

ELECTRONIC TUBE REFERENCE

1300M

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA
2 SECTIONS
CONSTRUCTION
CATHODERAY

High-sensitivity double-gun oscilloscope tube with a 13 cm faceplate and helical post-deflection acceleration. Two identical electron guns share horizontal deflection while retaining independent vertical systems for simultaneous instrument traces.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	6.3 V / 600 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Cathode Ray
No fixed ratings recorded.

1300M — Double-Gun Cathode Ray Tube

A high-sensitivity, double-gun cathode ray tube featuring helical post-deflection acceleration, designed for dual-trace oscilloscope applications requiring independent vertical deflection and a shared horizontal deflection system.

Overview

The **1300M** is a specialized double-gun cathode ray tube (CRT) designed by The M-O Valve Company Limited (GEC) for high-sensitivity oscilloscope applications. It features a 13 cm (5 1/4 inch) diameter faceplate and utilizes helical post-deflection acceleration (p.d.a.) to achieve bright, high-resolution traces.

The tube contains two identical, independent electron guns. These guns share a common horizontal (X) deflection system but utilize completely independent vertical (Y) deflection systems. This architecture

allows two separate waveforms to be displayed simultaneously on a single screen while sharing a common timebase. The 1300M is also associated with the designations Brimar SE5/2A and CV9337.

Screen and Phosphor Characteristics

The tube is normally supplied with GEC type 24 phosphor, designated as the **1324M** configuration. The optical and persistence characteristics of this standard screen are:

- **Fluorescence:** Green
- **Phosphorescence:** Green
- **Persistence:** 1 to 5 ms
- **EIA Phosphor Code:** P31
- **GEC Phosphor Code:** 24
- **Pro Electron Phosphor Code:** GH

Other screen phosphors can be supplied to special order to meet specific application requirements.

Physical Construction and Mounting

The 1300M is a precision-engineered glass-envelope tube with the following physical specifications:

- **Overall Length:** 365 ± 5 mm
- **Maximum Neck Diameter:** 64 mm
- **Minimum Useful Screen Diameter:** 120 mm
- **Overall Screen Diameter:** 132 ± 1.5 mm
- **Weight:** 1.25 kg (2 3/4 lb) without external shielding

Mounting Guidelines

The tube may be mounted in any physical position. However, it must not be supported by its electrical base alone. The recommended mounting method is to support the tube using a suitable rubber mask at the screen face and a clamp around the magnetic shield near the base. The socket must have sufficient freedom of movement to accommodate variations in overall tube length and base orientation tolerances.

Magnetic Shielding

Because the electron beams are highly sensitive to external magnetic disturbances, care must be taken not to expose the tube to stray magnetic fields during operation or storage. A suitable magnetic shield is required for proper operation.

Heater and Base Connections

The tube features an indirectly heated cathode system with a shared heater supply.

- **Heater Voltage:** 6.3 V
- **Total Heater Current:** 0.6 A or 1.2 A

The electrical interface uses a **B12F** base, supplemented by a side contact (CT8) for the high-voltage fourth anode (a_4) and a series of side pins arranged around the neck for deflection and correction signals.

B12F Base Pin Connections

Pin	Connection
1	Control grid, gun 2 (g_1'')
2	Cathode, gun 2 (k'')
3	Heater (h)
4	Heater (h)
5	Focus anode, gun 2 (a_2'')
6	Focus anode, gun 1 (a_2')
7	Control grid, gun 1 (g_1')
8	Cathode, gun 1 (k')
9	Trace registration electrode (g_2) [Common]
10	First anodes, guns 1 and 2 (a_1' and a_1'') [Internally connected]
11	Beam blanking electrode (g_3) [Common]
12	Internal Connection (IC)
CT8	Fourth anode (a_4) [Side contact]

Side Pin Connections

Viewed from the base and reading clockwise from base pin 2, the side pins are arranged as follows:

- x_1 : Horizontal deflection plate 1 (Common)
- x_2 : Horizontal deflection plate 2 (Common)
- a_3'' : Third anode, gun 2
- y_2'' : Vertical deflection plate 2, gun 2
- y_1'' : Vertical deflection plate 1, gun 2
- s_1 : Geometry correction electrode (Common)
- a_3' : Third anode, gun 1
- y_2' : Vertical deflection plate 2, gun 1
- y_1' : Vertical deflection plate 1, gun 1

Absolute Maximum Ratings

All operating potentials are specified with respect to the cathode unless otherwise noted. Operating the tube outside these absolute limits may cause permanent damage or severely degrade performance.

Parameter	Symbol	Minimum	Maximum	Unit
Fourth Anode Voltage	V_{a4}	3.0	8.0	kV
Third Anode Voltage	V_{a3}	0.8	2.0	kV
Ratio of Fourth to Third Anode Voltage	V_{a4}/V_{a3}	—	4.0	—
Focus Anode Voltage	V_{a2}	0	1.5	kV
First Anode Voltage	V_{a1}	0.8	2.0	kV
Control Grid Voltage	$-V_{g1}$	0	200	V
Y Plate to Third Anode Voltage	V_{y-a3}	—	200	V
X Plate to Third Anode Voltage	V_{x-a3}	—	500	V
Heater-to-Cathode Voltage	V_{h-k}	—	180	V
Geometry Correction Voltage	V_{s1}	0.8	2.0	kV
Trace Registration Voltage	$V_{[g2]}(/tubes/G2)$	0.8	2.0	kV
Beam Blanking Voltage	V_{g3}	0.8	2.0	kV
Heater-Cathode Circuit Resistance	R_{h-k}	—	1.5	MΩ

Parameter	Symbol	Minimum	Maximum	Unit
Y Deflector Plate Circuit Resistance	R_{y-a3}	—	0.25	MΩ
X Deflector Plate Circuit Resistance	R_{x-a3}	—	5.0	MΩ
Grid-to-Cathode Circuit Resistance	R_{g1-k}	—	1.5	MΩ

Typical Operating Conditions

Under typical operating conditions, all potentials are referenced to the cathode:

- **Fourth Anode Voltage (V_{a4}):** 4.0 kV
- **Third Anode Voltage (V_{a3}):** 1.0 kV
- **First Anode Voltage (V_{a1}):** 1.0 kV
- **Focus Anode Voltage (V_{a2}):** 290.0 V
- **Control Grid Voltage for Spot Cut-off ($-V_{g1}$):** 45.0 V
- **Nominal Trace Registration Voltage ($V_{[g2]}(/tubes/G2)$):** 1.0 kV
- **Nominal Beam Blanking Voltage (V_{g3}):** 1.0 kV
- **Nominal Geometry Correction Voltage (V_{s1}):** 1.0 kV
- **Maximum Y Deflection Factor (D_y):** 6.6 V/cm
- **Maximum X Deflection Factor (D_x):** 21.0 V/cm
- **Typical Line Width (Type 24 Phosphor):** 0.4 mm (measured using a shrinking raster at the geometric center of the faceplate)

Equipment Design Ranges

For design purposes, the following ranges express the performance limits per kilovolt of the reference anode voltages:

- **Focus Voltage (V_{a2}):** 200 to 400 V per kV of $V_{a1,3}$
- **Control Grid Voltage for Spot Cut-off ($-V_{g1}$):** 30 to 60 V per kV of V_{a1}
- **Blanking Voltage (V_{g3}):** Maximum 50 V per kV of V_{a1}
- **Y Deflection Factor (D_y at $V_{a4}/V_{a3} = 4$):** 5.4 to 6.6 V/cm per kV of V_{a3}
- **X Deflection Factor (D_x at $V_{a4}/V_{a3} = 4$):** 17 to 21 V/cm per kV of V_{a3}
- **Post-Deflection Acceleration Spiral Current:** Maximum 10 μA per kV of V_{a3-a4}

Display and Deflection Characteristics

Scanned Area

- **X Axis:** 10 cm
- **Y Axis (each gun):** 6 cm
- **Y Axis (overlap):** 4 cm

The center of the 10 x 4 cm overlap rectangle falls within a circle of 3 mm radius centered on the geometric center of the faceplate.

Deflection Linearity and Spot Position

The deflection factor for any deflection less than 75% of the useful scan does not differ from the deflection factor at 25% of the useful scan by more than 2%.

When focused and undeflected, the spots of both guns fall within two 10 mm diameter circles. The centers of these circles lie on the geometric Y-axis, positioned at ± 10 mm from the geometric center of the faceplate.

Orientation

Looking directly at the screen with pins 9 and 10 of the base positioned uppermost, a positive potential applied to the x_1 plate deflects the beam to the left. A positive potential applied to y'_1 or y''_1 deflects the corresponding beam upwards.

Interelectrode Capacitances

Capacitance values measured for each gun assembly are as follows:

- **Cathode to all other electrodes:** 5.5 pF
- **Control grid to all other electrodes:** 8.5 pF
- **Blanking plate to all other electrodes (both guns):** 12.0 pF
- **Deflector plates y_1 to y_2 :** 2.5 pF
- **Deflector plates y_1 to all electrodes except y_2 :** 4.0 pF
- **Deflector plates y_2 to all electrodes except y_1 :** 4.0 pF
- **Deflector plates x_1 to x_2 :** 4.0 pF
- **Deflector plates x_1 to all electrodes except x_2 :** 4.0 pF
- **Deflector plates x_2 to all electrodes except x_1 :** 4.0 pF

Beam Control and Correction Adjustments

Beam Blanking

A potential of 50 V per kV of V_{a1} (preferably negative) relative to a_1 , when applied to the blanking electrode g_3 , completely cuts off both electron beams. The blanking electrode g_3 must not be used as a brightness control.

Superimposition of Traces

The vertical traces of the two guns can be superimposed along the vertical diameter by adjusting the potential of the trace registration electrode g_2 relative to a_1 . This adjustment typically requires a range of ± 10 V per kV of V_{a1} .

To align and superimpose the vertical traces at the extreme limits of horizontal (X) deflection, the relative potentials of the two cathodes can be adjusted. Circuit designs should provide for a potential difference of up to 40 V per kV of V_{a3} between the two cathodes for this purpose.

Astigmatism Correction

Astigmatism can be corrected by adjusting the potential on the third anode a_3 relative to the mean potential of the Y deflection plates. A range of adjustment of ± 30 V per kV of V_{a3} should be provided.

Pattern Correction

Barrel or pincushion distortion is minimized by applying an appropriate potential to the geometry correction electrode s_1 relative to the mean potential of the X deflection plates. The circuit should allow an adjustment range of -30 to +30 V per kV of V_{a3} .

These correction potentials assume that the mean potentials of the X and Y plates are equal. If a difference between the X and Y plate mean potentials is unavoidable in a specific application, this difference must be kept to an absolute minimum.

Pattern Distortion Limits

With pattern correction properly applied, the edges of a test raster for each beam will fall entirely between two concentric rectangles measuring 102 x 51 mm and 100 x 50 mm. Under these conditions, the angle between the X and Y deflection axes for each beam is $90^\circ \pm 1^\circ$. When the beams are superimposed, the angle between their respective Y axes is $0^\circ \pm 1.5^\circ$.

Technical Summary

The **1300M** is a specialized 13 cm double-gun cathode ray tube featuring helical post-deflection acceleration, designed for high-sensitivity dual-trace oscilloscope applications. Operating with a 6.3 V heater and a B12F base, it provides independent vertical deflection systems alongside a shared horizontal deflection system. With a maximum fourth anode rating of 8.0 kV and precise correction electrodes for

astigmatism, geometry, and trace registration, the 1300M delivers highly accurate, low-distortion dual-trace displays with a typical line width of 0.4 mm.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1968 General Electric Co

Published test conditions and operating points. Values on this page are preserved as reported by this source.

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Section 1 · Cathode Ray

EQUIPMENTDESIGNRANGE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Focus Voltage Maximum	400 V	—
Focus Voltage Minimum	200 V	—
Y Deflection Factor Maximum	6.6 V/cm/kV	—

TUBE TINKER

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