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Reserved
RMA # 6AB7

1853

Television Amplifier Pentode

RCA-1853 is a heater-cathode type of metal tube indended for use by the amateur and experimenter in experimental television receivers. Because of its extended cut-off characteristic, it is recommended for use in the r-f and i-f stages of the picture amplifier of such receivers, particularly those employing automatic gain control. The 1853 can also be used as a mixer and makes a good oscillator in low-voltage amplifications.

A special shielded lead construction has been employed in the 1853 to permit bringing out the control-grid lead to a base pin rather than to a pin cap. With this construction, it has been possible to keep the grid-plate capacitance as low as that of this tube with capped construction. From a circuit standpoint, the proximity of grid pin to cathode pin simplifies wiring and decreases the size of the inductance loop connecting the input circuit to the tube. These are features important at high frequencies because they provide de-decreased feedback and improved circuit stability.

TENTATIVE CHARACTERISTICS and RATINGS

HEATER VOLTAGE (A.C. or D.C.)	6.3	Volts
HEATER CURRENT	0.45	Ampere
DIRECT INTERELECTRODE CAPACITANCES: °		
Grid to Plate	0.015 *max.*	μμf
Input	8	μμf
Output	5	μμf
MAXIMUM OVERALL LENGTH	2-5/8"	
MAXIMUM DIAMETER	1-5/16"	
BASE	Small Wafer Octal 8-Pin	

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS

PLATE VOLTAGE	300 *max.*	Volts
SCREEN VOLTAGE	200 *max.*	Volts
SCREEN-SUPPLY VOLTAGE	300 *max.*	Volts
PLATE & SCREEN DISSIPATION (total)⊕	4.4 *max.*	Watts
SCREEN DISSIPATION	0.65 *max.*	Watts

TYPICAL OPERATION and CHARACTERISTICS:

	*Condition I**	*Condition II***	
Plate Voltage	300	300	Volts
Suppressor Voltage	0	0	Volts
Screen-Supply Voltage #	200	300	Volts
Screen Series Resistor	-	30000	Ohms
Grid Voltage ## ●	-3 *min.*	-3 *min.*	Volts
Amplification Factor (Approx.)	3500	3500	

°, ⊕, *, **, #, ##, ●: See next page.

Plate Resistance (Approx.)	0.7	0.7	Megohm
Transconductance	5000	5000	Micromhos
Grid Bias for Transconductance = 50 micromhos	-15	-22.5	Volts
Plate Current	12.5	12.5	Milliamperes
Screen Current	3.2	3.2	Milliamperes

° With shell connected to cathode.

* Condition I is with fixed screen supply.

** Condition II is with series screen resistor.

Screen-supply voltages in excess of 200 volts require use of a series dropping resistor to limit the voltage at the screen to 200 volts when the plate current is at its normal value of 12.5 milliamperes.

• May be obtained with cathode-bias resistor having a minimum value of 190 ohms.

The d-c resistance of the grid circuit should not exceed 0.25 megohm with fixed bias. When full cathode bias and a series screen resistor are used, the d-c resistance of the grid circuit may be as high as 0.5 megohm.

● Precautions should be taken to insure that dissipation rating is not exceeded with expected line-voltage fluctuations, especially in the case of fixed-bias operation.

INSTALLATION

The *base* pins of the 1853 fit the standard octal socket which should be installed to hold the tube preferably in a vertical position, with the base either up or down. Horizontal operation is permissible if the socket is positioned so that pins No.2 and No.7 are in a vertical plane.

The *heater* of the 1853 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.

The *cathode*, when the 1853 is operated from a transformer, should be connected through a bias source either to one side or 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 should be tied through a bias source to the negative battery terminal. The potential difference between heater and cathode should be kept as low as possible.

In some installations having automatic bias control which provides a fixed minimum bias adequate to limit the plate current to 12.5 milliamperes, and also using a 30000-ohm series screen resistor, the cathode may be connected through an unby-passed resistor to ground. This resistor may conveniently form a portion of the fixed minimum bias. Such an arrangement serves to minimize changes of input capacitance and input conductance, as explained under Control-Grid Bias.

Control-grid bias for the 1853 may be obtained by means of a cathode-bias (self-bias) resistor adjusted to give a plate current

of 12.5 milliamperes, or from a fixed source, depending on the application.

In tubes such as the 1853, with a very high value of transconductance, there are appreciable changes of input capacitance and input conductance with plate current. In order to minimize these changes when the 1853 is used as an r-f or i-f amplifier, a portion of the cathode-bias resistor may be left unby-passed. Reducing the changes of input capacitance and input conductance in this manner, however, is accomplished with some sacrifice in effective transconductance and with some increase in effective grid-plate capacitance. To prevent excessive effective grid-plate capacitance, precautions should be observed to keep the external capacitances between plate and cathode leads at a minimum. It should be observed that with this method of minimization, the cathode is not at a-c ground potential. Because of this fact, the most favorable connection of the tube electrodes will be obtained when screen and suppressor are at a-c ground potential, as shown in the circuit R-F or I-F AMPLIFIER on page 5.

The *screen* voltage for the 1853 may be obtained from a potentiometer, a bleeder circuit across the B-supply source, or through a series screen resistor. Use of the series screen resistor (Condition II) provides a somewhat more extended cut-off characteristic than is obtained with fixed screen voltage (Condition I).

The *suppressor* should be connected in r-f and i-f stages directly to ground, in order to minimize feedback.

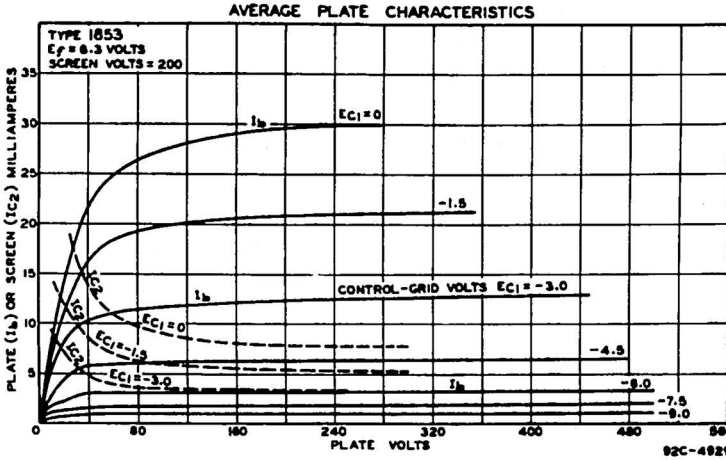
APPLICATION

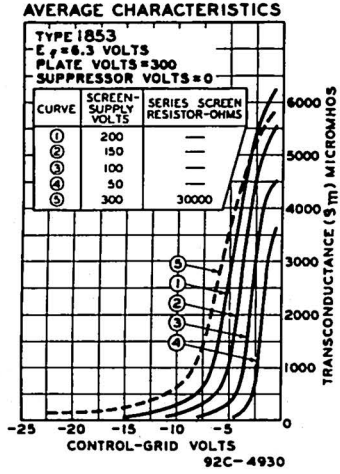
As an *amplifier*, the 1853 is especially suited for use in the r-f and i-f stages of the picture amplifier of experimental television receivers employing automatic gain control.

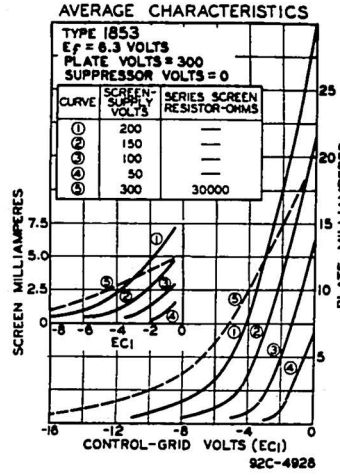
When minimization of changes in input capacitance and input conductance is not accomplished by leaving a portion of the cathode-bias resistor unby-passed, it will be found advisable to operate the 1853 with circuits heavily loaded by resistance and capacitance. Although such circuits minimize the effect of the relatively small variations in tube capacitance and conductance, they also cause some sacrifice in gain.

The series-screen-resistor method of obtaining screen voltage from the plate supply is satisfactory for the 1853 because its suppressor practically removes the effects of secondary emission phenomena. With this method, the screen-to-cathode voltage will rise as the control-grid voltage is varied from minimum to maximum. This rise of screen-to-cathode voltage above the normal maximum value is allowable because the screen and the plate current are reduced simultaneously by a sufficient amount to prevent damage to the tube.

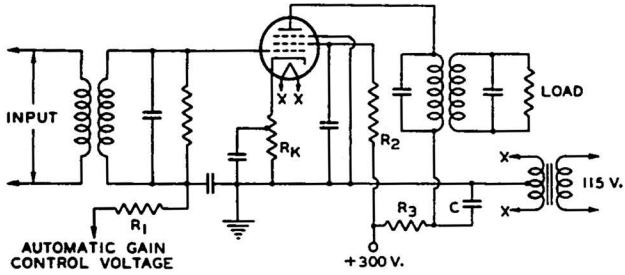
A schematic circuit illustrating the use of the 1853 is shown on page 5.


AVERAGE PLATE CHARACTERISTICS
TYPE 1853
Ef = 6.3 VOLTS
SCREEN VOLTS = 200
PLATE (Ib) OR SCREEN (Ic2) MILLIAMPERES
PLATE VOLTS
CONTROL-GRID VOLTS EC1 = -3.0
Ec1=0
-1.5
-3.0
-4.5
-6.0
-7.5
-9.0
92C-4929

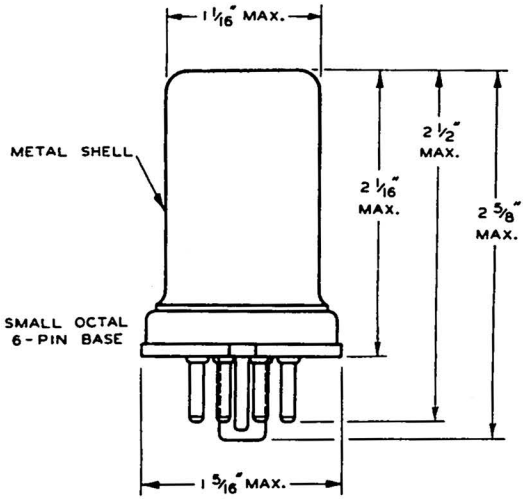

AVERAGE CHARACTERISTICS
TYPE 1853
Ef = 6.3 VOLTS
PLATE VOLTS = 300
SUPPRESSOR VOLTS = 0
CURVE
SCREEN-SUPPLY VOLTS
SERIES SCREEN RESISTOR-OHMS
① 200 —
② 150 —
③ 100 —
④ 50 —
⑤ 300 30000
TRANSCONDUCTANCE (Sm) MICROMHOS
CONTROL-GRID VOLTS
92C-4930


AVERAGE CHARACTERISTICS
TYPE 1853
Ef = 6.3 VOLTS
PLATE VOLTS = 300
SUPPRESSOR VOLTS = 0
CURVE
SCREEN-SUPPLY VOLTS
SERIES SCREEN RESISTOR-OHMS
①②③④⑤ 200 —
①②③④⑤ 150 —
①②③④⑤ 100 —
①②③④⑤ 50 —
⑤ 300 30000
SCREEN MILLIAMPERES
PLATE MILLIAMPERES
EC1
CONTROL-GRID VOLTS (EC1)
92C-4928

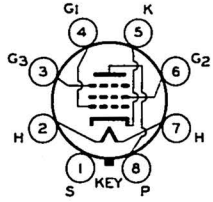
R-F OR I-F AMPLIFIER



C = 0.05 μf
R_1 = 0.25 MEGOHM
R_2 = 30000 OHMS
R_3 = 1000 OHMS
R_K = 190 OHMS, WITH TAP AT APPROXIMATELY 70 OHMS FROM CATHODE END



BOTTOM VIEW OF SOCKET CONNECTIONS



G_1 = CONTROL GRID
G_2 = SCREEN
G_3 = SUPPRESSOR
H = HEATER
K = CATHODE
S = SHELL

8 N

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