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POWER DETECTOR

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A detector that is a true power detector produces an output voltage equal to some constant times the square of the input voltage. The current versus voltage characteristic of most diodes has a slope greater than square law for low voltage and current. At high current the resistance of the diode and the load resistor causes the slope to reduce to a linear law. Therefore, there is a region where almost any detector produces a square law output.

The circuit that increases the range of square law output is shown in Figure 1. Graphs for $R_x = 0$, ∞, and 1.5 K ohm are shown in Figure 2. The dotted line represents a perfect power detector function. The curve for R_x = 1.5 K ohm follows the square law curve for outputs from 10 millivolts to 150 millivolts. The R_x = 1.5 K ohm curve starts near the one-diode curve and approaches the two-diode curve at high currents. The value of R_x determined the region in which the transfer from the one-diode curve to the two-diode curve occurs.

The principle of shunting diodes can be expanded to many diodes. Each diode will require a different R_x. The number of diodes required is estimated to be one diode for each 6 db of square law range. The maximum input voltage is approximately 200 millivolts per diode. Since the optimum value for R_x changes with temperature, a wide range detector may require an oven. Figure 3 is a typical four-diode detector.

The detector as shown in Figure 1 is used in the correlation receiver. The 90 source impedance required that the input resistor be changed from 68 ohms to 100 ohms.

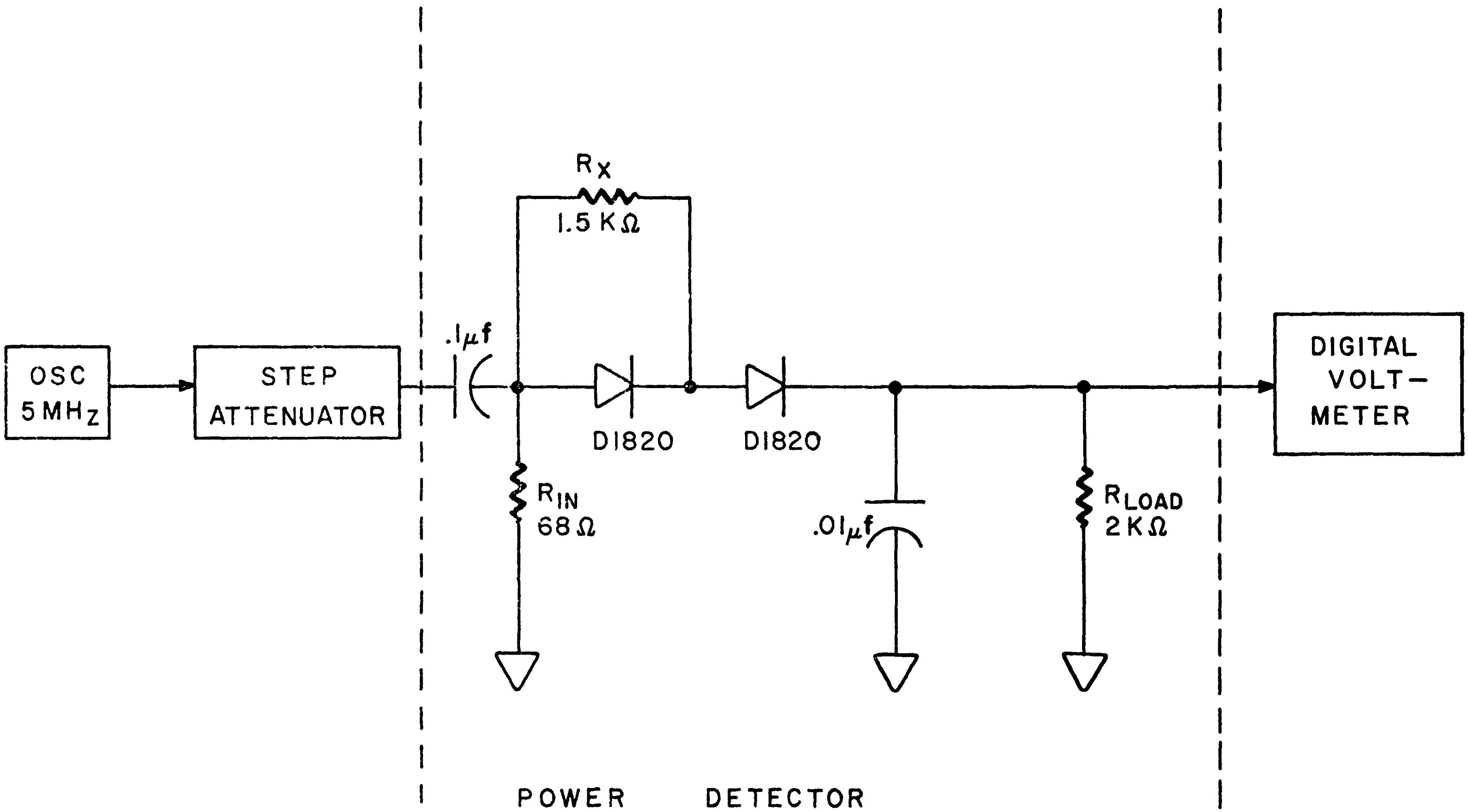

OSC
5 MHz
STEP
ATTENUATOR
.1μf
Rx
1.5 KΩ
D1820
D1820
RIN
68Ω
.01μf
RLOAD
2KΩ
DIGITAL
VOLT-
METER
POWER DETECTOR

FIGURE 1

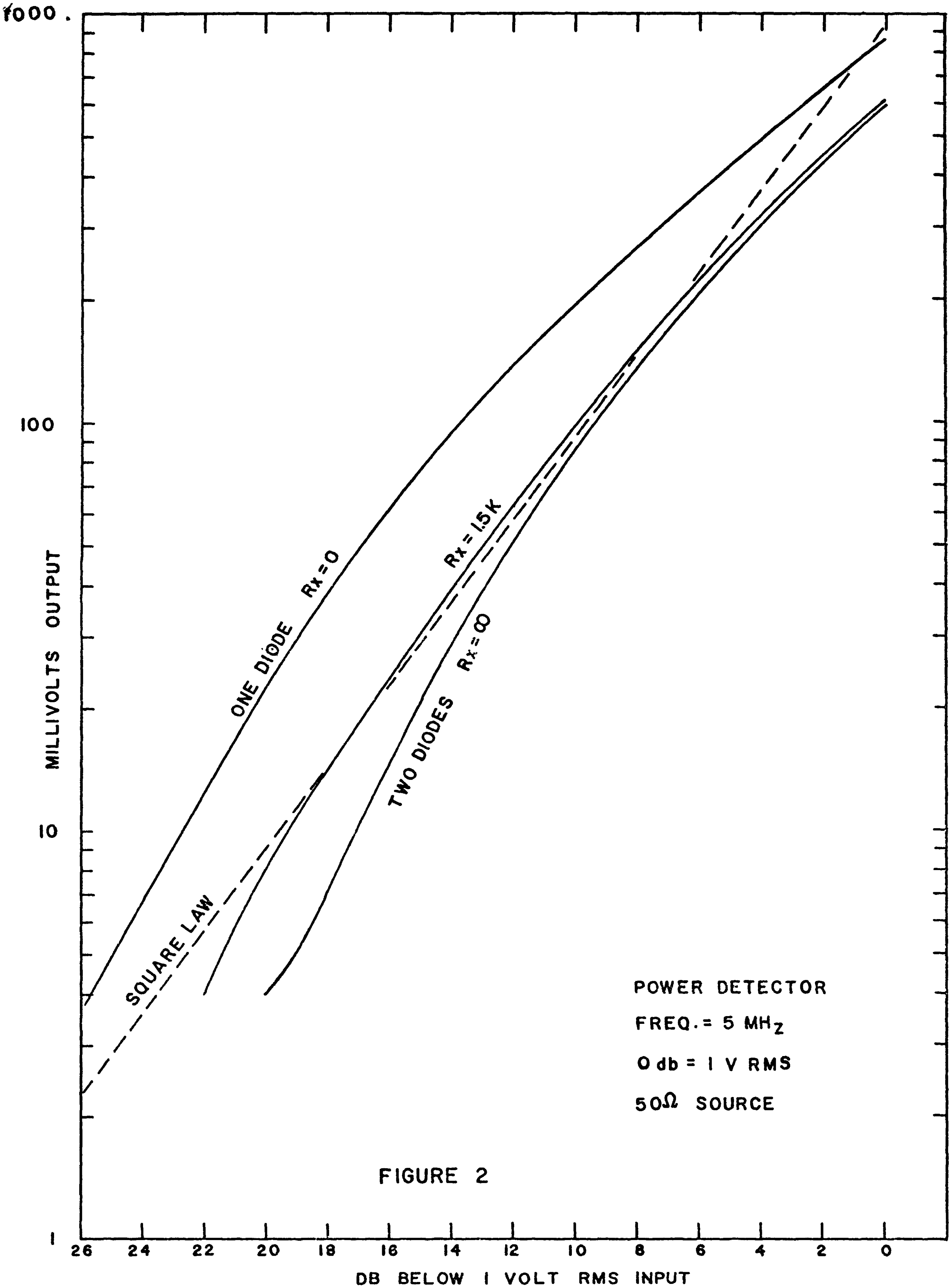
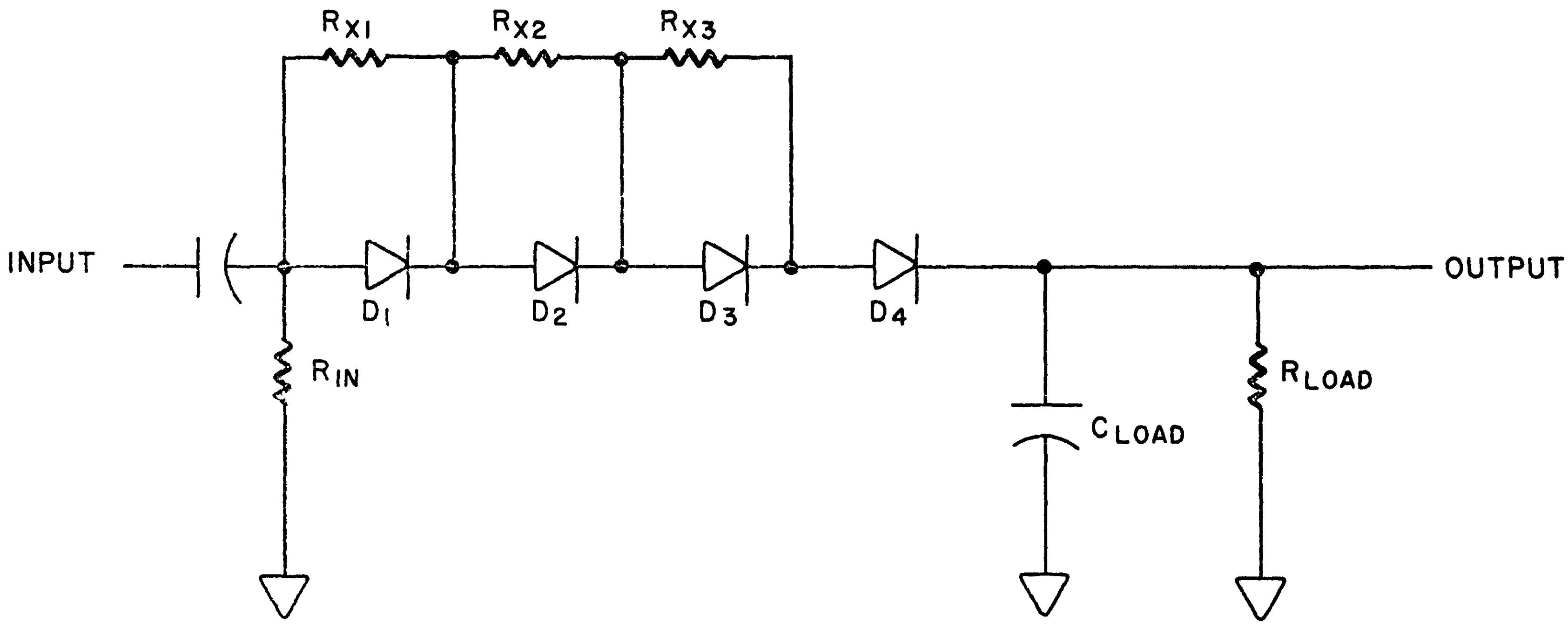

1000
100
10
1
MILLIVOLTS OUTPUT
ONE DIODE Rx=0
SQUARE LAW
Rx=1.5K
TWO DIODES Rx=∞
POWER DETECTOR
FREQ.= 5 MHz
0 db = 1 V RMS
50Ω SOURCE
26
24
22
20
18
16
14
12
10
8
6
4
2
0
DB BELOW 1 VOLT RMS INPUT

FIGURE 2



FOUR DIODE POWER DETECTOR

FIGURE 3