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MEASUREMENTS OF TEMPERATURE OF THE DIFFERENT PARTS OF A RADIO RECEIVER AND OF THE OSCILLATOR DRIFT DURING WARMING-UP PERIOD

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ABSTRACT. Temperature variations of the different parts of a radio receiver (Philips 595 HN) were measured. The temperature rise was the highest above the ballast tube, the maximum temperature rising to about 84°C. Near the I.F. transformer the temperature rose to little over 42°C. Of the five positions the region just above the gang condenser showed the minimum rise in temperature. The steady temperature was attained at least after 2½ hours' operation.

The frequency of the oscillator was found to decrease gradually from 2515 Kc/s to 2492 Kc/s, corresponding to the change of temperature from 31° to 35°C near the oscillator coil.

INTRODUCTION

To the designer of a radio receiver, the study of temperature variations of the different parts is indeed an important problem, so far as the selection, treatment and proper placing of the component parts are concerned. The different parts of the receiver rise to widely different temperatures during the warming-up period. This rise of temperature has sometimes a marked effect on the working of a receiver and its longevity. Temperature variations cause minute mechanical movements and distortion of components and they also change the electrical properties, such as the dielectric constant and insulation resistance of materials. Owing to high order of sensitivity in modern receivers, these small changes may effect a serious change in efficiency and alignment of a receiver. In many cases these changes are not fully restored when a corresponding decrease in temperature takes place. This leads to a gradual deterioration in efficiency and performance of a receiver. The rise of temperature may often vary the tuning position, this being due to variation in capacity of the tuning condenser. This drift that occurs during the warming-up period may persist for some time and necessitates alteration of the tuning control to keep the desired station in exact tune. This trouble is often to be found in the short wave bands of a receiver. It is due to gradual changes in the I.F. alignment of a superheterodyne receiver or more frequently to changes in frequency of the oscillator of the receiving system. A study of temperature variation of the different parts of a receiver and its effect is thus of practical importance to a design engineer.

In the present paper results of some experiments on temperature variation of the different parts of a superhet receiver and on the frequency drift of the

oscillator system in the receiver during the warming-up period are given. The receiver under test was a Philips set, Model No. 595 HN. Similar work on the effect of temperature was reported by Scott (1938).

ARRANGEMENT AND PROCEDURE

The Philips 595 HN. receiver was placed in the middle of a room such that the walls were at least at a distance of 10′ feet on all sides. This was done to ensure that there was no appreciable reflected radiation from the walls affecting the receiver parts. Sensitive thermometers were placed one at each of the following positions.

1. Above the ballast tube.
2. Beneath the chassis centre.
3. Near I.F. transformer.
4. Beneath the chassis near coils.
5. Just above gang condenser.

Before the commencement of observations the receiver was not worked at all for about 4 to 5 hours in order to ensure that all parts of the receiver were at the room temperature at the time of the commencement of observation. Observations were started as soon as the receiver was switched on. For an hour, readings of the thermometers were noted down at an interval of 10 mins. and then at an interval of half an hour for three hours more.

EXPERIMENTAL RESULTS ON TEMPERATURE VARIATION

The experimental results of the temperature variations for the five

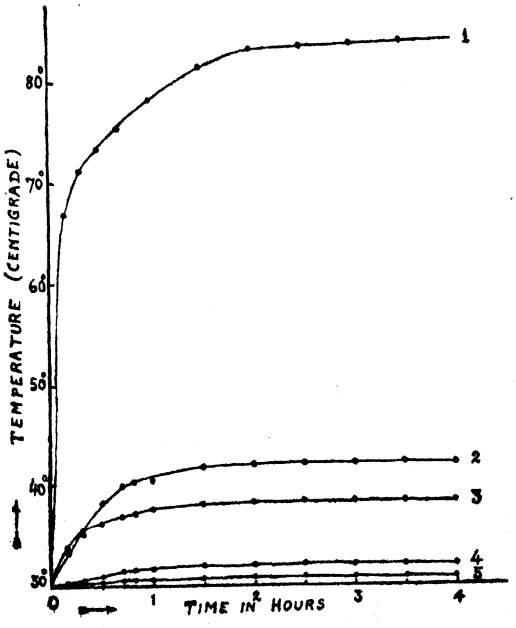

FIG. 1

different parts of the receiver are shown in Fig. 1. The temperature rise was the highest above the ballast tube—the maximum temperature rising to about 84°C. Near the I.F. transformer the temperature rose to a little above 42°C. Of the five positions the region just above the gang condenser showed the minimum rise in temperature. It will be noted that the steady temperatures were not attained until after at least 2½ hours' operation.

DETERMINATION OF OSCILLATOR FREQUENCY DRIFT WITH TEMPERATURE

The change in the frequency of the oscillation of the receiver was noted on a small calibrated vernier-condenser placed in parallel with the main tuning condenser of a heterodyne wave-meter. There was a definite fre-

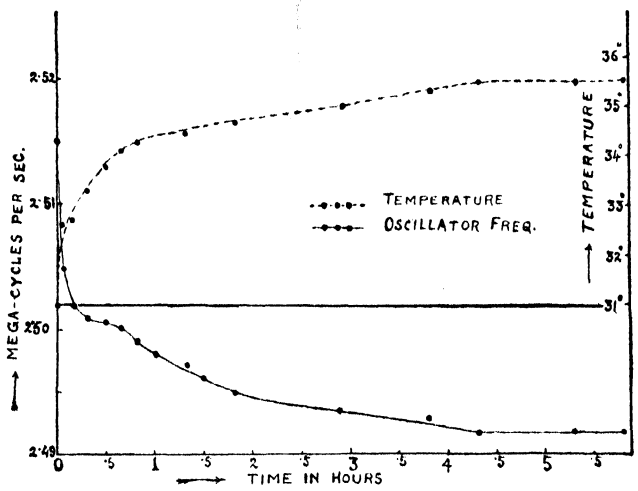

FIG. 2

quency drift which is graphically shown in Fig. 2. Initial oscillator frequency was 2515 Kc/s. The temperature change during this experiment is also shown in the same diagram.

The temperature near the oscillator coil changed from 31°C to 35°C. The frequency of the oscillator was found to decrease gradually from 2515 Kc/s to 2492 Kc/s. In this experiment the temperature attained a constant value after about 4 hrs. The total reduction of oscillator frequency during this time was 22.2 Kc/s.

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REFERENCE

Scott, A. H., 1938, Proc. World Radio Convention, April (Sydney).

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