ELECTRONIC TUBE REFERENCE

1000H

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA
2 SECTIONS
CONSTRUCTION
CATHODERAY

Electrostatically deflected cathode-ray display tube with post-acceleration capability to 8 kV, intended for displaying electrical waveforms with separate horizontal and vertical deflection-plate drive.

General characteristics

BASE DESIGNATION	B12F	**BASE PINS**	12
NOMINAL HEATER	6.3 V / 1.2 A	**PARALLEL HEATER**	— / —
HEATING	Indirect	**SERIES OPERATION**	Not specified
CATHODE ARRANGEMENT	Separate cathodes	**SECTION CONSTRUCTION**	Similar

Section ratings

SECTION1 Cathode Ray

MAXIMUM PLATE VOLTAGE	8000 V

Double-gun CRT; common published ratings represented once.

1000H — Double-Gun Oscilloscope Tube

A 4-inch (10 cm) high-sensitivity double-gun cathode ray tube featuring helical post-deflection acceleration, designed for general-purpose oscilloscopes displaying two independent signals on a common time base.

Overview

The **1000H** is a specialized double-gun cathode ray tube with a 4-inch (10 cm) screen diameter. It is designed for general-purpose oscilloscope applications where two independent signals must be displayed simultaneously on a single, common time base. The tube incorporates helical post-deflection acceleration to achieve high trace brightness while maintaining high deflection sensitivity. Manufactured by The M-O

Valve Co. Ltd. (Brook Green Works, London), the 1000H is available with either a standard or an aluminised screen, with the latter offering enhanced trace brightness.

Screen and Phosphor Options

The 1000H can be supplied with several screen phosphor options to suit different visual and photographic recording requirements. The standard configurations include:

- **P31 (G.E.C. Phosphor Code 24):** Green fluorescence and green phosphorescence with a short persistence of 1 to 5 milliseconds.
- **P7 (G.E.C. Phosphor Code 46):** White fluorescence and yellow-green phosphorescence with a long persistence of 10 to 60 seconds.
- **P11 (G.E.C. Phosphor Code 08):** Blue fluorescence and blue phosphorescence with a short persistence of 1 to 5 milliseconds.

For tubes equipped with an aluminised screen, the G.E.C. phosphor code is increased by adding 50 to the standard code (for example, code 74 represents an aluminised P31 screen).

Physical Dimensions, Mounting, and Shielding

The physical construction of the 1000H is designed for precise alignment and mechanical stability within oscilloscope chassis:

- **Maximum Diameter:** 106 ± 2 mm
- **Overall Length:** 365 ± 5 mm
- **Minimum Useful Screen Diameter:** 9.5 cm (95 mm)
- **Weight:** Approximately 2.25 lb (1 kg)

Mounting and Support

The tube must not be supported by its base alone. It should be secured using a suitable rubber mask at the screen and a clamp around the magnetic shield near the base. Compatible rubber masks are produced by the Standard Insulator Co. Ltd.

Magnetic Shielding

To prevent electromagnetic interference from distorting the electron beams, a shield made of high-permeability material must be used. The thickness of this shield is determined by the ambient magnetic field at the tube's operating position, and the shield itself must be securely earthed. Recommended suppliers for suitable shields include Oliver & Randall Co. Ltd., Telcon Metals Ltd., and Magnetic & Electrical Alloys Ltd.

Orientation

When looking directly at the screen with pins 9 and 10 of the base positioned uppermost, a positive potential applied to the $x1$ deflection plate will deflect the spot to the left, and a positive potential applied to the $y1$ deflection plate will deflect the spot upwards.

Heater and Electrical Connections

The 1000H utilizes an indirectly heated cathode system with a common heater supply for both electron guns.

Heater Parameter	Value
Heater Voltage (V_h)	6.3 V
Heater Current (I_h)	1.2 A (total)

Base and Pin Connections

The tube uses a **B12F** base. The pin connections, viewed from the underside of the base, are assigned as follows:

Pin Number	Connection
1	Grid of second gun (g'')
2	Cathode of second gun (k'')
3	Heater (h)
4	Heater (h)
5	Anode 2 of second gun (a_2'')
6	Anode 1 of first and second guns (a_1' and a_1'')
7	Trace registration
8	Anode 2 of first gun (a_2')
9	Beam blanking
10	No Connection (NC)
11	Cathode of first gun (k')
12	Grid of first gun (g')

Side Contact and Side Pins

In addition to the B12F base, the tube features a **CT8** side contact for the post-deflection accelerator anode ($a4$). The position of this CT8 side contact relative to the bulb contour conforms to BS448:1953, section 6/18.

There are also several side pins arranged around the neck of the tube. Viewed clockwise from base pin No. 3, these side pin connections are:

1. $x1$ (Deflection plate)
2. $x2$ (Deflection plate)
3. $a3''$ (Anode 3 of second gun)
4. $y2''$ (Deflection plate)
5. $y1''$ (Deflection plate)
6. IS (Isolation shield common)
7. $y2'$ (Deflection plate)
8. $y1'$ (Deflection plate)
9. $a3'$ (Anode 3 of first gun)

For electrical connections, suitable B12F sockets are available from Carr Fastener Co. Ltd. (Type 77/842). Connectors for the CT8 side contact and the side pins are also available from Carr Fastener Co. Ltd. (Type 77/699 and 75/602, respectively).

Interelectrode Capacitances

The internal capacitances of the tube electrodes are detailed below:

Capacitance Parameter	Value
Cathode to all other electrodes (c_{k-all})	5.0 pF
Grid to all other electrodes (c_{g-all})	8.3 pF
Deflection plate $x1$ to $x2$ (c_{x1-x2})	3.7 pF
Deflection plate $y1$ to $y2$ (c_{y1-y2})	2.0 pF
Deflection plate $x2$ to all except $x1$ (c_{x2-all} less $x1$)	3.7 pF
Deflection plate $x1$ to all except $x2$ (c_{x1-all} less $x2$)	3.7 pF
Deflection plate $y1$ to all except $y2$ (c_{y1-all} less $y2$)	3.3 pF
Deflection plate $y2$ to all except $y1$ (c_{y2-all} less $y1$)	3.3 pF
Beam blanking electrode (c_{beam} blanking)	12.0 pF

Ratings (Design Centre System)

The maximum and minimum ratings for the 1000H are established under the Design Centre rating system. Minimum voltage limits differ depending on whether the tube is equipped with an aluminised or

non-aluminised screen.

Parameter	Maximum Rating	Minimum Rating (Aluminised)	Minimum Rating (Non-Aluminised)
Anode 4 Voltage (V_{a4})	8.0 kV	4.0 kV	3.0 kV
Anode 3 Voltage (V_{a3})	2.0 kV	1.0 kV	0.8 kV
Anode 2 Voltage (V_{a2})	1.5 kV	—	—
Anode 1 Voltage (V_{a1})	2.0 kV	1.0 kV	0.8 kV
Modulator Grid Voltage ($-V_g$)	200 V	0 V	0 V
Peak $x1, x2$ to Anode 3 Voltage ($V_{x1,x2-a3(pk)}$)	500 V	—	—
Peak $y1, y2$ to Anode 3 Voltage ($V_{y1,y2-a3(pk)}$)	200 V	—	—
Heater to Cathode Voltage (V_{h-k})	180 V	—	—
Isolation Shield Voltage ($V_{isolation\ \text{shield}}$)	2.0 kV	1.0 kV	0.8 kV
Beam Blanking Voltage ($V_{beam\ \text{blanking}}$)	2.0 kV	1.0 kV	0.8 kV
Trace Registration Voltage ($V_{trace\ \text{registration}}$)	2.0 kV	1.0 kV	0.8 kV

- **Modulator Voltage Limit:** The direct current (d.c.) value of the modulator grid voltage must never become positive with respect to the cathode.
- **Post Accelerator Ratio:** The ratio of the post-deflection accelerator voltage to the third anode voltage (V_{a4}/V_{a3}) must not exceed a maximum of 4:1.
- **Maximum External Grid-to-Cathode Resistance (R_{g-k}):** 1.5 MΩ.
- **Maximum External Deflection Plate-to-Anode 3 Resistance:** R_{x-a3} is 5 MΩ; R_{y-a3} is 0.25 MΩ.

Typical Operating Conditions

Under typical operating conditions, the 1000H is configured with the following electrical parameters:

- **Anode 4 Voltage (V_{a4}):** 4.5 kV
- **Anode 3 Voltage (V_{a3}):** 1.2 kV (Individual adjustment of the $a3$ potential is recommended for precise astigmatism control)
- **Anode 2 Voltage (V_{a2} for focus):** 360 V
- **Anode 1 Voltage (V_{a1}):** 1.2 kV
- **Modulator Grid Voltage ($-V_g$ for cut-off):** 54 V
- **Isolation Shield Voltage:** 1.2 kV
- **Line Width:** 0.35 mm
- **Deflection Sensitivity (S_x):** 19.5 V/cm
- **Deflection Sensitivity (S_y):** 7.25 V/cm

Note on Distortion Control: The inner end of the post-accelerator helix and the isolation shield are connected together internally. Applying the correct potentials to these electrodes minimises both barrel and pin-cushion distortion effects.

Electrical Characteristics and Performance Limits

The operating characteristics of the 1000H scale with the applied anode voltages. The following ranges define the tube's performance per kilovolt of anode potential:

- **Focusing Anode Voltage (V_{a2}):** 200 to 400 V per $kV_{a1,3}$
- **Grid Cut-off Voltage ($-V_g$):** 30 to 60 V per kV_{a1}
- **Horizontal Deflection Factor (S_x):** 15.0 to 17.5 V/cm per kV_{a3}
- **Vertical Deflection Factor (S_y):** 5.4 to 6.67 V/cm per kV_{a3}
- **Isolation Shield Voltage:** 967 to 1017 V per kV_{a3}
- **Post Accelerator Helix Resistance:** 50 to 350 MΩ
- **Heater-to-Cathode Insulation Resistance (r_{h-k}):** Minimum of 1.5 MΩ (measured with a heater-to-cathode voltage of ±125 V)
- **Grid-to-Cathode Insulation Resistance (r_{g-k}):** Minimum of 10 MΩ

Deflection and Alignment Tolerances

- **Spot Position:** When undeflected, the spots from both guns will lie within two circles of 4 mm radius, the centres of which are located on the y-axis at ±8 mm from the physical centre of the tube face.
- **Minimum Scan Amplitude:**
  - Horizontal (x): 8 cm
  - Vertical (y, each gun): 6 cm
  - Vertical (y, overlap): 4 cm
- **Overlap Geometry:** The centre of the 8 cm x 4 cm overlap rectangle falls within a circle of 3 mm radius from the physical centre of the tube face.
- **Deflection Axis Alignment:** The angle between the deflection axes of each individual gun is $90^\circ \pm \frac{1}{2}^\circ$. The alignment error between the deflection axes of the two guns is restricted to a maximum of

□rac{1}{2}^∘ for both the x and y axes.

- **Deflection Linearity:** The deflection factor for a deflection of less than 75% of the useful scan will not differ from the deflection factor at 25% of the useful scan by more than 2%.
- **Pattern Distortion:** At a post-accelerator ratio of $V_{a4}/V_{a3} = 4$, the edges of a test raster will lie entirely between two concentric rectangles measuring 70 mm x 40 mm and 68.6 mm x 39 mm.

Operational Adjustments and Features

Trace Superimposition

The vertical traces of the two independent guns can be superimposed along the vertical diameter of the screen. This alignment is achieved by adjusting the relative electrical potentials between the trace registration electrode and the first anode ($a1$).

Y-Trace Alignment at Extreme Deflection

An adjustment of the position of the vertical (y) traces at extreme horizontal (x) deflection can be performed by adjusting the relative cathode potentials of the two guns. A maximum potential difference of $20\ \mathrm{V}/kV_{a3}$ is required to achieve proper alignment.

Flyback Suppression (Re-trace Blanking)

The 1000H includes a dedicated beam blanking electrode. Applying a potential of $50\ \mathrm{V}/kV_{a1}$ negative with respect to a_1 to this electrode will completely cut off both electron beams, facilitating flyback suppression. This electrode is designed strictly for blanking purposes and must not be used as a trace brightness control.

Deflector Plate Operation

The deflector plates are designed for symmetrical operation. Because the vertical (y) plates may intercept a portion of the electron beam during operation, a low-impedance deflection drive circuit should be employed to maintain signal integrity and linearity.

Technical Summary

The **1000H** is a highly specialized, 4-inch double-gun cathode ray tube featuring helical post-deflection acceleration and a B12F base. With its dual independent gun structure, it is optimized for displaying two distinct signals on a shared time base. Operating with a 6.3 V, 1.2 A heater, the tube supports post-deflection accelerator voltages up to 8.0 kV and provides high deflection sensitivity ($S_x \approx 19.5\ \mathrm{V/cm}$, $S_y \approx 7.25\ \mathrm{V/cm}$ under typical conditions). Its design incorporates advanced features such as an internal isolation shield to minimise barrel and pin-cushion distortion, dedicated trace registration and beam blanking electrodes, and adjustable cathode potentials for precise trace alignment.

SOURCE OPERATING CONDITIONS

1968 General Electric Co

SOURCE PDF

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

1968 GENERAL ELECTRIC CO

Section 1 · Cathode Ray

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
PostAcceleratorVoltageMaximum	**8 kV**	—
DeflectionPlateXPeakVoltage	**500 V**	—
DeflectionPlateYPeakVoltage	**200 V**	—

TUBE TINKER

An independent reference for electronic tubes, vacuum tubes, and their source documents.

Catalog Tube types Full books Blog Feedback & corrections

© 2026 Tube Tinker