RCA-1853 is a heater-cathode type of metal tube intended 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 instead of 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 decreased feedback and improved circuit stability.

**TENTATIVE CHARACTERISTICS and RATINGS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEATER VOLTAGE (A.C. or D.C.)</td>
<td>6.3 Volts</td>
</tr>
<tr>
<td>HEATER CURRENT</td>
<td>0.45 Ampere</td>
</tr>
<tr>
<td>DIRECT INTERELECTRODE CAPACITANCES:</td>
<td></td>
</tr>
<tr>
<td>Grid to Plate</td>
<td>0.015 max. μμf</td>
</tr>
<tr>
<td>Input</td>
<td>8 μμf</td>
</tr>
<tr>
<td>Output</td>
<td>5 μμf</td>
</tr>
<tr>
<td>MAXIMUM OVERALL LENGTH</td>
<td>2-5/8&quot;</td>
</tr>
<tr>
<td>MAXIMUM DIAMETER</td>
<td>1-5/16&quot;</td>
</tr>
<tr>
<td>BASE</td>
<td>Small Wafer Octal 8-Pin</td>
</tr>
</tbody>
</table>

**MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLATE VOLTAGE</td>
<td>300 max. Volts</td>
</tr>
<tr>
<td>SCREEN VOLTAGE</td>
<td>200 max. Volts</td>
</tr>
<tr>
<td>SCREEN-SUPPLY VOLTAGE</td>
<td>300 max. Volts</td>
</tr>
<tr>
<td>PLATE &amp; SCREEN DISSIPATION (total)</td>
<td>4.4 max. Watts</td>
</tr>
<tr>
<td>SCREEN DISSIPATION</td>
<td>0.65 max. Watts</td>
</tr>
</tbody>
</table>

**TYPICAL OPERATION and CHARACTERISTICS:**

<table>
<thead>
<tr>
<th>Condition I**</th>
<th>Condition II**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Voltage</td>
<td>300</td>
</tr>
<tr>
<td>Suppressor Voltage</td>
<td>0</td>
</tr>
<tr>
<td>Screen-Supply Voltage</td>
<td>200</td>
</tr>
<tr>
<td>Screen Series Resistor</td>
<td>–</td>
</tr>
<tr>
<td>Grid Voltage ##</td>
<td>-3 min.</td>
</tr>
<tr>
<td>Amplification Factor (Approx.)</td>
<td>3500</td>
</tr>
</tbody>
</table>

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 appli-
cation.

In tubes such as the 1853, with a very high value of transcon-
ductance, there are appreciable changes of input capacitance and in-
put 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 transcon-
ductance 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 elec-
trodes 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 poten-
tiometer, a bleeder circuit across the B-supply source, or through a
series screen resistor. Use of the series screen resistor (Condition
III) 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 di-
rectly 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 tele-
vision 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 sup-
pressor practically removes the effects of secondary emission phe-
nomena. 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 si-
multaneously by a sufficient amount to prevent damage to the tube.

A schematic circuit illustrating the use of the 1853 is shown
on page 5.
R-F OR I-F AMPLIFIER

INPUT

AUTOMATIC GAIN
CONTROL VOLTAGE

R1

R2

RK

R3

LOAD

+300 V.

115 V.

C = 0.05 μf

R1 = 0.25 MEGOHM

R2 = 30000 OHMS

R3 = 1000 OHMS

RK = 150 OHMS, WITH TAP AT APPROXIMATELY 70 OHMS FROM CATHODE END

METAL SHELL

SMALL OCTAL 6-PIN BASE

1 5/16" MAX.

2 1/2" MAX.

2 1/16" MAX.

2 5/8" MAX.

BOTTOM VIEW OF SOCKET CONNECTIONS

G1 = CONTROL GRID

G2 = SCREEN

G3 = SUPPRESSOR

H = HEATER

K = CATHODE

S = SHELL

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