



ELECTRONIC TUBE REFERENCE

1400C

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Rectangular flat-faced single-gun oscilloscope CRT with spiral post-deflection acceleration and an aluminum-backed screen. Its approximately 8×10 cm display area is intended for bright, sharply defined oscillographic instrument traces.

GENERAL CHARACTERISTICS

BASE DESIGNATION	B12F	BASE PINS	12
NOMINAL HEATER	6.3 V / 300 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 0 Cathode Ray	
MAXIMUM PLATE VOLTAGE	7000 V
Fourth anode absolute maximum 7.0 kV.	

1400C — Flat-Faced Oscilloscope Tube

The **1400C** is an 8×10 cm flat-faced, single-gun cathode-ray oscilloscope tube designed for precision display applications. Manufactured by The M-O Valve Co. Ltd. (a member of the G.E.C. group), this tube features a spiral post-deflection accelerator (p.d.a.), a thin aluminum-backed screen, and direct side-pin connections for the deflection plates to minimize input capacitance and optimize high-frequency performance.

Physical Construction and Screen Characteristics

The 1400C is built with a rectangular faceplate and a specialized envelope designed to facilitate precise waveform measurement. The physical dimensions and screen properties are tightly controlled:

- **Overall Length:** 365 ± 5 mm
- **Faceplate Dimensions:** 125.0 ± 1.5 mm (width) $\times$ 100.0 ± 1.5 mm (height)
- **Faceplate Radius:** 508 mm (front surface), with a corner radius of 19 mm and a diagonal of 145 mm
- **Maximum Neck Diameter:** 60 mm
- **Maximum Cone Diameter:** 90 mm
- **Weight:** Approximately 1.0 kg

Screen and Phosphor Specifications

The tube utilizes a thin aluminum-backed screen that provides high brightness and prevents charge buildup. The standard phosphor configuration is G.E.C. type 74, which corresponds to the E.I.A. phosphor code **P31**.

Parameter	Specification
Fluorescence	Green
Phosphorescence	Green
Persistence	1-5 ms
Line Width (Typical)	0.7 mm (measured at the geometric center with a 5 μ A beam current)

Mounting and Handling

The 1400C can be mounted in any physical orientation. However, it must not be supported by its electrical base alone. The recommended mounting method is to hold the tube in a suitable rubber mask at the screen end and secure it with a clamp around the magnetic shield near the base. The mounting socket must have sufficient freedom of movement to accommodate tolerances in overall length and base orientation.

Because the electron beam is highly sensitive to external disturbances, the tube must not be exposed to strong magnetic fields during operation or storage.

Electrical Connections and Base Configuration

The tube utilizes a **B12F** base (conforming to BS 448) for primary gun connections, a **CT8** side contact for the final post-deflection accelerator anode (*a4*), and four dedicated side pins on the neck for the deflection plates.

Base Pin Assignments (B12F)

The base pins provide connections to the heater, cathode, control grid, and focusing anodes:

Pin	Connection	Description
1	$g1$	Control grid
2	k	Cathode
3	h	Heater
4	h	Heater
5	$a2$	Focusing anode
6	$a1$	First anode
7	$g2$	Blanking electrode
8	$a3$	Astigmatism/interplate shield anode
9	IC	Internal connection (do not connect)
10	IC	Internal connection (do not connect)
11	s	Pattern correction electrode
12	IC	Internal connection (do not connect)

Side Connections and Orientation

The final anode ($a4$) is connected via a CT8 side contact (conforming to BS 448), positioned such that its center lies within 2 mm of the major axis of the faceplate.

The deflection plates are connected via four side pins located on the neck. When viewed from the base and reading clockwise from base pin 9, the side pins are arranged in the sequence: $y1$, $y2$, $x1$, $x2$. These pins are contained within a 92° zone, with a minimum spacing of 6 mm between adjacent pins, a pin diameter of 1 mm, and a minimum pin length of 3.0 mm.

When looking directly at the screen with base pins 6 and 7 positioned uppermost:

- A positive potential applied to $x1$ deflects the beam to the left.
- A positive potential applied to $y1$ deflects the beam upwards.

Accessories

To facilitate proper electrical and mechanical installation, the following accessories are specified:

- **Base Socket:** Carr Fastener Co. Ltd. Type No. 77/842
- **CT8 Connector:** Carr Fastener Co. Ltd. Type No. 77/699

- **Magnetic Shield:** Magnetic Shields Ltd.

Heater and Absolute Maximum Ratings

The 1400C features an indirectly heated cathode. All voltage ratings are referenced to the cathode unless otherwise specified.

Parameter	Rating Type	Minimum	Maximum	Unit
Heater Voltage (V_h)	Nominal	—	6.3	V
Heater Current (I_h)	Nominal	—	0.3	A
Final Anode Voltage (V_{a4})	Absolute	3.5	7.0	kV
Interplate Shield Voltage (V_{a3})	Absolute	0.6	1.7	kV
Voltage Ratio (V_{a4}/V_{a3})	Absolute	—	4.0	Ratio
Focusing Anode Voltage (V_{a2})	Absolute	0	1.0	kV
First Anode Voltage (V_{a1})	Absolute	0.6	1.75	kV
Control Grid Voltage ($-V_{g1}$)	Absolute	1.0	200	V
Blanking Grid to First Anode Voltage (V_{g2-a1})	Absolute	-200	+200	V
Y-Plate to Anode 3 Voltage (V_{y-a3})	Absolute	—	500	V
X-Plate to Anode 3 Voltage (V_{x-a3})	Absolute	—	500	V
Heater-to-Cathode Voltage (V_{h-k})	Absolute	—	± 150	V

Parameter	Rating Type	Minimum	Maximum	Unit
Grid 1 to Cathode Resistance (R_{g1-k})	Absolute	—	1.5	MΩ
Y-Plate to Anode 3 Resistance (R_{y-a3})	Absolute	—	100	kΩ
X-Plate to Anode 3 Resistance (R_{x-a3})	Absolute	—	500	kΩ

Operating Characteristics and Adjustments

Under typical operating conditions, the tube is configured with a post-deflection acceleration voltage of 4 kV and an interplate shield voltage of 1 kV.

Typical Operating Point

- V_{a4} (p.d.a. voltage): 4 kV
- V_{a3} : 1 kV
- V_{a2} (focus): 175 to 400 V
- V_{a1} : 1 kV
- $V_{[g2]}$ (/tubes/G2) (nominal): 1 kV
- V_s (nominal): 1 kV
- $-V_{g1}$ (for cut-off): 35 to 65 V
- D_y (maximum deflection factor): 8.5 V/cm
- D_x (maximum deflection factor): 15.5 V/cm

Equipment Design Ranges

For circuit design, the required voltage ranges are scaled relative to the anode voltages:

- **Focusing Voltage (V_{a2}):** 175 to 400 V per kV of V_{a3}
- **Cut-off Voltage ($-V_{g1}$):** 35 to 65 V per kV of V_{a1}
- **Y Deflection Factor (D_y):** 6.9 to 8.5 V/cm per kV of V_{a3} (at $V_{a4}/V_{a3} = 4$)
- **X Deflection Factor (D_x):** 12.7 to 15.5 V/cm per kV of V_{a3} (at $V_{a4}/V_{a3} = 4$)

Correction and Alignment Adjustments

- **Astigmatism Correction:** Astigmatism can be corrected by adjusting the potential on $a3$ relative to the mean potential of the y-deflection plates. A design adjustment range of ± 50 V per kV of V_{a3} should

be provided.

- **Pattern Correction:** Barrel or pincushion distortion is minimized by applying an appropriate potential to the pattern correction electrode (*s*) with respect to the mean potential of the x-deflection plates. The design range for this adjustment is ± 50 V per kV of V_{a3} . These correction ranges assume that the mean potentials of the x and y plates are equal; any difference between them should be kept to a minimum.
- **Axis Alignment:** The electrical x-axis of the tube lies within $\pm 5^\circ$ of the major axis of the faceplate. It can be precisely aligned using an axial coil placed around the cone of the tube. The maximum coil drive required for alignment is calculated as: Maximum Ampere-Turns = $12\sqrt{V_{a4}}$ where V_{a4} is expressed in kilovolts. For a typical V_{a4} of 4 kV, this requires a maximum of 24 ampere-turns.
- **Beam Blanking:** Complete beam cut-off is achieved by applying a positive potential of $+60$ V/kV $_{a1}$ with respect to a_1 to the blanking electrode (g_2) at a cathode current of 500 μ A. The blanking electrode g_2 is designed solely for beam blanking and must not be used as a brightness control.

Display and Deflection Performance

The 1400C provides a highly linear and well-defined display area with minimal distortion.

Scanned Area and Spot Position

- **Minimum Scanned Area:** 10 cm (horizontal) $\times$ 8 cm (vertical). This scanned area is centered within 3 mm of the major and minor axes of the faceplate.
- **Undelected Spot Position:** The focused, undelected spot falls within an 8 $\times$ 10 mm rectangle centered at the geometric center of the faceplate, with the longer dimension parallel to the x-axis.
- **Deflection Linearity:** The deflection factor for any deflection of less than 75% of the useful scan does not differ from the deflection factor at 25% of the scan by more than 2%.
- **Pattern Distortion:** With pattern correction applied, the edges of a test raster will fall entirely between two concentric rectangles measuring 100 $\times$ 80 mm and 98 $\times$ 77.5 mm. The angle between the x and y deflection axes is $90^\circ \pm 1^\circ$.

Interelectrode Capacitances

The typical capacitances of the tube electrodes are as follows:

Capacitance	Value
C_{k-all}	4.4 pF
C_{g1-all}	9.3 pF
C_{g2-all}	10.0 pF
C_{y1-y2}	1.2 pF
$C_{y1-all \text{ less } y2}$	2.7 pF

Capacitance	Value
C_{y2} —all less $y1$	3.0 pF
C_{x1-x2}	2.1 pF
C_{x1} —all less $x2$	4.1 pF
C_{x2} —all less $x1$	4.1 pF

Technical Summary

The **1400C** is a high-performance, flat-faced, single-gun oscilloscope tube featuring an 8 × 10 cm display area, a spiral post-deflection accelerator, and a P31 green phosphor screen. Operating with a typical final anode voltage of 4 kV and an interplate shield voltage of 1 kV, it provides deflection factors of 8.5 V/cm (Y-axis) and 15.5 V/cm (X-axis). The tube incorporates dedicated electrodes for astigmatism correction, pattern correction, and beam blanking, alongside an external axis alignment coil capability. Housed in a B12F base with direct side-pin connections for the deflection plates, the 1400C is optimized for precise, low-distortion waveform visualization in professional test and measurement equipment.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

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

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Section 0 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Third Anode Voltage Maximum	1700 V	—
Typical Fourth Anode Voltage	4000 V	TypicalOperation

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