



ELECTRONIC TUBE REFERENCE

1203HB

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 H-type orange screen has very long persistence, favoring radar presentations where echoes must remain visible between successive sweeps.

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	15000 V
<i>Published Ferranti ratings, capacitances, and typical operating data promoted where applicable; additional electrical values retained as parameters.</i>	

1203HB — Electrostatic Focus Radar Display Tube

The **1203HB** (also designated as **12/03 HB**) is a 12-inch diameter cathode-ray tube manufactured by Ferranti for radar display applications. It features a metal-backed screen, magnetic deflection, and low-voltage electrostatic focusing. The tube is characterized by its Type 'H' phosphor screen, which provides orange fluorescence and an orange afterglow with very long persistence, making it highly suitable for radar PPI (Plan Position Indicator) displays where target tracks must remain visible between antenna sweeps.

A closely related variant, the **12/03 JB** (or 1203JB), shares the same physical dimensions, electrical ratings, and base connections but utilizes a Type 'J' phosphor screen with blue fluorescence, yellow afterglow, and long persistence.

Physical Construction and Screen Characteristics

The 1203HB is constructed with a glass envelope having a maximum overall length of 485 mm (nominally 478 ± 7 mm) and a maximum bulb diameter of 305 ± 2 mm. The useful screen diameter is 265 mm, and the faceplate has a spherical radius of 1000 mm. The neck of the tube has a diameter of $35 +1/-0$ mm, with a reference line diameter of 36 mm. The deflection angle is 50 degrees.

Screen and Phosphor

The 1203HB features a metal-backed screen with a Type 'H' phosphor. This phosphor is optimized for radar display, exhibiting:

- **Fluorescence:** Orange
- **Afterglow:** Orange
- **Persistence:** Very long

Because of the nature of the Type 'H' screen material, it is highly susceptible to burning if operated with a stationary or slow-moving electron beam spot. To prevent permanent damage to the phosphor, the tube must not be operated under stationary or slow-scan conditions, even when the beam current is set to a low level.

External Conductive Coating

The tube is equipped with an external conductive coating. The capacitance between the anode and this external coating is approximately 1200 pF, allowing the coating to be utilized as an integrated capacitor for extra-high tension (E.H.T.) smoothing in the high-voltage power supply circuit.

Heater and Base Connections

The 1203HB uses an indirectly heated cathode. The heater is designed for either parallel or series operation.

Heater Specifications

- **Heater Voltage:** 6.3 V
- **Heater Current:** 0.3 A

The nominal heater power can be calculated from the rated voltage and current as follows: Heater Power = $6.3 \text{ V} \times 0.3 \text{ A} = 1.89 \text{ W}$

When the heater is configured for series-string operation, the surge heater voltage must not exceed 9.5 V r.m.s. To protect the heater filament from damage during startup, a current-limiting device must be incorporated into the circuit to restrict the initial switching surge.

Base and Pinout

The tube utilizes a **B12A (Duodecal)** base. High-voltage connections to the second and fourth anodes are made via a side contact of the **CT8 Cavity Type** (also designated as Cap Type C.T. 2). The mounting position for the tube is unrestricted (any position).

The pin connections, viewed from the underside of the base, are as follows:

Pin	Connection
Pin 1	Heater
Pin 2	Grid
Pin 3	No Pin
Pin 4	No Pin
Pin 5	No Pin
Pin 6	3rd Anode (Focusing Anode)
Pin 7	No Connection
Pin 8	No Pin
Pin 9	No Pin
Pin 10	1st Anode
Pin 11	Cathode
Pin 12	Heater
Side Contact	2nd Anode, 4th Anode

Electrical Ratings and Operating Limits

The 1203HB operates with high voltages on its accelerating anodes and requires careful adherence to maximum and minimum ratings to ensure reliable operation and prevent internal arcing.

Absolute Maximum and Minimum Ratings

- **First Anode (A_1) Voltage:** 200 V (Min) to 500 V (Max)
- **Second and Fourth Anode ($A_2 + A_4$) Voltage:** 8 kV (Min) to 15 kV (Max)
- **Third Anode (A_3) Voltage:** -500 V (Max. Negative) to +500 V (Max. Positive)
- **Heater-to-Cathode Voltage (V_{h-k}):** 200 V (Max)
- **Grid-to-Cathode Circuit Resistance (R_{g-k}):** 1.5 M Ω (Max)
- **Heater-to-Cathode Circuit Resistance (R_{h-k}):** 1.0 M Ω (Max)

Typical Operating Conditions

In typical radar display applications, the tube is operated under the following conditions:

- **Heater Voltage:** 6.3 V
- **First Anode (A_1) Voltage:** 300 V
- **Second and Fourth Anode ($A_2 + A_4$) Voltage:** 12 kV
- **Third Anode (A_3) Voltage for Focus:** -300 V to +300 V
- **Grid Voltage (V_g) for Visual Cut-off:** -30 V to -70 V

The third anode (A_3) serves as the electrostatic focusing electrode. The optimum focus point is achieved at a voltage within the range of -300 V to +300 V relative to the cathode.

Interelectrode Capacitances

The interelectrode capacitances of the 1203HB are low, minimizing the loading on drive circuitry:

- **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 1200 pF

Physical Dimensions and Ring Gauge Data

The physical profile of the bulb is precisely defined to facilitate mounting and magnetic deflection yoke alignment. The distance from the center of the screen to various ring gauge diameters along the bulb body is specified as follows:

Ring Gauge Diameter (mm)	Distance from Centre of Screen (mm)
280	96 ± 10
230	150 ± 9
180	191 ± 8
130	222 ± 7
80	249 ± 6

These dimensions ensure proper seating of the deflection coils and alignment within the radar console housing.

Technical Summary

The **1203HB** is a specialized 12-inch radar display tube featuring low-voltage electrostatic focus and 50-degree magnetic deflection. Its Type 'H' metal-backed screen provides orange fluorescence and very long orange afterglow, making it ideal for displaying slow-scan radar sweeps. Operating with a typical

accelerating potential of 12 kV on the combined second and fourth anodes, the tube achieves sharp focus using a third anode adjustable between -300 V and +300 V. Housed in a glass envelope with a B12A Duodecal base and a CT8 cavity-type side contact, the 1203HB incorporates an external conductive coating of approximately 1200 pF that serves as an auxiliary E.H.T. smoothing capacitor.

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	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
Second/fourth-anode voltage maximum	15000 V	—
First-anode negative voltage maximum	-500 V	—
First-anode operating voltage	300 V	—
Third-anode focus voltage minimum	-300 V	—
Third-anode focus voltage maximum	300 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode-to-all capacitance maximum	8 pF	—
Grid-to-all capacitance maximum	8 pF	—
External-coating capacitance approximate	1200 pF	—