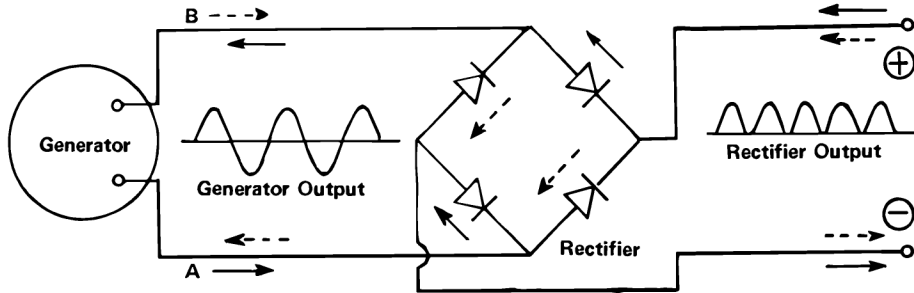


Full-wave Rectification



391

c. Rectifier

The alternating current output of the generator must be rectified, i.e. changed to direct current, to charge the battery and supply field current. Fig. 391 is a simplified diagram of the circuit used for efficient full-wave rectification (rectification of both positive and negative halves of the AC generator output). Only one of the three phases is shown in the diagram, but with slightly additional wiring, all three phases can be rectified with this circuit.

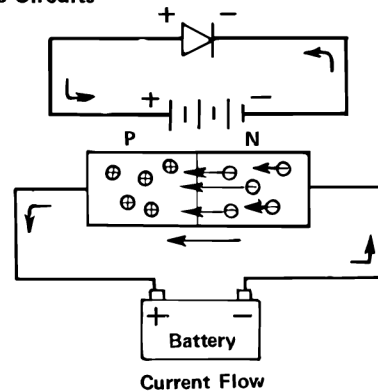
The diodes used (four shown here) conduct current in only one direction, and the two different current paths for the first and second halves of each cycle are shown in Fig. 391. The A arrows indicate current flow during the first half of the cycle when the top generator lead is + and the bottom lead is -; the B arrows show current flow for the other half cycle.

The diodes are manufactured by fitting together two pieces of silicon material. Each of the two pieces is impregnated with a different type of impurity, so that one piece always has a surplus of electrons (the N, or negative piece), and the other has a constant shortage of electrons (the P, or positive piece).

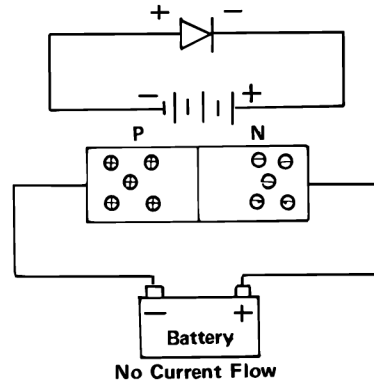
When a voltage is applied to the diode in the direction of the battery in Fig. 393, the surplus, or free, electrons are repelled by the negative voltage and attracted toward the positive voltage, and current flows.

In Figure 394 the voltage source is connected in the reverse direction, but since there are no free electrons in the P material to flow in the reverse direction, no current flows.

Diode Circuits

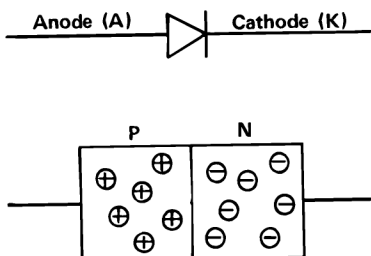


393



394

Diode



392

From the preceding explanation it can be seen that if an alternating current is applied to the diode, it will conduct only on the half of the cycle when the polarity of the voltage corresponds with the polarity of the diode. Due to this half-conduction-only property of the diode, it is called a "semiconductor", and is used to change current flowing in both directions (AC) to single-directional current (DC). Other examples of semiconductors are transistors and thyristors, which are made from three or four pieces of a different type of semiconductor material.

NOTE:

1. Excessive heat or current in a semiconductor will cause it to break down, and current will then flow through it in either direction. Once a semiconductor has broken down it will not return to its former semiconductor state, and must be replaced.