



ELECTRONIC TUBE REFERENCE

165003HB

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Electrostatically focused, magnetically deflected 50-degree CRT for radar, monitor, and display service, using an orange very-long-persistence H phosphor and typically operated at 15 kV.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
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 1 Cathode Ray	
MAXIMUM PLATE VOLTAGE	18000 V
<i>Published Ferranti ratings, capacitances, and typical operating data promoted where applicable; additional electrical values retained as parameters.</i>	

165003HB Radar Display Tube

The **165003HB** (also designated as the 1650/03HB) is a 16-inch diameter radar display tube designed for professional radar applications. Manufactured by Ferranti, this cathode-ray tube features a metal-backed screen, magnetic deflection, and low-voltage electrostatic focusing. It is designed to provide high-resolution displays with a nominal deflection angle of approximately 50 degrees.

Screen and Phosphor Characteristics

The 165003HB is equipped with a specialized **Type "H"** phosphor screen. This screen configuration is characterized by:

- **Fluorescence:** Orange

- **Afterglow:** Orange
- **Persistence:** Very Long

Due to the nature of the Type "H" phosphor material, the screen is highly sensitive to thermal and beam-intensity damage. It is liable to burn if operated with a stationary or slow-moving spot, even when the beam current is kept at low values.

A closely related variant, the **1650/03JB**, shares the same physical and electrical structure but utilizes a **Type "J"** phosphor screen, which exhibits blue fluorescence, a yellow afterglow, and long persistence.

Physical Specifications and Basing

The tube is constructed with a glass envelope featuring a nominal diameter of 406 mm and a maximum overall length of 600 mm. It utilizes a standard **B12A (Duodecal)** base and a **CT8 Cavity Type** anode cap.

Dimensional Tolerances

- **Overall Diameter:** 406 ± 4 mm
- **Overall Length:** 600 ± 10 mm
- **Neck Diameter:** 35 ± 0.5 mm
- **Reference Line Diameter:** 36 mm
- **Distance from Reference Line to Faceplate Edge:** 380 ± 5 mm
- **Distance from Cavity Cap to Faceplate Edge:** 290 ± 10 mm
- **Faceplate Spherical Radius:** 700 mm

Mounting and External Coating

The 165003HB can be mounted in any position except vertically with the screen facing downwards. The tube is manufactured with an external conductive coating. This coating, when combined with the internal anode structure, forms a capacitance of approximately 1500 pF, which can be utilized for Extra High Tension (E.H.T.) smoothing.

Pin Connections

The B12A base connections, viewed from the underside, are allocated as follows:

Pin	Connection
Pin 1	Heater
Pin 2	Grid
Pin 3	No Pin
Pin 4	No Pin
Pin 5	No Pin

Pin	Connection
Pin 6	3rd Anode (A_3)
Pin 7	No Connection
Pin 8	No Pin
Pin 9	No Pin
Pin 10	1st Anode (A_1)
Pin 11	Cathode
Pin 12	Heater
Side Contact	2nd and 4th Anodes (A_2, A_4)

Electrical Ratings and Operating Conditions

The 165003HB operates with an indirectly heated cathode requiring a nominal heater supply of **6.3 V** at **0.3 A**.

Absolute Maximum and Minimum Ratings

To ensure reliable operation and prevent damage, the following limits must be observed:

- **Maximum First Anode (A_1) Voltage:** 500 V
- **Minimum First Anode (A_1) Voltage:** 200 V
- **Maximum Combined Second and Fourth Anode ($A_2 + A_4$) Voltage:** 18 kV
- **Minimum Combined Second and Fourth Anode ($A_2 + A_4$) Voltage:** 8 kV
- **Maximum Positive Third Anode (A_3) Voltage:** +500 V
- **Maximum Negative Third Anode (A_3) Voltage:** -500 V
- **Maximum Heater-to-Cathode Voltage (V_{h-k}):** 200 V
- **Maximum Grid-to-Cathode Resistance (R_{g-k}):** 1.5 M Ω
- **Maximum Heater-to-Cathode Resistance (R_{h-k}):** 1.0 M Ω

Typical Operating Points

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

- **Heater Voltage:** 6.3 V
- **First Anode (A_1) Voltage:** 300 V
- **Second and Fourth Anode ($A_2 + A_4$) Voltage:** 15 kV
- **Third Anode (A_3) Voltage (for Focus):** -300 V to +300 V
- **Grid Voltage (V_g) for Visual Cut-off:** -40 V to -100 V

Modulator Operating Constraints

The modulator (grid) must never be allowed to become positive with respect to the cathode during normal operation. The only exception is immediately after switching off the equipment, at which point the grid voltage may be permitted to rise to a maximum of +1 V.

Deflection, Shielding, and Capacitances

The 165003HB employs magnetic deflection with a nominal deflection angle of 50 degrees.

Magnetic Shielding Requirements

When external static shift coils are used in conjunction with the main deflecting system, the neck and lens regions of the tube must be carefully shielded from fringe magnetic fields. Failure to provide adequate shielding will result in deflection de-focusing.

Interelectrode Capacitances

- **Cathode to all other electrodes (C_{k-all}):** 8 pF
- **Grid to all other electrodes (C_{g-all}):** 8 pF
- **Anode to external conductive coating ($C_{a-ext.coating}$):** Approximately 1500 pF

Technical Summary

The **165003HB** is a specialized 16-inch radar display tube featuring a metal-backed screen with a very long persistence Type "H" orange phosphor. It utilizes low-voltage electrostatic focusing and 50-degree magnetic deflection. Operating with a 6.3 V, 0.3 A heater, the tube requires a typical high-voltage supply of 15 kV on its combined second and fourth anodes, with a focusing range of -300 V to +300 V on the third anode. Housed in a glass envelope with a B12A Duodecal base and a CT8 cavity cap, it is designed for precise radar display systems where long-persistence tracking is required, provided that precautions against screen burn and magnetic fringe fields are strictly maintained.

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	—
Deflection angle	50 deg	—
Fluorescence	Orange	—
Persistence	Very long	—

CONSTRUCTION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Phosphor type	H	—

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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
First-anode voltage maximum	500 V	—
Second/fourth-anode voltage maximum	18000 V	—
Third-anode positive voltage maximum	500 V	—
Third-anode negative voltage maximum	-500 V	—
First-anode operating voltage	300 V	—
Second/fourth-anode operating voltage	15000 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Third-anode focus voltage minimum	-300 V	—
Third-anode focus voltage maximum	300 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode-to-all capacitance approximate	8 pF	—
Grid-to-all capacitance approximate	8 pF	—
External-coating capacitance approximate	1500 pF	—

TUBE TINKER

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