AN EASILY ADDED "S" METER

Centre Tap describes a Useful Accessory for addition to any Superhet Circuit fitted with AVC . . . . . .

FROM the time the superhet circuit first became popular, most of the better quality receivers have been fitted with some form of visual tuning indication. With the simple broadcast receiver some means of accurately determining the correct tuning point is a highly desirable feature. The superhet is inherently highly selective, and any deviation from the exact tuning point must result in a cutting of the side-bands, with a consequent deterioration in reproduction quality. It is far simpler to tune by the eye than it is by the ear, and receivers with any pretensions of being in the 'quality' class have always been fitted with one form or another of the various visual tuning devices, of which the magic eye has been the most popular.

The "S" meter, because of the greater ease in noting the optimum tuning point, is far more suited to laboratory work and communications receiver design, however out of place it may seem in the drawing room. Apart from this advantage, it is far more consistent with the "instrument" type cabinet than the "furniture" cabinet of the commercial broadcast receiver, and thus nearer to the hearts of the constructor and experimenter.

Simplest Application

With straight receivers, it was formerly customary for amateurs to include a milliameter in the anode circuit of the detector valve and tune to maximum "dip" (the smallest meter reading). With a straight circuit such a device is rather by way of being a gadget, instead of a necessity as it is under the critical tuning conditions of a well-designed superhet.

It is of interest to note that in a circuit using anode bend detection the anode current, and therefore the meter reading, rises as a signal is accurately tuned.

A large number of the Services receivers have a switched position in order that the meter can be used as a tuning device (where no "S" meter is fitted) when in tuning the operator can watch for maximum dip. In these receivers the meter is switched in series with one or more of the AVC controlled IF valves when a downward reading (fall in HT) in proportion to the strength of signal is obtained.

Such circuits too, were formerly popular amongst amateurs, who often fitted the meters upside down so that the needle movement was to the right. Indeed, at least one American firm manufactured a 'backward' reading meter especially for this purpose to enable it to be fitted the right way up !

Other Uses

Quite apart from the "S" meter's normal role of measuring signal intensity with reasonable accuracy, or at least of indicating comparative strengths, it serves as a first-rate guide to aerial performance and an invaluable asset in making alignment or other adjustments.

From the point of view of amateur communications radio, it is essential for enabling reliable relative reports on carrier strength to be made, or for measuring the back-to-front ratio of rotary beams, etc.

It must be remembered, too, that an S7 to 8 undermodulated signal may sound weaker than an S5 to 6 fully modulated signal. This should be particularly noted by SWLs who are interested in reporting and "veri" collecting. An inaccurate report is not only valueless but may be actually misleading.

Simple Circuit

An "S" meter on these lines was described in the Short Wave News for December, 1948, for addition to the Basic Superhet and similar receivers, the essential feature being that the set must incorporate an AVC system. It is, of course, the AVC which actuates the meter, its position in the circuit being the final IF amplifying valve.

It will not give readings for CW reception, although special arrangements *can* be made for this purpose. The AVC is always shorted

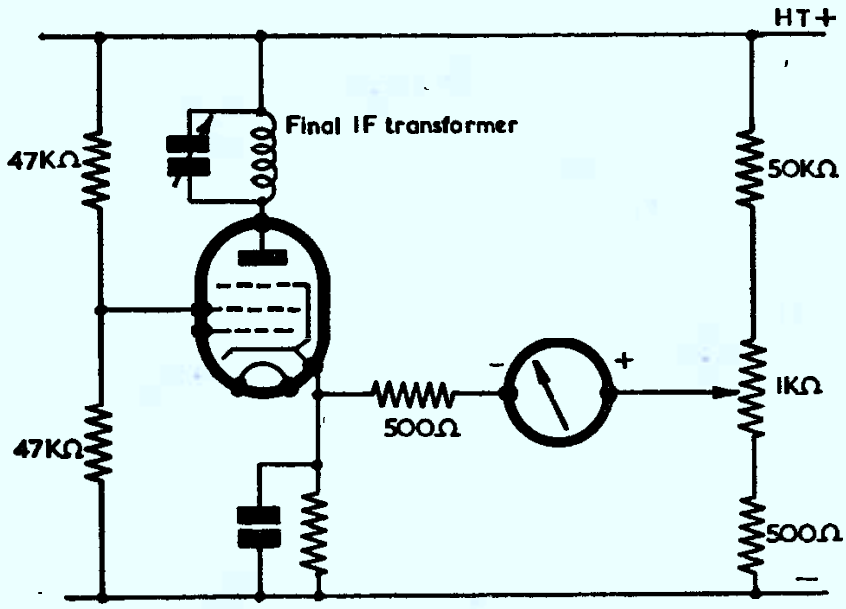

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Fig. 1: Showing how the meter is connected.

out when the BFO is switched on.

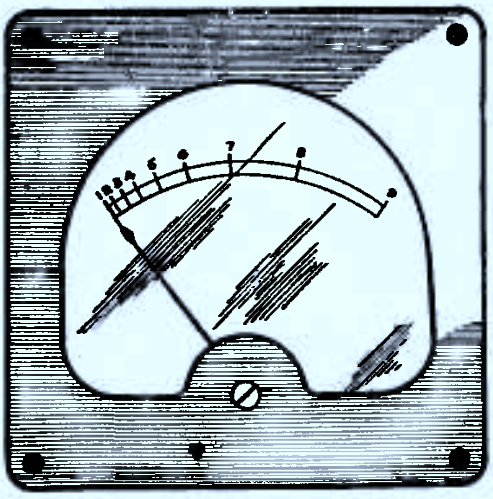
The circuit shown is actually just as simple as it looks, both in wiring and in the initial adjustment. The resistor from the HT to the screen will, of course, be part of the existing circuit. That from the screen to the chassis will possibly have to be added and it should be of a value approximately equal to that on the HT side.

Operation

No current flows through the meter under "no signal" conditions, but, as the AVC voltage rises, current flows as the cathode becomes less positive and thus a forward reading is obtained. The resistor between the meter negative terminal and the cathode is to prevent excessive current on very strong signals, and by increasing or decreasing its value the meter sensitivity can be varied. It should also be noted that it serves to prevent the bias from falling below its proper value, via the resistor on the positive side of the meter by which it would be shunted.

If it is found that the needle drives over hard against the back stop, either the value of the 500 ohm resistor from the potentiometer to the chassis should be reduced, or the value of the resistor from the potentiometer to HT positive should be increased. This applies to the normal operating condition—the needle will go over hard to full scale when the set is first switched on from cold.

The initial setting is made when the set has had time to warm up. The aerial lead is removed and the aerial terminal is shorted to chassis. The needle is then set to zero by the potentiometer adjustment.



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Practical Considerations

The meter movement itself will depend on the receiver into which it is to be incorporated, and for one where it follows two RF stages a meter with a 3 or even a 5 mA movement could well be used.

A .0.5 or 1 mA moving coil instrument will be best for the average small receiver. The smaller the set the more sensitive the movement will need to be—it should never be necessary to need to improvise in order to get adequate readings.

In calibrating the scale it will be found to be far from linear—no "S" meters are ! Nor is

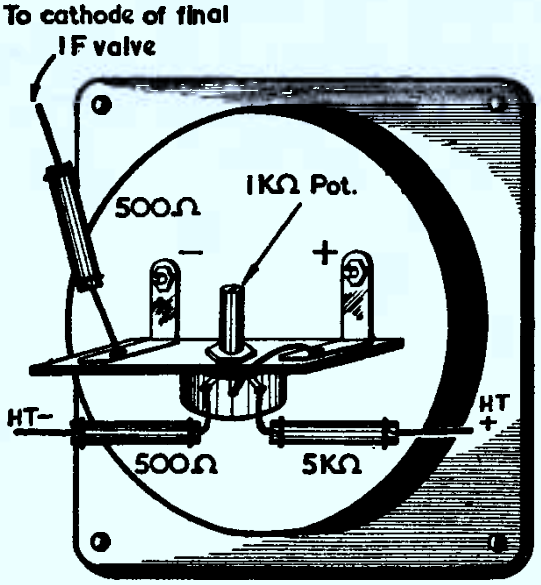
it possible to lay down any arbitrary rules: much depends on the receiver efficiency. The reading is not only dependent on the relative incoming signals, but will also be affected by variations in the slope of different valves.

The scale will be cramped at the low reading end and a rough general approximation is given in the accompanying specimen. For the more technically minded it might be mentioned that a good working basis for the scale is a variation of 3 dB for each division.

Fitting

A convenient form of mounting where space is limited can be arranged with the assembly mounted on a paxolin or bakelite strip at the rear of the meter itself. The brackets supporting it are held by the meter terminals, and these may well also serve as soldering tags. If a midget pre-set type of potentiometer is used, this arrangement will occupy the minimum amount of space. The potentiometer, by the way, which is used for making the zero adjustment, must be a good quality one. The resistors other than the two forming the potential divider for the valve screen, can also be mounted on the platform.

An alternative arrangement with the meter forming a separate external unit, as in the Eddystone and some of the Hallicrafter models, may be preferred. In this case the associated resistors, etc. are best mounted in the separate unit and the three leads taken out via a plug and socket fitted at the rear of the receiver chassis. A miniature valve base and holder will be found ideal for this purpose.



REAR VIEW OF METER SHOWING BRACKET ASSEMBLY

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