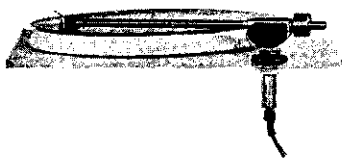
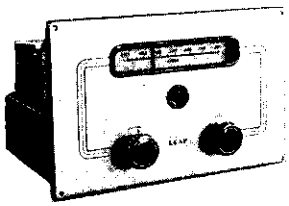
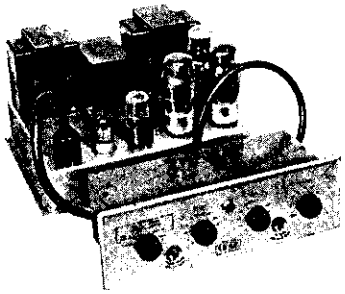
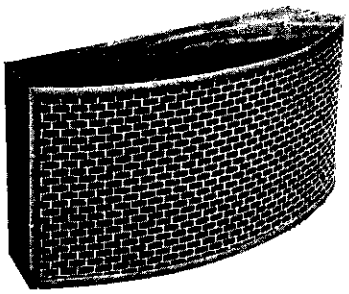
HIGH FIDELITY
HOME MUSIC SYSTEMS

LEAK









TROUGH-LINE
F.M. TUNER

Why F.M.?

It is not possible to obtain very high quality from the signals broadcast by medium-wave and long-wave amplitude-modulated (A.M.) transmitters. At their very best, the signals from such stations will not approach the quality obtainable from a good L.P. record with a first-class pickup.

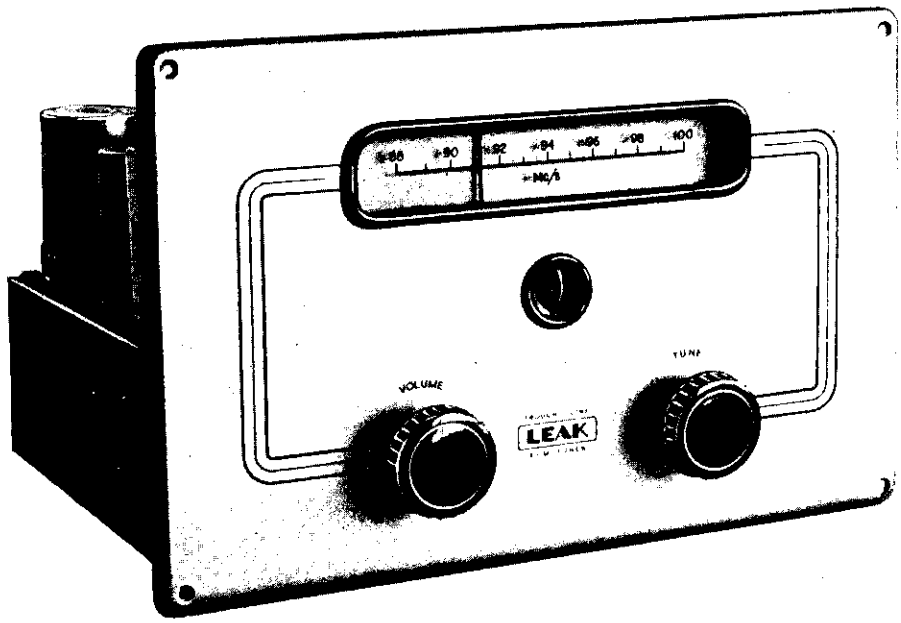
On the other hand, the quality from short-wave frequency-modulated (F.M.) transmitters is better than the best record, provided that the programme is "live" and that good land-lines are used between studio and transmitter, and provided that a first-class F.M. tuner is used.

The Problems

To produce an F.M. tuner, that can be classified as first class, the requirements are as follows :—

1. To prevent frequency drift (station going off tune). We have encountered some makes of F.M. tuners in which the tuning drift is so severe that the station will disappear as the set warms up unless the tuning knob is continually adjusted. This means that such a set has a total drift of over 100 kc/s, this being many times the maximum permissible drift which should be less than 10 kc/s.
2. To reduce re-radiation and so prevent mutual interference between the F.M. tuner and any TV set in the same house. Some designs interfere so seriously with neighbouring TV reception that we foresee the possibility of legislation to prevent the use of some common forms of circuitry.
3. To design a tuner sufficiently sensitive to operate throughout the B.B.C. transmission areas and to prevent the objectionable rushing noise commonly found when tuning between stations.
4. To incorporate a tuning indicator which is sensitive to very small changes in the oscillator frequency and to ensure that its indication coincides precisely with the optimum tuning point.
5. To overcome the necessity of using an external filament transformer or an external power supply unit.
6. To reduce tuner unit distortion to a minimum and to eliminate interference by unwanted signals.

The Complete Solution



Leak Trough-line F.M. Tuner

How these problems were solved in the Trough-line F.M. Tuner

1. The oscillator employs a trough-line as a tuning inductor, and we believe that, in this respect, the receiver is unique in the world today. This trough-line tuning inductor in conjunction with the application of Automatic Frequency Control results in tuning stability within 5 kc/s from the instant of switching on. The trough-line occupies much of the space under the chassis and is positioned to provide some RF screening.

2. The intermediate frequency was chosen as 12·5 Mc/s in preference to the usual value of 10·7 Mc/s and the oscillator operates on the high side of the signal frequency. Its output is injected into the coupling between the RF stage and the mixer, the network at this point being designed to attenuate second channel signals. This ensures that :—

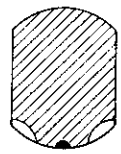
   (*a*) the oscillator frequency never operates in Band II and cannot, therefore, cause interference with other receivers.

   (*b*) harmonics of the intermediate frequency, which are inevitably generated in the later stages of the IF amplifiers, do not fall within Band II. With an IF lower than 12·5 Mc/s such harmonics can be received as "dead" carriers.

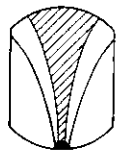
   (*c*) Band I (TV) signals cannot cause "image" interference with F.M. transmissions.

3. The tuner's sensitivity is such that full limiting is obtained for an input of 2 micro-volts at the aerial terminals. So far as we know, this sensitivity is higher than that of any other receiver on the British market and first-class reproduction is therefore possible wherever the signal appreciably exceeds the noise level. The "quieting" control is at the rear of the tuner and should be initially adjusted by the user ; this controls the standing bias on the limiter stage and can be adjusted to ensure a silent background between stations in the majority of receiving locations in this country. In fringe areas (locations of low signal strength), or when using a poor aerial, it may be necessary to forego some or all of the inter-station noise suppression in order to receive clear reception from the B.B.C. transmissions.

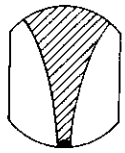
4. The tuning indicator used is of novel design and will show a change in oscillator frequency of as little as 2 – 5 kc/s. Inputs to the tuning indicator are obtained from two sources, the first, being derived from the AGC line, results in a deflection of the trace as a station is approached ; the second input, from the discriminator, is short circuited fifty times a second by small metal rectifiers supplied from an L.T. winding. When the receiver is accurately in tune the discriminator output is zero and the magic-eye gives a crisp display with sharply defined edges to the areas of luminescence. If, however, the receiver is mistuned there is an output from the discriminator, positive or negative depending on the sense of the mis-tuning, and this voltage, chopped up and superimposed on the AGC voltage, causes the eye to give a blurred display.



No Signal



Incorrectly Tuned



Correctly Tuned

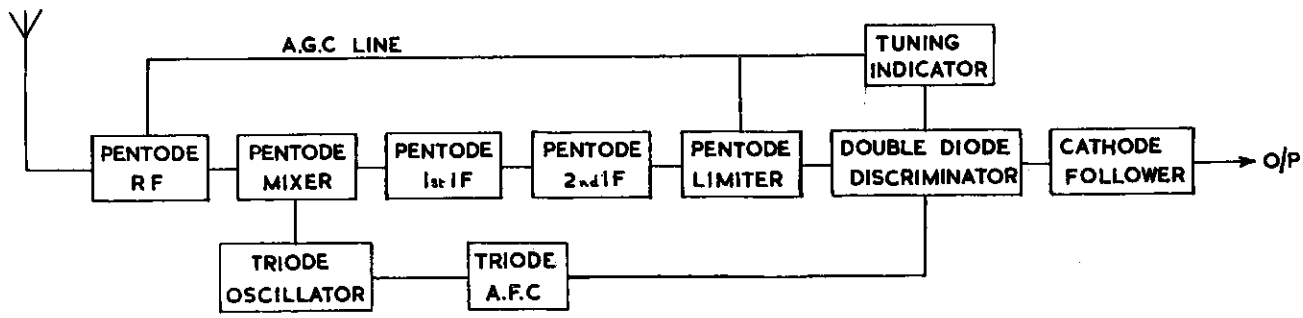
5. Any sensitive low-distortion tuner such as the Trough-Line will draw some 60 mA of H.T. and 3 amps of filament current ; these demands are outside the limits of the spare supply from any available power amplifier. We have removed the need for an external transformer or an external source of power supply by incorporating in this tuner its own power supply unit.

6. To give the highest possible quality we have not used the ratio detector. The discriminator is a Seeley-Foster type, employing thermionic diodes, and the preceding stage has a limiter which eliminates amplitude-modulated signals, thereby rendering the receiver insensitive to ignition and other forms of impulse interference.

SPECIFICATION

Frequency Range :	88 – 100 M/cs.
Sensitivity :	2 micro-volts at the aerial terminals for full limiting.
Aerial Impedance :	70/80 ohms, balanced with centre tap earthed.
Audio Output :	Cathode follower output delivers approximately 1 volt and facilitates the use of long output leads with negligible high frequency attenuation.
A.C. Power :	200/250 volts, 50-60 c/s, 46 watts.
Valves :	2 × EF80, 3 × ECF80, EB91, EM81, EZ80. Lamps : 2 × Lilliput 8V, 0·15A.
Dimensions :	$10\frac{3}{4}'' \times 7'' \times 7''$ deep. (27·2 × 17·7 × 17·7 cms.).
Cut-Out :	$10\frac{1}{8}'' \times 6''$ (25·7 × 15·3 cms.).
Weight :	10 lbs. (4·536 kgs.).
Price :	£25 · 0 · 0d. plus Purchase Tax £10 · 10 · 0d.

BLOCK CIRCUIT DIAGRAM OF THE TROUGH-LINE F.M. TUNER



We shall be pleased to supply full details of other LEAK high fidelity home music equipment on request.

FREL is the trade name of the Leak Full-range Electrostatic Loudspeaker which will be available to the public in 1957. The design is original and has great theoretical and practical advantages over previously described electrostatic loudspeaker systems. It is the result of intensive research and development work carried out by H. J. Leak, M. BRIT. I.R.E., and A. B. Sarkar, M.Sc., who are the authors of a paper, describing the basic design principles of this loudspeaker, which was published in the *Wireless World*, October 1956.

A reprint of this paper will be supplied on request.

H. J. LEAK & CO. LTD.

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