Service Type CV6113 (T963D)

ABRIDGED DATA

12-inch diameter radar tubes for use with valve or transistor scan amplifiers. Two sets of scan coils may be fitted for alpha-numeric character display in processed radar and computer read-out systems. The T963D or Y will give flicker-free images at low repetition frequencies for computer read-out; T963Y is more suitable for very low repetition frequencies.

These tubes offer higher resolution and mechanical accuracy than the T953 series, which have a similar outline.

Neck Diameter	1·378 inches	(35 mm)
Deflection Angle	50	Degrees
Deflection Method		Magnetic
Focus Method (*See Note* 1)		Magnetic
E.H.T. Voltage	15	kV

GENERAL DATA

Electrical

Cathode	Indirectly Heated, Oxide Coated
Heater Voltage (*See Note* 2)	6·3 V
Heater Current	0·3 ± 10% A
Faceplate	Clear
Screen (*See Note* 3)	Aluminised
Inter-electrode Capacitances:	
Grid to all other electrodes, less than	12 pF
Cathode to all other electrodes, less than	12 pF

Mechanical

Overall Length	25·197 inches (640mm)	Max
Overall Diameter	12·087 inches (307mm)	Max
Useful Screen Diameter	9·843 inches (250mm)	Min
Maximum Neck Diameter	Determined by neck gauge page 9	
Net Weight	12 pounds (5·4kg) Approx	
Base	B.S.448–B12A	
Final Anode Connection	Cavity Cap B.S.448–CT8	
Mounting Position	*See Note* 4	

MAXIMUM AND MINIMUM RATINGS
(Absolute Values)
(All voltages with respect to cathode)

	Min	*Max*	
Anode 2 Voltage	9·0	15·5	kV
Anode 1 Voltage	250	600	V
Grid Voltage, negative value (*See Note* 5)	0	250	V
Heater to Cathode Voltage (*See Note* 6):			
Cathode negative	—	150	V
Cathode positive	—	200	V
Peak Heater to Cathode Voltage:			
Cathode positive (*See Note* 7)	—	410	V
Cathode Current (Mean)	—	150	μA
Grid to Cathode Resistance	—	1·5	MΩ
Grid to Cathode Impedance (at 50c/s)	—	0·5	MΩ
Heater to Cathode Resistance		*See Note* 8	

TYPICAL OPERATING CONDITIONS

Anode 2 Voltage	15	kV
Anode 1 Voltage	300	V
Focus Coil (*See Note* 1)	540	Ampere-turns
Grid Voltage for cut-off	−60 to −150	V
Grid Drive for 50μA beam current	20 to 40	V
Line Width (*See Note* 9)	0·2	mm
Astigmatism (*See Note* 10)	20	% Max

OPTIMUM BEAM FOCUSING

In order to obtain maximum brightness and minimum spot size, it is necessary to carry out the following procedure.

(*a*) Stray magnetic fields should be minimised in the region of the gun structure by fitting a tubular mumetal shield over the neck.

(*b*) The beam may be centred in the defining aperture by a small magnet, located in the region of the grid and adjusted to give maximum brightness.

(*c*) The magnetic axis of the focus coil should be aligned with the electron beam. This may be done either by adjusting the position of the focus coil (See Method 1), or by fitting additional deflection coils to adjust the position of the beam (See Method 2). In each case a.c. focusing (*See page* 3) may be used to identify the optimum alignment condition.

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Method 1

Adjustment of the focus coil position

The mounting of the focus coil should be such that the coil can be moved in any direction, i.e., vertically, horizontally and tilted about either the vertical or horizontal axis. An a.c. current is passed through the focus coil and the position of the coil is adjusted until the optimum alignment is reached. (*See A.C. Focusing note * below*).

Method 2

Electromagnetic deflection of the beam

Two sets of alignment coils are fitted on the tube neck, between the beam defining aperture and the focus coil (*See diagram, page* 8). Each set of coils is capable of deflecting the beam slightly in both X and Y directions. The currents in the alignment coils are adjusted to give correct alignment of the beam. (*See A.C. Focusing note * below*).

**A.C. Focusing*

An alternating current is passed through the focus coil such that the positive and negative excursions of the current each produce a focused spot. Provided there is no current through the main deflection coils, the picture on the tube faceplate will consist of a defocused area and two focused spots. The optimum focusing condition is obtained when the two focused spots coincide at the centre of the defocused spot.

NOTES

1. The focus coil should be positioned so that the focusing field is entirely on the screen side of the beam defining aperture. When using a focus coil having a short air gap, the centre of the air gap should be approximately 220mm from the reference plane.
2. The heater is suitable for series or parallel operation. In series operation the surge heater voltage must not exceed $9{\cdot}5V_{r.m.s.}$ when the supply is switched on and a current limiting device may be necessary in the circuit to ensure that this voltage is not exceeded.
3. Tubes in the T963 series have screens with the following characteristics.

Type	EEV Screen	Equivalent	Fluorescent Colour	Persistence
T963D	D*	E.V.S.007	Yellow-orange	Long
T963Y	Y*	P33	Orange	Long
T963Z	Z*	P26	Orange	Very Long

*This is a fluoride screen which is sensitive to burn and should not be operated with slow-moving spots.

The tube can be manufactured with alternative screens, and customers' enquiries are invited.

4. The tube may be mounted in any position except with the screen down and the axis of the tube making an angle of less than 20° with the vertical.

5. The d.c. value of grid bias must not be allowed to become positive with respect to the cathode except during the period immediately after switching the equipment on or off when it may be allowed to rise to + 1V. The maximum positive grid excursion may reach 2V and at this voltage the grid current may be expected to be approximately 2mA.

6. To avoid excessive hum, the a.c. component of the heater to cathode voltage should be as low as possible, preferably less than $20V_{r.m.s.}$

7. During a warming-up period not exceeding 45 seconds.

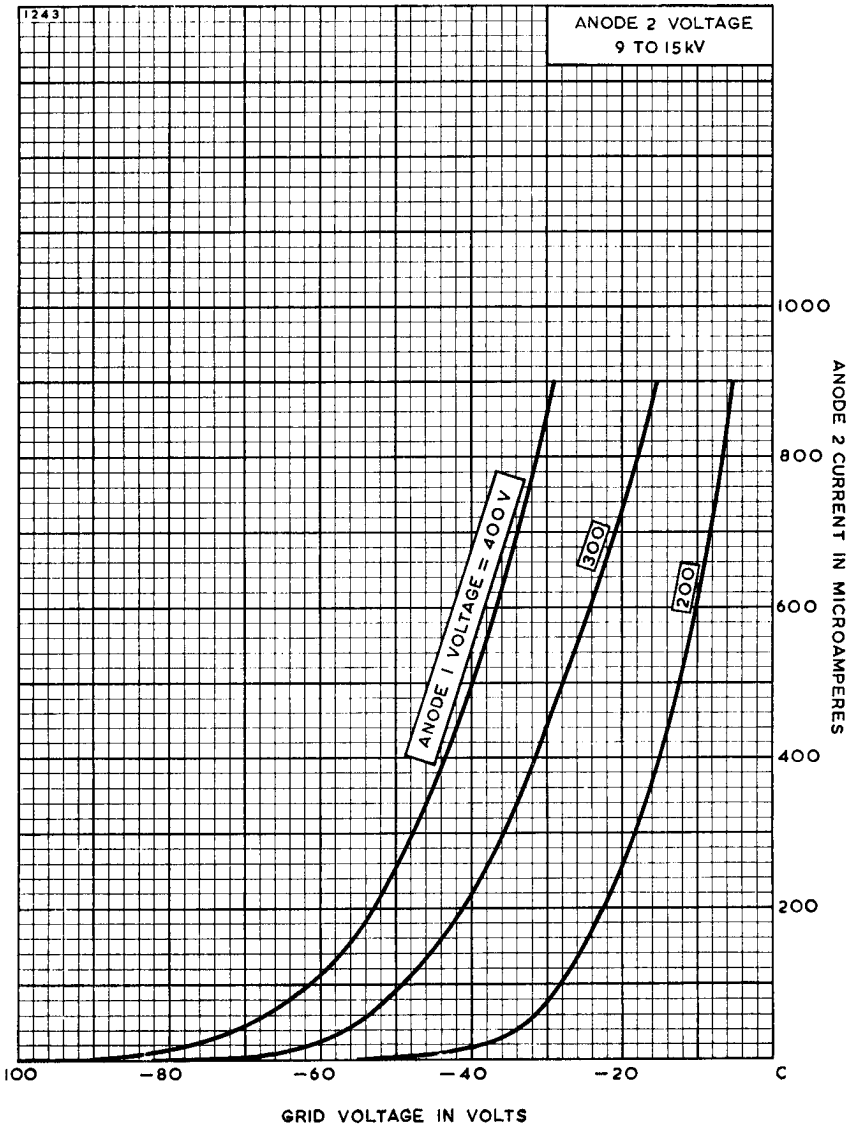
8. When the heater is in a series chain or earthed, the impedance between the cathode and earth at 50c/s must not exceed 100kΩ. When the heater is supplied from a separate transformer, the heater to cathode resistance must not exceed 1MΩ.

9. Measured under the following conditions:
   Pulsed line 250mm long
   Pulse length 100μsec
   Pulse repetition rate 50p.p.s.
   Beam current 50μA (peak)
   Modulation pulses and deflection waveform synchronised
   Line width measured with a microscope as in K1001/5.A.5.7.2.2.

10. Measured under the following conditions:
    Undeflected, focused, pulsed spot
    Pulse length 0·1μsec
    Pulse repetition rate 50p.p.s.
    Beam current 50μA (peak).

ENGLISH ELECTRIC

GRID VOLTAGE CHARACTERISTICS



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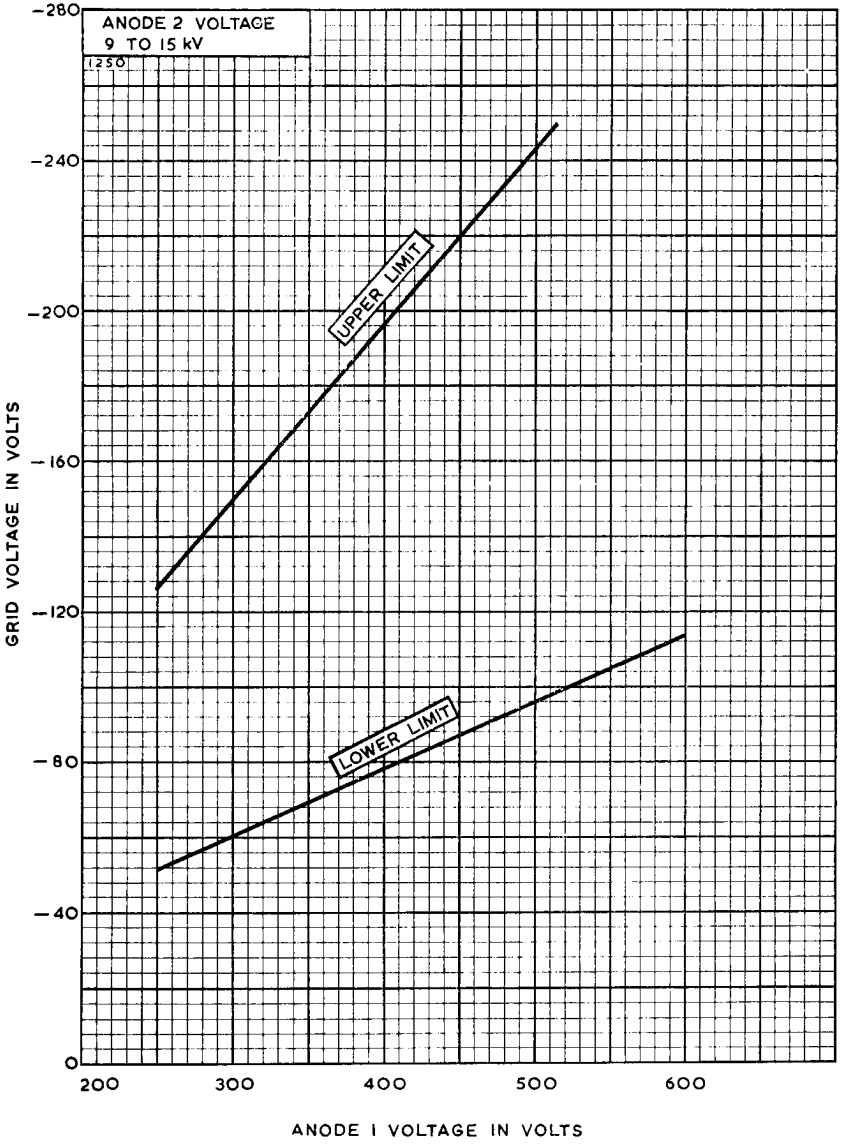
GRID VOLTAGE CUT-OFF LIMITS



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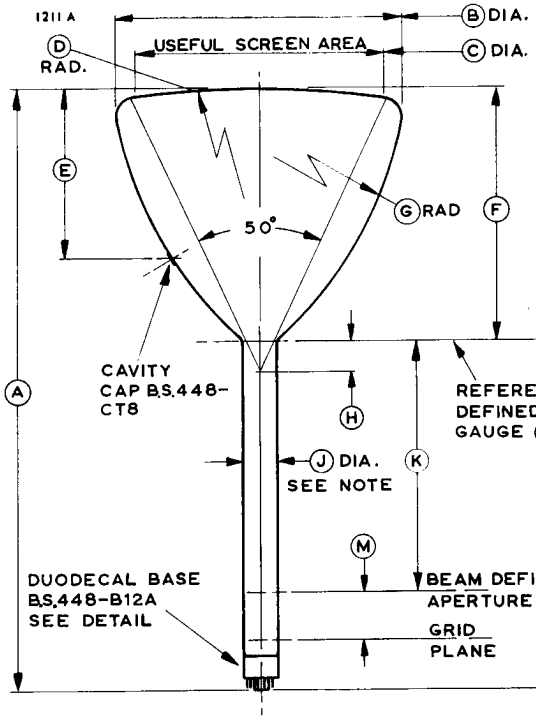
OUTLINE



Bulb Ring Gauges

Ring Gauge Diameter (mm)	Distance from centre of Tube Face (mm)
280	93 ± 10
230	150 ± 9
180	191 ± 8
130	222 ± 7
80	249 ± 6

Ref.	Inches	Millimetres	Ref.	Inches	Millimetres
A	25·000 ± 0·197	635·0 ± 5·0	H	1·260 Max	32·0 Max
B	12·008 ± 0·079	305·0 ± 2·0	J	1·378 $^{+0·020}_{-0·039}$	35·0 $^{+0·5}_{-1·0}$
C	9·843 Min	250·0 Min	K	10·787	274·0
D	39·370 ± 3·937	1000 ± 100	L	1·417	36·0
E	7·087 ± 0·197	180·0 ± 5·0	M	1·772	45·0
F	10·709 ± 0·138	272·0 ± 3·5	N	14·291	363
G	16·772	426·0			

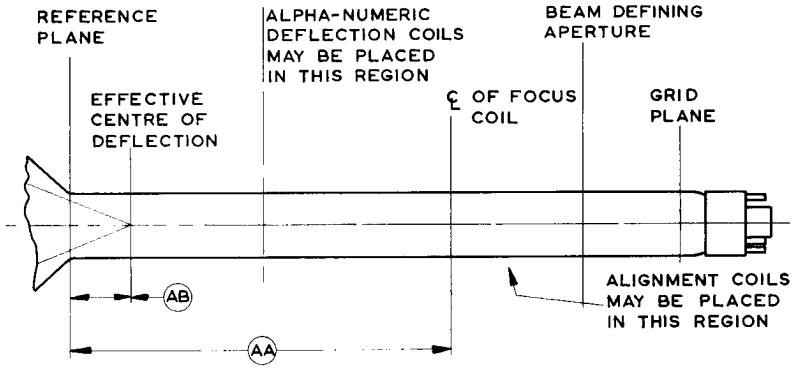
Inch dimensions have been derived from millimetres.

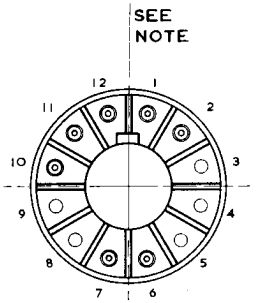
NOTE The mean axis of the neck will pass within 2mm from the geometric centre of the tube face and within 1° of a normal to a plane tangential to the geometric centre of the tube face. The tangential plane is determined by a 3 point spherometer gauge concentric with the tube face.

ENGLISH ELECTRIC

OUTLINE DETAILS

1203





Ref.	Inches	Millimetres
AA	8·661	220
AB	1·260 Max	32·0 Max

Inch dimensions have been derived from millimetres.

Note. The anode cavity cap will be in line with the base key to within 15°.

Pin	Element	Pin	Element
1	Heater	8	No Pin
2	Grid	9	No Pin
3	No Pin	10	Anode 1
4	No Pin	11	Cathode
5	No Pin	12	Heater
6	No Connection	Cavity	
7	No Connection	Cap	Anode 2

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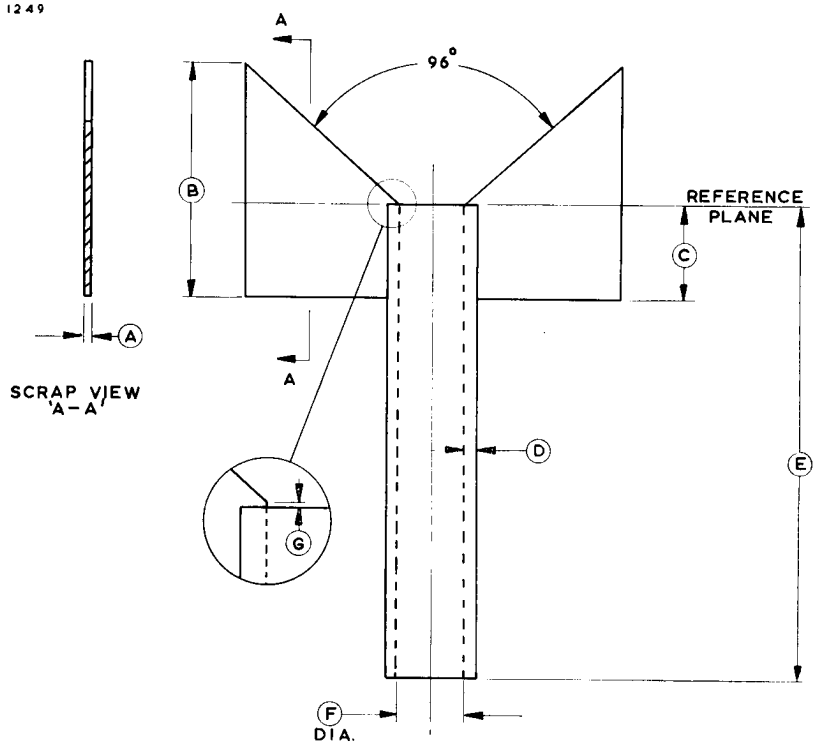
NECK GAUGE



The gauge shown above will pass freely over base and neck to the reference line, and when rotated through 360° the blades of the gauge will contact the flared neck at the reference line only.

Ref.	Inches	Millimetres	Ref.	Inches	Millimetres
A	0·125	3·18	E	9·843 ± 0·039	250·0 ± 1·0
B	4·921 ± 0·039	125·0 ± 1·0	F	1·417 $^{+0·003}_{-0·000}$	36·00 $^{+0·08}_{-0·00}$
C	1·969 ± 0·039	50·0 ± 1·0	G	0·C00 $^{+0·002}_{-0·000}$	0·00 $^{+0·05}_{-0·00}$
D	0·252 ± 0·012	6·4 ± 0·3			

Inch dimensions have been derived from millimetres except dimension A.