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The Radio Amateur's Journal

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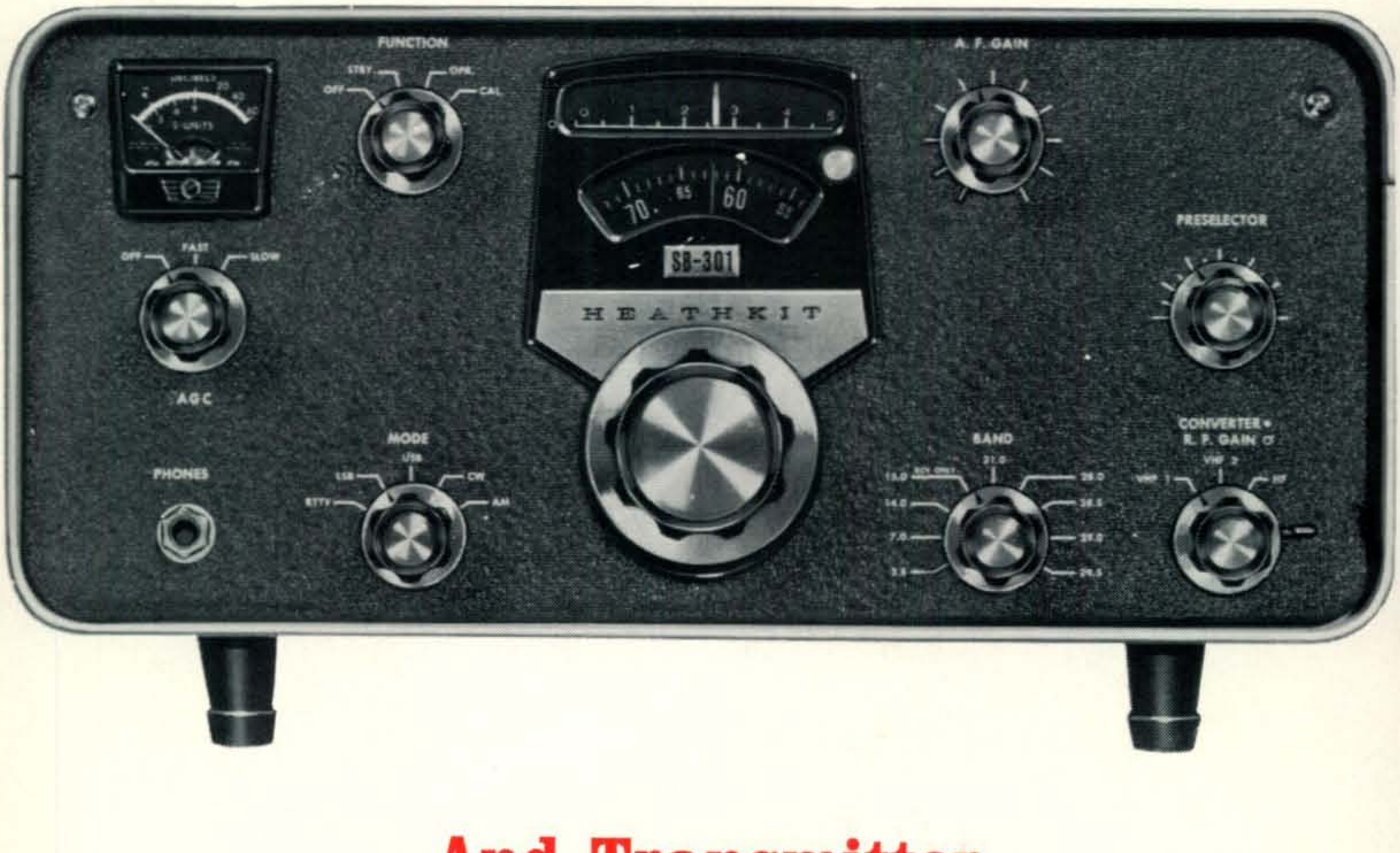

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The HEATHKIT® SB-301 amateur band receiver

Performance-Plus Features, Top Dollar Value And Sophisticated, Quality Engineering Have Made The SB-301 The World's Largest Selling Receiver

• 80 through 10 meter coverage on AM, CW and SSB with all crystals furnished • Famous Heath factory assembled and aligned Linear Master Oscillator for truly linear, high stability tuning • Crystal-controlled front end for same rate tuning on all bands • 1 kHz dial calibration — 100 kHz per dial revolution • Less than 50 Hz backlash • Less than 100 Hz drift per hour after warm-up • Bandspread equal to ten feet per megahertz • Tuning dial to knob ratio approximately 4 to 1 • Three speed AGC

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• RTTY position on mode switch — SB-301 is a fully capable RTTY receiver • 15 to 15.3 MHz coverage for WWV reception • Built-in 100 kHz crystal calibrator • Built-in switch selected ANL — a real help if your QTH is in a high noise location • Front panel switching for control of optional 6 and 2 meter plug-in converters — enables complete 80 through 2 meter amateur band coverage • Front panel switch selection of optional AM and CW crystal filters • Circuit board, wiring harness construction make assembly fast and simple

Kit SB-301, Amateur Band Receiver, less speaker, 23 lbs. **$270.00***
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Kit SBA-300-3, 6-Meter Plug-in Converter, 2 lbs. . . . **$19.95***
Kit SBA-300-4, 2-Meter Plug-in Converter, 2 lbs. . . . **$19.95***
Kit SB-600, Communications Speaker, 5 lbs. **$19.95***

Look over the specs and find out why thousands of hams have chosen the SB-301 for their shack!

SB-301 PARTIAL SPECIFICATIONS — **Frequency range** (megahertz): 3.5 to 4.0, 7.0 to 7.5, 14.0 to 14.5, 15.0 to 15.3, 21.0 to 21.5, 28.0 to 28.5, 28.5 to 29.0, 29.0 to 29.5, 29.5 to 30. **Intermediate frequency:** 3.395 megahertz. **Frequency stability:** Less than 100 Hz per hour after 20 min. warmup under normal ambient conditions. Less than 100 Hz for ±10% line voltage variation. **Visual dial accuracy:** Within 200 Hz on all bands. **Electric dial accuracy:** Within 400 Hz on all bands after calibration at nearest 100 kHz point. **Backlash:** No more than 50 Hz. **Sensitivity:** Less than 0.3 microvolt for 10 db signal-plus-noise to noise ratio for SSB operation. **Modes of operation:** Switch selected; LSB, USB, CW, AM, RTTY. **Selectivity:** RTTY; 2.1 kHz at 6 db down, 5.0 kHz at 60 db down (crystal filter supplied). SSB; 2.1 kHz at 6 db down, 5.0 kHz at 60 db down (crystal filter supplied). AM; 3.75 kHz at 6 db down, 10 kHz at 60 db down (crystal filter available as accessory). CW; 400 Hz at 6 db down, 2.0 kHz at 60 db down (crystal filter available as accessory). **Spurious response:** Image and IF rejection better than 50 db. Internal spurious signals below equivalent antenna input of 1 microvolt. **Audio response:** SSB; 350 to 2450 Hz nominal at 6 db. AM; 200 to 3500 Hz nominal at 6 db. CW; 800 to 1200 Hz nominal at 6 db. **Audio output impedance:** Unbalanced nominal 8 ohm speaker and high impedance headphone. **Audio output power:** ½ watt with less than 8% distortion. **Antenna input impedance:** 50 ohms nominal. **Muting:** Open external ground at Mute socket. **Crystal calibrator:** 100 kHz crystal. **Power supply:** Transformer operated with silicon diode rectifiers. **Power requirements:** 120/240 V AC, 50/60 Hz, 50 watts. **Dimensions:** 14⅞" W x 6⅝" H x 13⅜" D.

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SB-401 SPECIFICATIONS — **Emission:** SSB (upper or lower sideband) and CW. **Power input:** 170 watts CW, 180 watts P.E.P. SSB. **Power output:** 100 watts (80-15 meters), 80 watts (10 meters). **Output impedance:** 50 to 75 ohm — less than 2:1 SWR. **Frequency range:** (MHz) 3.5 — 4.0; 7.0 — 7.5; 14.0 — 14.5; 21.0 — 21.5; 28.0 — 28.5; 28.5 — 29.0; 29.0 — 29.5; 29.5 — 30.0. **Frequency stability:** Less than 100 Hz per hr. after 20 min. warmup. **Carrier suppression:** 55 db below peak output. **Unwanted sideband suppression:** 55 db @ 1 kHz. **Intermodulation distortion:** 30 db below peak output (two-tone test). **Keying characteristics:** Break-in CW provided by operating VOX from a keyed tone (Grid block keying). **CW sidetone:** 1000 Hz. **ALC characteristics:** 10 db or greater @ 0.2 ma final grid current. **Noise level:** 40 db below rated carrier. **Visual dial accuracy:** Within 200 Hz (all bands). **Electrical dial accuracy:** Within 400 Hz after calibration at nearest 100 kHz point (all bands). **Backlash:** Less than 50 Hz. **Oscillator feedthrough or mixer products:** 55 db below rated output (except 3910 kHz crossover which is 45 db). **Harmonic radiation:** 35 db below rated output. **Audio input:** High impedance microphone or phone patch. **Audio frequency response:** 350-2450 Hz ±3 db. **Power requirements:** 80 watts STBY, 260 watts key down @ 120/240 V AC, 50/60 Hz. **Dimensions:** 14⅞" W x 6⅝" H x 13⅜" D.

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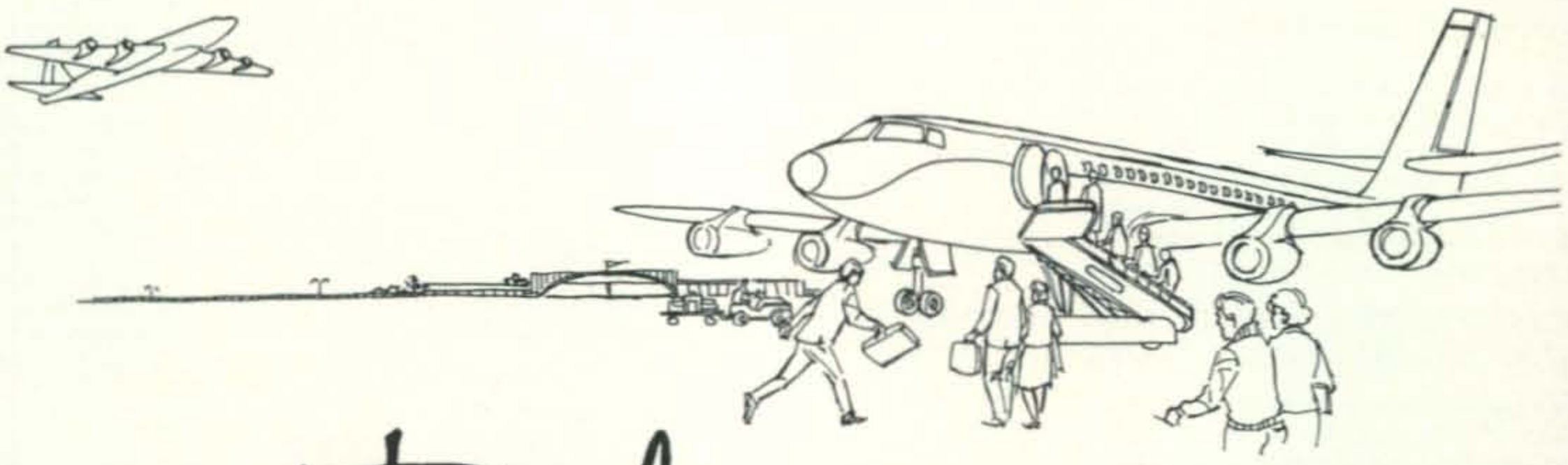

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MARCH, 1970 VOL. 26, No. 3

The Radio Amateur's Journal

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DEPARTMENTS

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					Plate Volts	Plate Amperes		
4CX600B	6.0	890	5-PIN SPEC.	Air	3000	0.6	750W	WIDEBAND AMPLIFIER SERVICE
4CX600F	26.5							
4CW800B	6.0	890	5-PIN SPEC.	Liquid	3000	0.6	750W	WIDEBAND AMPLIFIER SERVICE
4CW800F	26.5							
4CX600J / 8809	6.0	150	OCTAL SPEC.	Air	3000	0.6	750W	CLASS AB-1 LINEAR SERVICE

More? Our Application Engineering Department's ability to design tube into circuit means less engineering time for you. For all-around capability, talk to EIMAC. For circuit and application information on these new power tetrodes, write to EIMAC for our new, free application bulletin #14, *Using the 4CX600 Family Tetrodes*. Or contact your nearest Varian/Eimac Electron Tube and Device Group Office. They are located in:

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ZERO BIAS

THE cover of *CQ* for May 1967 hailed the imminent launch of OSCAR V, perhaps a little prematurely, but certainly with great enthusiasm. After an agonizingly long delay of nearly three years, another in the historic OSCAR (Orbital Satellite Carrying Amateur Radio) series is in orbit. Though not functioning at 100%, the new satellite is providing amateur radio's avid corps of space listeners with excellent practice in satellite tracking which will be put to good use when the next in the OSCAR series lifts off, hopefully within a year.

By now, surely every reading amateur has become familiar with the new satellite's proper name: Australis-OSCAR 5. The Australis part of the title, of course, comes from the new OSCAR's country of origin, Australia. Built by a group of amateurs at the University of Melbourne, headed by VK3ZPD, the orbiting package underwent rigid environmental tests in the US before being cleared for launch aboard a NASA Delta-N rocket, piggyback with Tiros-M, a second generation weather satellite.

With the glory for designing and constructing the tough little package going to the Melbourne group, the honor of knowing that they made the launch a practical reality goes to a select group of US amateur-space enthusiasts united under the name of AMSAT. The Washington, D.C. based group represents, to some degree, a second generation of its own, with key people like Perry Klein, K3JTE and Jan King, K8VTR/3 who were caught up in the excitement of space communications with OSCAR I in 1961 while still teenage students. Now, as professionals in the US space program, they reinforce the amateur radio satellite program with countless hours of their leisure time, as did the West Coast amateurs in the early '60's.

As pleased as we are with the success of Australis-OSCAR 5, we must voice again—as we have for previous OSCAR launches—our discontent with the post-launch support given to the people for whom the whole task was ultimately undertaken: the amateur radio space enthusiasts. These loyal supporters of the OSCAR concept ask for very little beyond a satellite to track. But they do need accurate and up-to-the-minute orbital information. It's available, but not to the average amateur, who must ordinarily rely upon W1AW broadcasts for orbital data. We have pleaded before, and we plead again now, that the individuals who bear responsibility for getting the needed information to the amateurs act in a responsible, interested and open-minded manner to prevent wrong, outdated information from being broadcast. As has occurred before, the W1AW predictions of OSCAR's orbit were erroneous for several days following the launch, despite repeated efforts by properly equipped people to break through the wall of complacency at League headquarters. If no better information were available, one could excuse the dispersal of bad information. But when correct data is ignored because it is offered by a competitive magazine (*CQ*), or is offered by non-affiliated, non-political amateurs, and because ARRL doesn't actively participate in OSCAR tracking and doesn't understand the consequences of errors, we find the matter impossible to excuse.

If League headquarters must host OSCAR victory parties for the press at the expense of its membership, let it remember that it only grudgingly gave support to the OSCAR concept in the early years, and has since copped more undeserved credit for someone else's labors than we can allow to pass unmentioned. If glory grabbing is "their bag" so be it, but let them at least support amateur space listeners with a willingness to distribute *right* information no matter who supplies it. It's not too much to ask.

73, Dick, K2MGA

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OUR READERS SAY

The Extra Class License

Editor, *CQ:*

The letter from W1FE on high-speed c.w. and the "Opinion" by K4IIF of the Extra Class license gives good food for thought and a few of mine may be of interest.

I am a believer in c.w. though I am not the fanatic that many are. I have long felt that it should be a required subject in school, just as swimming is in many places. As an emergency tool, there are times when it could be invaluable.

But try to sell someone else on it! I tried this, then hoping to get some support from the millitary, I discussed this with a friend who was a career Army officer and he told me that so far as he was concerned it was too slow and that they never used c.w. in his outfit anymore. There seems to be little support for c.w. outside of certain amateurs who made a big deal of it so it would appear that perhaps we are overdoing the importance of c.w. and falling into fetishism somewhat. True, we need a code test as part of our exams but this is to satisfy international treaty rather than from practical need. It would seem to the writer that we may be slowing down our own growth with an archaic idea here and there.

I recall reading somewhere that field day exercises in the c.w. department averaged about 3 w.p.m. in actual practice, possibly a practical speed during an emergency when accuracy is more important.

As one interested in constitutional law, it would seem to the writer that the present amateur license structure is class legislation and that if forced into a corner, the only legal structure could be single class license with a single code test, low enough to be practical, say 5 w.p.m. and a theory exam of such complexity that it could guarantee proper operation within the bands. The League has a good Code Proficiency program and it is questionable whether the FCC as a regulatory agency should be burdened with additional work of maintaining a stratified license program.

The fact that a person has a specific license does not guarantee courtesy which is a big factor in the public image of ham radio and of America in general. Perhaps the ham organizations could help the image of America by promoting the public image of the ham rather than laying so much stress on technical excellence, an important item, but something that will grow with activity.

Bob Forman, W9RJH/KØTNX
Monmouth, Ill.

Editor, *CQ:*

I have just finished reading the January issue. Please spare me any more whining by K4IIF and others about how hard it is to make Extra. My tears get the pages all soggy and then I can't read the fine technical articles such as those by Scherer and Bibby, to mention a few. In other words, it detracts from an otherwise excellent publication.

The Extra licence is a top-class certificate, and the exam covers all areas of radio communications—circuits, propagation, RTTY, a.m., FAX, antennas, Radar, s.s.b. and c.w. Its holders must demonstrate competence equivalent to that of journeyman (2nd class) commercial radoiotelephone AND radiotelegraph operators. As competence in c.w. requires an ability to send and receive code, any code requirement less than the equivalent 20 w.p.m. commercial grade rate would detract from the high standards set for the certificate.

Some suggest removing the code speed requirement for Extra. I don't see how anyone could claim to be a top-class operator and not be able to copy international distress and safety messages at their authorized transmission speeds, For those who are willing to be second-rate, who say that their only interest is radiotelephone and that they can afford factory-built, push-button stations, there is a place in ham radio for them too, and appropriate license grades. But to qualify as a top-class operator one should be adept in all phases of the game.

Granted it takes some effort to earn Extra. If this were not so there would be no value to it. And it is entirely appropriate that there should be some incentives and privileges such as those set by FCC, to reward this extra effort. This is one way to demonstrating internationally the value of amateur frequency authorizations—that is, as a training ground for thoroughly competent operators. Unless we can give our representatives at frequency conferences some talking points such as this we may end up some day with one big band, like from 10,000 to 10,100 mc.

F. V. Kohl, W4NM
McLean, Va.

Editor, *CQ:*

In response to Mr. Gardner's article, ("Our Readers Say," Jan. '70 *CQ*,) I would have to say he has spent little or no time copying or listening to the very many types of commercial services still done by code. The radio spectrum is so full of these services one could hardly call them obsolete and until phone is greatly improved, code as a means of ship to shore, weather, press and dozens of other services will for a long time be done by code, for one simple reason—less space, faster and less expensive.

I would say after taking the Extra class test I found the code test to be a lark. I could not say that about the written portion, which in my case dealt almost exclusively with one form of phone or another in which I have no interest. I doubt that even many of the phone men (those who have never used anything but a commercially built rig), could have coped with it. At the time I took the test there were twelve of us, eight

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phone and four c.w. operators. I know of no-one who passed the test. I will agree that I can see no reason why a phone man should have to pass a 20 w.p.m. test, but neither do I see why my written exam was exclusively a phone exam.

For a long time now I have been convinced that if the radio industry would finish their job and when building incorporate those circuits necessary to make true break-in operational, supply a good keying tone, good muting and keying it would be a big boost to c.w. I will agree that the industry is doing everything to make c.w. obsolete on the ham bands.

In these years of commercially built equipment I have yet to meet a phone man who can say that technically ham radio has improved his position in any way, however I have worked many c.w. operators who through ham radio are now commercial operators.

I am grateful for ham radio. I am retired and I know from working hundreds of other retirees, ham radio means everything to them now. Many are not physically able to pursue any other hobby and I think it is great that we are not all interested in the same type of operation.

In Florida where there are so many retirees, extending the so-called Extra class space would mean only one thing as far as the c.w. extension is concerned and that is, it would give the Latin phones fifty more kc of QRM free space. There is today here in Florida no such thing as a c.w. portion of any band, especially forty where so many c.w. men would like to operate.

The entire c.w. portion of 40 is filled with Latin phones most of whom use high power, amplitude modulation and very poor regulation. I would say if this were to continue the least we could do is give the c.w. operator A-2 mode of operation, we could at least turn off the b.f.o. and mix the dots and dashes with the Spanish.

E. M. Hollis, K4CN
Palmetto, Fla.

"Our Readers Say" welcomes letters about nearly anything of interest to amateurs, whether about *CQ* itself, the state of the hobby, or whatever else you have on your mind. The most interesting letters will be selected for publication each month. Drop us a line.

Announcements

Nicaragua

According to a letter received here from the Club De Radio Experimentadores De Nicaragua, Nicaraguan Government Communications Department Decree No. 682 as of Dec. 4, 1969, now allows all Nicaraguan amateurs to use the prefix HT during 1970 besides or instead of the prefix YN. This authorization is part of the governments participation in the clubs silver anniversary.

Saint Pierre and Miquelon Islands

The French/US reciprocal licensing agreement now extends as of October 3, 1969 to the islands

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of Saint Pierre and Miquelon. For complete information on operating conditions on the islands contact Gus Roblot, FP8AP, Box 398, Saint Pierre and Miquelon.

La Grange, Illinois

The Chicago Suburban Radio Association will hold their annual Hamboree on March 22nd at East Ave. and 55th St., Countryside (La Grange), Ill. Flea Market and prizes. For information and directions contact Col. Wilson Thomas, W9-KWA, 4017 Vernon Ave., Brookfield, Ill. 60513. Phone: 312-HU 5-0451.

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. Activities start about 10 A.M. with an auction. Plenty to do throughout the whole day.

Midland, Texas

The Midland Amateur Radio Club's annual St. Patrick's Day Swapfest will be held on March 14th and 15th. For full information contact: MARC, Box 967, Midland, Texas 79701.

Champaign, Illinois

An auction sponsored by the Twin City Amateur Radio Club will be held on March 22, at Lamb's Auction House, 1600 N. Oak, Champaign, Ill. For further details write to: Milt Forsberg, K9QZI, 807 W. Charles St., Champaign, Illinois 61820.

VE8 QSO Party

The Yellowknife Centennial Amateur Radio Club in N.W.T., Canada have organized this event in conjunction with other amateurs in the N.W.T. and Yukon as part of the Centennial activities and Artic Winter Games. The QSO Party starts at 0000 GMT, Monday, March 9th, and ends at 0600 GMT, Monday, March 16, 1970. All bands may be used and the same station may be worked on each band and mode for contact credit. Exchange: QSO number, RS/RST and N.W.T. stations. (ARRL section and/or country for others)

Suggested frequencies: 3560, 3785, 3855, 3990, 7030, 7240, 7290, 14040, 14140, 14225, 14290, 21050, 21300, 28100, 28600, 50250, 50360, 144, 144.5, 144.8 (mc). Certificates will be awarded to the top scorer in each ARRL section and Country with a trophy to the leading N.W.T. station and the leading "outside" station. Mailing deadline is April 30, 1970. Logs go to: VE8NWT, c/o YCARC, Attn: Contest Chairman, Box 1944, Yellowknife, N.W.T., Canada.

Detroit, Michigan

The South Eastern Michigan Amateur Radio Association will hold its annual Swap & Shop on April 12, from 10-4, at the Cannon Memorial Recreation Center, on the corner of Cadieux and E. Warren, Detroit, Michigan. Lots of door prizes. For more information contact: Marty De Ven, WA8SJX, 18810 Washtenaw, Harper Woods, Michigan 48225.

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SCRATCHI

Feenix, Ariz.

Deer Hon. Ed:

Hon. Mother's Day, Father's Day, Veteren's Day, Secretaries Day, Groundhog Day, Independence Day, Grand-dad's Day, Labor Day, Columbus Day, April Fool's Day, Flag Day, St. Valentine's Day, St. Patrick's Day, Memorial Day, Election Day, Bachelor's Day —by the beard of my Hon. Sacred Ant Fuji, everybuddy got days but us amchoors.

I say it's high time we no longer standing still for such treetment. It's high time all of us amchoors standing up for our rites. How abouts it, Hon. Ed., will you leeding us victoriously to victory so we can having an Amchoor Day?

Don't you thinking we been treeted shabbily? Oh sure, we having a postage stamp issued in commemorayshun of Amchoors. But just try mailing a letter with it. Hah! It only a nickel stamp, and you know how far that getting a letter these days.

So, open the pages of your Hon. Mag and start the attack. Write an editorial. Ask everybuddy to write his Hon. Congressman. Let's get the ball rolling.

I not looking for anything fancy. In fackly, the more I think about it, the more I think we ought to keep the date of Amchoor Day a secrut. Howcomes? Well, if everybuddy knowing the date, I'm afraid Amchoor Day will become reel commercialized.

If we keeping the date secrut, then, in effect, we celebrating it all year. I mean like, supposing you are about to sineing off a QSO. Not knowing when Amchoor Day is—it mite be the next day—you desiding you better wishing the other ham a Happy Amchoor Day. So, you rapping out a fast dididdit, didah, dahdidit.

Inasmuch as nobuddy knowing what date it is, you can having "Happy Amchoor Day" printed on your QSL cards. Think of the

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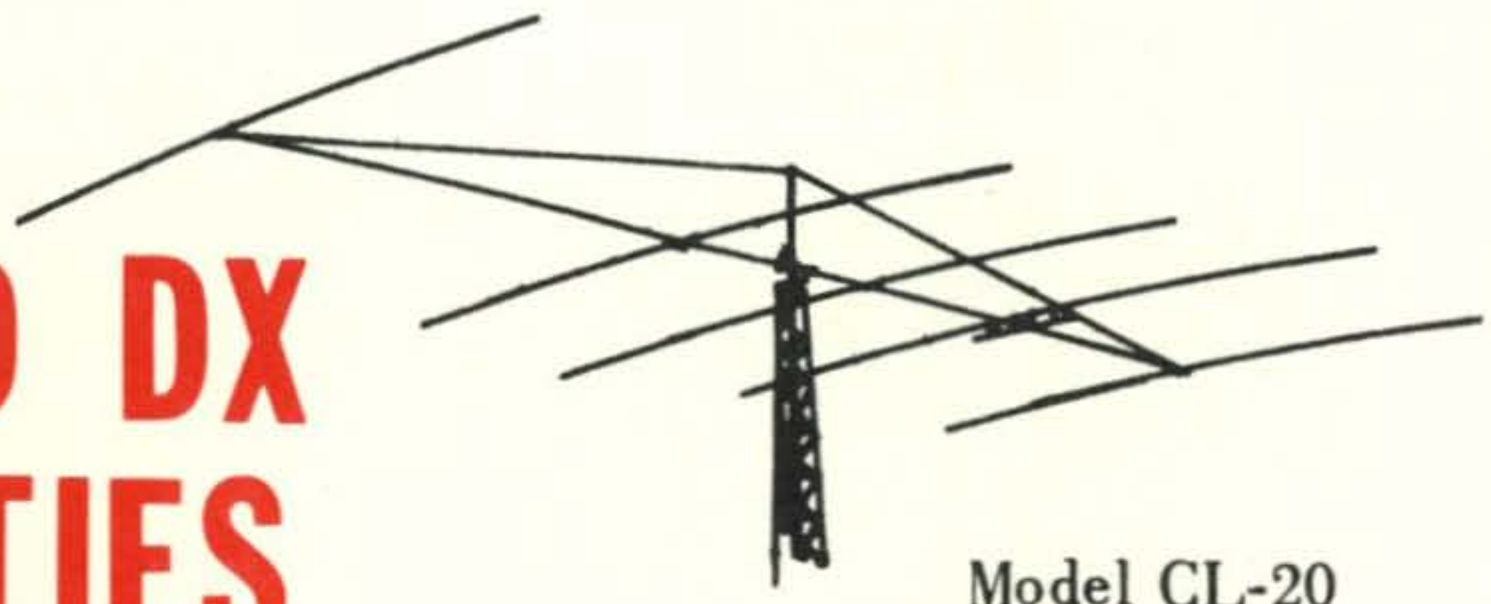
NEW SINGLE-BAND BEAM
FROM MOSLEY

The Classic 20 WITH EXPANDED DX CAPABILITIES



Model CL-20

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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

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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

thousands and thousands of greetings we passing back and forth on QSL cards! Every time you getting a QSL card, you getting a Happy Amchoor Day greeting!

That's a lot better than having everybuddy know the date. If date is widely known, then the greeting card companies getting in the act. You would walking into your middle-of-the-block drugstore and finding Happy Amchoor Day cards with poems on like this:

For messing up my televishun,
I'd like to see you go to prison,
Which prompts me now to you to say,
I hope you're miserable on
Amchoor's Day.

or, maybe a poem like:

Since you were just a little tyke,
Fooling with that dawgone mike,
All I could do was reely pray,
You'd have a happy Amchoor Day.

Then when that was happening, and Amchoor Day was getting reel well known, the next thing would be other companies coming out with speshul gifts to giving to amchoors on Amchoor Day. One company would put out there reseevers with a fancy ribbon around it, spelling out "Happy Amchoor Day."

Another company would package there mikes in speshul boxes, with a space to write in "From" (Ant Minnie)..."To" (Johnny) ..."on Amchoor Day."

First thing you knowing, Hon. Seek-You Magazine having to run lots more ads several months before Amchoor Day, on acct. of all the companies coming to you forcing money down your throat so they could advertising and selling there products as gifts to giving on Amchoor Day. That making your Hon. Rag so think it being hard to reed.

And then, when Amchoor Day dawning grite and early, amchoor are having to pulling himself out of bed and going to Hon. Operating Table to see what presents everybuddy giving him for Amchoor Day, like a new reseever, a new automatic key, a new scope, of even a hundred bux bift certificate.

(That's a cute little touch–the putting of the presents on the operating table, don' t you thinking, Hon. Ed?)

So, just because the date of Amchoor Day is being widely known, we having all these problems, like getting every yeer ... Hmmm ... Hmmm ... You knowing, Hon. Ed., I not

[*Continued on page 98*]

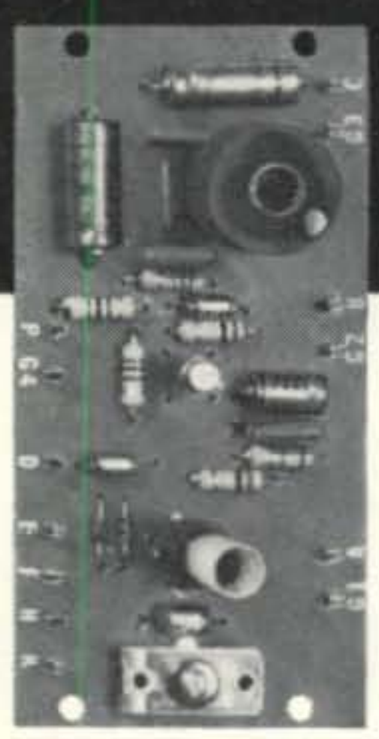
See page 110 for New Reader Service

Solid-state Building Blocks

for inexpensive low power transmitting/receiving.

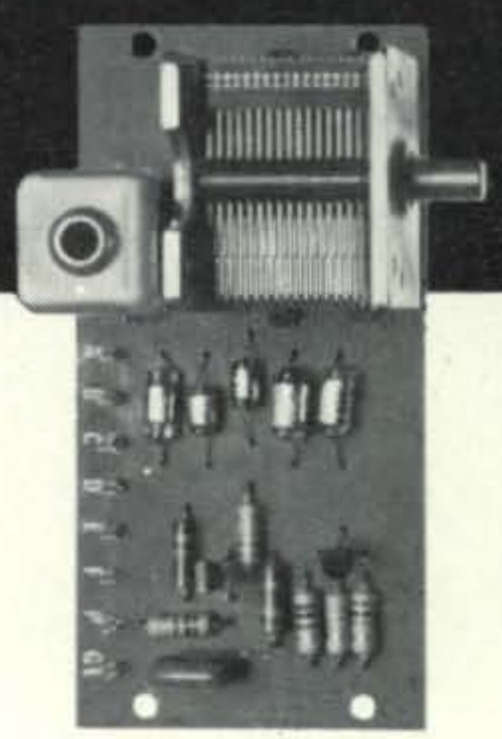
These four modules, MX1, AA1, VO1 and TX1 are completely wired and assembled circuit boards to custom build a 40-80 meter CW transceiver. Use the VO1 for a transmitting and receiving VFO. The MX1 converts signals directly to audio. Crystal provision in the TX1 allows Novice use. AA1 amplifier drives head phones.

MR1, set of four modules, with instructions **$29.95**



MX1—Synchrodyne detector-converter uses dual gate MOSFET for high sensitivity, low noise and effective reduction of overload. Selectivity 2KHz. 2″ × 4″ circuit board. Power +12 VDC @ 3 ma.

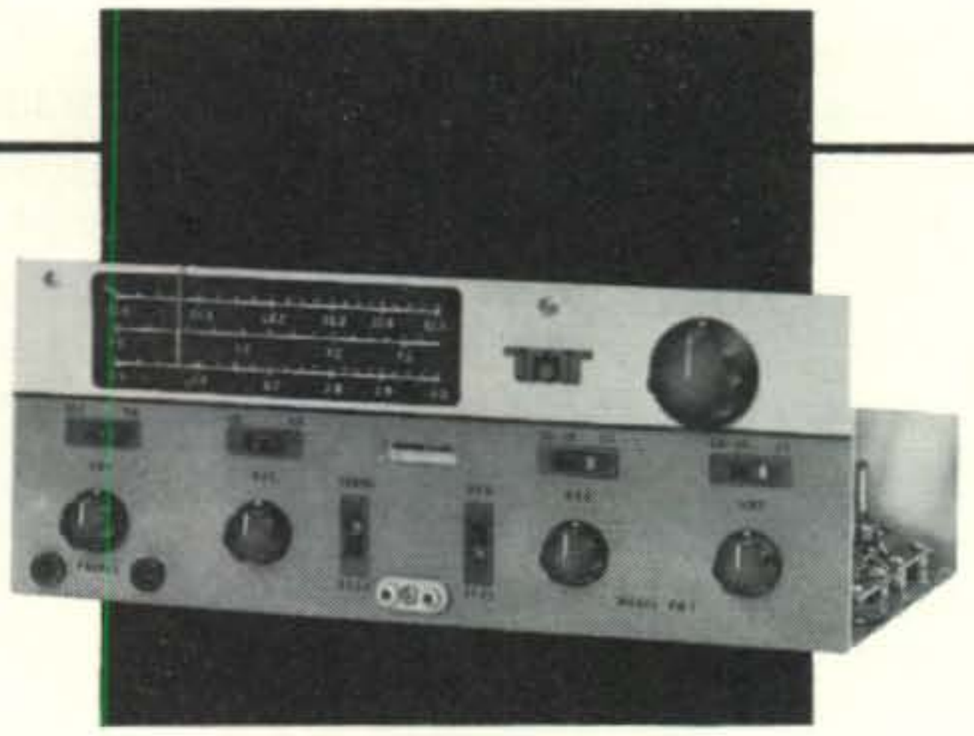
AA1—Integrated circuit audio amplifier has 100 db gain. Response shaped 200-2500 Hz. Output impedance 1000 ohms. Drives high impedance headphones. 2″ × 4″ circuit board. Power +12 VDC @ 9 ma.



VO1—40-80 meter oscillator-buffer. Drift less than 100 Hz. Output 2 volts R.M.S. Low impedance. Designed for use with MX1 or TX1. 2″ × 4″ circuit board. Power +12 VDC @ 15 ma.

TX1—Crystal oscillator and power amplifier. Tapped toroidal coils cover 80-40-20 and 15 meters. Final amplifier power input 2 watts. 2″ × 4″ circuit board. Power +12 VDC @ 250 ma.

$7.95 Each!



POWER-MITE 1 The MX1, AA1, VO1, and TX1 modules are wired into a band-switching 80-40 meter CW transceiver. Front panel controls: On-off, Transmit-Receive, Receiver Resonate, VFO-Crystal, Bandswitches, Oscillator tuning, Final Resonate. A meter is provided to monitor final amplifier current.

PM1 **$49.95**
PM2 (with case) **$54.95**

AC1—Convenience kit for MR1 modules. Contains amplifier current meter, power switch, antenna switch, knobs and connectors. **$7.95**
AC3—15 meter converter. Converts 21 MHz band to 3.5 MHz. Free running injection oscillator. Dual gate MOSFET. 12 VDC @ 8 ma. **$8.95**
AC4—Low power SWR meter. Usable from ½ watt to 250 watts. **$14.95**
AC5—Low power antenna tuner. Matches random length twin lead or open wire line fed antennas. 10 watts maximum. **$8.95**
AC6—Extend MR1 module group to 20 meter transceive operation with side-tone for all bands. Built-in side-tone volume and frequency adjustable. 12 VDC @ 5 ma. **$7.95**
KR3—Solid state keyer module. Integrated circuit. Complete with speed pot (6-60 wpm) and keying reed relay. 2″ × 4″ circuit board, use with AC2 monitor. 6 VDC @ 100 ma. **$17.95**
AC2—Keying monitor. Also ideal code practice oscillator drives speaker or phones. 6 VDC @ 50 ma. Use with Model KR3 Keyer. **$5.95**

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This is the view that greets my neighbor when he steps into his backyard. Six bands worth of antennas on a 54-foot tower.

SAFE & SOUND

TOWER INSTALLATION

Part I

BY MORT WATERS,* W2NZ

AFTER 8 years of constantly nursing a quad I decided to switch to a yagi because it just had to be less trouble. I couldn't see how it could help but be an improvement, at least physically. Even if it broke as often as once a year, I'd be way ahead.

The Hy-Gain TH6DXX looked good to me so that was chosen as the basis of my new antenna farm. This brought about complications, however. My skinny old self-supporting tower had served me well, but it couldn't carry this load. Neither would the AR-22 I'd been using be able to keep the big beam pointing where I wanted it. Both would have to be replaced.

Because backyard space is small at my QTH, a guyed tower was out of the question. Also, because I refuse to climb higher than the third step of a ladder, the new tower would have to be a crankup, foldover type.

After much soul searching and catalog studying, I picked a free-standing Rohn tower, model HD-3-54. The model number tells the story: heavy duty, 3 section, 54 feet fully extended. I like the way Rohn designs their towers. As they get higher the bottom sections get fatter, instead of just adding thinner ones at the top as some do. With it I could get a tilt base that incorporated a built-in self-erecting winch. There was another feature that appealed to me greatly because my old tower lacked it. These sections moved smoothly on roller guides. Hoisting and lowering were easy and silent. Thinking ahead, I also liked the 40 to 1 ratio gear winch which could be easily motorized so that it would be possible to raise and lower the tower from the operating position.

If your situation is like the one I faced—extremely limited space for a tilting tower—you have to find a place for it with room to tilt. At the same time, you have to consider the spread and turning radius of the antenna to keep it within the bounds of your property. The TH6DXX's turning radius is 23 feet.

*82 Boston Ave., Massapequa, L.I., N.Y. 11758

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The boom is 24 feet long and the biggest element is the reflector at the end of the boom. Its length is 31 feet plus, precise size being determined by the chosen resonant frequency.

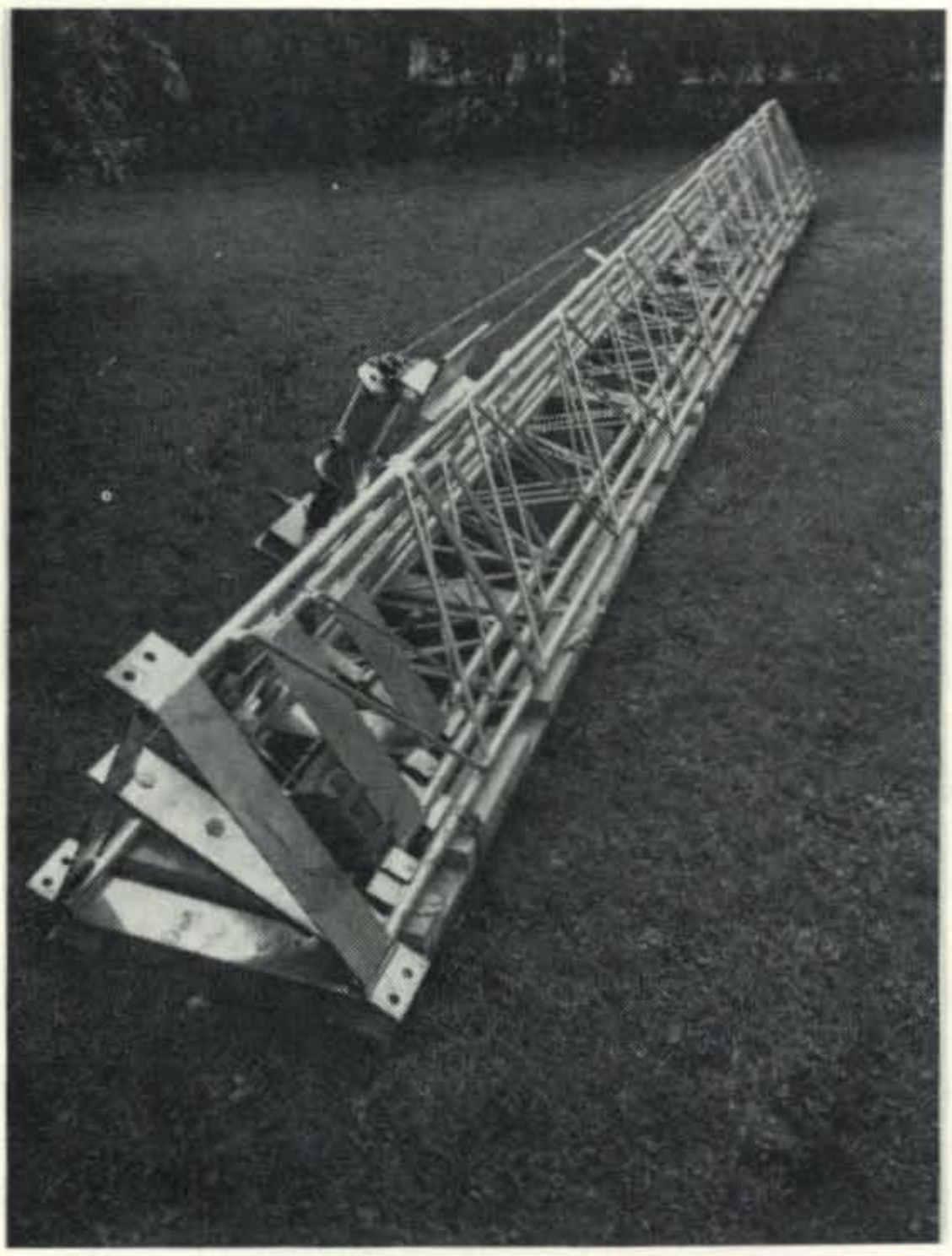
To summarize, these are the factors to consider in selecting the spot for the tower:

1. Antenna turning radius.
2. Orientation of the base and tower so that it tilts in the proper path.
3. The amount of clearance required in one or more directions from the base, for both erection and tilting.

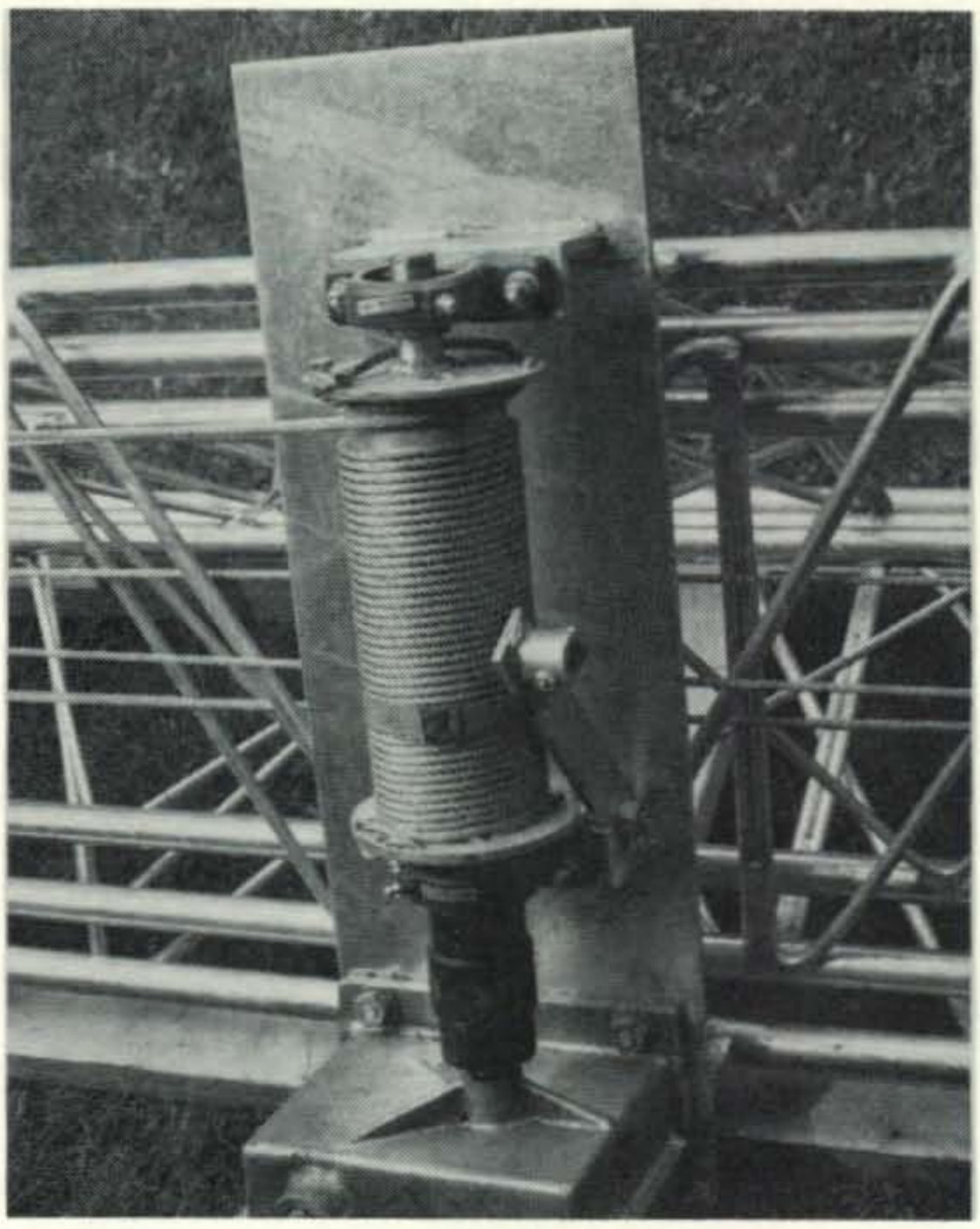
To determine the latter, you must obtain from the manufacturer the distance from the top of the tower (when fully collapsed) to the hinge point, and from the hinge point to the bottom of the tower. For this tower, these distances were 13½ feet and 8 feet respectively. To the upper dimension, you must also add the height of the mast—or, as I did, the height to the point where the beam would be attached, because I wanted it to lie entirely within my property when tilted.

While some makes don't require it, the Rohn system is such that you have to provide one-time clearance of the full collapsed length of the tower, in a direction 180° from the path in which it will tilt. This is due to the uniquely easy erecting system Rohn has used for many years. The photos show how it's done, but here's a brief explanation. With the base set in concrete, the tower is maneuvered into position on the ground so that the welded ears on the bottom of the tower match another pair on the bottom of the base. A pair of bolts is slipped through matching holes, a cable from the small erecting winch is attached, and the tower is cranked to a vertical position. Once upright, ears 8-feet up the tower mate with ears at the top of the base. Again bolts are slipped through. The hoisting cable is removed from its erecting position, rerouted through another pulley at the bottom of the base, and shackled to the tower. The pair of bolts inserted in the first step is then removed and the tower is free to tilt *in the opposite direction* on the upper pair of bolts.

It is suggested that all holes be checked for bolt clearance before erection. I found that excess galvanizing had managed to solidify over part of the openings, and had to be removed before the bolts would fit. This can be done with a 1/2-inch rattail file, but I used a tiny grinding stone powered by a high-speed Dremel Moto-Tool, which did the job in moments. In addition, although the tower hardware is also heavily galvanized, I smeared



The tower is delivered assembled with hoisting cables already strung and attached to raising winch. Notice ears at bottom in foreground, for bolting to base. One of two ears on which the tower pivots for tilting is visible well above the winch.



Winch drive is by 40 to 1 worm gear. Crank is strapped to drum for shipping. Cabling is double; pull-down cable pays out as tower goes up. Hoisting cable winds on drum at same time. As tower is lowered, the reverse takes place.

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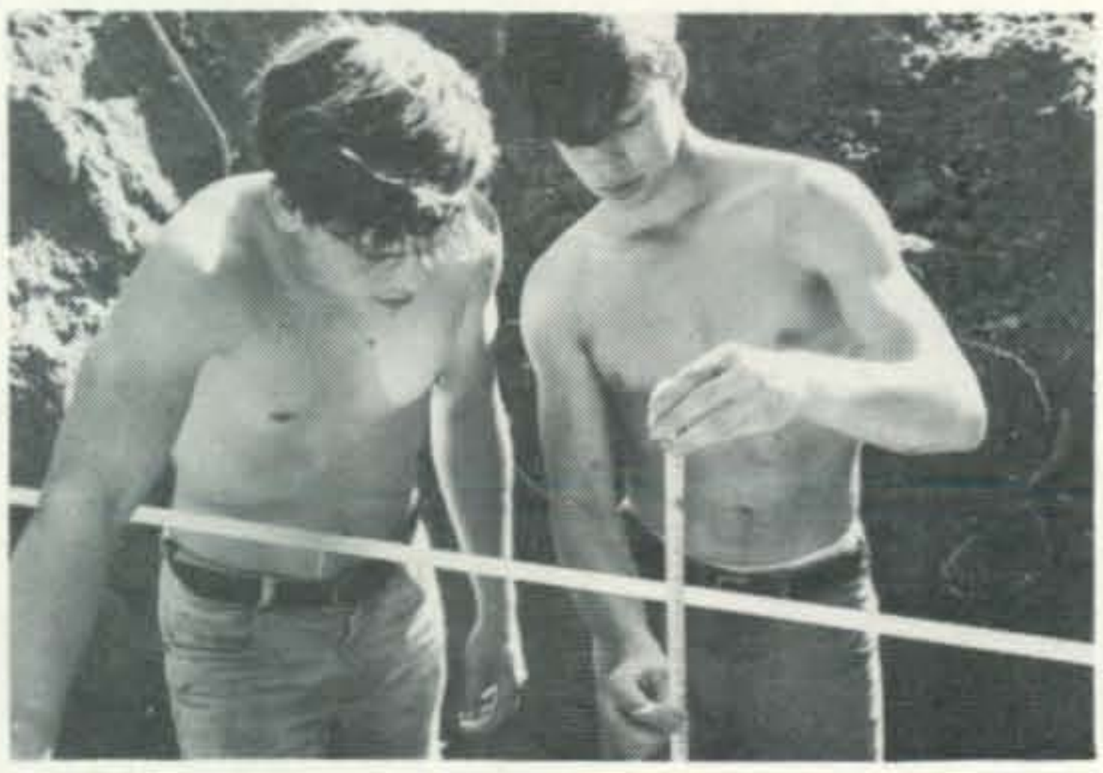
Massive base is constructed of heavy steel galvanized pipe and solid rod braces welded to uprights. Enclosed area in foreground goes into the concrete. The open vee protrudes above ground and enfolds the tower.

Careful locating of the base and the hole for it are absolute musts, as explained in the text. Two young huskies begin digging. A layer of clay was found right beneath the surface, probably from backfilling when the house was built. Pick was needed to break through it.



Hours later, the right depth had been reached. You can measure it accurately by laying a straightedge across the hole and dropping a rule from that point to the bottom. The sides of the hole must be square or even undercut.

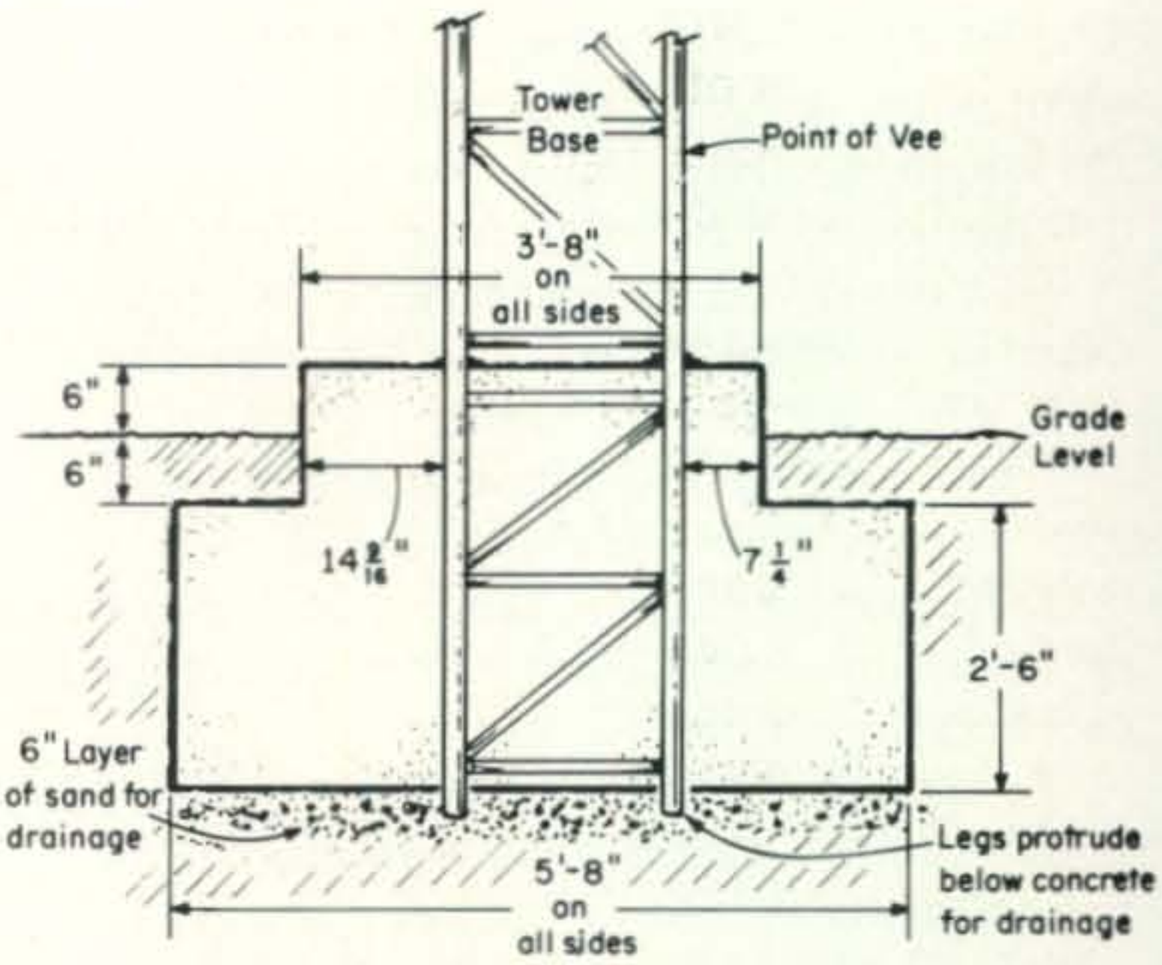


Fig. 1—Recommended configuration of poured concrete base for the author's 54' heavy-duty crank-up tilt-over tower when erected in sandy or unstable soil. Note that the tower base is *not* centered in the concrete to allow for the shifting center of gravity as the tower is tilted.

the bolts and nuts with a coating of wax-like waterproof graphite grease. I had used it on my old tower, too, and it stood up for eight years. The hardware came off as if it were brand new. The grease is made by Joseph Dixon Crucible Co., Jersey City, N.J. and can be identified by its consistency. It is as stiff as paste wax, if not more so, and should last practically forever. Ordinary grease will wash away and need renewal. I also used this grease for all mechanical hardware on the antenna—perhaps an unnecessary waste of time, but I know that anything I ever want to remove won't fight back.

My problem was further compounded by the fact that a couple of trees grew within antenna span of the only possible place I could locate the tower. The trees were about 35 feet high—well above the nested tower height and would therefore interfere with assembling the antenna to the mast. More on that later. The XYL refused to let me cut them down, as that would destroy much of the shade in our yard. Furthermore, a third tree would interfere with the original erection of the tower, but that was easily corrected by lopping off a couple of its lower branches. Finally, the antenna would have to clear the roof and the end of the house as it described a descending arc when being lowered for adjustment or repair, because the elements on one side of the boom would have to come down in an area only about 8 feet wide, between the house and the hedge at the property line.

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To find the proper spot, I carefully measured the height of the roof where the antenna would pass over it in tilting, the distances to the hedges and the end of the house, all the while keeping in mind the tree that would be in the way when getting the tower upright the first time. These careful measurements were then plotted to scale on graph paper. Then I laid on a scaled-down cutout representing the tower and antenna to see what kind of clearance I had. It was close, but I could do it. This care paid off later. The tower fit exactly as I had planned, but cleared the house with only a foot to spare.

The point is important and worth emphasizing. Be sure to arm yourself with every fact you need to know. Be sure to have the manufacturer's complete installation instructions before you commit yourself to a site.

Erecting The Base

The first step in actual construction was staking out the location for the concrete slab. Here I had previously encountered a problem that, while not unique, is not too common, and brings in yet another factor which had to be considered. The soil of much of Long Island, especially the south shore where I live, consists of very fine sand just like the ocean beaches. In describing this to the Rohn engineers, they recommended a larger-than-normal concrete base. The usual size for this tower is a cube measuring 3½ feet on each side, less than 2 cubic yards. For my backyard beach club, however, a larger amount was suggested. The shape was to be a sort of squared off keystone. And because of the condition again, the steel base was not to be sunk squarely in the center of the block, as was the normal practice. Instead, it was to be placed offside, the better to withstand the strains and stresses of tilting and erection in what was, perhaps, an unstable soil. Fig. 1 gives the dimensions of this slap.

Okay—so now I staked out the slab. Then I found myself a couple of local huskies to do the hard work. The dirt they dug up made quite a pile. When digging any hole into which concrete is to be poured, go down only as far as you must. Avoid disturbing the earth below that point. However, if you do go deeper, for whatever the reason, and then must backfill, moisten (don't soak) the fill and tamp it down firmly. Let it settle for a few days before pouring the mix, in order to provide a base that won't sink later under the heavy load.

The base is set in the hole and positioned properly with respect to the edges. It is *not* set dead center (see text and fig. 1). Check orientation also to be sure of clearance for tilting. Tower tilts toward the point of the open vee.

Drainage for the pipe legs must be provided to prevent water from accumulating inside and rusting the pipes. Fortunately, the bottom of this hole was pure sand and nothing else had to be done. The base is seen here being leveled before the concrete arrives.

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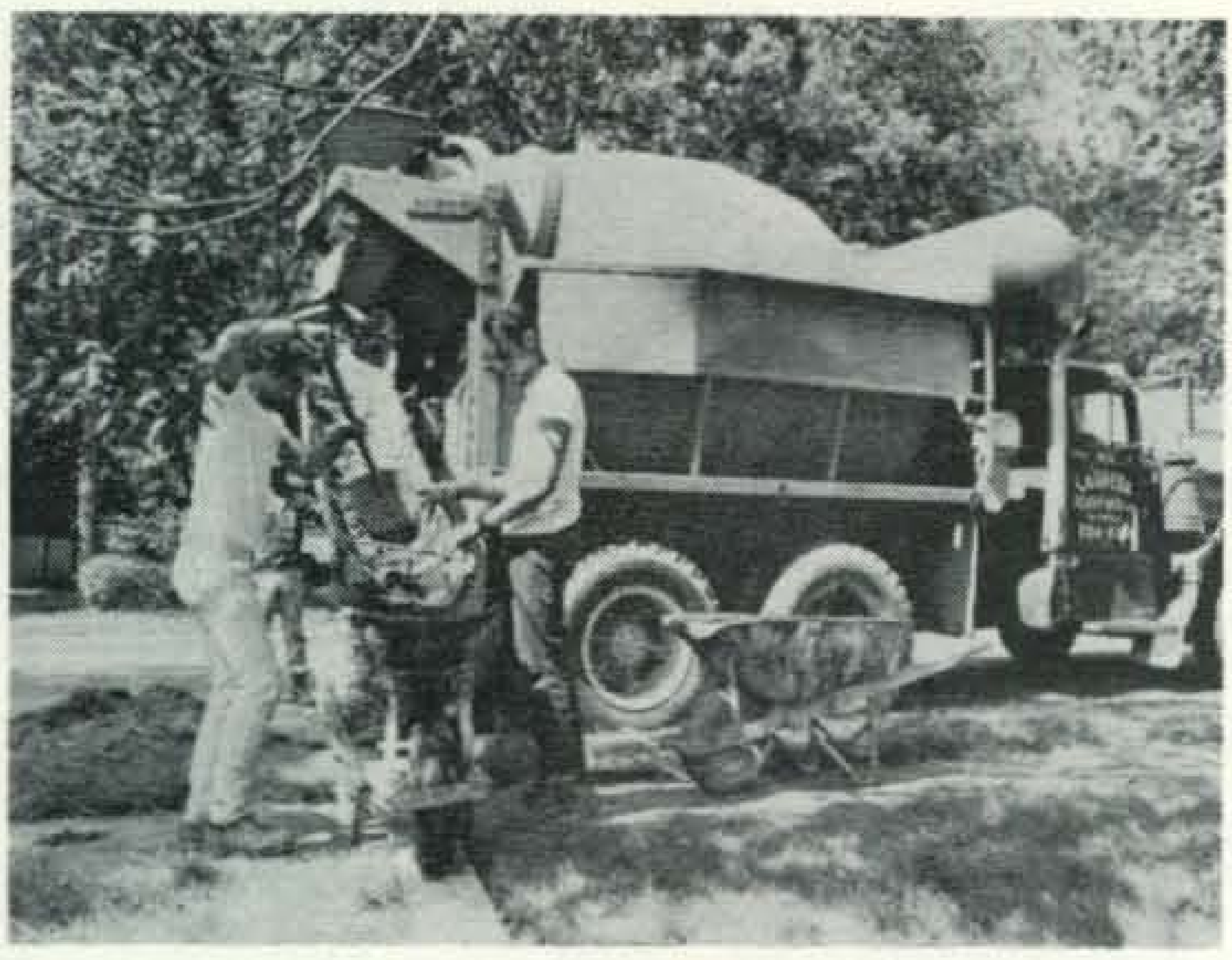
Half-inch reinforcing bars are wired together around the base, the vertical members being spaced about 1 foot on centers. Location is not supercritical. Reinforcing bars are also placed horizontally, right through the base. Wherever they touch the base, they are wired together.



The concrete truck arrived on schedule. The mix is a standard 3000 lb. concrete.

A big moment! The first wheelbarrow load is dumped into the hole. Throughout the pouring, the base was leveled frequently, and several times needed slight correction after having been disturbed by the force of the falling concrete.

Several 8-foot ground rods should be slammed into the bottom of the hole. When the tower base is placed, wire it to the rods with #8 or larger aluminum wire for good grounding. Level the base with care for the tower won't be plumb if it isn't just right. The Rohn base is designed to extend below the concrete to provide drainage for the pipe legs, so you have to include that in your calculations as well.

The last step before pouring was to build a criss-cross wire-tied cube of half-inch deformed reinforcing bars, according to Rohn's specifications. They formed a cage around and through the tower base. Bars and base were tied together with wire at each meeting point. The base was checked for level at each stage of the work. I cannot overemphasize the importance of doing so. It's bad news if you don't.

With all in readiness, the Transit-Mix truck arrived with a load of standard 3,000 p.s.i. concrete. This was brought around to the house in big wheelbarrows and dumped into the hole. Several times during the pouring, the base was checked and readjusted to the vertical from which it had been slightly moved by the force of the wet concrete falling into the hole.

Many barrowloads later, the level of the large part of the slab had been reached. Here's where I learned a new trick from the contractor. He built two L-shaped forms, placed them around the base on top of the fresh pour from which the reinforcing bars still protruded, nailed the ends of the L's together and had a nice square form for the

[*Continued on page 97*]

At this point, the top of the main slab has been reached and the mason is trowelling before putting on the form for the final pour. Note the tops of the bars protruding. The balance of the pour was made in such dim light that photos couldn't be taken.

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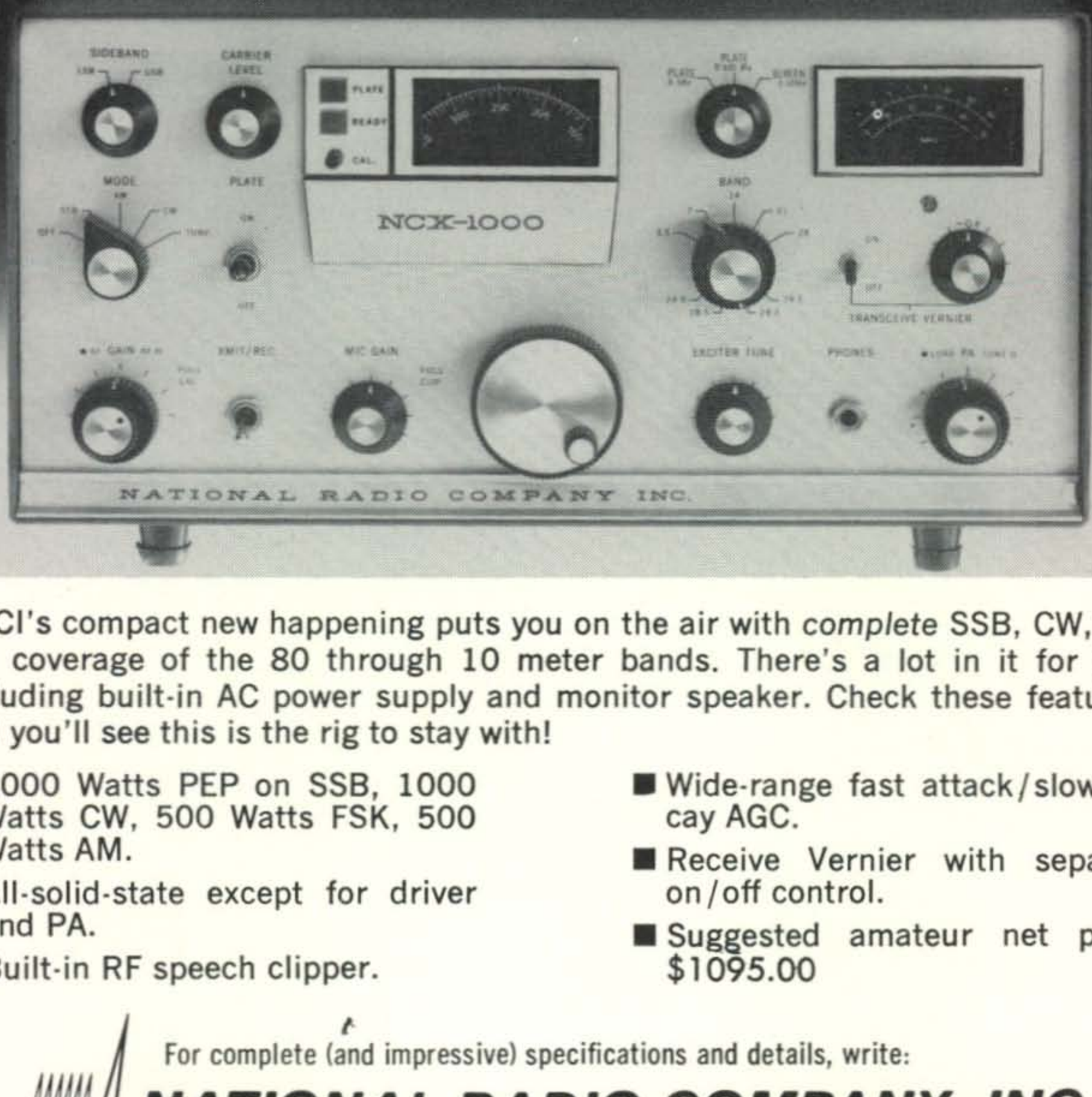
MEET THE NCX-1000 TRANSCEIVER...
THE NEW DESKTOP POWER PACKAGE FROM NRCI



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HY-GAIN'S NEW 400

Up to 10 times the mechanica capability of any rotator on th

Until now, if you wanted a rotator for a large beam or stacked arrays, you had little choice. You could either build it from scratch, or spend a bundle of money. (Of course there was a third choice of buying a rotator that just wasn't up to the job.) But that's all changed. Now you can have Hy-Gain's "400" with up to 10 times the mechanical and braking capability of anything currently on the market. Handles stacked large beams with ease. And it costs just $189.95.

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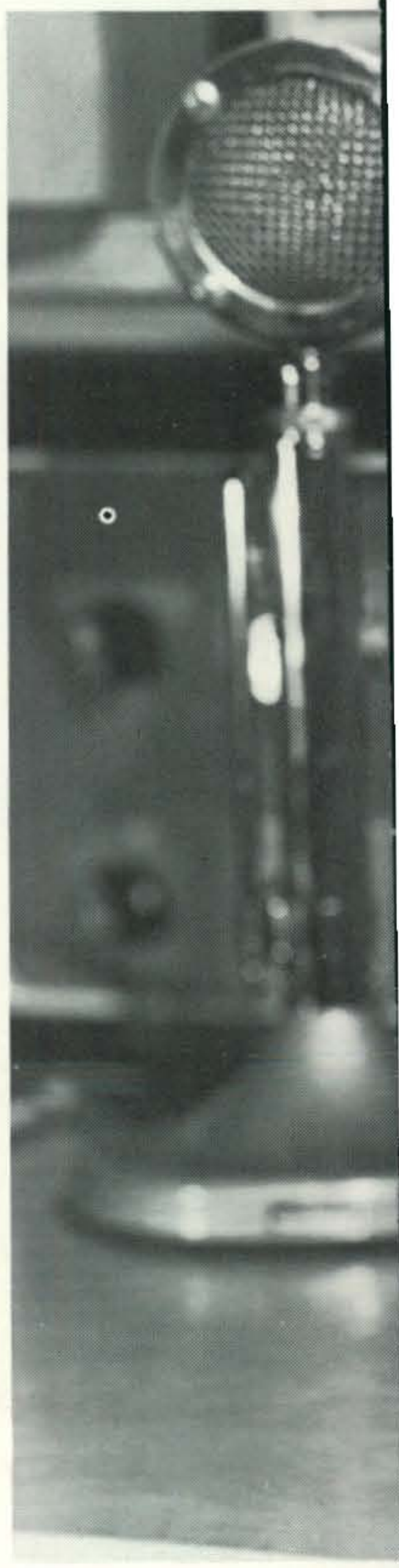
The "400" delivers over 4,000 IN/LBS of starting and rotating torque. Gears are cut from steel and ductile iron. Braking is through a disk clutch that *slips* at 3,500 IN/LBS to prevent damage to parts. Motor and gear train are protected by a weather-resistant housing. Heavy-duty mast clamp takes up to 3" maximum O.D. masting. Mounts to standard tower plate. Mounting kits available for poles and small towers or a universal tower mount is available for towers that do not furnish a mounting plate. Operates from a 110V 60 cycle power source.

There are no blind spots. You can point your antenna anywhere in the world, in fact your rotation includes an extra 20° of overlap.

There's just nothing like Hy-Gain's "400" at anywhere near the price. Buy one from the best distributors under the sun—those who stock Hy-Gain.



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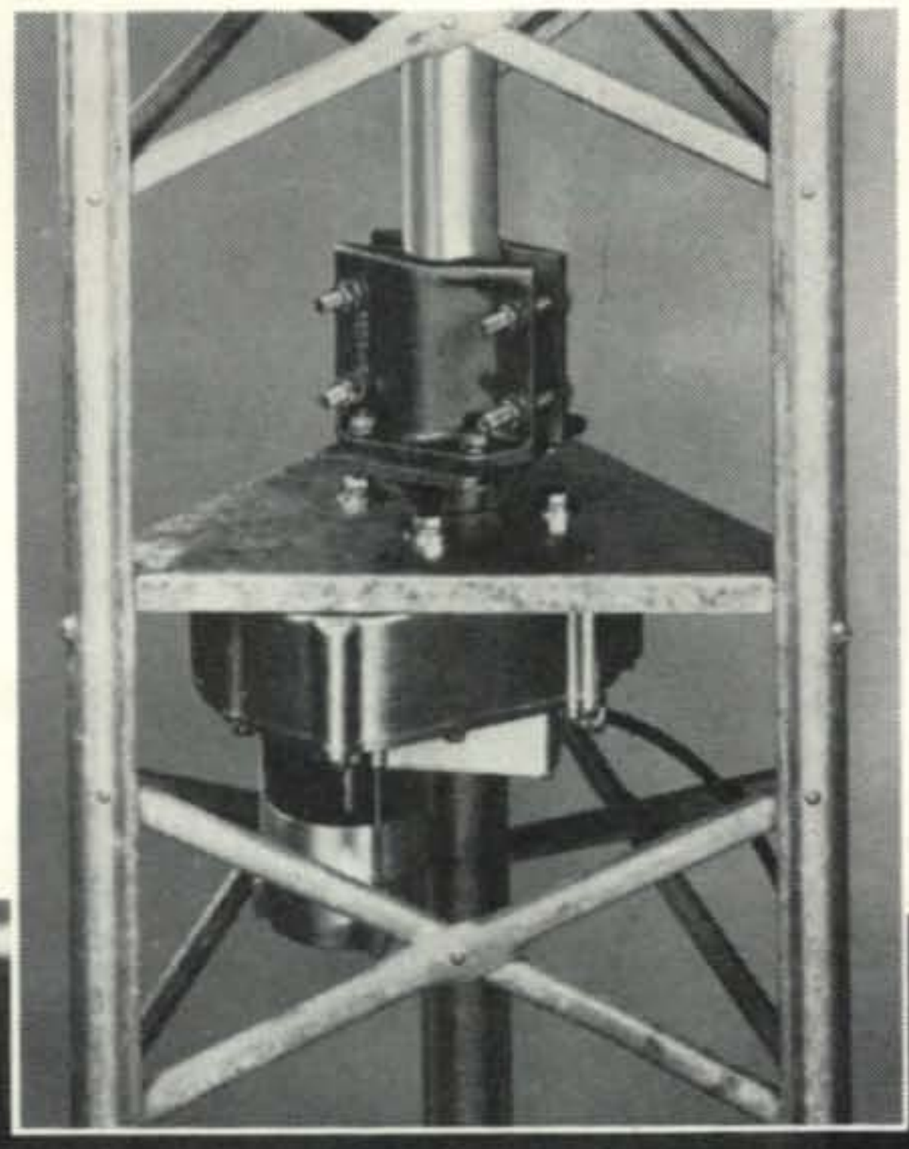

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AN ALL TRANSISTOR HOMEBREWED COMMUNICATIONS RECEIVER

BY DONALD SINNOCK,* WØRWH

Front view of the transistorized communications receiver. The upper left control is the pre-selector tuning. On the bottom, left to right, are the Bandswitch, Crystal Selector, Tuning, Sensitivity, AF Gain and, below the S-Meter, the Sideband Selector.

THE all transistor receiver illustrated here grew out of the desire of the author to have a modern unit at a reasonable cost. This project was aided by the appearance on the market of the low cost RCA dual gate FET transistors. These transistors have a high gain as well as high impedances which allow coils to be used in much the same way they are used in tube circuits.

*Route 3, La Plata, Mo. 63549.

Circuit

The circuit of the receiver is a common dual conversion type (see fig. 1) with the first oscillator being crystal controlled. The r.f. amplifier (3N140, Q_2 in fig. 2) operates on three different bands which are switched by S_2. The ranges for this stage as well as the first mixer are: A) 3.3-5.0 mc, B) 5.0-15 mc, C) 14-30 mc.

The high frequency oscillators (fig. 3) are

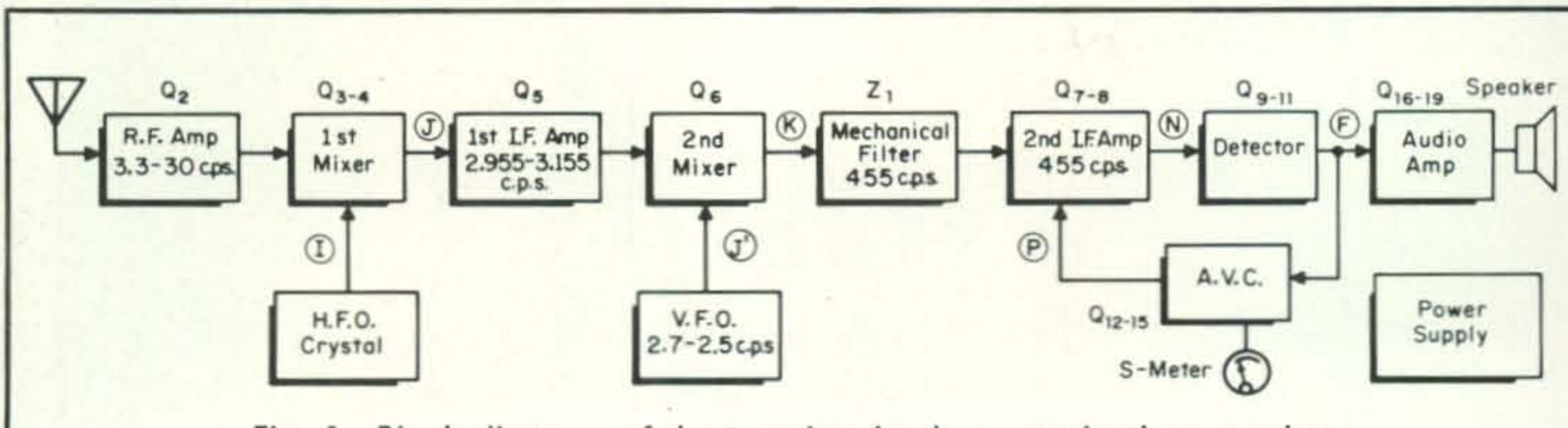

Fig. 1—Block diagram of the transistorized communications receiver.

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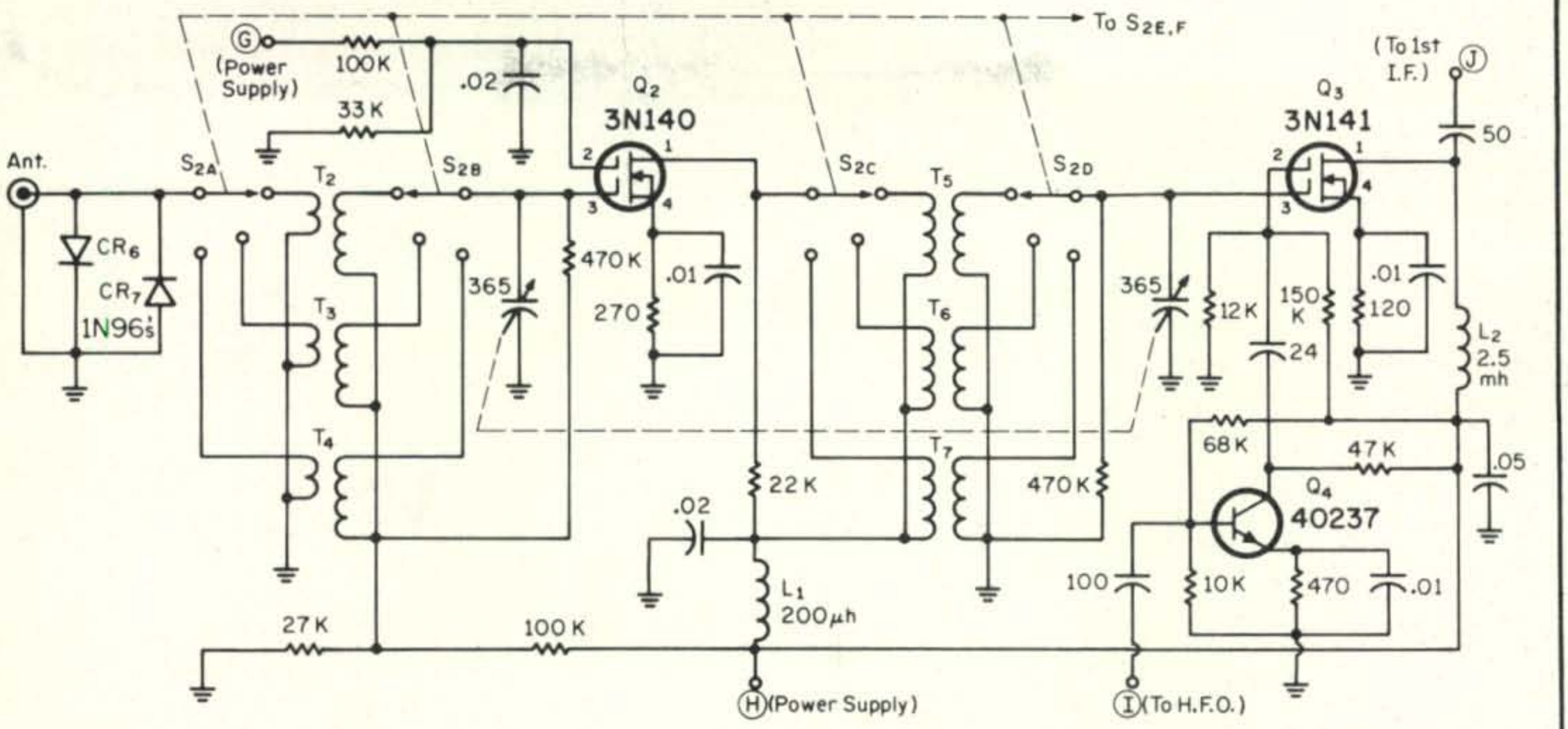


Fig. 2—Circuit of the r.f. amplifier and first mixer. All capacitor values less than one are in mf; greater than one are in mmf. Resistors are 1/2 watt.

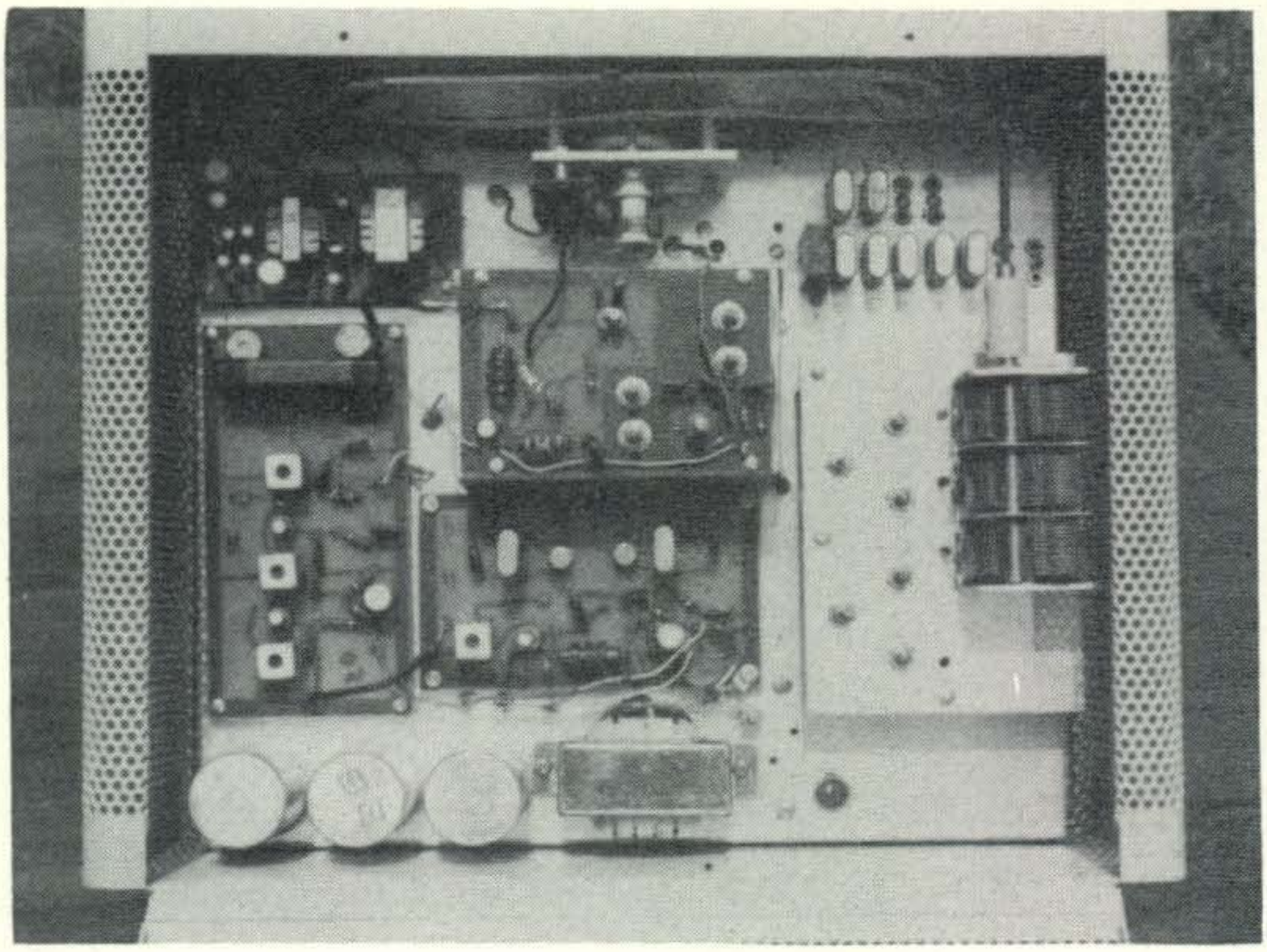
T2—Miller B5495A or equiv.
T3—Miller C5495A or equiv.
T4—Miller D5495A or equiv.
T5—Miller B5495RF or equiv.
T6—Miller C5495RF or equiv.
T7—Miller D5495RF or equiv.

the International Crystal OX series, one being used on each band. The use of a different oscillator on each band simplified crystal switching. This method also allowed the outputs of the different crystal oscillators to be broadly tuned on each band.

The output of the first mixer is fed into a broadband amplifier (3.155-2.955 mc), shown in fig. 4, which utilizes nearly the same circuit as the first r.f. amplifier and mixer except that it has no tuning capacitor.

The second mixer receives an injection voltage from the v.f.o. which operates in the 2.7-2.5 mc range. The v.f.o. circuit is shown in fig. 5. This arrangement gives the receiver a 200 kc tuning range on any band selection between 3.3 and 30 mc.

The output of the second mixer (Q_6) is fed into a Collins 2.1 kc mechanical filter (fig. 6) and then into a two stage i.f. strip.



Top view of the overall receiver. The preselector on the right uses only two of the three sections of the variable capacitor. The crystals for the first mixer can be seen in front of the preselector.

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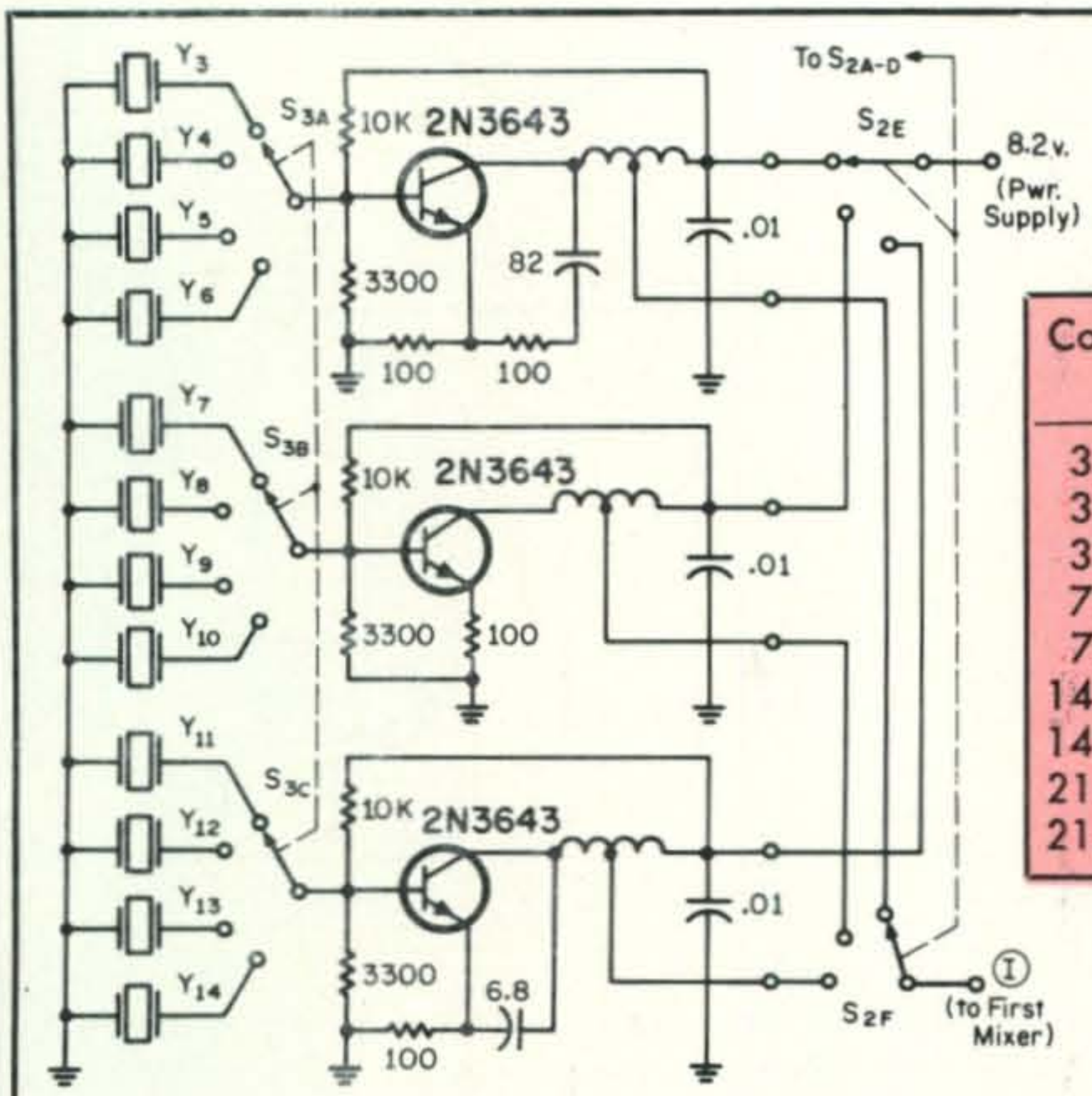


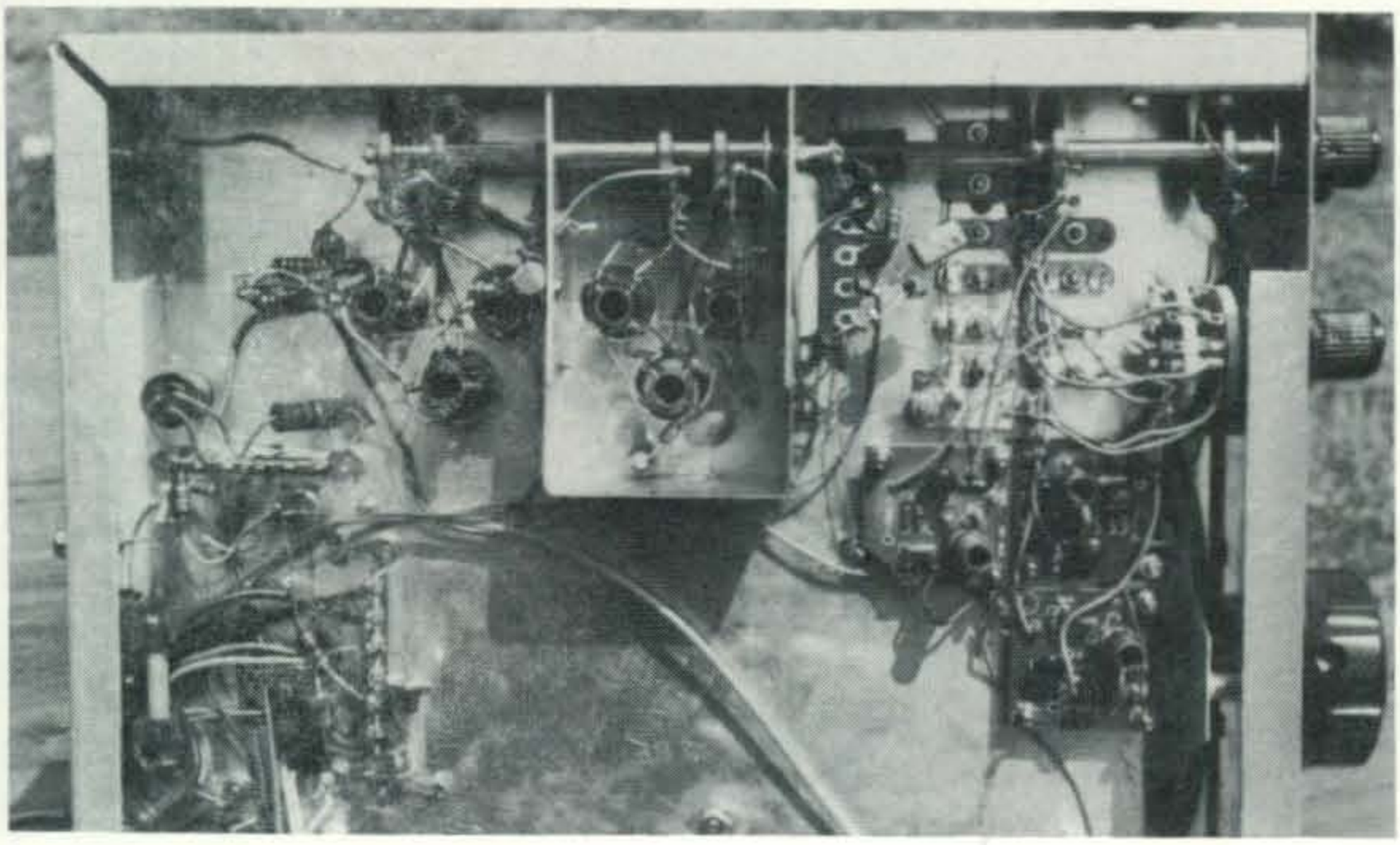
Fig. 3—High frequency oscillators are three international Crystal OX series with the crystals indicated below.

Coverage (mc)	Xtal Freq (mc)	Coverage (mc)	Xtal Freq (mc)
3.4-3.6	6.555	21.4-21.6	24.555
3.6-3.8	6.755	28.0-28.2	31.155
3.8-4.0	6.955	28.2-28.4	31.355
7.0-7.2	10.155	28.4-28.6	31.555
7.2-7.4	10.355	28.6-28.8	31.755
14.0-14.2	17.155	28.8-29.0	31.955
14.2-14.4	17.355	29.0-29.2	32-155
21.0-21.2	24.155	29.2-29.4	32.355
21.2-21.4	24.355	29.4-29.6	32.555

The output of the i.f. strip is fed into the product detector (fig. 7) through a regular transistor i.f. transformer connected in reverse to stabilize the high gate impedance of the FET (Q_9). Two separate crystal controlled b.f.o.'s were built for stability and so no r.f. switching would be involved in changing sidebands. To change sidebands, voltage is merely switched from one b.f.o. oscillator to the other (between points L and M).

The product detector output is fed to a ready built audio amplifier through a suitable gain control. The particular audio amplifier used was designed for positive ground so some changes were made in the circuit to conform to the power supply. These changes are reflected in the circuit shown in fig. 8.

The a.v.c. system (fig. 9) is of the audio type and consists of two resistance coupled audio amplifiers. These amplifiers feed into T_{12} and the output is rectified by CR_9. The RC network C_4-R_2 determines the rise and fall time of the a.v.c. circuit as the input impedance of Q_{14} is very high. Rise time can be controlled by the size of C_4 and the decay time is controlled by the relative size of C_4 and R_2. Transistor Q_{14} controls the bias voltage on transistor Q_7 by the brute force method; when Q_{14} is conducting heavily, no bias, the base voltage on Q_7 is lowered (more



Bottom view of the section of the chassis containing the r.f. and first mixer stages. Note the three International Crystal OX series boards (fig. 3).

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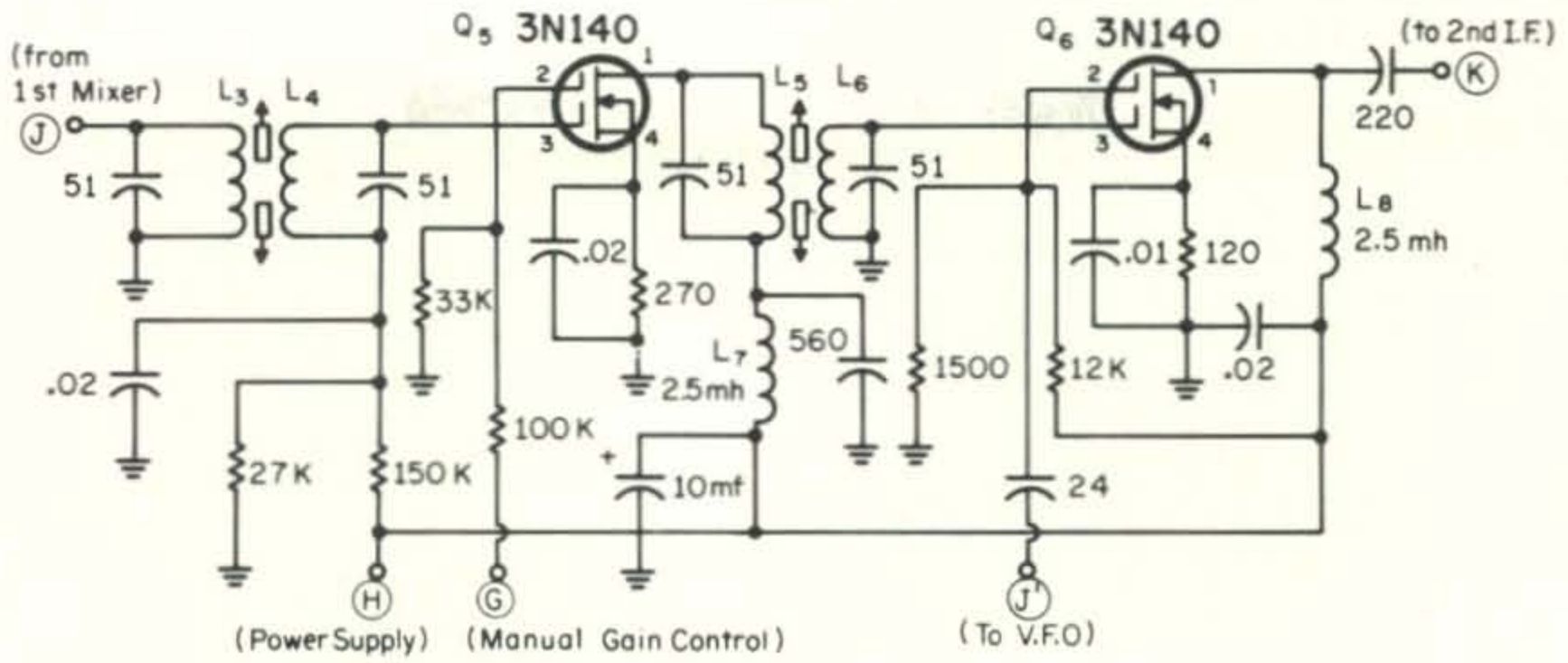


Fig. 4—Circuit of the first i.f. and second mixer. The mounting centers between coils L_3 and L_4 and coils L_5 and L_6 are 3/4 inches. All Capacitor values less than one are in mf; values greater than one are in mmf except where otherwise indicated. Resistors are all 1/2 watt. Coils L_3 to L_6 are Miller 42A335CBI that tune from 27.5 to 58 μh.

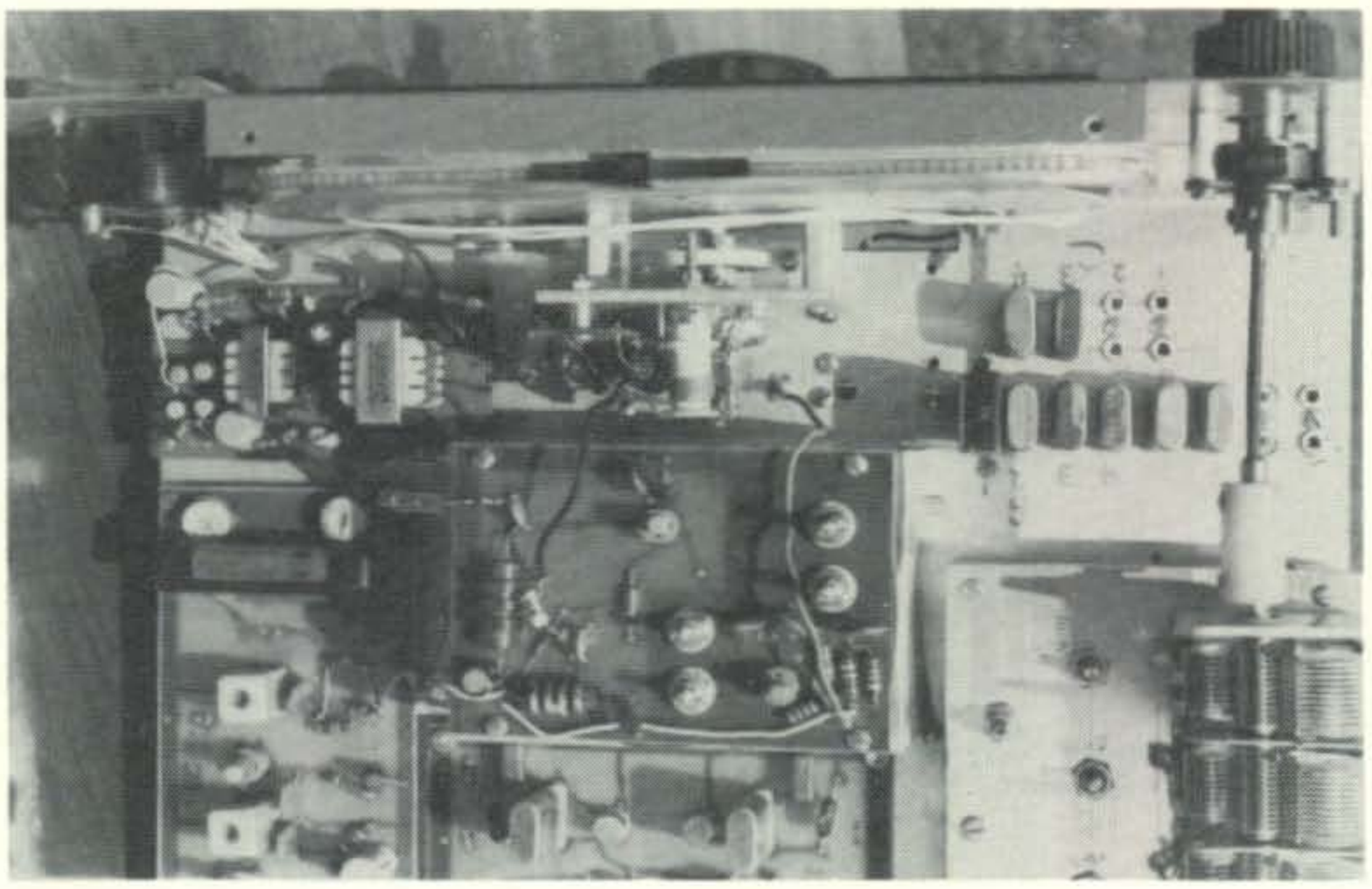
negative) which makes it conduct more thus giving more i.f. gain. When Q_{14} gets some rectified audio from CR_9 it draws less thus making the base of Q_7 more positive which in turn decreases its gain. Transistor Q_{15} is simply a d.c. amplifier used to operate the S-meter. The size of R_2 may have to be adjusted to get the desired S-meter action.

The power supply shown in fig. 10 either supplies the voltage directly or through zener regulator circuits. The regulators are for the various oscillators to improve stability. Transistor Q_1 is used as a d.c. switch for muting the receiver. This method was found necessary in order to keep the sparking of contacts from creating large transients in the a.v.c. voltage.

Construction

Most of the receiver was constructed on fiberglass backed printed circuit boards. These include: First i.f. and second mixer, second i.f., product detector and b.f.o., a.v.c. system, and a small portion of the v.f.o. Anyone not familiar with the etched circuit procedures can find them in various radio handbooks and in many of the monthly publications.

The mechanical part of the v.f.o. must be very rigid to prevent a change in frequency during operation of the other controls. To accomplish this the coil, capacitor and small etched circuit board were mounted on a piece of 1/8 inch aluminum which in turn was mounted on the back side of the Millen no string dial. This method makes the whole



Close up of the v.f.o. section and the first i.f. and second mixer board behind the v.f.o. The audio is on the left near the front of the receiver.

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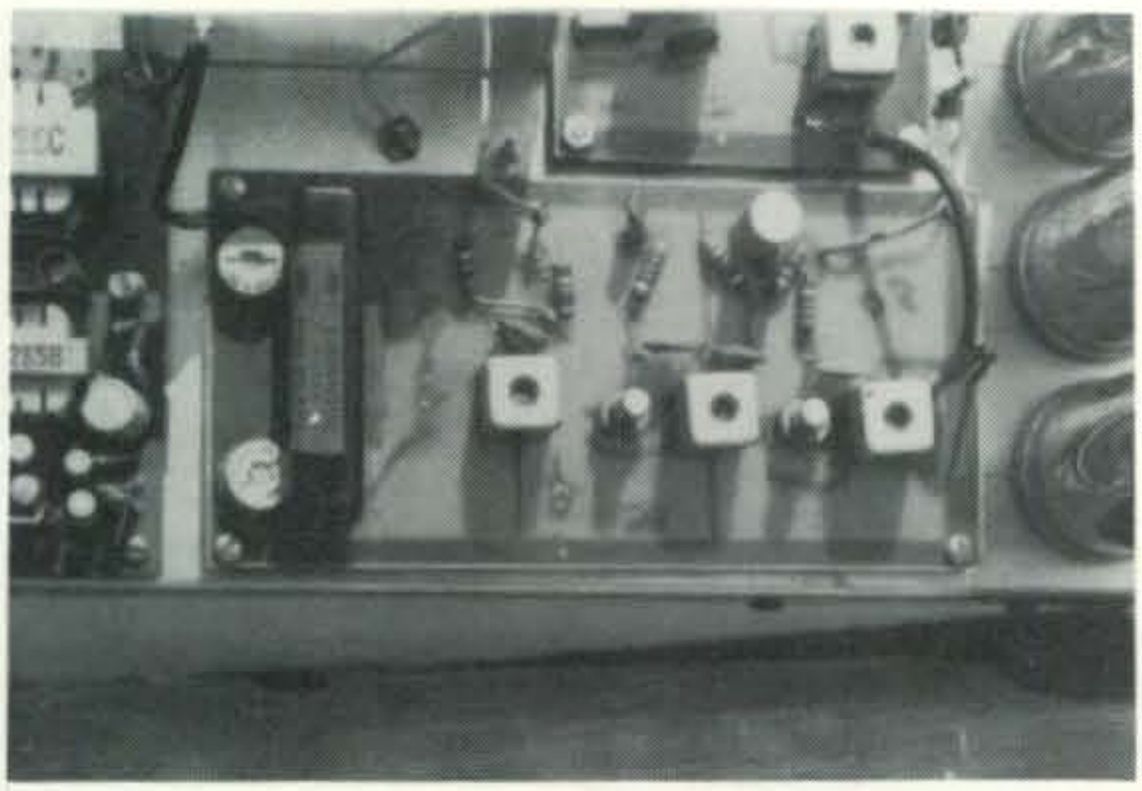

Close up of the i.f. strip and mechanical filter. Note the two ceramic trimmer capacitors used to tune the input and output of the filter.

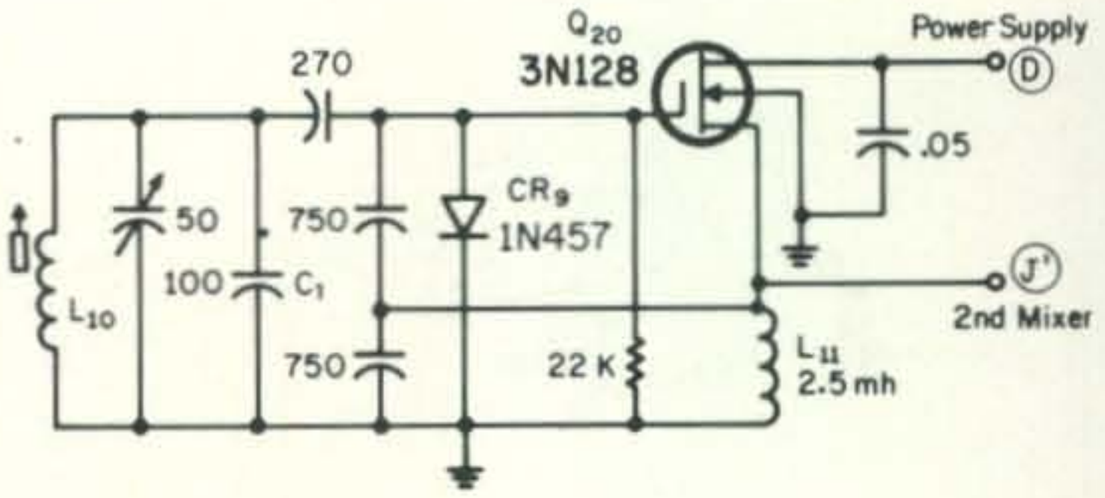

Fig. 5—Circuit of the variable frequency oscillator. The two 750 mmf and 270 mmf capacitors must be dipped micas. The 100 mmf capacitor must be adjusted for proper coverage as described in the text. The 50 mmf variable is the tuning capacitor. Inductor L_{10} is a Miller 42A155CBI that tunes from 9.4 to 18 μh.

unit very rigid.

The first r.f. and mixer is built on the shields that are placed through the bandswitch with the transistor sockets mounted in the shields. There is no need for any precaution except to keep the connecting wires as short as possible. Great care should be exercised when plugging and unplugging the IGFET transistors as a very small transient will damage them. It is best to wrap a small wire around all four leads very close to the transistor base before removing the shipping eyelet. This wire can be removed after the transistor is plugged into the socket.

The receiver is housed in one of the LMB CO-1 cabinets which match the Collins S-line. As no chassis was available that suited the design a 13″ × 17″ × 2″ standard chassis was cut down to 13″ × 11¾″ × 2″. The open part was bolted to the front panel with 1/2 inch aluminum angle stock.

A recommended order for the receiver construction so it can be checked as you go along is, power supply, audio amplifier, product detector, second i.f., first i.f. and second mixer, v.f.o., first r.f. and mixer, h.f.o. crystal units and finally the a.v.c. system.

Alignment

The alignment of the receiver is much the same as any receiver. The second i.f. should be aligned on 455 kc by peaking transformers T_8, T_9, and T_{10}. Also C_2 and C_3 should be peaked on the mechanical filter part of the circuit. While the generator is set for 455 kc the transformer on the product detector should be peaked (T_{11}). Next, the v.f.o. should be adjusted to cover 2.7-2.5 mc. If it covers too much range the size of C_1 can be increased and if it covers to small a range the size of C_1 must be decreased. In this unit the 100 mmf value of C_1 gave a full 200 kc with a little left over on each end to make overlapping ranges.

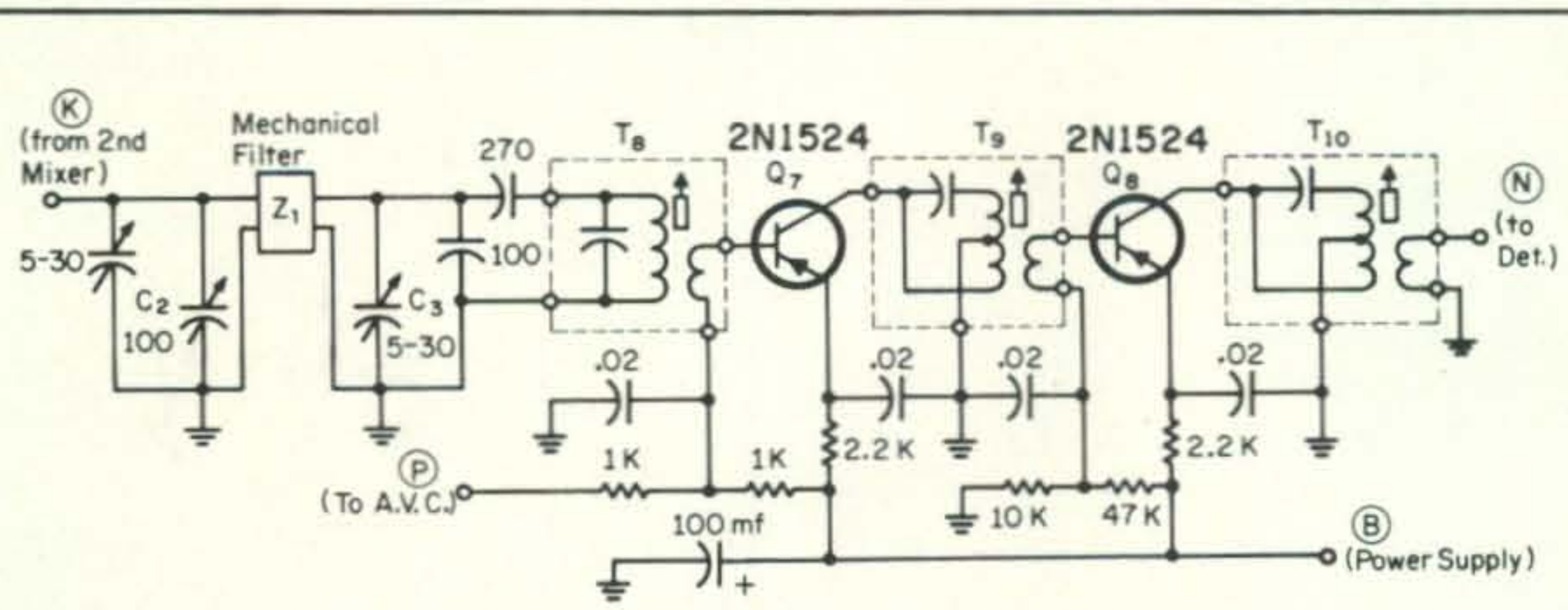

Fig. 6—Circuit of the second i.f. amplifier. The filter, Z_1, is a 455 kc mechanical type with 2.1 kc bandwidth (Collins F455FB21). Transformers T_8, T_9 and T_{10} are Miller #2041. All Capacitor values less than one are in mf; values greater than one are in mmf except where otherwise indicated.

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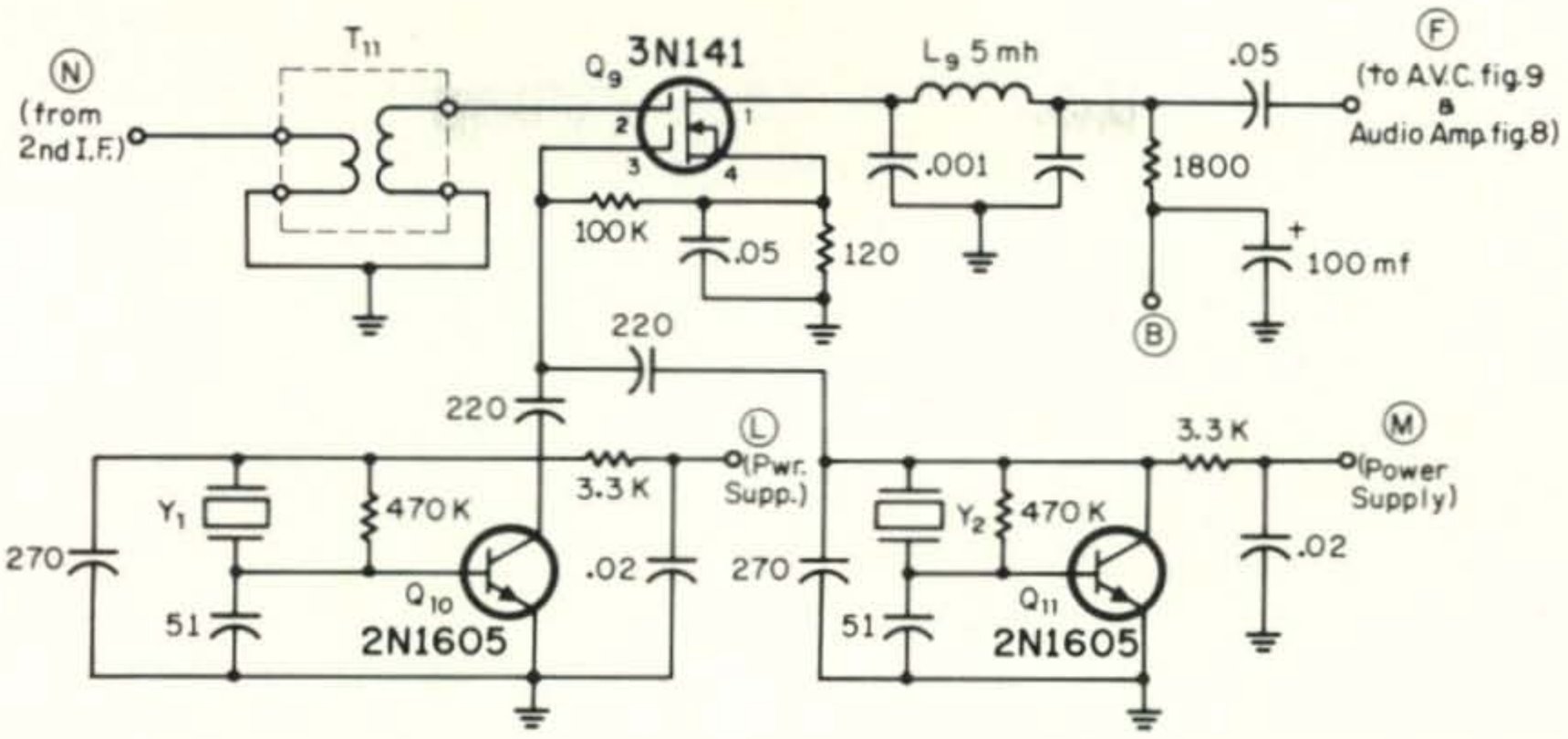


Fig. 7—Detector-b.f.o. circuit utilizes a reversed i.f. transformer, T_{11}, a Miller type 2041. The crystals, Y_1 and Y_2, are 453.65 kc and 456.35 kc. The 51 and 270 mmf capacitors are dipped mica types and the 100 mf capacitor is rated at 25 volts while all the others are rated 50 volts. All resistors are 1/2 watt; capacitor values less than one are in mf and capacitor values one or more are in mmf except where otherwise noted.

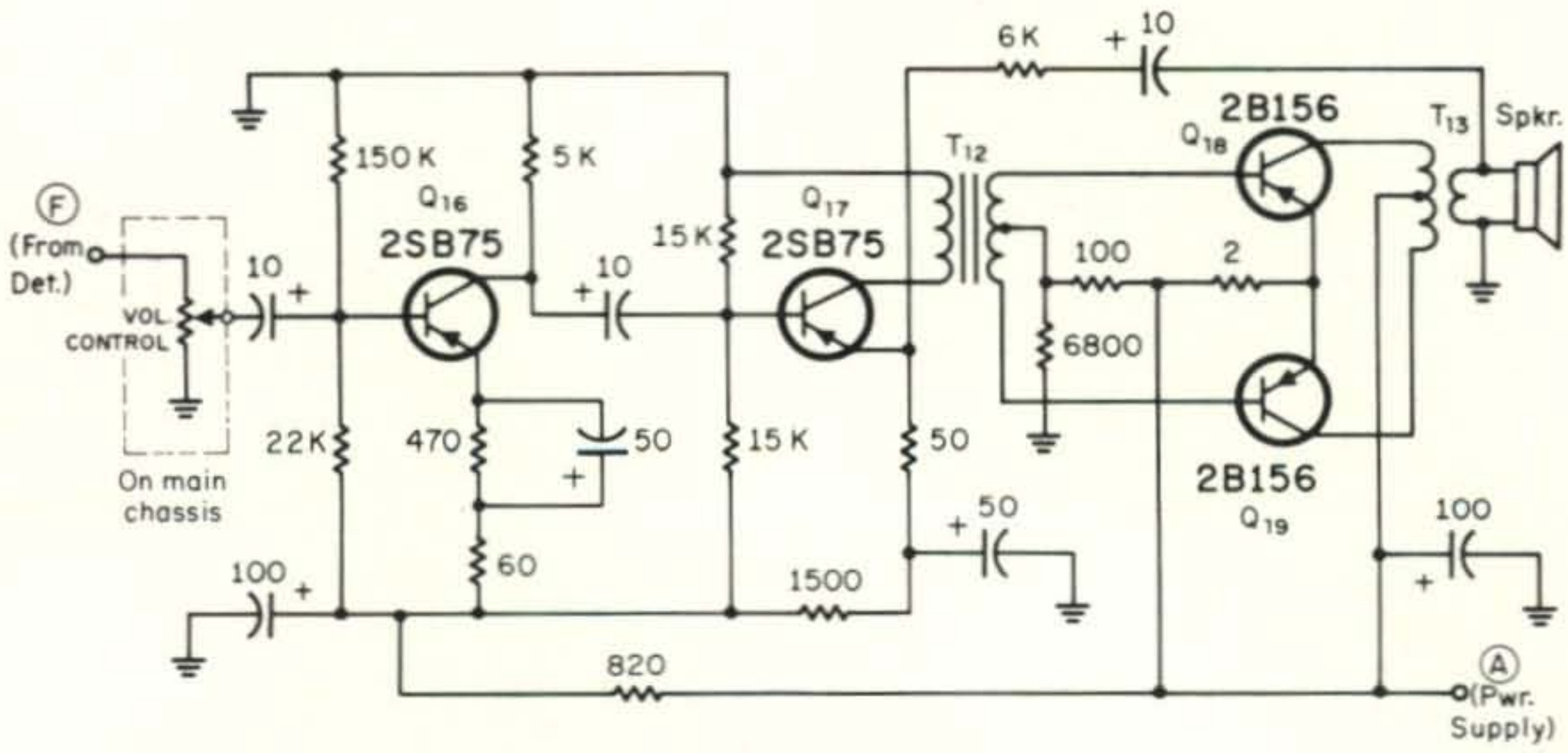
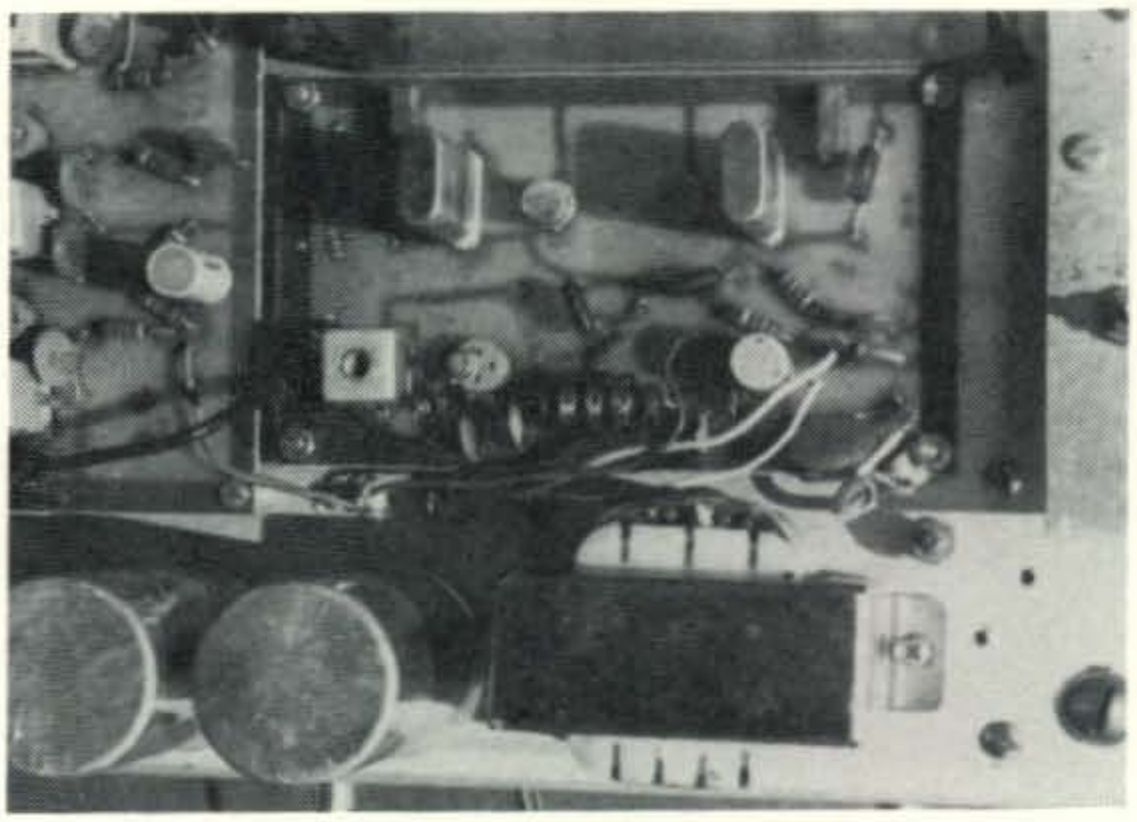


Fig. 8—Circuit of the modified Radio Shack #277-038 1 watt audio amp. All capacitor values are in mf.

After the v.f.o. is adjusted the first i.f. and second mixer coils, L_3, L_4, L_5, and L_6 should be peaked with a signal frequency of 3.055 mc fed into point *I*. If the unit it too sharp the coils may be slightly stagger tuned or resistors may be placed across them.

Alignment of the first r.f. and mixer is necessary on each of the three bands. It was found that by peaking the coils for the ham bands there was enough sensitivity on all the frequencies needed but if you do not find it this way small capacitors may be placed across each coil to provide better tracking. Since both coils are operating on the same frequency, however, they seem to track very well.

In the a.v.c. circuit, R_4 (fig 10) is ad-



Top view of the product detector board located at the rear of the receiver near the power supply section.

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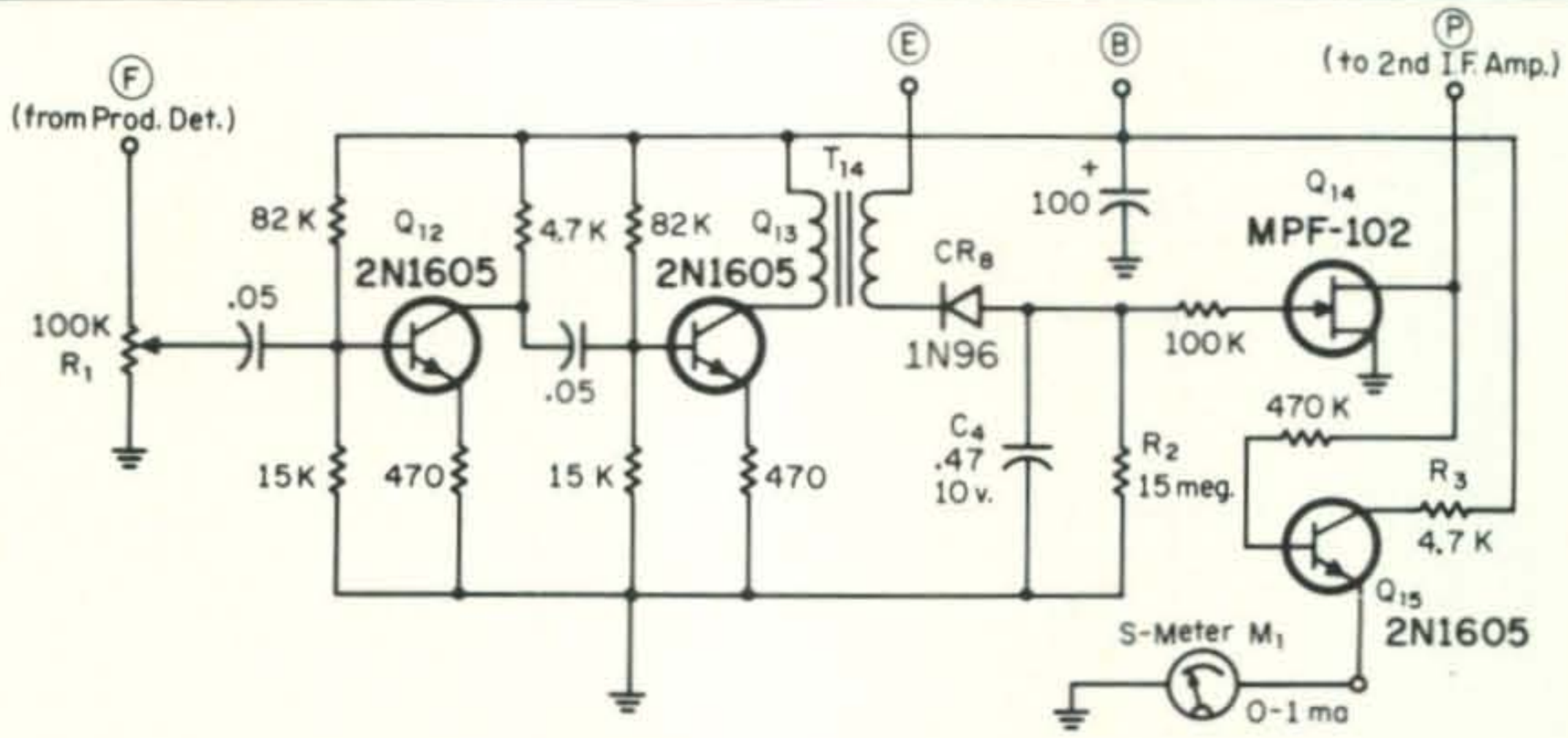


Fig. 9—Circuit of the a.v.c. system. Transformer T_{14} is an audio driver, 10K to 2K. All capacitors are in mf and all resistors are 1/2 watt. The 100k pot is a mini type. See the text for the function of this pot.

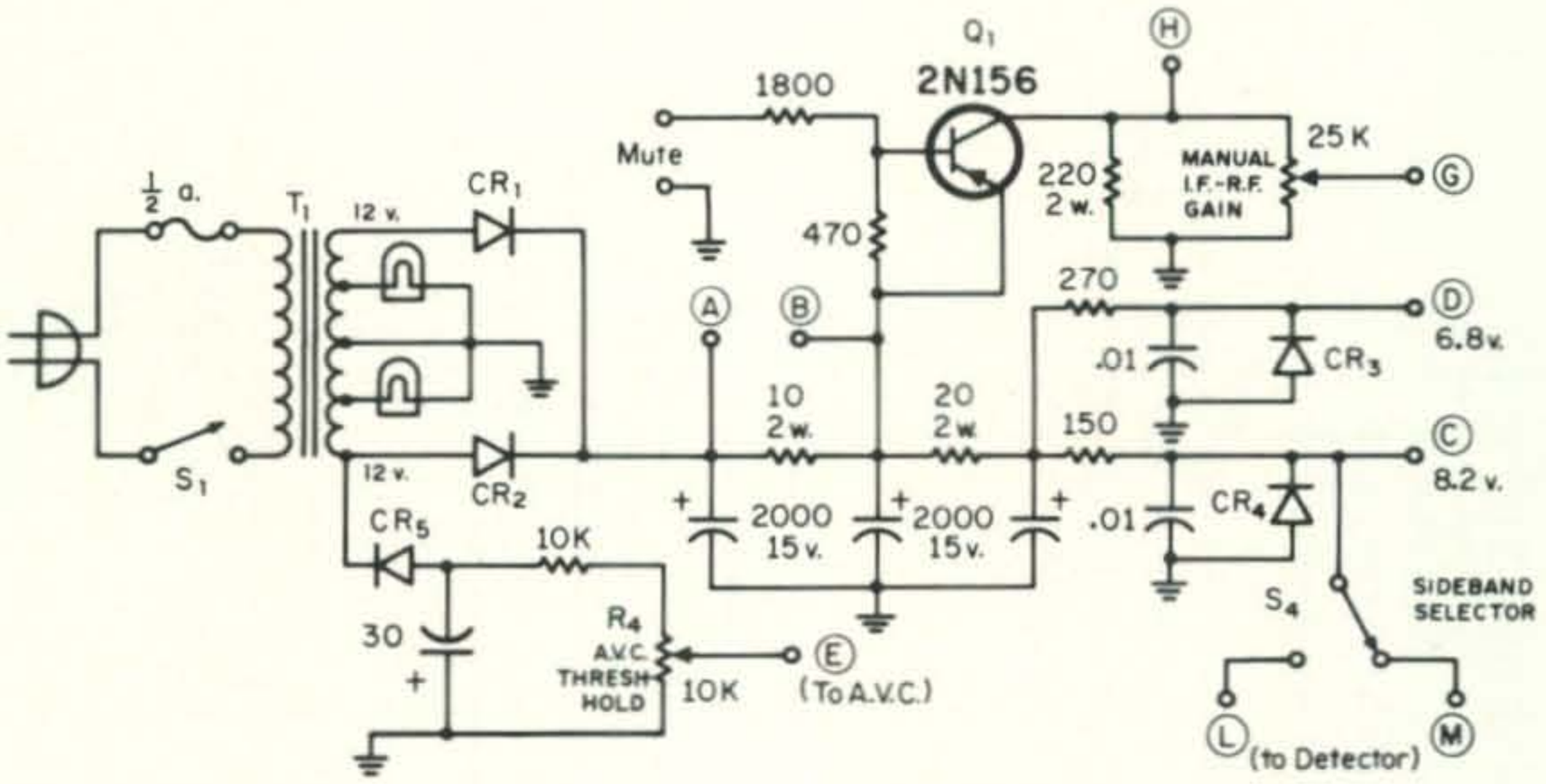
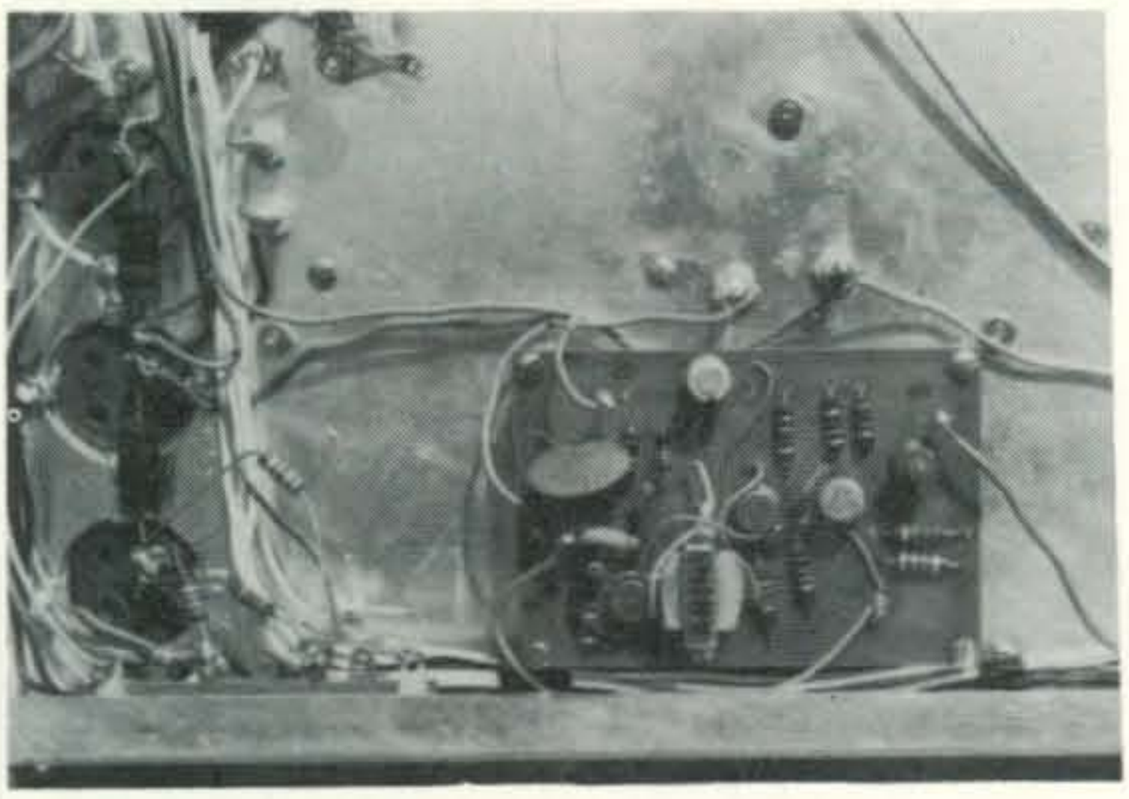


Fig. 10—Circuit of the main chassis components and the power supply for the transistor communications receiver.

CR_1, CR_2—2a. 100 p.i.v.
CR_3—6.8v. 1 watt Zener diode.
CR_4—8.2v. 1 watt Zener diode.
CR_5—0.5a. 100 p.i.v.



View of the a.v.c. board located beneath the chassis.

justed for the threshold control and R_1 is adjusted to give the desired a.v.c. action on strong signals.

Conclusion

The receiver has been used during the *CQ* DX contest, ARRL Field day and is presently being used on AF MARS frequencies where I am a net control as well as the ham bands. I have not had a chance to measure the sensitivity but it is good as is the stability. ■

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CQ Reviews:
The Heathkit HG-10B V.F.O.

BY WILFRED M. SCHERER,* W2AEF

MANY newcomers to the ranks of amateur radio, such as the Novices, have upgraded their license status, or are planning to do so, to the degree that entitles them to v.f.o. operation of a transmitter and thus realize the advantages gained thereby over being "rock-bound" with crystal control.

It is with these operators in mind, as well as others who may be interested, that at this time we present a review on the Heathkit HG-10B V.F.O. (the latest version of the original HG-10) which is ideally suited for operation with c.w. or a.m. transmitting gear such as the Heath DX-40, DX-60 series, the HW-16 transceiver, the HW-17A 2-meter transceiver or similar equipment already in use with crystal control. Existing gear, therefore, need not be outdated.

Features

The HG-10B is a highly stable v.f.o. designed to provide variable-frequency operation over the full range of all the seven amateur bands, 80 through 2 meters, with individual frequency calibrations on slide-rule scales automatically switched into position by the bandswitch. A high-ratio drive provides vernier tuning for ease of getting exactly on frequency.

*Technical Director, *CQ*.

The Heathkit HG-10B V.F.O.

Stability is ensured by temperature-compensating components, impregnated oscillator inductors, a regulated B-plus potential and rugged construction. This is further enhanced by a cathode-follower isolation stage at the output. The r.f. output is rated at up to 5 volts r.m.s. (open circuit) and the unit is designed for operation into loads of 50,000 ohms or more.

Grid-block keying of the oscillator is normally provided; however, cathode keying may be arranged when required with certain transmitters, such as the DX-40. A three-position switch provides standby, on-the-air operation or frequency spotting on the receiver without putting a signal on the air.

Operating power is obtained from the associated transmitter or other external source. The requirements are: 108 v.d.c. at 25 ma and 6.3 volts a.c. or d.c. at .75 a. This power is available directly from the accessory socket of the DX-60A, DX-60B and DX-40 transmitters, or the HW-16 and HW-17A transceivers. A minor circuit change is required in the v.f.o. when it is used with the DX-40 or similar transmitters.

The unit is styled to match the Heath Line of amateur gear. Its size is 6½" × 9⅜" × 9⅛" (H.W.D.) and it weighs 9½ lbs.

Technical Details

The basic circuitry for the HG-10B is shown at fig. 1. It employs a 6CH8, the pentode section of which functions as the variable oscillator, while the triode portion is used as a cathode-follower output stage. The oscillator circuit is a series-tuned Colpitts setup (often referred to as a Clapp type) with different combinations of inductance and capacitance switched in for the frequency-determining elements L_1, C_1-C_3 for the various bands.

One combination tunes over a range of 3.5-4 mc which is used for coverage of the 80-meter band. A different inductor and other capacitors are switched in for the next range

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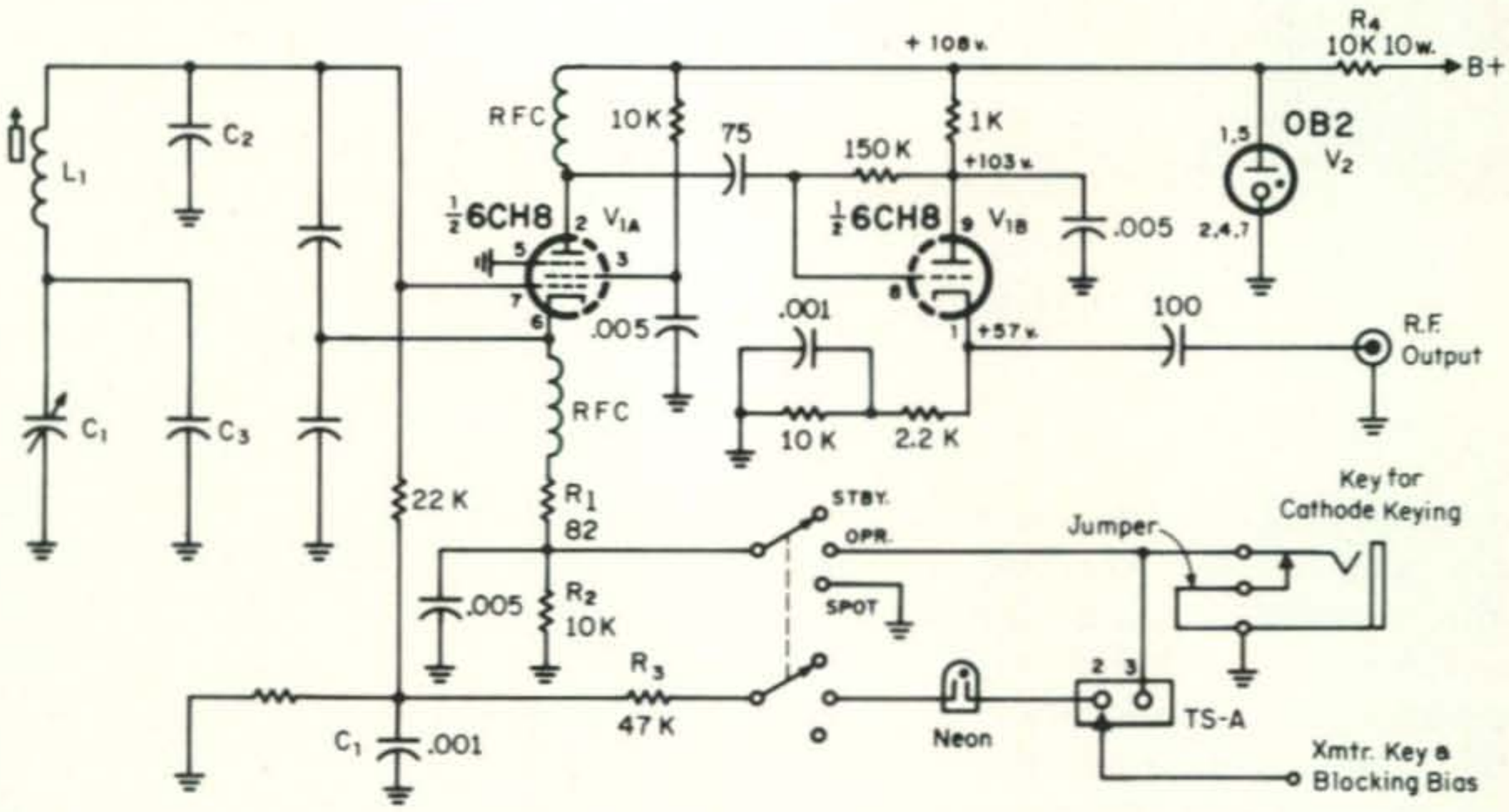

Fig. 1—Basic circuitry for the HG-10B V.F.O. Only the components essential to the text discussion are labeled.

which tunes from 7 to 7.4 mc and thus takes in the 40-meter band. This same range also is used for the 20, 15 and 10-meter bands, in which case the 40-meter output frequencies are multiplied accordingly by other stages in the associated transmitter, as would be the case if normal crystal-control operation were used with 40-meter crystals.

Another separate inductor/capacitor combination is engaged for 6-meter operation, in which case the oscillator output is 8.333-9.0 mc which is then multiplied in the transmitter to 50-54, as would be the case with 8.3 mc crystals.

For 2-meter operation, the resonating capacitance at the inductor used for 6 meter operation is altered to provide an ocillator output of 8.0-8.222 mc for transmitter multiplication to 144-148 mc, again like use with 8 mc crystals.

Silver-mica, NPO disc-ceramic and N750 temperature-compensating capacitors plus NPO trimmers provide a high degree of frequency stability. In addition, sturdy epoxy-impregnated inductors are stabilized and resistant to the effects of moisture.

Except for the biasing arrangement, the cathode-follower setup is conventional. Its employment minimizes the effects of variable loading on the oscillator which may be caused by following stages. It further isolates the oscillator to prevent r.f. feedback from suceeding stages that might otherwise introduce frequency instability or keying chirps. This is a very important consideration in cases where the transmitter output is at the same frequency as that of the v.f.o.

Grid-block keying is applied to the oscillator with a negative bias from the associated gear which is keyed in the same manner. This blocking bias is applied to the oscillator grid through a neon lamp, which then conducts. When the key is depressed, the lamp extinguishes and ceases to conduct. It thus functions as an "arc-less" switch that minimizes certain type key clicks. A measure of click reduction is augmented by filter R_3/C_4 plus any waveshaping in the associated gear.

For cathode keying, such as with the DX-40, the keying line must be disconnected from terminal 2 at tie strip A and be connected to terminal 3 instead. The jumper also must be removed from the keying jack. The setup then may be cathode-keyed through either the v.f.o. key jack or that on the DX-40. When the key is up, R_2 in the cathode circuit of the oscillator provides a high self-bias that prevents oscillation. Since it is connected across the key, it also functions as a click-suppressor.

Also, for operation with other gear besides the DX-60 series or the HW-16, the dropping resistor, R_4, for the VR tube, V_2 must be changed for proper operation with other plate-supply voltages that might be involved. Instructions for doing so are furnished in the manual.

Where power is not available from the associated transmitter, a small power supply may be put together for the job as indicated in the manual.

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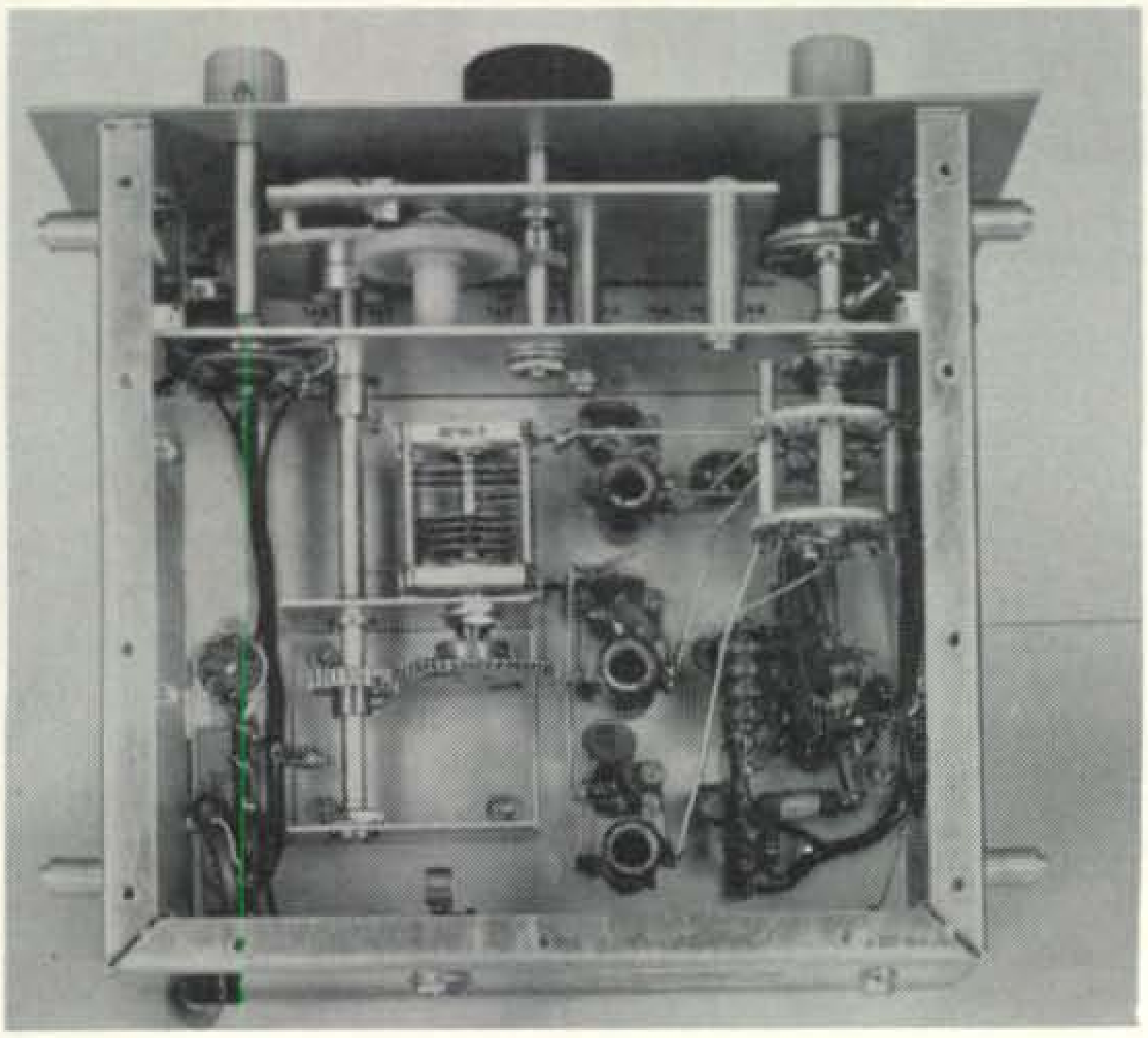


Bottom view of the HG-10B V.F.O. Some of the gearing for the tuning drive may be seen at the top and at the lower end of the tuning capacitor. The three inductors for the different basic ranges are in line near the center. They are wound on ceramic forms and impregnated in epoxy. The band-switch is a ceramic type.

Function Switch

With the function switch at the STANDBY position, the low-resistance path of the oscillator cathode circuit is opened, thus disabling the v.f.o. In the OPERATE position, the low-resistance path of the cathode return is grounded, allowing the oscillator to function when it is keyed along with the transmitter. At the SPOT position, the low-resistance cathode circuit is again closed and the blocking bias is removed from the oscillator, but at the same time the transmitter is kept disabled by its internal blocking bias. This allows the v.f.o. signal to be heard on the receiver without the transmitter's being activated, thus preventing unnecessary on-the-air qrm while the v.f.o. is adjusted to the frequency to which the receiver is tuned.

Mechanical Details

The v.f.o. is tuned by a drive mechanism with a 28:1 ratio obtained using several metal spur gears, a nylon one and a spring-loaded gear. Excellent vernier tuning is realized without adverse backlash. The tuning capacitor has a four-posted frame with ceramic end plates and a bearing at each end of the capacitor rotor shaft. A string drive, coupled to the tuning system, moves the indicator for the slide-rule scales.

The bandswitch has ceramic-insulated decks. When it is operated, a string drive attached to it rotates an illuminated thick-plastic drum on which the slide-rule scale then appears at the dial window for only the band for which the switch is set.

The scales for the 80 and 40 meter bands are calibrated in 10 kc increments, those for 20, 15, 10, 6 and 2 meters are in respective steps of 20, 25, 50, 100 and 100 kc. The calibration points are spaced at an average of about 1/8".

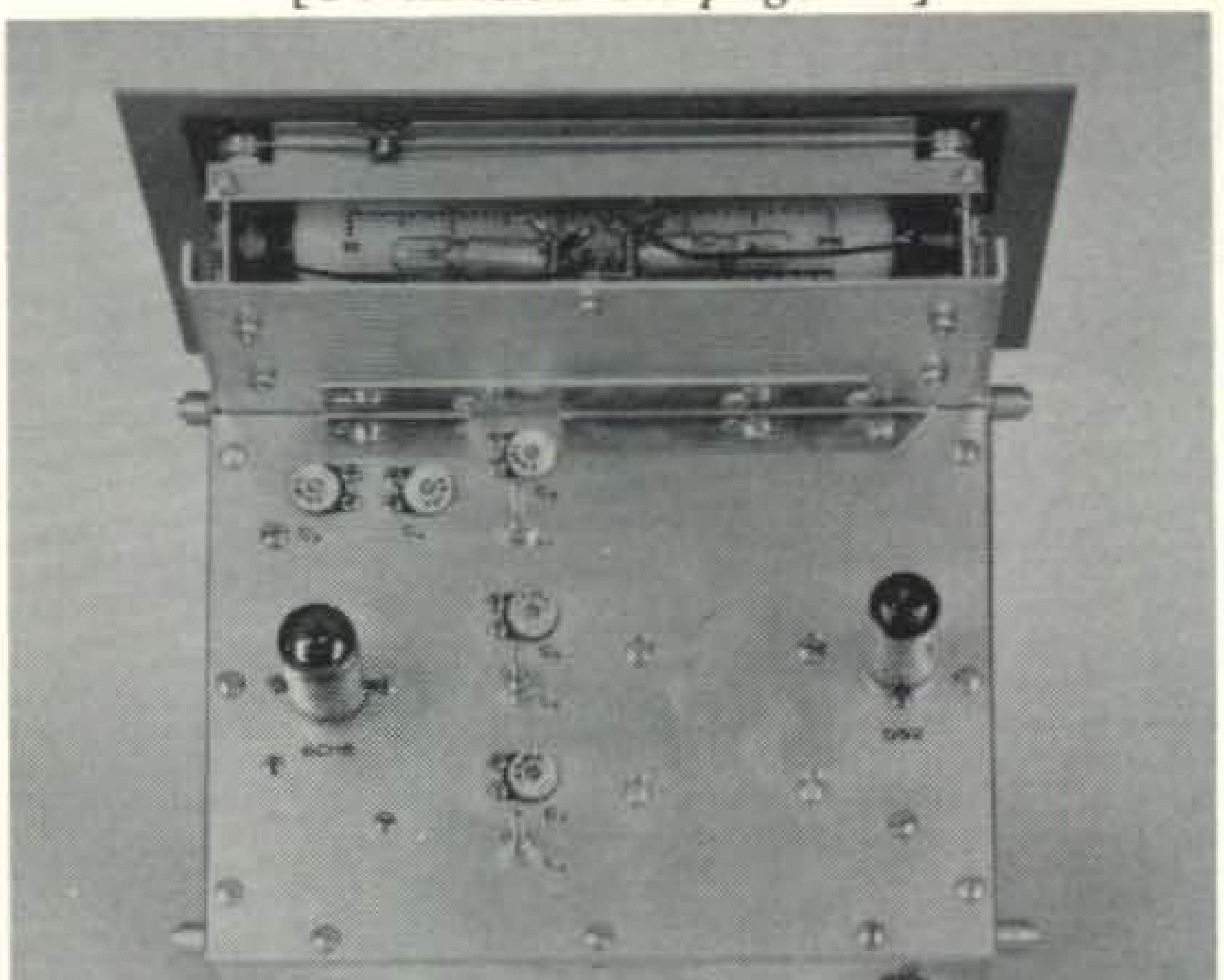
The key jack is a standard type on the rear of the chassis along with a ceramic-insulated phono-type jack for the v.f.o. output.

The chassis is made up of a heavy-gauge metal U-shaped frame with thick rigid top and bottom plates and with well-braced dial and gear-assembly plates. All the metal parts are well secured with plenty of screws used throughout. The whole setup is exceptionally rugged, making it highly resistant to flexing under mechanical or enviromental thermal stress, another feature that aids frequency stability.

Assembly

Assembly of the HR-10B is easily done following Heath's standard type of procedures outlined in the assembly-manual instructions. Eight to ten hours are required to do the job. We ran into no particular problems in this respect, except that special care is required with the adjustment and alignment

[*Continued on page 92*]



Top view of the HG-10B V.F.O. The adjusting screws for the inductor slugs and the trimmers are slightly to the left. Dial and drive mechanisms are between the vertical bracket and the panel. Other components are bottled up and well shielded within the chassis.

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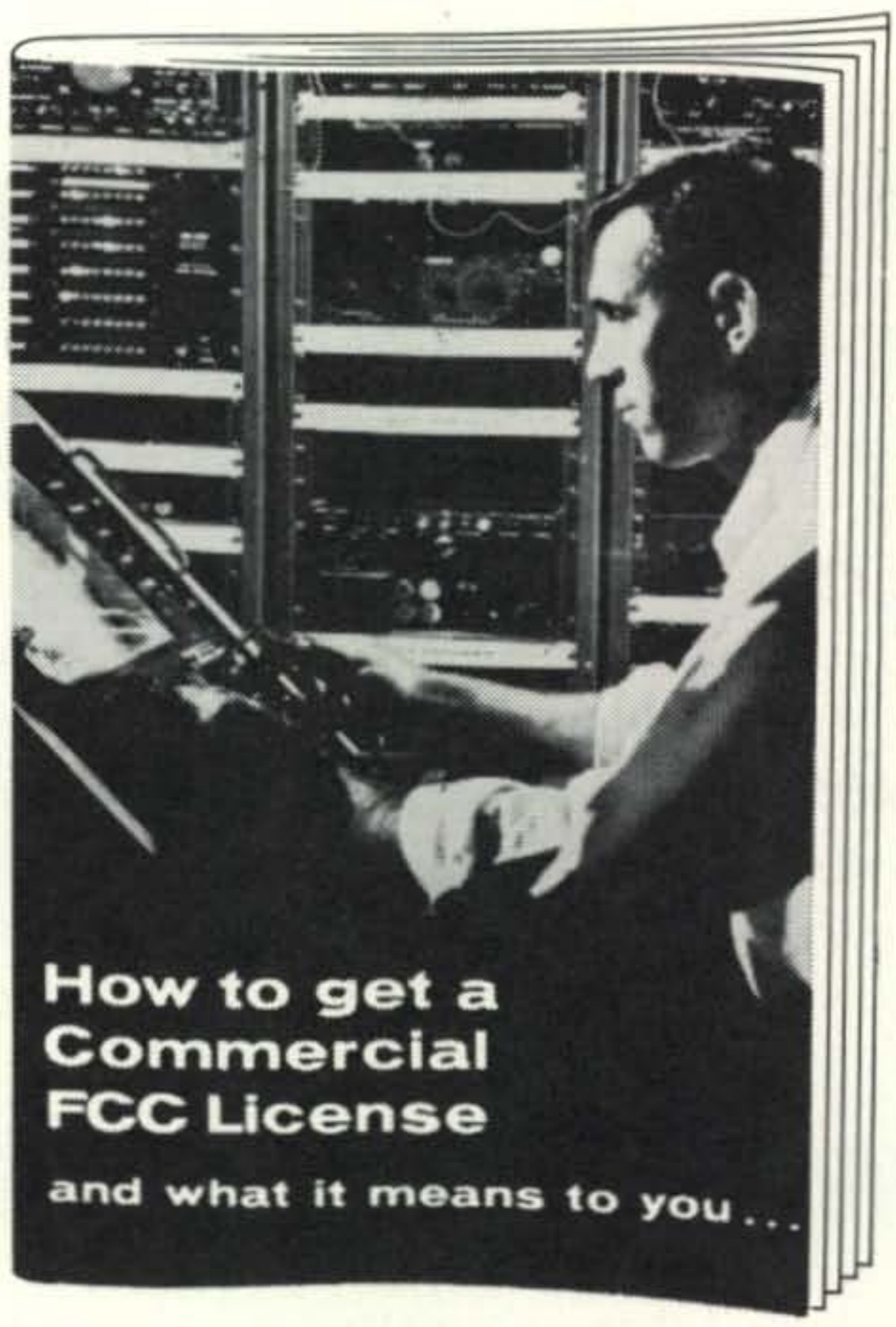

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A PREAMPLIFIER FOR TUBE-TYPE TRANSCEIVERS

BY JOHN J. SCHULTZ,* W2EEY

Most transceivers will benefit from the use of a preamplifier in the receive mode. This article describes a tube-type preamplifier which is particularly effective and easy to construct as well as simply connected to a tube-type transceiver.

With so many solid-state projects being described, one tends to forget at times that vacuum tubes can perform in at least an equal or superior manner in many applications. One particular illustration of such an application is as a preamplifier for a tube-type transceiver.

Most transceivers tend to compromise somewhat on the receiver portion input circuits both for economy and to reduce the number of front panel controls. Some transceivers will place the receiver r.f. amplifier "take-off" point after the power amplifier pi-network output circuit. In others, the transmitter driver plate circuit also acts as the input circuit for the receiver r.f. amplifier stage. Both arrangements share the same disadvantage in that the optimum conditions for the transmitter section do not correspond to those for the receiver section. Most instruction manuals for a transceiver only describe the tuning conditions for the driver and/or power amplifier output circuit when using the transmit mode. If, however, these circuits are tuned when using the receive mode, it will generally be found that the best performance results with *slightly different* settings! The difference in the receiver section performance probably is not significant in a

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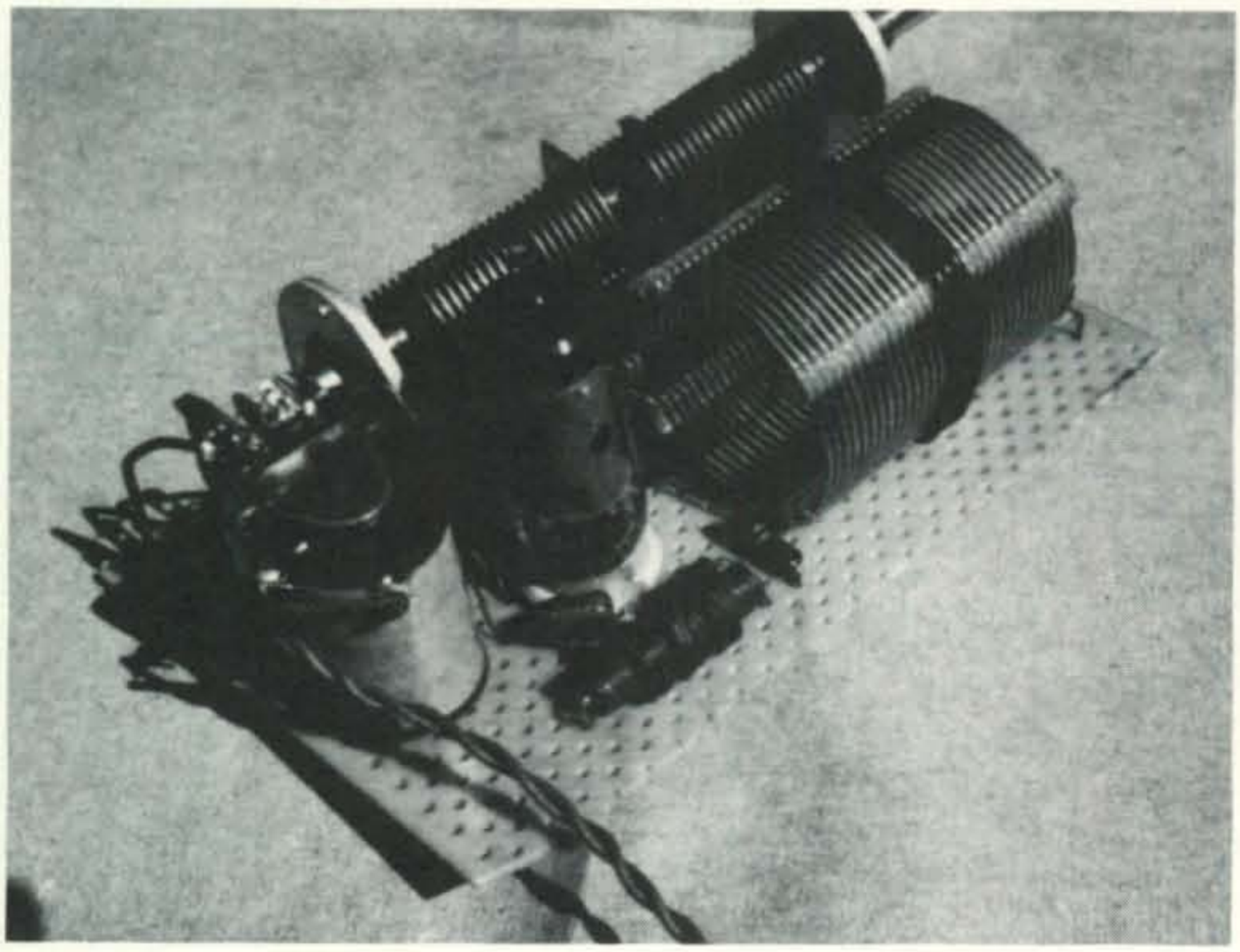

Construction of the preamplifier on perforated board is especially simple using techniques described in the text. Bypass relay is to the right of the tube, input coil to the left and tuning capacitor to the rear.

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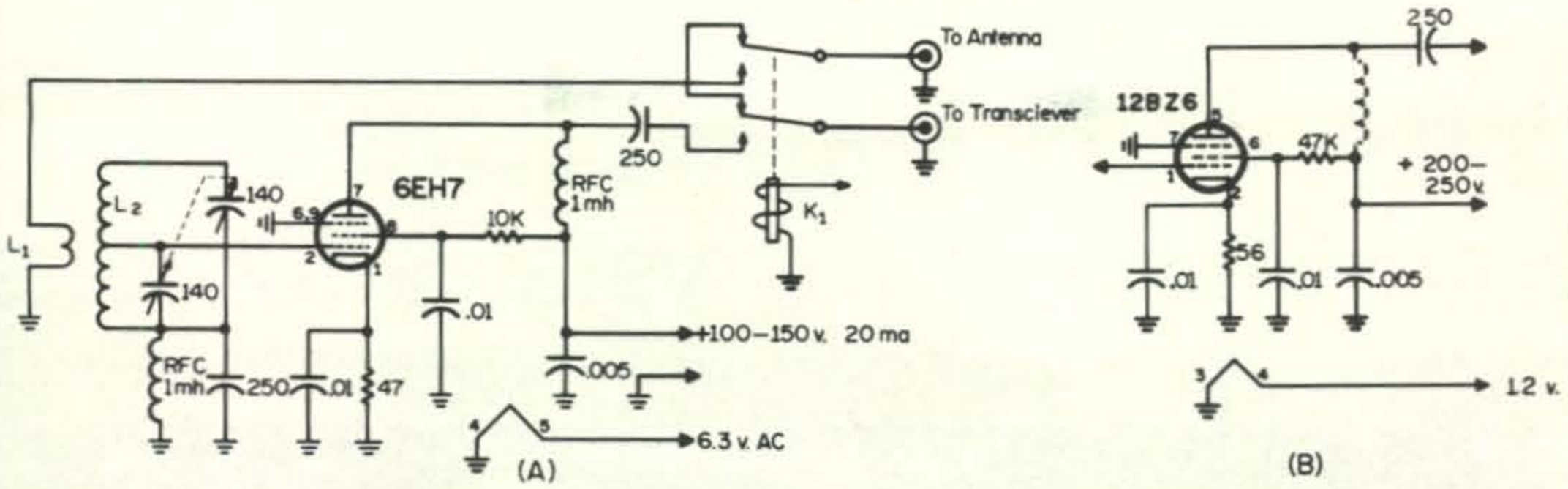

Fig. 1—Schematic of frame grid tube amplifier (A) and connections for alternative use of a conventional 12 volt r.f. amplifier tube (B). The coil value of the relay K_1 depends upon the linear amplifier switching circuit used in the transceiver, as explained in the text.

L_2—29t. B & W #3015, center tapped. L_1—4t. #20 wound over L_2.

mobile situation where the ambient noise level is quite high, but in a fixed station situation it can mean the difference between usable and lost copy of a very weak signal.

Digging into the transceiver to correct the situation is possible, but generally a complicated procedure. The use of an external preamplifier is both a very effective and economical solution. In fact, if care is taken with the circuit of the preamplifier, the performance of the receiver portion of the transceiver can be improved even beyond that obtainable with optimum settings of the transceiver circuits for performance in the receive mode. The reason for this is that a preamplifier circuit can be built with adequate gain but especially with a lower noise figure than the receiver r.f. amplifier stage in the transceiver. Also, a preamplifier circuit can be built with better input circuit Q than that possible in a transceiver. The former advantage is particularly useful on the higher frequency bands, such as 10 meters, while the latter advantage is significant on the lower frequency bands.

In summary, a preamplifier should provide good noise figure for high frequency performance, adequate gain, a high *Q* input circuit, good "burn-out" level and easy utilization of the power supply potentials available within the transceiver. The first three properties can now be provided by solid state as well as vacuum tube circuits. The "burn-out" protection that must exist when the antenna line to a transceiver is rapidly switched around an in-line preamplifier when going from the receive to transmit modes usually requires that a solid-state preamplifier have some sort of protective circuitry, such as diode limiters in its input. When used with a tube type transceiver, the preamplifier employing a vacuum tube can simply be connected to the B plus and filament lines within the receiver portion of the transceiver. No voltage dropping or extra filter circuits are required as is usually the case with a solid state preamplifier powered from the transceiver.

The preamplifier described in this article satisfies all of the above requirements for use with a tube type transceiver and actually adds a few extra advantages of its own. A multi-band input circuit is used which does away with the need for a bandswitch for 80-10 meter operation. Alternatively, the unit can be built with a single-band input circuit for operation on any band down to 6 meters. The perforated board type of construction used provides sturdiness but yet allows the unit to be constructed with almost the same ease as any solid-state unit.

Preamplifier Circuit

Figure 1 (A) shows the complete circuit of the preamplifier. The input circuit is constructed from standard B & W coil stock and is a variation of a multiband non-switching circuit made popular during the early days of s.s.b. linear amplifier construction before grounded grid configuration became popular. The circuit will show a sharp resonance in each harmonically related amateur band from 80-10 meters. Note that the tuning capacitor used must be insulated from ground. A Hammarlund HFBD 140 unit is

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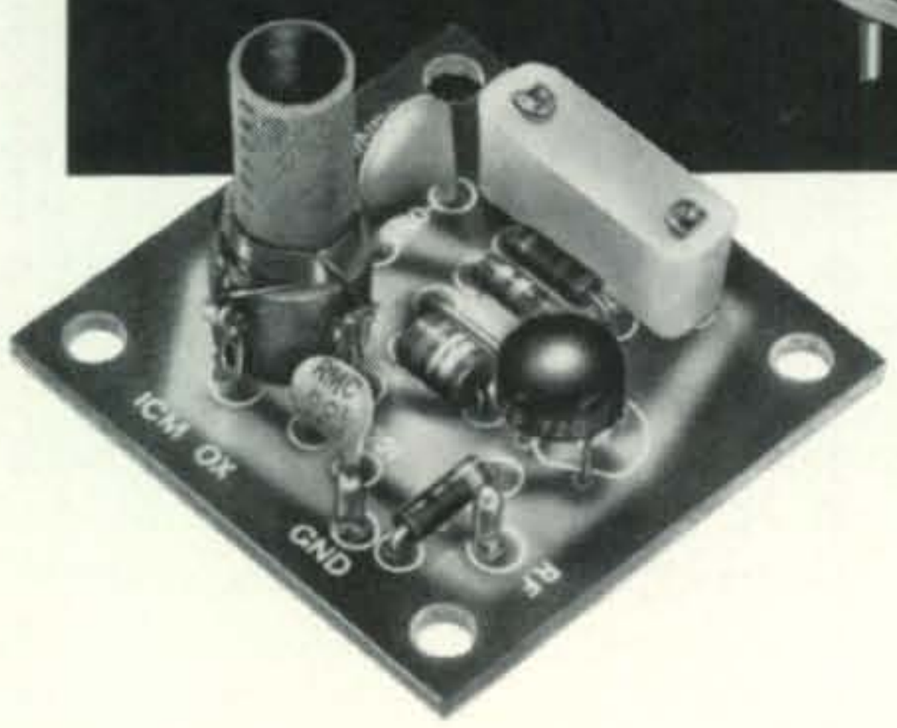

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particularly suitable but any similar variable capacitor will suffice. The tube shown is a frame-grid type which was specifically developed for low-noise operation on the u.h.f. TV channels. It is especially recommended as its noise figure will be below that of almost any tube used in present day transceiver r.f. amplifiers. In the circuit shown, the noise figure will be about 3-5 db and the stage gain about 15 db. The output circuit is left untuned for several reasons. Construction, of course, is thereby simplified. Tuning of the output circuit would increase the stage gain but this is not really necessary as its gain is already sufficient for the self-generated noise of the stage to exceed that of the receiver r.f. amplifier stage in any transceiver. So, no weak-signal reception gain would be achieved by having the output circuit resonated. Finally, the r.f. amplifier stage tuning in a receiver will most nearly achieve coincidence for maximum performance with the transceiver tuning set for maximum transmitter output when the antenna input impedance in the receive mode is very high. The preamplifier output is in the order of several hundred to a thousand ohms on each band.

The relay in the preamplifier is energized from the "linear amplifier" switching contacts available in almost any transceiver. The rating of the relay coil has to be chosen accordingly. Some transceivers simply provide a grounding contact and the relay can simply be an a.c. type operated from the filament supply line. When de-energized (transceiver in receive mode), the relay routes the antenna to the input of the preamplifier and the output of the preamplifier to the transceiver's antenna terminal. When energized, the preamplifier is bypassed. The relay, therefore, must be capable of handling the transceiver's output power. For transceivers in the 100 to 150 watt *output* category, simple power type relays will generally suffice. If the transceiver is used together with a linear amplifier, the preamplifier should be located between the transceiver and linear amplifier in order to reduce the requirements for the r.f. power handling ability of the relay. Also, because of the high impedance output of the preamplifier, it is desirable to keep the connection from the output of the preamplifier to the transceiver as short as possible (one foot or less).

The plate and filament power requirements can be supplied easily from any tube type transceiver. Preferably, the plate voltage should be taken from a point in the transceiver which is deactivated when the transceiver is in the transmit mode. Otherwise, there is some danger of the preamplifier breaking into oscillation.

The preamplifier gain may cause some overloading of the r.f. amplifier stage in the transceiver when very strong signals are received on the lower frequency bands. Usually, simple detuning of the input circuit will eliminate this rather rare problem. Another solution would be to add a 1K ohm potentiometer in series with the 47 ohm cathode resistor to ground to act as a gain control. The use of a potentiometer with a simple pull type on-off switch would also allow a means to control the antenna relay and thus switch the preamplifier in or out of the transceiver antenna line as desired.

Figure 1 (B) shows the connections for a tube which might be easier to use for those transceivers employing a 12 volt filament line. The 12BZ6 will generally be found equal in performance to the 6EH7 of fig. 1 (A) down to 15 meters. On 10 or 6 meters, use of the 6EH7 will produce a definite advantage.

The harmonic type multiband input circuit can be replaced, if desired, by any single band or bandswitch circuit to provide either selective or continuous coverage from 160 meters through to 6 meters.

Construction

One could construct the preamplifier using conventional metal chassis methods but the use of perforated board construction is both simpler and more economical. For those not used to using perforated board for tube circuit projects, there is a pleasant surprise in store. Holes of almost any dimension can be easily "burned" into the perforated board using a sharp soldering iron tip. The edges of the holes are fairly sharp and can be finished up with a small file. Use of the soldering iron tip as a "burning tool" will leave an oxide coating on the tip so the use of a separate tip for soldering purposes is suggested. Using this technique, holes for the tube socket and mounting of the relay and tuning capacitor were formed in a few minutes time.

The overall dimensions of the perforated board used was about 5 × 3 inches. The tuning capacitor and input coil were mounted as shown and the small circuit components

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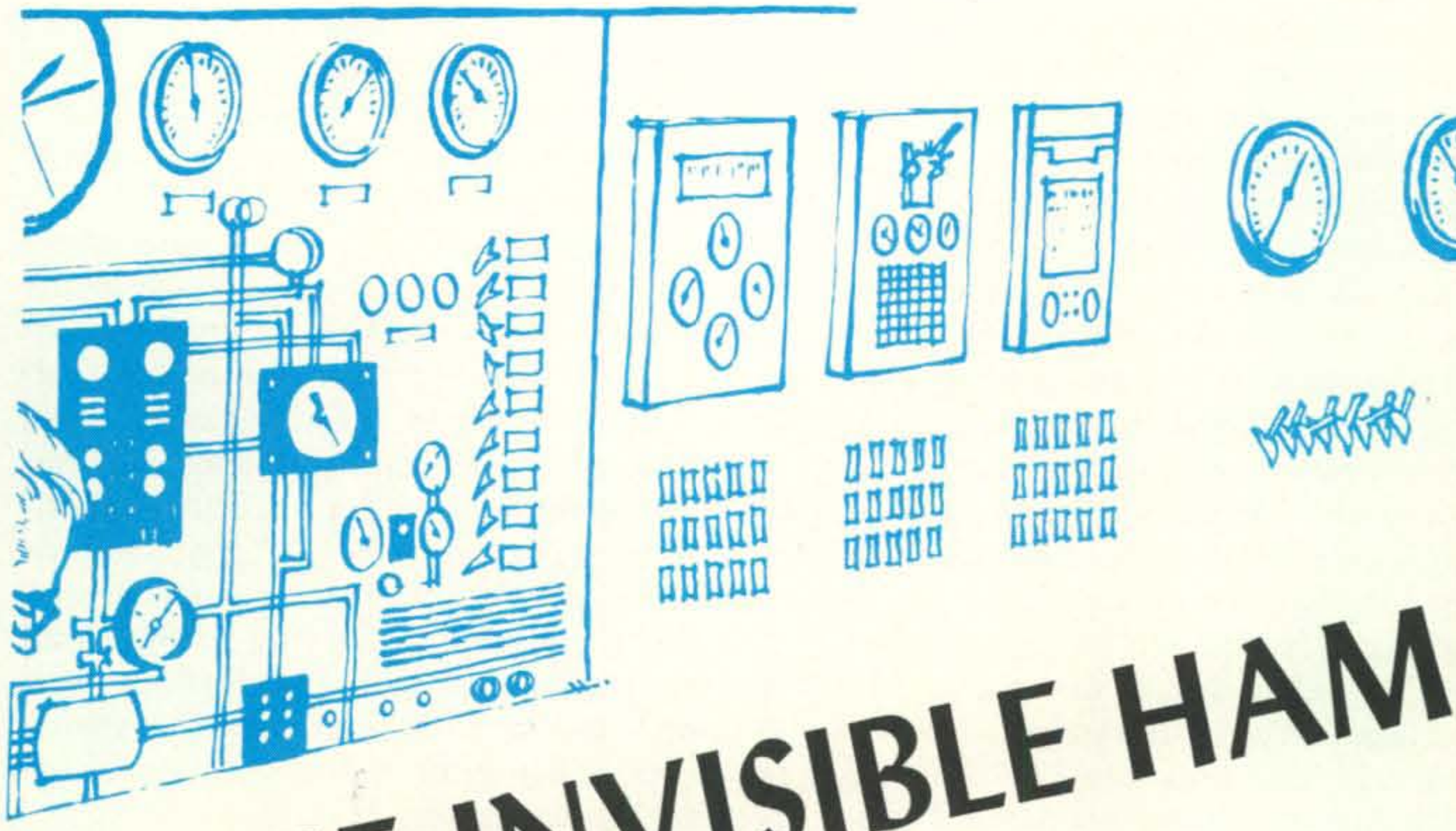

THE INVISIBLE HAM

BY RAYMOND H. LARSON,* WØGHX

My friend W8*** is a methodical man. I should have realized that in our Army days, now that I look back on it, but I didn't. It's taken me until now—eleven years—to figure it out.

When I met Ed—that's W8***—he was Chaplain's assistant in the same building that housed the base ham shack. Since I hung around the shack all the time, Ed and I naturally became good friends. I even got him interested enough in radio to get a license of his own. I think he did it more out of boredom than from real interest, but he took to it like flux to solder. In a few months he developed into a crack c.w. operator. Still, he never seemed like the ham type, if you know what I mean.

For one thing, Ed was a high-brow. An intellectual. I had never met anyone like him before. Not that he was a snob; not at all. It just seemed that he always had more serious things on his mind. He already had degrees in music and psychology, but what impressed me most was that he could read Greek. He even got me interested in music and literature and all that. He was quite a guy.

After we got our discharges we went our separate ways. I enrolled at the University of Iowa and began working on my engineering degree. Ed went back to Ohio. I didn't hear from him often, but what I did hear was high-voltage stuff. First he got his Ph.D. in psychology from Ohio State. Then five or six years later I heard he had an M.D. and was working in a hospital in Cleveland. Next I heard he had gotten a degree in psychiatry and neuro-surgery and was building up a private practice on the side while still working full-time at the hospital. He also said he was teaching a full load at the University. Somewhere along the line he had gotten married, and he and his wife Murielle had moved into a house in the country.

By now my imagination was beginning to boggle, not so much at the thought of the money he must be making—Ed had always had money—as at the staggering amount of work he was doing. I'm easy-going myself—don't believe in work for work's sake—and from what I knew of Ed, he didn't either. Why all this frenzied activity then? It didn't make sense. I wrote it off to unusual ability, but frankly I was puzzled.

Imagine my shock then, when I found out

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that on top of all this work Ed had been an active ham all these years! I had assumed that with all of his activities he had let his ticket expire and had forgotten ham radio entirely. That had nearly happened to me. I had been QRT all through college, and after I graduated and found a job, I had gotten married and just sort of forgot about ham radio. But I kept my ticket, and after a few years the bug bit again. I bought some used equipment and set up a shack. I also started reading the ham journals again, and it was here I discovered that Ed was still active.

Feverishly active, in fact. In the years since I had known him, Ed had apparently established himself as one of the top operators in the world. W8*** was listed in *QST* as having over 300 countries confirmed, and he ranked near the top in all of the DX awards. Checking frantically through back issues of ham journals in our club library, I was amazed to find that Ed had come within a hair of winning the last two ARRL DX Contests, had actually won the CQ DX Test in 1966, and had placed as one of the three or four highest c.w. entries in the SS contest for the last five or six years. Ed had apparently become a force to be reckoned with in the operating world.

At first I thought it must be a mistake—Ed's ticket must have expired and some eager young operator had gotten his call and was covering it with fame and glory. But no, there is was in the latest *Callbook*, still listed under Ed's name. What added to my perplexity was that not once in his letters had Ed ever mentioned ham radio. It was unbelievable. I dashed off a note demanding an explanation for holding out on me. Ed's reply was non-commital. He simply repeated his standing invitation for me and my wife to come and spend a few days with him.

By now my curiosity was unbearable. The question "what makes Ed run?" had become a burning issue in my life, and I was determined to answer it. Besides, Mary was anxious to get away for awhile and she was also excited about meeting this friend of mine she had heard so much about. We decided to spend our next vacation in Ohio.

We spent a lovely two weeks at Ed's. A maid even brought us breakfast in bed. There was music, good food, and stimulating conversation. It was like a second honeymoon for Mary.

But despite all the luxury, I was dissatisfied. I still had no answers to my questions. Every time I tried to swing the conversation around to Ed's accomplishments, he directed it elsewhere. I still had no idea how he got all his work done—from what I could see, he never left the house except to attend a play or a concert. He said he was also on vacation, and that could explain his absence from his office and the hospital, but what about the feats of radio operating? Big-league operating takes plenty of time, and Ed didn't even have a shack in the house (I had snooped). How did he do it?

I finally found out on our last day there. I just asked him point-blank:

"C'mon Ed, don't keep secrets from a friend. You've been putting me off ever since we got here. Now level with me. You work at the hospital, teach at the U, and run a private practice yet. And you're practically a one-man DX club. How do you do it man? And why, for Pete's sake?"

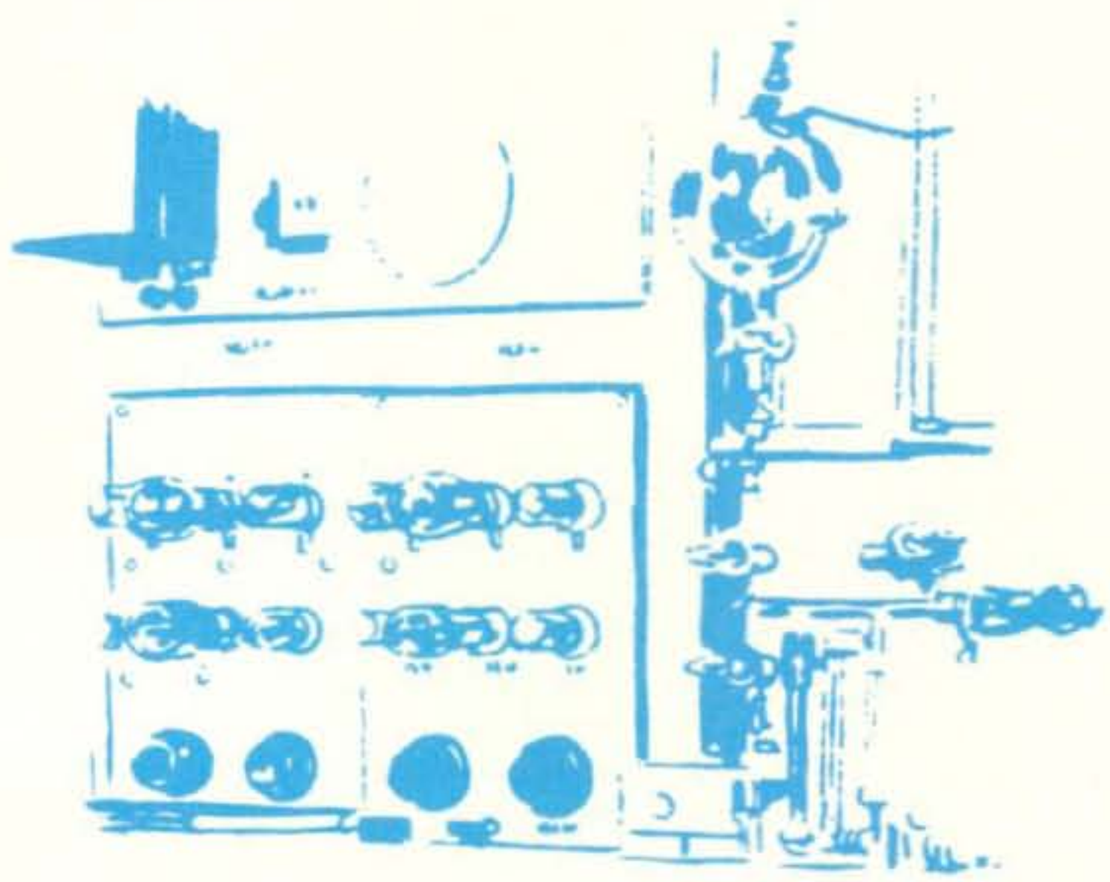
Ed hesitated a moment, looking thoughtfully into his coffee cup. "It's really very simple, John. You've probably heard of Plato's dictum 'virtue is knowledge.' Well, that's true."

"So that explains your degrees, but what about all the other stuff?"

He smiled. "Knowledge isn't a passive thing, John—it's active. It doesn't mean a thing unless it's applied. The same with virtue. Do you know that Plato's word for virtue really means 'efficiency'?" He paused to light a cigar. "I try to combine virtue and knowledge in my work, that's all."

It was Greek to me. I was getting exasperated. "Readability zero, Ed. How does it work in practice?"

"Quite simple. You master a field and learn the ropes of the trade, and then do the job as



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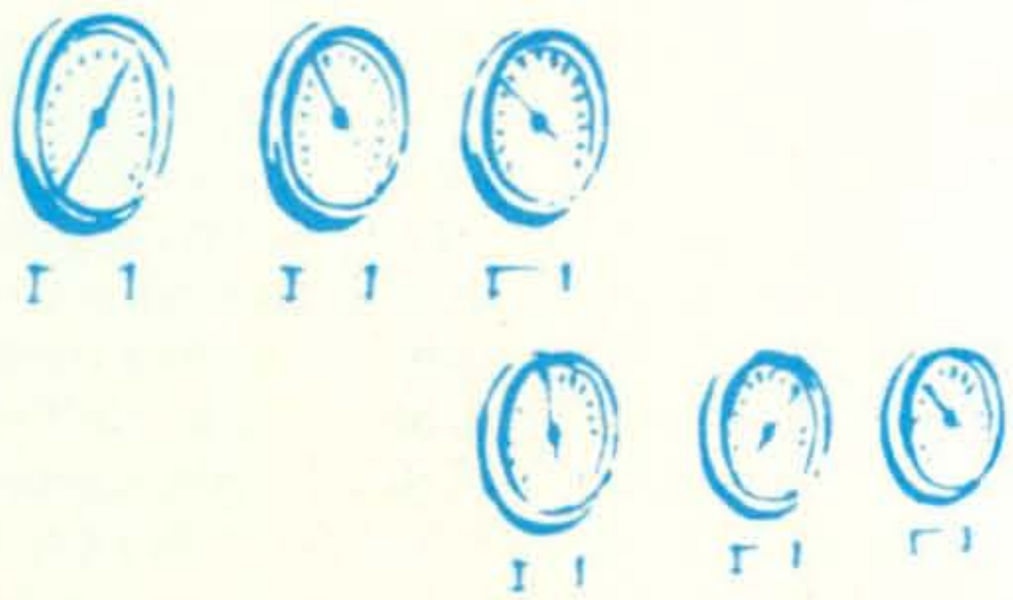

efficiently as possible. Take my university courses, for example. You don't imagine I teach them, do you?"

I stared at him dumbly. Ed continued imperturbably: "Do you suppose I'd go in and teach a bunch of knuckleheads, casting false pearls before real swine? Of course not." He blew a puff of smoke into the room.

"But who teaches them?" I cried.

"Graduate students, of course. Teaching assistants. They do all the work—I just write up the courses and collect the salary and the professional reputation. That's efficiency. Like some more coffee?"

I was too stunned to say yes. "What about the hospital?" I demanded.

"The same thing," he said, pouring himself some more coffee. "I've rounded up a couple of crackerjack interns to work under me. They do everything but the emergency cases and the actual operating, and of course we try to discourage those cases. We all get paid by the hospital, and I get the credit for the work. It's very efficient."

I was feeling dizzy. "The private practice?"

Ed laughed. "That I do myself. Psychoanalyzing frustrated wives and overwrought businessmen. But my secretary is very capable. He does all the preliminary work and I collect the fee—a hundred dollars an hour. I normally spend four hours a day in the office, and maybe an hour or two a week in the hospital. It's not so bad."

"So that's why you have so much operating time!" I blurted out. "But where's your shack? It's not in the house."

Ed looked slightly embarrassed. He coughed behind his hand. "It's not here . . . ," he said vaguely.

"But where is it?"

Ed hesitated. Then he stood up. "Come on, I'll show you."

Ed's shack lay out in the woods a few miles from his house. We roared out to it in his red Ferrari, skimming along the country roads. He had bought a piece of land, he explained, and erected a shack on it to keep the vulgar thing away from the house.

The first thing that caught my eye as we turned into the driveway was a massive tower poking through the treetops and reaching for the clouds. It was topped by a staggering array of rotary beams. There were aircraft warning lights all the way up.

"My gosh, Ed—it looks like the Voice of America! How high is it?"

"A hundred and forty feet," he replied, bringing the car to a halt in front of the low cement-block building that nestled under the tower. "There are stacked beams for ten, fifteen, and twenty, ten elements each. That makes the top twenty-meter beam about a hundred and seventy feeet above the ground. —For forty there's only one five-element beam," he added apologetically.

I was too overwhelmed to speak. I had expected a fabulous set-up, but nothing like this. We entered the shack, and I found myself in a carpeted outer office. It was air-conditioned. A girl sat behind a big desk. She seemed to be a secretary or receptionist.

"Good morning, Mr. Baldwin," she said.

"Good morning, Miss Anderson. How's it going?"

"Fine, thank you. I'm all caught up for a change. It's been a slow week. Conditions must be poor."

Before I could frame an intelligent question, Ed had walked across to the back of the office. He unlocked a door that led into a back room, and motioned for me to follow. I did.

I saw what must have been the operating room. Along one wall stood a bank of six transmitters. Six receivers were mounted in racks along the opposite wall. There was also a bank of relay and switching equipment, and another of test gear. The room was cold—it was heavily air-conditioned. I noticed that all the receivers and transmitters were turned on. That didn't make much sense, but what really puzzled me now that I looked around was the obvious lack of an operating position. It was apparently just an equipment room. Occasionally I heard a relay click.

"A 75A-4 and a kilowatt transmitter for each band, plus a spare," said Ed. "Naturally just c.w., but we're working on plans for a s.s.b. set-up too."

I finally recovered my voice. "But where's your operating position, Ed? Do you work

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this stuff remote control from another part of the building?"

Ed looked at me hard. "This is it," he said with finality.

I looked around the room uncomprehendingly. Ed continued:

"It's all done automatically, John. No need for an operator. Each receiver is tied in with a transmitter, and they're rigged with selsyn drives to scan the bands automatically. Whenever a receiver runs across a station signing a call it automatically locks in, and the call is processed by a computer system. If it's a new country or zone and it's calling CQ or signing, the computer give a go-ahead sign and the transmitter automatically fires the station's call back to him and signs. There are pre-recorded tapes to handle the QSO, and the computer slips in the signal report and feeds the guy's name back to him. For contests we reprogram the computer and use special tapes. It's a neat little system, don't you think?" He calmly lit a cigar.

My brain wasn't functioning very well. "But the beams?" I stammered.

"Automatically rotated to give the strongest S-reading on any signal," said Ed, blowing out a cloud of smoke, which immediately drifted away through the air-conditioner. 'The computer records the QSO for logging purposes and prints out all the necessary QSL information on a card that's deposited on my secretary's desk. All she has to do is type up the log sheets and address the QSLs."

"How did you line all this up?" I asked feebly.

"I had a team of engineers design it and set it up. They're good boys."

"It must have cost a fortune, Ed!"

"Not really. Just the price of the materials. The labor was free. All of the engineers' wives are patients of mine, and I just traded couch time for drawing board time." He flicked an ash onto the floor.

"But the computer..."

"I just rent that, John. From a computer firm in the city. We operate over a phone line. The rent's free too—the president's wife is also a patient of mine." He snorted.

"What about your secretary," I cried in exasperation, "do you analyze her too?"

Ed laughed. "No, I pay her a salary. Shall we go? It's cold in here."

We drove back to the house in silence. Dinner that night was excellent, but I was

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MODERN REMOTE TUNING

BY JOHN J. SCHULTZ,* W2EEY

The days of motor-driven remote tuning systems have been replaced by devices such as capacitance diodes and lamp-photocell modules. Various techniques are discussed for using these devices for the remote control of mobile transceivers and sample circuits are included from several transceiver units.

Not too long ago one could read about various remote control systems employing drive motors with complicated control circuitry in order to allow the placement of a transmitter or transceiver in the trunk of a car, a large transmitter in a remote corner of a home, *etc.* Of course, the advent of the "table-top" kilowatt station has pretty well eliminated the need for anyone to worry about having to remote control a transmitter in one or two six foot relay racks located in the basement of a house. However, the situation still does exist where many amateurs would prefer to have a transmitter or transceiver in the trunk of a car, controlling it remotely via a neat control box, rather than have a bulky and unsightly unit mounted by the driver's position. The system of drive motors and their circuitry necessary for remote control has now also been replaced by a number of devices having no moving parts and requiring only simple d.c. control lines from the remote control position to the transmitter or receiver to perform such functions as tuning, level control and switching.

The devices used are voltage-controlled capacitance diodes, lamp-photocell modules and diode switches. The basic application of the first two components is further expanded by the use of multi-turn potentiometers. All of these components have been available for a few years already, but it is only now that they are becoming economically priced and readily obtainable. This article does not discuss in any detail the basic operation of these components. Many articles have already performed that service. Rather, the emphasis in this article is on the specific application of these components for remote control purposes. Examples are given of the application of these components to perform remote control functions of varying complexity for specific transceivers. The same techniques that are described may, however, be adapted to other transmitters or transceivers as well.

The one area that is not covered is the remote control of high power or high current circuits, such as power amplifier tank circuits or base loaded whip antenna tuning networks. Some of the techniques described would be applicable to these circuits, but the cost of the components involved are still extremely high to the point of being out of reach of 90% of us. The areas that are covered can be applied to various general situations as described next.

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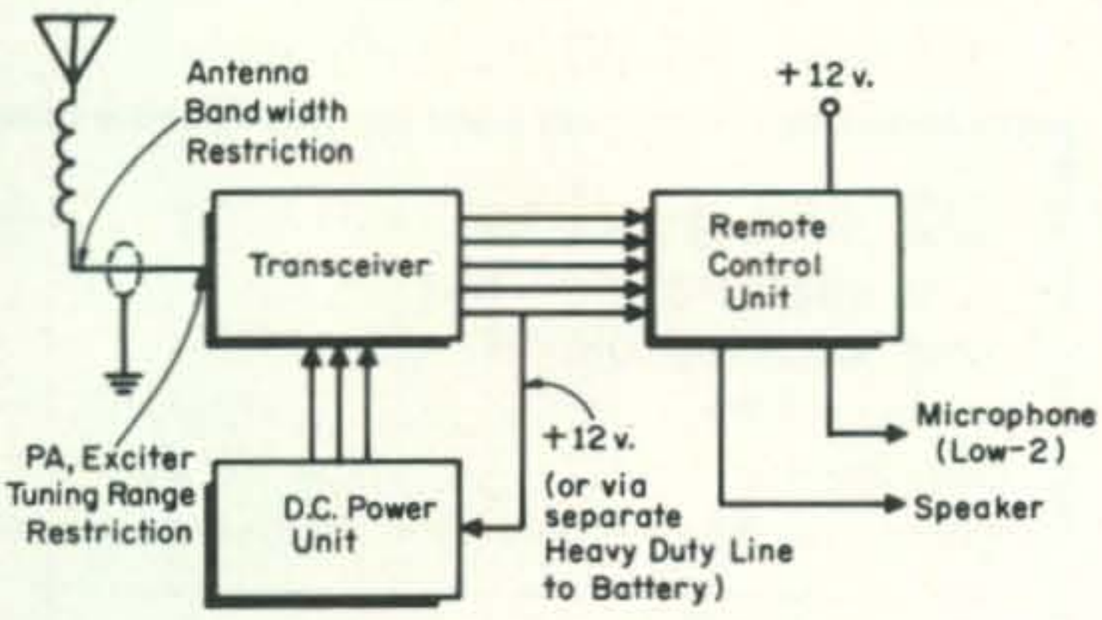

Fig. 1—The general situation relating to the remote control of a transceiver unit. The remote control line functions can include power control, remote frequency tuning, audio level control (receive), other level controls, and microphone with p.t.t. operation.

General Remote Control Situations

Figure 1 shows the simple block diagram layout of an elementary remote control mobile situation. The limiting factor in most

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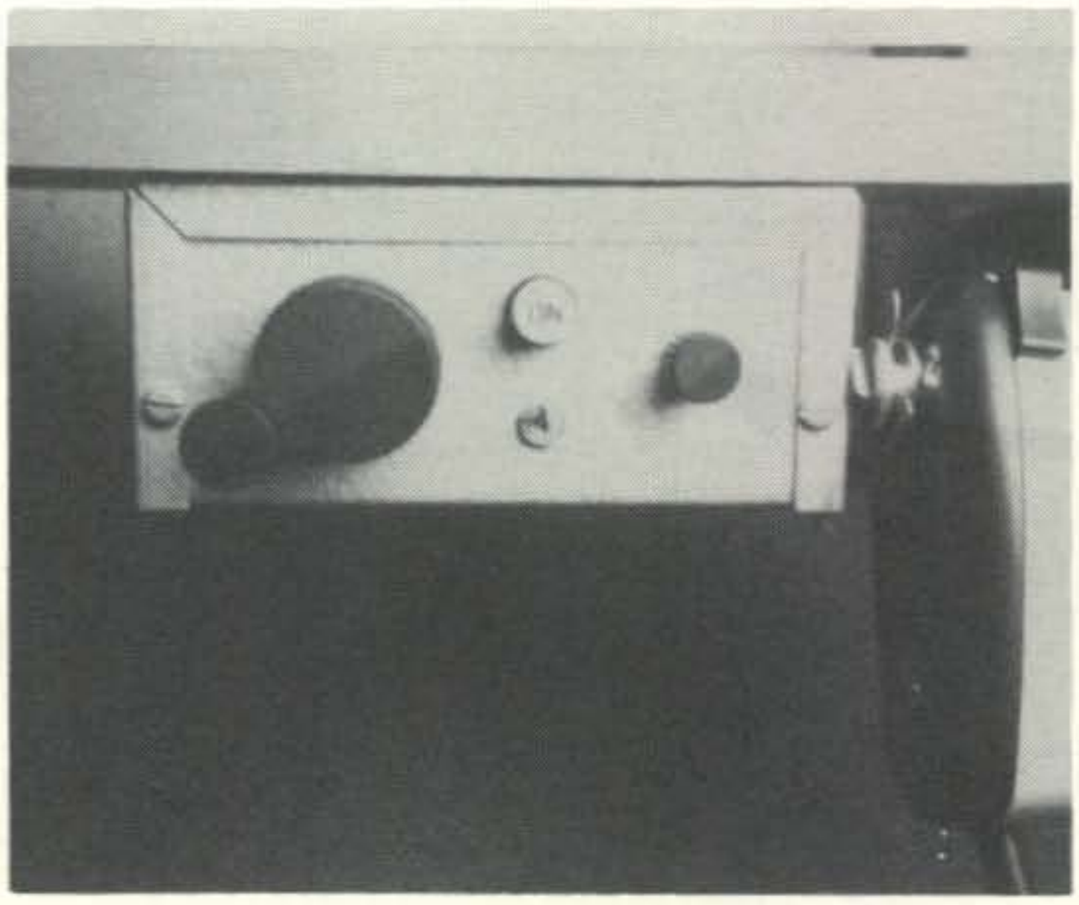
such situations is the range over which the antenna or transmitter output circuit can be operated, assuming that one doesn't want to get involved with the more complicated situation of remoting these functions also. On the lower frequency bands, the antenna bandwidth is usually the limiting factor (being confined to 10 to 20 kc at best) while on bands such as 10 meters the limiting factor is the transmitter output circuit, which in a favorable situation might operate so as not to exceed a 3:1 s.w.r. for 200 kc or so.

Within this context, several remote control arrangements are possible. The simplest would be the situation on a low frequency band where the transmit frequency would not be varied and the receiver tuning would vary only over an incremental range to facilitate the tuning in of station not exactly on the transmit frequency. In addition, remote a.f. volume control of the receiver audio would be desired and possibly remote r.f. gain control. A second situation might be that where both variation of the transmitter and receiver frequency simultaneously in transceiver fashion is desired, with the possible option of switchable incremental receiver tuning once the transceive frequency is set. Still another variation possible is that where it is desired to vary the transmit frequency over a narrow to medium range but it is desired to vary the receiver frequency over a wide range, so one can scan a band for activity even though the receiver may not operate at full sensitivity throughout the band because of having common fixed tuned circuits with the transmitter section of a transceiver.

One has to decide from experience with a mobile situation and on the basis of how much work it is desired to do on a remote installation as to what remote control functions are really necessary and desired. The following examples show ideas which can be combined to suit almost any situation.

Transceivers with Incremental Tuning

A number of transceivers have built-in receiver incremental tuning and in such a case it is usually quite easy to provide for remote control of the incremental tuning function while the transmit frequency remains fixed. Examples of transceivers to which this procedure can be applied, and where the incremental tuning function is performed by means of a built-in voltage-controlled capacitance diodes, are the SR-150, NCX-5 and SB-34.



Simple remote control unit of type discussed in the text. Raytheon 125 series spinner knob controls a ten-turn potentiometer for tuning. Small knob provides a.f. level control via lamp-photocell module. Microphone is 300 ohm dynamic type to eliminate need for shielded microphone cable.

Figure 2, for example, shows the incremental tuning function in the SB-34 transceiver. The collector-base junction only of the 2N3565 diode is used to form a voltage-controlled capacitance diode. When in the receive mode (+12 volt on receive bus), the voltage on the base of the 2N3565 is determined by a voltage divider network consisting of the 1K DIAL CORRECT potentiometer, 470 ohm, 1K, and either of the 1K ZERO ADJUST or PITCH potentiometers. In the transmit mode, the 470 ohm resistor in series with the diode to the receiver bus completes the voltage divider network instead of either of the 1K ohm potentiometers leading to the transmit bus. With the RIT switch ON, the

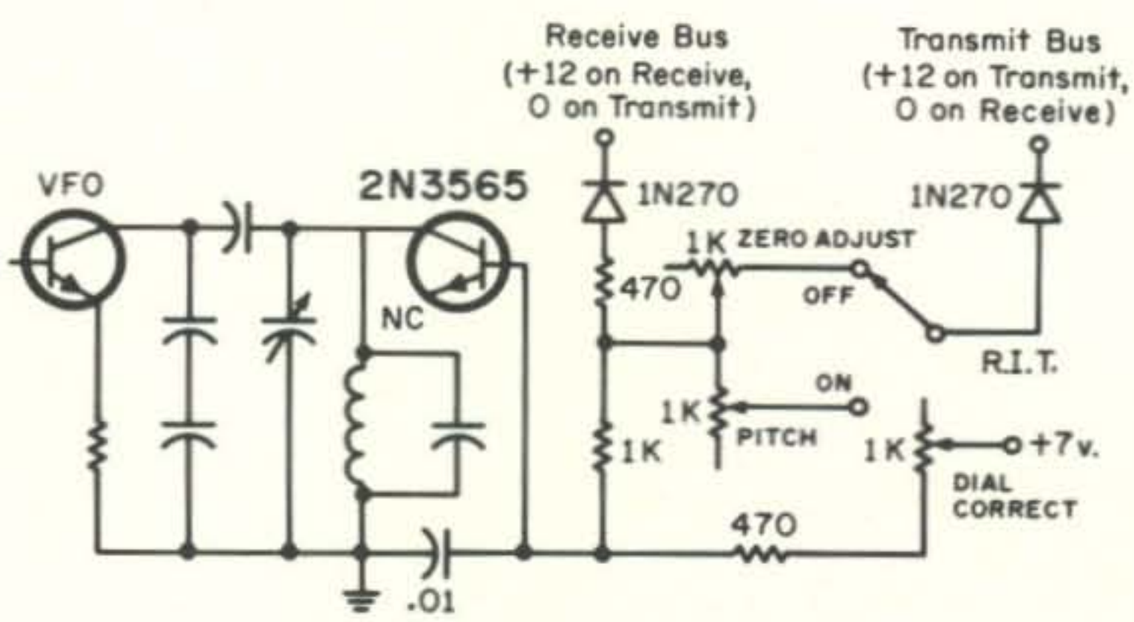


Fig. 2—Diode switching incremental tuning circuit from SB-34 transceiver. Remote control of the incremental tuning feature requires direct remote placement of the 1K ohm PITCH control or its replacement by a lamp-photocell module.

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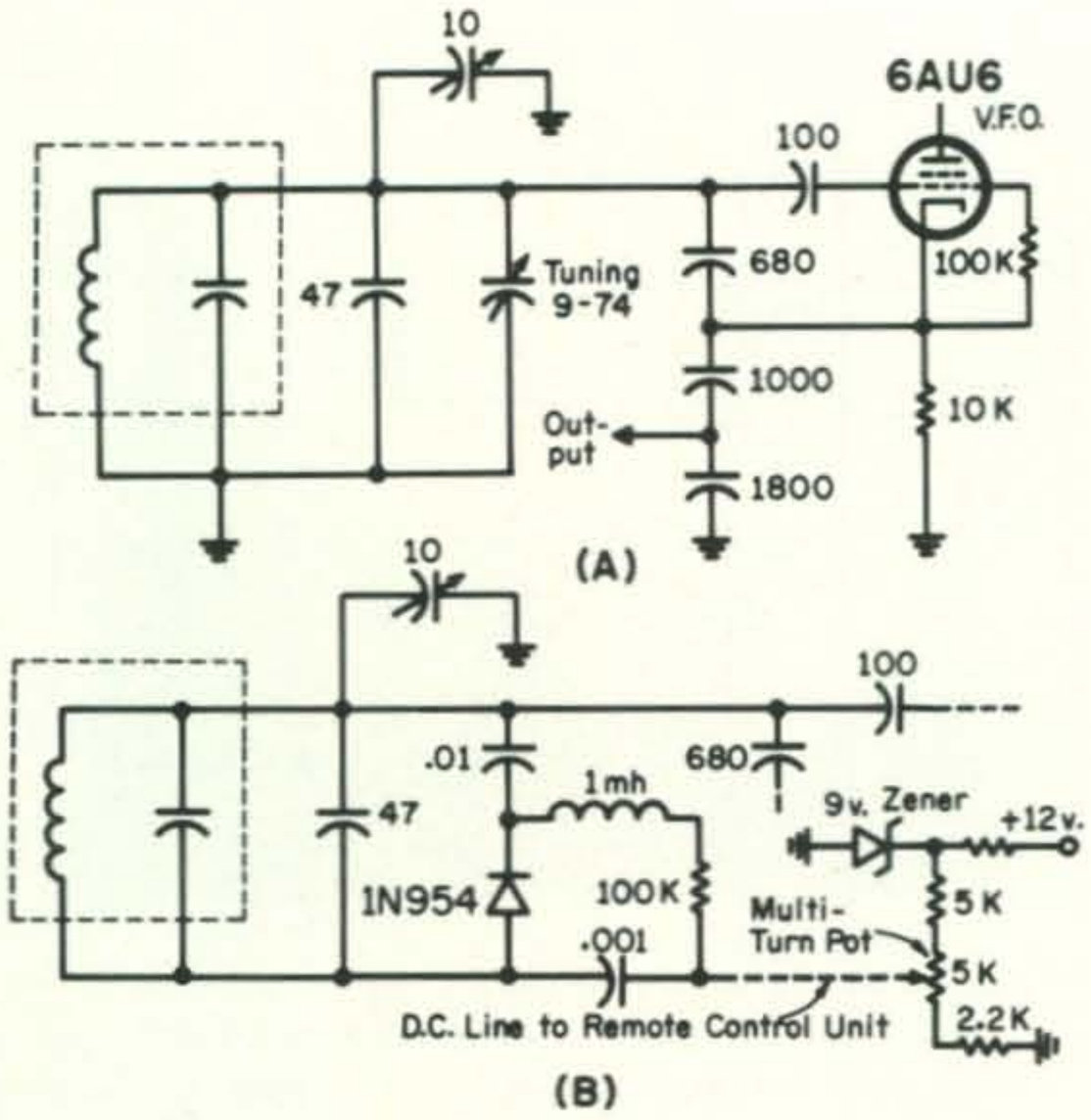

Fig. 3—Unmodified HW-22 v.f.o. circuit (A) and replacement of tuning capacitor with capacitance diode (B) to permit remote tuning over a selected frequency range.

positive potential on the base of the 2N3565 varies from about 3.5 to 5.0 volts to produce a linear capacitance change for rotation of the linear 1K PITCH potentiometer.

In order to remotely control the incremental tuning feature, it is simply necessary to leave the RIT switch at ON and replace the 1K PITCH potentiometer with a remote unit. The simplest way to do this would be by just physically moving the 1K potentiometer to the remote control position with some additional 0.01 mf bypassing to protect against stray pickup. A loudspeaker at the remote control position could be used in place of the built-in SB-34 speaker and a simple T pad (Mallory TSA-10) used at the remote position to control the volume. With the addition of a heavy duty toggle switch to control the 12 volt battery line (or a relay) to the SB-34, one would have a very simple but still quite useful remote control capability. Since the SB-34 microphone is already of a fairly low impedance type and does not use a shielded cable, its length can be extended as necessary without pickup problems. For transceivers having a high impedance microphone input, it generally will be found easier to use a high to low impedance matching transformer at the transceiver and use a low impedance (50-250 ohm) microphone at the remote position rather than running a shielded high impedance microphone lead around a vehicle.

There are several ways by which the remote control functions just described can be refined as will be described shortly, but basically the remote control provisions provided allow simple fixed frequency transmit operation and incremental remote receiver tuning using a transceiver having RIT built-in or a transceiver to which RIT has been added.

Transceivers Without Incremental Tuning

The Health HW-32, 22, *etc.*, are examples of good single band mobile transceivers without incremental tuning. Suppose it is desired to remotely tune such a transceiver over a 75 or 100 kc band segment to correspond to a mobile antenna bandwidth in straight transceive frequency fashion. Since the combination receiver r.f. amplifier input/transmitter driver plate circuit is broad-band and the p.a. output circuit is assumed to stay in tune, the only circuit that needs to be remotely tuned is the v.f.o. circuit, as shown in fig. 3(A). One would first determine the capacitance range of the v.f.o. tuning capacitor which corresponds to the frequency segment coverage desired. A voltage-controlled capacitance diode then can be used to either replace the variable capacitor or placed in parallel with it. Suppose that the capacitance range desired were 30 to 55 mmf and one were to use the voltage-controlled capacitance diodes whose characteristics are shown in fig. 4. (Many other diodes can be used as well but one must know their tuning range characteristics.) Any one of several of the diodes could be used but the IN954 or IN955 would be good choices if one wanted to have the control voltage taken from the 12 volt battery line (via a zener regulator) and still have the capacitance range covered without having the diode bias voltage become so low that self-biasing due to rectification of the oscillator tank voltage is a danger. Using the IN954, a bias voltage range of about 1½ to 5½ volts is necessary. Fig. 3 (B) shows how the circuit can be formed.

The resistors in the voltage divider network restrict the output bias voltage to the required 1½ to 5½ volt range. Using a regular potentiometer, however, would mean covering 100 kc in a 270° rotation which hardly would permit easy s.s.b. tuning. To expand the kc/turn ratio, either a 3 turn or 10 turn potentiometer can be used. A number of radio parts outlets now offer these multi-turn potentiometers with regular 1/4" diameter shafts at reasonable prices ($3-4). One source is Fertick's Electronics, Ninth and Tioga

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Streets, Philadelphia, Pa. 19140. Normally, there is no need to provide frequency readout at the remote tuning position in this type of application, as long as the installation is carefully set initially to cover only a specific segment of a band. One could, of course, remotely activate a calibrator in the transceiver to check the stability of the extreme excursions of the remote frequency control potentiometer.

Remote control of the receiver audio gain could be done with a simple T pad in the loudspeaker line but use of a lamp-photocell module allows fuller audio range control since it replaces the a.f. gain potentiometer in a transceiver directly. This application of a lamp-photocell module can be expanded to remotely control any potentiometer function, in fact.

Figure 5 (A) shows the use of a lamp-photocell module for remote a.f. gain control. In conjunction with the 1 megohm series resistor, the photocell forms a voltage divider network as the latter's resistance ranges from 100 ohms to over 10 megohms, depending upon the lamp illumination. A number of reasonably priced lamp-photocell modules are available with lamp voltages suitable for mobile use – Clairex 3012, Raytheon CK-1121, CK1122, etc.

The photocell is a two terminal device and so it cannot alone be used to replace a three terminal potentiometer where true potentiometer action is a necessity. However, two wide range lamp-photocell modules (such as those cited above) can be wired to provide potentiometer action to replace any 100 ohm to 1 megohm potentiometer. The circuit is shown in fig. 5 (B), illustrated for replacement of a 1K potentiometer. As the remote lamp control potentiometer is varied, one photocell lamp darkens while the other brightens. When the upper lamp is fully bright, its photocell resistance is minimum (100 ohms or less), the lower lamp is out and its resistance very high. In parallel with the 1K fixed resistances, the total effect is the same as though the potentiometer arm (the junction of the resistors) were at the upper end of an equivalent 1K potentiometer. When the conditions of the lamps is opposite, the effect is as though the potentiometer arm were essentially at ground potential. Thus, one can remote any potentiometer function desired, a.f., r.f., microphone levels, *etc.* The lamp-photocell module idea could, of course,

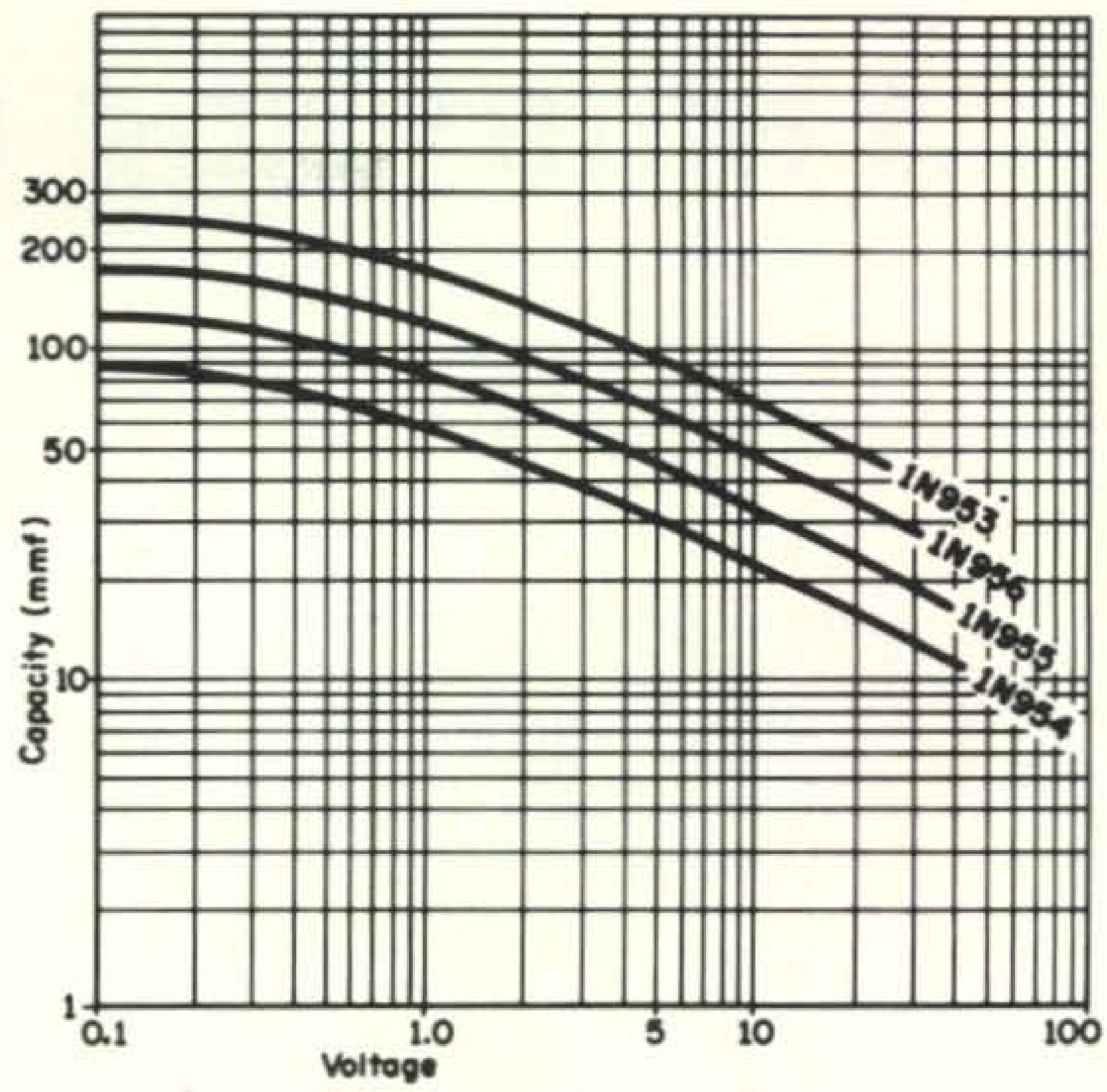

Fig. 4—Capacitance range of some commonly available voltage controlled capacitance diodes. Many others can be used in applications described, but one must have available specific characteristics data.

also be used to remotely control a potentiometer controlling receiver incremental tuning for complete isolation between the RIT circuit and the remote control unit.

Combination Tuning Functions

The two tuning schemes mentioned so far have been fixed transmit frequency/incremental receiver tuning and pure transceive frequency operation over a moderate band segment. Another type of operating scheme that may be desirable is to have the capability of transceive frequency excursion over

[*Continued on page 98*]

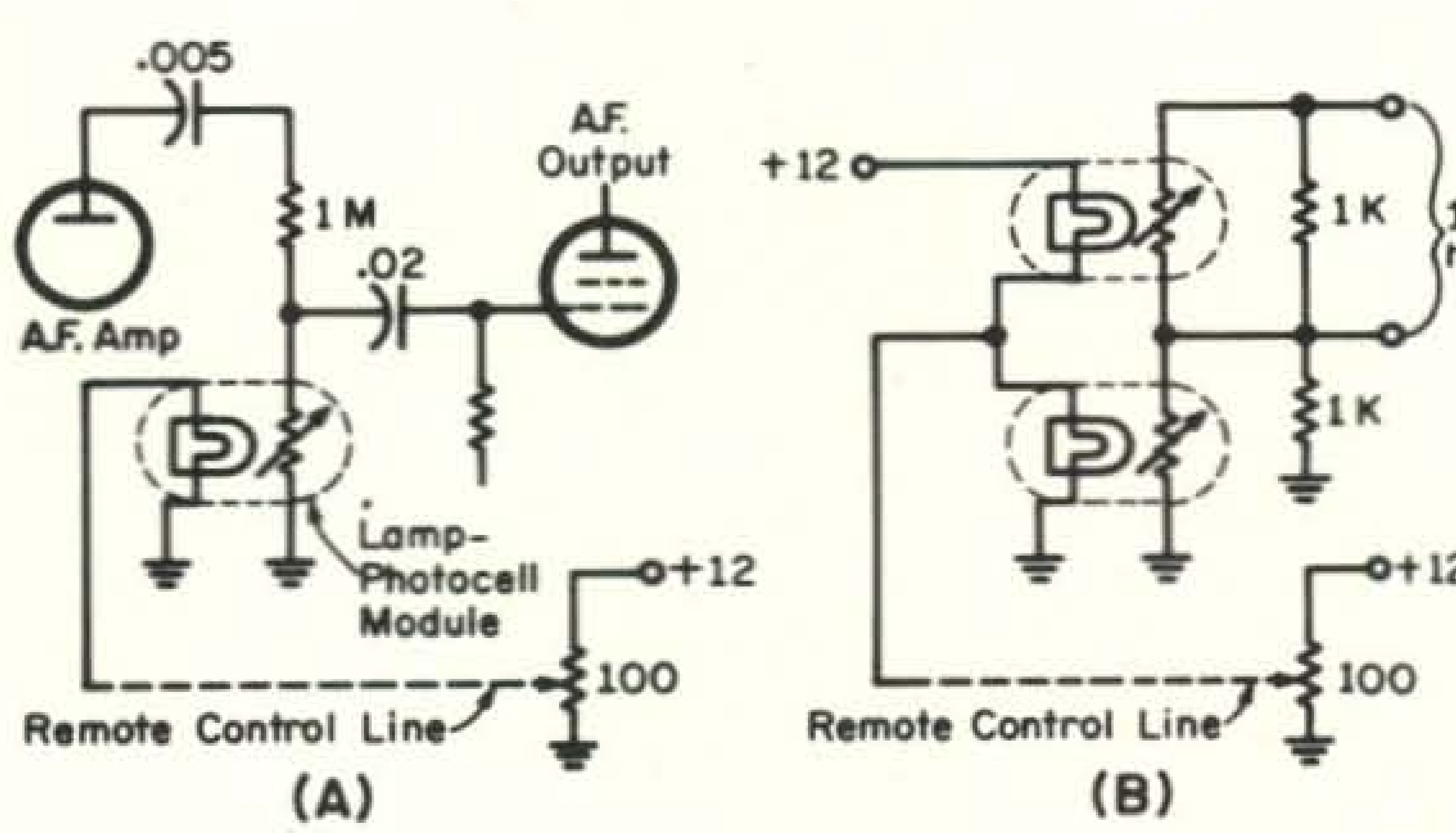

Fig. 5—Single lamp-photocell unit acts as a.f. gain control (A). Two lamp-photocell units can be used with external resistors to remotely duplicate action of almost any value potentiometer. Circuit at (B) illustrates simulation of 1K potentiometer.

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Announcing

THE CQ WORLD WIDE WPX SSB CONTEST

April 11-12, 1970

I Contest Period: Starts: 0000 GMT Saturday. Ends: 2400 GMT Sunday. Only 30 hours of the 48 hour contest period permitted for Single Operator stations. The 18 hours of non-operating time may be taken in up to 5 periods anytime during the contest, and must be clearly indicated on the log. Multi-operator stations may operate the full 48 hours.

II Objective: Object of the contest is for amateurs around the world to contact as many amateurs in other parts of the world as possible during the contest period.

III Bands: All bands, 3.5 thru 28 mc may be used, but operation is confined to two-way single sideband *only*.

IV Type of Competition: 1. Single Operator (a) All Band, (b) Single Band. 2. Multi-operator, All Band, *only*. (a) Single Transmitter, (only one signal permitted) (b) Multi-Transmitter, (one signal per band permitted).

V Exchange: Five figure serial number, RS report plus a progressive three digit contact number starting with 001 for the first contact. (Continue to four digits if past a 1000) (Multi-Transmitter stations use separate numbers for each band.)

VI Points: 1. Contacts between stations on different continents; count 3 points on the 14, 21 and 28 mc bands, and 6 points on the 7, 3.5 and 1.8 mc bands.

2. Contacts between stations in the same continent but not in the same country; count 1 point on 14, 21 and 28 mc, and 2 points on 7, 3.5 and 1.8 mc. (Exception: Contacts between different North American countries count 2 points on 14, 21 and 28 mc, and 4 points on 7, 3.5 and 1.8 mc. This applies to North American countries *only*.)

3. Contacts are permitted between stations in the same country for the purpose of obtaining a Prefix multiplier, but have no QSO point value.

VII Multiplier: The multiplier is determined by the number of different prefixes worked.

A "prefix" is considered to be the two or three letter/number combination which forms the first part of an amateur call. (W1, W2, WA2, DL1, DJ, 4X4, 5A1 and etc. See WPX rules.)

Each prefix may be counted only *once* during the contest.

VIII Scoring: 1. Single Operator (a) All Band score, total QSO points from all bands multiplied by the number of different Prefixes worked. (b) Single Band score, QSO points on that band multiplied by the number of different Prefixes worked.

2. Multi-Operator stations. Scoring in both these categories is the same as the All Band scoring for Single Operator.

3. A station may be worked once on each band for QSO point credit. However, prefix credit can be taken only *once* regardless of the band.

IX Awards: Certificates will be awarded to the highest scoring station in each category listed under Sec. IV.

1. In every participating country.

2. In each call area of the United States, Canada and Australia.

All scores will be published. However to be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must show a minimum of 24 hours.

A single band log is eligible for a single band award *only*. If a log contains more than one band it will be judged as an all band entry, unless specified otherwise. However a 12 hour minimum is required on the single band.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

X Special Awards: 1. WORLD–Single Operator, Single Band. A trophy donated by Jack Chalk, KW6EJ.

2. WORLD–Single Operator, All Band. A Trophy donated by Don Murray, K4FMA.

3. WORLD–Multi-operator, single transmitter. The Ted Thorpe, ZL2AWJ Memorial Award, donated by Don Miller, W9WNV.

4. WORLD–Multi-operator, multi-transmitter. The Chuck Swain, K7LMU. Memorial Award, donated by Don Miller W9WNV.

5. CANADA–Single Operator, Single Band. A Trophy donated by Gene Krehbiel, VE6TP.

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WORLD-WIDE WPX SSB CONTEST

Page 1 of 5 Pages

CALL 4U1ITU Log For 14 Mc Band COUNTRY ITU

(Use separate log for each band.)

DATE / Time GMT	STATION	SERIAL NUMBER Sent	SERIAL NUMBER Received	Fill in only when QSO is mult. PREFIX	Points
0003	K1HVV	59001	59002	K1	3
05	WA2SFP	59002	59004	WA2	
06	VO1HI	59003	57001	VO1	
09	HI8XAL	59004	59005	HI8	
10	K3IWW/WY	57005	57003		
12	VE6TP	57006	56004	VE6	
15	WA4PM	56007	56010	WA4	
25	W9EWC	55008	55011	W9	
36	KP4CL	56009	55009	KP4	
48	~~VO1HI~~	~~65016~~	~~45001~~	DUP	0
OFF	0100 –	0400 –	3 hrs		
0405	YV5BIG	59011	59058	YV5	3
09	YV5AGD	59012	59087		
12	HK4REI	58013	57081	HK4	
13	HC1EY	57014	56090	HC1	
33	CX9CO	56015	55092	CX9	
45	PY2CG	56016	55100	PY2	
0600	VK9GN	56017	56516	VK9	
12	VK2ACK	57018	57525	VK2	
13	VK3GY	56019	56320	VK3	
24	VK3AXK	56020	56290		
35	ZL1KG	56021	56615	ZL1	
47	KW6EJ	55022	55555	KW6	
OFF	0700 –	1000 –	3 hrs		
1000	G3NMH	53023	54756	G3	1
01	DL4FS	57024	57001	DL4	
03	DL4SK	57025	57561		
05	DJ6QT	57026	57770	DJ6	
17	ST5KG	56027	56600	ST5	3
20	I9KB	57028	57011	I9	1
29	~~DL4FS~~	~~56024~~	~~58002~~	DUP	0
30	OH2AM	58036	58025	OH2	1
42	4X4FM	56031	56575	4X4	3
53	UR2AR	57032	57461	UR2	1
OFF	1100 –	1700	6 hrs		
2201	JA1REA	55033	57120	JA1	3
05	YV2DKZ	55034	55190	YV2	1
10	UL7JA	55035	55281	UL7	1
15	UA9KHA	55036	55366	UA9	1
26	DU1FH	55037	55475	DU1	1
			TOTAL POINTS THIS SHEET	31	11

CQ Form 1069 eff. Feb. 1968

A sample log sheet already filled out. Official log sheets are available from CQ, see (7.) below.

6. OCEANIA–Single Operator, All Band. A Trophy donated by Jack Chalk, KW6EJ.

XI Club Competition: No club award is planned at this time, however one may be given if sufficient interest is shown.

XII Log Instructions: 1. All times must be in GMT. The 18 hour non-operating periods must be clearly shown.

2. Use a separate sheet for each band.

3. Prefix multipliers should be entered only the FIRST TIME they are contacted.

4. Logs must be checked for duplicate contacts and prefix multipliers. Recopied logs must be in their original form, with corrections clearly indicated.

5. A prefix check list is not only desirable but a *must* for proper contest operation. (It is recommended that you also send it along with your contest log.

6. Each entry must be accompanied by a Summary Sheet listing all scoring information, the category of competition and the contestant's name and mailing address in BLOCK LETTERS.

Also a signed declaration that all contest rules and regulations for amateur radio in the country of the contestant, have been observed.

7. Official log and summary sheets are available from CQ. A large self-addressed envelope with sufficient postage or IRCs must accompany your request.

If official forms are not available you can make your own by following the attached sample, with 40 contacts to the page.

(Daystrom Limited has made an International Log Form which is available to Canadian amateurs. We will supply them with Summary Sheets. Write to: 1480 Dundas Highway East, Cooksville, Ontario.)

XIII Disqualification: Violation of the regulations of amateur radio in the country of the contestant, or unsportsmanlike conduct, or taking credit for incorrect QSO's or Prefixes, or duplicate contacts in excess of 3% of the total made, will be deemed sufficient cause for disqualification.

Actions and decisions of the Committee are official and final.

XIV Deadline: All entries must be postmarked *no later* than May 15, 1970. In rare isolated areas the deadline will be made more flexible.

Logs go to: CQ WPX SSB Contest Committee, 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050. ■

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ALL ABOUT MICROPHONES

BY W. EDMUND HOOD,* W2FEZ

THERE are as many different kinds of microphones as there are uses for them, and each type of microphone has a particular application to which it is best fitted. This often becomes confusing to the experimenter, and many times a perfectly good idea is lost simply for the lack of a little more data. A little care in the selection and in the use of a microphone can spell the difference between success and failure. Let us, then, examine some of the terminology and principles involved.

Impedance

Impedance means the total opposition a device offers to alternating current. It often is quite difficult to measure and generally can only be calculated by the man who designed it. The impedance of most electronic devices, except antennas which we are not discussing here, is always measured at a frequency of 1000 c.p.s.

For the best results in audio work, it is necessary that the impedance of the microphone be the same, or nearly the same as the circuit it is feeding. There is quite a bit of tolerance here, a two to one mismatch being about the limit you can tolerate. If a mismatch cannot be avoided, a low mike impedance to high load impedance, is a lesser evil than the other way around.

Output

The output of the microphone is often given as minus so many db. In order to understand this one has to know just what level is called 0 db. Most manufacturers don't tell, but a power level of one milliwatt is most frequently used as the reference point. This can be converted to volts if you remember the formula $P = E^2/Z$. Where P is the power level, E is the voltage, and Z, the impedance. You can do a quick and dirty conversion from db to power difference if you remember that each 3 db represents a two to one difference, and each 10 db represents a ten to one difference in power. Using this rough standard, you should have no trouble getting into the right ballpark. For example, suppose we had a microphone with an impedance of 50 ohms, and its output was −55 db.

Remember that each 10 db represents a 10 to 1 difference in power. Therefore, −10 db would be 0.1 mw, assuming 0 db to be 1 mw. Thus −20 db would be 0.01 mw. Get the idea? Each −10 db moves the decimal

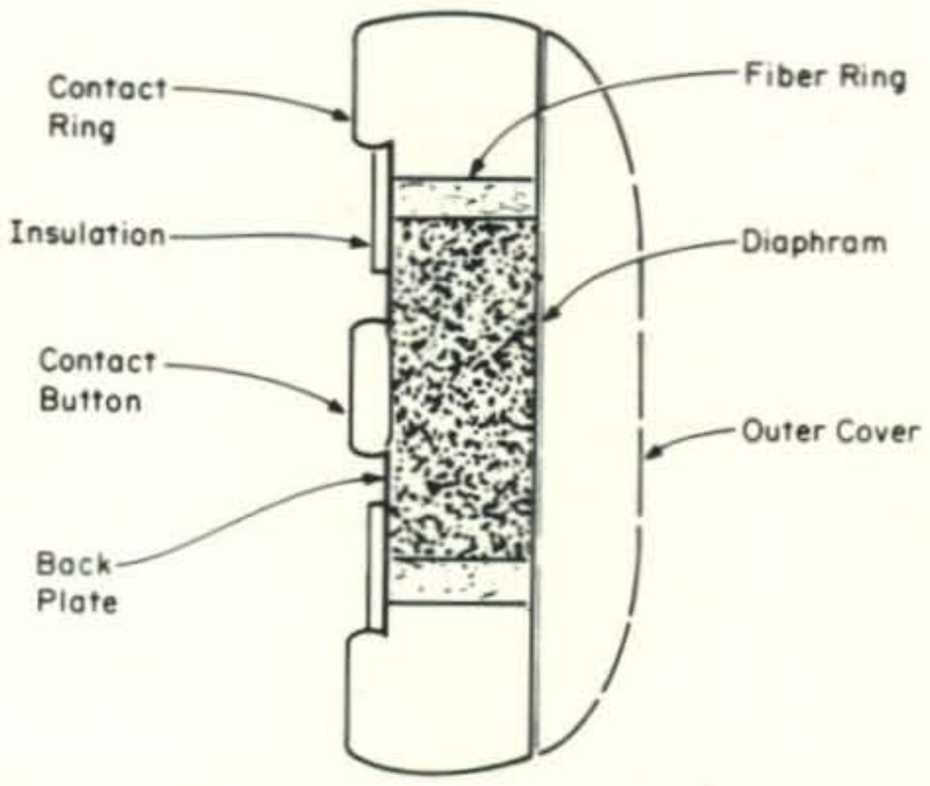

Fig. 1—Simplified cross-section of a typical carbon microphone.

*223 Pullman Ave., Rochester, N.Y. 14615.

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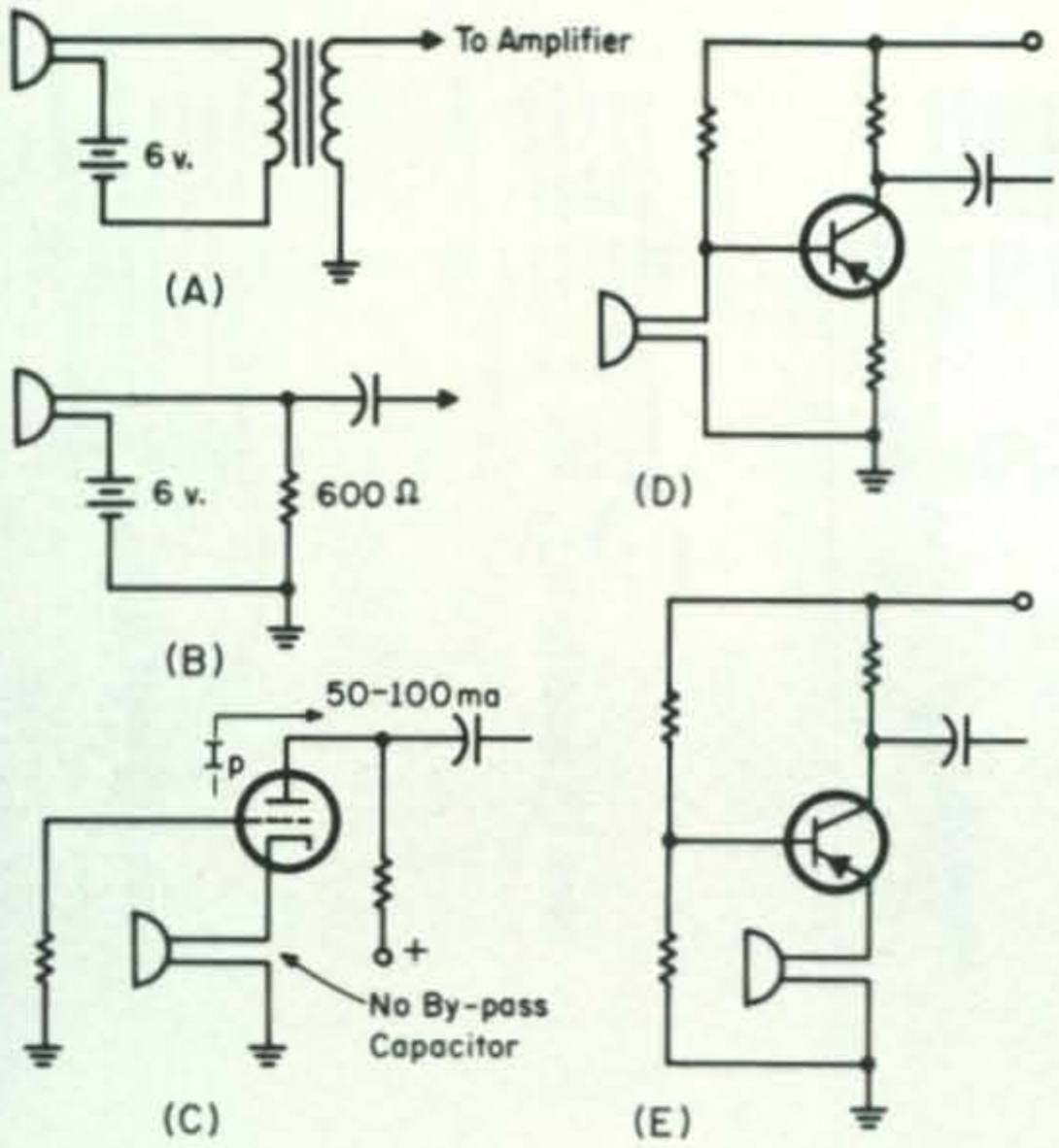

Fig. 2—(A) Conventional method of coupling a carbon microphone into an amplifier. (B) The voltage divider coupling system. (C) Cathode coupling. (D) Transistor base bias voltage divider coupling and (E) Transistor emitter resistor coupling.

point one place to the left. So, −50 db would be 0.00001 mw. Now, we still have to go down another 5 db. We can go down 6 db and still come out fairly close. As I said before, −3 db represents a 2 to 1 difference. So if we went down 3 db, and then another 3 db, it would be a 4 to 1 difference. Thus 6 db below 0.00001 mw is 0.0000025. If we are not frightened by a lot of decimal places, we can convert this power level to an actual voltage.

Our power level is expressed in milliwatts so our result will be in millivolts. The formula is:

$$P = E^2/Z$$

and yields:

$$E = \sqrt{PZ}$$

where:

$$P = 0.000025 \text{ (or } 2.5 \times 10^{-5})$$

$$Z = 50$$

$$E = \sqrt{2.5 \times 10^{-5} \times 50}$$
$$= \sqrt{0.000125}$$
$$= 0.118 \text{ millivolts}$$

Unfortunately, few manufacturers tell what sound level coming into the microphone produced the stated output. A close investigation showed this level to be expressed as so many *microbars*. The exact definition of a microbar leads to much confusion and self-contradiction. Ordinarily a microbar would be interpreted as being a millionth of a bar. However some people are beginning to leave out the MICRO prefix, giving a double definition to the word bar.

A bar is a measurement of pressure. (In this case, it would refer to the pressure exerted on the diaphragm by the sound waves.) Some microphone manufacturers specify a sound level of so many *dynes per centimeter*. A dyne is equal to one microbar. Precisely speaking, it is that amount of pressure required to accelerate a mass of one gram to a speed of one centimeter per second if applied for one second.

The reference of dyne per centimeter means one dyne on each square centimeter of diaphragm area. Therefore we see that the larger the diaphragm, the more sound power it collects, and consequently, the more sensitive is the microphone.

The reference levels of microbars and dynes per centimeter are useless to the amateur since expensive equipment is required to produce them with any accuracy. In the ensuing discussion, I will give approximate voltage levels for each type of microphone, using for my reference a normal speaking voice with the microphone about six inches from the mouth.

The Carbon Microphone

The carbon microphone is one of the oldest and simplest forms of a microphone. It is best applied in the transmission of speech where a high output and the maximum intelligibility is required. Carbon microphones are used almost exclusively in the telephone system. They also see considerable use in battery-powered portable bullhorns, and a small amount in two-way radio communication.

A carbon microphone consists of a diaphragm, which is, in fact, one end of a very small can filled with carbon granules. (See fig. 1.) The carbon granules are very loosely packed. When sound strikes the diaphragm, it vibrates. This causes the carbon granules to be alternately packed more tightly or more loosely. This makes corresponding change in the electrical resistance of the device. A battery is connected in series with the microphone. The fluctuating resistance of the microphone causes the current through it to

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fluctuate.. The fluctuating current produces a fluctuating voltage-drop across the microphone, which can be coupled into a line by a transformer or by other means.

If you were to try to measure the internal resistance of a carbon microphone, or *button,* as it is sometimes called, you might be in for a surprise. The internal resistance is not a constant thing. It varies dependent upon the concentration of the carbon granules inside, which varies according to the sound striking the diaphragm. You can get a fairly good idea of the *average* resistance by connecting an ohmmeter across the element and rapping it while you watch the meter. You will find that the average carbon button has a typical internal resistance between 300 and 700 ohms. They are generally operated with a current of between 50 and 100 ma. With a good quality microphone, and using a transformer designed for the purpose, you can get about a quarter of a volt across the primary, and anywhere from 3 to 10 volts available on the secondary to the grid of the amplifier. This is assuming that the microphone is from 6 to 12 inches from the mouth and the speaker is talking in a normal conversational tone.

Several methods of connecting a carbon button are shown in fig. 2. Method (A) is the accepted conventional means of coupling. In (B), the microphone is a variable element in a voltage divider. The a.c. component is taken off through the capacitor, which should be in the neighborhood of 1 to 5 mf. The output of this circuit, of course, would be much lower than method (A).

In fig. 2C, the microphone takes the place of the biasing resistor in a typical triode amplifier. A relatively low mu tube would be best, and even then it would tend to distort easily.

Figures 2 (D) and (E) show the microphone replacing the biasing elements in a transistor stage. Let me repeat that methods (B) through (E) are non-conventional. Method (A) works best, and unless you are experimenting, that is the one you should use.

Figure 3 shows how a carbon mike is used in a typical portable electric bullhorn. Figure 4 is a simple telephone hookup. If a battery is used at the remote end, care should be taken that it is aiding, not opposing the main battery.

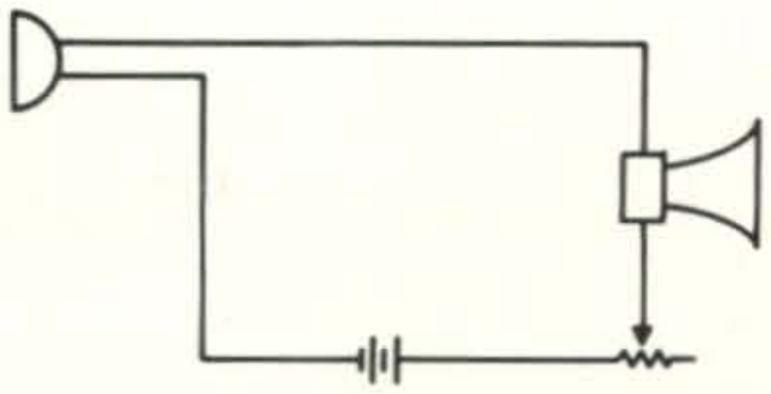

Fig. 3—Circuit of an electric bullhorn using a carbon microphone.

Crystal And Ceramic Microphones

These are by far the most widely used, and the lowest price microphones available, so far as the home hobbyist is concerned, though not necessarily the best quality. Most home recorders and many auditorium sound systems use this type of microphone. Nine times out of ten, when there is a bargain sale on microphones at the local electronic supply store, it is a crystal mike. They are fairly rugged, and very simple to use.

Both crystal and ceramic microphones work on exactly the same principle. When a piece of quartz or certain ceramic material is subjected to mechanical stress, an electric voltage is generated. When a piece of quartz or ceramic material is subjected to electrical stress, a mechanical change takes place. In a microphone of this type, the element is mounted between a diaphragm and a fixed metal plate. Sound waves, striking the diaphragm, cause it to put a mechanical strain on the element, and the resulting voltage is taken off between the diaphragm and the fixed plate. The only difference, other than quantity, between a crystal and a ceramic microphone is the material used. For the sake of convenience, throughout most of the remainder of this section, both will be referred to as crystal microphones.

Crystal microphones are very high impedance devices. They range anywhere from 1 to 10 megohms. For this reason, the con-

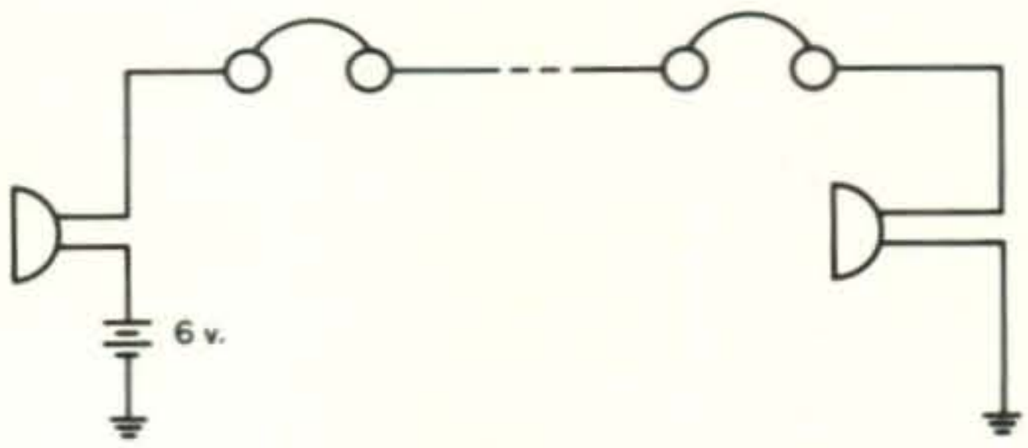

Fig. 4—Basic telephone circuit uses a carbon microphone.

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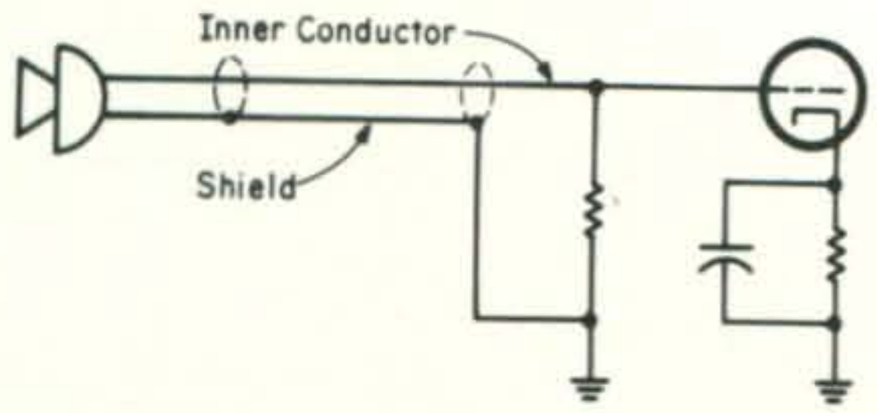

Fig. 5—Method of connecting any high impedance microphone to an amplifier using shielded cable in an unbalanced circuit.

necting cable should be shielded to minimize hum pickup. The cable should not be longer than 5 to 10 feet. Loss of high frequency response is one result of too long a cable. Both these problems will be discussed later.

Coupling a crystal microphone into an amplifier stage is simple because of the high impedance. See fig. 5. It is connected directly into the grid, or base, of the first stage. The output across a 1 to 3 megohm resistance is in the order of 30 to 50 millivolts. Here it should be mentioned that, in any self powered microphone, you get no more power out of it than you put in. The larger the diaphragm, the more sound it will collect, and consequently the more sensitive it will be. Most manufacturers try to strike a happy medium between size and sensitivity. The figures given above for output are typical, but may vary.

The quality of a crystal mike is, as a rule, good, but not necessarily the best. Most crystal microphones have a better response at the high frequency end than at the low. The cheaper models tend to have resonant peaks in their frequency response. As a rule, ceramic mikes tend to be of better quality than quartz crystal types. Quartz crystals are also more sensitive to temperature and humidity. As with anything else you get what you pay for. If you want a high quality crystal microphone don't expect to get it for $3.96.

One other application of crystal microphones is the electrifying of musical instruments. The microphone generally used in the cheap do-it-yourself kits is called a contact microphone. Rather than pick up sound waves traveling through the air, it picks up the sound by direct contact with the instrument. As a rule, it leaves much to be desired if you're seeking perfection.

Dynamic Microphones

When a moving wire cuts a magnetic field electrical energy is produced. This is the principle of operation of a dynamic microphone A very lightweight coil of wire is attached to the diaphragm, and a magnet is so placed that the coil is within its energy field. Sound waves, striking the diaphragm, cause it to vibrate. The motion of the coil in the magnetic field produces electrical currents which correspond exactly with the sound waves.

Dynamic microphones are the workhorse of the entertainment world. They are generally of a superior quality to the types previously discussed, and are widely used in a.m. broadcasting, as well as by singing groups and by many smaller recording studios. Also, that cheap walkie-talkie that junior got last Christmas probably used a low-priced version of a dynamic mike, as they are very similar to loudspeakers and can double for that purpose quite nicely. In an office intercom set the loudspeaker serves as a low impedance dynamic microphone.

The impedance of a dynamic microphone is in the neighborhood of 30 to 50 ohms. The output of the element is in the vicinity of one millivolt.

Because of their low impedance and low output voltage, dynamic microphones may be connected through a transformer as illustrated in fig. 6. This is done for you when you buy a "high impedance" mike of this type. In professional studios the transformer is located right at the input of the amplifier while in home equipment it is inside the microphone case. The professional arrangement is best because it allows the use of what is called a "balanced" circuit. In a balanced circuit neither conductor is grounded. This, together with the low impedance allows the use of a long cable with virtually no hum pick-up. A third conductor, grounded to the microphone case, is connected either to the center-tap of the input transformer and the amplifier ground, or just to the amplifier ground.

In high impedance dynamic microphones, where the transformer is inside the microphone case, an unbalanced circuit is used. In an unbalanced circuit, one conductor is grounded, and usually serves as a shield around the ungrounded or "hot" lead. This type of microphone, ranging in impedance from 25,000 to 50,000 ohms, can be connected directly into the same input as a crystal microphone, although the output will be considerably lower. You can use a cable as long as 10 to 20 feet or so. Also, its impedance value allows it to match nicely into

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transistorized equipment.

So-called impedance dynamic microphones have a small transformer built into the case which raises the impedance to 25,000 or 50,000 ohms, and provides an output of 30 to 50 millivolts.

Dynamic microphones range in price from as low as $10.00 to hundreds of dollars for the highest quality. Often if you get a cheap dynamic mike you can improve it by removing the internal transformer, and replacing it at the amplifier with a transformer of better quality.

Velocity Microphones

A velocity microphone is a high-quality device used in broadcasting and recording. Its principle of operation is similar to that of a dynamic mike. A thin corrugated metallic ribbon is suspended between the poles of a magnet. The velocity of the sound waves travelling along this ribbon cause it to vibrate. Again, the motion of an electrical conductor in a magnetic field generates electrical currents. These are very low impedance devices and must be coupled into the amplifier through a transformer. Also, they need another stage of amplification. They are quite expensive and not generally used by the amateur.

Capacitor Microphones

Unless you get into professional end of the broadcast game, it is not very likely that you will come across one of these. Capacitor microphones depend on the variations in capacitance between the vibrating diaphragm and a fixed plate. They have an extremely flat and wide frequency range with very low distortion. The impedance of a condenser microphone is almost infinitely high, and the output voltage very low. Often they have one or two amplifier stages built right in the case.

A capacitor microphone must have a high voltage applied to it through a large series resistor as illustrated in fig. 7. The output is taken from across this resistor and, as said before, the first couple of stages are contained right in the microphone case.

General

Carbon microphones are used where a lot of abuse is expected, high output desired, and only speech is to be transmitted.

Crystal and ceramic microphones are used for better quality speech and some singing.

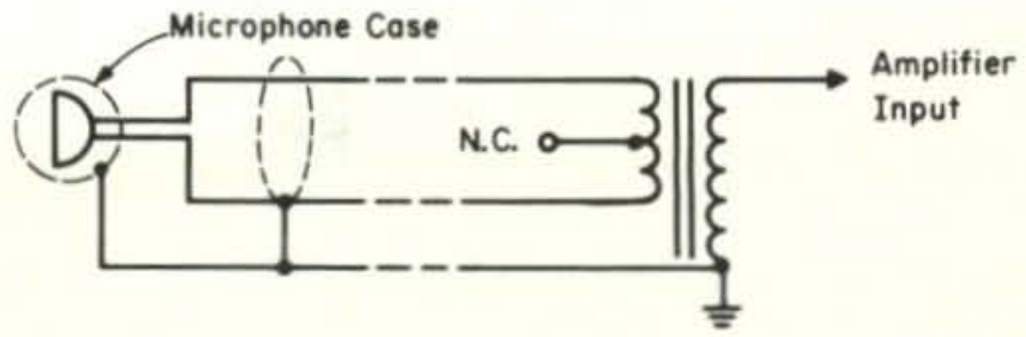

Fig. 6—Conventional method of connecting a low impedance microphone to an amplifier using two conductor shielded cable in a balanced arrangement. The transformer primary center tap may not be grounded.

For example, public address systems, home recorders, amateur radio, citizen radio and public service communication.

Dynamic microphones are used in better quality public address, entertainment, radio broadcasting, some amateur radio and citizen radio and a few recording studios. They are suited wherever better quality speech and some music is to be picked up.

Velocity microphones are used mostly in radio broadcasting and recording.

Condenser microphones are used for high quality recording and broadcasting.

The impedance of carbon microphones is a few hundred ohms direct, or several thousand through a transformer. Crystal microphones have an impedance of several million ohms. Dynamic microphones have an impedance of 20 to 50 ohms direct, or several thousand through a transformer. Velocity microphones are similar in this respect to dynamic microphones. Condenser microphones have an extremely high impedance.

The output of a carbon microphone is 3 to 10 volts at the transformer secondary. Crystal and ceramic microphones give out 30 to 50 millivolts. Velocity and dynamic mikes are about one millivolt direct, and 30 to 50 millivolts through a transformer. Condenser microphones have a very low output. ■

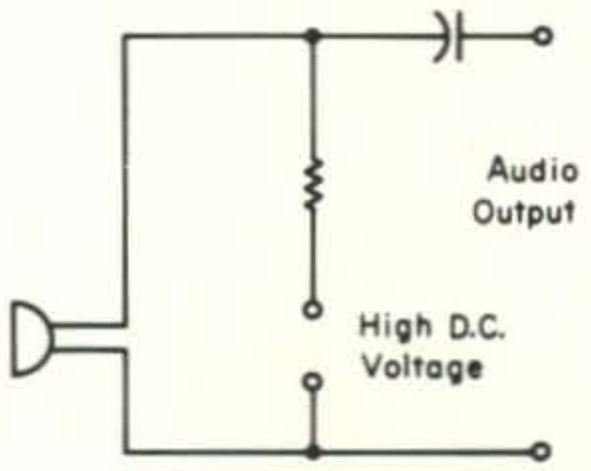

Fig. 7—Method of connecting the capacitor microphone into an amplifier requires a high d.c. voltage and a lot of preamplification.

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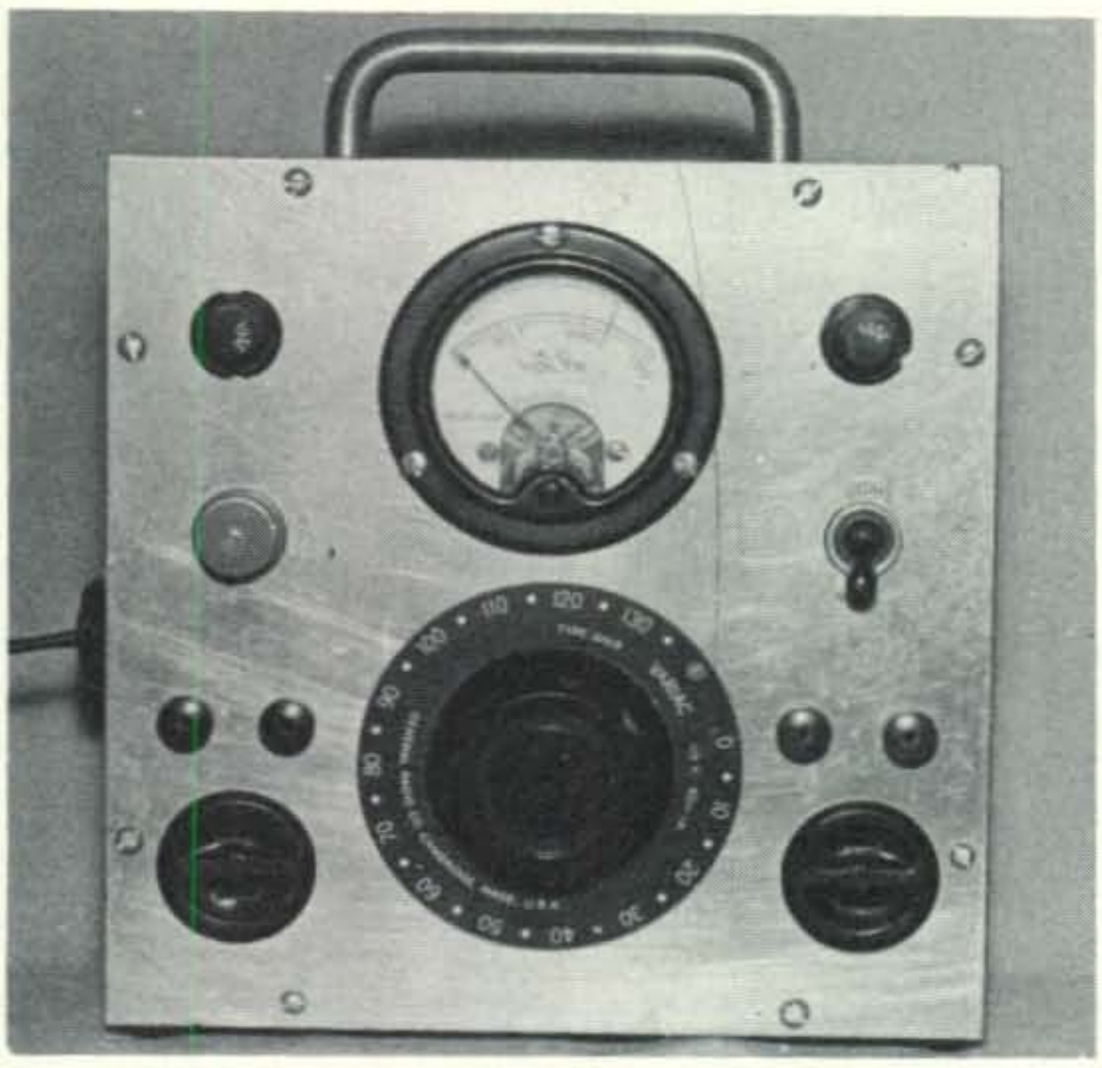
A HANDY-DANDY VARIABLE A.C. SUPPLY

BY JOSEPH P. FINCUTTER,* K3STU

WHEN a.c./d.c. radios were first introduced many years ago, a safety hazard was born. Although many manufacturers utilized various and sundry means of reducing chances of severe shock, there still remains the possibility of a severe "tickle" which although not 'lethal' can be very damaging, not only from the shock itself, but also from the secondary effects (which can be very costly). When we do get 'tickled' we usually jump or make some other violent motion which might cause us to drop something, knock a piece of equipment off the bench onto the floor, hit something a damaging blow, *etc.* I'm sure you know what I mean and you could go on with experiences of your own. You might say that transistor radios have replaced the a.c./d.c. radios. Well, maybe they have. But have you taken a good look at some a.c. operated transistor radios or tape recorders? One side of the a.c. line is *common ground!* Yes, I'm amazed that some big manufacturers do this. In fact some "Transistor Do-it-Yourself Project" books show circuits with an a.c. line at common ground. True, the user is protected because the "metal" of the set is completely enclosed in plastic; but, what about you who must work on the set? And what about the many electrical appliances that your XYL asks *you* to fix? Do you have an isolation transformer on your work bench? You should have! Even to work on your own equipment!

True, they are expensive if purchased at present day prices (average cost around $20 to $30, dependent upon current rating) but I'm sure that some can be found on the surplus market at much lower prices. Elimination of this hazard in your shop is well worth the price if it would prevent damage to you or your equipment. Figure 1 is a schematic of a typical isolation transformer.

*5620 Alta Vista Rd., Bethesda, Md. 20034.



Front view of the variable a.c. supply. The jacks and switches are described in the text.

Variable A.C.

A device which I built many years ago is shown in fig. 2 and it has been a very useful item. It provides me with a variable source of a.c. voltage from 0 to 135 volts (my unit limits me to 1.25 amperes). But, you could substitute any of the common variable autotransformers in the circuit, changing only the size of the fuse, dependent upon the current rating of the auto-transformer. Notice that the auto-transformer does *not provide isolation* between the input and output! Therefore, you need the isolation transformer to eliminate the shock hazard. (It should be men-

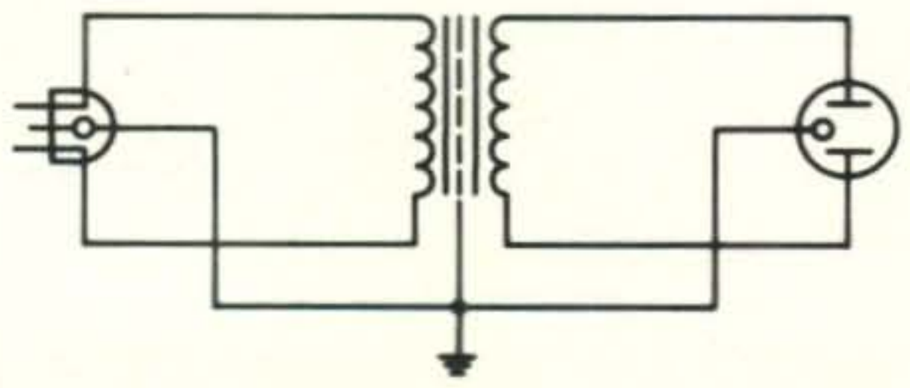


Fig. 1—Basic isolation transformer circuit.

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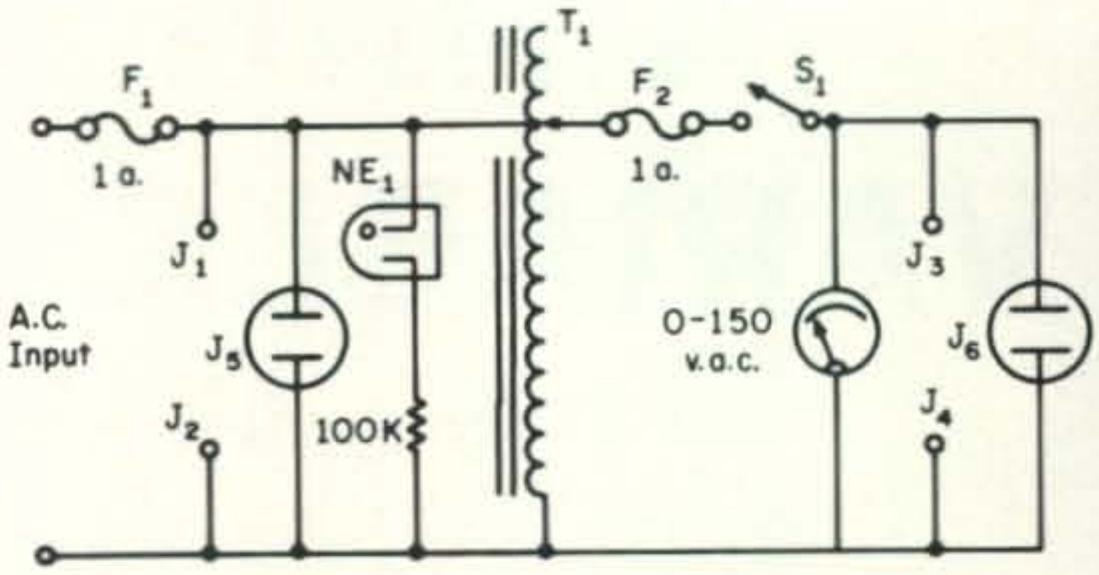

Fig. 2—Variable a.c. voltage source circuit diagram. Jacks J_5 and J_6 are a.c. outlets and T_1 is a variable auto transformer.

tioned here that another good practice would be to "polarize" all a.c. outlets on your workbench and to use polarized plugs (3-wire grounded) on your a.c. cords so that the common lead will always be at ground potential and the ground lead will be at ground.)

This little box shown in the photograph satisfies the many needs of a variable a.c. voltage on the workbench. I'm sure that you can list many uses and with a little imagination you can find many more. Transformer T_1 is a variable auto-transformer, referred to by many as a Variac (General Radio Company tradename), but General Electric, Staco, Superior, *etc.*, manufacture the same item under different tradenames. They all do the same thing. And, they come in all sizes (input volts, output volts and output volt-amps). Again these are expensive unless you find one at surplus prices.

I added some pin jacks in parallel with the input and output sockets so that I could use test leads with alligator clips and/or other assorted connectors. From the photograph the a.c. outlet on the lower left is in parallel with the input power (also the pin jacks directly above). The outlet on the right and the pin jacks directly above are in parallel with the output of the auto-transformer. The meter indicates the output voltage at all times. Switch S_1 opens and closes the output circuit so that you can work on the equipment being tested with no voltage applied. From fig. 2 you can see that both the input and output of the transformer are fused.

Although this little "Handy-Dandy" has served me well for about 20 years, I often wished that I had included an a.c. ammeter in the circuit and that the current drain was not limited to 1.25 amperes. But then, I used what was available in the shack at the time. ■

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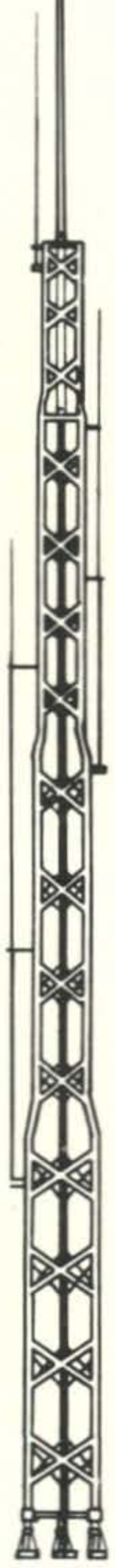

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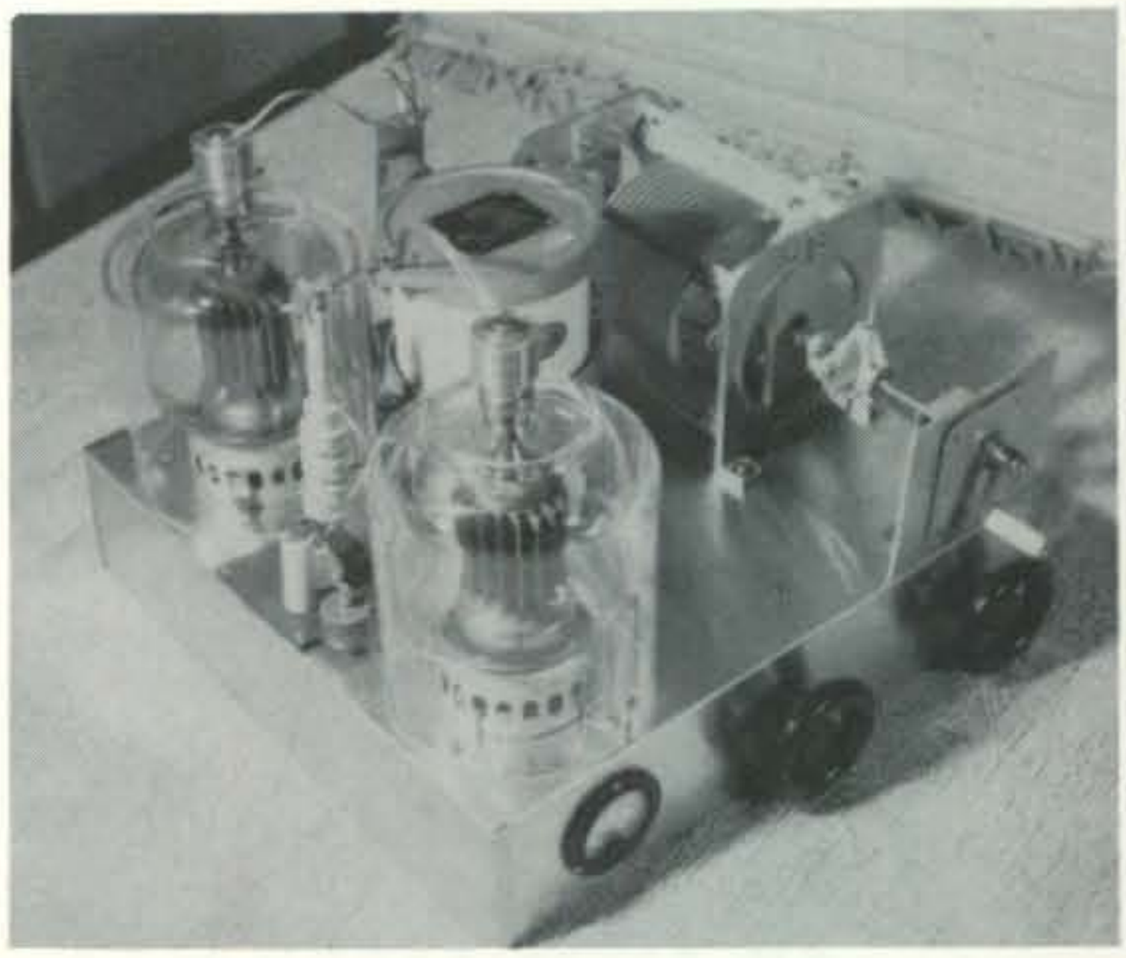
AN A.M. HIGH POWERED AMPLIFIER

BY DON HOISINGTON,* W4CJL



Top view of the linear showing the location of the major components.

A HIGH-powered final amplifier is a substantial investment for the average ham. Many of us are interested in using it in several modes for the sake of economy. With this in mind, we selected a circuit that will allow efficient operation on Double Sideband with Supressed Carrier, or, Double Sideband with Reduced Carrier.

The circuit used in building the amplifier described herein first appeared in an article in the January, 1947 issue of Electronics, and was written by Oswald J. Villard, Jr., W6-QYT. Recently this same circuit appeared in two issues of *CQ*, W3PHL being the author.[1] Since the operation of the circuit was outlined in detail by W3PHL, only a brief discussion will appear here. Essentially the circuit uses a balanced modulator arrangement. The grids could be in push-pull and the plates of the two tubes in parallel, or, the grids in parallel and the plates in push-pull. If the amplifier is modulated less than 100% it will operate as an ordinary a.m. transmitter and will sound normal on a receiver using diode or non-linear detection. However, the splatter resulting when modulation exceeds 100% due to carrier "cut-off" does not appear with the use of this circuit.

In the amplifier described and shown in fig. 1, the Peak tube, V_2, supplies the r.f. tank circuit with voltages 180 degrees out of phase with that of the Carrier tube, V_1, whenever over-modulation makes the plate of V_1 negative in respect to ground. Negative modulation in excess of 100% is distortion free with no sideband splatter normally caused by carrier cut-off. In fact, modulation in excess of 100% is a regular feature of this amplifier. Modulation is *unlimited* and distortion free, provided the linearity and the plate disipation of both V_1 and V_2 are not exceeded, and that no distortion is introduced by the modulator. The only limit to the percentage of modulation and subsequent sideband power is the availability of undistorted power from the modulator.

D.S.B.R.C.

Double sideband with reduced carrier offers any amateur an economical means for converting his push-pull a.m. or c.w. final amplifier for increased "talk-power." While d.s.b.r.c. requires increased band space over s.s.b., it does permit an added feature of allowing the receiving operator to select either the upper or the lower sideband in the event of interference. D.s.b.r.c. offers still another advantage of allowing, with some distortion, reception by a receiver with only linear or diode detection.

Circuit Description

The basic circuit described uses a pair of 4-1000A tubes, pentode connected. Any triode or pentode of any power rating can be used. Tubes such as the 4-400A, 4-250A, 810 or 833A can be used with this circuit. Both tubes are connected in a balanced

*202 Baker Drive, Florence, Alabama 35630.

[1]Doughty, F.C., "Modulaton Unlimited," *CQ*, Part I July 1968, p. 16, Part II Aug. 1968, p. 37.

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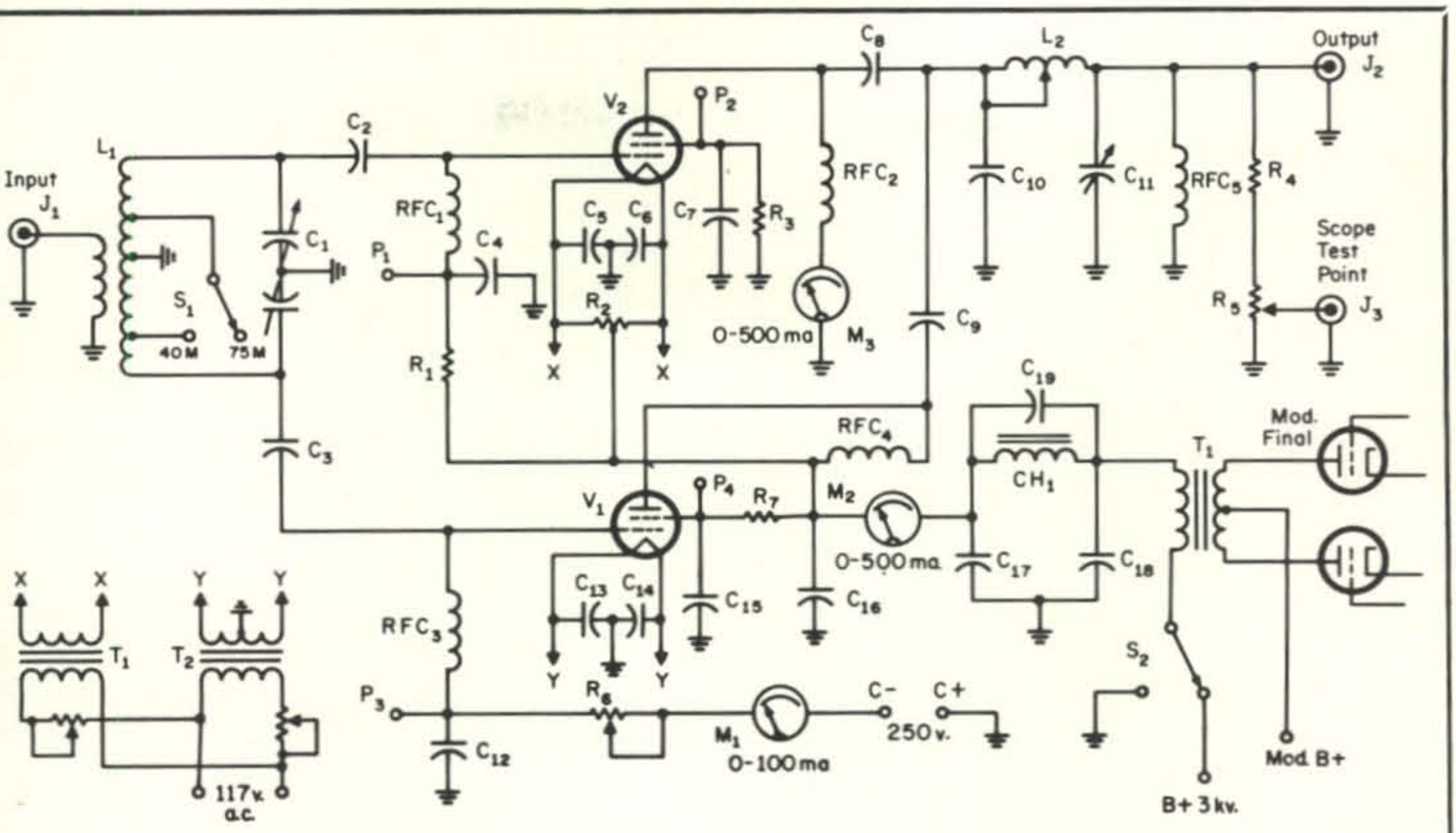

Fig. 1—Circuit of the high power final amp. for d.s.b.r.c. or d.s.b.s.c. for 40 and 75 meter.

C_1—Split stator tuning capac., 100 mmf per section.
C_2, C_3, C_{16}—500 mmf 30 kv.
C_4, C_5, C_6—0.01 mf 3 kv ceramic.
C_7, C_{15}—0.004 mf 3 kv ceramic.
C_8—1500 mmf 20 kv.
C_9—1500 mmf 30 kv; three 500 mmf in parallel.
C_{10}—150 mmf 20 kv.
C_{11}—2000 mmf., 3.5kv vacuum variable,
C_{12}, C_{13}, C_{14}—0.01 mf 3 kv, ceramic.
C_{17}, C_{18}, C_{19}—0.005 mf, 10 kv.
Ch_1—1 henry, 1 ampere.
L_1—75 meter grid tank coil tapped for 40 meters.
L_2—6 millihenry variable tank coil.
R_1—7.5K, 100 watts.
R_2—100 ohms center tapped.
R_3—30K, 100 watts.
R_4—5K, 2 watts.
R_5—25K, 3 watts.
R_6—5K, 100 watts adjustable.
R_7—30K, 200 watts.
RFC_1, RFC_2, RFC_5—2.5 mh, 100 ma.
RFC_3, RFC_4—National R-175-A plate choke.
T_1—Modulation transformer, 7K secondary, primary to match modulator.

modulator type circuit with push-pull grid input and parallel plates output. They are both biased to four times cut-off as Class C amplifiers for good linearity and increased efficiency. It is quite important to observe that the grid-filament circuit of V_2 is operated at high voltage, the plate potential of V_1. This requires that good insulation be used in this part of the circuit. Mycalex insulation board was used to mount the feedthrough insulators for the filament leads for V_2 and also to feedthrough the high voltage from V_1 to the center tap resistor on the filaments of V_2. High voltage rectifier type filament transformers with low winding capacity should be used for V_2 to prevent break-down on high modulation peaks.

The filament transformers for both V_1 and V_2 are Stancor type F-520HB which are rated at 5 volts, 20 amperes with either a 115 or a 230 volt primary winding. Insulation test is 15,000 volts for the primary and 10,000 volts for the secondary. I have to use two of these transformers in series to obtain 7.5 volts with the aid of a series resistor in the primary. Surplus 5 volt high voltage filament transformers for rectifiers are suitable if they have a 20 amp or more secondary. However, two must be used in series to obtain 7.5 volts. Normally there is no high voltage on the filament of V_1; however, during tune-up when the plate power supply is reversed and 3,000 volts positive is applied to the chassis ground, there is a 3,000 volt potential between the

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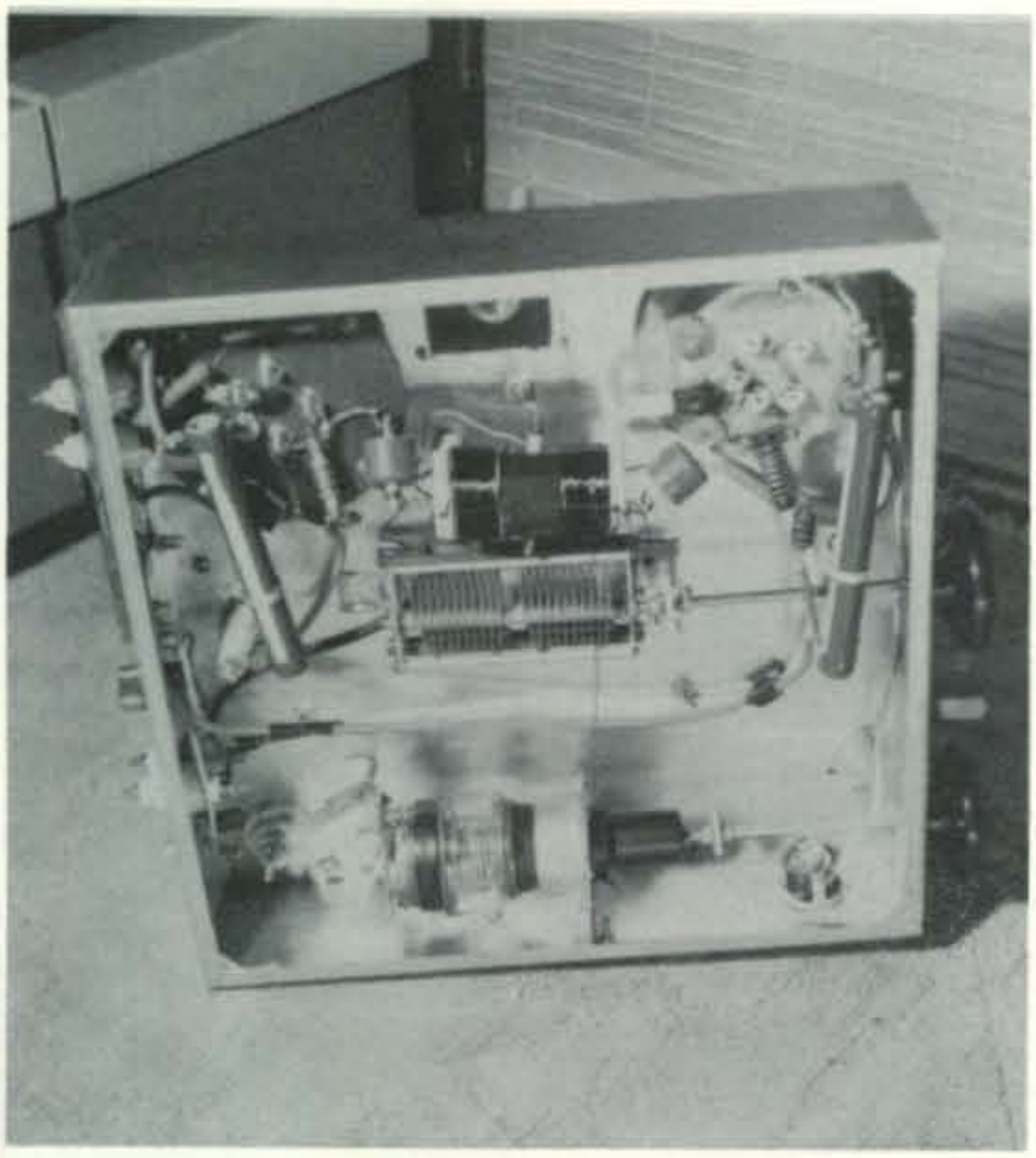

Bottom view of the linear showing the input and output tuning capacitors.

filaments of V_1 and the 115 volt primary of the V_1 filament transformer.

Tune Up

Tune up is very simple once construction is completed. If triodes are used instead of pentodes, no neutralizing will be necessary provided precaution is observed in the layout of parts to insure balanced leads to both tubes.

The first step is to light the filaments with no plate voltage applied. Excitation is applied to the grid circuit and adjusted to give 50 ma of grid current as indicated on M_1. Voltmeter readings are then taken by inserting leads into test jack, P_1 and P_3. Adjustment of R_2 should be made until grid voltages are the same for each tube. An adjustment of the excitation will have to be made as R_2 is varied, maintaining the 50 ma of grid current on M_1.

The dummy antenna may now be connected to the output of the amplifier and the d.c. power supply should be available with both the negative and positive terminals *above* ground potential. This is necessary in order to reverse the terminals which will be connected to the amplifier.

First connect the negative power supply terminal to the B plus terminal on the amplifier. That is right, connect the negative power supply terminal to the *positive* terminal on the amplifier. The reason for this is to place the Peak tube, or V_2, in an operating condition. The Carrier tube or V_1 will not be in the circuit at this stage. With normal grid current indicated on M_1, apply high voltage through the power supply and quickly rotate L_2 to resonance. Capacitor C_{16} at this stage should be at maximum capacity to unload the antenna and tank circuit. Adjust the antenna loading capacitor, C_{16}, towards minimum capacity and observe resonance of the tank circuit until normal plate current is indicated on M_3. (This is 300 ma for the tubes used.) Measure the screen grid voltage of V_2 at test jack, P_2. Record this voltage, as well as plate current indicated on M_3.

Remove plate voltage and before changing leads, discharge all filter capacitors in the power supply as a safety precaution. Reconnect the leads to the amplifier, this time placing the positive power supply terminal on the B plus terminal of the amplifier and grounding the negative lead to the chassis. Once again apply plate voltage and of course the amplifier will be tuned and loaded. Observe the plate current on V_1 to determine if it is lower or higher than the plate current previously read on V_2 by meter M_3. Plate currents of both tubes should then be balanced. This can be accomplished by adjusting the screen grid voltage on V_1. In the amplifier described, this was accomplished by adjusting R_7, the screen grid dropping resistor for V_1, the carrier tube.

With grid drive balanced to both tubes, and plate current balanced, the output of each tube still will not necessarily be equal. If you are fortunate in having several spare tubes around, a combination may be found that will completely balance the amplifier. The problem of imbalance reflects back to the modulator which sees an unequal load on either the negative (peak tube) or positive (carrier) peaks.

Audio excitation to the modulator can now be applied and a sampling of the output can be made by connecting the scope to the J_3 socket. Audio gain can be advanced until 100% modulation is observed. Tube V_2 and M_3 are not in operation at this point. As modulation is increased beyond 100% negatively, M_3 will start to read in proportion to the amount of percentage of modulation over 100%. Essentially, V_1 is cut-off when modulation reaches 100% negatively, and the plate current and voltage drops to zero. As the voltage reverses 180 degrees in phase, V_2 then begins to supply power to the final tank

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circuit and r.f. continues to be supplied to the antenna.

Double Sideband

Another added feature of this amplifier is that it can be operated as a double sideband transmitter with carrier completely suppressed. A high voltage switch, S_2 is inserted in the B plus lead supplying voltage to the modulation transformer secondary. When this terminal is grounded, and the power supply is turned off, no d.c. voltage will be supplied to the amplifier. Switch S_2, used to select the amplifier mode, must be a well insulated unit. With a ground at one point and 3 kv at another point the tendency to arc over will be great unless a heavy duty job is used.

By applying audio through the modulators to the final with the B plus terminal of the Class B secondary grounded, a.c. voltages are applied to both V_1 and V_2 resulting in a double sideband transmitter. The power is determined by the amount of voltage available from the modulators. A typical "bow-tie" pattern will be observed on the scope coupled to the output of the amplifier. If the carrier is not completely suppressed, a slight adjustment of R_2 will bring the tubes into complete balance.

When operating in the d.s.b. with Reduced Carrier mode, the Carrier plate meter, M_2, does not vary with modulation as in d.s.b.s.c. While it is true that the current and voltage are varying, the meter reads only the average, and the average is zero. The negative peaks are just as large as the positive peaks, regardless of the carrier level, or lack of one. The d.c. input to the amplifier remains constant during any percentage of modulation that is applied.

Modulator Power

It is important to point out that to take full advantage of this circuit, considerable *distortion-free* audio power must be supplied by the modulator. In order to modulate 200%, *four* times the audio power needed to modulate 100% is required. To modulate 300% *nine times* the power is required. Extra plate power dissipation by the Carrier tube, V_1, is also required during modulation peaks. If the modulator power output is 2,000 watts, this power is divided, 670 watts going to the Peak tube (V_2) and 1330 watts to the carrier tube, (V_1). In addition the Carrier tube must handle the d.c. power input of say, for instance, 600 watts. Total power handling capacity of the Carrier tube in this case would be 1930 watts. We are assuming of course that the 600 watts mentioned above is that power being dissipated by the Carrier tube. This is the reason why a tube of sufficient power handling capacity, a 4-1000-A, as in this amplifier, was selected. If, for instance, the actual d.c. power input to this amplifier was only 600 watts, with a modulating power of 2,000 watts of audio applied, this amplifier will produce a signal at the receiver equal to that transmitted by a conventional amplifier modulated 100% and running 2,400 watts d.c. power input.

Receiving D.S.B.R.C.

In regard to the reception of the d.s.b.r.c. signal, when received on a regular a.m. detector the signal will appear to be distorted. This will occur whenever the modulation exceeds 100%. Up to this point, there is no difference in the operation and reception of the d.s.b.r.c. signal on a diode or linear detector. However, when modulation percentage does exceed 100%, the signal does appear distorted as in the reception of an s.s.b. signal. The distortion is not being created by the d.s.b.r.c. signal. When received in the s.s.b. position with a product detector or a synchronous detector no distortion is present and the quality will far exceed that of any s.s.b. transmitter. It is only fair to point out that any distortion created in the audio section through the Class B modulator and applied to the final amplifier will of course create a distorted signal and subsequent sideband splatter.

The splatter filter consisting of capacitors C_{17} to C_{19} and choke CH^1 is designed on the basis of a 7K secondary for T_1 and worked out for a 40 db drop at 4 kc. If a different transformer secondary impedance is used, these component values will have to be modified to maintain a cut-off frequency between 3.5 to 4.0 kc.

Perhaps it is time for the progressive amateur to investigate a system of transmission that appears to have a number of very attractive advantages over the conventional s.s.b. transmitter. D.s.b.r.c. offers, regardless of power level, the transmission of *unlimited* sideband power legally as long as the 1 kw d.c. power input requirement is met. ■

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Does everything
(but cook your meals)

14AVQ by Hy-Gain

Because it's unsurpassed for portability and dependable long haul communications, the 14AVQ is used on more DX-peditions than any other antenna.

The 14AVQ develops an extremely low-angle radiation pattern so you get the kind of super-powerful signal that makes DX and other long-haul contacts a cinch.

"Hy-Q" low loss traps are such precision tuned (electronically) to give true resonance on each band. And you have practically no static or lightning problems because the 14AVQ is trap vertical at DC ground... an exclusive feature.

In addition, you get low VSWR on all bands from 40 through 10 meters plus the ability to adjust and readjust for top performance at any specific frequency.

If you want, you can phase two 14AVQ's and get the signal directivity of a beam without the bother or expense of a tower or rotor. And you can also get excellent performance on 80 meters by using Hy-Gain Model LC-80Q loading coil.

Built of high grade, heat treated aluminum using high impact polystyrene, the 14AVQ resists rust and deterioration month after month, year after year.

Go get one at the best distributor under the sun... he's the one that stocks all Hy-Gain products.

FOR THE STRONGEST SIGNAL UNDER THE SUN

HY-GAIN ELECTRONICS CORPORATION
P. O. Box 5407-FC Lincoln, Nebraska 68505

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A SOLID STATE V.H.F. REGENERATIVE RECEIVER

BY SAM KELLY,* W6JTT

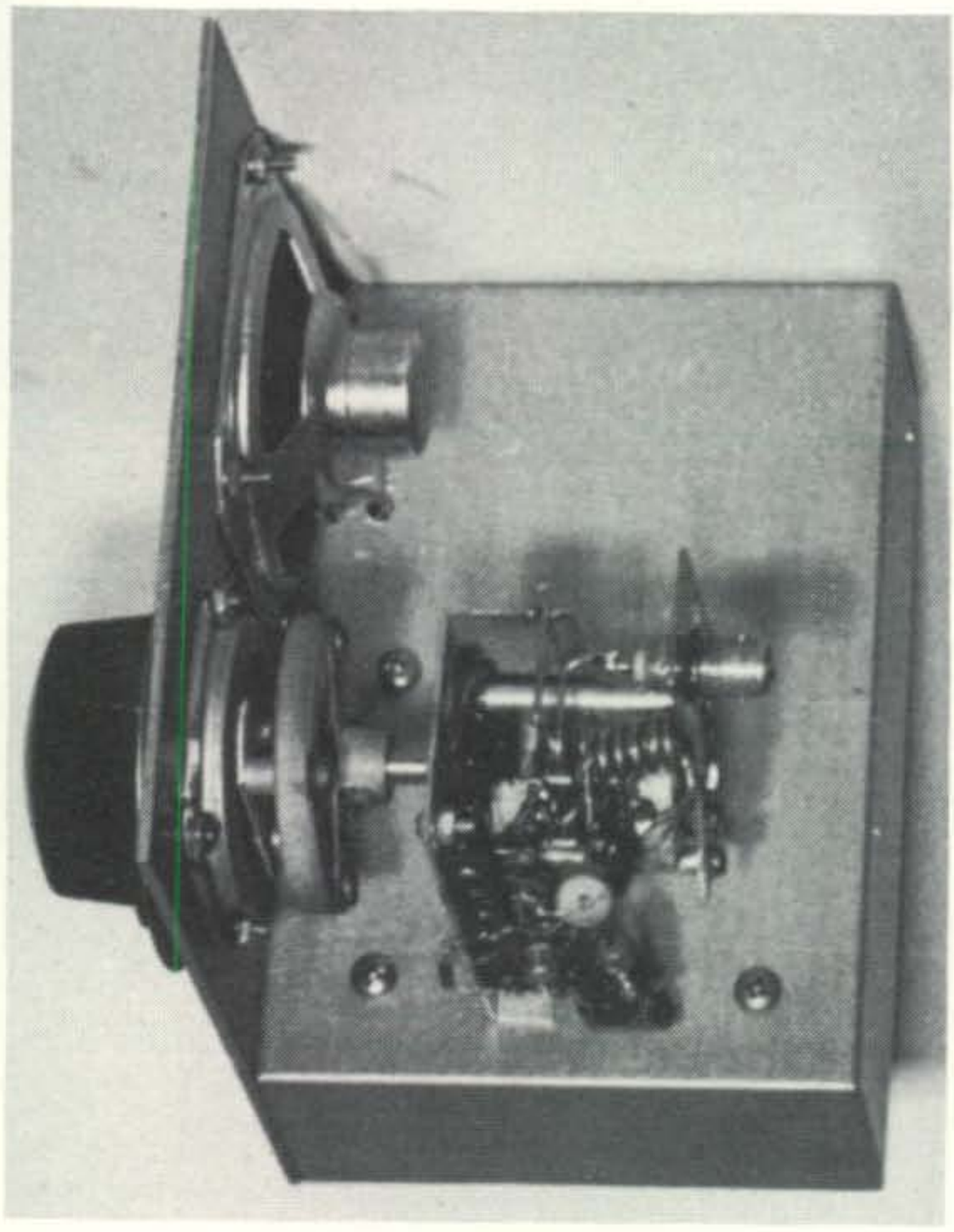
DURING the early days of v.h.f. reasonable performance was provided by simple regenerative receivers. In fact, the Heath "Twoer" is still quite popular. While millions of transistorized regenerative receivers have been turned out for CB handie-talkies, there have been a few built for v.h.f. use. I decided to see what kind of performance could be obtained from as simple a circuit as possible. The original aim was to build a receiver for the 162.5 mc ESSQ weather service. However, the tuning range turned out to be from 140-174 mc, covering two meters, the 152-174 mc public service channels and a number of other services.

Semiconductors

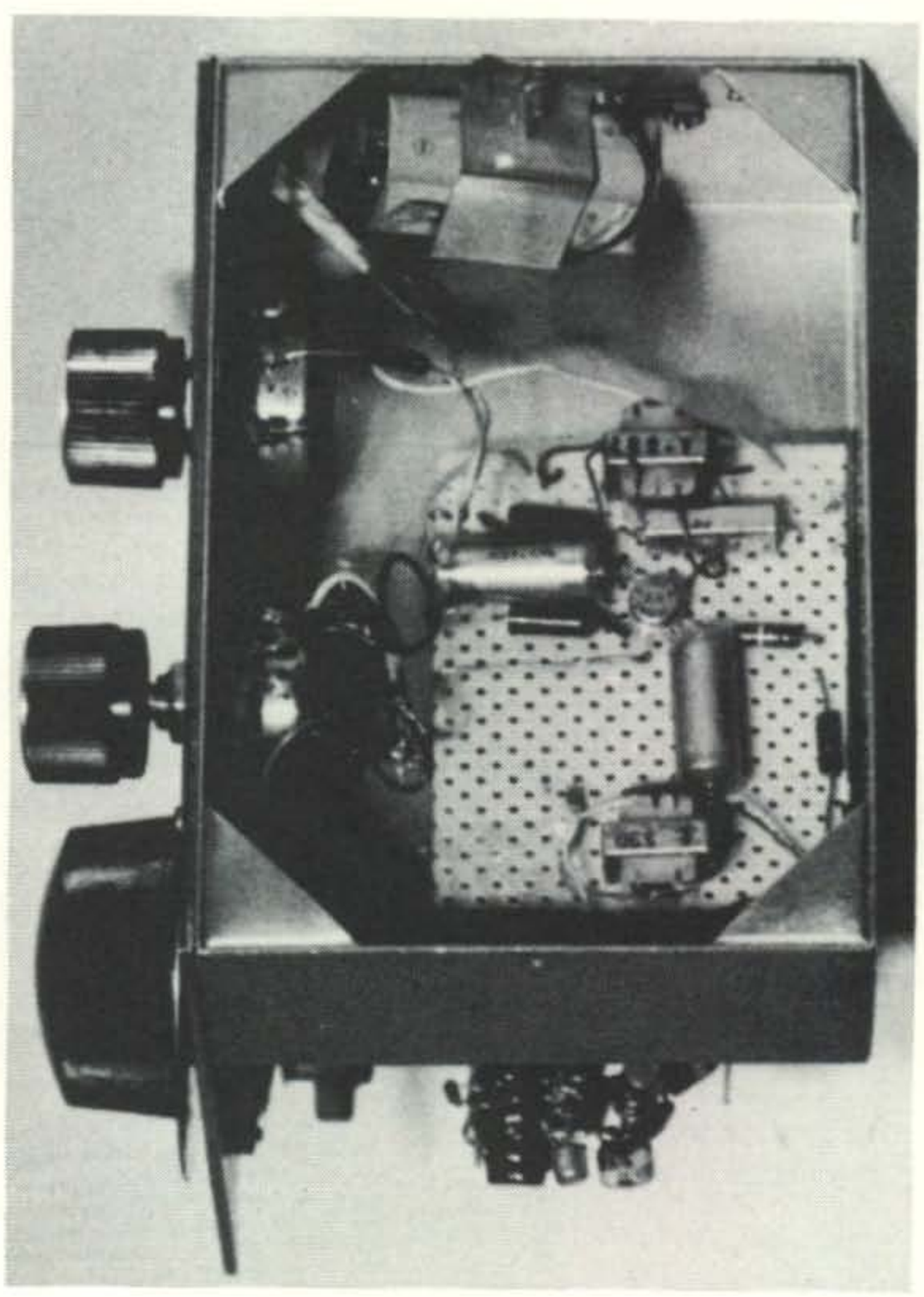
The semiconductors used were an RCA 40235 entertainment grade transistor for the detector, and an RCA CA3020 integrated circuit audio amplifier. The CA3020 is an interesting device. You can get out over 500 mw. with an input of 45 mv. (at 50K ohms input impedance).[1] All this in a TO-5 case for about three bucks!

*12811 Owen St., Garden Grove, Calif. 92641.

[1] *RCA Linear Integrated Circuits,* Technical Series IC-41, Page 266.



Top view of the two meter receiver. Note the short lead lengths. The small ceramic trimmer capacitor is C_2 a 9 to 35 mmf capacitor used to set the range of the regeneration control. It is not critical, and should be experimented with until the smoothest regeneration control is obtained.



Bottom view of the 2 meter regenerative receiver showing the placement of the small piece of vector board that mounts the audio circuitry.

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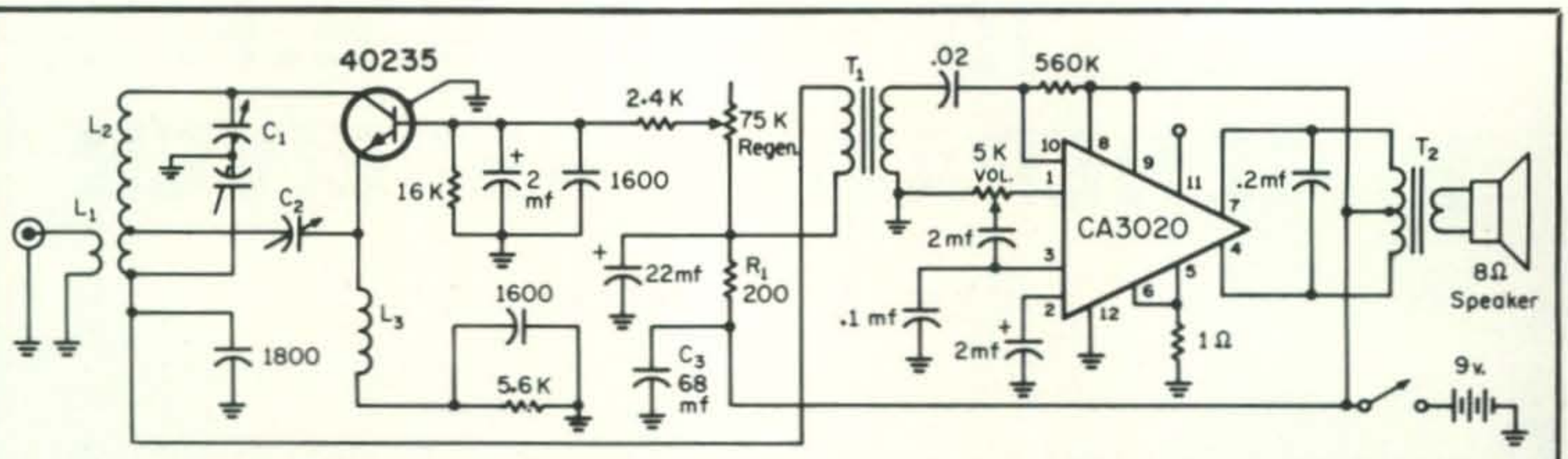

Fig. 1—Circuit of the solid state v.h.f. 2 meter regenerative receiver. All resistors are 1/2 watt and all capacitors greater than one are in mmf; capacitors less than one are in mf, except where otherwise noted. All capacitors are rated for 15 working volts. No connection is made to pin 11 of CA3020.

C_1—20 mmf split stator tuning capacitor.
C_2—9-35 mmf ceramic trimmer capacitor.
L_1—1t #10e., 1/4" diam. coupled to the cold end of L_2.
L_2—6t #10e., 1/4" diam. tapped at 3/4 turns.
L_3—14t #24e., wound on a 1 meg 1 watt resistor.
T_1—2K to 10K. Olson T-230 or equiv.
T_2—250 ohms center tapped to 8 ohms.

Figure 1 is the circuit of the receiver. It was built on a 4 × 6 inch aluminum chassis. All r.f. circuitry was mounted on a small bracket above chassis. The small r.f. components were mounted on a 6 point tag strip belted to the bracket. The audio circuitry was mounted on a small piece of vector board supported from the chassis by stand off's. The dial was made from a Velvet Vernier unit salvaged from a BC-375E tuning unit.

The power supply is a 9 volt battery. A word of caution. The idling current is approximately 20 ma with peak currents approaching 100 ma—so use a good quality battery. The best bet is to use six "D" cells in a battery holder.

While the receiver is battery operated, it must be remembered that batteries have significant source impedances. This is particulary true of the cheap grade of 9 volt transistor radio batteries. One sympton is motorboating. If the motor boating isn't cured by replacing the battery it will be necessary to experiment with different values of C_3 and R_1.

Front view of the two meter solid state v.h.f. regenerative receiver. This set is an ideal starting point for the Ham who wants to get his feet wet in solid state electronics.

Testing

After assembling and checking the circuit connect the battery and an antenna. I have been using a two meter ground plane, but the TV antenna works as well. Turn the set on and adjust the regeneration control until a clean hiss is heard. Tune around until you pick up a signal. You will either notice a quieting of the hiss, or hear the modulation. Adjust the regeneration control for the best reception while peaking the signal simultaneously with the tuning control.

Performance of the receiver is good enough for use as an emergency communications receiver. In fact I have copied two meter AFSK RATT traffic on it without any problems. ■

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Australis-Oscar; It's In Orbit!

BY GEORGE JACOBS,* W3ASK

It's UP, it's finally UP, the AUSTRALIS-OSCAR satellite is flying!!! It made it successfully on January 23, 1970. After a lapse of almost four years, there's an amateur radio satellite again orbiting the earth, high in space.

At precisely 2 seconds past 1131 GMT on January 23, a giant two-stage Delta-N booster rocket began to lift slowly off it's pad at NASA's Western Test Range near Lompoc, California. Amid a tremendous roar and a blinding blaze of flame and smoke, the 39-pound AUSTRALIS-OSCAR satellite, nestled in the framework of the giant booster, began its piggyback ride into space.

An hour and five minutes later, over South Africa, the Delta-N attained its orbital altitude of approximately 900 miles, and the AUSTRALIS-OSCAR satellite was ejected into space to become the fifth in a series of satellites designed and built by radio amateurs and amateur science enthusiasts, to successfully achieve an orbit in space.

Once in orbit, beacon transmitters aboard the satellite began transmitting telemetry data on 29.450 mc in the 10 meter band and 144.050 mc in the two meter band.

The first radio amateur to report receiving the beacon transmissions was 5R8AS as the satellite passed into range of his QTH on the island of Madagascar, off the southeast coast of Africa. He reported reception of the 2 meter beacon from 1238 GMT until it passed out of range at 1241.

Now that the AUSTRALIS-OSCAR satellite is in orbit it has undergone some name changes. Officially, according to international agreement, the satellite has been given the designation 1970-0008 B. As part of the OSCAR concept, it now bears the title of AUSTRALIS-OSCAR 5, or unofficially AO-5 or just plain OSCAR 5, for short.

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

Initial Observations

As the satellite sped away from 5R8AS's QTH at a speed of 15,951 m.p.h., its initial orbit next took it into range of western Europe and the easternmost coast of North America. G2AOX, the OSCAR coordinator for Europe, reported good telemetry signals from the 2 meter beacon which he copied from 1244 to 1305 GMT, using a simple dipole antenna. Both G2BVN and G3DAH also reported reception of the 2 meter transmitter during its initial orbit.

DL3OJ and DJ4ZCA were among the first to report reception of the satellite's 10 meter signals. DJ4ZCA copied the signal from 1246 to 1303 GMT, and DL3OJ from 1246 to 1305 GMT. Among the first to hear the 2-meter signals in North America was VE1AFB who logged it between 1302 and 1311 GMT peaking S-9.

WA1IOX at the Talcott Mountain Science Center, Avon, Conn. was among the first U.S. radio amateurs to copy AO-5's signals during its initial orbit. He reported excellent reception of the 2 meter transmission between 1304 and 1312 GMT.

Appropriately, during its initial orbit, the OSCAR 5 satellite passed within range of its birthplace at the University of Melbourne in Australia. Its signals were copied by the Melbourne University Radio Club between 1346 and 1358 GMT with solid telemetry reception.

It was a text book launch, and all indications were that the satellite was operating within its nominal design range, and the project was off to a good start. (Sometime during the third orbit, however, the modulation on the 10 meter signal was observed to drop off sharply, and later reports indicated that it was very difficult to decode the telemetry on this channel for this reason. As we go to press the reason for this low telemetry level has not been determined. The 2 meter tele-

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mtry circuit continues to operate properly.)

With each successive orbit, more and more radio amateurs throughout the world began to tune the satellite's signals, and by the end of the first day of operation, AMSAT headquarters had already received more than 100 tracking, telemetry and reception reports.

The 2 meter transmitter, which is operating continuously, is expected to have a life period of about a month, and may not be operating by the time this appears in print. The 10 meter transmitter, which will be operating primarily during weekends, may still be operating during March. Be sure to check 144.50 mc daily and 29.450 mc on weekends to see if you can receive signals from OSCAR 5. There may still be time.

Four Year Effort Successful

The successful launch of the AUSTRALIS-OSCAR satellite culminates a four year effort on the part of a large number of devoted radio amateurs on two continents.

The idea for the satellite was conceived during March, 1966 by the members of the Melbourne (Australia) University Astronautical Society and the Melbourne University Radio Club. With the assistance of the Wireless Institute of Australia and the Australian electronics industry, the satellite was designed and built entirely by the amateur participants. It went from drawing board to completion in little more than a year's time.

The completed satellite arrived at the west coast headquarters of Project OSCAR during July, 1967, where it remained for more than a year and a half while attempts were made to cut away the red tape encountered in arranging for a piggyback launch.

During March, 1969, with the formation of the Radio Amateur Satellite Corp. (AMSAT)[1], the Australian built satellite was shipped to AMSAT's Washington, D. C. headquarters. It took another nine months for AMSAT to put the satellite into final shape for launch acceptance, to arrange with NASA for the launch, and to wait out the many agonizing delays caused by booster difficulties. But all this came to a happy and successful end at 1131 GMT on January 23, 1970.

Big News In Australia

The launch of OSCAR 5 made big news in Australia since this was only the second Australian-built satellite ever to make it into space. News of its launch was carried on the front page of many newspapers, and it was featured on radio and television as a major news story.

A direct commercial telephone circuit was leased by the Australians between the University of Melbourne and the NASA's Goodard Space Flight Center, Greenbelt, Md. The line was in use for a three hour period beginning about 15 minutes before launch. Every word and piece of information that was filtered through the control center was fed live to Australia. The countdown and some of the control center's commentary was carried live by radio and television stations in Australia.

In addition, W1AW and several AMSAT liason stations operating in various h.f. amateur bands, transmitted the countdown and the control center commentaries live to radio amateurs throughout the world. After the satellite was successfully in orbit, these stations stood by to receive tracking and other reports bound for the control center. At one point the amount of traffic flowing in and out of OSCAR control sounded much like Houston control during an Apollo mission!

Initial Results

The following are initial orbital and signal data for the OSCAR 5 satellite *confirmed* by observed reports received during the first several days the satellite was in operation.

DATE OF LAUNCH: January 23, 1970.

TIME OF LAUNCH: 11:31:02 GMT.

PLACE OF LAUNCH: NASA Western Test Range, Lompoc, California.

FREQUENCIES: 144.050 mc. in 2 meter band. 29.450 mc. in 10 meter band.

PERIOD: 115.06 minutes.

INCLINATION: 102 degrees (to the equator).

ALTITUDE: 910 miles apogee. 880 miles perigee.

EQUATORIAL CROSSINGS: 28.8 degrees progressively to the west for each new orbit in a south-to-north direction.

The 2 meter beacon transmitter seems to be operating perfectly. Maximum signal is just under a half microvolt, and the telemetry modulation is strong, sharp and clear. There appears to be some trouble with the 10 meter telemetry signals, however. As expected, because of propagation differences, this signal is somewhat weaker than the 2 meter signal, but unexpectedly the level of telemetry modu-

[1]Information concerning membership in AMSAT can be obtained from AMSAT, P.O. Box 27, Washington, D.C. 20044.

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lation is also very low. Many observers have reported considerable difficulty decoding the 10 meter telemetry signal for this reason.

Initial telemetry data indicates that the satellite is operating nominally within its designed range. Channel 1 indicates a battery current reading of between 60 and 70 ma when both beacon transmitters are operating. Channel 3 indicates a battery voltage fairly stable at approximately 20 volts. According to channel 5, the satellite's internal temperatures which was as low as 25 degrees C. during its initial orbit, has risen somewhat during the first few days of operation and appears to have stabilized at approximately 40 degrees C. Channel 7 shows that the satellite's skin temperature has stabilized at approximately 50 degrees C, varying slightly depending on whether it is in the earth's shadow or in full view of the sun.

Channel 2, 4 and 6 indicate that the satellite is spinning at its predicted rate, and as this is being written there hasn't been enough time yet for the on-board magnetic attitude stabilization system (MASS) to take over to stabilize the satellite. By the seventieth orbit however, MASS had taken over and telemetry data indicated that the satellite had stabilized properly.

Future OSCAR Satellites

The effort that finally led to the successful launch of AOA-5 is indicative of AMSAT's tremendous vitality. Even before the heat had time to cool at the launching pad, AMSAT officials were discussing future plans with high level NASA officials and with some of America's leaders in the field of space communications.

It's a bit too early to say what the next OSCAR satellite might be like, but AMSAT is busily evaluating and testing a two meter translator built by Euorpean radio amateurs, called EURO-OSCAR. At a recent conference of Region 1 (Europe and Africa) of the International Amateur Radio Union, a decision was taken for AMSAT is vigorously pursue the launch of the EURO-OSCAR satellite. If all goes well, perhaps this will be the next OSCAR satellite to make it in space.

With a success already chaulked-up, Project Australis, under the sponsorship of the Wireless Institute of Australia, proposes to build a channelized amateur repeater as the next AUSTRALIS-OSCAR satellite. While plans have not yet been finalized, the use of the 144 mc band for the up-link and the 432 mc for the down-link, along with the use of solar power, is being considered.

Longer range, AMSAT is investigating the possibility of including two amateur experiments as a part of the huge ATS-G satellite to be launched by NASA during 1973. One proposed experiment is a channelized repeater aboard the satellite which would receive signals in the 144-146 mc band and retransmit them in the 420-450 mc band. Another ATS-G experiment proposed by AMSAT would consist of the transmission of radio amateur television signals for translation and relay back to earth by the satellite in the 432 mc band, where the signals would be receivable on regular home TV sets equipped with special low-noise converters and fairly high gain antennas.

There is even talk of plans for a moon-based OSCAR repeater to be brought to the moon by some future astronaut

These activities are leading the way in demonstrating that amateur radio, through participation in space communication experiments, continues to make worthwhile contributions in the field of communications, and in furthering man's knowledge of science.

Amateur radio progress in the field of space communications will be reported regularly on the pages of *CQ*.

Interesting Primary Package

Almost lost in the glare of excitement surrounding the OSCAR 5 satellite is TIROS-M, the primary package with which the radio

[*Continued on page 91*]

Historical OSCAR Dates

Dec. 12, 1961-Jan. 1, 1962: OSCAR 1, amateur ratio's first satellite, transmitted telemetry data on 2 meters.

June 2-June 20, 1962: OSCAR 2 transmitted telemetry data on 2 meters.

March 9-24, 1965: OSCAR 3, amateur radio's first translator in space operated up and down-links in the 2 meter band. A 2 meter telemetry beacon transmitter continued to operate until July 9, 1965.

Dec. 21, 1965-mid-March, 1966: Operational period of OSCAR 4's translator, with the up-link on 2 meters and the down-link in the 432 mc band.

Jan. 23, 1970: Launch of OSCAR 5 at 1131 GMT with 10 and 2 meter beacon telemetry transmitters.

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DX

BY JOHN A. ATTAWAY,* K4IIF

ALTHOUGH many readers are still seeing snow on the ground, the spring DX season is upon us. The highlight for most sidebanders will be the *CQ* Worldwide WPX S.S.B. Contest the weekend of April 11 and 12. Check Frank's CONTEST CALENDAR column for the latest information. When conditions are good it's possible to make SSB WPX on this one weekend.

Speaking of conditions, George, W3ASK, advises that sunspots are steadily on the way down. By the end of the year the sunspot level will have dropped from the mid-90's to the mid-70's. Therefore DX conditions on 10, 15, and 20 meters will deteriorate slightly by late spring, while there will be a slight improvement in DX conditions on 40, 80, and 160 during the fall and winter months. Propagation should be relatively good for the April contest, but when planning your contest strategy check George's Propagation Column for his last minute forecast. It can be very useful.

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

S.S.B. DX HONOR ROLL

W2TP	318	G8KS	307	W8EVZ	293	K9PPX	270
W9ILW	318	ZS6LW	307	K8ONV	293	G3WW	269
WA2RAU	316	W5KUC	307	F2MO	292	W9QLD	269
W3NKM	316	W2ZX	305	W2FXN	292	MP4BBW	267
DL9OH	315	W4OM	304	K1IXG	288	G2PL	265
VK3AHO	315	W4SSU	304	SM6CAS	286	WA6GLD	265
W2RGV	315	W6YMV	303	W2LV	286	G2BVN	264
WA2IZS	315	K0UKN	303	W6EUF	286	W2FXE	264
W6EL	315	OK1ADM	302	K8RTW	286	HP1JC	263
K6CYG	315	W2BXA	302	W9EXY	284	W2MJ	261
W0BW/W0QVZ	315	W4IC	302	W3KT	281	W6PTS	260
		W6NJU	302	W1LLF	280	W6WNE	259
I1AMU	314	G3AWZ	301	W6UOU	280	PJ2AA	258
TI2HP	314	G3DO	301	W3FWD	279	PAØEEM	256
K6LGF	314	G6TA	301	W4RLS	279	CT1PK	254
W8DE	314	WA2EOQ	301	K4OEI	279	W6BAF	254
WA8AJI	314	W3DJZ	301	DL3RK	278	K6CAZ	254
W4NJF	313	G3HDA	300	DL1IN	276	PAØSNG	252
W4QCW	313	VE3ACD	300	K4HYL	276	K4GXO	252
W4OPM	312	K1SHN	300	W7DLR	276	VE6TP	251
K6YRA	311	W9JT	300	PZ1AX	274	W8ILC	251
G3FKM	310	5Z4ERR	299	K9LUI	273	W1AOL	250
SM5SB	310	K2DX	297	W6RKP	272		
XE1NE	309	W8BT	297	W8BVF	272		
XE1NE	309	K8IKB	296	G3NUG	270		

De Extra

How Will Amateur Radio Develop—The Japanese Way, The U.S. Way, or By a Cooperative Route?

Using numbers of amateurs as a standard, Japan and the U.S. are the "Super-powers of amateur radio." Although most people in this country don't realize it, these two major powers are taking opposite courses in determining the future of the hobby in their respective countries.

Japan and the U.S. each made its decision independently on the basis of what it considered best for its own amateurs. The U.S. felt that stricter standards should be imposed on W, K amateurs even though U.S. licensing requirements were already the most difficult in the world. Incentive licensing was put into effect and the U.S. amateur population continues to remain static at about 250,000, where it has been for the past 10 years. Japan relaxed it's requirements and the growth of its amateur service has been almost unbelievable. JARL lists the amateur population of Japan at 135,000 and this fantastic growth rate continues unabated.

This column opposed the stricter U.S. licensing requirements because we felt it would be an exercise in futility. Unfortunately this was a fairly accurate prediction. We also have serious reservations about the Japanese system which has pegged its requirements too low. However, one exceedingly important point stands out in any evaluation of the JA approach. Japan has succeeded in attracting its youth to amateur radio. The average age of the JA amateur is less than 20 years, while the average age of the U.S. amateur is estimated to be over 40 years.

The best approach to developing amateur radio worldwide lies somewhere between the highly restrictive U.S. system and the relatively unrestricted Japanese system. We have read plenty about the U.S. philosophy over the past few years so let's take a minute to see what the JA's are saying.

JARL proposed the following six conditions for the advancement of worldwide amateur radio at the IARU Region III Conference in Sydney, Australia in 1968:

1. Violations and limitations of the frequencies allocated to amateur radio by the ITU Conference must be eliminated. (Particular emphasis on removing intruders from the bands.)

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2. Efforts to conclude reciprocal operating agreements should be intensified in every country.

3. The licensing system should be simplified to increase the number of amateur radio stations.

4. The age limit established in some countries should be abolished.

5. As amateur radio is a hobby independent of ideology or religion it must remain free of any ties to them.

6. The blind and other physically handicapped should be given an equal chance to obtain a ham license.

Five of these points agree closely with U.S. attitudes. However, point 3, simplification of the licensing system, leaves a lot of room for thought in a country with *six* (6) classes of licenses. Count 'em: Novice, Technician, Conditional, General, Advanced, and Amateur Extra.

The JARL position paper made an additional point of great interest when it stated that a sucessful defense of the amateur frequencies could not be accomplished by a single society, but would require the allied power of every society. Cooperation with this rapidly-growing amateur group would certainly appear desirable. As DXers know better than most, this is a hobby which doesn't stop at the three mile limit. Therefore, more uniformity in worldwide licensing requirements would be advantageous. Each country must be allowed the flexibility to handle it's own particular situations, but the great difference between the U.S. and Japanese systems should be narrowed somewhat.

Next month our Amateur Radio in Other Countries section will feature Amateur Radio in Japan. It will give you a deeper look at the Japanese licensing structure as well as other aspects of the hobby in this interesting country.

SSB DX Awards Move West

Effective March 1, 1970, the new Manager of the *CQ* S.S.B. DX Awards is Jerry Hagen, WA6GLD, longtime editor of the *Southern California DX Club Bulletin*, who also handles WPNX, *CQ's* DX Award for Novices. Jerry replaces the very able Louise Rippe, W8HDB, who had done a wonderful job of restoring our SSB DX Honor Roll.

New Award applicants, as well as Honor Roll members, may reach Jerry at 5031 Arroway Ave., Covina, Calif. 91723.

One of Japan's top DX'ers is the ever present Akira, JA1AG. His signal from Kawasaki has managed 314 countries as well as WAZ and WPX honors. *(Photo via K4DSN).*

New West Gulf Committeeman

Mr. Don Busick, K5ADD/W5UW, of Carribbean DX fame, is now the West Gulf area member of the *CQ* DX Awards Committee. Don succeeds Frank Campbell, W5-IGJ, who was a member of the original committee and participated in all of the DX Hall of Fame selections.

New Prefixes for WPX

HR7, HRØ, or *HQØ*—Mentioned as possible allocations to Swan Island stations when it comes under Honduran jurisdiction.

The S.S.B. DX Award Program

100 Countries	200 Countries
614.....K4DSN	195.....WA3IKK
615.....W6EIF	**300 Countries**
616.....CT1MW	48.....W4OM
617.....WØUCK	49.....KØUKN

Complete rules and an application blank for the *CQ* S.S.B. DX Awards may be obtained by sending a self-addressed, stamped envelope to WA6GLD, 5031 Arroway Ave., Covina, Calif. 91723.

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This OM is Oscar, YS1O, of San Salvador, El Salvador, Central America. Oscar recently earned all three WAZ Certificates, C.W.-Phone, S.S.B. and Phone. His cards went through our very efficient Mexico City checkpoint manned by XE1AE. *(Photo Courtesy XE1AE).*

HT1—HT prefixes will be used by Nicaraguan hams in 1970.

OJ0—OJ0MR was the call of the Finnish group operating from Market Reef. QSL via OH2NB.

U1, U4, U0 etc.—These are special prefixes in use in Russia to commemorate the 100th anniversary of the birth of Lenin.

UK—All Russian club stations will be using this prefix from 1970 onward. In addition, the first letter after the numeral will indicate the Republic or Oblast. For example, UP2KAA will become UK2PAA.

The WAZ Program

S.S.B. WAZ

750.....W9KRU	754.....F8HA
751.....DJ9BW	755.....I1CAW
752.....W9BGX	756.....I1LCK
753.....WA0EMS	757.....JA7EHU

Phone WAZ

431.....JA1AAT	433.....VK3BM
432.....DK2BL	434.....PY2DSQ

C.W. Phone WAZ

2824.....JA3CF	2832.....3C4OX
2825.....WA3BGC	2833.....WB2YQH
2826.....WB4KZG	2834.....W2MZ
2827.....HB9PQ	2835.....VE3CDP-/W9
2828.....DJ8WD	
2829.....WA0EMS	2836.....VE3MZ
2830.....W3ML	2837.....HB9AIJ
2831.....K8HZU	2838.....HB9AKJ

Complete rules and an application blank for WAZ may be obtained by sending a self-addressed, stamped envelope to DX Editor,

WPX HONOR ROLL

The WPX Honor Roll is based on confirmed current prefixes. Stations are listed with both net and gross prefix credits. The Honor Roll is based on the current *net* regardless of an operator's all-time gross prefix count.

MIXED

W4OPM	Joe Hiller	925/1025
W8LY	Michael Bakos	727/755
G3DO	D.A.G. Edwards	703/755
K1SHN	Chuck Banta	685/702
I1SF	Serafino Franchi	657/657
W3PVZ	Joseph Olnick	65-/667
W4IC	George Mack	647/700
W8ROC	Fred Reicks	645/650
WA5LOB	James Edwards	640/640
WA6EPQ	Larry Brockman	622/656
W8KSR	Jon Hodgin	612/612
W8GMK	John Marhefka	611/611
WA6GLD	Jerry Hagen	601/626
DL1MD	Heribert Rechl	557/557

SSB

W4OPM	Joe Hiller	800/875
W4NJF	Gay E. Milius	758/772
WA5LOB	James Edwards	632/632
DL9OH	Karl Muller	611/611
G3DO	D.A.G. Edwards	603/625
HC1JC	Juan Chen	601/603
K1SHN	Chuck Banta	586/601
K2POA	Arthur Johnson	580/600
I1AMU	Alfonso Porretta	562/599

CW

W4OPM	Joe Hiller	825/850
W8KPL	William Simpson	741/853
W8LY	Michael Bakos	729/802
VK3AHQ	Henry Denver	706/706
DL1QT	Helmut Baumert	700/700
G2GM	F. D. Cawley	606/666
VE4OX	D. E. McVittie	580/614
K1SHN	Chuck Banta	572/603
I1SF	Serafino Franchi	554/554

PHONE

G3DO	D.A.G. Edwards	691/715
CX2CN	Samuel Barreiro	574/608
F2MO	Dort Michael	536/552
I1SF	Serafino Franchi	526/526

WB5—Calls containing this prefix are now being issued by the FCC.

WX3—WX3MAS was a special Christmas call issued by the FCC. It was used by a station in Christmas City, Pennsylvania.

Amateur Radio in Australia

The information for this article was furnished by Geoff. Wilson VK3AMK, Federal Awards Manager of the Wireless Institute of Australia.

"Amatetur radio's official body in Australia, the Wireless Institute of Australia (WIA), dates from 1910, prior to ARRL. It

See page 110 for New Reader Service

is possibly the oldest continuously active amateur radio society in the world. During 1970 WIA will celebrate it's 60th anniversary. As 1970 is also the bi-centenary of the discovery of the eastern coast of Australia by Captain James Cook in 1770, the special prefix AX will be available for use by Australian stations to commemorate these two important occasions. A special award will be isued to overseas stations working 50 different Australian stations using the AX prefix.

"WIA is administered by a Federal executive plus six state divisions which coordinate amateur affairs within the respective states. Included are weekly news broadcasts, news letters, group meetings, lectures, the QSL Bureaus, and many other services for members. A monthly magazine entitled *Amateur Radio* is sent to all members. Each issue includes technical articles, award news, and news of group activities such as v.h.f., s.w.l., DX, etc. Young people are helped toward their licenses by a youth radio scheme which encourages interest in radio at the school ages. Classes and correspondence courses are offered to help anyone interested in obtaining a license.

"The Wireless Institute Civil Emergency Network (WICEN) is a group whose aim is to provide emergency communications during civil disasters such as floods and brushfires. Mock exercises are held to test preparedness and gear.

"The number of licensed amateurs in Australia is around the 6000 mark and increasing. Over 50% belong to WIA.

"Government administration of amateur radio in VK-land is through the Radio Branch of the Postmaster General's Department. Two types of licenses are available. The highest class of license is called the Amateur Operators Certificate of Proficiency. It entitles the holder to full priviledges on all amateur bands, and requires the passing of examinations in theory and regulations plus a 10 words per minute code test. The other license class is called the Amateur Operators Limited Certificate of Proficiency. It's theory and regulations exam is identical to that for the higher class, but no code test is required and privileges are restricted to 52 mc and above. No c.w. can be used. There is no time limit on the limited type license. Reciprocal license agreements exist with a number of countries including the USA.

"The power limit for both classes of license

Jim O'Connell KR6NR/W9JZR, recounts some of his experiences operating from Okinawa where he worked 273 countries for DXCC credit. This was at the December meeting of the Northern California DX Club in San Francisco's Chinatown. Others in the photo are Walt Cooper, W6CDJ, Secretary-Treasurer of thet NCDXC, Dave Baker, W6WX, of the CQ DX Advisory Committee, KR6NR, Hugh Cassidy, WA6AUD, President off the NCDXC and John Gibson, K6-YGS, Editor of the NCDXC DXer. *(Photo Courtesy WA6AUD).*

is 150 watts d.c. input or 400 watts p.e.p. s.s.b. output. This applies to all bands including 160 meters. Frequencies available are 1.800-1.860 mc, 3.500-3.700 mc, 7.000-7.150 mc, 14.000-14.350 mc, 21.000-21.450 mc, 26.960-27.320 mc, 28.000-29.700 mc, 52.000-54.000 mc, 144.000-148.000 mc, 420.000-450.000 mc, plus seven bands between 576 mc and 22,000 mc. There are no definite rules regarding sub-bands other than by gentlemen's agreement.

"Apart from the special award for working

Erich, DJ7XC, at his home QTH. Erich made over 3000 QSO's from San Marino during his DJ7-XC/MI operations in 1965 and 1966.

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The WPX Program

Annual Report for 1969—A total of 254 applications were processed, not including 35 Honor Roll applications. This represents a 29% increase over 1968 and a 73% increase over 1967. The greatest mode increase was noted in s.s.b. No mode showed a decrease. Endorsements were up by 34%.

While 1968 applications were 55% DX and 45% U.S. stations, in 1969 the percentages were 44% DX and 56% U.S. This change was brought about solely by an increase in U.S. applicants as the number of DX applications remained the same.

New certificates and endorsements this month were as follows:

S.S.B.

481........WA7BAV 483........WB2VQG
482........I1CCL

C.W.

989........WA9UET 992........W9MCJ
990........DL6KC 993........OK3UN

Mixed

221........WA5LOB 222........W3PVZ

Phone

185........OE2EGL

VPX

17........Yutaka Tanaka, JA3-2520
18........Milos Oblak, YU3–RS–523

Endorsements

SSB: WA6TAX–400, W6CYO–350, OK2DB–300, W4WSF–300, I1CCL–250, and W2-WNW–250.

C.W.: YU1AG–650, VE4OX–600, W6UNP–600, K1LWI–550, YU1SF–500, OK3DT–350, and WA9UET–350.

Mixed: YU1AG–700, W8ROC–650, WA5-LOB–600, K6SDR–550, and W4WSF–450.

Phone: CX2CN–600, OE2EGL–500, W4-WSF–350, and W6CYO–350.

Europe: DJ4VP, OK3DT, W4DQD, W8-GKM, and YU1SF.

Asia: VE4OX and W8ROC.

Africa: W8ROC.

North America: W8ROC.

South America: W8KPL.

20 Meters: YU1SF.

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, Fla. 32208.

AX prefixes in 1970, there is only one award issued to overseas stations by the WIA. This is the Worked All VK Call Areas which is issued free to any amateur working 22 stations in specified call areas of VK. Many individual radio clubs issue awards. Among these are the E. G. Moorabbin & District Radio Club (VK3APC), Ipswich & District Radio Club (VK4IO), and the Elizabeth Amateur Radio Club (VK5LZ). Information regarding these awards can be obtained by writing directly to the clubs. Other VK awards include the Down Under Award issued by VK4SS, and the Brisbane DX Club Award.

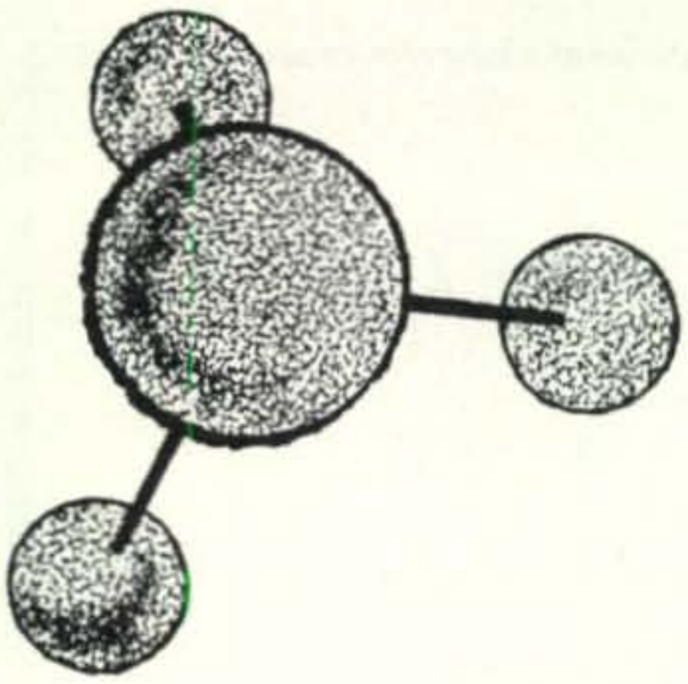
"As there are a large number of operators licensed only for 52 mc and above, there are very active v.h.f. groups in all main cities. Two meter f.m. is very popular and repeater stations are coming into wider use each month.

"Although about half of the VK operators use commercial gear, there are still many hams who take a keen interest in building their own equipment."

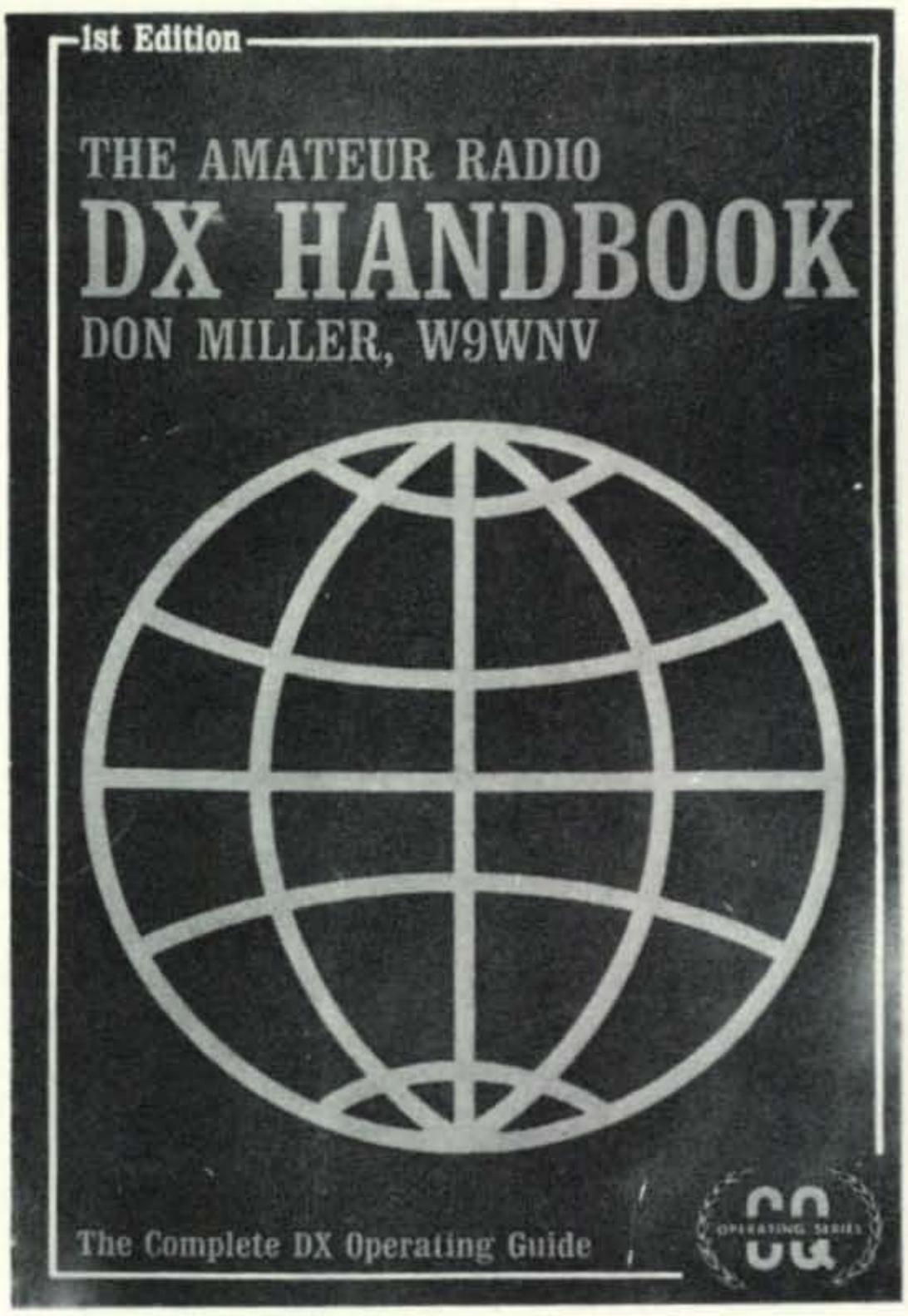
QSL Information

C21JW—Jack Wirth, c/o Radio House, Nauru Island, Central Pacific.
CR6CA—Via VE3GNM.
CT2AW—To K9KGV, 1916 Hillcrest Rd., Rockford, Illinois 61108.
CW2AA—D.O.T.M., P.O. Box 7388, Newark, N.J. 07107.
EA9EJ—P.O. Box 172, El Aaiun, Spanish Sahara.
FØMH/p—Via WB8ABN, P.O. Box 62, Rochester, Mi 48063.
FB8ZZ—To F8US.
FG7TD—c/o WB8ABN.
FH8CD—Via F2LI.
FM7WQ—To W4OPM.
GM5AMS—c/o K7KPM.
HBØCM—Via HB9CM, 37 route de Neuveville, 2525 Le Landeron, Switzerland.
HS2JR—To DK1RR.
I1DFL—c/o Amateur Radio Club, 6917 Security Group, APO New York, N.Y. 09240.
JW7UH—E. Oyan, N-9173, NY. Aslesund, Svalbard, Norkay.
M1I—Via I1BNZ.
MP4QBK—W/K/VE via K4MQG, others via MP4BHH.
MP4TCE—P.O. Box 176, Sharjah, Trucial Oman.
OX3FD—c/o WB8ABN.
PJØDX—Via W3AZD.
PY7AWD/PYØ—To PY7PO, P.O. Box 341, Recife, Brazil.
PZ1BX—c/o P. O. Box 2003, Paramaribo, Surinam.
TI8PE/TI9—All except VK & ZL go to WA5-GFS, Box 462, Chickasha, Ok. 73018.
TR8DG—G. Delas, P.O. Box 356, Libreville, Gabon.

[*Continued on page 90*]



WHAT'S TO KNOW ?



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

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Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Feb. 28–Mar. 15	IARC Propagation CW/RTTY
March 7-8	ARRL DX Phone Contest
March 7-8	RSGB BERU C.W. Contest
March 14-16	Virginia QSO Party
March 21-22	ARRL DX C.W. Contest
Mar. 28–Apr. 19	IARC Propagation Phone
April 4-5	SP DX C.W. Contest
April 4-5	Florida QSO Party
April 4-5	New Mexico QSO Party
April 11-12	**CQ WW WPX SSB Contest**
April 18-19	Helvetia XXII Contest
April 25-26	ONE LAND QSO Party
April 25-26	PACC CW/Phone Contest
April 25-26	DARC WAE RTTY Contest
May 16-17	YL Inter. SSBers Party
May 16-17	World Telecomm. Contest

IARC Propagation Contest

CW/RTTY–Feb. 28 to March 15
Phone–March 28 to April 19

Starts: 0001 GMT Ends: 2400 GMT

The "contest with a purpose" was covered in last month's CALENDAR.

Mailing deadline is June 1st and logs go to: L. M. Rundlett, IARC Contest, 2001 Eye Street, N.W., Washington, D.C. 20006

ARRL DX Contest

Phone: March 7-8 C.W.: March 21-22
Starts: 0001 GMT Sat. Ends: 2359 GMT Sun.

This is the second half, the first part took place last month.

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

*14 Sherwood Road, Stamford, Conn. 06905.

SP DX 1969 Results

United States All Band		21 mc		Canada All Band	
WA1DAG	23,562	W9QWM	48	W1JT	108
W1FZ	9,588	14 mc		WA3BHJ	48
W8VSK	4,998	W4WSF	2,184	W2ZPG	3
WAØKDI	2,496	W2CVW	1,716	Canada All Band	
K5YAA	1,716	WAØEPG	432	VO1HI	2,340
WAØVJN	624	W4KMS	300	VE2IL	12
K8NMG	108	W8IBX/2	216	14 mc	
		W3GN	144	VE1AE	4,884

RSGB BERU C.W. Contest

Starts: 0001 GMT Saturday, March 7
Ends: 2359 GMT Sunday, March 8

This contest is open to members of the RSGB residing in the British Isles, and amateurs licensed to operate within the British Commonwealth and British Mandated Territories.

This is the 33rd edition of this c.w. only contest, use all bands 3.5 thru 28 mc, but do not get involved unless you meet the above qualifications. Some real juicy calls usually show up during this contest.

Complete rules in the January issue of *Radio Communication*, the RSGB magazine.

Your entries go to: BERU, RSGB HF Contests Committee, c/o J.C. Graham, G3TR, "The Willows" Church Road, Lowfield Heath, Crawley, Sussex, England.

Virginia QSO Party

Starts: 1800 GMT Saturday, March 14
Ends: 0200 GMT Monday, March 16

The Roanoke Valley ARC is again sponsoring this annual QSO party. Phone and c.w. are separate contests and separate logs should be submitted. The same station may be worked on each band for QSO point credit.

Exchange: QSO nr., RS/RST and QTH; county for Va. stations; state, province or country for all others.

Scoring: One point for each QSO. Virginia stations multiply total by number of states, VE provinces, countries and Va. counties worked for final score. Out-of-state stations multiply number of Va. QSOs by number of Va. counties worked. (max. of 96)

Frequencies: c.w.–3560, 7060, 14060, 21060, 28060. Phone–3930, 7235, 14240/14340, 21310/21400.

Awards: Certificates to the highest scoring station in each state, province and country, Virginians will compete for 1st thru 5th place certificates.

Logs must be received no later than April

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30th and go to: Roanoke Valley ARC, Att: Van A. Wimmer, WA4BIX, 110 Union Street, Salem, Virginia 24153

SP DX C.W. Contest

Starts: 1500 GMT Saturday, April 4
Ends: 2400 GMT Sunday, April 5

Its the world working the SPs (and 3Z) on c.w. only in this one. Use all bands 3.5 thru 28 mc.

There are two divisions; single operator, single and all band, and multi-operator, all band only. S.w.l.s may also enter.

Exchange: RST report plus a 3 figure QSO number starting with 001 for foreign stations. Polish stations will send the RST plus their powiat letters. (ie: 579WA, 579CP and etc.)

Scoring: Each QSO with a SP station is worth 3 points. Multiply total by number of different SP powiats worked. A station may be worked on each band for QSO points, but a powiat may be counted only *once* as a multiplier.

Awards: Certificates to the top scorers in each category, in each country. Additional awards where returns justify.

Contest contacts may be credited for the many PZK awards, and applications may be sent with the contest log.

Use a separate sheet for each band and indicate the multiplier only first time it is worked. Include a summary sheet with all the scoring information, a signed declaration that all rules and regulations have been observed, and your name and address in BLOCK LETTERS.

Check your log for duplicate contacts and accuracy of the scoring, on penalty of disqualification.

Mailing deadline is May 1st and logs go to: Contest Manager of PZK, P.O. Box 320, Warszawa 1, Poland.

Florida QSO Party

Three Periods: (GMT)
1500-2000 Saturday, April 4
0000-0500 Sunday, April 5
1400-2400 Sunday, April 5

Florida Skip, the amateur radio magazine announces its sixth annual QSO party.

Phone and c.w. are separate contests, the same station may be worked on each band for QSO points, and Florida stations may work in-state stations for QSO points only.

Exchange: QSO nr., RS/RST and QTH. County for Fla.; State, province or country for all others.

Scoring: One point per contact. Florida use states, VE provinces and DX countries for their multiplier. (max. of 11 DX) All others use Fla. counties for their multiplier. (max. of 67)

Frequencies: 1807, 3570, 7070, 14070, 21070, 28070. Phone–1817, 3870, 7270, 14270, 21370, 28570.

Awards: Certificates to the top scorers in each state, province and DX country, and Novice in each U.S. call area. (min. of 5 QSOs) Floridians will be competing in each county, for single operator, multi-operator, portable and novice. (multi. a min. of 50 QSOs) There are also 4 Trophies for the Top Banana "as follows: Florida, single, multi and portable, and leading out-of-state station. (Phone and c.w. scores are not to be added.)

Mailing deadline is May 30th to: *Florida Skip,* Contest Chairman, P.O. Box 501, Miami Springs, Fla. 33166. Include a 6¢ stamp for issue with results.

New Mexico QSO Party

Three Periods: (GMT)
2200 Sat. April 4 to 0100 Sun. April 5
0300 to 0600 Sunday April 5
1800 to 2200 Sunday, April 5

The Los Alamos ARC is the sponsor.

[*Continued on page 96*]

Helvetia XXII 1969 Results

United States	W4WSF 2,070	W9TLU 312
W2NQ 12,960	K5YAA 1,980	K9ABQ 270
W4BYB 12,393	W9QWM 1,863	W1PYM 216
WA1FHU 8,448	W2NCG 1,782	W1JT 168
W3BYX 8,322	K1SHN 1,716	WA2FBI 75
W1TX 6,669	W8IBX/2 1,680	W4WRJ 36
W8DA 6,552	W9RKP 1,458	W9GF 27
K4YXJ 6,438	K8NQP 1,350	
W9LKI 5,394	WA2BCT 1,326	
WA1GUH 4,h00	WA2DNB 1,122	**Canada**
W2QIP 3,780	W4KMS 714	VE1AIH 12,168
W8VSK 3,654	W1FZ 702	VE3BWY 6,960
KØDYM 3,108	WA2EMS 684	VO1AW 3,042
W7LVI 2,925	W6ISQ 675	VE5XJ 1,980
W4HOS 2,496	WA2BHJ 546	VE1AE 1,377
K4OLQ 2,400	WA8WGM 432	VE2IL 1,242
W1DAL 2,277	K4VQT 363	WA5JDR
W2CVW 2,100	W9WEN 324	/VE 1,020

P.A.C.C. 1969 Results

United States	W4JUK 243	W6JPH 18
W3BYX 3,432	W9LKI 216	K8NMG 3
W4BYB 756	W6UZX 189	**Canada**
W1FZ 715	W6DGH 96	VO1AW 1,824
W8VSK 432	W4WSF 27	VE1AE 312
W9KXK 432	W6ISQ 27	VE2IL 3

C.A.R.T.G. RTTY Results

Medallion Winners

ON4BX	WA3HXR/YV5	W3KV	W1BZT
W4YG	VK5DM	W3ABT	VE7UBC
W9HHX	W8CQ	G3MWI	

Propagation

BY GEORGE JACOBS,* W3ASK

MARCH and the spring months in the northern hemisphere correspond to the fall season in the southern hemisphere. During this period relatively similar h.f. radio propagation conditions exist in the temperate regions of both hemispheres as compared to the extreme conditions that exist when it is summer in one and winter in the other.

As a result of this equalization, radio propagation conditions on h.f. paths between both hemispheres are at their best during the spring (or fall) months. Maximum usable frequencies are at their highest values, and signal intensities are at their strongest levels. Good openings on these inter-hemisphere circuits, for example from the United States to South America, Australasia and the central and southern regions of Africa, are expected on all amateur bands between 10 and 40 meters, with the possibility that some openings may also occur on 80 and 160 meters.

In the northern hemisphere, typical springtime propagation conditions become noticeable during March. Fewer east-west openings are forecast for 10 meters, but with increased hours of daylight both the 15 and 20 meter bands should remain open somewhat longer than during the winter months. Higher static levels, fewer hours of darkness, and seasonal increases in ionospheric absorption are expected to result in somewhat poorer propagation conditions within the norhern hemisphere on 40, 80 and 160 meters.

The following is a summary of h.f. amateur band propagation conditions forecast for March, 1970. For more specific information, refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts valid from March 15 through May 15, as well as Propagation Charts centered on Alaska and Hawaii. The Short-Skip Charts contain band opening forecasts for predominantly *one-hop* openings for distances varying between 50 and 2300 miles.

For day-to-day propagation conditions expected during March, see the "Last Minute Forecast", which appears at the beginning of this column.

10 Meters: While fewer DX openings are forecast, some fairly good ones should be possible during the daylight hours, especially to southern and tropical areas. A few fairly good short-skip openings should also be pos-

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for March 1, through April 15, 1970

	Forecast Rating & Quality			
Days	(2)	(1)	(4)	(3)
Above Normal: March 4, 8, 24-25, 31. April 5, 12.	B	B-C	A	A-B
Normal: March 2-3, 5-7, 9, 11-12, 15-16, 18-19, 21-23, 26, 30. April 1-4, 6-9, 11, 13, 15.	C	D	A-B	B
Below Normal: March 1, 10, 13-14, 17, 20, 28-29. April 10, 14.	D	E	B-C	C-D
Disturbed: March 27.	E	E	C-D	D-E

How To Use These Charts

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

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

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

On the "Short-Skip" Chart where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecat 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 Propagation Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 300 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss reception will become poorer by one level.

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

6—These Propagation Charts are valid through May 15, 1970. These Charts 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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sible between distances of approximately 1000 and 2300 miles. Conditions on this band are expected to peak during the afternoon hours.

15 Meters: This expected to be the best band for DX propagation conditions during most of the daylight hours. Excellent openings are forecast to most areas of the world during this period, with conditions peaking during the late afternoon hours. Some circuits to southern and tropical regions are likely to remain open into the early evening hours as well. Excellent short-skip openings are also forecast for most of the daylight hours, between distances of approximately 1000 and 2300 miles.

20 Meters: With longer hours of daylight, 20 meters will remain open for DX well into the evening hours. It should be the optimum band for DX openings during the sunrise period, and again during sunset and the early evening hours. The band is likely to remain open throughout the hours of darkness as well, especially to southern and tropical areas. Excellent short-skip openings are expected during the daylight hours, between distances of approximately 750 and 2300 miles, with many openings continuing through the evening hours.

40 Meters: Fairly good DX openings are forecast to many areas of the world from sundown through sunrise, with conditions peaking during the hours of darkness. Excellent short-skip openings are expected between a range of 50 and 750 miles during the daylight hours, and between approximately 500 and 2300 miles at night.

80 Meters: Although some DX openings are forecast during the hours of darkness, this band is expected to be noticeably noiser during March as a result of a seasonal increase in static levels. Excellent daytime short-skip openings should be possible between 50 and 250 miles, with the distance increasing to between 200 and 2300 miles during the hours of darkness. Conditions should peak on this band when it is darkness on the western terminal of a path and sunrise at the eastern terminal.

160 Meters: No openings are expected on this band during the daylight hours, but short-skip openings up to a distance of 2300 miles, and an occasional DX opening should be possible during the hours of darkness and the sunrise period.

V.h.f. Ionospheric Openings

A seasonal increase in short-skip openings due to sporadic-E propagation usually begins during March, and an occasional 6 meter opening should be possible during the month, over distances between approximately 1000 and 1300 miles.

Auroral activity also increases during March, and there is a good chance that a number of v.h.f. ionospheric short-skip openings should be possible by means of auroral-scatter propagation. Check the "Last Minute Forecast" at the beginning of this column for those days that are expected to be disturbed or below normal. These are the days on which v.h.f. auroral openings are most likely to occur.

Trans-equatorial scatter propagation (TE) is also expected to increase during March, and some 6 meter openings should be possible from the southern half of the United States to South America, up to a distance of approximately 5000 miles. TE openings must cross the magnetic equator at or near a right angle, and the optimum time for 6 meter openings is beween 8 and 11 P.M. local time at the path mid-point.

Not much meteor activity expected during March, although some v.h.f. meteor-type openings may be possible when minor meteor showers peak on March 16 and 26.

Sunspot Cycle

The Swiss Federal Solar Observatory at Zurich reports a mean monthly sunspot number of 94 for December, 1969. This results in a 12-month smoothed sunspot number of 103 centered on June, 1969, as the present sunspot cycle continues to decline slowly, but steadily. A smoothed sunspot number of 91 is forecast for March, 1970.

73, George, W3ASK

CQ Short-Skip Propagation Chart

March 15—May 15, 1970

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

Distance From Transmitter (Miles)

Band (Meters) / *50-250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10 — *Nil*	09-13 (0-1)	08-09 (1) 09-12 (1-2) 12-15 (1-3) 15-17 (1-2) 17-20 (0-1)	08-09 (1) 09-12 (2) 12-15 (3) 15-17 (2-3) 17-18 (1-2) 18-20 (1)

See page 110 for New Reader Service

15	*Nil*	08-09 (0-1) 09-15 (0-2) 15-18 (0-1)	07-08 (1) 08-09 (1-2) 09-15 (2-4) 17-19 (1-2) 19-21 (0-1)	07-08 (1) 08-09 (2) 09-15 (4) 17-19 (2-3) 19-21 (1-3) 21-22 (0-2) 22-23 (0-1)
20	11-13 (0-1) 13-15 (0-2) 15-17 (0-1)	07-08 (0-2) 08-11 (0-3) 11-13 (1-4) 13-15 (2-4) 15-17 (1-4) 17-19 (0-3) 19-21 (0-2) 21-07 (0-1)	06-07 (1-2) 07-08 (2-3) 08-11 (3-4) 11-17 (4) 17-19 (3-4) 19-21 (2-4) 21-22 (1-3) 22-00 (1-2) 00-06 (1)	06-07 (2) 07-08 (3) 08-10 (4) 10-15 (4-3) 15-21 (4) 21-22 (3-4) 22-00 (2-3) 00-04 (1-2) 04-06 (1)
40	06-07 (1-2) 07-09 (2-3) 09-19 (3-4) 19-21 (2-3) 21-23 (1-2) 23-06 (0-1)	06-07 (2-3) 07-09 (3-4) 09-11 (4-3) 11-13 (4-2) 13-15 (4-3) 15-19 (4) 19-21 (3-4) 21-23 (2-3) 23-03 (1-2) 03-06 (1)	06-07 (3-2) 07-08 (4-2) 08-09 (4-1) 09-11 (3-1) 11-13 (2-1) 13-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-21 (4) 21-23 (3-4) 23-03 (2-3) 03-06 (1-2)	06-08 (2-1) 08-15 (1-0) 15-16 (2-1) 16-17 (2-1) 17-19 (3-2) 19-23 (4) 23-03 (3-4) 03-06 (2-3) 03-06 (2-3) (3-3) - (2-3) - (2-3)
80	07-08 (3-4) 08-11 (4) 11-18 (4-3) 18-21 (3-4) 21-23 (3-4) 23-02 (2-3) 02-05 (1-2) 05-07 (2-3)	07-08 (4-2) 08-11 (4-1) 11-16 (3-0) 16-18 (3-2) 18-20 (4-3) 20-23 (4) 23-02 (3-4) 02-05 (2-3) 05-07 (3)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-02 (4) 02-05 (3) 05-07 (3-2) 05-07 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-02 (4-3) 02-05 (3-2) 05-07 (2-1) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2) 03-05 (3-2)	05-06 (1-0) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1) 03-05 (2-1)

ALASKA

March 15-May 15, 1970

Openings Given in GMT‡

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	20-22 (1) 22-00 (2) 00-01 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-01 (2) 01-02 (1)	13-15 (1) 20-22 (1) 22-01 (2) 01-03 (3) 03-04 (2) 04-06 (1)	06-13 (1)* 07-12 (1)*
Central USA	20-23 (1) 23-01 (2) 01-02 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1)	14-16 (1) 21-00 (1) 00-02 (2) 02-04 (3) 04-05 (2) 05-07 (1)	07-14 (1) 08-12 (1)*
Western USA	20-23 (1) 23-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1)	16-19 (1) 19-00 (2) 00-02 (3) 02-04 (4) 04-05 (3) 05-06 (2) 06-09 (1)	07-09 (1) 09-12 (2) 12-14 (1) 09-10 (1)* 10-12 (2)* 12-13 (1)*

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

‡To convert to Local Standard Time in Alaska, *subtract* 8 hours from the times appearing in the Chart in the Pacific Standard Time Zone; 9 hours in the Yukon Time Zone; and 10 hours in the Alaskan Standard Time Zone. To convert from GMT to local times in other areas of the USA, *subtract* 5 hours from the times shown in the Chart in the EST Zone; 6 hours in the CST Zone; 7 hours in the MST Zone and 8 hours in the PST Zone. For example, when it is 18 GMT it is 10 A.M. in San Francisco and 1 P.M. in Washington, D.C.

HAWAII

March 15-May 15, 1970

Openings Given In Hawaiian Standard Time†

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	08-10 (1) 10-11 (2) 11-13 (3) 13-15 (2) 15-16 (1)	06-07 (1) 07-08 (2) 08-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-20 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-22 (3) 22-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 20-22 (1)* 22-01 (2)* 01-02 (1)*
Central USA	08-10 (1) 10-11 (2) 11-14 (3) 14-16 (2) 16-17 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-13 (3) 13-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	09-13 (1) 13-15 (2) 15-17 (3) 17-20 (4) 20-23 (3) 23-05 (2) 05-07 (3) 07-09 (2)	19-20 (1) 20-22 (2) 22-02 (3) 02-04 (2) 04-06 (1) 20-23 (1)* 23-03 (2)* 03-04 (1)*
Western USA	08-09 (1) 09-11 (2) 11-15 (3) 15-17 (2) 17-19 (1)	06-07 (1) 07-09 (2) 09-11 (4) 11-14 (3) 14-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	15-17 (3) 17-20 (4) 20-23 (3) 23-02 (2) 02-04 (1) 04-06 (2) 06-08 (4) 08-10 (3) 10-15 (2)	18-19 (1) 19-21 (2) 21-22 (3) 22-03 (4) 03-05 (3) 05-06 (1) 21-22 (1)* 22-23 (2)* 23-04 (3)* 04-05 (2)* 05-06 (1)*

†Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours *behind* PST and 10 hours *behind* GMT. For example, when it is noon or 12 hours in Honolulu, it is 5 P.M. or 17 hours local time in NYC and 2 P.M. or 14 hours local time in Los Angeles.

See page 110 for New Reader Service

THE awards PROGRAM

BY ED HOPPER,* W2GT

FLASH!
Robert G. Bosbach, W1BHV/K1CXP
Has Qualified For #17
USA-CA-3079 All Counties Plaque
Dated 1-2-70

USA-CA HONOR ROLL

3000		1500		500	
W5ROP	34	ZL1KG	125	W2BLM	759
2500		W5ROP	126	YU1AG	760
W5ROP	63	1000		ZL1KG	761
2000		W2BLM	186	W5ROP	762
GW3NWV	89	ZL1KG	187		
W5ROP	90	W5ROP	188		

THE March, "Story of The Month", about John Sulak, W8UMR after this data on awards issued.

Bob Bosback, W1BHV/K1CXP qualified for the BIG ONE. Obviously the fellows at Ft. Sill have stayed in good health and thus gave Doc. Blasi, W5ROP/W4NXD time to catch up on his paper work and apply for USA-CA-3000, 2500, 2000, 1500, 1000, and 500.

Bob Holt, GW3NWV qualified for USA-CA-2000 All A3A and Bob continues to be the only GW with a USA-CA certificate.

Roy C. Needham, ZL1KG became the first ZL station to reach the 1500 mark and received USA-CA-1500, 1000, and 500, all endorsed All Fone.

Dick Lennon, W2BLM applied for (and received) USA-CA-1000 and 500 the hard way—All 75 M A3A.

Another first was Djura Borosic, YU1AG who was issued the first USA-CA-500 award to any YU station. Djura is the Awards Manager for YU.

It was brought to my attention that I failed to mention in my December column that Roy Hall, Jr., WA5OCG qualified for USA-CA-2000 and 2500, endorsed All A3A.

John M. Sulak, W8UMR

John first saw the light of day, June 11, 1915 in Whitney, Pennsylvania and attended schools in Fayette County at Georges Township near Uniontown, Pennsylvania.

At the age of 9, he became interested in radio and experimented with radio receivers and transmitters, using Ford Spark Coils, honeycombe coils, spider coils, crystals and one tube.

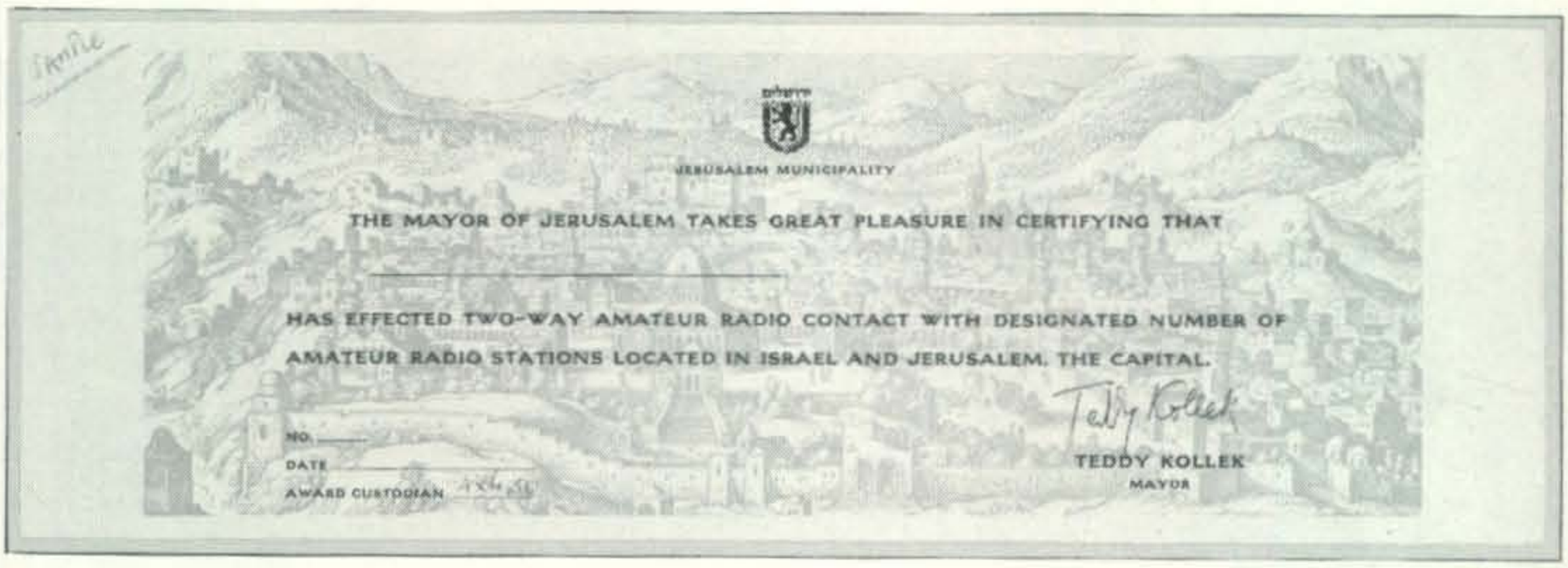
Meeting Dale Messenger, W8EUM in early 1930, really introduced John to amateur radio. A few years later, while in high school, a correspondence course in electronics was completed and upon graduating from high school, John joined the U.S. Air Corp.

An amateur license was received in Norfolk, Virginia in 1936 with the call W8UMR as John used his home address in Pennsylvania which was then in the eight call area.

John M. Sulak, W8UMR

*103 Whitman St., Rochelle Park, N.J. 07662.

See page 110 for New Reader Service



The Jerusalem Award

Later, several years were spent doing service work for Sears Roebuck and Co.

The big event, getting married, took place in 1941 before joining the CAA (Civil Aeronautics Agency) now known as FAA (Federal Aviation Administration) as a communications operator.

Amateur radio activity was mostly on 160 meters until a move was made to Springfield, Illinois and then operation was on all bands with the call W9YEP.

After the war, an interest in DX and contests was acquired while living in Columbus, Ohio and later to the present QTH in West Virginia, and John was fortunate enough to acquire his old call, W8UMR, *and* to acquire some 450 awards and certificates and his score of YLs, XYLs (QSO's) is over 2500 in some 100 different countries. (John says, and I agree, *many* are A-1 c.w. operators).

County Hunters at Fayetteville. Left to right: Bill, K4ISE; George, W1EQ; Kent, W4KRE; Steve, K3LXN; Vic, W4EXI; Dick, WA4OIV; John, K4ZLE; Paul, W4YWX; Andy, K4BXU. Among the missing in foto—George, K8VSL and Gil, W4IZR.

When the announcement of the USA-CA Program appeared in *CQ*, John was most interested and at once checked to find that he had well over the necessary 500 confirmations, but he did not apply for USA-CA-500 until June 1962 and a year later received USA-CA-1000. But his interest in County Hunting faded when he had so much trouble getting confirmations.

Then an interest was acquired for 10 meter mobiling and he used to check into many Nets. Although he did check into the old 40 meter County Hunter Net at times, a real interest was rekindled when he ran across the 20 meter County Hunter Net and he made up his mind to work at it to achieve the Top Goal.

Needless to say, many wonderful people have been worked, many great friends have been made and a most wonderful time has been had along the way.

John enjoys acting as NCS and wants to thank the many, many, many, wonderful ones who have helped him reach the 3079—naturally big thanks go to the many mobiles who go out of their way to help the many on the Net.

Our records show that John got USA-CA-500 #103 June 26, 1962; 1000 #17 on September 20, 1963, June 5, 1968 he acquired 1500 #76; 2000 #48 and 2500 #30. May 24, 1969 he made it USA-CA-3000—#20 and hit the Top 3079 September 13, 1969. CONGRATULATIONS!

Awards

WA5OCG Texas County Award: This certificate available to all Licensed Amateurs, any band, any mode, no time restrictions. The *ONLY* requirement is to work Roy Hall, WA5OCG while *he* is *MOBILE* (not fixed or

See page 110 for New Reader Service

portable) in 150 or more more TEXAS Counties. Band and mode endorsements, etc., as applicable. There will be stickers for 200 and for 254 counties.

The Jerusalem Award: The Jerusalem Award is issued to licensed amateurs throughout the world, who submit proof of 2 way radio contact with seven amateur stations in Israel. At least two of them located in Jerusalem. All contacts in any mode of operation on any band from May 15th, 1948–the day the State of Israel was founded–are valid for this award. Log extracts certified by one radio amateur, with two (2) IRCs should be sent to 4X4SO, 21 Hapisgah Street, Jerusalem, Israel.

The Cook Bi-Centenary Award: To mark the occasion of the 200th anniversary of the discovery of the eastern coast of Australia by Captain Cook in the year 1770, The Wireless Institute of Australia is issuing this Special Award. It will be available free to any licensed Radio Amateur through the world who, during 1970, makes two-way radio contact with the required number of Australian Amateur Radio Stations. 1970 is also the 60th anniversary of the founding of the Wireless Institute of Australia, the Australian Amateur Radio body which has served the interests of Radio Amateurs since 1910 and is the world's oldest Radio Society. During 1970, a new prefix is available for use by Australian Amateurs between 1st January and 31st December, 1970. The VK prefix may be replaced by the special AX prefix (either may be used, but only AX counts for this award). Contacts may be made on any band available to Australian stations. Cross band operation does *not* count nor do contacts made with ships or aircraft in Austrailian Territories. Land mobile or portable stations will count if at the time of the contact, the location of the station is clearly indicated. All contacts must be made between 1 January and 31 December 1970 and each station may be worked only once during this period. Stations outside Australian Territory must contact 50 different Australian Amateur Stations using the AX prefix. Stations within Australia must contact 100 different stations and the devision of these is a bit complicated but fully noted in all Australian and English publications. Those applying do *not* forward the QSL cards, but should submit a list of the stations worked (in order of call signs by call areas) plus the details of each contact includ-

WA5OCG Texas County Award

ing date, time (GMT), band, mode and report. This list certified by two other licensed amateurs should be sent to: Awards Manager, W.I.A., P.O. Box 67, East Melbourne, Victoria, Australia 3002. On the back of the envelope which has in it the application and certification, clearly mark, "COOK AWARD".

Notes

With the addition of the WA5OCQ AWARD, this brings to about five (hope I did *not* miss any) awards taken care of by our Independent County Hunter Net members: they include the *303* Award being issued by Cleo J. Mahoney, WAØSHE as described in December '69 *CQ*; the W4YWX Georgia County Mobile Award issued by Paul Newberry, W4YWX, mentioned in November '69 CQ and page 89 of December '69 *CQ;* the All Oregon Certificate issued by Floyd Markham, K7WQJ, see April '69 *CQ* and Floyd also takes care of the regular Oregon County Award, see July '69, *CQ;* the Worked WØKZZ/Mobile in North Dakota Counties issued by Carl Reed, WØKZZ, see December '69 *CQ*. Also it appears that an Award will soon be issued for working a required number of those who have qualified

[*Continued on page 97*]

The Cook Bi-Centenary Award

CQ BOOK SHOP

Surplus Conversion Handbook

Compiled by Tom Kneitel, WB2AAI, this contains 192 pages of conversion articles, covering almost every piece of surplus gear worth the effort to convert to ham use. $3.00

Surplus Schematics

Ken Grayson has loaded this book with schematics for currently popular pieces of conversion gear, making it invaluable to amateurs as a guide to surplus gear. $2.50

Antenna Roundup I

Edited by Art Seidman, a 160 page mass of antenna information directed at answering a multitude of questions surrounding the mysterious antenna. $4.00

Antenna Roundup II

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

Antenna Handbook

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

Electronic Circuit Handbook I

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

The New RTTY Handbook

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

Electronic Circuit Handbook II

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

Shop & Shack Shortcuts

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

The New DX Handbook

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

CQ Anthology I

1945-1952 contains valuable articles from issues long out of print and now unavailable. $2.00

CQ Anthology II

1952-1959 250 pages of more recent but still hard-to-get important articles from glorious yesteryear. $2.00

☐ New RTTY Handbook	$3.95	☐ CQ Anthology I	$2.00
☐ Electronic Circuits Handbook I	$3.00	☐ CQ Anthology II	$3.00
☐ Electronics Circuits Handbook II	$3.00	☐ Antenna Roundup I	$3.00
☐ Shop & Shack Shortcuts	$3.95	☐ Antenna Roundup II	$4.00
☐ New DX Handbook	$5.00	☐ Antenna Handbook	$4.00
☐ Surplus Schematics Handbook	$2.50	☐ Mobile Handbook	$2.95
☐ Surplus Conversion Handbook	$3.00	☐ Ham's Interpreter	$1.50
		☐ CQ Binders	$5.00

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Q AND A

BY WILFRED M. SCHERER,*
W2AEF

More On Oscar V Telemetry

Part of the item in last month's Q & A Column about copying Oscar V Telemetry was inadvertently left out. This referred to another method of determining the telemetry tones which may be conducted easily and instantaneously.

It is use of an audio-frequency meter, such as the "W3ZP Meter" described in *CQ*, July 1966, page 70. Note that in fig. 1 thereat, the polarity of CR_1 and CR_3 should have been shown in reverse.

The meter may be used at the output of the receiver for instantaneous on-spot use or at the output of a tape playback for later use from a tape recording of the signals.

For those interested in determining Oscar V's position at any time during a particular orbit, copies of an "Oscilloscope Track"[1] with polar grid are available for the asking. Send a stamped self-addressed envelope with your request.

Linear-Amplifier A.L.C. with Cyclone SR-400 Exciter

QUESTION: I have a Cyclone SR-400 which has an a.a.l.c. circuit in it; however, there is no output jack for also applying the a.a.l.c. voltage to a linear amplifier. My linear is the SB-200 which has an input jack for applying an a.l.c. voltage from the exciter. Can you provide a circuit diagram and modification steps for bringing out the a. l. c. voltage through a jack on the SR-400 for applying this voltage to the SB-200 a.l.c. input jack?

ANSWER: In respect to using a.l.c. with the SR-400 and the SB-200 linear; first of all, you do not apply an a.l.c. voltage from the exciter to the linear amplifier. This is done in reverse; that is, the a.l.c. voltage is obtained *from* the linear amplifier and is applied *to* the exciter.

This may be accomplished in the above case by connecting the a.l.c. output from the SB-200 to the junction of CR_4 and CR_5 used in the a.a.l.c. setup of the SR-400. Install a phono-type jack on the rear of the SR-400 and connect the inner-conductor terminal to the junction of the diodes. Use a shielded lead to interconnect this jack with the a.l.c. jack on the SB-200.

The a.l.c. threshold in the SB-200 might be too high, in which case in the SB-200 disconnect the cathode (banded-end) of D_{18} from junction of R_{10}-R_{11} and connect the diode cathode to ground.

Articles on Heath Comanche and Cheyenne Gear

QUESTION: I should appreciate a bibliography for articles that have appeared in *CQ* on shedding additional light on the Heathkit Comanche (MR-1) and the Cheyenne (MT-1) including modifications. Can you help?

ANSWER: The following articles relating to the Comanche and Cheyenne units have appeared in *CQ* Magazine:

"Building the Heath Cheyenne", March 1960, page 58.

"Heath MT-1 Crystal Controlled ", (HAM CLINIC), August 1960, page 79.

"Universal Power Supply for the Heath Commanche", January 1961, page 67.

"Upgrading the Heath Comanche Receiver", June 1964, page 55.

"Putting the Cheyenne on Six Meters", March 1966, page 65.

"Crystal Control for Heath Cheyenne", (Q & A Column), November 1968, page 115.

Heath SB-110/110A on A.M.

QUESTION: I should like to know if *CQ* was the publication that described a modification for adding a.m. operation to the Heath SB-110A S.S.B. Treasceiver. If so, when did the article appear?

ANSWER: Yes. An article on modifying the SB-110 to include a.m. operation may be found in *CQ*, November 1966, page 10. Additional data for doing the job on the SB-110A will be found in *CQ*, August 1967, page 75 (this includes a correction applicable to both models).

Antenna-Feedline Impedance

QUESTION: Could you please tell me if it is Okay to use 52-ohm RG-8/U coaxial cable to feed a 40-meter antenna. I understand the impedance of a 40-meter antenna is 75 ohms. I have about 100 feet of RG-8/U and would like to use it.

---

*Technical Director, *CQ*.

[1]See "The Oscillator", *CQ*, August 1965, page 64.

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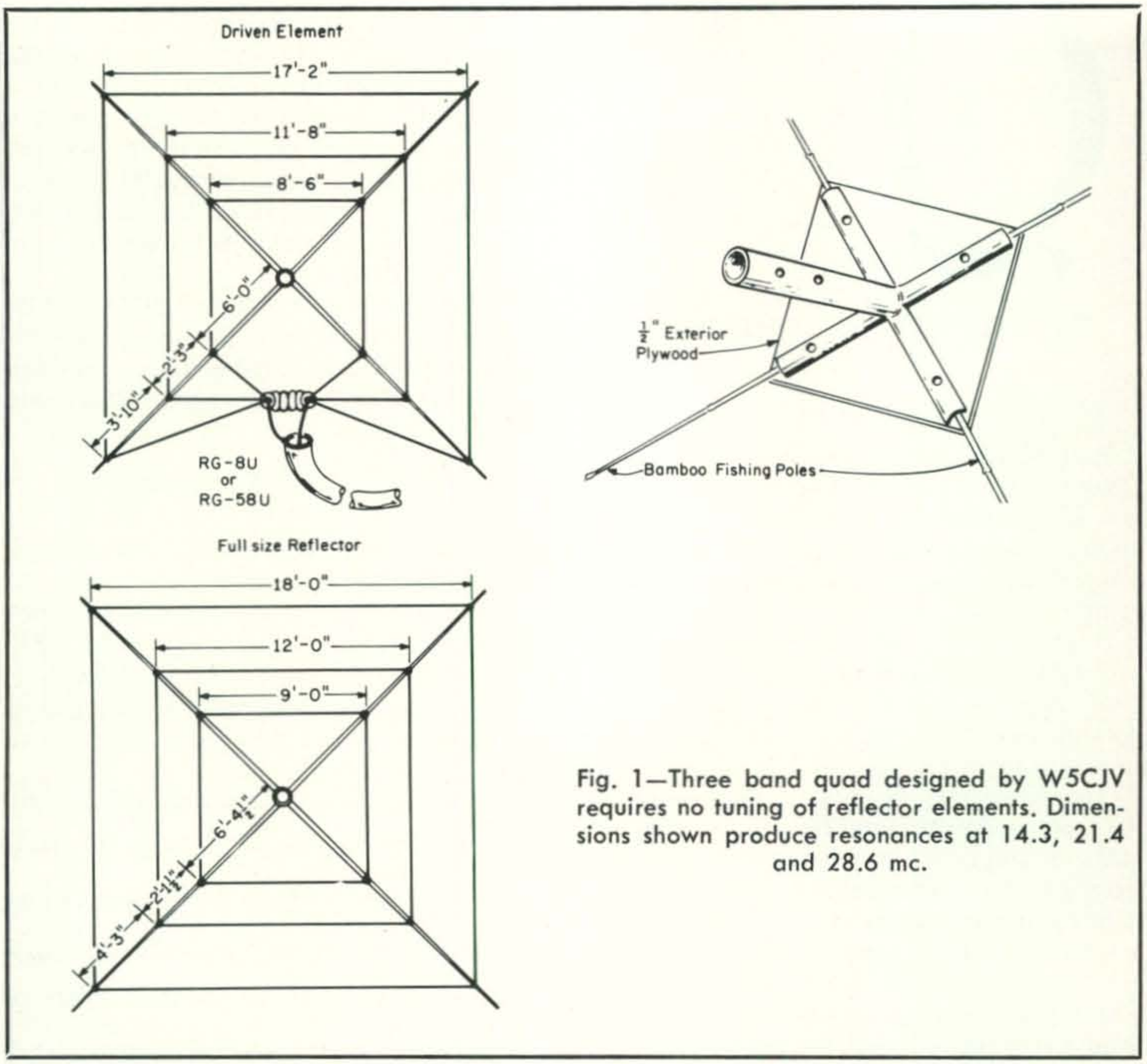


Fig. 1—Three band quad designed by W5CJV requires no tuning of reflector elements. Dimensions shown produce resonances at 14.3, 21.4 and 28.6 mc.

ANSWER: Use of 52-ohm cable for feeding a 75-ohm antenna would result in an s.w.r. of about 1.5:1 which should not be of any serious consequence.

The impedance of an antenna (such as a 40-meter dipole) depends primarily on its height above ground. It may vary between 10 and 100 ohms. For example: the theoretical impedance is about 10, 40, 75, 98, 72, 48 ohms at the respective heights of 1/14, 1/8, 1/4, 3/8, 1/2, and 5/8 wavelength. Other approximate values may be found in antenna handbooks which have a graph showing antenna impedance vs height above ground. These figures also are subject to some variation depending on the type of ground and the effects of nearby objects. Chances are that your antenna height may be such that the impedance may provide a close enough match to 52-ohms for all practical purposes, so go ahead and use the RG-8/U.

Simple Cubical Quad Antenna

Data on a simple Quad antenna, the W5-CJV Special, has been furnished by Clarence Hunter, W5ZUS, Drawer F, Tipton, Oklahoma 73570. His letter reads as follows:

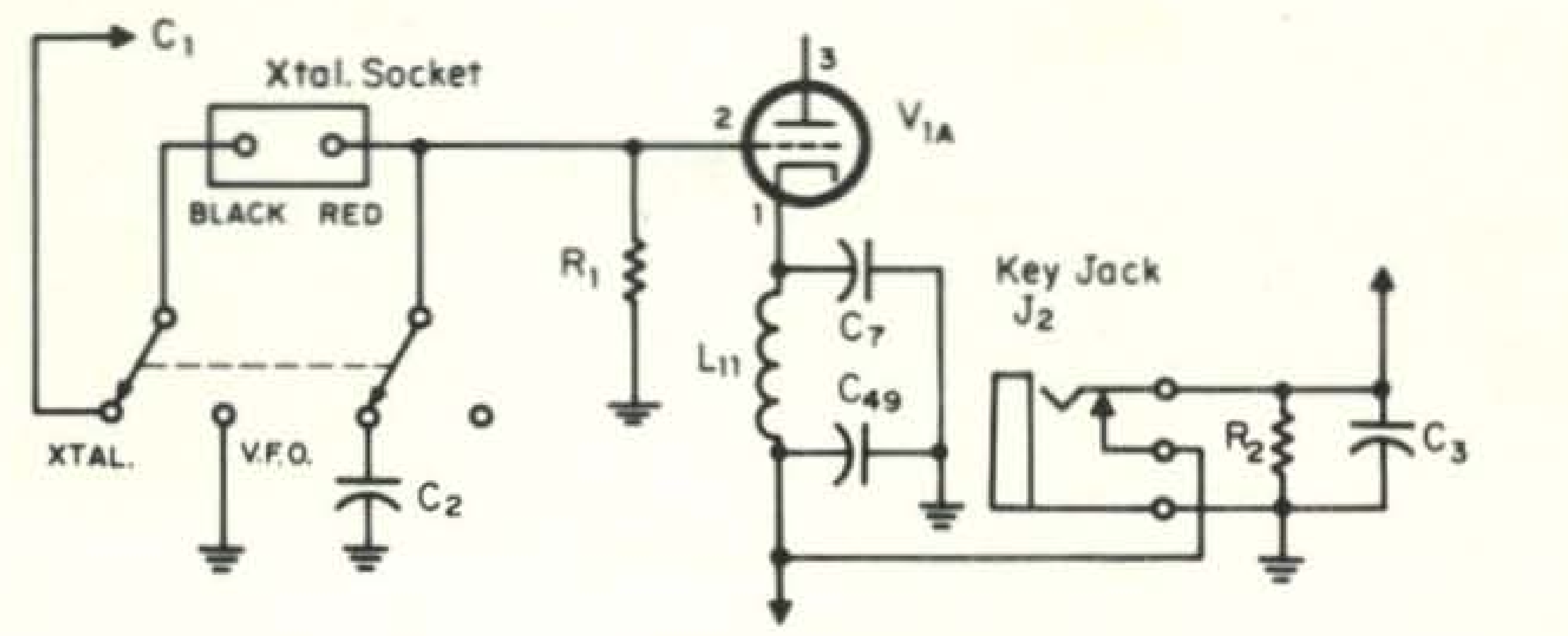
"I am enclosing a diagram of a tri-band cubical quad antenna for 20, 15 and 10 meters. The main feature about it is that it requires no tuning of the reflector elements.

"I built this quad which a friend of mine, W5CJV/OA2BH, worked out and it works wonderfully with s.w.r. less than 2:1. I did not, however, add the 20-meter sections as this makes it too bulky to mess with. Using a 1½" wood dowel for a boom, my antenna weighs only fifteen pounds. I believe this data would be of value to a lot of hams.

"I've also enclosed a diagram of a special quad spreader-to-boom fitting made out of conduit or galvanized pipe which works wonders. I have been told that the problem of

See page 110 for New Reader Service

Fig. 2—Hallicrafters HT-40 oscillator circuit modifications for improved v.f.o. drive on 10, 15 and 20 meters.



mounting a boom to the bamboo (or fiberglass) poles has been one of the main obstacles to putting up a quad in windy areas like Oklahoma. This type spreader was suggested by Novice WN5YBR".

Dimensions for the W5CJV Special are shown at fig. 1A. Data on the galvanized-pipe spreader are shown at fig. 1B.

Many thanks Cal. We hope others will find this data useful.

Dumont Oscilloscope Manuals

Requests are ocasionally received for manuals on various models of Dumont oscilloscopes. Many of these are available at a price from Dumont Oscilloscope Laboratories, 40 Fairfield Place, Caldwell, N.J. 07006.

Code Practice

QUESTION: Can you tell me where I can get some tapes for a regular tape recorder that are cut with code, particularly using code groups or mixed characters? I can copy about 35 w.p.m. in plain language, but cannot copy accurately in mixed code. I cannot tell 5's from H's or B's from 6's, nor can I copy "behind" like good operators do.

ANSWER: With regards to your request for data on a source for code-practice *tape* recordings, we suggest you contact Pikering Radio Company, P.O. Box 29, Portsmouth, R.I. 02871, and ask for details on the tapes they have available, some of which include a bit of material in code groups.

You might also try some on-the-air code practice using the sources listed in our April 1969 Q & A Column on page 79. These stations transmit weather and press; however, the U.S. Naval station (especially NSS) frequencies listed thereat also are a good source for mixed code, 5-letter groups, etc. Good mixed characters also may be found in the stock reports and the end of some of the night-time press transmissions from the commercial communications stations such as WSL.

Another suggestion is to use your tape recorder to record such transmissions while at the same time you are copying the code with paper and pencil. By using a fast tape-recorder speed at this time, you can later playback the recorded code transmissions at half the tape speed which then will reproduce the code at half the original code speed. This will make it easier for you to check the accuracy of what you have written down during the original transmissions.

The tone of the code signal, of course, will be at half the audio frequency of the original signal. During the original recording at the faster tape speed, tune the receiver for a beat note of about 1000 c.p.s., in which case the playback at the slower tape speed (one-half rate) will have a 500 c.p.s. tone.

Another thing that can be done is to record slower-type code signals at a slow tape speed and play them back at a faster tape speed to get practice at a faster code speed.

If a code-practice oscillator is available, you also might make recordings of your own sending of 5-letter code groups using many of the characters with which you are having difficulty. This may be done at a slow tape speed using a moderate code speed which when played back at a faster tape speed will reproduce a correspondingly faster code speed. Since the characters will be mixed, in all probablity you'll not remember the groupings and thus you'll not be able to "read in" what you have originally recorded. In other words this will avoid cheating (hi!). The procedure should provide good practice for overcoming the particular problems you're up against.

More Drive Using V.F.O. with HT-40 Transmitter on 20, 15 and 10 Meters

QUESTION: I have a Hallicrafters HT-40 transmitter which can be driven okay on 80 and 40 meters with a v.f.o., but sufficient

[*Continued on page 92*]

SURPLUS sidelights

BY GORDON ELIOT WHITE

SURPLUS goodies are not all sophisticated equipment. Some are rather simple things that, put to an ingenious new use, can make things more handy around the shack or workshop. Fig. 1 is a photo of a convenient container, originally made to hold computer magnetic tape but quite useful as a small parts bin.

I discovered this box at Sasco Electronics, 1009 King St., in downtown metropolitan Alexandria, Virginia, but they should be available around the country by the thousand. They are heavy, clear plastic, about one inch high and 11½ inches in diameter, with a locking knob to keep them closed. They may be stored on edge, or stacked, as in fig. 2. The boxes shown, made by MEMOREX, will nest together, allowing a reasonably tall stack to be accumulated without danger of tipping over.

Not only are these boxes useful for resistors, nuts, bolts, and other small electronic parts, but they can help keep peace among the younger members of the family. They will lock tightly enough that your five-year-old can keep his building toys in them, away from the inevitable disaster of an 18-month-old who likes to throw things. The wife can store her sewing things in them too.

*5716 N. King's Highway, Alexandria, Virginia 22303.

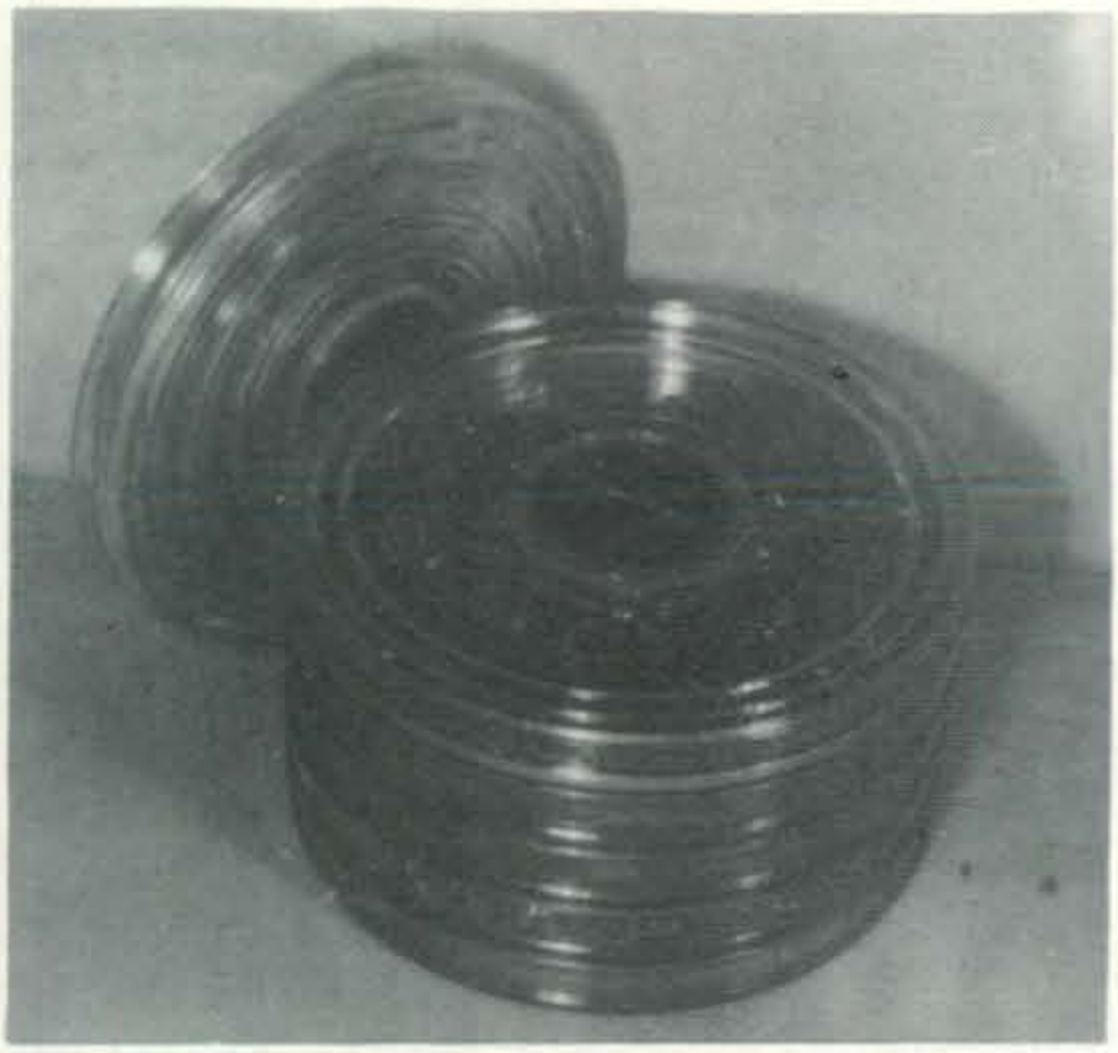


Fig. 1—A clear plastic container originally designed to store magnetic computer tape but which makes a very convenient container for small parts and hardware.

Datafax

My surplus unit for the month is the Stewart-Warner Datafax Facsimile receiver, and its associated transmitter, now showing up in surplus in limited quantities (Fig. 3).

The tube-type and early transistorized Datafax equipment, used in some quantities by Western Union, The Associated Press, and others, are available at some Surplus outlets, and may be more common in the next few months. These were designed for wire-line use, and very few, if any, were ever put on radio circuits. They are the late type electrolytic recorders, but suffer from speed and formats that are not standard with international radio fax specs.

Almost all of the wire service transmissions of a broadcast nature—sent to all of the newspapers and other subscribers in a region—are put out on a party-line wire, with each receiving office set up to record all of the pictures sent. Electrolytic recorders are used, with continuous rolls of paper requiring almost no attendance except to tear off the received photos. In this process, current is passed through a wire, wound on a helix drum, as the drum is rotated in synchronism with the transmitting drum. Current in the helix wire darkens the moist paper, and no-current condition leaves a white area. This avoids the smell and dirt of the burning-stylus method, (TXC-1; RC-92) more convenient than the photographic type recorders that require darkroom facilities. The phototype units are still employed for special transmissions or between main wire service offices, since they give better quality recordings, but the electrolytic type is far easier to use.

But the datafax units are set up to work with each other, not with the AP, UPI, weather map service, or satellite transmissions. It should be possible to adapt them for such use, but considerable rework would be necessary. The Datafax units come in various speeds, mostly not compatible with the fax services most amateurs are interested in. It is possible to buy gears for 240 r.p.m. oper-

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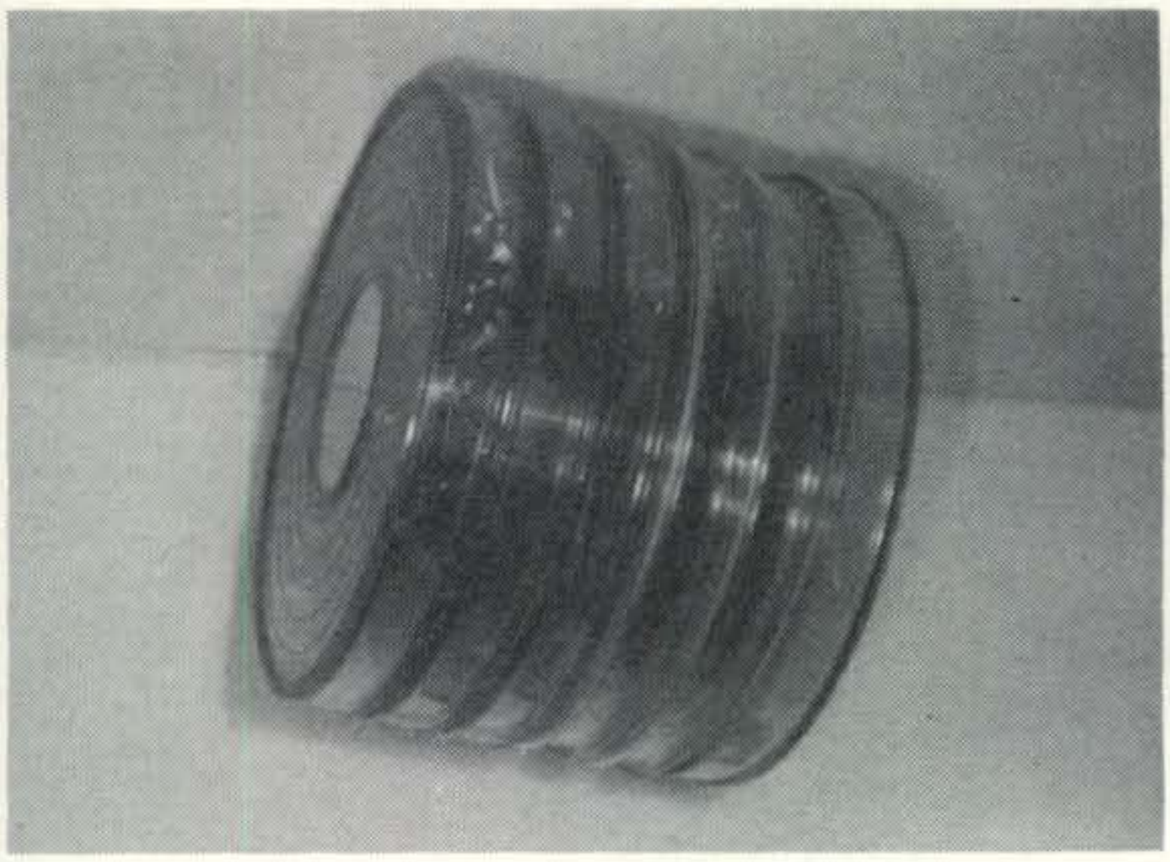

Fig. 2—The containers may be stored on edge or stacked as shown in this view.

Fig. 3—The Datafax facsimile receiver and its associated transmitter.

ation, from Stewart-Warner, 1300 N. Kostner Ave., Chicago 60651, at $88 a set, but no gears seem to be available for 60, or 120 r.p.m.

The weather satellites turn up 240 r.p.m. signals, and the common weather map and news service transmissions are at 60 and 120 r.p.m.

It should be possible to set up power supplies using solid-state frequency generation, in order to provide other speeds by varying the frequency of the power input. The original Datafax units used 60 cycle power line frequency to keep their synchronism, and by running a. 280 r.p.m. receiver on 53 c.p.s. power, you should get 240 r.p.m. By the same reasoning, a 26.5 c.p.s. power frequency should turn the thing at 120 r.p.m., but whether the motor would have sufficient torque to run that way might be debatable.

Some of the Datafax units ranged from 180 r.p.m. to 900. Carrier frequencies (amplitude-modulated audio) ranged from 2400 c.p.s. to 9500 c.p.s.—higher frequencies

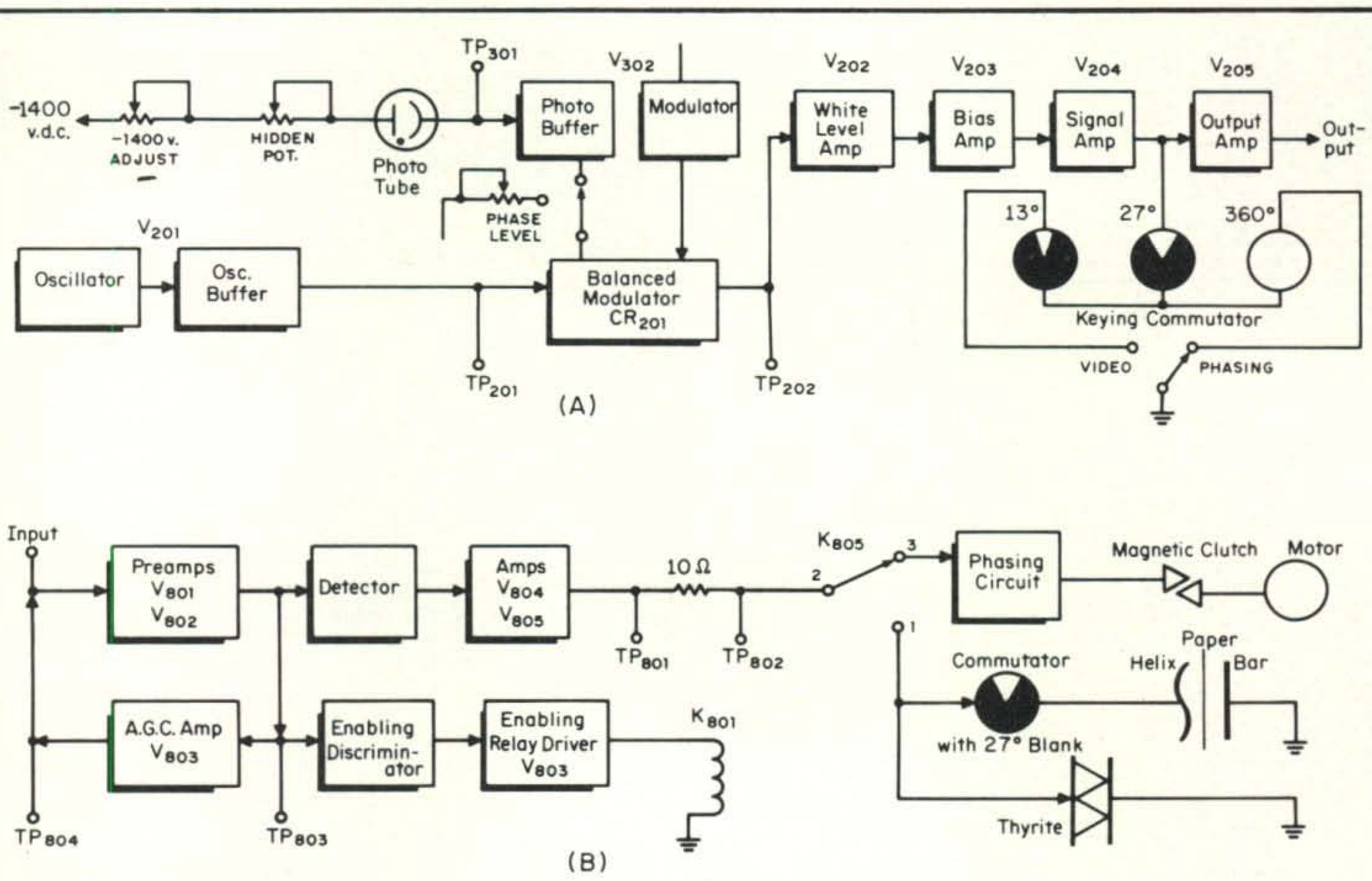

Fig. 4—(A) The transmitter block diagram for the ABC chassis. (B) The receiver block diagram and the magnetic clutch.

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TABLE:

MODEL	FILTER FL-801	TUNED CIRCUIT ASSY Z-801	L-801	L-802	C-804	C-808	R-811	R-820
FR-1824	OIP203053-1	A310301	3.0 h	2.0 h	.0047	.002	33K	33±1%
FR-3646	OIP203064-1	A110700	1.5 h	1.0 h	.0025	.0012	33K	20±1%
FR-3628	OIX203165	01A216554-1	JUMPER BETWEEN 2-3	1.5 h		.002	33K	20±1%
FR-2828	OIX203165	01A216554-2	JUMPER BETWEEN 2-3	1.5 h		.002	33K	20±1%

NOTES:
1. ALL CAPACITORS ARE IN MICROFARADS (μfd).
2. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE IN OHMS, ½ WATT, 10%, K=1000, M=1,000,000.

Fig. 5—The schematic diagram for the Datafax receiver units, models FR1824, FR2828, FR3628, and FR3645.

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for faster speeds.

A good number of the units have been sold without the electronic innards. This is not all bad, as the conversion of the original set would probably require rebuilding a lot of the demodulator, but in buying these sets one should look to see how much he is getting for his money.

Figure 4 (a) and (b) are the transmitter and receiver block diagrams of the Datafax units.

Without going too deeply into facsimile theory, the photo to be transmitted is scanned at the sending end, by a light and photocell combination, "reading" the density of the particular spot under the lens as the copy is rotated past the transmitter. In Datafax work, black is transmitted as −15 db and white as −35 db. The receiver demodulates the incoming audio signal and converts it to direct current, which is passed on to the paper by the helix wire.

Technically speaking, as a *marking* current flows through the helix wire, which is made of a silver alloy, chemicals in the paper react to dissolve a minute quantity of the bar, which reacts with a developing solution in the paper, forming an opaque image on the paper. The density of the image is proportional to the amount of current flow.

Some Datafax models have internal crystal-controlled power frequency clocks, giving better speed regulation than the usual power company synchronism, but few if any these have been seen in surplus.

There is a good deal of intricate machinery in the Datafax units devoted largely to automatic phasing, *i.e.* alignment of receiving helixes with the transmitter. This is not usually done automatically in the amateur application, but may be set up with a button that is held down, then released to phase. Rather than go deeply into that subject, I thought it more useful to devote the space to a schematic of the receiver (fig. 5).

Correction

In my discussion of the LM frequency meter, in the December *CQ* surplus Column, I perpetuated an error that was made by the Navy Bureau of Ships years ago, in one of the diagrams. Jim McMechan, WØPFP, brought to my attention the fact that through an apparent design error, plate dropping resistor

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R-116 is switched *out* of the circuit on the high-voltage position, and *into* it on the low-voltage position. Actually, the reverse would be correct. The way many LMs are wired, the neon bulbs do not ignite on low voltage and carry excessive current in the high position.

The mistake was made both in NavShips Manual 900,002, from which I copied the schematic, and in the units themselves. For better operation, the LM sets should be rewired to put R-116 in the circuit in the high-voltage position and out of it on low voltage. ■

DX [*from page 72*]

VK9KY—Via VK2SG.
VK9LB—P.O. Box 223, Berry Research, Norfolk Island, Pacific.
VKØHM—To WA6AEM.
VP2MF—c/o VE3GCO.
VP5AA—Via W1WQC.
VP5CS—To K1BTD.
VP5TH—c/o WA5GFS.
VP8KL—Via WA3IKK.
VR4EJ—Peter Butler, c/o B.S.I. Broadcasting Station, Honiara, Soloman Islands.
VU2BEO—To W3BWZ.
WX3MAS—c/o W3OK. (Send extra large envelope).
XF4J—Via XE1J.
XF4KS—To XE1KS.
XF4EB—c/o XE3EB.
XW8CN—P.O. Box 25, Vietiene, Laos.
YA1KO—Via W7WDM.
YA1YB—P.O. Box 279, Kabul, Afghanistan.
YN1GLB—To WA5GFS.
ZC4UA—Box 216, Famagusta, Cyprus.
ZD3K—c/o W9EVT.
ZD8AB—To W8BMS.
ZD8DB—Via WØELT.
ZD9BM—Via GB2SM.
ZD9BN—c/o GB2SM.
ZF1AN—Via W2SUC.
ZM1BN/A—To ZL2AFZ.
ZM3PO/C—c/o ZL2AFZ.
ZM3PP/C—Via ZL2AFZ.
ZS2MI—To ZS6LW.
3V8AL—c/o W4WHF.
5H3KJ—Via W7VRO.
5U7AR—Box 442, Niamey, Niger Republic.
5Z4LR—P.O. Box 347, Malindi, Kenya.
8QAYL—To 4S7YL.
9H1AZ—c/o G3LQP.
9J2RQ—Via WB2EXS.
9L1RP—To GW3AX.
9U5CR—c/o ON5TO.
9U5DL—P.O. Box 92, Bujumbura, Burundi.
9V1 Bureau—Singapore Amateur Radio Transmitting Society, P.O. Box 2728, Singapore 1.
9V1OI—Via K9CSM.
9V1OX—To K9CSM.
9X5AA—c/o W1YRC.

73, John, K4IIF

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Australis-Oscar [*from page 67*]

amateur satellite was launched piggyback into space. This satellite is also of considerable interest to radio amateurs since it is the latest and the largest of a long series of operational weather satellites.

TIROS-M is the first in a new series of Improved TIROS Operational Satellites, and now that it is successfully in orbit, will be called ITOS-1. This second generation operational weather satellite will not only more than double the daily weather coverage now possible from earlier satellites, but will do it at less cost, more effectively and during a longer lifetime.

ITOS-1 will provide cloud cover photos night and day, every 12 hours, and will relay these photos to earth via an on-board Automatic Picture Transmission (APT) system. A relatively inexpensive ground receiving station can be used to receive APT weather transmissions, and many of them have been built and are operated by radio amateurs.[2]

ITOS-1 is in an orbit very similar to OSCAR-5, and is transmitting telemetry data on command on 136.77 mc, and APT data on command on 137.5 mc.

Some Firsts

Among the *firsts* chaulked-up by the AO-5 satellite are the following:

First radio amateur satellite to be launched by NASA. The four previous OSCAR satellites were launched by the U.S. Air Force. With launches now possible under civilian auspices, the OSCAR program has considerably greater flexibility than in the past.

First satellite to operate in the 10 meter band. All previous OSCAR satellites operated in either the 144 or 432 mc bands, or both. This makes it possible for a much greater number of radio amateurs to copy OSCAR 5's signals than was possible with previous satellites.

Along with the TIROS-M primary package, OSCAR 5 was the first satellite to be launched by a two stage Delta-N booster rocket. The Delta-N, used for the first time, contains six solid-fuel strap-on rockets for additional thrust at liftoff.

First radio amateur satellite to be command

[2]Vermillion, C. H., "Construction Inexpensive Automatic Picture-Transmission Ground Station", NASA Report SP-5079; 1968, available from NASA, Code UT, Washington, D.C. 20546. Tuke, J. B., "Copying Weather Pictures Via Amateur Facsimile," *CQ*, Aug. 1966, page 25.

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controlled from the ground. The satellite's 29.450 mc transmitter will be turned on and off from the ground to permit weekend operation only, in an effort to conserve battery power.

First amateur satellite to contain a magnetic self-stabilizing system (MASS), to reduce spin, roll and signal fading.

Along with these firsts is also a second. The satellite is the second built by Australians to be launched successfully. WRESAT-1, launched on November 29, 1967 is the only other Australian-built satellite to make it into space. This was a scientific satellite which made solar and ionospheric observations. ■

CQ Reviews Heath V.F.O. [*from page 31*]

of the gear-drive setup in order to obtain smooth operation thereof.

Performance

As for performance, the HG-10B delivered an r.f. output of 4.5 volts r.m.s. into 50,000 ohms using the 80-meter range, 4.25 volts for the 40-10 meter ranges and 2.5 volts for the 6 and 2 meter ranges.

With frequency-stability runs made at the oscillator frequency used for the highest ranges (the 8 mc ranges used for 6 and 2 meters) the drift after a 15-minute warmup was 440 c.p.s. with 400 c.p.s. drift during the next hour and 150 c.p.s. or less per hour thereafter. These amounts, of course, must be multiplied by 6 or 18 for 6 and 2 meter operation respectively. In most cases this would be still within tolerable limits usually required for a.m. operation as mostly engaged on these bands.

On the lower bands the fundamental oscillator frequency held to within one-quarter to one-half that reported above, which with frequency multiplication up to 10 meters also held within tolerable limits.

With power-line voltage variations of ±10% the frequency held to within 25 c.p.s. on all ranges.

Subjecting the unit to mechanical stress, such as vibration or banging, gave no evidence of frequency jitter, thanks to the rugged construction involved.

After calibrating the v.f.o. through use of a receiver equipped with a crystal calibrator, as per the manual instructions, the calibration accuracy on all ranges came within a little more than the width of the dial pointer, except for a slightly greater amount at the extreme extreme end of the range.

Used in conjunction with the HW-16 c.w. transceiver, the v.f.o. keyed beautifully with the overall effect of a bell-like characteristic, yet one not too soft nor with tails. No adverse key clicks were evident. No chirp was found nor were there any frequency variations experienced when various stages in the transmitter were tuned, attesting to the effectiveness of the precautions employed against r.f. feedback.

The Heath HG-10B V.F.O. (kit) is priced at $44.95. It is a product of The Heath Company, Benton Harbor, Michigan 49022.

—W2AEF

Q & A [*from page 85*]

drive cannot be obtained for 20, 15 and 10 meter operation. I have checked with three other amateurs and they have the same problem. We have tried Eico, Heathkit and Johnson v.f.o.'s with outputs up to 5 volts. What can be done to improve v.f.o. operation on the higher bands?

ANSWER: If an early model of the HT-40 is involved, when the v.f.o.-input position is used, C_2 (22 mmf) is in shunt across the grid of the HT-40's oscillator tube (V_{1A}) to which the v.f.o. signal is applied. This capacitance could reduce the applied v.f.o. signal by an amount depending on the ratio of this shunt capacitance to that of the output-coupling capacitance of the v.f.o. Therefore, first try disconnecting C_2 to see if this provides an adequate solution.

If it does so, replace the XTAL/VFO switch with a d.p.d.t. job and rewire the grid circuit for V_{1A} as shown at fig. 2. This will automatically switch C_2 in or out as needed for either v.f.o. or crystal operation.

If the unit is a later model, the HT-40 Mark I, rewire the oscillator circuit (using the new d.p.d.t. switch) to allow V_{1A} to function as an amplifier (in the Mark I it is normally disabled during v.f.o. operation).

If the above suggestions do not do the trick, there are two other approaches with either model. One is use of an outboard cathode follower/amplifier as described in relation to a similar problem presented in the Q & A Column for January 1968, page 104.

The other approach is to rewire the HT-40 oscillator-tube circuit as indicated at fig. 2 and add a tuned circuit across the r.f. choke (L_1) at the plate of the oscillator tube (V_{1A}). This circuit should be tuned to 40 meters for 20 and 15 meter operation, and to 20 meters

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for 10 meter use. For 20 it might also be tuned to 20, but V_{1B} may tend to self-oscillate.

Atta Boy!

In a letter recently received from Arlan J. "Al" Brandt, WA3KOI of Gibsonia, Pa., he inquired as to whether or not a particular modification could be adapted to another piece of gear and if it would be a practical step. Only our *opinion* was requested. He would work out the adaption for himself.

Al goes on to say, "I have not been a ham too long, only since June 1968. I still have a lot to learn, but I'm not afraid of a soldering iron. I find that this is the only way to really learn anything".

To this we say, "That's the spirit Al. It's a pleasure to see a newcomer interested in more than just sitting back as a so-called appliance operator."

After our forwarding an opinion along with several hints, Al has since informed us that everything worked out fine in relation to the required work and the results. Congrats OM!

73, Bill, W2AEF

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A Message From The Publisher of CQ

THE average *CQ* reader, and for that matter, the average radio amateur is far above the national median insofar as both intelligence and education are concerned. And although we've found over the years that hams can be quite stubborn once they've made their minds up, we've also found that most can be quite reasonable and objective when presented with both sides of an argument. This all is leading up to the fact that certain things need to be said, certain issues need to be clarified, and certain claims need to be refuted. Some of our readers may be a bit offended by what's to follow, but we feel that the overall fairness and objectivity of the mass amateur population will prevail.

At the very recent Tropical Hamboree held in Miami, *CQ* was just one of the publishers to display an exhibit booth. During the weekend we had the opportunity to speak with literally hundreds of hams, to exchange ideas, and to get their opinions on some current problems within the ham ranks. One individual particularly caught our interest, however, because of one thing he said. This fellow, a well-dressed man, soft-spoken and probably in his early or middle forties, approached our booth, picked up an issue of *CQ* and remarked, "If you've stopped your feud with Wayne Green and *73 Magazine*, I'll probably pick up the subscription I let lapse a few years ago when I couldn't stand the bickering anymore." The reason this remark stood out is simple. Although there's certainly been no love lost between us and either Mr. Green or his magazine, the editors and publisher of *CQ* have bent over backwards during the past nine years to meticulously avoid editorial reference to Mr. Green or *73*. During those nine years only three or four total mentions have been made of the above, and only then because something appearing in the other publication was, we felt, so off base and so inaccurate as to deserve comment.

We would like to, therefore, clear the air and clarify a few specifics, and the reason is simply this: we've found it unfortunately true that if you lie or exagerrate long and loud enough about some thing, and go unrefuted, sooner or later people begin to believe the things you say. Our guilt at *CQ* has been to turn the other cheek, but this seems to have only lent credence to some of the ridiculous claims that have been made against us.

To cite an example: the front cover of *73 Magazine* carries the statement, "World's largest independent ham magazine." Largest in what, we wonder. *CQ* has far more readers (both paid subscribers and over-the-counter buyers), *CQ* carries more advertising (both in total pages and dollar volume) and *CQ* has run more editorial pages and articles over the years than *73* can ever hope to approach. In what then, is *73* larger, we ask? In its ability to cause havoc and dissension within the amateur ranks? In its ability to contradict itself more times than we dare to count? Or perhaps, in its complete disdain for the intelligence of the mature, adult amateur population?

Mr. Green has long professed to be a champion of the "pure amateur" fraternity and a firm believer in abiding by the rules and operating procedures set up by the amateur code of ethics and the FCC. We wonder, then, how many years Mr. Green will have to reside in New Hampshire before he decides that he, like we other mortals, should operate legally as a W1 rather than as W2NSD/1. Are we being picayune about this? Maybe so, but we have the feeling that people in the public eye who attempt to influence their fellow man have an obligation to be just a bit more scrupulous in their operating habits.

This past October *73 Magazine* proudly proclaimed its "10th anniversary issue," yet the same issue is volume #109. It seems to us that a nine year old in grade school could figure out that a tenth anniversary should be after ten years of publishing, not nine.

We have in our possession a copy of *73 Magazine's* subscription renewal reminder which states that the cost of postage alone is almost 33¢ (the average cost of the magazine in the offer). According to our records it costs somewhere between 3 and 5¢ to mail a ham magazine the size of *73* under the

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second class postal rates that Mr. Green enjoys.

The February issue of *73* contains an article (actually a guest editorial) attacking our company for publishing both an amateur magazine and another magazine for CBers. In that article the author states, "Through the years, however, in the pages of *CQ* magazine we have seen hints, outlines, draughts, suggestions, proposals, resolutions, and motions, all calling for the creation of additional frequencies for Citizens' Band." To this we say *poppycock*, and leave our readers to judge for themselves from the back issues of *CQ* that most of them collect. But we wonder to ourselves if this comment in *73*, as blatantly inaccurate as it is, isn't a bit strange in its timing just two months after *73* has itself announced the launching of a new magazine for CBers?

Over the years, the numerous editorials by Mr. Green, we've seen him make shady references to the fact that the president of our company spends much of his time on a "56 foot yacht" cruising around the waters of Long Island, rather than supervising his business. Well, folks, the truth of the matter is this. The president of our company went into semi-retirement some years ago and he does own a boat. But the boat at the time Mr. Green first mentioned it in *73* was a 28 foot single engine cabin cruiser, and it hasn't grown much since those early days. But here again, we wonder why Mr. Green has been so outraged. After all, when he, W2NSD worked at *CQ* his personal hobbies included a boat, an airplane, two sports cars, and a horse, all of which he managed to support on the meager salary which he struggled to eke from *CQ* at the time.

There have been dozens, no scores of comments made in *73* about *CQ* and its editors and publishers, many distortions, many exaggarations, and many outright lies. And, as we said before, over the years *CQ* has patiently turned the other cheek. We don't believe that the pages of *CQ* are the place to wage a battle of words with a competitor, and we sincerely hope that we won't feel forced to do so again. However, the air needed to be cleared and the truth was screaming to be told.

Dick Cowan, WA2LRO
Publisher, *CQ*

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Contest Calendar [*from page 75*]

Exchange: QSO nr., RS/RST and QTH; county for New Mex. stations; state or country for all others.

Scoring: 1 point for QSOs on 40, 20 and 15, 2 points on 80 and 10, 3 points on 160. Multiplier is sum of states and countries for New Mexicans, (KH6, KL7 and USA not countries) and New Mex. counties for all others. (max. of 32) New Mex. may work in-state station for a multiplier only.

Frequencies: c.w.–3565, 7065, 14065, 21065, 28065. Phone–3900, 7250, 14275, 21350, 28850. High end on 160.

Awards: Certificates to highest scoring station in each state and country, and top New Mexico scorers. (min. of 5 QSOs)

A check sheet of contacts is required for stations making over 25 contacts. Include a s.a.s.e for copy of results.

Logs go to: Bill Wageman, K5MAT, 35 San Juan, Los Alamos, New Mexico 87544, no later than May 1st.

CQ World Wide WPX SSB Contest

Complete rules will be found on page 47 of this issue. We also gave a brief rundown in last month's CALANDAR.

Rules are the same as last year, with the exception of QSO point value on the 40, 80 and 160 meter bands. Contacts on these bands are now worth double the previous value. One point contacts between stations on the same continent will count 2 points, between stations on different continents, 6 points. And between stations in North America, 4 points.

The prefix multiplier will still be counted *only once* during the contest.

Let me know what you think of this increase of QSO credit on the lower bands, and if it will give you an incentive to operate these bands.

Editor's Notes

Certificates for the 1969 WPX SSB Contest will be going out shortly so please be patient. The 1968 WW awards were also very late but you should have received yours by the time you will be reading this column.

The blame for these delays rests squarely on my shoulders, and I apologize. There are only so many hours in a day and only a small portion can be devoted to contest matters. We will try to find more time in the future.

73 for now, Frank, W1WY

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Towers [*from page 18*]

smaller top slab. More concrete filled the forms to the top and was then troweled smooth. Even though the additional concrete was poured right on top of the first batch the form didn't lift or budge at all. After it had set a bit, he edged the slab inside the form with a curved finishing trowel.

A couple of hours later, I set up a soaker hose around the base and left it on for a week. The slower concrete dries, the stronger it will be. The idea is to keep the water in the mix from evaporating too quickly. This is especially important in the kind of hot weather we had when the pour took place. In the winter, you must keep the concrete from freezing. This is accomplished by covering it with a thick layer of hay or straw with roofing paper over that. In extremely cold weather, you can get a special concrete mix that has some built-in antifreeze.

Now all I had to do was wait for the block to cure until it was strong enough to stand the stresses raising the tower would place on it. Concrete reaches about 75% of its maximum strength in 7 days when properly curing, so don't rush to raise the tower or you may find yourself with a few tons of cracked concrete—and then what do you do?

Here's another free bit of advice—if you're not doing it yourself, be there when the base is set and the concrete is poured. My contractor obviously knew how to handle concrete, but wasn't very good with figures. Had I not been present, the tower base would have been set about four inches deeper into the concrete than called for. It doesn't sound serious—but had this happened, the tower could never have been tilted and the tilt-base would have been a complete waste.

Next month we'll continue our description of the tower and beam installation, much of which can be accomplished while the concrete base is curing. ■

USA-CA [*from page 81*]

for All 3079 Counties—details soon, *and* it is thought that Jack Shipman W5DAU will soon decide to issue an Award for working him mobile in a required number of counties!

A telephone call from Reno, Nevada from Jack Carpenter, K8MNG to the effect that his friend, the Chief of Police of Carson City advised him that on September 4th, 1969, the County of Ormsby was taken into Carson City and that Ormsby is no more. A

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telephone call to the state capital confirms this but no-one seemed to know what an Independent City was—so to keep the grand total at 3077—contacts with old Ormsby County and Carson City will count as ONE. Yes, you know we lost Princess Anne and Norfolk Counties as of January 1, 1963—but fear not—if you get the other 3077, you can qualify for the Plaque.

A telephone call and letter from William M. Nash, K4FSJ, Director, Convention Bureau, 705 Gay Street, Knoxville, Tennessee 37902 to remind you that the Independent County Hunters Convention's new date is the week-end of July 4-5—make reservations *now*. Old date was June 27-28.

AGAIN thanks to Bill Todd, K4ISE for the photograph of some of the fellows who gathered in Fayetteville last November.

What a month—wow some time off, some illness, and some jury duty, not yet finished—How was your month?

73, Ed., W2GT.

Scratchi [*from page 12*]

feeling all that strongly about keeping the date of Amchoor Day a secrut.

I meen, like if you thinking there being some slite benefit to having peeples know when Amchoor Day is each yeer . . . if companies want to buy lots of ads . . . if I getting lotsa presents on Amchoor's Day . . . well, I can swallow a lot of corny poetry:

It's Amchoor Day—let's celebrate,
You and I know it's grate—just grate,
And if we reely use our noodle,
Man oh man—will we get the boodle!

Respectively yours,
Hashafisti Scratchi

Remote Tuning [*from page 45*]

the band segment where the transceiver p.a. tuning and antenna require no retuning, but yet allow the transceiver in the receive mode to tune a much wider range so one could more broadly check band activity. Still another possibility would be to have separate transceiver receive-transmit frequency control (using separate ten-turn potentiometers at the remote position) or selectable transceive frequency operation.

All of these possibilities, as well as several more, can be accomplished using the ideas already presented, either separately or by combining them. For instance, in the case of the circuit of fig. 3 (B), the bias voltage range

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in the receive mode could be increased to permit a greater tuning range but restricted in the transceive mode to the selected range. Thus, one could incorporate in the remote control box a BROAD-TUNE/TRANSCEIVE switch. In the BROAD-TUNE position, receive only operation (to protect the p.a. from damage) would be possible. Similarly, one could have separate remote potentiometers control either a single or separate voltage-controlled capacitane diodes in the receive and transmit modes with transceive control being switched to one potentiometer when desired.

Summary

This article has not tried to present in detail the full remote control operation possibilities of any specific transceiver but rather to present a number of ideas which can be applied in a simple or as elaborate a fashion as desired. The basic idea has been to illustrate that with simple multi-conductor intercom type cable between a remote control unit and a transceiver, full range control of any low-level circuit function is possible without resorting to any mechanical control systems. ■

Invisable Ham [from page 41]

too preoccupied to notice. Ed must have seen it, because he raised the subject himself over coffee:

'Don't take it so seriously, old boy. I know how you feel—I was an idealist once myself. The adventure of working DX, the thrill of snagging a rare one and all that. But that's just not the way it works. The rules of this game are the same as for all the others. I discovered that equipment had gotten more important than operating, and I just drew the logical conclusion and went all the way. In a few years, it'll all be like this—computers working computers. Remember John, virtue is knowledge." He paused. "Look at it from the positive side, John. Think of all the tedious hours of DX hunting I'm spared, all the dreary QSOs with their endless exchanges of signal reports and equipment descriptions." He shuddered. "Now I have time to do the things I really enjoy."

I had nothing to answer.

Mary and I drove home the next day and we no longer have breakfast in bed. We're lucky if we have breakfast at all. It's been three months since our visit, and I haven't been on the air since. I don't seem to have much interest anymore. Mary keeps talking

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about the wonderful time we had with Murielle and Ed, and she's already pestering me about seeing them again next year, but I don't think we can afford it. They could come and see us, I suppose, but I doubt if Murielle would enjoy it. Ed would. He's no snob, he's adaptable, and as I said, he's a very methodical man. ■

Preamplifier [*from page 37*]

associated with the amplifier were mounted directly around the tube socket, some being below the perforated board to take advantage of the shortest possible lead lengths. If the board is mounted in a plastic enclosure, the fastening of the dual variable capacitor shaft to the front panel of the enclosure will easily support the entire board assembly. Otherwise, either an insulated shaft coupling has to be used with a metal enclosure or an insulating washer around the rotor shaft mounting and a non-metallic tuning knob.

Installation and Tuning

As mentioned before, the main point to remember when installing the preamplifier is to keep the coaxial line between the preamplifier output and transceiver antenna input as short as possible. The correct action of the bypass relay within the preamplifier should be verified with the preamplifier tube initially removed. Otherwise, the tube will be lost if the bypass relay does not shunt the antenna line around the preamplifier when the transceiver is in the transmit mode.

Once proper bypass relay operation is established, the preamplifier tube can be installed. The input circuit should be tuned for maximum response when tuned to a weak signal or just to input noise. A definite "peaking" in the noise or a weak signal should be observed as the tuning capacitor is varied, starting with near maximum capacitance on the 80 meter band and ending with near minimum capacitance on the high end of the 10 meter band.

Summary

The preamplifier circuit described is especially recommended for those amateurs who realize the "compromise" aspect of many transceiver receiver portion input circuits. The perforated board construction method allows a tube type preamplifier to be built in one or two evenings' time with an absolute minimum of tools or constructional difficulties. ■

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JUNE 7, 1970—Save this date for the Starved Rock Radio Club Hamfest. Same place as last year. Details on request after April 1, 1970. Write SRRC/W9MKS, G. E. Keith, Secretary-Treasurer RFD #1, Box 171, Oglesby, Illinois 61348.

FOR SALE: BC-610 transmitters modified for commercial use. $35.00 each. Post Office Box 23503, New Orleans, Louisiana 70123.

AUCTIONFEST: Broward A.R.C. Saturday, March 14, Chaminade High School. 500 North 51st Ave., 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 Street 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.

WINTER BLUES? Cheer up! You have the ARRL Hudson Division Convention to look forward to! Exhibits lectures, Contests, Gabfests, New York City Sightseeing, Fun. October 17-18, Hilton Motor Inn, Tarrytown, N.Y. Hudson Amateur Radio Council, Box 58, Central Islip, N.Y. 11722 has the happy news.

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WANTED: 2 meter F.M. equipment, Pohn Petrek, W8BNO, 424 Lewis Seifert Rd., Hubbard, Ohio 44425.

WILCOX 96A, 96C3, CRI43007, 233A, ARC5S, 405-1, Instruments, meters. Capacitors oil & mica some Collins xformers, chokes & RF coils. Rec. xmitting tubes 2K25, 2C43, 2C46, 723AB, 715C, 3E29 others. Spectra 70 diode logic unit. 60 plug in boards. Driver 28 boards with magnetic memory unit. Ferrite corc stacks. Stamp for list. Doug Craton, 5625 Balfrey Dr., W. Palm Beach, Fla. 33406.

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MANUALS—R-274/FRR, TS-323/UR, $5.50 each; R-390/URR, R-390A/URR, $6.50 ea. Many more. List 20¢. W3IHD, 4905 Roanne Drive, Washington, DC 20021.

LOOP new communications system details for $1.00 write George WA4NQR, 102 Willow Rd., Savannah, Georgia 31404.

RAGS hamfest Syracuse, New York, April 11, 1970 at Song Mountain. Box 88, Liverpool, New York. 13088.

SALE: SX 96 Hallicrafter $100. Hq 170 Hammarlund $170.00. Ht 37 Hallicrafter $200. TR3-RV3-Pwr Supl, $480. Ranger 1, $67. Cashier Ck- F.O.B. P.O. Box 684, "K5ROE". Nederland, Tx. 77627.

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AUCTION—March 22, 1970, at Lamb's Auction House, 1600 N. Oak, Champaign, Illinois. Sponsored by the Twin City Amateur Radio Club. Details, contact K9QZI, Milt Forsberg, 807 W. Charles Street, Champaign, Illinois. 61820.

SALE: Clegg Zeus $300 and Interceptor $325; Drake TR4 with power supply $500 and R4B $325; Olson "6" with Lafayette 6 & 2 VFO $100. All mint condition, factory manuals and cartons. Any reasonable offer considered. Barney Scholl, 1655 Kimberly Road, Sharon, Pennsylvania. 412-342-4462.

"QSLs: Samples, 6¢ stamp. K5HYB, Rt. 6, Box 527A, Pine Bluff, Ark. 71601.

SELL: CQ magazines continuous run January 1947 to November 1969. $40 plus shipping. James Scott, W9CWH, 706 No. Elmhurst, Mt. Prospect, Ill. 60056.

WANTED: 1000 T tube triode urgent its an old tube for my 20M Lin. VE7WJ, 1770 Regan Ave., New Westminister, B.C. Canada.

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SALE: SB33, good shape, mike $150; HW-16 very good $95; Eico 722 VFO, 14AVQ, both almost new; all manuals. John Chapman, WA5VCT, 3214-A Hemlock, Austin, Texas. 78722.

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SWAN 350 (late model) Plus 117XC power supply with speaker. $300.00. F.O.B. Omaha, J. R. Belt, 1006 N. 76 Street, Omaha, Nebr. 68114.

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FOR SALE: DX-100 $50.00, mint condition Warrior Kilpwatt Linear amplifier $135.00. Dennis Quinn, 88 Woodrow Ct., Sharon, Pa. 16146.

FOR SALE: VHF-152A converter for 6, 10, & 15 meters in good condition. RCA WO-91A Oscilloscope, 1076 B&K Analyst all in good condition. R. Dorough, W5-DPN, 117Pecan Street, Terrell, Tx. 75160.

SELL: Collins 30L-1 Linear—Swan 508 V.F.O. WA3-HMQ—301 Blacksmith Rd., Camphill, Pa. 17011.

WANTED: Operating manual or copy for Johnson Ranger I. A. Van Osdel, 2202 N. 40th Drive, Phoenix, Arizona 85009.

WANTED: Heathkit model IO-18 or IO-12 oscilloscope or knight kit model KG-635 scope. Also want good mutual inductance tube tester and Heathkit HX-10 transmitter needing repair. Glen Anderson, 1100 New Jersey Ave., Pine Beach, N.J. 08741.

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FOR SALE: Hallicrafters HT-37 ssb-cw 180 w. transmitter. In good condition, $160.00. Larry, WA9WPO, Strasburg, Ill. 62465.

WANTED: Central electronic MM-2 instruction book. H. Frank Jordan, W5EDX, 2334 W. Mulberry, San Antonio, Texas 78201.

FOR SALE: DX-100 needs a little work but operates $45. JT-30 microphone $8.00 old rider manuals Vol. 1-15 best offer over $15.00. DK-60G2C relay over $8.00. HA-10 Warrior Linear amplifier in Al mint condition, $125.00. WA3EIP, 88 Woodrow Court, Sharon, Pa. 16146.

JOHNSON VIKING II transmitter and matching VFO. Excel. cond. Sacrifice $75. (516) 374-1532 or write Dick Hopp, 1185 E. Bway. Hewlett, L.I., N.Y.

FOR SALE: Sideband slicer, Model A with AP-1 adapter and manual $25.00. Thomas O. Crow, W6-HGW, 5801 Ambler Street, Sacremento, Calif. 95823.

SWAP: Drake 2NT transmitter only used four months for a Heathkit HW-22A 40-meter rig, in equally good condition. WA1JLV, 71 Canonchet Dr., Portsmouth, R.I. 02871.

BC-221, AC supply and Calibration Book. $35.00. or trade for 16mm movie equipment. Norman Ince, 3240 Dartmoor Drive, Dallas, Texas 75229.

FOR SALE: Drake 2B and 2BQ, like new, $180.00. Drake 1KW, Low pass filter, $9.00. John Bricker, W4EPZ, Sunshine Villas-G8, Lehigh Acres, Fla. 33936.

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WANTED: Mint HBR-13c with schematic and modifications. State details. K3QEQ, 725 Patterson Ave., DuBois, Pa. 15801.

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FOR SALE: Heath SB-10, separate power supply. $50. R. Zeran, 304 E. CHestnut Street, Rome, N.Y. 13440.

SALE: So. California area only Tilt-over, crank-up tower, Yagi Antennas, Ham-M & Etc. Complete installation. Phone for details. 714-962-5940. A. Emerald, 7956 Swallow Ave., Fountain Valley, Calif. 92708.

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POSTAL EMPLOYEES—Active and retired. National net opens Tue thru Sat 0330Z 3597 kHz. For info contact W8QCU.

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WANT DB-22A or DB-23 preselector in excellent working condition. Please describe condition and price. K8IKO, Box 222, Worthington, Ohio 43085.

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WANTED: Heath HA-14 SSB amplifier (no power supply) for conversion to 160 meters. Unit can be partially dismantled or inoperative. W2BP, Al Segen, 101 Collins, Pleasantvile, N. Jer. 08232.

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SELL: Johnson Viking Challanger Xmitter—$45. Lafayette HE30 receiver with HE 56 converter—$50. Krakauer, WB2DKF, 199 S. Allen Street, Albany, N.Y.

WANTED: SSB exciter (3 watts) SB-10, CE-10A, Home Brew, etc. for Valiant; also Vibroplex WA2JJF, Gary Whitehead, 6 Reynolds Rd., Glen Cove, N.Y. 11542.

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LINEAR: CE 600L Broadband no tune! 6 Bands incl. 160M only 20w. drive $190. J. Taylor, W2OZH, 1257 Wildflower, Webster, N.Y. 14580.

FOR SALE: Hallicrafters SX-110 in very good condition, $80. Wanted: Manual RBA-1. Joseph W. Pinner, Jr., 1380 Laman, Apt. 406, Memphis, Tenn. 38104. Locals only on Rec. 275-3259.

FOR SALE OR TRADE: Eico 722 VFO like new $39.00, Johnson TR switch 250-39 $9.00, Heath SWR bridge AM-2 $7.50, RME 4350 A $89.00. All good condx., Ron Martinmaki, Rte. 3, Box 200, La Crosse, Wisc. 54601.

SELL: 2 Mtr FM complete with Ant. 12v. All/set for .34/.94 repeater. $90.00. WA2AMU, 208 Third Ave., Kingston, N.Y. 12401.

FOR SALE: Dodge gen parts and info on conversion to alternators. H. Bard, W6EOS, 391 5th Ave., Chula Vista, Ca. 92010.

POLY-COMM 6-2B. Perfect condition. $150. WA4ILQ, 11002 N. E. 13 Ave., Miami, Florida. 33161.

WANTED: Heath AM-1 Impedance meter with manual in good condition. Lonnie F. Gillilan, W5DHZ, Route 1, Warner, Okla. 74469.

FOR SALE: Swan 500-C, AC & DC power supply, VOX, Speaker, $500. Has about only 10 hours operating time, just like new. HQ-180AC & speaker $300.00. Viking 11 & VFO $100.00. Darell Preston, K0JID, Mt. Hope, Ks. 67108.

EICO ELECTRONIC KEYER Model 717 wored and tested. HQ 170 AC 160 to 6 meters no scratches guaranteed. Wanted 2 meter xcvr make and condx please. F. Colella, 105 18 131 Street, Richmond Hill, L.I., N.Y. Phone MI 1-2559.

WANTED: Receivers 8503-8507-8506B-8510-3001A-3002A-0128AV write Box 8352, Savannah, Georgia 31402.

FOR SALE: Adventurer, $50.00, Af-67, AC Supply, Challenger, each $100.00. HQ-170 AC, $250.00. W4-ZGY, 1801 Alaska Drive, Richmond, Va. 23224.

FOR SALE: 2-RCA 826's, one National Vernier Dial "oldie'—Purchased 1926. Make offer. R. Fisher, K8-KRK, 466 S. Sandusky Street, Tiffin, Oh. 44883.

FOR SALE: GE pre-prog Base station, ET7BZ & ER7-B2, 50 watts—on 29.6 MHz—$60.00. Phone 232-7746.

COLINS TRANSCEIVER WANTED KWM1 must be reasonable and good condition. C. K. Brosius, WA6-SAH, 6427 Crafton Ave., Bell, Ca. 90201.

GONSET, 2 meter, Comm. II, 12V-117V. With Gonset 2 meter V.F.O., Telerex 2 meter Spiral ray Ant. and 2 meter vertical. $175.00. W2ASI, 15 Kensington Oval, New Rochelle, N.Y. 10805. 914-NE 3-7077.

FOR SALE: Heath scope, 10-12 Grid dipper Tv and FM Gen. electronic switch. Many other items. Write E. B. Schofield, 301 N. 3rd Street, Lantana, Fla. 33460.

WANTED: KWS 1 power supply state condition, BIRD Mod. 43 elements. W4ELL, W.R. LaVielle, 709 Daneshall Dr., Louisville, Ky. 40206.

EICO 460, EICO 232, LO-CAP & Demod. Probes—Both $95.00. T. Gosman, 143 Roxton Rd., Plainview, N.Y. 11803.

FOR SALE: Heath SB301 $250 SB401 $275—$275.—misc. RTTY gear, W3INW, Phone: 215-535-0448.

FOR SALE: Johnson Viking II, and Globe DSB-100. Want Autronic Keyer WA6HCH, Larry Plummer, Box 502, Lathrop, Calif. 95330.

WANTED: Old battery operated radios of the early 1920's. Need not be in working condition. State your price. McKenzie, 1200 West Euclid, Indianola, Iowa. 50125.

TWO PUSH TONE TELEPHONES. Onet desk (pink) one wall (white). Excellent condition. You make offer. WN2LSW. Marty, 379 Adams Ave., West Hempstead, N.Y. 11552. Tel. (516) 489-5899.

SIX METER AM, HALLICRAFTERS SR46A and HA26 VFO. Like new in factory cartons. Sell $125. Open for offers or trades. WA5WGO, 4911 Western, New Orleans, La. 70122.

PACIFIC-SOUTHWESTERN Divisions ARRL Convention. May 15-17, Travel Host (Hacienda) Motel. FARC, P.O. Box 783, Fresno, Ca. 93712 for details.

WANTED: 75S-2 receiver or 75S-1 in any condition. Meter for Ham-M rotator. Mike Ludkiewicz, 143 Richmond Road, Ludlow, Mass. 01056.

WN5YDB Gregg county will sked on 15 cw Mark Waldman, 308 Horseshoe, Kilgore, Tx. 76552. Wanted: Old issues of CW & 73.

FREE MAPS of world showing all three maritime mobile regions. Not fancy, but adequate. SASE, K8-YUW/5, 2020 29th Street, Gulfport, Ms. 39501.

WANTED: Johnson Tapped Base Loaded Mobile coil. W3MSN, 5400 Boulder Dr., Oxon Hill, Md. 20021.

NEW MEXICO QSO PARTY will be held April 4-5. See contest calendar for rules. Wm R. Wortmatn, W5QNY, P.O. Box 305, Los Alamos, N.M. 87544.

SALE: Linear amplifier 1000 watts, Hunter Bandit 1000A L.N. $149.50. Wm. Sakal, 62 Bacon Hill Rd., Pleasantville, N.Y. 10570 Ph. 914-769-0866.

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FIFTH ANNUAL HAM AUCTION and Flea Market sponsored by Penn Wireless Radio Club will be held on March 8, 1970, at Fairless Hills Community Center Fairless Hill Penna. open saes from 10AM til—?? Auction from 2PM till 5PM. Table space $1.00. A 2 meter FM repeater demonstration will be held. Talk in freq. on 39 20MC., 146.34 FM. Held indoors rain or shine. For further informmation write WA3HBT, Bob Almeida, Box 111, Cornwells Heights, Penna. 19020.

TRADE: $700.00 Vega Pro II Banjo for ham gear. W7-SOC, Box 75, Coos Bay, Ore. 97420.

STAMP COLLECTORS exchange your surplus U.S. stamps. Send me 25-200 Diff for 25-100 of mine. W9GET, J. Moore, 24W-538 Lake Street, Roselle, Ill. 60172.

JOHNSON MATCHBOX 250-23-2 $75; Vibro-Keyer $12; M&M Keyer EK-1 $25; Dow Key DK60-C $12; WB2CKU, 7 Bowen Place, Stony Brook, N.Y. 11790. 516-751-8792.

FREE TV TRANSFORMERS—U pick up. Retired, so usually at home. Cellar full of surplus—What do you need? WB2OBO, 1533 Lowell Ave., New Hyde Park, L.I., N.Y. 516-FL 4-7152.

SWAP TS-175/4 freq. mtr. 85-1000 MHz orig. cal. book for stable gen. coverage rcvr (SX100 etc.) Del 200 mi. D. Townsend, RR#1, Box 272A, Fortville, Ind. 46040. K9JGJ.

BC-458 (Command xmitter)—$8.00; BC-946 (BC band command receiver)—$18.00. Both like new. Cal Enix, W8EN, Box 474, White Pigeon, Mi. 49099.

RME-69 Gen. cov. xcvr, .55 to 30 MC. Circa 1939 with manual. Original and working. Make offer. WA2FFZ, 186 West Ave, Pitman, N.J.

SB-200 Excellent $185.00 firm. Money order or casher's check. Fred Alden, W8JTD, Box 222, Baroda, Mi. 49101. 616-422-1040.

FOR SALE: Hallicrafters HT 37 transmitter and SX-101A Receiver. Perfect condition. $350.00. takes both. But you pick up. W2GIE, Ph 212-926-3961.

COUNTER—Berkeley 554B, 10 cops to 100 kc. Checked with Cushman and reads and works perfecr. $175.00. net. Pepos S. Douson, 914 W. Mistletoe Avenue, San Antonio, Texas 78201 512-735-5554.

WANTED: HP-524A Frequency Converter or any plug-in for HP-524B or HP-524C or Northeastern Engineering Inc. 14-20C Counters. Pepos S. Douson, 914 W. Mistletoe Avenue, San Antonio, Texas 78201 512-735-5554.

FOR SALE: HW-12, xtal calibrator, mike, DC power supply & Hustler for bumper. Also, 1500 watt 115V Alis Chalmers Generator, K4OJB, Ben. 703—552-5421. Blackburg, Va.

SSB EXCITER, 100 watts for sale with Collins PTO and modulation scope built-in, with power. R. Mendelson, 27 Somerset Pl., Murray Hill, N.J. 07974.

40 METER BEAM 2 element, Hy-Gain 402BA $119.00. WA6OLB, John Stransky, 924 E. Leslie Dr., San Ganriel, Cal. (213) 285-2912.

WANTED: Collins Mechanical filters: 500B-08 also 500 B-14 and 500B-31. State price and condition. W4AIS, 300 Thornwood Dr., Rt. 4, Taylors, S.C. 29687.

SELL ONLY: Complete parts for KW linear. Power supply built and working from QST Feb. 66 Page 17. RF section to be completed. Includes three 813. $75. WB2U2W, 10 Scott Street, Massapequa Park, N.Y. 11762.

SELL: Heathkit-Apache trans. Brand new, never on the air. Wired, ready to go. FB Rig for CW Traffic. ($75.00). Phone 714-443-2213.

WANTED: Heath Chippwax KW linear amplifier with or without power supply—L8NLM, 1109 Graystone Drive, Dayton, Ohio 45427.

GONSET GSB MKIII 2.K.W. PEP Linear 4 572b's for $250. SWAN 350 with 110-220 ac supply and 12v dc supply $350. Or best offer. G. Woodhouse, 15 Tanners Lane, Levittown, N.Y. 11756.

WANTED: Heavy Duty 70′ or 80′ crank up fold over tower. T. G. Soukup, Rfd 3, Bob Hill Rd., Ridgefield, Conn. 06877.

WANTED: Set of coils for Central Electronics 10A exciter. E.J. Bundschuh, 503 Evergreen, Sherman, Texas 75090.

FOR SALE: Ameco PCL-P preamp $23.00. Knight P-2 SWR $11.00. Johnson 6N2 converter $39.00. Collins DL-1 $35.00. W8IIT, 281 Jenny Lane, Dayton, Ohio. 45459.

FOR SALE: Hallicrafters HT-37 ssb-cw 180 w. transmitter. In good condition. $160.00. Larry, WA9WPO, Strasburg. Ill. 62465.

SELL: EICO 430 scope and probes, $70; Knight T-175 6/10 meter linear, $60. Paul V. Skinner, W9QXR, Research Hosp., Galesburg. Ill. 61401.

LK 2000 BTI Linear for sale; $495. WA6ZCQ, Ph. 213-663-1581.

WANTED: Circa 1912 Weagant valve, Welsh 501, Spherial bulb UV204, and other antique tubes. W9-LGH, 610 Monroe Ave., River Forest, Ill. 60305.

WORKED SOUTH AMERICA CERTIFICATE: Work all 13 countries. Send $1 and confirmation to HC1TH, Box 583, Quito, Ecuador, South America.

TOROIDS 88 mh uncased 5/$1.75 pp R.H. Sanborn, 8800 W. Clovernook Ct., Milwaukee, Wisc. 53224.

3 BC-221s; All good condx w/books: $60 each. First 3 cert. chks/M.O.S. Take. G. Seymour, WA2HVN, 433 Valley Dr., Syracuse, N.Y. 13207.

WANT SB101 with AC/PS or SB301/401 combo. W5-AYI, 6015 Lattimer, Houston, Texas. 77035.

SELL: (2) Motorola handie talkies Fptr, 30 to 50 Mc. $20 each; Montitoradio DR200 $90. J. Wasiewicz, 229 Sarles Lane, Pleasantville, N.Y. 10570.

WANTED: SB-610 & Drake Low Pass filter, for sale Preamps $5.00 new—Phil 11820 Engleside, Detroit, 48205.

WANTED: 1Z2 rectifier tube, scope bezel for CV-60/URR, power cable with connectors for RBB/RBC receivers. L. R. Pfleger, K9WJB, 5405 Century Ave., Apt. 208, Middleton, Wis. 53562.

WANTED: KWN 2, AD & DC P.S., Mounting and Car Antenna. Schwartz. Call Day (914) 668-3534; Night (914) 668-3677.

SELL: DX-60A $59, HG10 VFO $25, DK-60-G2C Ant. Relay $9, Astatic 335H mike $5, as package $88. W0EJE, Rfd 8, Box 364, Springfield, Missouri 65804. 417-881-5526.

WANTED: CE200V or CE100V with factory 160 meter coils E. Erickson, W2CVW, 13 Robert Circle, So. Amboy, N.J. 08879.

FOR SALE: DX100 Trans. $65.—HT32 Trans $165.—CE20A trans. $75.—Eico trans. w/751-752 supplies—$225. KOUDF, 1100 N. Duluth, Sioux Falls, So. Dak. 57104.

SELL: Xfmr, 2950 VCT at 500 ma; 115/230 Primary, $35.00; Fil. xfmr. 7½ V at 21 amps, $15.00, WANTED: 4-1000A, WB2YRU, Al Povol, 3538 Centerview Ave., Wantaugh, N.Y. 11793.

33 ASR and 33 KSR cabinet. Sell or trade of 33 page printer or tape equipment. D.C. Harrington, K0SHK, 1620 Gardena Ave., Fridley, Minn. 55421.

COLLINS FILTERS FOR SALE: (75A-4) 500 cycle $45; 2.1 Kc $40; 6 Kc $25. AR22 TV Rotator, excellent condx. $16. Rev. Bittner, W0AIH, 814 4th St., S. Virginia, Minn. 55792.

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FOR SALE: Jones Mciro Match meter complete—mint $25.00., also Reflector SWR and in-line meter $20.00. K3YMN, 2185 Sampson Street, Pgh. Pa. 15235.

WANTED: 500 hz filter for 75A4. Also need instruction book for 32V3. Advise price. Harold Cagle, K4CR, Rt. 2, Box 373, Jonesbore, Tenn. 37659.

2 ORTHICONS #5820 sell or trade for ham gear or test equipment. Al Lane, K5MWV, 740 Ramsgate, El Paso, Texas 79907.

WANTED: Junk GSB-100 for spare parts. Sell large lot of Jerrold Wired TV parts, outlets, etc., Send for list. Gene, W7DI, 6633 E. Palo Verde, Scottsdale, Ariz. 85253.

FOR SALE: Antique chevrolet pickup, $125.00. Rudolph, 743 Berryville Ave., Winchester, Va. 22601.

SELL OR TRADE: Linear systems model 350-12 D.C. power supply. With cables for TR-4. Want LM or BC-221 Freq. meter. Or make offer. Also Hustler antenna with RM-75 Resonator. C.W. May W4NNV, Rt. 1, Waynesboro, Ky. 40489.

WANTED: Postage stamps. My 10 year-old collects stamps—all gifts would be appreciated. A.M. Fox, Box 895, Greeley, Colo. 80631.

SELL: EICO 3070 80 watt stereo amp. and EICO 3200 stereo FM tuner. Excellent. $110 postpaid. Schultz, 1829 Cornelia Street, Brooklyn, N.Y. 11227.

FOR SALE: Model 26 teletype printer, with keyboard, cover, and table. 110V AC, sync. motor. $50.00. P. L. Lemon, 3154 Stony Point, Santa Rosa, Ca. 95401.

WANTED: Good clean KWM-1 and 516F-1 state condition and best price H. P. Westler, W6OKQ, 596 Fletcher Drive, Atherton, Calif. 94025.

NEEDED: Want to rent (copy & return) oper. Inst & schematics for Oak Ridge Products Mod. 101 (Sub tester) 103 (sig gen) 104 (syncro Gen). R. Wendel, 160-20 Grand Central Pkwy, Jamaica, N.Y. 11432.

GONSET IV perfect 200.00 VFO $60.00 both for $245.00. 845 Cliffside Ave., N. Woodmere, N.Y. WA2OHN.

SELL: 6.5 KVA 110-220 volt 60 cps single phase generator on trailer.Self contained. $525.00. 100 KC Beckman scaler units—$7.50 each. Pick them up at SAROC. R. M. Ellis, 1356 Elizabeth Street, Las Vegas, Nevada. 89109.

SELL: Late model Swan 350 with xtal cal, VOX and 117XC P.S. All for $350. K5SCE, Griffithville, Arkansas 72060.

HEATH SB-301 receiver w/spkr. New! Exceeds specks. $290. as kit, must sell for $225. W6LCT, Bay area. (415) 471-6929.

WANT QST's 1930 & Prior. Sell Hunter Bandit 2000B. Also Drake & Galaxy gear. WA5TYB, Box 19522, Dallas, Texas 75219.

HALLICRAFTERS P-500AC power/speaker, excl cond, $65 or best offer; WA6BWB, 13241 Eton Place, Santa Ana, Cal. 92705.

WATERS Compreamp 359. Unused: Bough Waters 3002. Instr. sheet. $18 or best offer. Felstead, KH6CU, 1777 Ala Moana, Honolulu, Hi. 96815.

COLLINS S-Line For Sale: for price details write Charles Kaufman, 231 So. Jasmine Street, Denver, Colo. 80222.

SALE: Hallicrafters HT32B, Hammarlund HQ 180 with clock and noise immunizer. Xmtr $300. Rcvr $275, both $525 very good condition. Sam Carter, 6675 E. 19th Street, Indpls, Ind. 46219. WA9VBG.

HQ-110-C with instruction book $100, HT-40 $50. William E. Blaine, 4132 Haverhill Dr., N.E., Atlanta, Ga. 30305.

WANTED: Front panel for a DX-100. Please quote condition and price in letter. Forrest Bryant, W0FDS, 607 South 4th Street, Princeton, Minn. 55371.

FOR SALE: HRO5TA1 with speaker, ABCD coils, instruction book perfect condition. Make offer. HRO5 coils e, f, g, h, J, ja sold seperately. Make offer. over $25 each. Heath IG57 post marker sweep generator make offer. Heath IO14 wide band scope make offer. Wells Chapin W8GI, 2775 Seminole Road, Ann Arbor, Michigan. 48104.

SELL: RTTY Gear, Report, motors, table, page printer, more. Magazines, CQ, QST, odd issues 15¢ each. Send S.A.S.E. for complete list. L. Pfleger, 5405 Century Ave., Apt 208, Middletown, Wisconsin 53562.

WANTED: Schematic and/or manual for PACO T-65 transistor tester. W. F. Williams, 1322 South Calif., West Covina, Calif. 91790. W6FVL.

FOR SALE: Sylvania 101A TV camera, excellent condition, complete w/lens, spare vidicon. $200. W5ZSL, Box 638, Mesilla Park, N. Mex. 88047.

STAMP COLLECTORS—I will trade U.S., U.N., Japan or Ryukyus stamps or FDCs for Ham gear. What do you have and what do you need? Charles Simmons, Box 552, Plattsburgh, N.Y. 12901.

SELL: Hammarlund HQ-140X receiver, $80; Heath Twoer, $30; Eico 730 modulator $25. All good condx. WA2HGJ, Highland Park, N.J. (201) 572-2980.

WANTED: Drake MN-2000 Antenna Tuner; Mainliner TT/L2 demod with filters; a small TTY machine. KX6FJ, Box 1554, APO San Francisco. 96555.

FOR SALE: Excellent Heath GR-54 General Coverage receiver expertly wired and aligned $75.00. Stephen G. Hawley, WA4UAZ, Route 3, Box 476-b, Clarksville, Tenn. 37040.

ATTENTION: I have a fine HW-16 rcvr for sale, $85. Shpg. paid in U.S. Want quad ant info. J. Byrn, WB4-LIL, 125 Buckwood Drive, Richmond, Ky. 40475.

FOR SALE: Lafayette HA460 6 meter, new in original carton, complete with Saturn 6 meter Antenna including Antenna transformer, both $80. Henry S. Parizman, WA2RQJ, 1781 White Street, Bellmore, L.I. 826-6423.

WANTED: Parts to rebuild NCL-2000. Power transformer, 8122, tank circuit, variable capacitor, switch. WA4WPL, Manders, 245 Marlin, Merritt Island, Fla.

WANTED: Heath XC-2 or 6 meter converter for RX-1 recv. Also binders for 73 magazines WA0QPM, Larry Waggoner, 7611 Cottontail, Wichita, 67212.

SELL: Hy-Gain 14AVQ Vertical 6 mo. old. Worked 70 countries in 2 mo. $25. W0MXE, 63 Mobile Manor, Knob Noster, Mo. 65336.

YOUR Antique receiving, transmitting tubes rebuilt; working condition; $12. Replicas, $15.00. Postage extra. Sam Diaz, Pine Grove Mills, Pa. 16868.

WANTED: Collins 310B type transmitter; National FB7 type receiver. All leters answered airmail. Jock ZL2GX, 152 Lytton, Gisborne, New Zealand.

WANTED: Manual or schematic for Navy low freq. receiver RBA-3 and power supply. Jack Clement, W6-NTR. 6612 Andasol Ave., Van Nuys, Cal. 91406.

SELL: Clegg Zues & Interceptor receiver $575. Transmitter just reconditioned. Contact K8LAV, 614-453-3000. Pock up or ship.

SALE OR SWAP QST's before 1950 looking for 2B and Johnson Matchbox Lad Nagurney, 727 Marion Street, Scranton, Pa. 18509.

FOR SALE: TR-108 2M-XCVR, ARC-5—7.0-9.0 MHz. V.F.O. Want F.M. Gear, either 2-M or 150-170 MHz. Mike Wachur, WB2YRM, 134 Concord Rd., Yonkers, N.Y.

NEED Sockets for 4X150 tubes. Trade new 4CX250F for four sockets. M. Brame, Rt. 3, Logan, Oh. 43138.

SELL: Deluxe Chrome Vibro Keyer, $20 postpaid. Want VLF receiver, 15-600 KHz. W6CZP, Ross Webster, 850 Groff Street, Pamona, Ca. 91766.

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CLEANING SHACK-EX-Experimenter has large assortment of resistors, capacitors, receivers, transmitters, etc. SASE for list J. Brink, POB 3734, Fayatteville, N.C. 28305.

MY JUNQUE BOX runeth over, request list of bargains W. C. Holder, 1000 West Alden Ave., Valdosta, Ga. 31601.

WANT Knight 600B Tube tester, must be in good condition and reasonable. W. C. Holder, 1000 West Alden Ave., Valdosta, Georgia. 31601.

WANTED: Antique Test Equipment state make, model, Condition, price desired. Ed Knight, WB8DVP, 25125 Kingshire, Southfield, Michigan. 48075.

DX-40 $35.00 1st check takes it. I pay postage. 75w. Greg Pifer, 3766-Brookside, Barberton, Oh.

TA-33; TriEx self supporting 30 ft tower; 60 ft RG8U; TR-44 Rotator es Control, cable; 2 years old. Jones SWR; all A-1 condx. Deposit with offer. Ship via truck—W6BIL.

WANT QST's 1930and prior. Prefer entire volumes. Have many 1938-1965 for sale or swap. WA5TYB, Box 19522, Dallas, Texas. 75219.

COLLINS 32sl; 75al; both $199; Central Elect 20a $45; C348 $89; Hallicrafters HT32 & HT33 2KW ssb $449. Clem W6NPV, 571 H. St. Chula Vista, Ca. 420 9888.

DX-60 in perfect condition with 80 es 40 M xtals. Only $50. U pay shipping. K. McKewen, WN3LPK, 2300 Louise Ave., Baltimore, Md. 21214.

FOR SALE: 40 mtr CW novice Mobile with power supply $25, VFO 80 mtrs described in Dec. 67 CQ $15, W6BLZ, 528 Colima Street, La Jolla, Calif.

WANT CLEAN ARRL HANDBOOKS 1940 & 1945 Ed. will pay $1.50 each including postage. M. Bae, Box 9, Kingston, N.J. 08528.

F.M. TRANSCEIVER 12/W PYE now on 146.94 M.C., like new, complete w/control, mike, & spkr. $60. W. J. Davis, K6KZT, 4434 Josie Ave., Lakewood, Calif. 90713.

WANTED: SB6/0 and SSB/CW transmitter in any condition. Tom Dornback, 19W167 21st Place, Lombard, Ill. 60148.

WANTED: KW Matchbox. State price, condition first letter. W3WIY, 1705 Kaywin Ave., Bethlehem, Pa. 18018.

GALAXY III, Complete station. like new. Trade for sporting goods. Box 351, Kimball, Nebr. 69145.

SELL OR TRADE HALL. HT-40 75w AM-CW 80-6m factory wired. Mint $50. H. Carney, 60 Wadsworth Street, Cambridge, Mass. 02142.

COMPETITION? You bet! Join a new contest/DX group placing 3rd nationally in first try. If you live 100 airline miles from central Conn., contact K1JHX, K1GUD, or K1VTM.

FOR SALE: Heath SB 200 Linear. Best offer over $175.00. will take it. WA6ERL, 318 N. Ninth Street, Santa Paula, Calif. 93060.

SELL: 75S-3, speaker, manual, spare tubes: $400. KWM-1, power supply, speaker, manual, tubes: $300. 34-24 76th Street, Queens, New York, (212) 639-3195.

W4FCB is now K4NL. See old friends all bands CW/SSB or drop me a line to "Mac", William T. McClain, P.O. Box 65, Odessa, Fla. 33556.

WANTED: Mechanical filters for Collins 75A-4. F455J-.05 and F455J-21 types. Please write W2AEB, 90 Lakewood Ave., Cedar Grove, N.J. 07009.

KONIKA AUTO SE CAMERA: Cost $130 absolutely brand new. Swap for transceiver or ?? Fred Martin, 202 Kenny Street, Fayetteville, New York 13066.

FOR SALE: Model 15 teletype machine $50.00. C. Vinson, W2GJJ, 2796 Larkspur Street, Yorktown Heights, N.Y. 10598.

HAM CALL license plates from KL7, KP4 & KZ5 collection. A. Herridge, G3IDG, 96 George Street, Basingstoke, Hants, England.

WANTED: Old battery radios of the early 1920's. Need not be in working condition nor have the tubes. State your price. D. T. McKenzie, 1200 West Euclid, Indianola, Iowa. 50125.

WANTED: Collins 500 cycle mechanical filter, Collins part Number F455-FA-05-6428. Also may carry No. 526-9446-00. Center frequency 455 Kh. Advise your best price. K4ZQP, 409 Kaelin Dr., Louisville, Ky. 40207.

DX 20 manual wanted. To buy or copy. K0RNZ, 4830 North Glendale, Wichita, Kansas. 67220.

FOR SALE: IRE proceedings and associated IRE publications 1958 thru 1962—Ed Block, K5ENL, Grandview, Texas 76050.

BEST OFFER: Swan 250C, & AC power supply. Used very little. MINT. K3YMN, 2185 Sampson Street, Pittsburgh, Pa. 15235.

OLD QST'S for sale; some 1920 to 1950. Wanted; CQ's prior to 1957 SASE for list. W9GF, Carl Thoms, 9551 W. Beckett, Milwaukee, Wisc. 53225.

SELL: Complete in new binders. Postpaid 67 68 69 CQ $10 each. 68 69 QST $8 each. All 5 $40. W9HNG, 921 Walnut Street, Decatur, Ind. 46733.

DX60B & DX 150 for sale or trade. Want Matchbox or Quad & rotator or ?? Best deal WN1MFB, 44 Washington Street, Shrewsbury, Mass.

SELL: Hustler 20m. resonator, desk mast, spring and deck or bumper mount, $20. Excellent older style desk dial telephone $10. WA0LYO, 811 10th Spearfish SD. 57783.

THE WORKED ALL BRITAIN AWARD—Grant Gazetteer Record Book price $1.50 or 15 IRCs from G3ABG, John Morris, 24 Walhouse Street, Cannock, Staffs., England. USA WAB Rep is W2HWA.

FOR SALE: HA-1 To Keyer and vibroplex key. Hardly used-guaranteed $75.00. Will ship PP. R. Cook, W9NAH, 815 S. Center Street, Flora, In. 46929.

WANTED: Knight Kit T-150 or Heath Kit DX 60 or DX 40 in trade for Lafayette HA 500. J. Straley, WN2LUC, 378 Glen Ave., Elmira, N.Y. 14905.

FOR SALE: TDQ transmitter as described in June 1967 CQ, $50. W5BJO, 160 Wildwood Terrace, Jackson, Miss. 39212.

2000 WATT AMPLIFIER using 4CX-250 Bs. $ Sacrifice $139; Solid State P/S 2200V DC at 600 Ma. $89. Earl, W3QHN, (215) 323-2721.

FOR SALE: Collins 30S-1—32S1 and power pack—mint condition. J. T. Lundy, Deming, N.M. 88030.

GALAXY V Mk II, AC400, M & M Keyer, & h. b. movement, mike; $300. WA0KST/WA0YVR, 123 South Quad, Iowa City, Iowa. 52240.

FOR SALE: Motorola 80D 110V base 80W 2 freq $125.00. GE MT36N 12V 2 freq 50W $125.00. K4IZU, 521 Fleda Rd., Memphis, Tenn. 38117. Phone: 901-685-5574.

GOOD ART 13, BC611 handi talkies, BC 645, complete TCS, BC22IT, Xfmrs, etc. Sell or trade. L. Basham, Cave Junction, Ore. 97523.

FOR SALE: 120 tower, crank up, never used. Audio oscillator—osciloscope—vacuum tube voltmeter, excellent condition. J. T. Lundy, WA5BMM, Deming, N.M.

SWAP G D 48 metal Locator Heathkit for HW 16 or HW22 or best offer—Will Sced on 75 meters—NO SHIPPING—Used three hours—C. Koenderman, WA3ERA, Milford, Pa. 18337.

OSBORNE Xformer Pri, 110VAC Sec. 1000 CT at 2 amps Best offer, need 160 meter equip. A. J. Buchheit, RR 2, Box 32, Williamsburg, Ohio 45176.

See page 110 for New Reader Service

SELL: Hallicrafters S-108 $70, T-60, xtals $28, WRL vfo $15, Heath Q-Mult, $5, 3-30 Mhz Preamp $9, S. Lee, WA3LBU, 8836 Satyr Hill Rd., Baltimore, Md. 21234.

FOR SALE: Magazines—as far back as 1936—not all years complete. Service-radio world—Radio—QST—Radio Craft-Radio News—Shortwave & Television. SASE for list. K0JHW, Charles P. Courtney, 7061 Idlewild Ave., Jennings, Mo. 63136.

GALAXY REJECTOR $18. Heath Xformer 800, 120 and 6.3V (for SB-200) unused $15. WA3JHB, 2286 Rose Garden, Pittsburgh, Pa. 15220.

FOR SALE OR TRADE: RX, TX, Send for low price list of my accumulation. F.A. Jerome, 908 Holoway, Midwest City, Ok. 73110.

C.E. 10 A, B.C. 458 VFO, 500 watt 4 CX H.B. Linear, all mounted in 5 Ft. rack. Make reasonable offer. W3-WIY, 1705 Kaywin, Bethlehem, Pa. 18018.

HAMMARLUND HQ 170C rcvr & small spkr, clean, perfect cond. Went xcvr. $165. You pay freight. W3-LMA, E. Dillmeier, 109 Pinehurst Rd., York, Pa. 17402.

HEATH SB-100, 200, 300, 400—Swan 240 with mobile p.s. New 4-1000A tube, 5KW plate xformer and HV parts. W0FGB/6 4453 Via Pinzon, Palos Verdes Estates, Calif. 90274.

SALE OR TRADE: Collins 30L-1 Linear O Mint $350.00. Want Swan or Drake transceiver. WA3HMQ—301 Blacksmith Road, Camphill, Pa. 17011.

VARIACS, Constant voltage transformers, and power supply components, write your needs, S.A.S.E. Dale R. Lee, W3JRM, 1228 Shelbourne Dr., Bethlehem, Pa. 18018.

FOR SALE: Collins 75A4, 3 Filters, mint condition, $400. Also Collins 32V3, with Solid State P.S. $200. WANT: Collins receiver 51J series, or 51S, or similar. W2LXT, L. E. Nichols, 254-17 Morgan Street, Littleneck, L.I., New York 11363.

SWAN-14-117 P.S. Complete New-never used-in orig. carton. First $60.00. Will ship. R. P. Lampley, Box 326, El Campo, Texas 77437.

G.E. 50/w F.M. transceiver 150 MC Pre-Prog. Model T-powered, w/control & cables, very clean. $50. W. J. Davis, 4434 Josie Ave., Lakewood, Calif. 90713. 1710No.

URGENT—Need H.F.-I.F. Transformer—3M.C.—Part No. 1710-860 For link 11-UF Ed 7c. Buy or trade L. A. Folger, 8215 Water Street, Garrettsville, Ohio 44231.

2-813's, $15., 10V. 10A. F. L. Trans. $6.50, 4-866A $16. Air Dux 195-2, $14. All like new. K3FOD.

FOR SALE: RME 6900, $140. NCX-3 plus NCXD $225. W3DN, 214-933-3150.

FOR SALE: 75S1, 32S1, 516 F2, mint condition for $600.00 SR-500 $190.00. P. H. 214-793-2515. Al Waegner, 2929 Wood Street, Texarkana, Tex 75501.

SWAN 350 (Late) with 117xc supply $250.00. Gonset 6 meter 913A $150. Never out of box. All for $375. A. Parker, 314 S. Western Ave., Springfield, Ohio. 45506.

FOR SALE: Carter Dynamotor. Code 520 AV Input. 5.5 V.D.C. Output 500V DC .200 AMP. $7.50. F.O.B. Douglas, 2254 Pepper Dr., Concord, Calif. 94520.

SELL: Precision/Paco B12 supply $30; Precision 960 transistor tester $20; H-P 520A scaler $40; Robert Ireland, Pleasant Valley, N.Y. 12569.

SELL: 20A Exciter, VFO, 811 A Linear, $150.00. BC 348-c AC supply & Q mult. $65. All mint condx. Bob Van Nevel, WA9SCR, 1905 E. Bowman Street, So. Bend, Ind. 46613.

RANGER $95; EICO 723 $20; HA-350 $75; DSB-100 $20; HA-1 $50; VF-1 $15; SX-111 $100; dlvr So. Calif. K6CS, H. Vester, 805-49507883.

See page 110 for New Reader Service

AMATEUR ELECTRONIC SUPPLY

Make those "S" meters bounce!

You will with the exciting new... Galaxy GT-550

- 550 Watts P E P-SSB, 360 Watts CW
- Highest Powered 80-10 Meter Transceiver in its Class!
- Sharp 2.1KHz filter for minimum QRM and concentrated "Talk Power"
- ALC prevents "Flat Topping" and keeps those S-meters reading High

SAVE $50

Purchase a GT-550 or R-530 for the regular price, with no trade, and you may take a $50.00 Bonus Credit toward other merchandise. ($10.00 Bonus on FM-210)

FULL GALAXY LINE IN STOCK!

GT-550 80-10m Transceiver	$550.00
AC-400 110/230v AC Supply	99.95
G-1000 DC Supply	129.95
SC-550 Speaker Console	29.95
RV-550 Remote VFO	95.00
RF-550 RF Console	75.00
PR-550 Phone Patch	49.00
VX-35C VOX Accessory	29.95
CAL-25 25KHz Calibrator	25.00
F-3 300Hz CW Filter	37.50
GTM Mobile Mount	8.95
ZZM Floor Adaptor	6.00
R-530 .5-30MHz Receiver	795.00
SC-530 Speaker Console	45.00
FL-5305 500Hz Filter	45.00
FL-53015 1.5KHz Filter	45.00
FL-5306 6Hz Filter	45.00
FM-210 2m FM Transceiver	200.00
AC-210 AC/DC "Booster"	39.95

AMATEUR ELECTRONIC SUPPLY

4828 West Fond du Lac Avenue
MILWAUKEE, WISCONSIN 53216
PHONE (414) 442-4200

To: AMATEUR ELECTRONIC SUPPLY
4828 West Fond du Lac Avenue
Milwaukee, Wisconsin 53216

I am interested in the following new equipment:

_____

I have the following to trade: (what's your deal?)

_____

Ship me the following New Equipment.

_____

I enclose $_____; I will pay balance (if any)

☐ COD (20% deposit) ☐ Revolving Charge Plan

Name_____

Address_____

City_____

State_____ Zip_____

☐ Send Reconditioned Equipment Bulletin

STORE HOURS Mon & Fri 9 to 9; Tues, Wed, Thurs 9 to 5:30; Sat 9 to 3

AMATEUR ELECTRONIC SUPPLY

See page 110 for New Reader Service

READER SERVICE

To obtain literature from advertisers simply check the box to the name of each advertiser listed below whose product or service is of interest to you. We'll pass your name on and you'll get literature from the advertiser in short order.

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- ☐ Amateur Wholesale Electronics, A Div. of International Electronic Systems, Inc.
- ☐ Arrow Electronics, Inc.
- ☐ Baker & Winnay
- ☐ Barry Electronics
- ☐ Bob-Frank Electronics
- ☐ CQ Book Binders
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- ☐ CQ DX Awards Log Book
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- ☐ CQ Rtty Book Ad
- ☐ Cleveland Institute of Electronics
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- ☐ Tri-Ex Tower Corporation
- ☐ Midway Antenna: Western Electronics
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- ☐ World Radio Labs

CQ Reader Service
14 Vanderventer Ave.
Port Washington, N. Y. 11050

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Please send me information on the products and services which I have checked above.

Name.....Call.....

Street Address.....

City.....State.....Zip.....

Advertiser's Index

See page 110 for New Reader Service

GREAT MARCH BARGAINS

NCX-500 only $249.95*

NEW

SPECIFICATIONS

Frequency range: 80, 40, 20, 15 and 10 meter bands (full coverage of 10 meters with optional crystals). 500-watt PEP input on SSB, grid-block keying on CW and compatible AM operation. Receive vernier ±3 KHz. Sidetone monitor, plus built-in code practice oscillator. Rugged heavy-duty 6LQ6's.

PRICE SCHEDULE

NCX-500 w/AC500	$299.95
NCX-500 w/NCXB (spkr. & cab. inc.)	319.95
NCX-500 w/Linear Systems 400-12	359.95
NCX-500 without supply	249.95
XC-28 plug-in solid state crystal calibrator (Available 1 March)	19.95

SOLD OUT

SPECIAL!

SPECIFICATIONS

Receiver: dual conversion; sensitivity better than .35μv for 10 db S+N; frequency coverage 49.9 to 52.1 MHz; switchable ANL; speaker built in Transmitter: 22 watts input, output, 52 ohm; ptt operation; operates with 8.3, 12.5, or 25 MHz crystals or external VFO; spotting switch for transmitter frequency checks; built-in solid state power supply for both 115 volt AC and 12 volt DC operation.

NEW

CLEGG 66'er $175.00

USED EQUIPMENT

RECONDITIONED, WITH FULL SIX MONTHS GUARANTEE—NO TRADES

- Clegg Venus w/416 AC supply-mint $350.00
- Clegg Zeus w/supply & modulator 350.00
- Collins KWM-2 w/312 B5 console—like new .. 995.00
- Hallicrafters HA-2 transverter 125.00
- Hallicrafters new demo SR-500/P-500 AC supply 400.00
- Hammarlund HQ-170AC VHF—mint 325.00
- Hammarlund demo HX-50 transmitter 389.95
- Heathkit HA-10 Warrior linear amp. 175.00
- Heathkit HX-20 HR-20 SSB transmitter & receiver—matching pair in almost brand new condition—1 only 230.00
- Swan 250 transceiver for 6 meters 275.00

NEW EQUIPMENT

- Clegg Zeus w/power supply & modulator 4 available $525.00
- Clegg Apollo 6 4 available 245.00
- Galaxy V Mark III w/AC400 power supply 2 available 410.00

BARGAIN SPECIALS

- PTT mobile mikes/standard plug $10.00
- Coax 5-6 ft. lengths RG8/u w/PL259's each end 1.00
- National 1¼ meter converters 453-1929 (new) 15.00
- For the DX'er—DX QSO recorder (displays no. of countries contacted and/or confirmed—reg. $2.50) 1.00
- American Beauty 100W soldering iron 4.95

*All prices FOB Harvard, Mass.

HERBERT W. GORDON COMPANY

America's largest exclusive ham store

Woodchuck Hill Road
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(617) 456-3548

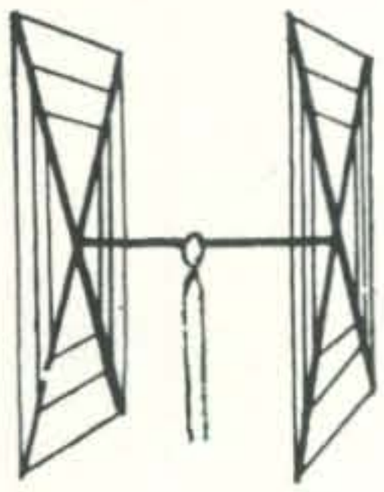
See page 110 for New Reader Service

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

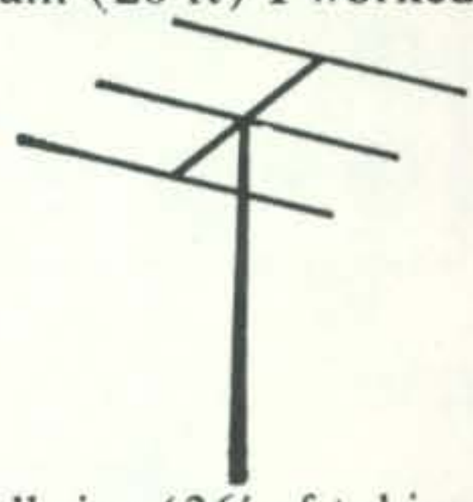
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

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)

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

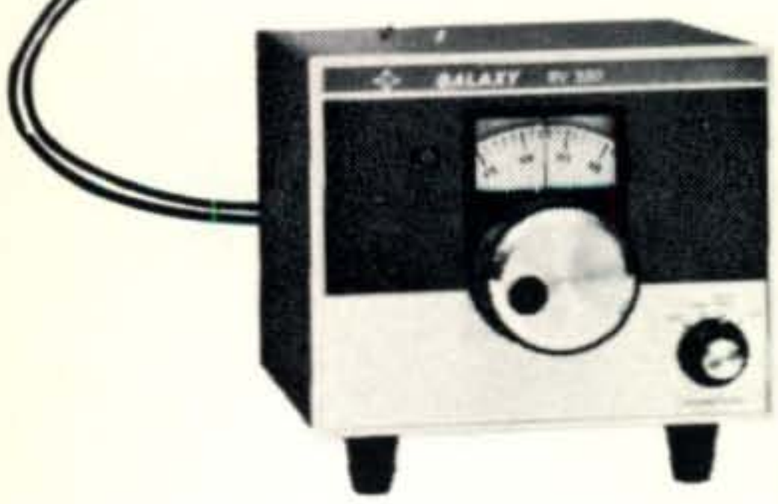
HOW TO ORDER: Send money order. We ship immediately by REA Express charges collect. Gotham ham and CB antennas are available for pick-up in: Rockford, Ill.; Orange, Calif.; Cleveland, Ohio; Daytona Beach, Fla.; Calgary, Canada; Hannibal, Mo.; Indianapolis, Ind.; South Bend, Ind.; Oklahoma City, Okla.; 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.

GOTHAM
1805 Purdy, Dept. CQ,
Miami Beach, Fla. 33139

See page 110 for New Reader Service

The GT-550's "business" end... Plug-in Versatility!

The Superb Transceiver with Total System Capability

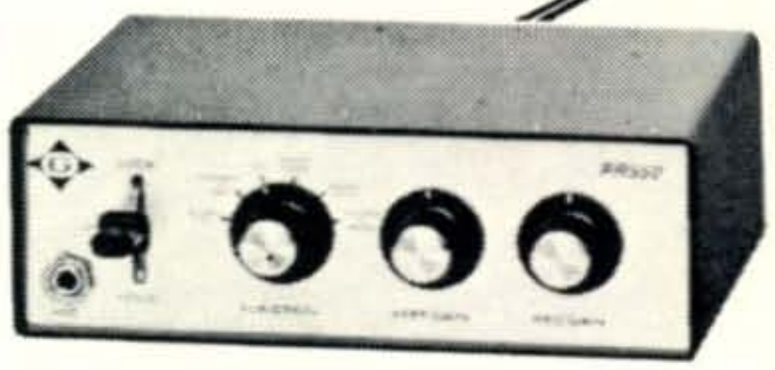


Plug in the RV-550 Remote VFO!

With its function switch you can select the remote unit to Control, Receive, Transceive or Transmit frequency independently. Gives you about the same flexibility as a separate transmitter and a receiver!

Plug in the PR-550 Phone Patch!

Record your own station, playback a recording to the transmitter, record or playback to your phone...or record a complete two-way conversation while making a phone patch with the use of a tape recorder!



Plug in the RF-550 Console!

Precision wattmeter 3.5 –30.0 mHz with 400 and 4,000 watt scales, forward and reflected power. *Built-in Antenna Selector Switch for six positions with unused outputs grounded.*

Write for free brochure on the GT-550 line –

galaxy electronics

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Our fans take No.1 for granted.

Take power tubes, for example.

RCA amateur tube fans expect maximum performance year after year. And they get it. So do our professional customers. As a matter of fact, designers of amateur, commercial and military electronic equipment have rated RCA first in power tube brand preference studies year after year.*

So take a tip from the professionals. When you need power tubes, insist on No. 1—RCA. We have the widest choice. And the best. We suggest you obtain a copy of the 1970 Guide to RCA Industrial Tubes, TPG 200E.

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*Brand preference studies conducted by leading Electronic Publications.

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