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CQ

April 1966
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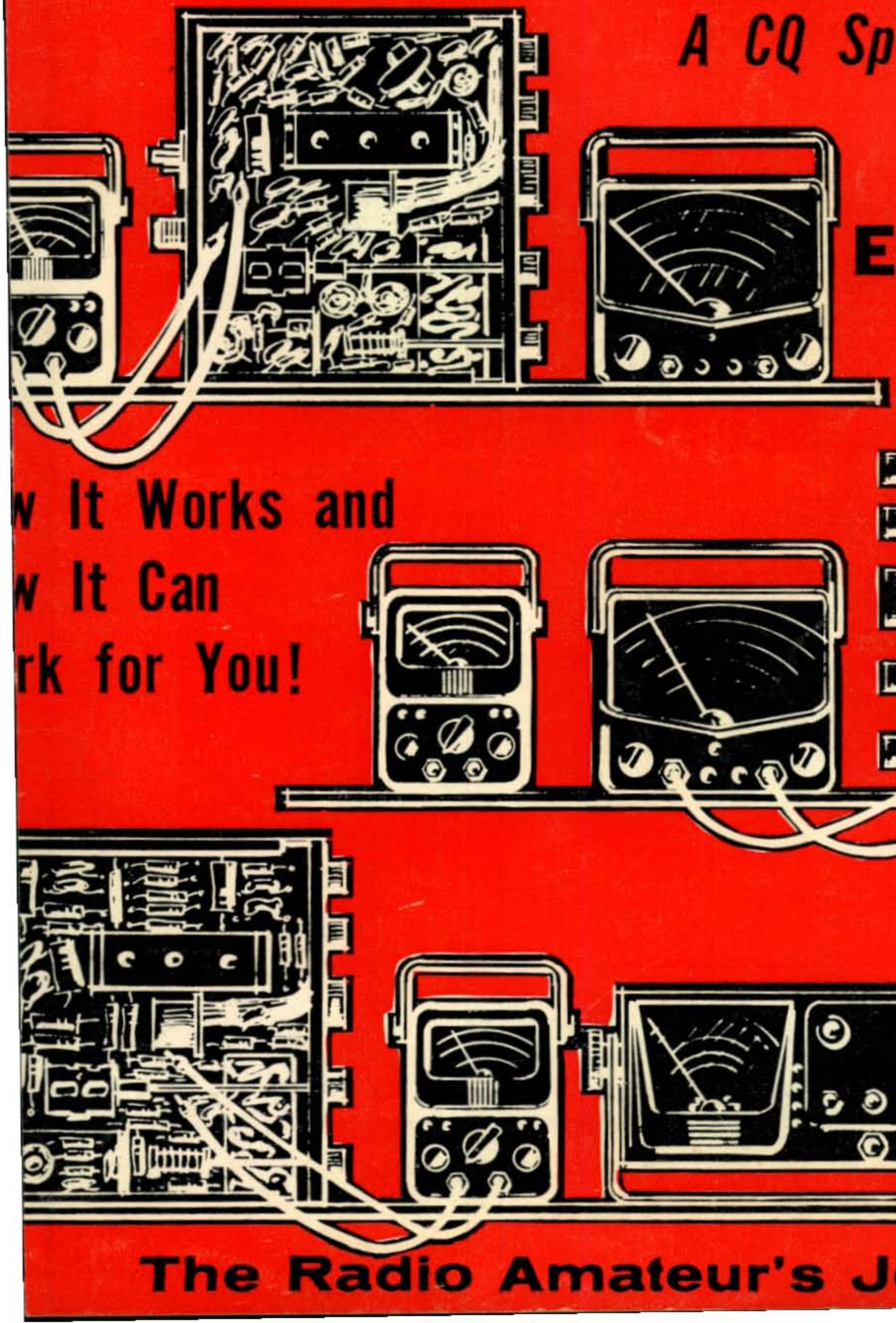

The Radio Amateur's Journal

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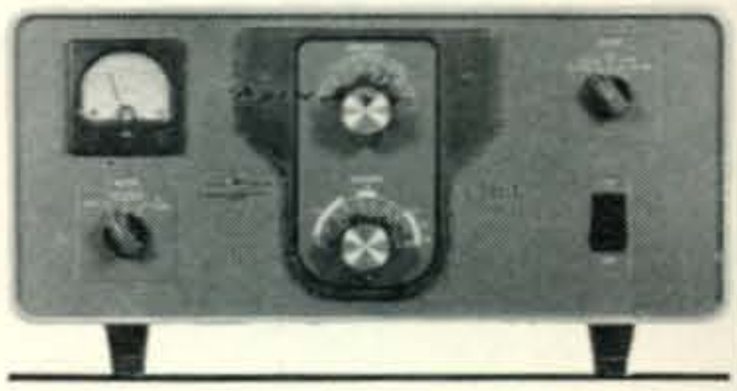

COLLINS

For further information check number 26 on page 112

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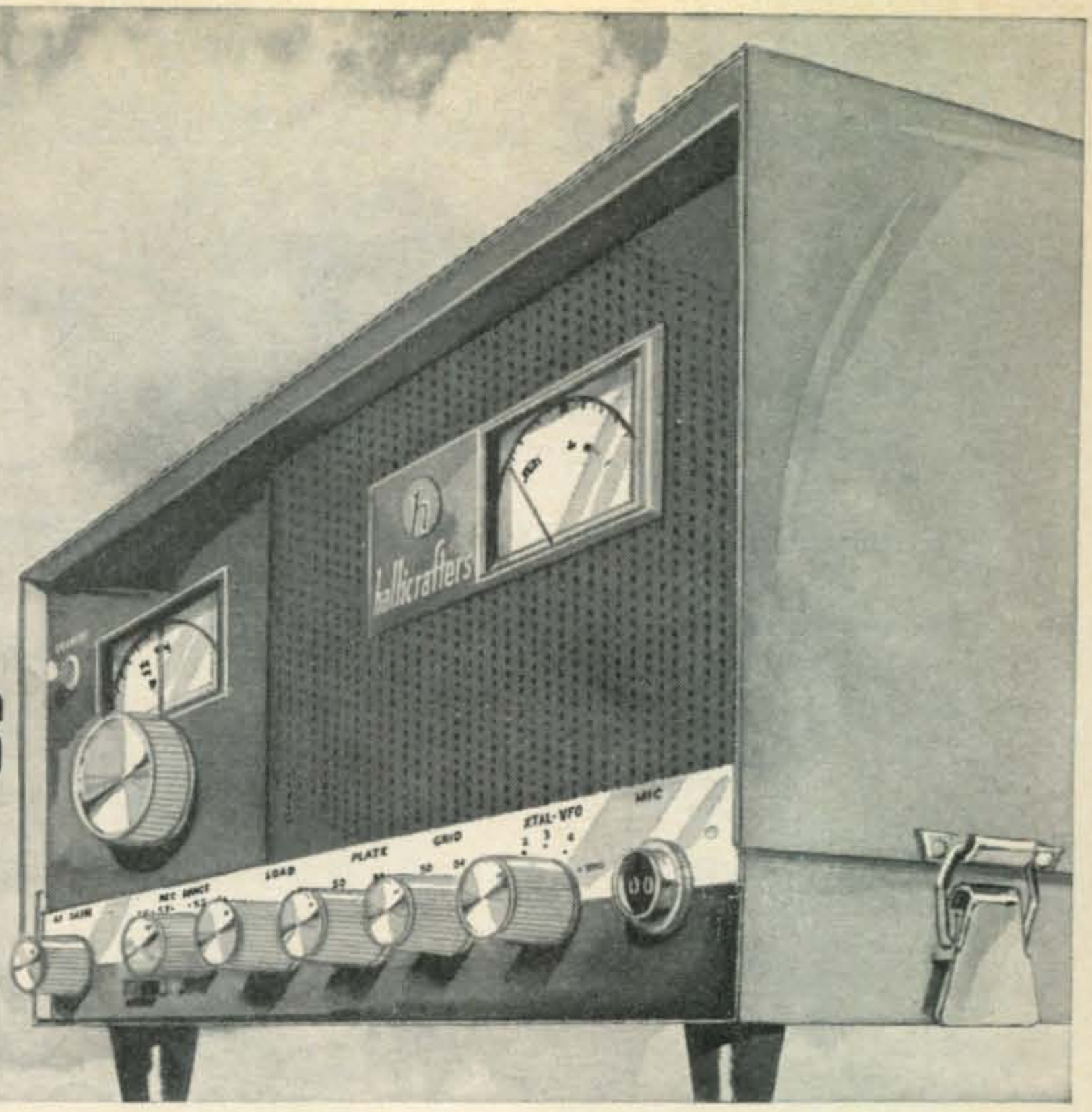

Efficient filters and selected injection frequencies make the new SR-46A and SR-42A virtually immune to FM and TV interference. Squelch, too!

Interference-free reception is only one of many advantages in the new SR-46. Complete six meter band coverage is another. Or full two meter coverage, if you prefer, in the companion SR-42 unit. Both give you double the usual bandspread, through use of dual tuning ranges. A neutralized nuvistor front end boosts sensitivity, and eleven tuned circuits increase selectivity while suppressing interference. Push to talk, of course.

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FEATURES

Frequency Coverage: 50 to 52 Mc and 52 to 54 Mc (144 to 146 Mc and 146 to 148 Mc in the SR-42). **Power Input:** 10-12 watts. **Power Supply:** 115 VAC and 12 VDC (vibrator and line cord optional extra). **Transmitter Crystals:** high frequency type; provision for four (one furnished), plus external VFO, switch-selected from front panel. **Tubes:** 10, plus zener diode oscillator control and four diodes (11 tubes, 2 zeners and four diodes in the SR-42). **"S" Meter** automatically switches to RFO. **Cabinet:** "snap-off" type for easy access. **Size:** 5½" high, 12⅛" wide, 8¼" deep. **Shipping Weight:** 17 lbs. **Amateur Net Price: $199.95**

New **SR-42A**
SR-46A

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For further information, check number 2, on page 112

CQ

APRIL 1966 VOL. 22, No. 4

The Radio Amateur's Journal

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Offices: 14 Vanderventer Avenue, Port Washington, L. I., N. Y. 11050. Telephone: 516 PO 7-9080.

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How to choose a microphone for SSB

Model 664
$51.00 Amateur Net

Hand us a blank check. Tell us you want the best microphone you can buy for SSB — with price no object. We'll hand you the Model 664 dynamic cardioid microphone. We'd like to tell you why the 664 is so uniquely suited to SSB operation.

Let's start with the transmitter. Almost every quality SSB transmitter, commercial or home-brew, incorporates an automatic level control circuit. And the general practice in transmitter design is to assume that the microphone response will be flat. On this assumption, the audio input circuits are designed to shape your speech characteristics, in conjunction with the ALC control, so that proper transmitter setup gives you maximum PEP.

Anything less than flat microphone response limits your ability to obtain maximum PEP, and your effective radiated power will be reduced. To satisfy this basic requirement, the 664 is unusually free from peaks or dips in response. It allows maximum PEP while retaining your natural voice characteristics.

Another important SSB feature, found in almost every modern transmitter, is voice operation. The 664 flat response, plus the effective Variable-D® cardioid pattern, reduces the possibility of accidentally opening the VOX circuit when speaker level is high. That's because the 664 rejects sound from the back and sides of the microphone. You can operate with higher receiver volume with complete safety. And noise, reverberation and echoes in the ham shack are reduced by the cardioid pattern to give you better intelligibility on the air.

Despite the performance advantages of the 664, this is not a fragile microphone, far from it. It's rugged, almost indestructible. The dynamic design meets the most rigorous tests for quality and service. And at the heart of 664 dependability is the diaphragm, made of Acoustalloy®; a unique plastic material available only from Electro-Voice. Acoustalloy is virtually impervious to shock, temperature extremes, humidity and the countless other environmental conditions that gradually destroy less rugged instruments.

But there's more to the list of 664 advantages: High output level, handsome appearance, and the guaranteed backing of a manufacturer of unquestioned integrity and wide experience in electro-acoustics.

While we manufacture microphones ranging from the communications units in the Gemini space program to professional models that have won an Academy Award for their contribution to motion picture sound, no field is closer to our hearts than amateur communications. And the engineers and hams in our organization are particularily responsive to the needs of the amateur fraternity. They insist on good value for every product, in every price range.

But when price is no object, their choice is the 664 for SSB. Outstanding in performance and value for even the most critical amateur radio operator. We urge you to try the 664 in your own shack soon. We guarantee your satisfaction, or your money back.

For further information,
check number 4, on page 112

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new power amplifier pentode provides excellent linearity

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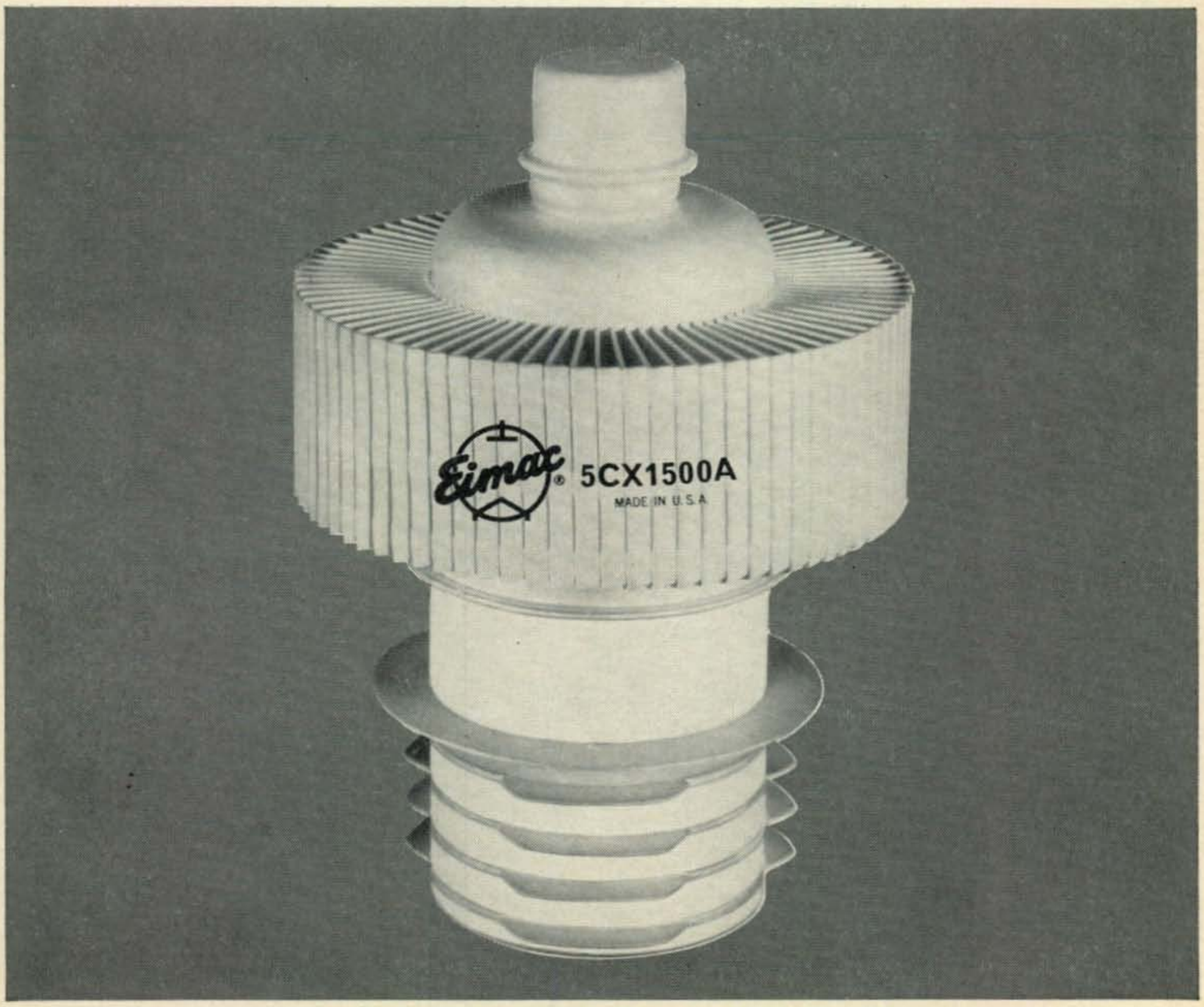
5CX1500A	
CLASS C MAXIMUM RATINGS	
DC PLATE VOLTAGE	5000 V
DC PLATE CURRENT	1.0 Amp.
DC SCREEN VOLTAGE	750 V
PLATE DISSIPATION	1500 W
SCREEN DISSIPATION	75 W
GRID DISSIPATION	25 W
SUPPRESSOR DISSIPATION	25 W
TYPICAL CLASS AB, LINEAR AMPLIFIER MEASURED VALUES IN TWO TONE TEST	
DC PLATE VOLTAGE	4000 V
DC PLATE CURRENT (No Signal)	250 mA
DC PLATE CURRENT (Two Tone)	485 mA
DC SCREEN VOLTAGE	500 V
PEAK ENVELOPE POWER OUT	1785 W
THIRD ORDER IM MAXIMUM	−35 db

EIMAC
Division of Varian
San Carlos, California 94070



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ZERO BIAS

The Ted Thorpe Fund

FREQUENTLY, in the aftermath of a tragic event, men of good will join together to aid those who have been stricken. So it is that in the aftermath of the Chuck Swain, K7LMU/Ted Thorpe, ZL2AWJ disaster in late January,[1] an idea has been proposed which we hope will help ease the terrible loss to the Thorpe family.

Gay E. Milius, W4NJF, an enthusiastic DXer, and author, wrote recently offering his services as a central clearing house for any and all contributions which DXers may wish to make to the widow of ZL2AWJ to help soften the economic blow to herself and her two young daughters. Surely, no amount of money could ever equal Mrs. Thorpe's loss, but the loss can be made just a bit less painful that it already is. We commend Gay for his spirit of ham fellowship.

Readers may wonder why the Swain family has not been mentioned in a similar connection. The reason is that Chuck was not the "bread-winner" of the family, as was Ted. The sorrow and grief is certainly no less to the Swain family, but the economic realities must be faced.

May we suggest to our DX readers (friend and foe) that the next $10 bill earmarked to support another DXpedition be diverted to W4NJF for the Ted Thorpe Fund. You might not get your QSL so fast, but you'll sleep better.

Our Callous Contemporaries

In line with the loss of the K7LMU/ZL2AWJ expedition, I must take another swipe at *some* DX chasers.

When word first arrived that something was amiss with the expedition's ketch *Marinero*, back in January, a series of phone calls were placed to Ack, W4ECI, organizer of the trip, to dig out the facts. Ack was the epitome of southern graciousness as he fielded each question with practiced ease, and supplied us with every detail that was available up to that time.

Only once did Ack's composure slip a bit, and ours with it. Ack reported that 20 meters was filled with unfounded rumors and conjecture, as might well be expected, but he also reported that a number of DXers were *more concerned about the whereabouts of the logs* from Chuck's VR5AB and FW8 operations *than they were about the men themselves!*

---

[1] See page 10 for full information.

I just couldn't believe that any amateur operator could be so callous, so I flipped on a nearby receiver and heard it first-hand. Fellows, it's true! A handful of ghouls had written off five lives with a shrug of the shoulders, but shuddered at the though of not receiving a QSL from Wallis Island! Rest easy, my selfish friends, you'll get your QSL's in due time—the logs are safe in the hands of W4ECI. I wish we could say the same for the fellows who made it all possible.

What's Wrong With Q-Signals

For several years we've read and heard weak and withering attacks against that traditional amateur workhorse: The Q-Signal. The hue and cry of the assailants is "say it with words." Nonsense!

Haven't these fellows got anything better to to do with their leisure time than to plot nefarious plots against the radio amateur's most individualistic jargon? Must all amateurs be reduced to the level of the CBer by being pressured into use of mundane and lackluster phrases?

Which is more likely to catch the imagination of the newcomer, and of the layman: "a little QRM on you that time, OM; let's QSY up 10 kc and try it again," or "Your signal was interfered with by other signals on your last transmission, friend, let's move our frequency of operation 10 kilocycles higher and try again." Ugh!

Would you rather receive a "card confirming two-way contact with a station in a very distant country," than a "DX QSL?" Not me!

Say it with words? Never! I'd sooner turn in my ticket than cater to a handful of crybabies out to chip away one more little piece of amateur radio's character. QSP *that* far and wide!

73, Dick, K2MGA

Our Cover

Staff artist Joe Venetucci turned creative to draw attention to our current series of articles on test equipment. The series is being written by our own Bill Scherer, W2AEF, and will eventually give in-depth coverage to most popular pieces of amateur test equipment. So far, the series has given intensive treatment to the v.o.m. and v.t.v.m., and appears this month on page 30.

...and now from Amperex—
for all your intermittent, short-talk Mobile Communications Designs
A JOB-RATED TUBE AT A JOB-RATED PRICE

It's the new Amperex 8637, a long-life, radiation-cooled, beam-power twin-tetrode. It's the world's first JOB-RATED tube for 60 watt intermittent brief-talk, mobile transmitter service. (It delivers 72 watts from less than 3 watts drive power under PTTS* conditions.) Its quality is strictly in keeping with Amperex standards of excellence and yet it is only a fraction of the size of conventional tubes and costs only one-third the price.

It can be used as an RF power amplifier, oscillator and frequency-multiplier in communications equipment up to 175 Mc.

In other words, the new 8637 is just plain unbeatable for the economical and compact design of high-quality, push-to-talk gear for delivery trucks, emergency repair vehicles, taxicabs, marine, fire, police and avionics.

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ALL THIS—and AMPEREX QUALITY, TOO
(One 8637 Push-Pull)

Frequency	175 Mc
DC Plate Voltage	600 volts
DC Grid #2 Voltage	200 volts
Grid #1 Voltage	–75 volts
DC Plate Current	210 ma
DC Grid #1 Current	3 ma
Drive Power	3 watts
Plate Input Power	126 watts
Useful Power Output	72 watts

*PUSH-TO-TALK SERVICE, MAX. DUTY CYCLE 1 MIN. ON, 4 MINS. OFF.

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The Miller/Swain/Thorpe Expedition

The following bulletin was distributed recently by W4ECI and W9WNV regarding the ill-fated expedition to many rare South Pacific Islands, late 1965 and early 1966. The information is the most accurate and up to date available at this time and should be considered completely authoritative. Further comments on the expedition can be found in the DX Column (page 71) and ZERO BIAS (page 6).

Dear Fellow DXer:

On January 27, 1966 at 0100 GMT, the 38 foot ketch *Marinero* sailed from Wallis Island en route to Western and American Samoa. Aboard were five individuals, including Chuck Swain, K7LMU and Ted Thorpe, ZL2AWJ, who had just completed a successful operation as FW8ZZ on Wallis Island, the 15th such operation during the World Radio Propagation Study Association's 1965-1966 S. E. Asia-Pacific DXpedition. This DXpedition has been received with enthusiasm by the DX fellows in the USA and throughout every country of the world in which DXers were to be found. During the preceding six months, over 75,000 QSO's had been logged on c.w. and s.s.b. Chuck Swain and Ted Thorpe, who had done a great part to make all this possible, were returning from the Wallis Island trip; Ted was to return to New Zealand and Chuck was to again join Don Miller in American Samoa and the DXpedition was to continue for another two months, during which time operations were planned from Manihiki (ZKI), Heard Island (VKØ), two small islands in the South Pacific which were to be counted as new countries by ARRL and possibly others.

On 29 and 30 of January, a full blown hurricane struck the Wallis Island-Samoa area, the eye of the storm passing directly over Wallis Island with winds in excess of 100 miles per hour and waves 50′ to 75′ in height. The *Marinero*, with Chuck and Ted aboard, never reached port; it was caught by the hurricane just a few miles from Apia, Western Samoa. In the vast Air and Sea Search that followed, in which the U.S. Coast Guard, U.S. Air Force and the Royal New Zealand Air Force participated, no trace of the ketch or its debris was found. During the storm, a 100 ton Korean Fishing Boat of wood and steel was completely destroyed with only 2 survivors out of 22 aboard. The *Marinero* is now assumed to have sunk and the five on board, including Chuck and Ted, dead.

It is hoped that every DXer will give some consideration to just how much these two have contributed to DX to make it a more enjoyable hobby for all DXers. For those of us who knew Chuck and Ted personally, there were no two finer individuals on earth who were so devoted and risked so much, so that so many throughout the world could enjoy many happy hours of DXing.

Despite this heartbreaking experience, we have decided to continue the DXpedition, at least to attempt to complete our original plans in the South Pacific, plus Heard Island. Although the DXpedition is now hopelessly in the hole financially, we will do all that we can to complete our plans. We hope that in the years to come, all DXers will, like Chuck and Ted, think about what they can do to make DXing a better hobby, particularly in the area of international good will and understanding and spend less time counting their countries.

Ack and Don

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LETTERS TO THE EDITOR

Letters Abroad

Editor, *CQ*:

Letters Abroad, Inc., is an organization founded in 1952 for the purpose of fostering international good will through the exchange of letters between the people of the United States and the people of other countries. It is completely philanthropic being financed by donations and being serviced by volunteers. Its offices are at 18 East 60th Street, New York, N.Y. 10021.

It appears to me that amateur radio operators, so many of whom are in contact with foreign lands, could participate in the program or could assist in obtaining Pen-pals for letter writers in the U.S. The organization needs names of people overseas who would like to correspond with people here. It is difficult to get the other fellows and while we are in radio contact, it is a good source of conversation to mention this matter.

When Letters Abroad receives the names of those desiring U.S. pen-pals or letters from overseas expressing a desire to exchange letters, volunteers read the letters and select an American who also wishes a pen friend in that country. They attempt to get one close in age and interests. The service, of course, is absolutely free.

Two presidents of the U.S. have given Letters Abroad commendations for its work in bringing together people of the free world. So there is merit in the idea and amateurs who are already spreading good will can assist in spreading more by mentioning it in their DXQSO's. The organization will give you further information if it is desired.

Gay E. Milius, W4NJF
421 Saddle Rock Road
Norfolk, Va. 23502

Vietnam Operation

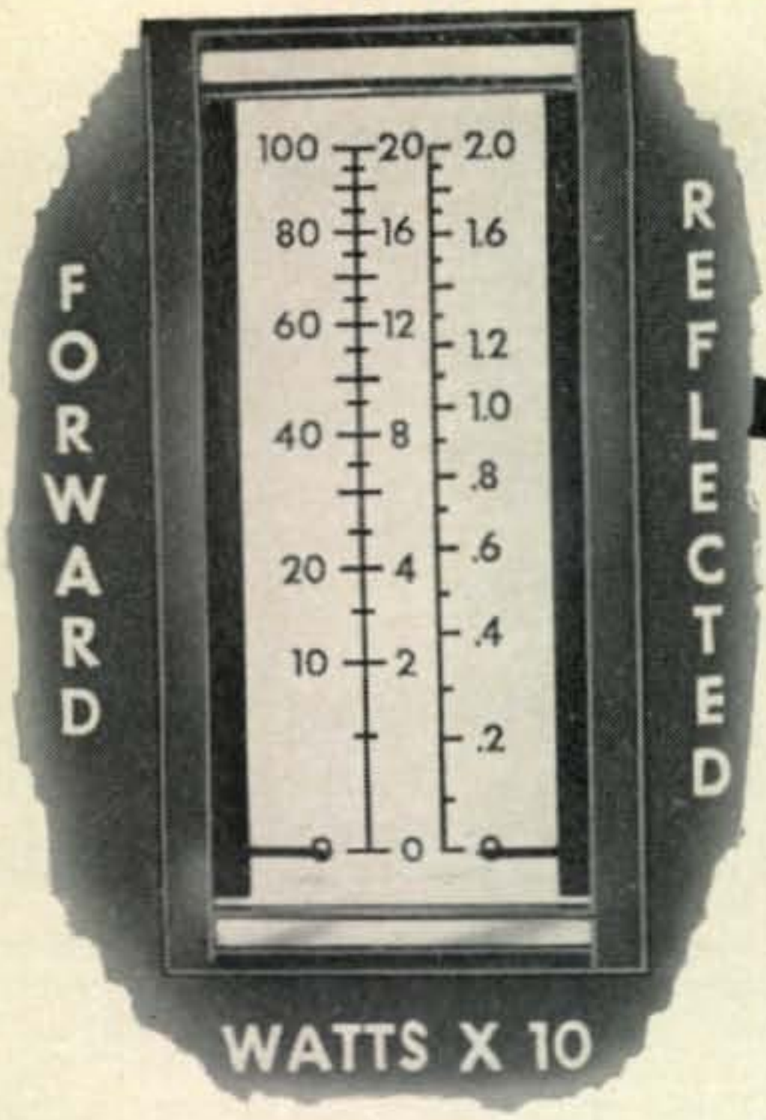
Editor, *CQ*:

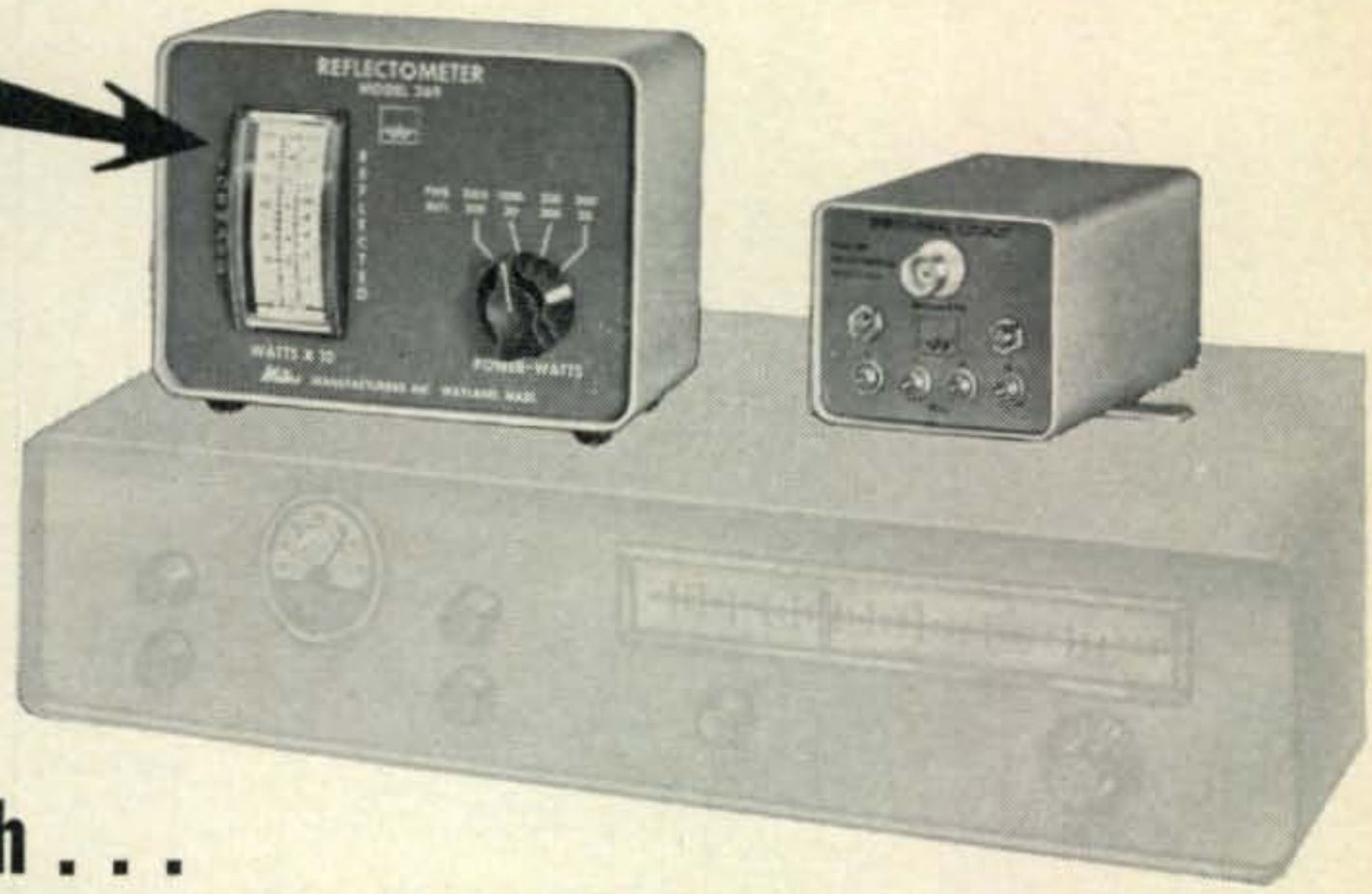
After many years with no amateur radio activity in the Republic of Vietnam the recent activation of an amateur radio station here has caused a great deal of interest in the ranks of amateurs worldwide and especially among those amateurs now in, or about to come to Vietnam. ARRL bulletin #40, other published notices, and on-the-air discussions have caused this Headquarters to receive a unprecedented number of requests for information concerning authorization to operate here. Answering these requests imposes an added burden that can be ill afforded. It is the purpose of this letter to explain the current status of amateur radio in the Republic of Vietnam and ask that you publish this information in *CQ* Magazine.

For many years the Republic of Vietnam has been torn by strife and it was in this setting shortly after independence was attained that amateur radio was banned and

AND NOW... from Waters the

REFLECTOMETER





Tells at a glance, both . . .
the power you're putting out
and reflected power, too!

Another precision-engineered first from pace-setting Waters! Amazing new REFLECTOMETER with unique dial indicator that lets you read both the forward and reflected power of your rig (expressed in RF watts) on every transmission you make! Two separately set forward scales of 200 watts and 1000 watts (20 and 200 watts reflected) insure accurate readings at whatever power you're operating. VSWR can be immediately determined from a calibrated reference chart. The REFLECTOMETER operates apart from its Directional Coupler which may be located remotely in the antenna coaxial line and connected with the cable provided.

SPECIFICATIONS
MODEL 369

Scales Forward	1000 and 200 watts.
Scales Reflected	200 and 20 watts.
Impedance	52 ohms.
Frequency Range	3 to 30 megacycles.
Accuracy Power	±10% f.s. (in 52 ohms).
Power Loss	Negligible.
Size	Indicator - 5½ x 3¾ x 4¼ in. Directional Coupler - 4 x 2 x 2 7/16 in.
Weight	Indicator - 1½ lb. Coupler - ¾ lb.
Price	$115.

Waters Test Gear . . . to get top Operating Performance!

DUMMY LOAD/ WATTMETER Model 334

Operates from 2 to 230 megacycles at 52 ohms. Measures RF output in watts up to a full kilowatt. Three calibrated scales insure accurate readings. Compact and weighs but 12 lbs.

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Provides 61 db of attenuation in 1 db steps. Used effectively for S-Meter calibration; checking receiver sideband suppression; measuring cross-talk in switches, receiver image, IF signal rejection, etc.

Model 371-1 UHF	**$27.95**
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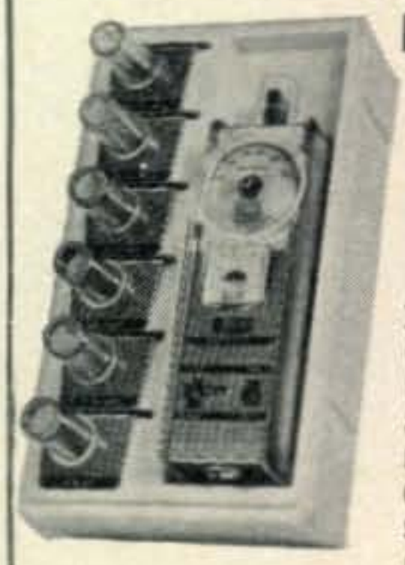
"LITTLE DIPPER"® RF DIP OSCILLATOR Model 331



Fully transistorized . . . covers 2 to 230 megacycles in 7 overlapping plug-in coil ranges. 1000 cycle audio oscillator for modulation; DC amplifier and meter for dip detection. In stainless steel case.

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For further information, check number 13, on page 112

an exception to amateur operation was filed with the ITU. Until late in 1965 there was no legal amateur operation in this country. At that time the Government of Vietnam extended the privilege of amateur operating authorization to Deputy Ambassador William J. Porter, K1YPE, as a courtesy to a high ranking United States diplomatic representative. Simultaneously, action was initiated to withdraw the exception to amateur operation filed with the ITU to enable other countries to recognize his operation.

Ambassador Porter has been authorized by the Government of Vietnam to use the call XV5AA and there is no restriction on third party message and phone patch traffic. However, since other governments have not yet been notified of this action by the ITU, until they are, Ambassador Porter is using the portable call K1YPE/XV5 for U.S. amateur contacts at the request of the FCC. His use of this call will cease when the ITU notification is received and he will then commence using the call XV5AA. He is already using XV5AA, however, for contact with non-U.S. amateur stations.

There have been some questions received concerning the prefix used for Ambassador Porter's call sign. The exclusive use of 3W8 for amateur stations seems to have been implied by certain published listings in which only 3W8 appeared, but this is incorrect and other listings correctly show both 3W8 and XV5.

While the Government of Vietnam has authorized Ambassador Porter to operate, this action does not represent a general change in the policy which strictly prohibits all other amateur radio operation. In addition, all personnel under military jurisdiction are subject to Military Assistance Command, Vietnam (MACV) Directive 105-6, 14 Dec 65, which prohibits amateur operation in Vietnam.

There have been many requests for amateur operation and all, with the exception of Ambassador Porter's have been turned down. Ambassador Porter will continue to encourage the Government of Vietnam to grant additional amateur operating authorizations when in its opinion conditions in the country make that practical. It should be remembered that it has not been the practice of most governments to permit amateur activity in time of war.

Ambassador Porter has found there is almost a complete lack of knowledge in this area on the subject of amateur radio. He has stated his desire to help amateur radio get a start in the southeast Asia area and as the situation permits he hopes to carry on his own educational program to bring about a better general understanding of amateur radio activity. This, however, will take time and for personnel in Vietnam now, or going there, Ambassador Porter has already accomplished something of immediate benefit: With his help a MARS system was authorized late in 1965, after three years of effort. There are Army, Navy, and Air Force military unit MARS stations in operation, but individual member and club stations are prohibited. The support for MARS operation rests in large part with licensed amateurs volunteering to operate the stations. As a result many amateurs can satisfy their desire to operate by offering their assistance to the local Army or Air Force MARS Director or Navy MARS Cognizant Officer.

The MARS net structure consists of one in-country net in which all stations may participate to exchange message and phone patch traffic in-country and each station participates in an Army, Navy, or Air Force Pacific area MARS net.

The MARS operation is expected to expand, but amateur operation is expected to remain in the present status for some time. In view of this, individual amateurs are urged to refrain from writing for late information concerning amateur operation in Vietnam. If there is any change in the policies concerning amateur operation in the Republic of Vietnam this Headquarters will disseminate the information promptly.

Walter E. Lotz, Jr.
Brigadier General, USA
Assistant Chief of Staff, J-6
US Military Assistance Command, Vietnam

The Big DXing Controversy

Dear Dick:

Re: January Editorial on DXing.

I was glad to read your thoughts on the DXCC rat race and fully agree with them. When I was first licensed, all new G's had to use c.w. for the first year with 25 watts maximum input.

WELCOME ABOARD!

International's "FLYING SHOWROOM 66"
will visit your area soon.
Welcome aboard this fabulous electronic flying display.

During 1966, International's Martin 202 Flying Showroom will tour cities throughout the United States, bringing with it displays of International electronic equipment and products, plus a technical staff available for consultation. ■ A space age electronic show for Amateur Radio operators, radio experimenters, hobbyists, Citizens Radio dealers and users, commercial 2-way radio operators and manufacturers requiring special electronic products. ■ If you are a manufacturer, radio equipment dealer, Amateur or Citizens Radio Club, or other interested groups, we will attempt to schedule a specific time and date to visit your area. Watch for announcement or write International Crystal Manufacturing Co., Inc. for details.

Discuss your technical and engineering requirements with International's staff. See how International electronic products can work for you.

INTERNATIONAL

CRYSTAL MFG. CO., INC.
18 North Lee
Oklahoma City, Okla. 73102

For further information, check number 15, on page 112

With only a home brew 807 TX and low, wire antennas, to ever achieve DXCC seemed a pipe dream. When after a mere eight years, I finally made it, I felt ten feet tall. Now, most any dedicated soul can work DXCC in a couple of contest weekends, if he tries.

As you remark, when some unheard of reef in the middle of nowhere is suddenly decreed a new "country" all the lads at the top of the heap work it—or get someone else to do it for them!—thus maintaining the status quo and achieving nothing. However, should some lesser mortals catch them napping and work St. Peter and Paul Rocks, WOW! They almost take it to the International Court at the Hague.

The performance of some of the DX Kings has to be heard to be believed at times. They have become the objects of ridicule especially when they started referring to each other as "Uncle!" I have met many of the leading DXers and most of them are sensible about country chasing. Some, tired of all the ritual now attached to what was once a worthwhile and meaningful yardstick of operating skill, have opted out of the DXCC stakes whilst others, with good equipment and locations, work all the DX but never bother to send in any claims.

There is no doubt that operating manners and procedures have deteriorated in recent years and DXpeditions have contributed to this. Whilst the manners and skill of a fellow like Gus Browning are above reproach, the mere presence of him in a rare spot seems to bring out the very worst behavior in many operators. It is becoming fairly commonplace during pile-ups to hear people saying, "4X4 . . . why don't you shut up!" and often far worse.

Then there is the guy with the big signal getting all his pals in . . . "Now Charlie, I want you to listen for Uncle Horace; he will call you now. No breakers please . . ." This circus may go on for half an hour and get nowhere by which time the skip has changed, and those who could have worked dear Charlie have lost the opportunity.

Finally, when it subsequently transpires that dear Charlie might never have set foot in the "country" after all, the futility and hypocrisy of the entire racket is apparent.

I agree that future sponsored DXpedition QSO's should not count for DXCC or any other award. Only true amateur DXpedition QSO's should, that is where the amateur has paid all his own expenses as on a vacation, and uses his own gear.

I understand that large sums have been donated to promote DXpeditions. Surely this money could have been spent better in buying a native amateur in a rare country some reliable equipment so that his country would be regularly on the air over a long period. This would avoid the nasty, bitchy pile-ups inevitably caused by the 48 hour only operations.

As an alternative, since DXpeditions really only benefit those with about 280 countries worked. ARRL could consider a one dollar levy on each ten country sticker after that number, the entire proceeds being put into a "DXpedition Pot" to provide the finance for the scheme suggested in the previous paragraph.

Norman A. S. Fitch, G3FPK/3AØBT
79, Murchison Road
London, E. 10 England

Motion Picture "I"

Editor, *CQ:*

I read with much interest W1UXK's solution for MPI (*CQ*, February '66, p. 107). Our college radio club planned to handle traffic in conjunction with the local showing of the "Bedford Incident" and we used his formula (in early December, 1965) for minimizing interference. We planned to use a Clegg 99'er as a six meter link to our club station where the traffic would be handled on the lower bands. The antenna was a halo mounted on a music stand located in the lobby, which we expected would attract attention if nothing else did. What we hadn't counted on was the presence of a Broadcast station's studio in the same building as the theater. Eight watts of r.f. was sufficient to overide the input to their new transistorized control board. The result—a nasty situation instead of good public relations that we had hoped for. It makes us wonder if it's worth the effort, but we'll keep trying to improve the overall image of amateur radio.

Wishing to remain anonymous,
A dedicated amateur

NOW! A 3-BAND SSB TRANSCEIVER KIT FOR 189.95

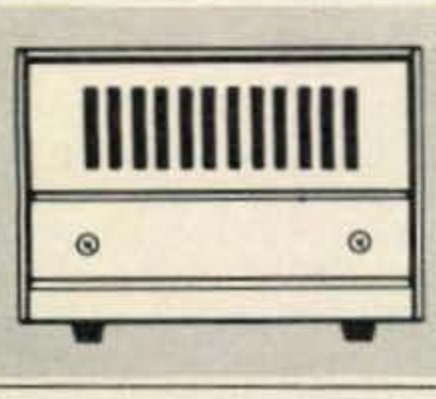
NEW EICO 753 SSB/AM/CW 3-BAND TRANSCEIVER

WITH SILICON SOLID STATE VFO

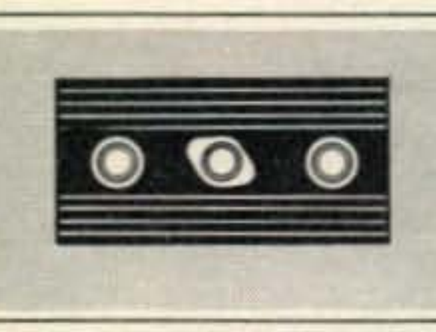
Build the finest of SSB/AM/CW 3-band transceivers with 200 watts of SSB punch and every wanted operating facility, plus the extra reliability and maintenance ease inherent in kit design. Assembly is made faster and easier by VFO and IF circuit boards, plus preassembled crystal lattice filter. Rigid construction, compact size, and superb styling make this rig equally suited for mobile and fixed station use. The new EICO 753 is at your dealer now, in kit form and factory-wired. Compare, and you will find that **only the 753 has all these important features:**

■ Full band coverage on 80, 40 and 20 meters. ■ Receiver offset tuning (up to ±10kc) without altering transmitter frequency. ■ SILICON SOLID-STATE VFO for drift-free and voltage stable operation in both fixed and mobile installations. ■ Built-in VOX. ■ Panel selected VOX, PTT & STANDBY. ■ High level dynamic ALC to prevent flat-topping or splatter and permit the use of a linear amplifier. ■ Automatic carrier level adjustment on CW and AM. ■ Dual ratio ball drive permits single knob 6:1 rapid tuning and 30:1 vernier bandspread (over 10 degrees of scale). ■ Position of hairline adjustable on panel. ■ Illuminated S-meter/PA Cathode Current Meter and tuning dial. ■ Fast attack, slow decay AGC. ■ Grid-block break-in CW keying. ■ Product detector for SSB and CW, triode detector for AM. ■ TR relay with auxiliary contacts for use with high power linear amplifier. ■ Includes mobile mounting bracket.

Power Supplies Tailored for Optimum Performance of the 753.



Model 751 Solid State AC Supply/Speaker Console.
Matching table-top companion unit. Built-in PM speaker.
Kit $79.95 Wired $109.95



Model 752 Solid State Mobile Supply.
For use with 12 volt positive or negative ground systems. Fully protected against polarity reversal or overload.
Kit $79.95 Wired $109.95

ADDITIONAL SPECIFICATIONS

FREQUENCY COVERAGE: 3490-4010kc, 6990-7310kc, 13890-14410kc. SSB EMISSIONS: LSB 80 and 40 meters, USB 20 meters. RF POWER INPUT: 200 watts SSB PEP and CW, 100 watts AM. RF POWER OUTPUT: 120 watts SSB PEP and CW, 30 watts AM. OUTPUT PI NETWORK MATCHING RANGE: 40-80 ohms. SSB GENERATION: 5.2 Mc crystal lattice filter; bandwidth 2.7kc at 6db. STABILITY: 400 cps after warm-up. SUPPRESSION: Carrier-50db; unwanted sideband-40db. RECEIVER: Sensitivity 1uv for 10db S/N ratio: selectivity 2.7kc at 6db; audio output over 2 watts (3.2 ohms). PANEL CONTROLS & CONNECTORS: Tuning, Band Selector, AF Gain, RF Gain, MIC Gain with calibrator switch at extreme CCW rotation, Hairline Set (capped), Mode (SSB, AM, CW, Tune), Function (Off, Standby, PTT, VOX), Carrier Balance, Exciter Tune, PA Tune, PA Load, Receiver Offset Tune, MIC input, phone jack. REAR CONTROLS & CONNECTORS: VOX Threshold, VOX delay, VOX sensitivity, Anti-VOX sensitivity, PA Bias adjust, S-Meter zero adjust, power socket, external relay, antenna connector, key jack, accessory calibrator socket. METERING: PA cathode on transmit, S-Meter on receive. SIZE (HWD): 5 13/16" x 14 1/4" x 11 1/4". POWER REQUIREMENTS: 750 VDC at 300 ma, 250 VDC at 170 ma, -100 VDC at 5 ma, 12.6 VAC at 3.8 amps.

The Model 753 is an outstanding value factory-wired at $299.95.

EICO For FREE Catalog and 753 Spec. Sheet write to EICO Dept. CQ-4
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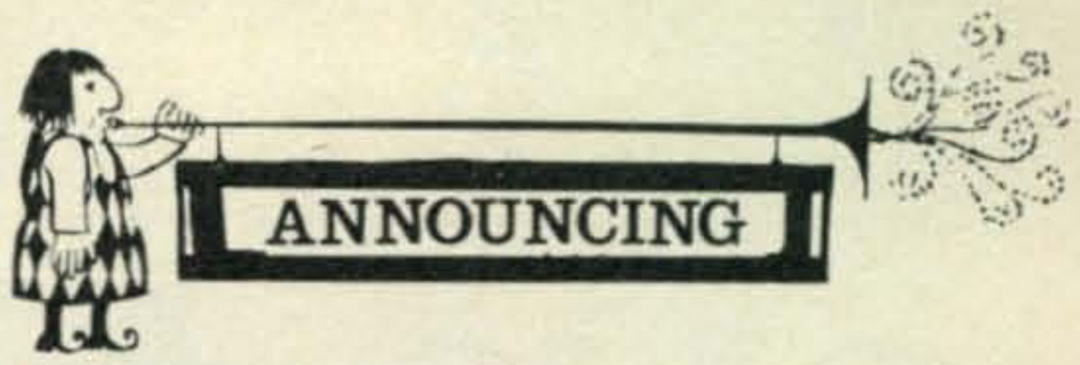
For further information, check number 17. on page 112



Boston, Massachusetts

The Federation of Eastern Mass. Amateur Radio Association will once again offer its "Ham Of The Year Award." They will present a cash award and a handsome plaque to a ham in the first call district who has met one or more of the following qualifications:

1. Performed a meritorious public service to his community through the medium of amateur radio,
2. Made a major contribution to the science of amateur radio,
3. Helped greatly to stimulate interest in amateur radio in others,
4. Aided other radio amateurs to acquire a greater knowledge and skill in operating or building amateur radio equipment.

This award will be given at the ARRL National Convention on April 23, 1966 at the Sheraton-Boston Hotel. Please send all nominations to Eli Nannis, Chairman, Awards Committee, 37 Lowell St., Malden, Mass. The closing date for these nominations is April 6, 1966.

Granite City, Illinois

The Old Timers night at W9AIU, the Egyptian Radio Club, Inc., will be held at the club house south of the Chain Of Rocks Bridge at 8 P.M. on April 21. Bill Du Bord WØQDF will present "Confessions of a Retired DXer." Old-timers and new-timers are cordially invited as guests of the club. Ace Ratcliff, WØROA, and Joe Russo, K9TCU are co-chairmen.

Anaheim, California

The Orange County Council of Associated Radio Clubs will sponsor the 1966 ARRL Southwestern Division Convention which will be held at the Disneyland Hotel, Anaheim, California, on May 27, 28, and 29. The combined effort of six radio clubs will offer guest speakers, manufacturers clinics, open forums, contests, mobile judging, ladies' luncheon and other programs. Tickets are $10.00 if purchased before the April 15th pre-registration date. The price includes banquet dinner, registration, and all drawings. After April 15th, all tickets are $12.00. Requests for tickets and information go to: ARRL Convention, P.O. Box 217, Tustin, California. Hotel reservations and information go directly to the Disneyland Hotel.

Sullivan, Illinois

The Moultrie Amateur Radio Klub is having its 5th annual old fashioned hamfest and get-together on April 24th. It will be held in the American Legion Pavilion in Sullivan, Illinois. For further info, write: P.O. Box 41, Sullivan, Illinois.

Hudson, New Hampshire

Attention Clergymen! The sixth edition of the *Clergy and Religious Radio Operators Callbook* is now being prepared for publication. The callbook is for the benefit of those listed, and there is no cost or obligation connected with it. Over 1200 calls are now included. Please inform us of additions and changes. Write: K1QFT, Capuchin-Franciscans, St. Anthony Seminary, Hudson, New Hampshire, 03051.

Dekalb, Illinois

The Kishwaukee Radio Club will hold its annual House on Illinois Route 23 in DeKalb, Illinois. The usual swapfest activities will be carried on. One dollar donation is requested but no commission to swap or sell your gear.

The Latest Advance in Long Range Radio Communication

LIST PRICE $385.00

MOBILE

BASE STATION

BOAT

PORTABLE

THE NEW RF COMMUNICATIONS Co-Pilot

Single Sideband Transceiver!

The RF Communications CO-PILOT SSB Transceiver was designed for long range communications in INDUSTRIAL, GOVERNMENT, POLICE, SEMI-MILITARY and PRIVATE applications.

HIGH PERFORMANCE—The Co-Pilot provides single channel operation. The channel can be specified anywhere between 2 to 12 Mc. Power output is 50 watts (can be reduced to 10 watts with rear panel switch for reduced battery consumption).

TRANSISTORIZED—All circuits except high power stages are transistorized. Instant heat tubes available for low battery consumption applications.

SIMPLE OPERATION—Only three front panel controls. An untrained operator can use the Co-Pilot with less than 5 minutes of instruction.

LOW POWER INPUT—The Co-Pilot operates from 12 volt D.C. power. Power consumption in receiver is about one watt (80 ma).

SMALL SIZE—The Co-Pilot measures 10x10x4 inches and weighs under 12 pounds.

QUALITY CONSTRUCTION—All materials and construction of highest commercial quality. Can be used in regions of high temperature and humidity, and under conditions of high shock and vibration.

FULL LINE OF ACCESSORIES—Including base station and mobile antennas, rechargable battery kit, transceiver carrying case, battery carrying case, direction finding antenna, and others.

High Performance Commercial Grade Communications At a Reasonable Price!

Please write for details

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For further information, check number 19, on page 112

Brno, Czechoslovakia

We have a request from Jaromír Bares a twenty year old electrical engineering student in Czechoslovakia. He is looking for a pen-pal(s) who can help him with ham radio. Jaromír is also interested in pop and jaz music, records, and magazine collecting. You can write to him at the following address: Jaromír Bares, College Of T. University, Leninova 88, Brno, Czechoslovakia.

Rockaway Park, New York

The Rockaway Amateur Radio Club will hold a "Rockaway On The Air Day" on two meters, Sunday April 17th from 1200 to 1800 EST. The purpose is to allow radio amateurs to contact five or more Rockaway ARC members and thus qualify for the club award. Send a copy of the log to Rockaway ARC, P.O. Box 205, Rockaway Park, N.Y. 11694.

Brookfield, Illinois

The annual auction of the Chicago Suburban Radio Association will be held on Wednesday, April 6th at National Hall, 3907 Prairie Ave., Brookfield, Illinois. No admission—all interested in amateur radio invited. For more information contact: Bob Vlk, 3040 Forest Ave., Brookfield, Illinois.

Newark, New Jersey

The North Jersey DX Association announces its Third Annual DX Roundup to be held Saturday, May 14, 1966, at the Holiday Inn, 430 Broad Street, Newark, N.J. An afternoon devoted to DX topics will start at 1:30, to be followed by a filet mignon dinner at 7:00 P.M. The featured speaker of the evening will be Sax Ringler, W2SAW, who will describe his trip to XE5-Revilla Gigedo. Tickets are $8.50 and may be obtained from Bob Stankus, W2VCZ, Box 15, Ramsey, N.J. 07446.

Iowa QSO Party

This contest is sponsored by the Sioux City Amateur Radio Association. The date: April 10, 1966, time: 0000z to 2400z. All contacts are to be made during this 24 hour period. Full or part time operation, all bands, all modes, and same station may be worked on different bands and different modes for extra points. The general call will be "CQ Iowa" for out of staters and "CQ de Iowa" by Iowa Stations. Exchange QSO number, report and state, province or county. Count one point for each contact and multiply by number of states, countries, provinces, or for out of staters number of different Iowa counties worked.

Awards will go to the first three winners in each state and to each county winner in Iowa. Logs showing date, time, freq., band, mode and location of station worked, with claimed scores to be mailed not later than April 30, to Cliff T. Taylor, WØEQN, 3818 5th Ave., Sioux City, Iowa, 51106.

Camp Counselor Needed

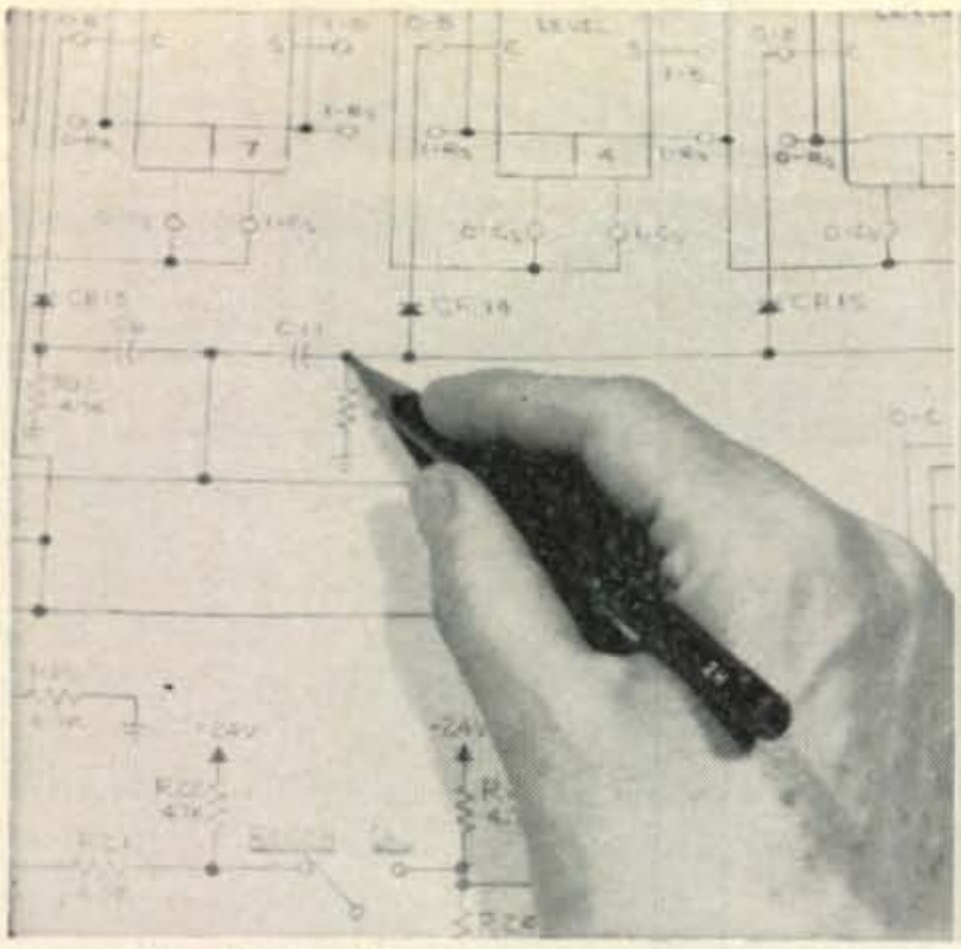
Camp Colang, located in Lackawaxen, Pa., in the Pocono Mountains, a co-ed camp with 300 campers, needs a Ham Radio Counsellor for the boys program. Our season is from July 1st through August 26th. Salary would depend on age, experience, and equipment. Please call or write our New York office, c/o Hotel Martinique, 32nd St. and Broadway, New York 1, N.Y. PE 6-3800, ext. 228.

Norristown, Pennsylvania

The North Penn Amateur Radio Club invites you to attend their 13th Annual Banquet. This will be held at Sunnybrook, Pottstown, located east of city limits on Route 422 on Saturday, May 21st at 7:00 P.M.

Then menu will consist of eye roast of beef and all the trimmings at a cost of $4.75 each. Tickets may be purchased from Jack Barnshaw, K3ROK, 309 Prince Frederick Street, King of Prussia, Pa. May 14th is the deadline for tickets to be purchased and there will be no tickets sold at the door.

The TELEPRODUCT® line:



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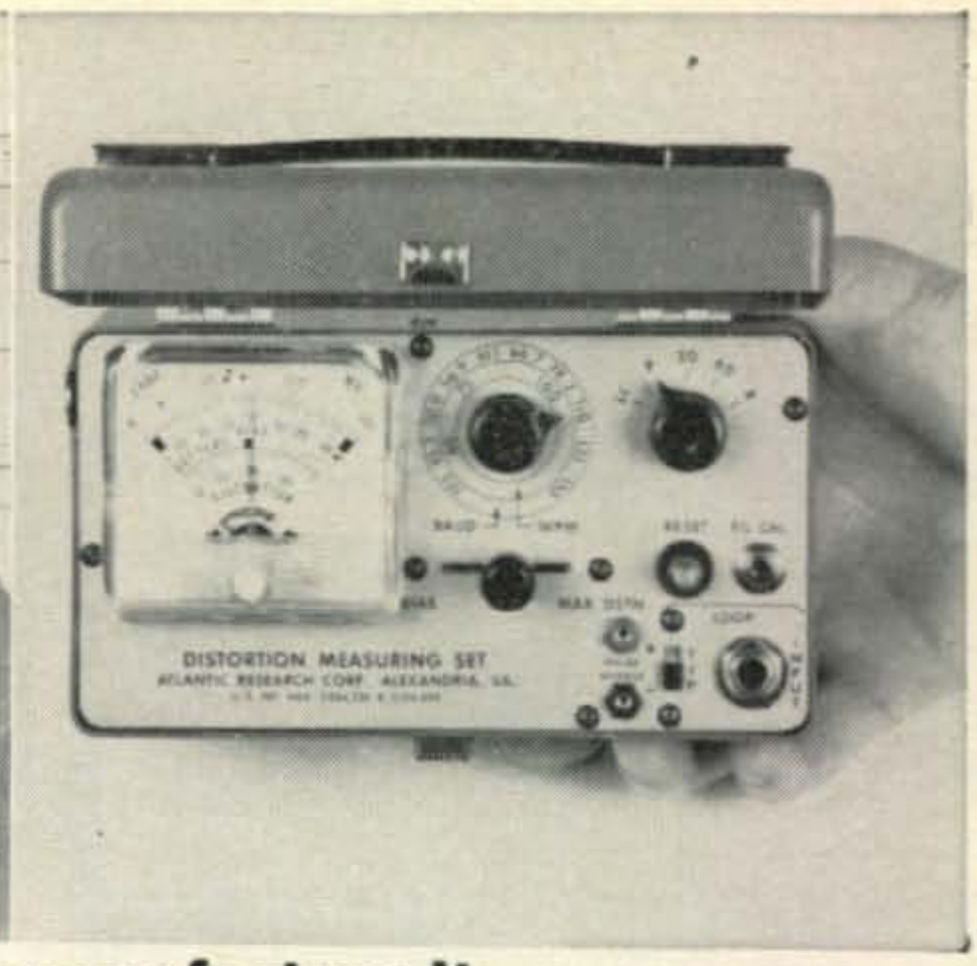

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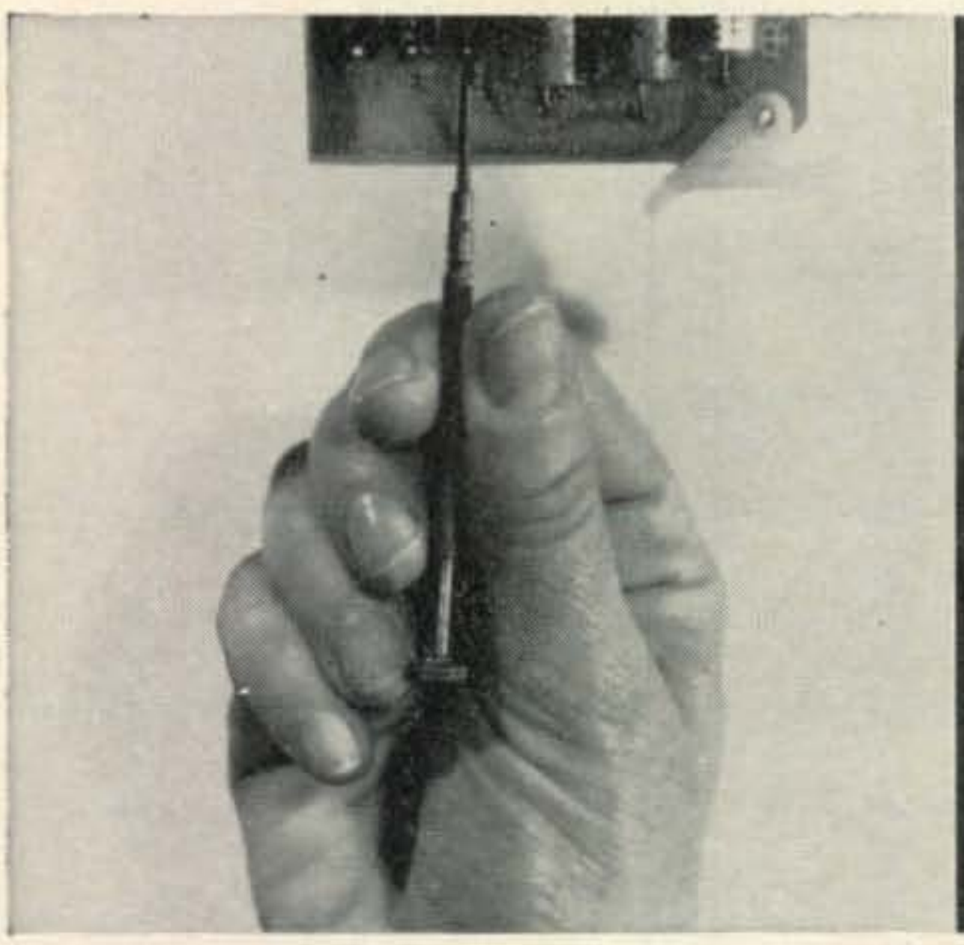
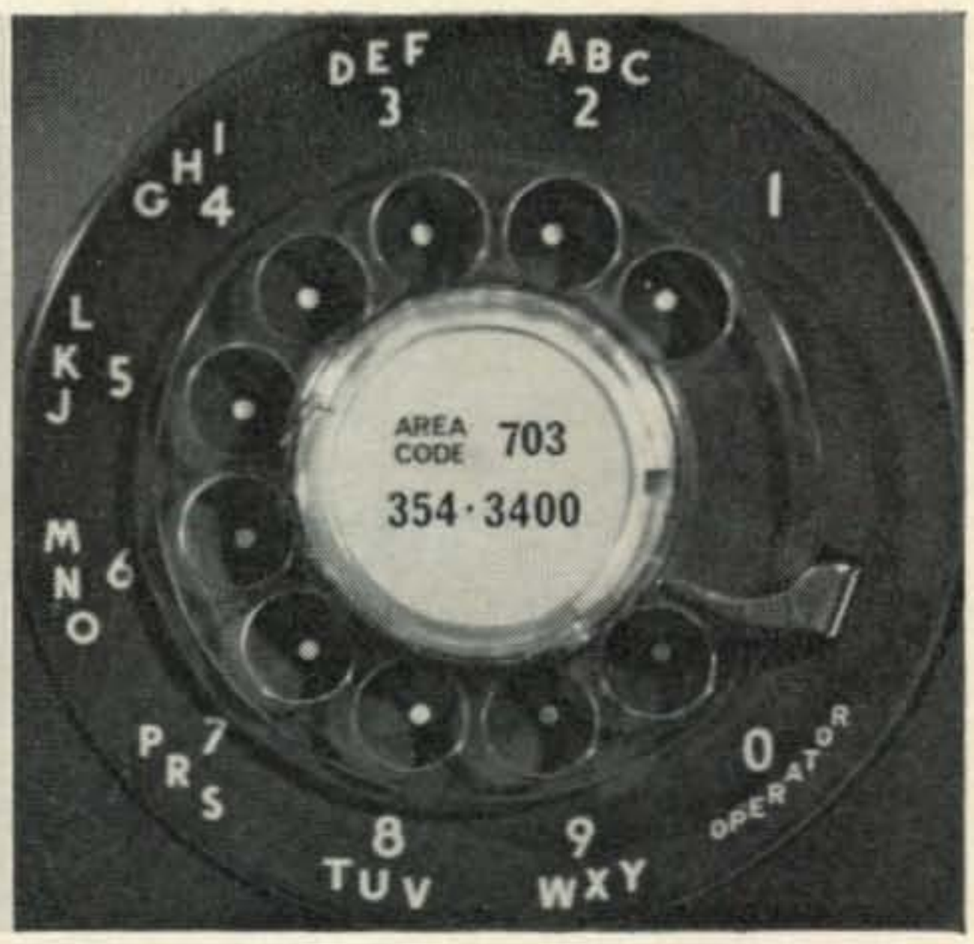


service it.



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TELEPRODUCT® equipment includes:
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Special offer for ham operators only: A limited number of DMS-1A Distortion Measuring Sets (some reconditioned) are available at a special price of $75.00.

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For further information, check number 21, on page 112

CLUB FORUM

AL SMITH,* WA2TAQ

THE CLUB FORUM receives many nice letters from readers and I do my best to answer all of them in at least three weeks time. If you don't hear from me in that time, drop me a QSL or post card and bawl me out as I probably have overlooked your letter.

A fine letter was received from Samuel Knox, WB2MRA the recently elected and "installed" President of the Southern Counties (New Jersey) Amateur Radio Association, Inc. While I would really like to include Sams entire letter space will not permit. Here is some of it:

"I would like to extend to you my sincere thanks for your CLUB FORUM which I have followed with much interest since its inception. In the months ahead I intend to make frequent reference to it as I will be installed as President of SCARA for 1966 and it is my intention to make full use of many of the excellent ideas and suggestions contained in your column."

Some of the things reported in Sams letter concerning what SCARA has been doing are: setting up a mobile unit for ROAR (Rotorians of Amateur Radio) at Rotory Convention and providing communications for delegates at a major political convention, both held in Atlantic City.

Their Club committees for this year include: Welcoming, Refreshments, Membership, Mobile Unit, Field Day, TVI, Program & Publicity, Ways and Means, By-Laws, and Special Projects. All Chairmen are required to give a verbal account of committee activities at each meeting. In the event a chairman is absent, a special report form is provided, which is filled out by the Chairman, and read by a committee member at the meeting.

A questionnaire is sent to all members which asks among other things the date of birth of the member and his wife as well as the anniversary date of their wedding. These items are reported in a special column in the clubs monthly publication *Scara News*. In addition a supply of suitable greeting cards are kept on hand and mailed out as these special dates come to pass.

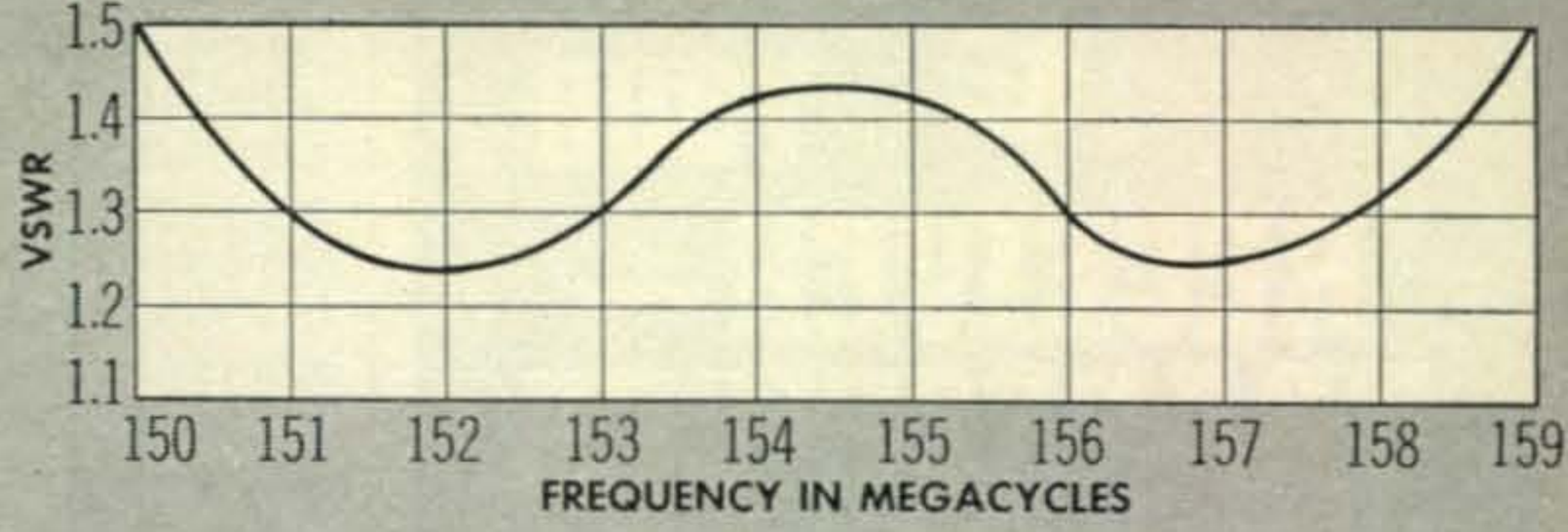
The annual SCARA installation dinner with some 125 usually in attendance is certainly an affair for each member to look forward to each year. A full course dinner in a private dining room, a master of ceremonies, gifts for a lucky one third of the group, guest speaker, and an award to "the amateur of the year." What a fine demonstration of planning and enthusiasm. Con-

*504 Beach 43rd St., Far Rockaway, N.Y. 11691.

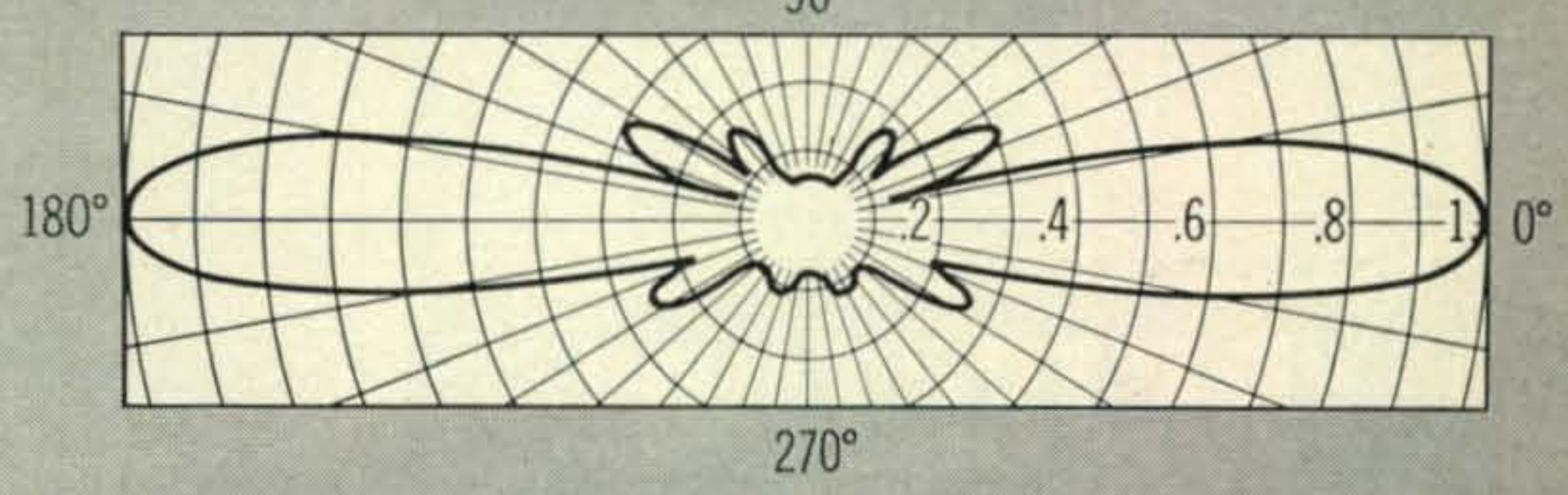
It's Here! The New CPC BROADBAND...

SUPER STATIONMASTER®

Base Station Antenna



9.0 Mc Bandwidth!



This new CPC antenna has all the qualities of its predecessor, plus new features not now available in any antenna made for the land mobile services

ONE WAY
—to GREATER efficiency!

RIGHT TURN
—to HIGHER performance!

SMOOTH ROAD AHEAD
—SMOOTH OUT communication problems!

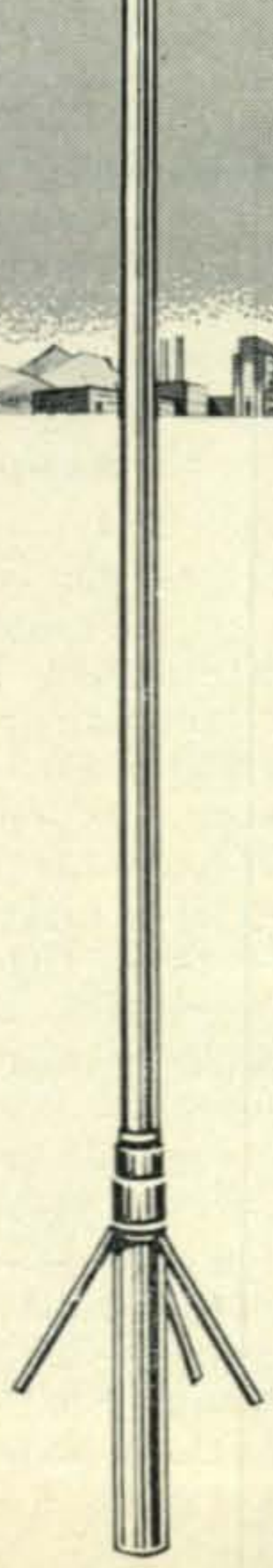
SHORT CUT
—to BETTER communication!

CAT. No. 220-509
SUPER STATIONMASTER

is a second generation antenna growing out of 30,000 STATIONMASTERS and ten years of experience with this type array.

Because of its exceptional bandwidth, the SUPER STATIONMASTER is produced in three ranges which cover the VHF band, 150 to 159 Mc, 157 to 166 Mc, 165 to 174 Mc.

A 10 db—10 Mc wide version, CAT. No. 455-509, is available to cover 450 to 470 Mc in two ranges.



Electrical Specifications

Nominal input impedance	50 ohms
VSWR	1.5:1
Bandwidth	9.0 MC
Maximum power input	500 Watts
Flexible terminal extension	18" of RG 8A/U
Terminations	Type UHF female and Type N male
Vertical beam width (½ power points)	18°
Lightning protection	Direct ground

Mechanical Specifications

Radiating elements	Copper
Element housing material	Fiberglass
Element housing length	20'
Support pipe	2¾" dia. 6061-T6 aluminum pipe
Rated wind velocity	100 MPH
Lateral thrust at rated wind	79 lbs.
Bending moment 1" below ground plane at rated wind	521 ft. lbs.
Weight	30 lbs.

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For further information, check number 23, on page 112

gratulations to SCARA and tnx for sharing some of your ideas with our readers.

Bits & Pieces

The CLUB FORUM receives scores of club publications each month and you can be sure they are all read by this editor. In addition Dick Ross, K2MGA my esteemed Editor has been sending even more publications to me which are addressed to headquarters in Port Washington. We thought it might prove interesting to both quote and report on items appearing in these excellent club papers. In fact we may make this a regular feature of the CLUB FORUM.

Before we get into the Bits and Pieces I think a few comments are in order and I hope they will prove helpful. We can't help but observe that some club publications do not contain a masthead. Some do not list the Editors name or address and in one case the club name could not be ascertained anywhere in the issue. A lot of hard work goes into producing a club publication and certainly recognition is due the Editor so how about it fellas and gals. Don't forget to include your club address too.

We read in *Bandspread* that the Cedar Valley Amateur Radio Club has attained the dream of every club that is to have a place to call home. The "club's facilities" are located at the new City Hall Defense Center in Cedar Rapids, Iowa.

We note that in a recent VHF contest the Mt. Airy VHF Radio Club Inc. of Philadelphia, Pa., (better known as the Pack Rats) circulated a contest check list containing 128 names of members who are active on 6 and 2 in the Phil. area. Many out of towners trained their beams on the Phila. area and picked up plenty points.

We see, that the QRP Amateur Radio Club, one of the largest organized amateur radio groups has a new General Secretary/Treasurer Harry Turner, W9YZE who succeeds John Huetter, K8DZR. As of the January Newsletter, the membership goal for 66 is 5,000 low power ops.

Reminder

Field Day is just a few short months away and now is the time (if you haven't done so already) to get your committee picked out and your chairman named. Your committee should rehash last years participation and see just what was missing and where. There's nothing like experience to improve ourselves and past Field Day experience in addition to being fun to review, will help to make this years affair even better than before. Getting all the photos together that were taken at last June's event will help to refresh memories to the things that should be improved upon.

While we can't all be winners in Field Day there is one way to make things just a bit more interesting that is to compete against last year's score. We could also strive to have better antenna installations, better equipment and good shelter. And how about a little friendly competition with neighboring clubs, perhaps band against band for the highest score. 73, Al Smith, WA2TAQ

THE HOT LINES FROM GONSET®

For HFers

GSB-201 RF LINEAR AMPLIFIER

- Covers 80, 40, 20, 15, and 10 Meter Bands
- Input 2000 Watts PEP, 1000 Watts CW, 400 Watts AM
- Controlled Avalanche Silicon Rectifiers
- Built-in Antenna Changeover Relay

The GSB-201 Linear Amplifier makes an ideal fit into any high frequency system. It provides high performance in a compact handsome package at a comfortable price.

Gain — 10 db worth on the 80, 40, 20, 15 and 10 meter bands.

Input — Maximum power ratings are 2000 watts PEP, SSB, 1000 watts on CW, 400 on AM.

Exciter — Any SSB unit capable of delivering 65 to 100 watts output.

Circuits — Grounded-grid for max stability — low cost 811A tubes — silicon rectifiers for dependability.

Plus — A built-in antenna changeover relay, switchable panel meter to indicate plate current or power output, and a switch facility for preliminary tuning at low power.

For VHFers

G-50 COMMUNICATOR

- 6-Meter Fixed Station Transceiver
- 48 Watt Transmitter
- Built-in Power Supply
- VFO or Optional Crystal
- Dual Conversion Receiver

Here's a complete 6-meter amateur station in a compact, smoothly operating package. Look at these features:

Full Band Frequency Coverage — 50 to 54 Mc with a built-in low pass filter to attenuate harmonics and spurious signals over 65 Mc. 48 watts at your fingertips, with VFO or crystal, pi network, and ganged multiplier stages.

Reception, Plus — RF receiver stage provides high S/N ratio and top sensitivity. Dual conversion means excellent image rejection, 7 Kc selectivity.

With Full Control — Adjustable squelch; "S" meter; calibrated, planetary vernier dial tuning; VFO spotting switch; meter conversion switch for amplifier grid or plate currents, or modulator plate current.

The Gonset G-50 has all the dependability and performance that goes with the name Gonset, for over 25 years the leader in VHF amateur radio gear.

Complete specifications on the G-50 Communicator and GSB-201 Linear Amplifier are included in Gonset's Amateur Equipment Catalog AG-1303 — yours on request from your local Gonset distributor, or write —

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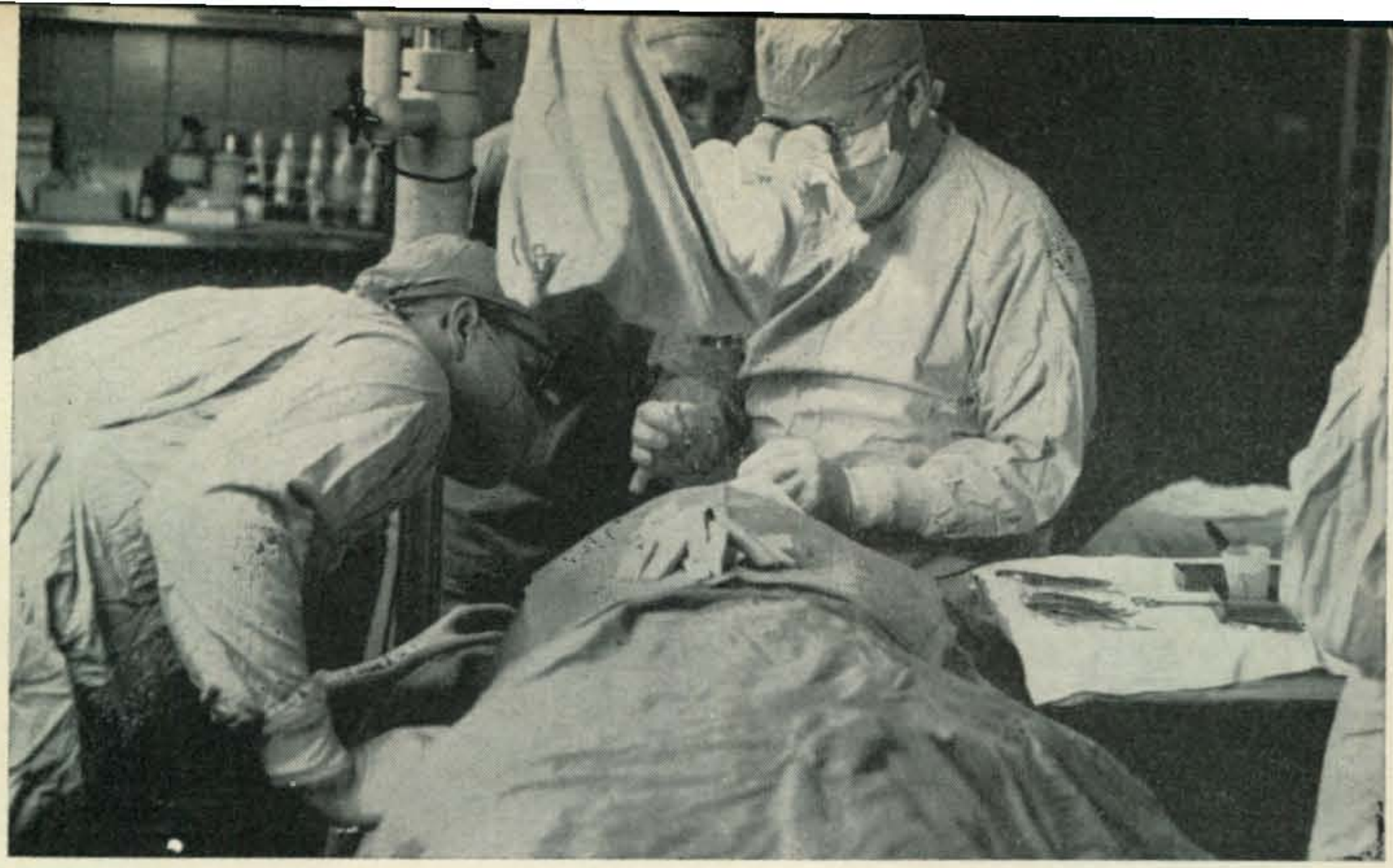
For further information, check number 25, on page 112



Dr. Alson Braley, WØGET, is shown performing eye surgery on an accident victim.

The Eye-Bank Network

BY ROBERT M. BROWN,* K2ZSQ

This is the story of the highly successful Eye-Bank Network, and the world-famous Eye-Bank, which it supports.

THE reader familiar with amateur radio knows of those many occasions when hams have been of great service in disasters and emergencies. Even the stranger to this fascinating hobby has probably noted an occasional news headline such as "Hams Bring Word from Earthquake Victims in Alaska" or "Amateur Station Sole Contact With Hurricane-Stricken City." But, the day-to-day work of a devoted group of amateurs constituting the Eye-Bank Network is less well-known, though just as satisfying, and equally in keeping with the public service traditions and spirit of the hobby. Five times each weekday, and at least twice on Sunday, a group of amateurs, each representing an eye-bank in his vicinity, meets on-the-air to exchange information on where there are emergency needs for eyes, and which cities have a surplus.

Well over a hundred amateurs, representing sixty cities in thirty-three states, take part in this activity. The list of participating stations changes from time to time, as members get new jobs or move to new locations, and as more amateurs learn of the work and want to take part in it.

How It All Began

In 1962, an Iowa citizen lost his sight because no eyes were available for the needed corneal transplant. Perhaps more than any other single factor, this incident triggered Dr. Alson E. Braley, WØGET, and Ted Hunter, WØNTI, into action. Something had to be done, and now.

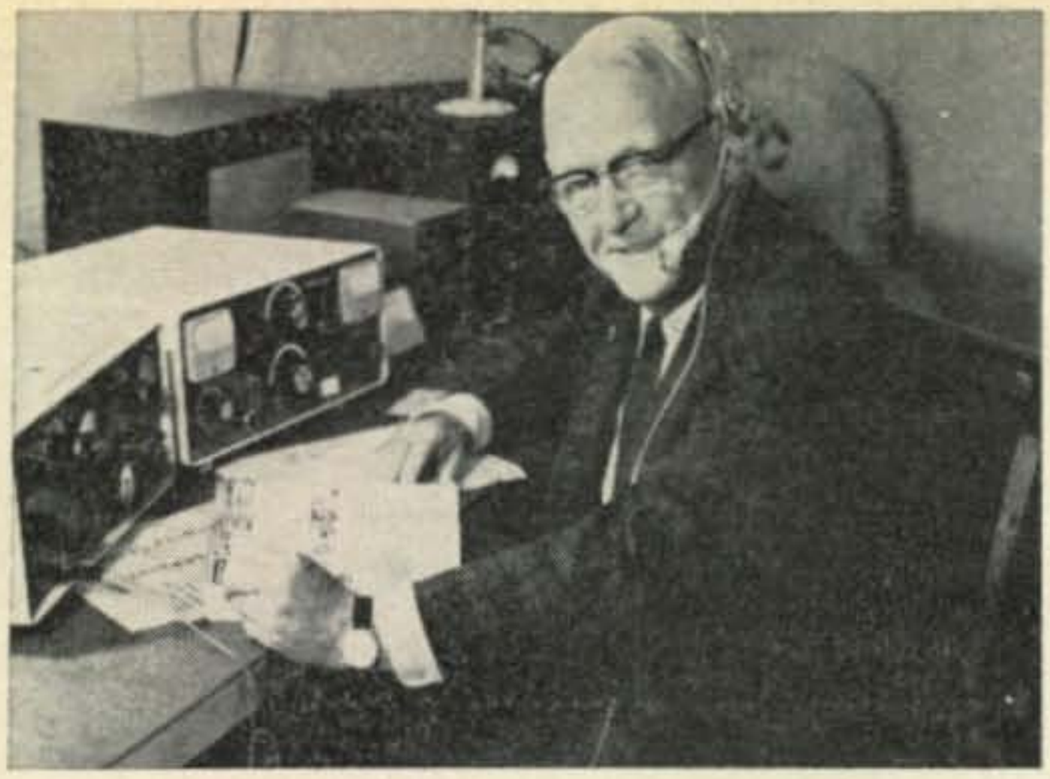
The urgency of locating and transporting eyes stems from the most frequent forms of eye damage: accidents causing a "perforated" eye condition, and a disease called keratconus, which results in blindness. In the case of a perforated cornea, immediate treatment is necessary, lest the fluid escape, and the eye collapse.

At this point a "fresh" cornea is needed fast. Here, too, doctors fight time because transplant tissues must be removed by surgery *within hours* after an eye donor dies. Once the eyes are secured, they must reach the needy party—often thousands of miles away—within 48 hours. Unlike blood, which can be bottled over long periods of time for transfusions, doctors still haven't been able to preserve the eyes.[1] And to further complicate matters, although great numbers of people have donated their eyes, they aren't always available when needed.

Troubled with these problems, Braley and Hunter determined to provide the missing ingredient: rapid, reliable, low-cost communications through ham radio.

*Contributing Editor, *CQ*, 19 Hillview Ave., Port Washington, L.I., N. Y. 11050.

[1]Using newly developed experimental techniques, it has been found possible to dry, and consequently preserve, fresh corneas for prolonged periods, long in excess of the normal useful life. However, some 99% of corneal transplant situations still call for fresh corneal tissue.



Listening in on one of the net's five daily sessions is Ted Hunter, WØNTI, co-founder of the Eye-Bank Network.

Starting with a nucleus of 20 mid-western stations in December 1962, the network expanded rapidly as amateurs in additional cities heard it in operation. Arrangements were made to represent their local eye-banks, and newcomers soon began to check into the morning or evening sessions. As activity surged, additional sessions were scheduled to permit operators in different sections of the country to take part.

But, all wasn't easy, Braley explains. Initially, when eye-banks in other cities began getting phone calls from amateurs, "The doctors didn't understand that we could actually communicate anywhere in the world."

The first session, early each weekday morning, is primarily for eastern state operators who must leave for work before the regular nets meet.

An hour later the regular morning net is called together, usually by a midwestern station. At least one station from the east coast early net calls in to report emergencies or surplus eyes listed. Even at this hour it is still long before daylight on the west coast. Two hours later the net meets again, covering the southwestern and Rocky Mountain states.

At about 7 P.M. CST an eastern station will establish contact with the western operator and exchange information and reports.

The final session of the day is the late-evening gathering of west coast stations, to pass information from the regular evening session and gather reports to be taken to the main net the following morning.

Net Operation

The purpose of the network, and its procedures, were simple at the outset and have not changed materially. The objective is two-fold: to get word of emergency needs for eye tissue to as many eye-banks as possible, so that there is the greatest chance of finding eyes to meet the need; and to provide wide distribution of information on the availability of surplus tissue—eyes for which there is no immediate local need —so that they may be shipped to a doctor who can use them before deterioration begins.

The actual operation of the 3970 kc Eye-Bank Network is something unique to amateur radio. Most traffic nets spend much of their time exchanging personal messages, saving the sender the cost of a telephone call or wire. The Eye-Bank operation, however, is in a *constant state of emergency*, yet quietly appears and disappears on 75 meters without even causing the ragchewers to raise an eyebrow, much less fully realize what is taking place.

A typical net session lasts from 10-20 minutes. The net control station, often Wayne Walters, W9DOG, whose principal qualifications for the job are his skill and availability, calls the net to order at the scheduled time.

After a brief introduction outlining the nature and purpose of the network, and summarizing any pertinent information from preceding sessions, net control calls for reports of any emergency needs anywhere on the net. Those calling in are recorded with net control, who repeats the needs for the entire net. When all traffic has been received and relayed, the roll is called alphabetically *by cities* and each station in turn acknowledges receipt of traffic. At the end of roll call the session is concluded with a final summary of information that has been transmitted.

A typical week's traffic on the unique Eye-Bank Network would look something like this:

Monday, April 4—W4ISH in Winston-Salem, N.C., reports emergency need for two eyes at the Old Dominion Eye-Bank in Richmond, Va. WA4BMM in Gainesville, Florida, reports an urgent need for two eyes in his city. W3ZN in Philadelphia brings word that two eyes are available at the Maryland Eye-Bank in Baltimore.

Tuesday, April 5—Relayed from the Southwestern Net is the report that the Albuquerque, N.M., and Memphis, Tenn., banks each have urgent need for two eyes. Needs at Richmond and Gainesville reported filled from Winston-Salem, and Washington.

Wednesday, April 6—Baltimore reports that Johns Hopkins sent two eyes to Columbia, S.C. Needs at Memphis and Albuquerque continue. K2VRQ/8 reports emergency request for two eyes for a Detroit doctor.

Thursday, April 7—Detroit reports its emergency has been met locally. Albuquerque has

Dr. Braley, WØGET, at his shack monitoring the Eye-Bank 75 meter frequency. Braley co-founded the amazing Eye-Bank Network with WØNTI.

Miss Ruth Fisher, who ably handles public relations for the Iowa Lions Eye Bank, visits patients after they have received transplants at the hospital. Miss Fisher is the recipient of two successful corneal transplants.

been taken care of. Schenectady, N.Y., has shipped two eyes to Memphis. All known needs satisfied.

Friday, April 8—There are no new requests, and Akron reports two fresh eyes available. Net control asks as many stations as possible to check in over the weekend in the east as weather reports indicate first real warm-weather weekend of spring. (All signs such as this must be watched closely, since more traffic accidents spell more emergencies.)

Saturday, April 9—Detroit reports receipt of two eyes from Akron, used for operation this morning. Memphis has urgent need for two more eyes.

Sunday, April 10—Memphis need has been filled; no other requests, and warm eastern weekend results in no new emergencies.

Rising To Meet The Emergency

Service is not limited to regular 75 meter sessions. Twice in a few weeks, emergencies arose on Saturday, before check-in time. In both cases the eyes were needed for immediate operations.

The ability of the Eye-Bank Net to rise to such an occasion is shown by the way they met one of these emergencies. In Miami on Saturday, July 13, 1964 the Miami Eye-Bank called Mildred, K4JGU, in Hollywood, Fla., to say that a doctor needed two eyes as soon as possible.

Mildred and her husband Phil, with no regular net session coming up in time, started calling any stations they could reach in eye-bank cities with directional CQ's. Those amateurs reached telephoned the regular eye-bank stations to get on the air. Several did, talked with K4JGU, contacted their eye-banks and in turn went on calling CQ for stations in more eye-bank cities.

Within hours the word spread across the country. No one will ever know how many amateurs played a roll in this particular drama—W8-GRG's guess is about 100—but the important thing is that it worked. The Navy MARS station in the Pentagon, K4NAA, representing the Washington, D.C. Eye-Bank, had eyes available and shipped them to Miami in time for a Sunday morning operation.

Since this time, more regular net sessions have been scheduled to cope with situations like this.

How The Eye-Banks Work

The International Eye-Bank Association, parent organization of the local eye-banks that serve major cities throughout the U.S. and countless countries, was founded by Medico in Washington, D.C. in February of 1961. Basically an eye-bank is an organization to collect human eyes and to distribute them to hospitals where a cornea is needed for grafting or transplanting. It also stores the vitreous fluid for use in retinal detachment operations or transplants.

It is interesting to note several facts about enucleation (removal) of eyes. Ophthalmologists tells us that the donor's race or age is of no significance whatever, nor is the condition of his sight before death! Apparently since only the cornea is transplanted, any defects in seeing are not transmitted.

But perhaps the most significant factor in the entire worldwide program is that patients *are not charged* for this precious gift. Eyes are neither bought nor sold at any level, and all those concerned donate their services to insure rapid transit of the eyes to the operating table.

When a need is reported through the Eye-Bank Network, the local bank arranges for the Red Cross or State Police to transport the precious tissues to the airport. (With no concern for speed limits, police reach the airlines within minutes, where the eyes are put upon the next plane out.) All major airlines, by the way, cooperate with amateurs and the program by taking over completely once the container is in their hands. In many cases the hams themselves, anxious to see the eyes on their way, have personally delivered the container to the airport.

Photo at left shows an eye with a clouded cornea. This eye is blind, and in need of a corneal transplant.

At right is the same eye after a transplant. Note the neat circular incision marking the boundary of the precious new cornea.

Where does the eye-bank get the eyes? It must be notified by telephone immediately after the death of a donor. Prior announcement of a person's intentions to donate to his physician, by the way, relieves the family of this duty and the bank takes care of all arrangements with no delay.

"My Son Has Freckles . . ."

Corneal tissue is unique in that it contains no blood. It is very tolerant of being used for surgery involving grafts. Because of this tolerance, the corneal transplant operation is usually very successful and provides many human interest stories about sight restoration and sight preservation. For example, here are some excerpts from letters written by recipients of corneal transplants:

"Tell the doctor that the thing that really gave me my biggest thrill was to discover that my son has freckles on his nose. It's been like discovering a whole new world . . ."

"To a 19-year-old girl with almost her whole lifetime ahead of her, losing one's sight is a very frightening experience. But thanks to the Eye-Bank and two donors, I can see better than I ever thought possible."

"Without a donated cornea, I would be sightless today. Without the Eye-Bank, there would be no donated corneas. What greater epitaph could a man have than, 'He gave his eyes so that another might see.' "

"Being able to see again after 20 years, I'll never forget that."

"I saw my grandaughter for the first time; she's going on three years. What a thrill. I am so grateful that someone left such a precious legacy that I may have this precious sight. This is truly an Easter that means much to me . . ."

These comments may sound a bit too dramatic for your taste, but the workings of the Eye-Banks of the world combined with modern Ophthalmology have made them very real for many thousands of people. In the last two years alone, more successful transplants have been accomplished giving sight to the blind than in all previous time.

It is this "gift" that draws a select group of amateurs into the Eye-Bank Network Service. With such miracles being performed each day, it strikes many operators as unthinkable that someone needy of this tissue should not have them.

The Eye-Bank Net Now

There are still many eye-banks not represented regularly on the network. Liaison between the eye-banks and the amateurs in many cities could be improved, and the hams themselves better organized. Every effort is presently being made to correct these conditions.

In addition, radio conditions being what they are, there are far too many times when it is physically impossible for stations in the southwest and west coast to copy the midwestern and eastern stations, or to make themselves heard through the QRM and frequent QRN.

The Iowa Lions Eye Bank Station is being manned in this photo by Gene Weiner, KØCKX, a physicist. Party at right is staff visitor.

Some of the existing deficiencies can be corrected by the cooperative efforts of local amateurs and their eye-banks. In this regard, the net is now urging local member-stations to get together and select one of their number to be responsible for all communications with the eye-bank. This person would see that all traffic gets to the eye-bank, and, equally important, that the eye-bank is not burdened by duplicate calls. This same individual would also be responsible for arranging schedules so that his city is represented on as many net sessions as possible.

Network officials further suggest that eye-banks keep their amateur representatives advised when they have patients on a waiting list for eyes. Even though only emergency needs are transmitted over the network, knowledge of these waiting-list requirements—the so-called "routine" needs—will permit the amateur to express the eye-bank's interest whenever a surplus in another city is announced.

The group is always looking for ways to improve its service. Regular morning and evening nets threaten to become unwieldy as coverage expands. Suggestions have been made including the limiting of check-ins to one station per city, and breaking the roll call down into regions which could be called simultaneously by assistant net control stations using reduced power. Plans are also being made to improve the net's DX coverage and to provide frequencies of emergency communications in the hours between regular net sessions which will insure getting an emergency need in any part of the country on the next net.

The Intercontinental Traffic Net, which meets daily on 20 s.s.b. and covers the U.S., has volunteered its services and Navy MARS is also a promising possibility. Procedures will be passed along to all network stations when they are sufficiently developed, and in the meantime suggestions are welcomed.

No End In Sight?

With the advent of the amateur-operated Eye-Bank Network, more and more Eye-Banks are springing up around the globe. At last report,

[*Continued on page 101*]

Using the V.O.M. and the V.T.V.M.

BY WILFRED M. SCHERER,* W2AEF

LAST month our discussion centered around the basic operation of the v.t.v.m. and v.o.m. and d.c. voltage measurements. This month we'll investigate the a.c. functions of the same instruments, and current measurement in both a.c. and d.c. circuits.

A.C. Voltage Measurements

A.c. voltages are measured in the same way as those for d.c., except the function switch is set for a.c. and a particular polarity need not be observed when the test leads are connected. However, with a v.t.v.m., care must be used when connecting the common lead, since it usually is attached electrically to the v.t.v.m. case or panel, or it might actually be grounded through a third wire in the a.c. power-line cord. This is particularly important if measurements are to be taken on an a.c. power line or on an a.c./d.c. set, as the instrument case or panel may present a serious shock hazard.

In this connection a good safety measure would be to first *ground* the common v.t.v.m. lead and then touch each side of the test circuit with the other lead to determine which is the "hot leg" of the circuit. This will be the side on which a voltage is indicated by the meter. During measurements the common lead then should be connected to the "dead" side (the one that does not indicate a voltage between it and ground).

Similarly, when an a.c./d.c. set is involved where the chassis may be connected to one side of the power line, ground the common lead and touch the other one to the chassis. If no voltage is indicated, the chassis is at ground potential. If a voltage is indicated, the chassis is *above* ground, in which case the set's a.c. power plug should be reversed for a no-voltage reading between chassis and ground before you do any servicing. This principle also should be followed when a v.o.m. is used.

A.c. potentials generally are measured in terms of r.m.s. voltage. Peak, average or peak-to-peak a.c. voltage readings may be required in applications involving pulses, waveshaping, etc., but since these are seldom encountered in amateur gear, they will not be discussed here; except to show the various relationships at fig. 1.

On many v.o.m.'s two different positions are available for a.c. measurements. One is labelled A.C., the other OUTPUT. When the A.C. position is used, the meter is connected directly to the test circuit, but in the OUTPUT position a d.c. blocking capacitor (usually 0.1 mf) is inserted in series with the meter to permit measurement of an a.c. voltage which is superimposed on a d.c. voltage, such as at the plate of an a.f. amplifier tube.

With OUTPUT measurements the impedance of the blocking capacitor can affect the accuracy of the meter reading. The error increases as the frequency is lowered and as the ohms/volt sensitivity of the meter drops. This can be serious below a few hundred cycles in which case it would be better to use the regular a.c. position with a 2 to 4 mf capacitor in series with one of the test leads. The a.c. settings should normally be used directly for measurements at power line frequencies and for all a.c. readings where no d.c. is present. A v.t.v.m. has a built-in blocking capacitor for all a.c. work, but the internal impedance relations are such that a uniform response can be still maintained down to about 20 c.p.s.

In servicing ham gear a.c. voltages that are mostly involved are those for tube filaments or heaters, on a.c. power-transformer windings or of the main a.c. power source.

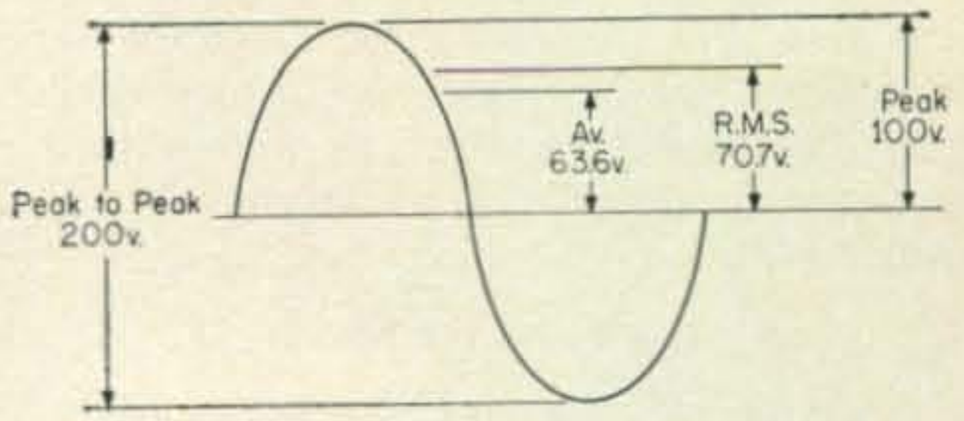


Fig. 1—Relationships between peak, peak-to-peak, r.m.s. and average voltages of a sinewave having a peak-to-peak value of 200 volts.

*Technical Director, *CQ*.

The OUTPUT position of the v.o.m. is used to measure a.c. impressed upon d.c.

A.C. Voltage Equivalents

Peak-to-Peak Voltage	= 2.828 ×	R.M.S. Voltage
Peak Voltage	= 1.414 ×	R.M.S. Voltage
Average Voltage	= .9 ×	R.M.S. Voltage
R.M.S. Voltage	= .707 ×	Peak Voltage

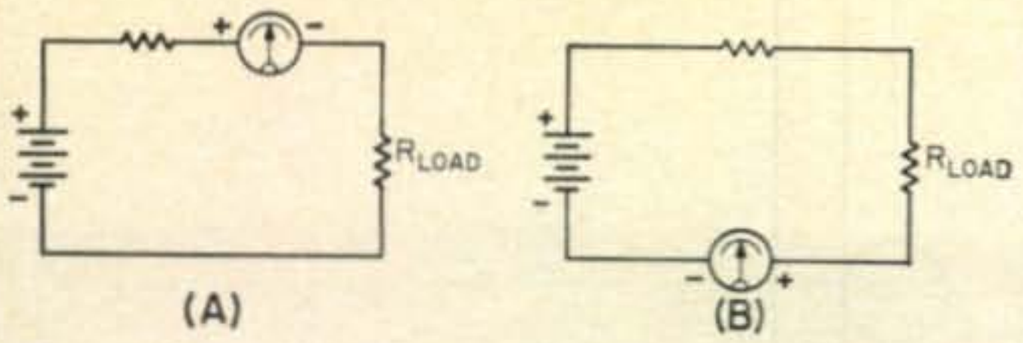


Fig. 2—Method of connecting meter to directly read current. Note that the meter has the same polarity as the source voltage. The terminal with polarity opposite to that of the source goes to the load.

If the filament or heater voltage is a suspect of equipment failure, do not depend on a reading taken on the supply line alone, but also compare the voltage right at the pins of the tubes. Where this cannot be done, make contact directly on a part of the socket-terminal lug rather than with the wire connected to it. A loss in voltage on the tube may be due to poor socket contact or a badly soldered terminal connection.

A defective power-transformer winding may be found by noting if it is delivering the rated a.c. voltage. By checking for voltage at the primary or at various points along the 120-volt input line, you can determine if a fuse is blown, if the power switch is defective or if the line cord is open.

Measurement of Direct Current

A v.t.v.m. cannot be used to directly measure current in d.c. circuits, so the v.o.m. must be relied upon instead. This is done by setting the v.o.m. to read current and then connecting the meter in series with the load as shown at fig. 2. Since this necessitates opening the circuit, the equipment power should first be turned off.

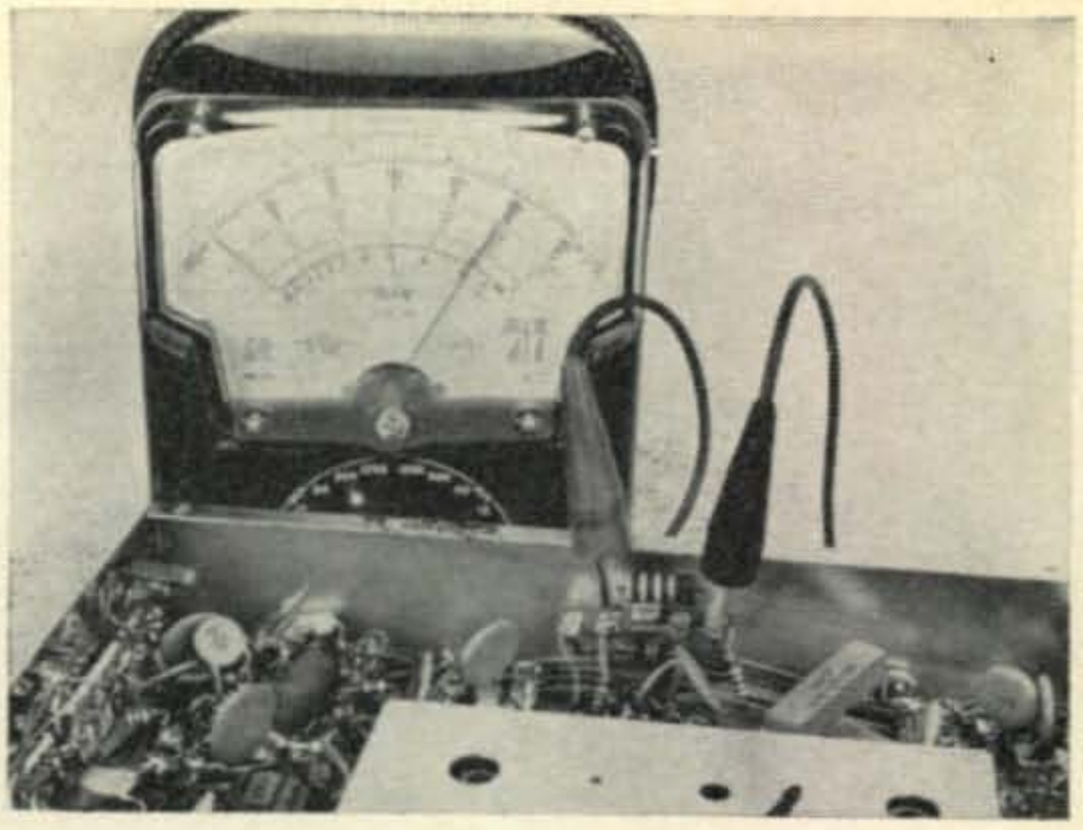
The polarity of the meter leads must be based on the polarity of the voltage source; that is, the meter lead which corresponds to the polarity of the *source* should be connected next to the source, while the lead of opposite polarity should go to the load as shown at fig. 2. (Use the red lead for the positive connection, the black for the negative.)

Besides the general precautions mentioned in this series, take special care to make certain that a current-indicating meter is never connected *across* a source of voltage, because the meter may easily be damaged.

Before making a measurement, set the meter to a high-current range and note the direction of the meter deflection when power is applied, for correct meter polarity. If the polarity is correct, then proceed with the measurement using a lower range as needed.

Meter Resistance

Just as the resistance of a voltmeter can lower the voltage on high-resistance circuits, as explained last month, so can the resistance of a microammeter or milliammeter seriously decrease the current in *low*-resistance circuits and thus drop the applied voltage to the load and affect normal operation of the equipment. This is most likely to occur with transistor circuitry.



Measuring current by the indirect method.

A voltage drop of 0.25 volts at full-scale current generally is encountered with the current ranges of most v.o.m.'s. Thus, the meter resistance on a 100 microampere range would be .25v. ÷ .0001 a. = 2500 ohms. Similarly the 1 ma range would exhibit 250 ohms, the 10 ma range 25 ohms, etc. Where this resistance may result in adverse effects, the best practice is to use as high a current range as possible, consistent with obtaining a useable reading.

Indirect Measurement of Current

A direct measurement of current may not always be convenient, since it requires opening up a circuit for insertion of the meter. An alternate procedure is to use an indirect method whereby a voltmeter range is used to measure the voltage drop across a known resistor that already may happen to be in the circuit, and then by Ohm's Law, calculate the current from $I = E \div R$ as shown at fig. 3.

The voltmeter method makes it possible to measure current with a v.t.v.m.; in fact, it will provide the best accuracy, since the resistance of the meter should be high compared to that of the resistor across which the voltage is read so that most of the normal current drawn by the load will go through the resistor. Because the case of a v.t.vm. may be connected to the common test lead, extreme caution must be exercised, as the instrument may then be at a high potential above ground. Also, if the v.t.v.m. is one that has its common lead actually grounded, no attempt should be made to make this type measurement if both sides of the test circuit are above ground.

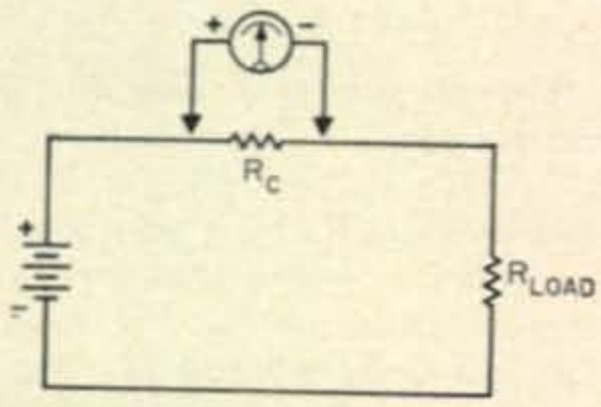


Fig. 3—Setup for indirect method of determining current by calculations using Ohm's Law after using a voltmeter to find the voltage drop across a known resistor, R_c, that is in series with the voltage source and the load.

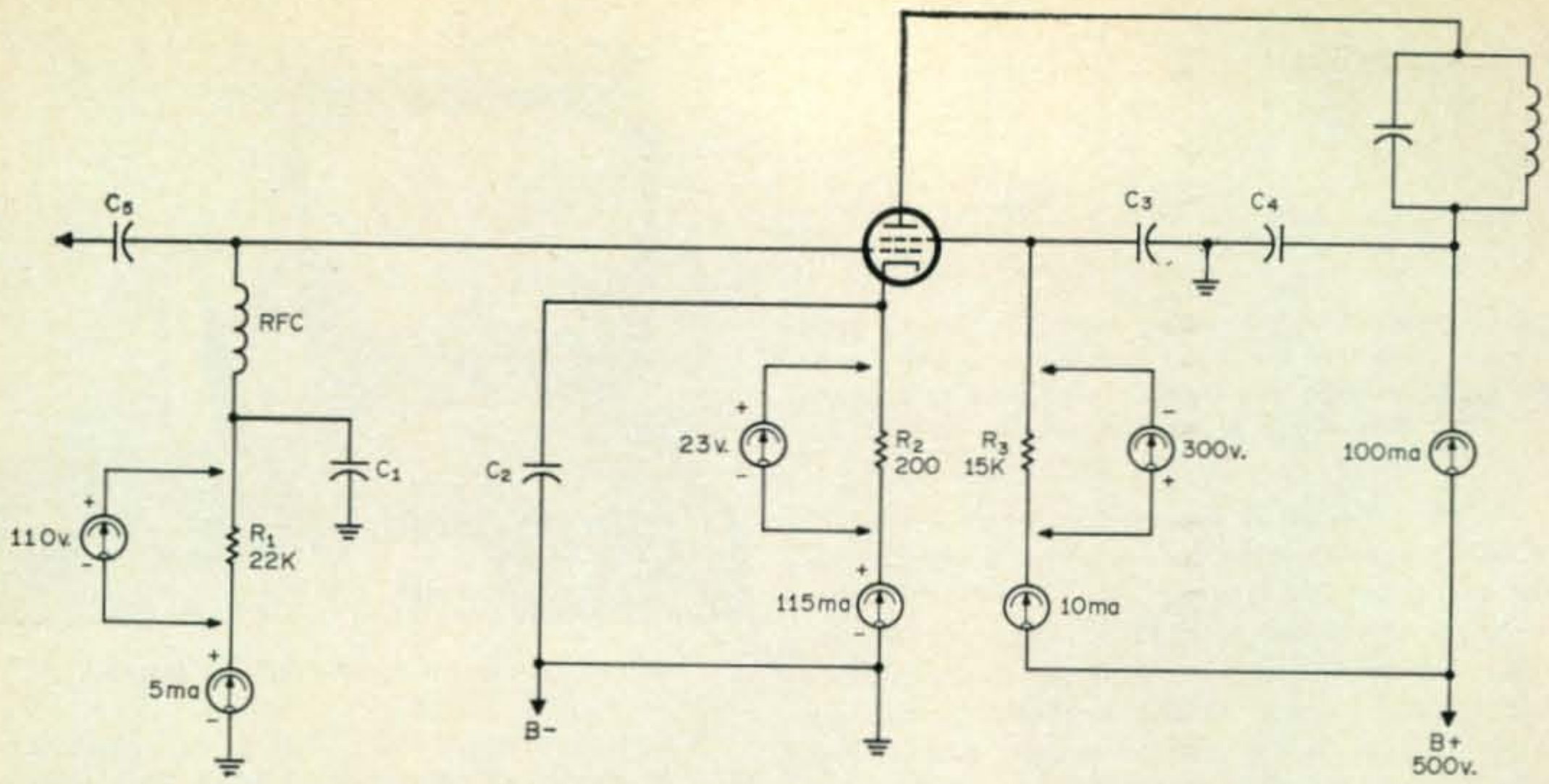


Fig. 4—Examples of direct and voltmeter methods of measuring current on an r.f. amplifier. The grid current may be read directly with the v.o.m. (set to read current) inserted between ground and the bottom end of the grid leak R_1. Assuming that the indicated current is 5 ma, indirect measurement with any voltmeter across R_2 would indicate 110 volts from which the current may be found by $I = E \div R = 110$ v. $\div$ 22,000 ohms = .005 a. = 5 ma. The cathode current (the sum of the grid, screen and plate currents) through R_2 or the screen current through R_3 may similarly be determined as indicated. Using Ohm's Law you can also find the value of R_1, R_2 or R_3 from the voltage and current, since $R = E \div I$. For instance: $R_1 = E_{grid} \div I_{grid}$ = 110 v. $\div$ .005 a. = 22,000 ohms.

Examples of current measurements using both direct and voltmeter methods are shown at fig. 4. Note here that there is no resistor in the plate-voltage feed, so measurement of plate current at this point will be limited to the direct method with the milliammeter connected as shown; however, if a suitable meter is not available for direct measurement, you can use any voltmeter with a small "circuit" resistor installed instead of the milliammeter, and then applying the voltmeter method.

The circuit resistor should be small enough to incur only a slight voltage drop, in order that the loss of applied voltage will not adversely affect the operation of the equipment. At 10 ma

[*Continued on page 107*]

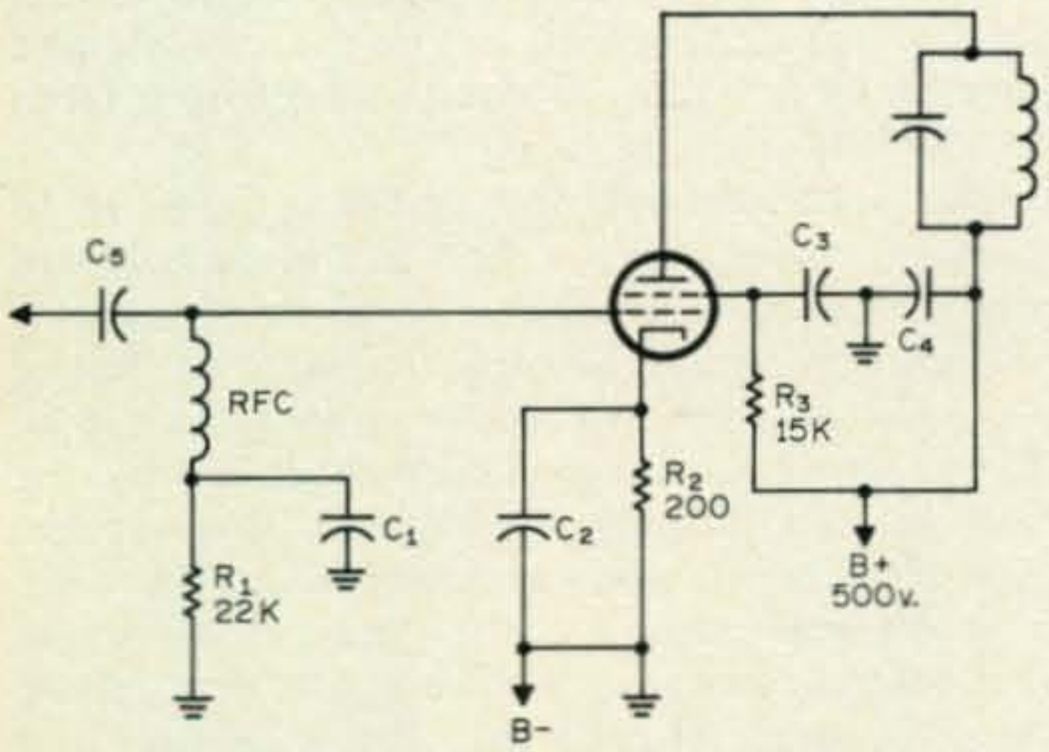


Fig. 5—Some typical symptoms are possible causes of malfunction in an r.f. amplifier as traced by current measurements. Under static conditions (no r.f. drive applied) incorrect readings may result from some of the causes as follows (assuming normal B-plus voltage is applied).

1. Current through the grid leak R_1: Due to bad tube with possible grid-to-cathode short, insufficient bias.
2. No current through R_1: Normal condition, except for a few microamperes which may be indicated due to contact potential generated in the tube.
3. No current through cathode resistor R_2: Due to bad tube, no screen voltage, no plate and screen voltage, open cathode circuit, no heater voltage.
4. Low current through R_2: Due to high bias, poor tube, low heater voltage, low plate and screen voltage.
5. High current through R_2: Due to low bias, defective tube, no plate voltage but with screen voltage applied, grid shorted to ground, excessive plate and screen voltage.
6. No screen current through R_3: Due to defective tube, R_3 open.
7. Low current through R_3: Due to incorrect bias, poor tube, low heater voltage, increased resistance of R_3.
8. High current through R_3: Due to incorrect bias, C_3 shorted, lowered resistance of R_3, no plate voltage on tube (tank coil open).
9. No plate current: Same as step 3.
10. Low plate current: Same as step 4.
11. High plate current: Same as step 5, except last item.

The following symptoms and some causes as may be found under dynamic conditions (r.f. drive applied):

1. No grid current through R_1: Due to C_5 open, C_1 shorted, R_1 open.
2. Low grid current through R_1: Due to insufficient r.f. drive, increased resistance at R_1, RFC defective, poor tube, need for neutralization, high bias.
3. High current through R_1: Due to excessive r.f. drive, lowered resistance at R_1, need for neutralization, low bias.
4. Low cathode or plate current (tank tuned to resonance): due to high bias, bad tube, insufficient output loading.
5. High cathode or plate current: Due to insufficient r.f. drive, tank out of resonance, low bias.
6. High screen current through R_3: Due to output tank insufficiently loaded, C_3 defective.

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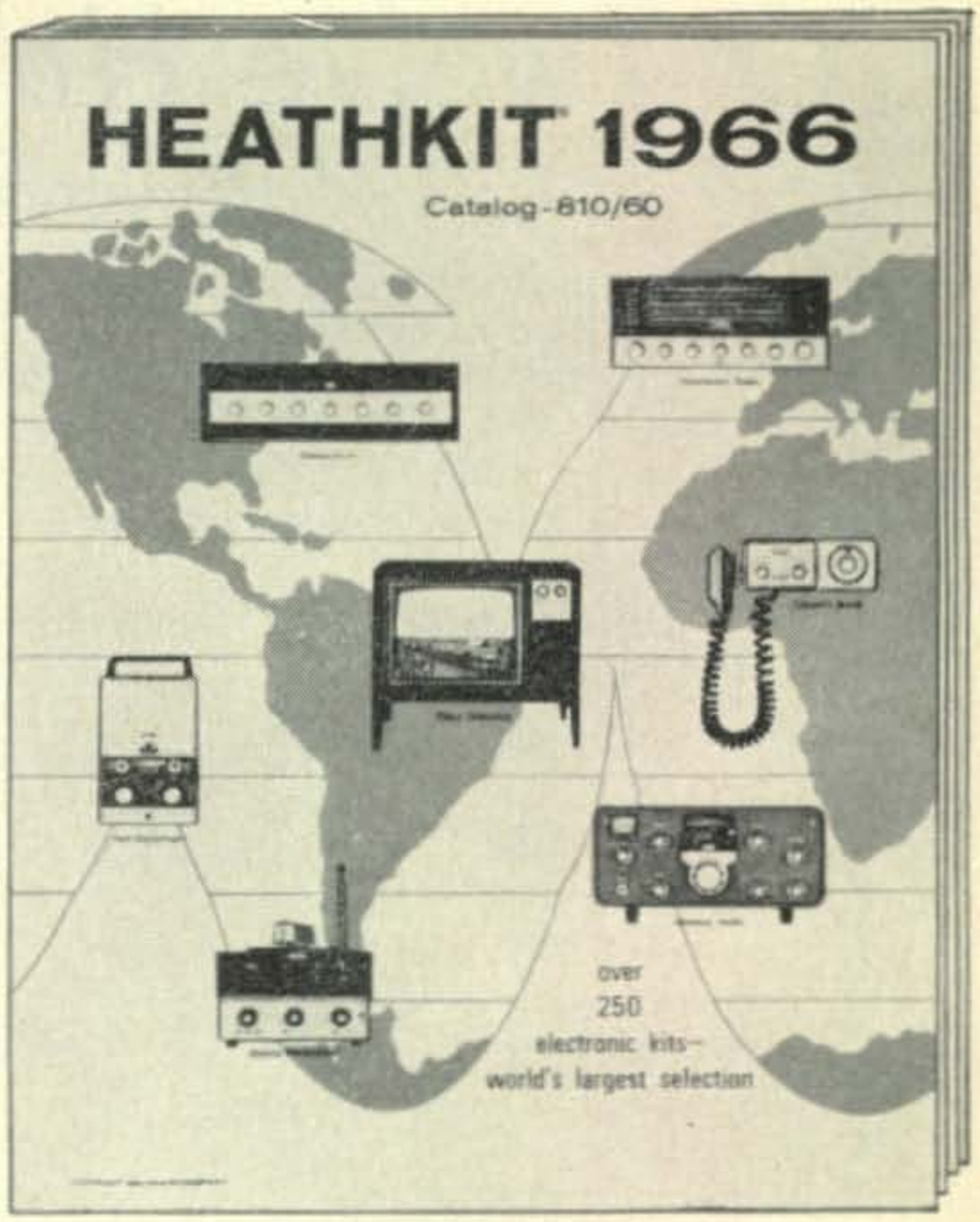

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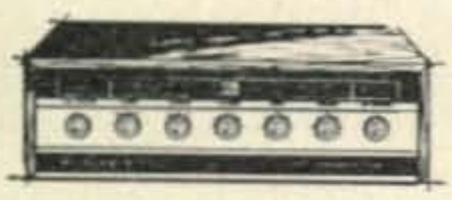

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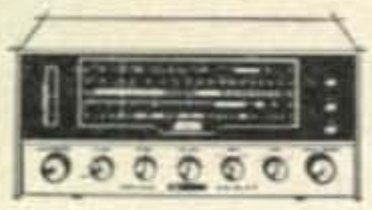

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For further information, check number 35, on page 112

Pages 33 - 34 - Missing

Announcing the

CQ Twelve Hour VHF Contest

Saturday, May 7

All amateurs equipped for the bands from 50 to 432 mc are invited to participate in the *CQ* 12 Hour VHF Contest which will take place on Saturday, May 7. This is a single-band-only contest; that is, no multi-band entries will be accepted, but you may enter separate logs for more than one band.

Contest begins at 9 A.M. local time and ends at 9 P.M. the same day.

Contest Rules

A. CLASSIFICATIONS: 1. 50 mc only; 2. 144 mc only; 3. 220 mc only; 4. 432 mc only.

B. OPERATORS:
1. Any number of operators may work together under one call. Be sure they all sign the log.

C. INFORMATION EXCHANGE:
1. Your county and state.
2. His signal report at your station.
3. Your contact number to him (numbers starting from 1).
4. Your handle.
5. Typical on-the-air exchange: "Roger OM. You're 59 Union County, New Jersey. You're my number 17. Handle is Bob. Over."

D. CONTACT POINTS:
All completed contacts with the required information count one point.
2. Mobile stations may be worked only once during the contest.
3. Aero-mobile and maritime-mobile contacts do not qualify.

E. COUNTIES:
1. In the United States only counties will qualify as sections.
2. In other countries the equivalent political sub-divisions will qualify.

F. HOURS MULTIPLIER:
1. One different contact during each hour of the contest constitutes a "contest hour." Example: 10 hours equal 10 (power multiplier). Simple?
2. These must be NEW contacts—not repeats.

G. POWER MULTIPLIERS:
1. 25 watts input or under (a.m., c.w.), multipliers of 3.
2. 125 watts input or under (a.m., c.w.), multiplier of 2.
3. 1000 watts input or under (a.m., c.w.), multiplier of 1.
4. Sidebands entrants use above breakdown base on peak envelope power (PEP).

NOTE: Power levels should remain constant throughout the contest period.

H. SCORING:
1. Each completed contact counts 1 point.
2. Each county worked scores 1 point (toward county multiplier.)
3. Each hour scores 1 point (towards hours multiplier).
4. Your power multiplier, as explained in paragraph G above.
5. Computation: Add up all your contacts, then add up all your counties; count up all the hours and write down your power multiplier. If you're running 20 watts, on the air 10 hours, and work 100 stations in 20 counties, you'll score thusly:
$3 \times 10 \times 100 \times 20 = 60{,}000$ total score.
Contacts times counties times hours times power multiplier. Now what could possibly be simpler?

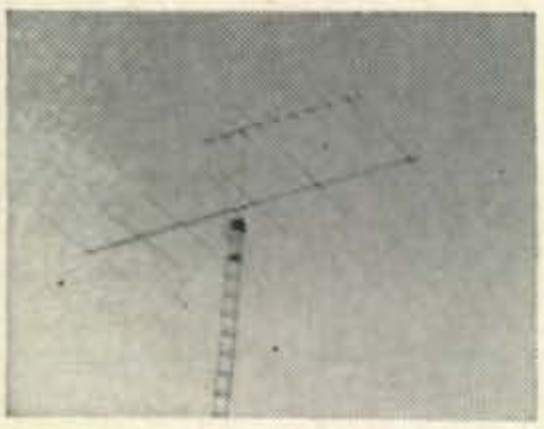
I. AWARDS:
1. Certificate will be awarded to high scores in each state, for each band.
2. Certificate will be awarded to the high scoring Novice in each state.
3. A "Club Aggregate" trophy will be awarded to the club whose members accrue the highest point total. Members *must* indicate on their logs that their score is to be credited also to their club's aggregate score.

J. LOGS:
1. Logs should be complete in every detail and should contain your total claimed score. Sheets should include (for a typical contact) your time in, your number, his number, his call letters, county, and his state, his handle, and his signal report (as heard at your end).
NOTE: This differs slightly from the verbal on-the-air exchange. Be sure to get all the required information.
2. A cover sheet should accompany all entries including band operated (6 meters, 2 meters, etc.), your name and address, names of other operators, and final claimed score. A letter and photograph would be doubly appreciated.
3. Logs are available free from us. Just send a self-addressed-stamped-envelope for your supply to: *CQ*, The Radio Amateur's Journal, 14 Vanderventer Avenue, Port Washington, New York 11050.
4. FINAL DEADLINE: Monday, June 13, 1966. Tuesday we start compiling results.
5. Send all logs and photographs to:
CQ The Radio Amateur's Journal
Att: VHF Contest Committee
14 Vanderventer Avenue
Port Washington, New York 11050.

Results of the August 1965 CQ Twelve-Hour V.H.F. Contest

K3NGF/3 third in the overall 50 mc picture and proud Penn. state certificate winner. Site: 2100 ft. mountaintop.

A double first—WA4PWO and WA4JKP pooled resources to make this their first contest efforts QTH: Harriman, Tenn.



Antenna system at K3MWQ (formerly K2MYQ), Ellicott City, Md. Jerry racked up 22,080 on six meters.

On the roof of a three story building in downtown Rochester, N. Y., WA2ZNC/2 set up operations on 6 meters for the August Contest.

Kim, WA7BTG, at his 6 meter Bremerton, Wash., station during the Aug. 12-hour contest.

Danny Berg makes cable connection during Aug. contest at the site of WA7BJU/7, Mt. Scout, Oregon.

BY BOB BROWN,* K2ZSQ

THE short-duration v.h.f. contest of August 7, 1965, was a complex competition, not because of the rules governing the contest, but primarily due to the last-minute decision on the part of the *CQ* staff to alter the basic structure of the meet. What happened was clear. The traditional August marathon was thrown out for a 9 A.M. to 9 P.M. single-band affair, the least painful ever scheduled on a national basis. No problem here. But everyone was expecting the two-day 31-hour job and chaos resulted.

This confusion was, of course, anticipated by the staff, and rather than wait another year we decided that if a major change must be made, now is the time. Prior to this "quickie", the 12-hour idea has only been tried once. But the response was overwhelmingly in favor of the one-day concept.

And so it was with the August contest. Nearly all participants took the time to write assuring comments on their logs that they'll be there next year. A rough count showed that 94% of those with notes came out *for* more twelve-hour competitions, although many were embittered over the relative drop in activity.

Another item that surprised us somewhat was that the majority of those participating were in favor of new power multiplier structure, which allowed 1 point for high-powered transmitters, 3 points for those under 25 watts. Especially in outlying areas, scores evened out on a national basis, giving the feeling of equality to many new entrants.

Unlike our 31-hour Spring contest, in August the competition was by band. There was no limit on the number of operators one station could avail itself of, but no advantage was to be realized by maintaining an all-v.h.f. setup (50 through 432 mc). Hence the "evening out" process helped bring a high percentage of newcomers and low-powered one-band stations into the fold.

Mother Nature and CQ

For some dark unexplainable reason, 1965 marked the best weather-year yet for *CQ* v.h.f. contests. The May contest afforded hundreds the sunny weather necessary for multiple-oper-

*Contributing editor, VHF COLUMN.

Portable/mobile station of K3ARR/3. Bus has been converted to ham shack on wheels. Power is by generator.

Inside his bus, K3MPN operates six meters at K3AAR/3 on Jones Mt., Pa., 2186 feet.

On the air at Larch Mtn. Lookout in Oregon are K7LFT (in front) and K7GWE (back to camera) operating K7ZFG/7. The boys accumulated 18,468 pts. on 144 mc.

WA2USG and WA2ZPD operating at WA2USG/2. North Salem, N. Y., 960 feet. The two-man team had one of the strongest two meter signals in the NYC area.

HIGH SCORES

Six: WA8EHI, Ohio	549,936
Two: WA2LTM, N.J.	150,024
Novice: WN2RRS, N.Y.	74,520

ator mountaintopping and fingers were crossed in August. Coming through like a trooper, Saturday came and went with only a few thunderstorms in an isolated section of the midwest. The rest of the country enjoyed excellent weather conditions and the ambitiously minded among us sought out the high spots.

Truly astounding was the two-man team of WB2BML and WA2FQA, who hoofed the three-mile path to the summit of the infamous Slide Mountain in Ulster County, upstate N.Y. Running a Heath Shawnee into a three element Hilltopper antenna, the two racked up an impressive 209,664 points on six meters. Their county total was 52, running roughly one new county for each two contacts. The word "astounding" was used earlier in view of the fact that each man carried a seventy-pound knapsack those three miles, scaling a steep terrain all the way. Jerry (WA2FQA) noted that they were taken by surprise Saturday morning when they found there was no road to the top. Perhaps if they had read *CQ*'s VHF COLUMN a few years back they would have been better prepared. (K2ZSQ unsuccessfully attempted to mount Slide Mtn. earlier, generator and all.)

The life-saver, as far as the contest was concerned, was the 12-volt well-charged auto battery the team hauled to the top. Estimating its life as ten hours without a re-charge, operation was methodical, allowing breaks every so often to give the battery a relief period. Jerry adds that in this manner the team was able to catch the 12-hour multiplier. Battery gave out 15 minutes before the end of the contest.

Mountaintopping in general was lower than normal in this contest, but so was overall participation. If more advance notice had been afforded the 12-hour stint, it is a near-certainty that more portable stations would have been heard.

Those who took site on the high spots, however, had "great fun." In Pennsylvania, that state's highest peak was scaled for the first time in a *CQ* affair, while in other areas portable QTH's ranged from a renovated bus to a dilapidated 1948 Chevy, all strategically situated for maximum line-of-site communication.

A General Look at Six & Two

In the densely-populated New York City area, it was surprising to note the shift of activity from six to two meters. As earlier noted, we expected an overall drop in contest participants, but not the heavy concentration here on two meters. Stations known for their anti-contest sentiment took mike in hand and had a real go at it. New England enthusiasts were also quick to note the good participation in the NYC area that resulted in a good variety of counties all around.

And to add still more incentive, band conditions were generally good on the East Coast, lending a tropo boost to the already excellent weather condition and permitting mild "DX" for contesters.

On six meters, however, conditions ran from "poor" to "good" with a sufficient mixing of Sporadic-E to keep everyone at least temporarily satisfied. Spotty, rapid-fade openings were experienced over most of the country resulting in the inflated scores that can be seen in many state listings.

WA8EHI surprised no one by once again soaring to the top of the six meter pile, although WA2VLR in N.J. was notably shaken. Probably the power multiplier, long EHI's forte, once again separated the two. Both stations, by the way, took maximum advantage of the E openings, which improved the county-contact ratio immensely.

Although six meter activity was lower in the eastern states than expected, the rest of the country pretty much evened it out. Two meters worked exactly opposite—heavy participation in the NYC area, poor elsewhere.

Conclusions

It was interesting to note that while almost no one went for the full 31 hours in May, invariably all contesters took advantage of the 12-hour multiplier in August. Also a surprise was the large proportion of operating teams that backed up a great deal of the scores shown here.

Hence we are making only two changes in future *CQ* V.H.F. Contests: Shifting the 12-hour meet to the first weekend in May, the 31-hour marathon to August and opening the Club Aggregate classification to include both affairs. After much debate and consideration of suggestions filed during 1965, the majority vote went to the short-term contest for May. Reasons were boiled down to this: A May 12-hour meet will allow full club participation (before vacations set in) and coincides ideally with established annual activity peak. The big August contest will afford the best weather for heavy portable activity and comes at a time when most people can spare the entire weekend. Novice certificates will be offered in both contests.

For now, our congratulations to the winners. Will see you Saturday, May 7th!

73, Bob, K2ZSQ

Contest shack of K9OYD, Gary, Indiana. Bob ran 25 watts on 144 mc for the contest, although he has a full KW at his disposal when needed.

50 Mc Results

The number groups after the call letters denote the following: number of contacts; number of counties; hour multiplier; power multiplier and final score. The other competition classifications follow suit.

Alabama

K4BEI/4	61	42	12	2	61,488

California

K6UMV	69	17	12	2	28,152
W6OST	76	11	12	2	20,064
WA6ZNP	84	8	12	2	16,128
WB6MVF	60	11	12	2	15,840
K6AYU	86	5	12	3	15,480
WB6CGZ	43	2	11	2	1892
WB6OOW	10	5	4	3	600
W6AB	4	3	2	1	24

Connecticut

W1BAA/1	95	67	12	2	152,760
K1TLA	30	14	8	3	10,080
K1PCC	30	25	4	3	9000

Florida

WA4JZT	120	75	12	2	216,000

Georgia

WA4QPL	113	69	12	2	187,128
W4CAH	4	4	2	2	64

Illinois

WA9FIH	27	5	10	3	4050

Indiana

K9AWH	44	28	11	2	27,104
KØEEQ	47	9	12	3	15,228

Iowa

WAØCVA	14	8	8	2	1792

Kentucky

WA4SKP/4	69	34	12	3	84,456

Maine

K1TOL	23	18	4	2	3312

Maryland

K3MWQ	46	24	10	2	22,080
K3ZSX	34	12	12	3	14,688

Massachusetts

K1PYX/1	131	73	12	2	229,512
K1MIM	109	53	12	2	138,648
K1ZGH	99	46	12	2	109,296
K1PLX	59	38	11	3	73,986
WA1DPX	43	28	12	2	28,896
K1ZKA	26	14	12	3	13,104

Michigan

W8HJR	59	19	12	2	26,904
WA8CDF	41	28	12	1	13,776

Mississippi

WA5FII	38	30	10	2	22,800

Missouri

KØTLM	50	11	12	2	13,200
WAØIKI	44	8	12	2	8448
WAØKXZ	31	7	11	3	7161

Nebraska

WAØDJK	12	2	8	3	576

New Jersey

WA2VLR	191	85	12	2	389,640
WB2LYP/2	115	60	12	2	165,600
WB2QEA	103	42	12	2	103,824
WB2LWP	45	20	12	3	32,400
W4CEB/2	51	20	9	3	27,540
K2VAC/2	90	51	3	1	13,770
WB2LGJ	46	20	7	2	12,880
WB2GKB	40	16	9	1	5760
WB2QZZ	15	9	7	2	1890

New York

WB2BML/2	112	52	12	3	209,664
WA2WIY	110	38	12	2	100,320
K2EEK*	91	32	12	2	69,888
WA2ZNC	77	34	12	2	62,832
K2PBU	43	36	10	2	30,960
WB2FEQ	77	19	10	2	29,260
K2ZSQ*	33	11	6	3	5994
K2OEQ	6	4	3	3	216

North Carolina

K4VAA	17	11	3	2	1122

Ohio

WA8EHI	201	76	12	3	549,936
W8KKF	96	39	12	3	134,784
W8JRN	76	26	12	2	47,424
WA8PAM	66	23	10	2	30,360
WA8LOW	39	18	11	3	23,166
W8INS	35	23	12	2	19,320
WA8PAF	53	15	10	2	15,900

Oregon

WA7BJU/7	36	14	12	3	18,144
K7LFT	41	12	11	3	16,236

Pennsylvania

K3DVS/3	208	94	12	1	234,624
K3NGF/3	103	62	12	2	153,264
K3CXZ/3	77	50	12	2	92,400
K3ZPG	76	36	12	2	65,664
K3ARR/3	79	51	12	1	48,348
K3RWA	58	19	12	3	39,672
W3ETB	59	26	10	2	30,680
WA3AJU/3	30	14	12	3	15,120

Rhode Island

W1KMV	84	56	9	2	84,672

South Carolina

WA4LTS	87	63	12	2	131,544

Tennessee

WB4ARU	50	32	11	2	35,200
WA4YFL	61	28	9	2	30,744
WA4PWO	33	23	12	3	27,324
WA4CGA	29	23	7	2	9338
K4FJW/4	20	10	12	3	7200

Texas

K5OJI	74	11	12	3	29,304
WA5EOI	47	9	10	3	12,690
W4ZIL/5	15	10	12	2	3600
WA5LPA	33	6	8	2	3168
WA5MRC	20	5	7	3	2100
WA5IYX	3	3	2	3	54

Virginia

K4EJQ/4	83	59	12	3	176,292
WA4GLO	32	16	10	2	10,240
K4AWE	22	8	9	3	4752

Washington

WA7BTG	14	4	9	3	1512

West Virginia

K8UEH	38	24	12	3	32,832
K4TIG/8	29	25	10	3	21,750

Canada

VE3BGA	52	40	12	2	49,920
VE3GAF	17	6	12	2	2448

144 Mc Results

California

WA6TGH/6	150	8	11	2	26,400
WB6FGP	94	7	12	3	23,688
K6JHV	59	13	12	2	18,408
WB6GFD	33	15	12	3	17,820
WB6GUS/6	46	7	12	3	11,592
WB6ERG	68	5	11	3	11,220
WB6IMV	34	6	9	2	3672
WB6OOW	24	6	8	3	3456
WB6KIL	22	4	12	3	3168
W6AB	16	6	5	1	480

Connecticut

K1HTV	73	33	12	2	57,816
WA1DQL	69	23	10	2	31,740
WA1AAL	49	24	12	1	14,112
K1UJB	16	4	8	3	1536
WA1CCR	5	1	4	3	60

Georgia

K4YZE	17	6	11	3	3366
WA4QPL	14	5	7	3	1470
WN4ARB	9	4	10	3	1080

Illinois

WA9MRN	18	6	9	3	2916
W9EHU	19	3	7	3	1197

Indiana

K9OYD	41	12	12	3	17,712

**CQ* staff, ineligible for award.

Maine

WN2TSW/1	31	17	12	3	18,972

Maryland

K2ODL/3	11	7	5	3	1155

Massachusetts

W1UDT/1	61	31	12	2	45,384
W1BDF/1	49	32	9	2	28,224
K1YLU/1	53	26	10	1	13,780
K1OJQ	5	3	3	3	135

Michigan

W8VRH	34	10	12	2	8160
WA8NEH	24	5	11	2	2640
WN8QPN	10	5	3	3	450

New Jersey

WA2LTM	133	47	12	2	150,024
WB2GCD	90	25	12	3	81,000
WB2JKU	95	29	12	2	66,120
WB2TCB	104	17	12	3	63,648
WB2KHD	82	32	12	1	31,488
K2VAC	55	18	10	3	29,700
WN2TGT	48	15	12	3	25,920
K2OWR	65	19	8	1	9960
W4CEB/2	24	11	8	3	6336
WB2PAZ/2	11	6	2	3	396
WN2STR	5	3	3	3	135

New York

W2UFT	140	42	12	2	141,120
WA2USG/2	90	33	12	3	106,920
WN2RRS	90	23	12	3	74,520
WB2FXB	93	30	12	2	66,960
WB2QJB	78	23	12	3	64,584
WN2QLP	80	21	12	3	60,480
WN2TOC	36	12	11	3	14,256
WB2OUK	37	14	9	3	13,986
W2GKZ	28	15	12	2	10,080
WB2DQP	21	6	10	3	3780
WA2PMW	25	11	9	1	2475
WN2TXK	19	4	6	3	1368
W2IP	12	7	2	3	504
WA2JZX	5	2	2	3	60
W2NJS	3	2	2	3	36
WB2PKQ	2	2	1	3	12

Ohio

K8HVA	19	13	10	2	4940

Oregon

K7ZFG/7	57	9	12	3	18,468

Rhode Island

K1ABR	57	32	12	2	43,776

Canada

VE3ASO	41	11	12	3	16,236

Novice Results

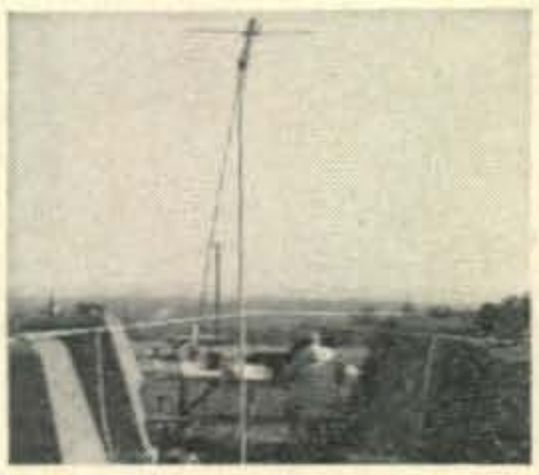
WN2RRS	90	23	12	3	74,520
WN2QLP	80	21	12	3	60,480
WN2TGT	48	15	12	3	25,920
WN2TSW/1	31	17	12	3	18,972
WN2TOC	36	12	11	3	14,256
WN2TXK	19	4	6	3	1368
WN4ARB	9	4	10	3	1080
WN8QPN	10	5	3	3	450
WN2SYR	5	3	3	3	135

220 MC

K2VAC/2 (N.J.)	19	5	10	3	2850

432 Mc

K7ZFG/7 (Oreg.)	1	1	1	3	3



Two meter station of WN2TSW/1, high atop Mt. Agementicus in Maine.

Top view of the transistorized 80-40 meter Novice c.w. transmitter. All controls are clearly marked. Note how the crackle finish was neatly removed in the area of the two output transistors for more effective surface contact.

THE 80 AND 40 METER "TRANSISTOR SPECIAL"

BY JOHN S. HILL,* K4QJZ

This compact (2" × 3" × 5") 40 and 80 meter transmitter is completely transistorized, simple to construct, low cost, will operate into any antenna and produces 15 watts or more output.

Most amateurs consider transistors beyond their pocket book and technical ability. Actually they can be less expensive and easier to handle than vacuum tubes. The rig described was built for a Novice nephew. It is also an ideal Field Day or Briefcase transmitter for the James Bond set. Unlike so many transistor transmitters it has sufficient output to deliver a healthy signal and weekly schedules have been maintained in the Novice bands over a 600 mile distance.

Circuit Description

A transistor equivalent of the Pierce oscillator is used. Any crystals including low drive surplus metal can units can be used. 40 meter operation with 80 meter crystals is possible with some output decrease.

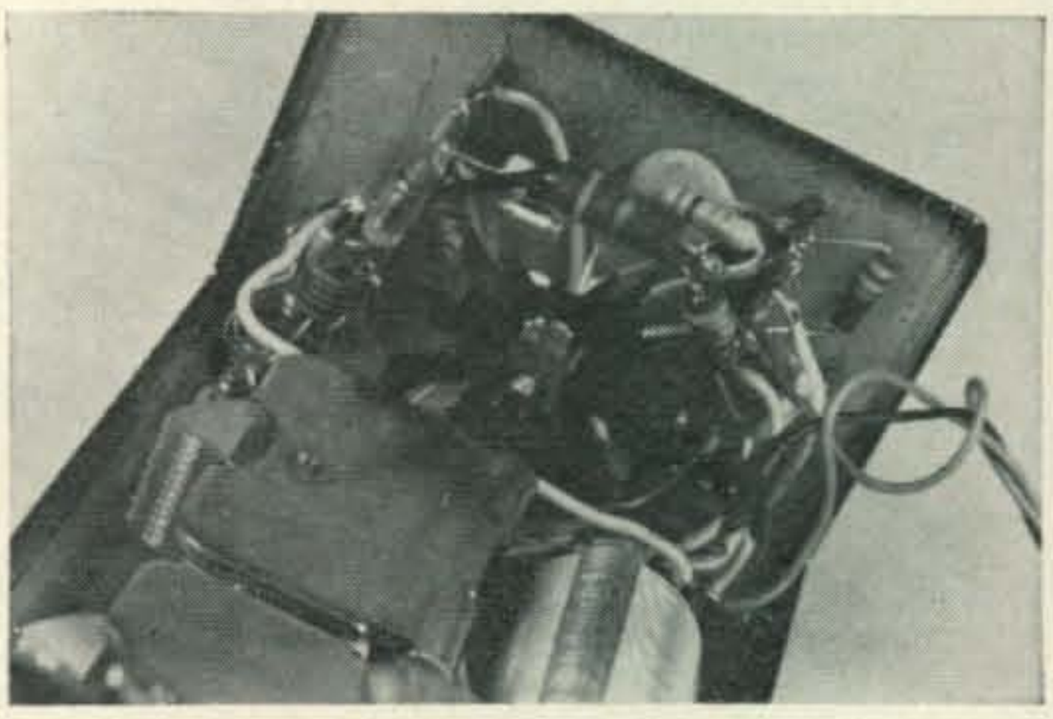
The oscillator is followed by an emitter follower basically similar to a vacuum tube cathode follower. Since the oscillator is relatively high impedance and the input impedance of the p.a. is very low, either tuned circuits or an impedance matching stage must be used. Power gain is limited with transistors at high power levels and the buffer gives about 10 db gain which permits the oscillator to operate at low power. The original unit built did not include a buffer and worked well but the high oscillator input, about 1 watt, produced severe chirp and crystal drift.

The power amplifier uses 2 transistors to deliver about 16 watts output on 80 and 11 watts on 40 meters with a 24-26 volt power source. Input is 20-15 watts. Operation at 12-15 volts is possible but output will be about 5 watts on 80 and 0.25 watts on 40.

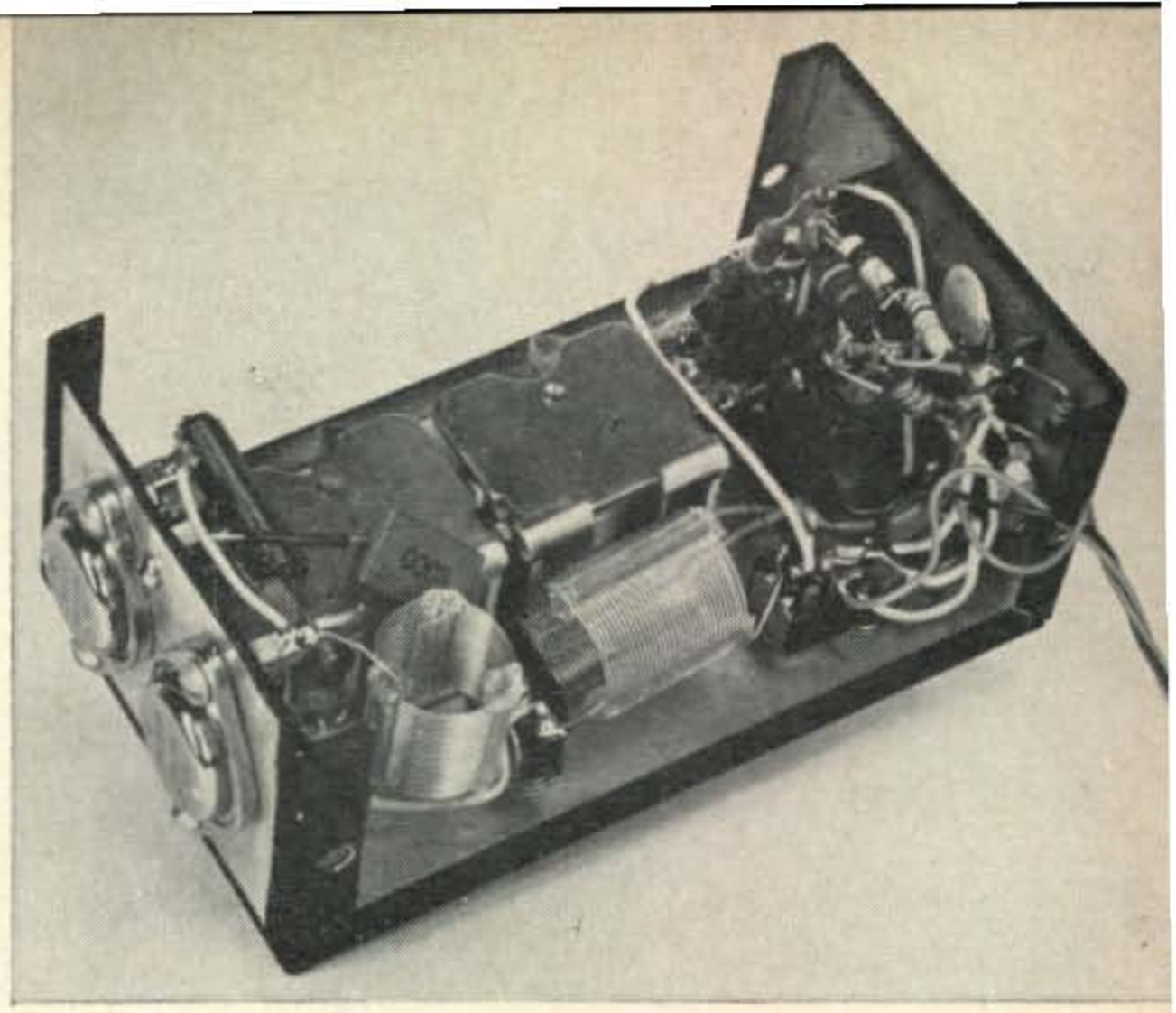
*2114 Buckingham Road, Raleigh, North Carolina.

The power amplifier output impedance is very low, about 26 ohms at 12 watts output. An L-pi output circuit gives reasonable component values, excellent harmonic suppression, easy duplication and ease of tuning plus transistor protection. The L section (L_1 and part of the tuning capacitor) transforms the low collector impedance to several thousand ohms where a conventional "vacuum tube" pi section can be used for tuning and loading. A switch is used to add tuning capacitance for 80 meters and the combination of a fixed and variable loading capacitor permit any antenna over 10 feet to be used on either band. Bulb type p.a. current and antenna voltage/current indicators are used for easy tuning, size, and cost reduction.

A d.p.d.t. switch is included for TRANSMIT-RECEIVE. In the RECEIVE mode the oscillator and buffer can be keyed to zero a receiver and the transmitter tuned circuits act as a receiver pre-



Closeup view of the buffer transistor and circuitry. Note the use of the heat sink for the buffer transistor.



Overall view of the interior of the 80-40 meter Novice transmitter shows the location of the LOADING and TUNING capacitors and the coils. The buffer and oscillator circuits are on the right end of the chassis.

selector and matching unit for improved results with simple receivers. A companion 80-40 receiver of the same size has been built with only two tuned circuits.

Tuning

No tuning other than the final is required. Unlike vacuum tube transmitters the p.a. draws very little current until fully loaded whether off resonance or not. The L network is basically a high impedance at all frequencies other than resonance, the opposite of a conventional parallel tuned vacuum tube tank circuit.

Transmitter adjustments should always be for *maximum output* not minimum p.a. current. P.a. current measurement is included only to indicate relative power input. Adjust p.a. tuning for maximum output (Ant. current) voltage indicators then adjust p.a. load for higher output if possible. Continue adjusting both until no further output increase is noted. With a 50 ohm load typical total capacitor values are:

	80 meters	40 meters
Tune	390 mmf	105 mmf
Load	500 mmf	310 mmf

If antennas under 30 feet or ½ wave are used the output capacitance will be much less and the tuning capacitance more; the #49 bulb will show less current, but the neon bulb will ignite showing high voltage feed. In general tune for maximum antenna bulb brightness regardless of load.

A calibrated wavemeter or S meter should be used for initial tune-up on 80 meters since the final doubles very efficiently. Mark the capacitor settings for future reference.

Other Bands

No changes are required for operation on any frequency from 3-8 mc. Operation on 160 meters at full power can be obtained by changing L_1 and L_2. Twenty meter or higher operation is not practical except at very low output, about 4 watts on 20 and 2 watts on 15 using half frequency crystals. Inductors L_1 and L_2 have to be changed for either band.

Components

The chassis used was a BUD, CU 3006A. The PADT 50's are mounted on one end using the entire case as a heat sink. Clean off the crackle finish, use mica insulating washers and a silicon grease when mounting. RFC_1 should be low resistance; use a ¼" loop stick core and at least 20 turns of #28 wire or larger. No component values are critical except for the p.a. coils which should be close to the values shown.

The NE-2 antenna voltage indicator should be mounted flat against the chassis near the #49 bulb with both leads connected to the antenna

[*Continued on page 104*]

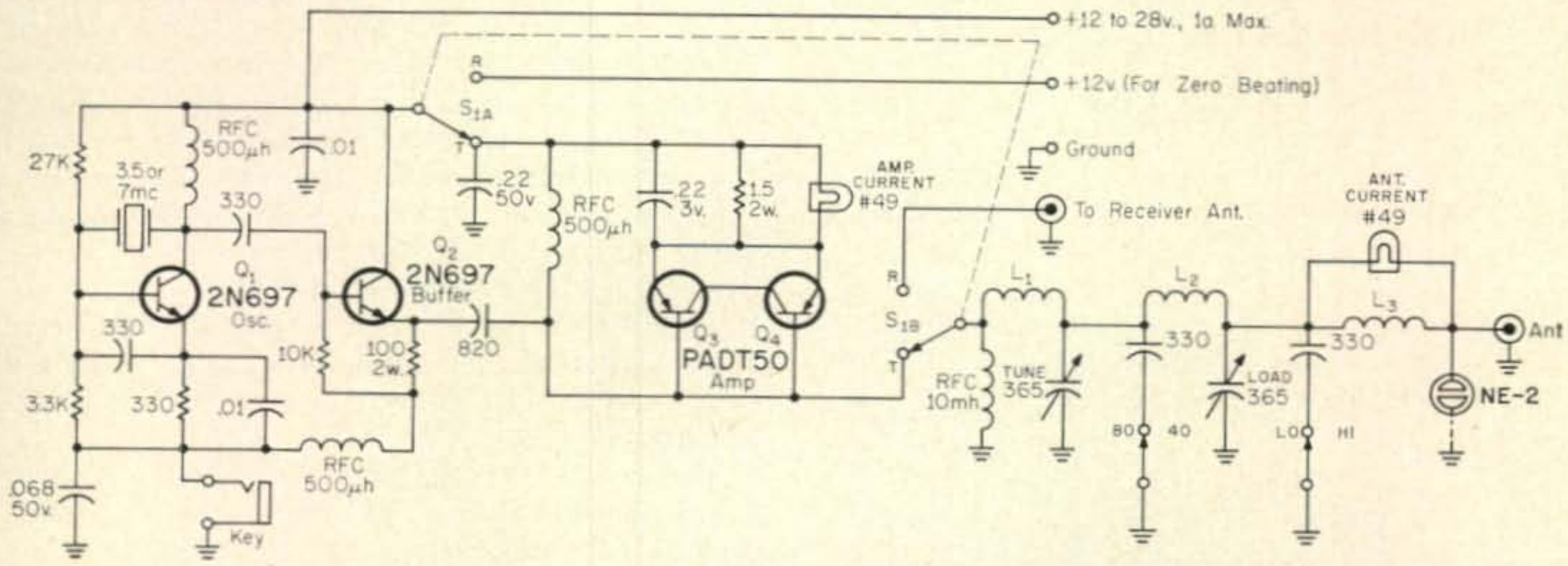
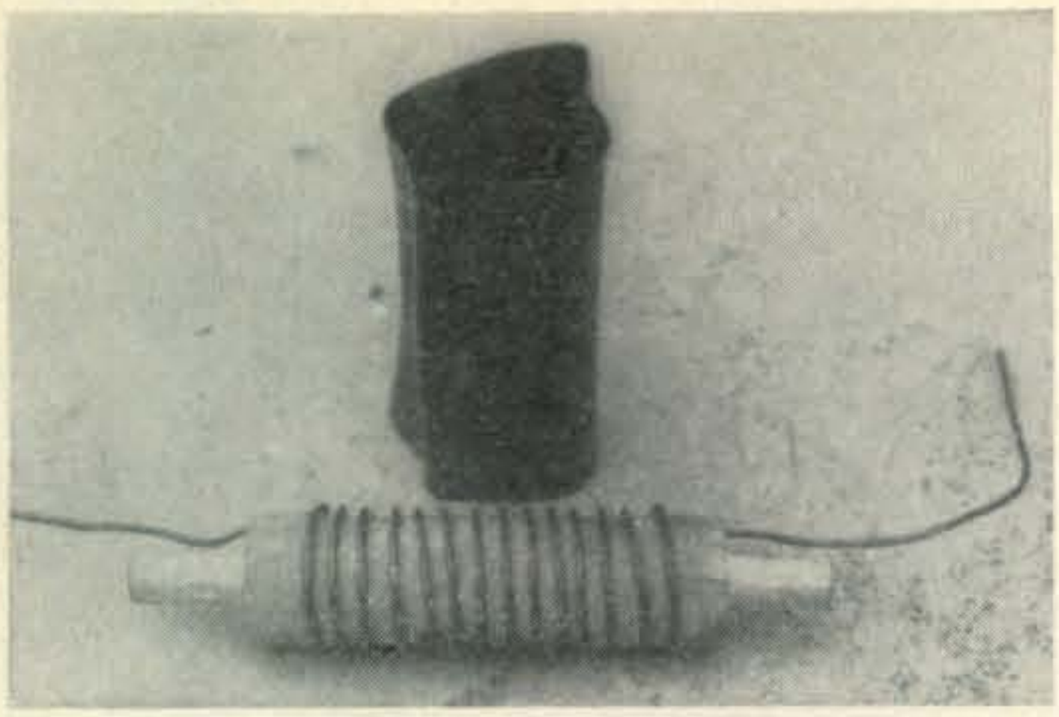


Fig. 1—Circuit of a transistorized 80 and 40 meter c.w. transmitter. The buffer heat sink must be 10 in. ^{2} and the Power Amp. heat sink 20 in. ^{2}. All capacitors greater than one are in mmf; those less than one are in mf. All resistors are ½ watt unless otherwise noted. Currents shown are for a 25 volt supply on 80 meters with 16 watts output.

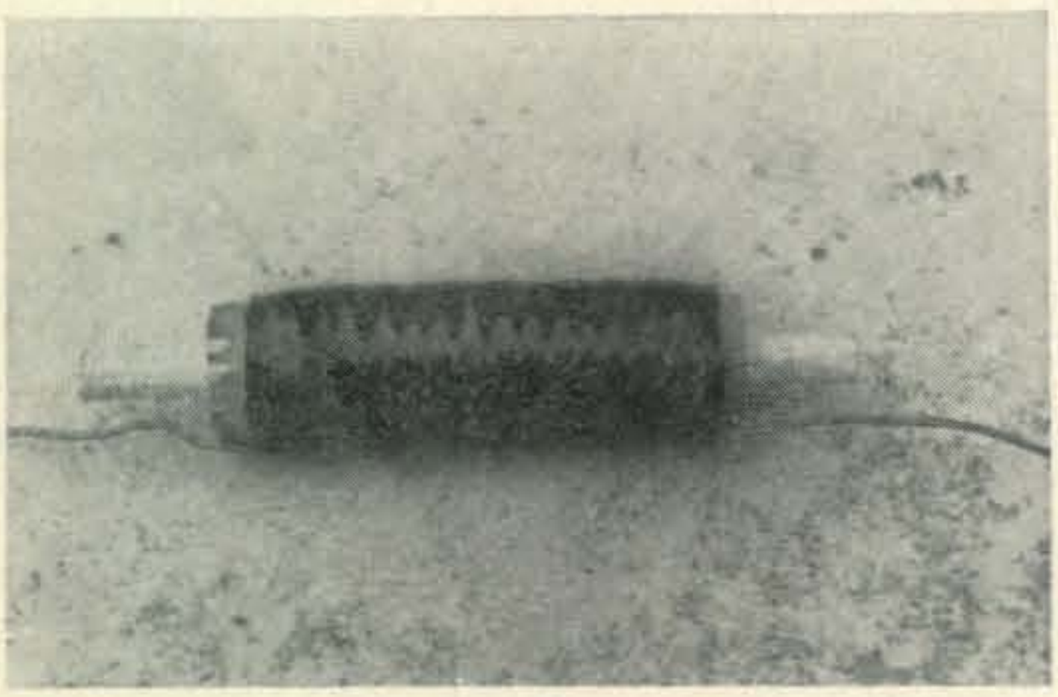
L_1—22 t. ¾ o.d. at 32 t.p.i. Air Dux 632 or equiv.
L_2—30 t. ¾ o.d. at 32 t.p.i. Air Dux 632 or equiv.
L_3—5 t. cotton covered wire on small ¼" powdered iron core
Adjust turns for normal lamp brightness at maximum output into 52 ohm load.
RFC_1—See text.



A homebrewed coil and form with a length of Hy-Shrink.

WEATHER-PROOFING ANTENNA TRAP COILS

BY RONALD LUMACHI,*
WB2CQM



Coil with the Hy-Shrink tightly formed around it for weatherproofing.

MULTIBAND antenna design requires the careful placement of resonant traps along the length of the radiating array. A truly efficient system, if it is to perform well, must boast weatherproof design around the rather critical high impedance points if the entire antenna is to function properly even under the most adverse conditions. Commercial multiband antenna manufacturers have advantages where design facilities are concerned. However, the average homebrewer because of his inherent shortcomings must be content with less than perfect conditions of construction and operating results.

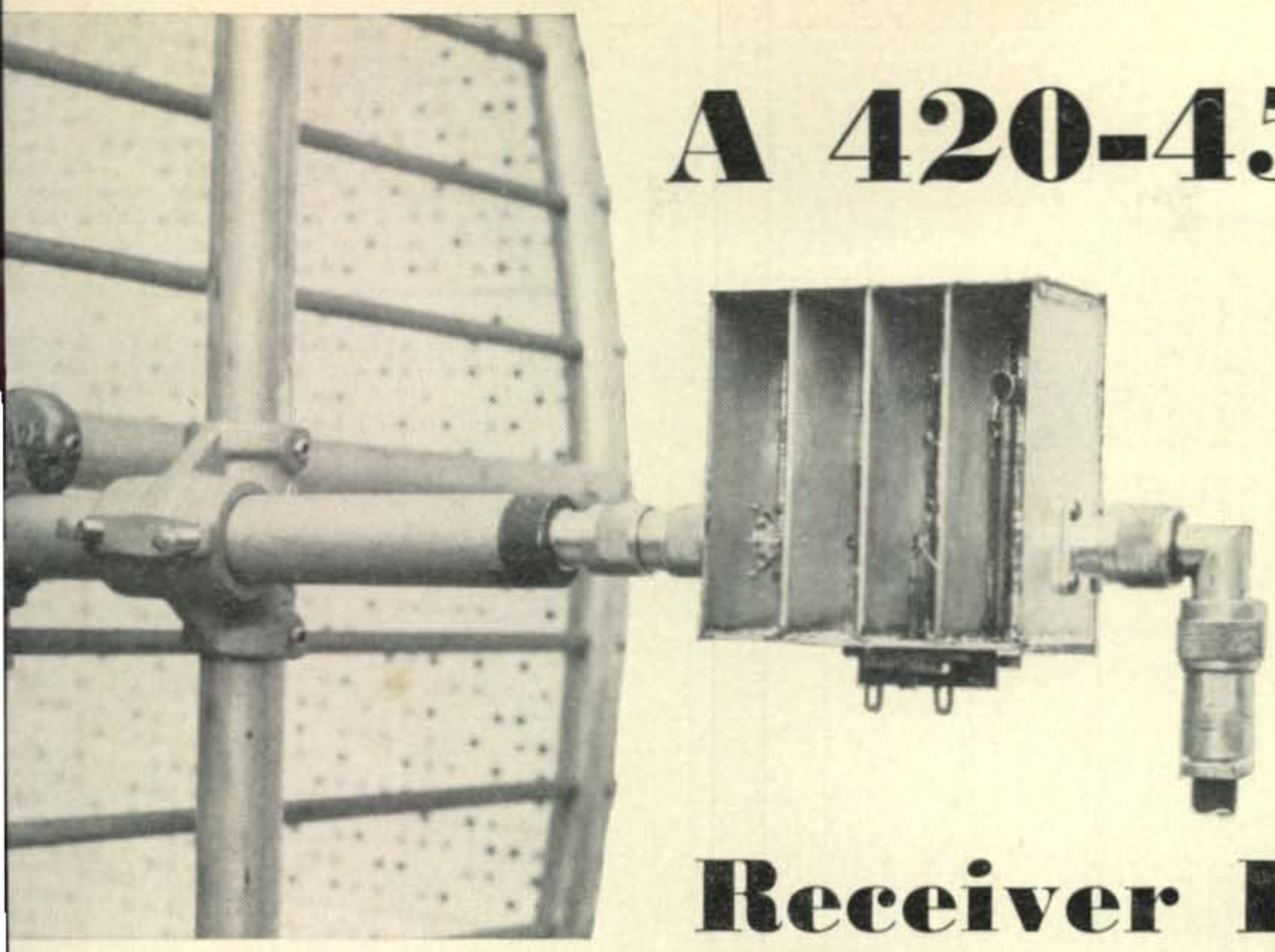
One of the more difficult problems with designing traps is to devise a simple, foolproof, and above all economical method to protect the coil lengths from the affects of the prevailing weather conditions. Thus the amateur will be assured of consistent efficiency once the initial adjustments are completed.

A novel product called Hy-Shrink heat shrinkable irradiated tubing designated PVC ST-96 can be easily incorporated in various aspects of amateur antenna construction projects in order to eliminate the presence of water and moisture. This material when subjected to about 250 degrees of heat will constrict to one half its original size and will tend to form tightly over even the most irregular surfaces. For example, the tubing will shrink simultaneously over a coil and between the individual turns of wire thereby protecting the entire unit from moisture as well as maintaining proper wire spacing relationships. The tubing can also be placed over the telescoping joints of "plumbers delight" type yagi beams in order to prevent water accumulation at these connecting points. Although the Hy-Shrink material will shrink to one half its diameter the longitudinal shrinkage is only 5 per cent. Its dielectric strength is rated at 800 volts and it does not alter the input characteristics of a coil in an r.f. application to any measurable extent. Its tensil strength is rated at a minimum of 2000 p.s.i. and even under the most adverse conditions will not split. The tubing will not support any fungus growth and its resistance to chemical acids including gasoline and oils is excellent. Fourteen sizes are available with diameters varying from 3/64" to 4". Simply apply heat from a stove or portable torch to seal off any type unit. If removal is necessary, simply slit and peel away. Although the tubing will constrict tightly over material it will not adhere or bond permanently.

The cost is reasonable. A one foot length of 2" material will cost $1.16. However, when discounted along with many trouble free years of moisture proof operation, it is quite reasonable. Further information and individual price schedules are available from Mr. B. Thayer, Mil-Spec Supply Inc. 17468 Ventura Boulevard, Encino, California. ■

*73 Bay 26th Street, Brooklyn, N.Y. 11214.

A 420-450 MC



Receiver Preamp

BY JACK E. FRECKER,* WA7BAE

This low noise transistorized, antenna mounted (shown above with dust cover removed) preamp has a 4 db noise figure, a 21 db gain and a 30 mc Bandwidth.

ANY amateur who has ever tried to get a receiver working on the 420-450 mc band has quickly learned how difficult it is to obtain a good noise figure. At best, simple diode mixers are not very good. Most vacuum tubes fail to work at all at this frequency, and even the better ones produce relatively little gain. And there is transmission line attenuation. Thirty feet of RG-58/U cable at this frequency can turn an otherwise good noise figure into a poor one if used between the receiving antenna and the receiver.

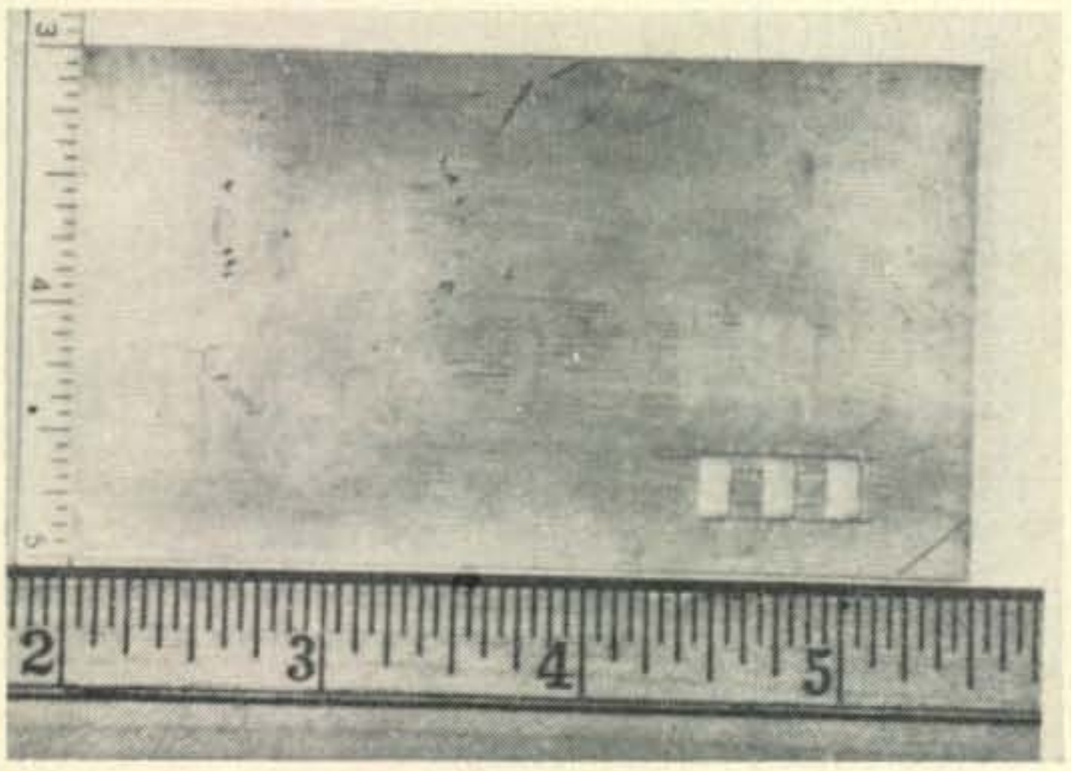
Here is a low noise, transistorized, antenna-mounted preamplifier that will produce state-of-the-art performance when used ahead of even a mediocre receiver. It has a 4 db noise figure, 21 db gain and a 30 mc 3 db bandwidth. Total cost is under $55, and it can be made for under $35 with a slight degradation of performance.

The general expression for noise figure of two cascaded networks is:

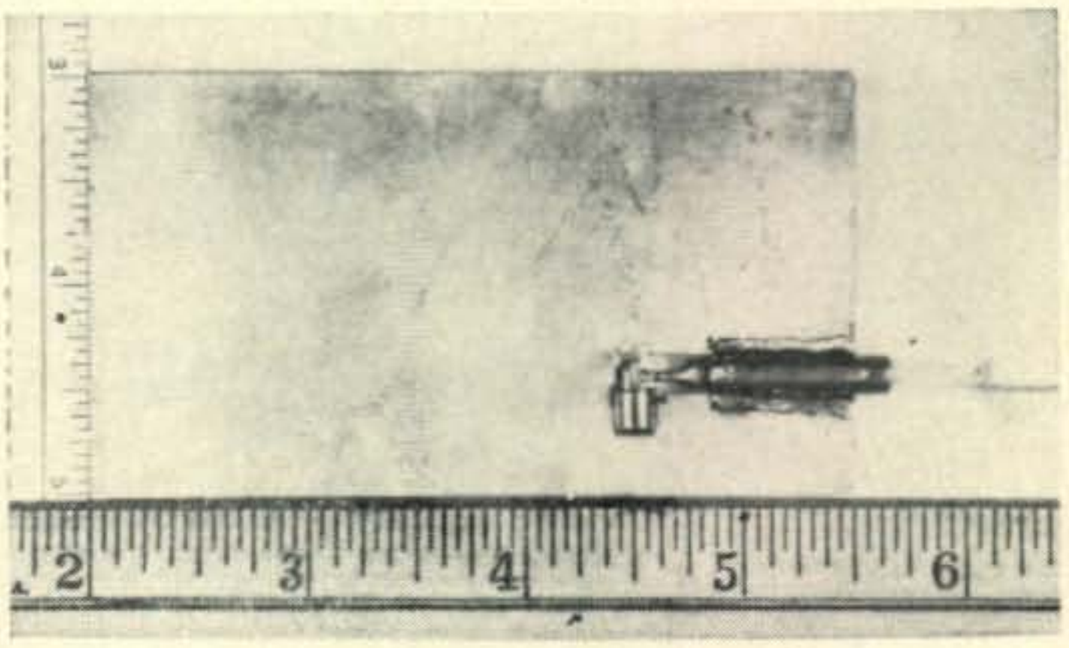
$$NF = NF_1 + \frac{NF_2 - 1}{G_1}$$

where NF is the overall noise figure of the system; NF_1 and NF_2 are the noise figures of the first and second networks; and G_1 is the gain of the first network. Noise figures and gain are expressed as power ratios rather than in decibels. Suppose this preamplifier were used ahead of 40 feet of RG-58/U coax into a receiver with a 15 db noise figure. The new noise figure would

*Applied Research Laboratory, University of Arizona, Tucson, Arizona.



Partition for separating L_1 and L_2 in the 430 mc preamp is shown above. The three holes allow positioning of C_5 for the best noise figure.



Partition for separating L_2 and L_3 in the 432 mc preamp contains Q_1 and C_7. Capacitor C_7, a feed through type, is soldered into the end of the brass tube which, in turn, is soldered to the partition.

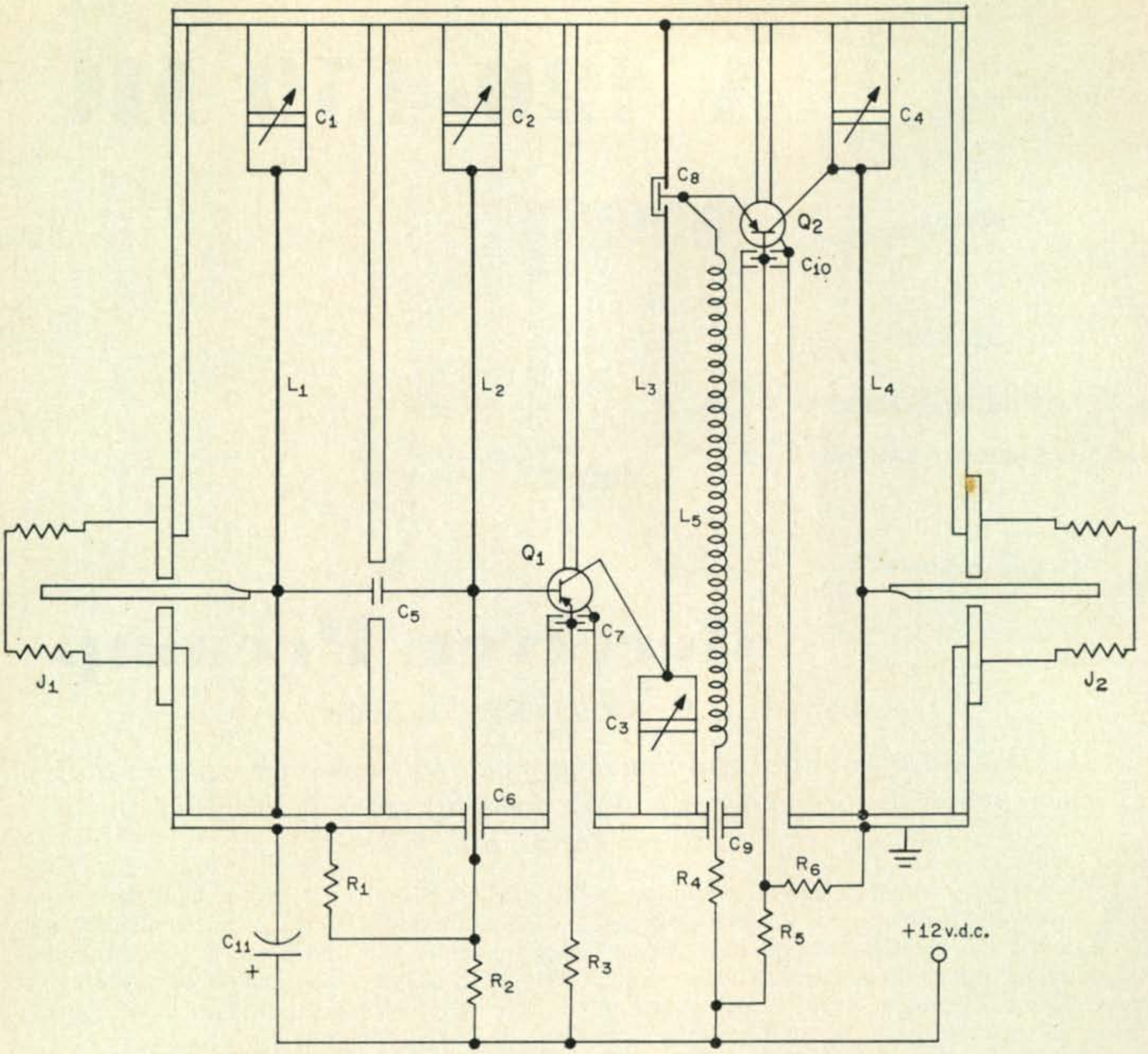
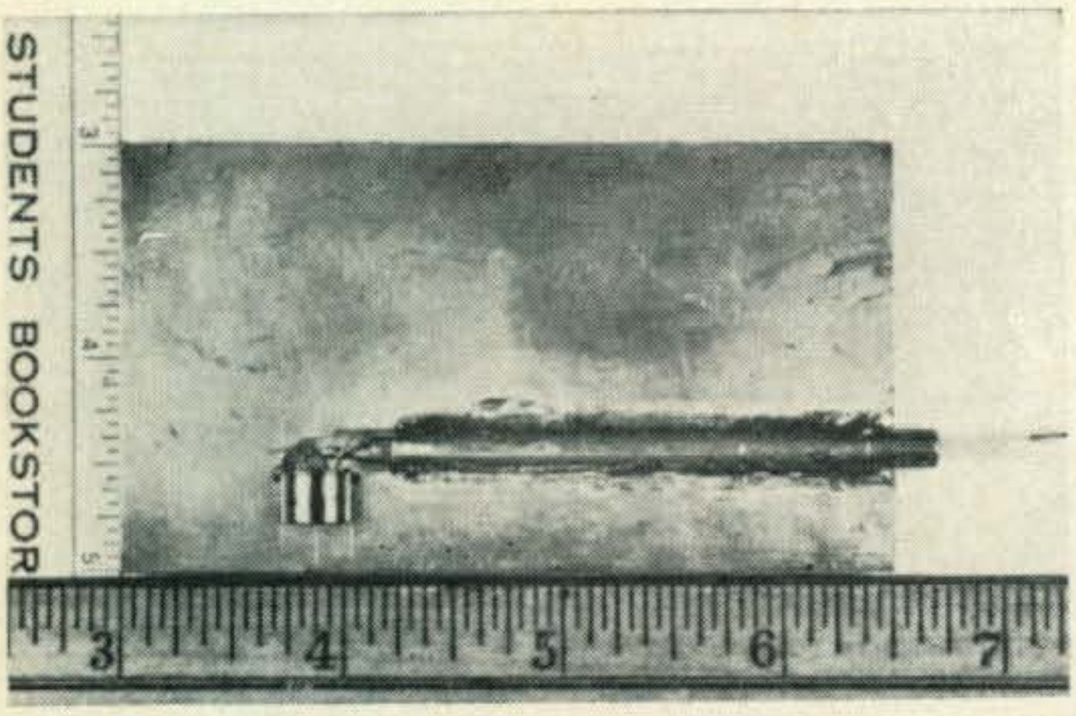


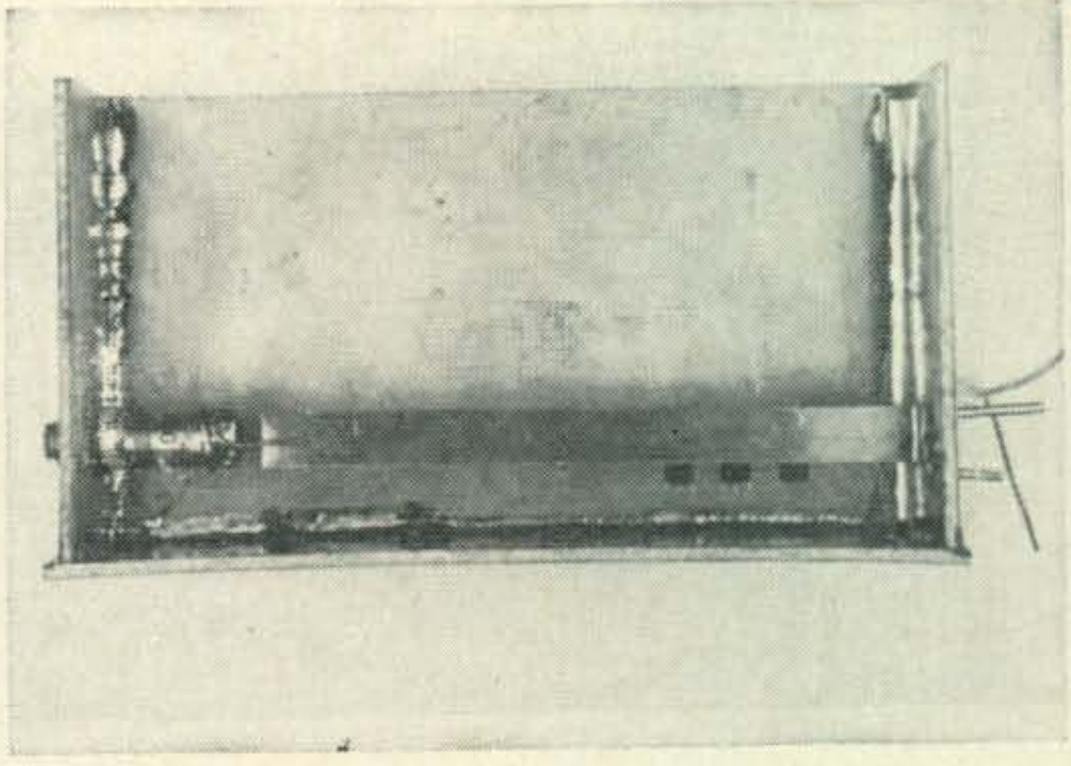
Fig. 1—Combined pictorial and schematic diagram of the 430-450 mc preamp. All physical dimensions may be taken directly from the drawing which is at a one to one scale.

C_1, C_2, C_3, C_4—0.8-8.5 mmf piston capacitor. JFD VC20G.
C_5—1000 mmf ceramic.
C_6, C_7, C_8, C_9, C_{10}—1000 mmf feedthrough. Centralab MFT 1000.
C_{11}—15 mf 15 volt tantalum capacitor.
J_1, J_2—UG-58A/U

L_1, L_2, L_3, L_4, L_5—See text.
Q_1—2N2415, Texas Instrument.
Q_2—2N2398, Sprague.
R_1—18K, ½ watt, 5%.
R_2, R_5—4.7K, ½ watt, 5%.
R_3, R_4—1.2K, ½ watt, 5%.
R_6—15K, ½ watt, 5%.



Partition for separating L_3 and L_4 in the 432 mc preamp mounts Q_2 and C_{10}. Capacitor C_{10}, a feedthrough type, is soldered into the brass tubing which is soldered to the partition.



View of L_1 and C_1. The center line of L_1 and C_1 is one half inch up from the bottom.

be under 5 db, which is an improvement of 10 db over the receiver alone, or 14 db over the receiver plus its own coax. A 14 db improvement is equivalent to increasing the size of an antenna array 25 times!

The Circuit

Why transistors? Simply because they offer the best, cheapest and most reliable way to accomplish the desired end result. The circuit, shown in fig. 1, consists of a 2N2415 common emitter stage with about 12 db gain, followed by a 2N2398 common base amplifier of about 9 db gain. Although the circuit resembles a cascode amplifier it should not be considered as such.

The antenna input is connected to a tap on the input circuit L_1, C_1. This circuit, and all the others, are capacitively shortened quarter wave lines. They behave like conventional *LC* circuits except that they have a higher *Q* and are easier to build at this frequency. This circuit is coupled to L_2, C_2 by C_5. The position of C_5 up or down on L_1, L_2 determines the degree of coupling between the two lines, and it was positioned for best noise figure. Line L_2 is insulated from the chassis, and base bias for Q_1 is via the feedthrough capacitor, C_6, at the bottom of L_2. The input impedance of Q_1 is 50 to 100 ohms.

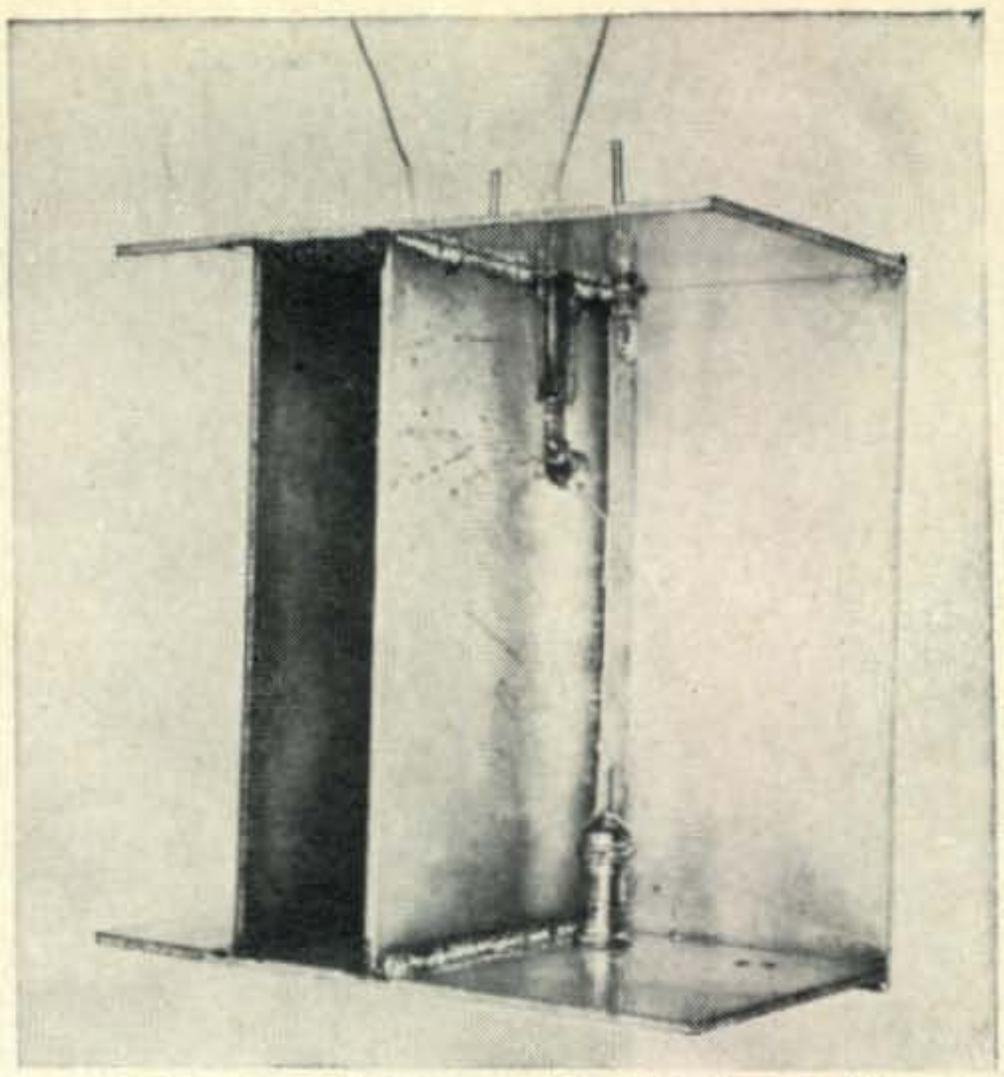
The collector of Q_1 is a high impedance point, and is connected to the top end of L_3. A tap on L_3 drives the emitter of Q_2 in the common base configuration. Inductor L_5 is a long narrow r.f. choke to suply emitter bias to Q_2. It had to be made this way because it lies completely within the field of L_3 throughout its entire length. The collector of Q_2, another high impedance point, is connected to the top end of L_4; and finally a tap on L_4 goes to the output connector. The emitter of Q_1 and the base of Q_2 are bypassed and biased by mounting feedthrough capacitors at the ends of brass tubes, which are soldered to the chassis throughout their entire length.

Construction

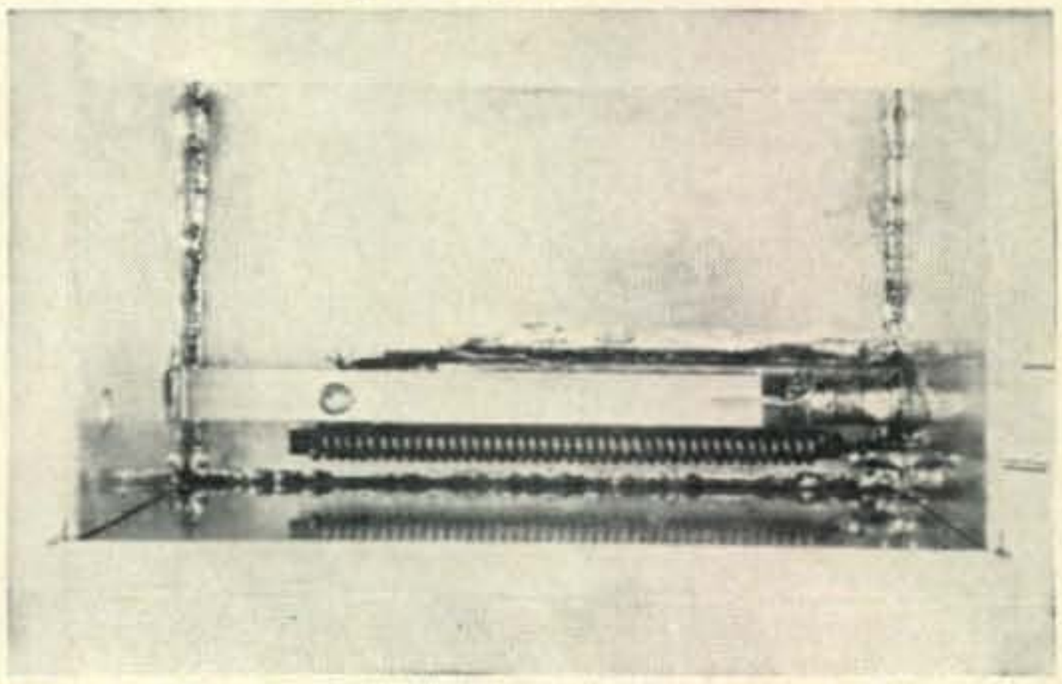
The body of the unit is constructed of 1/16 inch epoxy fiberglass etched circuit board, copper clad on both sides. If you have never worked in this medium before, it is a supurb construction material. It is strong; it is easily worked with saws, tin snips, sheet metal shear, *etc*. Its low thermal mass makes it far easier to solder than sheet copper. A set of Swiss files is essential to cut the various holes and slots.

It will be noticed from the photographs that the resonant lines are close to the bottom of deep, three sided troughs. This was done for a purpose. Although the top side of each line is open, the line's field is essentially confined by the deep sides. This makes it possible to test and operate the unit with the top cover (not shown) removed. Attaching the cover has no detuning effect whatsoever.

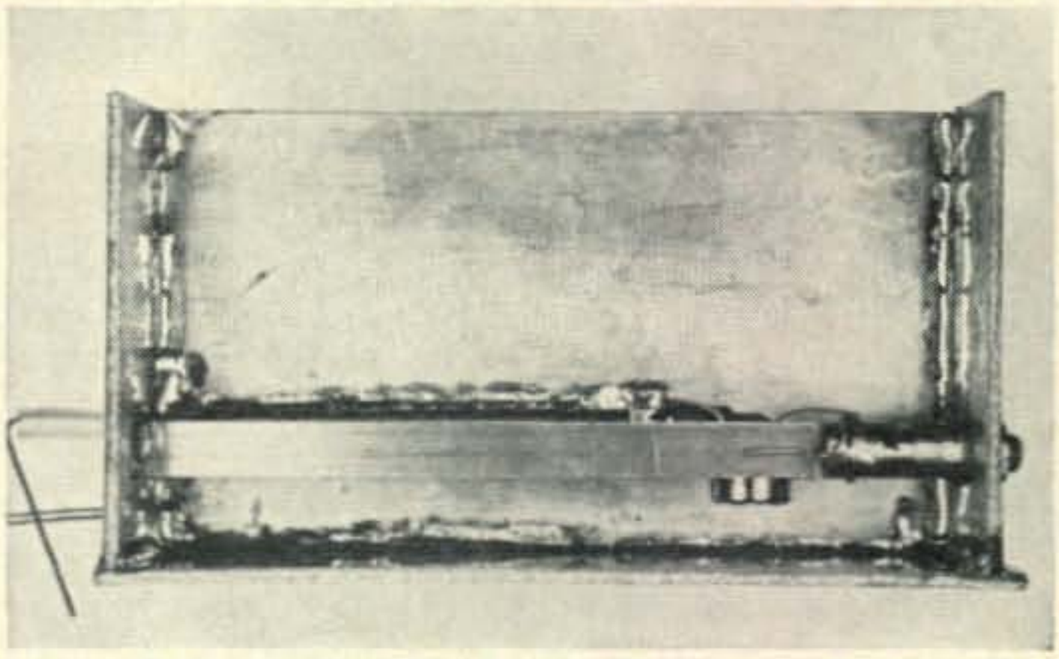
The partition between L_1 and L_2 has three



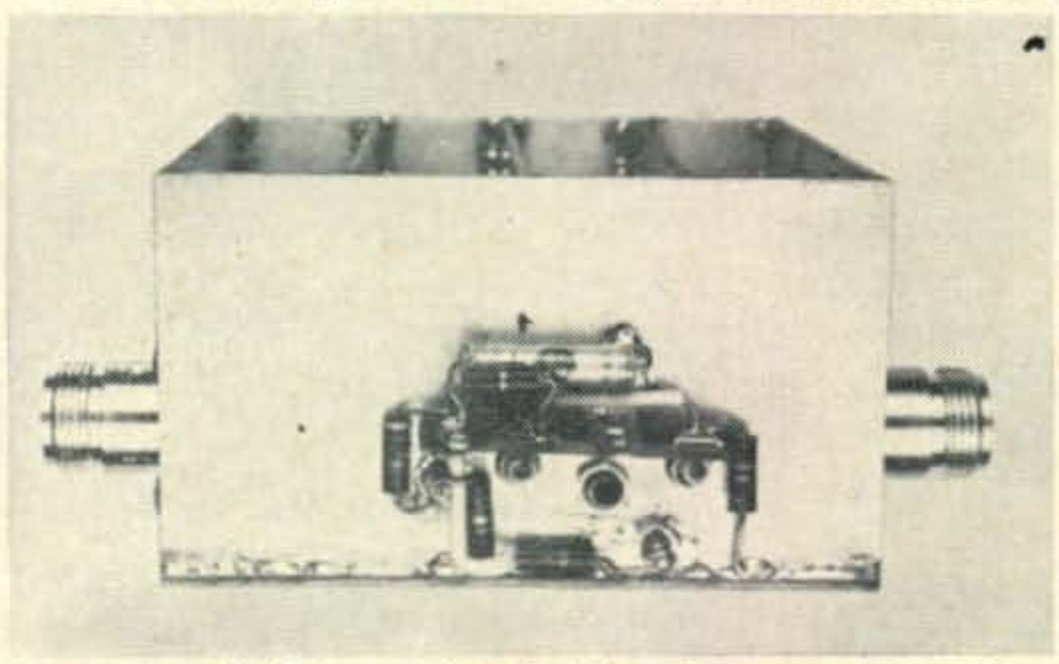
View of L_2, C_2 and C_6 from the left hand side of L_2. Note Q_1 and C_7 in the brass tube.



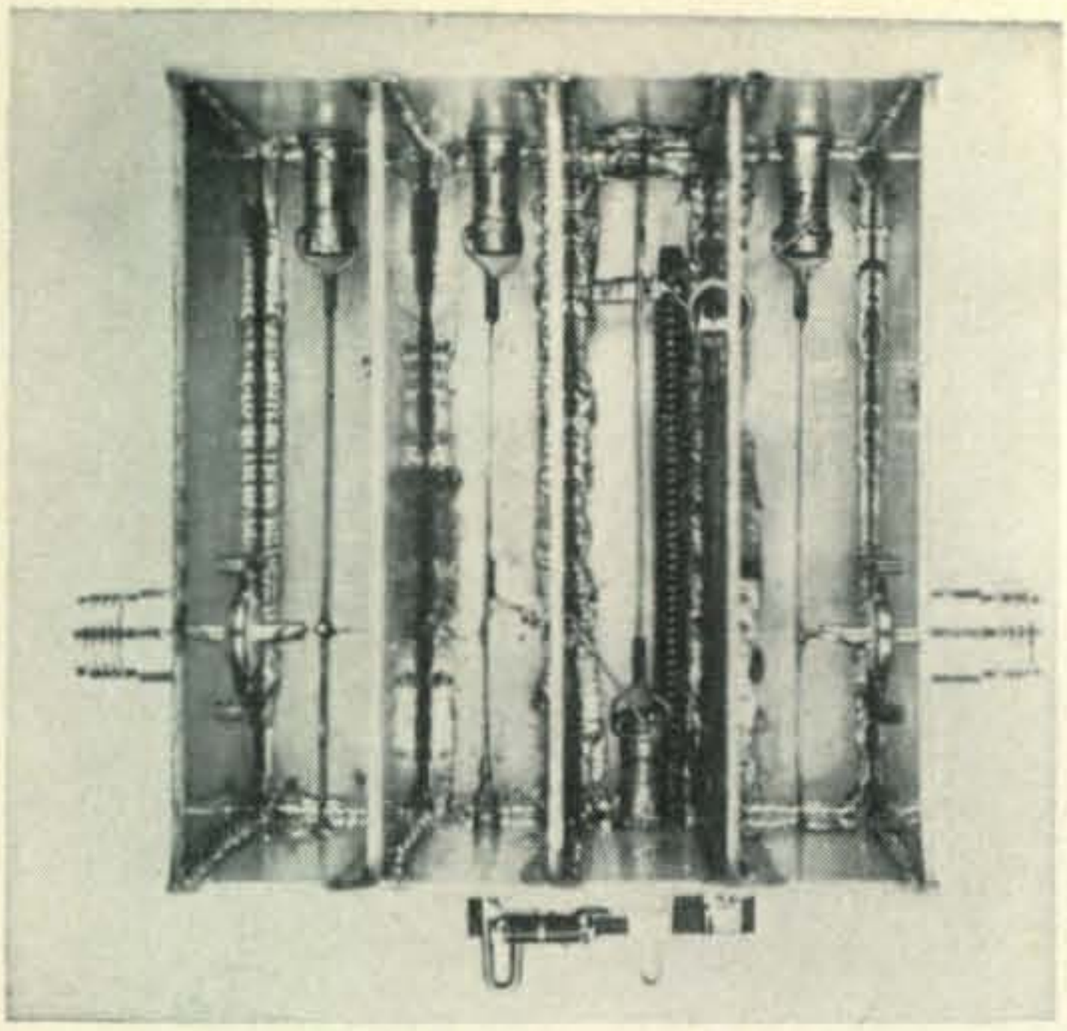
The L_3, C_3 compartment, viewed from the left hand side, shows L_5 below L_3 and C_3 on the right end of L_3.



View of the output line L_4, C_4. Transistor Q_2 is visible mounted in the partition with C_{10} in the brass sleeve.



Top view of the completed 420-450 mc preamp. Connector J_1 is on the left and J_2 on the right.



The low noise 430-450 mc preamp shown mounted on the antenna at WA7BAE. The protective cover is not in place.

small holes. These were put in to allow connecting C_5 at various points. The upper one of the three holes was used.

Solder a wire to one end of feedthrough capacitor C_7. Insulate this terminal with a piece of No. 10 teflon tubing. Then solder the mounting flange of C_7 to a short piece of 3/16 inch o.d. brass tubing, available at most hobby shops. It helps to first clean out the end of the brass tubing with a tapered reamer. Cut the partition between L_2 and L_3 as shown and mount C_7. Transmitter Q_1 emitter lead must be very short. Solder lead No. 4, the case of Q_1, to the partition. The best way to heat sink the leads of Q_1 for soldering is to place a drop of medicinal alcohol on the transistor in the center of the four leads, touching all four. At $26 each, be careful with it!

The partition between L_3 and L_4 is made in much the same way as the previous one. Make the end partitions holding J_1 and J_2. Make the two boards at each end of the resonant lines. The centers of all of the lines and J_1, J_2 are ½ inch up from the bottom of the amplifier. Capacitor C_9 is ⅜ inch up from the bottom. Finally, assemble all of the sides, bottom and partitions.

Lines L_1 through L_4 are made from 0.020 inch shim brass strips, ¼ inch wide, length as required to fit. R.f.c. L_5 is made by space winding #22 wire on a piece of ⅛ inch diameter plastic rod, 2¼ inches long. Wire size and number of turns is unimportant, but it *must* be space wound to avoid self resonance effects.

I have built two of these units. The prototype was not silver plated. This one was. No noticeable difference exists between the performance of the two.

Tuning And Operation

Connect the completed unit to your receiver through the piece of coax that is to be used with it. Connect a signal generator to the input and apply power. Peak up C_1 through C_4 for maximum gain. Then, on approximately unity signal-to-noise ratio adjust C_1 and C_2 for best noise figure. Try connecting the base lead of Q_1 to different points on L_2. Retune and measure gain and noise figure at each point. Best noise figure will be found with the connection between ¾ inch and 1½ inches up from the cold end of L_2.

Mount the unit on your antenna, radiate a signal into your antenna from your signal generator and readjust C_1 and C_2 to match your antenna.

Although the unit was designed to be mounted at the antenna you may choose not to do so. This is acceptable if a short run of good coax is used from the antenna to the preamplifier. RG-8/U attenuates about 5 db per 100 feet when new.

This unit is, for the most part, unaffected by temperature. It has been run at +130 degrees *F*, at room temperature, and at —110 degrees *F* packed in dry ice. Its gain was slightly reduced at the high temperature, so the unit should be protected from bright sunlight, such as we have in Arizona.

The cheapest way to use the same antenna for transmitting and receiving is to use one cable run from a coax relay at the antenna to the transmitter, and a separate run from the preamplifier output to the receiver. A shorting type relay, such as the Danbury Knudson type 317-010255-8 should be used.

Modifications

It was mentioned that cost could be cut by about $20. To do this, replace the first stage with two stages patterned after the second stage. The 2N2398's cost about $3.50. Total gain of the three stage unit will be 25-30 db, and noise figure 5 or 6 db. If your receiver noise figure plus antenna coax attenuation is less than 15 db use only two stages of amplification.

This unit has shown no need for neutralization. The best way to check for this is to measure reverse attenuation. This was done to each stage of the prototype and from output to input in the final model. Reverse attenuation should exceed forward gain by greater than 10 db per stage.

The piston capacitors in the parts list are rather expensive, but less expensive ones may be used. Whatever is used, the total length of line and capacitor must remain 3½ inches. Single turn capacitors are not recommended. The unit is tunable from 300 mc to over 600 mc, and single turn capacitors would be far too touchy to adjust.

All in all, this unit should make your 420-450 mc operating a real pleasure. I would like to express my most sincere appreciation for the help received from Dr. Tom Gehrels, the Lunar and Planetary Laboratory, and Project POLARISCOPE[1]. 73's, and happy DX. ■

[1]Supported by National Science Foundation Grant No. GP-1770 and The National Aeronautics and Space Administration Grant NASr-138.

The business center of São Paulo, Brazil.

"CQ Brazil..."

BY FRANCISCO SILVA JR.,* PY2CUB

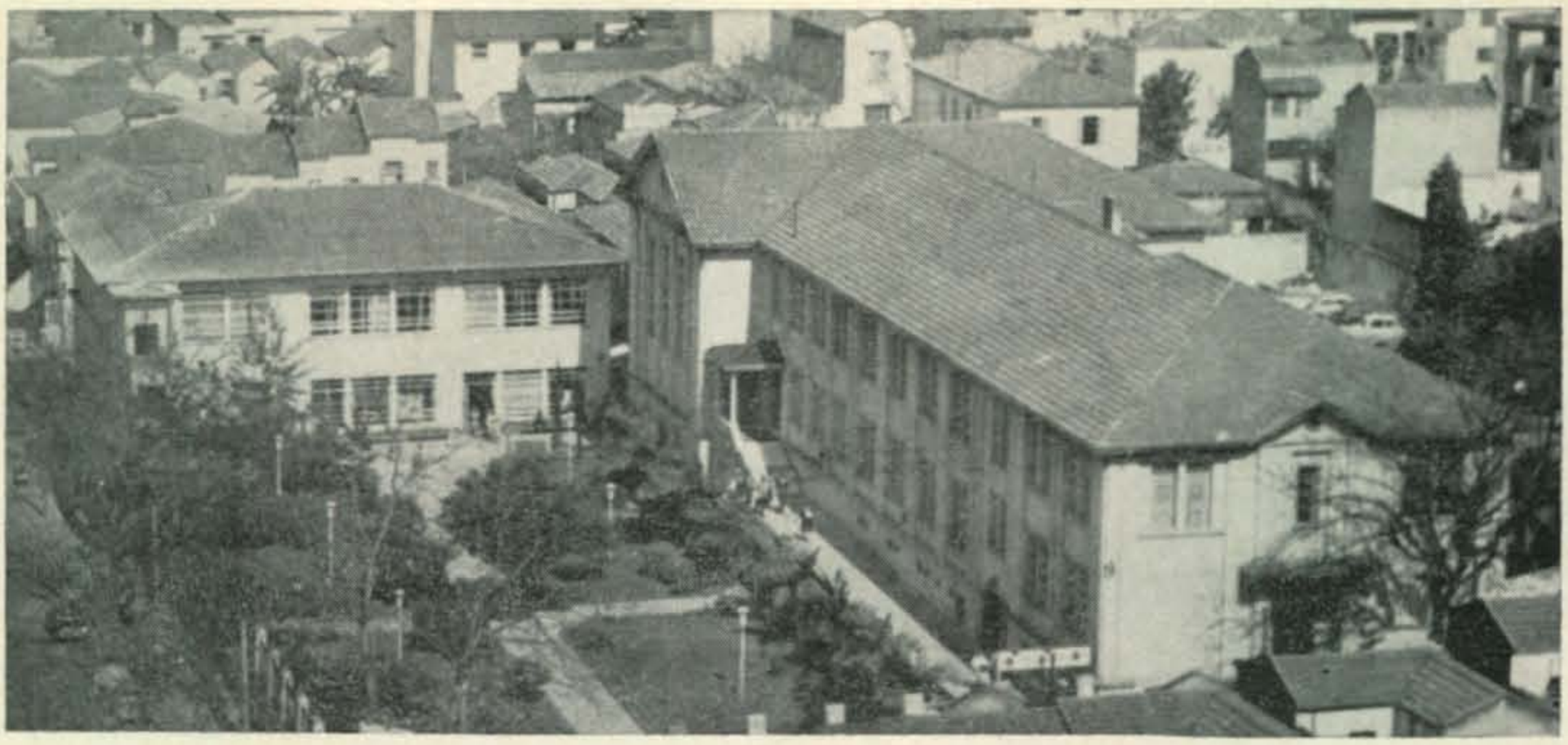
WHEN you call "CQ Brazil," you are trying to cover a lot of territory, indeed. Familiarity with certain peculiarities of such a vast nation will make your contacts easier and much more pleasant. Some of the unknown facts belong to grammar school lessons, but they must be brought to mind even in the best ham shacks. For instance: Brazil is not all in the tropics. During July and August temperature may drop to freezing point in many Brazilian regions and snow flurries may change the appearance of many antennas in South Brazil. Brazil has a coastline of over 4000 miles, with a variety of landscapes that run from dark jungles to sand dunes, from palm-fringed inlets to pine groves on high plateaus. Brazil has a territory that is larger than that of the United States (without Alaska) and is exceeded in size only by China, Russia and Canada. Our population is now close to 80 million people, a melting pot of Portuguese, German, Italian, Spanish, Japanese and African descents. But the Brazilian nationality is well defined in language and characteristics. Brazil has but one language—not Spanish but Portuguese. Most Brazilians can understand Spanish, of course, but are somewhat proud of their exclusiveness. In fact, we Brazilians may seem too sensitive in our pride when someone seems to be indifferent to the fact that we are different . . . We expect the world to know that we speak Portuguese and that this fact is not to be taken lightly. And we also know that human sensibilities cannot be ignored in any form of international relations.

Besides being the only people in all Latin America that do not speak Spanish, these eighty million Brazilians have profound peculiarities that make them quite different from any other nationality below the Rio Grande. Perhaps we Brazilians would have a great deal to gain, in sources of information, if Spanish were also spoken in Brazil. But that is not our case. Therefore, this essential factor must be considered by anyone interested in making friends and influencing people in this nation. Having been discovered and colonized by the Portuguese and not by the Spaniards, Brazil has created a civilization of its own, which is evident in our literature and other forms of art, in our philosophy of life, in our boisterous sense of humor, in our irreverence toward some ridiculous pretenses of mankind—and then in our food, in our music, in our names etc. These contrasts become apparent to most tourists that arrive in Brazil after observing other American countries. A similar surprise may hit those radio hams that have become used only to the mental images created by their contacts with Spanish-speaking countries.

The similarity between the Spanish and the Portuguese languages is well known. But little is said of the pitfalls that await those who believe blindly in such similarities. The spelling is sometimes alike but the meaning is entirely different. Some Brazilian expressions are shocking in Peru, in Argentina, in Mexico . . . And, then, some words of household use in Mexico, Guatemala or Venezuela cannot be repeated in Brazil among ladies and gentlemen. Only recently, a famous Brazilian soccer player became an international idol during a championship game in Chile. But his nickname, by which he is known throughout Brazil, had to be changed in Chile—as censor-

The author, PY2CUB, on a recent trip to London. Towers of London Bridge can be seen in the background.

*Caixa Postal 30.123 São Paulo, Brazil.



União Cultural Brazil-Estados Unidos (Brazil-US Cultural Institute) occupies half a city block. PY2USA is its latest link in Brazilian-American relations.

ship would have banned all headlines in the Chilean newspapers! One can imagine the difficulties that simple descriptions and technical specifications may cause if proper caution is not taken: *Largo* in Spanish means long while in Portuguese it can only mean wide. *Oficina* in Brazil can only be a workshop, a machine shop; in Spanish it is an office. If you look for an office in Brazil, you must ask for an *escritorio* (which in Spanish means a writing desk). Simple, isn't it?

Now, take a good look at a large map of Brazil and consider the differences that all these tremendous distances, climates, habits, traditions, etc., must bear on the meanings of words and on the formation of phrases. Several expressions of common usage in the Amazon Valley are unknown in South Brazil. But differences are to be found even in neighboring cities, like Rio de Janeiro and São Paulo: If you damage your car's fender in São Paulo, you go to a *funileiro* (funnel maker) to have it repaired. But in Rio you will never find a *funileiro* for such a job; your *carioca* friends will recommend a good *lanterneiro* (who is not a maker of lanterns and lamps). In São Paulo, if your faucets need repair you go to the *encanador* for help, as he is a "pipe fitter." In Rio, you would look for a *bombeiro* (pump maker), a person you would call for in São Paulo only in case of fire—as *bombeiros* in São Paulo are firemen.

All this to say that your "CQ Brazil" call will put you in contact with a people that will try their very best to be of service to you—a people always ready with quick repartee, with an enviable sense of humor, always telling the latest joke in vogue, humming the spiciest sambas—and yet capable of creating a most amazing civilization in the tropics. A better knowledge of these people becomes convenient, if one does not wish to irritate these good-humored Brazilians with misconceptions and generalities—just because Brazil is below the Rio Grande.

Radio hams in Brazil are now close to 20,000. Deficient communications in the interior of Brazil have shown that necessity is both mother and father of invention. An empty cigar box, a few pieces of copper wire, some second-hand tubes . . . and a Brazilian rube produces a neat transmitter or receiver for his 40-meter rag chewing sessions. After one year as a Class-B operator on forty and eighty meters, he may try the higher

[*Continued on page 102*]

The QSL card of PY2USA. The stars represent the Southern Cross and are outlined in blue, as it similarly appears on the blue globe of the Brazilian Flag. The USA is alternate red and white strips symbolic of the United States flag.

Byron C. Sharpe, W9JKC, shown fourth from the left among the Directors of PY2USA at the recent opening of the club station.

FERRITES

or

What's Mu(μ) With You

BY HANK OLSON,* W6GXN

Below is a thorough discussion of ferrites, the sources of ferrite cores and some applications that will be useful for the amateur.

THE phenomenon of ferromagnetism has been known to man since pre-New Testament times. Lodestones, lumps of magnetite, had been used as "lead-stones" or compasses by early mariners. This facet of ferro-magnetism—remanence, or the property of retaining magnetic field after excitation is removed—was for centuries the most important and also the most intriguing feature of these lodestones.[1] Even today magnets have a fascination about them, and are widely used in toys and other gadgets.

The bulk of application of ferro magnetic material, however, is not in permanent magnets. Most commercial ferromagnetic material is of the "soft" type that has a purposely low remanence, and is used in motors, transformers, inductors, generators, and many other devices. This "soft" magnetic material is what one normally finds in power transformers, in laminated form. The laminated construction was engineered early in electrical history to prevent "eddy-current" loss, which occurs because the iron core is an electrical conductor, and would have the effect of a shorted-turn, were it not broken up by the mutually-insulated laminations. For low frequency power applications the lamination method was quite effective, but as transformer technology pushed up into the audio spectrum and higher, the laminations had to be made ever thinner and thinner if eddy-current loss was to be avoided. This method has perhaps been carried to its ultimate in the one-tenth mil tape-wound cores now available from Magnetics Inc. and other companies.

Powdered Iron

As early as 1898, Oliver Heaviside suggested that a way to make magnetic iron cores for high frequencies would be to use iron dust, coating each dust particle with insulation, then pressing the insulated particles into a homogeneous mass.[2] This technique was subsequently made practical and adapted to telephone frequencies by Bell Telephone Co. The techniques of powdered iron core production have been improved constantly over the years, and nowdays one can purchase powdered iron cores usable throughout the h.f. band and even useful for some applications in the v.h.f. region. The upper limit in frequency, of powdered iron cores, is dependent upon how small one can make the conducting particles of iron. However, as the particle size becomes smaller, the insulating coating thickness must also decrease if one is to maintain the percentage of ferromagnetic material to inert material. Practical considerations, then, become the limit.

Ferrites

The search for ways to reduce the size of conducting particles and insulating material coating thickness had been practically carried to its conclusion, when ferrites became a reality commercially. Ferrites have a high bulk resistance, and so it is not necessary to finely divide ferrites to prevent eddy-current losses—because the current induced in any shorted-turn of a ferrite is minute. It is worth noting that with the advent of ferrites the technology has executed a full circle. We started out with a ferrite (magnetite or magnetic iron oxide) which is a non-conductor; went through all the advances of irons, steels, and alloys; and eventually came back again to a ferrite.

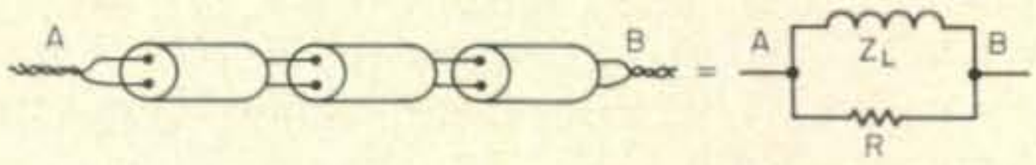
Present-day ferrites are not exactly the same as the original magnetic iron oxide that early man found in lodestones. Modern ferrites are formed in the shape that they are to be used, of magnetic iron oxide and various additives such as manganese, nickel, and zinc; and then baked at high temperature which vitrifies them.[3] Finally, grind-

*Stanford Research Institute, Menlo Park, Calif. 94025.

[1]Ghirardi: "Radio Physics Course", 1931, p. 106-7.

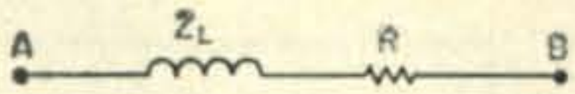
[2]Heaviside, O., "Electromagnetic Theory", Vol. 1, 1893, p. 441.

[3]Gorter, E. W., "Some Properties of Ferrites in Connection with Their Chemistry", *Proc. IRE*, Dec. 1955, Vol. 43, p. 1945.



Frequency	R	Z_L
29mc	240Ω	+j 180Ω
50mc	252Ω	+j 270Ω
98mc	286Ω	+j 400Ω
146mc	310Ω	+j 500Ω
220mc	340Ω	+j 700Ω

Fig. 1—Equivalent parallel impedances of three 56-390-31/4B ferrite beads made by Ferroxcube.



	Single 56-590-65/3B		Single K5-001-00/3B		Double 56-590-65/3B		Double K5-001-00/3B		Triple 56-590-65/3B		Triple K5-001-00/3B	
Freq.(mc)	R	Z_L	R	Z_L	R	Z_L	R	Z_L	R	Z_L	R	Z_L
30	40	+j56	———	———	68	+j120	61	+j70	99	+j180	82	+j110
50	43	+j60	53	+j45	71	+j120	67	+j85	100	+j220	89	+j140
100	81	+j60	95	+j55	88	+j120	90	+j85	110	+j200	101	+j150
120	102	+j60	118	+j60	91	+j120	96	+j100	110	+j200	109	+j155
140	112	+j70	145	+j65	104	+j130	112	+j100	120	+j210	116	+j160
160	130	+j75	153	+j75	110	+j140	118	+j100	122	+j200	120	+j160
180	162	+j80	185	+j75	126	+j145	132	+j100	132	+j190	128	+j155
200	187	+j80	230	+j80	136	+j130	148	+j100	141	+j180	137	+j150
225	242	+j90	270	+j90	163	+j130	178	+j120	155	+j170	157	+j140
250	280	+j115	350	+j120	187	+j130	218	+j120	175	+j170	180	+j130

Fig. 2—Equivalent series impedance of two types of Ferroxcube shielding beads on a solid #22 wire one inch long.

ing is used to finish the critical surfaces.

Ferrites are available in a variety of shapes from several manufacturers. Torroids, pot cores, E-I cores, threaded coil slugs, C cores, bars, rods, beads, and tubes are among the commonly useful ones. In addition, special shapes for tape recorder heads, for TV deflection yokes, and for other purposes are available. One bad feature of these ferrites is that one is constrained to use the available shapes and sizes, except for slight modification by relatively expensive grinding.

But now let's have a look at what ferrites, with their high μ and low loss at high frequencies, can *do* for us. D.c. to d.c. converters, i.f. amplifier transformers, broadband r.f. transformers, broadband baluns, r.f. chokes, and harmonic generators are among the devices that can be made with ferrites. Of course, the widely commercialized use of ferrite is in the antenna "loopstick" of portable radios, in the wide-angle deflection yokes of TV sets, and in the horizontal output transformers of TV sets. These uses are mentioned here, not because the reader is likely to be designing either a TV set or a "rock 'n' roll transducer" but because these entertainment devices are constantly in the "beyond repair" category and are discarded—representing a good, free, source of usable ferrites. Already, several articles have appeared that make use of discarded TV or other readily obtainable ferrites for amateur radio gear construction.

We can simply construct 1:1 and 4:1 broadband baluns for use in connecting balanced antennas to coax using ferrites. These are usually made by winding a transmission line on a ferrite torroid core.[4,5] However, one commercial manufacturer (North Hills) uses the pot core form of high frequency ferrite to produce transformers that will match 50 or 75 ohm unbalanced line to a variety of balanced impedances from 75 to 800 ohms. For this purpose, non-gapped pot cores are used. This use of non-gapped cores limits the power handling capability because such cores are easily saturated.

[4]Ruthroff, C. L., "Some Broad-Band Transformers", *Proc. IRE*, August 1959, p. 1337.
[5]Turrin, R., "Broad-Band Balun Transformers", *QST*, August 1964, p. 33.

Beads

Recently, Ferroxcube, which sells a broad line of ferrite materials, has offered a series of ferrite "beads" for use in decoupling r.f. in power leads between stages.[6] The v.h.f. converter designers seized these beads as the answer to their filament choking problems. A single ferrite bead slipped over a piece of ordinary #20 hookup wire will make the wire appear as if it were greater than 50 ohms resistive in series with greater than 50 ohm inductive reactance over the entire v.h.f. range. At last, a compact isolating choke could be built, with negligible loss at d.c. or 60 cycles, for filament choking. Since these beads are quite lossy, the choke will not form any high *Q* spurious resonances with its associated bypass capacitors, which solves another problem. Ferrite beads are inexpensive and available with several size holes, and also in a "two-holer" model.

As an example of how such a device performs, fig. 1 shows the reactance of a pair of #20 wires through three two-hole cores (the wires in parallel, as they might be used to decouple a tube heated by "balanced to ground" heater

[6]Ferroxcube Corporation of America, *"Ferroxcube Shielding Beads"*, Bulletin 502.

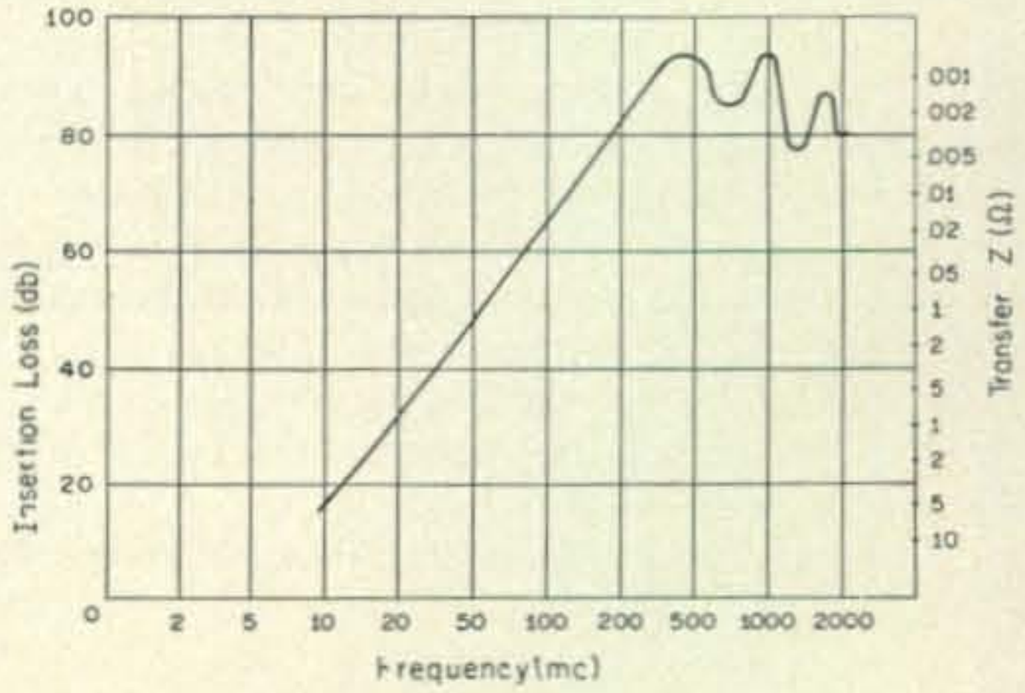


Fig. 3—A combination of a ferrite bead and a feed-through ceramic capacitor produces an L decoupling network. The attenuation *vs* frequency curve for the Erie "Filtercon" is shown above.

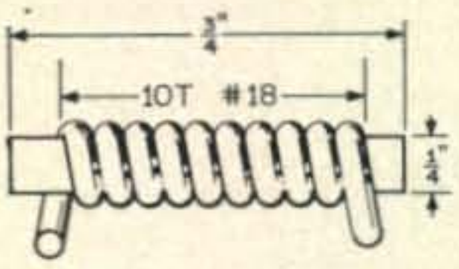
voltage). These measurements were made on a Boonton "RX Meter" Model 250A. Figure 2 shows the reactance of a single-hole bead with a piece of #20 hookup wire through it.

In addition, these tiny ferrite beads have been wedded to the feedthrough ceramic capacitor to provide a compact "L" decoupling network, by at least two manufacturers. These are known as "Filtercons" or "Band Pass Filters", depending on whether one gets them from Erie or Ferroxcube. A typical "Filtercon" attenuation versus frequency curve is shown in fig. 3.

The use of a whole string of beads on a wire, of course, increases the effective series value of the choke, and in fact it becomes a dissipative transmission line such as has been advocated (and with good reason) by many engineers interested in r.f.i. reduction and control.

Self Resonance

Ordinary powdered iron cores, even those designed for audio frequencies, can be used for h.f. decoupling in the same way as lossy ferrites. One wouldn't ordinarily think of using these older torroid cores above the frequency for which they were intended. The thing that makes them useful as dissipative filters is the fact that their μ does not go down as frequency increases, but at high frequencies their eddy-current loss increases sharply. For instance, an old 2-inch diameter audio core with 10 turns of #16 wire on it measured 18 μh, and had a Q of 12 at 1 kc (in the frequency range for which it is designed). This coil had about the same inductance at 14 mc, looking like +j 1350 ohms in parallel with 900 ohms resistive. Note that such an inductor would be totally useless as a tank coil at 14 mc, but as a line-decoupling choke it is just fine. Such cores are readily available surplus (this one had to be extricated from many turns of wire with a saw) at very low prices. Chokes made in this way should be checked for their self-resonant frequency, and used only at frequencies below that self-resonance (as all chokes, air or otherwise should be checked). It may be quite surprising to see how low the self-resonant frequency of such a choke can be, but remember that the inductance of a few turns is now many times what it would have been if



Frequency(mc)	R_P(Ω)	Z_L(Ω)	Q
7	16.3K	100	160
14	12.5K	200	62
28	9.1K	400	23
50	9.1K	740	12
100	10.6K	1480	7

Fig. 4—Filament decoupling choke wound on a short piece of loopstick ferrite. The self-resonant frequency is about 110 mc. Measurements were made with the Boonton RX Meter Model 250A.

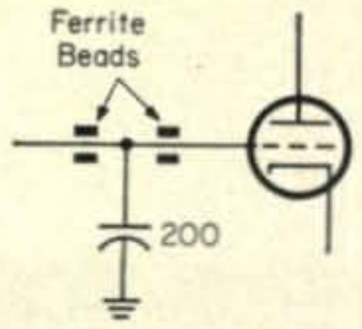


Fig. 5—The use of ferrite beads to eliminate Hi Fi I in low impedance circuits where the usual 75K resistor cannot be used. The capacitor rating is in pf.

air wound. Winding only one layer of wire on one side of the torroid is one way of keeping self-capacity small, and thereby keeping the self-resonant frequency of the coil high.

Very effective higher Q decoupling chokes for use between stages in filament decoupling can be made in the standard solenoidal form by using short pieces of ferrite-loop antenna rod as forms for coils of a few turns. The antenna rod should preferably be round and smaller than 3/8" diameter. It can be cut by making a circumferential scratch with the corner of a carborundum stone, and then breaking the ferrite rod with the short end clamped in a vise. As an example, a piece of 1/4" diameter ferrite 3/4" long with 10 turns of #18 wire close-wound on it performs as in fig. 4. For mechanical stability, the core and coil were dipped in epoxy after winding (any epoxy will do, including the two-tube household types).

Ferrite Cores

Using ferrites that are especially made for h.f. may be a little exhilarating at first encounter. A half dozen turns on a Q2 or 3D3 torroid or non-gapped pot core will yield an amazing coil with large inductance for its size and very high Q (over 200 with no special winding care is typical).

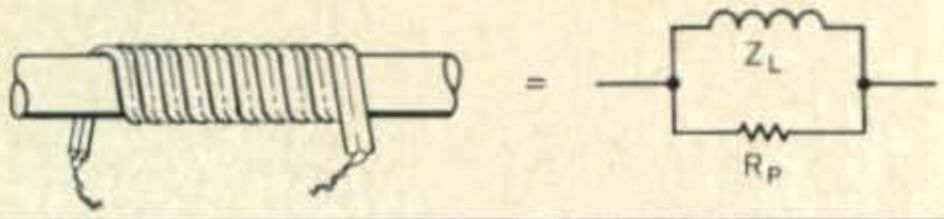
As resonant elements, these coils are very compact and low loss; but there are some limitations to their use. Excessive current must not be carried by ferrite core coils if saturation (with consequent decrease in inductance) is to be avoided. The cores which have an air-gap are less susceptible to saturation but also give less inductance per turn. This saturation effect is not unique with ferrites, but is the same thing that happens in a "swinging-choke" as widely used in transmitter power supplies.

The temperature sensitivity of the ferrite must be compensated, as well as allowance made for Q change with temperature. Many ferrite cores have temperature characteristics which are compensated by a given type of dielectric capacitor. The stable combination of many Siemens ferrite pot cores and Sientens polystyrene capacitors is widely used, for example.

Interference

One of the particularly vexing areas of ham radio is interference: "TVI", "BCI", and "Hi Fi I." Even here the friendly ferrite comes to the rescue.

Bypassing the line cord of the HiFi, TV, *etc.* to the chassis (right where it enters the chassis)



Frequency (mc)	$R_p(\Omega)$	$Z_L(\Omega)$	Q
3.5	15K	+j 100	150
7.0	25K	+j 200	125
14.0	14.4K	+j 400	36
21.0	12K	+j 600	20
28.0	9.8K	+j 800	12

Fig. 6—Winding the line cord on a loopstick core increases the inductance and aids in eliminating r.f. from TV chassis or other types of home equipment. The table above shows the characteristics of a coil consisting of 12 turns of #18 zip cord on a 3/8" diameter loopstick 4" long. (Measured on the Boonton 250A.)

with two .01 mf, 1 kv discaps, will keep a good deal of r.f. out of the chassis interior. Many manufacturers use such bypassing (but not always low inductance discaps). By winding the line cord up on a 4 inch piece of old 3/8" antenna "loopstick" ferrite, right as it comes out of the chassis (say about 12 turns), the effectiveness of the internal .01 mf capacitors can be increased. The bifilar coil thus formed can be taped up or screwed to the back of the chassis with two plastic clamps and a couple of sheet metal screws. The ferrite core greatly increases the inductance of the line cord, and thus forms a far better L-C low-pass filter in combination with the .01 mf discaps inside the chassis.

A second area where ferrites are effective is where r.f. is causing an audio stage to detect. The high impedance grids of low-level audio stages are easily cured by R-C filtering as covered in any amateur handbook. However, in many low impedance input stages the insertion of a 75K resistor in series with the grid would seriously reduce gain. A case in point is the low impedance, high gain input for a dynamic phonograph pickup. Here the ferrite beads again are used as series impedance, in an L-C filter. Their use is shown in fig. 5; the beads are, of course, placed as close to the tube grid pin as possible.

The "line-cord-on-loopstick" approach is good for *all* interference categories mentioned, ridding the interior of the chassis of large r.f. voltages; the "ferrite-bead-at-the-grid" should only be used in audio stages to suppress "first grid rectification".

As an example of how effective the "line-cord-on-loopstick" is in increasing line cord inductance, data on a typical unit is shown in fig. 6.

D.C. to D.C. Converters

Both the ferrite core of the horizontal flyback transformer and the "cracked ring" sections of the deflection yoke from a TV set may be used to make transistor d.c. to d.c. converters. A mobile power supply using a horizontal transformer core for conversion of 12 volts to 200 volts is shown in fig. 7. The core was one of several that all appeared identical (even though removed from different brand sets) and which are apparently type CF602(H) of Indiana General. The primary was wound of ordinary #12 T.W. house wire; the base winding was of #28 solid hookup wire. The core gaps (two pieces of cardboard) were removed from the original TV assembly to make the ferrite saturate more easily.

Baluns

If a ferrite bead on a piece of hookup wire can make it look like several hundred ohms at v.h.f., why couldn't one use a larger "bead" on the outside of a coax line to make it, too, look like a high impedance? This would have the effect of a 1/1 balun since current would be prevented from flowing down the outside of the coax and subsequently radiated.

Since big "beads" aren't available, small torroids stacked up may be used or ferrite "tubes" may be used for RG58/U and similar small cables.

The effectiveness of such a balun is hard to measure, but all indications are that it is working (judging by how much the r.f. in the shack was reduced by adding a few beads over the coax braid at the antenna feed point).

Several Indiana General CF102 (Q2 or Q3) torroids will slide over RG58/U or RG59/U; CF109 cores will do for RG8/U, RG9/U or RG11/U; and a Ferroxcube "tube" ferrite (K5 00085-4D) is fine for RG174/U.

Nomenclature

Last of all, a word about how to use the nomenclature stamped on pot-cores (that you may find in surplus shops or fall heir to) is in order. These are generally stamped with an identification number, the material type, and an AL number. The I.D. and material numbers will only make sense if you have the manufacturer's catalog, but the AL number is *directly* useful. It tells you how much inductance per turn-squared the core will give in nano-henries.

[*Continued on page 102*]

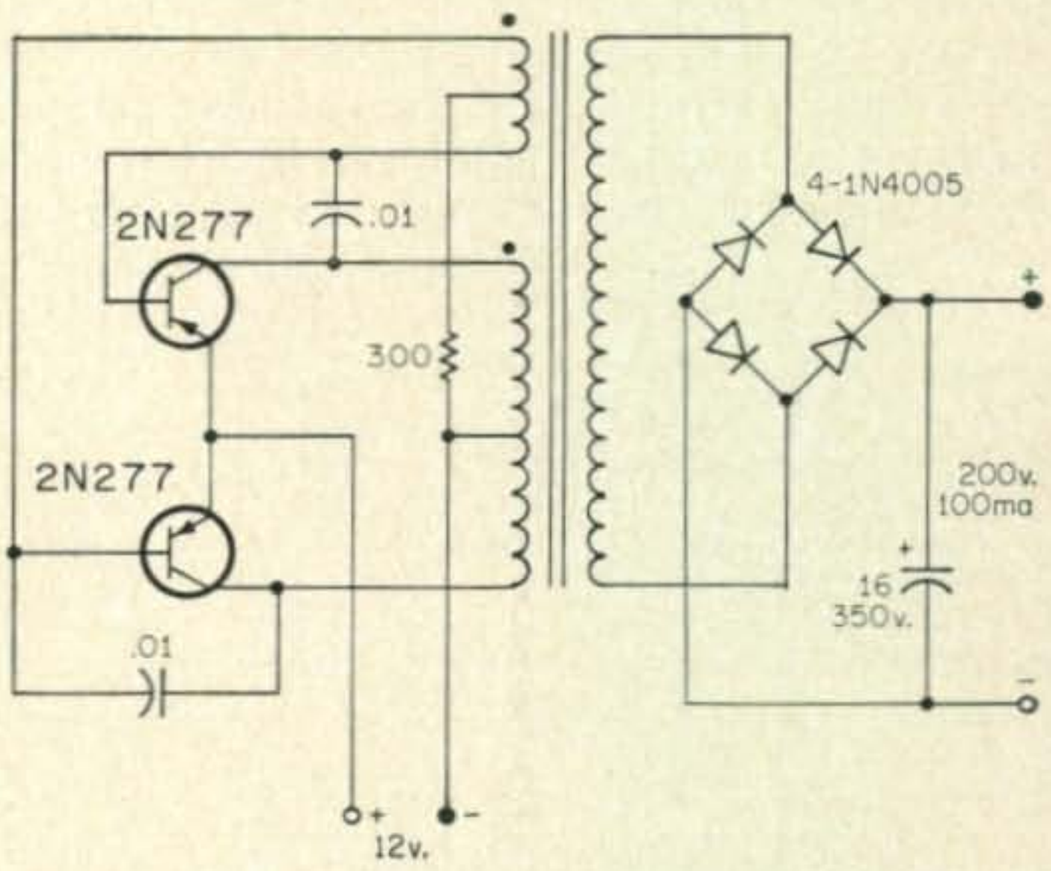


Fig. 7—Circuit of a d.c. to d.c. converter utilizing ferrite cores taken from TV set horizontal output transformers. The winding data is as follows: Base, 18 t. #28 Solid hookup wire; Collector, 24 t. #12 T.W. c.t.; H. V., 200 t #32 formvar.

MEMTAC—A New Method of Communication

BY JERZY OSTERMOND-TOR,* EX-YM4XR

Two years ago, in the April 1964 issue of CQ, Professor Ostermond-Tor, ex-YM4XR, wrote a new chapter in the history of amateur radio with his article entitled, "Ionospheric Amplification." Hailed throughout the world, the article is generally credited with initiating the trend back to low power transmitters, which is now so evident in the amateur bands. Continuing with his research experiments, this past year Professor Ostermond-Tor developed a technique for using the earth's magnetic field for long-distant communications. Called MEMTAC, this technique shows great promise for revolutionizing radio communications. The Editors of CQ suspect that the following article by Professor Ostermond-Tor, in which he discusses the MEMTAC system, will have as great an impact on amateur radio as did the Professor's article of two years ago.

I AM very happy dear readers of *CQ* to tell you how things have been going with old Tor. But first, I want to thank you all for the many nice letters I received after my last article was published in *CQ*. I understand that during the past two years many radio amateurs conducted ionospheric amplification experiments of their own, and have confirmed the advantages that I reported in my article for low power transmissions. This is really the greatest reward a scientist can receive for his efforts, to know that the results of his work are being put to good use.

As a result of my article in *CQ*, I also received several letters from old-timers who recalled working me before the War when I was operating my own amateur radio station, YM4XR, in the Free City Of Danzig. What wonderful memories those letters brought back to me! Even though nearly thirty years have passed since then, I can remember many of the QSOs as if they took place yesterday.

I am also very grateful to *CQ* for reuniting me with an old school friend, Emil Heisseluft. Before the War, Emil attended the University of Danzig and was in many of my classes. He was quite an expert on speech in those days.

I last saw Emil during the summer of 1939. I can still remember the warm August night as we toasted each other with beer at the Danzig Hofbrau Haus, after Emil had made the decision to continue his schooling in England. It was a very wise decision because in less than two weeks the War had begun and our beloved city of Danzig was in ruins. Although I did not know it at the time, Emil was already safe in England.

Last year, Emil Heisseluft, now a Professor at the Lauton Institute, near Vienna, wrote an article for *CQ*.[1] What a coincidence! As a result we were united in New York last spring. What a thrill it was seeing Emil again after all those years. He was much stouter than when I last saw him in Danzig, and he had quite a beard, but he was still the same old friendly Emil.

Emil encouraged me to join the scientific staff at the Lauton Institute. I returned to Austria with him, and my first visit to the Institute convinced me that this would be a wise choice. So, dear readers, that is where I have been for the past year.

*Correspondence to Professor Ostermond-Tor should be addressed to him, c/o *CQ*, 14 Vanderventer Ave., Port Washington, L.I., New York, 11050.

[1]Heisseluft, E., "Developing A DX Voice", *CQ*, April, 1965, pp. 52-54.

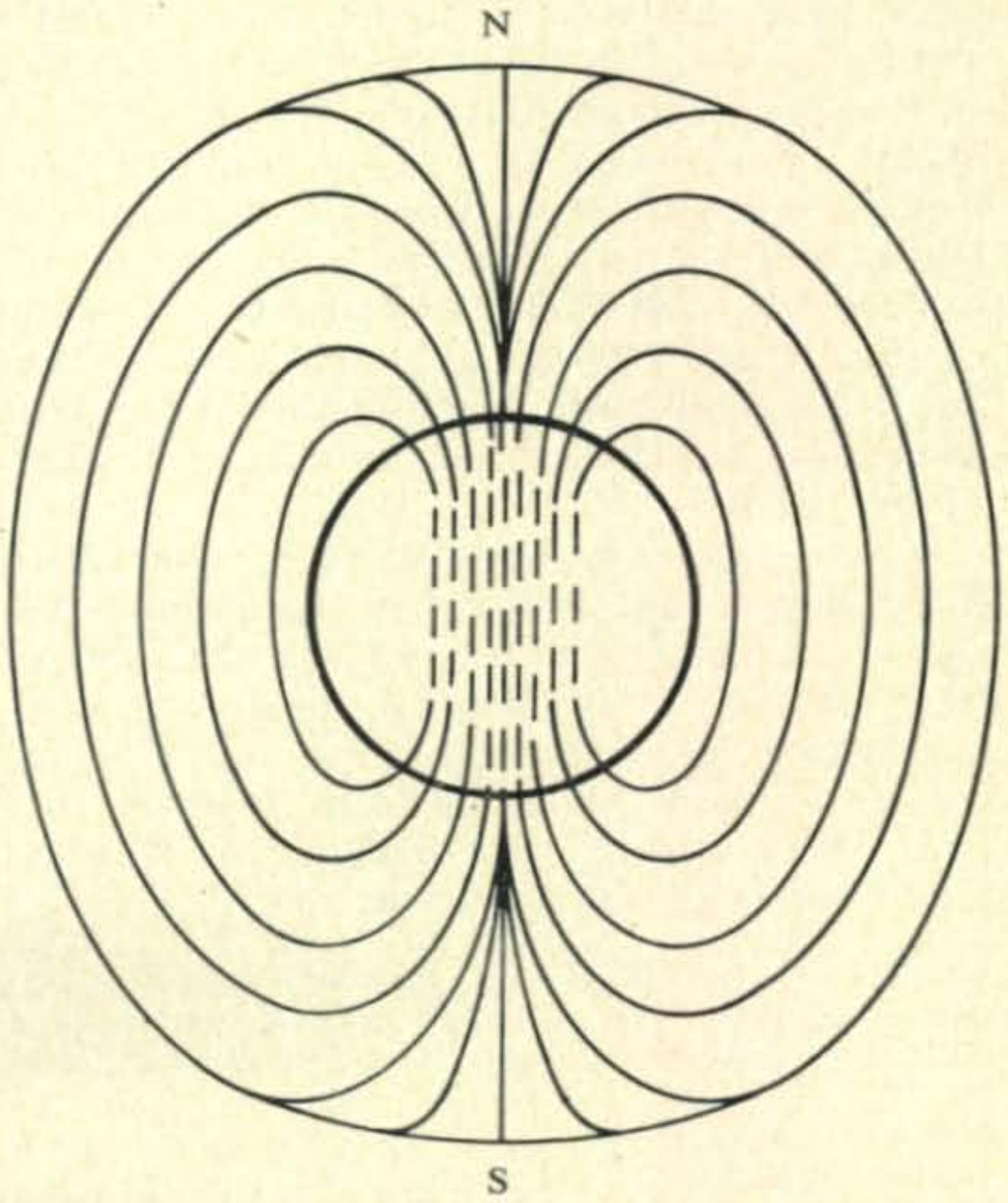


Fig. 1—The distribution of the Earths magnetic fields. Each path (of which there are billions) can accommodate one communications circuit.

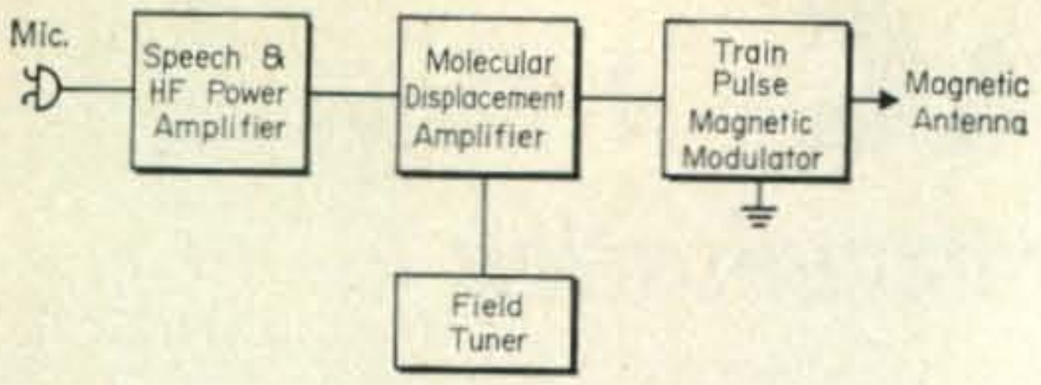


Fig. 2—A magnetic field modulator capable of a peak power output of 50,000 watts.

Life at the Institute is pleasant and professionally stimulating. It is located in a small town on the Danube River, a dozen miles east of the beautiful city of Vienna. From my laboratory window I look through a beautiful forest, across the wide, muddy Danube River, towards the mountains of Czechoslovakia on the eastern horizon. When life gets a little dull at the Institute, in less than an hour I can be in Vienna, enjoying all that that wonderful city has to offer —the Opera, wine in the Grinzing, wonderful meals at the Bristol and Sacher, coffee and schlag (whipped cream) at one of the innumerable Viennese coffee houses, a brisk walk in the Vienna woods, etc. So you see, old Tor has found happiness.

But I have not been asked to write this article just to tell you what a happy time I am having in Austria. I know that you are all interested in communications and that you would like to know what I have been experimenting with this past year. I will tell you about this right now.

For the past few years I have been very interested in "whistler propagation". This is a type of propagation where noises from lightning flashes in one part of the world are propagated by the lines of force of the earth's magnetic field to the opposite side of the world. At the receiving end, the noise sounds like a whistle, and that is why it is called whistler propagation.

Whistler propagation is not a new thing. Much of the theoretical and practical study of this type of propagation is being conducted in the United States at Stanford University, Dartmouth College, the Naval Research Laboratory and the Central Radio Propagation Laboratory.[2,3] It is also being studied by an international group of scientists under the International Telecommunication Union.[4]

What intrigued me about whistler propagation is the thought that if static from lightning flashes can be carried great distances by the lines of force of the earth's magnetic field, why can't intelligence be transmitted this way? There seemed to be two main obstacles to doing this. First, there was no way to couple intelligence into the line of force, and second, it appeared that tremendous power levels would be required to excite the earth's magnetic field. You will notice that I use the past tense concerning these obstacles. My experiments of this past year have shown me how to overcome them. The MEMTAC system, which stands for "modulation of the earth's magnetic field to affect communications," is capable of modulating the earth's magnetic field. It's 50 watt magnetic amplifier is adequate to excite the field, and couple intelligence to it. Once excited, the lines of force unleash stored energy in a chain reaction to propagate the modulation impressed by the amplifier over great distances, up to halfway around the earth.

[2]Allcock, G. M., Dinger, H. E. and Morgan, M. G., "Observations Of Whistling Atmospherics At Geo-Magnetically Conjugate Points" *Nature*, Vol. 177, 1956, pp. 29-31.

[3]"Radio Noise Of Terrestrial Origin", Edited by F. Horner, published by Elsevier, Amsterdam, 1962.

[4]Report 262 and Study Program 201 (VI), Whistler Mode of Propagation, Vol. II, Report of 10th Plenary Assembly, International Radio Consultative Committee, International Telecommunication Union, Geneva.

Theory of MEMTAC

The theory involved in the design of the MEMTAC system is very complicated, but I thing that I can draw some simple analogies which should get the main ideas across.

The earth is engulfed in a magnetic field which extends from its surface to millions and millions of miles into space. This is shown in fig. 1. One may consider the lines of force making up this field as a carrier, in much the same manner that a railroad track is a carrier for a train.

The field is generally quite constant, except when interrupted. To verify this, take an ordinary magnetic compass, lay it on a table, then pass a piece of iron around the compass. You will immediately see that the needle moves, indicating that you have disturbed the lines of force *around* the compass. Suppose now that the magnetic field could be disturbed at a rate corresponding to audio modulation. If the disturbance is strong enough, it should be propagated along the magnetic lines of force in the same manner as whistler propagation. In the nutshell, this is what MEMTAC does.

Modulation of the Feld

I first devised a unit to modulate the earth's field. To understand how this works, see fig. 2. The molecular displacement amplifier (MDA) is the heart of the system. However, the train pulse magnetic modulator (TPMN) plays a very important part in the modulation process in that it contains a magnetic storage and delay system to provide a peak pulse of 50,000 watts which

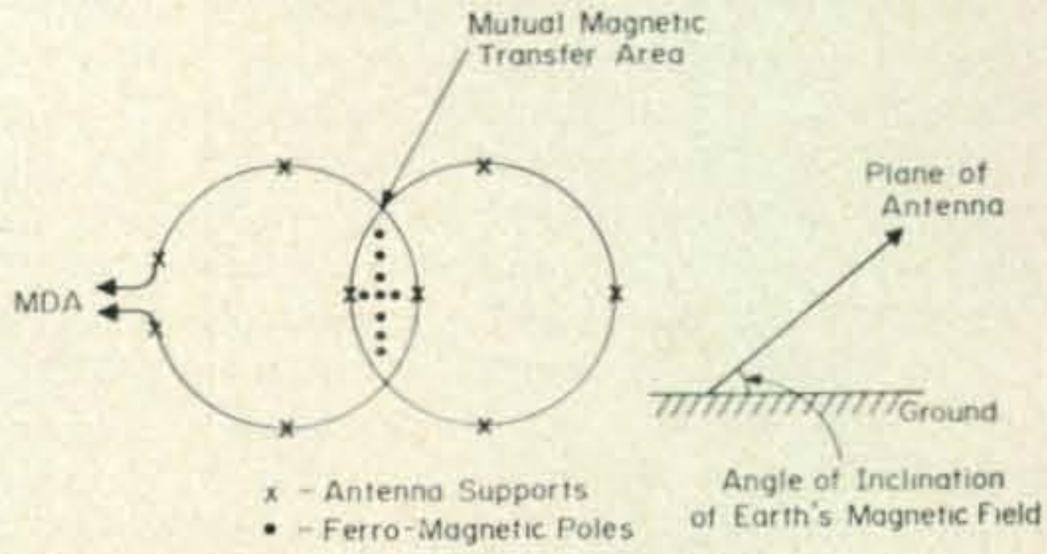


Fig. 3—A magnetic antenna used to couple the magnetic modulation to the earth's magnetic field. Diameter of the loop is equal to a halfwave at the operating frequency.

is required to set off the chain reaction along the magnetic line of force. This power is developed from a relatively simple magnetic amplifier of only 50 watts output.

The MDA converts normal speech input to magnetic line components which are then fed to the TPMN, where they are stored, delayed, amplified and converted into pulsed peak signal power.

Coupling to the Field

The MDA is coupled to the earth's magnetic field by a magnetic antenna system which I designed. The antenna consists of two overlapping loops, each a halfwave in diameter. I conducted my experiments at 6 meters, so the diameter of each of the loops in my antenna were nine feet. Each loop overlaps for one-quarter wavelength. In the overlap area, poles made of a ferro-magnetic material provide a mutual core for both loops. See fig. 3 for details of the antenna.

The output of the MDA is fed into one loop of the antenna system. The second loop is, of course, surrounded by the earth's magnetic field. The magnetic modulation is transferred from one loop to the other through the mutual coupling that exists in the overlap region.

In order that maximum excitation of the earth's magnetic field takes place, it is necessary to launch the magnetic disturbance parallel to the earth's field. This is done by orientating the antenna parallel to the inclination of the field. The field is horizontal near the equator, and vertical at the poles, and somewhere in between at all other locations. At Vienna, the magnetic inclination is 60 degrees, and for other locations it can be found in any textbook dealing with magnetism.

Once the modulation disturbs the earth's magnetic field, the rest is up to nature! As Maxwell's Equations point out, there is a tremendous amount of energy stored in magnetic fields, which are released when the field is disturbed. This released energy sets up another magnetic disturbance, which in turn releases some more energy, which in turn sets up another magnetic field. By such a chain reaction, the modulation is propagated along the magnetic line of force with the speed of light.

The Demodulator

The demodulator, see fig. 4, is a special receiver which I designed. The first stage is connected to a receiving antenna which is exactly like the one used for transmitting. I call this first stage a magnetic line displacement detector amplifier. It receives the high power pulses, which have actually deformed the magnetic lines in accordance with the applied modulation.

Connected to the detector amplifier is a magnetic storage unit and a reforming amplifier. These are in turn connected to the molecular replacement amplifier (MRA). The MRA transforms the magnetic modulation into audio intelligence. The output of the MRA feeds a conventional a.f. amplifier.

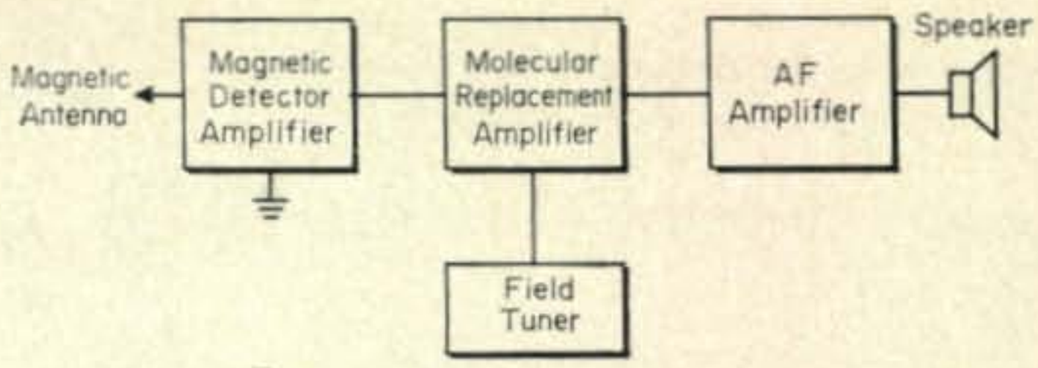


Fig. 4—A magnetic field demodulator. Its sensitivity is much greater than a regular radio receiver, being in the order of .1 microvolt.

Experimental Results

Only a limited number of experiments have so far been performed with the MEMTAC system, but they all have been successful. Communications have been established between the Lauton Institute, near Vienna, and California, and between the Institute and Australia. Some modification is still required in the equipment, but the results have been very encouraging.

One might ask, "What is the advantage of MEMTAC?" Well, its main advantage is that it does not rely on the ionosphere for propagation, and so is not subject to the irregularities of the ionosphere. The earth's magnetic field is always present, so it will always be possible to communicate with MEMTAC. It will no longer be necessary to worry about the right frequency, skip zones, or blackouts. MEMTAC is a low power transmission system. With just 50 watts, it should be possible to reach any place in the world. With an infinite number of magnetic lines of force available, one would expect very little, if any interference between signals using the MEMTAC system.

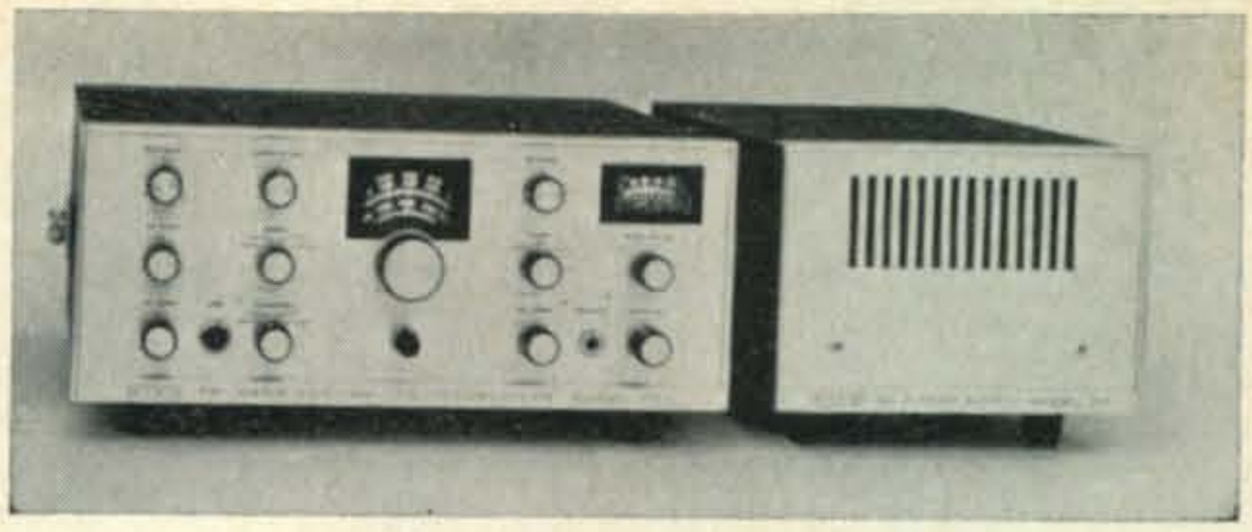
Of course, MEMTAC is not the solution to everything. I have noticed some fading and signal level changes as the earth's magnetic field changes intensity from time-to-time. But these fluctuations are relatively insignificant when compared to those which occur in other communication systems.

Amateur Interest In MEMTAC

I don't see any reason why MEMTAC can't eventually be used by radio amateurs. At the present time the cost of building a MEMTAC modulator and demodulator would be quite expensive, but in time it could be done for less than the cost of today's conventional equipment. Space doesn't permit me to discuss these circuits in detail, but if you are interested in the MEMTAC system, I would be very glad to hear from you.

I intend to spend this coming year using the MEMTAC equipment to experiment with worldwide communications. Perhaps some radio amateurs will volunteer to conduct some experiments with me, as we did with ionospheric amplification. If MEMTAC is successful, it will certainly be the communication system of tomorrow. ■

The Eico Model 753 Tri-Band Transceiver shown with the Model 751 AC Power Supply/Speaker Console.



CQ Reviews:

The Eico Model 753 Transceiver

MANY readers of this column have asked for a review on the Eico Model 753 Tri-Band Transceiver, but unfortunately an unavoidable delay was encountered before we could present the following up-to-date report.

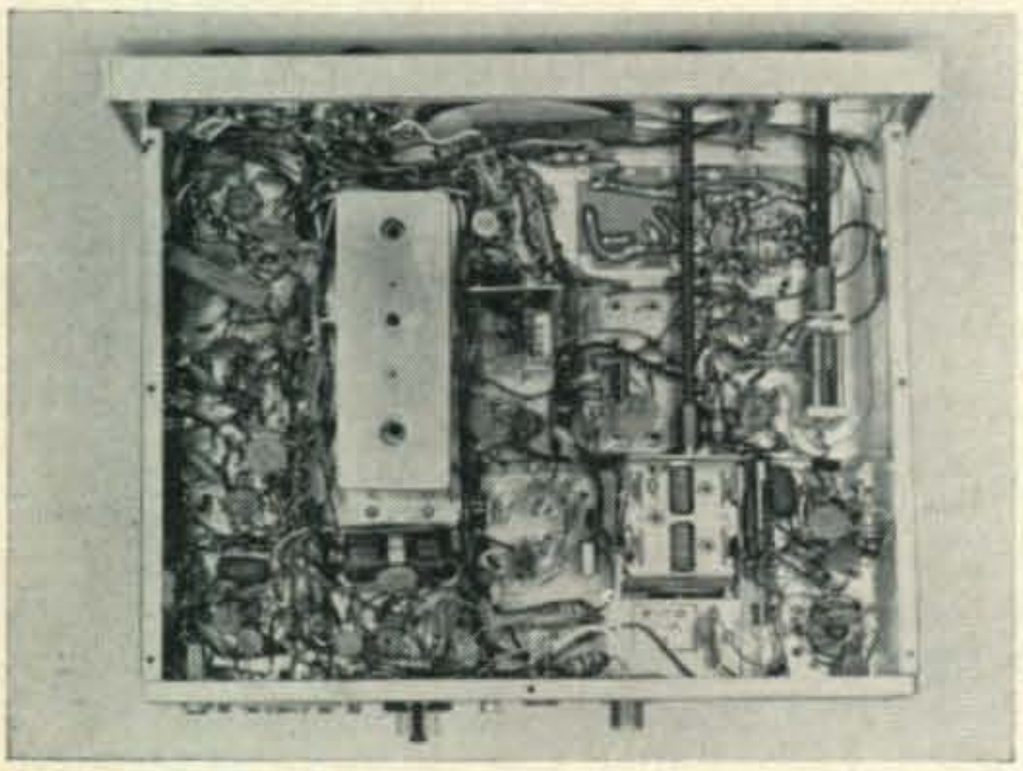
The Eico transceiver is available as a factory-wired unit or as a kit which you can assemble yourself at a considerable saving in cost; as a matter of fact, in kit form it is one of the lowest-priced three-band affairs available.

The Model 753 is designed for transceive operation on 20, 40 and 75 meters with s.s.b., c.w. or a.m. Full frequency coverage is obtained on each band with all types of operation. S.s.b. operation is provided on the sideband customarily used for each amateur band; that is, u.s.b. on 20, l.s.b. on 40 and 75 meters. For s.s.b. and a.m. either push-to-talk or built-in v.o.x. operation may be instantaneously selected with a function switch on the panel. Grid-block keying is used for c.w. with v.o.x.-type break-in. The transmitter input power is rated at 200 watts p.e.p. for s.s.b. and c.w., 100 watts on a.m. (s.s.b. with 50 watt carrier). A.l.c. is included.

S.s.b. generation and receiver selectivity is obtained using a 5.2 mc filter made up of four crystals for a 6 db bandwidth of 2.7 kc. The receiver has offset tuning (±10 kc) without altering the transmitter frequency. A product detector is used for s.s.b. and c.w., a triode detector for a.m. The a.g.c. has a fast attack, slow decay.

Other features include: Pi-network output adjustable for 40-80 ohms, receiver sensitivity of 1 μv for 10 db s./n. ratio, unwanted sideband suppression 40 db, carrier suppression 50 db, automatic carrier-level adjustment on c.w. and a.m., two-speed drive mechanism for fast or vernier tuning, adjustable calibration hairline, illuminated meter automatically switched to read receiver S-units or p.a. current, mobile mounting bracket. Power supply is separate. There are two models, one a console type with built-in loudspeaker for operation from 120 v.a.c., the other a mobile supply for use with 12 v.d.c.

*Technical Director, *CQ*.



Bottom view of the Model 753. The crystal filter is located in the elongated can near the center.

Tube Lineup

The Model 753 employs single conversion on both transmit and receive; consequently, the lineup is quite simple. A block diagram is shown at fig. 1. It is self explanatory, but a few points merit special description.

The stages marked *R* are biased to cut off during receive, those with *T* are cut off on transmit. The bias switching is accomplished with the transmit-receive relay which operates from the v.o.x. relay amplifier. For push-to-talk operation a panel switch is changed from the v.o.x. position to p.t.t., in which case the mike button activates the relay amplifier (by removing its cutoff bias) and causes the v.o.x. relay to operate.

Automatic Level Control (A.L.C.)

During transmit the relay disconnects the a.g.c. line from the common i.f. amplifier and connects the a.l.c. control bias, instead, to this stage. The a.l.c. system itself is quite unique and is one which we have not run across up to this time.

Referring to fig. 2, R_3 is connected in series with the voltage-supply line to the final-amplifier screens. The screen current on the final tubes rises sharply when the control-grid voltage approaches zero on modulation peaks. This produces a voltage drop across R_3 which varies at the audio rate. This a.f. voltage is then applied to a 1N295 diode rectifier to provide a d.c. control bias back to the common i.f. stage. C_2 is fixed for the proper amount control voltage needed to hold the gain of the common i.f. amplifier down to where the peak drive is below

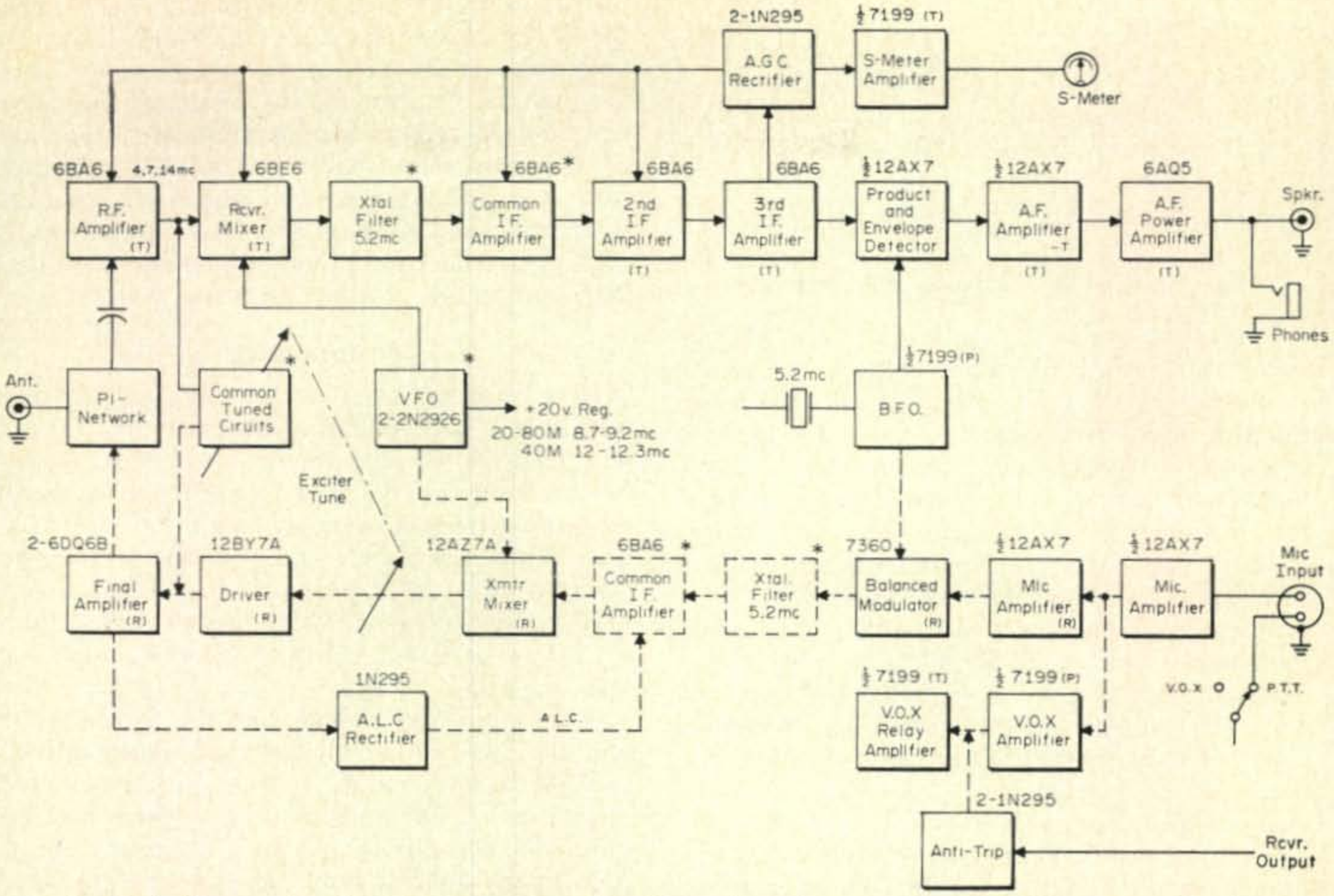


Fig. 1—Block diagram for the Eico Transceiver. The bilateral sections are marked with an asterisk, denoting that they are common to both the transmitter and receiver. Solid lines indicate receiver routing, dashed lines show transmitter routing.

that which might otherwise cause flattopping of the final amplifier. The time constant due to C_1 and R_1 eliminates a.l.c. pumping effects. A.l.c. operation does not depend on some final-amplifier grid current to produce the required control voltage as is the case with most a.l.c. systems, so the a.l.c. takes hold *before* any flattopping occurs.

The V.F.O.

For 14 and 4 mc the v.f.o. operates in the 9 mc range. The sum of the i.f. (5.2 mc) and the v.f.o. frequencies is used for 14 mc, the difference frequencies for 4 mc; but unlike similar frequencies combinations where a 5 mc v.f.o. is used, the variable frequency is the 9 mc one which makes the tuning on both bands go in the same direction. U.s.b. operation is automatically obtained on 14 mc, l.s.b. on 4 mc.

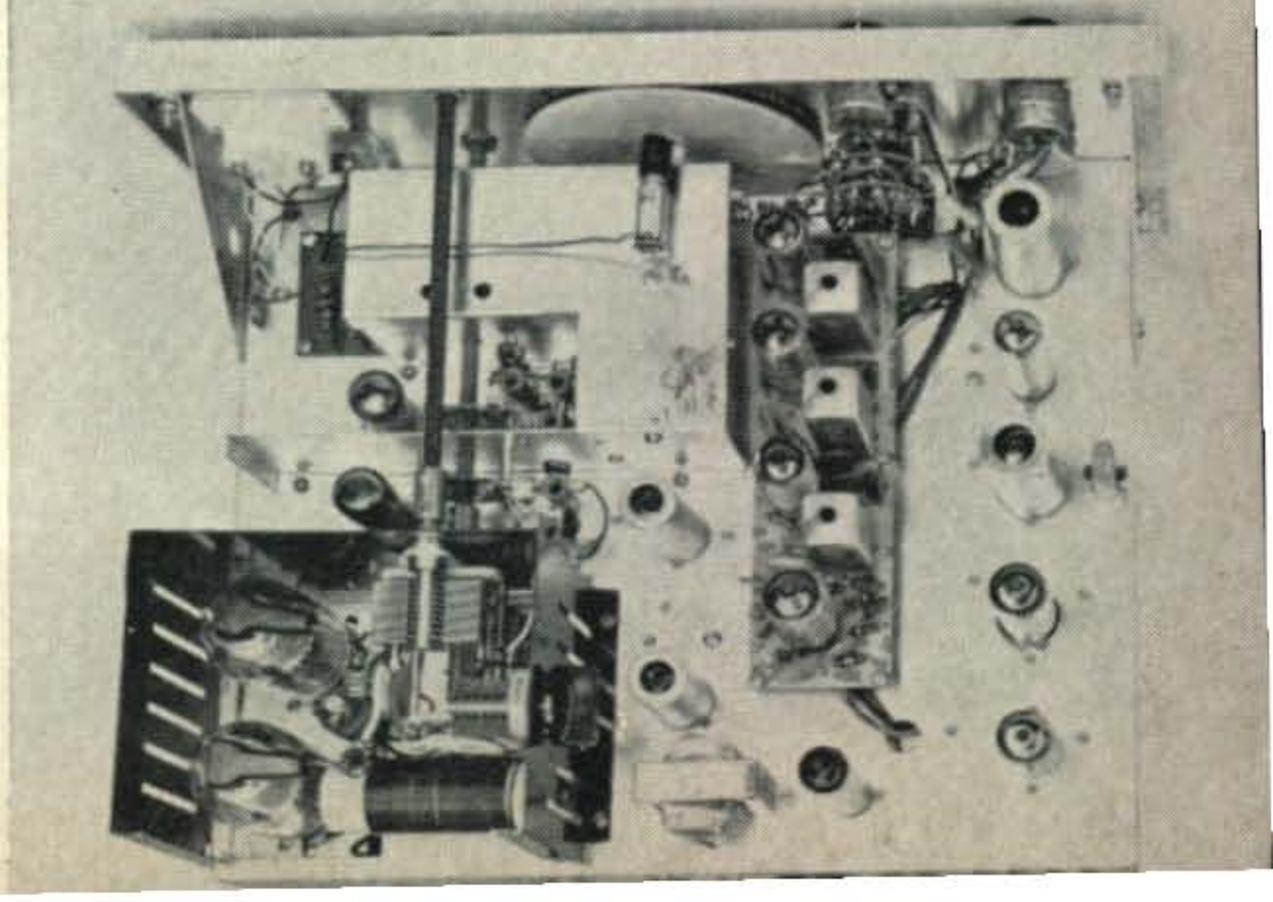
For 7 mc the v.f.o. operates in the 12 mc range using the difference frequencies. Tuning is in the same direction as on the other bands and l.s.b. operation is obtained.

Early models of the 573 had a vacuum-tube v.f.o., but current units use a transistor version for improved frequency stability. Two type 2N2926 silicon transistors function in an oscillator/buffer setup. The oscillator is a series tuned affair as shown at fig. 3. The proper feedback ratio is obtained with C_1 and C_2, C_3 is the tuning capacitor, C_4 and C_5 are for bandsetting and temperature compensation. The latter two are changed with the bandswitch for the different ranges. C_6 couples the collector of the oscillator to the output stage, while C_7 tends to wash out variable loading effects that might be present at the output.

Strict voltage regulation is obtained with a zener-diode regulator which in turn is supplied with a regulated voltage from an 0B2 tube.

Offset receiver tuning is obtained with a Varicap diode, CR_1, the capacitance of which is controlled by a variable bias obtained from R_1. During normal on-frequency transceive operation the arm on R_1 is manually set opposite the fixed tap on the potentiometer. The same bias voltage is therefore applied to CR_1, regardless of whether the relay is in the receive or in the transmit position. The receiver and transmitter are then always on the exact same frequency.

Top view of the Eico Model 753. The v.f.o. is built on a printed-circuit board which is covered by the L-shaped shield can at the upper left.



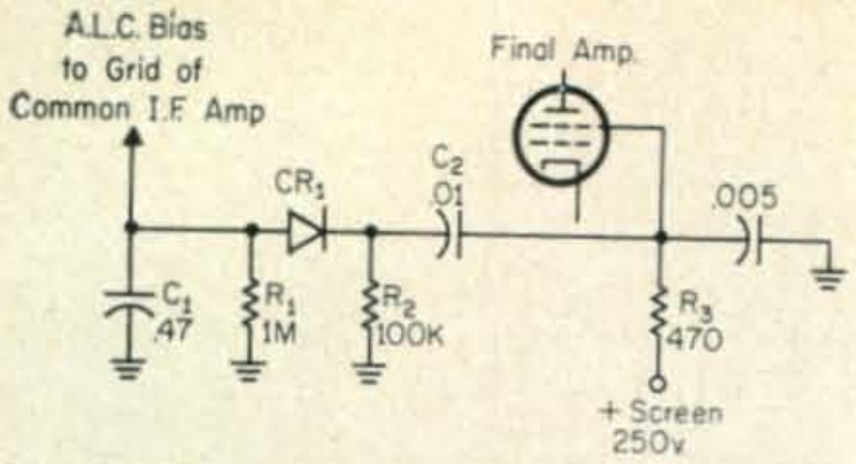


Fig. 2—Circuit for a.l.c. operation. See text.

For offset operation, the frequency of the receiver can be varied either side of the center frequency by changing the bias on CR_1 when the arm of R_1 is set below or above the tap. On transmit, the relay connects CR_1 back to the tap and the initial center frequency is restored for transmitting.

Thus you can zero the transmitter with a received signal when the offset control is at the center tap (as indicated by a panel marker) and then adjust the offset for a beat note on the received signal, such as may be desired with c.w., without altering the transmitter frequency which remains at the initial zero beat with the received signal.

Block-grid keying for c.w. is applied to the transmitter mixer. Both mixers have a common tuned circuit which is ganged with the transmitter-driver tuning. Peaking adjustments made during receive thus automatically peak the transmitter at the same time, and vice versa.

The product detector is a single triode with the i.f. signal applied to its grid and the 5.2 mc b.f.o. applied to the cathode which is 680 ohms above ground. For a.m., the cathode is grounded by the mode switch and the tube functions as a grid-leak detector.

Assembly

The Eico transceiver was supplied to us already assembled and wired, so we cannot comment on constructional problems that might be encountered with the kit; however, after looking through the assembly manual, it hardly seems possible that even a relatively inexperienced kit builder could go wrong in spite of the complexity of the unit.

Some of the work is simplified by use of individual printed-circuit boards for the i.f. strip and for the v.f.o. Besides easy step-by-step instructions presented in the usual fashion, there are 35 large-size diagrams which are drawn on both sides of six 21" × 16" sheets apart from the manual. On most of the diagrams the number of each related step is identified alongside of the component involved therewith, a feature that saves time and which reduces the chances of errors in the work. It appears that the assembly time would require between 40 and 80 hours, depending on your experience and adeptness.

Performance

Here is what was found in the way of performance: The receiver sensitivity on 14 mc was 1 μv for 10 db s./n. ratio, on 7 mc it was 0.5 μv and on 4 mc 0.35 μv—all within specifications. Unwanted-sideband suppression at 1 kc was 35 db. Frequency stability was within the rating of 400 c.p.s. per hour after warmup and ±20% line-voltage variation resulted in less than a 10 c.p.s. frequency shift. Mechanical stability also was good.

A problem experienced with the S-meter was that the zero setting drifted and could not be brought to zero (with the rear apron control) until after the set warmed up for about 15 minutes. This was due to a drift in the resistance of R_{38} (in the meter circuit) as it heated up. This can be corrected by substituting a 5-watt wirewound resistor.

The a.g.c. characteristic for all bands averaged 7 db a.f. output change for 80 db input-signal variation (10-100,000 μv), 15 db for 1-10 μv. A.g.c. operation was smooth which, in spite of the very high gain of the set, showed little evidence of annoying pumping on strong signals.

The one-knob tuning mechanism has an automatic clutch that engages the slow-speed drive after you back up slightly from the direction in which the fast tuning was made. The vernier-tuning range is about 30 kc. When you tune further than this amount, the clutch kicks in the fast tuning drive.

I.f. signal rejection (5.2 mc) was 40 db on 75 and 40, 46 db on 20 meters. While this may be sufficient in many instances, in other cases where you're using a long antenna particularly on 4.0 mc, interference from teletype signals near 5.2 mc may be bothersome as it was to us. A

[*Continued on page 101*]

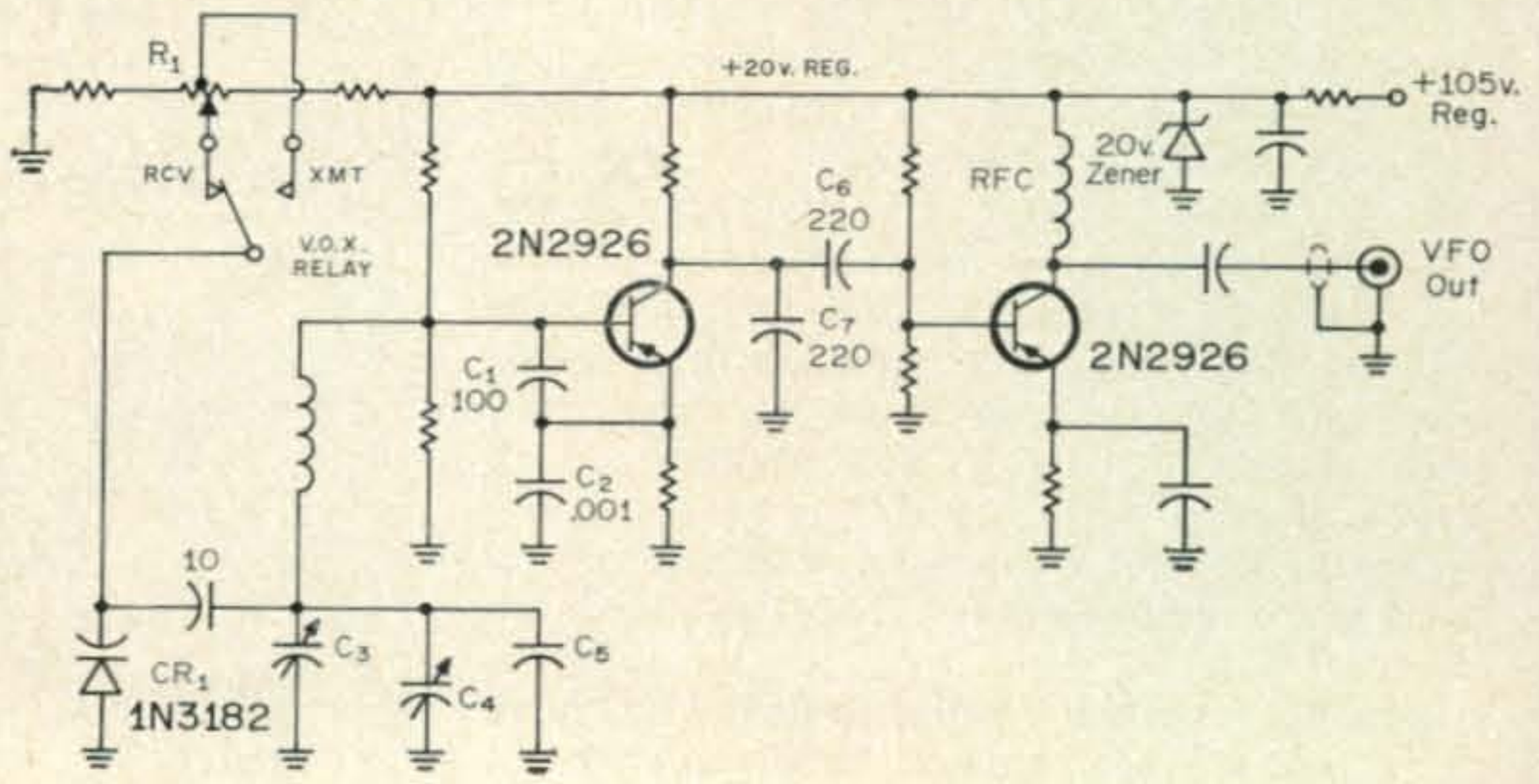


Fig. 3 — Circuit for the transistorized v.f.o. used in the Eico Transceiver. The identified components are those discussed in the text.

Frank Friedl, OE1FF proudly displaying his complete set of 10 AC-district QSL cards, including the rare AC3 and AC4 cards from Sikkim and Tibet. Frank was recently awarded the WAZ diploma, and he's done it all with less than 90 watts!

This is the portable location of Joseph Campanella, K2KNJ, 2,500 feet above sea level in the Catskill Mts. of New York. Shown is a small part of Joe's 124 acres and only one corner of his rombic antenna. The site also includes three towers that are not shown. One guess as to where Joe will be this Field Day.

PEOPLE AND PLACES

That proud look is being expressed by Nils Segerdahl, W2UX as he displays his fine station. Nils, an avid RTTYer, recently wrote us about adding an automatic carriage return and line feed to a model 15 and enclosed this snapshot.

Bruce Robbins, a young Canadian asthmatic patient at National Jewish Hospital in Denver, talks via a portable rig to his father (VE1DW) in Yarmouth, Nova Scotia. Local hams who have made their rigs available to Bruce are: Roden Rogers, WØNNI (shown left),Vern Redmond, WØEZO, and Tillie Currington, KØRGU. Bruce's dad and we have nothing but praise for the Denver area hams who have helped establish the 2,000 mile radio link between Yarmouth and National Jewish Hospital.

At a recent CHCFHC gathering, their trophy was awarded to Charles Emary, G5GH. This was the first time this trophy was presented to an amateur outside the U.S. Left to right: Roy Stevens, G2BVN, President of R.S.G.B., John Rouse, G2AHL, General Manager of R.S.G.B. and Charles Emary, G5GH.

We're still waiting for that picture you were going to send in last month.

A "GOODY BOX" FOR THE NCX-3

BY ELSTON H. SWANSON,* W2PEE

This outboard unit provides vernier tuning for transceive operation and optional incremental tuning for the receiver in the NCX-3.

It seems to me, after having used several transceivers over a period of years, that the ability to tune the receiver independently of the transmitter, over a small frequency excursion, is a most convenient feature. Only in this way can the operator accommodate stations whose receiver and transmitter are not exactly synchronized, or handle net operations without a continuous leapfrogging in frequency taking place. So, I decided to improve the NCX-3 belonging to my father, W4GGE, by adding incremental tuning.

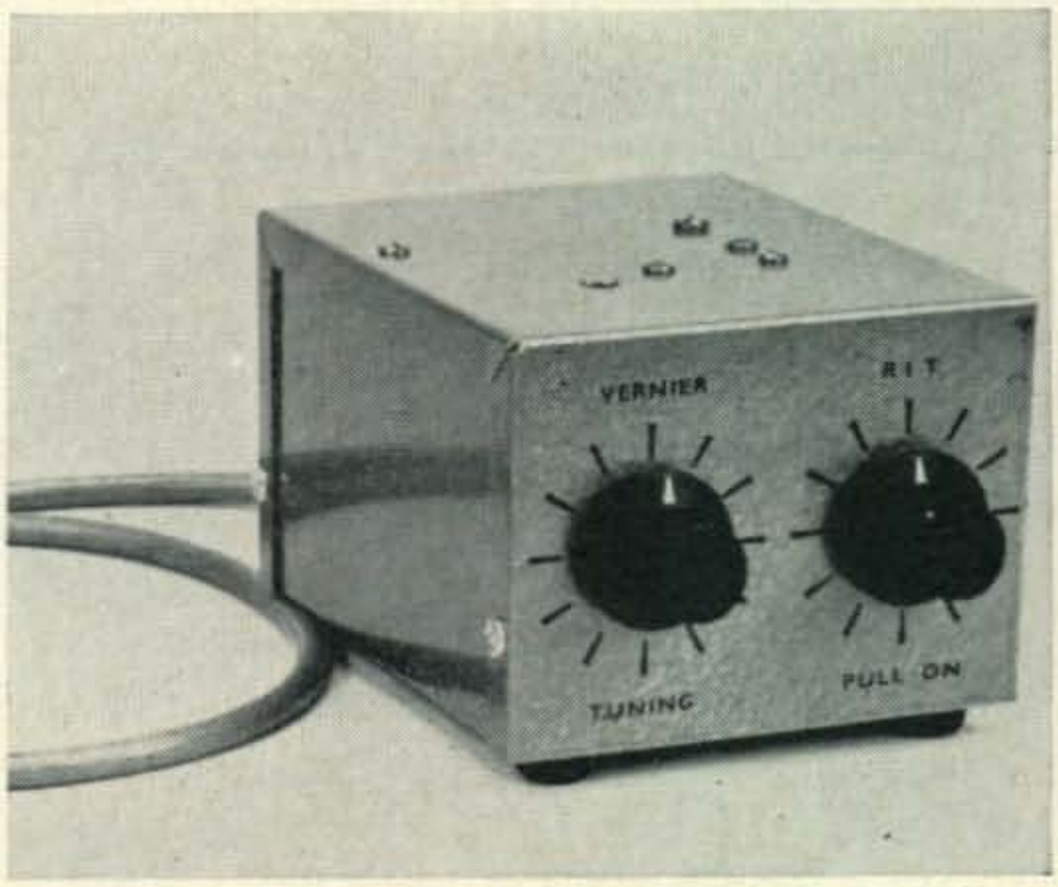
Other Features Evolve

After careful examination of the front panel and considering the mounting of controls for incremental tuning, it was decided to install the necessary circuitry and controls in an accessory box to be connected to the NCX-3 via the accessory socket on the rear apron. Having made this decision, then, a logical extension was to consider building a crystal calibrator into the same box since the connections for a calibrator are already present at the accessory socket. The next step in evolution occurred when the preliminary model was tried and it was observed that the slow tuning rate afforded by the incremental tuning control was often a help in receiving certain difficult-to-tune signals. A little more design indicated a manner in which the circuit could be revised to provide both a vernier control which tunes the transmitter and receiver together over a limited range and an incremental tuning control to provide an offset between transmitter and receiver. In its final form, as shown in the photograph, the unit is mounted in a minibox 5" × 4" × 3" and provides (a) a 100 kc crystal calibrator, (b) a vernier tuning control, and (c) receiver incremental tuning. The modifications to the NCX-3 are slight and require no drilling of holes of any kind. There are sufficient unused pins on the accessory socket to provide for the incremental and vernier tuning provisions.

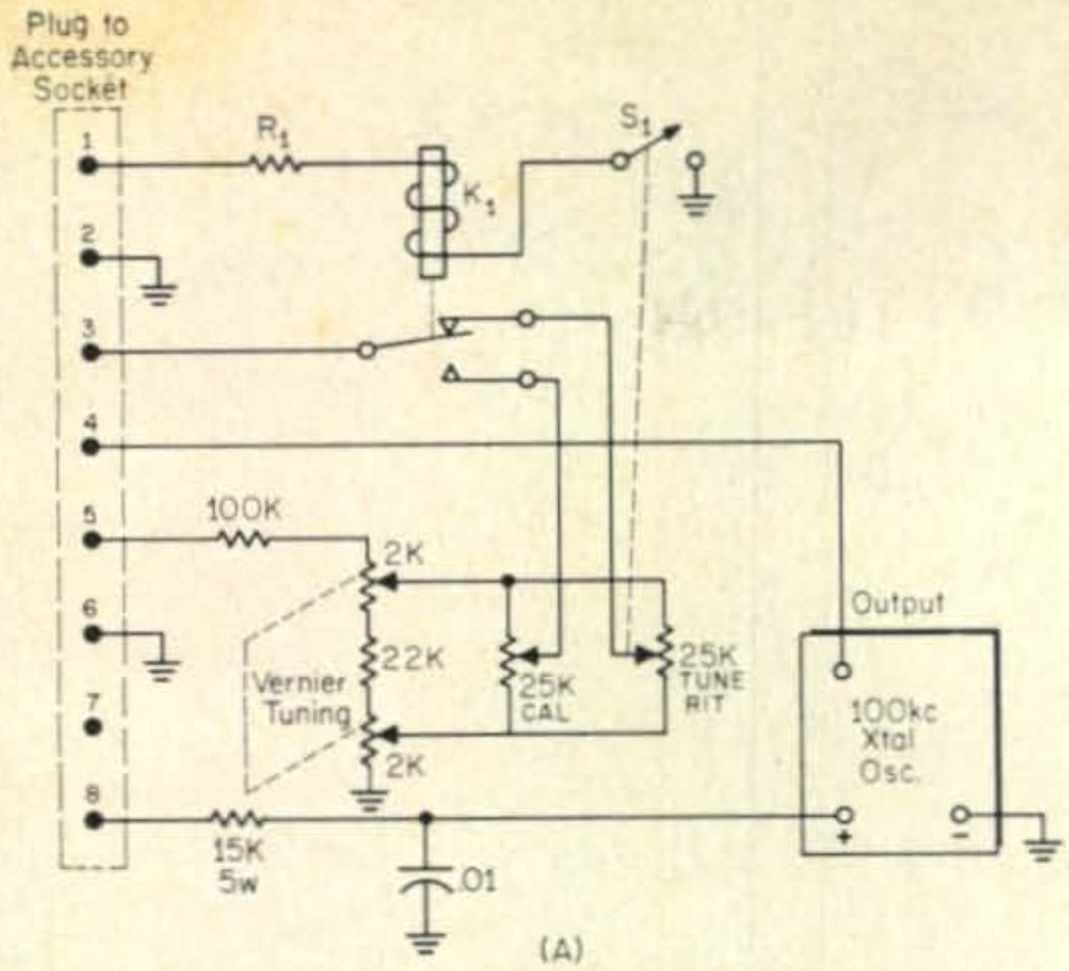
*RFD #1, Wolver Hollow Road, Oyster Bay, New York.

Modifications To The NCX-3

The incremental tuning is accomplished by varying the bias on a Pacific Semi-Conductor Varicap which is capacitively coupled to the cathode of the v.f.o. The Varicap, together with the rc decoupling filter, is mounted on a single-hole, three-lug, terminal strip. It was found convenient to mount this assembly immediately adjacent to the v.f.o. tube under one of the mounting screws for the main tuning capacitor. A shielded lead to pin 5 on the accessory socket completes this part of the installation. Additionally, regulated 150 volts is picked up at pin 1 of the voltage regulator tube, V_{18}, and brought to pin 3 of the accessory socket. The final remaining modification is to pick up the switched receiver B+ to operate the send-receive relay in the incremental tuning circuit. It was found convenient to obtain this on pin 6 of V_6, the S meter amplifier. The wiring should be dressed with and tied to the existing harness for neatness and safety. These changes complete the entire modification of the NCX-3 itself and it can then be closed up.



View of the Goodie Box used with the NCX-3. The CALIBRATE pot is mounted on the back panel



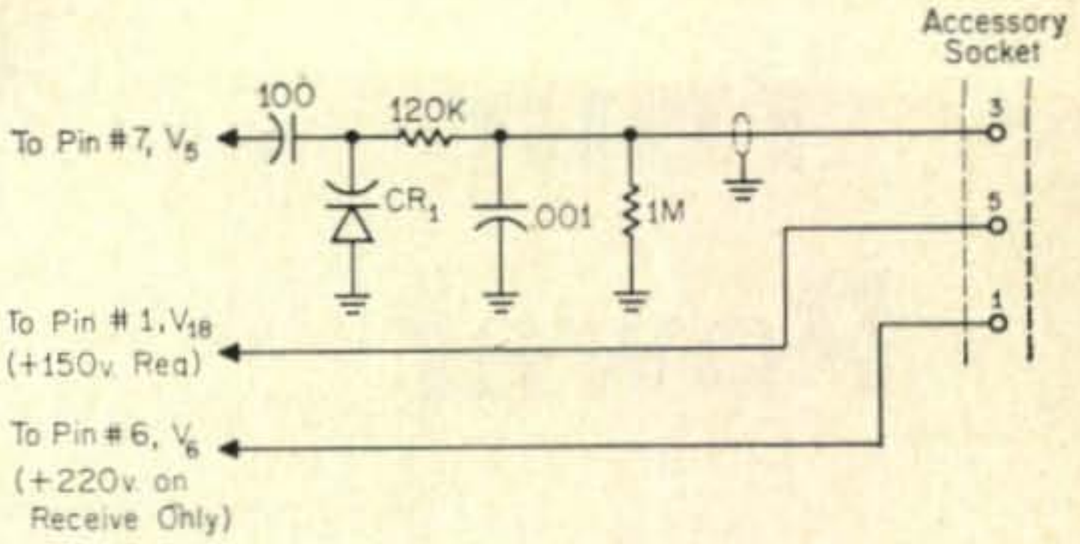


Fig. 1 (A) Circuit modification in the NCX-3. The components must be mounted close to V_5, the v.f.o. Varicap, CR_1, is a Pacific Semiconductor, Type V 20. (B) Goodie Box wiring is also very simple. The 25K RCVR INCREMENTAL TUNING (RIT) has a log taper and a push-pull on-off switch mounted on it. The 100 kc oscillator is a commercial unit discussed in the text. Resistor R_1 value is selected for the particular relay used.

The Goodie Box And Its Calibration

The relay used in the incremental tuning circuit can be any small low current d.c. type and the series resistance is adjusted to provide the proper coil current. It is suggested that a relay requiring ten milliamperes or less is desirable to minimize the additional load on the power supply. Lead lengths are of no great consequence since the circuits are all operating at d.c. It is desirable, however, to use a shielded lead to the Varicap circuit inside the NCX-3 to prevent pickup of 60 cycle a.c. which could cause undesired frequency modulation.

Adjustment of the incremental tuning is as follows: A steady carrier (the crystal calibrator can be used) is tuned to zero beat with the incremental tuning on and the control set at the center of its range. The incremental tuning is then switched off without changing the control position and the calibrate potentiometer is adjusted to return the circuit to zero beat. It is then locked in place. It will be found that the receiver calibration is changed about 3 or 4 kilocycles by this addition and the calibrated dial can be moved to re-establish the calibration. Incidentally, it was found that much more stable operation with minimum calibration change occurs by using the Varicap in the cathode circuit than by coupling it to the oscillator grid even though a very small coupling capacitance is then used.

Being an inherently lazy type of ham, I procured a Peterson Radio, 100 kc oscillator, their Model No. PR100, and installed this in the Goodie Box intact. Since this is a transistorized device, it is of course necessary to drop the voltage from the receiver to the level required for satisfactory transistorized operation. The correct polarity must be used. It was also found desirable to short out the output coupling capacitance in the PR100 since a "gimmick" type capacitance is already provided within the NCX-3 in this coupling circuit. An initial concern of possible damage to the transistor oscillator due to coupling of transmitter output turned out to be groundless, probably because of the very low impedance presented by the transistor circuit. If it is desired, a tube-type oscillator can easily be built into the Goodie Box.

Operation Without The Goodie Box

This Goodie Box can be disconnected from the NCX-3 with no alteration in its operation other than a small recalibration which is easily within the range of the movable fiducial. One word of caution, however: Do not eliminate the 1 meg resistor connected from the Varicap line to ground. If this is omitted, serious frequency drifting will occur when the Goodie Box is disconnected. ■

"I'm taking an abbrev., cours., in bas., elect's."

Double Your Power

BY WAYNE W. COOPER,* K4ZZV

How can you raise your transmitter power output with minor changes? Replacement of the final amplifier tube and some changes in the power supply will provide double the power output.

SINCE all of the new transmitters and transceivers are coming out with their ever increased ratings, 200, 240 and 300 watts, I have that left behind feeling with my little 175W p.e.p. input job. If one wants to keep up with the Jones in this horse-power race the choice centers around trading up to higher power or, a solution with the slide rule and scratch pad. The ease of doubling the power output of a rig is surprising. This is a 3 db signal increase that probably will go unnoticed on the crowded band, but be there a ham with soul so dead that wouldn't rather have said 350 watts than have to admit to a mere 175? So, let us carry on with our easy solution.

Two Tone Tests

Our typical linear amplifier has a pair of 6146 tetrodes operated in Class AB[1]. This covers quite a lot of transmitters in use and the solution also helps a lot of transmitters that use some types of TV horizontal amplifier tubes as well. Examination of the two-tone peak envelope power input formula, $P_{in} = E_b I_{bmax}/3$, shows that the power can be increased by raising the plate voltage and/or the screen voltage. Throughout this article all reference will be made to the two-tone test condition for all calculations and measurements. For practical purposes this gives a signal that can be analyzed on a scope and spectrum analyzer. Tube application data for s.s.b. linear amplifier operation is usually given in this manner. Also, the currents involved are less than in the usual single-tone test. This holds down the dissipation while making test measurements or tuning up into the antenna or dummy load. These measurements also resemble voice conditions more closely when the amplifier is in operation. After it is all over we can quickly convert to p.e.p. single-tone readings by multiplying by 1.57, so we can compare with the advertising claims quoted on the air.

Characteristic Curves

From the above statements and a look at the tube characteristic curves we can easily see how increasing the plate voltage will increase the

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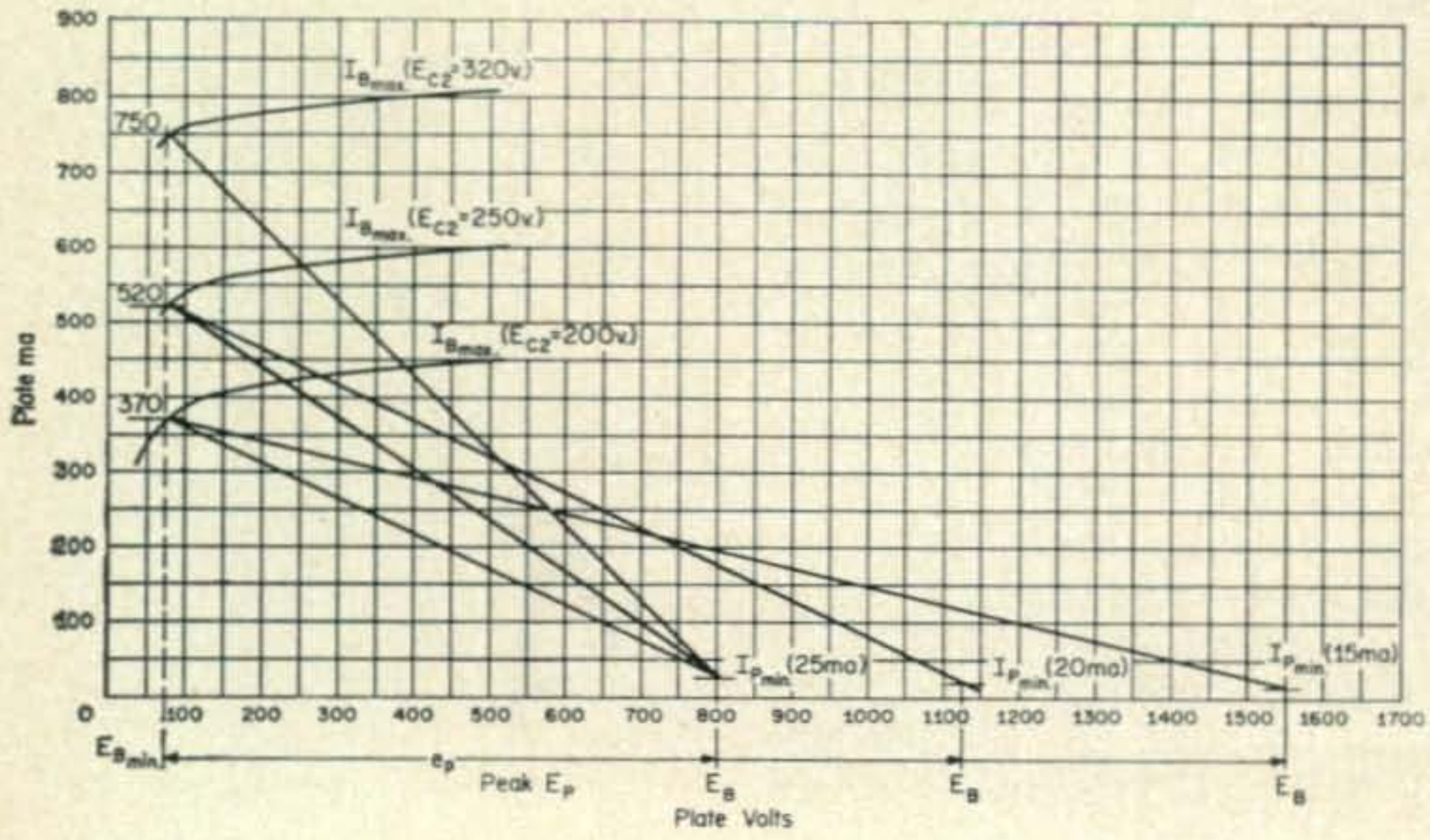


Fig. 1—Curves depicting the zero bias characteristics of the 6146 with screen voltages of 200, 250 and 320 volts.

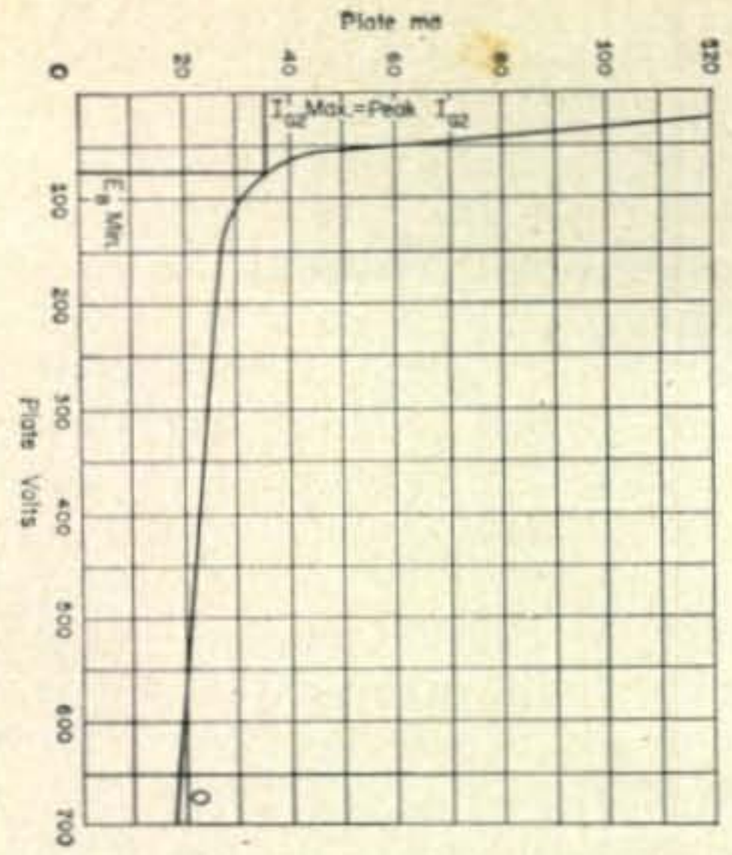


Fig. 2—The method of determining the peak screen current is shown above.

power. Increasing the screen voltage accomplishes the same results as it increases the usable peak plate current as is shown on the tube curves. In a Class AB1 amplifier we are concerned with the zero bias line as this limits the swing to a point where zero grid current is drawn. Above this point, where grid current starts to flow, a number of undesirable things happen as will be shown later. Increasing the screen voltage raises the zero bias line and allows increasing the swing, within the tube dissipation limits, without drawing grid current Referring to fig. 1, the 6146 tube (all types), at its rated 200 volts on the screen, has an $I_{b max}$ of 370 ma with an $E_{b min}$ of 75 volts at the knee of the zero bias curve.

A check of the TV horizontal amplifier tubes in the 6GJ5, 6GW6, 6DQ6, 6JB6 class shows that the zero bias curve with 150 volts on the screen approximates that of the 6146 tube so there would be nothing gained by considering them. We now turn to the TV horizontal amplifier group of tubes including the 6DQ5, 6HF5 and 6JE6. They have an $I_{b max}$ of 750 ma at a screen voltage of 150 volts. This will allow double the power, by our formula, with the same plate voltage and 50 volts less on the screen as compared to the 6146.

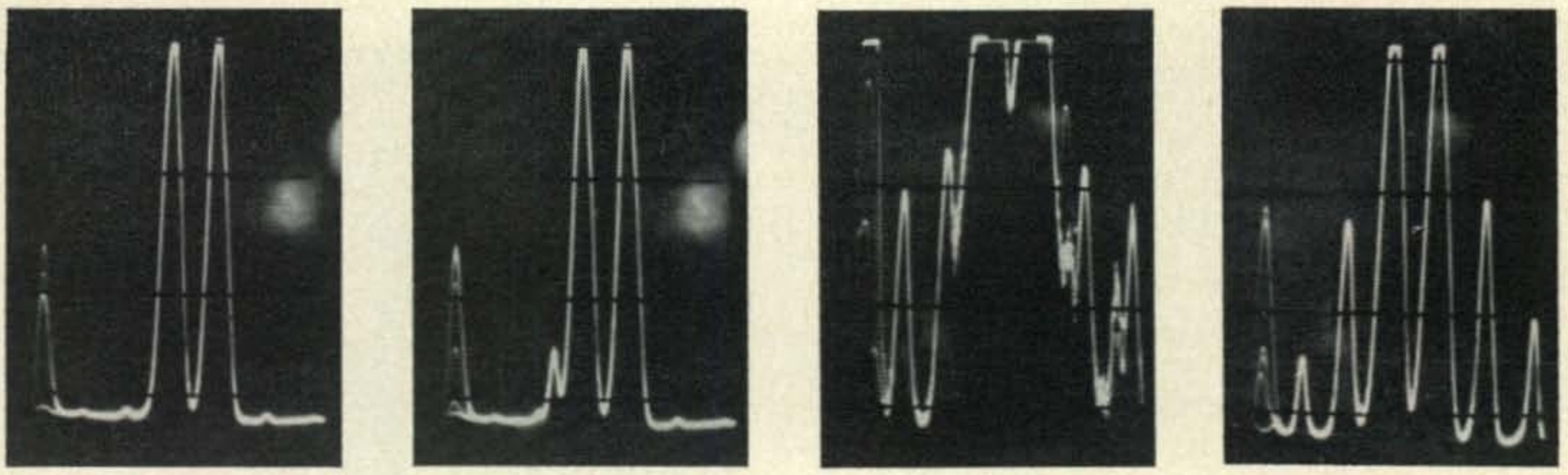
	6146			6HF5	
E_{c2} volts	200	250	320	150	175
$I_{b max}$ ma	370	520	750	750	900
$I_{b av}$	88	124	179	179	214
p.e.p.$_{in}$ w.	98	138	200	200	240
p.o.$_{av}$ w.	33.5	47	68	68	78
I_{c2max} ma	36	50	72	52	81.5
I_{c2} ma	6.4	8.9	12.9	9.3	1.4
P_{c2} w.	1.28	2.22	4.13	1.4	2.45
E_b volts (p.o.-68w.)	1550	1125			

Table I—Comparison of the 6146 and 6HF5 performance with E_b at 800 volts and $E_{b min}$ at 75 volts for two tone modulation.

We will take the 6HF5 for our practical example as it is closest to the same size and will fit into the same space. Its Compactron design, with no base and multi-leads from each element to give short r.f. paths to ground, makes it ideally suited for a transmitting tube. Where space is no problem, changing the tube socket might be avoided by using one of the other tubes in the group.

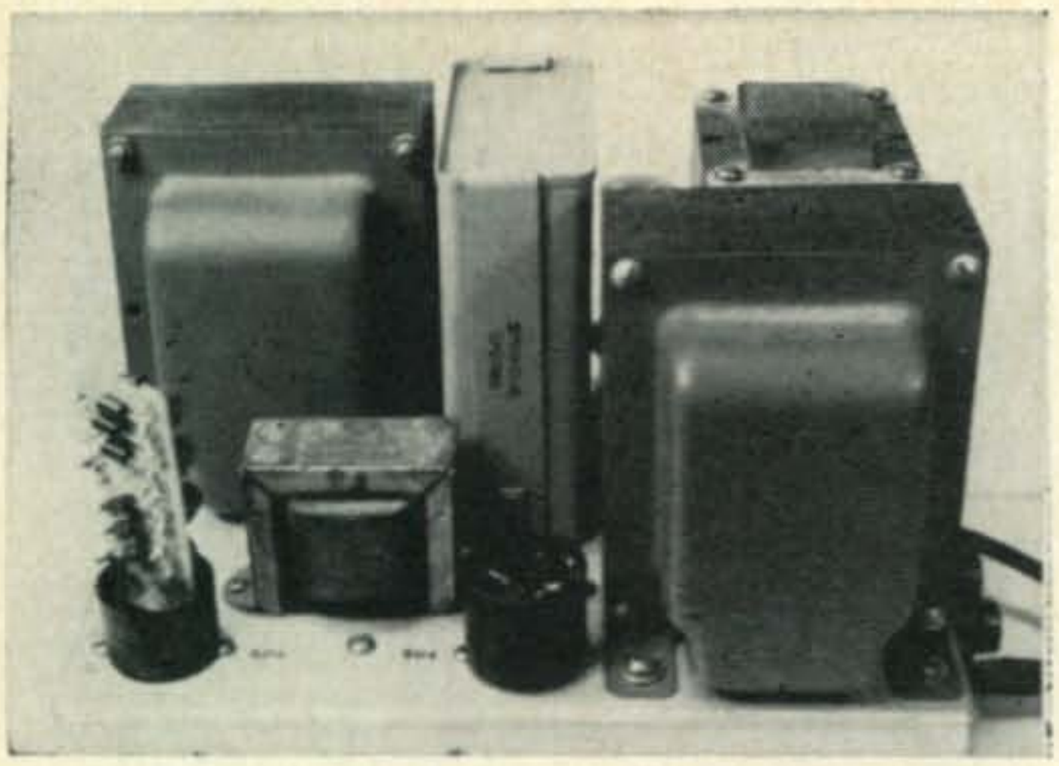
Consulting Table I, where all of the slide rule exercise has been done will point up some interesting comparisons. Figure 1 shows graphically, on the 6146 tube E_pI_b curves, the peak voltage and current values from Table I at the screen and plate voltages used in the calculations. A load line has been drawn between the $I_{b max} - I_{p min}$ points for the five different operating conditions tabulated. It will be noted that as the plate voltage is increased, the $I_{p min}$ has to be reduced, *i.e.* bias increased, to hold the plate dissipation within the tube limits. Similar load lines can be drawn on a 6HF5 family of curves to show its operating conditions from Table I.

The calculated output for the 6HF5 is double that of the 6146 with 200 volts on the screen as was expected. The 200 volt screen voltage for the 6146 is shown since it is the manufacturer's rating, and some of the commercial transmitters (and home-built ones too) hold to this value.



(A) (B) (C) (D)

Fig. 3—(A) A two-tone test pattern (1000-2500 c.p.s.) shown on the spectrum analyzer. The distortion products are just beginning to appear and are below —30 db. (B) The same pattern as in fig. 3(A) is shown here but with a —25 db carrier inserted in order to see where the sidebands are. (C) Here is the same pattern as in (B) but with the spectrum analyzer gain turned up an additional 30 db to be better able to observe the harmonic distortion. (D) Spectrum analyzer display of a typical amateur transmitter with no a.l.c. and only a half ma peak grid current. Note the high 3rd and 5th harmonic distortion products.



The tubeless power supply uses Barry's 36¢, 750 ma, 600 p.i.v. diodes. Four are used for the 5U4 and six for the 5R4 with 0.001 mf capacitors across each.

The transmitter that was used in the example has 250 volts on the screen as do other transmitters/transceivers on the market.. As there are thousands of these in use, the comparison on the table should be interesting.

For those who might have wanted to avoid replacing tubes or rewiring tube sockets the additional calculations were made to see if the 6146 tube could be pushed up to the level of the 6HF5 types. They *can't*, judging from those that ended up in the waste basket in the course of taking measurements and patterns. With 320 volts on the screen or 1125 to 1550 volts on the plate, depending on the screen voltage, the output would be the same as the 6HF5 at rated voltages. Besides the short tube life, the bias has to be increased to bring down the static plate current to keep the dissipation within the limits of the tube. The effect of increasing the bias brings the operation of the tube down into the non-linear portion of the curve and increases the distortion. This is shown as a concave curve on the trapazoid pattern as viewed on the scope or a broader signal as viewed by other hams on the band.

In the course of expending 6146's and not observing an excessively red plate color, the screen dissipation was calculated and it was seen that it quickly got out of hand when the screen voltage was raised above the ratings. Figure 2 shows how the peak screen current is found. As with determining $I_{b\ max}$, $E_c2_{\ max}$ for other than the published E_c2 it is convenient to use the conversion factors nomograph, fig. 49 of the RCA Transmitting Tube Manual.

Practical Approach

There are a few practical problems to converting all our paper work into that big signal on the air. The filament circuit must be able to handle *twice* the wattage. In this particular case the increase was taken care of by removing the 5R4GY h.v. rectifier tube and replacing it with a silicon diode unit. Besides getting rid of some 20 watts of filament and plate loss in heat, the h.v. regulation was improved about 5%. This helped with the increased plate input requirement but with the low duty cycle of a s.s.b. linear amplifier in amateur radio service, no special beefing up of the h.v. supply should be required to make this change if too many corners were not cut in the original design.

Depending on the tubes being replaced, the screen voltage will probably have to be readjusted. In the example set and its 250 volt unregulated screen supply, a 4K resistor in series with an 0B2 and 0C2 voltage regulator tubes was used to supply a regulated 175 volts to the screens. These were installed on a bracket inside the transceiver.

Retuning of the final amplifier input and output circuits will be necessary as there is a change in the input and output capacities of the amplifier tubes. Re-neutralizing will also be necessary and may require additional capacity to take care of the higher *g-p* capacity of the tubes being installed. (All well designed tetrode/pentode amplifiers should be neutralized.)

The transmitter is now loaded up to 280 ma with our two-tone test signal and we have 350W p.e.p. input to report on the next QSO. (800 v. × 280 ma × 1.57 = 350 w. p.e.p. single-tone input.) Table I does show that it should be possible to load up to 280 ma on two tubes with 150 volts on the screens. However 175 volts on the screens gives enough margin to compensate for the tank circuit design and tube ageing.

As mentioned before, a number of undesirable things happen when a Class AB1 linear amplifier is driven into grid current. The output shows up as a distorted and broad signal. Figure 3(A) shows a 1000-2500 cycle two-tone test pattern of an s.s.b. transmitter on a spectrum analyzer. The distortion products can be seen just appearing and below —30 db.

Figure 3(B) shows the same pattern but with a —25 db carrier injected so that the relation of the carrier and the sidebands can be observed. Just to check and see how far down the 3rd and 5th harmonic distortion products are in fig. 3(C), the analyzer is turned up an additional —30 db and they are shown to be some —34 and —36 db down respectively.

Figure 3(D) was taken with an amateur transmitter under what is probably typical operating conditions of no a.l.c. and *only* a 0.5 ma peak of grid current. A 0.5 ma peak won't show up very

[*Continued on page 104*]

After the modification, install the 6HF5's, drive twice as hard and get twice the power.

Improving the Keying of the T-150

BY ARTHUR C. ERDMAN,* W8VWX

The Knight T-150, a most sound transmitter, can have its keying characteristics improved pronouncedly by the following simple modifications listed below.

BASICALLY, the T-150 (plus its modifications kit) is a well-engineered transmitter. It represents a good compromise between performance and cost. The external appearance of the front panel and the cabinet is indeed pleasing. However, the keying tone *is* unsatisfactory. The keying suffers from the following:

1. *Yoop*—Some of the final amplifier output feeding into the v.f.o. in spite of the fact that the v.f.o. operates on a lower frequency than the final. Yoop can be distinguished from chirp by allowing the v.f.o. to run continuously and listening for frequency shift as the final is tuned through resonance. I added a cathode follower between the v.f.o. and the doubler to eliminate the possibility that loading was causing the change in frequency. There was considerable frequency shift especially on 20 c.w. Yoop must be eliminated first.

2. Rough note with an external ground connected to the chassis. The rough note (T6) was noted by distant stations indicating that the problem was not a local one. I, at first, thought that the line frequency harmonics, due to the type of power supply, were getting into my receiver. But distant stations also heard the roughness. The solution was simple.

3. Excessive key clicks—There was no click filtering at all. The cathodes of every stage were keyed together.

4. *Chirp*—I am very fussy about c.w. tone and consider any keyed v.f.o. a "chirper". My solution was to run the v.f.o. continuously, yet have no audible signal in a wide-open communications receiver. I tried differential keying but did not like the slight chirp at the beginning of each keying sequence. I have specialized in building the "silenced" v.f.o.s. I recommend two solutions for silencing the v.f.o. I realize that many operators do not consider full break-in, so it is not necessary for them to spend the time silencing the v.f.o. However, I prefer T-R

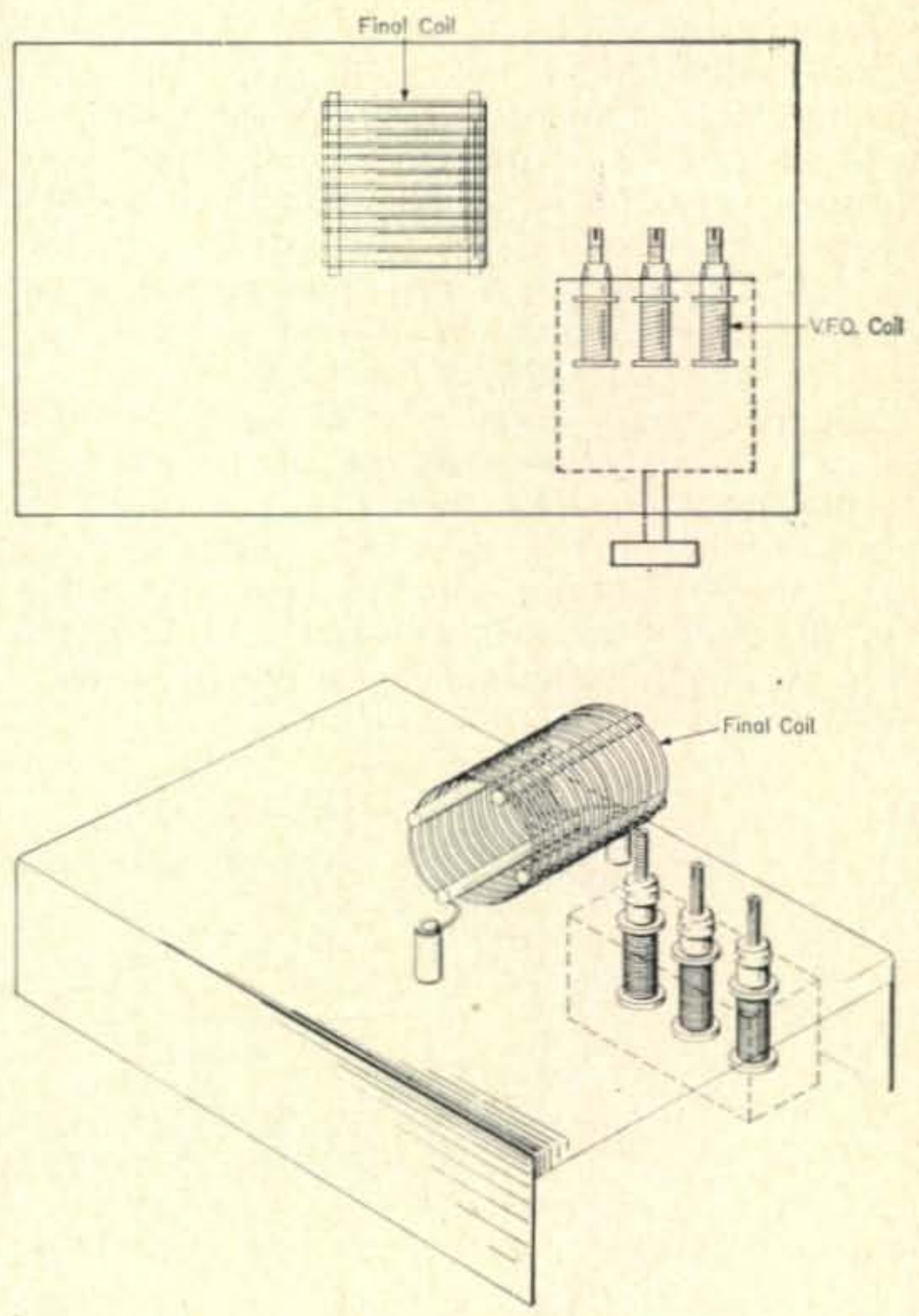


Fig. 1 (A)—Location of the final and v.f.o. coils before modification and (B) after modification. This operation eliminates yoop as explained in text.

*241 Garden Road, Columbus, Ohio.

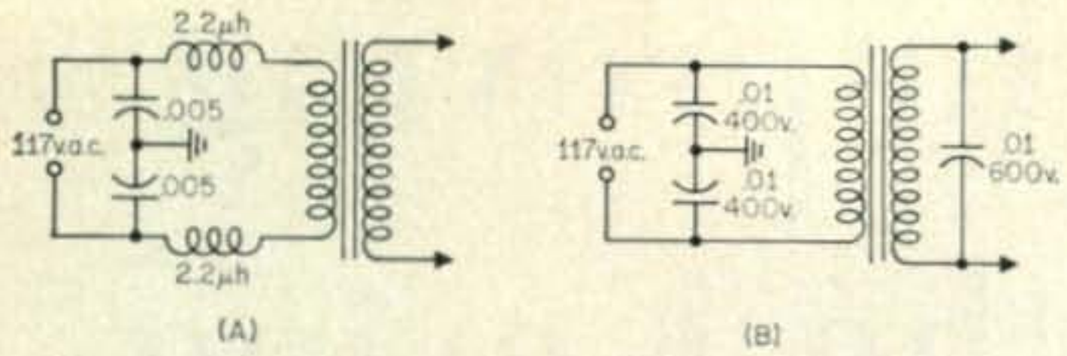


Fig. 2 (A)—Original power supply power input circuit and (B) modified version.

switches and receiver protection to "one-switch break-in."

Solutions

The solutions to these problems are as follows:

Yoop—The v.f.o. coils and the final amplifier coils axes were originally in the same plane. Orienting the v.f.o. coils so that the plane of their axes was perpendicular to the axis of the final coil cured the yoop. The v.f.o. coils were mounted in a Minibox and placed beneath the chassis. Figure 1A shows the original coil orientation and fig. 1B indicates the change in orientation.

Although not strictly necessary, I also completely shielded the final amplifier by enclosing it within an aluminum box. The lid of the box must be the kind that has an array of quarter-inch holes to allow the heat of the final amplifiers tubes to escape. I shielded the final, mainly, to prevent any TVI from leaking out of the cabinet. I also put a shielded box around the v.f.o. tuning capacitor and v.f.o. tube. This shielding was necessary for silencing the v.f.o. when it runs continuously.

The yoop is now gone. Roughness, clicks and chirps can now be conquered!

Rough note—When an external ground is connected to the chassis a rough note appeared. Figure 2A shows the original power supply input circuit. The modified circuit is shown in fig. 2B.

The input filter circuit for the power line was examined closely because the use of a line isolation transformer cut out the rough note. By removing the two r.f. chokes and increasing the value of the line bypass capacitors the rough note was eliminated. Actually, the power supply in the T-150 is really a marvel of engineering as it is compact and light for the power it delivers.

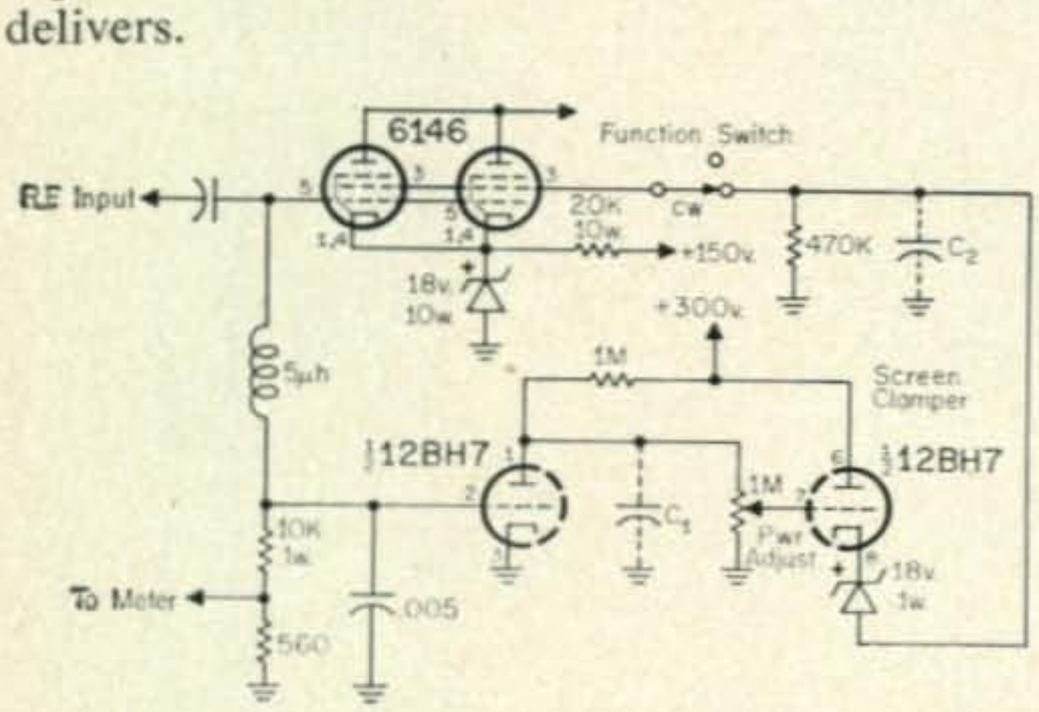


Fig. 3—Modified circuit of the final and clamper stages. Capacitors C_1 and C_2 vary the keying characteristics. Capacitor C_1 should be about 0.005 mf and C_2 about 0.02 mf.

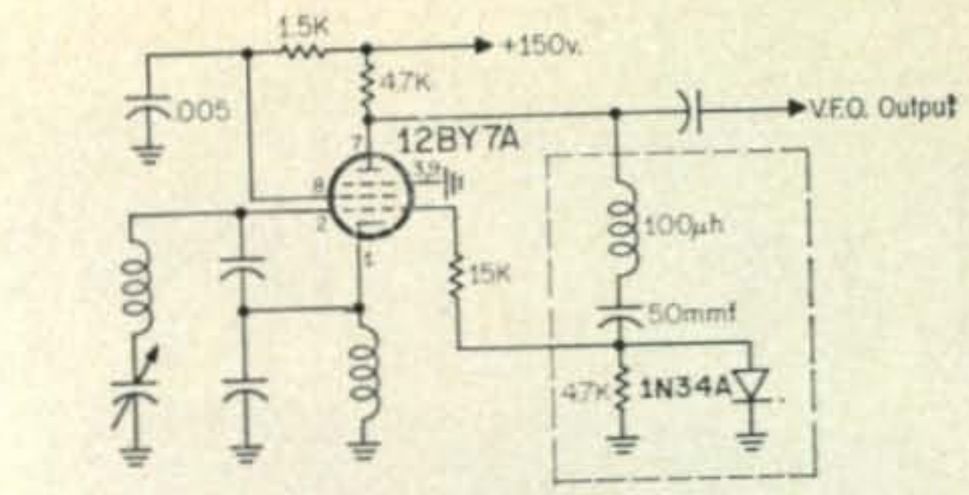


Fig. 4—Circuit showing method of adding inverse feedback to the v.f.o. for reduction of harmonic output. The components enclosed by the dotted line constitute the feedback network.

Key clicks—Key clicks are reduced by introducing a lag in the screen circuit of the final. A cathode follower type clamping circuit is employed is also used to vary the d.c. input to the final. Figure 3 shows the clamping circuit. Because I choose to allow the v.f.o. to run continuously, the final must be completely cut-off under key-up conditions. The two zener diodes provide the necessary biasing to completely cut-off the paralleled 6146's. The screen-to-cathode voltage of the final is slightly negative when the key is up. The cathodes of the two low level stages are keyed as before.

I found that when the v.f.o. is running with the two low level cathodes open (key-up), a sizeable signal was audible in the receiver if the final drew only a few microamperes of plate current. The signal fell below normal noise level of the receiver when the final plate current hit actual zero.

Chirp—The keying circuit already described eliminated the annoying chirp. Although I chose thorough shielding to eliminate the audible signal from the v.f.o., there is another approach that works equally as well. By using feedback, the oscillator can be made to operate Class A. The waveform of the oscillator becomes almost free of harmonics. The second harmonic becomes almost inaudible with little shielding. Naturally, the output voltage of the oscillator falls with feedback. The 100 microhenry coil and the 50 mmf capacitor shown in fig. 4 keeps the feedback about constant when the v.f.o. is changed from 160 meters to 80 meters. The feedback is about zero on the 8.333 mc range. ■

"The antenna here is rather unusual . . ."

RTTY From A to Z

BY DURWARD J. TUCKER,* W5VU

PART XXI

Keyboard misalignment causes distortion. Keyboard mechanism service requirements and adjustments necessary to eliminate printing errors from this source are covered in this installment.

ANY ham knows what c.w. written copy looks like when a 15 w.p.m. c.w. operator tries his hand at copying 25 w.p.m. Unfortunately, a lot of RTTY copy on the amateur bands looks the same way. RTTY is not a case of speed, but a case of forming the characters properly so that the teletype machine recognizes them. The teletype machine does not sit and ponder about a character. The teletype machine does not pause or hesitate, it goes right along and puts down something, depending upon its interpretation of what it received.

There is too much poor copy on the RTTY amateur bands that is due to avoidable *RTTY* distortion. RTTY distortion should not just be read and talked about, but something that should be corrected.

Sending End Distortion Source

A coverage of polar relays has been given, as well as their associated problems of distortion. There is still another source of distortion at the sending end and that is the teletype machine keyboard transmitter contacts, or sending mechanism.

Earlier in the text, in the coverage of frequency shift keying methods, it was indicated that such systems could be keyed directly from the keyboard transmitter contacts. Many RTTY'ers do exactly that, in fact, far too many of them do this.

The sending mechanism has five sets of character forming contacts, as well as a set of start-stop contacts, six sets in all. Remember that the polar relay only has *one* set of contacts. It is certainly reasonable to deduce then, that one could expect considerably more trouble from the keyboard sending mechanism contacts, collectively, than from the single set of contacts of a polar relay. This then should point up to the fact that it would be much more desirable to let the keyboard transmitter contacts key a polar relay and let the polar relay, in turn, key the frequency shift keying circuit of the RTTY transmitter. There are, however, other reasons for this besides the sheer number of contacts involved.

The RTTY'er must have a good working knowledge of both polar relays and the keyboard mechanism in order to cope with the distortion problems associated with each. As pointed out before, certain types of sending end distortion can be compensated for at the receiving end. In fact, there are three possible ways to do this. Some terminal units are provided with special adjustable circuitry to cope with this problem. A regenerative repeater such as the surplus

*6906 Kingsbury Drive, Dallas 31, Texas.

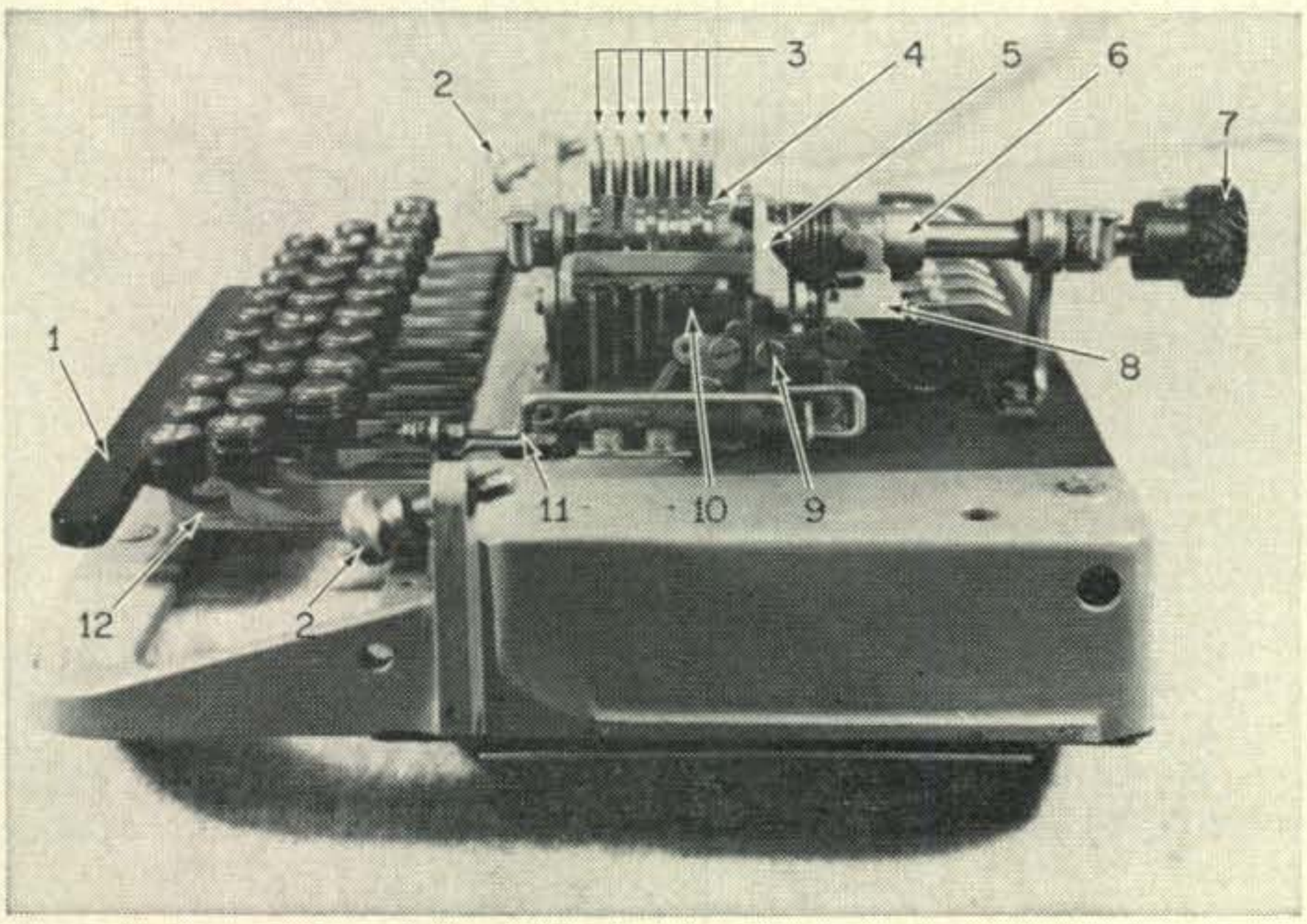


Fig. 123—Pictorial view of the teletypewriter keyboard, including identification of major parts.

1—Space bar.
2—Thumb screws.
3—Contact levers.
4—Start-stop cams.
5—Lock loop.
6—Clutch.
7—Gear.
8—Clutch throw out lever
9—Intermediate pawl.
10—Locking levers.
11—Repeat space rod.
12—Key levers.

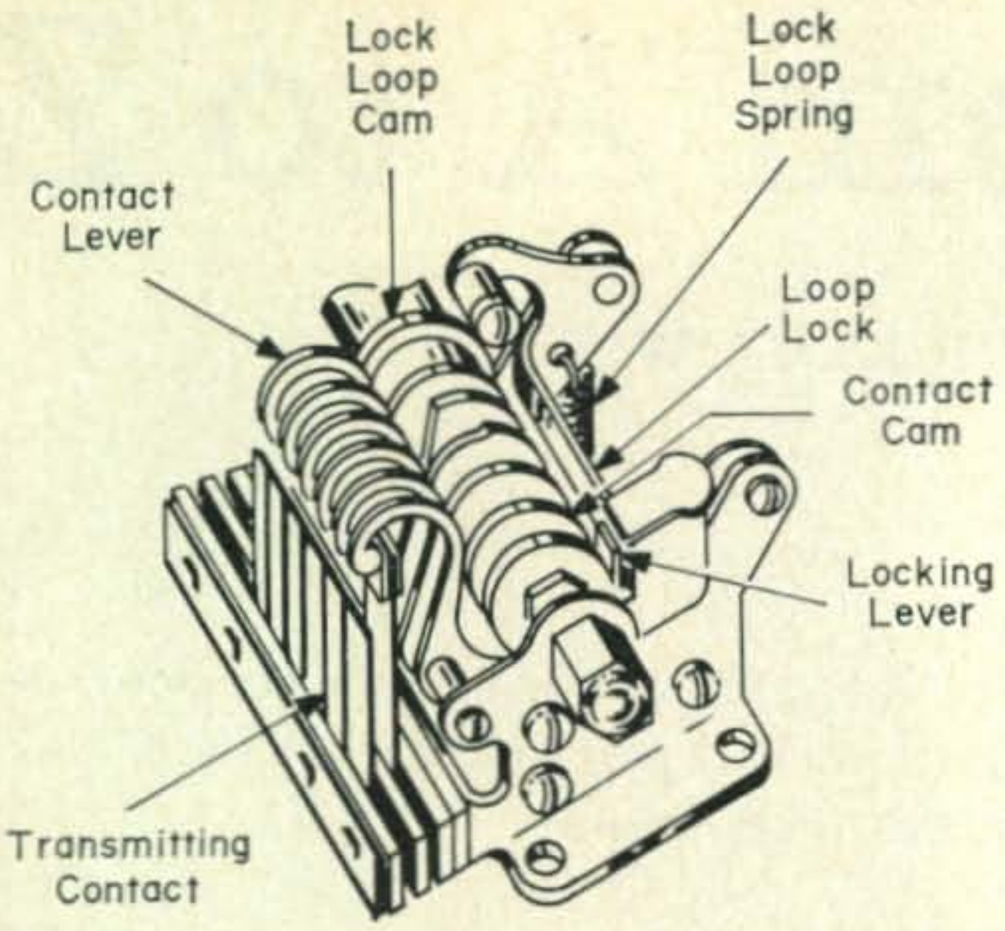


Fig. 124—Line drawing of only the transmitter mechanism identifying the major parts.

TT-631A may be used for this purpose. Some operators resort to moving the selector magnet range finder of their machine in a last ditch effort to copy heavily biased RTTY signals. There surely isn't any future to this last method. Sending end bias should, by all means, be *corrected at the sending end.*

Keyboard Distortion

The f.s.k. circuits discussed earlier covered both the "dry contact" (little or practically no voltage across the keying contacts) and the "wet contact" (substantial voltage across the keying contacts) method of keying. The pitfalls of dry contact keying were pointed out and these apply to polar relay contacts as well as keyboard transmitter contacts. Only solid-state switching f.s.k. circuits were given, since they are relatively simple and in universal use. With solid-state switching circuits the voltages involved in wet keying are not too high.

Direct keying of the radio transmitter oscillator circuit by means of the keyboard contact mechanism invariably brings on *fortuitous distortion* caused by keying transients. Fortuitous distortion is an erratic shortening of *mark* and *space* as mentioned earlier. This is in contrast to a systematic shortening or lengthening of *mark* and *space*. Bias and characteristic distortion, covered earlier, are examples of systematic distortion. Bias distortion is most prominent in amateur RTTY work, with fortuitous distortion next. It was shown earlier that bias distortion is relatively easy to measure and correct, in most instances. This is not the case for fortuitous distortion. It is not a systematic or re-occurring phenomenon. Fortuitous distortion not only displaces the TTY signal in a random manner, but by various amounts as well. This makes its detection difficult and its measurement even more difficult. Most RTTY distortion measuring instruments measure the *total* distortion that is present in a circuit. *Total distortion,* as represented by the displacement of a received transition from its proper or correct time of occurrence is equal to the *algebraic sum* of the systematic (all) distortion and fortuitous distortion. It takes quite a sophisticated instrument to measure fortuitous distortion alone. Such an instrument is found in scattered commercial use. Its price and complexity does not make it practical for amateur use.

Fortunately, fortuitous distortion can be isolated and detected in a round about way. When it is present in an amateur RTTY system, it is usually traced to the TTY keyboard transmitter contacts. One should, by all means, look here first whenever it is suspected.

Much of the trouble arising from fortuitous distortion can be avoided by *not* keying the transmitter oscillator circuit directly with the keyboard transmitter contacts in the first place. Secondly, one can virtually eliminate this bothersome error-maker by proper servicing of the keyboard mechanism in accordance with the following sections on servicing of the various parts of this all-important mechanism.

The general requirements and basic fundamentals of servicing for all parts of the teletypewriter were covered a few sections back. We are now ready to apply this knowledge to specific parts of the machine. It is not within the scope of this text to give minute and specific information on every part of the teletype machine. That undertaking alone would require a sizeable book, especially if many different type machines were covered.

We will cover, however, the most important parts of a machine well known and well used by the amateur RTTY'ers, the Model 15 which is also, in essence, the Model 19 as well, in many respects. The actual differences were covered earlier. At the moment we are only concerned with the keyboard and its associated mechanism.

Transmitter Mechanism

A general description and explanation of how a keyboard transmitter mechanism works was given earlier. A general view of the mechanism

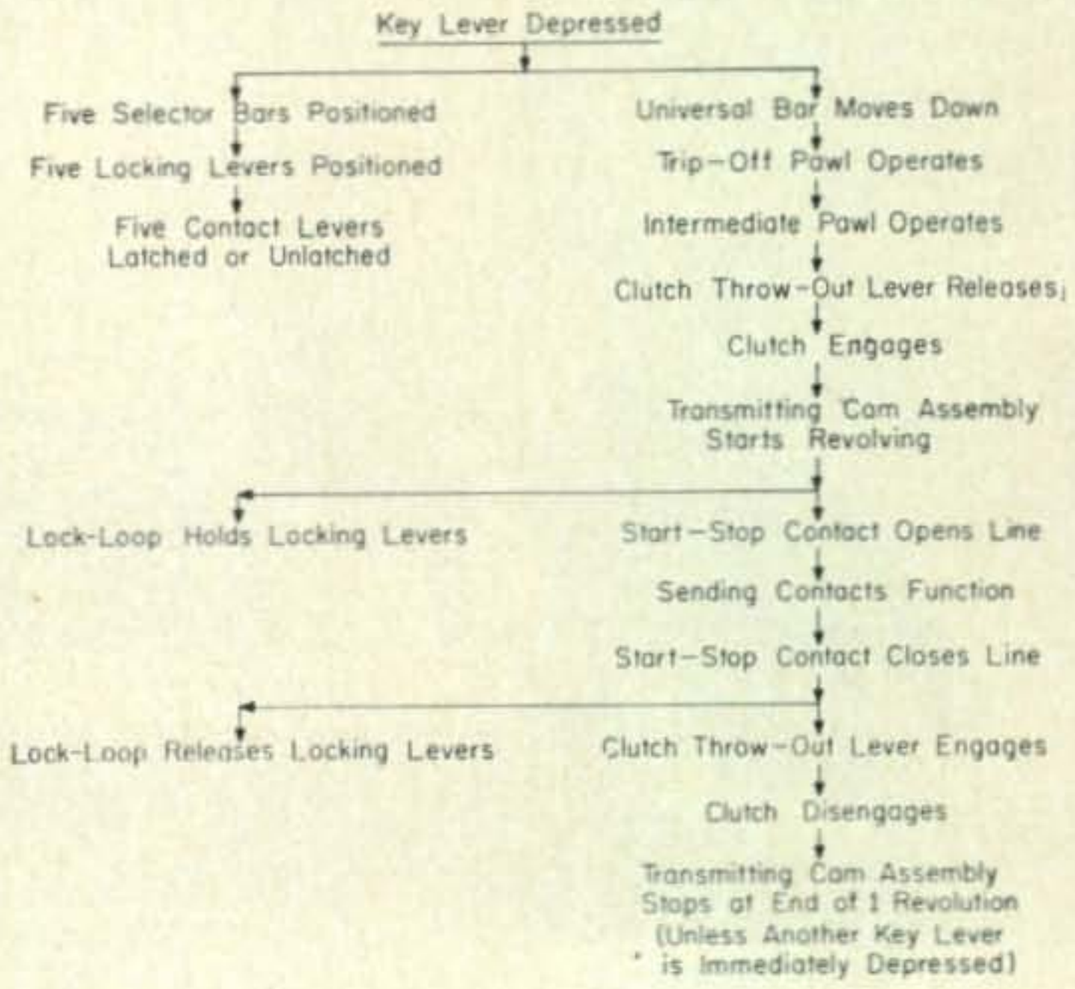


Fig. 125—Chart showing sequence of the keyboard functions after a key lever has been depressed.

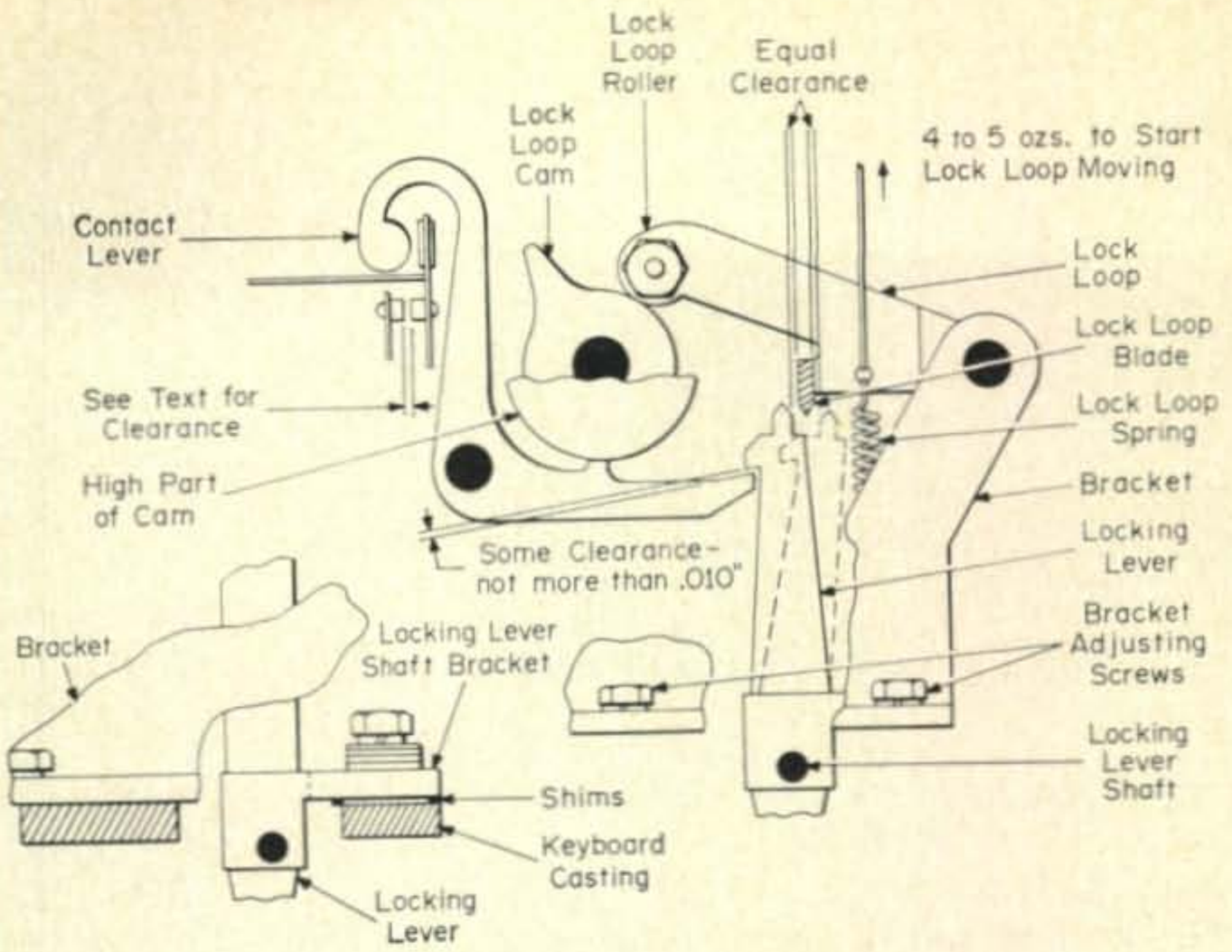


Fig. 126—Transmitter contact and lock lever mechanism of a Teletype Model 15 keyboard.

can be seen in figs. 14 and 21. Partial details of the mechanism can be seen in figs. 19 and 20. Figures 123, and 124 show additional details of this all important mechanism. A chart showing sequence for keyboard functions is given in fig. 125. These pictures and line drawings, together with the earlier description and explanation of how this unit functions should aid in understanding and actually performing the keyboard adjustments that follow.

Keyboard Adjustment

Proper adjustments of the associated mechanisms of a keyboard include *tension* adjustments as well as *spacing* adjustments. This requires an 8 ounce spring scale and a 32 ounce spring scale, as well as a feeler gauge. Possibly an emery board and burnishing tool may also be needed if the transmitter contacts are found to be pitted or corroded. Review the listing of tools given in fig. 112.

The keyboard should be separated from the rest of the teletypewriter, as shown in fig. 123, before attempting to inspect, service or adjust any parts of its mechanism. Any required cleaning operations should be carried out before making any adjustments, as this operation could alter spacings of parts as well as spring tensions.

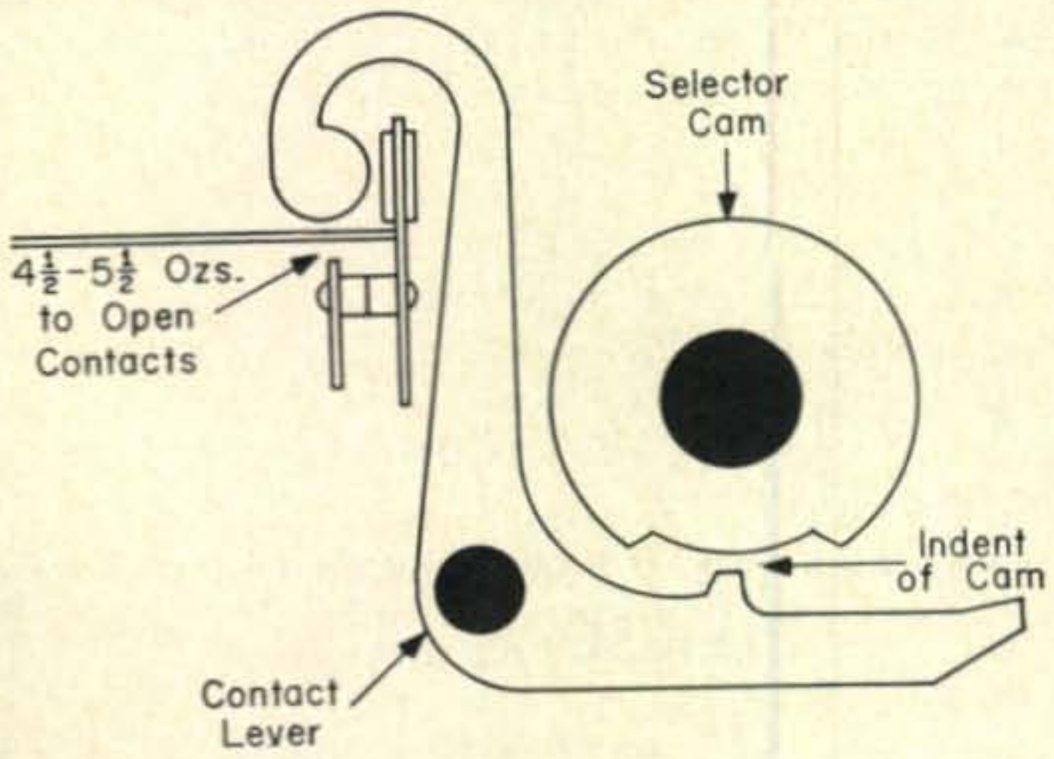


Fig. 127—Contact lever, selector cam and switch contacts of one of the five character element forming mechanisms shown in fig. 126.

Transmitter Contact Cleaning

Any required emery work and/or burnishing on the transmitter contacts should be performed before the spacing and tension adjustments of these contacts are made. The emery board should not be used on the contacts unless they are burned or badly pitted. Even then it should be used sparingly and carefully. Be careful not to emery down a contact so that you alter its surface angle. Move the emery board in a direction *parallel* to the plane of the contact arm at all times. Any surfaces that have had an emery board used on them should be burnished with a burnishing tool following the emery board use.

Lock-Loop

Figure 126 is a line drawing giving a simplified end view of the transmitter mechanism showing one set of contacts and associated cam, lock loop, locking lever, *etc*. One must visualize that behind this are the other duplicate contacts and mechanisms for the other four elements for character forming, as well as that for stop-start. These details were also shown in other figures previously. All parts in fig. 126 are identified and adjustable clearances are also indicated.

Rotate the transmitting cam cylinder (See fig. 129) slowly by hand, in the *proper direction*, which is *counter-clockwise* as viewed from the front of the keyboard, until the lock loop roller is resting on the low circular part of its cam as shown in fig. 126. Hook the eight ounce spring scale in the lock loop spring hole and pull upward in opposition to the spring and in line with the spring axis (see fig. 126). If the tension of the spring is proper, a pull of four to five ounces will counteract the spring pull and start the lock loop moving. The manufacturer states that this spring should be replaced if its tension does not fall within these limits. (An exact replacement may not be so readily obtained and a reasonable substitute can be even harder to locate.) This should be repeated for the other four character forming mechanisms that are identical and in line with this, the front one.

Check the clearance between each contact

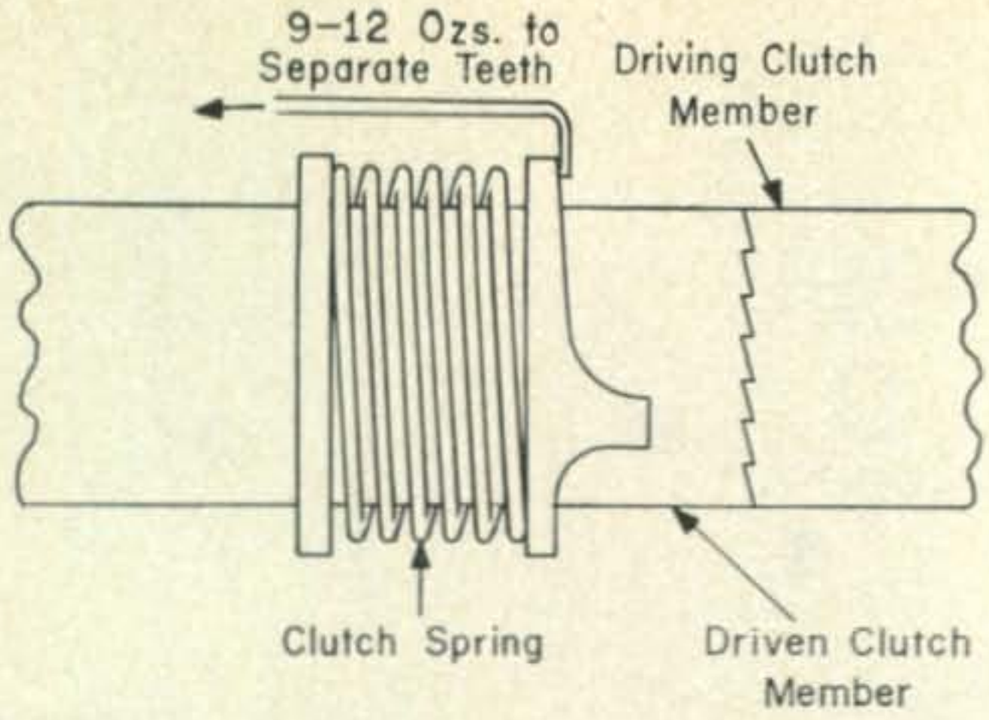


Fig. 128—Transmitting shaft clutch spring.

lever and its associated locking lever when the contact lever is on the high side of its associated cam as shown in fig. 126. This clearance should be checked and measured while pressing firmly (not too hard) down on the locking lever. There should be a measurable clearance here under these conditions, but it should not be more than 0.010 inch. This spacing requirement can be obtained by adding or removing (in accordance with the requirement) shims between the bracket holding the five locking levers shaft and the keyboard casting. This is clearly shown and identified in fig. 126.

The excursion or movement of the locking levers to either side of the lock-loop blade should be the same with the alternate depressing of the LETTERS and BLANK keys. Depressing the LTRS key positions all five of the locking levers to the *right* (fig. 126) and depressing the BLANK key positions all of the locking levers to the *left*. The locking levers shaft bracket may be positioned laterally, under its mounting screws, to meet this requirement. Don't forget to retighten these screws after making this adjustment.

Transmitter Contact Adjustment

After the lock-loop spring and locking lever adjustments, as outlined above, have been completed, one is ready to proceed with the adjustment of the transmitter contacts. It is assumed at this point that the instructions to clean and condition these contacts have been followed, if required.

First, check the gap spacing of each set of transmitter contacts. This spacing should be within the range of 0.020 to 0.025 inches. In each instance the gap measurement is to be made *only* when the associated contact operating lever is on the *high* part of its associated cam (see fig. 126). If a gap clearance is not within the specified limits, then the *shorter* contact spring, in each instance, should be bent accordingly.

We are now ready to check the spring tension of each set of transmitter contacts. This spring tension check is only to be made when the associated contact operating lever is on the *low* part of its associated cam, as shown in fig. 127. Each spring tension measurement must fall within the range of 4½ to 5½ ounces. In each instance, the proper indicated reading on the

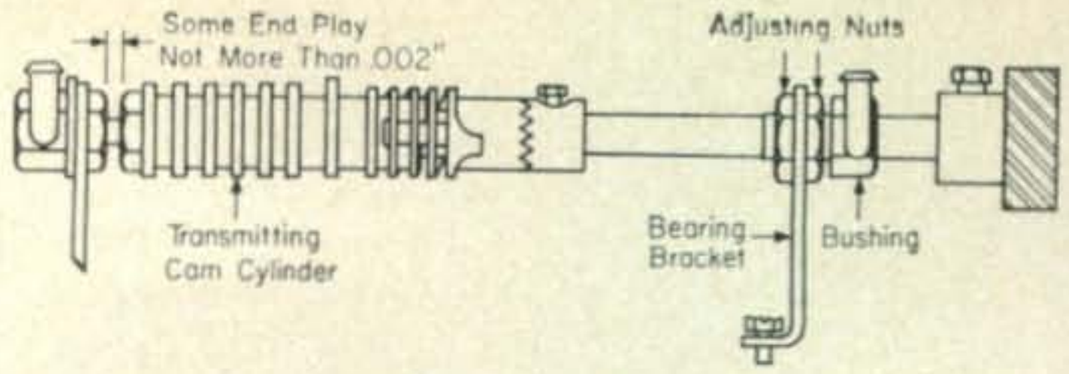


Fig. 129—The transmitting shaft.

spring scale is the reading at the instant the contact opens. If any spring tension is not within the required limits, then the *longer* contact spring, in each case, should be bent accordingly.

It may be seen that the contact gap spacing and the contact spring tension are interrelated so that an adjustment of one may alter the other. The contact gap spacing should be rechecked each time that the contact spring tension is altered. Likewise, the spring tension should be checked each time the contact gap is altered. This may appear to be an unending circle of adjustments. It can mean several cycles of adjustments if a set of contacts happen to be considerably out of line due to rough handling or accidental bending. Generally 1½ or 2 cycles of adjustments are all that is required for each set of transmitter contacts.

Transmitting Shaft Adjustments

The transmitting shaft clutch spring tension may be checked by hooking the 32-ounce scale to the clutch-driven member edge projection and pulling directly in line with the shaft so as to compress the spring as shown in fig. 128. The separation of the clutch teeth should require a pull of 9 to 12 ounces. As in the case with the lock loop spring, the manufacturer recommends that the transmitting shaft clutch spring be replaced if its spring tension does not fall within the specified limits. Here again, a replacement or a substitute spring may not be easy to locate.

There should be some end play between the transmitting cam cylinder end and the rear bearing bushing as illustrated in fig. 129. This end play should be no more than 0.002 inches. If there is little or no end play or more than 0.002 inches, then the position of the *rear* bearing bushing in its mounting bracket should be altered accordingly by turning the adjusting nuts. The rear bearing and associated adjusting nuts are to be seen in the right hand side of fig. 129.

Next month's installment will cover the servicing and adjustment of additional parts of the keyboard, passing on to the servicing and adjustment and other data and information on the typing unit.

[*To be continued*]

PLEASE include your ZIP code number on all correspondence.

DX

BY URB LE JEUNE,* W2DEC

By this time I'm sure you are all aware of the K7LMU/ZL2AWJ tragedy. I will not try to go into the details at this time because I don't have all the facts. However, I will report them in full as soon as possible.[1]

I received a letter from Gay, W4NJF, a few days ago and would like to quote a section of it. "Ted Thorpe, ZL2AWJ, joined the Miller-Swain DXpedition on his own and with his own funds. For nine months I had been in correspondence with him when I learned that he was quite interested in going on a DXpedition by himself. When Don and Chuck decided they would cover the Pacific, it more or less took the wind out of Ted's plans. Then Don invited Ted to come along and meet them in Tonga where they would go on to ZK2 and FW8. Ted would have to pay his own way, but I believe that they needed Ted's license at several locations.

"I believe that it would be fitting for the DX interested amateurs to try and help Mrs. Thorpe financially. She has been left a widow with two small girls, all because of Ted's devotion to amateur radio and DXing. This is a terrible plight, and we should help out.

"I have spoken to Ack and he feels that it is not too soon to start this ball rolling. As it appears to be my idea, I will volunteer to make the collections."

This is really an excellent idea, and I hope you will all take a minute to drop a small (or large) contribution in the mail, addressed to W4NJF. Let's show Mrs. Thorpe the true spirit of ham radio.

Send all correspondence to: Gay E. Milius, W4NJF, 421 Saddle Rock Rd., Norfolk, Va. 23502.

*Box 35, Hazlet, New Jersey 07730.

[1]Details of the tragedy as released by Ack, W4ECI, and Don, W9WNV appear on page 10.

SSB HONOR ROLL

TI2HP	305	W3MAC	282	G2BVN	264	W3VSU	235
WØQVZ	305	W1LLF	282	G3DO	260	OZ7FG	234
K4TJL	305	W6UOU	282	W4RLS	260	W4HUE	231
W2TP	305	W3KT	282	W6WNE	260	W3DJZ	231
W2BXA	304	I1AMU	282	PJ2AA	258	W2PTM	231
G3AWZ	303	W2RGV	279	KP4CL	256	WA2EOQ	229
W2ZX	302	K4HYL	277	K6CYG	252	W6ZJY	228
5Z4ERR	301	DL1IN	276	K6LGF	251	W3FWD	226
W8PQQ	300	HB9TL	276	W1AOL	250	K1SHN	224
G8KS	298	PZ1AX	275	W4OM	249	K2JFV	223
K2MGE	297	W4SSU	274	W4PAA	249	K4JEY	221
W3NKM	296	W6RKP	274	W4NJF	248	W2MJ	215
W2FXN	294	K9EAB	274	GM3JDR	247	SM5UF	209
W4OPM	291	W2LV	271	XE1AE	247	WØQLX	206
W2VCZ	291	G3NUG	270	W7CMO	246	W5KC	206
K1IXG	289	K8ONV	270	YV5AFF	240	W6USG	204
K8RTW	288	G2PL	266	W7DLR	239	KØUKN	202
WA2IZS	288	W6YMV	265	K1JMV	236	ZS6YQ	202
						G3HDA	200

Virginia Century Club

The 1965 DX Certificate, for the amateur who has accomplished the most during the past year for DX and international amateur radio, has been awarded by The Virginia Century Club, of Norfolk, Virginia, jointly to Don Miller, W9WNV, and Chuck Swain, K7LMU, for their outstanding contribution and endeavors in this field. Their energy, enterprise, and ingenuity against great odds created two remarkable DXpeditions, one of which is continuing into 1966.

Early in 1965 both men succeeded in obtaining permission to operate, and did operate, in Cambodia and Viet Nam, which had not been authorized previously for many years. Later, on another trip to the Far East, they operated from Indonesia, a country which had been under a ban and had been silent for a considerable period of time. Don and Chuck engineered a separate DXpedition into Red China, where Chinese citizens of that nation operated and contacted U.S. amateurs, something which Red China would not permit heretofore. Together with this, they put three new countries on the DX countries roll.

Don and Chuck also operated from several locations considered to be rare by the DX fraternity. For all this and their exceptional operating skill they have won the acclaim of the DXers throughout the world; and although differences have occurred, it cannot be denied that they have achieved the impossible.

Inasmuch as the rules of the award state that only one certificate will be issued annually, the 1965 certificate, the fourth issued, was prepared in duplicate. Both certificates are number four and were presented on January 28th in Norfolk, Va. at the annual dinner of the Virginia Century Club.

Past winners of the annual DX award are Gus Browning, W4BPD, Ack Atckerson, W4ECI, and Stuart Meyer, W2GHK. Ack Atckerson, incidently, is the man behind the scenes for Don and Chuck in their latest travels.

Here and There

CR3 Portuguese Guinea: CR3AD on 14050 at 2100 GMT and CR3KD on 21063 at 2030 GMT. *(Tnx LIDXA).*

FS7 Saint Martin: Reg, FS7RT, is active again on 21435 about 2000 GMT. *(Tnx WGDXC).*

FU8 New Hebrides: FU8AG can often be found in a round table with the FK8 gang and FB8WW on the low end of 14 mc s.s.b. band. He also operates around 14085 between 0730 and 1030 GMT. *(Tnx VERON).*

The following certificates were issued between the period from January 6th, 1966 to February 5th, 1966:

CW-PHONE WAZ

2129	W7WLL	Donald S. Tucker
2130	G2ATM	Stanley Read
2131	SP3AIJ	Tadeusz Babczynski
2132	DJ3ZV	Ulrich Ruske
2133	EP2RC	Richard J. Cormier
2134	DM3SMD	Heinz Komm
2135	SM7ASN	Bertil Andersson
2136	G3KMQ	R. G. Heslop
2137	W1GDQ	David L. Miller

ALL-PHONE WAZ

324	KØYEF	Orville L. Eriksen
325	W8QNW	John W. Govier
326	K7CHT	Gerald F. Newton
327	W5IPH	Walter C. Snyder
328	W4VMS	William Du Hart
329	K8AJK	Jerry Gadowski
330	K6EC	Everett W. Thatcher

TWO-WAY SSB WAZ

367	W8QNW	John W. Govier
368	K7CHT	Gerald F. Newton
369	W5IPH	Walter C. Snyder
370	W4VMS	William DuHart
371	VE7SB	Allen H. N. Koo

CW WPX

701	ZC4GB	F/Sgt. J. A. Bassford
702	DJ5BV	Gerhard Parzonka
703	VE3BLU	Richard Matsumoto
704	W3URE	Edwin W. Hill
705	EP2RC	Dick Cormier (K1KOM)
706	LA2Q	Ahlert Horn

PHONE WPX

126	DJ4AH	Heinz Richter

SSB WPX

228	WA5KBK	Fred A. Duran, Jr.
229	SM7ACB	Gillis Stenvall

TWO-WAY SSB WAZ

372	W8HDB	Louise Rippe
373	OE1KW	Karl A. Waniek
374	SM6CAS	Nils G. Persson
375	K8AJK	Jerry Gadowski
376	K6EC	Everett W. Thatcher

KX6 Marshall Islands: "I became custodian and trustee of KX6BQ last June 65. The station is located on the Island of Eniwetok, Marshall Islands. It is a club station with many visiting amateurs, but only two that are here on a permanent basis, and they are John, WB6IKI, and myself, WA6MFY/VR3O.

"We have an excellent location, our equipment consists of two complete Collins S-lines, with the big final (30S-1), and two KWS-1's and 75A-4's. Antennas at the moment are a Hy-Gain TH6 and Mosley TA-33, the TH6 being 90 feet up and the TA-33 is up 75 feet. We also have a double extended Zepp for 80 meters and 40 meters, in addition to dipoles for the low bands. On the way is a six element full size Telrex 20 meter beam which will be up 100 feet and a Telrex Duobander for 15 and 10 meters.

"DX from this location is very good. In the last *CQ* contest, I worked 107 countries in 44 hours of operating including 36 zones. In the ARRL contest (1966) we will be operating both weekends using single transmitter multi-operator.

"We are also interested in moonbounce from Eniwetok. There is a possibility of obtaining a 28 foot dish, so we will be in there trying. I will send more details regarding this later.

"After spending a year on Christmas Island 1962 to 1963 as VR3O, it is still amazing to see how many cards we receive that are marked local time and not GMT. Since June 1965, the station has QSL'ed 100% upon receipt of cards, mostly via Airmail, but we would appreciate s.a.s.e. I have been spending some time on 80 meters, signals to the States have been pretty good.

"To conclude, I would like to pay tribute to the company I work for, Holmes and Narver, Inc., and to the United States Air Force Western Test Range, who provide us with excellent equipment and support. Without their help, many, many amateurs would still be looking to get KX6 confirmed, not only in Eniwetok, but Kwajelein as well.

"Although they install these stations primarily to run traffic for morale, we still find plenty of time to join in all the other various amateur activities, from DX to RTTY. (signed) Martin, A6MFY."

TA Turkey: TA2BK on 14 mc c.w. around 0800 GMT. *(Tnx LIDXA).*

TT Tchad Republic: TT8AW (ex-TL8SW) on 14115 around 1400 GMT. *(Tnx LIDXA).*

TR8 Gabon: Max, TR8AD, has been active on 20 s.s.b. between 2000 and 2200 GMT. He works transceive, does not speak English and runs from the pile up. Good luck. *(Tnx LIDXA).*

TU2 Ivory Coast: TU2BD (ex-XT2HV) on 14203 at 2200 GMT. *(Tnx LIDXA).*

TY Dahomey Republic: TY3ATB skeds his QSL manager, VE2ANK, on 14140 at 1930 GMT on Fridays. *(Tnx LIDXA).*

UG6 Armenia: UG6KAA on 14218 s.s.b. at 1330 GMT. *(Tnx LIDXA).*

VKØ Macquarie Island: VKØFO is a new operator here. VKØTO is now back in VK land. VKØFO operates on 14050 kc around 0900 GMT. *(Tnx LIDXA & VERON).*

VP8 South Georgia: Pat, VP8HY, on 14220, between 0200 and 0400 GMT. *(Tnx LIDXA).*

VR1 Gilbert Islands: VR1S on 14107 at 0500 GMT. *(Tnx LIDXA).*

XV5 Viet Nam: K1YPE/SV5 is okay to work. Third party traffic also legal.

ZD3 Gambia: ZD3B (G5FH) 14042 at 2100-2200 GMT.

ZD5 Swaziland: ZD5D on 14198 daily. *(Tnx LIDXA).*

ZD9 Tristan da Cunha: ZD9BE on 14029 from 1800 GMT. *(Tnx LIDXA).*

ZF Cayman Islands: ZF1RV on 14245 at 2100 GMT. *(Tnx LIDXA).*

ZL Campbell Island: ZL4CH on 14047 starting at 0600 GMT. *(Tnx LIDXA).*

[*Continued on page 102*]

Propagation

BY GEORGE JACOBS,* W3ASK

DURING April, 20 meters is expected to be the optimum band for DX propagation conditions during the daylight and early evening hours. Fairly good 15 meter openings are also forecast to many areas of the world during the daylight hours. Few 10 meter openings are expected, but some may occur during the daylight hours to South America and other southern areas. With longer hours of daylight during April, both 15 and 20 meters are expected to remain open for considerably longer periods of time than during the winter months.

Forty meters is expected to continue to be the best band for DX propagation during the hours of darkness. Fairly good 80 meter openings are also predicted to some areas of the world during the hours of darkness, and some 160 meter openings may also occur during this period.

Ionospheric absorption continues to increase in the northern hemisphere during April, as the sun rises higher in the northern sky. This is expected to result in somewhat weaker DX signal levels during daytime openings on all bands. Atmospheric noise (static) also increases during April, as thunderstorms become more numerous. This is expected to result in somewhat higher noise levels, especially on 40, 80 and 160 meters.

DX propagation predictions for each of the amateur bands from 10 through 160 meters appear in the Charts on the following pages. For predictions of short-skip openings, between 50 and 2400 miles, refer to the *Short-Skip Propagation Chart,* which appeared in last month's column, and is valid through April 30, 1966.

V.h.f. Ionospheric Openings

A seasonal increase in sporadic-E propagation begins during April, and this is expected to result in an increase in the number of short-skip openings on 10 and 6 meters. Sporadic-E openings on these bands generally take place over distances ranging between 750 and 1300 miles, although openings over greater distances are sometimes also possible. While sporadic-E openings can occur at any time of the day or night, there is a tendency for them to peak between 8 A.M. and noon and again between 5 and 8 P.M., local standard time.

Some meteor-type v.h.f. ionospheric openings are likely to occur during the end of the second and the beginning of the third week of the month, when the *Lyrids* meteor shower is expected to take place.

V.h.f. auroral-type ionospheric openings are likely to occur during April when the ionosphere is disturbed. Check the "Last Minute Forecast" at the beginning of this column for the dates which are expected to be either "below normal" or "disturbed".

Solar Cycle News

The Zurich Solar Observatory reports a monthly sunspot number of 27 for January, 1966. This was the highest level of monthly solar activity reported since October, 1963.

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for April

Days	*Forecast Rating and Quality* (4)	(3)	(2)	(1)
Above Normal: **4, 6, 10, 15, 20, 27**	A	A-B	B-C	C
Normal: **2-3, 5, 7-8, 11, 13-14, 18-19, 22-23, 25-26, 28, 30**	A-B	B-C	C-D	D-E
Below Normal: **1, 9, 12, 17, 21, 24, 29**	C	C-D	D	E
Disturbed: **16**	D	D-E	E	E

HOW TO USE THESE CHARTS

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

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

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

3—With the forecast rating noted above, start with the numbers in parentheses 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 meanings: A-excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak and considerable fading and noise; E—poor opening, or none at all.

4—This month's DX Propagation Charts are based upon a transmitter power of 250 watts c.w.; 500 watts s.s.b., or 1000 watts d.s.b. into a dipole antenna a quarter-wave above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

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

6—The Eastern USA chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9 and Ø areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid through May 31, 1966, and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences And Aeronomy of the U.S. Dept. of Commerce. Boulder, Colorado

The latest smoothed sunspot number, centered on July, 1965 is 16. The sunspot cycle is based upon smoothed sunspot numbers, which take into account solar activity averaged over a 12-month period. A smoothed sunspot number of 30 is forecast for April, 1966.

The Zurich Solar Observatory has released the official monthly sunspot numbers observed during 1965. Since some of these numbers vary somewhat from the provisional numbers reported in this column every month, the official numbers are repeated, as follows:

Jan.	17.5	July	11.9
Feb.	14.2	Aug.	8.9
Mar.	11.7	Sep.	16.8
Apr.	6.8	Oct.	20.1
May	24.1	Nov.	15.8
June	15.9	Dec.	17.0

The yearly average sunspot number for 1965 was 15.1. This is higher than the 10.2 mean reported for 1964, and marks the first year of the new sunspot cycle.

Based upon the official monthly numbers, the following are the smoothed sunspot numbers for the period January 1964-July 1965:

Jan. 64	19.5	July	10.3	Jan. 65	11.7
Feb.	17.8	Aug.	10.3	Feb.	12.0
Mar.	15.4	Sep.	9.9	Mar.	12.5
Apr.	12.7	Oct.	9.6	Apr.	13.6
May	10.9	Nov.	9.6	May	14.6
June	10.2	Dec.	11.0	June	15.0
				July	15.5

According to the Zurich Solar Observatory, Cycle 19 ended during September, 1964. The new cycle, Cycle 20, is considered to have begun with a smoothed sunspot number of 9.6, during October, 1964.

The April, May and June, 1961 issues of *CQ* contained a three-part article entitled "The Sunspot Story, Cycle 19; The Declining Years." Written by George Jacobs and Stanley Leinwoll, this article has become a classic in its field. A sequel to the article, covering the end of Cycle 19 and the beginning of Cycle 20 is now in preparation and will appear in *CQ* later this year. The sequel will review Cycle 19 and attempt to predict the future of Cycle 20, including the influence of the cycle upon propagation conditions in the various amateur bands. A limited number of copies of the original article, bound into a 28-page booklet, are still available for $1 postpaid from: Circulation Manager, CQ Magazine, 14 Vanderventer Ave. Port Washington, N.Y. 11050.

New Name For CRPL

The Central Radio Propagation Laboratory has recently merged with the Coast and Geodetic Survey and the Weather Bureau to form a new government organization called the *Environmental Science Services Administration* (ESSA). Located within the U.S. Dept. Of Commerce, in the words of President Johnson, ESSA has been created to provide "a single national focus to describe, understand, and predict the state of the oceans, the state of the upper and lower atmosphere, and the size and shape of the earth."

As part of ESSA, the CRPL has been renamed the *Institute for Telecommunication Sciences and Aeronomy*. The functions of CRPL will continue as before, and Dr. C. Gordon Little, former Director of CRPL will continue as Director of the new Institute. The transfer and redesignation of the CRPL from the National Bureau of Standards to ESSA is the latest step in a continuous history which can be traced back more than fifty years to studies of radiowave propagation initiated by the National Bureau of Standards in 1909. Milestones in this growth pattern include the creation of the first NBS Radio Section in 1913, the formation of the Inter-Service Radio Propagation Laboratory within the NBS at the request of the combined Chiefs of Staff of the U.S. Armed Forces in the spring of 1942, the post-War transformation of the IRPL into the Central Radio Propagation Laboratory of the NBS in May, 1946, the designation of the CRPL as an Institute within NBS during 1964, and the transfer of CRPL from NBS to ESSA during October, 1965.

A pamphlet describing the responsibilities of the new Institute can be obtained without charge from: Institute For Telecommunication Sciences and Aeronomy, ESSA, U.S. Dept. Of Commerce, Boulder, Colorado. 73, George, W3ASK

CQ DX Propagation Charts

APRIL AND MAY, 1966

Time Zone: EST (24-hour Time)

Eastern USA To:

	10/15 Meters	*20 Meters*	*40 Meters*	*80/160 Meters*
Western & Central Europe & North Africa	09-12 (1) 12-16 (2) 16-18 (1)	05-07 (1) 07-09 (3) 09-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-19 (2) 19-21 (1)	17-19 (1) 19-20 (2) 20-23 (3) 23-01 (2) 01-03 (1)	19-22 (1) 22-01 (2) 01-02 (1) 21-22 (1)† 22-00 (2)† 00-01 (1)†
Northern Europe & European USSR	10-16 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-19 (1)	19-00 (1)	20-23 (1)
Eastern Mediterranean & East Africa	10-15 (1)	05-07 (1) 07-09 (2) 09-13 (1) 13-19 (2) 19-21 (1)	19-21 (1) 21-23 (2) 23-01 (1)	21-23 (1)
West Africa	12-15 (1)* 03-10 (1) 10-12 (2) 12-14 (3) 14-16 (2) 16-18 (1)	05-06 (1) 06-08 (2) 08-13 (1) 13-15 (2) 15-17 (4) 17-19 (3) 19-21 (2) 21-23 (1)	21-01 (1) 01-02 (2) 02-03 (1)	00-02 (1)
Central & South Africa	11-14 (1)* 08-11 (1) 11-14 (2) 14-15 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-01 (1) 01-03 (2) 03-05 (1)	21-23 (1) 23-02 (2) 02-04 (1)	22-02 (1)

*Predicted 10 meter openings, all others in column are 15 meter openings.

†Predicted 160 meter openings, all others in column are 80 meter openings.

Central Asia	08-10 (1) 19-21 (1)	06-09 (1) 19-22 (1)	04-06 (1) 18-20 (1)	*Nil*
South-east Asia	19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	*Nil*	*Nil*
Far East	17-20 (1)	06-07 (1) 07-09 (2) 09-10 (1) 18-19 (1) 19-21 (2) 21-23 (1)	04-06 (1)	*Nil*
Pacific Islands & New Zealand	15-18 (1)* 14-16 (1) 16-19 (2) 19-21 (1)	17-21 (1) 21-07 (2) 07-09 (3) 09-11 (2) 11-14 (1)	01-02 (1) 02-05 (2) 05-07 (1)	02-06 (1) 02-05 (1)†
Aus-tralasia	17-19 (1)* 16-18 (1) 18-20 (2) 20-22 (1)	20-22 (1) 22-00 (2) 00-06 (1) 06-08 (2) 08-10 (1) 14-17 (1)	03-04 (1) 04-06 (2) 06-07 (1)	04-06 (1) 04-06 (1)†
Central America & North-ern South America	12-14 (1)* 14-16 (2)* 16-18 (1)* 07-08 (1) 08-09 (2) 09-10 (3) 10-12 (4) 12-14 (2) 14-17 (4) 17-18 (3) 18-20 (2) 20-22 (1)	00-06 (1) 06-08 (3) 08-10 (4) 10-15 (2) 15-17 (3) 17-20 (4) 20-22 (3) 22-00 (2)	18-19 (1) 19-20 (2) 20-03 (3) 03-05 (2) 05-07 (1)	21-01 (1) 01-03 (2) 03-05 (1) 00-03 (1)†
Central & South-ern South America	13-14 (1)* 14-16 (2)* 16-17 (1)* 07-09 (1) 09-12 (2) 12-14 (1) 14-15 (2) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-03 (1)	21-01 (1) 01-05 (2) 05-07 (1)	01-05 (1) 02-04 (1)†
Mc-Murdo Sound, Antarc-tica	13-14 (1) 14-16 (2) 16-18 (1)	06-07 (1) 07-09 (2) 09-10 (1) 16-18 (1) 18-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	00-06 (1)	*Nil*

Time Zones: CST and MST (24-hour Time)
CENTRAL USA To:

	10/15 Meters	*20 Meters*	*40 Meters*	*80/160 Meters*
Western & Central Europe & North Africa	13-16 (1)	05-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-17 (3) 17-18 (2) 18-20 (1)	19-20 (1) 20-22 (2) 22-01 (1)	21-22 (1) 22-23 (2) 23-00 (1) 21-23 (1)†
North-ern Europe & Euro-pean USSR	*Nil*	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-20 (1)	19-23 (1)	*Nil*
Eastern Mediter-ranean	13-16 (1)	06-12 (1) 12-15 (2) 15-19 (1)	19-22 (1)	*Nil*
East & West Africa	09-11 (1)* 08-10 (1) 10-13 (2) 13-15 (1)	06-09 (2) 09-13 (1) 13-16 (2) 16-19 (3) 19-22 (2) 22-06 (1)	20-21 (1) 21-22 (2) 22-23 (1)	21-23 (1)
Central & South Africa	10-12 (1)* 07-11 (1) 11-13 (2) 13-16 (1)	11-15 (1) 15-16 (2) 16-18 (3) 18-20 (2) 20-00 (1) 00-03 (2) 03-05 (1)	21-22 (1) 22-00 (2) 00-02 (1)	22-00 (1)
Central Asia	07-09 (1) 18-21 (1)	06-10 (1) 17-18 (1) 18-20 (2) 20-22 (1)	04-06 (1) 18-20 (1)	*Nil*
South-east Asia	18-21 (1)	04-07 (1) 07-09 (2) 09-11 (1) 19-22 (1)	01-02 (1) 04-06 (1)	*Nil*
Far East	18-22 (1)	06-07 (1) 07-10 (2) 10-12 (1) 18-21 (1) 21-00 (2) 00-04 (1)	00-02 (1) 02-04 (2) 04-06 (1)	03-05 (1)
Guam & Pacific Islands	16-20 (1)* 14-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-23 (1)	07-09 (3) 09-11 (2) 11-15 (1) 15-20 (2) 20-23 (3) 23-07 (2)	00-02 (1) 02-05 (2) 05-07 (1)	01-02 (1) 02-05 (2) 05-06 (1) 02-05 (1)†
Aus-tralia & New Zealand	18-20 (1)* 15-18 (1) 18-20 (2) 20-23 (1)	06-09 (2) 09-13 (1) 13-15 (2) 15-22 (1) 22-00 (2) 00-06 (1)	02-03 (1) 03-05 (2) 05-07 (1)	03-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)†
Central America & North-ern South America	11-13 (1)* 13-15 (2)* 15-17 (1)* 06-08 (1) 08-10 (2) 10-13 (3) 13-15 (4) 15-17 (3) 17-19 (2) 19-21 (1)	00-06 (1) 06-07 (2) 07-09 (3) 09-14 (2) 14-16 (3) 16-19 (4) 19-21 (3) 21-00 (2)	18-20 (1) 20-02 (3) 02-04 (2) 04-06 (1)	20-22 (1) 22-01 (2) 01-05 (1) 22-02 (1)†
Central & South-ern South America	12-13 (1)* 13-15 (2)* 15-17 (1)* 06-08 (1) 08-12 (2) 12-14 (1) 14-15 (2) 15-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	06-09 (2) 09-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-00 (2) 00-03 (1)	20-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-06 (1)	00-04 (1)
Mc-Murdo Sound, Antarc-tica	12-14 (1) 14-17 (2) 17-19 (1)	05-06 (1) 06-08 (2) 08-11 (1) 16-18 (1) 18-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	01-05 (1)	*Nil*

Time Zone: PST (24-hour Time)
WESTERN USA To:

	10/15 Meters	*20 Meters*	*40 Meters*	*80/160 Meters*
Western & Central Europe & North Africa	*Nil*	05-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-15 (1) 20-22 (1)	19-20 (1) 20-22 (2) 22-23 (1)	20-22 (1)
North-ern Europe & Euro-pean USSR	*Nil*	05-07 (1) 07-09 (2) 09-15 (1) 19-22 (1)	19-22 (1)	*Nil*
Eastern Mediter-ranean & East Africa	*Nil*	06-10 (1) 10-12 (2) 12-15 (1) 19-23 (1)	19-22 (1)	*Nil*
West & Central Africa	09-11 (1)* 06-08 (1) 08-11 (2) 11-13 (1)	02-06 (1) 06-08 (2) 08-13 (1) 13-15 (2) 15-18 (3) 18-19 (2) 19-21 (1)	20-00 (1)	*Nil*
South Africa	09-12 (1)	05-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-22 (1)	20-01 (1)	*Nil*
Central Asia	05-07 (1) 18-20 (1)	07-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	04-06 (1)	*Nil*

[*Continued on page 102*]

HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

RADIO frequency interference (RFI) to the average radio amateur usually means QRM or QRN on his frequency in the band in which he is operating. TVI is a three letter designation for television interference (to reception) familiar to all hams. BCI of course means interference to broadcast receivers no matter the band. But RFI covers the *whole* radio frequency spectrum and is receiving more attention than ever before, not only by hams, but all governmental agencies, including the military and NASA as well as civilian services which use any of the radio frequencies for a large number of purposes.

What is RFI?

The proper definition of RFI is actually the undesirable interference caused to systems operating on proper and authorized radio frequencies by defective or mal-functioning radio-electronic or electrical systems or processes. RFI can and usually does show up as undesirable noise, but it can be and often is the actual encroachment of frequencies by other *authorized* radio frequency transmissions for any number of reasons, rendering these frequencies unusable or unreliable.

Causes of RFI

RFI can be caused by, but is not limited to the following: defective or improperly shielded or unsuppressed motors and electric generators, switches, relays and other electro-mechanical devices; diathermy and x-ray machines; old and defective power wiring; defective telephone switching gear; auto and furnace ignition systems; off-frequency, frequency related (harmonics) or spurious radio transmissions; radar and radio navigation systems; teletypewriter equipment; defective TV and radio receivers; radio operated garage door openers; arcing or loose connectors of all sorts used for carrying electrical power or low level signal energy; defective electrostatic copying machines; fluorescent lighting systems; 35 mm motion picture projection equipment; defective power line transformers as well as high voltage power distribution systems; arc welding equipment; electrolytic processing equipment; wireless intercommunication systems; radio jamming equipment; malfunctioning or improperly adjusted or defective radio transmitters of all sorts and household electrical appliances including vacuum cleaners, food mixers, electric razors, refrigerators, electric stoves, electric typewriters, door bell systems and so on.

RFI as it Concerns the Amateur

Although the radio amateur is often blamed for certain kinds of interference (especially TV), the interference actually created by him is a "small drop in the bucket" when the interference of other radio services (especially CB) are considered. Too, the undesirable interference caused by industrial electrical machinery does affect some of our most important radio communications services at critical times. One factory was forced to close down during one of the astronaut space shots by NASA because it was causing interference to communications circuits.

When the interference by radio amateurs is considered and compared to that of other radio services, industry etc., it is so minor that it is really not worth mentioning. Actually, the ham has more worry about RFI than nearly any other service because he is plagued by RFI created by appliances etc. in his home area. Now if you will go back and review the list of causes given earlier in this column you can well imagine how many of these apply to ham communications!

One ham I know spent over five months attempting to localize and finally cure RFI that made reception impossible at his QTH. It turned out that the cause of the extremely high noise level was due to a defective transformer more than 2½ miles from his station. The transformer did *not* feed the power grid to which his home was connected! After the power company replaced the transformer he could again operate.

RFI Prevention

Because of the studies made by various firms (most under government contract) on RFI, measures are now being taken throughout the United States by manufacturers, utility companies etc. to design their products and systems with RFI prevention in mind. The electric razor, food mixers, vacuum cleaners etc. now contain r.f. noise suppression components.

Radio transmitters, receivers, x-ray and diathermy machines and other equipment in this category are being designed with RFI suppression in mind. In some instances it was found that even though earlier models of equipment did contain proper shielding, suppressors etc., they could still interfere with certain radio frequencies up to and including those in the u.h.f. and s.h.f. spectrums.

To get away from RFI, most radio-astronomy stations are located in remote areas away from cities.

Radio frequency interaction studies which concern the possible interference of one service with another is receiving continuing attention. As time goes on we are bound to see the use of TV frequencies (both u.h.f. and v.h.f.) for communication as well as TV transmission and the

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

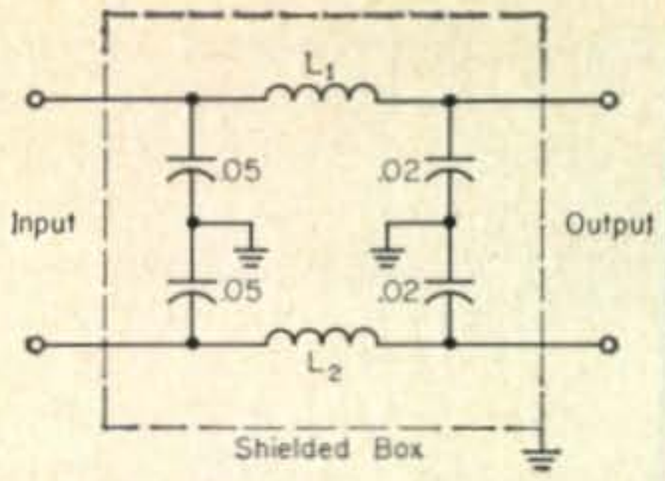


Fig. 1—An effective filter for use in a power line. L_1 and L_2 are No. 16 enameled wire spacewound on a ½" diameter wooden dowel, for 3.5". Coils are wound in the opposite direction to reduce coupling between them.

bulk use of these will be in the mobile radio service (police, fire, utilities etc.).

Although such government agencies as NASA and a few electric power companies do have RFI location teams properly equipped to ferret out RFI and stop it, there is still a great need for more such teams.

The ham can do his part in preventing RFI by using equipment that is properly designed and operating it properly. Off-frequency transmissions should be a thing of the past but unfortunately it is not. Too, transmitters that emit spurious frequencies can not only create TVI and bring the wrath of one's neighbor down on the ham, but can also cause interference with some very critical communications operations which do not only involve human lives but important scientific experiments as well.

Although your transmitter may be operating properly and you have no reports of RFI, take the time out to check (perhaps with a good grid dip meter) whether or not your set is putting out strong r.f. on spurious frequencies—this being true if you live near activities that use the u.h.f. or higher frequency spectrums, such as they do at Cape Kennedy, Vandenberg etc. If you happen to be a CB operator as well as a ham, also check your CB equipment.

Practical RFI Suppression Steps

It is impossible in the space allocated to us for the column to cover RFI in minute detail here, but there are some practical measures you as a ham can take to make your location better for reception and in doing so you will be helping others too. Remember, if your vacuum cleaner for example prevents you from receiving when it is operating, it is no doubt causing interference to your neighbors around you.

Old and worn insulation on power lines coming into your house can contribute to the noise picked up by your receiver—especially in wet weather. Insulators are not worth much when they have been coated with dirt, carbon, oil etc. over the years. A leakage path to ground can and usually does cause noise.

Utility "pole pigs" (transformers) feeding a housing area are often RFI generators and if located as the source of noise should be reported to the power company.

Noise can be roughly classified as conducted or radiated. The former coming over the power lines and the latter through the air and received directly by an antenna or the power distribution system and it then becomes conducted noise.

An effective filter against conducted noise can be purchased or one made up as shown in fig. 1. If used in conjunction with a receiver it will filter out many types of QRN coming over the power line. When used with a transmitter it can (depending on the channel being interfered with) attenuate or suppress TVI. Do use a shielded case when making the filter.

A filter for suppressing fluorescent lamp (FL) noise is shown in fig. 2. Like any other filter of this kind, it should be installed as close as possible to the noise source. In some FL installations, it may be necessary to place a ¼" block screen below the lamp.

Noise created by a furnace ignitor can be suppressed with a kit furnished for the purpose by the manufacturer. Sometimes an ordinary sparkplug suppressor as used on cars will work when installed in series with the firing unit.

The filter shown in fig. 3 can be used very effectively in devices causing noise such as a food mixer, vacuum cleaner, washing machine, electric razor, refrigerator etc. If the scheme does not work, use coaxial capacitors in series with each line. Make sure the coax capacitors used can carry the current required.

A word about coaxial capacitors: these are very effective at frequencies up to and including the u.h.f. spectrum (in some cases). The old tubular metal covered capacitors found on auto generators etc., are *not* generally effective over 3 mc.

RFI from x-ray, diathermy, neon advertising signs and the like should be reported to the user. If he does nothing, then the RFI should be reported to the FCC. Interference from commercial radio stations (when not allowed ham band sharing as is the case in Europe and its region) should be reported to the FCC, or if you happen to be in Europe to the International Telecommunications Union (ITU), Geneva, Switzerland.

Noise from generators or alternators such as are presently used in autos may be suppressed by using a trap as shown in fig. 4. The trap should cover the band in use. The example shown is for 20 meters. Make sure the wire used will carry the current. The compression type capacitor is tuned for minimum noise.

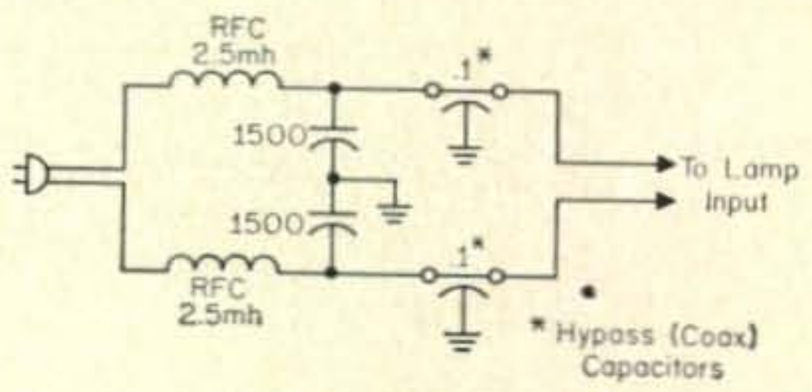


Fig. 2—A filter for use against fluorescent lamp noise. The ground is the lamp cover or any external ground in stubborn cases. (See the article in March 1965 CQ)

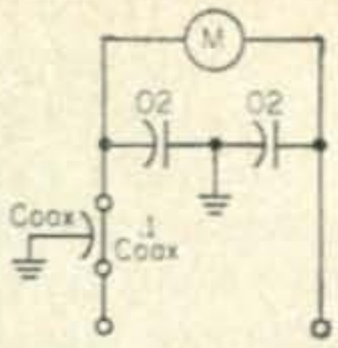


Fig. 3—A filter for home appliances. These should be installed as close as possible to the motor inputs.

Back to back diodes can be used sometimes across relay contact points, switches, thermostats etc. to reduce or eliminate contact noise. Sometimes a low value resistor (47 to 100 ohms) in series with contacts will stop the noise, or a high value resistor (5 to 22 megohms) placed across contacts will sometimes work. Commercial suppressors are available to reduce contact arcing and can be found in most good wholesale or industrial radio-electronic catalogs.

TVI has been covered in so many articles and books that it will not be covered here. How to suppress interference *from* TV sets (birdies) was covered in HAM CLINIC in the June 1965 issue of *CQ*. This shows you how to keep the TV from interfering with *your* reception. Reprints from the *CQ* editor of the article, $1.00.

RFI is a fascinating subject and it has only been glossed over here, but believe me it *is* important. If you have any unusual RFI problems send them in to us, we'll try to help you. However, if you live near or under a 44,000 volt (or more) high line, the only thing we can tell you to do (if there is too much RFI) is to move.

Those of you who are interested in detecting and eliminating TVI, power line interference mobile radio noise etc., should obtain the *Interference Manual* for $1.00 pp now available from Cowan Publishing.

Questions

Crystal Control of the HT-44 Transmitter—"Last Christmas my dad gave me an HT-44. I am only a novice studying for my general. How can I add crystal control to this fine set for novice band operation?"

It can be and is being done. Hallicrafters field service bulletin number 094-9033644 covers how to make up a crystal adapter. See fig. 5 and 6. All *crystal* frequencies will be between 4.350 and 4.850 mc. For example (for operation on 7,150 kc) you determine the number of kilocycles you desire to operate above the low frequency end of the band segment. In this case this is 150 kc. You then subtract 150 from 4850 and this gives you the *crystal* frequency of 4,700 kc that you need. Use a crystal type CR-18U. Please note that novices are allowed only to operate with a power of 75 watts input; it is necessary to provide metering of the plate or cathode current of the final amplifier tubes to insure that you do not go over 75 watts. The plate current meter can be connected into the plate circuit by removing the red lead from the bottom of the r.f. choke (L_{16}) and connecting the meter in *series* with this lead and the junction from which it was removed. After regular tune-up of the driver and final adjust the r.f. level control for the proper input.

S-38 Receiver Modifications—"A friend of mine who has been a ham for a long time gave me an old S-38 Hallicrafters receiver when I got my general license. This receiver still works fine but I'd like to add a Heath Q multiplier to it. Can this be done?"

Yes, but you'll have to use a separate filament transformer for the Q multiplier. The S-38 does not contain a filament transformer—the tubes are all in series. For "B" voltage connect the QM between R_{18} and R_{17} (+) and ground. Connect the QM output lead throuth the shielded cable to the plate of V_1 (12SA7). Try a series capacitor of 2mmf (pf) if there seems to be too much loading. The QM will also work by merely wrapping the output lead (insulated) around the lead going to the plate of V_2.

HX-500 Push-to-Talk—"I have an early model HX-500 Hammarlund transmitter. Can you tell me how to add push-to-talk please?"

Yes. Replace the present mike connector with an Amphenol type 80PC2F. Connect one of the insulated terminals and the common ground from this new connector to the input of the first audio stage as originally wired. The second insulated terminal should be wired to the junction of R_{55} and the contacts on socket SO-2A, rear section of the operation switch. This connection may be made directly to the proper contact on the switch or to the terminal strip located near the V_8 relay tube on the exciter chassis sub-assembly. Pushing the mike P-T switch will ground the cathode of the relay tube through R_{55} (470 ohms) energizing both the v.o.x. and antenna relays. For P-T operation the operation switch must be in vox position and the front panel vox sensitivity control should be set all the way counter-clockwise (off) position to avoid tripping the v.o.x.

I-177 Tube Tester Adapter—"Did *CQ* ever publish any information on an adapter for the I-177 surplus tube tester? If so, what issue?"

Yes. *CQ* May 1961. Title of the article:

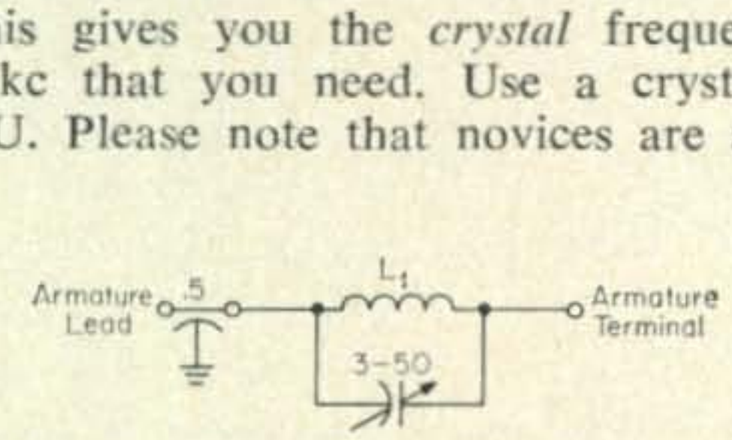


Fig. 4—A trap for 20 meter mobile operation. L_1 is 18t, #10 cc, spaced 1"d for 2¾".

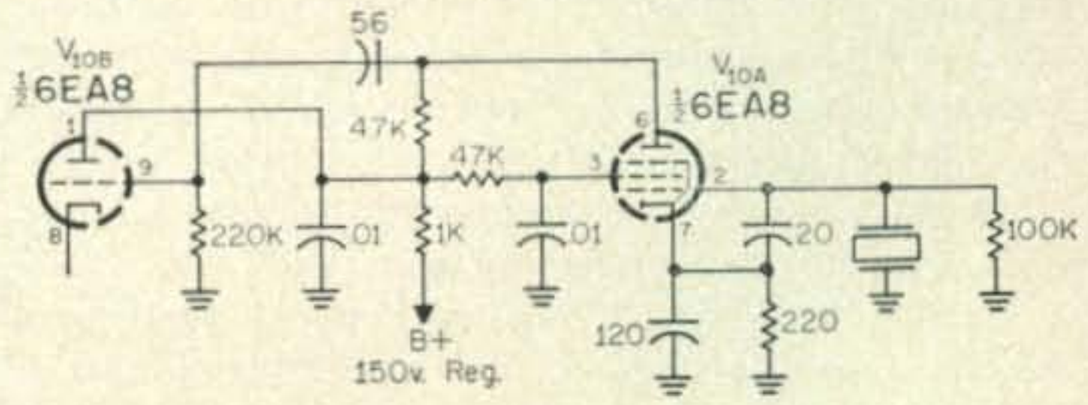


Fig. 5—The circuit that plugs into V_{10A} and V_{10B} to crystal control the HT-44.

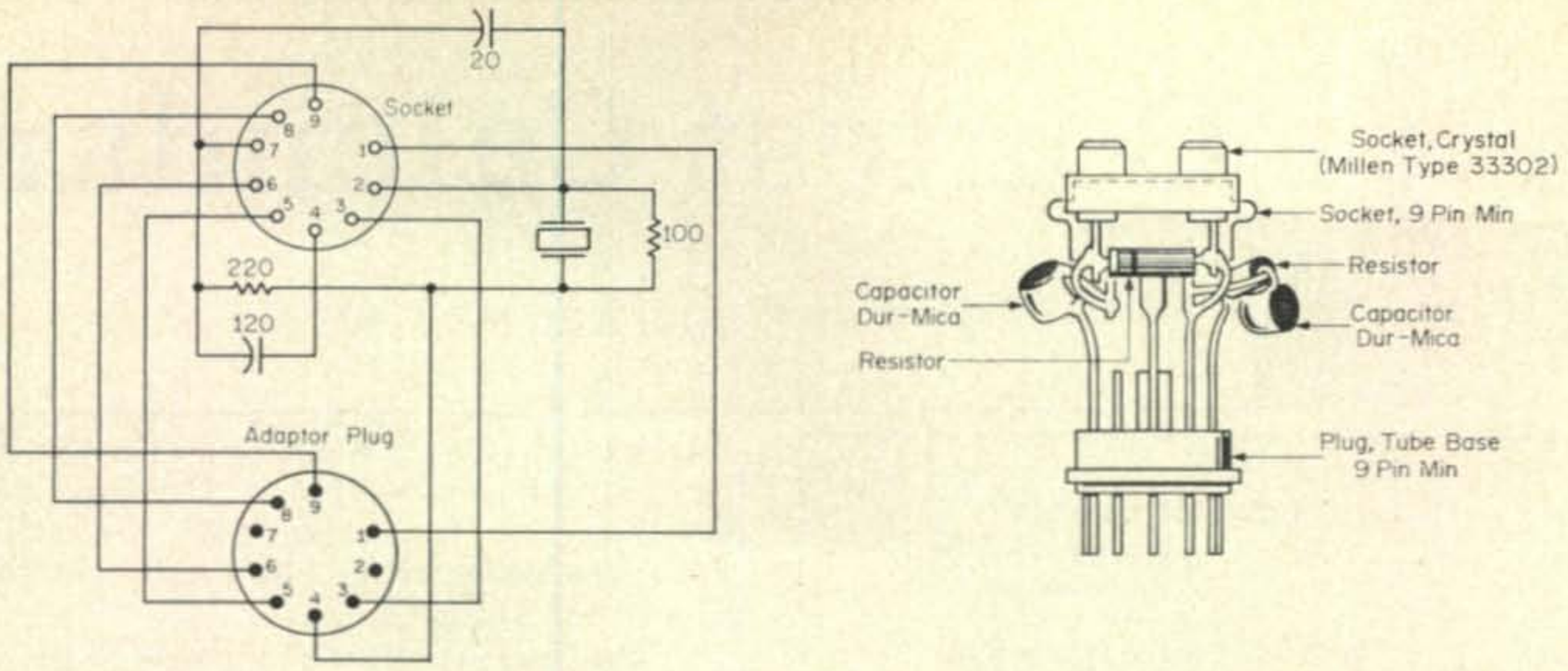


Fig. 6—A crystal adapter for the HT-44 showing the circuit connections and mechanical layout. A vector socket can be used.

"Adapter for Surplus Tube Testers" (I-177). Reprint from the *CQ* Editor, $1.00.

Souping Up the Heath Twoer—"Can you recommend an article to me on improving the Heath Twoer?"

Yes. See the March 1965 *CQ*. Reprint from the editor $1.00.

URC-4 on 50-144 and 220 mc.—"What is the latest information on putting the URC-4/on 144 mc.?"

See the October 1965 issue of *CQ*. This also gives you info on putting this surplus item on 50 and 220 mc.

R.f. Final Poop-out—"I have a well known s.s.b. transceiver that does not use a variable capacitor in the final for loading but instead uses fixed capacitors that are connected through a tap switch for each of the bands. Recently, my antenna connection came loose and one of the loading capacitors blew out (after I had retuned the transmitter into no-load). Tell me, shouldn't these capacitors be able to take it on no-load?"

Sometimes they will and sometimes they will not—depends on their voltage rating. What happened to the shunting r.f. choke (I'm sure there is one)? The transmitter you have calls for a 52 ohm load—this should be used.

SB-300 Receiver Improvement—"I own a Heath SB-300 receiver and I consider it a real fine receiver, but like all hams I am interested in improving it. What additions or modifications could you suggest to make this nice set better? I know you must get letters like this all the time, but hams are hams."

Not many. An i.f. shunt noise limiter and perhaps a variable selectivity control are about all I could suggest. Information on these have appeared in *CQ* before. *All* hams are not *hams*—some just tinker needlessly.

R.f. Output Indicator for DX-60—"Can you suggest an r.f. output indicator circuit for my DX-60?"

See the June 1962 HAM CLINIC feature on the Adapt-O-Citer. The article contains a good r.f. output indicator that can be used with the DX-60. Reprints from the *CQ* Editor, $1.00.

Thirty

Traveling all over Europe, the Middle East and Africa I always enjoy meeting hams—especially if they read *CQ*. If you are a ham in any of these areas and read *CQ* either as a subscriber or a newsstand reader, and you would like to say hello to me when I am in your area, why drop me a card. I'd like to see your station at the end of a business day and chat with you. I like to meet people and to make new friends.

We continue to receive lots and lots of mail from our kind readers and we appreciate your writing, but please *do not* send whole instruction books to us asking us to design into the circuit your pet ideas—we simply do not have time. Further, because we must return the book (and usually there is *no* return postage) this becomes a postage burden. If you write do include two IRC coupons or 25¢ to cover postage and address your letters to us at our present QTH, 4 Lutzelmatt Str. Luzern, Switzerland. If time is not important send your letters to me care of *CQ*. For this month then, thanks for reading HAM CLINIC and the many kind letters. This summer if all goes well I'll be back in the U.S. for a short while and will look for you on the bands. 73 and 75 Chuck.

"Well, Phil, if you've finished putting up your antenna I'll take my ladder back."

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

April	1-15	Goose Bay QSO Party
April	2-3	Florida QSO Party
April	2-3	SP DX C.W.
April	**16-17**	**CQ WW DX SSB**
April	23-24	PACC CW/Phone
April 30-May	1	Helvetia 22
April 30-May	1	OZ CCA C.W.
May	**7**	**CQ Spring VHF**
May	7-8	USSR DX
May	14-16	Georgia QSO Party
May	20-23	YL Int. SSB
May	21-22	Kansas QSO Party
May	22-23	Bermuda Contest
June	3-6	CHC/FHC/HTH Party
June	4-5	National Field Day
June	5-6	Bermuda Contest

Goose Bay QSO Party

Starts: 0001 GMT Friday, April 1
Ends: 2359 GMT Friday, April 15

This activity offers an opportunity to work the VOs for the WAG, Worked ALL Goose award. Details in last month's CALENDAR. Applications go to: G.B.A.R.C. Party, P.O. Box 232, Goose Bay, Labrador, Canada.

Florida QSO Party

Three Periods:
1400-2000 GMT Saturday, April 2
0000-0500 GMT Sunday, April 3
1400-2400 GMT Sunday, April 3

Rules and suggested operating frequencies appeared in last month's CALENDAR. Mailing deadline for your logs is April 30th and they go to: *Florida Skip,* Contest Chairman, P.O. Box 501, Miami Springs, Fla. 33166.

SP DX C.W.

Starts: 1500 GMT Saturday, April 2
Ends: 2400 GMT Sunday, April 3

Once again the P.Z.K. (Polski Zwiazek Krotkofalowcow) is holding its annual DX contest to renew friendships with Polish amateurs and make their awards available to interested amateurs. These awards are now also available to all s.w.l.s. (Note: This is the last year the SP Millenium Award will be available.)

1. Use all bands, 3.5 through 28 mc.

2. The serial number will consist of the usual six figures, RST report plus a progressive 3 digit contact number starting with 001.

3. Each contact counts 3 points and the same station can be contacted once on each band for contact and multiplier credits.

4. Your multiplier is determined by the number of SP call areas worked on each band, SP1—SP9, a possible maximum of 45. (In addition, special stations with the SPØ prefix can also be counted for a multiplier.)

5. The final score therefore will be the total QSO points multiplied by the sum of the multiplier from all bands.

6. There are two station classifications; single operator and multi-operator. (And also a s.w.l. section.) Multi-transmitter operation is not permitted.

7. Awards will be made to the highest scoring station in each classification in each country. In countries where the participation is high, awards will be also made for 2nd and 3rd place.

8. Use a separate log sheet for each band and show in this order: Date/time in GMT, station worked, number sent, received, contact points and call area. (First time contacted only.) Also include a summary sheet, showing the scoring, equipment description and your name and address in BLOCK LETTERS. Sign the usual declaration that all rules and regulations have been observed and that your report is a true one.

Contestants are expected to check and score their logs. Duplicate contacts in excess of 3% of the total made will be deemed sufficient cause for disqualification.

Mailing deadline for your logs is May 10th. They go to: The SP DX Club of PZK, Contest Committee, P.O. Box 320, Warszawa 1, Poland.

CQ WW DX SSB

Starts: 1200 GMT Saturday, April 16
Ends: 2400 GMT Sunday, April 17

Complete listing of the rules will be found on page 30 of last month's issue.

Briefly, QSO point credit is the same as for the WW DX contest. However the multiplier is determined by the number of prefixes worked and credit for a given prefix may be taken only *once* in the contest.

1965 Bermuda Contest Winners

VE1AGH	**2310**	WA2ZBS	798
VE3BKJ	2079	WA6SBO	741
WA8CWU	1920	VE4MP	693
W1GOG	1860	W5WZQ	627
WØAIH	1248	K4EMN	540
W3DKT	900	WA9HJM	297
		VE2BGD	60

VE1AGH was the Grand Prize winner of the trip to Bermuda. All the rest were certificate winners. VP9EP was the Top Banana in Bermuda.

*14 Sherwood Road, Stamford, Conn. 06905.

1965 SP DX Results. (USA)

W1EVT*	1785	W1CKA	144
W8VSK*	1190	W8NAN	144
W4SNU*	1104	W9WIO	112
W8JIN	608	W9LKI	66
W1WY	300	K4OBM	45
W7BTH	227	W9QWM	45
W3QQL	210	WB2HKV	20
W4HOS	190	W2NRV	9

*The first 3 were certificate winners.

Single operator stations are limited to 24 hours out of the 36 hour contest period. The 12 hours of non-operation can be taken in one or two periods, at the beginning, end or during the contest.

This rest period has been a point of contention since it was put into effect a few years ago. Mostly by the all band operators, as the single banders haven't had much of a problem during the present low propagation cycle.

There is no doubt the rest period is a handicap to an all out effort on all bands. Some would have us believe that everybody is against this regulation. However I'm not so sure about it being unanimous as I have also received letters approving this compulsory time out. It not only provides a time for rest but also time to go to Church.

How about making it a 48 hour contest but still retaining the 12 hour rest period? This would make more night hours available for operation on the low frequency bands.

We would like to see more discussion on this topic before even contemplating any changes. Address your suggestion to the CONTEST CALENDAR.

PACC CW/Phone

Starts: 1200 GMT Saturday, April 23
Ends: 1800 GMT Sunday, April 24

The V.E.R.O.N. once again invites all amateurs to participate in their 10th annual PACC Contest. Besides certificate awards in the contest, contacts made in the contest may be applied toward the PACC Award for working 100 different PA stations. C.W. and Phone are two separate categories and separate logs must be submitted.

1. Use all bands, 1.8 thru 30 mc (On 160, PA stations are confined to 1825-1835 c.w. only).

2. The usual 5 and 6 figure serial number, RS/RST report plus a progressive 3 digit QSO number starting with 001. The PA/PI/PE stations will identify their province by two letters after their serial number, (ie: 579001/GR).

Abbreviations for the 11 provinces are: GR, OV, NH, ZL, FR, GD, ZH, NB, DR, UT, LB.

3. Each completed QSO counts 3 points and the same station may be worked once on each band.

4. The multiplier for stations outside the Netherlands is determined by the number of provinces worked on each band, a possible multiplier of 66. The PA stations will use the DXCC country list for their multiplier; in addition the call areas of the following will also be considered a multiplier: W/K, VE/VO, PY, VK, ZL, ZS, CE, JA.

5. The final score therefore will be the sum of QSO points from all bands multiplied by the sum of the multiplier from all bands.

6. Certificates will be awarded to the highest scorers in each country and each call district as indicated above.

7. Your log should show in this order: Date/time in GMT, station worked, multiplier column for each band, (fill in only when it is a new multiplier) serial number sent and received, and QSO points.

Also include a summary sheet with your entry, show the scoring and your name and address in BLOCK LETTERS. A signed declaration that all rules and regulations have been observed, is also requested.

Entries must be postmarked no later than June 15th, and they go to: Mr. P.v.d. Berg, PAØVB, Contest Manager VERON, Keizerstraat 54, Gouda, Netherlands.

Helvetia 22

Starts: 1500 GMT Saturday, April 30
Ends: 1700 GMT Sunday, May 1

This popular contest has still to find a permanent date in the Spring Calendar. And conditions have not favored them the past few years. The HB boys usually make every effort to activate all 22 Cantons but very few have ever been able to contact all of them in a contest week-end, no W/K stations to our knowledge. It's a mighty attractive certificate, one well worth your efforts.

Rules for the contest are the same as they have been for the past few years.

1. All bands are allowed, 1.8 thru 29.7 mc, c.w./c.w. and phone/phone.

2. Serial numbers are the usual five and six digits, signal report plus a progressive 3 figure contact number starting with 001. In addition, Swiss stations will also send the abbreviation of their Canton after their number. (ie: 579001/ZH)

Really now, aren't you tired of looking at same stereotype rig and antenna pictures? Here's a winter scene from Estonia, courtesy of UR2CW.

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

3. Each contact with a HB station counts 3 points and the same station can be worked once on each band, either on c.w. or phone.

4. The multiplier is the sum of Swiss Cantons worked on each band, a possible 22 per band.

5. Your final score therefore will be your total QSO points multiplied by the sum of Cantons worked on each band.

6. Certificates will be awarded to the highest scorers in each country and each call district in the United States and Canada.

7. Include a summary sheet showing the scoring and your name and address in BLOCK LETTERS. Also sign the usual declaration that all rules and regulations have been observed.

8. Your logs must be postmarked no later than May 30th and they go to: USKA Traffic Manager, HB9ZY, Meggen—LU, Switzerland.

OZ CCA C.W.

Starts: 1200 GMT Saturday, April 30
Ends: 2400 GMT Sunday, May 1

This year's OZ contest is confined to c.w. only. It's a world wide type contest so the conflict with the H 22 activity may not be too objectionable.

1. Use all bands 3.5 thru 28 mc.

2. Serial numbers will be of the usual six figure variety, RST report plus a 3 digit QSO number starting with 001.

3. Each completed contact is worth 3 points. However contacts with OX, OY and OZ stations are worth 6 points.

4. The multiplier is determined by the number of countries (ARRL DXCC list) worked on each band. In addition, each call area in W/K, VE/VO, PY, LU, VK and ZL will also count as multiplier.

5. The final score, total QSO points multiplied by the sum of the multiplier from each band.

6. Certificates will be awarded to the highest scorer in each country and each call area as indicated above.

7. Your log should show in this order: Date/time in GMT, station worked, progressive multiplier for each band, serial number sent and received, and QSO points.

8. Include a summary sheet with your entry, showing the scoring, equipment description, name and address in BLOCK LETTERS and sign a declaration that all rules and regulations have been observed.

Mailing deadline for your log is June 15th and they go to: The E.D.R. Contest Committee, P.O. Box 335, Aalborg, Denmark.

USSR DX

Starts: 2100 GMT Saturday, May 7
Ends: 2100 GMT Sunday, May 8

Announcement of this activity was received too late to publish the rules in details. However, they are the same as previous years and will be found in last year's April issue. It's a c.w. contest and scoring is figured only on a 12 hour period of continuous operating time.

Mailing deadline is June 1st and your logs go to: The Central Radio Club, Box 88, Moscow, USSR.

CQ Spring VHF

Starts:
Ends:

See Bob Brown's VHF Rules on page 36 for the details on this one.

Complete details on the following activities will be given in next month's CALENDAR.

Georgia QSO Party

Starts: 2300 GMT Saturday, May 14
Ends: 0500 GMT Monday, May 16

YL Int. SSB

Starts: 2300 GMT Friday, May 20
Ends: 0600 GMT Monday, May 23

Log forms, team applications and any questions concerning this party may be had by writing to: Pete Billon WA6MWG, 4040 via Opata, Palos Verdes Estates, Calif. 90274

CHC/FHC/HTH Party

Starts: 2300 GMT Friday, June 3
Ends: 0600 GMT Monday, June 6

Write to Clif Evans, K6BX, Box 385, Bonita, Calif. 92002 for log forms and additional information. A s.a.s.e. will get you quick service.

Editors Notes

The Western Penn. DX Society members will be on the air from 1100 GMT April 9th to 2400 GMT April 10th to afford stations an opportunity to gain credits for the club's "Hearts" award. They will be found on c.w. between 14075 and 14100 and on s.s.b. between 14275 and 14300 kc. Your applications go to: Stanley Springer, W3NKM, 716 Marlow St., Pittsburgh, Pa.

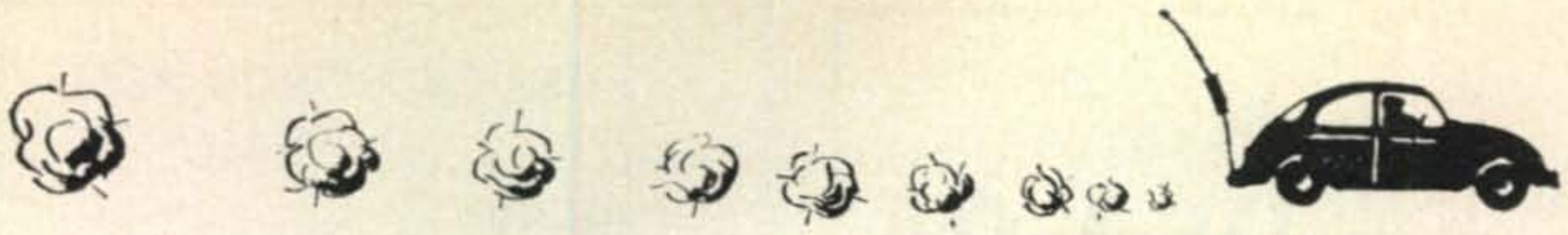
The Rockaway ARC will have a 2 Meter Party on Sunday April 17th from 1200 to 1800 EST. You qualify for a RARC award if you contact 5 or more members. Send reports to Rockaway ARC, P.O. Box 205, Rockaway Park, N.Y. 11694.

The announcement of the B.A.R.T.G. RTTY Contest, March 12/14, was received too late for the March issue. However those that participated can send their logs to: Alan Walmsley, G2HIO, The Woodlands, Bath Lane, Moira, Staffordshire, England.

Also too late for publication was the "Tacoma Loggers Contest." Logs for this one go to: Radio Club of Tacoma, 1249 So. Washington St., Tacoma, Washington.

As we have stated time and time again, announcement of your activities must be received at least 3 months before the date of the contest. Otherwise we cannot give you the proper coverage. And don't always expect me to remind you that you have a contest coming up, have your secretary get on the ball.

73 for now, Frank, W1WY



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the USA-CA PROGRAM

BY ED HOPPER,* W2GT

An interesting letter from WA5AEB about his latest super county expedition after this information on awards issued. Of course, Leo, WA5AEB hit the jackpot with USA-CA-2000 award mixed, and mixed, all 7 mc and all 2 × s.s.b. for USA-CA-1500, USA-CA-1000 and USA-CA-500 awards. Mixed USA-CA-500 awards went to W2SZ, Rensselaer P.I., and Olen, KØITF. USA-CA-500 award endorsed all A-1 went to an old friend, Gil, W4JA and USA-CA-500 award endorsed all A-3 went to Mabel, W6YZV.

County Expedition

Leo, WA5AEB, writes: "Finally had a captive audience to sign my application. WØJWD & K9BLX were stuck with me for 5 days. We just completed a super county expedition from Dallas to Florida and return. Over 1100 contacts, 2700 miles, 6 states and 98 counties. Excellent net controls, high net activity and above average band conditions made it a fine trip. Fellow county hunter W4OHP met us in Tallahassee and he paired with K9BLX to cover the Florida panhandle, while WØJWD and myself covered S.E. Georgia and N.E. Florida. Band conditions were excellent for we never lost them all day. W4OHP, WØJWD, WA9AJF, WA4NBC and myself completed ALL-FLORIDA that day.

"Imagine!!! On a typical Saturday full of QRM, we worked 28 stations in Washington county, Alabama and 27 stations in Choctaw county, Alabama. Strong net controls like K8CIR, K3LXN and K8YGU, along with the many stations on frequency, helped to keep the QRM level down. This is the 3rd multi-day, multi-operator county expedition I've been thru in one year and 'tis quite an experience. Put W4OHP at the mid-point and it is all-the-more enjoyable. We noticed that many new stations checked in, so you are still generating interest. Wish more people would try expeditions, for they are missing more fun than collecting counties. Pick an unusual route, give advance notice with air publicity, enlist or draft strong net control stations like K8CIR, W9ICF and K8YGU and you will have a mixture that can't miss. Even had some 20 and 75 meter people move to 7.223 mc for the trip. (And think they will be back.)

"Ed, on page 104 of my record book are the counties given to the county hunters net. You can pretty well follow my vacations, business territory, and expeditions covered in the past two years. Thanks for lending an ear and I will send you a picture of the group in Tallahassee."

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

USA-CA HONOR ROLL

2000

WA5AEB	26

1500

WA5AEB	45

1000

WA5AEB	94

500

W6YZV	544
W2SZ	545
W4JA	546
WA5AEB	547
KØITF	548

QSO Parties

Goose Bay QSO Party starts at 0001 GMT Friday, April 1 and ends at 2359 GMT Friday, April 15. This gives anyone a good chance for the Worked All Goose award which requires US and Canadians to work 4 members of the Goose Bay Club, others must work 3 members.

Florida QSO Party has three periods: 1400 to 2000 GMT Saturday, April 2; 0000 to 0500 GMT Sunday, April 3 and 1400 to 2400 GMT Sunday, April 3. There are 67 counties in Florida.

Full details on the above QSO Parties appeared in CONTEST CALENDAR by Frank Anzalone, W1WY in March *CQ*.

Letters

Dick, WA2KIZ, QSL manager for W2SZ, writes: "You have here the product of 1½ years effort

Charles Rick, WØJWD, holder of USA-CA-2500 Award #7, USA-CA-2000 #15, USA-CA-1500 #29, USA-CA-1000 #69 and USA-CA-500 Award #376.

SPECIAL USA-CA HONOR ROLL TOP TWENTY-FIVE COUNTY HUNTERS

K9EAB	3079	K8KOM	2500
WØMCX	3079	WØVFE	2410
K8CIR	3064	W8UPH	2368
W9ICF	3050	W9CMC	2368
K5SGJ	2960	WØGYM	2231
K5SGK	2960	K8VSL	2180
WØJWD	2950	W5NXF	2080
K4VOF	2944	W2JWK	2050
WA9AJF	2900	K3LXN	2050
K8IWI	2780	WA5AEB	2049
VE3-9301	2679	K9UTI	2000
WØKZZ	2580	W5EHY	2000
		WA8EZW	2000

ET3USA Achievement Award

The Sun City Award

Mother's Day Certificate

on my part. When I came to Rensselaer P. I. in September 1964, I went through the club's 2500 QSLs and catalogued them. This is not a good showing for 45 years of operation but I found over 500 counties confirmed and spent the next year filling in two copies of the *USA-CA Record Book*. I hope you appreciate it, hi!"

Carl, WØKZZ, writes: "Here is my confirmed total for your honor roll. They come very slowly now, one at a time. Our 7.223 county hunters seem to be reviving and I would also like to see a group on 20 meters and 15 meters. We enjoy your USA-CA section in *CQ*, so very much."

Bill, K3CRC, writes: "It's taken me a long time to qualify for the USA-CA certificate and I will be most happy to receive it. The program certainly is a fine one and I look forward to the County Hunter's Nets—seems like that's all I want to do. I enjoy your column each month in *CQ*—it's the first thing I look at. Keep Up the good work, Ed."

Dick, K6ARE (ex-KA7DR, K1GCX), writes: "I received a letter from JA7CEK (ex-JA6ZD), a personal friend, and an award hunter, about some of his problems.

"One problem has been the Marianas Amateur Radio Club of Guam. He has sent several applications to them (in English) with IRCs for their award but has been unable to get any reply.

"He has received, through the courtesy of a "W" station, a copy of POD 26, but this does not help if "W" stations will not QSL.

"JA7CEK indicated that in 1964 he worked and sent QSLs to approximately 400 "W" stations, but received ONLY 150 QSLs in return. In January 1966, JA7CEK mailed, via the bureau, about 200 QSLs, and in each case this was the 2nd or 3rd QSL to a station that he needs a card from, to help him obtain USA-CA.

"It seems that the "W" hams who work DX, do not realize that a QSO is not complete until it has been confirmed, that he should have an envelope on file at his QSL bureau, or how much the DX station wants and needs the "W" QSL. A lot of the "W" stations scream about the high cost of sending a QSL to a foreign country, but in 99% of the cases the salary of the U.S. ham is several times that of the foreign ham, from whom the U.S. ham EXPECTS a QSL.

"If possible, I'd like to see a comment in your column reflecting that JA7CEK needs QSL cards from U.S. hams that he has worked as JA7CEK and as JA6ZD. QSLs can be sent direct to JA7CEK, Mitsuo Onishi, c/o Coast Guard, 21 Kamihamacho, Tsuchizaki, Akita City, Japan or via J.A.R.L., P.O. Box 377, Tokyo, Japan or via K6ARE, 206 Gregory St., Fairfield, Calif. 94533."

(*Ed:* there was a nice foto of JA7CEK/JA6ZD on page 73 of *CQ*, November 1965. And regarding the problem of not being able to get any action from the Marianas ARC of Guam, space permitting, I will from time to time list any other award sponsors who are so lax.)

The gear that enabled Harry "Smitty" Smith, WA2SAZ, to get USA-CA-500 Award #286 (only 3 such awards ever made) on six meter phone. He is now approaching the 1000 mark. He and Jerry, WB2FEQ, founded the successful National Award Hunters Club.

Awards

WAM, The Worked All Maine award is sponsored by The Portland Amateur Wireless Association. It will be issued to any and all amateur stations submitting confirmations of two way contacts with all sixteen (16) counties in Maine any time after 1201 A.M. EST January 1, 1955. Contacts must be made between one fixed home location and a fixed home station in each Maine county. (Fixed home location may be defined as from home residences, no two of which are more than 25 miles apart.) Portable operation will count only in event of: State of Maine QSO parties, ARRL Field Days, or non residents having fixed seasonal location of 4 weeks or more each year. Mobile operation will NOT count toward WAM award. Confirming QSLs or participating logs for any QSO party will be considered as satisfactory evidence. A seal (one of three) will be placed on the award indicating contacts by c.w., by phone, or combination of both. Applicants will receive additional seal(s)

Worked All Maine (WAM)

5-9/5-9-9 Awards

Paul Bunyon Award

upon producing evidence of additional contacts completed by phone or c.w., as the case may be. Type of seal will be governed by type of transmission used by the applicant. Return postage must accompany QSLs and applications which should be sent to: Marty J. Feeney, Jr., K1OYB, 38 Howard St., Portland, Maine 04101. Your WAM certificate will be honored as credit for 16 counties worked for the Worked All New England Award. *(Ed. note: There had been much discussion about easing the rules on mobiles and portables but this was turned down.)*

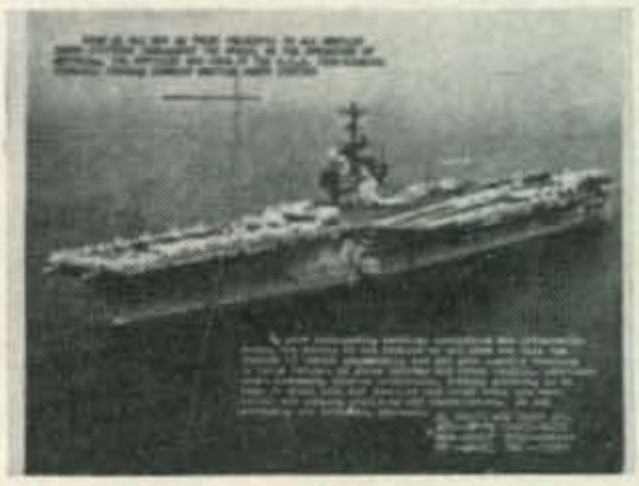
WANE, The Worked All New England award, with rules and photo in *CQ*, July 1965 has a new Certificate Manager: Norman R. Cain, K1SDL, P.O. Box 622, Portsmouth, New Hampshire 03801.

Mother's Day Certificate: In commemoration of Mother's Day, the Grafton Amateur Radio Association of Grafton, West Virginia, where Mother's Day originated in 1909, takes pride in sponsoring the Mother's Day Certificate. Only two contacts with members of the club in good standing are needed. Only contacts after January 1, 1966 count. Send list of stations worked with complete log data plus 50¢ to cover cost. Endorsements for all on one band and/or all one mode are free with initial certificate and 10¢ thereafter. Contacts with club station W8EP also count. Club members: W8NTV; K8s HHV, HUX, KRU, MRX, MYU, OEK, PBD, ZWN, and WA8KAN. CUSTODIAN: David L. Mays, K8MYU, RFD #1, Box 58-A, Philippi, West Virginia 26416.

ET3USA Achievement Award: Will be awarded by the Kagnew Station Amateur Radio Club to amateur radio operators and s.w.l.s all over the world, for working various Ethiopian stations (prefixes of ET3, 9E3 or 9F3) and different operators of Ethiopian club station ET3USA, 9E3USA or 9F3USA, when operating either fixed or portable. One point is achieved for each different Ethiopian station worked and one point for each different club operator contacted. Basic award is issued for 3 points and endorsement seals, up to a total of 8, issued for each additional 2 points accumulated. Special mode and/or band endorsement recorded only at time basic application is processed. QSL cards need not be forwarded. Log extracts, certified by radio club officer or two licensed amateurs is acceptable. Same station, when contacted on a different band, counts as a separate contact. You may not work more than one club station operator on the same day on the same band, but a different operator on a different band is acceptable. Forward certified list showing calls, bands, names of operators, etc. Only GMT times acceptable. Award is issued on basis of points accumulated for contacts commencing 1 January 1965. Fee: US $1.00 or 10 IRCs for basic certificate; SASE or SAE and 1 IRC for endorsement seals. Specific queries relative this award answered on receipt of SASE or SAE and 1 IRC. Apply to Custodian: Albert L. Kemmesies, K1QHP/1, Hq Co, USASATC&S, Box 643, Fort Devens, Mass., 01433, USA.

USS Independence (CVA-62) Award for outstanding service, assistance and cooperation was presented to about 300 hams but it is felt that some deserving hams have been overlooked. While enroute to a tour of duty in Viet Nam, WØFPA/mm was permitted to operate from 10 May to 5 June 1965, during this period 1,023 phone patches and messages were handled by U.S. amateurs. On the homeward trip from 21 November to 13 December 1965, 818 phone patches and messages were handled. Of this amount about 50 were in direct reply to an emergency message, such as to illness or death. The morale factor of this traffic is unmeasurable. Any station that handled any message or phone patch is entitled to this award. If the award has not been received, send a QSL to: Donald Schenewerk, WØFPA, Lt. USN, 728 Fox Run Road, Virginia Beach, Virginia. Operators on the trip were, Don, WØFPA, Bob, W9HJP, OB, W4HXJ, Chris, K4SIS, Bill, WB4ASB and Ike, K3SKB.

[*Continued on page 106*]



USS Independence Award

SPACE COMMUNICATIONS

BY GEORGE JACOBS,* W3ASK

At the end of February, OSCAR-4 continued to circle the earth in its highly elliptical orbit, with very little change from the previous month. Losing approximately seven seconds a day, the satellite was orbiting the earth every 577 minutes at the end of the month, and its altitude varied between approximately 100 and 20,000 miles, at an inclination of 26.73 degrees.

The electronic switch aboard OSCAR-4, which was intended to control the on-off cycle of the beacon transmitter, is still not functioning. As a result, the beacon transmitter on 431.928 mc operates almost continuously, and is blocking the translator for all but a few seconds every minute, or so.

Reception of the beacon transmitter was reported from all areas of the world during February, but only a single two-way contact was reported to have taken place through the translator. This was a QSO between K1LSY/6 and W6YK, which brings the total number of reported two-ways to seven. See last month's column for a listing of the other six.

The input passband to the transistor remains at 144.095-144.105 mc, centered on 144.1 mc. The translator's output has stabilized between a passband of 431.933-431.943, centered on 431.-938 mc. Due to the interference being caused in the translator's passband from the "run-away" beacon transmitter, Project OSCAR Headquarters points out that the best chance for a two-way QSO through the satellite is to use c.w. or f.s.k., as close to the *higher* end of the passband as possible.

The OSCAR-4 satellite is expected to remain in operation for at least several more months. Despite its malfunctioning switch, the satellite is providing useful data and can be used for communication between radio amateurs, if one is skillful and patient. Project OSCAR urges that as many radio amateurs in as many areas of the world as possible, participate in the OSCAR-4 experiment, as long as the satellite continues to function. Reports of reception of the beacon transmitter, as well as reports of two-way communications through the satellite, should be sent as soon as possible directly to Project OSCAR Headquarters, Foothill College, Los Altos Hills, California.

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

Project OSCAR Headquarters continues to provide orbital data for OSCAR-4 through station W6EE. OSCAR bulletins are transmitted every Thursday on ssb on 3935, 7235 and 14235 kc at 0400 GMT; on c.w. on 3507.5, 7015 and 14030 kc at 0415 GMT, and on RTTY on 3625, 7040 and 14090 at 0445 GMT. *Remember*, these times fall on Wednesday evening in the USA. OSCAR information is also carried nightly by W1AW on its regular bulletin schedule.

OSCAR-5

It's still too early to say for sure when the next OSCAR satellite may be launched, or what type of satellite may be launched, or what type of satellite it may be. However, plans for an OSCAR-5 satellite are well on their way, and fingers are crossed for a fall launching.

As part of the project's program to spread the work on future OSCAR satellites around to as many groups of radio amateurs as possible, work on what may eventually becime OSCAR-5 is presently taking place in at least three fairly wide spread places, California, Minnesota and Germany.

In California, Project OSCAR Headquarters could finish on rather short notice, a three-beacon satellite which was originally planned as the back-up for the translator satellite which was successfully launched as OSCAR-4. The California-built satellite would contain a beacon in each of the amateur 2 meter, 432 mc and 1296 mc bands. It would not contain a translator.

A 2 meter translator satellite, similar in design to OSCAR-3, is now in the final stage of assembly in Germany. The satellite, called OSCAR-EUROPA, is being built for Project OSCAR under the auspices of Region 1 of the International Amateur Radio Union (IARU). G3HRH, G2AIW, DL1LS and DJ4ZC have been appointed project coordinators for the IARU, and the satellite is being assembled at DL4ZC's QTH.

In Minnesota, two groups of radio amateurs have taken on design and construction projects for what may eventually become OSCAR-5. A solid-state, 1 watt output, radiation protected 2 meter satellite transmitter has been designed and built in Minneapolis by WØZBM and WØLER. In Rochester, a group consisting of WØUED, KØMHC, WØZUN, Donald Brouillard and Jeary Vogt, have designed and constructed a solid-state eight channel telemetry unit for OSCAR service. The unit has been designed to provide a future OSCAR satellite with the most accurate data acquisition system ever used with a radio amateur satellite.

It appears as if a race is on to see whose satellite will become OSCAR-5. This is a healthy race, and one from which amateur ralio will benefit. From this race will not only emerge OSCAR-5, but a family of radio amateur satellites which will be available for future launches as well.

LUNA-9

LUNA-9 was launched by the USSR on

[*Continued on page 104*]

NOVICE

WALTER G. BURDINE,* W8ZCV

JUST as an experiment I decided to run a column of material collected from amateurs of other countries to try to show the differences in our laws, regulations and customs. I have had many comments about the letters printed in the column from other countries, and figured we might learn many things from those in other lands. I believe this will help our international friendships and do much for our understanding of the other ham, his problems, the reasons for his hobby being important to him and to us. I have two other countries in mind, and I am working on the project, if this goes over well. After all, ham radio is international friendship and understanding. Now we shall try to catch up with all of the news as we received it in the mails.

Angus G. Pearson, W5MPE, 207 East 34th Street, Austin, Texas sends along this information about the Esperanto language as mentioned in a letter from SM5DAD. He thinks it would be a major service to amateur radio if *CQ* would print an article on the Esperanto international language.

Esperanto is very easy to learn. The grammar consists of 16 very simple rules which could be written on a postcard. The vocabularly is based on roots which occur in most western languages and incorporates a system of prefixes and suffixes which makes it possible to derive about a dozen words from a single root. A few hours of study makes it possible to write letters in Esperanto. The pronunciation is easy and regular. There are no irregular verbs, and in fact the grammar of verbs can be learned in a couple of minutes. In short, Esperanto is ideally suited to international Communication via ham radio, besides being fun to learn.

Hams interested in learning more about Esperanto may write to: The Esperanto League for North America, Inc., 808 Stewart Street, Meadville, Pennsylvania.

So, there you have it. I remember reading about Esperanto when it was first started but at that time I knew nothing about who was behind the movement. Learning an international language might help the cause of world peace. Thanks Angus.

Nets

George Wilkinson, W8CEZ, Hillsboro, Ohio sends along this list of nets operating in South Central Ohio. They are: The Rocky Fork Net at 50.7 mc at 08:00 EST each Sunday morning. The Clermont County Net at 50.850 mc at 2100 EST Sunday. The Clinton County Net at 50.7 mc at 20:30 EST Monday evening. The Highland Navy MARS Net at 49.692 mc at 20:00 EST on Wednesday. The Clermont-Brown Navy Net at 49.692 mc at 19:00 EST on Friday. If you want to join these nets you might get in touch with George.

A Good Deal at the ARRL Roanoke Convention

Garland M. "Pappy" Bates, W4ZZV, 2401 Pennsylvania Ave. N.W., Roanoke, Virginia writes this little note: "The coming convention will have a Home Brew session along with the ideas of your plugs for homebrew equipment. Joe, W4IMP, 4318 Hanover Avenue, Richmond, Virginia will be the session leader. Those interested might write Joe. The convention will be held in May so plenty of time is available to have the pet project ready for display."

I think this is a real good idea, we should have it at all the conventions and hamfests. It might help bring back the idea of building some of our own equipment. Along with this idea is the following note from Howard S. Pyle, W7OE, Mercer Island, Washington.

"Those interested in low-power might like to join the QRP club. The club does *not* advocate a reduction in legal power limits now imposed by our own FCC or any other governments. It is composed of hams running 100 watts or less power. This of course makes it a natural for the novice operator.

Life membership costs $1.00 sent to F. E. Behrman, K7LNS, 3425 S.E. King Road, Milwaukee, Oregon. 99222."

Also, along with the homebrew idea came the note that Howard's new book on amateur radio construction will be on the bookshelves in about 45 days. This looks like one of those books that every ham will need.

Keep It Neat

I just happened to pick up one of those aluminum trays that had been used to hold a Swanson's

George Wilkinson, W8CEZ, R.F.D. #6, Hillsboro says Ham radio is the nicest hobby that he knows of and besides it is good for the country. George is a Navy MARS member with the call NØYBM. He has been licensed for ten years and operates both 6 and 2 meters.

*R.F.D. 3, Waynesville, Ohio 45068.

TV dinner the other day while building one of my pet projects. I found they were very nice for holding all of the small parts that usually clutter up the bench when building or repairing radio equipment. The tray has four compartments but others have three and can be used for larger parts. They would be nice to use when repairing radio or television sets. One will hold most of the knobs, mounting screws, tubes and other small parts removed from the set. I haven't put one in the garbage since using the first one. Try it, you will see what I mean.

E. G. Taylor, "Ev", K7YSE, sends along a petition as sent to the Federal Communications Commission asking that single side band suppressed carrier transmissions be permitted on the frequencies 50.05 to 54 mc. The petition will read: "add the following: A3a and A3b from 50.05 to 54 mhz. This petition further requests that a.m. stations be restricted to frequencies above 50.1 mhz." *(ed. note: mhz is the newest term used to express megacycles.)* This petition was sent by Everett G. Taylor and Jerry M. Du Bois. They have the good of the amateur at heart.

Letters to the Editor

The YLs have the floor today, or rather their reps sent these letters. Dennis Silage, WB2LGJ, 62 Hancock Street, Trenton, New Jersey 08611 sends this nice letter. "Dear Walt: I tried to get a picture of my sister last year when she got her Novice license, but unfortunately I never got around to it. Now I have one which I hope you can use in the NOVICE column in *CQ*. *(ed. note: Dennis, don't forget this is the Novice and Technician column.)*

"Her name is Victoria, but don't ever call her that, it's Vicki to all of her friends. Vicki is fifteen years old and a sophomore in high school. She is a reporter on the school newspaper.

"The rig is a Heath Seneca, with a Lafayette HE-30 receiver, Ameco nuvistor converters for 6 and 2 meters. The antennas are a five element Cush-Craft for 6 meters and an 11 element Cush-Craft for 2 meters up in the air 55 feet. Vicki's total for states is 12 confirmed, and this is not too bad considering that operating time is limited for her. The reason is that her dad, Al, WB2-UIM, and her brother, Dennis, WB4LGJ, hog the rig. Vicki prefers ragchewing, but prefers those her own age. She is a ragchewer. Vicki is taking a secretarial course with courses in IBM programming and hopes to do this type of work after graduation, her call is WB2PWI. She is a swell sister. 73. Dennis."

My gosh I'm glad you took the time to write and send a picture, Dennis and I hope to work all three of your ham family soon. I could use more letters and PICTURES from either Novices or Technicians, this column is for both. Get to it, fellows and gals.

The following is part of a letter from Keith E. Lamonica, W6CVU, 102 North Fulton, Fresno, California. 93701. Keith is 23 and says

Judy Lamonica, WN6RWR, 102 North Fulton, Fresno, California, is in college and worked 5 countries her first day on the air. She built her own transmitter. Watch for her on the air.

he has been licensed for quite a while. He has Amateur Extra license.

"Dear Walt: My main reason for writing is to tell you of a new Novice in our family. My XYL, Judy just received her Novice license WN6RWR. She is on the air with a 6146 rig she built herself, an SX-117 receiver and verticals for 80/40 and a 3 element beam for 15 meters. Judy says her main interest is DX—boy do I agree. . . . Today, her first day on the air she has worked 5 countries: KZ5, XE2, VE3, W9, and an OA4. One thing I am really proud of is the fact that Judy decided to get her Novice license and sat down and really studied, it took her only two weeks to get the theory and get her code speed to 10 w.p.m. I'm not bragging for her, Walt, it's just that so many people think it is so hard to get the ticket and give up the test before they really try. . . . I hope you see what I mean.

You probably wonder why I am writing this letter instead of Judy—well she is in there trying to work some more DX. Well after the delicious dinner I prepared, all the housework, feeding the dog and doing the . . . Just KIDDING . . .

"I am quite active in the Novice bands, or at least I used to be, I look forward to hearing from everyone.

"I work as a disc Jockey and engineer at KMAK radio and we both are in college. All the best, Walt, and keep up the good work. 73. Keith, W6CVU and Judy, WN6RWR."

Thanks, Keith, for writing the letter and for all the nice words about the column. I will try to do the job well enough to merit them. I can surely use some help from all my readers and many pictures of Novices, Technicians, rigs, circuits and homebuilt equipment. I would appreciate hearing from a ham in Germany, France, Italy, Belgium and Czechoslovakia who would like to have a penpal in an exotic island country. YL hams from these countries may also write.

"Dear Walt: I think that you should have a section in the magazine where amateurs can write in and tell what kind of rigs they have, and describe their antennas and tell what they are working with the set up they have. Any other little news would be appreciated. I think this would be an enjoyable section to read. I know that you have some but not enough, possibly 10 or more

Vicki Silage, WB2PWI, 62 Hancock Street, Trenton, New Jersey, 08611 has confirmed 12 states despite the fact that she has to share operating time at the rig with her father and brother. She hopes to be a computer programmer when she finishes school.

from Novices and Generals, just to see what others are doing.

"SO, I will start the ball rolling. My call is WN6PYE, Scott Warwick, 14662 Tustin Street, Sherman Oaks, California 91403. My rig is an SX-140 and an HT-40 running 75 watts. They feed a Hy-Gain 2BQD trap dipole for 40 and 80 meters.

"I started my rig going in July 1965 at the time I was portable 7 in Harrington, Washington using an NC-121 and an Eico 723 to a 40 meter dipole. I now have 23 states, 3 Canadian provinces, 52 QSLs and 182 enjoyable QSOs. I enjoy rag-chewing as long as possible. I am 15 years old and attend Van Nuys High School. If anyone needs California for a new state or a rag-chew, I will be glad to help. At present I am working like a dog to get that General. 73. Scott."

Well, I did get some mail this month from a new country, my 48th country since becoming your reporter.

"Dear Walter: I am a regular reader of *CQ* especially the NOVICE Column. I am a radio amateur down here but unfortunately I am not very active. I do hope to be on more often before long after a fairly long layoff.

"I am 21 years of age, a teacher of Physics in one of the leading secondary schools in Trinidad. I am an amateur astronomer and hope to go into radio astronomy after graduation from the university where I hope to do a degree in electronic engineering.

"I collect stamps, read both scientific and non-scientific books, play chess, lawn and table tennis, swim and lift weights. I will try to get on the air more often and work more Novices. I hope to work you soon on the air. 73."

This letter was from R. Rampersad, 9Y4EH, 51 Moody-Stuart Street, San Fernando, Trinidad, West Indies. I would like to work him and would be glad to receive the other information from him for our column. This way we can better understand our neighbors. Thanks a lot, look for me on 15 and 20 s.s.b. or a.m.

I just have to include this letter from Arthur Henry Hallum, W8CLQ, 106 Burgess Street, Princeton, West Virginia 24740 because it has a message for all.

Dear Sir: First of all, I would like to compliment you on the fine job you're doing in your Column to help the newer hams. Your presenting of radio theory, both academic and application to specific projects, along with your comments and your readers comments on ham radio all demonstrate to the new-comer the basic purpose of the amateur radio service. (Notice, I said service and not hobby.)

"Specifically, I would like to express my 100% agreement with the letter sent in by W5ATT/2. (December 65, *CQ*.) When the radio amateur service degenerates to the point that another leading amateur magazine was featuring a column entitled, "Home Built Stations"; something is wrong. Almost everyone you QSO today, especially among calls issued after 1952, is using a bought transceiver, a bought linear, a bought tri-band beam, a bought crank-up tower and a bought electronic keyer.

"I have one such acquaintance who is presently on six meters and is always talking about how good the two meter band is. When I asked him why, then, didn't he get on two, he replied, "Because there isn't any commercial equipment available for two." The thought of building his own was simply not in the question.

"This kind of stuff is not ham radio; it's citizen-and radio. 73. Art."

The column does help some one once in a while as is shown by the following letter from Robert B. Harrell, K4OLQ, 1400 Lawrenceville Road, Apt. E, Decatur, Alabama. Bob is 21, has been licensed since 1957 and says next to DX the NOVICE Column is his favorite *CQ* feature. He would like to hear from apartment dwellers and compare antenna notes. *(ed. note; I will pass along any dope on antennas that I receive along this line as I'm sure many hams are faced with problems of this kind.)*

"Dear Walt: Your antenna tuner in June *CQ* was all I needed to get back on the air after a lay-off of some three years. I would sneak out at night and put up a long wire and work 40 c.w. during the dark hours. Later I was able, after some tests, to convince the management to let me put up a dipole. As I live in an apartment complex I must use QRP and 40 c.w. has been my band. In the past two months when I wasn't studying at Emory University, I have pounded out over 200 enjoyable QSOs with 20 of them being California and 32 other states. As for DX I have CO5, HK4, KP4, FP8, and VE2. All of this has been worked with a VF-1/AT-1 combination running 30 watts and receiving with a PMR-6A into a BC-453 Q-5er. I hope after graduation to locate where I can use my DX-100 and add some stickers to my DXCC. Again thanks, Walt and 73. Bob."

That just about winds it up for this month, so, good DX and let's build something for the station.

73. Walt, W8ZCV

THE VHF COLUMN

BY BOB BROWN, K2ZSQ
AND ALLEN KATZ, K2UYH*

EVERETT Taylor, W7BYF/K7YSE, of Scottsdale, Arizona, perhaps better known previously as W8NAF, has petitioned the FCC for reallocation of the six meter band to provide legitimate s.s.b. communications in the present c.w. subband, 50.0-50.1 mc. He contends that due to inherent characteristics of available 50 mc receiving equipment, s.s.b. stations are suffering greatly, often from QRM caused by 6-meter a.m. operators. Additionally Taylor feels that were a s.s.b. subband established, lower frequency stations would make the move to the frequencies above 50 mc. Finally, he concludes that his own observations have shown that the first 100 kc are not utilized fully now, and that the advent of s.s.b. would enhance the segment immensely.

This is food for thought. Perhaps Taylor is right; there might be benefits yet unimagined resulting from such a rule-making by the FCC. Or perhaps this would primarily relieve the QRM sidebanders complain of from a.m.'ers, making long-haul DX a bit easier.

The writers, however, do not subscribe to this theory. One of the most significant factors in the incentive licensing controversy was the further extension of segregation on the v.h.f. bands, e.g., so many kc's for you, so many kc's for me. Ham radio has so many cliques and exclusive groups now that we're finding unification almost impossible.

We don't agree either that a.m. stations are severely detrimental to s.s.b.'ers any more than sideband is to a.m. Furthermore the c.w. segment, at least in our opinion, is growing in its utilization and could be set back five years if such a rash move was made. Avid six meter enthusiasts know that during aurora sessions activity in that segment is high, to say the least. Making QSO's is often difficult, even for the skilled, without adding to the confusion by dropping in a few thousand s.s.b. stations.

In conclusion, may we remind Mr. Taylor that in a few years the sunspot cycle will again be at a high peak, with the m.u.f. hitting above 50 mc quite frequently. To destroy the DX effectiveness of c.w. in an era when few U.S. amateurs with v.h.f. equipment can recall QSO's with JA1's and ZL4's, can only mean one thing: That we have declined into the transceiver commercialism of the lower frequencies in grand style and feel that in push-to-talk v.o.x. operation lies our only potential for the years to come.

When a Docket number is assigned to this proposal, Taylor adds, amateurs are invited to write the FCC with their comments. We hope you will.

*c/o Allen Katz, K2UYH, 48 Cumberland Avenue, Verona, New Jersey, 07462.

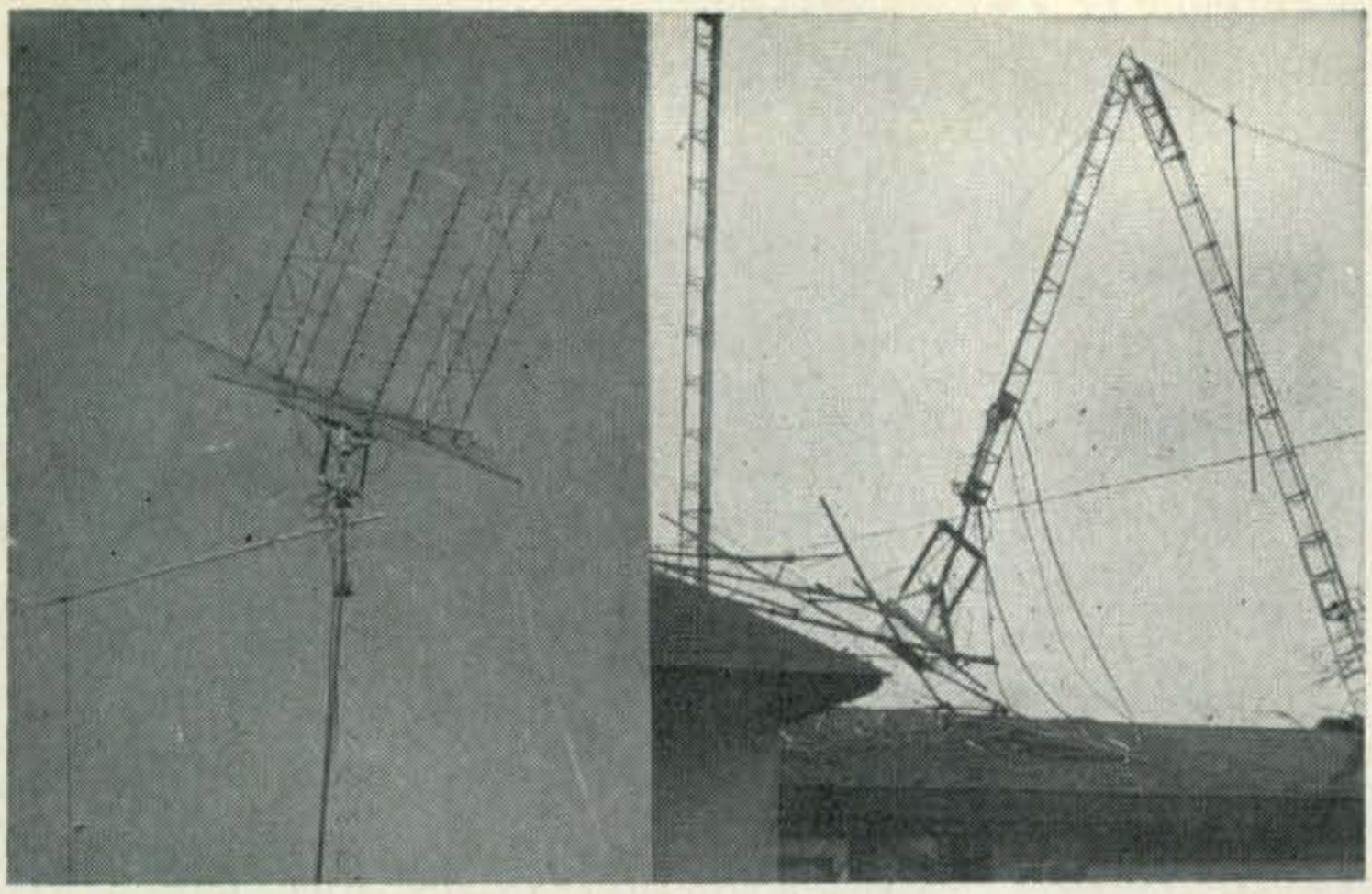
Can You Last 12 Hours?

Sure you can. Just remember to fire up the rig for the bash on Saturday, May 7th at 9 A.M. Club aggregates, Novices—all are urged to participate for the high honors roll. See you in the *CQ* 12-Hour V.H.F. Contest!

From The Mailbag

Oscar IV is still up and still running! Thus its *use* should be of prime interest to any "operational" v.h.f. station. The man who appears to have done the most with Oscar IV comes to us through a most informative letter, the text of which follows:

Here's a panoramic view of W3MFY's shack in Trevose, Pa. Responsible for Mt. Airy V.H.F. Society's winning the last contest (if you look close you can see Pres holding it), station breakdown is as follows: 6 meters, 1 killowatt to an 11-el. 36' Telrex, receiver SS1R; 2 meters, 350 watts to 15-el.; 220 mc, 40 watts to an 8/8 "J" beam; 432 mc 125 watts to 8/8 "J". Actual operation is all bands, 160 on up. Even tinkers with 432 ham TV! The picture above is the rather crude result of pasting two Polaroids end-to-end, but the shack is still impressive.



Like a reverse TV commercial, this shows WA2WEB's (East Coast V.H.F. Society) Oscar tracking antenna, before and after.

Bill, W6YK, Camarillo, California: "This is to report another two-way QSO via Oscar IV, on orbit 96 at 1455 to 1505 GMT on January 29, 1966, between W6YK and K1LSY/6 (also of Camarillo, Calif.), and to describe a technique whereby QSO's can be made through Oscar IV.

"For sometime now we have realized that Oscar IV can be "captured" and switched over from the beacon, where it usually stays, to the translator—and that it can be kept there—for varying lengths of time—if a 2 meter carrier strength above its threshold is maintained at the satellite. This has sometimes been done for minutes at a time.

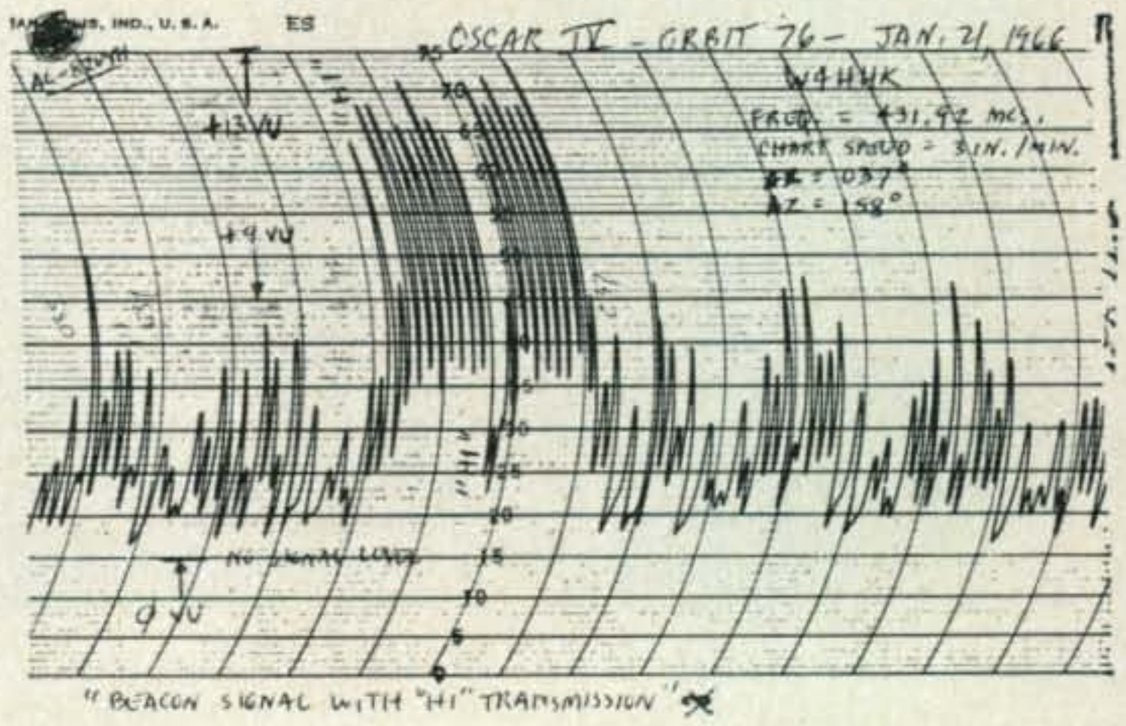
"A number of stations have therefore gone to f.s.k. (which I think was first suggested by Hank W6GXN, as a possible way to use Oscar IV since A1 seldom works now) hoping to hold capture long enough to QSO. W4WNH and W4AWS had a near miss on Orbit #61 copying each other's calls but failing to hold capture long enough to get signal reports thru, reporting very strong signals for about 10 minutes. W4WNH being setup so that he can hear his own signals repeated back to him.

"K1LSY/6, Joe Shepard, has done a lot of work on calculating the probable orbit of O4 and subsequent work actually tracking the satellite to confirm his figures. He has put in a great amount of time making tape recordings during which he has gotten some beautifully loud, and solid, repeats of his own, W6YK's and other signals. He has been using cascaded tuned cavities ahead of his Parks Converter with, usually, a 32 element expanded collinear receiving antenna. He has been using two receivers off the one converter so that he can listen simultaneously to the beacon frequency and the translator frequency band. Unquestionably this duplexer monitoring of his own and other signals is of immense value—when he hears his own sigs loud and solid (and even with f.s.k. a letter will still drop out now and then even when sigs are very strong!) he can be reasonably sure that others can also read him, and he can immediately turn it over to the other station while the translator is hot. However, even without this beautiful tool, it is possible to QSO by using f.s.k. in a way which maximizes the chance of retaining capture of the O4 translator. This involves making a sked to be run on a strict time basis with clocks synchronized to WWV.

"One station transmits during the first 30 seconds of each minute and the second station transmits during the last 30 seconds of each minute. Both use (high power) continuous carrier and frequency shift keying, shifting from 2 to 4 kc between key-up and key-down conditions, centered around 144.100 mc. More shift makes it a little more difficult to quickly determine which signal is saying something, and which is the senseless "backwave". It would help if everybody would shift "down" with key closed since you would always know which of the two signals to concentrate on (usually rapidly twinkling). It is well to remember also to track the doppler shift without getting fouled up with the backwave. (On the W6YK/K1LSY/6 QSO, the signal out of the translator went from 431.936 to 431.933 during the QSO.)

"To continue:

"1. Each station comes on 5 seconds before his scheduled transmit period with his *key-down* holding for 15 seconds. This helps to maintain the capture of the translator and allows the other operator to tune in the signal, which will carry the QSO information, before starting to transmit code groups!



W4HHK's pen recording of Oscar IV's beacon on orbit 76, January 21st. Strip shows a couple of HI's being sent and amplitude variation.

"2. Call once and sign once, over and over, as fast as the other fellow can copy. If you have heard the other fellows signals add RS# to the call and sign.

"Incidentally, meant to tell them we have been getting the passes at predicted 1300 (+) GMT and 275° W to 221° W very well, but at about an hour and a half of predicted perigee it bursts over horizon—we don't understand why but think the prediction times (crossings) may be too early.

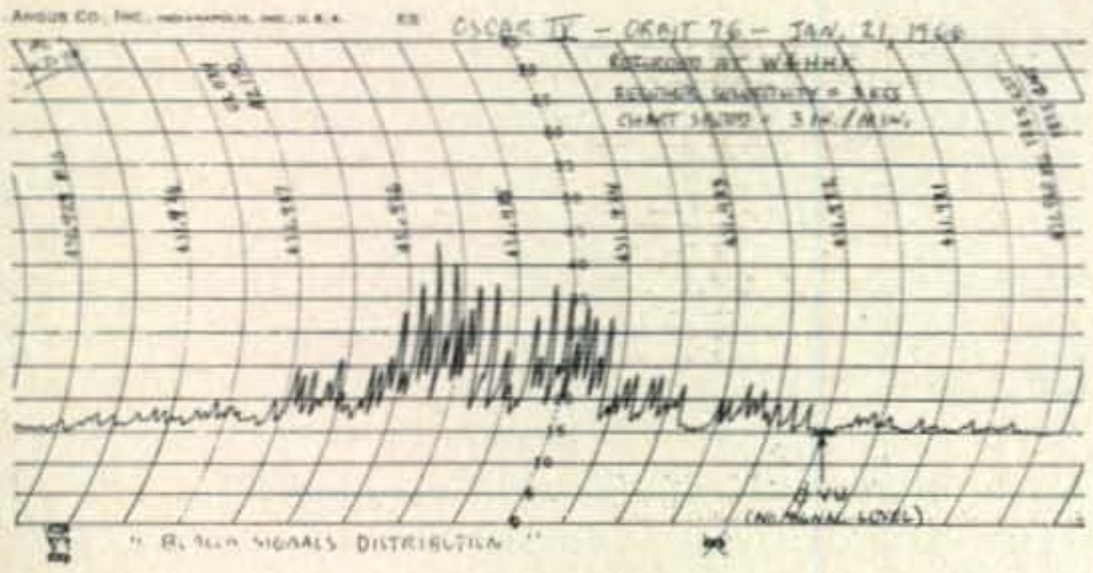
"3. When you have heard other fellows signal report to you, send over and over "QSL RS#" during your 30 second period. (This is a QSL to his sig report to you and a RS# from you to him).

"4. If you did not copy the other fellow's signal report to you, send over and over 'QRK? RS#.' If you copied his QSL to you, send only 'QRK?' for the 30 sec. period.

"This may sound a little far-fetched, but believe me, time is of the essence and considering the condition in which we now find Oscar IV circuitry, this kind of a procedure is necessary to get a QSO. Apparently the voltage regulation of the power supply is extremely poor and its time constant is such that the poor lost soul has a hard time switching from an *on to off to on* condition and crys piteously when required to do so! This is apparent on both the beacon and translator keying. Many times, on both, it is heard stuttering or chattering and not quite making the transition. (W4WNH, however, reported that—on Orbit #81 I think—the best signal he heard was an A1 signal.) Its frequency excursions during turn *on* makes it hard to copy even when it has dropped or lost very little.

"Both W4WNH and K1LSY have tracked O4 from its appearance over the western horizon to its disappearance in the South Atlantic and reported being able to capture the Translator for brief times throughout its travel with longer periods near the horizons when the signals have terrific strength—probably due to two-way ground reflection enhancement.

"This is what I reported occurred on the afternoon of Dec. 21 when I heard W6QJW with tremendous strength then lost him—and heard strong to fading signals from K5LCU? after that—as I reported in my previous report to Oscar Hdqtrs.



W4HHK's recording of Oscar IV's beacon signal's distribution, as checked on orbit 76. Graph was made by increasing receiver tuning 1 kc every 20 seconds. What you see is a "spectrum" look at the beacon.

Inside the tower, K4EJQ prepares for another go at the contest last year. In addition to no complaint of "lack of activity" he reports that TV reception can't be beat. Elevation reported to be of 4300 feet.

"Now—I had made skeds with G3LTF, ZS1SW, 9M2TC, JA1BIR, VK3ATN, and W4AWS for the first 'orbit which was to be'— based on the best rumors I could gather prior to launch. I have received reports from G3LTF, ZS1SW, and VK3ATN as follows: G3LTF, he first heard O4 on 23 Dec by 'random' listening with RX set to the beacon channel—he then tracked it each day until Jan 1 '66 when he had to return to work. His most interesting sessions were: 12-24-65 Heard OK2WCG, WA2WEB, DL9AR. 12-24-65 Called by OK2WCG after G3LTF had CQ'ed. 12-29-65 Near QSO with SM7OSC—didn't get all of his report unfortunately, heard DL9AR. 12-30-65 heard DL9AR. 12-31-65 heard, very clearly, K2MWA calling CQ, DL9AR. 1-1-66 heard DL9AR.

"He was told he had been heard by K2MWA, DL3-YBA, OH2DV, SM7OSC and OK2WCG.

"By the way, the signal in the translator band which I reported soon after activation as someone testing or the beacon moved over—probably was W4WNH moving his frequency in 1 kc steps to see how wide the pass-band really was! Hi.

"G3LTF tried using his 10 plus 10 el. crossed yagi on some days circularly polarized but very little improvement over the single 10 el. horizontal polarized. Peak sigs were 25/30 db above noise in a 500 c.p.s. band, using a 15' dish and a parametric amplifier—when the dish would not track far enough he used either his 72 el. or 24 el. stacks.

"ZS1SW reported the beacon the afternoon following launch and again the following night with fair signal strength.

"VK3ATN says (from vacation) that he was reported heard several times by other VK's but no QSO's.

"In an hour's time we figure the thing covered 107° long. up to 26° N lat. and back down to about 22° N lat. and climbed up to about 7000 miles north. For the next 8 hours it changes only about 5° long. while going to about 22° S lat. After this it gives like hell thru 26° S lat. and another 107° long. and back to 0° lat., a next perigee."

Pres Funk, W3MFY, Trevose, Pa.: . . . "As to your question of calls, some of the active ham TV stations in this area are K3UJD, W3DYQ, W3KMH, W3JNC and W3CJU. This is all that I am sure of at the present time . . ."

". . . Hope you can use picture enclosed. Believe you can match these two up as a panoramic view of the shack."

Thirty

Please keep those letters coming in, particularly if you are doing serious work on the bands above 50 mc. Reminder to May contesters: Don't forget to bring along your camera. 73, Bob, K2ZSQ & Allen, K2UYH

RTTY

BYRON H. KRETZMAN,* W2JTP

RTTY Operating Frequencies

Nets centered on frequencies given; operation usually ± 10 kc on h.f.

80 meters	3620 kc
40 meters	7040 kc
40 meters (narrow shift)	7140 kc
20 meters	14,090 kc
15 meters	21,090 kc
6 meters	52.60 mc
2 meters	146.70 mc

GETTING started in radioteletype is always something difficult to advise upon. Naturally, we are concerned with the interested radio amateur's motivation. Why does he want to get on RTTY? Invariably the answer is that he is just plain tired of the rat-race on the h.f. 'phone bands, and suddenly he realizes that the conversations on s.s.b. are completely inane. Most of these operators are using store-bought equipment so circuitry is no longer a topic of discussion. What is there to be learned, then? Has amateur radio become just a means of yaking with other people who have nothing better to do, and the money necessary to purchase the shiny sets?

If amateur radio was to be judged solely upon what is usually heard on 75 and 20 meter 'phone there would be little justification for us to retain our bands. Fortunately, there still exists a hard core of radio amateurs who still want to learn, to learn by doing and to learn by discussion about what they are doing, discussion with others with similar motives. This is where RTTY comes in. RTTY is still a challenge; the last frontier of amateur radio. The appliance operator cannot go into his favorite chrome-plate radio store, buy all the necessary "shiny boxes," go home and plug them all together with pre-fabricated cables, sit down at the keyboard, and be *on RTTY*. Thank God a little "systems engineering" (plain ham ingenuity) is still necessary.

The Essential Elements

Now, for the fellow who wants to get started, let us look at some of the essential elements of an RTTY operation. First of all, we must warn all those anxious to jump into the pool that the water is not soft. Some real honest effort, first of all to learn why and how, then to *build*, is required. You will get help from the active RTTYer, but he won't build it or connect it for you. So, assuming that the start takes place on the h.f. bands, let us see what is needed:

The Bands: 80 meters is the best bet for the newcomer. Activity is good from about 3610 to about 3640 kc and you will find fellows on even in the daytime, during week-ends. 40 meters is not recommended because of the limited activity and the split in operating segments. 7040 is useless in the east and midwest because of the heavy c.w. and foreign b.c. QRM. 7140 is used mostly for narrow shift, a more advanced form of RTTY. The second best bet, of course, is 20 meters, from about 14,080 to 14,100 kc. Activity is good and there is DX available without pileups. 15 meters is not recommended for the newcomer because of the limited time this band is open and the limited activity. It should be remembered, too, that stability (of both receiver and transmitter) comes easier on the lowest frequency.

The Receiver: A good stable receiver is a necessity. If you already have an SX-101, or a receiver in that class, you are in business. Just make sure you set the b.f.o. 2550-cycles off the center of the i.f. The "cheapy" receivers are seldom stable enough for RTTY reception, so if money is a problem we suggest you put together a combination of the surplus BC-453 "command set" receiver with simple crystal-controlled converters for the bands in which you are interested. This will result in as stable, as selective, and as sensitive (for this purpose) as anything you can buy.

The Transmitter: Actually, the significant part of sending RTTY is the v.f.o. (Most all of the chrome-plate transmitters available have no provision for frequency-shift-keying.) It must be stable, it must be easy to set the shift, and it must have enough output to properly drive the associated transmitter. You cannot buy a v.f.o. with f.s.k. built in—you will have to modify it, or better yet, build it from scratch. It is *not* recommended that you modify one of those chrome-plated s.s.b. transceivers for RTTY. Most of these, and their companion chrome-plated linear amplifiers, were not designed for continuous key-down operation, so you could ruin them by trying to use them on RTTY. The best bet is the good old-fashioned Class-C r.f. amplifier, which incidentally will give you much greater efficiency than any linear amplifier. (Read the HAM SHOP, plenty of big transmitters, home-brewed years ago, are available now at low prices.)

The TU: The receiving converter, or Terminal Unit as we call it (some newcomers use the term "demodulator"), can be bought for about $200 to $550, but you can build a simple TU from scratch for about $35 worth of parts. Just remember, you won't learn anything if you don't build it. Oldtimers are still searching for the "ultimate" TU design, but in the meantime,

*431 Woodbury Road, Huntington, N. Y. 11743.

YL

LOUISA B. SANDO,* W5RZJ

How splendid—another new YL club to report; From WA8ARJ, Bobby, comes word that the Michigan YLs have formed a club known as "TASYLS" (The Auto State Young Ladies). Officers for 1966 are: Pres., WA8ENW, Thelma; V.P., K8VCB, Betty; secy, WA8CTE, Mary; treas., WA8ARJ, Bobby. The officers and board members met on Dec. 7, '65 at QTH of K8ZJU, followed by luncheon at Clinton Inn, Greenfield Village, as guests of the Curator, Communications Div., Henry Ford Museum. Others attending were K8IAI, WA8-CXF, WA8LMR and WA8HYL. TASYLS will be issuing a certificate; more information on this later.

VE3BII

Winner of the c.w. section of YLRL's Anniversary Parties for both 1964 and 1965 was VE3BII, Jeanine Burgess. Jan also tied for first place in YLRL's Howdy Days contest in Sept. Jan's OM is Gord, VE3CRI, who is a chiropractic doctor. It was while building up his practice that Gord turned to radio (he had graduated from Radio College of Canada before entering Chiropractic College). Jan decided to study with him and when they met two other would-be ham neighbors they all studied together. All came up with tickets in '62 and a year later obtained advanced tickets.

Jan's first year was spent on c.w. working for WAS and copying W1AW. With her phone ticket she went after YLCC and got on the YL nets. Much of her time has been devoted to the YL International SSB'ers and she writes a column for *SSB'ers Voice*. Jan says her biggest thrill has been meeting other YLs in Ontario, and they must have felt similarly for they selected Jan to be first president of The Ontario Trilliums, first YL club in Canada. Besides TOT, YLRL, ISSB, CHC, ARRL, AREC and PON membership, Jan holds ORS appointment and has made BPL several times. With the help of Santa (Gord) VE3BII has gone from 70 watts a.m. to s.s.b. with a DX-100 and SB-10.

Jan is a registered nurse and she and Gord have two jr. YLs, Brenda age 4 and Yvonne age 2.

*4417 Eleventh St., N.W., Albuquerque, New Mexico 87107.

Silent Keys

We are sorry to have to record that Fran Darne, W3AKB, joined the Silent Keys Dec. 22, '65. Our sympathy to her OM, Ep, W3BWT. Fran has been written up here earlier and in one of the "Long-Time YL" chapters of our book *"CQ YL,"* for she had been active on the air since 1927. She was a member of the Quarter Century Wireless Club, YLRL, WAYLARC and others.

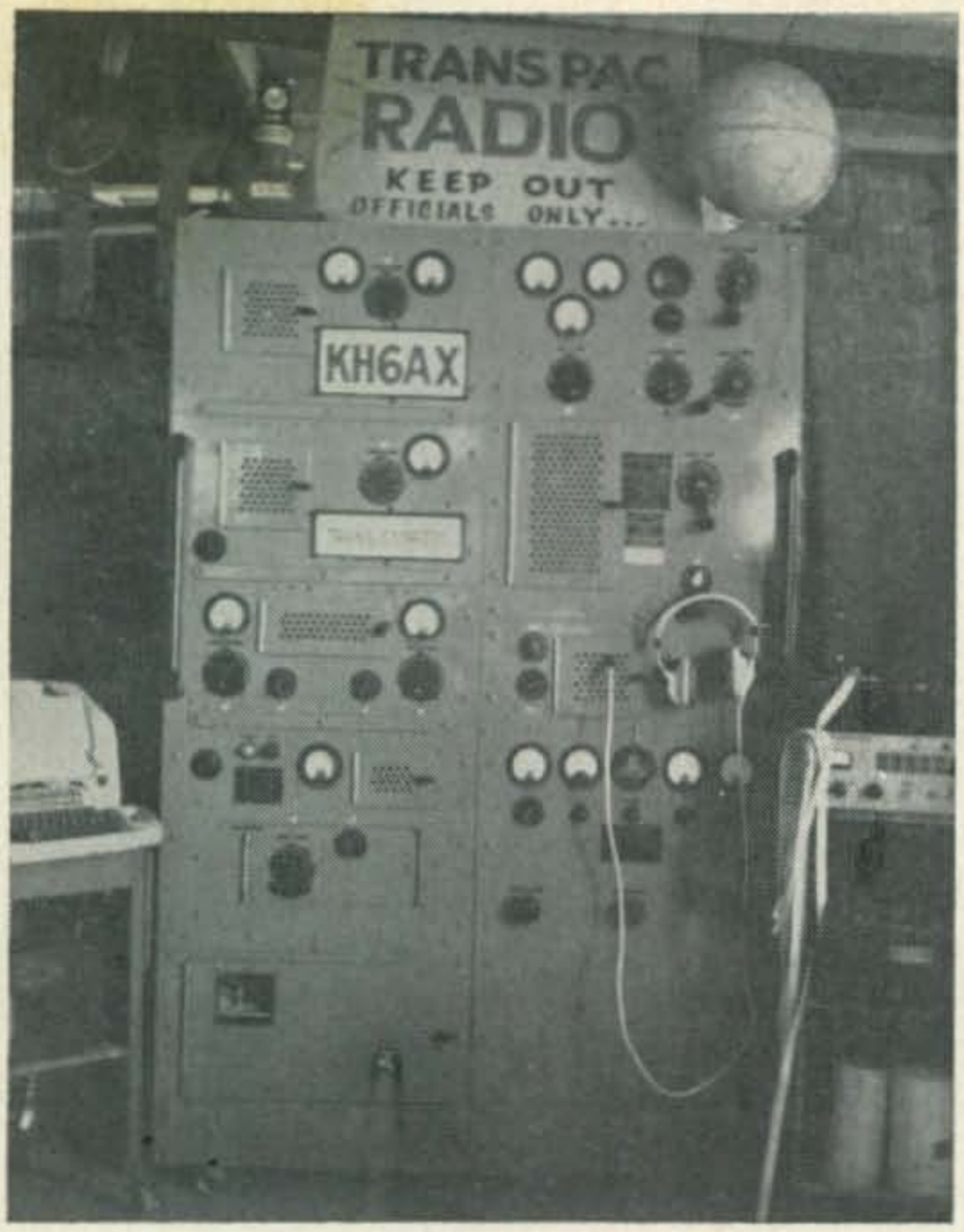
Fran got started in radio at the age of 12 when a boy next door received a "wireless set" for Christmas and she learned code along with him. In 1927 she went on the air with W3AKB from Philadelphia as Frances Rice. Before WW II she was ORS, RM, Asst. SCM for Eastern Pa. and active in AARS, as State Net Control of Pa. and Third Corps Area cryptographer. For several years she was secretary to Dr. Zworykin at RCA.

A graduate of Cornell in E.E., in 1942 Fran became an electronics engineer with the Navy's Bureau of Ships in D.C. and made this her career thereafter. Fran's special interest was 80-meter traffic and ragchewing and one sure-fire sked was with W3BWT, Ep Darne. In 1944 Fran became Mrs. Darne. Throughout the years W3-AKB remained active on c.w. and was rated among the best c.w. ops on the air.

Among the many notes and cards received at Christmas time was a most pleasant one from

VE3BII, Jan Burgess, and OM Gord, VE3CRI, of Alliston, Ontario. Jan earned the highest c.w. score in the YLRL Anniversary Parties for '64 and '65. She is president of The Ontario Trilliums, first YL club in Canada.

Officers of "TASYLS" (The Auto State Young Ladies), newly formed YL club of Michigan, pictured at a luncheon held Dec. 7, '65 at the Henry Ford Museum, Greenfield Village. L. to r.: WA8ARJ, Bobby, treas.; WA8ENU, Thelma, pres.; K8VCB, Betty, V.P.; WA8CTE, Mary, Secy.



KH6AX, Honolulu, Hawaii, station of Freeman Lang at Ala Wai boat harbor. There are no details on the KW transmitter, but there is a sign hanging on the front which says, "TRANSISTORIZED."

plenty of good copy is being made with the real simple TU's.

The Machine: The most available page printer right now is the Model 15 or the TG-7B military version. This is a rugged heavy duty machine that now is in the widest use in amateur RTTY stations. Prices range from about $85 to $125 at this time. Be sure you get one with gears for 60 w.p.m. The second best bet is the older light duty Model 26. These are less available but prices run from about $55 to $75. Both of these excellent machines are made by the Teletype Corporation, and because of their wide commercial use, plenty of information and replacement parts can be had. It is recommended that the newcomer stay away from any other make. It is also suggested that the newcomer stay away from the tape machines until some practical experience is gained with the page printer.

Information

Where can the newcomer find the answers to his questions about frequency-shifting his v.f.o., TU's, and the machines themselves? Well, he can get a good running start by getting a copy of the *New RTTY Handbook*, available directly from *CQ* for $3.95, postpaid. Then, the way to stay with it is to subscribe to *CQ*. Why? Because *CQ* is the only amateur radio magazine with a *monthly* RTTY Column, supplemented frequently by technical articles on the subject.

On the Bauds

W9GTC is /1 from Arlington, Mass., with 50 watts and tape gear on 80. WA1LFI of Needham, Mass., also works 80, but with a Valiant at 200 watts. K1ZKH of Springfield, Mass., runs 180 watts to a Marauder and uses a Model 15 with an SX-117. K1PLP of Wilmington, Mass., has been testing on 80 with less than 50-cycle shift. W1AOH works both 20 and 80 with narrow shift.

W2QDM of Central Islip, L.I., is on 80 with tape and 600 watts to an SB200. WA2CUB of Woodbury, N.J., and W2GDU of Freeport, L.I., both work 80 on weekends. K2SBD of Albertson, L.I., uses a Viking on 80, 40, and 20 with his Models 14 and 15, an SX-101, and a URA-8A TU. W2BFZ of Monsey, N.Y. is ex-W9VCZ from Chicago and now runs 160 watts to an Apache and uses Models 14, 15, and an FRDX tape set. W2NRY of Briarcliff Manor, N.Y., worked Munich and Paris on 20.

W3PYW has been named national coordinator by the ARRL for the sale and distribution of Western Union surplus teleprinter equipment. For info write, Frank C. White (Coordinator-WUSP), 7206 Harmon Road, Silver Spring, Maryland 20902. Also watch for W3PYW for bulletins at 2200 GMT Saturdays on 3620, 7040, 14,090 kc and 144.1 mc. W3ZIV of Stroudsburg, Pa., works 80 meters. WA3BBI of Lewisburg, Pa., is a newcomer on 80.

W4TLT of Montgomery, Ala., is on 80 with a Model 19 and is looking for info on a CV-94/5 GC5 converter. *(Try Propagation Products Co., Box 242, Jacksonville, Florida, Gene.)* W4BNI of Tampa, Fla., has some Kleinschmidt machine parts for sale or swap. WA4DXP of Huntsville, Ala., works 20, K5OLU of El Paso, Texas, uses tape on 20.

WB6ICR is a Teletype operator in the Army and wants to build transistorized gear that can be easily transported. W6NKP of Capitola, Calif., is building the W2JAV Dot Generator, from Dec. '62 *CQ (Don't forget to add a ground symbol to the collector of transistor Q_1 in the schematic diagram.)* W7RSJ is on 80 from Wyoming. W8POU of Centerville, Ohio, can copy on *mark* only. W8CQ of Royal Oak, Mich., works 80. WA8NCK of Hartville, Ohio, runs taped foxes on 80. WØGMU of Holton, Kan., is experimenting with narrow shift on 80. KØUXQ of Thief River Falls, Minn., is on 80 with a Marauder at 150 watts, a Model 15, and an FRXD. WØJTN of Wichita, Kansas, also works 80.

Comments

It appears to be a trend: key the frequency-shifter diodes directly from the keyboard. Nuts. This is why so many stations are sending with serious keying transients these days. Sure, this is the easy way. Ok, if you insist, but the least you can do is service and properly adjust the keyboard contact mechanism. This will considerably cut down on your transients and make you better copy on the *other* fellows' machine. For details on how to adjust the Model 15 keyboard, read again the RTTY Column in the July '64 issue of *CQ*. Give the other fellow a break.

73, Byron, W2JTP

Verna Franz, K9LUI.

Mary Busick, W5MBB.

DX YLRL'er Margaret Rasmussen, OZ1MR. Now comes word from WØHJL that Margaret's OM, Paul, OZ1PR, became a Silent Key on Jan. 18. Our deepest sympathy to you, Margaret, and may you find solace in the many friendships developed through ham radio.

DX Awards

More DX awards to YLs—WAZ on c.w.-phone: W5MBB, Mary Busick, and KL7DTB/6, Iris Colvin; 2-way s.s.b. WAZ: K9LUI, Verna Franz. In January *CQ* we reported VE6ABP, Margaret Tettelaar, had received WPX on s.s.b. Margaret also has received WAZ on c.w.-phone, on phone only, and on 2-way s.s.b. Congrats to all!

Mary, W5MBB, earned her class B ticket in '46 in New York City and advanced class just a year later in Houston. She says she took them both as presents to her OM on his birthday, Oct. 3. Max is W5EZE, and a long-time ham. Their 17-year old son, Don, K5AAD, has had his license since he was 11 and is a real DX'er, holding DXCC, WAC and WAZ. He graduates from high school in June and Mary says his graduation present will be a DXpedition, probably to the Antilles. Son David, age 8, is already showing interest in radio. Mary's father, who is 81, is also a ham, with call W5PIO.

The Busick station consists of "Gold Dust Twins"—75A-4 and KWS-1. Max runs Madison Electronics Supply in Houston and Mary helps with the business. For other interests Mary teaches an adult class in her church and is vice president of PTA. In spare moments she likes to decorate cakes. Her OM suggests Mary *could* work the rig between 12 midnight and 5:15 A.M. (when she gets up) if she just didn't waste time sleeping!

Verna, K9LUI, of Glen Ellyn, Ill. says DXing is the primary hobby around their house and she and OM Bill, K9KYF, are always on the lookout for a new one. Verna got her General license in Feb. '59 and she holds DXCC (phone) with over 300 countries confirmed, and YLCC as well as WAZ. Equipment consists of KWM2 exciter driving an NCL 2000 with a side receiver, a 75S-3B. Main antenna is a Telrex TW-30 at 75 ft. and a Hi-Gain Hy-Tower vertical used primarily to work Bill when he's mobile. Verna has attended Dayton and Pacific N.W. DX conventions. Other hobbies are philately, sewing and their five miniature black poodles.

Here and There

Congratulations to W4BAV, Cathy Seeds, who became the bride of W2HJM, Bill Soehl, on Nov. 21, '65. Cathy says all arrangements for the wedding were made via 75 meters. W4PUE, Andy, performed the ceremony. W4WPD, Shirley, was Cathy's attendant and W4DUI, Joe, was best man. A number of OMs and XYLs attended.

In addition to their Tuesday net on 3933 at 0900 EST and Fridays on 3900 at 2300 EST, the Floridoras have another net every Monday on 50.3 mc at 0800 EST. 33, Louisa, W5RZJ

New Amateur Product

United Transformer Corporation

UTC announces the release of its two new 1966 catalogs of iron core components. These catalogs are designed to be fully rounded working tools for the design engineer and purchasing agents. Volume I features 52 pages of transformers, inductors, and magamps. Volume II features 24 pages of electric wave filters, high Q coils and inductors. Also dispersed throughout these catalogs are data on specially built components and the capabilities of UTC in the area of miniaturization and reliability. For further details write to: United Transformer Corporation, 150 Varick Street, New York, N.Y. 10013, or circle 65 on page 112.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

ONE of the biggest problems of the "surplus hound" is finding important data on the electronic component he has just scrounged or bought from his local surplus dealer at a ridiculous price. Particularly today, with military gear becoming more and more complex, it is often impossible to use, or convert, surplus without the appropriate instruction manual.

Since this column started in February, I have had a steady stream of mail asking for manuals on surplus gear. Let me say right now that I am not in the book business. I suggest that before anyone writes to me that they try Propagation Products Co., Box 242, Jacksonville, Florida, Quaker Electronics, Box 215, Hunlock Creek, Pa., or Sam Consalvo, 4905 Roanne Drive, Oxon Hill, Maryland, or R. E. Goodheart Co., Box 1220, Beverly Hills, California. These are dealers who handle technical manuals.

If there are any other commercial sources of tech manuals I would be glad to hear about them, and to recommend them.

If you strike out at these sources, try me for information on rare equipment. I will try to suggest sources such as the Library of Congress, which can supply photocopies of certain of the older manuals. I cannot sell handbooks myself, except rarely, when I may have a duplicate on hand. I can, in some cases, get a particular schematic reproduced on request.

The problem of obtaining more recent manuals, many of them in current use by the military services, has become more difficult in recent years. It was once possible to order certain books through the Office of Technical Services in the Commerce Department, but this office has been abolished in an economy move. Its replacement, the Clearinghouse for Federal Technical and Scientific Information, is unable to supply manuals. It handles only scientific papers produced under government contracts.

The Clearinghouse has referred amateurs to the Army and the Navy for certain manuals, but so far as I can determine, neither service will sell directly to civilians. The Air Force will sell manuals however, through the Accounting and Finance Office, Robins Air Force Base, Georgia.

Now, all Army manuals are printed, or bought, by the Government Printing Office. They could be made available to the public.

It is simply a bureaucratic situation that prevents individuals from buying any non-classified material printed for the Government. I have instituted an investigation of this problem by the Joint Congressional Committee on Printing, an approach which might prove fruitful to amateurs, private industry, and everyone else who has run up against this same stone wall.

If you have strong feelings on this problem, it would assist me if you were to write a short, temperate, reasonable letter to the Honorable Carl Hayden, Chairman, Joint Committee on Printing, Room S-151, U.S. Capitol, Washington 25, D.C., attention John F. Haley, Staff Director.

A similar situation prevails in Navy manuals.

The Government Printing Office does sell certain, very general, military manuals. Many electronics training courses are available through the Superintendent of Documents, at nominal cost, even though books on specific gear are not now sold by the Government.

There are a number of price lists available, free, describing material sold by G.P.O., of which five are of particular interest to amateurs: Price List # 63, Navy, Marine Corps and Coast Guard Publications; Price List #85, Defense and Veterans Affairs; Price List #82, Radio & Electricity; Price List #19, Army Manuals; Price List #48, Weather, Astronomy & Meterology.

These lists show several hundred titles and prices of publications related to electronics and other technical subjects which can be ordered from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Here are a few examples of titles which are available:

Commercial communications services, USAF Communications doctrine 128 pages, 65¢,

Fundamentals of Electronics (Navy) 564 pages, $4,

Shipboard Electronic Equipment (Navy has short descriptions of many units) $1.25, 181 pages,

Fading Correlations Bandwidths . . . on a High Frequency Transauroral Path 53 pages, 40¢,

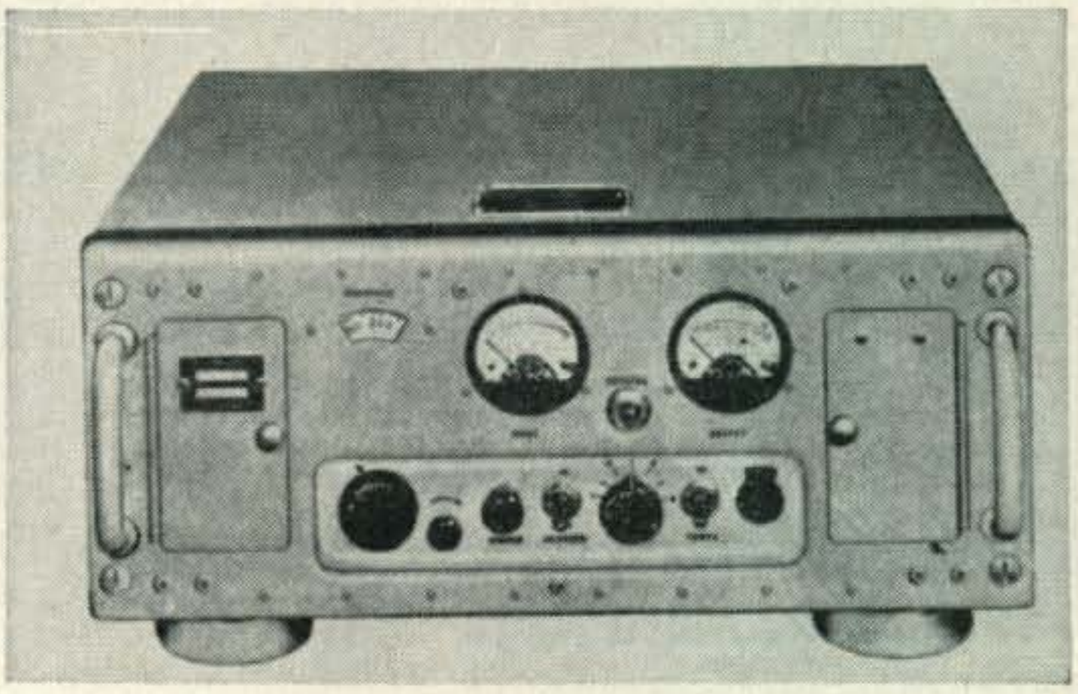
Magnetic Amplifiers 83 pages, 40¢,

TM 11-666, Antennas & Radio Propagation 225 pages, $1.25,

TM 11-4000, Troubleshooting and Repair of Radio Equipment 177 pages, $2 (contains a full schematic diagram of the R-390-A/URR receiver),

And many more.

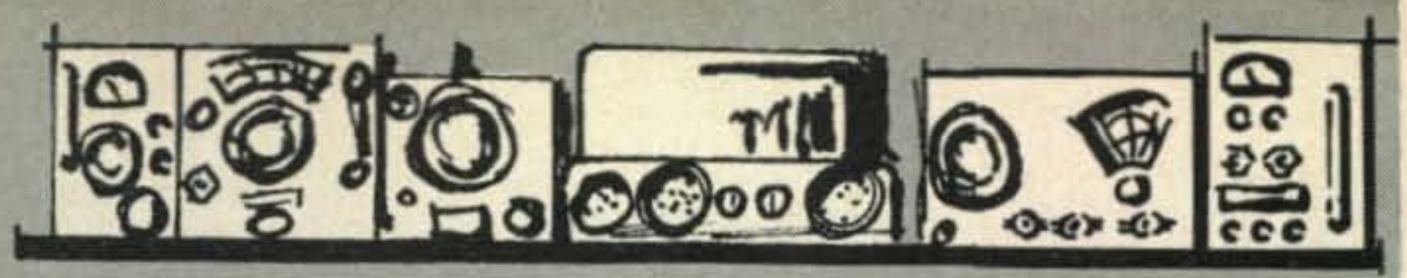
The definitive text on Radio Propagation, *The*



Front view of the AN/URR-35 Receiver.

*5716 North King's Highway, Alexandria, Virginia 22303

SURPLUS CORNER



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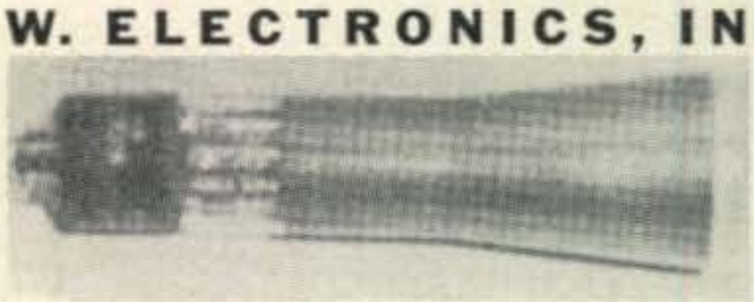

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For further information, check number 40, on page 112

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For further information, check number 41, on page 112

For further information, check number 42, on page 112

Bureau of Standards Monograph #80, is available from G.P.O. in hard covers at $2.75.

The surplus equipment we want to describe this month is a family of Navy-Air Force tuneable v.h.f. and u.h.f. receivers. This is a relatively rare sort of gear, most of the higher frequency sets being crystal controlled these days, in fact I know of only two other tuneable v.h.f. sets in surplus.

These receivers are the URR-13, URR-27, URR-28, and URR-35. All four are very similar in appearance. They are built in the usual Navy gray, semi-waterproof cases with rounded corners provided either for table or 19 inch rack mounting. They measure roughly 8 × 17 × 19 inches. Their rated sensitivity is only 8 microvolts for a signal to signal plus noise ratio of 10 db, and their output is 60 milliwatts into a 600 ohm load.

All four units are provided with 115/230 volt power supplies for 60 cycle a.c.

These were designed for ship or shore communications with aircraft, and are provided with panadaptor jacks for an i.f. of 18.6 mc allowing scanning of a 600 kc bandwidth. The antenna inputs are for a 50 ohm quarter-wave antenna.

The URR-13 was made in A, B, and C versions, but circuit differences are slight. All models cover 225-400 mc in a continuously-tuned band, with provisions for a single crystal-controlled channel in that band.

The technical manual for the URR-13-A is *NavShips #91270*, (Federal stock number 0280-057-6005 for those having access to Navy supply channels) and the URR-13-B and subsequent models are *NavShips 91535*. The sets are made by the Federal Telephone and Radio Corporation.

The R-516/URR-27 covers 103.9 to 191.9 mc, continuously tuned, with one crystal channel. The *NavShips* number is *91771*. The URR-27 is a National product.

The URR-28 covers 225-400 mc, and has provision for ten crystal channels in addition to continuous tuning. Built by National, the book is *NavShips 92333*.

The URR-35, oddly enough, is an older set, nearly identical to the URR-13, which is being replaced by the URR-28. The URR-35 covers 225-400 mc. The book is *NavShips 91906*, but *NavShips 92022* and *92676* also cover the URR-35.

The URR-13 is currently available from R. E. Goodheart, Box 1220, Beverly Hills, Calif., and from Columbia Electronics, 4365 West Pico Blvd., Los Angeles, Calif. ■

For further information, check number 43, on page 112

The Eye-Bank Network [*from page 29*]

these countries have joined: Algeria, Columbia, El Salvador, Formosa, Guatemala, Hong Kong, Ireland, India, Japan, Jordan, Pakistan, Panama, Philippine Islands, Thailand and Turkey.

To meet the growing demand, a new shipping container has been developed (see last month's front cover). WØNTI, president of Hunter Manufacturing Company has developed a new model polystyrene container after eight years of study, observation and experimentation with different models.

The new container is made of 2-inch Styrofoam and will keep human eyes at or near 36 degrees for 2½ days when the quart-sized plastic container inside is frozen with water and acts as the refrigerant. Two larger jars are used for shipping eyes, a smaller for preserved corneas. The container costs but $3.50 and is used for overseas shipment by the International Eye-Bank. (Needless to say, these are sold at cost to Eye-Banks who can use them.)

As might be expected, still another use of the network has been discovered: that of shipping preserved sclera tissue to needy doctors. The most important use of sclera grafts has been for sclera emergencies encountered in retinal detachment surgery. In these cases at surgery, the outer white coat of the eye (sclera) is found to be abnormally thinned due either to natural causes or previous surgery. The subsequent graft, referred to as the "scleral-boot", is invariably needed immediately where the Eye-Bank Network again comes on the scene. Right now these "scleral-boots" are still something new to the medical world, but already 114 graftings have been performed.

How You Can Help

Dr. Braley extends an invitation to seriously-interested hams to check in on 3970 kc at 8 A.M. EST anytime. A multitude of information is available on the workings of this unique network, as well as a complete magazine entitled *Forsight*, that circulates to members of the organization. For your copy, drop a QSL to Dr. Alson E. Braley, WØGET, Head of the Dept. of Ophthalmology, University Hospitals, Iowa City, Iowa, 52241.

Donation of eyes, of course, is still the most essential part of the eye-bank program. Donors are extremely scarce and, as Ted Hunter puts it, many people "leave their eyes to science, only for doctors to learn about it weeks later after the will is read."

Beset with a multitude of obstacles and an almost constant state-of-emergency condition, the Eye-Bank Network today is without a doubt one of the most outstanding examples of effective amateur public service. While most operators are chasing DX, Eye-Bank stations quietly combat QRM in a never-ending quest to save sight. Makes one wonder what could be accomplished by similar groups in other rewarding and necessary fields, doesn't it? ■

EICO Review [*from page 58*]

remedy is to install a series-tuned 5.2 mc trap between ground and the grid of the r.f. input stage. A suitable combination would be a 10 mmf capacitor in series with a slug-tuned coil of about 90 μh.

Image rejection averaged 70 db for all bands. Due to the use of single conversion, no internal spurious responses were present.

Although the audio-frequency response sounded nice, noticeable distortion was evidenced on s.s.b. signals. This was mainly due to several mechanical self-resonances of the loudspeaker in the a.c. power-supply console. Use of a separate speaker cleared up much of this difficulty.

Transmitter

The transmitter delivered a p.e.p. output of 80, 110 and 125 watts on 14, 7 and 4 mc respectively with excellent linearity observed on two-tone test patterns. Unwanted-sideband suppression was equivalent to that of the receiver and the carrier was down 50 db.

Proper operation of the a.l.c. is highly dependent on the screen characteristics of the final-amplifier tubes which unfortunately vary considerably from tube to tube. In our case, insufficient a.l.c. voltage was developed with the result that the transmitter mixer could be overdriven into flattopping and which thus limited the drive to the final. This was corrected by increasing the a.l.c. coupling capacitor (C_{110} on the main schematic for the set) to 0.1 mf. Adequate a.l.c. control was then realized with absolutely no flattopping of either the driver or the final, while still obtaining maximum p.e.p. output, no matter how high the mike gain was raised; in fact, the a.l.c. operation was one of the cleanest we've seen to date.

A desirable modification therefore might be to make C_{110} .25 mf (300-volt rating) and to change R_{117} to a 1 megohm potentiometer with CR_5 connected to the arm of the pot instead of at the top. This will provide adjustable a.l.c. control which should be set according to oscilloscope observations during modulation. Also, the exciter-tune should be peaked at all times.

Keying with c.w. turned out to be clean and nice, but at first, difficulty with chirp was experienced. This was traced to r.f. feedback due to lead dress. In this respect, you have to make sure that the leads, routed through the chassis cutout for the output-loading capacitor, do not pass near the exposed end of the inner conductor from the shielded cable connected to terminal 1 on TB-19.

A convenient feature in conjunction with c.w. and a.m., is that no carrier-level adjustment need be made, as this is automatically taken care of with the mode switch on the panel; provided, the carrier has initially been balanced out for s.s.b. operation.

The Eico Model 753 Tri-Band Transceiver is

priced at $189.95 for the kit, $299.95 for factory-wired models. The Model 751 a.c. power supply/speaker console is $79.95 for the kit, $109.95 for wired units. The Model 752 d.c. mobile power supply is $79.95 for the kit, $109.95 for wired models.

A modification kit for substituting the transistorized v.f.o. in older models is available for $5.00 to present owners of kits. This requires assembling a new printed-circuit board which is then installed in place of the present v.f.o. board.

The manufacturer is EICO Electronic Instrument Co., Inc., 131-01 39th Avenue, Flushing, N.Y. 11352.—*W2AEF*

DX [*from page 72*]

QTHs and QSL Managers

CR3AD	Box 205, Bissau, Portuguese Guinea
CR6FW	via W8GIU
CT1JJ	via W6LDA
EP2AX	via K4OEI
FM7WI	via W8GIU
HZ3TYQ/8Z4	via W1RAN
OA5AO	via K4OEI
OE9ZUH	via G2DHV
TR8AD	Box 1025, Liberville, Gabon Republic
TU2BD	B. P. 2261, Abidjon, Ivory Coast
VE8NO	via WA4KXC
VP2AC	for Nov. 23/24/1965 via K1IMP
VP2KY	via WØNGF
VP2SY	Nov. 25-29, 1965 via K1IMP
VP2VE	via W2MDQ
VP6WR	for Nov. 25, 26, 1965 via K1IMP
ZD5D	via WB6CWD
ZD7RH	via G2IO
ZF1GC	Bodden Town, Gran Cayman, West Indies
ZF1RV	via VE7RV
ZK2AF	via W4ECI
ZS3XG	Box 42, Walvis Bay, Southwest Africa
ZS8G	via VE4OX
3A2XX	via F2IC
5R8AS	via W6ZPX
6O1AU	via VE4OX
9L1JW	via K9RNQ
9X5CE	via K4ISV
9Y4VT	(VP4VT) via W8G1U

K1YPE/XV5 Bill Porter, c/o American Embassy, Saigon, Viet Nam or via W4UWC

KH6FBJ/4/KW6/KJ6/KG6SX/HS5OSQ/XW8AS H. C. Sherrod, Jr., Apt. 301, 3635 Barcroft View Terr., Falls Church, Va., 22041

Propagation [*from page 75*]

South-east Asia	21-23 (1)* 16-18 (1) 18-00 (2) 00-02 (1)	23-01 (1) 01-03 (2) 03-08 (1) 08-10 (2) 10-12 (1)	01-03 (1)	*Nil*
Far East	20-22 (1) 22-00 (2) 00-01 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-08 (2) 08-10 (3) 10-12 (2) 12-14 (1)	00-02 (1) 02-05 (2) 05-07 (1)	02-05 (1)
Guam & Pacific Islands & New Zealand	17-21 (1)* 14-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-00 (1)	07-09 (3) 09-11 (2) 11-16 (1) 16-18 (2) 18-20 (3) 20-22 (4) 22-00 (3) 00-02 (2) 02-06 (1) 06-07 (2)	23-01 (1) 01-05 (3) 05-06 (2) 06-07 (1)	00-02 (1) 02-05 (2) 05-06 (1) 02-05 (1)†
Aus-tralasia	12-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	07-09 (2) 09-11 (1) 11-13 (2) 13-18 (1) 18-20 (2) 20-22 (3) 22-01 (2) 01-07 (1)	00-01 (1) 01-05 (2) 05-06 (1)	01-02 (1) 02-04 (2) 04-05 (1) 02-04 (1)†
Central America & North-ern South America	14-16 (1)* 06-09 (1) 09-11 (2) 11-13 (3) 13-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	05-07 (2) 07-09 (3) 09-14 (2) 14-16 (3) 16-18 (4) 18-20 (3) 20-00 (2) 00-05 (1)	19-21 (1) 21-01 (3) 01-02 (2) 02-05 (1)	20-22 (1) 22-01 (2) 01-04 (1) 22-01 (1)†
Central & South-ern South America	12-15 (1)* 06-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	00-05 (1) 05-06 (2) 06-15 (1) 15-16 (2) 16-17 (3) 17-19 (4) 19-21 (3) 21-00 (2)	19-21 (1) 21-23 (2) 23-05 (1)	22-03 (1)
Mc-Murdo Sound, Antarc-tica	11-15 (1) 15-17 (2) 17-19 (1)	04-05 (1) 05-06 (2) 06-12 (1) 15-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-00 (1)	02-05 (1)	*Nil*

Ferrites [*from page 52*]

A nano-henry is 1/1000 microhenry, or 10^{-9} henry.

As an example, say we found some pot-cores with AL160 printed on them. This means that if we wind 10 turns of wire on the core, it will give 100 turn-squared times 160×10^{-9} henries of inductance, or 16 μh. The size of the wire will make little difference in this inductance, but will affect the *Q*. For a given number of turns, use the largest wire that you can (fill the bobbin). This will give the highest *Q*.

By now I hope I've convinced you that ferrites and the similar powdered iron cores are really friendly to hams. Understanding them fully is a really big task if one wants to explore the theory, but with the few hints herein outlined, ferrites can be put to use *now* by most any ham. ■

CQ Brazil [*from page 48*]

frequencies, provided the cigar box can be enlarged. If it is not improved upon with a remarkable ingenuity, the *macanudo* buys a rig made in Brazil and now available at modern radio supply stores. Wire, coaxial cables, fuses, connectors, and even tubes are made in Brazil. Technical courses are also offered at several schools.

Licenses to operate are granted to Brazilian citizens only. Age limit is eighteen years, but recent proposals to the Legislature are trying to reduce it to sixteen. Exams require technical knowledge and c.w. practice. Licenses are supervised by the Federal Authorities through the new Communications Department and the Postal and Telegraph authorities. The coordinating association, similar in its purposes to the ARRL, is the LABRE (League of Brazilian Amateurs). Labre offices are found in every large city in Brazil, for coordinating work, distribution of QSL's, social functions, etc. Brazilian call books are issued periodically through LABRE.

Radio Clubs similar to the ones that exist in the U.S., in schools, colleges, organizations etc., are practically unknown in Brazil. But a movement is now under way to encourage the creation of such clubs, including one at the São Paulo Rotary which has a five-story building where space for such a project is available. União Cultural Brasil-Estados Unidos, an educational institution sponsored by Brazilian-American entities and by the State Department, now teaching English to over 5000 pupils, in São Paulo, has just founded its radio club with a most adequate

CQ Brazil [*from page 102*]

call . . . PY2USA. Part of its rig has been donated by the Rotary Club of Glencoe, Illinois, through the personal efforts of Byron C. Sharpe, W9JKC, who flew to Brazil for the official opening of the station.

From the cigar-box rig to the other extreme of luxurious stations comprising three, five or six units of the latest models imported from the U.S., you will find a wide range of Brazilian operators among doctors, businessmen, teachers, lawyers, government officials—all ready to make a new friend abroad. These contacts are desirable, at a time when international relations in the Americas are a must. Swapping of ideas, of suggestions, of second-hand books etc., can help tremendously both sides. Let's all try to increase the number of QSO's between our sister nations.

Transistor Special [*from page 41*]

lead and only stray capacitance to ground. To save money the indicator bulbs may be mounted by pushing them through a rubber grommet.

The oscillator transistor requires no heat sink. The buffer transistor runs hot and a good heat sink *must* be used (Wakefield #NF207 or equivalent).

The overall size of the transmitter can be greatly reduced by using mica compression trimmers, Arco #303, for tuning but special knobs or screwdriver adjustments are required.

Results

The first two contacts using a dipole were a VE3 on 80 and a W7 on 40. Both answered CQ's on a Saturday night on the first call! Neither realized that low power was being used much less transistors until told so at which point I suddenly became 599 instead of 579.

Since that time schedules have been maintained on a regular basis day and night from Connecticut to North Carolina with a Novice using a "disguised antenna" (fine magnet wire any length thrown into the nearest tree with no insulators). The power supply is two small 12 volt Ni-Cad batteries and a trickle charger. ■

Double Your Power [*from page 64*]

much on the grid current meter under average voice conditions but it is not hard to see the —10 and —15 db 3rd and 5th harmonic distortion products well above and below the desired sideband. The voice was a little hard to photograph but it was much broader than the two-tone test signal.

If your transmitter does not have a.l.c. to hold down the modulation peaks (and it is generally not hard to install), watch the final grid current meter as a modulation indicator and adjust the audio until no indication is observed on peaks. If your s.s.b. transmitter or transceiver does not have a meter built-in, it is not hard to cut in an external 1 ma grid current meter. It may be used as an over-modulation indicator instead of watching to see how high the plate meter will swing and the boys on the adjacent channels will appreciate your thoughtfulness. ■

Space [*from page 87*]

January 31, 1966. On February 3, at 1845 GMT, LUNA-9's 220 pound payload became the first manmade object to make a successful soft landing on the moon's surface. Aboard were a television camera and a transmitting system.

Perched only two feet above the moon's surface, the television camera scanned the moon's horizon in all directions to flash pictures back to earth of such detail and clarity that objects as small in size as a dime were clearly seen. The surface of the moon appeared to be rough and irregular with no noticeable trace of dust.

The electronic components of the television pictures were flashed to earth on 183.538 mc. The pictures were copied and reproduced at scientific observatories in the USSR and in Great Britain. Several space-listeners have also reported hearing LUNA-9's signals during the two day period that its radio transmitter operated from the surface of the moon.

73, George, W3ASK

USA-CA [*from page 86*]

Paul Bunyon Award: The Arrowhead Radio Amateurs Club, organized May 12, 1919 at the home of W9DOQ, Duluth, Minnesota are happy to sponsor this new award. The award will be issued for having confirmed contacts with different stations in Minnesota, no date limitations. Minnesota stations contact 100 Minnesota stations, all other states contact 50 Minnesota stations. DX stations contact 25 Minnesota stations. QSLs not to be sent, but a list of stations, alphabetically by calls, this list to be certified by radio club officer or two licensed amateurs will be acceptable (GCR). Fee: $1.00 send to Arrowhead Radio Amateurs, P. O. Box 596, Duluth, Minnesota.

5-9/5-9-9 Awards: The 5-9 AM and 5-9 SSB diplomas are issued for R5 S9 contact with each of the six continental areas. The 5-9-9 CW awards are made for R5 S9 T9 contact with the same areas. The number of contacts needed from each continent to qualify are:

SSB		AM		CW	
Mixed	1	Mixed	1	Mixer	3
10 meter	1	10 meter	1	10 meter	3
15 meter	1	15 meter	1	15 meter	3
20 meter	1	20 meter	1	20 meter	3
40 meter	1	40 meter	1	40 meter	1
80 meter	1	80 meter	1	80 meter	1

Contacts must be confirmed, but no date limits. A statement from a radio club officer or radio amateur will be accepted in place of the QSL cards. Each certificate is different. Fee: 50¢ or 7 IRCs per certificate. Address: Tom Harmon, WØIUB, 1629 Pleasantview, Wichita 3, Kansas, USA.

The Sun City Award: This beautiful certificate promotes "The Sun City", St. Petersburg, Florida. It is printed in 3 colors with Mr. Sun predominating and is specially designed with elaborate art work and printed on semi-gloss paper. To win this award work 10 amateurs in St. Petersburg or the greater St. Petersburg area which consists of St. Petersburg, Pinellas Park, Bay Pines, Indian Rocks, Largo, Treasure Island, Redington Beach and St. Petersburg Beach. If all on v.h.f., work only 8. Available to s.w.l.'s on heard basis. Send log data only. Fee: $1.00 Awards Custodian, Jack Adams, W4NOK, Box 7326 Euclid Station, St. Petersburg 34, Florida.

Although I seem to have run out of space again, I somehow have the feeling that I got more material into the same space this month. As Dean Martin would say, "keep those letters coming in," Helen-mae, Debbie and I read each and everyone of them, but unlike Dean's family, we don't cry over them, we love them! I have a waiting list for overseas hams who need P.O.D. publications 26, so if you have an extra one or one from last year that you would like to donate, let me know and I will send you the name and address of a foreign friend in need of one. I'm always looking for worthwhile awards to publicize, so send them along with the latest rules. And please send that QSL. How was your month?

73, Ed, W2GT

Test Equipment [*from page 32*]

a 100-ohm resistor will produce a drop of only 1 volt, at 100 ma it will be 10 volts. The voltmeter reading across the resistor will be directly proportional to the current which may be read directly from the scale where for each indicated volt the current will be × 10 ma. Thus, using a 0-2.5 voltmeter the full-scale current range will be 25 ma, and using a 0-10 v. meter the range will be 100 ma.

For higher currents it will be better to use a 10-ohm resistor with which the drop will be 1 volt at 100 ma, 5 volts with 500 ma, and for each volt indicated by the meter the current will be × 100 ma. At full current the resistor will have to dissipate 2.5 watts, since $P = I^2R$. If a v.t.v.m. is used, don't forget to observe the precautions mentioned earlier!

Basic Approach with Equipment Failure

Current measurements may be used to track down equipment failures much in the same way in which measurements of voltage are used; however, most clues to trouble may more readily be obtained by voltage checks. Where these are abnormal, a test of the circuit current may then provide additional hints as to the difficulty, which may be due to a defect in the load such as the operating condition of a vacuum tube or a transistor. The basic approach is given below.

Assuming that the high-voltage power supply itself is functioning normally, the following faulty readings may be due to one of the principle causes suggested after the symptom:

1. No Current: Load circuit open or voltage-supply line open.
2. Too Low Current: Higher than normal load resistance, low applied voltage or increased resistance in voltage-supply line.
3. Too High Current: Lower than normal load resistance, high applied voltage or decreased resistance in voltage-supply line.

A number of examples are demonstrated at fig. 5.

Measurement of Alternating Current

The measurement of alternating current cannot be directly made with either the v.o.m. or v.t.v.m., but it could be found using the indirect voltmeter method if a resistor normally is included in the circuit. Alternating-current readings are seldom required in amateur gear, except possibly on tube heaters or filaments or on the primary-power line where the current may be in *amperes*. The voltmeter method therefore would not be practical, because with a circuit resistor even as low as 1 ohm, the voltage drop could be too large, affecting normal operation of the circuit. Also, the power rating of the resistor would have to be quite high. Other type instruments designed for direct measurement of alternating current would therefore be more suitable.

Next month we will conclude our discussion of the v.o.m. and v.t.v.m., and move on to other popular types of test equipment. ■

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- ☐ Please send WRL 1966 HAM/CB CATALOG

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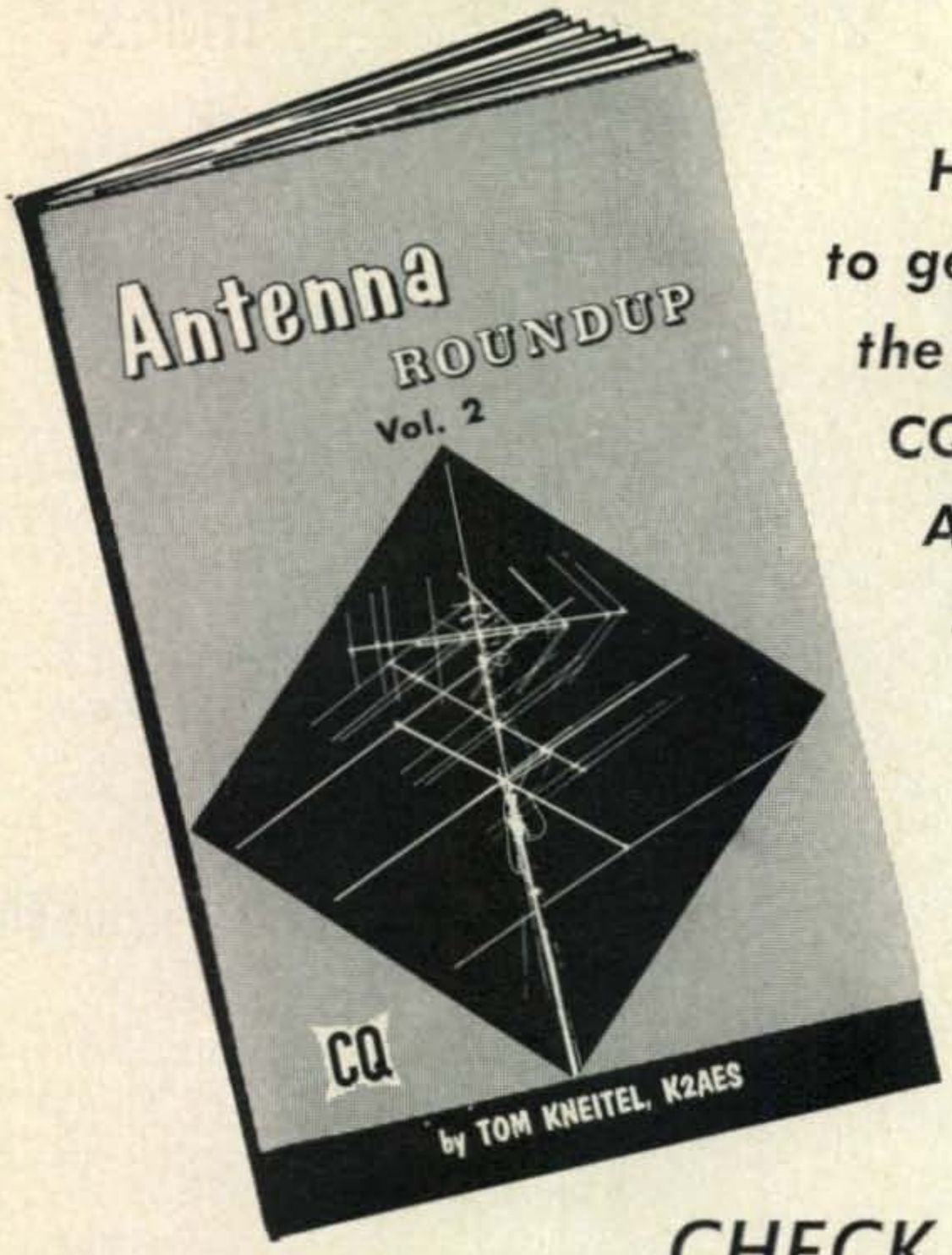
advertisers index

HOOKED ON SKY HOOKS?



Here's your chance to get an early copy of the latest addition to CQ's famous ANTENNA ROUNDUP series. Volume II covers antennas spanning frequencies between 10 cps and 2450 mc.

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- 10 BIG theory features!
- 10 WILD low band verticals to build!
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Gentlemen: Enclosed is $_____ for _____ copy(ies) of the brand new ANTENNA ROUNDUP, Volume II. Please rush me one of the first copies hot off the press!

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PRICE: $4.00*

SEND YOUR ORDER NOW!

NOW! YOU CAN ENJOY SIX METER SSB/AM/CW WITHOUT TVI!

OR YOUR MONEY BACK!

If your present transmitter and receiver, or transceiver, will work on ten meters — just connect this sensational Hallicrafters HA-6 "Transverter" to their antenna coax receptacles. Presto! You're on SIX METERS with a most sensitive receiver and a powerful transmitter!

Get away from the QRM! Have fun on six. It's FB for VHF DX, local QSO's, rag-chews!

Whatever mode you are using — SSB, AM, CW, RTTY, etc. — this superbly engineered piece of equipment will do a perfect job of converting both received and transmitted signals for operation in any part of the 50 to 54 MC band. Broadband design, you QSY with your regular receiver/transmitter tuning controls. Nuvistor front end gives excellent sensitivity with low noise figure. RF output indicator facilitates easy tune-up for maximum power — up to 120 watts input!

TVI? No sign of troublesome harmonics or spurious radiation, when you feed your output through one of the new WATERS coaxial cavity filters! (It improves your reception, too, by shutting out the "birdies" from TV, FM, and other transmitters.) Fundamental frequency front-end loading of TV receiver on channel 2 can usually be suppressed by simple stub trap at receiver.

GET YOUR HARRISON "HAPPY HAM/HAPPY TV NEIGHBOR" *BARGAIN PACKAGE!*

Hallicrafters HA-6 Transverter, Brand new, fully guaranteed. Original Amateur Net	$349.50
Matching P-26 Power Pack	99.50
Waters new 373-6 band pass filter.....	32.50
Drake TV-300-HP filter. (To convince that neighbor with early vintage TV receiver!)	3.97
TOTAL —	$485.47

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HERE'S MY MONEY BACK OFFER!

Buy the package, at the bargain price of only $185.00. Try it out thoroughly in your shack.

If, for **any** reason, you are not completely satisfied, just return it prepaid within 15 days after you received it.

I will promptly send back your full $185.00.

Fair enough? Send your order today, OM. TNX.

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Rush your "Happy Ham/Happy TV Neighbor" Six meter bargain package to me.

I understand that for **any** reason I may return it prepaid within 15 days in original condition for full refund.

NAME ..... CALL.....

ADDRESS .....

For further information, check number 30, on page 112

In a townhouse on Louisburg Square...

Louisburg Square . . . an island of tradition and elegance on Beacon Hill in Boston. Also, the home of hotel man Ernest Henderson, W1AUC/UDY, and the location of his amateur station. Mr. Henderson is Chairman of the Board of the Sheraton Corporation of America, and his choice of amateur equipment is National, of course.

For over half a century National gear has been the choice of critical amateurs requiring maximum performance, reliability, and workmanship. If these factors are important to you, then the logical choice for your station must also be National.

Amateur station W1AUC includes the NCX-5 Transceiver with digital dial, the NCX-A AC Supply/Speaker Console, the VX-501 VFO Console (all in walnut cabinets), and the NCL-2000 2 KW Linear Amplifier.

National, of course.

NATIONAL RADIO COMPANY, INC., *37 Washington St., Melrose, Mass. 02176*

NCX-5, $685.00; NCX-A, $110.00; VX-501, $249.95; NCL-2000, $685.00. Optional oiled walnut cabinets available at extra cost.

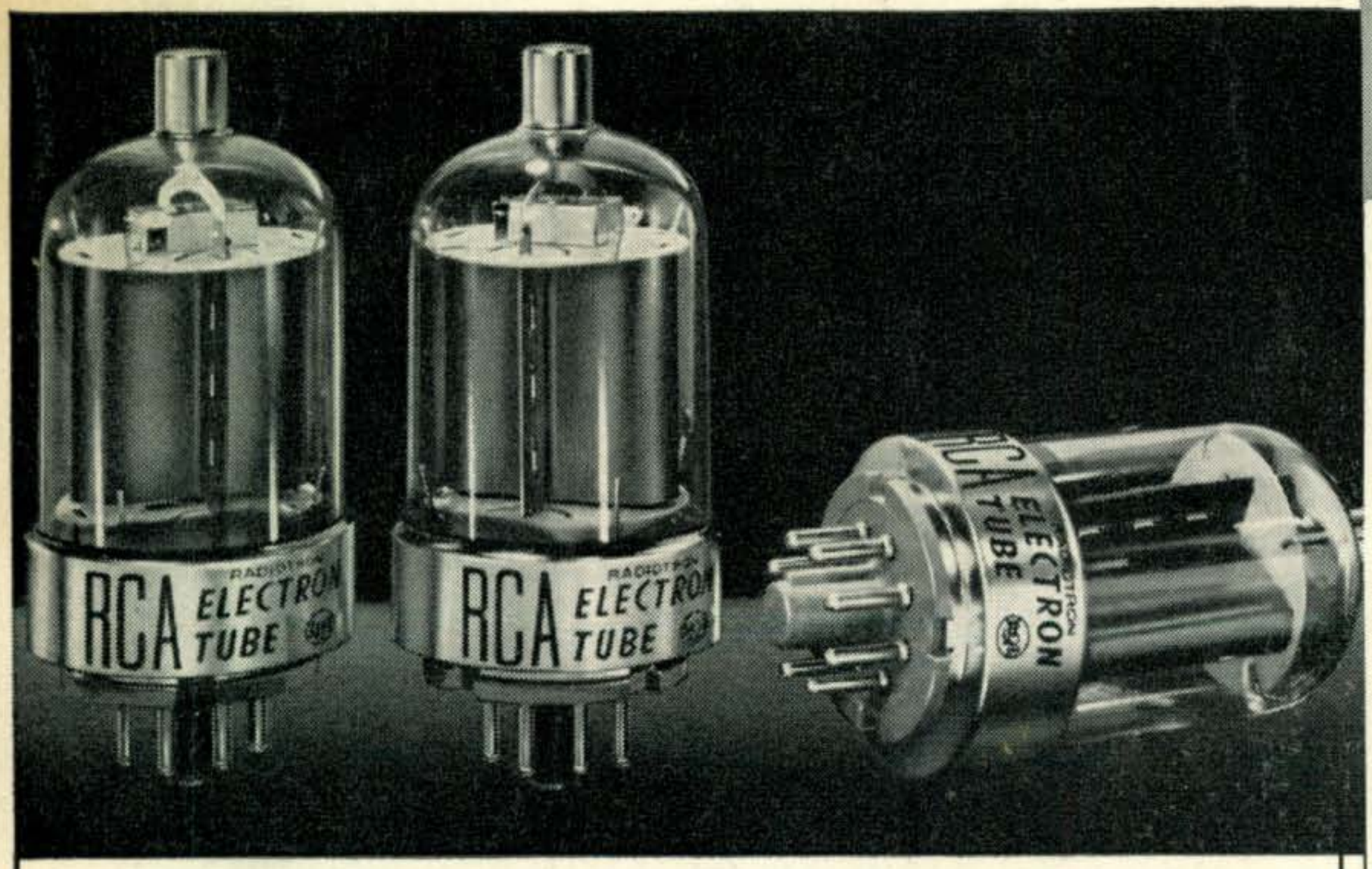
For further information check number 27 on page 112

"QRO"... WITH RCA BEAM POWER TUBES

Power Tubes made by Power people for amateurs who want Power

...and reliability! The RCA-6146 family of Beam Power Tubes has long been famous *for both,* because quality "extras" built into these RCA tubes assure you higher power output and longer life for your fixed and mobile applications.

The RCA-6146A, for instance, has its getter mounted below the base shield of the tube—out of the rf field—so you don't lose rf output power. And for extra reliability, RCA uses low loss "lead" glass envelopes for additional protection against the stresses of rf and heat. (If you tap the glass with your fingernail, the "ping" tells you it's "lead" glass.)



THE RCA 6146 FAMILY

RCA-6146A	For 6.0-volt mobile and fixed equipment applications.
RCA-6146B/8298A	Modified RCA-6146A with higher power output for critical 6.0-volt mobile applications.
RCA-6883B/8032A/8552	Modified RCA-6883 with higher power output for critical 12.0-volt mobile applications.

The RCA-6146B/8298A and RCA-6883B/8032A/8552 have the same built-in, extra RCA advantages to afford higher power input for AM and CW, and are designed for critical mobile applications. The chart lists three popular members of the RCA-6146 family which may be suitable for *your rig.* And they have all been designed specifically for power tube applications *and rated to do a particular job.*

For tabulated data of technical information on specific tube types, see your RCA Industrial Tube Distributor and ask for your copy of "Product Guide for RCA Power Tubes" (PWP-506A).

Available Through Your Authorized RCA Industrial Tube Distributor

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N. J.

The Most Trusted Name in Electronics

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