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## EXPERIMENT 10: Precision Rectification Peak Detection and Clamp

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**Objectives:** To compare the active and passive version of

- Half wave rectifier
- Peak detector
- Clamper (DC restorer)

**Materials and Equipment:**

10uF [1] 10K [1] IC 741 [1] Diode [1] Probe [3] Bread Board [1]

**Theory:**

### Precision Half Wave Rectifier

When a diode is used in the feedback loop of an op-amp then it behaves as nearly an ideal diode. So, the configuration as shown in fig 1 can be used for small signal (precision) rectification application. The input voltage that turns on

the diode is  $V_{in} = \frac{0.7}{1000,00} = 7\mu V$ .

### Active Peak Detector

When the diode as shown in fig 2 is reverse biased then the voltage across the capacitor is retained. Capacitor discharges through the resistor when the diode is reverse biased. Operational amplifier acts as a voltage follower when the diode is forward biased and charges the capacitor to the peak value.

### Active Clamper

Fig 3 is an active clamper. The first negative half cycle produces a positive op-amp output that turns on the diode. This allows the capacitor to charge to the peak value of input voltage. Just beyond the negative peak, the diode turns off, the loop opens, and the virtual ground is lost. Since  $V_P$  adds to a sinusoidal input voltage, the final output waveform is shifted positively through  $V_P$  volts.

### Precision Half Wave Rectifier

#### Procedure

1. Connect the circuit as shown in fig 1.
2. Note the input and output waveform.
3. Increase the input frequency and see the distortion in the output.
4. Reverse the polarity of diode and see the output waveform.
5. Remove the operational amplifier and note the output waveform of the passive version of half wave rectifier.
6. Try the passive version for different amplitude levels.

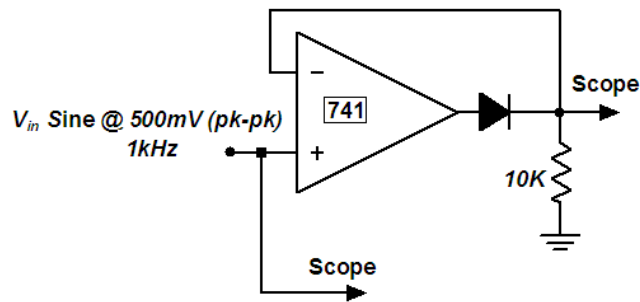


Fig1:- Precision Half Wave Rectifier

### Active Peak Detector

#### Procedure

1. Connect the circuit as shown in fig 2.
2. Note the input and output waveform.
3. Change the amplitude of the input sine and notice the change in output.
4. Reverse the polarity of diode and see the output waveform.
5. Remove the operational amplifier and note the output waveform of the passive version of peak detector for low input voltage level.

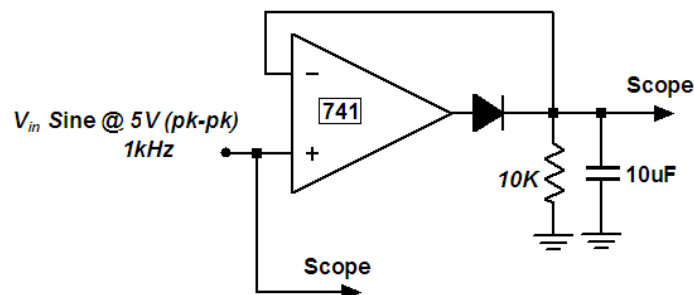


Fig 2:- Active Peak Detector

### Active Clamper

#### Procedure

1. Connect the circuit as shown in fig 3.
2. Note the input and output waveform.
3. Reverse the polarity of diode and see the output waveform.
4. Remove the operational amplifier and note the output waveform of the passive version of clamper for low input voltage level.

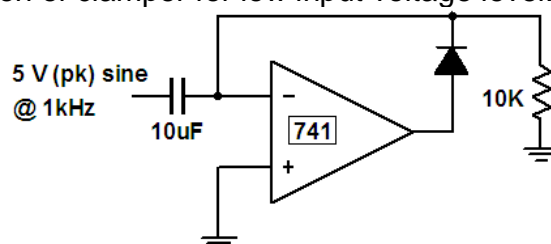


Fig 3:- Positive Clamper