SKYWIRE

THE CANADIAN RADIO AMATEURS' JOURNAL

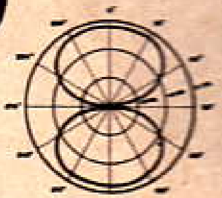
JANUARY 1952
20 cents

Toronto, Ontario, Canada.

VE3AKW, M. Crossley,
3 Woodland Ave.,
Hamilton, Ont.

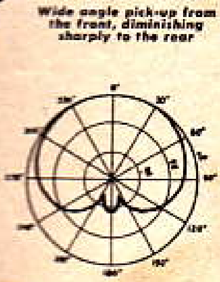
Microphones by TURNER

Polar pick-up pattern



Tru-Cardioid pick-up pattern

Wide angle pick-up from the front, diminishing sharply to the rear

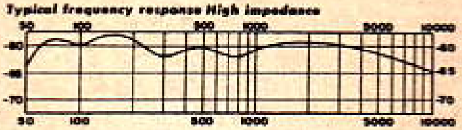


Turner MODEL 87 Velocity Microphone
High Fidelity . . . Bi-Directional
Multi-Impedance

A new unit, designed for broadcasting, indoor public address and recording where highest quality reproduction is desired. Engineered with single element ribbon supported in the field of an Alnico V magnet for maximum sensitivity. Thorough shielding excludes hum pick-up. The Model 87 has a bi-directional pick-up pattern with exceptionally smooth response from 80 — 10,000 c.p.s. Meets the most critical demands for high fidelity. Level: 62 db below 1 volt/dyne/sq.cm. at high impedance. Built-in impedance selector switch gives instant selection of 50, 200, 500 ohms or high impedance output. Equipped with universal swivel mounting, ⅝"—27 thread. Richly finished in dark umber gray with bright chromium screen. Complete with 20 ft. two conductor balanced line shielded cable.

Model 87

Typical frequency response High impedance



MODEL 77 . . . THE TURNER "TRU-CARDIOID"

The Turner "Tru-Cardioid" is a super-cardioid type microphone employing a combination of dynamic and velocity generators. Advanced engineering design effectively controls unwanted sound. The "Tru-Cardioid" pick-up pattern solves troublesome problems in broadcasting, recording and public address . . . practically eliminates feedback, audience and background noise. The Model 77 has a wide range pickup at the front and a sharply attenuated output at the rear with approximately 15 db discrimination between front and rear at all frequencies. Response: substantially flat from 70 — 10,000 c.p.s. Level: 62 db below 1 volt/dyne/sq.cm. at high impedance. Equipped with built-in impedance selector switch giving choice of 50, 200, 500 ohms or high impedance output. Has 90 degree tilting head, ⅝"—27 mounting. Finished in dark umber gray with polished chromium screen. Complete with quick-disconnect plug and 20 ft. two conductor shielded cable set.

Model 77

Typical frequency response High impedance

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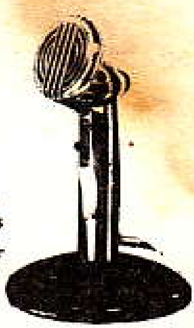

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Popular amateur microphone!
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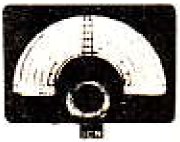

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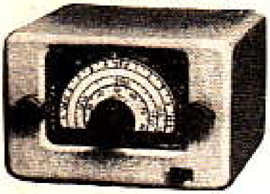
Grip-to-talk stand - $13.95



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Noise clipper
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Steering mount.
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NET PRICE
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Elements made of telescopic aluminum alloy with adjustable spacing between elements. Can be fed directly by 50 to 100 ohm twin conductor co-ax (BA4M).

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The New 77
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Unit less crystal - $15.65
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SOJ-1
SOJ-2
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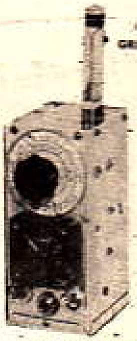

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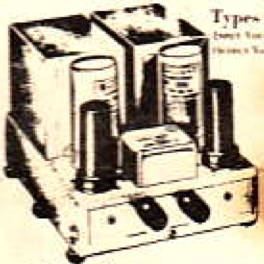
Heavy-Duty Dual Vibrapack



Both models are in stock now. A choice of either output voltage at one low price today. Canadian net is now down to ---- $48.00 !

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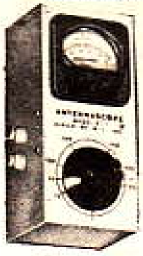

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NEW IMPROVED GRID DIP OSCILLATOR
Kit form
$35.45

NC-183 $471.25 - 60 cy
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HAMILTON, ONTARIO

VE3JU
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SKYWIRE

Vol. 5 No. 1

Published monthly as

THE CANADIAN RADIO AMATEURS' JOURNAL

Editor - Fenwick Job, VE3WO

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JANUARY, 1952

SKYWIRE BUSINESS AND EDITORIAL ADDRESS

VE3WO—86 INVERMAY AVE., WILSON HEIGHTS, TORONTO, ONTARIO

AUTHORIZED AS SECOND CLASS MAIL POST OFFICE DEPARTMENT, OTTAWA

UNIVERSAL CABINET PARTS

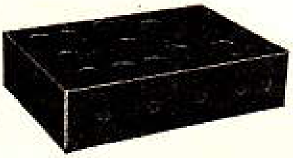
11" Front to Back
For Standard 19" Panels
1446 Chassis Recommended

Standard Finish — Black Wrinkle

Optional Finish — Gray Hammerlin
(Add "T" to Type No.)

Type	Description	Height	Panel
1490	Bottom Plate or Intersection Shield		
1492	Hinged Top Assembly		
1493	Cabinet End	5¼	Use 1473 or 1483
1494	Cabinet End	7	Use 1474 or 1484
1495	Cabinet End	8¾	Use 1475 or 1485
1496	Cabinet End	10½	Use 1476 or 1486
1497	Cabinet End	12¼	Use 1477 or 1487
1498	Cabinet End	14	Use 1478 or 1488

Sectional type — Build cabinet to desired height by adding cabinet ends — Provides economical and convenient method for increase in transmitter power or the extra cabinet space required to modulate that C.W. Transmitter.



PUNCHED CHASSIS

All holes punched for transformers, chokes, amphenol sockets and controls. Black wrinkle.

Type	Dimensions	Circuit Diagram	
1442G	6x10x2	#1250	7 W. Amp.
1444D	8x12x3	#1251	15 W. Amp.
1444F	8x12x3	#1253	Transmitter 30 W.
1444G	8x12x3	#1264	Modulator 15 W.
1446D	10x17x3	#1252	30 W. Amp.
1447D	12x17x3	#1256	60 W. Amp. 60 Cy.
1448D	14x17x3	#1256	60 W. Amp. 25 Cy.
1448E	14x17x3	#1254	Transmitter 150 W.
1448F	14x17x3	#1255	Modulator 75 W.

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SIDEBANDS

Amateur radio here in Canada is about to pass from one era into another, at least in some parts of the country. Operators in some of the larger Eastern cities are about to have more troubles than perhaps ever before in the field of amateur radio here.

It started happening in the United States a little more than half a decade ago. And as a result, it decimated the ranks of ham radio permanently. It doesn't take much thinking to realize that Television Interference is our biggest bugaboo in almost any city in Southern, Eastern and Western Ontario. Television is now big business from Windsor right through to Montreal, with nearly seventy thousand sets already installed and in operation. And that total is growing by several thousand each month, receiving tremendous impetus from the fact that both Montreal and Toronto CBC TV is just about ready to go. It's only a matter of a very few and all too short months before these transmitters are in operation, extending their orbit of amateur close-downs.

At this moment, the D.O.T. is advising hams who are interfering with TV stations located as much as 150 miles away in the U.S. that a remedy must be found if the fault lies in the amateur transmitter. Radiation of harmonics that fall in TV channels is now passe. It's necessary either to clean them up, and eliminate the source of the interference, or go on quiet hours during peak looking-in periods.

When you consider that the front end of a TV tuner is several megacycles wide (see page 28 of this issue) and that this broad tuner has been designed to work with a miraculously small amount of TV signal - as little as three millionths of a volt on the latest models, you begin to realize the enormity of our problem.

It points out one important fact. Most of the present day transmitters in any area where TV is, or will be shortly receivable -- most of these transmitters are now obsolete. That is to say, most of them will give trouble to TV and will have to be modified extensively, or completely closed down for rebuild.

One amateur in Chatham, Ontario, where as many as seven channels can be received with no great trouble, spent nearly one hundred and fifty dollars for material to de-bug his high powered rig. And he spent several months doing the job. He was one of the persistent hams. A great many of our brothers across the line, in absolute horror, threw up their hands, bought a picture box, and gave up ham radio entirely.

Fortunately, this is not necessary. There has been a tremendous volume of information published on how to overcome this distress. And the smarter amateurs in this country who are a little ahead in their thinking, will, when rebuilding now, plan for the future, by the simple expedient of designing and constructing that new rig to incorporate the filters that are needed to kill TVI.

And don't think, because there is not TV in your immediate neighborhood now that you don't need to think seriously about the situation at this moment. It would be far far wiser to learn what needs to be done now, and get the work finished when rebuilding, than to wait until too late, and lose many weeks of operating pleasure while you go hunting for the trouble that is blanking out the picture tubes is every set in the neighborhood. TVI doesn't give pretty pictures when severe!!

Explore the possibilities of rigs that are as new in concept as S.S.S.C. Dollar for dollar a Single Sideband transmitter will lick ten times its weight in heterodynes, and will at the same time, provide the absolute ultimate in a voice transmitter.

Let's not get caught with our filters down!! More than one VE ham is QRT at least temporarily because of TVI. Be sure it's not you!!

de VE3WO

BAND EDGE MARKER

With Visual Indication

By **H. M. HUMPHREYS**

MOST readers will probably agree that in these days of congested bands a VFO is essential if a reasonable number of contacts are to be made. While the self-excited oscillator has the advantage that it can be adjusted either to the frequency of the call being heard, or to a clear spot on the band if a CQ is contemplated, it also has the great drawback that it is all too easy to stray outside the band—an offence which the GPO is understood to view with grave displeasure !

The fact that the terms of the amateur licence require an approved frequency meter to be kept *and used* at a station where variable frequency control is employed does not entirely solve the problem, for several reasons. Despite good intentions, dials *can* be read incorrectly, especially where graduations are small and close together ; graphs or calibration charts *can* easily be misread ; oscillators *can* go off calibration quite unexpectedly ; and last, but far from least, is the frailty of human nature, which usually turns out to be at its weakest when there is a possibility of bagging some rare DX. There is great temptation to swing the VFO to within a few hundred cycles of zero-beat with that unusual call sign, and to hang on expectantly with the hope of beating all opposition to a snappy reply immediately the CQ ends. In such circumstances, accurate frequency measurement is usually postponed until a contact is firmly established, on the assumption that the automatic check against the other station's signals is sufficient assurance of being in the ever-increasing pirate crew who presumably have no hesitation in adding the minor offence of operating outside the recognised amateur bands to their major crime of being on the air at all.

Suitable Unit

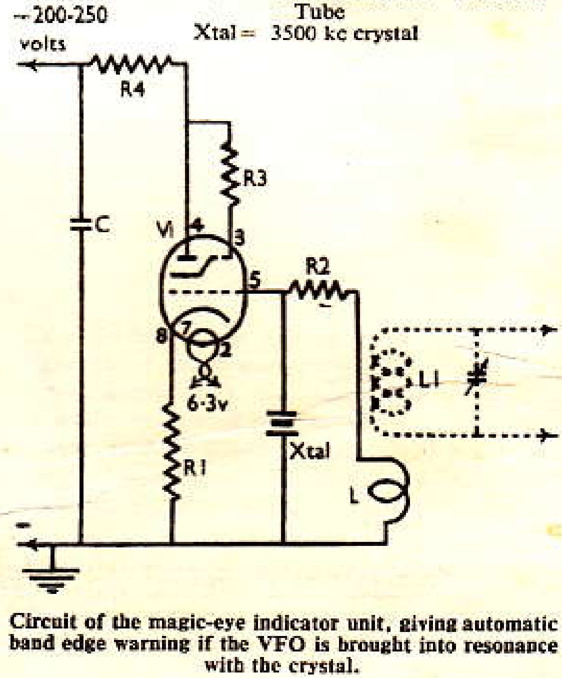
To obviate all these risks, it would appear eminently desirable to have a marker which would give an unmistakable indication of the band edge. As far as the CW enthusiast is concerned, he is unlikely to run out of any of the communications bands except at the low-frequency end, and the fortunate harmonic relationships which exist make it a simple matter to design and construct a thoroughly efficient indicator which can be arranged to serve for all bands.

Apart from a valve mounting and a couple of resistors, the only components needed are an Electron Eye Indicator Tube and a crystal, the frequency of which should be exactly 3500 kc. Both these items are readily and inexpensively obtainable from surplus sources. The circuit diagram is given at Fig. 1, and although it is fairly well self-explanatory,

Table of Values

Band Edge Marker

C	=	·01 μF, mica
R1	=	2,500 ohms, ½-watt
R2	=	15,000 ohms, ½-watt
R3	=	1 megohm
R4	=	47,000 ohms
L	=	2-5 turn link
L1	=	VFO tuning or buffer tank
V	=	Y63 Electron Indicator Tube
Xtal	=	3500 kc crystal



Circuit of the magic-eye indicator unit, giving automatic band edge warning if the VFO is brought into resonance with the crystal.

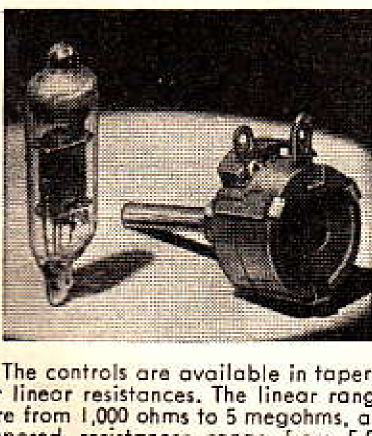
a few hints on adjustment and operation may help to get it working at maximum efficiency. A 3·5 mc crystal is used at GI3EVU, because the VFO in use operates in that band, doublers being included in the exciter to give outputs at 7, 14 and 28 mc as well as on the fundamental. There is, however, no reason why a 7 or even a 14 mc crystal should not be substituted at will, and no doubt many variants will suggest themselves to the experimenter. The principle of the circuit is straightforward. The crystal, which is not in continuous oscillation, has no frequency controlling effect, its sole purpose being to cause the eye of the indicator tube to close when the link is coupled to a tuned circuit oscillating at the same frequency as its own fundamental. The degree of coupling is fairly critical—not exceptionally so, but the link should be adjusted so that the eye is almost fully closed at resonance. If the coupling is too loose, the opening of the eye may be found to vary slightly at points well off resonance as the VFO tuning control is rotated. This effect will, however, disappear completely as the coupling is increased to the optimum, and in any event is not likely to be confused with the indication of resonance, which is sharp and unmistakable. It is immaterial whether the indicator is coupled to the frequency controlling inductance of the VFO or to the anode coil of a tuned buffer stage, as it has a negligible damping effect. The HT and LT demands of the tube are so small that they can almost invariably be supplied by the VFO or exciter power pack.

The electron tube should be mounted with the eye through a hole in the panel as close to the VFO tuning dial as possible, and gives a clear visual warning of approaching danger as the operator nears the band edge.

While the greatest service can be obtained from this circuit by using it as a band edge indicator as recommended, it can also be used with any crystal which the reader may possess to give a spot check on the calibration of a VFO.

SUBMINIATURE CONTROLS

Clarostat Mfg. Co., Dover, N. H., has announced the series 48A subminiature variable-resistance controls. Measuring only ⅝ inch in diameter, the body depths are 7/16 and 53/64 inch respectively, for single and dual units. The ⅛-inch shaft, obtainable as flattened or slotted tube or standard rod, extends ½ inch beyond the ¼-inch-long bushing.



The controls are available in tapered or linear resistances. The linear ranges are from 1,000 ohms to 5 megohms, and tapered resistances range from 5,000 ohms to 2.5 megohms.

Regeneration In Superhets

Methods of Improving Receiver Performance

By **A. D. ODELL**

Our contributor shows how the performance of even the simplest superhet can be considerably improved by the careful application of one of the oldest principles in receiver technique—controlled regeneration.—Ed.

ALTHOUGH regeneration is not favoured by commercial receiver designers, it is often the most economical and occasionally the best way of improving performance; and most amateurs are interested in any circuit which promises so much for so little. The writer, who is no exception, has expended a considerable amount of time and effort in endeavouring to extract a full quart of performance from various pint-sized circuits, and begs leave to record certain conclusions in the hope that they may be of interest.

Reacting Detectors

One of the most remarkable examples

Table of Values

Fig. 1. Separate RF Regeneration Stage

R1	47,000 ohms, ½-watt		
R2	100,000 ohms, potentiometer		
R3	100,000 ohms, ½-watt		
R4	33,000 ohms, ½-watt		
R5	1 megohm, ½-watt		
R6	250 ohms, ½-watt		
R7	47,000 ohms, ½-w		
R8	47,000 ohms, ½-w		
R9	33,000 ohms, ½-w		
R10	4,700 ohms, ½-w	C13	0·01 μF, mica
C1	0·25 μF paper	C14	0·25 μF, paper
C2	0·01 μF, mica	V1	Mullard EF36
C3	500 μμF, mica	V2	Brimar 6K8G
C4	100 μμF, ceramic		
C5	50 μμF, bandset		
C6	5 μμF, bandspread		
C7	30 μμF, trimmer		
C8	0·1 μF, paper		
C9	0·1 μF, paper		
C10	0·001 μF, mica		
C11	50 μμF, bandset		
C12	5 μμF, bandspread		

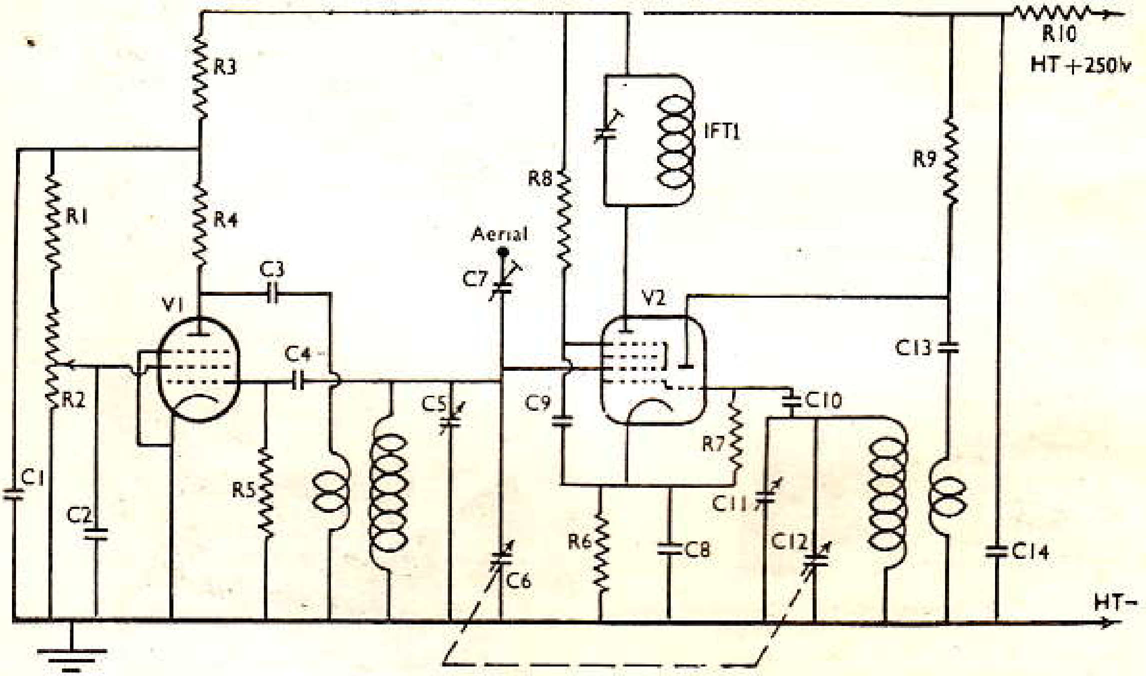


Fig. 1. Separate RF regeneration stage applied to the FC in a conventional superhet circuit. The advantages of this arrangement are discussed in the text.

of RF regeneration is shown by the amazing amplification obtainable in the simple reacting detector circuit, where a few watts of power radiated thousands of miles distant can be amplified sufficiently, *in a single stage*, to operate a pair of headphones. Unfortunately, any attempt to produce the same improvement in superheterodyne performance is doomed to failure, because the benefits obtained depend among other things on the strength of the received signal, the overall amplification, and the type of detector used.

The most favourable conditions occur in the O-V-O receiver where reaction is applied to the first tuned circuit and low-level square law detection is employed. In the case of the superhet, if reaction is introduced at a low-level part of the circuit it may degrade the signal-to-noise ratio. At a high-level point it confers little benefit and is subject to blocking by strong signals. In both cases it raises circuit impedances, necessitating care if instability is to be avoided, and by the time the circuit has been tamed, one is reminded of the familiar roundabouts and swings. However, by careful design it is possible to improve the performance of the simple

I still think it's the one they use for advertising .

FC-IF-Det-LF combination until it compares with receivers having an RF and two IF stages.

It is the writer's experience that regeneration is best introduced at the earliest possible point in the circuit, *i.e.* for the combination quoted above, the mixer grid. The usual way of accomplishing this is by inserting a small feedback coil in the anode with variation of mixer gain to provide control, but a little reflection discloses two inherent disadvantages of this method.

In the first place the control grid of most frequency changers is operated Class-A and the characteristically smooth control of the leaky grid detector will be lacking. Secondly, frequency changers are notoriously noisy and to feed back from anode to grid is to feed back noise and signal in equal proportions, resulting in practice in a degraded signal-to-noise ratio.

Separate Regeneration Stage

If, however, regeneration is produced by a *separate* low-noise valve using the leaky grid system of control then neither of these disadvantages should be present, and in theory the limiting value of the signal-to-noise ratio would be that of the low-noise valve. Fig. 1 shows the RF end of the writer's receiver which uses an EF36 to provide regeneration. The improvement in performance is considerable. Overall selectivity and signal-to-noise ratio are noticeably better: the increase in sensitivity is most marked, while image interference is conspicuous by its absence. Tracking problems are of course magnified. If more than one band is to be covered the coils must be carefully wound, and either a separate RF trimmer or slow-motion band-set condenser is essential. In the circuit shown, the two 5 $\mu\mu$F bandspread condensers are ganged, and with critical regeneration the selectivity is such that the vanes of these condensers needed bending to maintain tracking over the relatively narrow amateur bands. There should be an absolute minimum of "pulling" between RF and oscillator tuning, and in this respect control-grid injection should be avoided, while AVC applied to the mixer may cause detuning or instability due to variation of valve input impedance.

In view of this formidable list of "do's" and "don'ts," it is as well to consider seriously the alternative of adding a conventional tuned RF stage, and the decision will to some extent depend on the space and equipment available and on the type of circuit. In most receivers there is room to add a midget RF pentode and trimmer, though a set of switched coils and ganged tuning condenser might necessitate major structural alterations.

IF Regeneration

Turning now to the IF amplifier, regeneration can conveniently be applied here by deliberately making the amplifier unstable; a small capacity of 1 or 2 $\mu\mu$F between anode and grid is a simple and effective method. Alternatively, if the cost of the receiver must be kept as low as possible, then the arrangement of Fig. 2 can be recommended. In this circuit a 6SJ7 combines the functions of detector and feedback amplifier, with a tapped BFO coil replacing the second IF transformer. The connections are as shown, with the majority of turns in the anode circuit of the detector and the plate of the 6SK7 effectively tapped down the coil and thus looking into a fairly low impedance. This is primarily a precaution against premature oscillation of the IF amplifier when the regeneration control is advanced, but also, in conjunction with the low value of grid leak, to lessen the likelihood of pulling and blocking of the oscillator when receiving CW signals. Rectified output is taken from the detector grid, and undelayed AVC may be obtained from the same point if so desired. The remainder of the circuit comprises a conventional AF stage feeding a cathode follower. This combination provides ample gain and eliminates the output transformer, but a high slope pentode may be substituted at some increase in anode current.

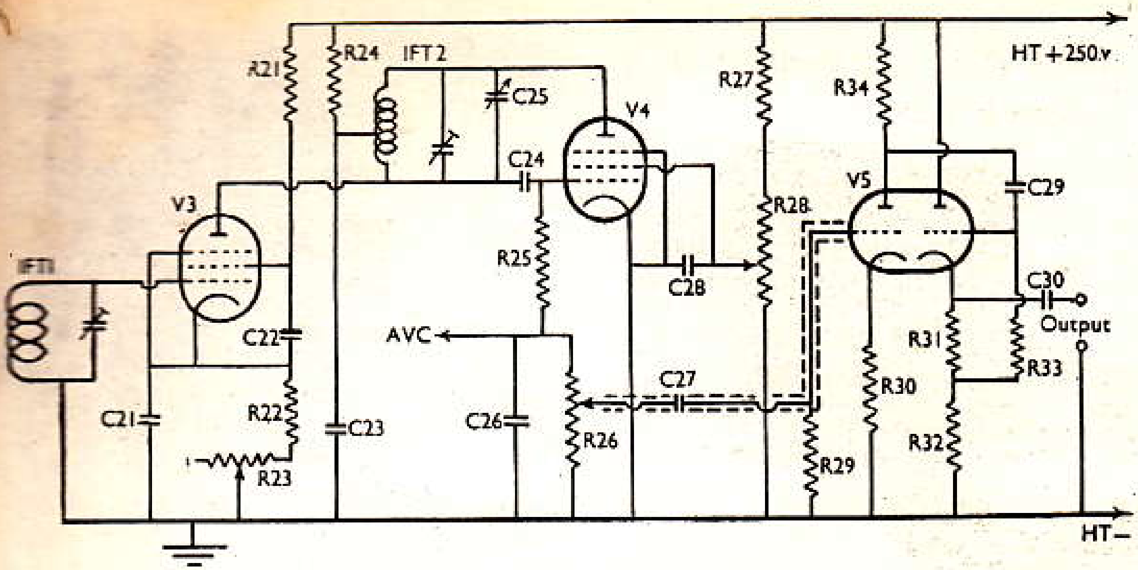


Fig. 2. Regeneration applied to the 2nd detector. Values are given in the table.

AF Regeneration

Regeneration in audio frequency stages has little to recommend it, as it results in a sharply peaked response having a long ringing time. This tends to smooth out rapid changes in amplitude and causes all but the slowest morse characters to run together. A better alternative is the use of a filter producing a rejection slot in the audio range, into which interfering CW signals can be moved by means of the BFO pitch control.

In conclusion, for the amateur who desires a low-cost receiver having above-average performance, the circuits of Figs. 1 and 2 may be successfully combined. Since space is probably the cheapest commodity in an amateur receiver, the various stages should not be crowded together; and more than average care should be taken over mechanical details—backlash and vibration become doubly annoying when selectivity is high.

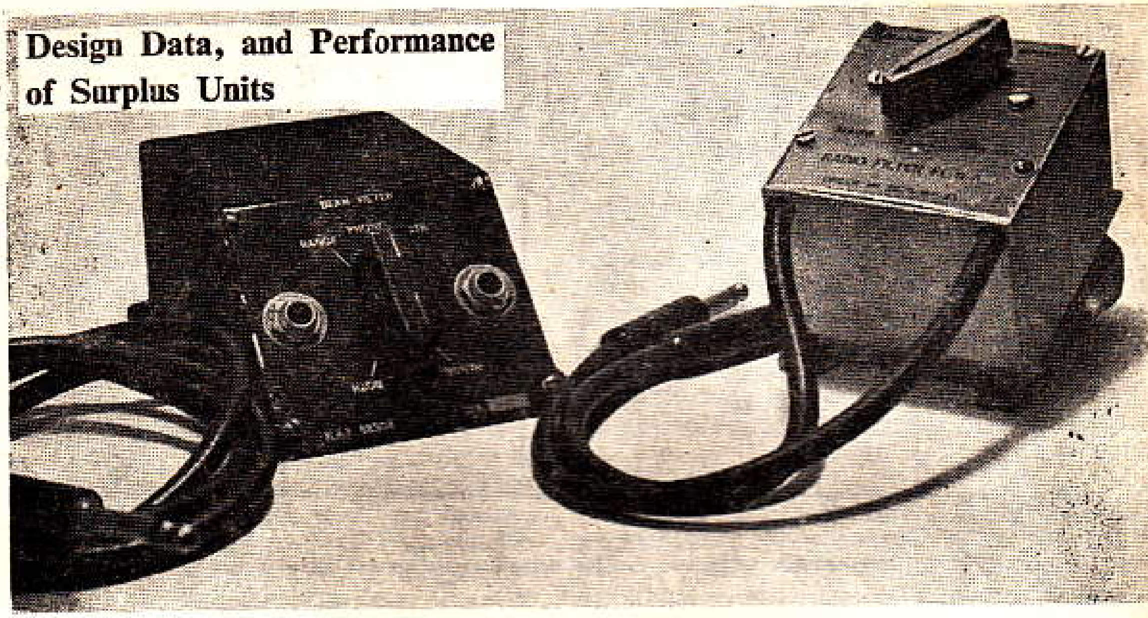
In the original model no special precautions were taken as regards screening, but too much is better than too little and it is simpler to instal before wiring-up than afterwards. There should be no traces of hand capacity providing a good earth connection is made, and any modulation hum should submit to the conventional treatment of a 0·1 μF condenser between each side of the mains transformer primary and earth.

Table of Values

Fig. 2. Regeneration on the 2nd Detector

R21	=	47,000 ohms, ½-watt
R22	=	200 ohms, ½-watt
R23	=	5,000 ohms, potentiometer
R24	=	4,700 ohms, ½-watt
R25	=	47,000 ohms, ½-watt
R26	=	250,000 ohms, potentiometer
R27	=	47,000 omhs, ½-watt
R28	=	100,000 ohms, potentiometer
R29	=	1 megohm, ½-watt
R30	=	2,200 ohms, ½-watt
R31	=	1,000 ohms, ½-watt
R32	=	22,000 ohms, 2-watt
R33	=	1 megohm, ½-watt
R34	=	100,000 ohms, 1-watt
C21	=	0·1 μF, paper
C22	=	0·1 μF, paper
C23	=	0·25 μF, paper
C24	=	100 μμF, mica
C25	=	25 μμF, trimmer
C26	=	200 μμF, mica
C27	=	0·01 μF, mica
C28	=	0·1 μF, paper
C29	=	0·001 μF, mica
C30	=	0·25 μF, paper
V3	=	6SK7
V4	=	6SJ7
V5	=	6SN7GT

Design Data, and Performance of Surplus Units



More on Audio Filters

PROBABLY one of the most interesting developments of recent months to the DX operator has been the use of audio filters. The word "development" is used loosely, since such filters were a feature of radio receivers of a bygone era and so far as amateurs are concerned only went out of favour with the introduction and evolution of single-signal superhets with their crystal filters. However, the selectivity accepted ten to fifteen years ago is hardly enough for to-day and, especially for the CW operator, discrimination measured in *tens* of cycles is required. Audio filters are capable of giving this degree of selectivity and their use would probably be more commonplace now if the majority of amateurs realised how simple they are to design and build.

Types of Filter

Audio filters may be one of two types. First, those which have fixed rejection and depend upon the BFO to inject the required signal at their particular acceptance frequency, and secondly, those which may be tunable over a particular range of audio frequencies.

The purpose of these notes is to describe a few such types, beginning with what is known as the Radio Range filter. Two different versions of this filter have been available as surplus in the country; one is the FL8, and another which has no marking except "Range Filter." These two very useful items are shown in the photograph.

The Service application of these filters was mainly limited to Beam Approach systems (SBA) in which the marker signals are generally given by modulated notes of about 1000 cycles. Voice transmission superimposed on the same carrier frequency was also given and the filters had three switch settings: Position 1 being range marker signals only; Pos. 2, voice signals only; Pos. 3, filter out of circuit.

Fig. 1 shows the curves resulting from the use of positions 1 and 2 of the selector switch. Position 1 is obviously of great interest to amateurs since it provides a very steep rejection on either side of the nominal frequency, which is approximately 1,025 c.p.s.

The unit is quite easily introduced into the Rx circuit by plugging it into the phone socket, and transferring the phones to the socket so marked on the filter. One disadvantage of these filters is that, being so sharp in the audio range, they give a peculiar ringing tone to the signal, a note which is difficult to copy for long periods due to its monotony.

Design of Filters

Filter design is often taken to be an electrical engineer's job, but basically it is relatively simple since the formulae have already been evolved and design data are easily obtained by substitution.

A simple single-section low-pass filter is shown in Fig. 2. The use of a low-pass filter is to be recommended since notes below 1,000 c.p.s. do not have much interfering effect and cutting off the lower notes produces a tone which is not comfortable to read over long periods. The design data are shown below :—

Rx = Load resistance (phones)
F_2 = Cut off frequency
F_3 = Frequency at which maximum attenuation is desired.

Then for Fig. 2 $L_k = \frac{R}{\pi F_2}$ $C_k = \frac{1}{\pi F_2 R}$

$$M = \sqrt{1 - \left(\frac{F_2}{F_3}\right)^2} = 0{\cdot}7$$

With a value of M = 0·7 a good match of input impedance over the pass-band of the filters can be obtained.

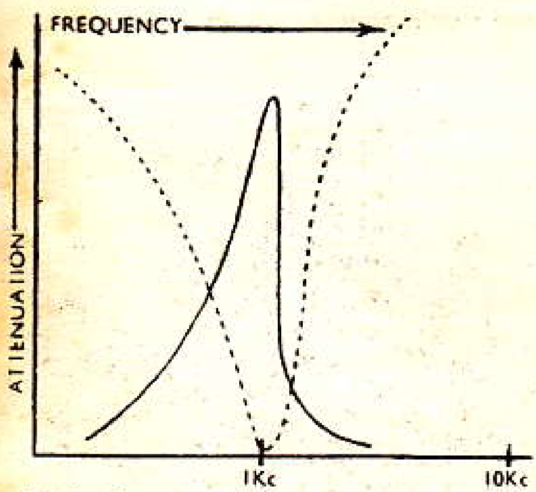


Fig. 1. Curves obtained for the surplus units discussed in the text.

Dealing with the simplest type shown, as in Fig. 2, a curve similar to B in Fig. 4 is obtained. This shape of curve is good for phone reception but if possible a steeper side to the rejection should be obtained and in order to produce this a type of filter known as the "M derived filter" is used. This is most suited to CW use, since it reduces to maximum attenuation a frequency only a short distance away. The calculation of the value of M gives a fixed value of $\frac{F2}{F3}$ of about 0·7, since 0·7 × 0·7 = 0·49, 1−0·49 = 0·51, and $\sqrt{0{\cdot}51}$ is approximately 0·7. This means that in order to have a fixed cut-off frequency of 800 cycles, which is that recommended for CW working, the frequency of maximum attenuation has to be approximately 1,100 cycles ($\frac{0{\cdot}8}{1{\cdot}1}$ = ·7 approx.)

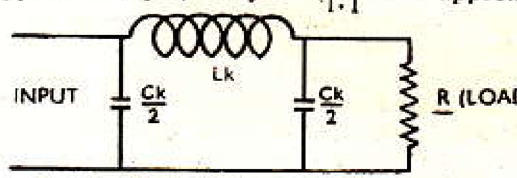


Fig. 2. Constant K-section low-pass filter.

Using an M-type filter, it is possible to obtain rejections of the order of 60 dB down at about 300 cycles away. A suitable calculation for such a filter is given later.

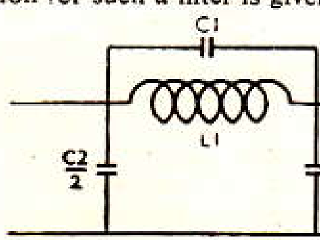


Fig. 3. The M-section filter.

For the simpler type of filter the two calculations are (*a*) for CW operators (*b*) for telephony operators. For CW it is :

$$L_k = \frac{R}{\pi F_2} = \frac{2000}{3{\cdot}14 \times 800} = 0{\cdot}8 \text{ H approx.}$$

$$C_k = \frac{1}{\pi F_2 R} = \frac{1}{3{\cdot}14 \times 800 \times 2000} \quad 0{\cdot}2\,\mu F$$

approx.

This gives an inductance value of 0·8 Henry, and a capacity value on either side of $\frac{0{\cdot}2}{2} = 0{\cdot}1\,\mu F$.

For phone use, a cut off frequency of 3 kc is suggested as suitable, for reasonable intelligibility. Then :

$$L_k = \frac{R}{\pi F_2} = \frac{2000}{3{\cdot}14 \times 3000} = 0{\cdot}21 \text{ H approx.}$$

$$C_k = \frac{1}{\pi F_2 R} = \frac{1}{3{\cdot}14 \times 3000 \times 2000}$$

$$= 0{\cdot}0535\ \mu\text{F approx.}$$

This gives an inductance value of 0·21 Henry and a capacity value either side of $\frac{0{\cdot}0535}{2}$ = approx. 0·027 μF.

This type of filter is termed "Constant K" and will have a characteristic curve as shown in (B) Fig. 4.

In order to improve the performance, still further the M-derived filter as shown in Fig. 3 can be used and values for this are as follows: (For CW use as before)

$L1 = 0{\cdot}7Lk = MLk = 0{\cdot}7 \times 0{\cdot}8 = 0{\cdot}56$ Henry

$C1 = 0{\cdot}267Ck = 0{\cdot}053\ \mu F$

$C2 = 0{\cdot}7Ck = 0{\cdot}4\ \mu F$, or $0{\cdot}2\ \mu F$ each side.

The resultant curve is shown at A in Fig. 4. By using two such filters in series the effect becomes more pronounced, since the resultant

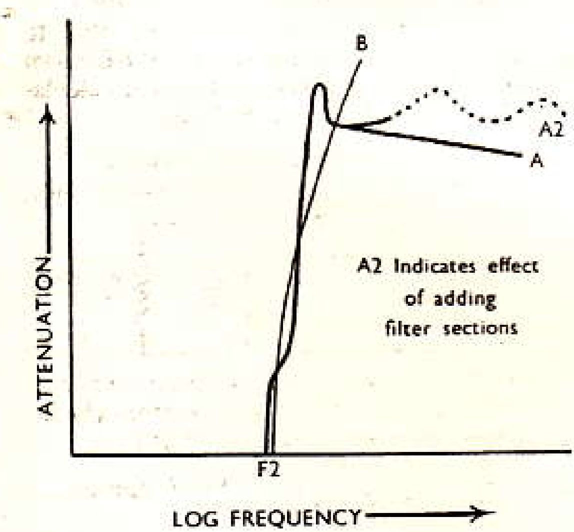


Fig. 4. Curves for the filters shown in Figs. 2 and 3.

attenuation is additive. The tendency for the curve to fall back from the frequency of maximum rejection is limited and consequently a much quieter background is obtained. Signal-to-noise ratio improves considerably when using the audio filters. By the proper choice of C1 and C2 in the M-derived filter, the cut-off and maximum rejection frequencies may be altered to suit individual taste by suitable switching.

A source of supply for the required inductances is the high frequency (ex-Govt.) power units now on the market; those operating in the range 800-1,000 c.p.s. offer some suitable components. Only highest quality condensers should be used and the bridging condenser in the M-derived filter *must* be mica.

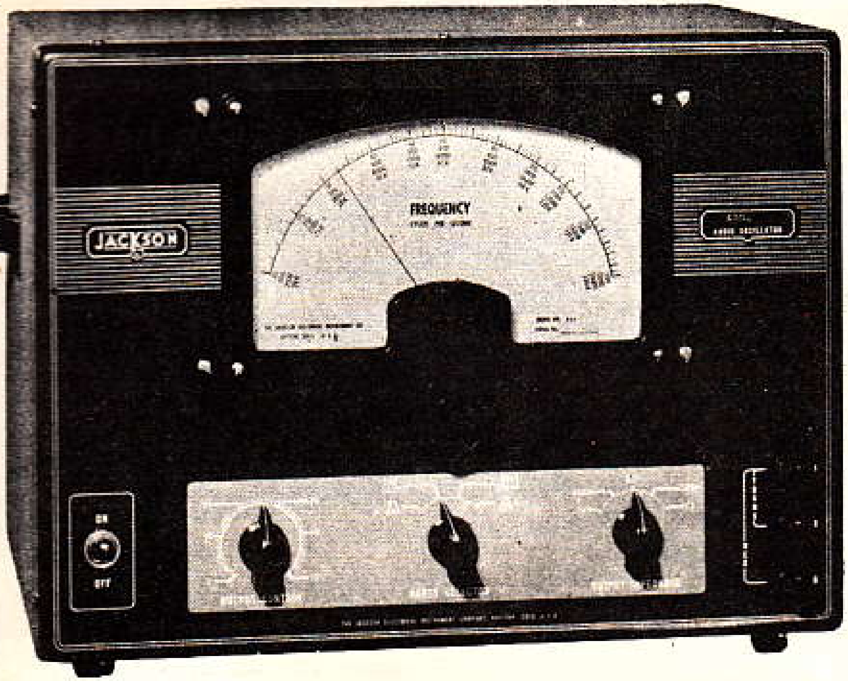
In commercial units toroidal coils are used but these are very difficult to make without specialised equipment. Good results can be obtained with normal inductances providing very careful shielding is allowed, especially around the coils.

The purpose of these notes may appear more theoretical than practical but the proof of the pudding is in the eating. If any reader has an ordinary LF choke of about the values mentioned above, substitution will easily enable the other values to be found and the frequency of cut-off determined.

The whole point is that audio filters enable signals to be copied through interference which even the best crystal filter cannot cope with, and it is therefore well worth while taking some trouble with a unit which can be introduced on the output end of the receiver, without any internal modification of the set itself.

Worrying out the maths!

AUDIO FREQUENCY OSCILLATOR



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Output control is continuously variable.
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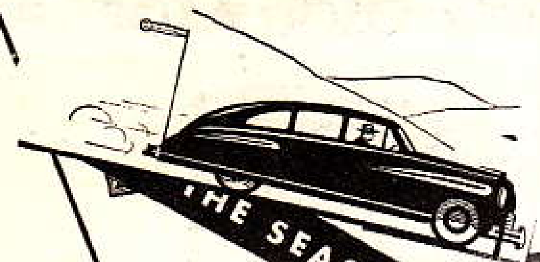

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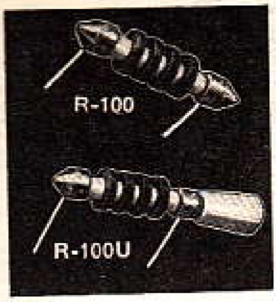

R-100

These RF chokes are identical electrically, but differ in mounting provisions. are available in 2.5, 5 and 10 millihenry sizes and are rated at 125 milliamperes.

R-300

These RF chokes are similar in size to R-100 series but have higher current capacity.

The R-33 series chokes are 2-section RF chokes available in 10, 50, 100 and 750 microhenry sizes.

The R-50 series chokes are 3 and 4-section RF chokes and available in 0.5, 1, 2.5, and 10 millihenry sizes. They are rated at 50 milliamperes R—50-1 choke is wound on an iron core.

The R-33G choke is a 2-section 750 microhenry RF choke hermetically sealed in glass with a current rating of 33 milliamperes.

The R-60 choke is a high current RF choke (500 milliamperes) available in 2 and 4 microhenry sizes.

R-152

For use in the range between 2 and 4 Mc. Ideal for high power transmitter stages operated in the 80 meter amateur band. Inductance 4 m.h., DC resistance 10 ohms, DC current 600 ma. Coils honeycomb wound on steatite core.

R-154

For the 20, 40 and 80 meter bands. Inductance 1 m.h., DC resistance 6 ohms, DC current 600 ma. Coils honeycomb wound on steatite core. The R-154U does not have the third mounting foot

The R-175 Choke is suitable for parallel-feed as well as series-feed in transmitters with plate supply up to 3000 volts modulated or 4000 volts unmodulated. Unlike conventional chokes, the reactance of the R-175 is high throughout the 10 and 20 meter bands as well as the 40 and 80 meter bands. Inductance 225 µh, distributed capacity 0.6 mmf., DC resistance 6 ohms, DC current 800 ma., voltage breakdown to base 12,500 volts.

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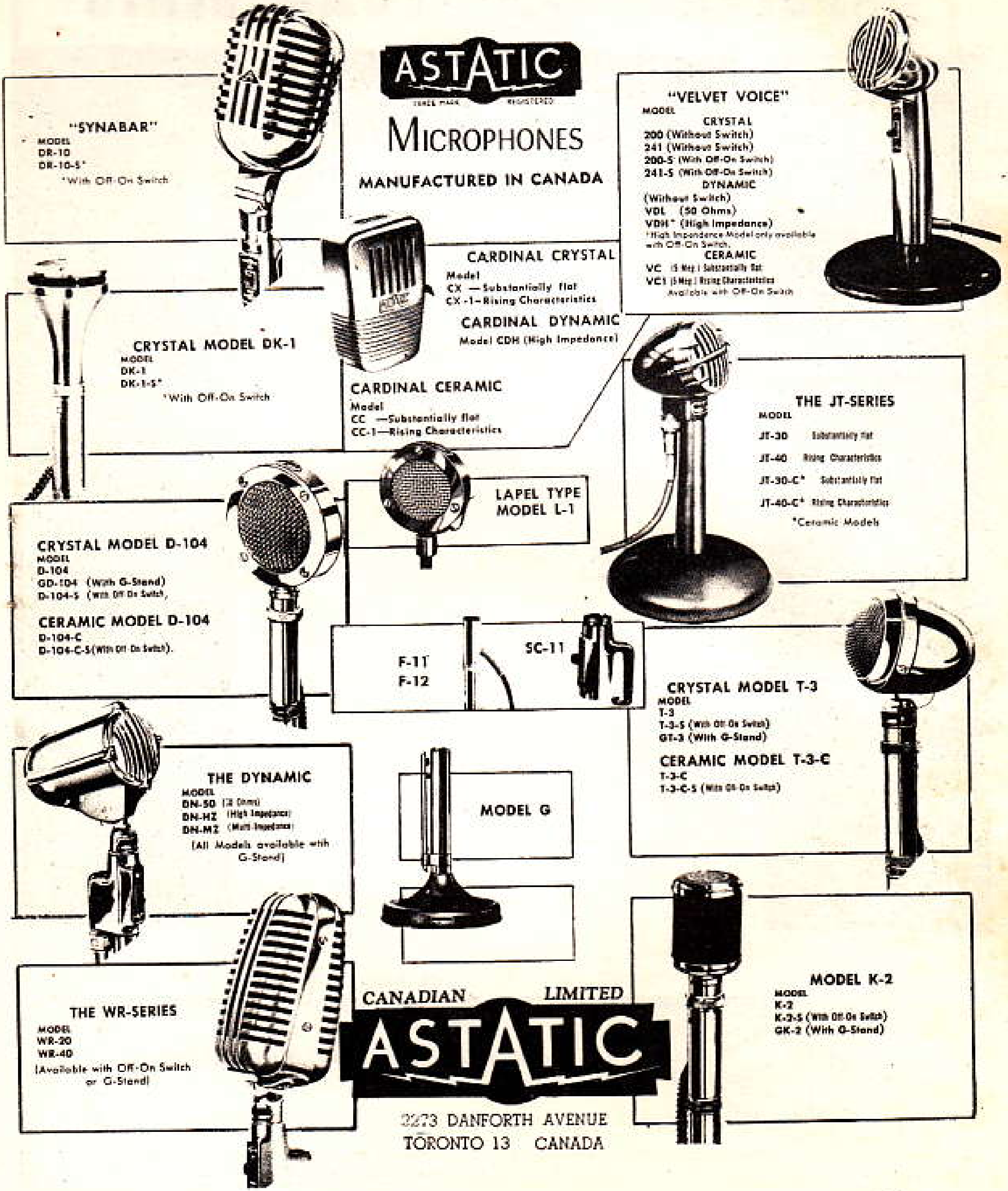

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JT-40 Rising Characteristics
JT-30-C* Substantially flat
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DX PREDICTIONS

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

PREDICTIONS FOR MONTH OF FEBRUARY, 1952.

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!

Toronto to: EST	00	02	04	06	08	10	12	14	16	18	20	22
Europe	7	7	7	14	14	14	14	14	14	14	7	7
Africa	-	-	-	-	-	28	28	28	14	14	14	14
Caribbean	7	7	7	7	14	14	14	14	14	14	7	7
S. America	7	7	7	14	14	14	14	14	14	14	14	7
Australia	-	7	7	7	7	-	-	-	-	-	-	-
U.S. - West	14	14	7	7	14	14	14	14	14	14	14	14
U.S. - Central	7	7	7	7	7	14	14	14	14	14	14	14
U.S. - South	7	7	7	7	14	14	14	14	14	14	14	14
Vancouver	14	7	7	7	14	14	14	14	14	14	14	14
Watrous	7	7	7	7	7	14	14	14	14	14	14	14
Montreal	4	4	4	4	7	14	14	14	14	14	7	7
Sackville	7	7	4	4	14	14	14	14	14	14	7	7

Sackville to: AST	01	03	05	07	09	11	13	15	17	19	21	23
Europe	7	7	7	14	14	14	14	14	14	7	7	7
Africa	-	-	-	-	-	28	28	28	14	14	14	14
Caribbean	7	7	7	7	14	14	14	14	14	14	7	7
S. America	7	7	7	14	14	-	-	14	14	14	7	7
Australia	-	7	7	7	7	-	-	-	-	-	-	-
U.S. - West	14	7	7	14	14	14	14	14	14	14	14	14
U.S. - Central	14	14	7	7	14	14	14	14	14	14	14	14
U.S. - South	7	14	7	7	14	14	14	14	14	14	14	14
Vancouver	7	7	7	7	14	14	14	14	14	14	14	14
Watrous	7	7	7	7	14	14	14	14	14	14	14	14
Toronto	7	7	4	4	14	14	14	14	14	14	7	7
Montreal	4	4	4	4	7	14	14	14	14	7	7	7

Watrous to: CST	22	00	02	04	06	08	10	12	14	16	18	20
Europe	7	7	7	7	14	14	14	14	14	7	7	7
Africa	7	-	-	7	14	14	14	28	28	14	14	7
Caribbean	14	14	7	7	14	14	14	14	14	14	14	14
S. America	7	14	14	7	14	-	-	-	14	14	14	14
Australia	-	7	7	7	7	-	-	-	-	-	-	14
U.S. - West	14	7	7	7	7	14	14	14	14	14	14	14
U.S. - Central	7	7	7	7	7	14	14	14	14	14	14	14
U.S. - South	14	14	14	14	14	28	28	28	28	28	28	14
Vancouver	7	7	7	7	7	14	14	14	28	28	14	14
Toronto	7	7	7	7	7	14	14	14	14	14	14	14
Montreal	7	7	7	7	7	14	14	14	14	14	14	14
Sackville	7	7	7	7	14	14	14	14	14	14	14	14

Montreal to: EST	00	02	04	06	08	10	12	14	16	18	20	22
Europe	7	7	7	14	14	14	14	14	14	7	7	7
Africa	-	-	-	-	-	28	28	28	14	14	14	14
Caribbean	7	7	7	7	14	14	14	14	14	14	7	7
S. America	7	7	7	14	14	14	14	14	14	14	7	7
Australia	-	7	7	7	7	-	-	-	-	-	-	-
U.S. - West	14	14	14	14	14	14	14	14	14	14	14	14
U.S. - Central	7	7	7	7	14	14	14	14	14	14	14	14
U.S. - South	7	7	7	7	14	14	14	14	14	14	14	14
Vancouver	7	7	7	7	7	14	14	14	14	14	14	14
Watrous	7	7	7	7	7	14	14	14	14	14	14	14
Toronto	4	4	4	4	7	14	14	14	14	14	7	7
Sackville	4	4	4	4	7	14	14	14	14	7	7	7

Vancouver to: PST	21	23	01	03	05	07	09	11	13	15	17	19
Europe	7	7	7	7	7	7	14	14	7	7	7	7
Africa	7	-	-	7	7	14	28	28	28	28	14	14
Caribbean	14	14	7	14	28	28	28	28	28	28	14	14
S. America	14	7	7	7	7	14	14	-	-	14	14	14
Australia	-	-	7	7	7	7	-	-	-	-	-	-
U.S. - West	7	7	7	4	4	7	14	14	14	14	14	14
U.S. - Central	7	7	7	7	14	28	28	28	28	14	14	14
U.S. - South	14	14	14	7	7	28	28	28	28	28	28	14
Watrous	7	7	7	7	7	14	14	14	14	14	14	14
Toronto	14	7	7	7	14	14	14	14	14	14	28	14
Montreal	7	7	7	7	7	14	14	14	14	14	14	14
Sackville	7	7	7	7	14	14	14	14	14	14	14	14

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!

Hammond twenty meter beam - complete, never been used, for sale. Have selsyn motors, prop pitch motor, couplings and all attachments. Nothing to buy but the feeders. $150.00 takes the works. Call Pat Murphy, VE3PM, 156 Golfdale Road, Toronto 12, Ontario. (MOhawk 5328)

Why be off the air? One ATR-5 60 cycle 110AC converted, beat oscillator, phone and CW, 75 meters, in cabinet. Workmanship is guaranteed - sell $65.00. No speaker! Write or call E. Harris, 7499 Bloomfield Ave., Montreal 15, Quebec.

NATIONAL 2-40-D receiver for sale, in excellent condition - $275.00 or best offer. Also have VHF-152A High Frequency converter, in excellent condition - $85.00 or best offer. Peter Travis, East 38, R.R. #6, Hamilton, Ontario.

FOR SALE - 50 watt transmitter, phone and CW, $95.00. W. Jackson, 856 Moy Avenue, Windsor, Ontario.

HARVEY WELLS transmitter, type TBS-50A deluxe model for sale, with crystals for 75, 20, 10, 6 and 2 meter phone. There are 16 rocks, plus a 25/60 cycle Hammond cased power supply, oil filters, and built to better than commercial standards. This rig really works on ALL bands and puts out a husky signal. Can be remotely controlled by built-in relay. This outfit would cost over $300.00 net today. First $225.00 takes it. Also have 11 volt input dynamotor which delivers 600 vdc at 225 mils. Motors easily on 6 volt battery and gives 400 volts for mobile - $17.00. Have BC-459-A now operating on 20 meters with doubler stage added, fine for VFO on both 40 and 20 - filaments wired for 12 vac and in aluminum case - $18.00. Also have BC-456-B modulator for this transmitter, for plate and screen modulation - $10.00. Have two 34 foot collapsible 19 set masts at $10.00 each brand new and a 50 mmf 5000 volt glass vacuum condenser at $2.00. Write E.F. Job, VE3WO, 86 Invermay Ave., Wilson Heights P.O., Ontario.

If you have some radio equipment around the house you no longer need, sell it or swap it for what you want through this column. An inexpensive advertisement in Skywire reaches 2500 hams coast-to-coast.

DX QTH's

CM9AA	306 Consulado, Havana, Cuba.
G2CUR/VQ4	Capt. V. H. Thomas, 2037 (Maur) Coy. R.P.C., Box 131, Mackinnon Road, Kenya.
HH3LD	Plantation Dauphin, Cap Haitien, Haiti.
HZ1AW	*via* Box 88, Moscow.
KA1ABT	G. Trinidad, 50 Park Avenue, Pasay, Rizal, Philippines.
MD7QRP	AACS, USAAF, attached RAF Nicosia, Cyprus.
MT2E	H. Orrell, c/o Cable & Wireless, Ltd., Box 400, Tripoli.
SV4UN	Messrs. Litz and Joyal, United Nations Radio Station, Hotel Desroses, Isle of Rhodes, Dodecanese.
TA3FAS	U.S. Military Mission, Ankara, Turkey.
TG9AG	Box 299, Guatemala City.
TI2JC	Box 774, San Jose, Costa Rica.

DX QTH'S

EK1AZ	D. W. Crews, c/o RCA Communications, Riverhead, N.Y., U.S.A.
EQ2L	Ray Ball, American Embassy, Teheran, Iran.
HP1BR	Box 1098, Panama, R.P.
HP1LS	Stanley Lawrence, Box 1616, Panama, R.P.
HP2X	*Via* W4LVV.
K2UN	United Nations Amateur Radio Club, Lake Success, N.Y.
KV4AH	Box 120, St. Thomas, Virgin Islands, B.W.I.
KG6CB	Utility Sqdn. No. 9, Saipan, c/o FPO, San Francisco.
KZ5XJ	Box 1176, Aucon, Canal Zone.
LF2O	West Radio Factory, Floroe, Norway.
MD4JG	Maj. J. R. Farr, King's African Rifles, c/o PM, Mogadishu, Somalia, East Africa.

HOW'S UR OBS IQ?

Official Bulletin Nr 324, Dec. 10, 1951 F.C.C. has released notice of proposed rule making to provide that the new Amateur Extra Class License will be issued without either a 20 wpm code or advanced written examination to any applicant who during or prior to April, 1917 was issued an amateur license. Interested parties have until December 21st to file comment with F.C.C. on this proposal.

Official Bulletin Nr 325, Dec. 18, 1951. You are cordially invited to take part in the Eighteenth A.R.R.L. International DX competition. Contest periods for phone are February 1 to 3 and 15 to 17. CW competition is scheduled for February 29, March 1 and 2 and March 14 to 16. Complete rules may be found in January QST. Amateurs outside the continental U.S. and Canada may obtain preprints of the rules by sending a request to A.R.R.L. Headquarters. Though not required for entry, convenient reporting sheets for CW, phone or both sections of the competition will be supplied A.R.R.L writers.

Official Bulletin Nr 326, Dec. 20, 1951. F.C.C. has just announced proposed rules for the Radio Amateur Civil Emergency Service. No changes are made in existing amateur rules but by amendment to present amateur regulations, the Commission would provide for continued participation of designated amateurs in civil defense operations. The new service would function from the effective date, also in the event that normal amateur operation should be suspended because of intensification of the national emergency. Frequencies previously earmarked for use of amateurs in providing a civil defense service would be used on a non-exclusive basis with specified types of emission. RACES station authorization would be granted only to persons holding any grade amateur operator license except Novice and Technician and an amateur station license. Application for RACES authorization would require certification of local, state and federal civil defense authorities. Additionally, Novice and Technician licensees may participate as operator. Copies of the detailed rule making proposal will be sent to A.R.R.L. clubs and all Emergency Coordinators. Interested parties have until February 15, 1952 to file comment with F.C.C. on this proposal.

Official Bulletin Nr. 327, Dec. 28, 1951 F.C.C. has now finalized its proposal of December 7th to provide that the new amateur Extra Class license will be issued without either a 20 wpm code or advanced written examination to any applicant who during or prior to April, 1917 held a valid amateur operator or station license and qualifies for or currently holds a valid amateur operator license of General or Advanced Class.

Official Bulletin Nr 328, Jan. 4, 1952. F.C.C. January third abolished requirement that Conditional Class licensees appear for examination if they move into General Class area. F.C.C. also abolished requirement for modification of license when licensee will be at temporary locations longer than four months, provided monthly notice is furnished both F.C.C. in Washington and District Engineer in Charge. See details February QST. Amateurs moving to temporary locations but still maintaining permanent residence at the address on license should not apply for modification but use this new procedure. Such amateurs with modifications now pending should write F.C.C. withdrawing application. Amateurs holding license at a temporary address should, when they next move, apply for modification back to permanent address & use temporary operation procedures if needed.

More Official Bulletin Stations are needed in all parts of Canada on all bands, to keep VE operators up to date on the latest official amateur news. You can help. Contact your SCM immediately on how to participate in this highly important phase of our hobby.

TV Guide's

Norman Brokenshire of *The Better Homes Show.*

Dr. Roy K. Marshall of *The Nature of Things.*

Panelist Arlene Franci of *What's My Line*

In recognition of outstanding television accomplishments

As will probably always be the case in a medium which makes such titanic demands on performers and material, the television year 1951 was an uneven combination of the good, bad and indifferent. The bad was often very bad indeed. Fortunately, the good was often brilliant.

In recognition of the latter achievement in main categories of the field, the editors have chosen the following as winners of the 1951 TV Guide Gold Medal Awards:

Comedian of the Year: Red Skelton. Big things were expected of this major radio and movie star as he made his television debut this fall. And big things were forthcoming. In a few short weeks, he has zoomed from nowhere in TV to second among all national programs in Neilsen ratings. Featuring a remarkably large gallery of rounded comic characters, he has put on a show of continuous laughter.

Variety Show of the Year: *Your Show of Shows.* Producer Max Liebman, stars Sid Caesar and Imogene Coca, and an immensely gifted supporting cast, have continued week after week to put on beautifully coordinated revues, distinguished by exceptional comedy, warmth, grace, imagination and unflagging good taste.

Dramatic Show of the Year: *The Celanese Theater.* In presenting dramas of proven excellence by the best American playwrights, and in giving first-rate adaptation, production and performance to these works by the greatest assemblage of writing talent ever employed by any program, *The Celanese Theater* has contributed definitely to American cultural life.

Musical Show of the Year: *Your Hit Parade.* With deft originality, and aided by three of the most attractive singers on the air—Snooky Lanson, Dorothy Collins and Eileen Wilson—this program has kept right on building fresh, diverting productions around the top popular songs every week.

Mystery Show of the Year: *Man Against Crime.* Consistently good production and writing and the personal magnetism and skill of its star, Ralph Bellamy, have kept this show well in the vanguard of televi-

1951 Awards

Herb Shriner, who also does his commercials.

WPIX's Veepee Larson greets Sen. Kefauver.

Martha Rountree, Lawrence Spivak of *Meet the Press.*

during the year, we announce second Gold Medal winners

sion's detective series.

News Show of the Year: *Douglas Edwards and the News.* Mr. Edwards' calm, illuminating commentary, and a pleasing, unobtrusive personality in conjunction with the excellent editing and smoothly-functioning organization of this nightly weekday program, have made it outstanding among a number of other first-rate news shows.

Children's Show of the Year: *The Magic Cottage.* With charm, good taste and an extraordinary understanding of her young audience, Pat Meikle makes her program one of the delights and credits of television.

Commercial of the Year: Arrow Shirts. With the wonderful Herb Shriner as commentator, these delightful commercials are among the most entertaining appeals that advertising has ever achieved. TV GUIDE is happy to make this award in its campaign to encourage commercials to entertain as well as sell.

Vocalist of the Year: James Melton. The concert and operatic star not only has one of the time's really stirring voices, but the dramatic ability to make the most of it.

Vocalist of the Year: Peggy Lee. The handsome young woman with the immaculate phrasing and golden, relaxed tones, has a way of making a song her own, no matter how many others have sung it.

Quiz Show of the Year: *What's My Line?* An ingenious idea, an extremely bright panel—Arlene Francis, Dorothy Kilgallen, Bennett Cerf and Hal Block—and a literate, articulate moderator, John Daly, have paid off every week in a highly engaging show.

Public Discussion Show of the Year: *Meet the Press.* With Lawrence Spivak sparking the panel of newsmen in interviews with front-page personalities, and with the gracious and expert Martha Rountree as moderator, this has been an exciting, adult and rewarding program.

Educational Show of the Year: *The Nature of Things.* Using simple words and illustra-

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THE CANADIAN RADIO AMATEURS' JOURNAL

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...sm. Dr. Roy K. Marshall has demonstrated an unparalleled knack for making the universe and what's in it clear and stimulating.

Homemaking Show of the Year: *The Better Home Show*, with Norman Brokenshire, has been a cornucopia of practical, useful household information, provided entertainingly.

Program of the Year: To WPIX for the Kefauver production. The televised hearings of the Senate Crime Investigating Committee brought new stature to the medium as a means of public information – and roused a nation out of its complacency toward the problem of government mixed with crime. Working under difficulties, the staff of WPIX did a great job of coordinating the network telecasts.

Personality of the Year: Jackie Gleason. A perceptive comedian of impressive scope, Gleason has the personal warmth and wit that would make him a successful performer in any facet of video.

New Idea of the Year: *See It Now*. Edward R. Murrow and the CBS-TV news staff have brought a new immediacy to the reporting of the week's news and feature stories, using the medium boldly and with maximum effectiveness. Employing the literal medium of news, Murrow achieves dramatic heights any playwright might envy.

Station Award: To WATV, ⑬: For its signal awareness of civic responsibility as demonstrated in its comprehensive program of community education.

Station Award: To New Haven's WNHC-TV, [6]: For local application of national program approaches in the field of news coverage, resulting in programs, as exemplified by *World News Today*, outstanding among community stations.

TELEVISION

NEW DEVELOPMENTS IN TELEVISION TUNERS

By
Paul J. Erdle and
Wendell K. Boots

Commercial Engineering Department

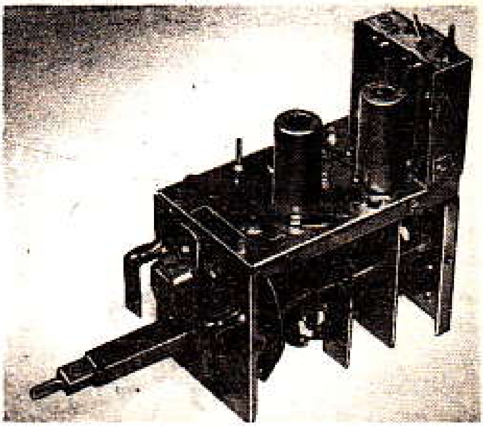

Figure 1. The Philco-Sickles tuner which switches a set of inductances across contact points for each channel. This model, utilizing a tapered line input transformer, is used in recent Philco models.

A discussion of new developments in television tuners must necessarily be limited to general trends, which will include some older systems with significant changes for present and future utilization. New receiver developments exert considerable influence upon tuner design, hence an introductory note on recent receiver developments is in order.

For proper sound reception, receivers designed with separate video and sound if strips require a local oscillator which is stable enough to permit the converted sound carrier to pass through the narrow sound if amplifier and FM detector without distortion or loss of sound. This requirement imposes restrictions upon stability many times more severe than those normally obtainable with commercially available tubes and components. To maintain proper stability, either afc systems or highly refined oscillator circuits are customarily used. Many receiver manufacturers are now using the intercarrier sound system in which the sound modulation is taken from the 4.5 mc beat between the aural and visual carriers. (See SYLVANIA NEWS, January 1949.) Small amounts of local oscillator drift are less noticeable with the intercarrier sound system, inasmuch as the 4.5 mc beat frequency containing the sound modulation is fixed at the transmitter. Due to the relaxed stability requirements, afc systems as well as special local oscillator refinements can be eliminated or simplified when the intercarrier sound system is used. This tends to simplify tuners and to reduce their cost.

Some manufacturers are changing from the conventional 24 mc if to 44 mc. Better image rejection plus the prospect of uhf channels are among the reasons for this trend to a higher if. (See SYLVANIA NEWS, September 1950.)

Tuner RF Input Circuits

Tuner rf input circuits have been subject to considerable development since the earliest tuners were marketed. Antenna systems currently available are designed for transmission lines ranging from 50 to 300 ohms characteristic impedance. Consequently, tuner manufacturers have attempted to accommodate the many impedance variations of these antennas by various methods. The tapered line antenna coupling network is one example of such an input circuit. By the use of specially constructed, interwound inductances, this coupling network efficiently matches either 75 or 300 ohm transmission lines to the grid of the rf amplifier tube. Such a coupling network supplies a voltage gain from the antenna terminals to the rf amplifier grid, as well as minimizing the standing wave ratio on the transmission lines. The tuner pictured in Figure 1 utilizes a tapered line antenna input. The coils of the tapered line transformer are visible behind the tubes in the tuner.

Both antenna impedance and rf amplifier input impedance vary considerably between channels 2 and 13. The use of separate input transformers for low and high bands, with band switching automatically controlled by the channel selector, provides an approximate match between antenna and rf amplifier over the range of present television channels in some tuners.

Although tuners with a broadband coverage have not been popular, there is a possibility of interest developing for their use with the higher 44 mc if amplifiers in television receivers. Broadband tuners depend upon a reasonably flat rf response over the necessary range of channels, the tuning being accomplished by varying the local oscillator frequency. The number of critical tuning elements is therefore reduced. It is possible to design broadband tuners which perform favorably in comparison with more conventional tuners. Adjacent channel rejection must be accomplished in the if strips of receivers utilizing broadband tuners. One disadvantage of broadband tuners is the radiated local oscillator signal which can be a serious problem.

Mechanical Developments

Considerable development work has been done on television tuners, mechanically. Recent designs tend to be very compact and have simplified tuning mechanisms. Smaller tuners provide the set manufacturer with more flexibility in chassis layout and cabinet styling than would be practical with bulky units. Simpler tuner mechanisms result in fewer field complaints and are more easily serviced. The reduction in tuner size has been obtained partially by the elimination of obsolete circuits, by using more effective circuits which require fewer parts, and by using the available space more efficiently. In fact, some units such as those shown in Figures 2 and 4 are more easily serviced than earlier models. The turrets shown in these pictures, for example, may be detached from the tuner assembly by the removal of three springs. Either turret can be further disassembled by the removal of the coil strip for any channel as illustrated. It can be seen that replacement of such a coil strip can be readily accomplished. Many tuners also have test points brought out to aid in alignment.

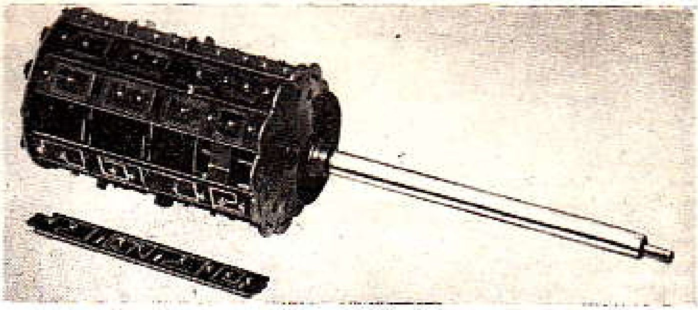

Figure 2. Turret assembly of the RCA-Victor printed circuit tuner used by Hallicrafters. Note the ease with which a strip may be replaced.

When separate sound and video if channels are employed, microphonism requirements for the tuner are extremely severe. Slight vibrations of either the oscillator tube or components can cause frequency variations in the local oscillator. These frequency variations appear at the output of the FM sound detector as ringing noises. To reduce vibrations and their effects, tuners are usually shock mounted on the receiver chassis. To further reduce vibrations of the oscillator tube, some manufacturers have placed a heavy leaden sheild over it, the mass of this shield being sufficient to dampen the vibrations of the tube. In sets which use the intercarrier sound system, the sound is no longer dependent upon the oscillator frequency remaining fixed, but upon the 4.5 mc carrier beat as discussed previously. Therefore, the frequency variations of the oscillator caused by vibrations do not appear at the output of the FM detector. For these reasons the microphonism requirements are materially reduced in sets employing the intercarrier sound system. In such receivers the shock mounting paraphernalia has been eliminated resulting in a simpler mechanical design.

Continuous tuning is employed in many of today's television tuners with various combinations of band-switching arrangements as desired by a set manufacturer. Thus one tuner operates continuously from 54 through 216 mc including the FM band. Another tuner switches from one television band covering channels 2 through 6 to the other band covering channels 7 through 13 automatically when the channel selector reaches a predetermined point in its travel. Still other tuners have manual band switching arrangements. Either variable inductance or capacitance can be used to accomplish continuous tuning. Figure 3 shows an example of continuous tuning with a manually operated band switch.

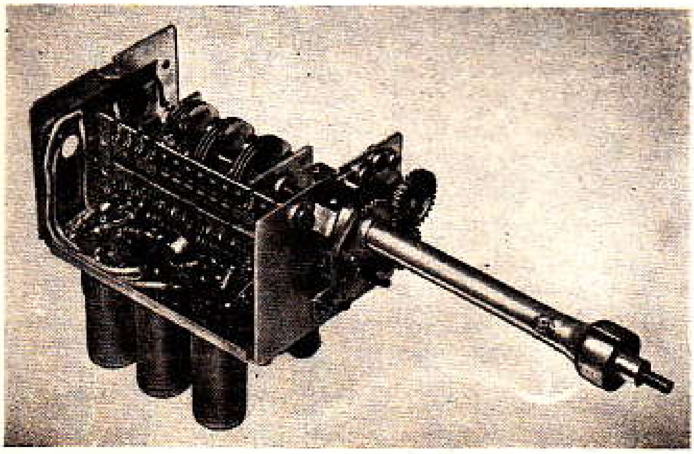

Figure 3. The General Instruments two band tuner used in Sylvania Movie Clear Television receivers. Continuous tuning across the lower band and upper bar channels is featured, with a band chan switch selecting the range desired.

Figures 2 and 4 show good examples of vernier tuning arrangements utilizing a variable dielectric principle. Other vernier tuning methods include schemes for varying the capacitance in the oscillator circuit by changing the spacing or effective area of condenser plates. Continuous type tuners, of course, require no electrical vernier tuning arrangement.

Turret assemblies were among the first tuner designs. Recent turret type tuners, as shown in Figure 4 permit more efficient, shorter connections. They also permit reception on all channels which was not possible on some of the earlier designs. One version of the turret type tuner is the use of printed circuits for the coils. Figure 2 shows a partially disassembled turret using printed coils. The printed circuit is produced by a photo-etch process. It is claimed that this construction is less susceptible to microphonism and permits more uniformity in the manufacture of tuners.

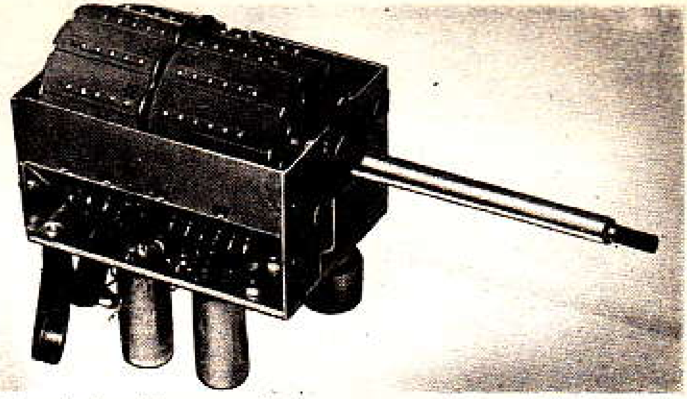

Figure 4. One of the most popular turret type tuners is the one made by Standard Coil which also features removable coil strips. Concentric chafts provide coil switching and vernier tuning. The vernier tuning cam is visible at the front of the assembly. This model is found in many receivers including Admiral, Hoffman and Magnavox.

Tube Developments

The earliest tuners were designed around the tubes then available, but which were not necessarily the best tubes possible for this sort of application. Manufacturers now employ tubes with higher transconductance and less loading which provide for higher efficiencies in tuners. Physically, the trend has been from the larger lock-in and octal based tubes to the miniature types. In addition to the advantages gained by the small size of these tubes, they also offer better high frequency performance as required by tuners because of the lower lead inductances of such tube designs. Still more recently, sub-miniature tubes applicable to tuners have been announced and are under consideration by tuner manufactures.

Test Equipment

In the early days of television, sweep generators, oscilloscopes and marker generators were expensive and generally regarded as laboratory equipment rather than essential servicing equipment for tuner alignment. Servicemen attempted to realign tuners, as well as if strips, by using a signal generator and vacuum-tube voltmeter. This procedure frequently resulted in improper operation. Service equipment manufacturers have designed and are today producing relatively inexpensive sweep and marker generators and oscilloscopes which greatly facilitate proper alignment of the tuner. These instruments are now regarded as essential to television servicing.

When the first television channels were assigned, it was believed that reception beyond fifty miles would be impractical due to the curvature of the earth as well as other natural obstacles. It was also believed that if transmitted power were strong enough to reach this distance, the signal to noise ratio would present no problem. Conforming with these beliefs, few attempts were made to build high gain video if amplifier strips into the first receivers. Furthermore, no special efforts were made to design tuners with low noise factors. After a short time, it became apparent that fringe area reception was possible over a larger radius. The tuner noise factor established a limit for the use of better if amplifiers. The trend in tuners has been toward an improved signal to noise ratio.

As the number of television receivers in any area increases, interference due to local oscillator radiation becomes a serious problem. Some tuner manufacturers have used effective shielding along with an rf amplifier stage between the oscillator and the antenna to reduce such radiation.

UHF And Color Television

Some television sets available on the market today have provisions for UHF. Space is available in these sets for the addition of a tuner for UHF reception. Power and signal sockets to accommodate such tuners are also usually available. There is at least one turret type tuner, however, which has circuits incorporated in a channel strip. This channel strip can replace one of the unused strips already in the tuner and will enable the receiver to operate in the UHF region.

To date color television has been more of a problem in scanning requirements than in tuner considerations. The CBS color system currently under discussion needs no added bandwidth for existing channel operation, hence the tuner requirements for the reception of such systems are not materially altered.

Future design trends in television tuners are unpredictable at the moment due to the uncertainties which still exist with regard to the proposed UHF channels. These designs will probably be largely influenced by further attempts to incorporate UHF operation into tuners. Such designs will be greatly dependent upon developments in circuitry, tubes and components which are still in the experimental stages. It is expected that these developments will provide inexpensive, yet stable and efficient tuners to cover all parts of the radio spectrum allocated to commercial television.

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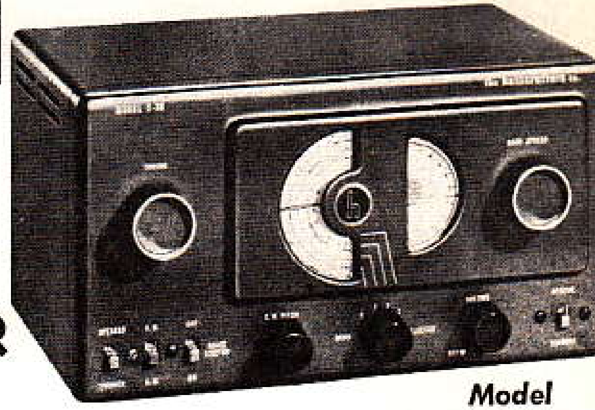
"The Radio Man's Radio"

Precision Performance

NEW LOW CANADIAN PRICES ON THESE POPULAR MODELS,



Model S-38B

Model S-77

Long a favorite with the Amateurs. The lowest cost, full-size (18½" wide) set in Hallicrafters line.

Covers Broadcast Band 540-1700 Kc and three short-wave bands 1.7-43 Mc. One r-f, two i-f stages for distance-getting sensitivity. Electrical bandspread tuning to separate stations on crowded bands. Switches for automatic noise limiter, code reception and three-position tone control. Code pitch control. Built-in PM speaker.

Satin black steel cabinet, 18½" wide, 8⅞" high, 9½" deep. Ship. wt. 38 lbs. Piano hinge top. Connections for using external power supply or remote control. 7 tubes plus rect. For 115 V. AC or DC.

Model S-38B The radio that amazes even the experts! Pulls in broadcast stations in weak signal areas where ordinary sets fail. Also offers world-wide reception for the short-wave listener and the new radio amateur. Has regular communications-type controls for greater flexibility of operation. Covers Broadcast Band and three short-wave bands 540 kc to 32 Mc.

Maximum sensitivity and selectivity from expertly engineered chassis—far superior to ordinary radios having same number of tubes. Separate Fine Tuning control to separate stations on crowded short-wave bands. Built-in PM speaker. Oscillator for reception of code signals.

Gray steel cabinet, 12⅞" wide, 7" high, 7¼" deep. Four tubes plus rectifier. For 115 V. AC or DC.

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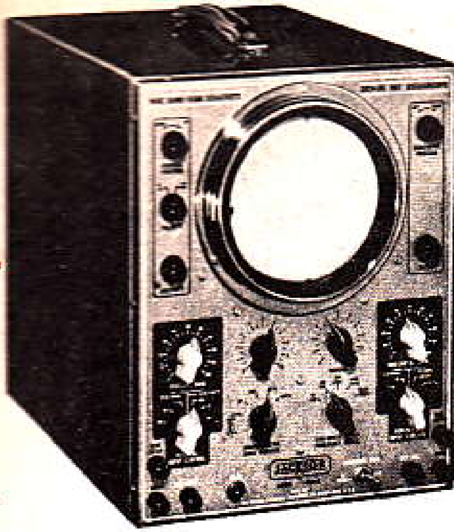
ROGERS MAJESTIC ELECTRONICS LTD.

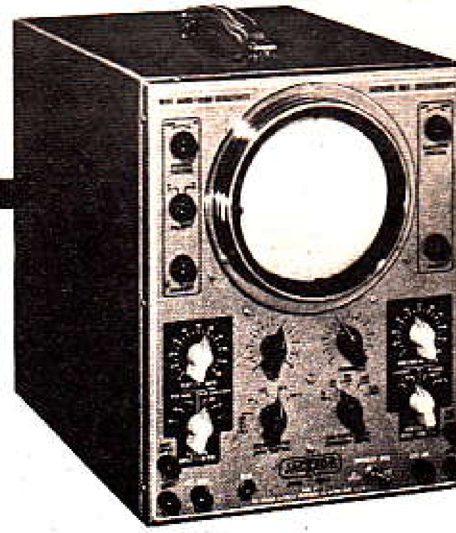
HALIFAX MONTREAL TORONTO WINNIPEG VANCOUVER



Stable Band Width
Thru 4.5 Mc

Vertical Sensitivity
.018 RMS v.p.i.

Look to
JACKSON
for Quality



JACKSON Oscilloscope gives you "dual service"

This is a high-quality, laboratory-grade 5" Oscilloscope that provides the "dual service" of both high sensitivity and wide band width.

specifications

Vertical Amplifier—Video-type frequency compensation provides flat response within 1.5 db from 20 cycles thru 4.5 Mc, dropping smoothly to a still useful value at 6 Mc.

Sensitivity Ranges—With a band width of 20 cycles thru 100 Kc, the sensitivity ranges are .018, .18, 1.8 RMS volts-per-inch. The wide band position 20 cycles thru 4.5 Mc has sensitivity ranges of .25, 2.5, 25 RMS volts-per-inch.

Horizontal Amplifier—Push-pull with sensitivity of .55 RMS volts-per-inch.

Input Impedances—Vertical: 1.5 megohms shunted by 20 mmfd. Direct to plates, balanced 6 megohms shunted by 11 mmfd. Horizontal: 1.1 megohms.

Linear Sweep Oscillator—Saw tooth wave, 20 cycles to 50 Kc in 5 steps. 60 cycle sine wave also available, as well as provision for using external sweep.

Input Voltage Calibration—Provides a standard voltage against which to measure voltages of signal applied to vertical input.

Vertical Polarity Reversal—For reversing polarity of voltage being checked or for choosing either positive or negative sync. voltages.

Return Trace Blanking—Electronic blanking provides clear, sharp trace to prevent confusion in waveform analysis.

Synchronizing Input Control—To choose among INTERNAL, EXTERNAL, 60 CYCLE, or 120 CYCLE positions.

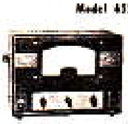
Intensity Modulation—60 cycle internal or provision for external voltage for intensity modulation uses.

Additional Features—Removable calibration screen—Accessory Model CR-P Demodulation Probe for Signal Tracing—All-steel, gray Ham-R-Tex cabinet. Total net weight only 26 pounds. Same height as other Jackson TV instruments: 13" H x 10¾" W x 15⅛" D.

"Service Engineered" Test Equipment

TWO OTHER FINE JACKSON INSTRUMENTS

Model 655 Audio Oscillator



Sine-wave 20 cycles to 200,000 cycles. Less than 2% harmonic distortion between 30 cycles and 15,000 cycles. Frequency calibration accurate within 3% or 1 cycle. Hum level down more than 60 db of maximum power output. Output impedances of 10, 250, 500, 5000 ohms or Hi Z resistive output.

Model TVG-2 TV Generator

Sweep Oscillator in three ranges from 2 Mc thru 216 Mc, all on fundamentals. Reversible sweep direction. Sweep width variable .1 Mc thru 18 Mc. Marker covers 4 Mc thru 216 Mc. Crystal Oscillator to use as Marker or Calibrator. Video Modulation, from external source for using actual video signal for check, or for use with Audio Oscillator to produce bars for linearity checks.

See your electronics distributor for more information, or write

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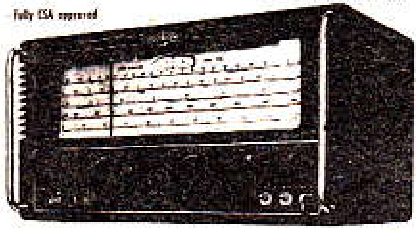
"Service Engineered" Test Equipment

The EDDYSTONE Model 750

WORLDS FINEST COMMUNICATIONS RECEIVER

Fully CSA approved



NOW CANADIAN SALES LEADER BY A WIDE MARGIN EDDYSTONE 750

THERE ARE MANY REASONS WHY EDDYSTONE 750 IS SETTING NEW SALES RECORDS AND A NEW STANDARD OF PERFORMANCES. CHECK THE FEATURES BELOW:

- Dual Conversion
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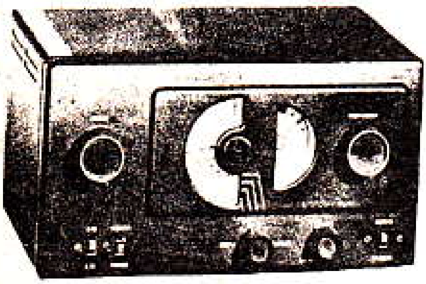
- Image ratio better than 40 db on 10!
- Ample All-Band Bandspread
- Synchro-Mesh Geared Dial Drive
- No tuning backlash at all
- Complete coverage 480kc through 32mc.
- Accurately calibrated linear dial scale
- Unbelievable Signal-to-Noise ratio
- No drift from line voltage variations
- Voltage regulated oscillator supply
- Mobile vibrator supply operation
- All-available Miniature tubes
- Highly effective series noise limiter
- More eye appeal than any other receiver
- More performance for your investment

Write today for an illustrated brochure giving many more important reasons why you'll be glad you waited for the Eddystone 750. Hear it and see [illegible] before buying any.

25 or 60 cycle **Ready To Go!**

$275.00 (Less Speaker)



Model S-38B The radio that amazes even the experts! Pulls in broadcast stations in weak signal areas where ordinary sets fail. Also offers world-wide reception for the short-wave listener and the new radio amateur. Has regular communications-type controls for greater flexibility of operation. Covers Broadcast Band and three short-wave bands 540 kc to 32 Mc.

Maximum sensitivity and selectivity from expertly engineered chassis—far superior to ordinary radios having same number of tubes. Separate Fine Tuning control to separate stations on crowded short-wave bands. Built-in PM speaker. Oscillator for reception of code signals.

You Asked for Them—So Here They Are! **NOW! $79.95**

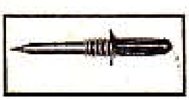
An all-electronic ac-operated vacuum-tube volt-ohmmeter by RCA

- GREATER VOLTAGE RANGE
- WIDER FREQUENCY RESPONSE
- HIGHER OVER-ALL ACCURACY
- COMPLETE ELECTRONIC OPERATION

JUNIOR VOLTOHMYST has high input resistance on all ranges, electronic protection against burnout, durable plastic case, built-in rf shield, negative-feedback bridge circuit, DC polarity switch, zero centering facilities. Measures DC from 50 millivolts to 1200 volts, AC from 100 millivolts to 1200 volts, (rms), and measures resistance from 0.2 ohm to 1-billion ohms. AC and DC Probes supplied.

Safely measures continuity of filaments of battery-operated receiving tubes. 8"H., 5⅜"W., 4½"D.

NEW WV-77A JUNIOR **is back again**



WG-289 High-Voltage Probe and WG-206 Multiplier Resistor extends DC rating of Jr. Voltohmyst to 50,000 volts and input resistance increased to 1100 megohms.

Includes DC probe, AC direct probe and cable, ground lead, and alligator clip.

Model WV-77A is an outstanding buy

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YOUR COST - 60 CYCLE $72.00

Drake hi-pass filters for TVI

Model TV-300-54HP for sets with 44 Mc I.F. - Your cost - $5.90

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