884

Gas-Triode

The 884 is a grid-controlled, gaseous-discharge tube of the heater-cathode type. It is designed for use as a sweep-circuit oscillator in cathode-ray tube circuits.

Operation of the 884 as a sweep-circuit oscillator is made possible by the feature that a negative voltage on the grid either maintains plate-current cut-off or promptly loses control, depending on the value of the plate voltage. After grid control is lost, it can be restored only (except in cases of very low plate current or very high grid voltage) by reducing the plate voltage below the ionization potential of the gas in the tube. This action can be controlled by means of a condenser shunted across the plate circuit and charged through a current-limiting resistor (see circuit, page 4). When the plate voltage reaches breakdown potential, the condenser discharges through the tube, the plate voltage drops, the grid resumes control and a new cycle starts. The shape of the waves produced in this manner resembles the teeth of a saw. This form of wave for sweep-circuit control of cathode-ray tubes permits a quick recovery of the beam to the starting position of the time axis and eliminates or keeps dim the visible pattern of the return sweep. The 884 is characterized by its extremely low de-ionization time, its corresponding practicability of operation at high frequency, and its stability of operation.

CHARACTERISTICS and RATINGS

HEATER VOLTAGE (A.C. or D.C.)	6.3	Volts
HEATER CURRENT	0.6	Ampere
GRID-PLATE CAPACITANCE	3.5	μμf
GRID-CATHODE CAPACITANCE	3.5	μμf
PLATE-CATHODE CAPACITANCE	2.5	μμf
TUBE VOLTAGE DROP (Approx.)	16	Volts
MAXIMUM OVERALL LENGTH	4-1/8"	
MAXIMUM DIAMETER	1-9/16"	
BULB	ST-12	
BASE	Small Shell Octal 6-Pin	

As a Sweep-Circuit Oscillator

PLATE VOLTAGE (Instantaneous)	300 *max.* Volts
PEAK VOLT. BETWEEN ANY 2 ELECTRODES	350 *max.* Volts
PEAK PLATE CURRENT	300 *max.* Milliamperes
AVERAGE PLATE CURRENT:	
For freq. below 200 cycles per sec.	3 *max.* Milliamperes
For freq. above 200 cycles per sec.	2 *max.* Milliamperes

GRID RESISTOR:

Should be not less than 1000 ohms per maximum instantaneous volt applied to the grid. Resistance values in excess of 0.5 megohm may cause circuit instability.

As Grid-Controlled Rectifier

For Frequencies below 75 Cycles per Second

PEAK VOLT. BETWEEN ANY 2 ELECTRODES	350 *max.* Volts
PEAK PLATE CURRENT	300 *max.* Milliamperes
AVERAGE PLATE CURRENT *	75 *max.* Milliamperes

GRID RESISTOR:

Should be not less than 1000 ohms per maximum instantaneous volt applied to the grid. Resistance values in excess of 0.5 megohm may cause circuit instability.

* Averaged over period of not more than 30 seconds.

INSTALLATION

The *base* of the 884 fits the standard octal socket which may be installed to hold the tube in any position.

The *bulb* becomes hot during operation of the tube. Although sufficient ventilation should be provided to prevent overheating, operation of this tube is not critical to changes in bulb temperature.

The *heater* of the 884 is designed for operation at 6.3 volts. The transformer winding supplying the heater should be designed to operate the heater at this recommended value under average line-voltage conditions. The heater voltage should be applied 30 seconds before drawing plate current.

The *cathode* should be connected through the cathode-bias resistor preferably to the electrical midpoint of the heater circuit. The heater may be made negative with respect to the cathode by a potential difference not to exceed 100 volts, provided the peak voltage between any electrode and the heater does not exceed 350 volts. It is recommended that the heater

never be made positive with respect to the cathode.

APPLICATION

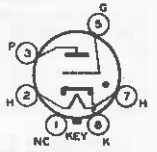
As a *sweep-circuit oscillator*, the 884 should be operated under conditions which do not exceed the maximum values given under CHARACTERISTICS.

A practical linear sweep circuit for the generation of saw-tooth oscillations up to about 350 volts, peak to peak, is shown on page 4. In operation of this circuit, condenser C_2, C_3, C_4, etc., charges through resistors R_4 and R_5 until the voltage at the plate of the 884 reaches breakdown potential. C_6 then discharges through the 884 and resistor R_3. The purpose of R_3 is to limit the peak current through the 884 to a low value. The saw-tooth voltage developed across the shunt condenser (C_2, C_3, etc.) is higher than that required for the amplifier input. For this reason, R_{10} is placed effectively in series with R_{11} to comprise a voltage divider. The frequency of the time-sweep oscillator is controlled by means of R_5 and S_1. In general, the more resistance included at R_5 and the more shunt capacitance selected at S_1, the lower the frequency of the saw-tooth oscillations.

The a-f amplifier is conventional in most respects, except that the usual cathode by-pass condenser is omitted in order to improve the overall frequency response. Potentiometer R_{11} acts as a gain control so that the horizontal sweep voltage applied to the cathode-ray tube can readily be varied.

For synchronizing purposes, a voltage of a few volts a.c. (preferably adjustable from zero) is suitable. Any means of introducing this voltage in the grid circuit is satisfactory, provided the total effective external grid-circuit resistance to both alternating current and direct current is in accord with recommended grid resistor values.

As a *grid-controlled rectifier*, the 884 may be operated as shown under CHARACTERISTICS.



BOTTOM VIEW

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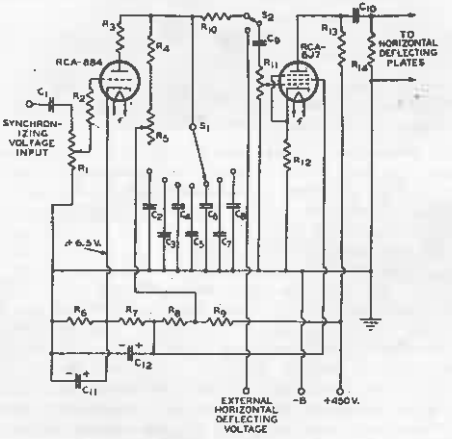
LINEAR SWEEP-CIRCUIT OSCILLATOR AND AMPLIFIER



C_1 = 0.1 μf
C_2 = 0.25 μf, 500 V.
C_3 = 0.1 μf, 500 V.
C_4 = 0.04 μf, 500 V.
C_5 = 0.015 μf, 500 V.
C_6 = 0.005 μf, 500 V.
C_7 = 0.002 μf, 500 V.
C_8 = 0.0008 μf, 500 V.
C_9 = 0.5 μf, 250 V.
C_{10} = 0.5 μf, 500 V.
C_{11} = 25 μf, 15 V.
C_{12} = 8 μf, 200 V.
R_1 = 0.25 MEGOHM
R_2 = 25000 OHMS, 0.5 WATT
R_3 = 500 OHMS, 0.5 WATT
R_4 = 0.3 MEGOHM, 0.5 WATT
R_5 = 1.0 MEGOHM
R_6 = 2000 OHMS, 0.5 WATT
R_7 = 25000 OHMS, 1.0 WATT
R_8 = 60000 OHMS, 1.0 WATT
R_9 = 60000 OHMS, 1.0 WATT
R_{10} = 1.0 MEGOHM, 0.5 WATT
R_{11} = 0.5 MEGOHM
R_{12} = 850 OHMS, 0.5 WATT
R_{13} = 0.1 MEGOHM, 1.0 WATT
R_{14} = 2.0 MEGOHMS, 1.0 WATT
S_1 = 7-CONTACT S.P. SWITCH
S_2 = S.P.D.T. SWITCH

APPROX. FREQUENCY RANGE (CYCLES/SEC.)

SWITCH (S_1) ON		C_2	C_3	C_4	C_5	C_6	C_7	C_8
R_5 AT	MAX.	20	43	109	280	670	1500	3600
	MIN.	59	132	340	880	2180	4900	11400