



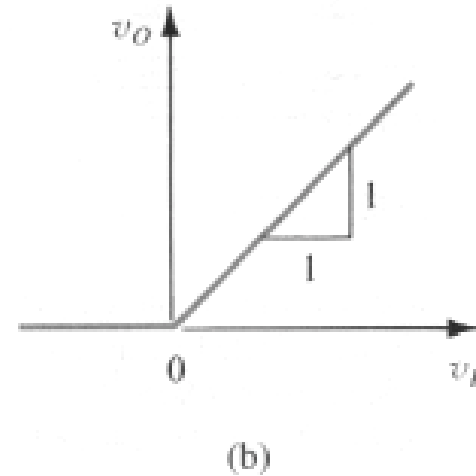
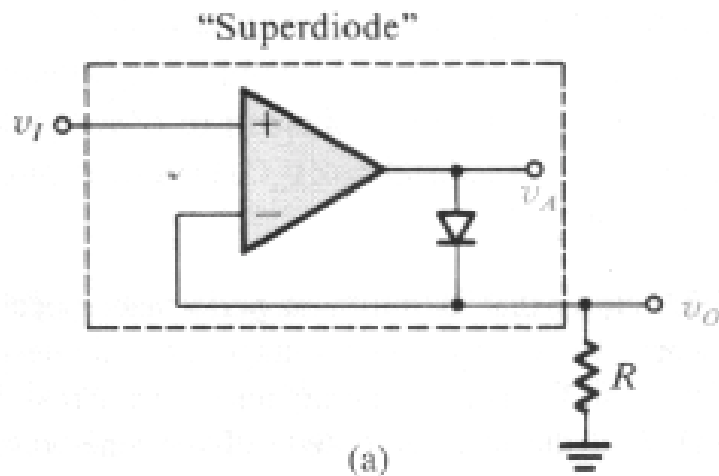
**School of Electronic
and Communications
Engineering**

Precision Rectifiers

Precision Rectifier Circuits

The power-supply rectifiers do not work with very small signals.

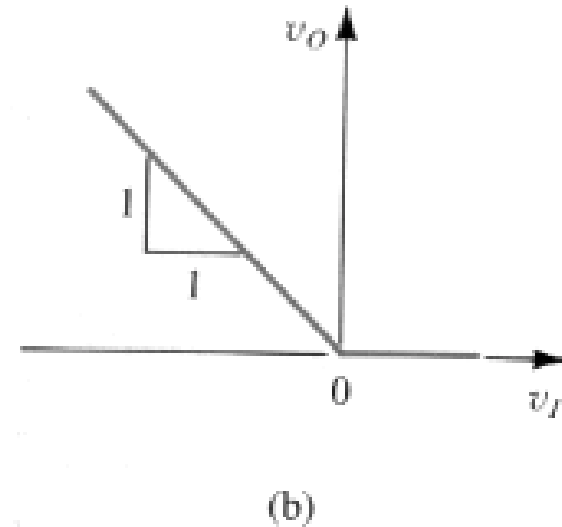
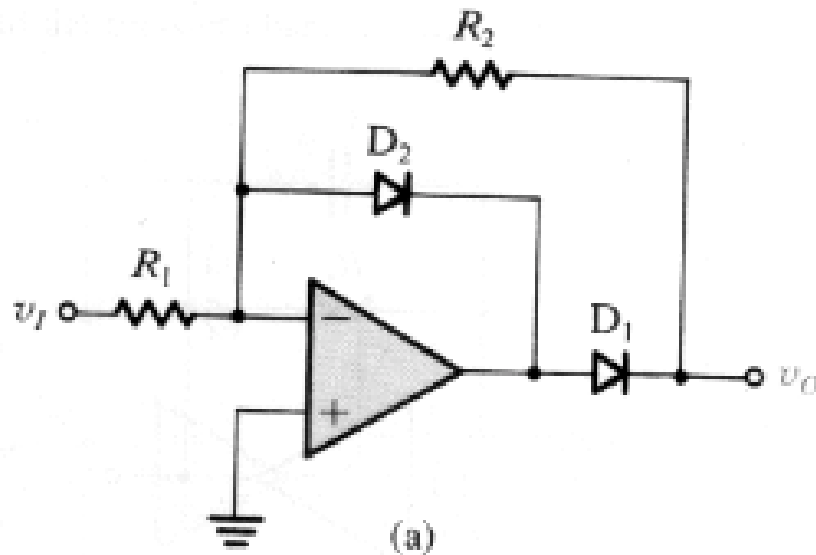
Precision rectifier has ideal V_i - V_o properties.



Superdiode precision half-wave rectifier

Precision Rectifier Circuits

Precision rectifier has ideal V_i - V_o properties.



Improved version of the precision half-wave rectifier

An Application: Measuring AC voltage

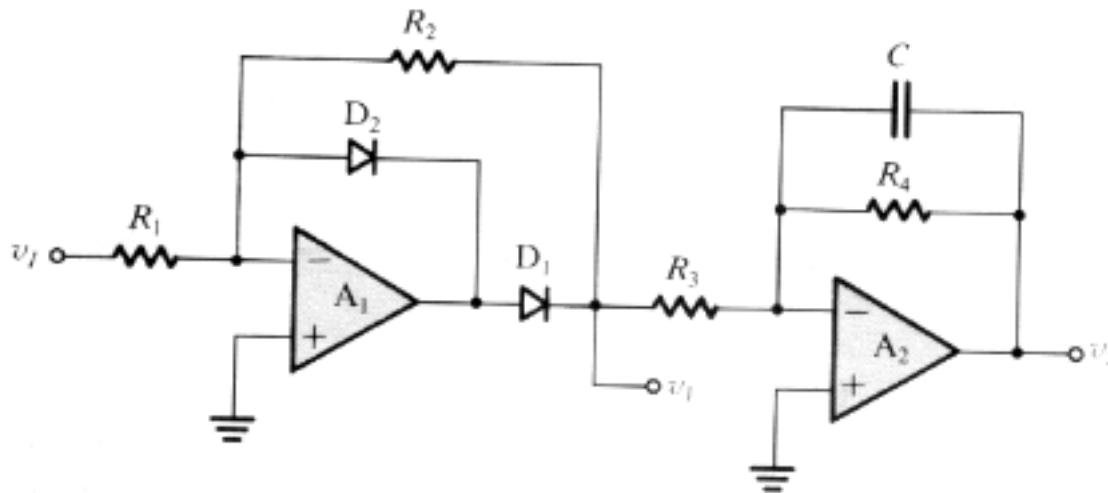


Fig. 12.35 A simple ac voltmeter consisting of a precision half-wave rectifier followed by a first-order low-pass filter.

An Application: Measuring AC voltage

For a sine wave input with peak value V_p , the output of the half-wave rectifier is a half sine wave with peak $V_p R_2/R_1$. This half-wave has the following DC component:

$$\bar{V}_1 = -\frac{1}{\pi} \int_0^{\pi} V_p (R_2 / R_1) \sin t dt = -\frac{V_p R_2}{\pi R_1}$$

The first order low pass filter can pick up the DC component with the gain R_4/R_3 . Hence the output is:

$$\bar{V}_0 = -\frac{V_p R_2 R_4}{\pi R_1 R_3}$$

Precision Full-Wave Rectifier

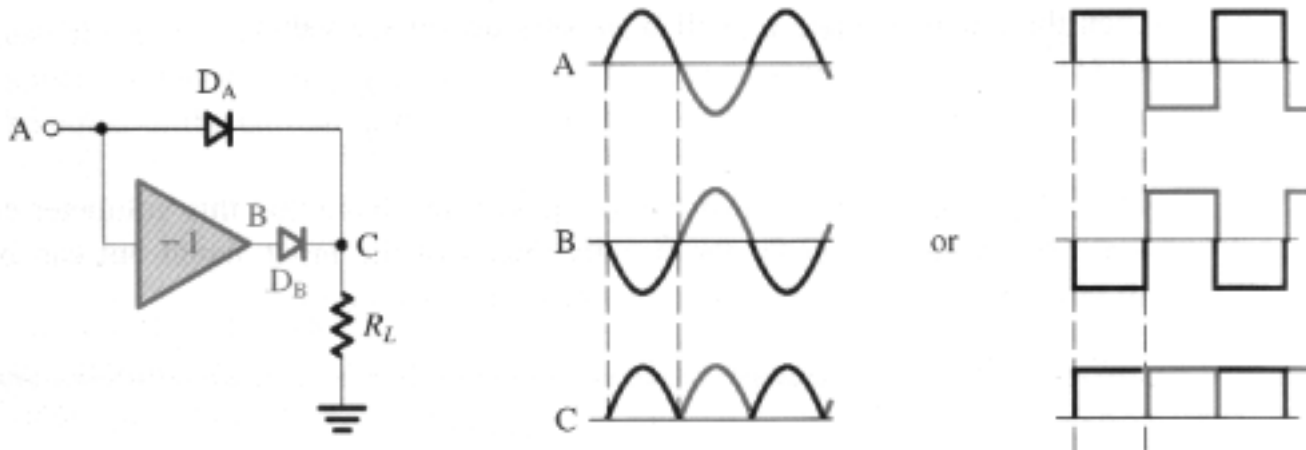


Fig. 12.36 Principle of full-wave rectification.

Precision Full-Wave Rectifier

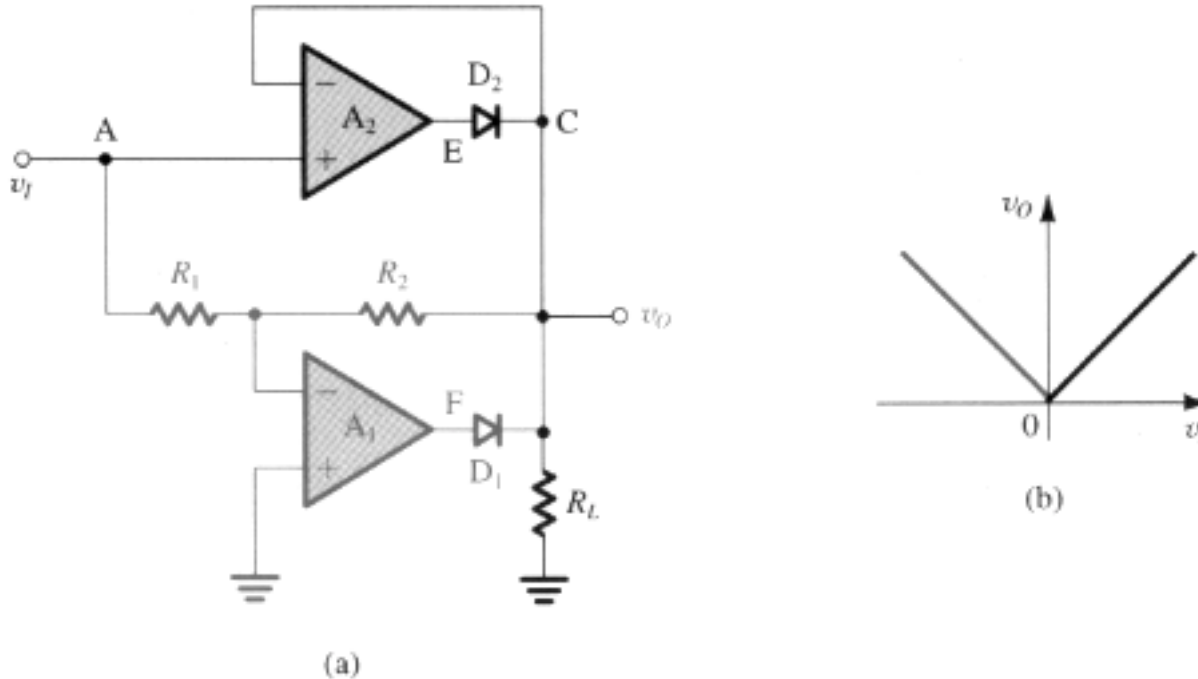


Fig. 12.37 (a) Precision full-wave rectifier based on the conceptual circuit of Fig. 12.36.
(b) Transfer characteristic of the circuit in (a).

A Precision bridge Rectifier for Instrumentation Applications

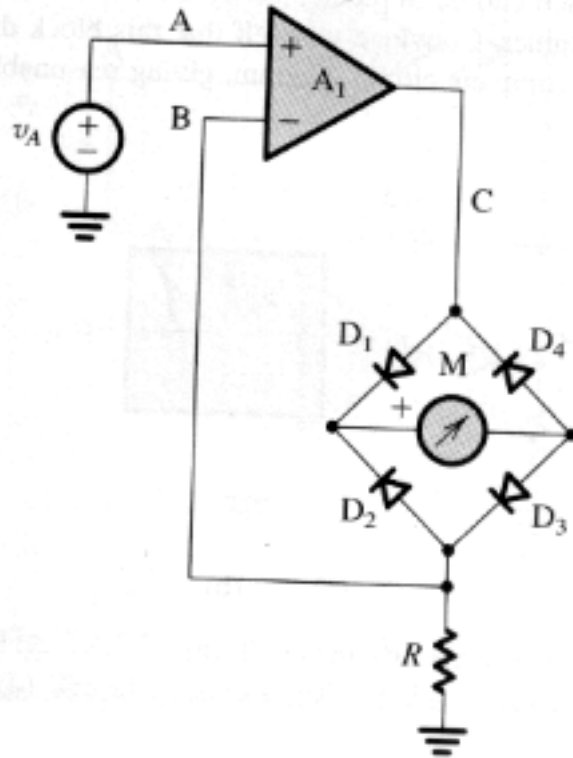


Fig. 12.38 Use of the diode bridge in the design of an ac voltmeter.

Precision Peak Rectifiers

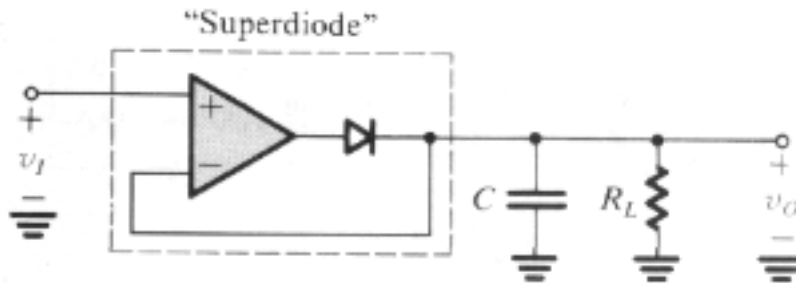


Fig. 12.39 A precision peak rectifier obtained by placing the diode in the feedback loop of an op amp.

When v_i exceed V_o , D will conduct and make V_o follow V_i . C will be charged. When V_i goes over its peak and drops, $V_i < V_o$, so the op amp is negative saturated, and D will cut off. This will keep V_o at the peak value (if the discharge is slow). Therefore after some time the output will be the peak input.

A Buffered Precision Peak Detector

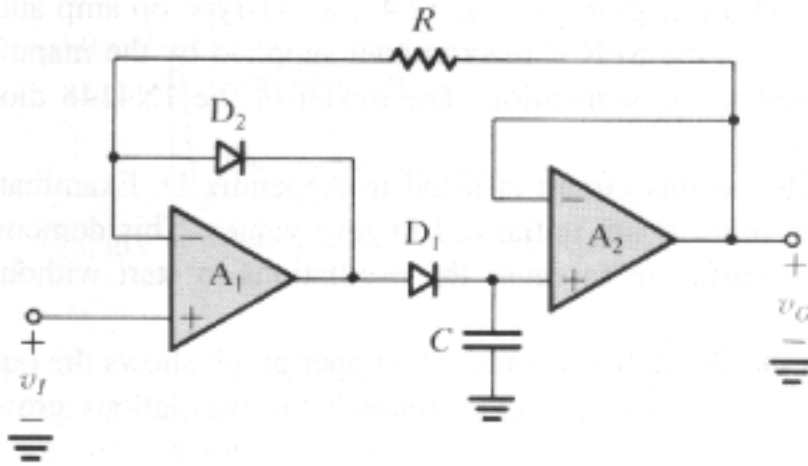


Fig. 12.40 A buffered precision peak rectifier.

