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USE OF A KEITHLEY MODEL 300 OP AMP AS A LOG CURRENT AMPLIFIER AND LOG OHMMETER

The instruction manual for the Keithley Model 300 operational amplifier outlines the use of IN459 diodes as feedback elements to derive an output where $V_{out} = -A \log I_{in}$.

It has been found that the P - N, base to emitter junction of a 2N2484 transistor (SLAC stocked) when used as a diode feedback element, provides a more truly logarithmic output for inputs from 10^{-12} to 10^{-6} amperes. Figure 1 shows the recorded output of a Model 300 amplifier with a positive current input from a Keithley 261 current source. The output is 70 millivolts per decade of current input. The 2N2484 was selected for low leakage by applying a reverse bias of four volts base to emitter and measuring the current with a Keithley 610A picoammeter. The unit selected had a leakage, at room temperature of approximately 0.8 picoamperes.

The same op amp and feedback element responded logarithmically to resistances applied to the input. An essentially logarithmic output was obtained for resistances from 10^3 to 10^{12} ohms. The output was 70 millivolts per decade of resistance, as shown in Fig. 2, when the coarse zero of the amplifier was offset so as to provide approximately 70 millivolts of output with a 10^{12} ohm resistor at the input. The amplifier and feedback element then present a voltage source to the applied resistor.

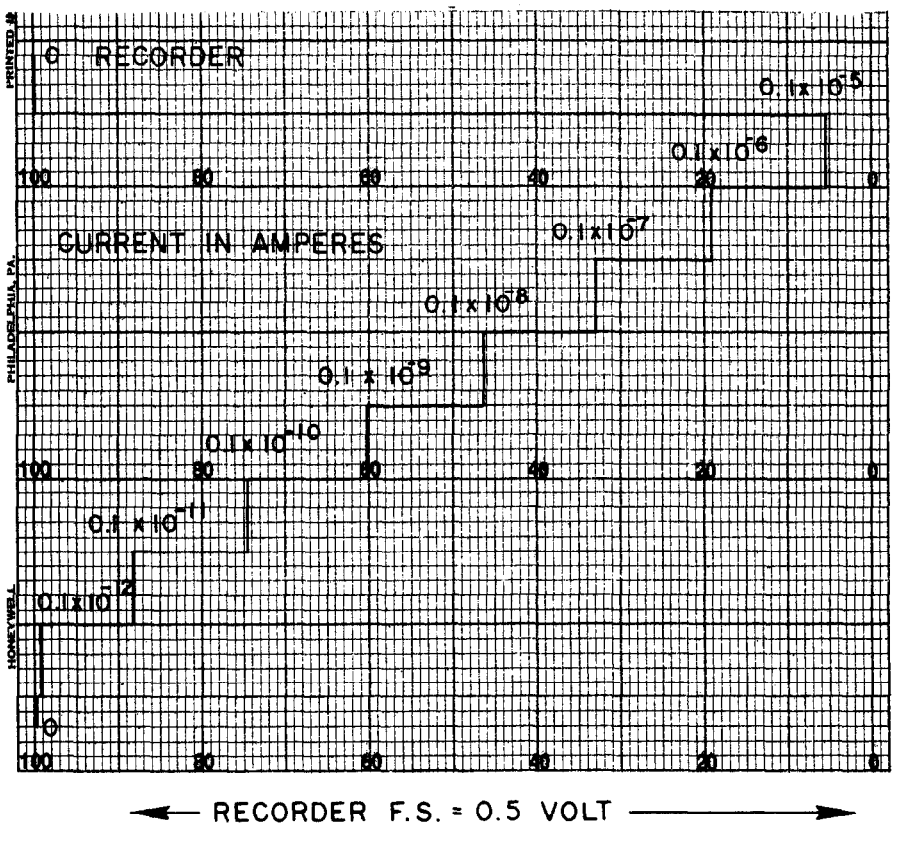

Fig. 1

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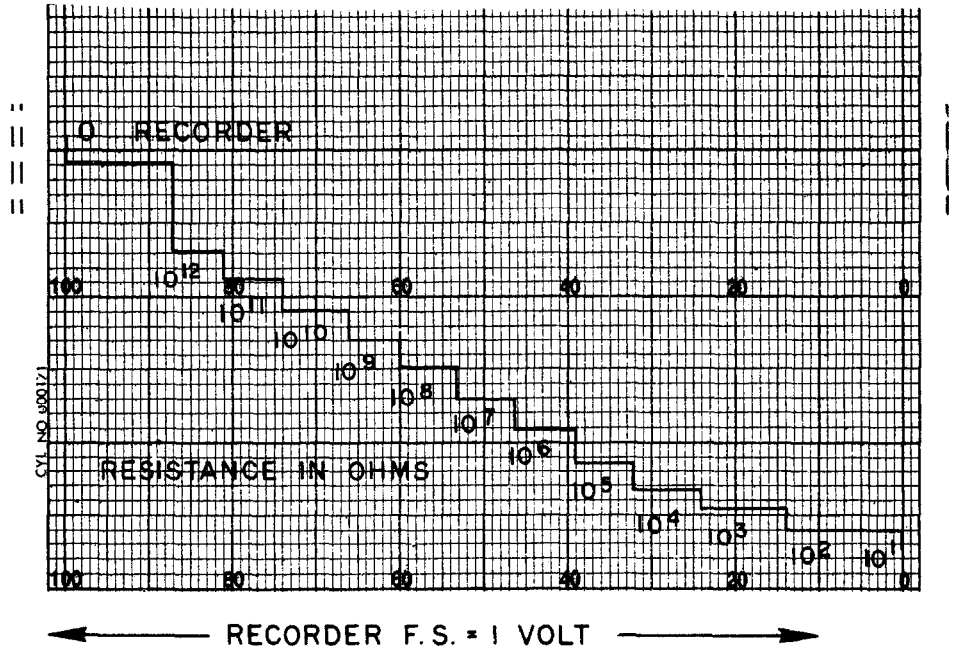

Fig. 2

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