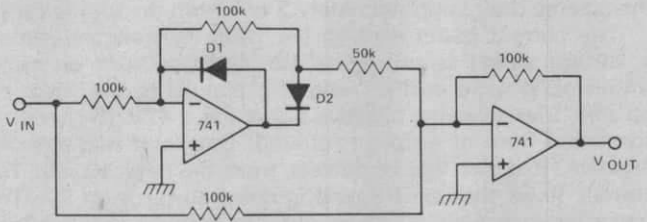

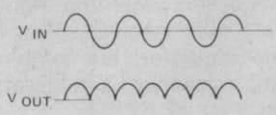

PRECISION HALF WAVE RECTIFIER

Rectifying small signals with any accuracy can be very difficult using diodes only due to their forward voltage drop of about 0.6 V. However, an op-amp can be used to reduce this voltage drop to virtually nothing. Consider the circuit shown. There is negative feedback so that 'virtual earth' circumstances exist. When Vin is positive, D1 conducts to maintain the virtual earth, D2 is reverse biased and so the output is just a 100 k resistor connected to 0 V. When Vin goes negative, the output rises positively, D2 is turned on and D1 turned off. As the virtual earth is being maintained, the output voltage is the exact inverse of the input voltage. This is true for all negative inputs. Therefore, the output is composed of positive going half sinewaves. Precision half wave rectification has occurred. In fact the diode error is very small, being equal to

$$\frac{600\ \text{mV}}{\text{(surplus voltage gain)}}$$

Therefore as the input frequency increases, and the surplus voltage gain decreases, precision falls.

By adding together the original and the half wave rectified signals together in the right ratio, it is possible to fill in the half cycle gaps and thus to generate precise full wave rectification. The addition of one summing op-amp and three resistors is all that is needed as shown opposite.