
EXPERIMENT 8: Log and Antilog Amplifiers

Objectives: To understand the behavior of logarithmic and antilogarithmic amplifiers.

Materials and Equipment:

Resistors: 100K Ω [2] Diodes: [2] IC 741: [2] Transistor: BC548 [1]
Breadboard and Multimeter

Theory:

Log amplifiers are widely used for analog signal compression applications. When a diode used in the feedback loop of an operational amplifier is forward biased by a constant current of magnitude $\frac{v_i}{R}$ then it develops a potential $V_D = V_T \ln\left(\frac{v_i}{RI_O}\right)$

across the diode. Note that the input voltage and diode voltage are related in a logarithmic fashion. If we take the diode voltage as an output voltage then the input and output will be related in a logarithmic fashion.

The base emitter junction of a bipolar junction transistor can be used as diode when collector and base are shorted. So a transistor can also be used in the feedback loop of an op-amp.

Antilog is inverse operation of log operation so; antilog amplifiers can be designed by reversing the arrangement of diodes and resistors in the log amplifiers.

It is important to note that a single polarity of current can only forward bias the diode. That means the log operation or antilog operation is single quadrant operation.

Log Amplifier using Diode

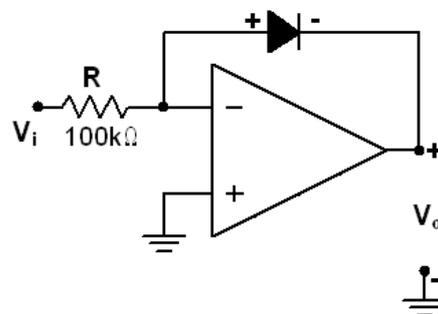


Fig 1

Procedure

1. Set the supply voltage at $\pm 12V$.
2. Set the input voltage to 1V.
3. See the voltage across the diode. Note the negative sign.
4. Increase the input voltage in the step of 1V up to 20V.
5. Plot the characteristics of input voltage and output voltage.
6. Reverse the polarity of the diode and see the effect for positive input voltage.

Log Amplifier Using a BJT

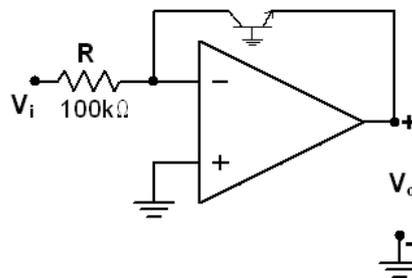


Fig 2

Procedure

1. Use an NPN type BJT in place of diode as shown in fig 2.
2. Set the input voltage to 1V.
3. See the voltage across the output terminal. Note the negative sign.
4. Increase the input voltage in the step of 1V up to 20V.
5. Plot the characteristics of input voltage and output voltage.
6. Compare the characteristics with that of diode based log amplifier.

Anti-log Amplifier

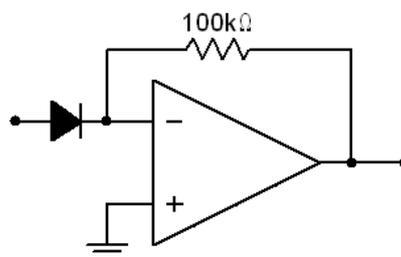


Fig 3

Procedure

1. Set the input voltage to 100mV.
2. See the voltage across the Resistor. Note the negative sign.
3. Increase the input voltage in the step of 50mV up to 500mV.
4. Plot the characteristics of input voltage and output voltage.
5. Reverse the polarity of the diode and see the effect for positive input voltage.

Log - Antilog Amplifier

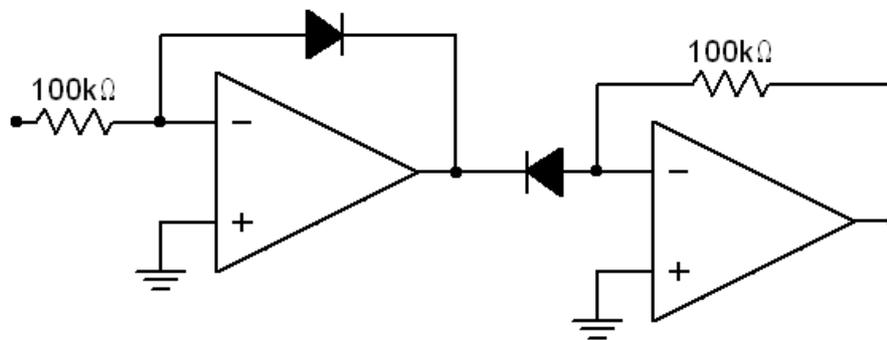


Fig 4

Procedure

1. Set the input voltage to 1V.
2. See the voltage across the output resistor.
3. Increase the input voltage in the step of 1V up to 20V.
4. Note the output voltage for all the input voltages.
5. Please get confused why the output is not the exact replica of input.
6. Reverse the polarity of diode in the antilog amplifier of fig 4.
7. Again set the input to 1V.
8. See the output and be angry with the output.
9. Increase the input from 1V and see the output.