January 12, 1955

APPENDIX TO HICKOK MODEL 235
INSTRUCTION MANUAL

Accuracy

This instrument is highly accurate on the VHF band giving direct readings, from 10 to 100,000 microvolts, however, it should be noted that the scale is essentially logarithmic and therefore can be read with greater accuracy from 10 to 1000 microvolts which comprises the first two thirds of the scale. In order to take advantage of this condition on signal levels above 1000 microvolts a 20 or 40 DB fixed attenuator may be placed in series with the "Calimatch" input.

A 20DB attenuator value represents a voltage ratio of 10 to 1. Therefore, all readings simply have to be multiplied by a factor of 10. This means that a signal of 10,000 microvolts would be indicated on the 1000 microvolt division of the meter scale when it can be read with considerably more accuracy.

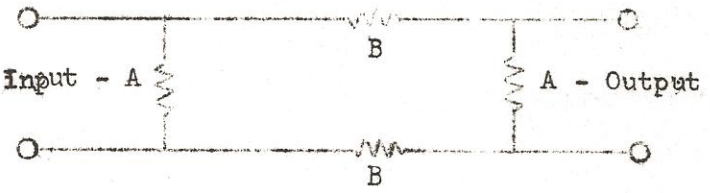
A 40 DB pad represents a voltage attenuation of 100 to 1. Thus the meter readings should be multiplied by 100. Consequently a reading of 1000 on the scale indicates 100,000 microvolts signal. Again this moves the indication to a portion of the scale where it can be read with ease.

Note that the input and output impedance of the attenuator should match those of the line. This is generally 300 ohms. Values for 20 and 40 DB pads with a nominal characteristic impedance of 300

ohms are given below. These pads can be readily made up using standard parts

20 DB A = 360 ohms
B = 750 ohms

40 DB A = 300 ohms
B = 7500 ohms



NOTE: Fixed and variable pads are available commercially from Centralab, their type PCH.

Spurious Responses

In order to obtain this instrument's unique advantages of extreme sensitivity, good accuracy and excellent portability, some compromise circuit arrangements had to be employed. This imposes certain unavoidable limitations on the image rejection abilities, which when full y understood should present little trouble to the user.

One must realize that under certain conditions various signals of frequencies other than those indicated on the dial can be obtained, which might be misleading when looking for television signals.

On the low band section of the meter, images of strong high band T.V. signals could be present, although their intensity will be greatly reduced by the low band input filter.

Near the high end of the low band (above channel 6) and the low end of the high band section of the meter, certain strong FM signals could show a deflection, although their strength will be greatly reduced by the high band input filter.

There are several methods of identifying and distinguishing these spurious signals. First of all, in most cases, spurious signals will not coincide with the frequency dial markings allocated for the picture and sound carriers of regular T.V. signals. Therefore, any signal or deflection that may show remote from the channel markings should be regarded with suspicion.

Spurious signals can further be identified by application of the high-low band selector switch. That is; the high band T.V. signal or other type of signal located near the high band frequencies, may present an image at the low band part of the meter, but will show a considerable larger deflection when the selector switch is tuned to high band position. This proves that the signal has its origin in or near the high band. The reverse condition applies where an FM signal or other signal near this frequency region presents an image on the high band part of the dial. Here the spurious signal will show a marked increase when the selector switch is turned to low band.

Other strong VHF signals located near or in between the television spectrum could also present spurious readings and can mostly be identified as such by the methods outlined above.

For definite identification of any signal, listening to the sound with a pair of high impedance head phones will be most helpful.

The selective filter of the field strength meter input circuit, will in general, provide an image rejection ratio of from 40 to 60 DBs (100 to 1,000 times). However, the primary purpose of the circuitry is to provide an input impedance of close to 75 ohms.

This is particularly important on the UHF range where standing waves could result in severely inaccurate readings.

To incorporate the UHF range within the field strength meter without seriously affecting its most wanted features of light weight, portability and compactness, etc.,little change could be allowed in the circuit.

The UHF frequency dial was calibrated to indicate UHF signals when the fifth harmonic of the local oscillator tunes 40 megacycles higher than the signal frequency measured.

The unit is calibrated and will be accurate at its stated design accuracy, when UHF signals are measured under these conditions.

The UHF input filter was designed as mentioned earlier, on consideration of providing a correct input impedance. The filter's image rejection ability is small and consequently some VHF signals will be present on the UHF position.

Also, UHF signals that fall into a different order of local oscillator harmonic, other than the fifth harmonic, will be present across the UHF dial.

It is therefore an advantage to note the UHF channel number under observation and execute any measurement on that part of the dial only, ignoring all other spurious readings.

NOTICE

Model 235 Field Strength Meter

Earphones used with this equipment should be of the high impedance crystal type. Ordinary magnetic earphones will load the circuit down so much that it may be difficult to hear the sound.

These phones (a single earphone with head strap) are available through The Hickok Electrical Instrument Company, our code number 5730-1, at a net price of $6.75, or they may be purchased from your local distributor.