to other points where additional responses are detected within about 500 kc both sides of the receiver frequency. Care must be taken to single out any responses that may be due to images, i.f.-signal leak-through or generator harmonics. These can be ascertained mathematically by reference to the generator frequency, the intermediate frequencies of the receiver and whether or not the associated heterodyning signals are above or below the i.f.

6.9–Using the smallest level increase (in db) that produces a spurious response, as found in steps 6.7 and 6.8, the spurious overload-response rejection ratio may be recorded as: *XX* db.

Conclusion

I.M. measurements on all the receivers tested in the *CQ* Lab indicated 3rd-order I.M. products of 1 μv were produced by two test signals 46 db above 1 μv (equivalent to about 200 μv or S-9+12 db) for the poorest receivers and 72 db above 1 μv (equivalent to about 4000 μv or S-9+38 db) for the best one. Similarly, the required test signals for the majority of amateur receivers and transceivers of various models were around 60 db above 1 μv (equivalent to 1000 μv or S-9+26 db).[7]

With the two test signals, required to produce a 1 μv 3rd-order I.M. product on the best receiver, applied to the poorer receivers, the I.M. level amounts to 20-50 μv or S3-9.

From these figures it may be seen how readily the adverse effffects of I.M. could crop up, especially with the poorer receivers, when two or more very strong undesired signals are present on a band, such as those easily found when propagation conditions are good.

Comparative figures for the other signal-handling characteristics of the various re-

[7]Where S9=50 μv.

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ceivers will not be given, but suffice it to say, that as a general rule the better the I.M. characteristics, the better will be the other signal-handling characteristics of a receiver. The measurement of the I.M., therefore, can be a good indication as to the relative performance to be expected between different receivers in respect to these other characteristics.

It also should be mentioned that stronger undesired signals usually are required to produce the other phenomena discussed herein. I.M. products thus are the ones most likely to appear in the presence of strong signals.

Where all the required test equipment is not available to an individual radio amateur, these type measurements might be handled as a radio-club project for which the various pieces of test gear may be drummed up from among the club membership.

If sufficient interest is indicated by our readers, we'll discuss other receiver measurements at some future time. ■

Propagation [*from page 87*]

Central & Northern Europe & European USSR	08-10 (1)	07-08 (1) 08-10 (2) 10-12 (1) 19-21 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-15 (2) 15-17 (1) 22-00 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Eastern Mediterranean & Middie East	08-10 (1)	07-08 (1) 08-10 (2) 10-11 (1) 20-22 (1)	07-12 (1) 12-15 (2) 15-18 (1) 18-22 (2) 22-02 (1)	18-21 (1)
West & Central Africa	09-11 (1) 11-14 (2) 14-16 (1)	07-09 (1) 09-12 (2) 12-13 (3) 13-15 (4) 15-17 (3) 17-18 (2) 18-19 (1)	04-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-22 (1)
East Africa	10-11 (1) 11-13 (2) 13-15 (1)	08-09 (1) 09-11 (2) 11-13 (3) 13-16 (2) 16-17 (1)	06-08 (1) 12-14 (1) 14-16 (2) 16-18 (3) 18-20 (2) 20-22 (1)	18-20 (1)
South Africa	08-09 (1) 09-11 (3) 11-12 (1)	06-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-08 (2) 08-13 (1) 13-15 (2) 15-18 (3) 18-19 (2) 19-21 (1) 21-23 (2) 23-06 (1)	18-21 (1)
Central & South Asia	07-09 (1) 17-18 (1) 18-19 (2) 19-20 (1)	07-08 (1) 08-10 (2) 10-11 (1) 16-17 (1) 17-19 (2) 19-21 (1)	16-18 (1) 18-21 (2) 21-23 (1) 02-03 (1) 03-05 (2) 05-07 (1) 07-09 (2) 09-12 (1)	05-07 (1) 18-20 (1)
Southeast Asia	08-09 (1) 09-11 (2) 11-12 (1) 14-16 (1) 16-18 (2) 18-19 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-17 (1) 17-20 (2) 20-00 (1)	06-09 (3) 09-11 (2) 11-15 (1) 18-00 (1) 00-06 (2)	00-02 (1) 02-05 (2) 05-07 (1)

CQ ADVERTISING RATES

Each month our advertising department receives numerous requests from readers for advertising rates. We've decided that we can save everyone some time by listing those rates right here. The costs per ad will vary, depending upon the number of ads run during a twelve month period. Advertisers may earn a rate from *the time the first ad appears,* rather than being obligated to run on a calendar year basis.

	1 or 2 times	3-5 times	6-11 times	12 times
Full Page	$525.00	$470.00	$430.00	$385.00
1/2 Page	275.00	255.00	235.00	215.00
3/8 Page	220.00	205.00	195.00	180.00
1/4 Page	150.00	140.00	130.00	120.00
3/16 Page	106.00	101.00	97.00	93.00
1/8 Page	80.00	75.00	70.00	65.00
1/16 Page	40.00	38.00	35.00	33.00

Costs for second color are $75.00 per ad. Bleed charges are $50 per page, $35 per fraction. Ad copy should be submitted by the 15th of the second preceding month; i.e., April issue closes by February 15th. For additional information or assistance contact CQ advertising department.

Back Issues

Back issues of *CQ* are available from our Circulation Department. Issues in the current year sell for face value (.75) and all others in stock are one dollar each, postpaid. If the issue is no longer in stock, photo copies of specific articles are available at one dollar each. Preferably, the entire issue will be sent.

SUBSCRIBE TODAY

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

Delayed Switching [*from page 40*]

output voltage is about 9.0 volts throughout the range of regulation of Q_3. This increase is due to the 0.6 volt bias voltage of Q_1 and the 0.2 volt bias voltage of Q_3. The total drop across Q_2 is just about 0.2 volt. Transistor Q_1 should be an NPN silicon transistor. Transistor Q_2 can be any medium-power PNP germanium transistor, while Q_3 should preferably be a high-gain medium-power germanium transistor with low bias voltage characteristic.

For high-current applications, the writer has worked out the time-delay/series regulator combination shown in fig. 4. The circuit features excellent regulation and filtering. Transistor Q_2 is a PNP germanium power transistor, Q_1, Q_2 and Q_4 are NPN silicon transistors and Q_5 is a high-gain PNP germanium transistor with a low bias voltage characteristic. With an appropriate power transistor in the Q_2 position this circuit can handle an output of several amperes. ■

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USA-CA [*from page 81*]

for sending that fine Manual of Awards offered by the German CHC Chapter #10.

To try to answer some questions that continue to be asked: Yes I issue the USA-CA (USA Counties Award), your *first* application must be made using a *USA-CA Record Book* obtainable direct from *CQ* for $1.25. To save time, all other correspondence regarding USA-CA should be sent to my home QTH.

Regarding QSOs with fixed or mobile stations in State or Federal Parks, Reservations, Forts, Military Establishments, and etc.; one and *only* one adjoining county can be used for credit, regardless of the number of QSOs, even with different stations.

Yes, I know there are only 3077 counties now, but fear not, if you work all those 3077 you *WILL* qualify for a Plaque. The county of *Princess Anne* was taken into the City of Virginia Beach on January 1, 1963. Also the City of South Norfolk and the County of *Norfolk* merged to comprise the City of Chesapeak. Thus, after January 1, 1963, QSOs with the *former* Virginia Counties of Princess Anne and Norfolk count for *Nansemond*.

The price of POD 26 has jumped to $4.50 plus postage when ordered from outside the USA. I have an offer from Henry Gepke, WA7HFG to send a POD 26 to perhaps 5 or more overseas needy County Hunters, so let me know.

Did I thank you all for your wonderful letters, cards of well wishes, SEASONS GREETINGS and etc? Please don't stop, let me know—How was your month?

73, Ed., W2GT.

VHF [*from page 83*]

communications should yield significantly stronger and longer duration signals than the zero angle reflections of radar. This conclusion would explain the discrepencies between amateur observations and radar results. It also introduces into the MS equation the factor of path length. Longer paths (to a point) should yield better results than shorter paths because of their more oblique angles.

The few observations made by K2CBA and W4IXC on 220 and WØDRL and myself on 432 would seem to indicate the picture supplied by the model of Brown and Lovell to be the more correct one. But realistically many more amateur observations have to be made before a definite conclusion can be reached. One prediction we will make is that a 432 mc MS contact will be made before many years pass.

Allen Katz, K2UYH

Drill [*from page 28*]

Special Note

Do not confuse the sheet-metal drill, which can also be used in wood if you wish, with certain wood-drills on the market having a similar appearance. These bits have a broader "V" shaped center section which is undesirable for work in metals and insulating board, and they are unlikely to be of high speed steel.

Conclusion

A few of the most used sizes between 1/4" and 3/4" will handle 90% of radio-electronic requirements, and the sheet-metal drill is fast, accurate, and considerably safer than the original in thin materials; for many purposes, it will replace a screw or other type punch. The actual grinding job is really not very difficult, and in some ways the special point is easier to produce than the "normal" one. ■

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Meters [*from page 18*]

volts to 12 volts, which is 10 volts plus or minus 2% of 100 volts.

To read with maximum accuracy, therefore, it is wise to choose a meter range such that the desired reading will fall in the upper third of its scale.

Though most meters appear to be well sealed, dust seems to have an uncanny way of working inside. It is important to keep meters out of dusty environments. When unavoidable, specially sealed meters can be obtained.

When using meters at high d.c. potentials, it is always safer to place the meter in the side of the circuit nearest to ground potential, decreasing the chance of electrical breakdown.

A Few More Pointers

When meters leave factory they are assumed to be within the specified calibration. But, with time, magnets loose their strength and other changes occur, causing the instruments to slowly increase error. When accuracy is necessary, such as while operating a transmitter near legal power limits, independent calibration laboratories are available in most cities to correct and certify readings. These laboratories maintain standards which are regularly certified by our National Bureau of Standards.

On many surplus meters where scales are calibrated in military values, the actual full scale can be found printed on the scale face, just below the bottom edge of the window. And, incidentally, when the window glue dries on such meters and the glass falls inward, it is usually a simple job to remove a few small screws from the rear of the meter, take off the entire plastic front cover, and reglue the glass in place.

In addition to reading voltage and current, modern meters are capable of performing many more complex functions. Miniature lamps and photocells can be installed in the movement so that the pointer breaks the light beam in a desired position, tripping a relay. Capacitive networks can be designed into dynamometers to provide direct readings of frequency. Wattage, phase angle, capacitance, and other functions can be read directly.

Electrical meters can tolerate an unexpected amount of violence, both electrical and physical, without damage. With minimal care they can do many jobs for you. ■

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Ham Shop

Advertising Rates: Non-commercial ads 10¢ per word including abbreviations and addresses. Commercial and organization ads, 35¢ per word. **Minimum Charge $1.00.** No ad will be printed unless accompanied by full remittance. **Closing Date:** The 10th day in the second month preceding date of publication.

Because the advertisers and equipment contained in Ham Shop have not been investigated, the publishers of CQ cannot vouch for the merchandise listed therein.

Direct All Correspondence & Copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.**

FOR SALE: Model 26 Teletype machine with cover and table—$50.00. P.L. Lemon, 3154 Stony Point Rd., Santa Rosa, Calif. 95401.

HOT CARRIER DIODES: New HP 2800, 90¢, 12/$10 pp. HAL Devices, Box 365C, Urbana, Ill. 61801.

SALE: Cleaning out shack. Test gear, parts, xmitters, receivers, pwr. supplies. Send SASE for list. Arnold Mireau, Box 34762, Dallas, Texas 75234.

HALLICRAFTERS STATION—HT-37, $180., SX-101A—$185. with manuals and original cartons, excellent condition. Will ship anywhere freight collect. Edward D. Meeker, WA4QEO, 5444 Sanders Road, Jacksonville, Fla. 32211. (904) 737-2413.

INTEGRATED CIRCUITS: New Fairchild MicroLogic, epoxy TO-5 package. 900 buffer, 914 gate, 60¢ each. 923 J-K flip-flop, 90¢ each. Guaranteed. Add 15¢ postage. HAL Devices, Box 365C, Urbana, Illinois 61801.

MANUALS—TS-173/UR, TS-323/UR, LM-18, $5.00 each. Many others. List 20¢. W3IHD, 4905 Roanne Drive, Washington, D.C. 20021.

APACHE XMTR FOR SALE: Novice or general, 75-180 watts cw, 150 watts phone, xtal or VFO, sacrifice—$75. Tape recorder, Masterwork M790 solid state, 2 speed, 7" reels, less than year old. Sells for $80 new, I'll sell for $45. Will ship items. Eugene Gascho, Pigeon, Mich. 48755. (517) 453-3747.

HALLICRAFTRS P-500 AC power/speaker—$69. 4CX-250K's—$14; International Crystal FCV-2 meter converter with power—$9; Gardiner code machine with 10 tapes—$9. Offers OK. WA6BWB, 13241 Eton Place, Santa Ana, Calif. 92705.

AUCTIONFEST—Broward A.R.C. Saturday, March 14, 1970, Chaminade High School, 500 North 51st Avenue, Hollywood, Fla. Doors open 8 a.m. Fred Schmidt, W4NYF, Box 8873, Ft. Lauderdale, Fla. 33310, Chairman.

CHICAGO SUBURBAN RADIO ASSOCIATION Annual Hamboree on March 22nd at East Avenue and 55th St., Countryside, (La Grange), Illinois. Flea market and prizes. For further information contact Wilson Thomas, W9KWA, 4017 Vernon Ave., Brookfield, Ill. 60513. Phone: (312) HU 5-0451.

TELETYPE EQUIPMENT and parts. New and used. We stock just about any Teletype item. Write for more details: RTTY Electronics, P.O. Box 655, El Cerrito, Calif. 94530.

HEATH "SENECA" 6 & 2 meter transmitter, 1000W Drake filter, Dowkey relay, all cables, extra xtals, mint condition—$95.00. Merrick, L.I., N.Y. (516) MA 3-4936.

RAGS HAMFEST Syracuse, New York, April 12, 1970 at Song Mountain. Box 88, Liverpool, New York 13088.

SELL MODEL 19 Teletype set. $25.00. Pick up. W2AH, 151 Rock Creek Lane, Scarsdale, N.Y. 10583.

FOR SALE: Complete Novice station. Ready to run. Includes EICO 720 transmitter, Hammarlund HA-110A receiver 40 meter matched dipole, insulators, coax and connections, T/R relay 40 meter crystals (3), C.W. key. Will ship. $250.00. WN9CPY, M.D. Hill, 811 Milton St., Fort Wayne, Ind. 46806.

COMPLETE SELL OUT: G-76 transceiver with AC and DC supplies, good for the Novice bands. Valiant II and Ranger II, both F/W and excellent. Rotator, tower, beam. Complete QST since 1945. Complete CQ since January 1945—except 2 issues. Test equipment. SASE for list. C.W. Robertson, W5MBP, Terrell, Texas 75160.

WRITE, PHONE OR VISIT us for the best deal on new or reconditioned Collins, Drake, Swan, Galaxy, Hallicrafters, Hammarlund, Hy-Gain, Mosley, Waters, Henry linear, BTI linear, towers, rotators, other equipment. We meet any advertised cash price on most equipment. We try to give you the best service, best price, best terms, best trade-in. Write for price lists. Your inquiries invited. Henry Radio, Butler, Missouri 64730.

SELL: Collins 75A-2 with cabinet and speaker, mint—$175.00;; Hammarlund HQ-160 receiver, very stable, nice—$125.00; Dumont 304-A general purpose scope 5" tube in mint condition—$50.00; RCA CV/57 URR "IF" converter with manual, excellent—$75.00; H.P. 205AG audio signal generator, mint—a $350. value—trade for F.B. linear. Dictaphone "time master" desk recorder, complete, one unit is portable, will trade for 2 meter gear or sell. WA4WIA, 1645 Dobbs Lane, B'Ham, Ala. 35216.

FOR SALE: H.T. 32B, mint condition manual and crystals for all bands. 4-6146 new spares. $325.00. H. R. Conley, 107 Coulee Shore Dr., Lafayette, La. 70501.

GET YOUR "FIRST"! Memorize, study—Command's 1970 Tests-Answers" for FCC First and Second Class License. Plus-Command's "Self-Study Ability Test." Proven. $5.00. Command, Box 26348-H, San Francisco, Calif. 94126.

DAYTON HAMVENTION April 25, 1970. Sponsored by Dayton Amateur Radio Association for the 19th Year. Technical sessions, exhibits and hidden transmitter hunt. An interesting program for XYL. For information watch ads or write Dayton Hamvention, Dept. C, Box 44, Dayton, Ohio 45401.

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

EMBOSSED OR PLAIN QSL CARDS. Samples free, with cut catalog 25¢. Ace Printing, 6801 Clark Ave., Cleveland, Ohio 44102.

RTTY gear for sale. List issued monthly. 88 or 44 Mhy torroids, uscased, five for $2.50 postpaid. Elliott Buchanan & Associates, Inc., 1067 Mandana Blvd., Oakland, Calif. 94610.

NOVICE CRYSTALS: 40-15M—$133; 80M—$1.83. Free flyer. Nat Stinnette Electronics, Umatilla, Fla. 32784.

SELL OR TRADE T.S. 452 combination scope, signal gen. and atten. 5-100 MC. H.P. slotted line Lambda D.C. power supply 0-32V at 2A. General Radio receiver 30-260 MC AM-FM-CW. Set of 4 Millen wavemeters 3.5 to 40 MC. Will ship. Want linear, UHF gear, test equipment. Whats your offer? K8NNU, 1034 Creyts Rd., Lansing, Mich. 48917.

TOUCHTONE DIAL equivalent from Denmark. Ten buttons, convertible to all twelve in a minute with data included. Beige, except green and white while they last. 12VDC required for oscillator operation. $15.00 postpaid USA. WA6UGY, 6606-5th Street, Rio Linda, California 95673.

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WORLD RADIO has used gear with trial-terms-guarantee! 99'er—$79.95 910A—$179.95; SR150—$299.95; HW10—$129.95; HW32—$89.95; Swan 400/420—$299.95; Swan 250—$229.95; DuoBander 84—$109.95; 753—$129.95; NC200—$249.95; SB33—$199.95; Galaxy Vmk 2—$279.95; Ranger 2—$149.95; 200V—$399.95. Free "blue-book" list for more. Write WORLD RADIO, 3415 West Broadway, Council Bluffs, Iowa 51501.

LIKE WASHINGTON we can't tell a lie. You'll have a ball at the ARRL Hudson Division Convention, October 17-18, Hilton Motor Inn, Tarrytown, N.Y. Exhibits, lectures, contests, gabfests, New York sightseeing, fun. Honest! Hudson Amateur Radio Council, Box 58, Central Islip, N.Y. 11722 has all the dope.

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SALE: 2 to 80 meters CW, AM, SSB Hallicrafters SX-117, HT44 with P.S. HA2 and HA6 with P.S. DW linear 2-701A, 10 to 80 meters with 10 extra 701-A, monitor scope, phone patch, and extras. All equipment clean, unmodified, $1,100.00. WA3BYR, Jim Ward, 2715 Green St., Claymont, Del. 19703.

TR-4, AC supply. Best offer. Hand deliver Ohio and adjacent states. Cordon Wolford, WB8CKP, 318 South Adams, New Carlisle, Ohio 45344.

COLLINS mechanical filter for 75A4; 800 cycle; $45. TA-33 and Ham-M; $165 W0YVA/4, 4423 N. 17th Street, Arl, Va. 22207.

WANTED: HAM-M control box. Any condition if meter ok. Mike Ludiewicz, 143 Richmond Road, Ludlow, Mass. 01056.

WANTED: Knight T-60 xmtr UR best price first letter. K8LJQ, 351 Mower Rd., Pinckney, Mich. 48169.

SWAP: Kalamar SL Reflex 2¼ x 2½ camera and access. for Heath HW SSB receiver or what have you. WA3CIV, C. Dwight, Mounted Route, New Cumberland, Pa. 17070.

SALE: Collins 351-DZ, Mobile mount, PMZ, C2; Cables $125. Bro. Gerald Malseed, 8102 La Salle Rd., Towson, Md. 21204.

FOR SALE: Seneca VHF 1 transmitter and plate modulator. John L. Wentz, West Library, Ohio 43357.

WANTED: Viking Ranger Two, must be in good electrical and mechanical condition. All letters answered. John M. Vasicak, W9ZEN, 124 North Glen Avenue, Oglesby, Ill. 61348.

WANTED: Diagrams and operation manual for Bendix FM receiver MRT-5-B. WA9GYF, 348 W. Main Street, Reedsburg, Wis. 53959.

WANTED: Replacement Simpson meter for Heathkit VTVM Model V-4A. Will answer all replies. W9RKE, 748 S. 28th Street, South Bend, Ind. 46615.

JOHNSON VIKING II transmitter & matching VFO. Excel. cond. Sacrifice $75. (516) 374-1532 or write Dick Hopp, 1185 E. Bway. Hewlett, L.I., N.Y.

SALE OR TRADE: DX 35 $32 G Scout 65A $40 Gonset 11B 6 Mtr $95 Old Hallicrafter Rcvr made 1933 or 1934 make offer; want Johnson Match Box 275W all items very good cond. W8IOR, Rte. 1, Lake Odessa, Mich. 48849.

B&W 5100 SSB transmitter with SSB adapter. HR-10 receiver. Both excellent. Falk, Noah Hall, Oberlin, Ohio 44074.

WANTED: Heath HA-16 mobile linear amplifier; Johnson 6N2 Thunderbolt Linear amplifier. W8ERD, 311 E. Kelso Rd., Columbus, Ohio 43202.

SELL 19ASR teletype $150, Lafayette HE-35-A $35, C. Vinson, 2796 Larkspur St., Yorktown Heights, New York 10598.

COLLINS S LINE FOR SALE: Exc cond High Serial numbers: WA0GUN, 231 So. Jasmine Street, Denver, Colorado. 80222.

WANTED: Gonset Com. 1, 2 or 3 for 2 Meters. State condition and price in first letter. W6GOU, Scott Hartman, P.O. Box 3192, Beverly Hills, Calif. 90212.

WANTED: Old telegraph instruments, stock tickers, railroadiana, Edison items, and Allied items for collector. Goodman, 5826 S. Westerm, Chicago, Ill. 60636.

INVITATION TO JOIN the "DLN" net. Saturdays—0900 GMT on 7.160 Mhz. WN2KZM net control—de WN9CHX.

SELL: SSB homebrew 150 watt, xtal filter, Collins PTO, scope, power supply, ready for air wkd WAC. R. Mendelson, W2OKO, 27 Somerset Place, Murray Hill, N.J. 07971.

SELL: Millen Type 90801 50 watt transmitter, no pwr. Instructograph with 10 tapes, Make offer. Ray V. Dunn, 1010 E. Locust, Tyler, Texas. 75701.

LINEAR: CE 600L, Broadband (no tuning) 6 bands including 160M. Only 20 W. drive needed. $190. J. Taylor, W2OZH, 1257 Wildflower Drive, Webster, N.Y. 14580.

WANTED: Old 201 201A, and 200 receiving tubes for antique radio. WB5ACP, 215 Carlisle NE, Albuquerque, New Mexico. 87106.

AN/ARN-14c or similar VHF crystal control receiver wanted. Dave Sundhemier, K9LYW/Q, 13020 Lakeview Dr., Burnsville, Minn. 55378.

"HELP!" New Amateur. Please send helpful hints on apartment house operation. Antenna systems, etc. John H. Pitcher, 1099-D Park Lane, Middletown, Ohio 45042.

WANTED: Heath SB-610 and Vibroplex key. Joe Ottinger, 6 Harbord Ave., Ft. Leavenworth, Ks. 66027.

FOR SALE: Heath Tunnel Dipper HM-10-A like new—$19.95. Post Paid in US. Joe V. Wright, W5AQN, Rockport, Tex. 78382.

SELL: Modified proppitch motor slave and indicator selsyns with transformer and case $45 FOB. L. A. NE Collett, 527 W. Walnut, Arcadia, Calif. 91006.

SELL: Modulation class B transformer 1KW made by RCA. New. Meissner, Signal shifter like new. Harper Richards, East Street, Argyle, N.Y.

GOING SIDE BAND? One mint Heath HX-20 with A/C supply $100.00. So. Calif. only. K. C. Jones, 6172 Gumm Drive, Calif. W6RLN.

WANTED: Information on building amateur weather forecasting station. Your help on design and parts availability appreciated. A.H. Davis, 1508 Gawain, Borger, Tx. 79007.

SELL OR SWAP: (3) 4X150G. (2) Unused. Want 2 mtr. gear, scope or make offer. W1EZA, 60 Gregory Rd., Holliston Maine 01746.

SPECTRUM ANALYZER. For Collins, etc. 455 khz input. 100 khz bandwidth. Brand new surplus $60.00 factory built. Have 3 units. SAE for details. K1VTW, Box 103, Sherborn, Mass. 01770.

FOR SALE: Viking 500 in first class shape. $225.00 takes it from C. E. Andersen, K3JYZ, 14601 Claude Lane, Silver Spring, Md. 20904. (301) 384-7771.

WANTED: SX88 receiver. State price and condition. W4WR R. M. Jones, 2345 Laurel View Place, Birmingham, Ala. 35216.

TRADE Galaxy DC35 supply for Galaxy accessory console. Matchbox Jr, or? Hustler 10-80 Whip w/ mount-$60. W0MXE, 63 Mobile Manor, Knob Noster, Mo. 65336.

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SELL OR SWAP: LM-10, BC-348, Maksutov telescope, ART-13, SASE for list. T. Gosman, 143 Roxton Rd., Plainview, N.Y. 11803.

FOR SALE: Antique Chevrolet pickup truck $125.00. W4OHM, 743 Berryville Ave., Winchester, Va. 22601.

WANTED: 70' Heavy duty crank-up and/or Fold over tower WA1AWX, 161 Bob Hill Rd., Ridgefield, Conn.

SONAR FR-103-S Police/Fire rcvr—Handheld, Squelch, 150-175 MHZ. Also covers standard BCB. $30. Joe Heffler, WB2QRF, 2200 Morris Avenue., Bronx, N.Y. 10453. 212-295-1694.

FOR SALE: KWM-2 complete frequency coverage. HB KW linear 4-811's. Heath MR-1 and MT-1/Audio oscillator. Reas. J. Brink, POB 3734, Fayetteville, N.C. 28305.

RECEIVER—100 to 1750 kc with 3" scope; R-65/APn-9. Ideal for ship to shore, etc. or even as a scope. $25. Jim Cooper, 834 Palmer Avenue, Maywood, N.J. 07607.

HALLICRAFTERS SR. 500 transceiver and A.C. power supply both in like new condx. and A1 shape. Any reasonable offer accepted. WA2PLU, 9 Nancy Lane, Larchmont, 10538 N.Y. Tel. (914) 834-4497.

WANTED: Antique transmitter and receiver tubes made before 1925, also UV-204 with spherical bulb, W9LGH, 610 Monroe Ave., River Forest, Ill. 60305.

I WANT TO BUY a badge issued at the National ARRL convention in Chicago, September 1925 for my antique collection. Erv Rasmussen, 164 Lowell, Redwood City, Calif. 94062.

WANTED: ANTIQUE TUBES: Sodium-Donle-Robert Dollar Detector—W2EZM, 431 Oakland, Maple Shade, N.J. 08052.

WANTED: National SW-3, FB-7, NCX 100, NCX 101. R. Arrowsmith, 3505 Woodburn Road, Annandale, Virginia. 22003.

CHEAP CHEAP! 4X150A pulls $3.00 ea. or 4 for $10.00. 4CX250B pulls $5.00 ea. All A-OK. New 4-65's $5.00 ea. plus postage. K30LG/6, G. L. Levine, 723 S. Curryer Street, Santa Maria, Calif. 93454.

LM-13 Freq. Meter, orig. calib. book, manual, pwr. supply. $25 plus shipping charge. M. Garey, 24771 Kay Ave., Hayward, Calif. 94545.

SALE: Heath DX60B, HR10B, crystals, relay, manuals, $100. takes all. WN4MWV, Route 1, Box 697, Tarpon Springs, Florida. 33589.

ONE OWNER Johnson 500 A1. Solar 500VA Reg. Xfr. new. Many meters, parts, etc. All FOB and best price. W4LF. E. Vordermard, 721 Second Street, Neptune Beach, Florida. 32233.

SWAP: "F" band coil for HRO 50 or 60 for "G" coil for same. Pat Kilgore, 1334 Glenwood Street, Birmingham, Alabama. 35215.

FOR SALE: Heath Mohawk rcvr. with manual and matching speaker. Mint cond. $120. Gene Stultz, WB4MHE, 19000 N.W. 11 Court, Miami, Florida. 33169.

FOR SALE: Valinet Converted SS Adapter and FSK Shifter—$350.00. Schwartz—days (914) MO 8-3534. nights (914) MO 8-3677.

BUY OR BORROW: Instruction book schematic for solid state rhythm or percussion generator. W9TKR, 505 South Elmwood, Waukegan, Ill. 60085.

CAN ANYONE send me a diagram for a Transcon 6, built by Creative Electronics Corp. Stamford, Conn. or Creative Electronics' adress. William Carsey, W8GBM, 459 South Ogden Ave., Columbus, Ohio. 43204.

DAVCO DR-30 Communications Receiver. Tunes ham bands, plus 5.5-6.0, 9.5-10 & 11.5-12.0 Mc $100. Paul Robbins, Jr., W4MKT, 121 Motor Road, Winston-Salem, N.C. 27105.

WANTED: Assembly construction manual for Johnson Viking 2 transmitter. John K. Young, R.D. #6, Butler, Penna 16001.

FOR SALE: Heath DX-35 well built; just like new. Key and 5 crystals, $45.00. F.M. Wood, Box 278, Seneca, S. C. 29678.

FOR SALE: Jones SWR Drake Patch, Heath audio and Sweep Gens Electronic switch, T3 Mike, Collins Mike. Make offer. Stamped env. for other gear. Schofield, 301 N. 3rd Street Lantana, Fla. 33460.

FOR SALE: PE mag., 1955-56, 62-65 comp., 54, 56, 61, 66 part. Reasonable. Write for prices. K5BBN, 2033 Coronado, Place, Orange, Texas. 77630.

PRECISION STANDARD CAPACITORS, Western Elect., 2631 Mfd., 1%, 250 VDC, —50 to +65 C, 10 for $5.00. G. W. Richie, 643 Diamond Rd., Salem Virginia 24153.

SELL: Drake TR3-AC3—$360. RV-3 $55 need 4-1000A Ray Clark, W2WNW, 126 Slosson Ave., Staten Island, N.Y. 10314.

SELL: Hallicrafters 2000 including power supply excellent in daily use can ship. W4BOJ, Gallant 4411, No. Federal Hwy, Pompano Beach, Fla. 33064.

HEATHKIT APACHE in good condition for sale. You pay shipping. Best offer over $60 takes it. All inquires answered, M. Buker, Box 214, Monroe, Ohio. 45050.

OLD-TIMERS the M.I.T. Radio etc. from W1MX, 1MX, and 1XM. Send to: Box 558, 3 Ames Street, Cambridge, Mass. 02139.

FOR SALE: Hammarlund HQ 105 TR receiver, good condition. This rcvr is all wave from .5 to 30 megs and also is a 5 watt CB or ten meter transmitter. Asking $85. Local deal preferred as I cannot ship. J. Dubinsky, W2LVR, 134-54 Maple Ave., Flushing, Queens. NYC. NY. 11355. Phone IN 3-1413.

SALE: Heath SG-8 Signal Generator very similar to present IG-102, with manual— $12.00 over 100 issues Popular Electronics & others—$10.00. WN1LWD, 96 King St., Bridgeport, Conn. 06605.

SELL: Three Collins PTO's type 70H3. Part No. 506 2725 003 at $65.00 each plus mailing. New, never used. KZ5MA, P.O. Box 1657, Balboa, Canal Zone.

SALE: HW-16, HS-24 sprk. Mint cond. $85. lower 250 kc 80, 40, 15 Bert O'Connor, 16 Smithshire, Andover, Mass. 01810.

WANTED: Tapetone Skysweep receiver. S.A.S.E. for list of gear and parts for sale. K3KEL. 629 E. 3rd Street, Berwick, Pa. 18603.

FOR SALE OR TRADE H.P. Linears & extra parts, tubes, transformers, sockets, and filter capacitors. W5HZD, El Reno, Okla. 73036.

SALE: Ameco PCL-P preamp $23.00 Collins DL-1 Dummy Load $35.00. Knight P-2 SWR Bridge $11.00 Johnson 6N2 converter $39.00 W8IIT, 281 Jenny Lane, Dayton, Ohio 45459.

1-BUD VARIABLE Low-Pass filter #LF-601-A $10.00. Bob Fisher, K8KRK, 466 S. Sandusky Street, Tiffin, Ohio 44883.

VALIANT II, F. W. Exc. cond. $175.00 Galaxy V, AC 35, xtal calib, spkr console $275.00. Both shipped REA P.P. in 48. WA5DZP 314 E. Main, Ada, Okla. 74820.

SALE: Heath GR64 receiver $32.00—Heath AR3 receiver, needs alignment $10.00— Both with manuals. Howard Hecht, WN1LWD, 96 King Street, Bridgeport-Conn. 06605.

ROCHESTER, N.Y. is again Hamfest; VHF meet and flea market headquarters for largest event in northeast, May 16, 1970. Write WNY Hamfest, Box 1388, Rochester, N.Y. 14603.

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QSLS: Second to none. Same day service. Samples Airmailed—25¢. Ray, K7HLR, Box 331, Clearfield, Utah 84015.

WANTED receivers 8503-8507-8506B-8510-3001A-3002A-128AV. Write Box 8352, Savannah, Ga. 31402.

FOR SALE: 2 Bird Termaline 1 KW dummy loads—$75 each. 2 ARR-7 HF RX with PS—$100 each. TS-173, 90-450 Mc. Freq. mtr—$75. Heath HW32A HP23 PS-$100. Pierson KP-81 Rx—$75. Link 1907 FM TX 5894 final—$10. Wilcox CW3 HF Rx—$10. Collins 516F2 DC supply—$85. 516E2 supply—$100. Davco DR30 Rx PS Book—$250. Motorola T51G and 80 D transceivers—$50 each. PSM-6 VOM—$25. Uher 4000 Report L solid state tape with accessories—$150. Roberts, 1620 Stereo tape rec. with accessories—$Z5. K6IWG, 7535 Perry Road, Bell Gardens, Calif. 90201.

SELL: 75S-3, speaker, manual, spare tubes: $400. KWM-1, power supply, speaker, manual, tubes: $300. 34-24 76th St., Queens, New York (212) 639-3195.

FOR SALE: HQ180AC excellent condition—asking price $275. F. Kruger, K2LDC, (212) 268-3361 Eves.

FOR SALE: National NC-183D, exc. cond. $80; Heath DX-40 w/VFO, $40. Makes good station. Write Jim Jameson, WA5WEU, Box 5421, Alexandria, La. 71301.

WANTED: C.E. 600L and low-priced xcr. Will buy even if repairs are needed. W3AXK, 2524 Salmon Street, Phila, Pa. 19125.

NEW GALAXY GT550 sealed carton. Reasonable, may take trade, W4UHO, 1300 Milton Street, Clearwater, Fla. 33516. Ph. 446-0886.

WANTED: Fairly recent editions of both U.S. and foreign callbooks by prospective Ham. Frank C. Dahm, 86 Garfield Street, Natrona, Penna. 15065.

SELL: SB-200 in perfect A-1 condition, looks and performs like new, built by RCA engineer. Has approx. 5 or 6 total hours of operating time in the 2 yrs. that it was built. Write Robert Simon—1694 Linden Place., North Merrick, New York 11566. Call (516) 538-3877.

RTTY INFORMATION for the Amateur interested in RTTY. F. DeMotte, P.O. Box 6047, Daytona Beach, Florida. 32022.

SELL OR TRADE: New, unused Swan 350C—$315.00. Navigator-excellent—$70.00, Ranger—$60.00. Send stamp for complete list. Want: Collins 51J rcvr, Hy-Gain Hy-Tower Vertical. J. Shank, 21 Terrace Lane, Elizabethtown, Pa. 17022.

WANTED: PS 150-12DC thats a DC power supply for a SR15-Hallicrafters will buy or trade. S. Luberman, K2IFL, 3237 Saywater Ct., Far Rockaway, Queens, N.Y.

NRI Transmitter, AM/CW, 2E26 Final, complete with key, mike, P/S AC, manuals, ship prepaid. $55.00 USA. W.L. Patterson, 5930 Denver Street NE, St. Petersburg, Fla. 33703.

SELL: Hallicrafters HT-32 all band 10 to 80 meters, S.S.B., C.W., A.M., mint condition, Hallicrafters finest rig., $215.00. Power transformers, 2400 volt at 1000 mils, $15.00. Fine for 2 K.W. P.E.P. Final. B. Nastoff, 320 W. 56th Place, Gary, Indiana. 46410.

NEEDED: Hammarlund HQ-10 rcvr. Best offer under $120. Urgent!! Send details to George Dinwiddie, WN4MDL, 3606 St. Croix Ct., Augusta, Ga. 30904.

WANTED: 70 ft. crank up and/or fold over tower. T. G. Soukup, WA1AWX, Rfd #3, Bob Hill Rd., Ridgefield, Conn. 06877.

MUST FIND: Collins 500 cycle or 800 cycle mech. filter for 75A4. Robert C. Daigh, K6ZCN, 721 Berkshire Ave., Pasadena, Calif. 91103.

FOR SALE: Heathkit EF-2 and 3 plus text book. $72.95 value for $40. Mint condition. A. Freeman, WA0AAD, 1805 No. Third Street, Grand Forks, No. Dak. 58201.

WANTED: Operating Manual for Viking Ranger One. K9ABQ, Dallas City, Illinois.

GRAPH PAPER, 140 sheets, assorted, engineering. Best offer. Felstead, Kh6CU, 1777 Ala Moana, Honolulu, Hawaii. 96815.

FOR SALE: Part of collection of Antique radios. SASE for list, please. Joe Horvath, W6GPB, 522 Third Street, San Rafael, Calif. 94901.

WANTED: Motorola or GE FM 30-50 or 152-172 mhz 12 volt or 110VAC. Also used KWM-2 with AC supply will swap trade or pay cash. Send inquires to James C. Kaufman, 517 Valley Drive, Burns, Ore. 97720.

NC-200 National xcvr, pwr supply, manual, 200w SSB. Used very little. Ex. cond. Must sell. Make offer. WA2FFZ, 186 West Ave., Pitman, N.J.

SELL: Crystal for Drake R4-B or T4X-B, etc. for 3.000 Mc for $3.00. Ed Gray, WA0CPX, Rfd #1, Burke, S.D. 57523.

SACRIFICE SHACK CLEARANCE—SSB/CW xmtrs, xcvrs, linears. Novice/legal limit. Big tubes, misc. Descriptive list SASE. WA0MNK, 512 Grandview, Chillicothe, Mo. 64601.

BEST OFFER, Swan 250 & 117 xc, P.S. Rme converter, model VHF 126. WA5QYR, Rfd #2, Lonoke, Ark. 72086.

SELL: Mint factory wired Heathkits. SWB-101, $350, SBW-200, $175, ARW-15 Stereo, $325. Also HA-14 Mobile linear with never used HP-14 DC supply $150. W8NDG, 2580 Locust Lane, Stevensville, Michigan 49127.

SELL: 6 Mtr Calif KW pr 4-400's cl B linear of cl C plate Mod. Variac controlled HV, fully metered (incl VU), protected (incl 3 time delay, under and overload relays) and interlocked. $495 delivered. W6NGV-/4. Col. W. O. Enderle, HQ 1st Signal Brigade, USAStratcom, CSEMA, APO San Fran., Calif. 96384.

COMDEL SPEECH PROCESSOR: 6 mo. old $75.00. Works fine, but need money. Bill Gode, 10352 Wallace, Iowa State U., Ames, Iowa 50010.

NOVICE GEAR: Globe Chief Deluxe Xmtr. $27, Hammarlund HQ-110 with spkr $95; Surplus crystals 16¢ ea. SASE for list. WA3JBN, 316 Donnell, Lower Burrell, Pa.

FOR SALE OR TRADE: UHF 450-470 MHZ General Electric model ME-42N Mobile 2-Way transmitter-receiver. Make offer. A. Emerald, 8956 Swallow Ave., Fountain Valley, Calif. 92708.

CLEANING HOUSE. Two 2-meter 30 watt Beudix rack mounted units, (on 94 & 76). 21" Bud cabinet. Motorola walkie-talkie, transistorized rcvr, Nicad supply. Nicad Charger and spare Nicade battery. Any or all to highest bidder. K5VYY, 3728 Wilkie Way, Ft. Worth, Texas. 76133.

SELL: Roberts 997 Professional 3 speed tape recorder in excellent condition. Will pay shipping in Continental US. $250. L. J. Krenek, WA5KZE, 211 Hillwood Road, No. Little Rk, Ark. 72116.

2304 MHz skeds anytime cw ssb tropo lunar. Phone (301) 384-5093, listen 3815 0400Z Tue & Fri or write W3GKP, Spencerville, Md. 20868.

FOR SALE: Prop Pitch motors. GOOD: $15.00. Better: $25.00: All in working condition. Write for info. W5CCP, Box 10703, Oklahoma City, Okla. 73110.

FOR SALE: Comdel CSP-11, $75. SB-200, spare "Finals", $200. SW240, TCW, ACPS, $200. James Craig, 29 Sherburne Ave., Portsmouth, N.H. 03801.

WANTED: Service manual for Collins 32RS-1 SSB transceiver (Navy surplus) James Humphrey, 1656 E 33 Street, Los Angeles, Calif. 90011.

SELL: Excellent Galaxy III and A.C. supply. Serial #4104M345. $175.00. K4RON, P.O. Box 363, Sylacauga, Ala. 35150.

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WANT: Manual for BC-1031-C Panoramic adaptor. WB6KKI, 6101 Heliotrope, Maywood, Calif. 90270.

FOR SALE: Honda-300 Generator, used 6 hours mint condition, 115-120 volt; 6-12 volts. Best offer over $100.00. W1LPO, 37 Rancocos Dr., Warwick, R. I. 02888.

FOR SALE: 1-Swan-240 D.C. power supply, and mobile mount $250.00. W.E. "Bill" Johnson, 423 4th Street, SE, Watertown, S. Dak. 57201.

FOR SALE: Old issues of CQ, QST, 73, FM, and Ham Radio available at a nickle per copy, plus shipping costs. Lerc Amateur Radio Club (W6LS), 2814 Empire Avenue, Burbank, Calif. 91504.

COMPETITION? You bet. Join a new contest/DX group placing 3rd nationally in first try. If you live 100 airline miles from central Connecticut, contact K1JHX, K1GUD, or K1VTM.

SALE: Heath DX-35 and VF-1 VFO $40; BC-654 $20; PE-103 dynamotor $10. RAX-1 rcvr (7-27 mc) $25; or offer. W6NHT, 1700 Pine, Martinez, Calif. 94553.

WANT: Johnson Adventurer Speech Amp., Mod.; Johnson Mobile XMTR, Heath Cheyenne MT-1, or like; Gonset Receiver G66. Units of any condition considered. WA5NQE, 701 Carolyn Ave., Austin, Texas.

SALE: AF-67 w/12V. transistor PS. $60. G-66B w/DC and AC-DC-spkr PS offer. W6DJZ, 3748 Floresta Way, Los Angeles, Calif. 90043.

DX60B & DX150 for sale or trade. Want Matchbox or Quad & rotator or best deal. WN1MFB, 44 Washington St., Shrewsbury, Ma. 01545.

SWAN VX-2 Vox. New. $16.00. Jay Sewell, W5DWN, 2714 Pecan Dr., Temple, Texas 76501.

SELL OR SWAP: Rayco SSB patch P&H preamp Heath DC supply and HP23 Mini Hi pwr tubes (new). Need Galaxy III or V. W2CPI 115 So. Delsea Dr., Clayton, N.J. 08312.

HEATH HAM SCAN, HO-13 for sale for $49; set up for 3395 kc. if's; perfect condition. Cal Enix, W8EN, Box 474, White Pigeon, Mi. 49099.

NATIONAL NC-200 xcvr AC-200 pwr supply, excellent condx. Factory cartons will ship. Best offer. Paul A. Breton, Klima, 15 Floral St., Bath, Me. 04530.

SELL: RME-69 spkr. VHF 152. LM-14, original book, comm. power supply. S. P. Carroll, 907 S.E. 48th, Olympia, Wash. 98501.

WANTED: G.E. progress line station receiver AC power supply, Model 4EP3A1 or similar. R.E. Ahrens, W3WJC, 3404 Reading Crest Ave., Reading, Pa. 19605. (215) 929-3466.

SELL HALLICRAFTER SR2000 inc power supply excellent daily use. Paul Gallant, W4EOJ, 4411 No. Federal Hwy., Pompano Beach, Fla. 33064.

WANTED: Loan or Xerox copy of manual or schematic for RBU-1 Panadapter Nick, WA2MTI, 21 Napoleon St., Newark, N.J. 07105.

FOR SALE: QST's 1947 to date, CQ's 1957 to date. 15¢ each. Ed Wagner, 6307 East Gate Rd., Monona, Wis. 53716.

HISTORICAL Collection at W1MX needs copies of old QSL's and corespondence from stations 1XM, 1MX and W1MX. Please send to M.I.T. Radio Society, Box 558, 3 Ames St., Cambridge, Mass. 02139.

HW-16 Mint cond. $85. Will ship. Bert O'Connor, 16 Smithshire, Andover, Mass. 01810.

FOR SALE: HW-12A, $85. Globe V-10 VFO, $30. Both excellent condx, with manuals. W. E. Kindred, 4874 Woodway Dr., Fort Wayne, Ind. 46805.

FOR SALE: HT32A. Very good condition. New power xfrmr. Break in keying mod. $235. Also need prop pitch motor. M. E. Knowles, K1HVV, 9 Brown St., North Billerica, Ma. 01862.

TA-33. Perfect condition in factory carton. $75. SB-200-mint—$200. A. B. Watson, K4BBF, 3606 Skyview Dr., Huntsville, Ala. 35801. 536-9776.

SELL OR TRADE: Hewlett Packard plug-in indicating decade counters (AC4-A)—$5 each. Digital frequency counter—$40 each. Hewlett-Packard 560A digital printers—$100 each. SASE list. Trammell, 1507 White Oak Ct., Martinsville, Va. 24112.

WANTED BOOKS: Antennas-Kraus, McGraw Hill 1950; Radio Antenna Engineering-LaPort. Any reasonable price. K4MI, 2401 East 4th St., Greenville, N.C. 27834.

FOR SALE: Clegg Zeus. Clegg intercepter with all bander. $675. Or will sell separtely. E. Wagner, 6307 East Gate, Monona, Wisc. 53716.

SELL: Viking 2. VFO. T.R. Switch. Manuals. Now on Air. $75. You pay shpping. A. Hustwit, WB4GGQ, 617 Peachtree St., Emporia, Va. 23847.

TRADE PR90 and spkr. Excl cond for solid state FM stereo—no ship. W. E. Shaw, RD 4, Box 13, Quakertown, Pa. 18951.

WANTED: Signal Corp. power supply PP-712/GRC-26. Advise price and condition to Phil Shafer, W7BM, 4102 East North St., Tucson, Ariz. 85716. All letters answered.

FOR SALE: NC-100 receiver in good working condition $35. Also HT-9 transmitter for sale—$75. Box 255 Hyde Park, N.Y.

SELL: Complete in new binders. Postpaid. 67, 68, 69 CQ—$10. each. 68, 69 QST—$8 each. All 5—$40. W9-HNG, 921 Walnut, Decatur, Ind. 46733.

FOR SALE: 2KD-2, $550. KWM-1, 516F-1, $225. KWM-2 #13459, PM-2, $750. R4-A (factory updated 12/69) $315. James Craig, 29 Sherburne Ave., Portsmouth, N. H. 03801.

SALE: Hy-Gain 4 element beam, full power. $25.00. Heavy duty deluxe Amphenol rotator with signal squirter direction indicator $25.00. K6VAT, 1417 N. Louise Street, Glendale, Calif. 91207.

WANT: 1" O.D. Thermoplastic tubing, meter for Bird 611. Sell/Trade meter for Bird 67, ste BC-453 IF/BFO Xfmrs $4. Conley, 4304 Willow Woods Dr., Annandale, Va. 22003.

FOR SALE: General coverage receiver SP 600JX good condition. $175.00. E. L. Shafer W8MSG, 3479 Kersdale Road, Cleveland 24, Ohio.

WANTED: Buy or swap. Gonset Commander transmitter, Super-Ceiver, and HF converter, usable condition for portable rig. prefer complete package. W4ZUS, Rankin, NAVEODFAC, Indian Head, Md. 20640.

NEED: Harrington Electronics. GP-20L Grid Drive assembly. W. T. Harris, 309 Murphree Street, Troy, Al. 36081.

HALL. HT-40 xmtr—HA-5. Not kits. New cond. $75.00. A.E. Wilson, Box 392, East Brewster, Mass.

WANTED: Mech. 2.1 KC filter for 75A4 Collins. W8-HBQ, Box G, Moundsville, W. V. 26041.

WANT JOB: EDP Prog/Graphics, Comm design, Syst Engr. $18K. BSEE-66. Midwest only. Avail 3/70. Capt. C. Dudey, K9WWQ/2, 2048B Titan, Rome, N.Y. 13440.

WANTED: MB6 morrow receiver state price. W. Gorner, P.O. Box 532, Atascadero, Calif. 93422.

FOR SALE: Conar Model 400-25 watt novice transmitter-80, 40, 15 meters. $25.00. George Groff, WN2-LJO, R.D. #2, Pine City, N.Y. 14871.

FOR SALE: H. V. Silicon rect. RCA CR 204 4800 PIV 400 Md $2.00 Ppd. WB2NXL, 22 Ambassador Dr., Victor, N.Y. 14564.

T60—$15, HG10 with PS—$30, AC1—$15, Wanted: Q-multiplier, RF-Preamp, BFO, audio filter, xtals, coax. WB4LIE, 108 Wabash Lane, Oak Ridge, Tenn. 37830.

See page 110 for New Reader Service

TRANSISTOR BOARDS with at least 4 transistors or more with a lot of other good usable parts, diodes, resistors, condensers. 3 boards for .50 plus postage. Bill Hayward, 3408 Monterey Street, St. Joseph, Missouri. 64507.

FOR SALE: Brand new, unopened., TR-44 rotor. Never used. Garanteed. Yours for $48.00. Will ship. PP. R. H. Cook, W9NAH, 815 So. Center Street, Flora, Ind. 46029.

CONVERTER: RME 20-15-10 with manual $25.00 prepaid. McShaffrey 4 Knox Ave., Monessen, Pa. 15062.

FOR SALE OR TRADE: Heath Sixer ANUSM 38 scope checks all diodes resistors cap transistors SCR'... Want 2M FM on 14694. J. P. Ferguson, Anderson, Texas. 77830.

FOR SALE: Heath SB-101 (w/400hz), HP23, SB600 best offer over $420, CL-33, $115; TR-44, $50; Spaulding 48' tower, $80—WA7HIL, 205 NW 87th Ave., Portland, Ore. 97229.

FOR SALE: Globeking 500B, now on air. 500 watts CW/phone. Make offer. D. Schwardt, 3745 Old Forge Road, Virginia. (703) 486-3241.

FREE TV transformers—You pick up! Sale; 6 meter "Lunch Box", MD 7 Modulator, SCR 522 complete, ARC 5s—most frequencies, lots more. Drop over and make an offer. WB2OBO, 1533 Lowell Ave., New Hyde Park, L. I., N. Y.

WANTED: R. F. Signal generator, must cover 144 MHZ. W3MSN, 5400 Boulder, Oxon Hill, Md. 20021.

1200w. Linear SB-200, professionally wired. Brand new—$220. P-prepaid. H. L. Greene, 211 Circuit, Hanover, Ma. 02339. (617) 878-1256.

HY-GAIN 6 mtr 6 ele beam—$19.95, AR22 rotor, 100' wire—$19.95, Ameco 6 mtr Preamp—new $7.50. Geffner, 48 Park Ave., E., Merrick, L.I., N.Y.

FM ACCESSORIES: 80D Control heads w/speaker mike, and cables (Brand New) $14—Permakay wide-band filters #K8436A—$3. G. Pohl P.O. Box 3321, Detroit Mich.

ONE 46250A, New, w/ceramic socket $11.00. Five 4x150A Used, good $25.00. One 4CX250B used good $6.50 FOB PP. T. Schropp, Rt. 6, Clarksville, Tenn. 37040.

SALE: HO-13 Heath Panadapter Scope $35. I ship. W. L. Poole, 2748 Abingdon Road, Birmingham, Ala. 35243.

CANADIANS: Wollensak like new, model 1500 tape recorder $75.00. Johnson & Drake KW Lo-pass filters $12.00. each. Drake W4 watt meter $40.00. Veish, P. O. Box 418, Sackville, N.B. Canada.

FOR SALE: BC-221AE $35; 3" 500 Ma, 5A RF meters $3.50 each; SCR522 Xmtr $15; W4TKD, J. Wingfield, 344 Linda Lane, Ft. Walton Beach, Florida. 32548.

SELL OR TRADE: New, unused Swan 350C—$315.00, Navigator—excellent—$70.00, Ranger—$60.00. Stamp for list. Want: 75A2 and Central Electronics 600L Linear. J. Shank, 21 Terrace Lane, Elizabethtown, Pa. 17022.

WANTED: KWM-2; AC and DC P.S.; mike and speaker. Schwartz—telephone day (914) 668-3534; night (914) 668-3677.

SELL: Navy, CBS Columbia Inc., wire recorder. Brand new, unused, with accessories. 28VDC. $10 plus shipping. Ken Maas, Burlington, Wisc. 53105.

WANTED: CB, Hi-Fi gear, police monitor, general coverage receiver. Will pay cash. Must be bargains. Sell mint Swan 350 w/AC and speaker—$350. Gerald Manning, Rt. 2, Box 191, Rocky Face, Ga. 30740.

SWAP: Heathkit KW Kompac amplifier with power supply for Drake or Johnson KW Matchbox. K4RON, Box 363, Sylacauga, Ala. 35150.

OLD OLD TIMERS CLUB 23rd Anniversary. If licensed 40 years, send your card for application to: Charles W. Boegel, Jr., W0CVU, 1500 Center Point Road NE., Cedar Rapids, Iowa 52402.

FM GEAR: G.E. Progress Line portable HF-11N on 45.14 mhz-$45. Progress Line FI-33W base station on .34/.94 and .94/.94 excellent condx—$200. FMTRU-41V on above frequencies $75. Zach WB2AEB, RFD-4, Mahopac, New York 10541.

WANTED: Last issue of QST to complete my personal collection, May 1916. Any reasonable price paid. K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I. N.Y. 11050.

COSMOPHONE OWNERS: Less than 100 of us in the U.S. Want to start a club? Contact K6VOI Bob Carlson, 1309 E. Elgenia Ave., West Covina, Calif. 91790.

SELL: Large ass't panel meters. AC & DC voltmeters, milliameters, KV meters. Free list. Ken Maas, Burlington, Wis. 53105.

WANTED: Heathkit SWR bridge model HM-11. Need meter in a hurry. Jim Pfister, 2038 S. Chestnut, Fresno, Calif. 93725.

COLLINS 30L-1 mint condition. $300.00. W9LKS, 2024 Sycamore, Quincy, Ill. 62301.

RADIO NEWS MAGAZINES from May 1946 to October 1958. Make offer. Joe Brand, K60JC, 1250 Val Vista, Pomona Calif. 91766.

RME4350A Swan 175 $75 each or swap for Ranger-Valiant-HW16/17 Art Ford, 120 Church Street, Northport, N.Y. 11768.

WANTED: Manual and/or schematic for Sonar BR-21 Linear Amp. Will return. T. Ordon, 31 Chopin Pkwy, Amsterdam, N.Y. 12010.

WANTED: Back issues of 73 Magazine as follows, March '67, Sept '66, June '62, and Jan '61 VK4NS, Lionel L. Sharp 19 Kelso Street, Chermside, Q'Land 4032, Australia.

FOR SALE: NC300 receiver, very clean, in excellent condition, recently aligned. Asking $200.00. or best offer. K1ABP, A.H. Watson, Fiske Hill Rd., Sturbridge, Mass 01566.

NATIONAL NCL-2000 linear mint, $300.00; Modified BC-348 with AC supply, $40.00. SASE for list of other goodies. D. Thompson, K5MDX, 631 Woodbury, Jackson, Ms. 39206.

KWM2 serial 11629 with homebrew AC $670. 312B5 $270.00. Trades considered. WA4LXX, F. E. Coble, 251 Collier Ave., Nashville, Tenn. 37211

FOR SALE: DK-60/ext DP DT contacts—$10, novice crystals—2 (80 m), 4 (40), 7 (15 m) $10 David Rehrig, Ashfield, Pa. 18212.

WANT: Hallicrafters S-27, S-36, S-37, SX-42. Must operate perfectly, be clean, no junk. Describe fully and give best price first letter. K2AES

SELL: LA400C Linear 800w PEP $90 HW30—$35, plus shipping. WB2VZW, 10 Scott Street, Massapequa Park, New York 11762.

THOR 6—Six meter transceiver—VFO made by Squire Sanders Inc. Serial 603-159 $5.00 with manual. W3KG, 4 Knox Ave., Monessen, Pa. 15062.

FOR SALE: HW-12, xtal calibrator, mike, DC power & Hustler for bumper. Also, 1500 watt 115V Alis Chalmers Generator. K4OJB, Ben 703-552-5421 Blacksburg, Va.

FOR SALE: Heath SB-400, mint. $215.00. Hallicrafter SX-101 Good $110.00 Both for $310.00. BC-221K with AC supply, $35.00. Bill Blake, W5SCM, St. Rt., Box 135D, Columbus Miss. 39701.

SELL: 500 PRE 1920 PIX post cards unsorted to highest bidder—no replys except to highest—U pay shipping. K2PFC, 9 Bennett Street, Canisteo, N.Y. 14823.

See page 110 for New Reader Service

WANTED: Power transformer for Ranger; manual schematic for Precision Model ES-500A oscilloscope. Marty Feeny, K1OYB, 38 Howard Street, Portland, Maine.

CODE RECORDS & LICENSE GUIDES. Ameco 16-01, 17-01, 106-33. Perfect condx. $6.00. E. Jeltrup, 27A Lincoln Place, Ossining, N.Y. 10562.

SB 33 or 34 wanted any condition. Have Regency M40 and Realistic RP 30-50 MHz Rec. Perfect. K1CCW, 6 Wirthmore Lane, Lynnfield, Mass. 01940.

FOR SALE: High power plate supply components. Write needs. Wanted: Antique Atwater Kent breadboard receiver. D.B. Whittenmore, W2CUZ, Masterton Rd., Bronxville, N.Y.

SELL: Drake R4A—rcvr—recently factory aligned—$295.00. Drake TR4, XCVRC, with AC power supply—$475.00. All manuals and cartons—WA4PFE. Neil Ganter, 375 E. Merritt Ave., Merritt Island, Florida 32952. Phone: 315-452-4354.

WANTED: Frequency and Deviation measuring equipment for two-way FM. Smith, 915 Lovera, San Antonio, Texas 78201.

WANTED: 100V or 200V with factory 160 meter coils. W2CVW, 13 Robert Circle, South Amboy, N.J. 08879.

SELL: HQ 170 AC Good condx $195. Duo-Bander "84" $100 Excellent condx. J.G. Swaney, NSGA, Box 253, Ft. Meade, Md. 20755.

SALE: ARB/CRV 195 kc to 9.1 mc receiver with speaker converter for 115v operation. $20.00. BC-459A 7-9.1 mc transmitter, never used $10.00. W9TVV. Michigan City, Ind.

SELL: Excellent HW32a, xtal calibrator, ceramic PTT mic $100 high impedance dual headset with hi-Z ceramic boom mic $9, WA0LYO, 811 10th Spearfield, S.D. 57783.

50 WATT Xmitter, 6L6 Xtal or vfo osc. 807 final, 2 6L6 mod. 2 pwr supp; Local only. W2IIR, 33 Grove, Woodbridge, N.J. 07095.

FOR SALE: 4-1000 A amplifier parts. Bew fil choke, 850 A pi Net vacuum variable-complete amplifier with four enclosed rack. D. Roden, WA4NPL P.O. Box 684, Scottsboro, Ala. 35768.

7.5 Jennings UCSX-700, 25-700 Mmfd Vac, var. w/ drive unit, excellent—$45. K8IKB, 221 Edinborough, Findlay, Ohio. Ph. 419-423-5890.

BTI LINEAR FOR SALE: Used two years asking $495.00. WA6ZCQ, Ph. 213-663-1581.

TRADE OR SELL: Gear excess my needs, all kinds HF thru 10 GHz. Send prices ur/list, SASE for mine. W4API, Box 4095, Arlington, Va. 22204.

TO BUY: Xcvr—Gal. Drake—Swan. TO SELL: Viking 2—$80—SX111—$135. Hicock Sig Gen $75.00. Collins Dyn. hand mike—$20. Muffin Fan $7. Tube tester $15. Superior V.O. Meter $15/ 1129 No. Knight Ave., Park Ridge, Ill.

FOR SALE: 2-Brass base 30 tubes $5.00 each fil ok one Tip open $2.00 201 A's $2.00 each. Douglas, 2254 Pepper Drive, Concord, Calif. 94520.

75A4 mint condition, manual, best offer or. J. P. Delaney, WB6BOQ, 1328 Calle Pimento, Thousands Oaks, Calif. 91360.

EXCELLENT JOHNSON KW matchbox with Dir-Compler Etc. What am I offered? Cash or trade? L. Basham, 735 Coves Hwy, Cave Junction, Or. 97523.

WANTED: 4-1000A's (new or used if guaranteed) SK-506, SK-510, SELL: Xformer 2500-2500 at 500 ma $30.00, WB2YRU, 3538 Centerview Ave., Wantaugh, N.Y. 11793.

FOR SALE: Cabinet racks with doors, 22" x 22" x 76" 70" of 19" rack space. $30 each. No shipping. Gonset 6-77A/G-66B $125.00. W4JSC, P.O. Box 15013, Tampa, Fla. 33614.

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Random Thoughts — — — —

From the Boys in the Back Room

This article is going to make some people angry. Comments on commercialism and its relationship to purely "Amateur" radio invariably do. Nevertheless, we feel that some things have been left too long unsaid.

To put it bluntly, the economic state of the commercial end of amateur radio is sick. Other than a small handful of manufacturers and about eight or ten distributors, no one in the ham radio industry is making a profit. So who cares? We think that all hams should, and for several reasons.

To begin with, it was the "commercial interests" that have paved the way for the growth of ham radio. The superb equipment that was made available for the first time in the late fifties and early sixties, was and still is, as good or better than anything possibly needed by the average ham. Because of the "commercial interests" we now have full use of our potential on s.s.b., RTTY, ham TV etc.

Again, it has been the "commercial interests" that have made possible the many excellent hamfests, conventions, and hamborees that make hamming so much more fun. Without the manufacturers and distributors donating prizes, buying exhibit booths, and taking ads in hamfest programs, these fun events just plain wouldn't be possible.

And, of course, it has been the manufacturers and distributors who have financially supported the amateur radio magazines like *CQ* and *QST;* not only has this advertising support made it possible for these magazines to reach their readers at an affordable cost, it has also helped provide for many free services such as technical assistance, contests, awards, and many others.

Several weeks ago I decided to visit a few of the better established ham distributors to get a better pulse of what's happening out in the field. Right down the line one thing struck me quite dramatically. On the shelves of each of these distributors was a myraid of good used equipment from a variety of manufacturers. But where have these manufacturers gone from a ham radio aspect? What ever happened to Central Electronics; to Barker and Williamson; to Cosmophone, Harvey-Wells, Lakeshore, or Multi-

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Elmac? Where have Pierson-Holt, Morrow, and Lettine disappeared to? And worse yet, who will be next to decide that it just doesn't pay to make products for amateurs?

What caused the demise of these once solid ham equipment manufacturers? We can't answer that in simple blacks and whites. What could have kept their interest in the ham radio market as keen as it once was? Here again, we can speculate, at best. But one thing is obvious. Despite the enormous population spurt of the amateur radio fraternity, the dollar volume of the industry began slipping at the turn of the decade, and it has never come close to reaching the figures that the industry enjoyed during the prosperous years of 1957-1961.

Let's turn our attention for just a moment to the distributor picture. During the heyday of amateur business there were between 120 and 130 active stocking distributors selling and making a profit on ham gear. And, for the most part, these distributors were able to stock thorough inventories of the products of more than a dozen major manufacturers.

What's the situation today? Less than a dozen distributors of any consequence stock even half the brands available, and inventories are far from complete, product-wise. Who can we blame? Possibly the "bargain basement" discount operations who sell for pennies above cost and survive because their overhead is nil. Possibly the bargain shoppers who buy on price alone, overlooking the fact that in order for a distributor to both make a legitimate profit and provide satisfactory service, he can't afford the outlandish discounts that the "bargain basements" offer. And possibly the magazines for failing to recognize their responsibilities to help keep the industry healthy.

We don't intend to make any excuses for our own shortcomings, but we must point out one fact. Twelve years ago there were two successful ham radio magazines, both doing a fine, thorough, and competent job for the ham radio population, and both, by the way, making a nice conservative profit. Today there are four publications serving the same basic audience, forced to charge more than 50% higher prices to make ends meet, and interestingly enough, struggling to make a buck. Fortunately, *QST* has ample financial reserves to never need worry about their losses; also fortunately for us, we have several other prosperous publications which are able to help carry the load and enable us to turn out *CQ* on the highest level it's ever been.

What do we ask you, our readers, to do about all this? Not a thing. But as the little man on TV quips every week, you might want to think about it."

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READER SERVICE

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Please send me information on the products and services which I have checked above.

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Advertiser's Index

See page 110 for New Reader Service

The Best Deal in our History

(NCX-500, 5 bands, 500 watts for less than $250.)

Since we opened our door, we have never had a more attractive ham offer!

We offer to hams, worldwide, the famous National NCX-500 transceiver *new* at the thrifty price of $249.95. With the companion AC-500 Power Supply the total price is only $299.95: less than the price of America's most popular kit. Here are the salient features of this deal:

ONLY $249.95

PRICE SCHEDULE

1. NCX-500 with AC-500 (no speaker, no cabinet) $299.95
2. NCX-500 with **NCX-B** Supply (speaker and cabinet included) $319.95
3. NCX-500 with Linear Systems' Power Supply 400-12—$359.95
4. NCX-500 without supply—$249.95
5. XC-28 plug-in solid state crystal calibrator (available after February 15, 1970) $19.95

A. Only fresh, factory cartoned material offered.

B. A full 6 months warranty provided.

C. No trades considered at these prices.

D. Prices quoted are FOB Harvard, Mass.

E. Bank America Card, Master Charge, or American Express charge accepted. Financing available through GECC subject to their acceptance of your credit.

F. Special overseas prices available to sterling customers. Write. Remember this set works on 230 volts, 50 cycles equally well.

G. Offer limited to first come, first served.

SPECIFICATIONS:

Frequency Coverage: 3500-4000 kHz, 7000-7300 kHz, 14000-14500 kHz, 21000-21500 kHz, 28500-29100 kHz (2 additional crystals available at $7 each to provide expanded coverage of entire 10 meter band).

Power Input: 500 watts PEP on sideband, 360 watts on CW, 125 watts on AM, D rated 20% for mobile operation.

Emission: SSB upper on 10, 15 and 20 meters; lower on 40 and 80 meters.

Output Impedance: 40-60 ohms minimum pi network.

Receiver Offset Tune: By means of a varactor controlled oscillator you obtain plus or minus 3 kHz.

SSB Generation: Crystal lattice filter 6-50 db shape factor 2.2-1, gate 2.8 kHz on 6 db, center frequency 5.202 mHz; uses stable solid state ring modulator.

Dial Calibration: 5 kHz on all bands.

Tuning Ratio: Excellent mechanical resolution with 45-1 rate.

Electrical Stability: Nominally 1500 cycles in first 30 minutes thereafter plus or minus 400 cycles for room ambient.

Suppression: Carrier minus db, rejected sideband minus 40 db, third order products minus 30 db at full output.

Sensitivity: .5 microvolt for 10 db s/n in ss mode.

Audio Output: Better than 2 watts into 3.2 ohms.

Metering: PA cathode current on transmitter. S units on receive.

Special Features: Includes side tone monitoring plus built-in code practice oscillator for Novices; incrementation toning, provision for crystal calibrator.

Dimensions: 6 3/16" high x 13 3/8" wide x 11" deep. Weighs but 15 lbs.

Accessories Available: AC-500 supply, 21 lbs.; NCX-A deluxe supply, 25 lbs.; 400-12 mobile DC supply, 13 lbs.; AC supply operates on either 117 or 234 VAC 50-60 cycles; suitable for export. Mobile bracket furnished at no extra charge.

Shipments: Prefer via United Parcel Service, Railway Express or Parcel Post. Specify and include provisions for same otherwise charges will go COD.

The National NCX-500 with its AC-500 currently sells at $425 and $99 respectively. Thus, this deal is both timely and thrifty. If you have waited because you could not afford a modern rig, here's your *buy* now; even while the rest of the world came up on price. If you are a beginner or even if you have a big rig and need a second one for a spare, the NCX-500 should be your cup of tea; and it's splendid for mobile too. Study the specifications, read the magazine reviews, but send in your order while our stock lasts.

HERBERT W. GORDON COMPANY.

America's largest exclusive ham store

Woodchuck Hill Road
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(617) 456-3548

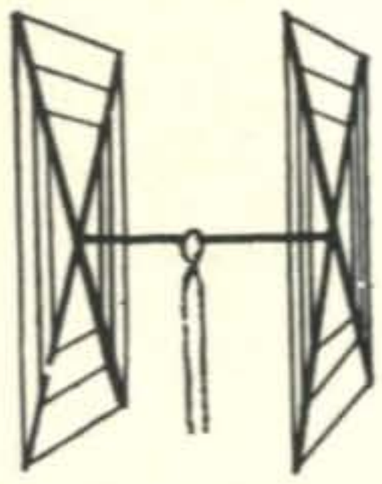
See page 110 for New Reader Service

AHA! YOU THOUGHT GOTHAM

made run-of-the-mill ordinary antennas. No, no, no. Our materials are the best, and our design superior. WA1JFG won the New England Round-Up championship with our 3-element 15meter beam by a margin of 5,982 points!

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:

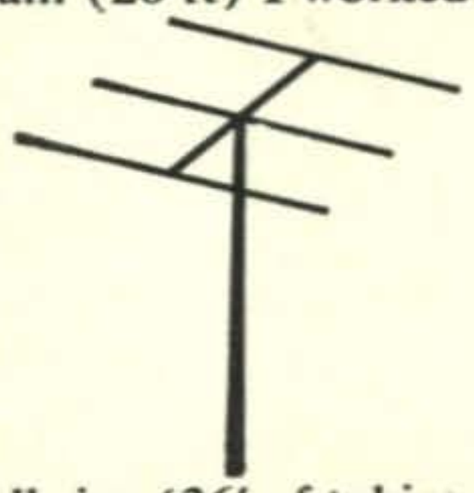
10-15-20 CUBICAL QUAD	$35.00
10-15 CUBICAL QUAD	30.00
15-20 CUBICAL QUAD	32.00
TWENTY METER CUBICAL QUAD	25.00
FIFTEEN METER CUBICAL QUAD	24.00
TEN METER CUBICAL QUAD	23.00

(all use single coax feedline)

GOTHAM
1805 Purdy, Dept. CQ, Miami Beach, Fla. 33139

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	$19	4 EL 10	$18
3 EL 20	25	7 EL 10	32*
4 EL 20	32*	4 EL 6	18
2 EL 15	15	8 EL 6	28*
3 EL 15	19	12 EL 2	25*
4 EL 15	25*		
5 EL 15	28*		

*20' boom

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts!
FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18.95

HOW TO ORDER: Send money order. We ship immediately by REA Express charges collect. Gotham ham and CB antennas are available for pick-up in: Rockford, Ill.; Orange, Calif.; Cleveland, Ohio; Daytona Beach, Fla.; Calgary, Canada; Hannibal, Mo.; Indianapolis, Ind.; South Bend, Ind.; Oklahoma City, Okla.; Leavenworth, Kansas; Dallas, Texas; Brockton, Mass.; Ellwood City, Penna.; and in the Benelux Countries and Australia. Write for name and address of franchised distributor. Other cities open.

See page 110 for New Reader Service

WORLD RADIO HAS THEM

The New Galaxy FM-210 Transceivers!

• The one the Amateurs have been waiting for! A 2-Meter FM Transceiver with Galaxy's well-known fine quality and performance! This American-made, solid state, FET front end transceiver offers no compromise performance for direct or repeater communications. A full 5 watts of Power (or 10 watts with the optional AC-DC Power Booster!) Check these specs and you'll agree – it's a lot of Transceiver for only $199.95!

SPECIFICATIONS

General: Frequency Range: 143-149 MHz. • Antenna Impedance: 50 Ohms Nominal Power Req'mts: 12-14 VDC (or optional power booster) • TRANS/REC. Crystals: 146.94 MHz included.

Transmitter: Power Input: 5 watts (10 W. with pow. booster)• Freq. Control: 3 Chan. crystal controlled • Microphone: High Impedance (PTT) required • Deviation: Adj. narrow or wideband with clipper filter also adjustable for optimum clipping level.

Receiver: Sensitivity: SINAD .5uv for 12db, 1uv provides 20db quieting. • Adjustable squelch • Modulation Acceptance: FM wideband (narrow band available) • Type: Dual Conversion, FET front end for minimum cross modulation and overload • IF Frequencies: 10.7 MHz and 455 KHz • Frq. Control: 3 chan. crystal controlled • Audio Output: 3 watts (internal 3.2 speaker)

Power Booster: Provides high power operation from either 12-14VDC or 117 VAC. Makes an ideal fixed station accessory. ($39.95)

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66MAO13 – GALAXY FM-210 ..... $199.95
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WORLD RADIO

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AC, DC, and resistance measurements are selected by a convenient switch in the single-unit probe. The probe is wired-in and equipped with fully-shielded input cable. Test leads are included for measuring current. An accessory slip-on, high-voltage probe is available for measuring up to 50,000 volts, DC.

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