



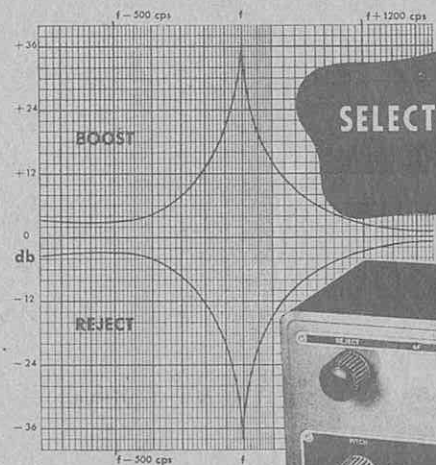
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November, 1950

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Rochelle salt crystal microphones are perhaps the most widely used of all types. In normal use they are dependable performers. Impedance is capacitive and is therefore not constant with frequency. They must be terminated with a high resistance (preferably 1 megohm or greater). Sensitivity is high and frequency response in general is good. They should not be used with long cables. Rochelle salt crystals are subject to permanent damage from excessive humidity and from temperatures in excess of 120°F.

A new development in microphones is the ceramic element. These are free from temperature and humidity limitations of the Rochelle salt crystals but to date microphones made using the ceramic element are appreciably lower in sensitivity. Capacity tends to be smaller necessitating the use of very high resistance termination and of short cables only.

Dynamic or moving coil microphones are used in most applications where ruggedness, dependability, and freedom from the effects of temperature and humidity are required in addition to excellent performance. A dynamic microphone is essentially a low impedance device, except as modified by impedance matching transformers, and may be used with long cables. Sensitivity is approximately the same as the Rochelle salt crystal microphone when referred to amplifier input through suitable matching transformers. It is somewhat more expensive to manufacture than a crystal microphone. In general, the less expensive dynamic microphone will have high sensitivity with somewhat restricted frequency range, entirely adequate for speech, whereas a high quality dynamic, at the expense of some sensitivity, will have wide frequency range and freedom from intermediate peaks and valleys. Also of importance in relation to the cost of a microphone are its ruggedness, accessories such as cable connectors, on-off switches, etc., and over-all excellence of design and precision of manufacture.

The velocity or ribbon microphone gives excellent performance coupled with a bi-directional pickup pattern. It is also essentially a low impedance microphone and may be used with long cables. Sensitivity tends to be somewhat less than that of dynamic microphones. Velocity microphones should not be used out of doors unless precautions are taken to prevent wind from damaging the relatively fragile ribbon.

There are many special types of microphones for special purposes. Mobile equipment, recording and public address work often require hand held crystal or dynamic microphones. A combination of dynamic and velocity types gives the useful "cardioid" uni-directional pickup pattern for reduction of feedback, echoes and audience noises, plus exceptionally smooth wide range response. Some microphones are designed to be of advantage in noisy locations.

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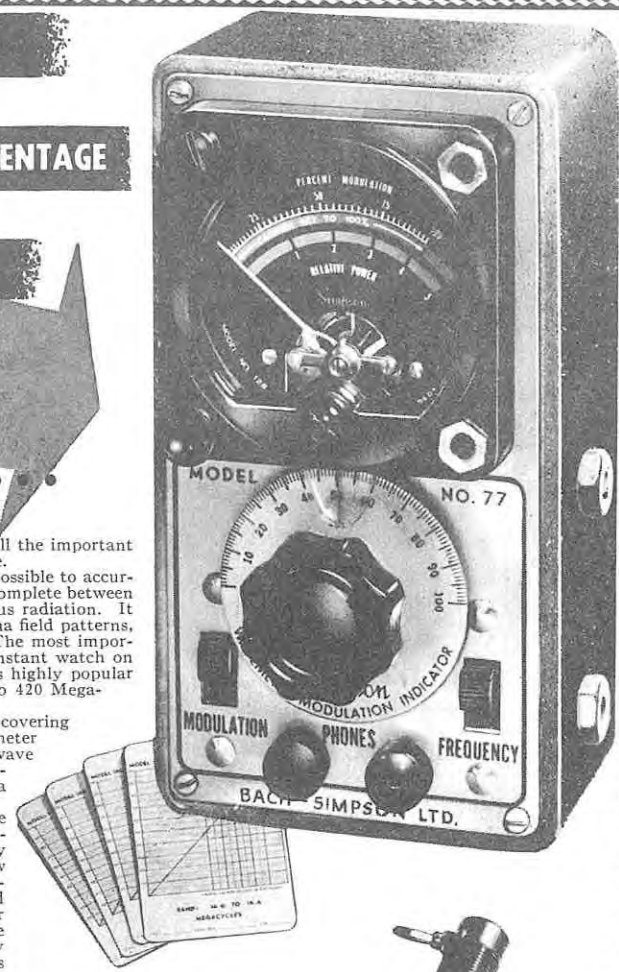
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SKYWIRE

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COMING NEXT MONTH - A full, descriptive article on how to build a simple, effective vacuum tube keyer and written by D.G. Murphy, VE2BV. Also, more data on dynamotor conversion by Tony Lubiniecki, VE2ACJ

November, 1950

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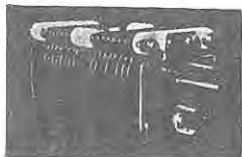
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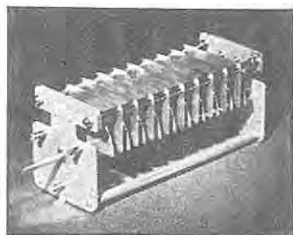
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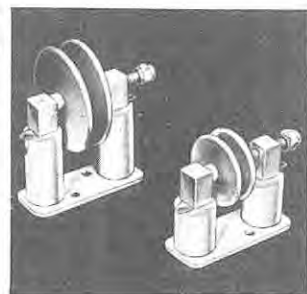


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SIDEBANDS

A lot of the talk among the boys on the bands seems to be about the DX they're going to work this winter. This is the time of year when the finals are ready to go, and the operators are beginning to feel like spending more time again in front of the receiver, looking for those extra countries.

The DX predictions for this next month are good - with openings through the ten meter band. But compare the predicted openings at this time last year, and you'll realize we are on the down side of the sun spot cycle once more. This simply means that DX will not be as good as it has been in the past four years, on twenty and ten. You're in the season of the year for those rare ones, but you'll have to look for them harder!

The truth of the matter is that the lower frequency bands will be in better shape for DX'ing than the high ones, and it begins to look like 21 megacycles, if it is turned over to the amateurs, will be past the peak period where it would combine the finest merits of both twenty and ten. And this trend will continue as the sun spot cycle steadily deteriorates good conditions.

However, if you're a real DX man at heart, there's something fine to look forward to, and that is the constantly increasing possibility of better than ever DX contacts on forty, eighty and even what is left of one sixty. Any of the old timers, who were operating during the mid-Thirties will be able to tell you that a signal on ten in those days was mighty rare, but that lots of good stuff was to be found under the local QRM on the lower frequencies.

It seems more than pure luck that the sun spot cycle nearly thirty years ago, was on the upswing when the first experiments were being made below two hundred meters. We have learned enough about radio propagation to

realize that had not the cycle been right during these early tests, the tests could have ended in dismal failure and short wave radio as we know it today would not be the highly technical and wonderful art it has become. As the early pioneers with their crude, and today laughable equipment, were continuing with their experiments, they were actually following this peak and the short waves, once considered useless, became the most valuable frequencies in the spectrum and a subject of international concern. None of our accepted developments of today such as radar, radio flying, television and the many other forms of electronic service in the world today, might have been possible if "luck" had not been with the experimenters.

A good many of those first Old Timers are still hamming it today. Some of them have made radio their livelihood from the days when the average person didn't even know that radio existed. And today, they get a bigger kick than ever out of the constantly expanding field.

During the week of October 23rd to 27th, here in Toronto, one of Canada's oldest ham supply house - Wholesale Radio - gave a fine, and nostalgic show of fifty years of radio. Held in their showrooms each evening during the week, antique radio equipment sat side by side with television gear beyond the wildest imagination of the men who knew radio inside out just a few decades ago. It was a great display enjoyed by many of the locals who found time to attend. We only wish every ham in Canada could have been there to see what the "hams" before him have accomplished, realizing that we've only made a start, and there's much more to come!!!

Another of Canada's oldest supply houses - Canadian Electrical Supply deserves mention for this year publishing the largest and most complete catalog found anywhere. A copy is yours for the asking. Write for yours!!!

Aerial Design and Installation

The Long-Wire, Yagi, Lazy-H and Sterba Curtain, with PART I Notes on Feeding and Matching

By I. E. HILL

WHEN selecting an aerial system for use on the higher frequencies the amateur must take local factors into greater consideration than need the professional. Often, structural considerations outweigh technical preference; the ultimate design is therefore a compromise and, perhaps far from ideal. The general initial tendency for higher-frequency working seems to be to adapt any existing aerial intended originally for lower-frequency operation. Alternatively or subsequently, if more regular usage is intended, a Yagi system of two-, three- or four-element rotary beam type is erected.

It is fairly safe to say that the majority of amateurs use aerials in one of these two categories. Perhaps the somewhat sketchy summary which follows will suggest an alternative approach to a part of the problem of converting transmitter RF output into DX receiver microvolts input.

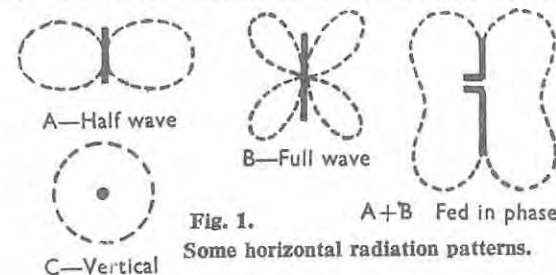
The Long Wire

The long wire—usually a low-frequency aerial operated on its harmonics—concentrates horizontal radiation in four main lobes which more nearly approach the run of the aerial as the length in terms of half-waves is increased. If a near approach to all-round operation is desired an aerial comprising one half-wave and one full-wave or longer, fed in phase and colinear, is probably the most effective. The radiation pattern will combine that of a half-wave aerial, which is broadside, with that of the long wire as in the example of Fig. 1. Alternatively, a vertical dipole could be used which would give the horizontal pattern shown at C, Fig. 1.

But this is only the horizontal radiation picture and at high frequencies the vertical

This article, to appear in two parts, discusses the design and installation of several effective radiating systems, with particular reference to the radiation pattern in both vertical and horizontal planes. It will be of value and interest to all who have to decide how to make the best use of restricted space for the erection of an aerial system.—Ed.

radiation pattern is equally important for DX communication. The only control over the vertical radiation pattern with a long wire or vertical dipole is height above effective earth. For DX working a relatively low vertical radiation angle is essential, and to achieve this the long wire must be at least half-wave above effective earth. This will give one broad major lobe at about 30° from the horizontal. Increasing the height will lower and narrow the lobe but also introduce additional lobes at higher vertical angles (see Fig. 2). Half-wave or full-wave above ground is probably the best compromise for general use, but as the aerial is intended also for lower frequency operation and a height of a full-wave even at 28 mc is about 30 ft.,



the aerial is likely to be surrounded by buildings, trees or other obstacles providing screening. The usual procedure with a long wire is, therefore, to erect it as high as possible and accept the results obtained with good grace. These results

Skywire

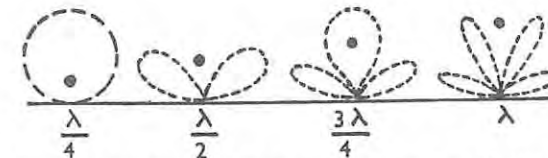


Fig. 2. Vertical radiation pattern for a horizontal wire at various heights above effective earth. The black spot indicates the elevation of the aerial.

will vary considerably with conditions and there will be marked blank areas—if the feeders are correctly adjusted—interspaced by areas of excellent coverage. However, as remarked earlier, the use of a long wire is usually dictated by a requirement for operation on a number of bands and the

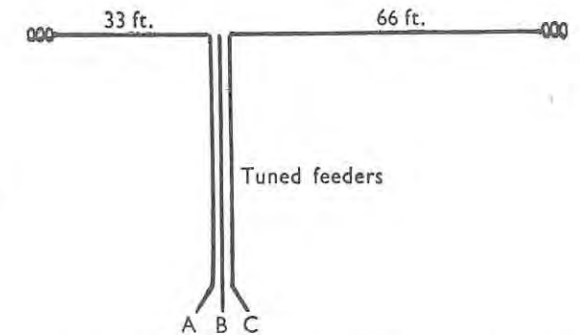


Fig. 3. (B) Dimensions for a suitable multi-band aerial, the design of which is discussed in the text. The vertical limitations are acceptable. The vertical

Feeder connections	1.7 mc	3.5 mc	7mc	14mc	21mc	28mc
A B C						
A B C						
A B C						
A B C						
A B C						
A B C						

Fig. 3. (A) Radiation pattern in the horizontal plane for different feeder connections to the aerial shown at Fig. 3 (B).

November, 1950

Page 7

aerial, for DX operation, can largely be ruled out owing to the difficulty of obtaining sufficient height above ground to attain anything approaching low angle radiation.

All-Band Compromise

An excellent compromise all-band aerial is that shown at Fig. 3 when erected well clear of surrounding obstacles. By the use of tuned feeders and provision of alternative connections to them, a number of combinations become possible and are listed. The example in Fig. 3 is based on 14 mc operation as the main requirement. The vertical radiation pattern will vary with the different frequencies and depend on the height selected. A satisfactory height for 14 mc will be 30/35 ft., but if this does not clear local obstacles the gain due to satisfactory vertical angle radiation may well be offset by power absorption in the obstacles. The safest rule is, therefore, to erect the aerial clear of obstacles and see what happens. If results are not up to expectation try a different height, up or down, before discarding the aerial as N.B.G.

Yagi Rotary Beam

The newcomer, having got the transmitter working on the existing long wire, finds there are directions in which he cannot make contacts and in nine cases out of ten his thoughts turn to a rotary Yagi multi-element beam. In many ways this is the solution of his difficulties and for many locations in built-up areas it is the only solution. But it is not the only or necessarily the best technical answer.

To be worth while a rotary beam must be uni-directional and concentrate radiated power or received signal in a narrow horizontal arc. Both these requirements are advantageous once a QSO has been established but are not helpful in making initial contact. If the beam has not got these properties there is no point in making it rotatable. A well-known "ten metre" amateur was once heard to say that he put the beam towards the direction

in which he expected to work and relied on hearing local stations calling for warning that signals were coming through from

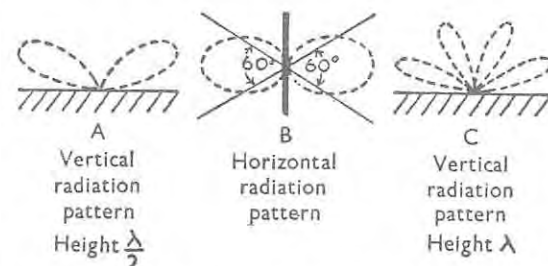


Fig. 4. Radiation patterns for a Lazy-H type of aerial.

other directions! It sounds a bit far fetched but does indicate that his aerial really was properly set up as a beam.

Amateur Communication Requirements

The amateur requirement is to put a signal into an area—usually at DX—and to do it with a minimum power input. Only a given amount of power is available for radiation and concentration in one direction must be at the expense of that in another. This is generally appreciated but is considered only in terms of the horizontal plane. Most amateurs therefore concentrate on directivity in the horizontal plane, and vertical directivity happens accidentally. On the higher frequency DX bands—28, 21 and 14 mc—only that power radiated at low vertical angle is useful for communication purposes, being reflected by the various ionised layers of the upper atmosphere. The power radiated vertically or at high vertical angle does little, other than during short skip conditions, than bounce off passing aircraft and produce an interesting flutter on the signal. It is RF power wasted.

The requirement, therefore, for amateur communication is an aerial system which will give both horizontal and vertical directivity. The horizontal directivity required can be stated precisely, but the vertical angle is a variable dependent on conditions and must be fairly low (10° to 30°). The rotary Yagi at a suitable

Skywire

height does achieve this condition, but it is not the only way of attaining it and if space is available it is interesting to try alternatives which may also give some advantages.

The Lazy-H

A half-wave dipole is directional horizontally broadside to the run of the wire. If a number of half-wave dipoles are erected, suitably spaced, in the same plane and all fed in phase the broadside directivity is increased. This property is utilised in the Lazy-H, which is perhaps the simplest form of stacked array and will give both horizontal and vertical directivity. By positioning a Lazy-H with the lower elements half-wave above effective earth the radiated power is concentrated in two opposite sectors of about 60° to 80° width in the horizontal plane and in vertical lobes at about 20° to 25° from the horizontal, as shown in Fig. 4. Increasing the height to full-wave will only affect the vertical radiation pattern, making the main lobe lower but introducing a near-vertical one. For DX working the latter is largely wasted power and the main lobe may or may not be more advantageous for DX working than the lobe obtained at half-wave height. For 28 mc operation something between one-half and three-quarter wave above ground seems to give maximum power in the right general vertical direction without wasting any in competition with the already harassed civil air lines. Dimensions for such an aerial are shown in Fig. 5. The feed can be either tuned line—which should not be greater than 50 ft. in length—or 600-ohm line with stub matching. Convenient feeder spacing, including the crossover section necessary to give in-phase feed, would be 4-in. using No. 14 copper wire as feeder.

(Part II of this article will appear next month)

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Driving the Cathode

Short Note on a Useful Circuit

By K. W. LAWSON (G3AHJ)

In the construction of economical and efficient VHF equipment, it is always essential to keep losses to a minimum.

One arrangement which is well worth more attention is the cathode-drive or inverted triode arrangement. It will work well with most triodes, either directly or indirectly-heated, and RF output can be obtained at frequencies at least as high as 150 mc.

Fig. 1 shows the basic circuit, and Fig. 2 a practical derivative of it. The input capacity of the valve, which is normally between grid and cathode, is now between cathode and earth, though still effectively cathode-grid but without the feedback due to anode-grid capacity. RF chokes are included in the filament (or heater) leads in order to minimise input losses caused by the capacity between the LT supply leads and earth.

No neutralisation is necessary, which is an important advantage, and with proper attention to layout, improved RF output can be obtained in comparison with the conventional arrangements.

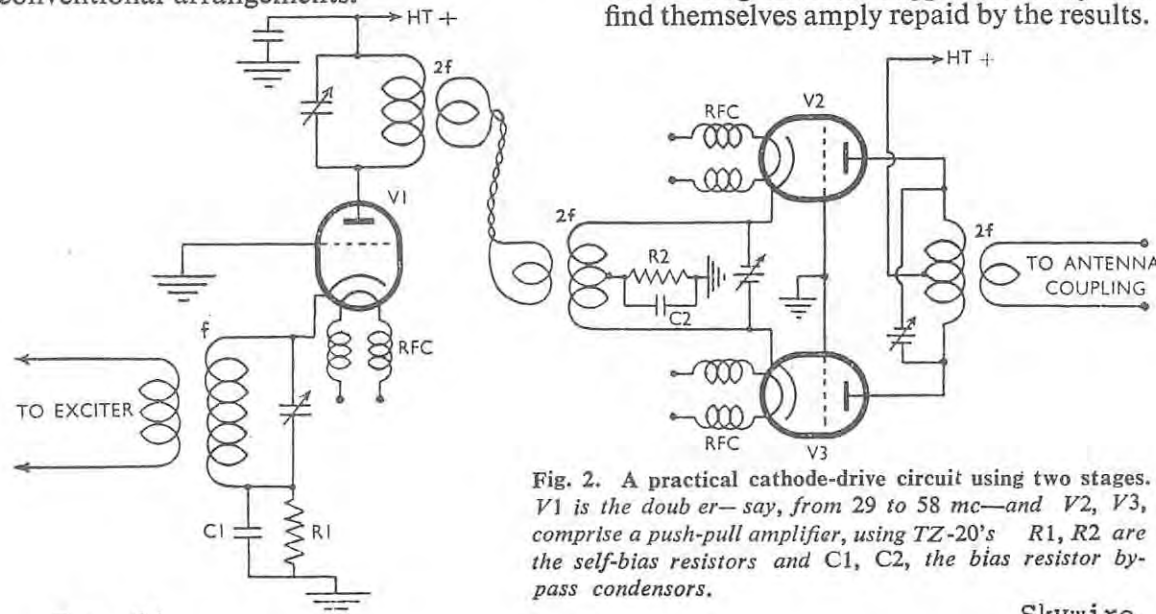


Fig. 1. Basic circuit for cathode drive RF amplifier

Those working on 28, and particularly 58 mc, are urged to do a little experimental work along the lines suggested. They will find themselves amply repaid by the results.

Fig. 2. A practical cathode-drive circuit using two stages. V1 is the doubler—say, from 29 to 58 mc—and V2, V3, comprise a push-pull amplifier, using TZ-20's. R1, R2 are the self-bias resistors and C1, C2, the bias resistor bypass condensers.

Bit of Psychology

Coping with That BCL !

By F. HENNIG

BELIEVE it or not, but hams are only human ! So next time you're launching your very best in CQ calls and a purposeful knock comes on the front door, don't be too ashamed of that hunted look that springs to your eyes and those little warning lights that flash "TVI" and "BCI" through your brain.

Oh yes—your rig just bristles with suppressors ; you boast the biggest Faraday screen East of the Rockies ; and you've tucked a trim little wavetrap into every aerial for miles around. But don't dare rest content till you've learnt how to act when that inspired "CQ" has burst boldly through all your protective barriers and the XYL is calling "Darling . . . there's a man at the door and he's asking about your broadcasting !"

Then it is, OM, that a little applied psychology can come to your aid. Remember, your only hope is to convince the complainant that the reins of *science* are held firmly in your grasp and that every microwatt that has ever jumped off your aerial has winged its way unswervingly along the path of Progress. Here's what to do.

Greet your neighbour at the door with an expression of intense, unsmiling wisdom. Wring his hand to the point where he is about to sue for peace and lead him straightway to the shack, uttering not a word. Once inside your den, of course, he's at your mercy.

Softening Him Up !

Fire up the rig without delay, switch on the carrier, and nonchalantly dangle your trusty bulb and loop as near to the PA tank as personal safety and your nerves permit. Idly strike neons in the most unexpected places, and slyly observe his reactions. Now all this may seem very *naïve* to you but few of the uninitiated can withstand the lure of lamps illuminated by unseen hands, and your victim will be no exception. His eyes will widen with childlike wonderment, his lips will tremble at

HF, and the softening-up process will be well under way.

Just for good measure, draw a sizable spark from the aerial, hand him the screwdriver and invite him to do the same.

Quick now !—you must thwart his endeavours to bolt for the door . . . and promptly turn his attention to the receiver.

With AF and RF gains wide open, swing to and fro over 7 mc (See now why this band is called the Roaring Forties ?) QRM ? QRN ? Don't let them worry you. It's *noise* that counts, and the more of it the better. Human powers of resistance are normally such that three minutes of this treatment will implant a frightening fixed grin upon the visitor's features and bring you a fervent apology for having been troubled.

If It Fails—

One final measure remains, only to be resorted to in the most troublesome cases. So you break in on his Brahms ? So the TV pictures of bird-life in Outer Mongolia are accompanied by a voice that no bird ever owned ? Very well !

Announce firmly your intention of popping round to look over his set and then, with awful deliberation, proceed to pack your tool-kit.

Hack-saw ? Yes, you'll need that. Four-pound hammer ? Of course ! Cold chisel ? In it goes ! Add a meter or two if you must, but these are uncalled for embellishments. Then stride with shining eyes towards the door.

See ? Your problem is solved. Your visitor has fled to protect his domain. That diplomatic cup of tea the XYL thought of just won't be needed now. Relax, OM, and drink it yourself—and get after Zone 23 again !



COMMAND CONVERSION

VE3WO

Most amateurs who have them have already found a way to put into operation, the now famous BC-457 and 458 Command rigs. But, for VFO operation, one thing was lost - the advantage of an accurately calibrated dial which would show within a kilocycle or so exactly where you were on a band without a fast check with the freq meter (?) or the shack noise box. Since most of these great transmitters are used as VFO-Exciters, this article will provide adequate information on modifying the coils to provide accurately calibrated tracking on the original dial.

First, we'll treat the modification of the 457 to bring it down in frequency for 80 meter use. The main cover and bottom plates are removed first. Then the shield can over the oscillator coil must be removed. This is the housing which is held down by a dozen small bolts, and which is located between the 1625 final tubes, and the oscillator, eye and crystal sockets. Remove the connection at the top of the coil, running to the condenser. This is simply done without damaging the coil in any way, by cutting the lead.

Next, add four turns of ordinary insulated hook-up wire - solid type about size 20, to the top of the coil, without spacing it at all. Connect the new top end to the condenser at the point cut off and solder down. Cement the turns into place after pushing them down hard against the rest of the original winding.

Replace the oscillator shield can, and then set the main tuning dial to read 5.1 megacycles. Shield can must be firmly bolted, to avoid variation in calibrating. Turn on oscillator plate voltage only and adjust the iron core in the oscillator section, until the magic eye shows resonance at the crystal frequency of 4.6 megacycles. Set the main dial to 4.0 and trim to 3.5 megacycles as heard in freq meter, with the small trimmer on the top of this can. Then repeat the operation several times to insure,

without error, the proper tracking. You may find it necessary to change the setting of the main oscillator padding condenser, to achieve this tracking. But if you do change it at all, move it just a hair at a time, or you'll have a rough time getting back to where you started.

When this operation is completed, add four turns of insulated hook-up wire to the top of the amplifier tank coil and insert a milliammeter in the main plate supply lead. Adjust the amplifier padder condenser, to be found below the chassis next to the 1625 sockets, to resonance, indicated by the usual plate current dip. Then dial across, and see how much variation in plate current there is from one end of the band to the other. It should not exceed three mils. If it does, re-adjust the padder for minimum change between 3.5 and 4.0 megacycles, and lock condenser shaft in place. Then, cut out the Figure 2 dial scale on opposite page and paste it up carefully. Result is an accurately calibrated range for the tuning is linear. If you want to read to fractions of a kilocycle, change the small knob by which dial is rotated to a larger one which can be read to as close as 500 cycles.

BC-458 FOR FORTY

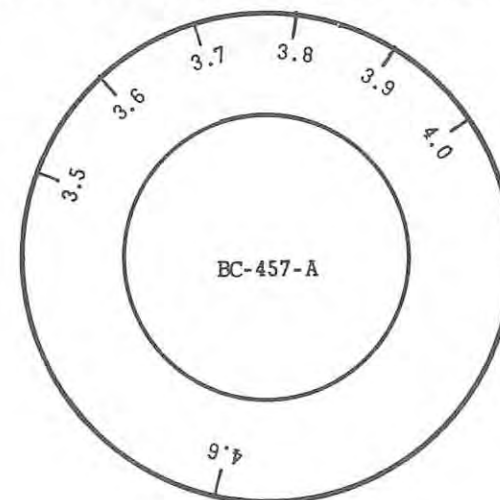
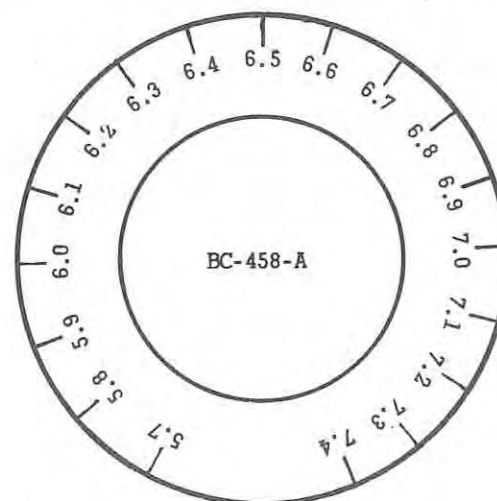
The modification of the BC-458 for use on forty meters is accomplished by much the means as outlined for the 457. One turn of the oscillator coil is removed in this case or simply shorted out by flowing solder in between the top two turns. Then the iron core is turned completely in. Replace can tightly now. Then adjust the oscillator trimmer for 7.4 megacycles with your dial set at 7.0 mc. Then set the dial at 5.8 and trim with iron core until resonance is shown in the magic eye - 6200 kc. Repeat these two adjustments several times until tracking is correct. If necessary, bend top of oscillator can down to lower slug into it farther and tracking will be exact.

Skywire

Short the two top turns of the final coil, and turn slug right in. Set the dial at 7.0 and tune amplifier padder for the plate dip. Set dial at 5.8 and tune iron core for the dip again. Repeat these two steps several times until plate current doesn't vary more than five mils from one end of dial to the

other. Then cut out the chart below and it will be an accurate calibration of the new range when pasted to the dial.

In case you're wondering, you need the entire dial to provide VFO drive for six meters - 8th harmonic of 6215 - 6750 kc.



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Recorder is a real asset in ham radio operation. It takes input from microphone, phono pickup or direct from your receiver. Outputs for external amplifier or speaker. Push button control makes Model 80 easy to operate while you are on the air, and provides all desirable recording, playback, and erasing combinations.

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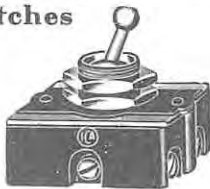
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TYPE 814 ----- \$3.00
Brand New In Cartons!!!!!!
2 for \$5.75

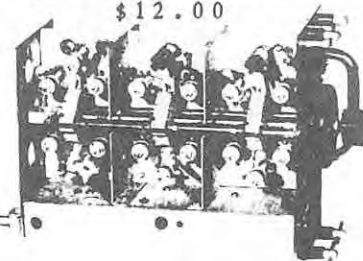
Heavy Duty Switches



4PDT centre off
15 amps - \$1.25

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capacity - \$1.00

10 METER CONVERTER
RF-24 complete with full
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\$12.00



SURPLUS SPECIAL LOW PRICED TUBES

2A3	-	\$1.67
2X2	-	.40
6C5	-	.75
6F6	-	.99
6J5	-	.80
6J5G	-	.80
6K6G	-	.60
6K7	-	.65
6K8	-	.95
6L7	-	.95
6N7	-	.95
6R7	-	.80
6SK7	-	.90
2V3G	-	.75
12C8	-	.65
EF50	-	.40
VR150	-	.65
304TH	-	7.25
446A	-	2.00
801A	-	1.60
807	-	1.75
813	-	7.50
814	-	3.00
816	-	.99
826	-	1.50
830B	-	4.60
878A	-	2.50
E1148	-	.40
1299A	-	.35
1616	-	.95
1619	-	.65
7193	-	.30
9003	-	.50
9004	-	.30
9006	-	.30



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Similar to illustration shown
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1N-34 crystals
\$1.29
each

THE RADIO CENTRE

62 CRAIG ST. WEST, MONTREAL P.Q.

HOW'S UR OBS IQ?

The American Radio Relay League

Official Bulletin Nr 260, Sept 29, 1950.
With the assistance of amateurs who are
active on 28 megacycles, A.R.R.L. each
year conducts a program of on the air
code practice for persons wishing to
learn the continental code. The current
program is getting under way, but addi-
tional volunteers are needed. Schedules
may be arranged to suit the convenience
of co-operating amateurs, and will be
published in QST. A combination of
voice and code transmissions is consid-
ered to be most effective. Suggestions
for conducting code lessons over the air
are available from A.R.R.L.. If
you are operating on 28 Mc and are will-
ing to assist in this program, send a
postal or radiogram to the Communication
Department, for full details.

Official Bulletin Nr 261 is of specific
W interest only - concerns election of
Directors, and will not be reprinted!

Official Bulletin Nr 262, Oct 12, 1950.
The latest C.R.P.L. propagation forecast
predicts ionospheric disturbances for
the periods October 15th through 17th,
October 21st and 22nd, and October 28th,
through November 2nd. Interesting opp-
ortunities for the VHF man may accom-
pany these disturbances. If aurora is
visible, or if strong aurora reflected
signals are heard on 28, 50 or 144 Mcs,
it is possible that the 50 Mc band will
be open the following morning to South
America, probably between 9.00 and 11.00
ayem local time. It is probable that the
2 meter band will be open for aurora
reflected CW communication during the
periods given above. VHF men are urged
to be on the job and to report their
observations to A.R.R.L.

Official Bulletin Nr 263, Oct 20, 1950.
You are cordially invited to take part
in the Seventeenth A.R.R.L. Sweepstakes
Contest November 18th, 19th, 20th, and
25th, 26th, and 27th. Awards will be
given in each A.R.R.L. section, one to
leading radiotelegraph and one to lead-
ing radiotelephone operator. Complete
rules appear on page 16 of November
QST. Send a postal or radiogram to the
A.R.R.L. Headquarters, giving the call
of the station from which you copied
this message and you will receive gratis
special Sweepstakes reporting forms.

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To write articles on transmitters,
receivers, antennas, test equip-
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eral interest to amateurs. Ar-
ticles should be typewritten, be-
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length, accompanied by suita-
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lists. Liberal payment made
upon acceptance.

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SKYWIRE

THE CANADIAN RADIO AMATEURS' JOURNAL
435 PARKSIDE DRIVE, TORONTO, ONTARIO

HAMADS

Skywire Hamads must pertain to amateur radio. Rates are 20 cents per word, per insertion for commercial advertisements for profit, and 4 cents per word for all non commercial, non profit advertisements by experimenters or licensed radio amateurs. Full remittance MUST accompany copy. Print plainly and count address in the total. Do NOT send personal checks unless exchange is included. Mail to Skywire, Toronto.

Wanted - HRO General Coverage or Band-spread coils for glass tube models. Write H.A. Moray, 6702 McLynn Ave., Montreal, P.Q.

Multitester - 2 inch, 3-1500 volts, 3-300 milliamperes, 0-1500-500K ohms - \$6.50! Write Kopulos, Three Hills, Alberta.

For sale - 1946 RME-45 with speaker, \$150.00 SX-17 with speaker, \$165.00. One RCA CMV-1A 150-172 Mc transmitter-receiver complete at \$475.00. McCullough, 514 Scarboro Ave., Calgary, Alberta.

Receiver - Super-Pro, 2.5 to 20 megacycles, plus broadcast. Can be converted at twenty bucks per band. Like \$150.00 but would appreciate any offer. H.E. Roe, 8 Margaret Court, St. John, New Brunswick.

Millen R9'er, brand new, with coils for ten and twenty meters, plus channel four television. 6AK5 is included. Amateur net cost now - over \$51.00. What cash offers in Toronto area that are reasonable. Phone LOmbard 7483 or write 99 Marchmount Road, Toronto, Ontario.

When sending Hamads to Skywire, be sure to include proper remittance to avoid the need for correspondence!

Deluxe transmitter - kilowatt class, for sale. This rig is completely enclosed in beautiful imported Par Metal blue-finished cabinet. Custom built for fine quality of appearance and operation, all meters, illuminated type, behind decorative glassed panel. Final consists of 833-A tube, plate modulated by 810's in Class B. Speech amplifier and driver and RF driver incorporated. Complete time-delay and relay circuits, relay overload and underload, remotely controlled. Some power supply components needed for 25 cycle area to put this rock crusher back on the bands. B&W coils throughout, highest quality parts used. Transmitter will be sold only on personal delivery basis, at reasonable price. For appointment to look this over, write Box 8, Skywire, giving address and phone number.

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unidirectional cardioid crystal
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NEW SYNABAR MICROPHONE

offers a new measure of clear-toned performance quality ... and its perfection does not diminish through long service life, thanks to a new ruggedness of construction. Perhaps the outstanding engineering achievement incorporated in this newly perfected unit is the use of a special sintered metal to cancel out 15 db front to back, making the Synabar, for practical purposes, dead to sound from the rear. Excellent frequency range, from 50 to 10,000 c.p.s., is further enhanced by a Response Selector switch, which provides choice of ideal pick-up characteristics for either crisp voice or general voice and music. The Synabar's crystal element has a special METALSEAL protection against moisture or dryness. A high impedance microphone, it has an output level of -54 db. It has a satin chrome finish, is furnished with detachable concentric cable connector and 20 feet of single conductor shielded cable, and is available in models with or without off-on switch.



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Compare style
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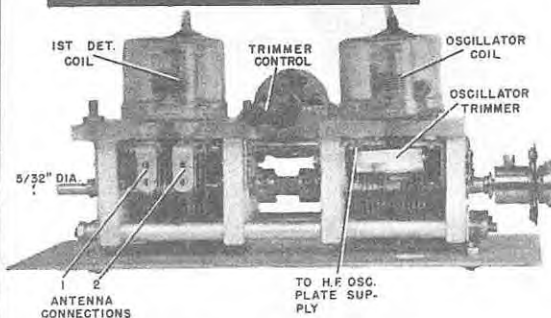
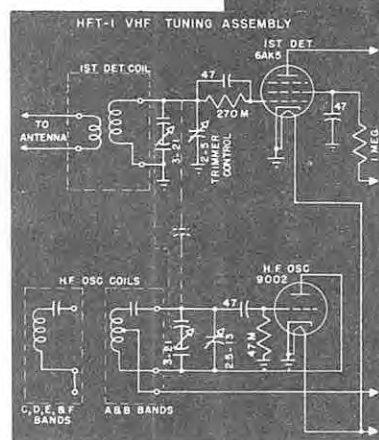
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your
own
VHF
equipment



National HFT-1 Tuning Assembly

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Established 1903

MARCONI BUILDING, - MONTREAL

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Add a VHF tuning unit to your converter. Tune the 1 1/4, 2, 6, 10 and 11 meter bands. Make your own broad-band FM broadcast installation. Build a complete VHF receiver.



NEUTRALIZING CONDENSERS:



NC-600U

With standoff insulator
NC-600

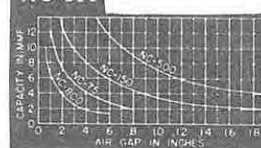
Without insulator
For neutralizing low power beam tubes requiring from .5 to 4 mmf., and 1500 max. total volts such as the 6L6. The NC-600U is supplied with a GS-10 standoff insulator screwed on one end, which may be removed for pigtail mounting.



STN

The Type STN has a maximum capacity of 18 mmf. (3000 V), making it suitable for such tubes as the 809. It is supplied with two standoff insulators.

NC-75
NC-150
NC-500



NC-75

For 812, 75TH and similar tubes.

NC-150

For RK36, 100TH, HK354, 250TH, etc.

NC-500

For WE-251, 304TH, 833A and the like. These large disk-type neutralizing condensers are for the higher powered tubes. Disks are aluminum, insulation steatite.

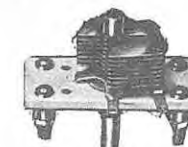


NC-800A

The NC-800A disk-type neutralizing condenser is suitable for the T40, 35TG, 808 and similar tubes. It is equipped with a clamp for locking.



MINIATURE CONDENSERS:



The UM condensers are low-loss, aluminum plate staked construction miniature variables designed for UHF converters, VFOs and the like — minimum capacity is exceptionally low. The UMs can be mounted in PB-10 or RO shield cans and have 1/4" dia. shafts front and rear for ganging



The UMB-25 are differential (balanced stator) models. UM-10D and UMA-25 are double-spaced and the latter is bolted construction for experimental capacity reduction. Hardware for panel or chassis mounting is supplied with all UM condensers.

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Established 1903

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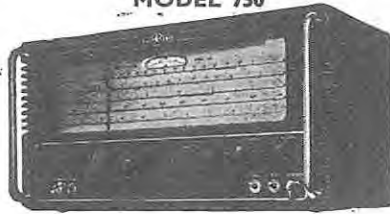
TORONTO

HALIFAX

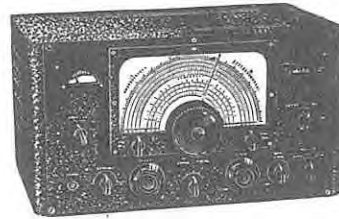
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EDDYSTONE
25 or 60 cycles
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IT'S MODERATELY PRICED!

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LINK ARM ASSEMBLY FOR ABOVE - \$3.00

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LINK ARM ASSEMBLY FOR HDVL \$3.37

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VE3YR

GEORGE

The Crawford Radio
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HAMILTON, ONTARIO

VE3JU

BILL

DX PREDICTIONS

Prepared by C.B. McKee, Engineering Division, CBC International Service

PREDICTIONS FOR NOVEMBER, 1950

Skywire frequency predictions are for amateur communications on various circuits to almost any part of the world. These tables are for five major areas in Canada, and amateurs who are operating reasonably close to the cities indicated will find these predictions quite adequate.

Figures shown are in megacycles and indicate the band to be used. They are for normal F layer transmission and don't consider Sporadic E which may provide unusual DX openings!

Sackville to:	AST	01	03	05	07	09	11	13	15	17	19	21	23
Europe	7	7	14	14	28	28	28	28	14	14	7	7	7
Africa	7	7	7	7	28	28	28	28	14	14	14	14	14
Caribbean	7	7	7	7	14	28	28	28	28	14	14	14	14
S. America	7	7	7	7	14	28	28	28	28	14	14	14	14
Australia	7	7	7	7	7	7	7	7	7	7	7	7	7
U.S. - West	14	14	14	14	7	14	28	28	28	28	14	14	14
U.S. - Central	14	14	14	14	7	14	28	28	28	28	14	14	14
U.S. - South	14	14	14	14	7	14	28	28	28	28	14	14	14
Vancouver	14	14	14	14	7	14	28	28	28	28	14	14	14
Watrous	7	7	7	7	7	14	14	28	28	28	14	14	14
Toronto	7	7	7	7	7	14	14	14	14	14	14	14	14
Montreal	3	3	3	3	3	7	14	14	14	14	14	14	14

Vancouver to:	PST	21	23	01	03	05	07	09	11	13	15	17	19
Europe	7	7	7	7	7	7	14	14	14	14	14	14	14
Africa	7	7	7	7	7	7	14	28	28	28	28	14	14
Caribbean	14	14	14	14	14	14	14	28	28	28	28	14	14
S. America	14	14	14	14	14	14	14	28	28	28	28	14	14
Australia	14	14	14	14	14	14	14	14	14	14	14	14	14
U.S. - West	14	14	14	14	14	14	14	14	14	14	14	14	14
U.S. - Central	14	14	14	14	14	14	14	14	14	14	14	14	14
U.S. - South	14	14	14	14	14	14	14	14	14	14	14	14	14
Watrous	7	7	7	7	7	7	14	28	28	28	28	14	14
Toronto	14	14	14	14	14	14	14	28	28	28	28	14	14
Montreal	14	14	14	14	14	14	14	28	28	28	28	14	14
Sackville	14	14	14	14	14	14	14	28	28	28	28	14	14

This Is The Ionosphere

by Clive B. McKee of CBC International
Service Engineering Department

This is the third in a series by CBC Engineer McKee on "The Sun and Short-wave Broadcasting." These talks were originally prepared for use on CBC International Service, and are presented in RADIO for your background information.

IN THE THIRD of this series of talks, we intend to take you on a short journey of 150 to 200 miles. Not very far is it, when you think of some of the distances mentioned in previous talks. But this journey is a most unusual one and we are afraid you can accompany us only by making full use of your imagination.

Come with us then, to an imaginary balloon 150 to 200 miles out in space above the surface of the earth. Do not be perturbed for we will have you back on terra firma safe and sound again before we finish our talk. During our descent we will describe the various layers of the atmosphere that we pass through and point out the ones which concern the communications engineer. These layers, the ones of importance in radio, communication, are each designated by a letter, and journeying downwards to the earth we will start at the "F" layer and pass through the "E" and "D" layers before our balloon finally comes to rest.

These letters of designation were originally given to the layers by the famous English scientist, Sir Edward Appleton, who has done so much to further man's knowledge of the Ionosphere and radio communication. You will notice that these layers are designated F, E & D. We can imagine you saying to yourselves where have the A, B & C layers gone. Well as yet there are no A & B layers, and it is only recently that scientists have tentatively designated a C layer. Sir Edward Appleton discovered the F layer and with the reasoning mind of a scientist realized that more layers might, in future years, be discovered above or below the one he had found. For this reason he arbitrarily designated his layer with the letter F.

At the present moment all of us in the imaginary balloon are in the F layer and before we descend, let us tell you very fully about this layer, as it is the most important of them all.

What then is the F Layer? The truthful answer, of course, is that we don't know definitely, we can only surmise. The F layer, in the light of man's present knowledge, can be called the roof of the ionosphere. And how is the F layer, and with it the E & D layers, formed?

Many of our listeners will undoubtedly have a barometer in the home. The barometer indicates the pressure that the world's atmosphere exerts upon the earth, and at sea level this instrument would record an air pressure of approximately 15 pounds per square inch.

At an altitude of three miles or nearly 16,000 feet we should find that our barometer indicated a pressure of about seven and a half pounds per square inch. Above this level the pressure continues to decrease rapidly.

At a height of about 100 miles the atmospheric pressure is so slight that the air is very very thin or, as the scientists call it, rarefied. Nevertheless this thin air is still composed of countless millions of molecules of oxygen and nitrogen more widely separated than at lower levels. Each one of these molecules is in turn composed of atoms.

The Atomic bomb ushered in a new era and made the world atom conscious. It may seem superfluous therefore to describe what an atom is, but what follows will be clearer if we do review briefly its composition. The atom is composed of positive and negative charges of electricity. Atoms also contain other infinitesimal particles



that do not belong to either of these charges of electricity, and because they remain strictly neutral, they are termed neutrons.

On our preceding talks, we said that ultra-violet rays from the sun caused ionization of the upper atmosphere. An atom is said to be ionized, when one of the little negative particles of electricity called an electron becomes detached from its parent atom. These electrons or negative particles of electricity, render the atmosphere electrically energized and when this happens it is possible for short-wave radio communication to take place.

Now the little electron is very fond of its parent atom and the atom is very fond of its little electron, so immediately after they have been separated, they attempt to feign each other. Due, however, to the great space in which they have become separated, it is by no means easy for them to find each other again! When of course they do rejoin, that atom is no longer ionized. That is the action of one atom, but we must remember that there are millions and millions of atoms all going through the same process of losing their electrons, finding them again, and then once again losing them and so on.

Now as we said before, the sun and the ultra violet rays radiated by the sun are responsible for this state of affairs. Now what happens when the sun's rays are no longer directed upon the atmosphere? Well, naturally all the electrons set off in search of their parent atoms, and vice versa and as you can imagine it takes a considerable time for them to find each other. As we have said before, while the atom is without its electron it is said to be ionized and it takes quite some time for

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the atom and its electron to be re-united. Therefore, after darkness has fallen the section of the atmosphere under discussion remains ionized for a considerable time. During the summer when the sun is present in the northern hemisphere for very many hours of the day, the ionosphere remains heavily ionized, and the ionization decreases only very little during the hours of darkness, usually reaching a minimum value just before daybreak. In winter the ionosphere reaches high levels of ionization only during a short period of the 24 hours, in the hours just prior to and just following mid-day. After this time the ionization decreases very rapidly. We have, therefore, varying degrees of ionization of the atmosphere surrounding the earth, from the highest degree of ionization in the sunlit part of the world, to the lowest degree of ionization over that part of the world which is in darkness. This variation in degree, or density, of ionization of the earth's atmosphere, is of great importance in communications engineering, and its action in this respect will be fully discussed in a subsequent talk. Its importance to the communications engineer is however comparable to the sailor's need for knowing the depth of the water through which he has to navigate his ship.

The height and density of the F layer is not constant and varies not only from day to day but from hour to hour, and it is necessary therefore for man to keep himself as fully informed as possible of its many variations. This is done by about 60 observatories in many parts of the world. The information obtained by their observation is sent to various centres where it is correlated and examined by scientists. Their findings are then passed on to broadcasting organizations all over the world to enable their engineers to extract and use that part of the information most suited to their particular needs.

Having introduced you to the F layer, let us now descend in our imaginary balloon to the E layer. The E layer is usually somewhere in the region of 70 miles above the surface of the earth. This is an ionized layer just like the one we have discussed. But with an important difference. The F layer was present in varying degrees of density of ionization around the earth whether the part of the earth concerned was in daylight or darkness. The E layer however is normally ionized sufficiently to effect short-wave communication only during daylight hours.

Now as we told you when describing the F layer, the ultra violet light causes the ionization of the atoms. To do this the ultra violet light had to expend energy. Due principally to this fact and also that it has to travel a greater distance through

the atmosphere before reaching the E layer, it does not raise the E layer to a very high level of ionization. In other words there are not so many electrons loose or free from their parent atoms. After the sun has passed on, therefore, the E layer quickly loses its ionization, and in fact is normally only ionized to any great extent between sunrise and sunset.

Let us now once again descend and shortly we come to the "D" layer at a height of 30 to 40 miles above the earth. This is a minor layer, of importance only in short-wave communication when the electrical stability of the ionosphere is upset and we have magnetically disturbed conditions.

Descending once again we enter and pass through other layers of the atmosphere.

First we pass through the ozone layer at a height of about 25 miles above the earth. It is thought that the lower part of this layer may be the region tentatively designated "C" by the scientists.

Next we enter the Stratosphere at about 16 miles above the earth, and then down through the Troposphere and the cloud layers until at last our balloon comes safely to rest on good Mother Earth.

It wasn't a long trip was it, but in imagination you have been to far greater heights than any man has ever yet attained. Now, let us just summarize briefly.

Firstly there are three layers which are of significance in radio communication. The F, E & D layers.

The Ionosphere covering a height of from 40 to 200 miles is an area of varying degrees of ionization principally concentrated into these three layers. The air at these levels becomes electrically energized by the ultra violet radiation from the sun, and also by charged particles shot off by the sun. This energized condition is called ionization.

Solar radiation at such high altitudes is far more intense than at the earth's surface, as it has suffered very little absorption by the atmosphere. The ultra-violet radiation from the sun is very intense at these heights. Fortunately for us, however, most of this radiation is absorbed by the upper atmosphere, as the ultra violet rays would otherwise be dangerous to human beings.

It is this intense ultra violet light which causes the atoms to "ionize," that is to "free" electrons from them. The free electrons tend to rejoin their parent atoms but the distances between atoms at such heights are very great, and once ionization occurs full recombination of the free electrons and atoms may not take place for a considerable time. The greater the ease and speed with which the free electrons rejoin their atoms, the lower the layer is

above the surface of the earth, that is the greater the atmosphere density.

The highest layer, that is nearest the sun and therefore receiving the full strength of the ultra violet radiations is the F layer, and as far as world wide broadcasting via short-waves is concerned this layer is by far the most important. The atmosphere at these heights is so thin that recombination of the free electrons and atoms takes place very slowly, and there is a sufficient density of ionization in this layer to last throughout the hours of darkness.

The E layer lies at varying heights of between 60 and 90 miles above the earth and is ordinarily observed only during daylight hours. This layer also by the action of the ultra violet radiation becomes ionized, with the maximum amount of ionization at local noon. Due however to the greater distance travelled by the ultra violet rays, the absorption already suffered at the F layer, and due to the increased atmospheric pressure, that is the increased density, the electrons can more easily recombine with their atoms. This layer does not therefore remain ionized for very long after sunset.

Next and last we have the D layer, which except under abnormal conditions is by no means as heavily ionized as either of the other two.

Now that you know something of the Ionosphere we shall be able to tell you in a future talk how and why it is used.

Haunted House



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EMERGENCY TEST

Reported by VE3IL - Bill Choat

The Toronto Emergency Corps Exercise of October 15 and 16 was headed by Arthur Gee, VE3DHQ, who acted as officer-in-charge of Local Headquarters which was set up in Hillcrest Park on Sunday, October 15th, at 1.00 p.m. Through efforts of the four EC's in Toronto Area - Les Weir, 3AIB, Karl Emes, 3RG, Si Young, 3BL, and Bill Choat, 3IL, the Toronto group had been advised that the Exercise would be held on the Sunday afternoon!

Promptly at 1.30 p.m., the various mobile units, with assistant operators, began to reports into HQ on 2, 6, 10 and 80 meters. At approximately 1.45, various assignments were given the 18 mobile units which had reported in, and contacts were made with, and messages delivered to and taken from, the three Red Cross Services in the city, the St. John's Ambulance Corps, and the Civil Defence Committee, also located in the city. A simulated emergency was made

For instance, we have RA-10's and TA-12's in fine condition at just \$37.00 per unit. And brand new surplus Marion hermetically sealed meter, various low prices. What do you need - what range? We also have a few of those great mobile units advertised last month - \$69.00 complete! And there's a ham near you who has one of our famous double conversion hamband receivers - the R-1116 which we sell at \$17.95 complete with tubes. There are relays, speakers, oil filters, resistors, 1068A VHF receivers, AT-1's - AT-7's, radar units, amplifiers and a pair of R-1155 receivers. Write for prices now, on anything you need for the winter DXing.

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from the fact that the centre of the city had been hypothetically bombed, and that evacuation centres had been set up in the northwest and northeast areas of the city, to which mobiles were despatched, and messages exchanged from those distant points, into the fringe of the presumably bombed out area.

Something in excess of one hundred and fifty messages were handled during the time the exercise was active, and a total of 49 members out of 52 registered in the Corps, who turned out to participate in the event. By means of a two meter link from the Emergency Headquarters, there was immediate contact with A.R.R.L. Headquarters at Hartford and this set-up proved highly satisfactory and efficient. The boys whose calls appear below - VE3's - deserve considerable praise for the manner in which the entire exercise was handled! ... Participants for the day were - ATR, AHV, AIB, AKO, AZX, ANO, ANT, AJJ, ARV, ADR, AHA, ALY, AOS, ARF, BL, BGY, BOY, BYZ, BIF, BUO, BOX, BJZ, BZV, BWQ, BXI, DGQ, DHL, DN, DHG, DAN, DDT, DHQ, DEG, DBY, EAM, ENB, FT, IB, IL, IZ, LT, RG, RH, SC, UT, VO, VZ, YS and WK.

November, 1950

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LADIES PRESENT

Probably the largest aluminum dish ever turned out of a factory is being finished off now at Cedar Rapids, Iowa. It is like a big aluminum plate, only it is fifty feet in diameter. Its' career will be astro-rather than gastro - nomical. The U.S. Navy will set it up in Washington, and use it to study radio waves from outer space.

Some engineers think this big new aluminum parabola may enable American technicians to bounce extremely short radio waves off the moon, to be picked up in other parts of the world. If this can be done, it will remove some of the existing limits on the use of short wave radio communications.

The intended use of the big platter is a little difficult to explain. It is like a tremendous optical telescope, except that it is used to focus short wave radio signals instead of visible or invisible light. Science hopes that the giant reflector capturing and measuring radio waves, will add to mans knowledge of the other planets and solar systems of outer space. Perhaps the data can be used as background material for long range weather forecasting and it is quite possible that through it, we can advance our present techniques of long range communication via short waves!!

Elsewhere in this issue are some of the latest developments in television. But it seems appropriate to mention here that most of the noise that interferes with the set is man made, and that most of this can be eliminated. These noises come from auto ignition, gas filled illumination sources, such as the new highway and street lighting systems, motor and generator commutators, gas rectifiers, elevator relays and other electrical noises from similar types of installations.

Less common are the noises which are of fairly long duration, originating at a fixed industrial location, as in automatic

furnaces and refrigerators. Then there is the continuous or single frequency buzz of daithermy machines, ham transmitters and homebuilt TV receivers. To these may be added the random or thermal noise which originates in vacuum tube equipment, such as industrial radio frequency heating units or super-regenerative radio receivers.

The noise is not picked up entirely in the antenna, it has been found. It can be picked up in lead wires, the antenna post or the intermediate frequency amplifiers, and in some cases by the video amplifier itself. Pick up of interfering signals can be reduced if the lead-in is coaxial cable, rather than open and unshielded line, and there are other tricks of course, of getting a noise reduction and only slight signal loss, by proper orientation of the beam.

A Swedish scientist has recently developed a means of X-Ray photography of the soft parts of the body, such as muscle, skin, and fat around the bones. These can now be pictured in great detail, and fresh possibilities for research have now been opened, after years of study. It has been suggested that this development may advance the understanding - and possibly arresting - of the processes of old age in the body.

How this works is this! The new X-Ray process will show the fatty degeneration which can be present in what appears to be a man in his mid-thirties in good health, or the better condition of an older man who has not degenerated so fast. So, if you are in doubt about your own condition, it is quite possible you'll be able to check on it soon, by this new process of X-Ray photography.

Electronic lathes which shape metal in response to directions of a piano roll device made directly from blue-prints were recently demonstrated in a Brooklyn lab. The way they work is almost like a page of fantasy come to life!

Skywire

These robot lathes provide precision production control on a standard lathe, once the attachment is added, without any human aid except the loading and unloading of the machine. They can control repeat output electronically, saving about seventy five percent of the time normally needed to make a standard machine part to tolerances as fine as plus or minus a small part of one thousandth of an inch.

Using robot fingers, a device actuates the servo controls on the transverse and longitudinal tool feed mechanisms, substituting an electronically operated brain for human skill, thus producing parts automatically. The new process has been named Armamatic, denoting that automatic production is provided by virtually automatic arms. It can be applied to almost any machine tool, from simple lathes and milling machines, to the more complex cam generators and fine jig borers. The rolls which actuate the electronic arms are easily made on paper, by punching the necessary data from blueprints in rows of dots.

The entire process merely requires adapting seven standard kinds of electronic combinations to new assemblies, according to the needs of each job. These electronic units include electrical resolvers, synchro Brain Block components, induction motors and generators, mechanical differentials, potentiometers and step motors. Some of these have been closely guarded military secrets up until now. And the implication of the development is that the fully automatic factory has been brought a great deal closer to reality.

Two Westinghouse scientists are collaborating on a world wide program to produce a new international means of measuring which will never change, and never get lost.

Using radar waves to bombard a rare form of atomically produced mercury, these men are helping to perfect a super-accurate standard on which all international units of length can be based. It won't be the kind of yardstick you can pick up, because it will be calculated from the wave length of

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light emitted from the bombarded mercury. The accuracy works out to one part in forty million, which is tying things down to a very fine point.

The scientists say that the basis of the new measuring device is the wave length of the light from a special kind of mercury which is artificially made from gold in a Tennessee atomic pile. A very small quantity of the mercury - about one twenty five thousandths of an ounce is placed in a capsule with argon gas, and is then bombarded with ultra short waves on radar frequencies. The radar bombardment causes the mercury vapor to glow, sending out a very bright light. By means of a spectograph and a special device called the interferometer, this light is broken up into various wave lengths and recorded on a photographic plate as a series of many concentric circles, one within the other. By measuring the diameters of the circles and then calculating by mathematics, the number of light waves of mercury in an inch, foot or yard are found.

Before the new measuring system can be accepted by the International Weights and Measures Committee, these measurements are to be confirmed by scientists in at least three different parts of the world operating independently. Research workers in Britain, France and the United States are currently working on this same problem.

It's rather interesting to note that the existing international standard for the meter is determined in a somewhat similar manner, with a different metal. In this case, the measure is calculated from the number of wave lengths of red light emitted in a similar way from the element cadmium, widely used as a good conductive plating, especially in radio work. This is compared with a meter long platinum-iridium bar kept in a special vault in the city of Paris.

Cadmium has an accuracy of one part in ten million and has long been the standard. But the special form of mercury being studied improves this to one part in forty million!

TELEVISION

The bombshell in color television came on October eleventh, 1950. A stunned industry learned that F.C.C. had authorized what most of the wise money had been against - the mechanical color filter C.B.S. system which is much like one discarded by the British more than a decade ago as entirely impractical.

Colorcasting is permissive - not mandatory, and few stations will carry it for some time to come except in periods where normally few people are looking in. The F.C.C. is now going to see how color catches on, before considering the possibility of pressuring stations, as a requirement of license, into transmission in color. And the door to any compatible system, says the F.C.C., is still open. Improvements in such systems will be considered whenever they come - and R.C.A., C.T.I. and G.E. have promised them soon!

There were repercussions to this unexpected, and seemingly arbitrary decision. It will be appealed in the courts, with many of the largest TV manufacturers opposing it. A few firms have said they would make color converters, but these are all small producers who can produce only a very small percentage of all annual output in the U.S. The big manufacturers have said they won't make color sets in quantity unless they have some absolute proof the public won't buy black and white. And even if they wanted to do so there is no definite engineering information on the F.C.C. bracket standards. Even the Commission doesn't know exactly what it requires, and manufacturers say it will be about eight months after these standards are set that large scale production would be possible.

In view of the current troubles the TV industry is having in obtaining enough of the essential parts to continue production at its present ten million sets a year level, and mobilize the industry's resources

for military production as well, the F.C.C. decision is considered by the majority of those engaged in any phase of the video industry as poorly timed. Consensus of opinion is that there is no need for hurry, and that the decision should have been left to a later date. If the bracket standards are straightened out, so that all sets incorporate them - and a compatible system is developed a year or so later - the public will be forced to pay about a half a billion dollars (billion is correct) for something it may never be able to use. And this, say the majority of manufacturers is something the F.C.C. has no right to impose.

While the controversy rages across the line, Canadian television, which has received no impetus from the C.B.C., is forging ahead. There are now more than twenty thousand sets in use in Canada, from seven to seventeen inches in screen size, and the manufacturers are working overtime trying to keep up with the demand. Windsor is still the leading Canadian viewing center, but the Toronto-Hamilton area is rapidly coming along and this Fall season is expected to bring TV into an ever-increasing position of importance as an entertainment medium, in Canada.

It is now expected that the C.B.C. will not be able to start telecasting in Toronto and Montreal before the Spring of 1952! However, it is possible that the Board of Governors will relent, and grant private station licenses in both centers in the near future. There is to be a meeting on this subject in mid-November at which such privileges will be discussed and perhaps passed upon. The unhappy side of the picture is that in spite of the fact that TV could become a tremendous business in this country almost overnight, as it has in the U.S., most of the thinking in Government circles seems to be that there is no hurry, and that the public is lukewarm at best, about the

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entertainment possibilities. Putting this thinking to a severe test, is that twenty thousand plus set total in regions where television reception is theoretically not possible, at prices almost double those below the border!

Last month we started discussing the major color systems proposed to the F.C.C. The C.T.I. system was outlined, and in this column, we'll tell you how both the R.C.A. and C.B.S. systems function. This material is all excerpted from the special color report dated September 2nd, 1950, and released by the Federal Communications Commission. First, since it has now been accepted as the standard, let's take a look at C.B.S. color!

In the C.B.S. system scanning is accomplished in the same manner as in the mono chrome system of today, currently used by 107 transmitting stations in the U.S.A. First, all the odd numbered lines are scanned, and then the even lines, and so on. Color is obtained by scanning the odd lines in the first field in red, the even lines of the second field in blue, and the odd lines of the third field again, in blue. Thus, the even lines of the fourth field are scanned in red, the fifth in blue, the sixth in green, and then you start all over again. Six complete fields are required to produce one complete color picture. The switching of colors at the end of each field gives the C.B.S. system its name - the field sequential system.

C.B.S. doesn't use the same scanning standards as monochrome TV. Instead of 525 lines, it has 405. Theoretical horizontal resolution in terms of lines is drastically reduced from 380 to 205. This means a very noticeably degraded black and white picture would be received from a color transmission, assuming you had no color converter in use. A field rate of 144 per second is employed, instead of 60, and 24 complete pictures per second result, rather than 30. The C.B.S. horizontal synchronizing rate is 29,100 per second as compared with 15,750, mono-

chrome standards today. The vertical sync rate is of course, 144, as against 60 in black and white.

During the hearing, C.B.S. offered testimony on using horizontal interlace as a means of improving horizontal detail. However, this was not offered as a proposal, but as a possibility. Demonstration of this idea was given in New York in April this year. Each line is broken up into picture elements, with blank spaces in between. In the first field, alternate dots are sampled from the odd lines; in field two sample dots are taken from the even lines. Blank spots are filled in by successive fields. Thus, 12 fields are needed to produce a color picture and twelve complete color pictures a second result. However, even with the horizontal interlace, color switching in the C.B.S. system occurs after each field - the horizontal interlace being used to increase the horizontal resolution.

Apparatus used by C.B.S. to demonstrate the system had a rotating disc with segments of red, blue and green filters, inserted between the lens and the pickup tube. Disc rotation is co-ordinated with the field scanning rate of 144. In the 144th of a second that the red filter is in front of the tube, all odd lines are scanned. The scanning beam generates amplitude modulated signals varying in amplitude in proportion to the intensity of red components scanned. The same process is repeated for each field. A rotating disc is used at the receiver to insert the colors properly, and this is synchronized to the same speed and position as the color disc at the camera. The synchronizing of the filter colors can be made by hand, or by an extra transmitted pulse to assure correct color phase.

R.C.A. Color!

The R.C.A. system is difficult to describe! It involves new and complex techniques, many of which weren't clearly described at the hearings. However, the R.C.A. system, unlike the other two (C.B.S. and C.T.I.), uses a different scanning method. Instead of the line interlace used by the others,

and nothing more, R.C.A. uses both the line interlace, and added to it a process called dot interlace. As this implies, each line is scanned in a series of dots, rather than continuously and the sequence comes out in a completely different manner. In the first field, the odd numbered lines are scanned in order. Colored dots appear on line one as in the table below, then line three is scanned with the displacement to the right as shown. The remaining odd lines are also scanned in order. The first field is scanned completely in a 60th of a second.

The second field even lines are then scanned with line two colored in dots as shown below and then line four through the field. The dot patterns for fields three and four are also shown. Thus, odd lines are scanned during the first field, but dots of the same primary color are separated by spaces. The even lines are scanned the same way - with spaces between like color dots. The third field scanning displaces the color dots so the spaces are filled, and the same applies to the fourth field. Four scanning fields cover a complete picture area, with all spaces filled with say green dots. Simultaneously the area is being covered by red and by blue dots. As there are sixty fields per second, there are fifteen complete color pictures per second. Here's how the system breaks down into dots:

Line	1st Field	Line	2nd Field
1	G R B G R B	1	B G R B G R
2		2	B G R B G R
3	B G R B G R	3	
4		4	G R B G R B
5	G R B G R B	5	
6		6	B G R B G R
Line	3rd Field	Line	4th Field
1	B G R B G R	1	
2		2	G R B G R B
3	G R B G R B	3	
4		4	B G R B G R
5	B G R B G R	5	
6		6	G R B G R B

This patterning becomes difficult to understand, although it can be simplified through the use of another table in the next column.

Thus, combining the series into one table of dots and fields, you get the following complete color picture. The numbers in the table refer to fields.

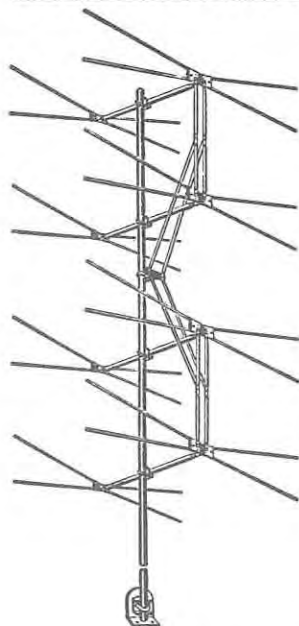
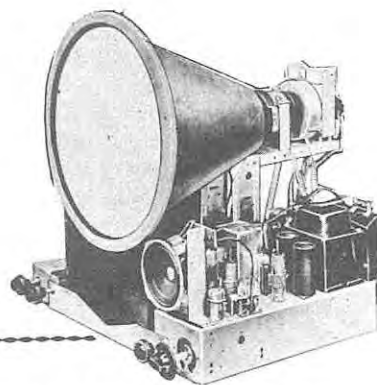
Line	G	B	R	G	B	R	G	B	R	G	B	R
1	1	3	1	3	1	3	1	3	1	3	1	3
2	4	2	4	2	4	2	4	2	4	2	4	2
3	3	1	3	1	3	1	3	1	3	1	3	1
4	2	4	2	4	2	4	2	4	2	4	2	4
5	1	3	1	3	1	3	1	3	1	3	1	3
6	4	2	4	2	4	2	4	2	4	2	4	2

The R.C.A. color camera consists of three camera tubes, each capable of four megacycle response. In front of these tubes is an optical system of dichroic mirrors and lens. The mirrors are made to reflect one color only - red, blue or green. The light which is reflected by each mirror falls on the photosensitive surface of one of the three camera tubes. Each of the camera tubes has applied to it the same horizontal and vertical scanning pulses from a common synchronizing generator. The scanning beams in the three tubes thus scan the entire scene simultaneously, generating separate amplitude signals whose intensity varies in proportion to the relative intensities of the colors in the scene being scanned.

Thus, three signals of four megacycle bandwidth are derived, and as the transmission bandwidth requirements are also four megacycles for the total picture, some means of combining or merging the three colors must be devised. This is done through what are called mixed highs, and color sampling at a terrific speed - 3.6 millionths of a second for each of three primary colors, red blue and green. The mixed highs principle transmits coarse color detail in each primary color in a two megacycle bandwidth - from 0 to 2 mcs, in spite of the fact that the cameras handle twice as much - and the fine details from 2 to 4 mcs in each color are mixed together (mixed highs) and then transmitted in black and white. This reduces the needed bandwidth to 8 megacycles, and the sampling process reduces this amount to the point where bandwidth is compatible with present black and white standards.

Next month - Commission Evaluations of the Three Color Systems!

...are You ...
Prepared?



One of these days, at a time not too far ahead, we shall have Television in Canada. One of these days soon, we'll turn a knob in our living room and see what is happening in Montreal or Vancouver, New York or Chicago. When that time comes, will you be prepared?? You will - if you....

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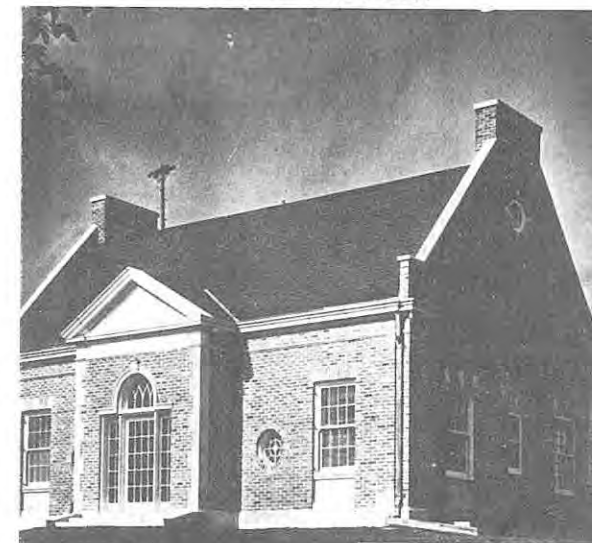
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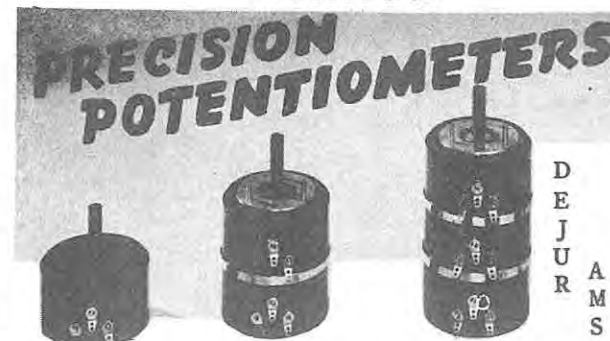
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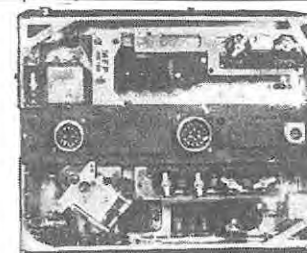


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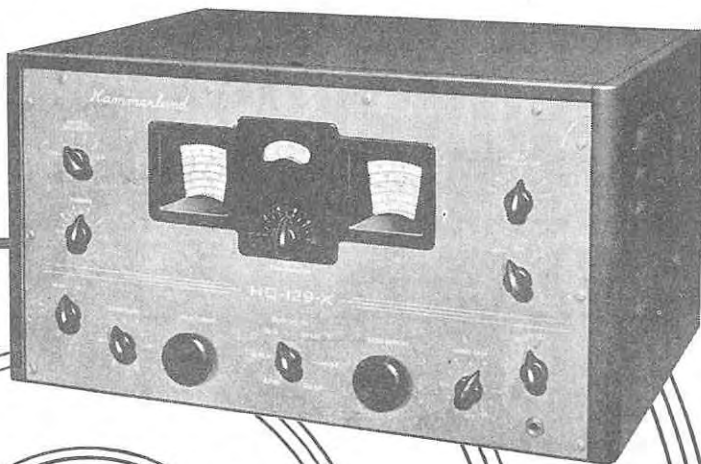
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