



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 as a combined audio voltage amplifier and output valve.

PHYSICAL DETAILS.

Base	...	...	B9A—Noval.
Max. Overall Length	...	...	78.5 mm. (3 $\frac{1}{2}$ 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 Voltage	...	...	6.3 volts.
Heater Current	...	...	0.78 amps.

RATINGS.

PENTODE SECTION.

Max. H.T. Supply Voltage	...	...	550 volts.
Max. Anode Voltage	...	...	300 volts.
*Max. Peak Positive Anode Voltage	...	...	+2.5 kV.
*Max. Peak Negative Anode Voltage	...	...	-500 volts.
Max. Anode Dissipation (frame output)	...	...	5 watts.
Max. Anode Dissipation (audio)	...	...	7 watts.
Max. Screen Grid Voltage	...	...	300 volts.
Max. Screen Grid Dissipation	...	...	1.8 watts.
Max. Screen Grid Dissipation (Speech and Music)	...	...	3.2 watts.
Max. Cathode Current	...	...	50 mA.
Max. V_{h-k}	...	...	100 volts.
Max. R_{g1-k} (fixed bias)	...	...	1.0 M Ω
Max. R_{g1-k} (cathode bias)	...	...	2.0 M Ω
Max. R_{h-k}	...	...	20 k Ω

TRIODE SECTION.

Max. Anode Supply Voltage	...	...	550 volts.
Max. Anode Voltage	...	...	300 volts.
*Max. Peak Positive Anode Voltage	...	...	600 volts.
Max. Anode Dissipation	...	...	1 watt.
Max. Cathode Current	...	...	15 mA.
†Max. Peak Cathode Current	...	...	200 mA.
Max. R_{gt-k} (Fixed bias)	...	...	1 M Ω
Max. R_{gt-k} (Cathode bias)	...	...	3 M Ω
Max. R_{gt-k} (Grid current bias)	...	...	22 M Ω
Max. V_{h-k}	...	...	100 volts.
Max. R_{h-k}	...	...	20 k Ω

CHARACTERISTICS.

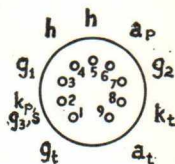
PENTODE SECTION.

Anode Voltage	...	100	200	250	volts.
Screen Grid Voltage	...	100	200	250	volts.
Suppressor Grid Voltage	...	0	0	0	volts.
Control Grid Voltage	...	-6	-16	-22.5	volts.
Anode Current	...	26	35	28	mA.
Screen Current	...	5	7	5.7	mA.
Mutual Conductance	...	6.8	6.4	5.0	mA/V.
Anode Impedance	...	15	20	25	k Ω
Inner μ	...	10	9.5	9.5	

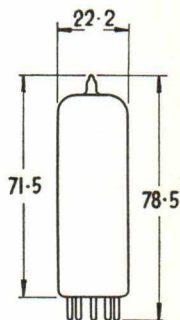
*Max. pulse duration 4% of one cycle, with a maximum of 800 μ sec.

†Max. pulse duration 200 μ sec.

ECL82



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	...	...	...	2.5 mA/V.
Anode Impedance	...	...	...	28 k Ω
Amplification Factor	...	...	...	70

TYPICAL OPERATION

PENTODE SECTION.

As Frame Output Valve.

In order to allow for spread of characteristics and deterioration during life, the frame timebase output circuit should be designed around the following values.

Peak Anode Current	...	...	...	85 mA.
Anode Voltage (V_a)	...	...	...	50 volts.
Screen Grid Voltage (V_{g2})	...	...	...	170 volts.

For an average new valve with V_a and V_{g2} as above and V_{g1} adjusted so that $I_g = +0.3 \mu A$. The following value applies:

Peak Anode Current	...	...	...	135 mA.
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As Audio Output Valve (Class A).

Anode Voltage	...	170	200	250	volts.
Screen Grid Voltage	...	170	200	*	volts.
Suppressor Grid Voltage	...	0	0	0	volts.
Control Grid Voltage	...	-12.5	-16	-22.5	volts.
Anode Current (no sig.)	...	35	35	28	mA.
Screen Grid Current (max. sig.)	...	6.5	7	5.5	mA.
Screen Current (max. sig.)	...	15	16	10.5	mA.
Anode Load	...	3.9	5.6	9.0	k Ω
Input Voltage	...	6	6.6	9.5	volts (rms.)
† Input Voltage	...	590	600	780	mV. (rms.)
‡ Power Output	...	3.3	3.5	3.4	watts.

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

Anode Voltage	...	200	250	volts.
Screen Grid Supply Voltage	...	200	250	volts.
** Screen Grid Feed Resistor	...	0	2.7	k Ω
Suppressor Grid Voltage	...	0	0	volts.
§ Cathode Bias Resistor	...	190	390	ohms.
Anode Current (Zero signal)	...	2 $\times$ 35	2 $\times$ 21.5	mA.
Anode Current (Max. signal)	...	2 $\times$ 39.5	2 $\times$ 27.5	mA.
Screen Grid Current (Zero signal)	...	2 $\times$ 7.0	2 $\times$ 4.2	mA.
Screen Current (Max. signal)	...	2 $\times$ 16.5	2 $\times$ 9.2	mA.
Input Voltage ($V_{in(g1-g1)}$)	...	25	38	volts (rms.)
Optimum Load (Anode to Anode)	...	5	10	k Ω
Power Output	...	9.8	9.0	watts.

*Screen Grid Feed Resistor 2200 ohms, undecoupled.

†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 screen grid feed resistor, undecoupled.

§Common Cathode Bias Resistor.

TYPICAL OPERATION.
TRIODE SECTION.

As A.F. Voltage Amplifier.

 Input Impedance = 220 k Ω .

V_b (V)	R_a (k Ω)	R_g (M Ω)	R_k (k Ω)	I_a (mA.)	R_{g1} (k Ω)	$\frac{V_{out}}{V_{in}}$	D_{tot} (%)
250	100	3.3	1.5	1.05	330	44	0.75
200	100	3.3	1.5	0.85	330	43	0.85
150	100	3.3	1.8	0.62	330	42	1.05
100	100	3.3	1.8	0.38	330	34	3.6
250	220	3.3	2.2	0.63	680	52	0.7
200	220	3.3	2.2	0.52	680	50	0.5
150	220	3.3	2.7	0.36	680	47	1.0
100	220	3.3	2.7	0.23	680	38	3.75
250	100	22	0	1.4	330	48	2.2
200	100	22	0	1.05	330	46	2.1
150	100	22	0	0.7	330	43	1.6
100	100	22	0	0.37	330	39	5.9
250	220	22	0	0.78	680	53	2.2
200	220	22	0	0.6	680	52	2.0
150	220	22	0	0.4	680	49	1.4
100	220	22	0	0.22	680	43	3.1

MICROPHONY AND HUM.

In circuits where an input voltage of less than 10 mV. produces an output of 50 mV. from the output stage, the triode section can be used without special precautions against Microphony and Hum.

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.

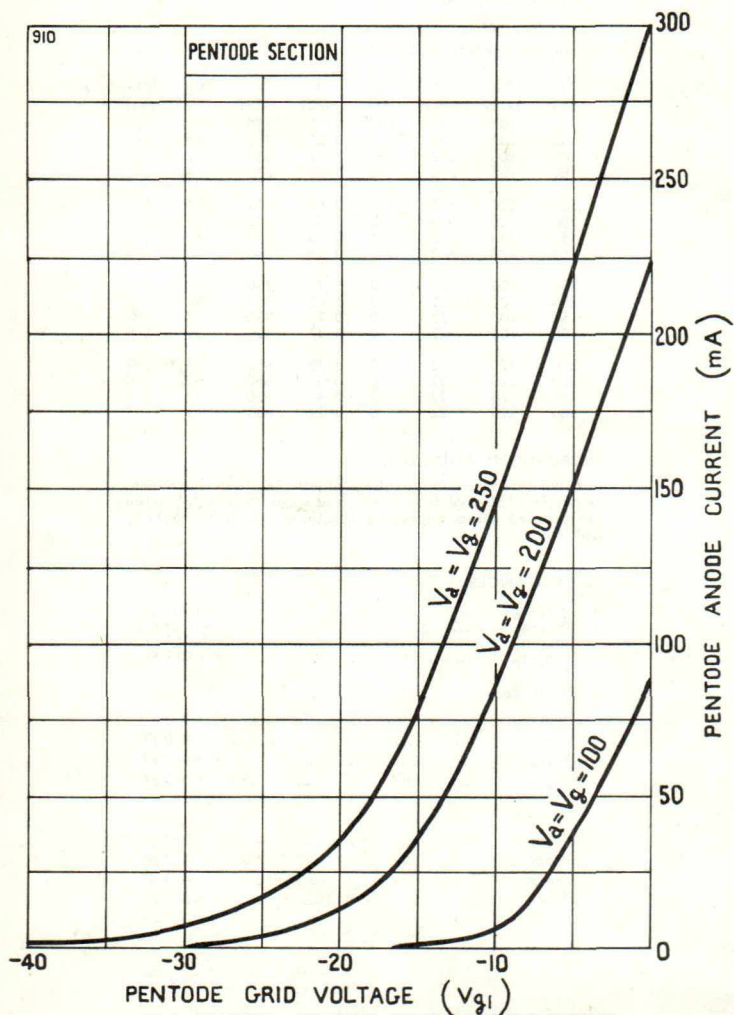
Triode.

C_{in}	...	...	...	...	...	2.9 pF.
C_{out}	...	...	...	...	...	4.3 pF.
C_{a-g}	...	...	...	...	...	4.4 pF.
C_{g-h}	...	...	...	...	...	<0.1 pF.

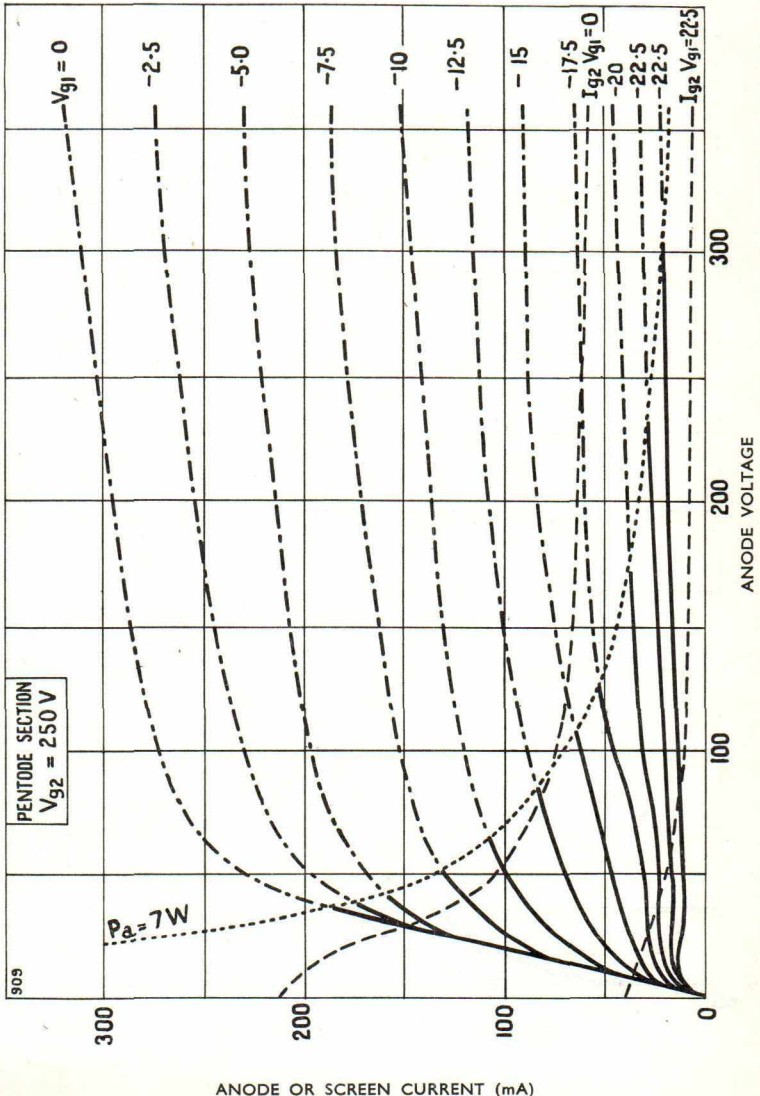
*Grid Resistor of the following valve.

†Measured with an input of 100 mV.

 ‡Measured at V_{out} = 10 volts.

TYPICAL ANODE CURRENT/GRID VOLTAGE CHARACTERISTICS
PENTODE SECTION

TYPICAL ANODE & SCREEN CURRENT/ANODE VOLTAGE CHARACTERISTICS
PENTODE SECTION



TYPICAL ANODE CURRENT/GRID VOLTAGE CHARACTERISTICS
TRIODE SECTION