

RCA-954

Detector, Amplifier Pentode (Acorn† Type)

For illustration, refer to 956 on page 133

The 954 is a heater-cathode type of pentode designed primarily for radio amateurs and experimenters working with wavelengths as short as 0.7 meter. As an r-f amplifier at a wavelength of one meter, the 954 is capable of gains of three or more in circuits of conventional design. Higher gains are, of course, attainable at longer wavelengths. Operation at short wavelengths is made possible by means of unconventional tube structure having small size, close electrode spacing, and short terminal connections.

CHARACTERISTICS

Heater Volts (a-c or d-c)	6.3	Grid-Plate Capacitance	
Heater Amperes	0.15	(With shield baffle)	0.007 max. μmf
		Input Capacitance	3 μmf
		Output Capacitance	3 μmf

As an R-F or A-F Amplifier—Class A

D-C PLATE VOLTAGE	250 max. Volts
D-C SUPPRESSOR VOLTAGE (Grid No. 3)	100 max. Volts
D-C SCREEN VOLTAGE (Grid No. 2)	100 max. Volts

TYPICAL OPERATION AND CHARACTERISTICS:

D-C Plate Voltage	90	250	Volts
Suppressor	Connected to cathode at socket		
D-C Screen Voltage	90	100	Volts
D-C Grid Voltage (Grid No. 1)	-3	-3	Volts
D-C Plate Current	1.2	2	Milliamperes
D-C Screen Current	0.5	0.7	Milliampere
Amplification Factor	1100	Greater than 2000	
Plate Resistance	1.0	Greater than 1.5	Megohms
Transconductance	1100	1400	Micromhos

As Detector

D-C PLATE VOLTAGE	250 max. Volts
D-C SUPPRESSOR VOLTAGE	100 max. Volts
D-C SCREEN VOLTAGE	100 max. Volts

TYPICAL OPERATION AS BIASED DETECTOR:

D-C Plate-Supply Voltage	250	Volts
Suppressor	Connected to cathode at socket	
D-C Screen Voltage	100	Volts
D-C Grid Voltage (Approx.)	-6	Volts
D-C Plate Current	Adjusted to 0.1 ma. with no input signal	
Plate Load*	250000 Ohms, or Equivalent Impedance	
Cathode-Bias Resistor	20000 to 50000 Ohms	

* For resistance load, voltage at the plate will be less than the plate-supply voltage by an amount equal to the voltage drop in the load resistor caused by the plate current.

INSTALLATION

The terminals of the 954 require a special method of mounting by means of clips supplied with each tube. The two small clips are for the control grid and the plate terminal at the bottom and top of the bulb, respectively. The five

† Registered Trademark.

large clips may be fastened to a supporting insulator. For minimum losses, it is desirable to clip circuit parts directly to the control-grid terminal and to the plate terminal. Since the circumferential tube terminals are located symmetrically, a stop of insulating material should be placed between the screen clip and the suppressor clip so that the cathode terminal will prevent insertion of the heater terminals in the screen and suppressor clips. This stop is identified on the Terminal Mounting Template shown under type 956 as Alignment Plug. *Do not attempt to solder connections to the terminals.* The heat of the soldering operation is almost certain to crack the bulb seal.

The heater is designed to operate on either a.c. or d.c. When a.c. is used the winding which supplies the heater circuit should operate the heater at its recommended value for full-load operating conditions at average line voltage. When d-c is used on the heater, the heater terminals should be connected directly across a 6-volt battery. Under any condition of operation, the heater voltage should not deviate more than plus or minus 10% from the normal value of 6.3 volts. Series heater operation of the 954 is not recommended.

The cathode of the 954, when operated from a transformer, should preferably be connected directly to the electrical mid-point of the heater circuit. In the case of d-c operation from a 6-volt storage battery, the cathode circuit is tied in either directly or through bias resistors to the negative battery terminal. In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible. If the use of a large resistor is necessary between heater and cathode in some circuit designs, it is essential that this resistor be by-passed by a suitable filter network or objectional hum may develop.

The screen voltage may be obtained from a fixed tap on the B-battery or from a potentiometer across the B-supply. The screen voltage may be obtained from the B-supply through a series resistor when the tube is self-biased by means of a cathode resistor. The latter method is not recommended if the B-supply exceeds 250 volts.

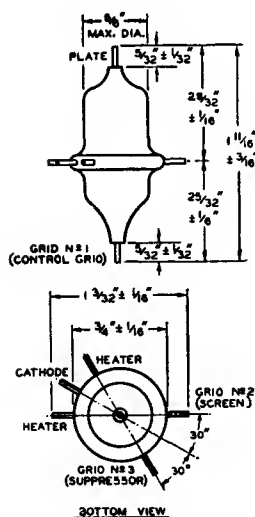
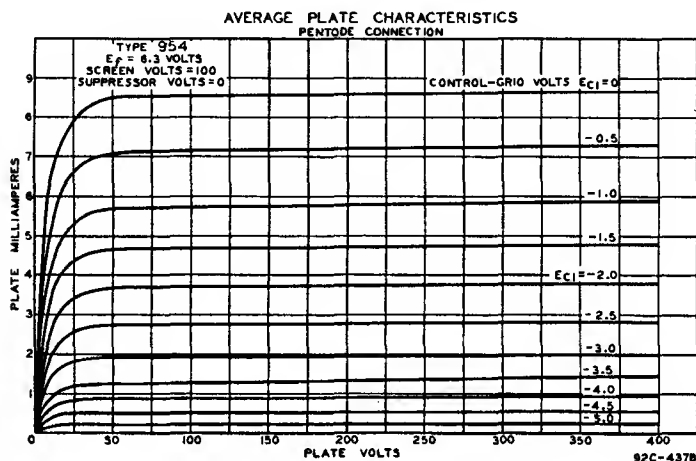
Shielding of each r-f amplifier stage employing the 954 is required in order to prevent interstage coupling. A convenient method of shield construction is illustrated under type 956. The control-grid end of the tube is inserted through a hole in a metal plate so that the metal edge of the hole is in close proximity to the internal shield in the control-grid end of the tube. It may be desirable, depending upon circuit requirements, to provide a small collar on the baffle hole in order to increase the shielding effect.

R-f grounding by means of condensers placed close to the tube terminals is required if the full capabilities of the 954 are to be realized at the ultra-high frequencies. Conventional by-passing methods and grounding are not adequate. One convenient method is to use ribbon lead-ins to the clips and to insulate the ribbon lead-ins and the terminal clips from the grounding plate by mica spacers to form by-pass condensers right at the tube terminals. It is important in the cases of the plate and control-grid circuits that separate r-f grounding returns be made to a common point in order to avoid r-f interaction through common return circuits. It may also be advisable in some applications to supplement the action of the by-pass condensers by r-f chokes placed close to the condensers in the return or supply lead for the control grid, the screen, the suppressor, the plate, and the heater.

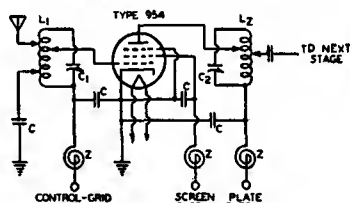
APPLICATION

As an **amplifier**, the 954 is applicable to the audio- or the radio-frequency stages of short-wave receivers, especially those operating at wavelengths as short as 0.7 meter. Typical operating conditions for this service are given under **MAXIMUM RATINGS** and **TYPICAL OPERATING CONDITIONS**.

For a-f amplifier circuits, typical operating conditions are as follows: Plate-supply voltage, 250 volts; screen voltage, 50 volts; grid voltage, -2.1 volts; suppressor, connected to cathode at socket; plate-load resistor, 250000 ohms; and plate current, 0.5 milliamperes. The grid resistor may be made as high as 1.0 megohm. Under these conditions, an undistorted voltage output of 40 to 50 volts RMS may be obtained. The voltage amplification is approximately 100.



TYPICAL R-F AMPLIFIER CIRCUIT



WAVE-LENGTH RANGE	2.75 TO 3.3 METERS APPROX.	1 TO 3 METERS APPROX.	0.8 METER APPROX.
L_1, L_2 (TURNS WIRE OUTSIDE DIA. LENGTH)	10 N#30 B.C.* $3/8$ $5/16$	4 N#30 B.C.* $3/8$ $5/16$	3 N#30 B.C.* $1/8$ $1/8$
C_1, C_2 (VARIABLE)	3 TO 25 μF	3 TO 25 μF	3 TO 4 μF
C	100 TO 500 μF	100 TO 500 μF	100 TO 500 μF
Z (TURNS WIRE OUTSIDE DIA. WINDING)	15 N#30 $1/8$ S.L.*	15 N#30 $1/8$ S.L.*	15 N#30 $1/8$ S.L.*

*B.C. = BARE COPPER

*S.L. = SINGLE LAYER

NOTE: THE ABOVE DATA ARE NECESSARILY APPROXIMATE FOR ULTRA-HIGH FREQUENCIES. COILS L_1 AND L_2 MAY BE TAPPED AT SUITABLE POINTS DETERMINED BY TEST TO REDUCE EFFECT OF TUBE LOADING ON CIRCUIT IMPEDANCES. SINCE ELECTRONIC PLATE LOADING IS NOT SERIOUS IN A PENTODE, THE USE OF COIL L_2 WITH TAPPED PLATE CONNECTION MAY NOT BE NECESSARY TO GIVE SATISFACTORY RESULTS. THE CONDENSERS SHOULD ALL BE OF HIGH QUALITY AND BE DESIGNED FOR ULTRA-HIGH FREQUENCY OPERATION.

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