

### INTRODUCTION

The T979H, T979N and T979X are 5-inch diameter cathode ray tubes for wide band, high speed oscilloscope applications. They are identical except for their screen characteristics.

The incorporation of a post deflection accelerator mesh and an internal spiral coating, together with an improved gun design, gives the tubes the following features:

- (1) Deflection sensitivities in the X and Y directions of 9V/cm and 3V/cm respectively, making them particularly suitable for use with deflection circuits employing transistors.
- (2) A large useful screen area, permitting the use of either 6 × 10cm or 8 × 8cm displays.
- (3) Excellent brightness, giving a visible trace at writing speeds up to 1–3nsec/cm, and with negligible distortion introduced in the post deflection accelerator (P.D.A.) system. The small amounts of barrel or pin cushion distortion, linearity distortion and astigmatism present can be eliminated by adjustment of electrode potentials.
- (4) Good sensibility due to the small spot size.
- (5) Variations of deflection sensitivities with variations in P.D.A. voltage are considerably reduced.
- (6) Minimum deflector plate inductance and inter-plate capacitance, due to the deflector plate connections being made via short pins sealed into the side of the bulb.

### GENERAL DATA

#### Electrical and General

Cathode . . . . .	Indirectly Heated, Oxide Coated
Heater Voltage ( <i>See Note 1</i> ) . . . . .	6.3 V
Heater Current . . . . .	0.3 ± 10% A
Faceplate . . . . .	Flat, Clear Glass
Screen ( <i>See Note 2</i> ) . . . . .	Aluminised
Deflection Method . . . . .	Electrostatic
Focus Method . . . . .	Electrostatic
Linearity of Scan ( <i>See Note 3</i> ) . . . . .	2 %
Raster Distortion ( <i>See Note 4</i> ) . . . . .	± 1 %
Orthogonality . . . . .	90 ± 1 Degrees

### Minimum useful scan

Y1 to Y2 ( <i>See Note 5</i> )	.. .. .	8.0	cm
X1 to X2 ( <i>See Note 5</i> )	.. .. .	10	cm

### Undelected Spot Position (to geometric centre of faceplate)

Y Orientation	.. .. .	±0.6	cm
X Orientation	.. .. .	±1.0	cm

### Helix Resistance

Anode 5 to Interplate Shield	.. .. .	200	MΩ Min
		1000	MΩ Max

### Inter-electrode Capacitances

(With all other electrodes not mentioned, and those marked \*, earthed)

Grid to all other electrodes	.. .. .	6.1	pF Nom
Cathode to all other electrodes	.. .. .	5.7	pF Nom
X1 Electrode to all other electrodes except X2*	.. .. .	3.5	pF Nom
X2 Electrode to all other electrodes except X1*	.. .. .	3.5	pF Nom
Y1 Electrode to all other electrodes except Y2*	.. .. .	2.9	pF Nom
Y2 Electrode to all other electrodes except Y1*	.. .. .	2.9	pF Nom
X1 to X2 Electrode	.. .. .	3.1	pF Nom
Y1 to Y2 Electrode	.. .. .	1.7	pF Nom
X1+X2 Electrodes to Y1+Y2 electrodes	.. .. .	< 0.1	pF
X1+X2+Y1+Y2 Electrodes to cathode	.. .. .	< 0.1	pF
X1+X2+Y1+Y2 Electrodes to grid	.. .. .	< 0.1	pF

### Mechanical

Overall Length	.. .. .	20.71 inches (526 mm)	Max
Overall Diameter (excluding cap)	.. .. .	5.37 inches (136.5 mm)	Max
Seated Height	.. .. .	21.260±0.236 inches (504±6 mm)	
Neck Diameter (excluding pins)	.. .. .	2.28 inches (58 mm)	Max
Useful Screen Area	.. .. .	2.36 by 3.94 or 3.15 by 3.15 inches	Min
		6.0 by 10 or 8.0 by 8.0 cm	Min
Net Weight	.. .. .	3 pounds (1.4 kg)	Approx
Base	.. .. .		B.S.448-B12F
Anode 5 Cavity Cap	.. .. .		B.S.448-CT8
Mounting Position ( <i>See Note 6</i> )	.. .. .		Any

→ Indicates a change

### MAXIMUM AND MINIMUM RATINGS

(Absolute Values)

(All voltages are with respect to cathode except where otherwise stated)

	<i>Min</i>	<i>Max</i>	
Anode 5 (Screen) Voltage ( <i>See Note 7</i> ) ..	6.0	15*	kV
Anode 4 Voltage .. .. .	1.0	3.3	kV
Anode 3 and Anode 1 Voltage .. .. .	1.0	3.3	kV
Anode 2 Voltage .. .. .	0	1.5	kV
Grid Bias Voltage (negative value) .. .. .	0	200	V
Grid Voltage (positive peak value) .. .. .	—	2.0	V
Cathode Current (intermittent mean) .. .. .	—	0.3	mA
Y Plate Shield Voltage .. .. .	—	3.3	kV
Interplate Shield Voltage .. .. .	—	3.3	kV
Mesh Shield Voltage .. .. .	—	3.3	kV
Mesh Voltage (negative with respect to mesh shield voltage) .. .. .	10	20	V
Deflection Voltage on X or Y electrodes (Peak)	—	500	V
Heater to Cathode Voltage (Peak):			
Cathode positive .. .. .	—	200	V
Cathode negative .. .. .	—	125	V
Screen Dissipation (average) .. .. .	—	5.0	mW/sq.cm
X1 or X2 to Anodes 3 and 1 Impedance .. .. .	—	2.0	MΩ
Y1 or Y2 to Anodes 3 and 1 Impedance .. .. .	—	1.0	MΩ
Grid to Cathode Impedance .. .. .	—	1.0	MΩ
Anode 4 to Anodes 3 and 1 Impedance .. .. .			<i>See Note 8</i>

\*With respect to anode 3 and anode 1 voltage.

### TYPICAL OPERATING CONDITIONS

Anode 5 (Screen) Voltage	12	12	12	kV
Mesh Voltage (with respect to mesh shield) . . . .	-15	-15	-15	V
Anode 4 Voltage (adjusted for minimum astigmatism) ( <i>See Note 9</i> ) . . . .	1.0	1.5	3.0	kV
Anode 3 and Anode 1 Voltage . . . . .	1.0	1.5	3.0	kV
Anode 2 Voltage (for focus)	165 to 335	250 to 500	500 to 1000	V
Grid Voltage (for spot cut-off) . . . . .	-30 to -57	-45 to -85	-90 to -170	V
Y Plate Shield Voltage ( <i>See Note 10</i> ) . . . . .	1.0	1.5	3.0	kV
Interplate Shield Voltage ( <i>See Note 11</i> ) . . . . .	1.0	1.5	3.0	kV
Mesh Shield Voltage ( <i>See Note 12</i> ) . . . . .	1.0	1.5	3.0	kV
Mesh Current . . . . .	( <i>See Note 13</i> )	( <i>See Note 13</i> )	( <i>See Note 13</i> )	
Anode 3 and Anode 1 Current . . . . .	( <i>See Note 14</i> )	( <i>See Note 14</i> )	( <i>See Note 14</i> )	
Anode 2 Current . . . . .	$\pm 15$	$\pm 15$	$\pm 15$	$\mu\text{A}$
Cathode Current . . . . .	( <i>See Note 14</i> )	( <i>See Note 14</i> )	( <i>See Note 14</i> )	
Deflection Factor ( <i>See Note 15</i> ):				
Mean Potential of X and Y plates . . . . .	1.0	1.5	3.0	kV
X1 and X2 Electrodes:				
Mean . . . . .	6.1	9.0	17.5	V/cm
Limits . . . . .	5.3 to 6.8	8.0 to 10	15.5 to 19.5	V/cm
Y1 and Y2 Electrodes:				
Mean . . . . .	2.0	3.0	6.2	V/cm
Limits . . . . .	1.6 to 2.3	2.5 to 3.5	5.2 to 7.2	V/cm

### Correction Potential Ranges

Mesh (with respect to mesh shield) ( <i>See Note 16</i> ) . . . . .	-12 to -18	-12 to -18	-12 to -18	V
Anode 4 (astigmatism) ( <i>See Notes 9 and 16</i> ) . . . . .	$\pm 40$	$\pm 40$	$\pm 40$	V
Y Plate Shield ( <i>See Notes 10 and 16</i> ) . . . . .	$\pm 20$	$\pm 20$	$\pm 20$	V
Interplate Shield ( <i>See Notes 11 and 16</i> ) . . . . .	$\pm 60$	$\pm 40$	$\pm 20$	V
Line Width ( <i>See Note 17</i> ) . . . . .	0.6	0.5	0.3	mm

### ASSOCIATED COMPONENTS

The following components can be obtained from the suppliers listed; there may possibly be alternative sources:—

- |   |   |  |
|---|---|--|
| (1) B.S.448-B12F socket                                     | Catalogue No. 77/842  | Carr Fastener Co. Ltd.<br>Stapleford, Notts.   |
| (2) B.S.448-CT8 Cavity<br>Cap Connector                     | Catalogue No. 77/699  | Carr Fastener Co. Ltd.<br>Stapleford, Notts.   |
| (3) Side Pin Connectors                                     | Miniature wander<br>socket type WSI<br>(colours: red, black<br>or blue) | A.E.I. Clix,<br>Radio & Electronics<br>Components Division,<br>Barton Hill, Bristol. |
| (4) Magnetic Shield to<br>suit T979 series<br>(See page 11) |   | Magnetic Shields Ltd.,<br>Headcorn Road,<br>Staplehurst,<br>Tonbridge, Kent.         |

### NOTES

- The heater is suitable for parallel operation only.
- The T979 series have screens with the following characteristics.

Type	EEV Screen	Equivalent	Fluorescent and Afterglow Colour	Persistence
T979H	H	P31	Blue-Green	Medium Short
T979N	N	P2	Yellowish-Green	Medium
T979X	X	P7	Blue with Yellowish-Green Afterglow	Long

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

- The deflection factor for a deflection of 75% of the useful scan will not differ from that for a deflection of 25% by more than 2%.

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4. The edges of a  $6 \times 10$ cm raster will fall between two concentric rectangles  $101 \times 60.6$ mm and  $99 \times 59.4$ mm.
5. The tube can be used for either  $6 \times 10$ cm or  $8 \times 8$ cm displays.
6. The tube should be supported near the screen and also on the parallel neck near the base; it should not be supported by the base only. The socket should not be mounted rigidly, but should have flexible leads and be able to move freely. To avoid the need for excessive magnetic shielding the tube should be mounted as far away as possible from transformers, chokes and other sources of stray field.
7. Anode 5 may be operated at a voltage lower than the minimum specified but the light output will then be limited by the screen aluminising.
8. When high beam currents are used, anode 4 collects current and the anode 4 to anodes 3 and 1 impedance should be kept as low as possible to avoid defocusing.
9. Adjustment of the anode 4 voltage about the mean Y plate potential is used to correct astigmatism introduced in the deflection system. The range of voltage required is of the order of  $\pm 40$ V.
10. The Y plate shields should be operated about the mean potential of the Y1 and Y2 electrodes. Variation of the potential about this value controls the edge effects of the Y deflection electrode field and provides a fine adjustment of the deflection linearity in the Y direction.
11. Variation of the interplate shield voltage about the mean potential of the deflection electrodes provides correction for barrel and pin cushion distortion. When the mean potentials of the X and Y deflection electrodes are equal, a range of  $\pm 40$ V maximum is required (with anode 3 and anode 1 voltage of 1.5kV); the range is slightly wider when the mean potentials are not equal.
12. The mesh shield should be operated at approximately the mean X plate potential.
13. At peak beam current, the mesh current will be of the order of  $5 \mu$ A.
- 14. Under normal operating conditions, the peak anode 3 and anode 1 current and the peak cathode current can exceed 0.5mA. Under low duty cycle conditions such as viewing transients however, the peak cathode current may reach 2.0mA and the regulation of the power supplies to the anode 3 and anode 1 circuit and the cathode circuit should be adequate for such variations.

→Indicates a change



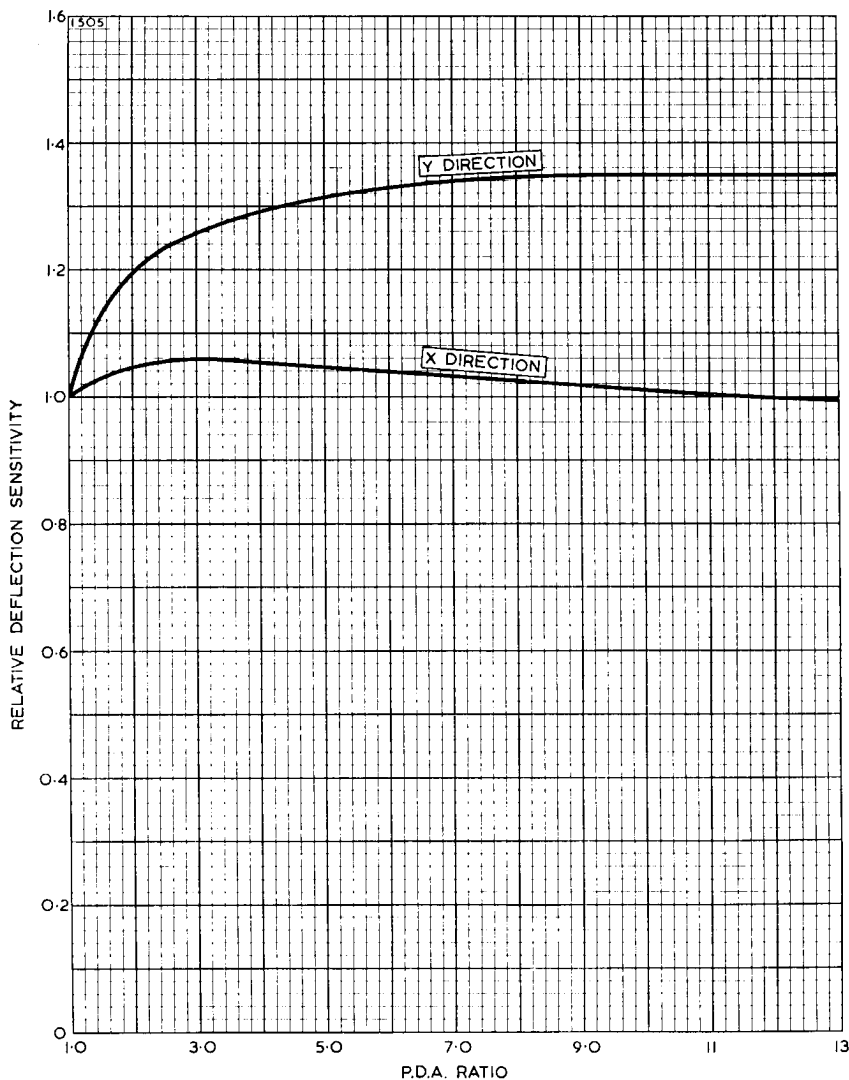
- 15. The X electrodes and Y electrodes are designed primarily for symmetrical operation. Some degradation of focus and trace geometry will result if the tube is operated under asymmetric conditions.
- 16. These figures apply when the mean potentials of the X and Y electrodes and anode 3 are equal. When the mean deflection electrode potentials differ from the anode 3 voltage, a slightly wider range will be required.
- 17. Measured under the following conditions:

Anode 4 Voltage .. .. .	Optimised
Anode 2 Voltage .. .. .	Optimised
Grid Drive .. .. .	25 V
Raster Size .. .. .	5 × 5 cm
Vertical Lines .. .. .	200
Frame Repetition .. .. .	50 c/s
Spot Velocity .. .. .	500 m/sec

The line width measured with a microscope as in K1001. Compared with the shrinking raster method, this method is more accurate but pessimistic. Thus it must be remembered that the equivalent line width measured by the shrinking raster method will be considerably less than the value stated when comparison is made with data given in these terms.



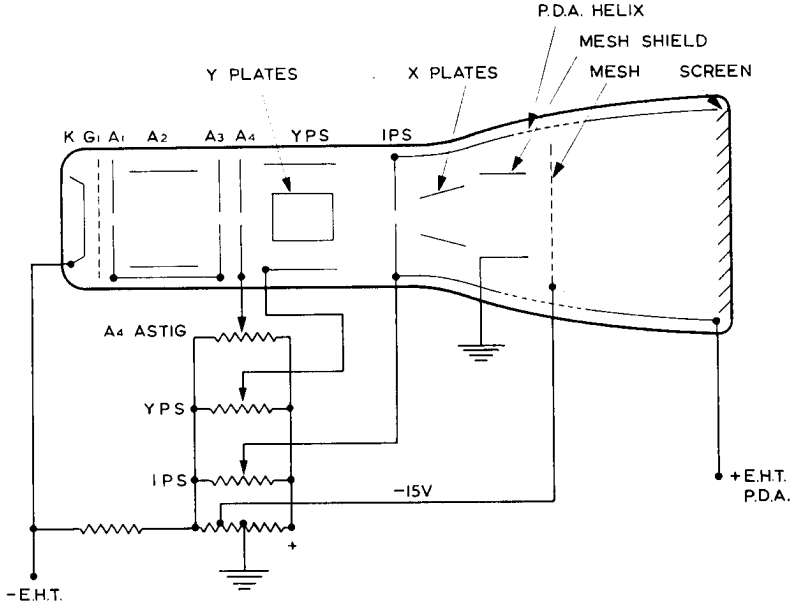
**P.D.A. RATIO CHARACTERISTIC**





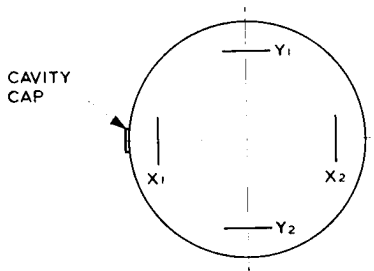
**SCHEMATIC DIAGRAM**

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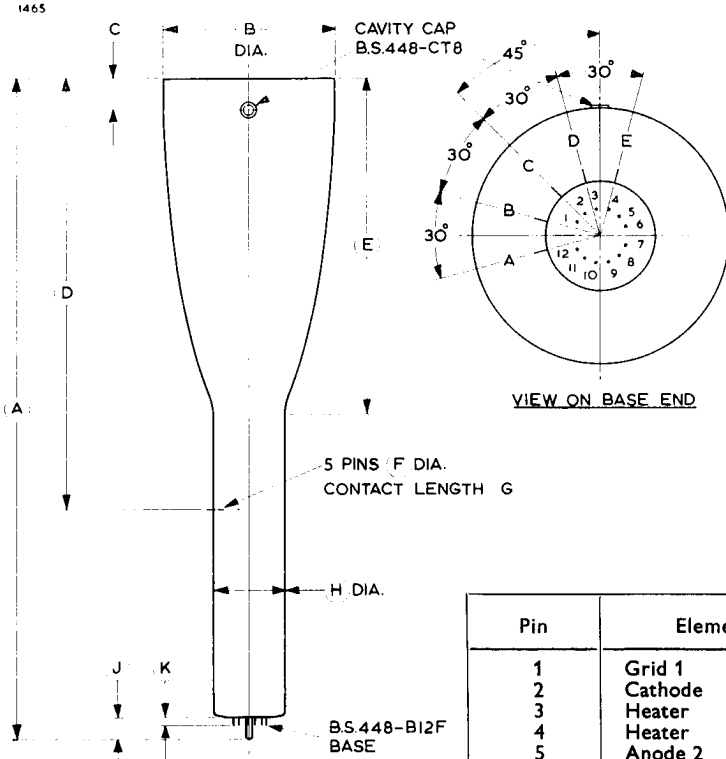
**ORIENTATION OF DEFLECTION PLATES**  
(view on screen end of tube)

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**OUTLINE**



Pin	Element
1	Grid 1
2	Cathode
3	Heater
4	Heater
5	Anode 2
6	Mesh Shield
7	Anode 3, Anode 1
8	Anode 4
9	Mesh
10	Y Plate Shield
11	No Connection
12	No Connection
A	X2 Electrode
B	X1 Electrode
C	Interplate Shield
D	Y1 Electrode
E	Y2 Electrode
Cavity Cap	Anode 5 (Screen)

Ref.	Inches	Millimetres
A	20.71 Max	526.0 Max
B	5.374 Max	136.5 Max
C	1.575 ± 0.118	40.0 ± 3.0
D	13.425 ± 0.197	341.0 ± 5.0
E	10.512 ± 0.394	267 ± 10.0
F	0.039	1.00
G	0.236 ± 0.039	6.0 ± 1.0
H	2.283 Max	58.0 Max
J	0.709 Max	18.0 Max
K	0.248 Max	6.3 Max

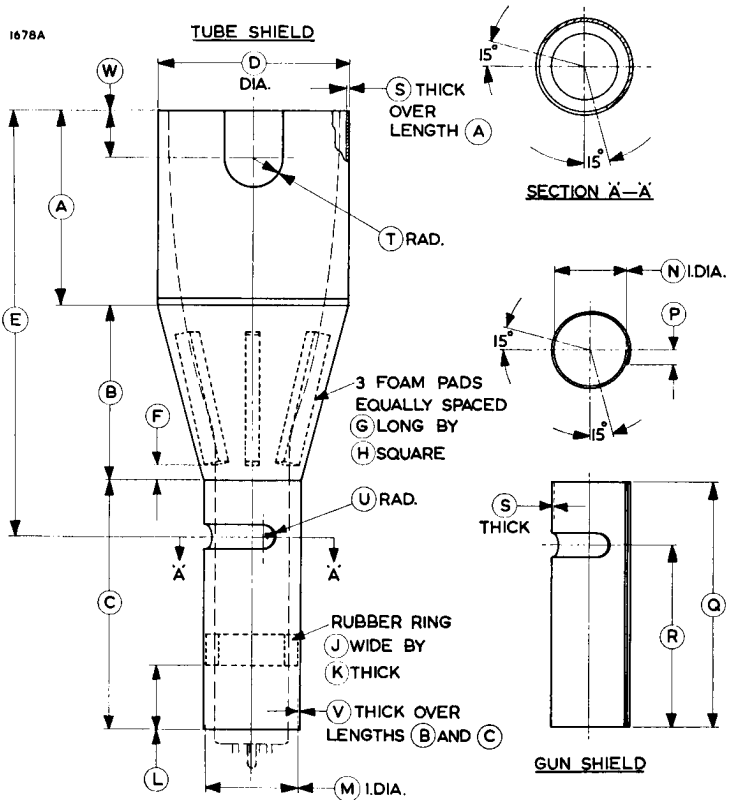
Inch dimensions have been derived from millimetres.

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The overall bulb diameter 'B' does not include the cavity cap.

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### OUTLINE FOR MUMETAL SHIELDS



Ref.	Inches	Millimetres	Ref.	Inches	Millimetres
A	6.125	155.6	L	2.000	50.80
B	5.437	138.1	M	3.094	78.59
C	7.875	200.0	N	2.125	53.98
D	5.437 <sup>+0.031</sup> -0.000	138.1 <sup>+0.79</sup> -0.00	P	0.500 Approx	12.70 Approx
E	13.437	341.3	Q	7.750	196.9
F	0.500	12.70	R	5.750	146.1
G	4.000	101.6	S	0.015	0.38
H	0.500	12.70	T	1.000	25.40
J	1.000	25.40	U	0.375	9.53
K	0.437	11.10	V	0.036	0.91
			W	1.562	39.67

Millimetre dimensions have been derived from inches.