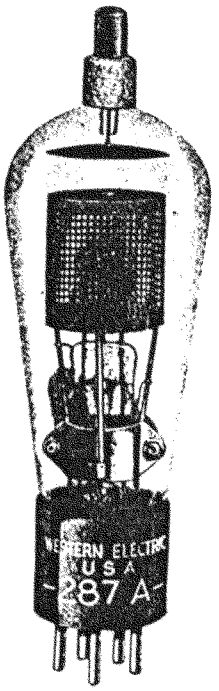
Western Electric

287A Vacuum Tube



Classification—Three element, mercury-vapor filled, grid-controlled rectifier with a filamentary cathode

It is primarily a rectifier of low internal impedance whose conduction cycle is determined by the relative instantaneous control-electrode and anode potentials. It is intended for use in special circuits as a relay or trigger-action device. A few of its other possible uses are: as a controlled-frequency oscillator giving a square wave-form, as a voltmeter or volume level-indicator, or as a variable voltage rectifier.

Dimensions—The dimensions and outline diagrams are given in Figures 1 and 2. The overall dimensions are:

Maximum length	$6\frac{9}{16}''$
Diameter	$2\frac{3}{16}''$

Mounting—The 287A vacuum tube employs a standard five-pin thrust type base suitable for use in a Western Electric 141A or similar socket. The arrangement of electrode connections to the base terminals is shown in Figure 2. It is to be noted that the filament terminals are tied together in parallel. The corresponding socket terminals should also be connected to insure best contact conditions. The fifth terminal in the base is connected to the control electrode. The anode terminal is located at the top of the bulb and is arranged for a special, quick-release connector.

The tube may be mounted in either a vertical or horizontal position, although the vertical position is preferable.

Filament Rating

Filament voltage	2.5 volts
Nominal filament current	7.0 amperes

The filament of this tube is designed to operate on a voltage basis. The voltage should be maintained to within 5% of its rated value (2.5 volts). Operation of the filament above the upper limit will definitely reduce the life of the tube, while a decrease below the lower limit may cause immediate failure. Alternating-current supply is preferable. When direct-current supply is used the anode and control electrode returns should be connected to the negative terminal of the filament.

Sufficient time should always be allowed for the filament temperature to reach its normal operating value before space current is drawn. If filament transformers with good regulation are used this time is 10 seconds. A period of 10 to 15 minutes should be allowed when the tube is used for the first time and also if operating at low ambient temperatures.

Operating Conditions

Approximate anode-cathode potential drop when conducting	15 volts
Maximum instantaneous potential between anode and cathode	2500 volts
Maximum operating ambient temperature range (in still air)	10° to 50° C.

Maximum Instantaneous Potential	Maximum Instantaneous Plate Current	Maximum Average Plate Current (averaged over 1 sec.)
Volts	Amperes	Amperes
500 to 2500	1.0	1.0
0 to 500	3.0	2.0

The characteristics of the 287A tube are such that, for any given anode potential and ambient temperature, there is a critical control-electrode potential. If the control-electrode is held more negative than this value and the tube is non-conducting, the space current will remain zero. If it is made less negative, the space current assumes a value determined by the applied anode potential and the resistance in the anode circuit. To extinguish the discharge and return the space current to zero, the positive anode potential must be removed. When space current is flowing, a visible discharge occurs in the tube. Under this condition, the anode-cathode potential is practically independent of the value of both the space current and the control-electrode potential. A protective resistance should always be included in the anode circuit to limit the maximum instantaneous space current to the rated values. Typical curves relating the critical control-electrode potential to the anode potential at various ambient temperatures are shown in Figure 3. These characteristics may vary from tube to tube and during the life of a given tube.

When the filament is heated with alternating current and the anode and control-electrode returns are connected to one side of the filament, the zero of grid bias should be taken at the axis "A".

When the filament is heated by alternating current and the anode and control-electrode returns are connected to the center tap of the filament transformer, the zero of grid bias should be taken at the axis "B".

When the filament is heated by direct current and the anode and control-electrode returns are connected to the negative terminal of the filament, the zero of grid bias should be taken at the axis "C".

Typical Circuits

The tube may be used in a variety of circuits adapted to the application of gas-filled and mercury-vapor tubes. One use of the tube is as a controlled-frequency oscillator. The circuit for this application is shown in Figure 4. The output will be a reproduction of the input with regard to frequency and phase. Nearly sinusoidal output voltage will be obtained if the capacitance "C" is so chosen as to resonate the inductance of the full output transformer winding at the driving frequency. If the transformer is replaced by resistance an essentially aperiodic circuit capable of giving a square wave-form will result.

Another use for the tube is as a relay device. In this application, the anode may be supplied from either alternating or direct current. When supplied from direct current, the circuit, Figure 5, possesses a "lock-in" feature since the anode potential must be removed momentarily in order to restore the tube to the non-conducting condition. When supplied from alternating current, the circuit possesses no "lock-in" feature but the average anode current may be controlled by the relative phase of control-electrode and anode potentials. The schematic circuit for this application is shown in Figure 6.

A grid-controlled rectifier circuit is available which has the property of providing a load voltage nearly independent of the load current even at light loads. In addition the magnitude of the load voltage may be controlled from 10% to full voltage manually.

It is also possible to design a rectifier circuit in which the current or power to the load may be limited to a predetermined value so that the load terminals may even be short-circuited without damage to the tubes or associated apparatus.

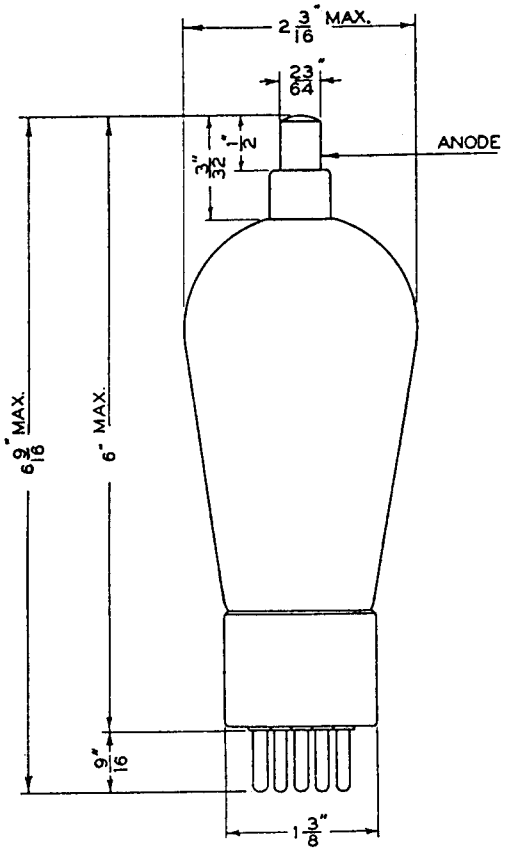


FIG. 1

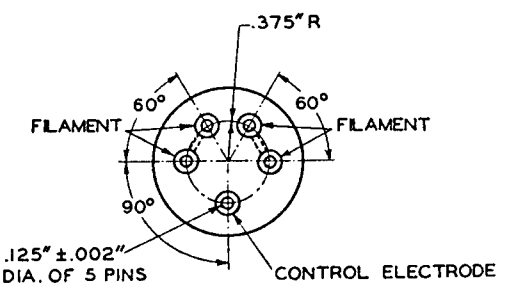


FIG. 2

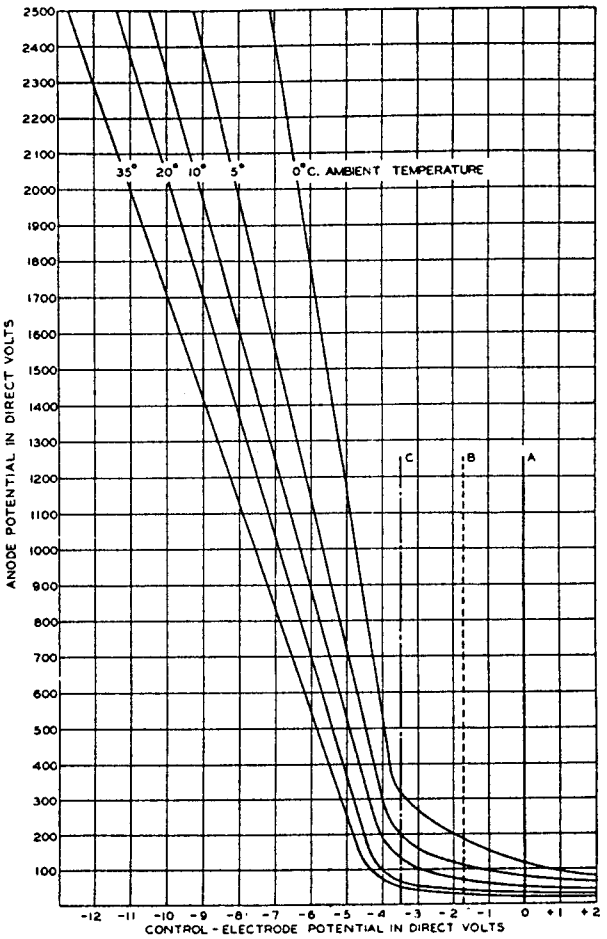


FIG. 3

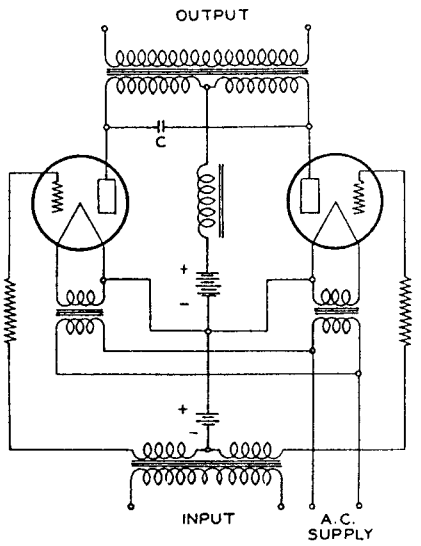


FIG. 4

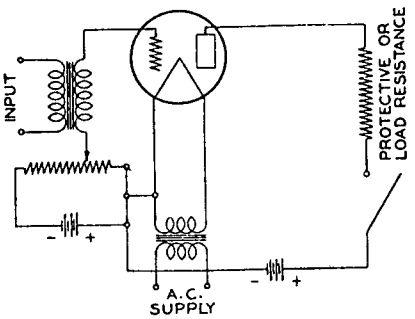


FIG. 5

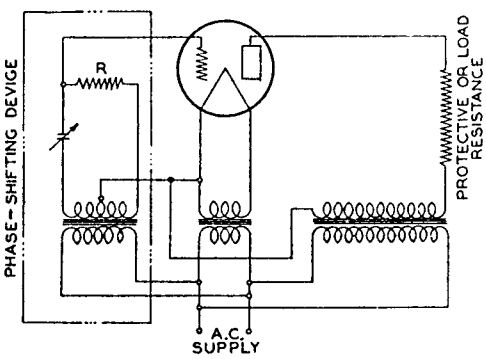


FIG. 6