

ELECTRONIC TUBE REFERENCE

1202HM

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Twelve-inch Ferranti radar, monitor, and display CRT with electrostatic focusing and magnetic deflection. Its orange long-persistence fluoride screen preserves displayed information, while the third anode operates in the roughly 9-13 kV range.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	4 V / 900 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Cathode Ray	
MAXIMUM PLATE VOLTAGE	13000 V
Published Ferranti ratings, capacitances, and typical operating data promoted where applicable; additional electrical values retained as parameters.	

1202HM — Electrostatic Focus Radar Display Tube

The **1202HM** (also written as **12/02 HM**, and formerly designated as the **A12/02** or **CV2162**) is a 12-inch diameter, flat-faced cathode ray tube designed specifically for radar display applications. Manufactured by Ferranti, this specialized tube features electrostatic focusing combined with magnetic deflection. It is equipped with a metal-backed, long-persistence fluoride screen designed to retain radar targets on the display.

Screen and Display Characteristics

The screen of the 1202HM is engineered for long-persistence radar display applications:

- **Fluorescence:** Orange
- **Afterglow:** Orange
- **Persistence:** Long
- **Screen Type:** Metal-backed fluoride

Due to the nature of the fluoride screen material, the phosphor is highly susceptible to burning if subjected to stationary or slow-moving electron beams. To prevent permanent damage, the tube must not be operated under stationary or slow-scan conditions, even when the beam current is kept at a low level.

Physical Specifications and Dimensions

The 1202HM is a physically robust tube with precise mechanical tolerances to ensure proper alignment within radar consoles.

Mechanical Dimensions

- **Maximum Overall Length:** 545 mm (with a nominal dimension of 535 ± 10 mm)
- **Maximum Diameter:** 306.5 mm (with a nominal dimension of 305 mm and a tolerance of +1.5 mm to -2.0 mm)
- **Neck Diameter:** 35 ± 2 mm
- **Faceplate Curvature:** 1000 mm spherical radius
- **Anode Cap Position:** The CT.1 anode cap is positioned on the side of the bulb and can lie within 15° on either side of the center line.
- **Reference Positions:** The distance from the tube face to the side cap is 180 ± 5 mm. The distance from the 36 ring gauge position (reference line) to the tube face is 272 ± 2.5 mm.

Base and Pin Connections

The tube utilizes an **International Octal** base. The pin assignments, viewed from the underside of the base, are as follows:

Pin Number	Connection
Pin 1	No Connection
Pin 2	1st Anode (a_1)
Pin 3	2nd Anode (a_2)
Pin 4	No Connection
Pin 5	Grid (g)
Pin 6	Cathode (k)

Pin Number	Connection
Pin 7	Heater (h)
Pin 8	Heater (h)
Side Cap	3rd Anode (a_3)

Heater and Electrical Ratings

The 1202HM operates with an indirectly heated cathode. The electrical ratings define the absolute limits and typical operating conditions required to maintain focus and prevent electrical breakdown.

Heater Characteristics

- **Heater Voltage:** 4.0 V
- **Heater Current:** 0.9 A

Maximum and Minimum Ratings

- **Maximum 3rd Anode Voltage (V_{a3}):** 13 kV
- **Minimum 3rd Anode Voltage (V_{a3}):** 9 kV
- **Maximum 1st Anode Voltage (V_{a1}):** 2.2 kV
- **Minimum 1st Anode Voltage (V_{a1}):** 1.5 kV
- **Maximum Heater-to-Cathode Voltage (V_{h-k}):** 150 V

A critical operating constraint governs the relationship between the first and second anodes: the voltage applied to the first anode (a_1) must always be at least 50 volts positive with respect to the second anode (a_2).

Interelectrode Capacitances

- **Cathode to all other electrodes (C_{k-all}):** < 10.0 pF
- **Grid to cathode (C_{g-k}):** < 10.0 pF

Typical Operation and Characteristics

Under typical operating conditions, the 1202HM is configured with the following parameters:

- **3rd Anode Voltage (V_{a3}):** 12 kV
- **1st Anode Voltage (V_{a1}):** 2.1 kV
- **2nd Anode Voltage for Focus (V_{a2}):** 1.85 to 2.05 kV
- **Grid Voltage for Visual Cut-off (V_g):** -70 to -120 V
- **Average Grid Drive (for $I_b = 50 \mu\text{A}$):** 22 V

Analysis of Characteristic Curves

The operational behavior of the 1202HM is characterized by the relationship between grid voltage, first anode voltage, and the resulting beam current.

Beam Current vs. Grid Voltage

The beam current (I_b) is controlled by the negative bias applied to the grid. For a 3rd anode voltage (V_{a3}) operating anywhere in the range of 9 to 13 kV, the beam current curves are primarily determined by the first anode voltage (V_{a1}):

- At higher first anode voltages (such as $V_{a1} = 2.2$ kV), the grid voltage required to cut off the beam is more negative, extending toward -100 V to -120 V.
- At lower first anode voltages (such as $V_{a1} = 1.8$ kV), the cut-off point shifts to a less negative value, typically around -80 V.
- As the grid voltage is made less negative and approaches 0 V, the beam current rises steeply, reaching up to 250 μ A depending on the specific V_{a1} bias.

Grid Cut-off Voltage Limits

The relationship between the first anode voltage (V_{a1}) and the grid voltage required for visual cut-off is non-linear and falls within a defined tolerance band:

- At the minimum rated V_{a1} of 1.5 kV, the visual cut-off voltage ranges from approximately -50 V (lower limit) to -90 V (upper limit).
- At the maximum rated V_{a1} of 2.2 kV, the visual cut-off voltage ranges from approximately -75 V (lower limit) to -125 V (upper limit).
- This tolerance region demonstrates that the cut-off voltage becomes progressively more negative as the first anode voltage is increased, requiring a wider grid swing to control the beam.

Technical Summary

The **1202HM** is a specialized **12-inch electrostatic-focus, magnetic-deflection radar display tube** featuring a long-persistence orange fluoride screen. Operating with a **4.0 V, 0.9 A** heater, the tube is designed for high-voltage operation with a 3rd anode rating of **9 to 13 kV** and a typical operating point of **12 kV**. It utilizes an **International Octal** base with a side-mounted CT.1 anode cap. Proper operation requires maintaining the 1st anode voltage at least **50 V positive** relative to the 2nd anode, with typical focus achieved when the 2nd anode is biased between **1.85 and 2.05 kV**.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1963 Ferranti

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

1963 FERRANTI

Section 1 · Cathode Ray

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Focusing method	Electrostatic	—
Deflection method	Magnetic	—
Fluorescence	Orange	—
Persistence	Long	—

CONSTRUCTION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Phosphor type	Fluoride	—

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Radar / monitor / display CRT	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Third-anode voltage maximum	13000 V	—
Third-anode voltage minimum	9000 V	—
First-anode voltage maximum	2200 V	—
First-anode voltage minimum	-500 V	—
Heater-cathode voltage maximum	150 V	—
Third-anode operating voltage	12000 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode-to-all capacitance maximum	100 pF	—
Grid-to-all capacitance maximum	10 pF	—

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