ENGINEERING DEPARTMENT

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TV Station Monitor

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member that we still have essentially a frequency meter, even though it is no longer calibrated directly as such. The normal mechanical zero of the meter will thus be at the extreme left end of the scale, at the zero DC point. Making use of this fact, a small fixed bucking-potential can be introduced which will deflect the meter in reverse by a predetermined amount, in the absence of a beat frequency. As the beat frequency increases from zero, the meter will remain off scale, in reverse, until the DC potential developed by the pulse-counter circuit equals the applied fixed potential. Further increase in the beat frequency will cause a proportionate deflection upscale on the meter.

The amount of zero-beat suppression should be sufficient to avoid operating within a range which includes most of the low-frequency video-synchronizing pulses. The maximum amount of zero-beat suppression is limited by the requirements of sensitivity, and linearity of the scale.

An arbitrary frequency suppression of 500 cycles for the lower range was chosen as a good compromise between obtaining the desired sensitivity and avoiding the majority of synchronizing-pulse frequencies. The actual beat frequency produced is thus 500-3500-6500 cycles on the lower channels, and 1000-7000-13,000 cycles for the higher channels. This makes for simplicity of initial calibration procedure, and with the use of reversible meter scales provides an easy method of changing ranges in the field.

The highest beat frequency obtained will be 13,000 cycles, when the deviation meter scale is indicating a transmitter frequency error of plus 6,000 cycles. To avoid interference from the line-frame video frequency of 15,750 cycles, a low-pass filter is used which has an attenuation peak at this frequency. Frequencies below 500 cycles are attenuated within the frequency meter itself.

Frequency Discrimination:

From the foregoing, it is evident in Fig. 2 that the monitor must operate with a beat-frequency range of 500 to 13,000 cycles maximum. The question now arises as to how the frequency meter can distinguish between the desired beat frequency and the normal television picture-video frequency components present within this range. For an answer to this, a consideration of the energy distribution in a television video signal is required. A large percentage of the energy contained in the video modulation consists of blanking and synchronizing pulses, occurring at a uniform rate, at frequencies below 500 cycles. Likewise, the 15,750- and 31,000-cycle video frequencies are a source of energy, at fixed frequencies.

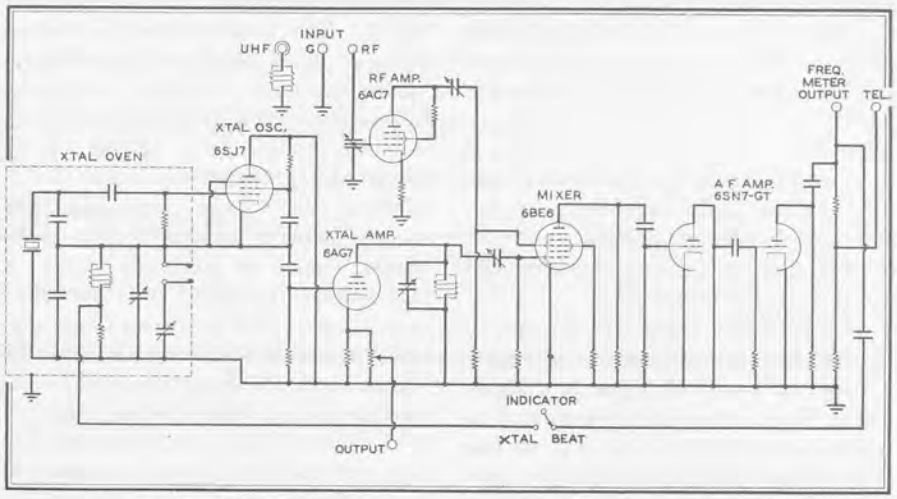

Fig. 5. Simplified schematic circuit diagram of frequency monitor unit

Within the range of 500-13,000 cycles, the energy consists of rapidly changing frequencies caused by the actual picture transmission, and hence is transient in nature. On the other hand, the beat frequency is steady and of large magnitude compared to any single transient component. An analogy might be that of a steady-state signal in the presence of a moderate noise level of limited bandwidth.

Circuit Details:

The frequency meter is a pulse-counter type, as shown in Fig. 3. It is operated from a square wave of constant amplitude, obtained by passing the beat-frequency through a series of limiting amplifiers. Noise peaks in the upward direction are thereby removed, and cannot affect the waveform. Noise peaks in the downward direction can affect the waveform as shown in Fig. 4. Since the capac-

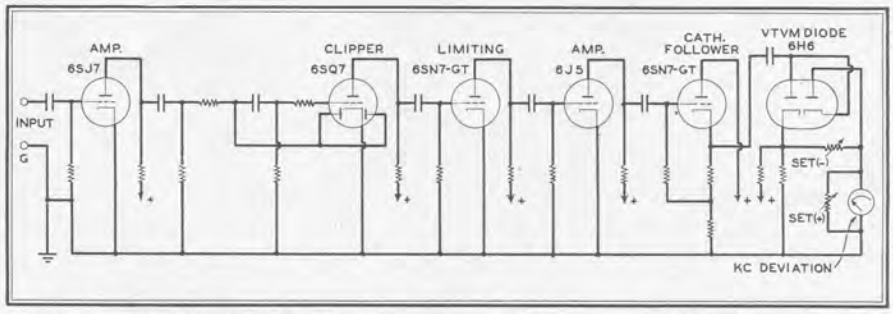

Fig. 6. Functional schematic of the frequency meter section of the TV monitor

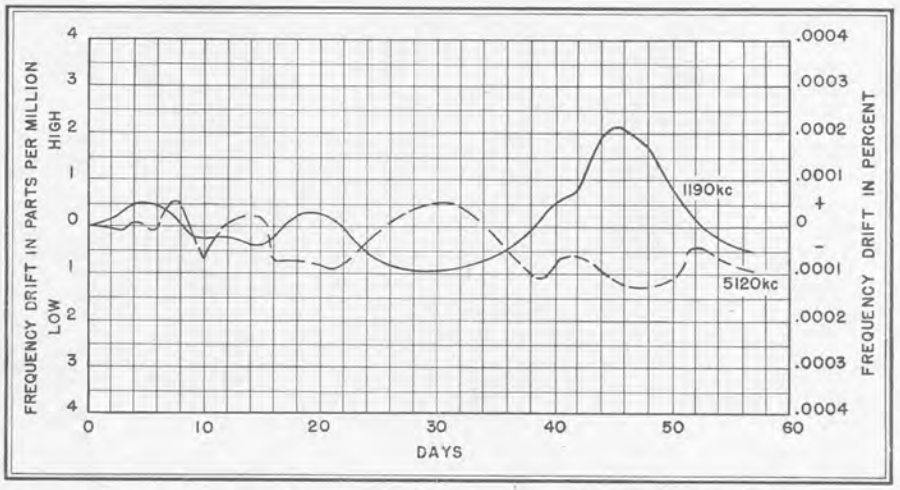

Fig. 7. Sixty-day record of frequency drift in a type 1182-T TV frequency monitor