TETRODE AMPLIFIER
DEPENDABLE LONGLIFETYPE

7150

The 7150 is a tetrode intended for use in broadband amplifiers from audio frequencies up to about 300 Mc/s.

Thanks to pentode-like characteristics 7150 is very useful in output stages. When triode-connected it is also very suitable as low-noise amplifier in input stages. The low capacitance between plate and cathode makes it fitted for use in grounded grid circuits.

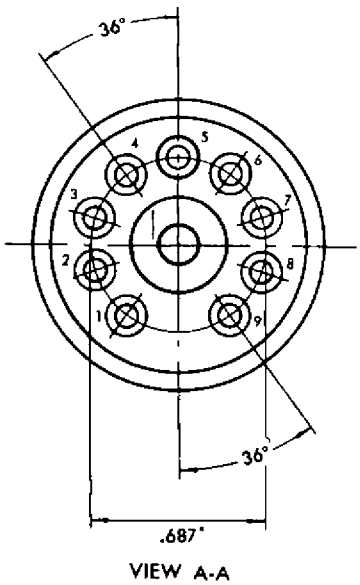
The figure of merit is outstanding, especially at intermediate frequencies owing to the low output capacitance.

The 7150 also offers small transit time loading and low cathode lead inductance. These features have been obtained by using close-spaced structure and triple cathode leads. Accordingly, the input conductance is low - approximately 1100 micromhos at 70 Mc/s.

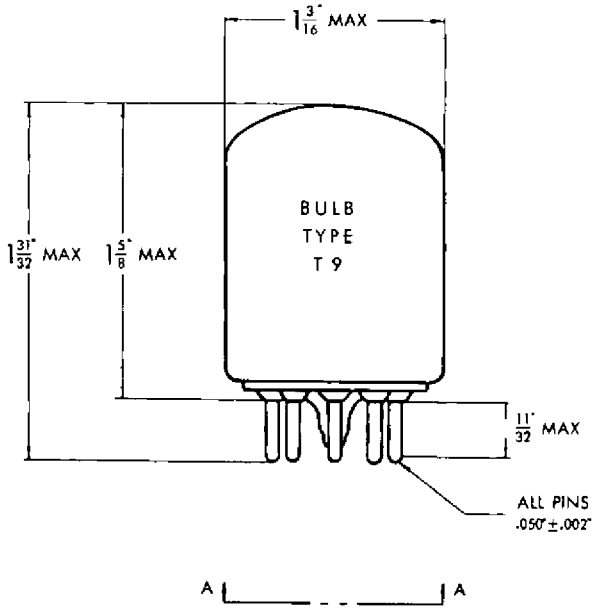
MECHANICAL DATA

Base: 9-pin, as per drawing below.
Bulb: T-9
Mounting Position: Any

Pin No	Connected to	Pin No	Connected to
1.	Plate	6.	Cathode
2.	Heater	7.	Cathode
3.	Cathode	8.	No Connection
4.	Grid No 1	9.	Grid No 2
5.	Heater & Int. Shield (see Note 1)		



VIEW A-A



Note 1: The internal shield connected to Pin No 5 should be grounded as there is a direct flow of electrons from the cathode to the shield when the latter is positive in relation to the cathode.

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MAXIMUM RATINGS (Absolute Values)

Plate Voltage	165	volts
Plate Dissipation	4.5	watts
Grid No 2 Voltage	165	volts
Grid No 2 Dissipation	1.65	watts *
(Plate + Grid No 2) Dissipation *	5.5	watts
Cathode Current	55	milliamps
Heater - Cathode Voltage	55	volts
Bulb Temperature (at hottest point)	140	°C
Grid No 1 Voltage, Positive Value	0	volt
Grid No 1 Voltage, Negative Value	-25	volts
Grid Circuit Resistance, Fixed Bias	0.05	megohm
Grid Circuit Resistance, Cathode Bias	0.10	megohm

TETRODE CHARACTERISTICS

COLD CAPACITANCES (without external shield)

Grid No 1 to Plate	0.03	uuF
Input	16	uuF
Output	2	uuF

TYPICAL OPERATION

Heater Voltage	6.3	6.3	volts
Heater Current	450	450	milliamps
Plate Supply Voltage	135	125	volts
Grid No 2 Supply Voltage	135	125	volts
Grid No 1 Supply Voltage (see Note 2)	+ 8	0	volts
Cathode Bias Resistor	260	45	ohms
Plate Current	27.5	24	milliamps
Grid No 2 Current	8.5	7.5	milliamps
Transconductance	35,800	34,000	micromhos
Plate Resistance, approx.	0.03	0.03	megohm
Equivalent Noise Resistance	160	160	ohms
Input Conductance at 100 Mc, appr.	2200	2200	micromhos
Transit Time Loading at 100 Mc, appr.	200	200	micromhos
Figure of Merit at low frequencies, $g_m / C_{in} + C_{out}$	2.0	1.9	
Figure of Merit at intermediate freq., $g_m / \sqrt{C_{in} \cdot C_{out}}$	6.3	6.0	

* Triode Connection = Grid No 2 connected to Plate.

Note 2: It is recommended to use the tube in combination bias as per column No 1 above.

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TETRODE CHARACTERISTICS
(Continued)

OPERATION RANGE VALUES

Heater Voltage		6.3		volts
Plate Supply Voltage		125		volts
Grid No 2 Supply Voltage		125		volts
Cathode Bias Resistor		45		ohms
	MIN	AVE	MAX	
Heater Current	410	450	490	milliamps
Plate Current	20	24	30	milliamps
Grid No 2 Current	-	7.5	13	milliamps
Transconductance	28,000	34,000	40,000	micromhos
Transconductance, End of Life Point	22,000	-	-	micromhos
Insulation Current, Heater to Cathode at E_{hk} = - 100 volts	-	-	20	microamps
Grid No 1 Current	-	-	- 0.2	microamp
Cutoff Plate Current at Grid No 1 Voltage = - 5 volts	-	-	0.1	milliamp

TRIODE CHARACTERISTICS*
(Grounded Grid Operation)

COLD CAPACITANCES (without external shield)

Plate & Grid No 2 to Cathode	0.6	uuF
Input (Cathode to Grid, Heater & Int. Shield)	18	uuF
Output (Plate & Grid No 2 to Grid, Heater & Int. Sh.)	7	uuF

TYPICAL OPERATION

Heater Voltage	6.3	volts
Heater Current	450	milliamps
Plate Supply Voltage	125	volts
Cathode Bias Resistor	33	ohms
Plate Current	35	milliamps
Transconductance	47,000	micromhos
Amplification Factor	35	
Equivalent Noise Resistance	60	ohms

* Triode Connection = Grid No 2 connected to Plate.

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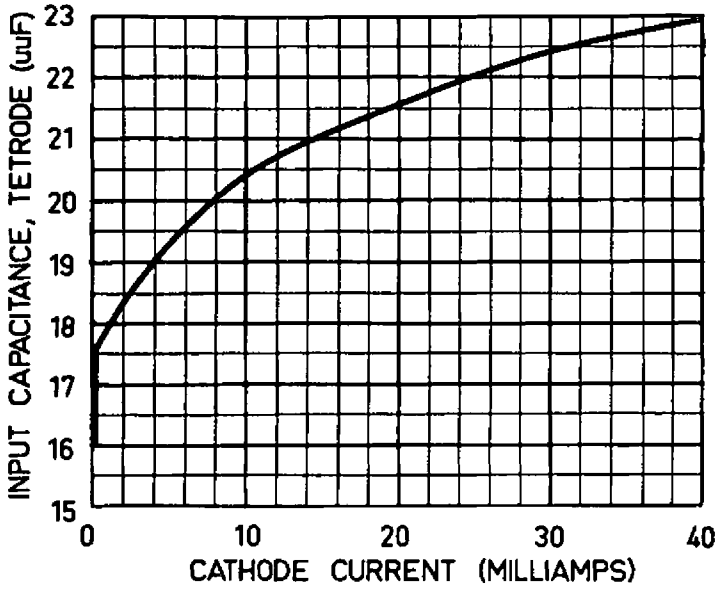
SPECIAL DATAS AND CHARACTERISTICS

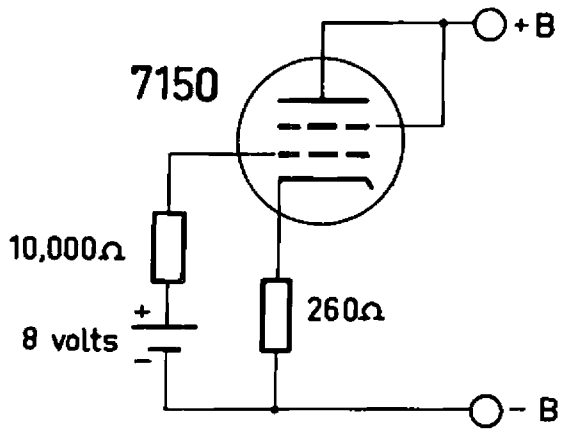
1. Capacitances in operation.

Space-charge effects in electron current flow cause an increase in tube capacitances. The input capacitance as a function of cathode current is shown below. At low frequencies approx. 8 uuF should be added for tube sockets and wiring capacitances. At intermediate frequencies approx. 5 uuF should be added for input circuit and 3 uuF for output circuit. For best value of figure of merit external shield should be excluded.



2. Bias considerations.

Because of the sensitivity to manufacturing variations of the operating characteristics of high transconductance tubes, the use of a 260 ohms cathode resistor in conjunction with a DC control grid return to a + 8 volts supply is recommended. This circuit is given below. To prevent burn out of grid wires owing to removal of Grid No 2 voltage with + 8 volts bias still applied, a limiting resistor of 10,000 ohms has been suggested in series with the bias supply. In applications, where the use of such resistor is not desirable, care should be taken that the grid bias is not applied before Plate and Grid No 2 voltages.



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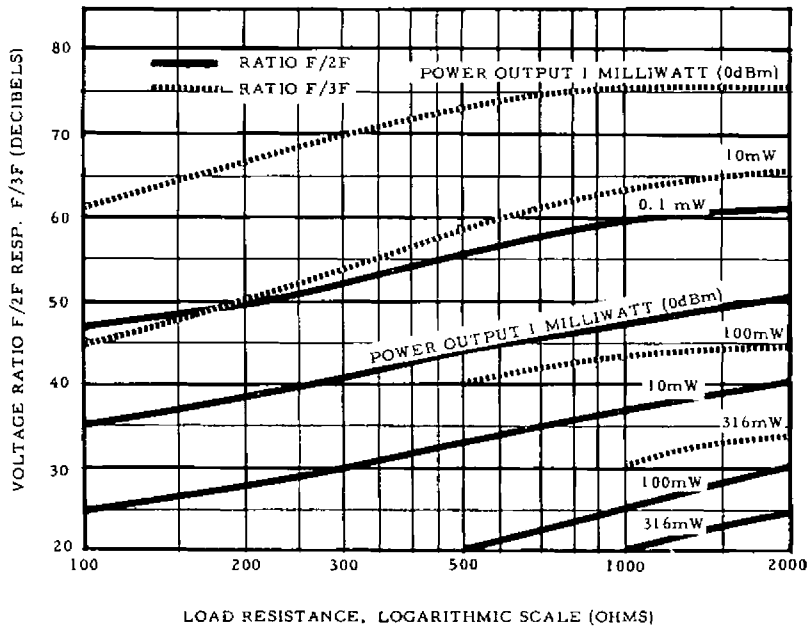
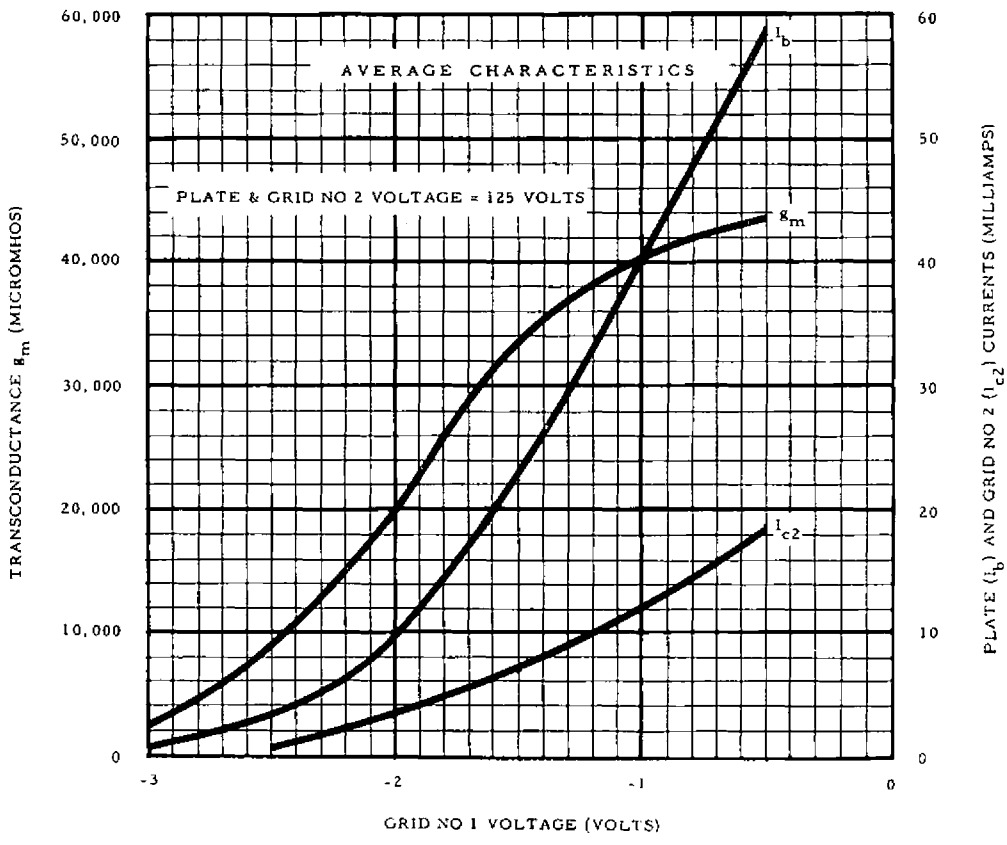
3. Harmonic Distortion.

The voltage ratio between fundamental frequency (F), and second harmonic (2F) respectively third harmonic (3F) as function of the load resistance at different power outputs under typical operating conditions is shown in the figure below.





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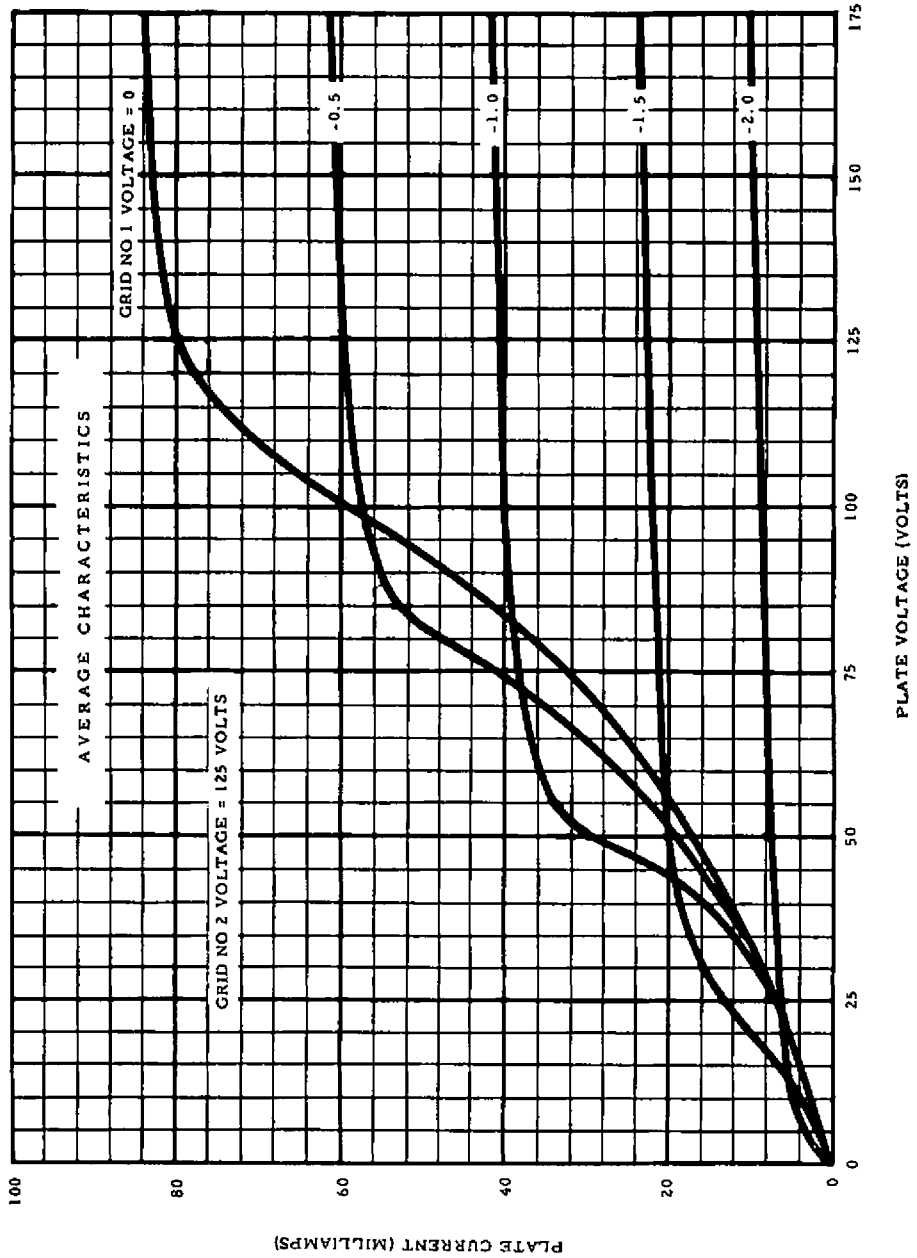

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