



TRIODE PENTODE

An indirectly heated triode pentode, primarily designed for use with the triode as a frame blocking oscillator and the pentode as a frame output valve, or it may be used as a combined audio voltage amplifier and output valve.

PHYSICAL DETAILS.

Base	...	...	B9A—Noval.
Max. Overall Length	...	...	78.5 mm. ($3\frac{1}{8}$ in.).
Max. Seated Height	...	...	71.5 mm. (3 in.).
Max. Diameter	...	...	22.2 mm. ($\frac{7}{8}$ in.).
Mounting Position	...	...	Any.

BASE CONNECTIONS.

Pin 1—Triode Grid.	Pin 5—Heater.
Pin 2—Pentode Cathode, g_3 and Shield.	Pin 6—Pentode Anode.
Pin 3—Pentode Grid (g_1).	Pin 7—Pentode Screen Grid (g_2).
Pin 4—Heater.	Pin 8—Triode Cathode.
	Pin 9—Triode Anode.

HEATER.

Heater Current	...	...	...	0.3 amps.
Heater Voltage	...	...	...	16 volts.

RATINGS.

PENTODE SECTION.

Max. H.T. Supply Voltage	...	...	550 volts.
Max. Anode Voltage	...	...	250 volts.
*Max. Peak Positive Anode Voltage	...	...	+2.5 kV.
*Max. Peak Negative Anode Voltage	...	...	-500 volts.
Max. Screen Grid Voltage	...	...	250 volts.
Max. Anode Dissipation (frame output)	...	...	5 watts.
Max. Anode Dissipation (Audio)	...	...	7 watts.
Max. Screen Grid Dissipation	...	...	2.2 watts.
Max. Cathode Current	...	...	50 mA.
Max. V_{h-k}	...	...	200 volts.
Max. R_{g1-k} (fixed bias)	...	...	1.0 M Ω
(cathode bias)	...	...	2.0 M Ω
Max. R_{h-k}	...	...	20 k Ω

TRIODE SECTION.

Max. Anode Supply Voltage	...	...	550 volts.
Max. Anode Voltage	...	...	250 volts.
†Max. Peak Positive Anode Voltage	...	...	600 volts.
Max. Anode Dissipation	...	...	1 watt.
Max. Cathode Current	...	...	15 mA.
†Max. Peak Cathode Current	...	...	100 mA.
Max. R_{gt-k} (Fixed bias)	...	...	1 M Ω
(Cathode bias)	...	...	3 M Ω
(Grid current bias)	...	...	22 M Ω
Max. V_{h-k}	...	...	200 volts.
Max. R_{h-k}	...	...	20 k Ω

CHARACTERISTICS.

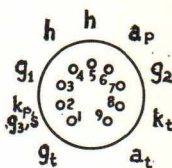
PENTODE SECTION.

Anode Voltage	...	170	200	220	volts.
Screen Grid Voltage	...	170	200	220	volts.
Suppressor Grid Voltage	...	0	0	0	volts.
Control Grid Voltage	...	-11.5	-16	-19	volts.
Anode Current	...	41	35	32	mA.
Screen Current	...	9	8	7	mA.
Mutual Conductance	...	7.5	6.4	6.2	mA/V.
Anode Impedance	...	16	20	22	k Ω
Inner μ	...	9.5	9.5	9.5	

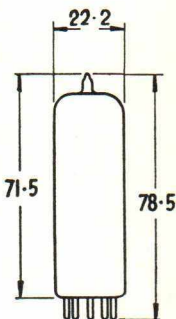
*Max. pulse duration 4% of one cycle, with a maximum of 800 μ secs.

†Max. pulse duration of 200 μ secs.

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Underside View
of Base



Dimensions in
millimetres.



CHARACTERISTICS—continued.

TRIODE SECTION.

Anode Voltage	...	...	100 volts.
Grid Voltage	...	...	0 volts.
Anode Current	...	...	3.5 mA.
Mutual Conductance	...	...	2.2 mA/V.
Anode Impedance	...	...	32 kΩ
Amplification Factor	...	...	70

TYPICAL OPERATION.

IN FRAME TIME BASE CIRCUITS.

TRIODE as OSCILLATOR.

In order to allow for tolerances on characteristics and deterioration of emission during life, the oscillator circuit should be designed so that the peak cathode current does not exceed 100 mA.

PENTODE as Frame Output Valve.

To allow for tolerances and the spread of characteristics during life, it is recommended that the frame time base output circuit should be designed around the following values.

Anode Voltage :	50	60	70	volts.
Screen Grid				
Voltage	170	230	230	volts.
Peak Anode Current	85	125	130	mA.

For new valves with $I_{g1} = \pm 0.3 \mu\text{A}$. the average of peak anode current is as follows :

Anode Voltage	50	60	70	volts.
Screen Grid				
Voltage	170	230	230	volts.
Peak Current				
Anode ...	135	200	210	mA.

PENTODE SECTION.

As Audio Output Valve (Class A).

Anode Voltage	170	200	200	volts.
Screen Grid Voltage	170	170	200	volts.
Suppressor Grid				
Voltage	0	0	0	volts.
Control Grid				
Voltage	-11.5	-12.5	-16	volts.
Anode Current	41	35	35	mA.
Screen Grid Current	8	6.5	7	mA.
Anode Load	3.9	5.6	5.6	kΩ
Input Voltage	6	5.8	6.6	volts (rms.).
†Input Voltage	590	560	600	mV. (rms.).
‡Power Output	3.3	3.4	3.5	watts.

As Audio Amplifier (2 valves in Class AB push pull).

Anode Voltage	...	170	200	volts.
Screen Grid Voltage	...	170	200	volts.
Suppressor Grid Voltage	...	0	0	volts.
§Cathode Bias Resistor	...	135	165	ohms.
Anode Current				
(Zero signal)		2 × 33	2 × 35	mA.
Anode Current				
(Max. signal)	...	2 × 37	2 × 38	mA.
Screen Grid Current				
(Zero signal)		2 × 6.2	2 × 6.5	mA.
Screen Current				
(Max. signal)	...	2 × 15	2 × 16.5	mA.
Input Voltage (g_{1-g2})	...	18	20	volts (rms.).
Optimum Load				
(Anode to Anode)		5	5	kΩ
Power Output	...	7	9	watts.

†For Power Output of 50 mW.

‡Total Distortion of 10%. Output and Distortion measured at fixed bias and represent power output available for reproduction of speech and music.

§Common Cathode Bias Resistor.

TYPICAL OPERATION.—continued.

TRIODE SECTION.

As Resistance Coupled Amplifier.
 $R_{\text{source}} = 220 \text{ k}\Omega$.

V_b (V)	R_a ($\text{k}\Omega$)	R_g ($\text{M}\Omega$)	R_k ($\text{k}\Omega$)	I_a (mA.)	* R_{g1} ($\text{k}\Omega$)	$\dagger$ $\frac{V_{\text{out}}}{V_{\text{in}}}$	V_{out} (r.m.s.)
200	100	3.3	1.5	0.84	330	44	30
170	100	3.3	1.8	0.67	330	41	25
100	100	3.3	1.8	0.40	330	36	12
200	220	3.3	2.2	0.52	680	52	26
170	220	3.3	2.7	0.43	680	51	25
100	220	3.3	2.7	0.25	680	47	15
200	100	22	0	1.06	330	51	24
170	100	22	0	0.86	330	49	20
100	100	22	0	0.40	330	42	9
200	220	22	0	0.61	680	55	25
170	220	22	0	0.50	680	53	21
100	220	22	0	0.23	680	47	10

MICROPHONY AND HUM.

In circuits where an input voltage of less than 10mV. produces an output of 50 mV. from the output stage, the triode section can be used without special precautions against Microphony and Hum. The a.c. voltage between Heater (Pin 4) and Triode Cathode should not exceed 6.3 volts.

CAPACITANCES.

C_{gt-ap}	...	...	...	...	...	<0.02 pF.
C_{at-ap}	...	...	...	...	...	<0.25 pF.
C_{at-gp}	...	...	...	...	...	<0.02 pF.
C_{gt-gp}	...	...	...	...	...	<0.025 pF.

Pentode.

C_{in}	...	...	...	...	...	9.3 pF.
C_{out}	...	...	...	...	...	8.0 pF.
C_{a-g1}	...	...	...	...	...	<0.3 pF.
C_{g1-h}	...	...	...	...	...	<0.3 pF.

Triode.

C_{in}	...	...	...	...	...	3.0 pF.
C_{out}	...	...	...	...	...	4.4 pF.
C_{a-g}	...	...	...	...	...	4.1 pF.
C_{g-h}	...	...	...	...	...	<0.02 pF.

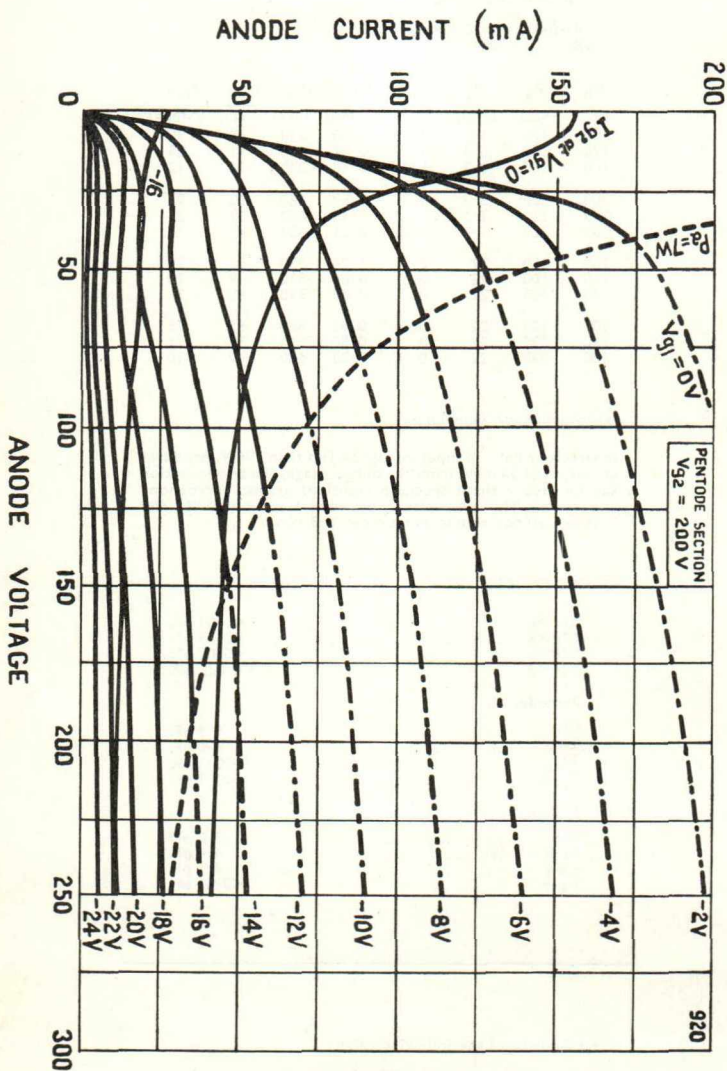
*Grid Resistor of the following valve.

†Measured with an input of 100 mV.

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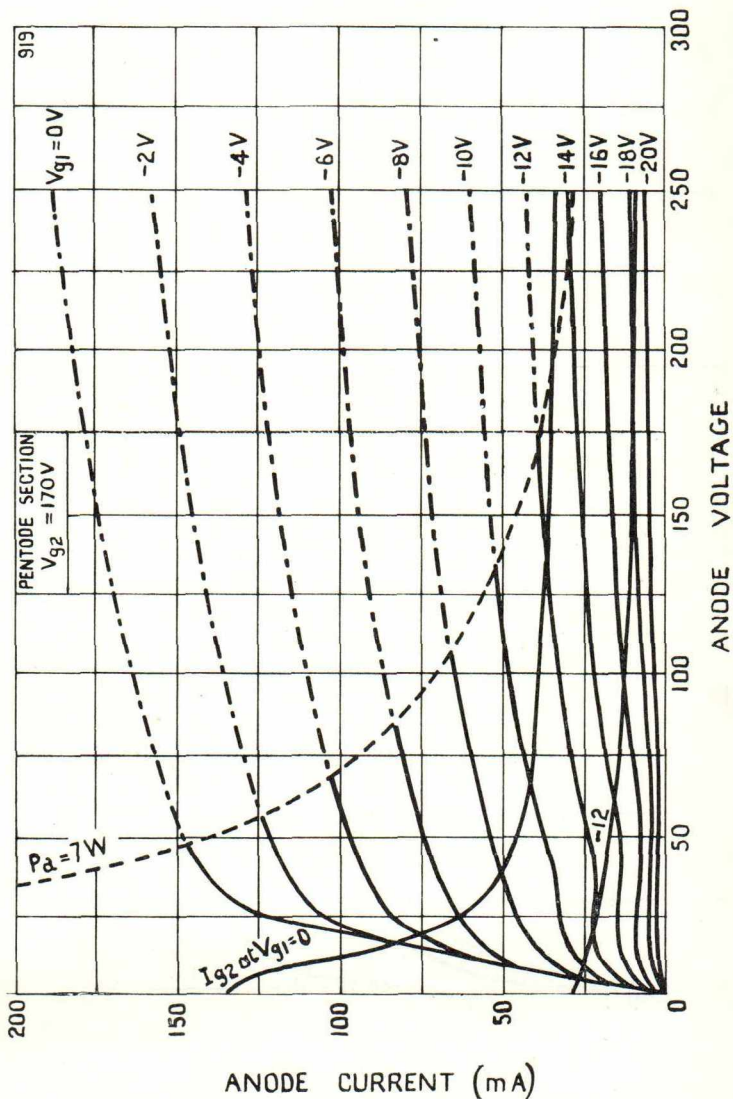
TYPICAL ANODE & SCREEN CURRENT/ANODE VOLTAGE CHARACTERISTICS

PENTODE SECTION



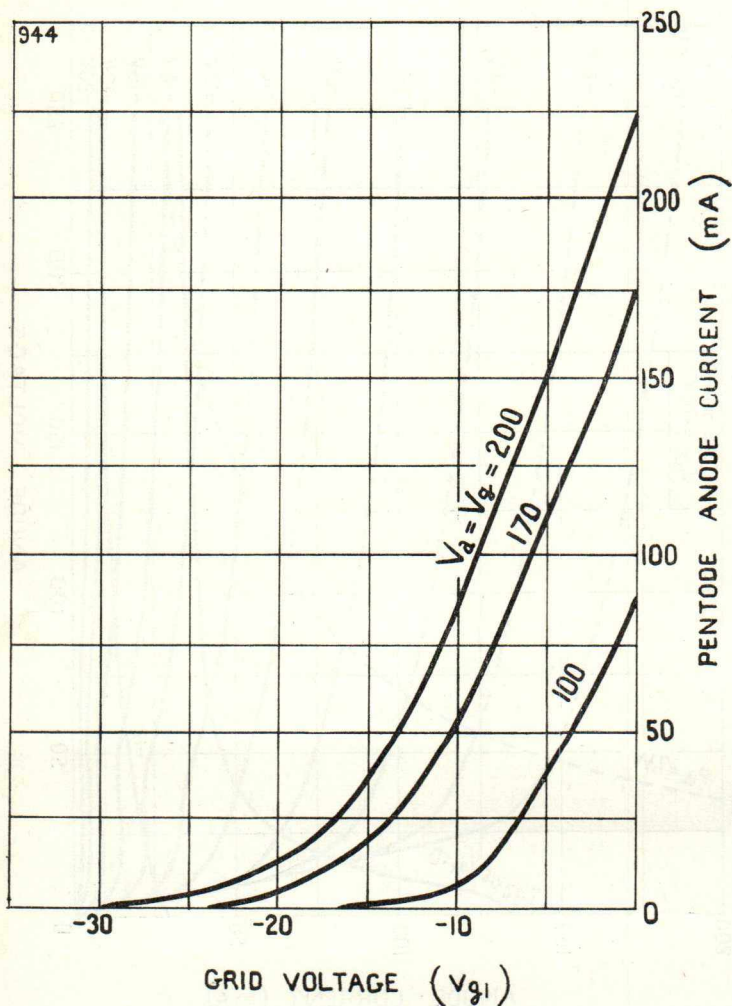
TYPICAL ANODE & SCREEN CURRENT/ANODE VOLTAGE CHARACTERISTICS

PENTODE SECTION



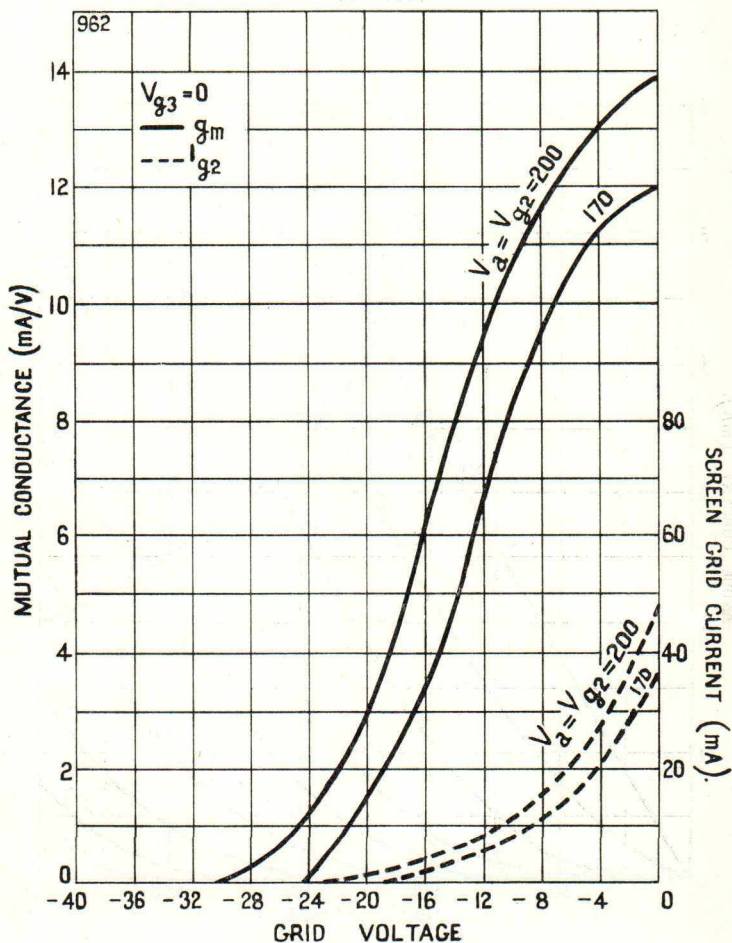
TYPICAL ANODE CURRENT/GRID VOLTAGE CHARACTERISTICS

PENTODE SECTION



TYPICAL MUTUAL CONDUCTANCE & SCREEN GRID CURRENT CHARACTERISTICS

PENTODE SECTION



TYPICAL ANODE CURRENT/GRID VOLTAGE CHARACTERISTICS

TRIODE SECTION

