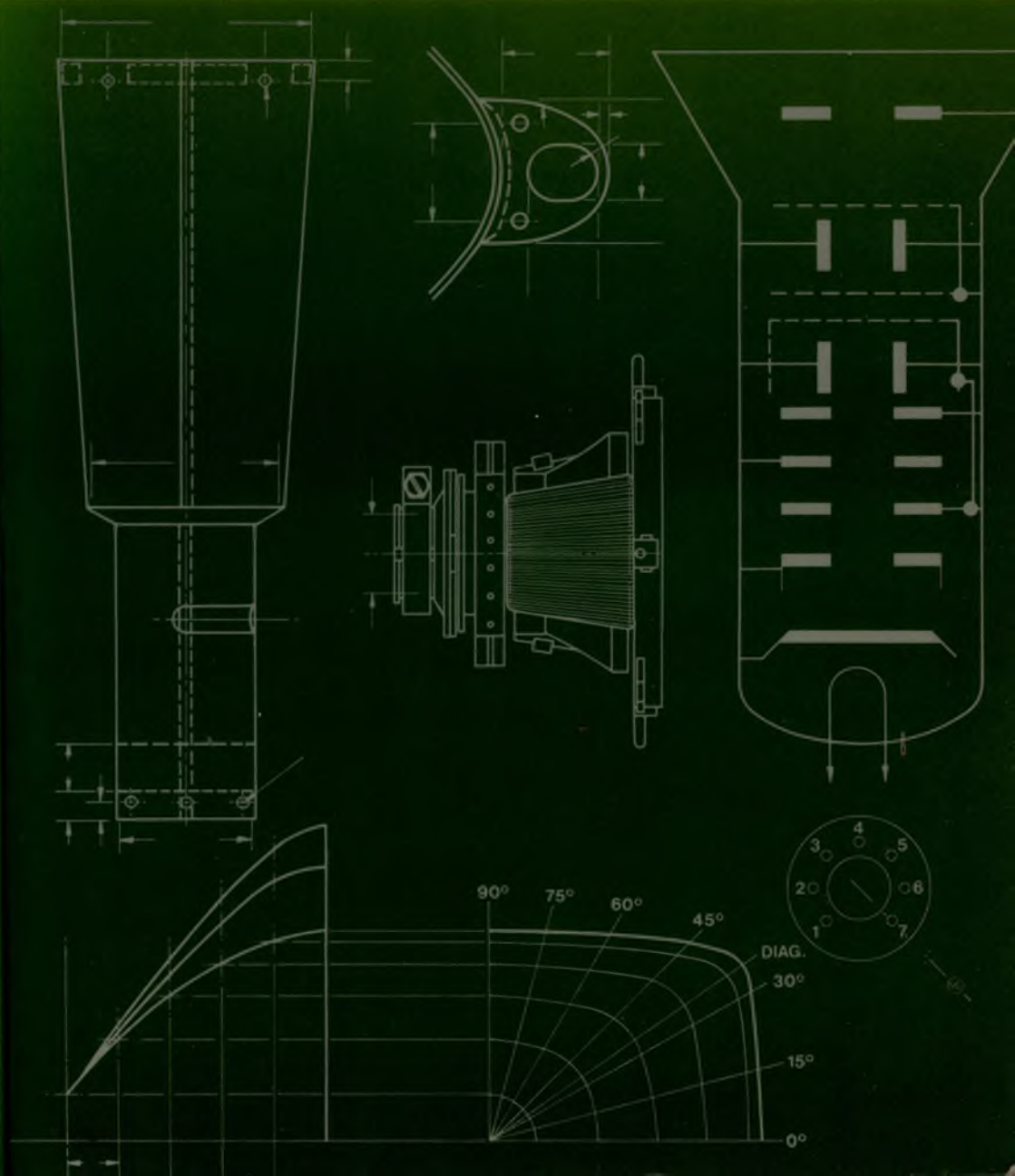
BRIMAR

Industrial Cathode Ray Tubes

Volume 2 **Data Section Issue 3**



Industrial Cathode Ray Tubes

Volume 2

Data Section Issue 3

DESIGN DATA HANDBOOK

INDUSTRIAL CATHODE RAY TUBES

Volume 2

The facilities and organisation of Thorn Radio Valves and Tubes Limited meet the requirements of the M.O.D. (P.E.) Defence Standard 05-21 and BS.9000.

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BRIMAR

B171/SP/1.5M/1078

Printed in Gt. Britain

The third edition of the Brimar Handbook has been published in two volumes.

Volume 1	**Operational recommendations** **Safety recommendations** **Aspects of Design Reports**
Volume 2	**Tube Index** **Tube selection tables** **Design data of phosphors** **Design data of accessories** **Design data of tubes**

Volume 1 is printed in English, French, German, Italian and Spanish.

Volume 2 data sheets are printed in "English" but the "terms" used in the volume are translated and can be found in the general section. The data sheets are filed in alpha-numerical order of tube type numbers.

Extreme care has been taken in the preparation of the data to ensure these volumes are as comprehensive, accurate and up to date as possible at the time of going to press. Before designing tubes into equipment, it is advisable to check with the sales office or authorised agents that availability and data remain unaltered.

HEALTH AND SAFETY AT WORK ACT 1974

Attention is drawn to the recommendations under this heading in the Safety Recommendations in volume one.

WARNING

These tubes should be used in accordance with their published ratings, and in conformity with the operational recommendations of the company's data handbook. The company will not entertain claims for loss or damage where this advice has been disregarded.

APPLICATIONS SERVICE

The Applications Laboratory provide a free advisory service to equipment manufacturers.

THORN RADIO VALVES AND TUBES LIMITED
Applications Laboratory,
Mollison Avenue,
Brimsdown, Enfield,
Middx. EN3 7NS

The following data is additional to that shown in the previous edition.

New Tube Data

D10-293..	6.8cm x 5.6cm display area, Medium to high bandwidth mesh p.d.a. tube.
D14-270..	10cm x 8cm display area, short length, mono-accelerator tube.
D14-280..	10cm x 8cm display area, Medium to high bandwidth mesh p.d.a. tube.
D14-310..	10cm x 8cm display area, high performance mesh p.d.a. tube.
D18-160..	12cm x 10cm display area, Medium to high bandwidth mesh p.d.a. tube.
M8-100..	74mm x 24mm display area, low profile screen, ruggedised gun construction data display tube.
M17-152..	M17-15.. with special minimum blemish screen for diagnostic photography.
M23-111..	23cm screen diagonal, 90° deflection angle, 20mm neck data display and monitor tube with anti-reflection face-plate.
M23-112..	23cm screen diagonal, 90° deflection angle, 20mm neck data display and monitor tube with Rimguard III implosion protection.
M23-113..	23cm screen diagonal, 90° deflection angle, 20mm neck data display and monitor tube with a tinted bonded face-plate and mounting lugs
M24-130..	24cm screen diagonal, 90° deflection angle, Mobile or military monitor fully ruggedised construction tube bonded face-plate integral mounting lugs.
M28-133..	28cm screen diagonal, 90° deflection angle, data display or monitor tube with a tinted bonded anti-reflection face-plate.
M31-190..	31cm screen diagonal, 90° deflection angle, Medical, data display or general purpose monitor tube. Rimguard III protection. Integral mounting lugs.
M31-191..	Version of M31-190 with a tinted bonded anti-reflection face-plate. 15% screen glass transmission.
M31-192..	Bonded face-plate version of M31-190.. 50% screen glass transmission.
M31-212..	31cm screen diagonal, 90° deflection angle tube specially designed for data display, with tinted bonded anti-reflection face-plate, integral mounting lugs.
M31-213..	M31-212.. but with clear glass bonded face-plate.
M38-105..	M38-100.. with a tinted bonded anti-reflection face-plate. 15% screen glass transmission.
M38-106..	M38-100.. with a tinted bonded anti-reflection face-plate, 30% screen glass transmission.
M38-142..	31cm screen diagonal, 110° deflection angle, high voltage focus, high resolution data display tube with Rimguard IV protection and integral mounting lugs.
59-60/90/074	38cm screen diagonal, 90° deflection angle fully ruggedised construction tube for mobile or military monitor application. Rimguard III re-enforced envelope and flying lead connections.

New Ancillary Data

Tube index			
Phosphor Screens	GX, GY	Socket	B12FPC
Graticules	58, 70, 82, 90, 98	Scan Coils	TBY2, TBY3, TBY5, TBY7


Ex-Libris
α
α
α
Ω
Ω
Arthur Missira
MCMXCVII

CONTENTS

Pro Electron Nomenclature

Industrial Cathode Ray Tubes

The type nomenclature consists of one letter and number joined by a hyphen to a number and one or two letters.

FIRST LETTER CLASSIFICATION

The first letter indicates the application and/or construction of the tube.

A	TV display tube for domestic applications
D	Oscilloscope tube, single trace
E	Oscilloscope tube, multiple trace
F	Radar display tube, direct view
L	Display storage tube
M	Professional television or display tube (except radar), direct view
P	Professional television or display tube, projection
Q	Flying-spot scanner

FIRST NUMBER CLASSIFICATION

The first number indicates the overall diameter or the overall diagonal of the glass envelope (face-plate) in cm.

7	Represents a 7 cm (3 in) face-plate
13	Represents a 13 cm (5 in) face-plate
50	Represents a 50 cm (20 in) face-plate

Note: Since the centimetre is smaller than the inch it is possible that more than one first number corresponds to a particular inch size tube,e.g. 47 and 49 have both been allocated for 19 inch tubes.

SECOND NUMBER CLASSIFICATION

The second number is a two or three figure serial number indicating a particular design or development.

FINAL LETTER(S)

The final letter(s) indicates the screen properties.

The first letter denotes the colour of the fluorescence (or phosphorescence in the case of long or very long persistence screens) according to the regions of the Kelly Chart of colour designations for lights, where applicable:

A	Reddish-purple, purple, bluish-purple
B	Purplish-blue, blue, greenish-blue
D	Blue-green
G	Bluish-green, green, yellowish-green
K	Yellow-green
L	Orange, orange-pink
R	Reddish-orange, red, pink, purplish-pink, purplish-red, red-purple.
W	"Standard White" television display tube phosphor.
X	Tri-colour screen
Y	Greenish-yellow, yellow, yellowish-orange.

The second letter is a serial letter to denote other specific differences in screen properties.

SUFFIXES

Internal or external graticules are indicated by a two-figure suffix separated from the final letter by an oblique stroke. Letter suffixes may also be used for Sparkguard bases.

EXAMPLES

D13-51GH	Single trace oscilloscope tube with a 13 cm (5 in) face-plate with phosphor type GH.
M59-25GM/24	Professional display tube with a 59 cm (23 in) face-plate and phosphor type GM and having an external co-ordinate graticule, type 24.

Translation of Terms

FRANÇAIS

Tubes a Rayons Cathodiques Industriels

Traduction des Termes

DEUTSCH

Industrielle Elektronenstrahlröhren

Übersetzung der Fachausdrücke

ITALIANO

Tubi a Raggi Catodici Per Uso Industriale

Traduzione di Termini

ESPAÑOL

Tubos de Rayos Catódicos Industriales

Traducción de Términos

Thorn Radio Valves and Tubes Limited

BRIMAR

ENGLISH	FRANÇAIS	DEUTSCH	ITALIANO	ESPAÑOL
Abridged data	caractéristiques résumées	Kurzdaten	Dati abbreviati	Datos Abreviados
Aluminised screen	écran aluminisé	Aluminiumhinterlegter Leuchtschirm	Schermo alluminizzato	Pantalla Aluminizada
Anti-flicker	anti-scintillement	Flimmerschutz	"Anti-flicker"	Anti-parpadeo
Anti-reflection facepiate	Face avant anti-réflexion	Schirmbügel mit Reflexionsschutz	Pannello frontale anti-riflettante	Placa externa antireflejos
Application	application	Anwendung	Applicazione	Aplicación
Banded p.d.e.	R.P.A. en bande gammée	Nachbeschleunigung mit Bandelektrode	Post accelerazione anodica a banda	acelerador post-deflexión de banda
Beam alignment electrode	électrode d'alignement du faisceau	Zentrierelektrode	Elettrodo de allineamento del fascio	Electrodo de Alineación de Haz
Black	Noir	Schwarz	Nero	negro
Blue	bleu	Blau	Blu	Azul
Bonded face plate	plaque protectrice de verre	Verbundglasscheibe	Pannello frontale "bonded"	Placa Protectora Incorporada
Camera viewfinder	viseur de caméra	Kamerasucher	Mirina per telecamera	Visor de la Cámara
Classification	classement	Klassifizierung	Classificazione	Clasificación
Clear glass	Verre transparent	Durchsichtiges Glas	Vetro lucido	vidrio transparente
Closed circuit television	télévision en circuit fermé	Industrielles Fernsehen	Televisione a circuito chiuso	Televisión en Circuito Cerrado
Common features	caractéristiques communes	Gemeinsame Merkmale	Caratteristiche comuni	Características Comunes
Common X deflection	déflection X commune	Normale X-Ablenkung	Deflessione X comune	Desviación X Común
Comparables	types comparables	Vergleichbare Typen	Tipi comparabile	Tipos comparables
Compass tube	tube pour boussoles	Funkpeilrohre	Tubo per bussola	Tubo Compás
Co-ordinate graticule	graticule de coordonnées	Koordinatenraster	Reticolo a coordinate	Reticula de Coordenadas
Corners cut	Coins Taillés	Gesundete Ecken	Angoli tagliati	esquinas redondeadas
Current types	types courants	Laufende Typen	Tipi correnti	Tipos Corrientes
Data Display Tube	Tube de visualisation de données	Datendarstellungsrohre	Tubo presentazione dati	Tubo para presentación de datos
Deflection yoke	Collier de déviation	Ablenkjoch	giogo deviatori	yugo de desviación
Demonstration tube	tube de démonstration	Demonstrationsrohre	Tubi de dimostrazione	Tubo de Demostración
Design data sheets	feuilles de caractéristiques	Datenblätter	Pagine dei dati	Hojas de Datos
Direction finder	goniomètre	Funkpeiler	Indicatore di direzione	Goniómetro
Double gun oscilloscope	oscilloscope à double canon	Zweistrahloszillograph	Oscilloscopio a doppio cannone	Osciloscopio de Cañón Doble
Dual phosphor	phosphore double	Dual-Phosphor	Fosforo doppio	Fósforo Doble
Edge illumination	Eclairage rasant	Randbeleuchtung	Illuminazione del contorno	iluminación de bordes
Electrostatic deflection	déviation électrostatique	Elektrostatische Ablenkung	Deflessione elettrostatica	Desviación Electrostática
Electrostatic focus	concentration électrostatique	Elektrostatische Fokussierung	Focalizzazione elettrostatica	Enfoque Electrostático
Equipment manufacturers	fabricants d'équipements	Gerätehersteller	Costruttori di apparecchiature	Fabricantes de Equipos
Equivalents	équivalents	Aquivalente	Equivalenti	Equivalentes
External graticule	graticule extérieure	Außenraster	Reticolo esterno	Reticula Externa
Features	caractéristiques	Merkmale	Caratteristiche	Características
Flat face	Face méplate	Flacher Schirm	Faccia piana	cara llana
Flashover protection	Protection de contournement	Überschlagschutz	Protezione contro scariche elettriche	protección salto de chispa
Flexibility	souplesse	Flexibilität	Flessibilità	Flexibilidad
Fluorescent	fluorescent	Fluorszent	Fluorescente	Fluorescente
Flying-spot scanner	balayage à spot mobile	Lichtpunktabtaster	"Flying spot scanner"	Exploración de Punto Volante
General purpose	usage général	Mehrzweck	Impiego generale	De Uso General
Graduated scale	échelle graduée	Kalibrierte Skala	Scala graduata	Escala Graduada
Graticule	graticule	Raster	Reticolo	Reticula
Green	vert	Grün	Verde	Verde
Grey	Gris	Grau	Grigio	gris
High sensitivity	haute sensibilité	Hohe Empfindlichkeit	Elevata sensibilità	Alta Sensibilidad
High voltage focus	Focalisation haute tension	Hochspannungsbündelung	Focalizzazione ad alta tensione	foco de alta tensión
Implosion protection	protection contre les implosions	Implosionsschutz	Protezione contro l'implosione	Protección contra Implosión
Industrial applications	utilisations industrielles	Industrielle Anwendungen	Applicazioni industriali	Aplicaciones Industriales
Industrial monitor	contrôle industriel	Industrieller Monitor	Monitor per impieghi industriali	Monitor Industrial
Instrument tubes	tubes d'instrument	Instrumentenröhren	Tubi per strumenti	Tubos para instrumentos
Integral mounting lugs	pattes de fixation incorporées	Eingearbeitete Befestigungsösen	Alette di fissaggio incorporate	Orejetas de Montura Integradas
Internal graticule	graticule intérieure	Innenraster	Reticolo interno	Reticula Interna
Internal scale	échelle intérieure	Innenskala	Scala interna	Escala Interna

ENGLISH	FRANÇAIS	DEUTSCH	ITALIANO	ESPAÑOL
Large display area	grande surface d'image	Große nutzbare Schirmfläche	Vasta area di rappresentazione	Area de Presentación Amplia
Large screen area	grande surface d'écran	Große Leuchtschemfläche	Grande schermo	Area de Pantalla Amplia
Large screen oscilloscope	oscilloscope à grand écran	Oszillograph mit großem Leuchtschirm	Oscilloscopio a grande schermo	Osciloscopio de Pantalla Amplia
Large spot	Gros spot	Großer Lichtfleck	Grande macchia luminosa	gran punto
Light injection	Injection lumineuse	Lichteinstreuung	Iniezione di luce	inyección de luz
Line width	largeur de ligne	Zeilenbreite	Ampiezza di linea	Anchura de Linea
Long	long	Lang	Lungo	Largo
Magnetic deflection	déviation magnétique	Magnetische Ablenkung	Deflessione magnetica	Deflexión Magnética
Magnetic focus	concentration magnétique	Magnetische Fokussierung	Focalizzazione magnetica	Enfoque Magnético
Magnetic shield	Ecran magnétique	Magnetische Abschirmung	Schermo magnetico	Blindaje magnético
Maintenance	entretien	Nachbestuckung	Manutenzione	Mantenimiento
Marine radar	radar marine	Schiffsradar	Radar marino	Radar Marino
Medical application	Application médicale	Medizinische Anwendung	Applicazione medica	Aplicación medica
Medium	moyen	Mittel	Medio	Medio
Medium bandwidth	largeur de bande moyenne	Mittlere Bandbreite	Media larghezza di banda	Anchura de Banda Media
Medium short	longueur moyenne	Mittel-Kurz	Medio breve	Medio Corto
Mesh P.D.A.	post-accélération mesh	Maschen-Nachbeschleunigungselektrode	Post accelerazione anodica a griglia	Acel. Post Desv. Rejilla
Mono-accelerator	Monoaccélérateur	Mono-Beschleuniger	mono-acceleratore	Mono acelerador
Monoscopes	monoscopes	Monoskopen	Monoscopi	Monoscopios
Mounting frame	cadre de montage	Befestigungsrahmen	Telaio di fissaggio	Marco de Montura
Narrow neck	Col etroit	Enger Hals	Collo stretto	Cuello estrecho
Neck diameter	diamètre du col	Halsdurchmesser	Diametro del collo	Diámetro de Cuello
Obsolescent	obsolescent	Auslaufend	In esaurimento	Anticuado
Obsolete	périmé	Ausgelaufene	Esaurito	Fuera de Uso
Octantal correction	correction octantale	Achtelkreisige Korrektion	Correzione degli ottanti	Corrección Octantal
Orange	orange	Orange	Arancio	Naranja
Oscilloscope tube	tube pour oscilloscope	Oszillographenröhre	Tubo per oscilloscopio	Tubo de Osciloscopio
Overall length	longueur hors tout	Gesamtlänge	Lunghezza totale	Longitud Total
Persistence	persistance	Nachleuchtdauer	Persistenza	Persistencia
P.D.A. ratio	rapport de post-accélération	Nachbeschleunigungsverhältnis	Rapporto di post accelerazione anodica	Relación de Acel. Post-Desv.
Phosphorescence	luminescence	Nachleuchten	Fosforescenza	Fosforescencia
Phosphors	phosphores	Leuchtschemarten	Fosfori	Fósforos
Photography	photographie	Photographie	Fotografia	Fotografia
Post deflection acceleration	accélération après déflection	Nachbeschleunigung	Post accelerazione anodica	Aceleración Post-Deflexión
P.P.I. display	visualisation P.P.I.	P.P.I.-Darstellung	Indicatore di posizione panoramico	Presentación P.P.I.
Purple	pourpre	Purpur	Porpora	Púrpura
Radar tube	tube radar	Radarbildröhre	Tubo per radar	Tubo Radar
Rectangular face	face rectangulaire	Rechteckige Frontfläche	Superfice rettangolare	Cara Rectangular
Reinforced envelope	enveloppe renforcée	Verstärkter Kolben	Involucro rinforzato	Bulbo Reforzado
Rimband	bande métallique	Metallstreifenschutz	Striscia metallica	Banda metálica
Rimguard	coquille métallique	Metallrahmen	Guscio metallico	Protección del Borde
Round face	écran rond	Runder Schirm	Faccia circolare	Cara circular
Sales classification	classement	Klassifizierung	Classificazione	Classificación
Scan coil	Bobine du balayage	Ablenkspule	Bobina per scansione	Bobina de exploración
Screen diameter	diamètre de l'écran	Leuchtschirmdurchmesser	Diametro della schermo	Diámetro de Pantalla
Secondary parameters	paramètres secondaires	Sekundärparameter	Parametri secondari	Parámetros Secundarios
Short length	longueur réduite	Kurze Baulange	Corto	Longitud Corta
Short neck	col court	Kurzer Kolbenhals	Collo corto	Cuello Corto
Short persistence	courte persistance	Kurz Nachleuchtdauer	Breve Persistenza	Corta Persistencia
Side pins	broches latérales	Seitliche Anschlußstifte	Contatti laterali	Patillas Laterales
Single gun	canon unique	Einstrahlsystem	Cannone singolo	Cañón Sencillo
Small electrostatic tubes	tubes petits électrostatiques	Kleine elektrostatische Rohren	Tubi piccoli elettrostatici	Tubos electrostáticos pequeños
Socket	Douille	Fassung	Presa	Zocalo
Sparkguard base	base anti-flash	Funkenschutzsockel	Base di protezione contro le scariche	Zócalo a Prueba de Arcos
Special quality	qualité spéciale	Sonderqualität	Qualità speciale	Calidad Especial
Special phosphors	phosphores spéciaux	Spezial-Phosphor	Fosfori speciali	Fósforos Especiales
Spiral P.D.A.	post accélération spirale	Spiralförmige Nachbeschleunigungselektrode	Post accelerazione anodica a spirale	Espiral Acel. Post Desv.
Standard phosphors	Phosphores standards	Normalleuchtschirmarten	Fosfori standard	Fósforos standard
Strengthened structure	structure renforcée	Verstärktekonstruktion	Struttura rinforzata	Estructura reforzada
Studio monitor	contrôle de studio	Studio-Monitor	Monitor per studio	Monitor de Estudio

ENGLISH	FRANÇAIS	DEUTSCH	ITALIANO	ESPAÑOL
Television monitor	contrôle de télévision	Fernsehmonitor	Monitor per televisione	Monitor de Televisión
Trace	Trace	Spur	Traccia luminosa	Trazado
Transistorised	transistorisé	Transistorisiert	Transistorizzato	Transistorizado
Translator scan	Balayage par transistor	Transistorablastung	Scansione a transistor	Barrido por Transistores
Twist coil	Bobine de déviation	Koordinatenablgleichspule	Bobina di regolazione coordinate	Bobina de alineación
Two phospher screen	écran à deux phosphores	Dual-Leuchtschirm	Schermo con due fosfori	Pantalla de dos Fósforos
Typical operation	conditions typiques d'emploi	Typische Betriebsweise	Funzionamento tipico	Funcionamiento Típico
Uniformly graduated	gradué uniformément	Stetige Teilung	Graduato uniformemente	Con Graduación Uniforme
Very long	très long	Sehr lang	Molto lungo	Muy Largo
Very short	très court	Sehr kurz	Molto breve	Muy Corto
Waveform display	visualisation de la forme d'onde	Oszillogramme	Rappresentazione di forme d'onda	Presentación de Formas de Onda
White	blanc	Weiß	Bianco	Blanco
Wide bandwidth	large bande	Große Bandbreite	Ampia larghezza di banda	Gran Anchura de Banda
Yellow	jaune	Gelb	Giallo	Amarillo
X-Y plotter	plotter X-Y	Koordinatenschreiber	Tracciatore X-Y	Trazador X-Y

Industrial Cathode Ray Tubes

Index

Index

Industrial Cathode Ray Tubes

Type Number	Section & Replacement
F21-130	Radar
F22-10	Radar
F22-11	Radar
F31-10	Radar
F31-11	Radar
F31-12	Radar
F31-13	Radar
F31-14	Radar
F31-111	Radar
F31-112	Radar
F41-12	Radar
F41-13	Radar
F41-14	Radar
F41-120	Radar F41-12
F41-121	Radar
F41-122	Radar F41-123
F41-123	Radar
F41-124	Radar
F41-130	Radar F41-13
F41-140	Radar F41-14
F41-141	Radar
M8-100	Data & Monitor
M14-100	Data & Monitor
M16-100	Data & Monitor
M17-10	Data & Monitor
M17-12	Data & Monitor
M17-15	Data & Monitor
M17-152	Data & Monitor
M19-100	Data & Monitor
M21-13	Data & Monitor

Type Number	Section & Replacement
M23-110	Data & Monitor
M23-111	Data & Monitor
M23-112	Data & Monitor
M23-113	Data & Monitor
M24-120	Data & Monitor
M24-121	Data & Monitor
M24-130	Data & Monitor
M28-11	Data & Monitor
M28-12	Data & Monitor
M28-13	Data & Monitor
M28-131	Data & Monitor
M28-132	Data & Monitor
M28-133	Data & Monitor
M31-100	Data & Monitor
M31-101	Data & Monitor
M31-120	Data & Monitor
M31-182	Data & Monitor
M31-184	Data & Monitor
M31-185	Data & Monitor
M31-190	Data & Monitor
M31-191	Data & Monitor
M31-192	Data & Monitor
M31-212	Data & Monitor
M31-213	Data & Monitor
M36-141	Data & Monitor
M36-142	Data & Monitor
M38-100	Data & Monitor
M38-101	Data & Monitor
M38-102	Data & Monitor
M38-103	Data & Monitor
M38-104	Data & Monitor
M38-105	Data & Monitor
M38-106	Data & Monitor
M38-111	Data & Monitor
M38-112	Data & Monitor
M38-113	Data & Monitor

Industrial Cathode Ray Tubes

Index

Index

Industrial Cathode Ray Tubes

Type Number	Section & Replacement
5960-99-000-0429	Radar CV429
5960-99-000-5119	Radar CV5119
5960-99-037-2027	Radar CV5203
5960-99-037-3477	Oscilloscope SE4D/P31
5960-99-037-4577	Oscilloscope D21-10GH
5960-99-037-4597	Oscilloscope SE5-2A/P31
5960-99-037-5397	Radar F22-10LD
5960-99-037-5739	Radar F21-12LC
5960-99-037-6038	Data & Monitor M31-100GH
5960-99-037-6039	Special XR1000-09
5960-99-037-6042	Data & Monitor M16-100W
5960-99-038-0170	Data & Monitor 59-60/90/037
5960-99-038-0723	Data & Monitor 59-60/90/074
5960-99-118-0715	Oscilloscope D13-51GH
5960-99-118-1105	Oscilloscope D13-51GH/26
5960-99-118-1602	Oscilloscope SE5-2A/GH
5960-99-118-2158	Radar F31-112LD
5960-99-118-2707	Data & Monitor M28-13LG/S
5960-99-118-3296	Data & Monitor M38-101LD/R
5960-99-118-3365	Radar F31-10LC
5960-99-118-3384	Data & Monitor M28-13W
5960-99-118-4000	Oscilloscope D21-10GM
5960-99-118-4668	Data & Monitor M38-112GH
5960-99-118-5158	Special XR1003-36

SINGLE GUN INSTRUMENT TUBES - CURRENT TYPES

Common features:- Electrostatic deflection and focus, 6.3V heaters

Type Number	Other Current Phosphors	Description	Face§ Diag. Diam. nom. inch	Useful Screen Area min. cm^2	Overall length max. mm	TYPICAL OPERATION - voltages to cathode								Base Type
						I_h A	V_{a1} kV	V_{a2} focus av V	V_{a3} kV	V_{a4} kV	$-V_g$† av V	D_x V/cm	D_y V/cm	
D3-130GH		General purpose indicating device	(1)	2.7*	103.2	0.3	1.0	96	1.0	1.0	34	80 to 120	58 to 88	B13B
D7-200GH	GM	Indicators, oscilloscopes, alpha-numerical readout	[3]	5 x 4	180	0.3	1.0	132	1.0	1.0	38	21 to 29	25 to 35	B13B
D7-201GH	GM	Improved D7-200GH	[3]	5 x 4	190	0.12	1.2	165	1.2	-	45	29 to 37	14 to 18	B13B
D9-110GH		Low profile *mono-accelerator*	[3.5]	6.6 x 4	264	0.12	2.0	405	2.0	-	64	28 to 34.8	12.8 to 16	B14G
D10-210GH	GM	Compact tube, mesh p.d.a.	[4]	7 x 5	230	0.075‡	0.6	160	0.54	6.0	42	11.2 to 13.8	8 to 10	B12F
D10-230GH		Flat-faced mono-accelerator	(4)	8 x 6.4**	260	0.3	1.5	305	1.5	-	48	21 to 26	13 to 16	B14G
D10-240GH	GM	Medium bandwidth, spiral p.d.a.	[4]	7 x 5	260	0.12	1.0	262	1.0	2.0	52	21.6 to 26.4	8.3 to 10.2	B12F
D10-293GH		Medium to high bandwidth, *mesh* p.d.a.	[4]	6.8 x 5.6	300	0.12	1.0	260	1.0	6	39	10.5 to 12.8	3.8 to 4.8	B12F
D13-47GH	BE, GL GM	Medium bandwidth, spiral p.d.a.	[5]	10 x 6	371	0.3	1.0	287	1.0	4.0	50	14.5 to 17.5	6.7 to 8.3	B12F
D13-51GH	GM	High bandwidth, mesh p.d.a.	[5]	10 x 6	335	0.3	1.0	90	1.0	10	70	11 to 15	4.5 to 6.0	B12F
D13-471GH	GM	D13-47GH with low wattage heater	[5]	10 x 6	371	0.12	1.0	287	1.0	4.0	50	14.5 to 17.5	6.7 to 8.3	B12F
D13-600GH	GM	General purpose short length, spiral p.d.a.	(5)	10 x 8**	315	0.3	1.5	400	1.5	3.0	73	21 to 27	10 to 12.7	B12F

Other phosphor screens are available to special order. Both x and y-plates are designed for symmetrical operation.

* Diameter † Cut-off § ◯ Round face ▭ Rectangular face ‡ V_h = 11V ** Corners cut.

SINGLE GUN INSTRUMENT TUBES - CURRENT TYPES (continued)

Common features:- Electrostatic deflection and focus, 6.3V heaters.

Type Number	Other Current Phosphors	Description	Face§ Diag. Diam. nom. inch	Useful Screen Area min. cm^2	Overall length max. mm	TYPICAL OPERATION - voltages to cathode								Base Type
						I_h A	V_{a1} kV	V_{a2} focus av V	V_{a3} kV	V_{a4} kV	$-V_g$ † av V	D_x V/cm	D_y V/cm	
D13-601GH		D13-600GH with low wattage heater	(5)	10 x 8*	315	0.12	1.5	400	1.5	3.0	73	21 to 27	10 to 12.7	B12F
D13-610GH	GM	General purpose, medium bandwidth, spiral p.d.a.	(5)	10 x 8*	371	0.3	1.0	275	1.0	3.0	50	12.5 to 15.8	6.8 to 8.7	B12F
D13-611GH	GM	General purpose, medium bandwidth, spiral p.d.a.	(5)	10 x 8*	371	0.3	1.0	275	1.0	3.5	52	14.1 to 16.9	7.0 to 8.9	B12F
D13-630GH		Short length mono-accelerator	(5)	10 x 8*	340	0.3	2.0	230	2.0	-	50	19 to 23	12 to 15	B14G
D14-150GH		High bandwidth mesh p.d.a.	[5.5]	10 x 8	386	0.3	1.2	115	1.2	12	70	11 to 14.5	4.6 to 6.0	B12F
D14-172GH	GL,GM GV	General purpose, short length, spiral p.d.a.	[5.5]	10 x 8	308	0.3	1.0	280	1.0	2.0	50	15.7 to 18.7	7.4 to 9.7	B12F
D14-173GH	GM,GV	D14-172GH with low wattage heater	[5.5]	10 x 8	308	0.12	1.0	280	1.0	2.0	50	15.7 to 18.7	7.4 to 9.7	B12F
D14-181GH	GM	Medium bandwidth, spiral p.d.a.	[5.5]	10 x 8	384	0.3	1.0	287	1.0	4.0	50	14.1 to 17	6.7 to 8.7	B12F
D14-200GH	GM	High bandwidth, mesh p.d.a.	[5.5]	10 x 8	405	0.3	1.2	115	1.2	12	70	11 to 14.2	4.3 to 5.4	B12F
D14-270GH		Large screen short length mono-accelerator	[5.5]	10 x 8	333	0.3	2.0	262	2.0	-	50	19 to 23	12 to 15	B14G
D14-280GH		Medium to high bandwidth mesh p.d.a.	[5.5]	10 x 8	395	0.3	2.0	535	2.0	12	80	14 to 17.4	5.6 to 6.9	B12F
D14-310GH	GM	High performance, mesh p.d.a.	[5.5]	10 x 8	420	0.3	1.5	475	1.5	12	50	11 to 14	3.4 to 4.3	B12F
D16-100GH	GM	Square face, X-Y plotter, spiral p.d.a.	[6.5]	10 x 10	387	0.3	1.25	350	1.25	2.5	65	13.5 to 17	13.5 to 17	B12F

Other phosphor screens are available to special order. Both x and y-plates are designed for symmetrical operation.

* Corners cut † Cut-off § (5) Round face [5.5] Rectangular face.

SINGLE GUN INSTRUMENT TUBES - CURRENT TYPES (continued)

Common features:- Electrostatic deflection and focus, 6.3V heaters

Type Number	Other Current Phosphors	Description	Face§ Diag. Dia. nom. inch	Useful Screen Area min. cm^2	Overall length max. mm	TYPICAL OPERATION - voltages to cathode								Base Type
						I_h A	V_{a1} kV	V_{a2} focus av V	V_{a3} kV	V_{a4} kV	$-V_g$† av V	D_x V/cm	D_y V/cm	
D16-110GH		Medium bandwidth, square face, X-Y plotter, spiral p.d.a.	6.5	10 x 10	384	0.3	1.0	287	1.0	4.0	40	14.5 to 18.5	8.5 to 10.7	B12F
D18-130GH	GM, GV	General purpose, large screen area, spiral p.d.a.	7	12 x 10	310	0.3	1.5	420	1.5	3.0	60	23 to 29	13 to 16.5	B12F
D18-160GH		Large screen, mesh p.d.a.	7	12 x 10	450	0.3	2.0	540	2.0	12	60	10.5 to 13.5	4.1 to 5.5	B12F
D21-102GH		Large diameter display p.d.a.	8.5	15 x 15*	420	0.3	3.0	1000	3.0	6	60	34.5 to 48	28.5 to 40.5	B12F

Other phosphor screens are available to special order. Both x and y-plates are designed for symmetrical operation.

* Corners cut † Cut-off § ◯ Round face ▭ Rectangular face.

DOUBLE GUN OSCILLOSCOPE TUBE - CURRENT TYPE

Electrostatic deflection and focus, post deflection acceleration, 6.3V 0.6A heater, B12F base, CT8 side contact.

Type Number	Description	Face Diam.	Useful Screen Area	Overall Length	Neck Dia.	TYPICAL OPERATION - voltages referred to cathode							
						V_{a1}	V_{a2} focus av.	V_{a3}	V_{a4}	$-V_g$ cut-off av.	P.D.A. Ratio max.	D_x	D_y
		inch	min. cm^2	max. mm	max. mm	kV	V	kV	kV	V		max. V/cm	max. V/cm
SE5/2A/GH CV9337	High sensitivity, common X deflection, beam alignment electrode.	5	10 x 5	380	65	1.0	200	1.0	4.0	60	4:1	22	7.0

Other phosphor screens are available to special order.

FLYING-SPOT SCANNER TUBES - CURRENT TYPES

Common features:- High resolution, small spot size, magnetic deflection, 6.3V 0.3A heaters

Type	Application and Description	Face Diam	Useful Screen Area	Overall Length	Neck Dia.	TYPICAL OPERATION - voltages referred to cathode					Base Type
						V_{a1}	V_a Focus	V_a Final	$-V_g$ cut-off	Max. Spot Dia. at 60% pk. luminance mm at I_{a3} μA	
		nom. inch	min. mm^2	max. mm	max. mm	V	kV	kV	V		
Q13-202GS	Electrostatic focus. Document readers or telecine. Precision mounting frame. EHT connection by rubber encapsulated flexible lead.	5	96.5 x 76.2 corners cut†	580	38	300	3.7 to 5.2	15	30 to 70	0.07 4.5	B12A
Q13-203GT	Smaller spot size version of Q13-202..	5	89 x 68.6 corners cut†	580	38	300	3.7 to 5.2	15	30 to 70	0.05 4.5	B12A

Other phosphor screens are available to special order. † Diagonal 108 mm min.

RADAR TUBES - CURRENT TYPES

Common features:- Electrostatic focus, magnetic deflection, 6.3V 0.3A heaters, aluminised screens, CT8 side contacts.

Type Number	Other Current Phosphors	Application and Description	Face Dia. nom. inch	Overall Length max. mm	Neck Dia. max. mm	Defl. Angle nom. °	TYPICAL OPERATION Voltages referred to cathode				Base Type
							V_{a1} V	V_{a2+a4} kV	V_{a3} V	$-V_{g}$ cut-off V	
F10-100LD		Small boat radar	4	271	38	30	400	5	0 to 400	40 to 77	B14G
F15-101LD		Small boat radar	6	242	29.4	53	400	9	0 to 400	40 to 77	B8H
F16-101LD		Small boat radar	6	370	29.4	37	500	14	0 to 400	27 to 44	B8H
7ABP33A		American type for small boat radar	7	342	38	50	300	7	0 to 250	28 to 72	B12A
F21-10LD	GM,LG	General marine radar	8.5	450	35.5	41	600	14	0 to 400	32 to 48	B8H
F21-130LD		General marine radar	8.5	326	29.4	60	400	14	0 to 400	34 to 78	B8H
F22-10GM		General marine radar	9	408	35.5	60	300	12	-300 to +300	30 to 78	B12A
F22-11LD		Enlarged spot version of F22-10LD	9	408	35.5	60	300	12	-300 to +300	30 to 78	B12A
F31-10GM	LC,LD LG	General marine radar	12	572	35.5	40	600	15	-300 to +300	40 to 85	B8H
F31-11LD	LC	Wider scan angle than F31-10LD	12	494	35.5	50	300	14	-300 to +300	30 to 70	B12A
F31-12LC		Narrower cut-off voltage range than F31-10LC	12	572	35.5	40	600	16	-150 to +450	44 to 70	B8H
F31-111LC	GR	Enlarged spot version of F31-11LC	12	494	35.5	50	300	14	-300 to +300	30 to 70	B12A
F31-112LD		Extended neck length variant of F31-11LD	12	528	35.5	50	600	14	0 to 400	32 to 48	B12A

The above tubes, in certain cases, can be supplied with phosphor screens other than those listed to special order.
Tubes using the B8H base may be fitted with the B8H Sparkguard Base and will then have a suffix after the type number.

RADAR TUBES - CURRENT TYPES (continued)

Common features:- Electrostatic focus, magnetic deflection, 6.3V 0.3A heaters, aluminised screens, CT8 side contacts.

Type	Other Current Phosphors	Application and Description	Face Dia. nom. inch	Overall Length max. mm	Neck Dia. max. mm	Defl. Angle nom. °	TYPICAL OPERATION Voltages referred to cathode				Base Type
							V_{a1} V	V_{a2+a4} kV	V_{a3} V	-V_g cut-off V	
F41-12LC	LD	Major radars for ships, ports & airport traffic control.	16	610	35.5	50	300	15	-300 to+300	40 to 80	B12A
F41-13LC		Narrower cut-off voltage range than F41-12..	16	610	35.5	50	300	15	-300 to+300	40 to 64	B12A
F41-14LD	LC	Enlarged spot version of F41-12..	16	610	35.5	50	300	15	-300 to+300	40 to 80	B12A
F41-123LG	LC	Long neck version of F41-12..	16	650	35.5	50	300	15	-300 to+300	40 to 80	B12A
F41-124LG	LG	F41-123.. except positive focus voltage range	16	650	35.5	50	300	15	0 to+400	40 to 80	B12A
F41-141LC		Enlarged spot version of F41-12..	16	610	35.5	50	300	18	-300 to+300	40 to 80	B12A

The above tubes, in certain cases, can be supplied with phosphor screens other than those listed to special order.
Tubes using the B8H base may be fitted with the B8H Sparkguard Base and will then have a suffix after the type number.

DATA DISPLAY AND MONITOR TUBES - CURRENT TYPES

Common features:- Rectangular face-plates, electrostatic focus, magnetic deflection, aluminised screens, CT8 side contacts.

Type Number	Other Current Phosphors	Application and Description	Face§ Diag. nom. inch	Overall Length max. mm	Neck Dia. max. mm	Defl. Angle °	Screen Glass Trans. (Appr.) %	TYPICAL OPERATION Voltages referred to cathode Vh V	Ih mA	V_{a1} V	V_a final kV	V_{a3} focus V	$-V_g$ cut-off V	Base Type
M14-100W	GH, GM GV	Medical and camera, viewfinder applications	5.5	184	20.7	70	62	11	75	250	10	0 to 350	35 to 69	B7G/D
M16-100W		Mobile or military monitor. Fully ruggedised construction Encapsulated flexible leads to base and anode button.	6	233.7	27.45	70	Clear	6.3	300	400	14	0 to 400	31 to 71	Flying leads
M17-10W		Small, quality monitor or TV camera viewfinder.	7	236	29.4	70	Clear	11.5	150	400	14	0 to 400	38 to 78	B8H
M17-12W		M17-10.. with different heater	7	236	29.4	70	Clear	6.3	300	400	14	0 to 400	38 to 78	B8H
M17-15W	BE, GR GV	Self-protected version of M17-10.. Bonded face-plate	7	242	29.4	70	Clear	11.5	150	400	14	0 to 400	38 to 78	B8H
M17-152BE		M17-15BE with improved screen	7	242	29.4	70	Clear	11.5	150	400	14	0 to 400	38 to 78	B8H
M19-100W		Medical, data display or general purpose monitor.	7.5	196	20.7	90	65	11	75	250	10	0 to 350	35 to 69	B7G/D
59-60/90/ 037		Mobile or military monitor. Fully ruggedised construction	8.5	292	27.45	70	Clear	6.3	300	400	14	-50 to 400	35 to 75	Flying leads
M23-110W	GH	Medical, data display or general purpose monitor.	9	222	20.7	90	50	11	75	250	10	0 to 350	35 to 69	B7G/D
M23-111W	GH	M23-110.. with a tinted bonded anti reflection face-plate.	9	228	20.7	90	30	11	75	250	10	0 to 350	35 to 69	B7G/D
M23-112GH	W	M23-110.. with Rimguard III protection	9	222	20.7	90	50	11	75	250	10	0 to 350	35 to 69	B7G/D

Other phosphor screens can be supplied to special order. § Rectangular face, Mounting frame, Mounting lugs.
Types using the B8H base may be fitted with the B8H Sparkguard Base and will then have a suffix after the type number.

DATA DISPLAY AND MONITOR TUBES - CURRENT TYPES (continued)

Common features:- Rectangular face-plates, electrostatic focus, magnetic deflection, aluminised screens, CT8 side contacts.

Type Number	Other Current Phosphors	Application and Description	Faces§ Diag. nom. inch	Overall Length max. mm	Neck Dia. max. mm	Defl. Angle °	Screen Glass Trans. (Appr.) %	TYPICAL OPERATION Voltages referred to cathode V_h V	I_h mA	V_{a1} V	V_a final kV	V_{a3} focus V	$-V_g$ cut-off V	Base Type
M23-113GV	GH, W	M23-112.. with a tinted bonded anti-reflection face-plate	9	228	20.7	90	30	11	75	250	10	0 to 350	35 to 69	B7G/D
M24-120W	LC, WA	High resolution data display	9.5	260	29.4	90	52	6.3	300	400	14	0 to 400	38 to 82	B8H
M24-121W		Unprotected version of M24-120..	9.5	260	29.4	90	52	6.3	300	400	14	0 to 400	38 to 82	B8H
M24-130GJ		Mobile or military monitor Fully ruggedised construction Bonded face-plate, integral mounting lugs.	9.5	280	29.4	90	32	6.3	300	400	14	0 to 400	38 to 82	Flying leads
M28-12W	GM, GP	Medical, data display or general purpose monitor	11	253	20.7	90	58	11	75	250	11	0 to 350	35 to 69	B7G/D
M28-13W	GH, GR GV, LC LG, WA	Self-protected data display tube with Rimguard III for push-through mounting.	11	266	29.4	90	58	11.5	150	400	14	0 to 400	40 to 76	B8H
M28-132GH		M28-13.. with a tinted bonded anti-reflection face-plate	11	271	29.4	90	35	11.5	150	400	14	0 to 400	40 to 76	B8H
M28-133GH		M28-13.. with a tinted bonded anti-reflection face-plate	11	271	29.4	90	18	11.5	150	400	14	0 to 400	40 to 76	B8H
M31-120W		General purpose monitor tube	12	233	20.7	110	50	11	140	250	12	0 to 350	35 to 69	B7G/D
M31-184W	GH	Data display or industrial monitor with Rimguard III protection	12	243	29.4	110	50	6.3	300	400	15	0 to 400	40 to 77	B8H
M31-185GH		Data display tube with tinted bonded face-plate	12	248.5	29.4	110	15	6.3	300	400	12	0 to 400	40 to 77	B8H

Other phosphor screens can be supplied to special order. § ▭ Rectangular face ⊓⊔ Mounting lugs.
Types using the B8H base may be fitted with the B8H Sparkguard Base and will then have a suffix after the type number.

DATA DISPLAY AND MONITOR TUBES - CURRENT TYPES (Continued)

Common Features:- Rectangular face-plates, electrostatic focus, magnetic deflection, aluminised screens, CT8 side contacts

Type Number	Other Current Phosphors	Application and Description	Face§ Diag. nom. inch	Overall Length max. mm	Neck Dia. max. mm	Defl. Angle °	Screen Glass Trans. (Appr.) %	TYPICAL OPERATION Voltages referred to cathode V_h V	I_h mA	V_{a1} V	V_a final kV	V_{a3} focus V	$-V_g$ cut-off V	Base Type
M31-190GH	W	Medical, data display or general purpose monitor Rimguard III Protection integral mounting lugs.	12	277	20.7	90	50	11	75	250	12	0 to 350	35 to 69	B7G/D
M31-191GH	W	M31-192.. with a tinted bonded anti reflection face-plate	12	282	20.7	90	15	11	75	250	12	0 to 350	35 to 69	B7G/D
M31-192GH	W	Bonded face-plate version of of M31-190..	12	282	20.7	90	50	11	75	250	12	0 to 350	35 to 69	B7G/D
M31-212GH		Data display tinted bonded anti-reflection face-plate integral mounting lugs	12	282	20.7	90	15	11	75	300	12	0 to 350	40 to 79	B7G/D
M31-213GH		M31-212.. but with a clear glass bonded face-plate	12	282	20.7	90	50	11	75	300	12	0 to 350	40 to 79	B7G/D
M36-141W		Studio quality monitor	14	425	38	70	60	6.3	300	300	12	-200 to +200	30 to 72	B12A
M38-100W	GH, GJ GR, LC LG, WA	Industrial monitor. Data display. Rimguard III protection. Squared-off screen	15	356	29.4	90	50	11.5	150	400	16	0 to 400	38 to 82	B8H
M38-101GH	LD	M38-100. with longer neck for "position & write" coils	15	378	29.4	90	50	11.5	150	400	16	0 to 400	38 to 82	B8H
M38-102GH		Bonded face-plate version of M38-100..	15	383	29.4	90	50	11.5	150	400	16	0 to 400	38 to 82	B8H
M38-103WA		Version of M38-100WA with modified lugs	15	356	29.4	90	50	11.5	150	400	16	0 to 400	38 to 82	B8H

Other phosphor screens can be supplied to special order. § ▭ Rectangular face ⌷ Mounting lugs.
Types using the B8H base may be fitted with the B8H Sparkguard Base and will then have a suffix after the type number.

DATA DISPLAY AND MONITOR TUBES - CURRENT TYPES (continued)

Common features:- Rectangular face-plates, electrostatic focus, magnetic deflection, aluminised screens, CT8 side contacts

Type Number	Other Current Phosphors	Application and Description	Face§ Diag. nom. inch	Overall Length max. mm	Neck Dia. max. mm	Defl. Angle °	Screen Glass Trans. (Appr.) %	TYPICAL OPERATION Voltages referred to cathode V_h V	I_h mA	V_{a1} V	V_a final kV	V_{a3} focus V	$-V_g$ cut-off V	Base Type
M38-104GH		Bonded face-plate version of M38-100GH	15	361	29.4	90	50	11.5	150	400	16	0 to 400	38 to 82	B8H
M38-105GH		M38-102.. with a tinted bonded anti-reflection face-plate	15	383	29.4	90	15	11.5	150	400	16	0 to 400	38 to 82	B8H
M38-106GH		M38-102.. with a tinted bonded anti-reflection face-plate	15	383	29.4	90	30	11.5	150	400	16	0 to 400	38 to 82	B8H
M38-113GH		High resolution "position and write" data display	15	441	38	90	50	6.3	300	400	15	0 to 400	30 to 70	B12A
59-60/90/074		Mobile or military monitor Fully ruggedised construction Rimguard III protection integral mounting lugs	15	372	29.4	90	50	6.3	300	400	16	0 to 400	42 to 86	Flying leads
M38-120W	GH	General purpose monitor tube	15	279.5	29.4	110	50	6.3	300	400	16	0 to 400	40 to 85	B8H
M38-121W	GH	Protected version of M38-120..	15	279.5	29.4	110	50	6.3	300	400	16	0 to 400	40 to 85	B8H
M38-122GH		Data display. Tinted bonded face-plate	15	284.5	29.4	110	15	6.3	300	400	16	0 to 400	40 to 85	B8H
M38-142W	GH	High voltage focus high resolution data display. Rimguard IV protection integral mounting lugs	15	321	29.4	110	50	6.3	300	450	17	4000*	35 to 85	B8H

Other phosphor screens can be supplied to special order. § ▭ Rectangular face ⟷ Mounting lugs. * Va2
Types using the B8H base may be fitted with the B8H Sparkguard Base and will have a suffix after the type number.

DATA DISPLAY AND MONITOR TUBES - CURRENT TYPES (continued)

Common features:- Rectangular face-plates, electrostatic focus, magnetic deflection, aluminised screens, CT8 side contacts

Type Number	Other Current Phosphors	Application and Description	Face§ Diag. nom. inch	Overall Length max. mm	Neck Dia. max. mm	Defl. Angle °	Screen Glass Trans. (Appr.) %	TYPICAL OPERATION Voltages referred to cathode						Base Type
								V_h V	I_h mA	V_{a1} V	V_a final kV	V_{a3} focus V	$-V_g$ cut-off V	
M44-120W	LC	Squared-up screen. Rimguard III push-through protection	17	291	29.4	110	48	6.3	300	400	16	0 to 400	40 to 77	B8H
M50-120W	GH, GR GV, LG WA	Squared-up screen. Rimguard III push-through protection	20	319	29.4	110	45	6.3	300	400	16	0 to 400	40 to 77	B8H
M61-120W	GH, GR	Squared-up screen. Rimguard III push-through protection	24	370	29.4	110	42	6.3	300	400	16	0 to 400	40 to 77	B8H

Other phosphor screens can be supplied to special order. § ▭ Rectangular face ⟷ Mounting lugs.
Types using the B8H base may be fitted with the B8H Sparkguard Base and will have a suffix after the type number.

Magnetic Shields Tube Coils

Tube Type	Magnetic Shield Number MS	Tube Coil Number TW
D3-130	2	-
D7-200	3	28
D7-201	33	28
	34	
D9-110	65	50
D10-210	6	24
D10-230	41	-
D10-240	7	33
D10-293	83	56
D13-33	27	-
D13-47	23	30
D13-51	36	21
D13-471	23	30
D13-600	47	-
D13-601	47	-
D13-610	49	-
D13-611	50	-
D13-630	43	-
D14-150	9	25
D14-172	15	20
		26
D14-173	15	20
		26
D14-181	20	23
D14-200	11	29
D14-270	70	52
D14-280	72	29
D14-310	1	29
D16-100	45	45
D16-110	63	45
D18-130	61	48
D18-160	84	29

Oscilloscope Tubes

Tube Type	Magnetic Shield Number MS	Tube Coil Number TW
D21-10	52	-
D21-102	52	-
SE4D	55	-
SE5/2A	58	-
SE5F	59	-

BRIMAR

Oscilloscope Tubes

Magnetic Shields Tube Coils

Magnetic Shield Number MS	Used on Tube Type number	
1	D14-310	
2	D3-130	
3	D7-200	
6	D10-210	
7	D10-240	
9	D14-150	
11	D14-200	
15	D14-172	D14-173
20	D14-181	
23	D13-47	D13-471
27	D13-33	
33	D7-201	
34	D7-201	
36	D13-51	
41	D10-230	
43	D13-630	
45	D16-100	
47	D13-600	D13-601
49	D13-610	
50	D13-611	
52	D21-10	D21-102
55	SE4D	
58	SE5/2A	
59	SE5F	
61	D18-130	
63	D16-110	
65	D9-110	
70	D14-270	
72	D14-280	
83	D10-293	
84	D18-160	

Tube Coil Number TW	Used on Tube Type number	
20	D14-172	D14-173
21	D13-51	
23	D14-181	
24	D10-210	
25	D14-150	
26	D14-172	D14-173
28	D7-200	D7-201
29	D14-200	D14-310
	D14-280	D18-160
30	D13-47	D13-471
33	D10-240	
45	D16-100	D16-110
48	D18-130	
50	D9-110	
52	D14-270	
56	D10-293	

Scan Coils — Data Display or Monitor Tubes

CURRENT TYPES

Tube Type	Scan Coil Number
M14-100	TBY3
M16-100	*
M17-10	TBY2
M17-12	TBY2
M17-15	TBY2
M17-152	TBY2
M19-100	TBY3
M21-13	TBY1
M23-110	TBY3
M23-111	TBY3
M23-112	TBY3
M23-113	TBY3
M24-120	TBY1
M24-121	TBY1
M24-130	*
M28-12	TBY3
M28-13	TBY1
M28-132	TBY1
M28-133	TBY1
M31-120	TBY3
M31-184	TBY1
M31-185	TBY1
M31-190	TBY3
M31-191	TBY3
M31-192	TBY3
M31-212	TBY3
M31-213	TBY3
M36-141	*

Tube Type	Scan Coil Number
M38-100	TBY1
M38-101	TBY1
M38-102	TBY1
M38-103	TBY1
M38-104	TBY1
M38-105	TBY1
M38-106	TBY1
M38-113	*
M38-120	TBY1
M38-121	TBY1
M38-122	TBY1
M38-142	*
M44-120	TBY1
M50-120	TBY1
M61-120	TBY1
59-60/90/037	*
59-60/90/074	*

* For scan coil information on these tubes contact -
Brimar Equipment Sales Department or Brimar Export Division.

BRIMAR

PHOSPHOR SCREENS

WA Screen for Colour Television Control Rooms

The facilities and organisation provided by Thorn Radio Valves and Tubes Limited meet the requirements of the M.O.D. (P.E.) Defence Standard 05-21 and BS 9000.

HEALTH AND SAFETY AT WORK ACT, 1974

Attention is drawn to the recommendations under this heading in the Operational Recommendations.

WARNING

These tubes should be used in accordance with their published ratings, and in conformity with the Operational Recommendations of the company's data handbook. The company will not entertain claims for loss or damage where this advice has been disregarded.

Thorn Radio Valves and Tubes Limited
Mollison Avenue - Brimsdown - Enfield - Middlesex EN3 7NS

BRIMAR

Phosphor Screens

Equivalents & Data Summary

Corresponding Designations			Approximate Persistence Time to 10%		Kelly Chart Colour	Flicker Threshold*	Typical use
New	EIA	Old	Spot	Raster	Fluorescence	Hz	
AA	P16	-	0.12μs		Bluish-purple (UV)	-	Flying-spot scanning
BE	P11	T3†	40μs		Blue	-	Oscillography & photography
GE	P24	T5	1.5 μs		Green	-	Flying-spot scanning
GH	P31	-	40μs	0.2 s	Green	45	General oscillography & photography
GJ	P1	T1	25ms	30ms	Yellowish-green	36	General oscillography & photography
GL	P2	-	40μs	0.5 s	Yellowish-green	40	General oscillography & photography
GM	P7	T6†	0.5 s §	7 s §	Purplish-blue ¶	38	Radar & oscillography
GP	-	-	100 μs	0.5 s	Green **	45	Data display
GR	P39	-	150ms	2 s	Yellowish-green	30	Radar & data display
GS	-	-	0.9 μs		Yellowish-green	-	Flying-spot scanning
GT	-	-	0.9 μs		Bluish-green	-	Flying-spot scanning
GV	-	-		9 s	Green ¶	38	Radar & oscillography
GW	P42	-	30 μs	0.2 s	Green	40	Data display
GX	P44	-	1.2 ms		Yellowish-green	45	Data display
GY	P43	-	1.2 ms		Yellowish-green	45	Data display
KB	-	T14		1.5 s	Bluish-green ‡	38	Radar & oscillography
LA	-	T11	25 ms	50ms	Orange	36	Data display
LC	P26†	T7		25 s	Orange	22	Radar & oscillography
LD	P33	T15		5 s	Orange	20	Radar
LG	-	T13		4 s	Orange	18	Radar & data display
W	P4	T4	10 μs	10 ms	White	45	Monochrome television
WA	-	-	10 μs	10 ms	White	45	Television monitors

* Over a range of observers and display arrangements the onset of flickers may vary by at least 5Hz from the above figure.

† Approximate. ‡ The phosphorescence is yellow-green.

§ Yellowish-green component. ¶ The phosphorescence is yellowish-green.

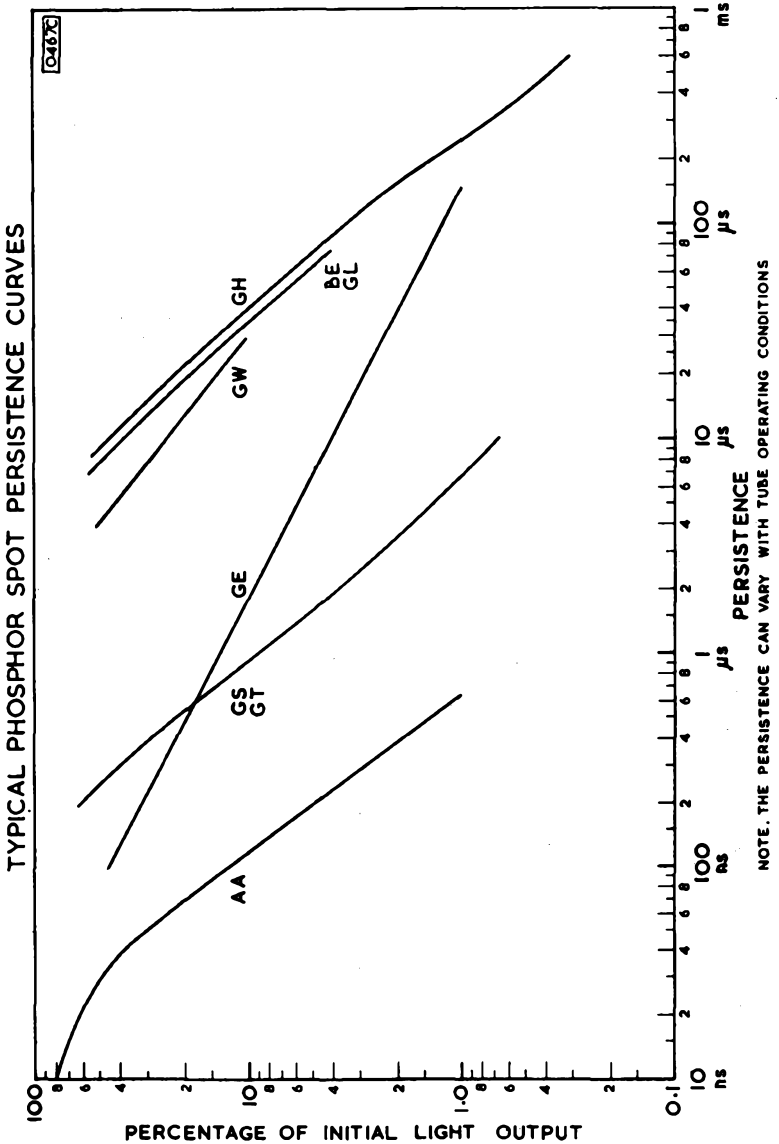
** The fluorescence at high brightness is bluish-green.

While alternative phosphors can be supplied to special order, most tube types are produced for stock with the particular phosphor most in demand by equipment manufacturers.

BRIMAR

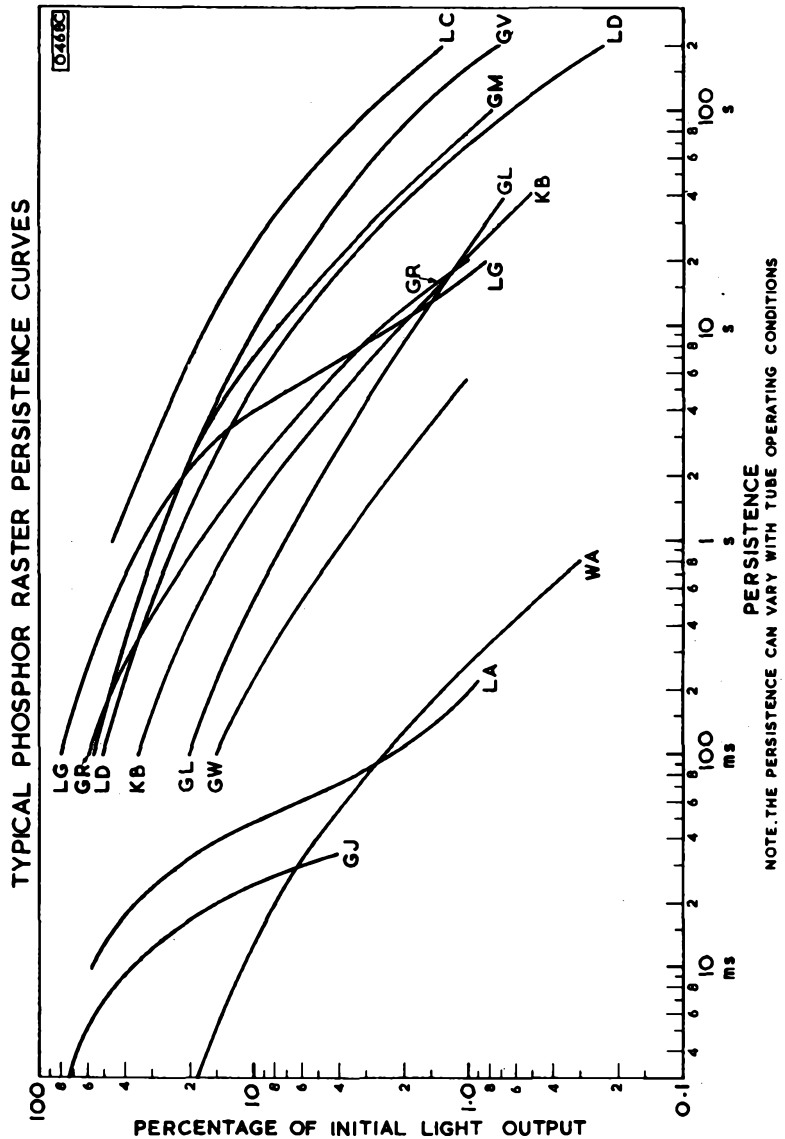
Persistence Curves

Phosphor Screen



Phosphor Screen

Persistence Curves

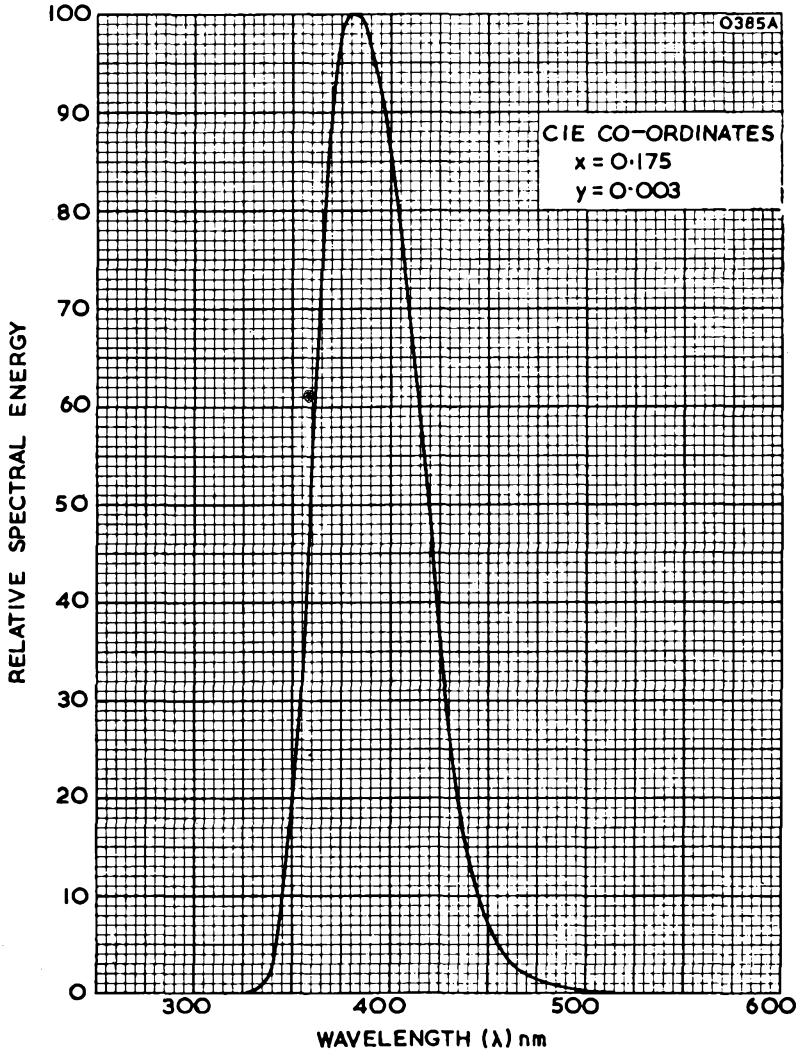


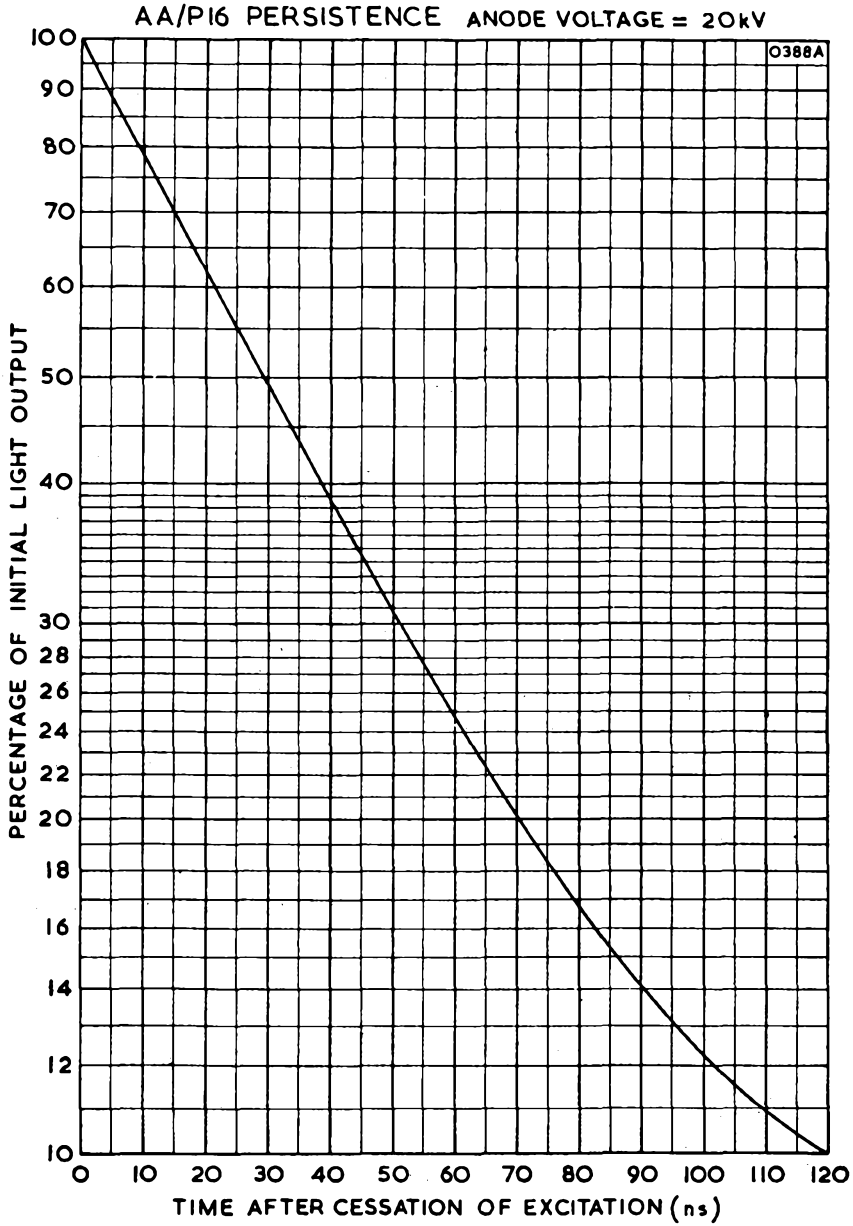
PHOSPHOR SCREENS

AA
P16

Phosphor Screen

RELATIVE SPECTRAL ENERGY DISTRIBUTION OF TYPICAL C.R.T. SCREEN TYPE AA/P16

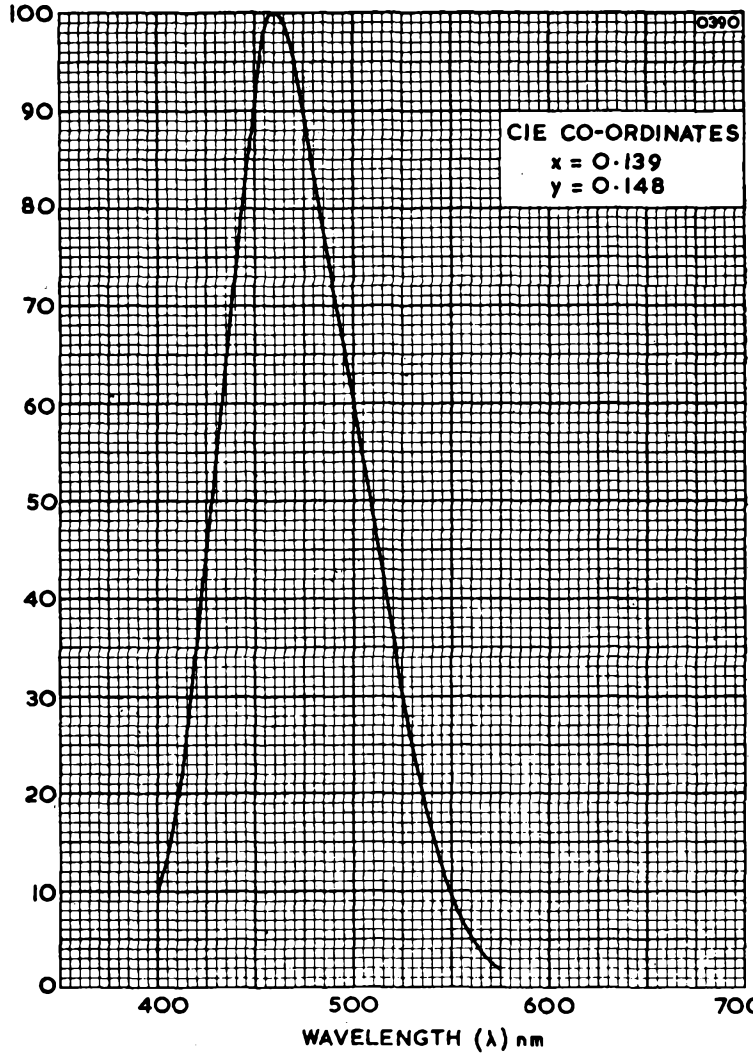


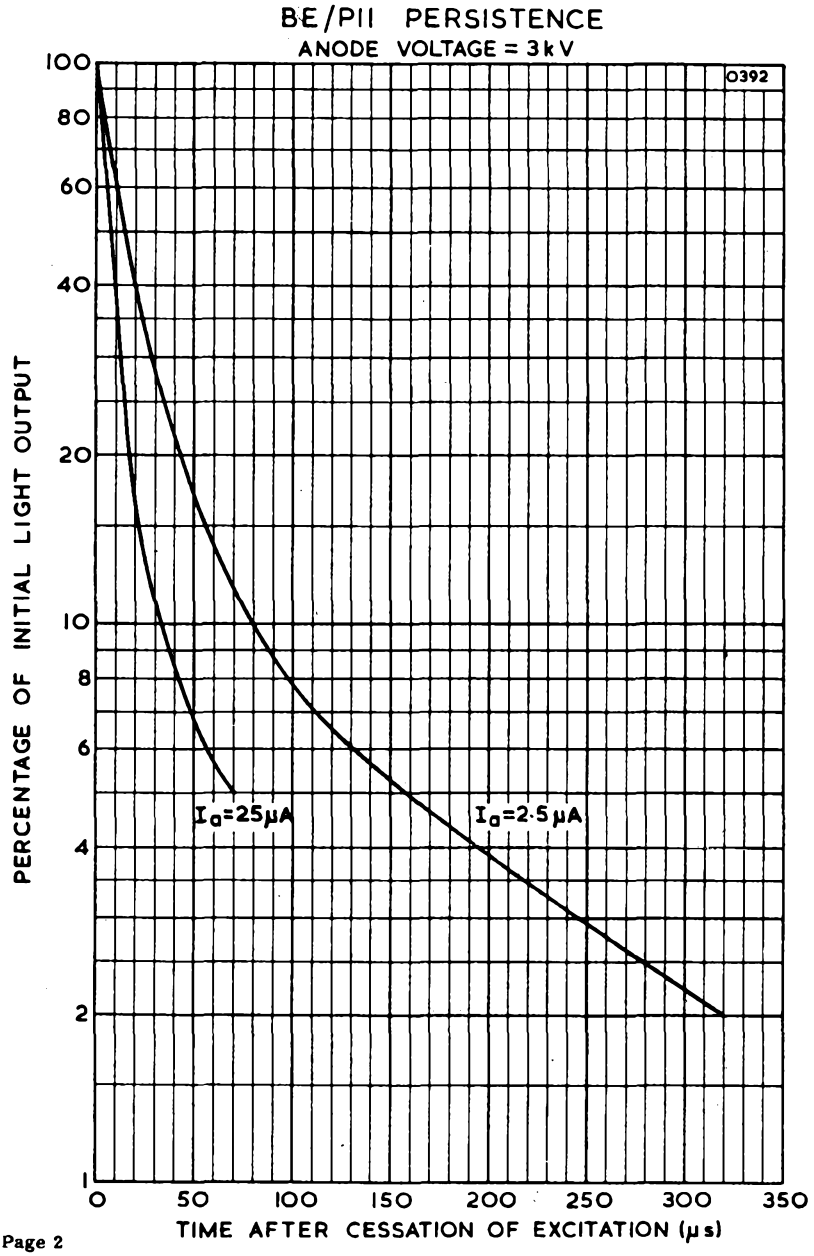

AA/P16 PERSISTENCE ANODE VOLTAGE = 20kV
0388A
PERCENTAGE OF INITIAL LIGHT OUTPUT
100
90
80
70
60
50
40
30
28
26
24
22
20
18
16
14
12
10
0
10
20
30
40
50
60
70
80
90
100
110
120
TIME AFTER CESSATION OF EXCITATION (ns)

BE
P11

Phosphor Screen

RELATIVE SPECTRAL ENERGY DISTRIBUTION OF TYPICAL C.R.T. SCREEN TYPE BE/P11



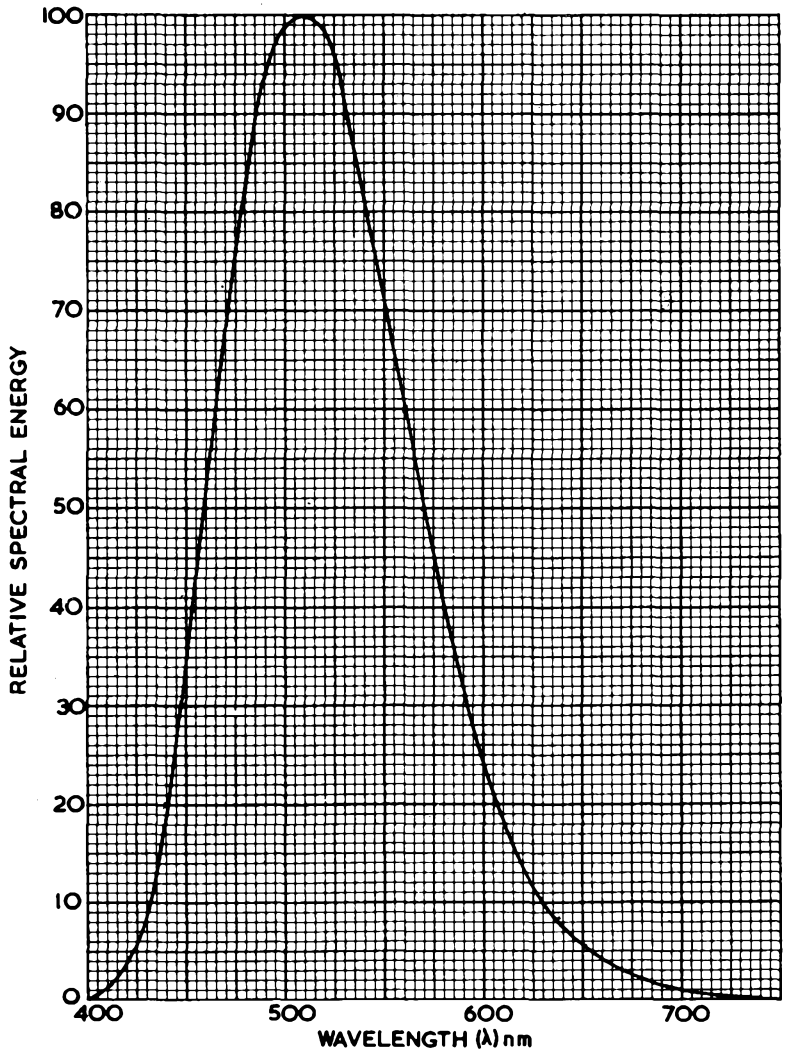

BE/P11 PERSISTENCE
ANODE VOLTAGE = 3 kV
0392
PERCENTAGE OF INITIAL LIGHT OUTPUT
100
80
60
40
20
10
8
6
4
2
1
I_a=25μA
I_a=2·5μA
0
50
100
150
200
250
300
350
TIME AFTER CESSATION OF EXCITATION (μs)

GE
P24
T5

Phosphor Screen

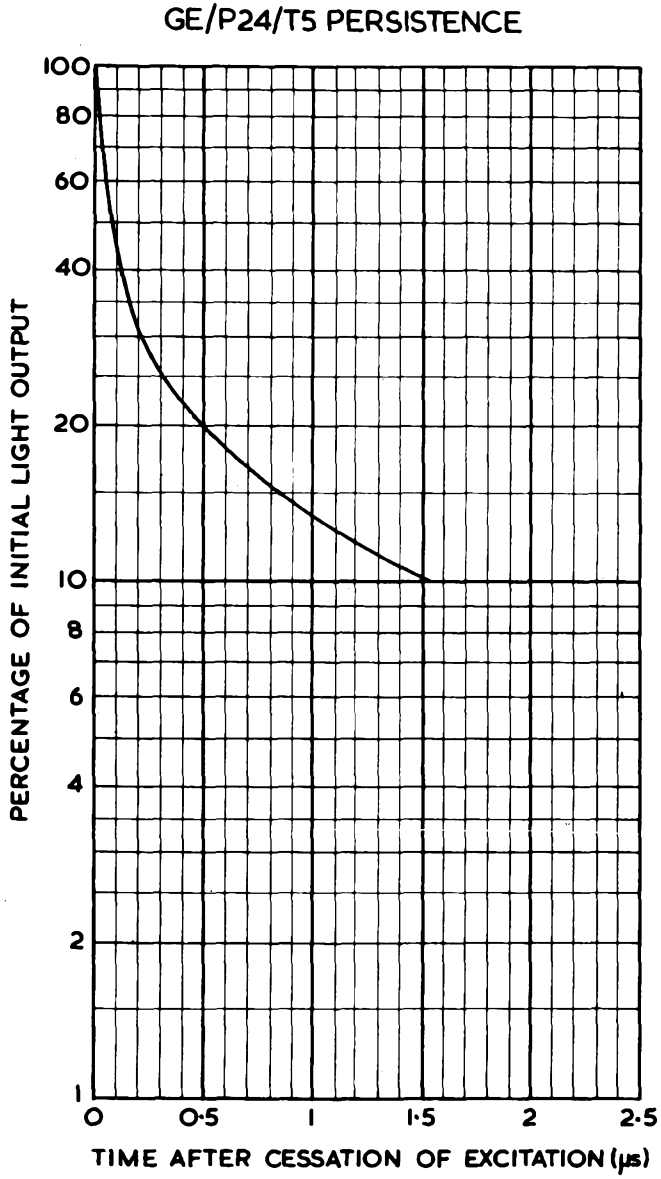
RELATIVE SPECTRAL ENERGY DISTRIBUTION OF TYPICAL C.R.T. SCREEN TYPE GE/P24/T5

CIE CO-ORDINATES $x = 0.245$
$y = 0.441$



Phosphor Screen

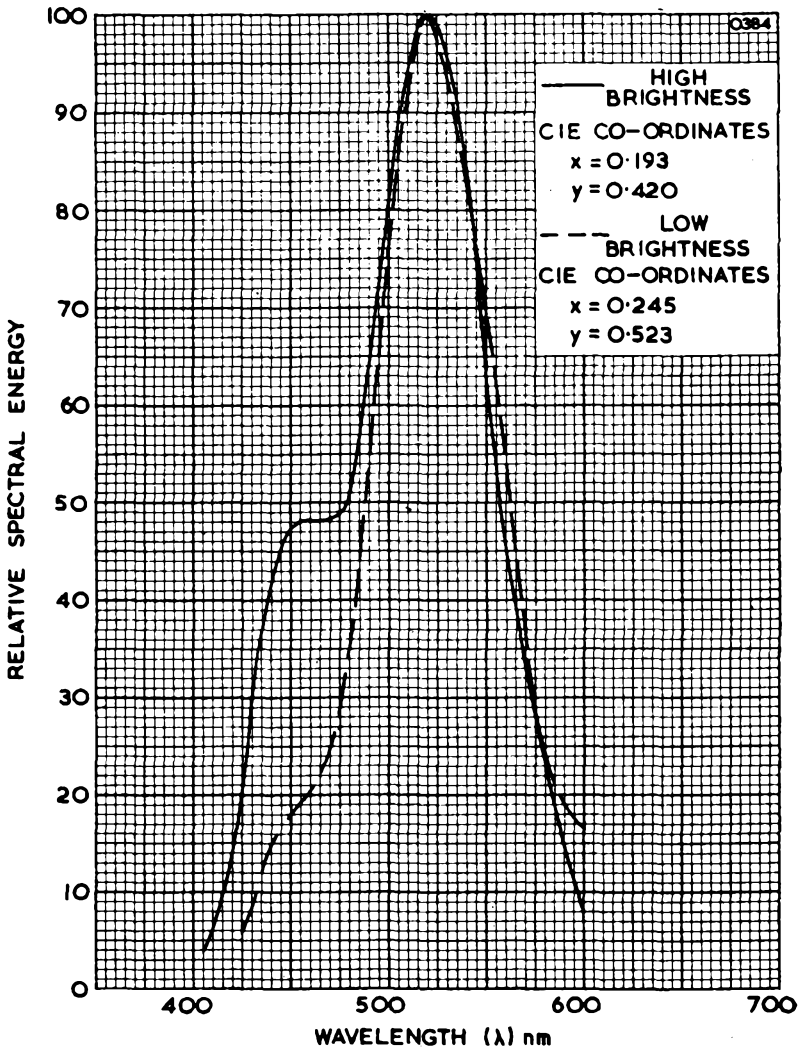
GE
P24
T5

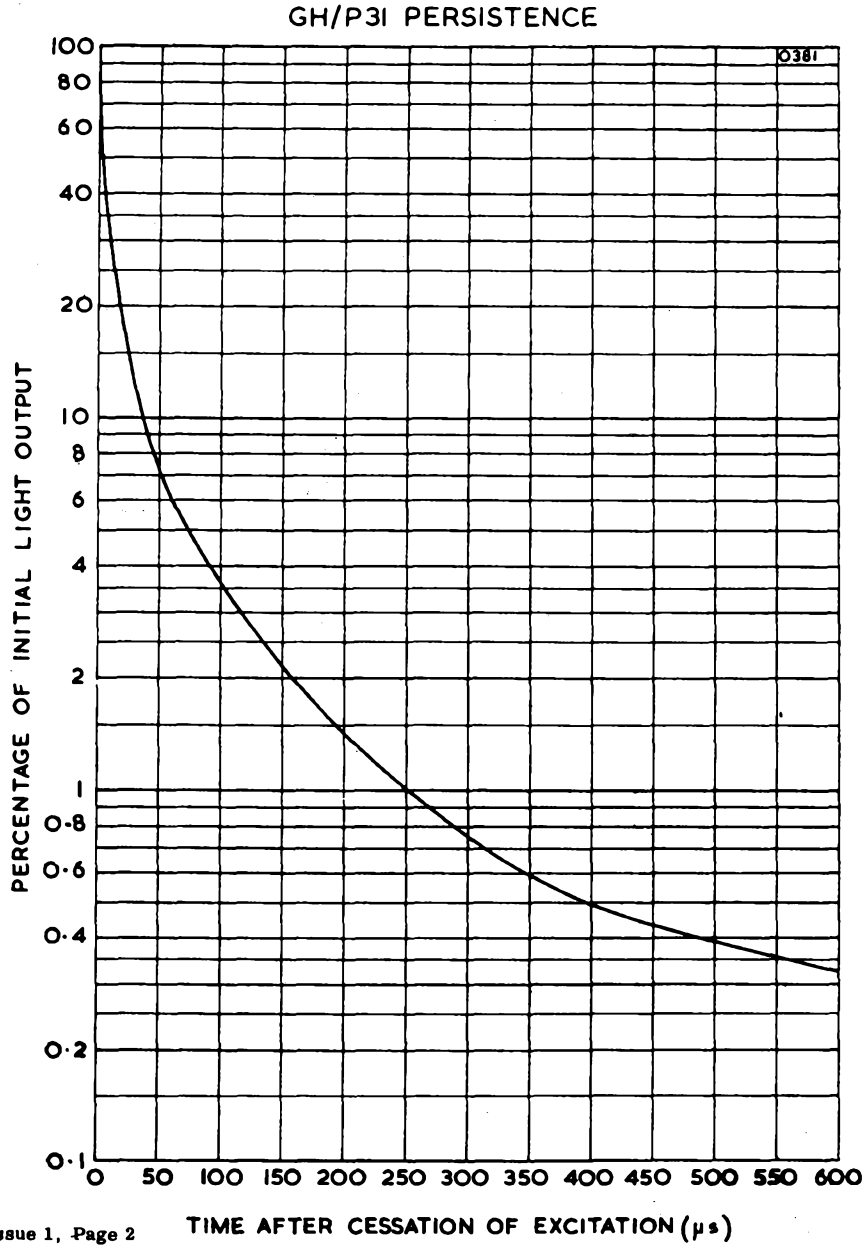


GH
P31

Phosphor Screen

RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE GH/P31

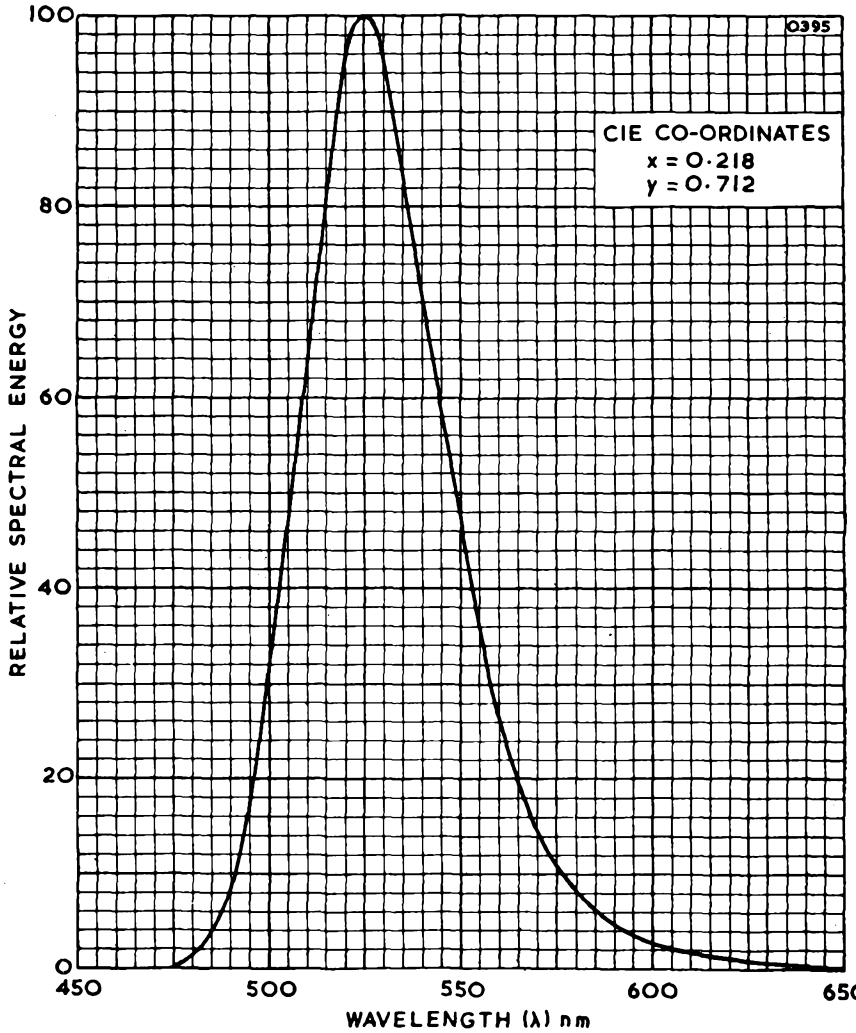


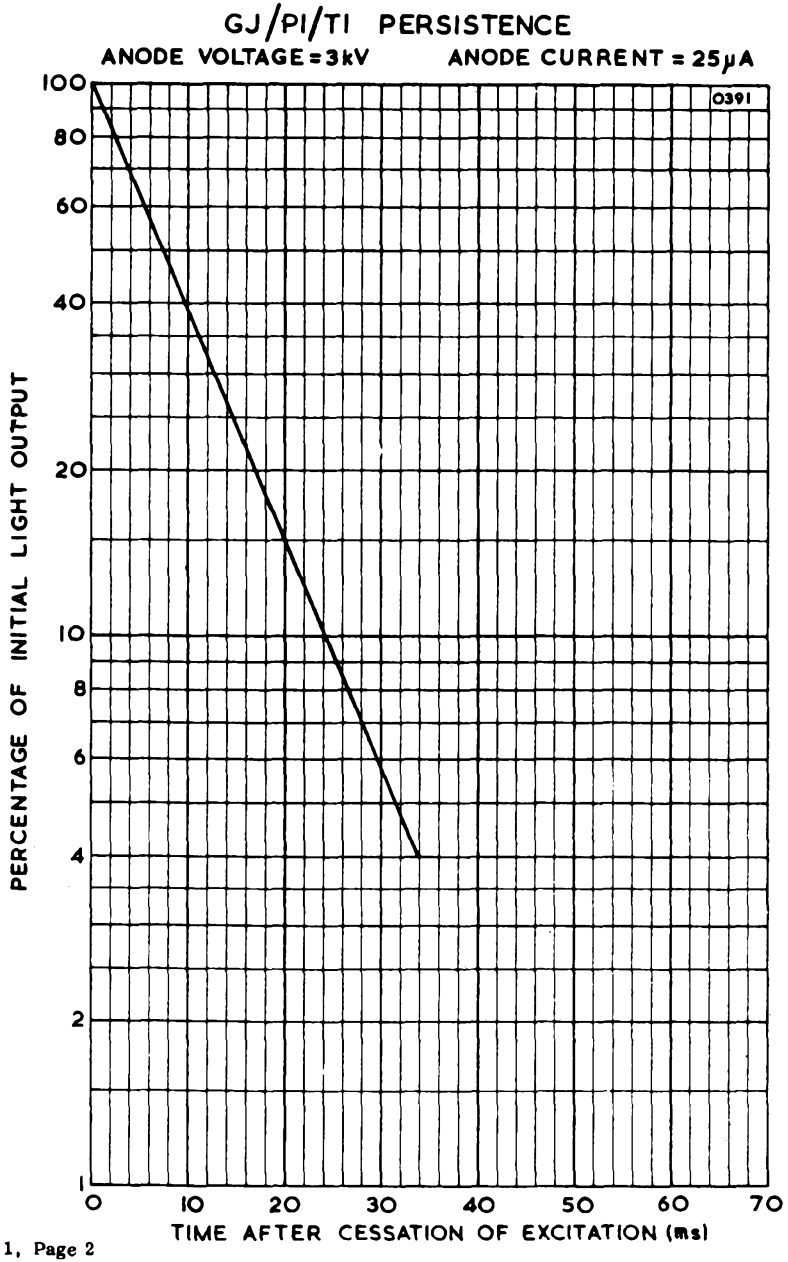

GH/P31 PERSISTENCE
0381
PERCENTAGE OF INITIAL LIGHT OUTPUT
100
80
60
40
20
10
8
6
4
2
1
0·8
0·6
0·4
0·2
0·1
0
50
100
150
200
250
300
350
400
450
500
550
600
TIME AFTER CESSATION OF EXCITATION (μs)

GJ
P1
T1

Phosphor Screen

RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE GJ/P1/T1

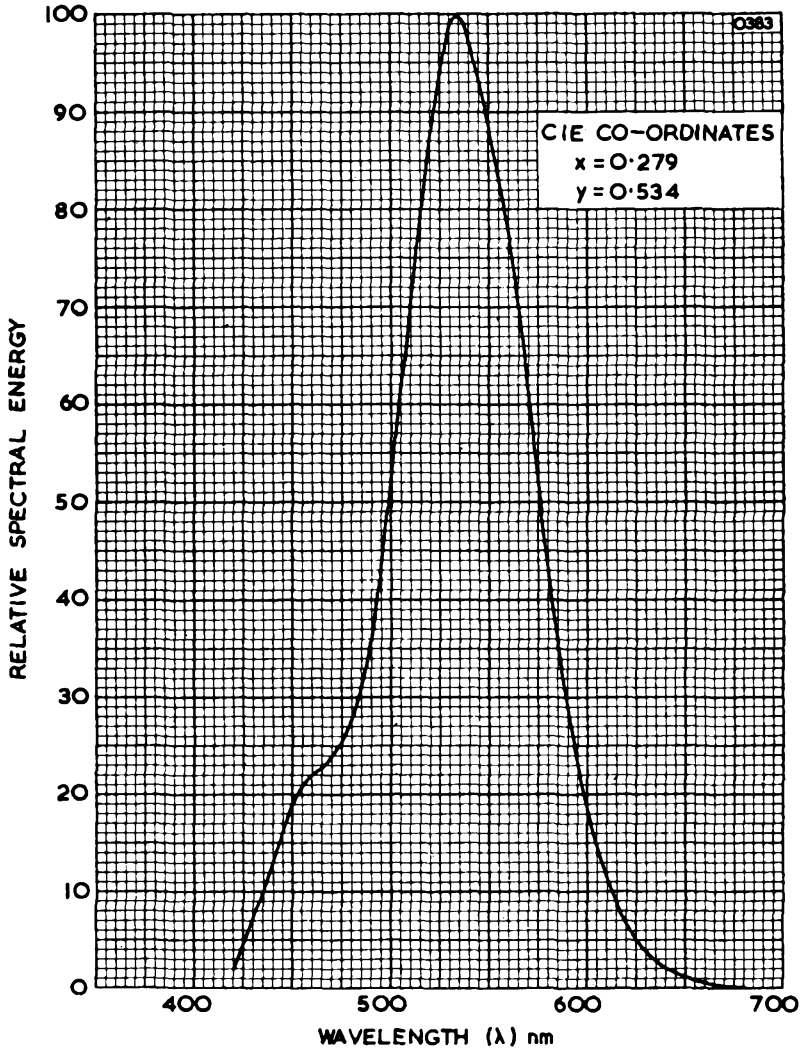



GJ/P1/T1 PERSISTENCE
ANODE VOLTAGE = 3kV
ANODE CURRENT = 25μA
0391
PERCENTAGE OF INITIAL LIGHT OUTPUT
100
80
60
40
20
10
8
6
4
2
1
0
10
20
30
40
50
60
70
TIME AFTER CESSATION OF EXCITATION (ms)

GL
P2

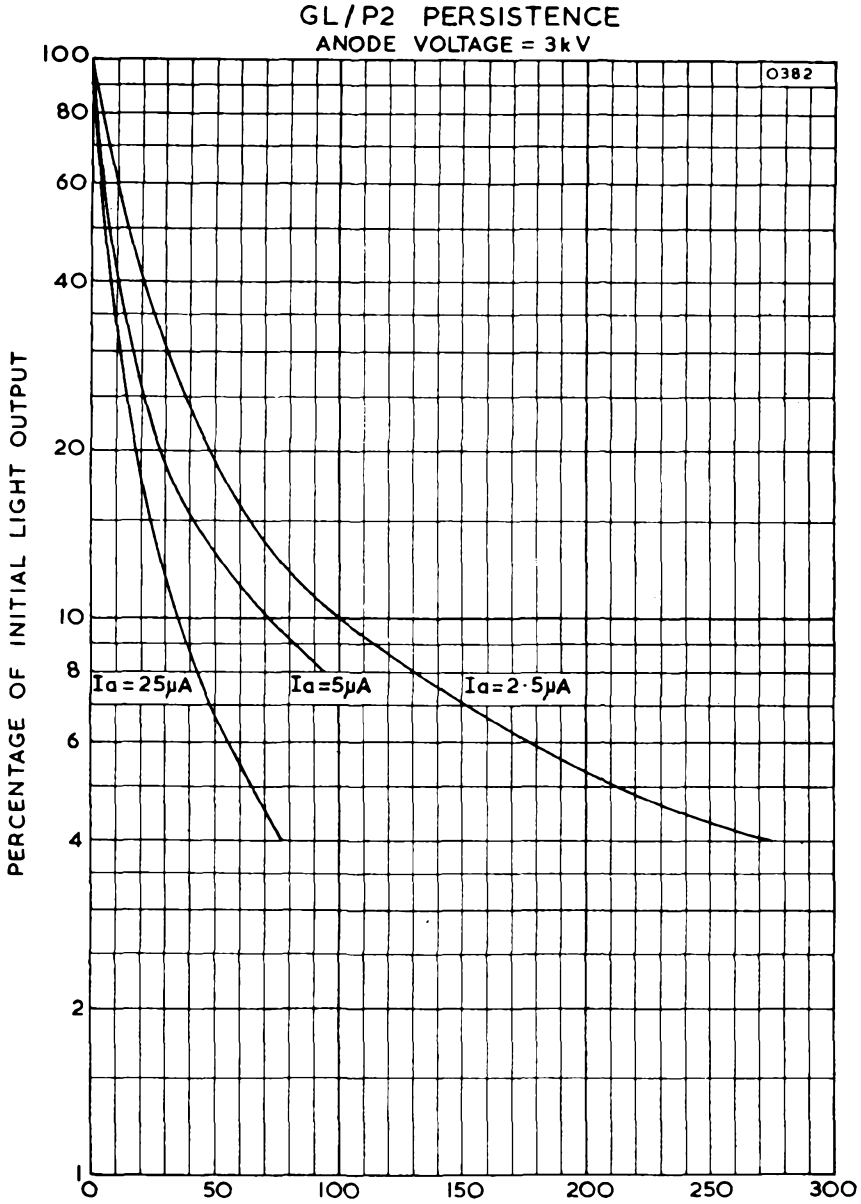
Phosphor Screen

RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE GL/P2



Phosphor Screen

GL
P2



Phosphor Screen

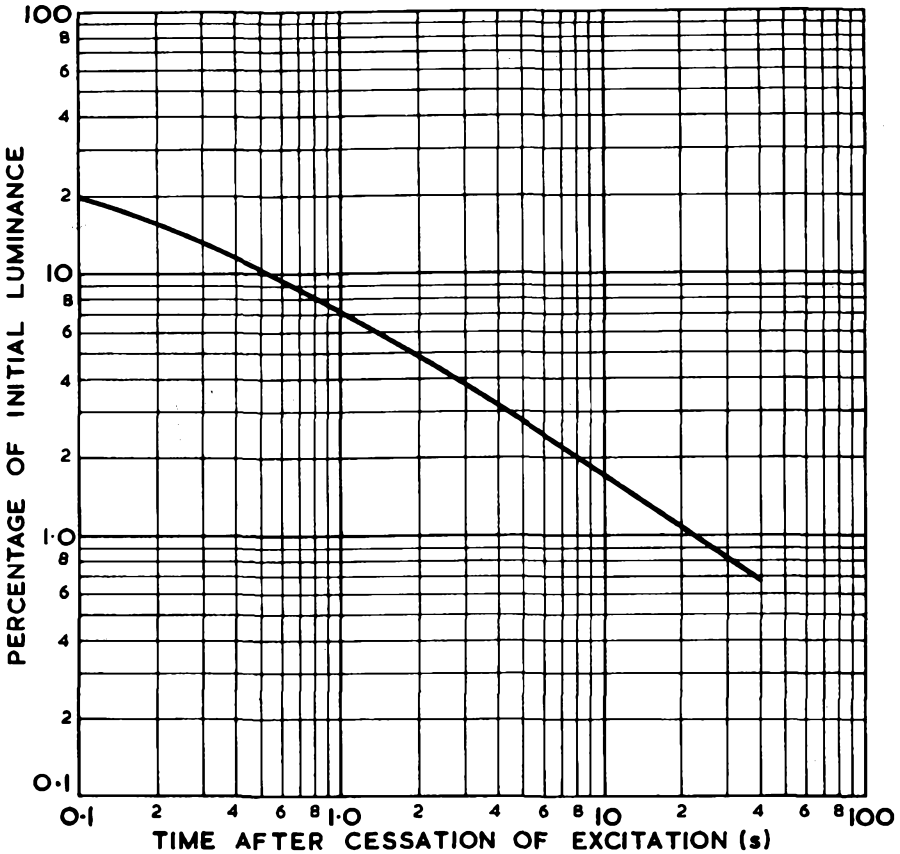
GL/P2 PERSISTENCE

FINAL ANODE VOLTAGE = 15kV

INITIAL LUMINANCE = 1 FOOT LAMBERT (3·43nt)

Excitation: continuous focused raster

Measured on C.R.T. with aluminised screen

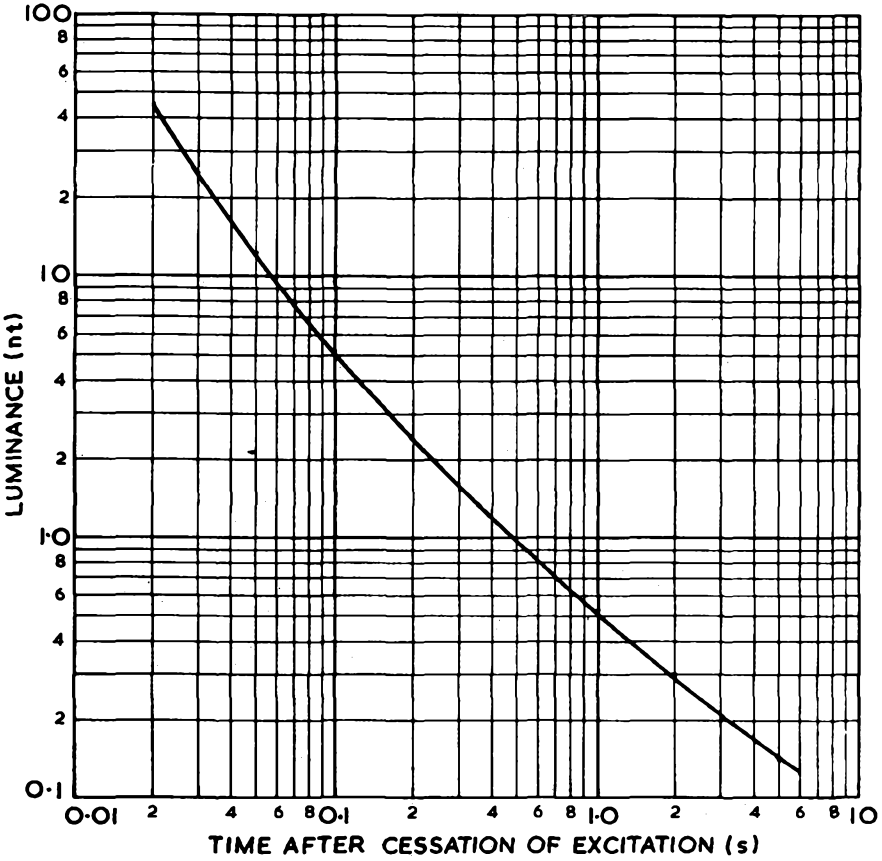


GL/P2 PERSISTENCE

FINAL ANODE VOLTAGE = 15 kV

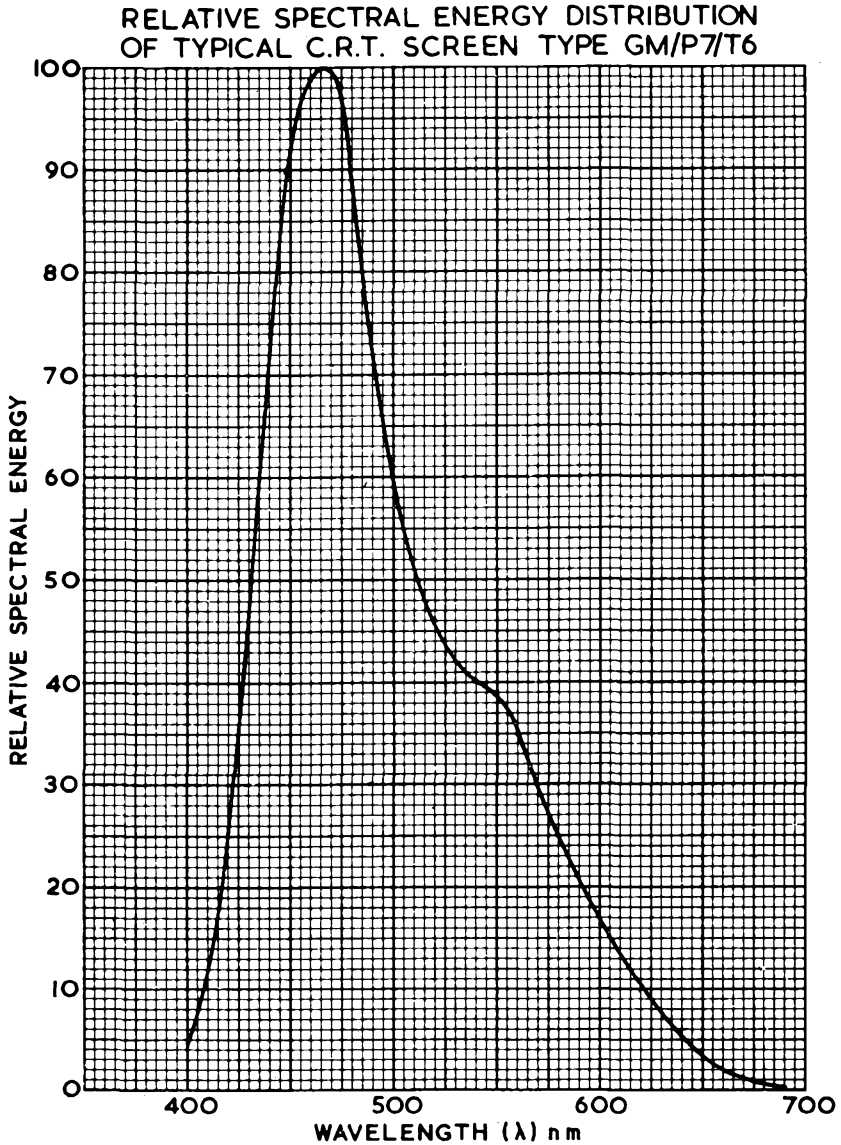
Excitation: single 20ms raster at 1μA/cm²

Measured as average luminance of raster on C.R.T. with aluminised screen.



GM
P7
T6

Phosphor Screen



Phosphor Screen

YELLOWISH-GREEN COMPONENT

FINAL ANODE VOLTAGE = 15kV

INITIAL LUMINANCE = 1 FOOT LAMBERT (3.43nt)

Excitation: continuous raster

GM
P7
T6

PHOSPHOR SCREENS

GM
P7
T6

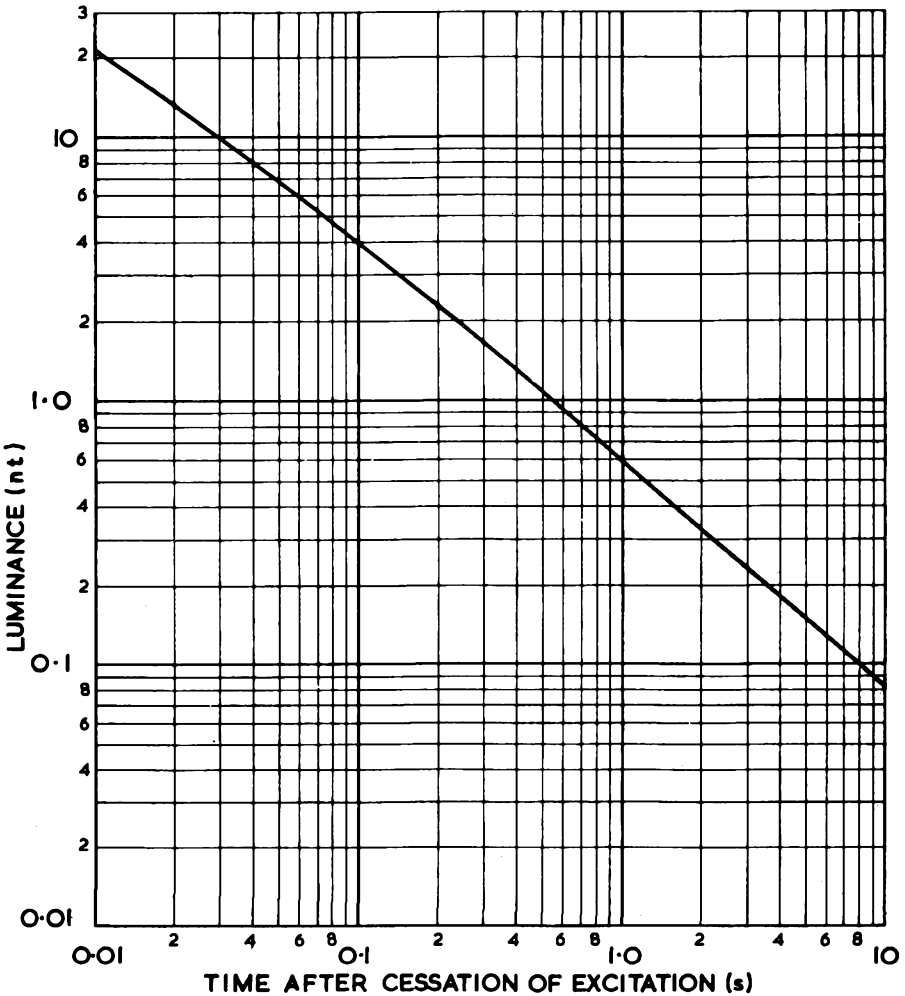
Phosphor Screen

GM PERSISTENCE

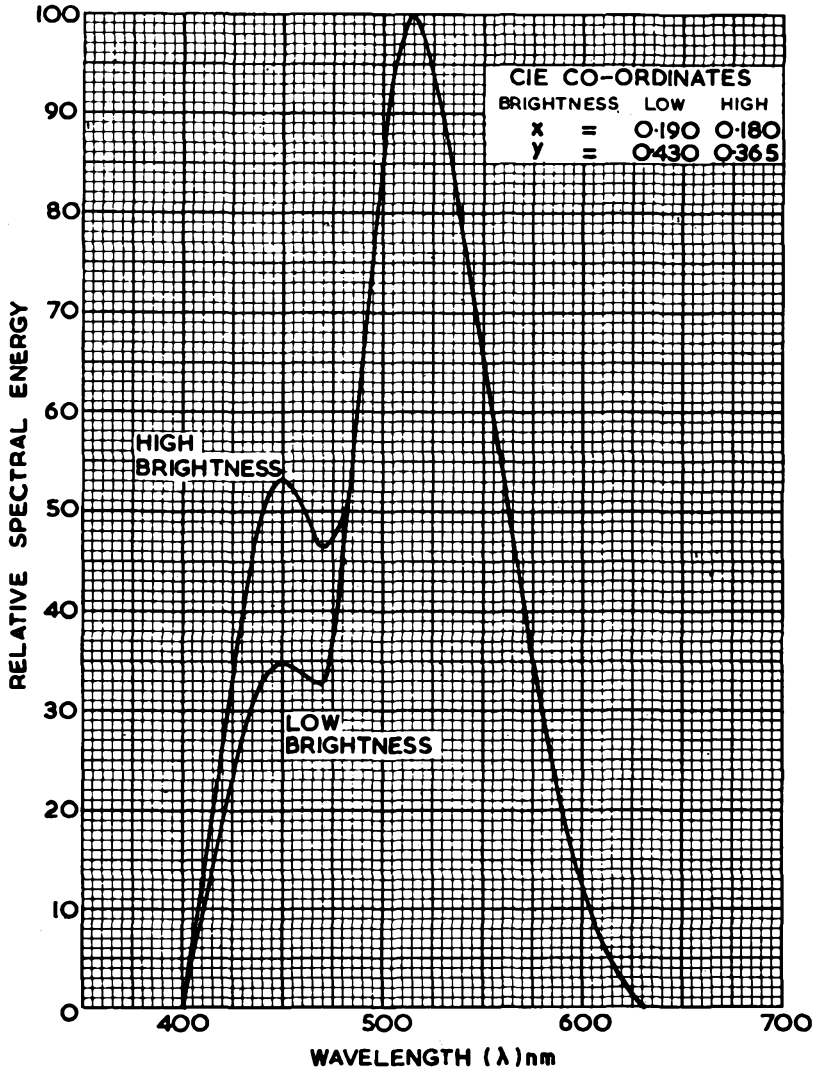
YELLOWISH-GREEN COMPONENT

FINAL ANODE VOLTAGE = 15kV

Excitation: single 20ms raster at 1μA/cm²

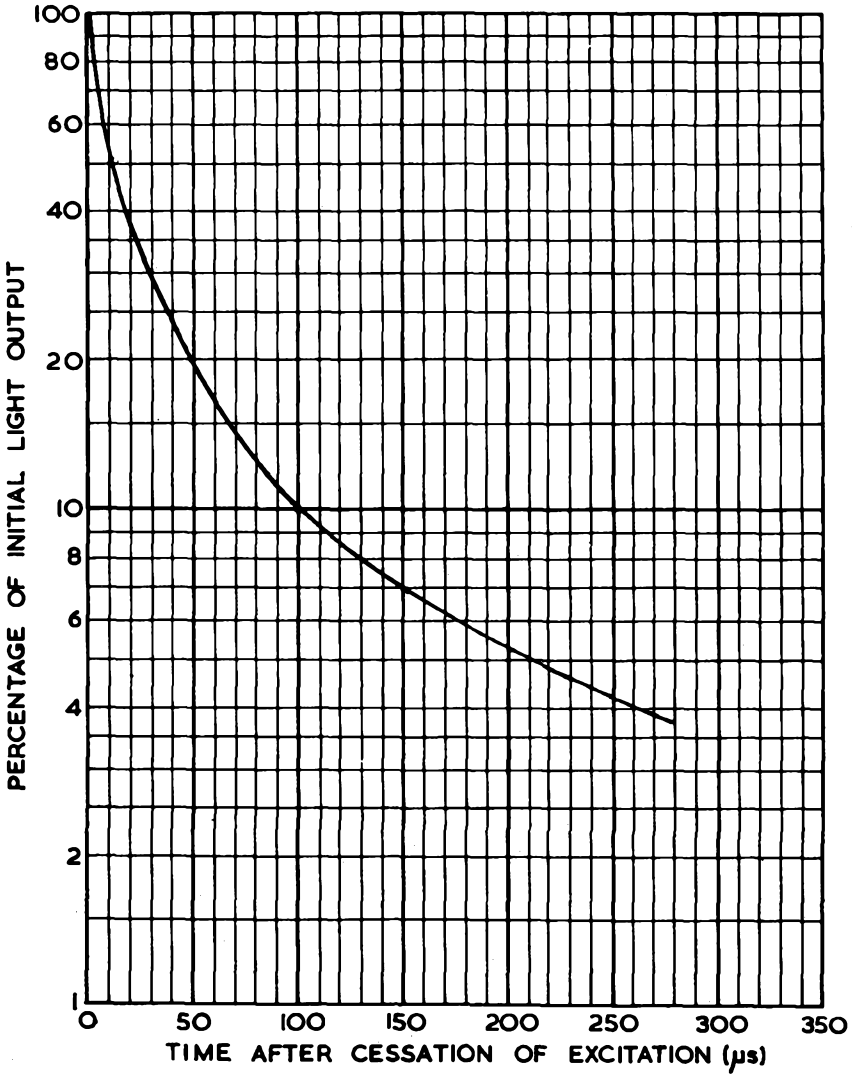


RELATIVE SPECTRAL ENERGY DISTRIBUTION OF TYPICAL C.R.T. SCREEN TYPE G P



GP PERSISTENCE

ANODE VOLTAGE = 4 kV ANODE CURRENT = 2·5μA



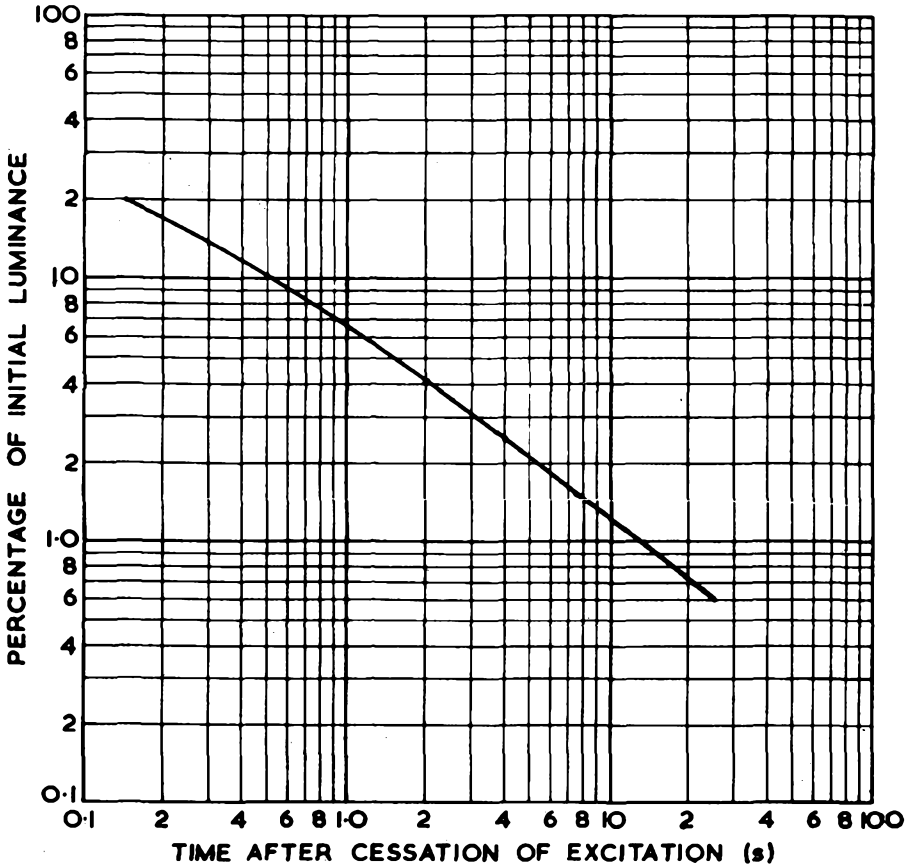
GP PERSISTENCE

FINAL ANODE VOLTAGE 15kV

INITIAL LUMINANCE = 1 FOOT LAMBERT (3·43 nt)

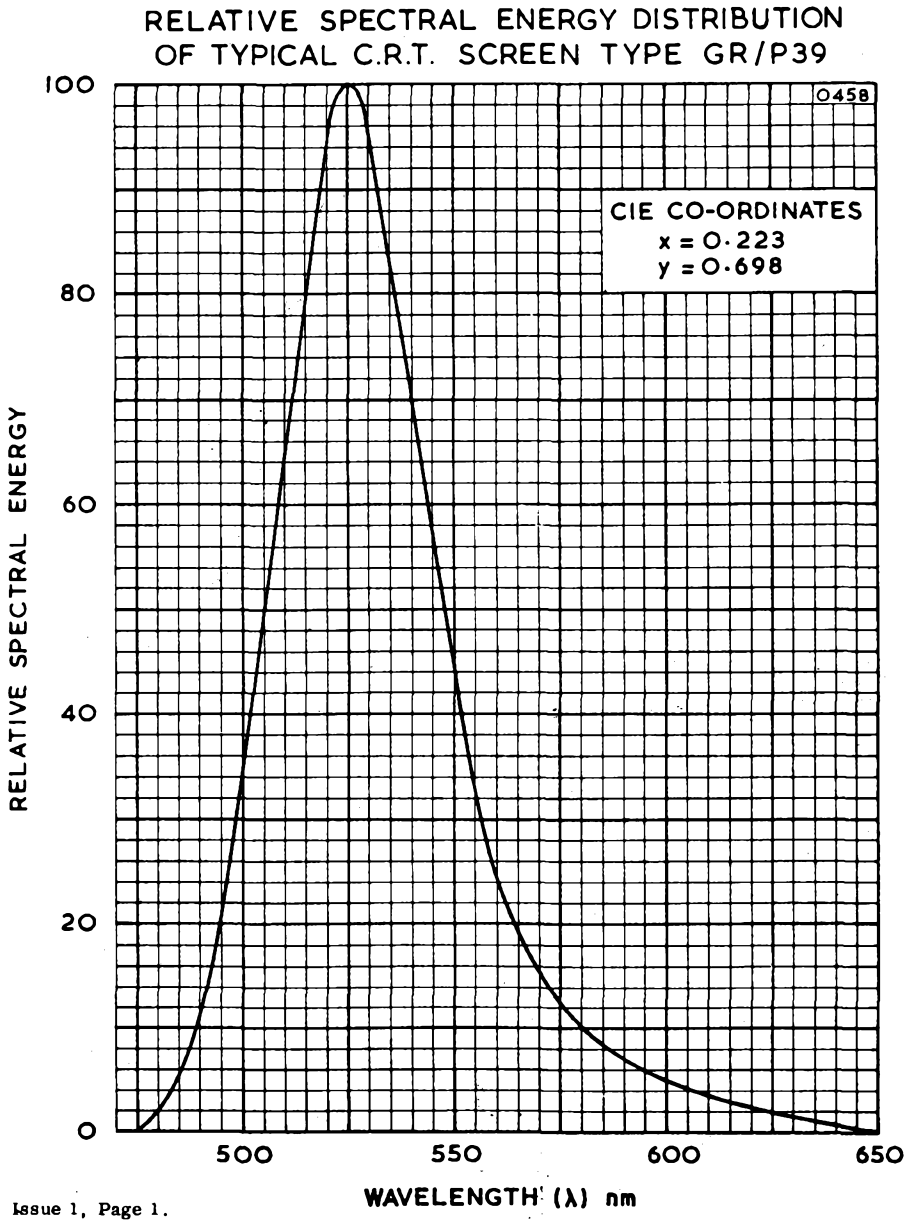
Excitation: continuous focused raster

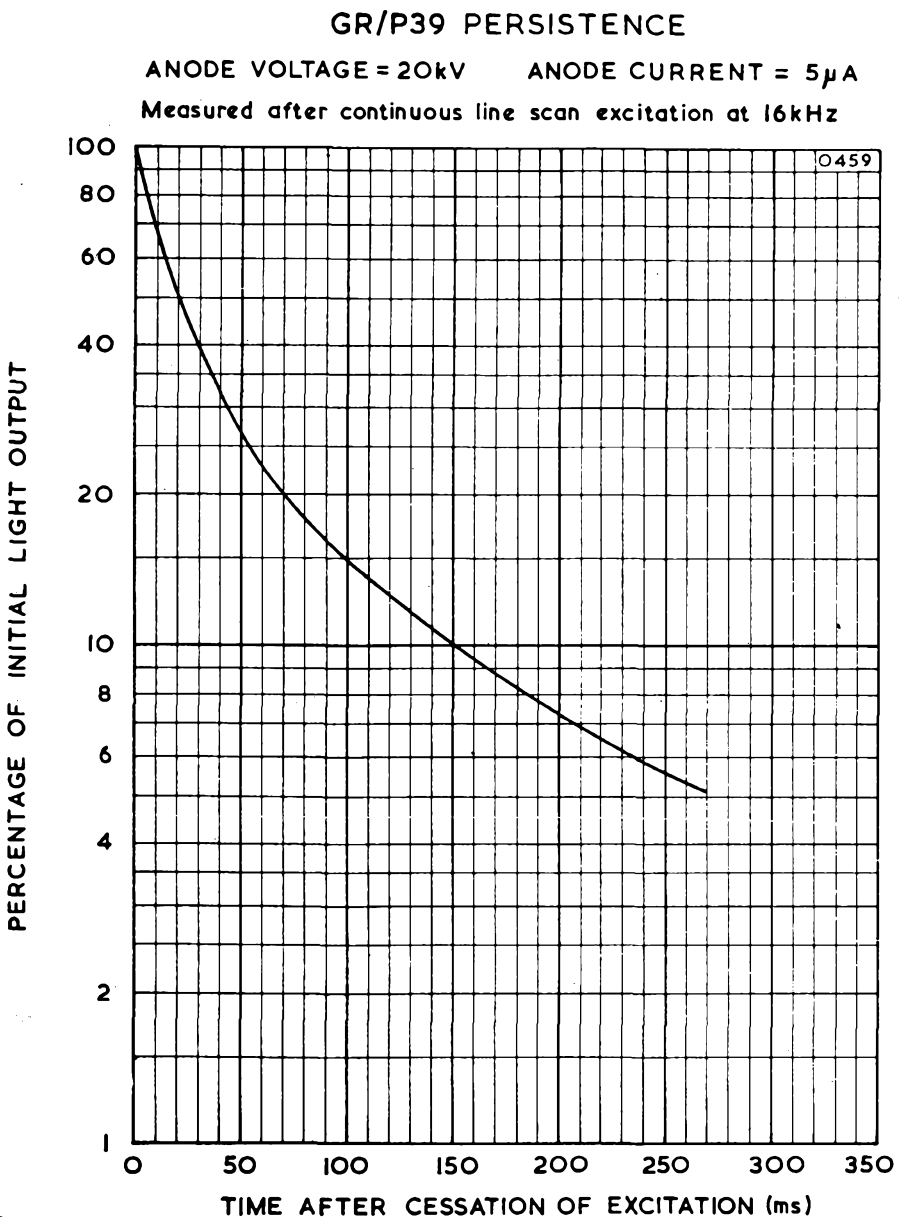
Measured on C.R.T. with aluminised screen



GR
P39

Phosphor Screen



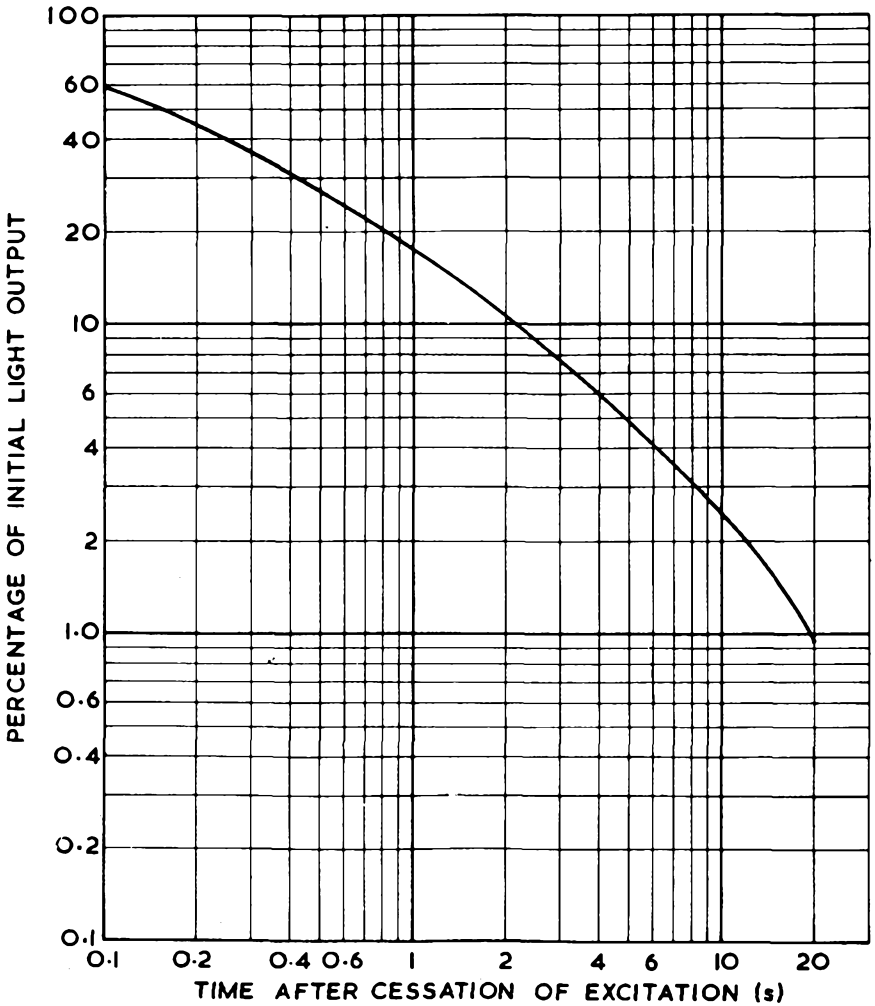

GR/P39 PERSISTENCE
ANODE VOLTAGE = 20kV
ANODE CURRENT = 5μA
Measured after continuous line scan excitation at 16kHz
0459
PERCENTAGE OF INITIAL LIGHT OUTPUT
100
80
60
40
20
10
8
6
4
2
1
0
50
100
150
200
250
300
350
TIME AFTER CESSATION OF EXCITATION (ms)

GR/P39 PERSISTENCE

ANODE VOLTAGE = 15kV

INITIAL LUMINANCE = 1 FOOT LAMBERT

Excitation: Continuous focused raster

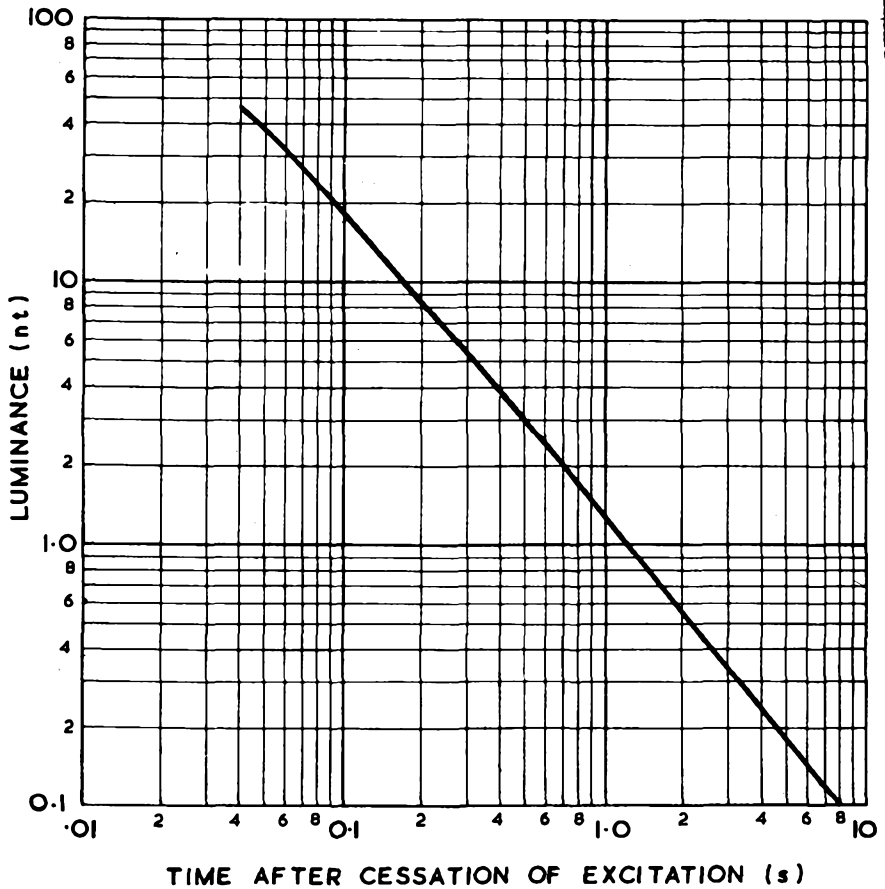


GR/P39 PERSISTENCE

FINAL ANODE VOLTAGE = 15kV

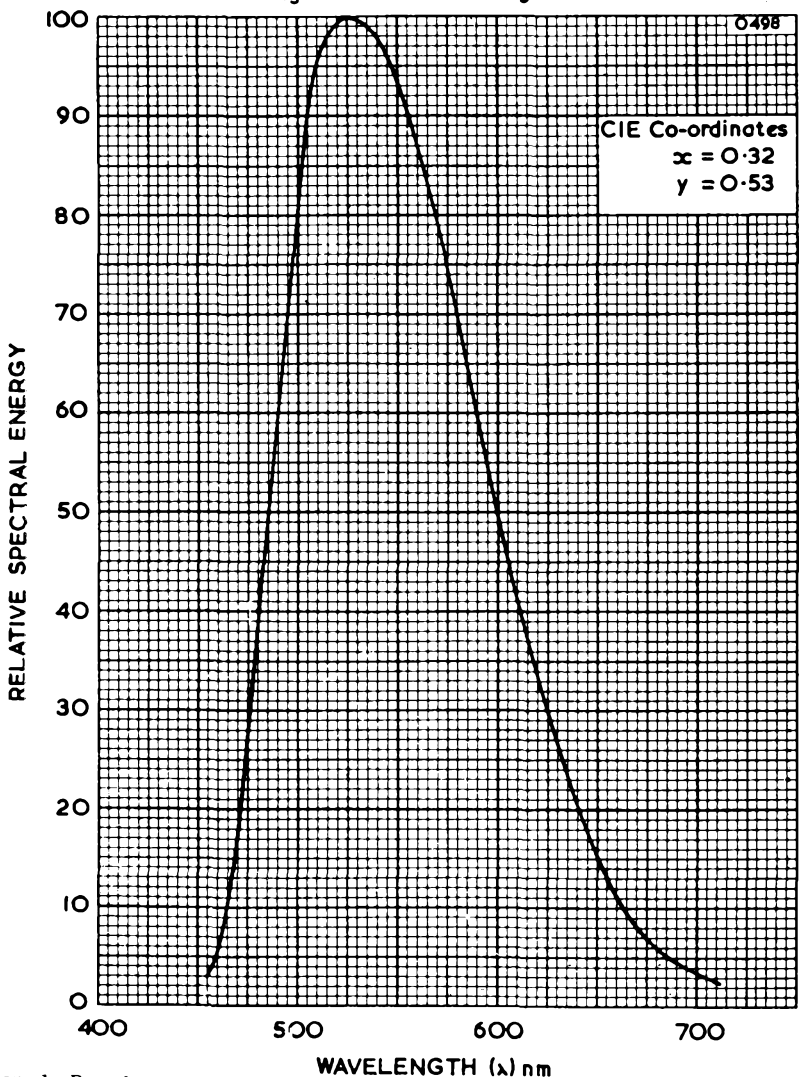
Excitation: single 20ms raster at 1μA/cm²

Measured as average luminance of raster on C.R.T. with aluminised screen



RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE GS
THIS CURVE VARIES WITH CURRENT DENSITY

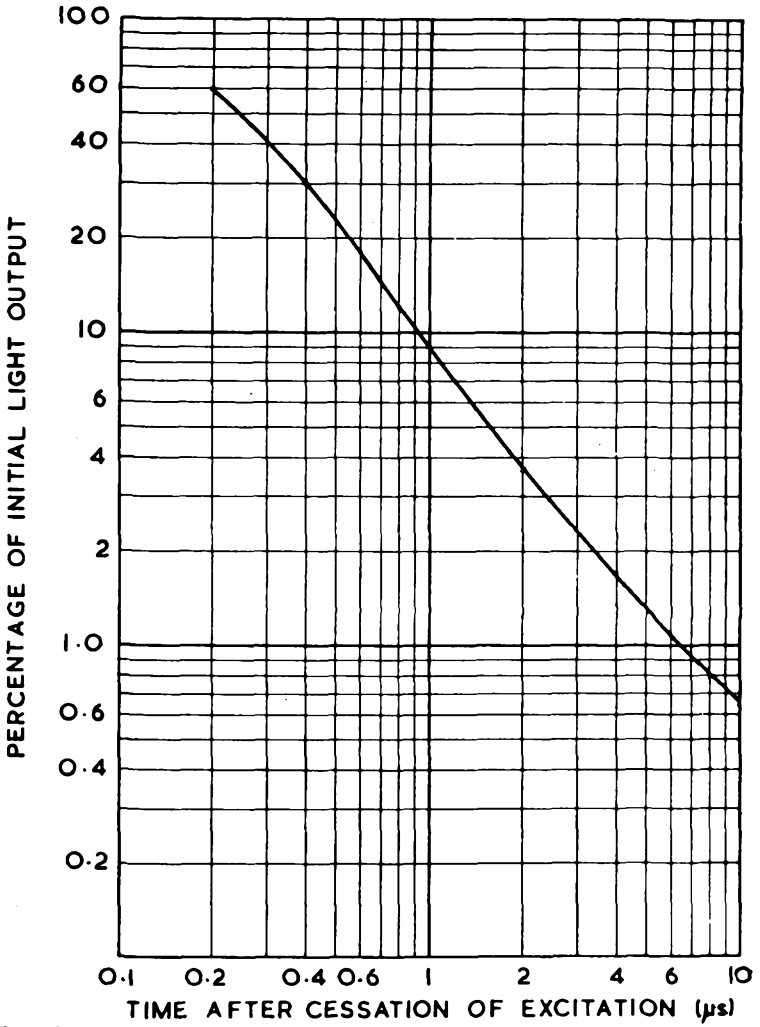
V_{a_3} = 15 kV I_{a_3} = 4·5 μA



GS AND GT PERSISTENCE

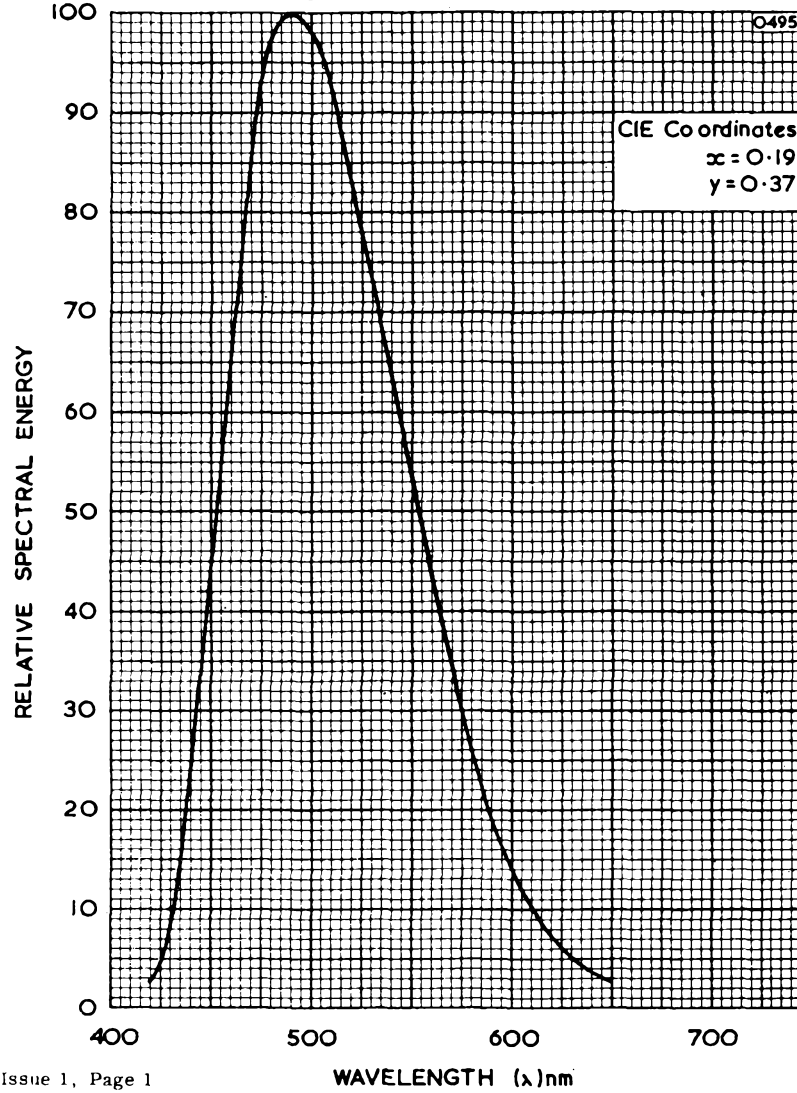
ANODE VOLTAGE = 15kV

Excitation: Pulsed focused spot



RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE GT
THIS CURVE VARIES WITH CURRENT DENSITY

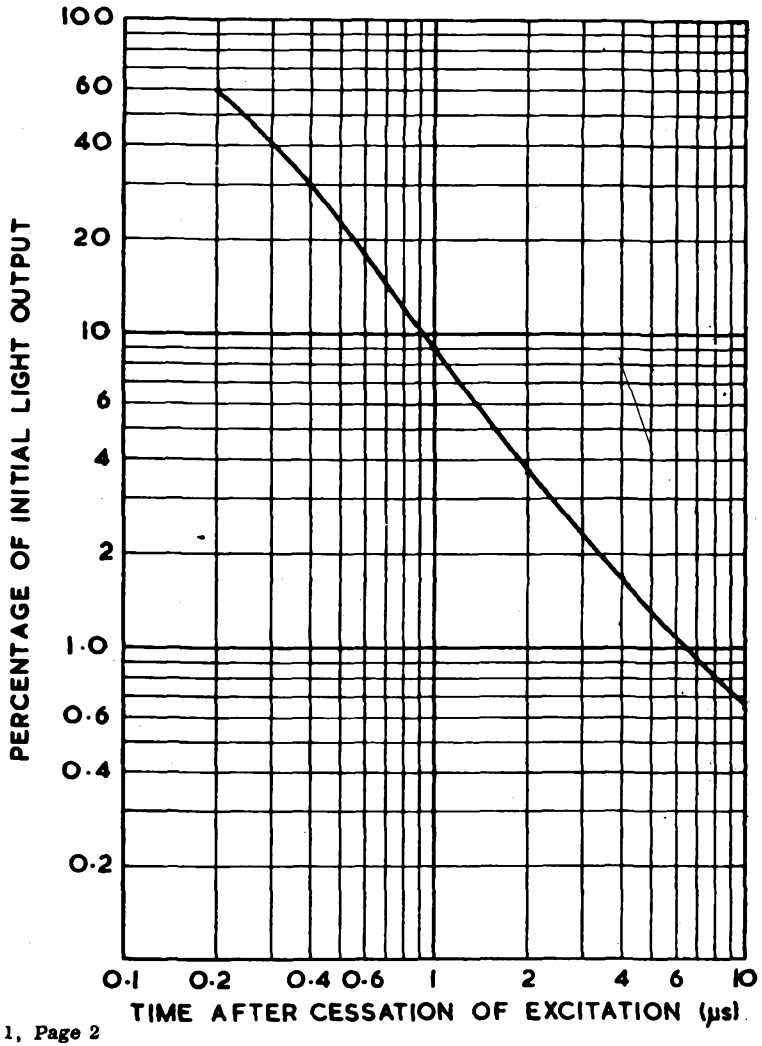
V_{a_3} = 15 kV I_{a_3} = 4·5 μA



GS AND GT PERSISTENCE

ANODE VOLTAGE = 15kV

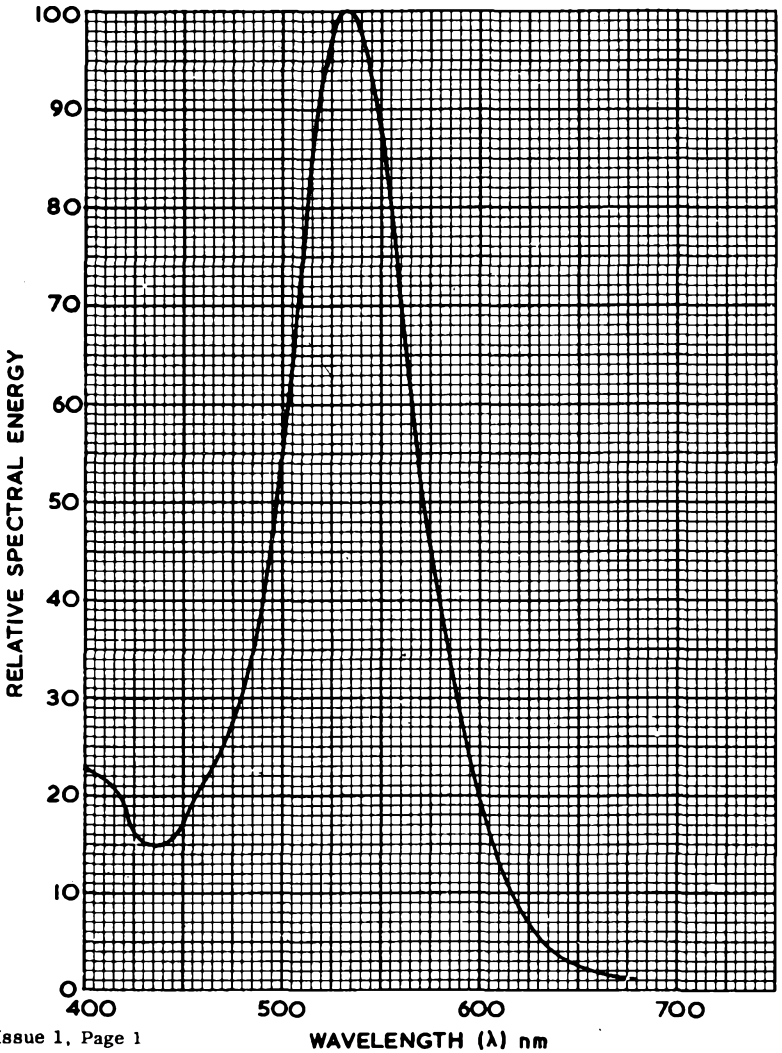
Excitation: Pulsed focused spot



RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE GV

KELLY CHART COLOUR—YELLOWISH-GREEN (Phosphorescence)

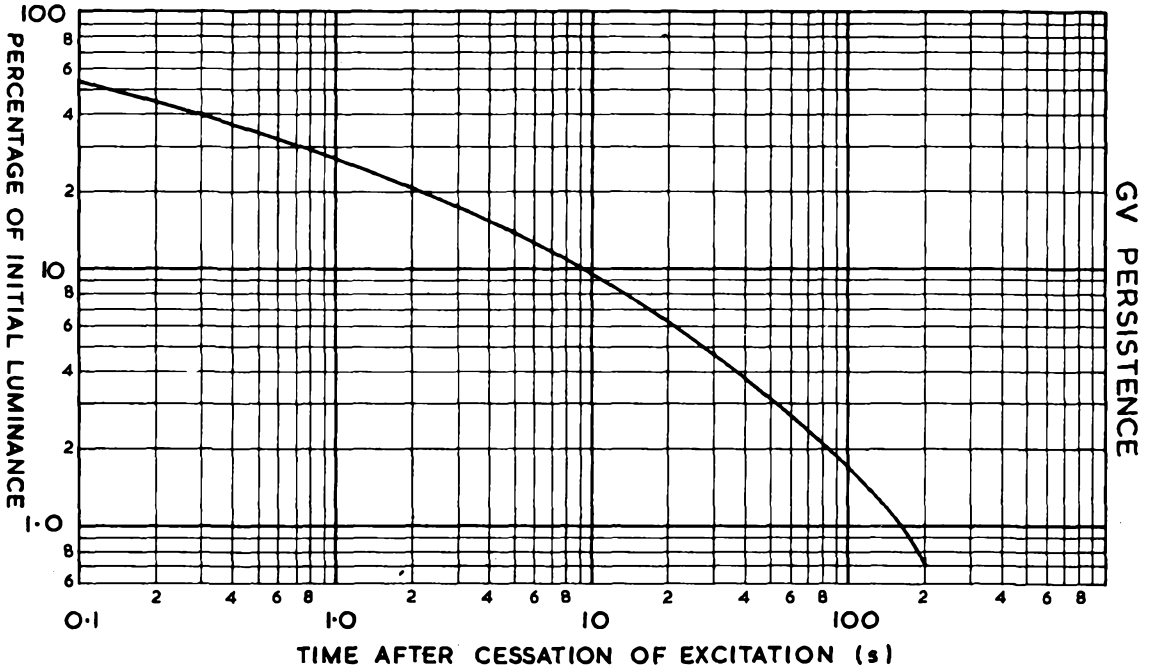
SCREEN VOLTAGE = 15kV CIE CO-ORDINATES x 0.28
y 0.53



FINAL ANODE VOLTAGE = 15kV

INITIAL LUMINANCE = 1 FOOT LAMBERT (3.43nt)

Excitation: 10 x 10cm² 405 line continuous raster

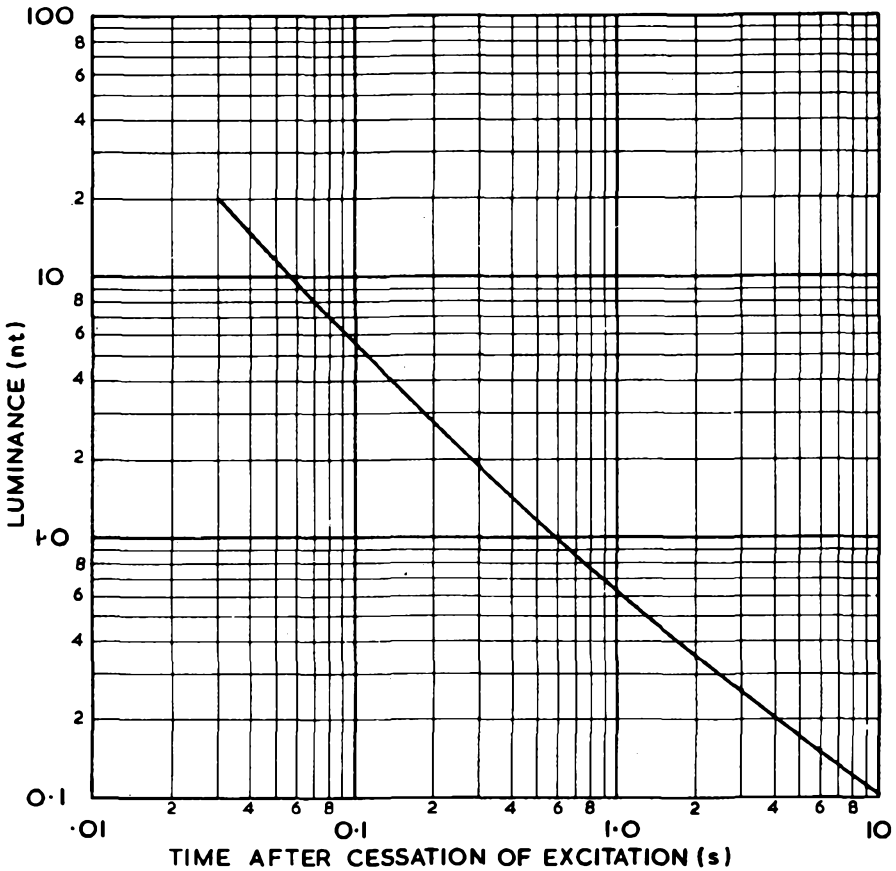


PHOSPHOR SCREENS

GV PERSISTENCE

FINAL ANODE VOLTAGE = 15kV

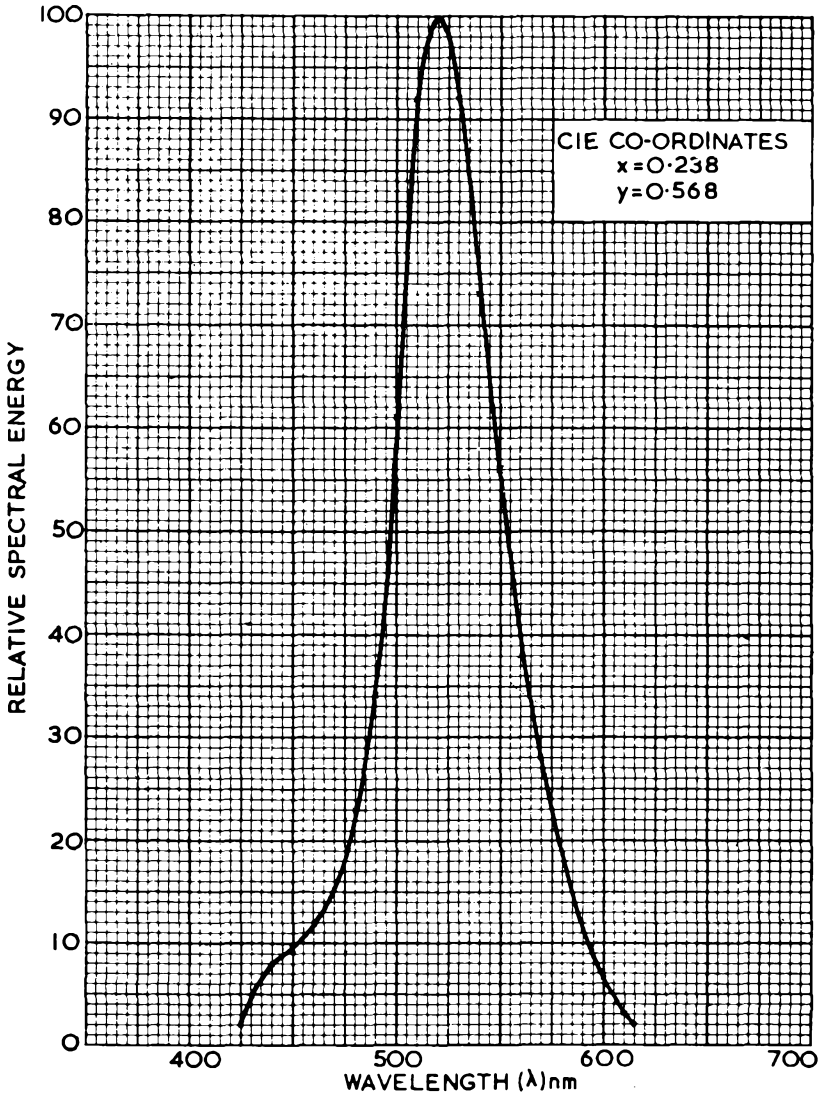
Excitation: single 20ms raster at 1μA/cm²



Phosphor Screen

GW
P42

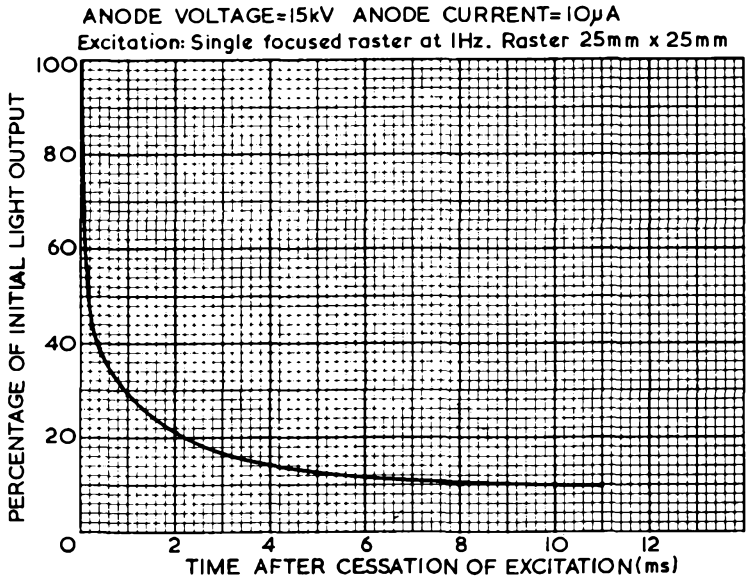
RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE GW/P42
ANODE VOLTAGE = 15kV

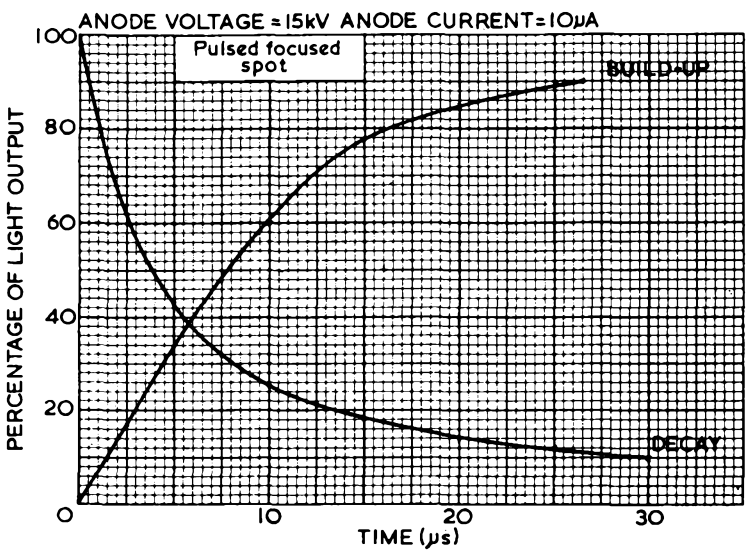


PHOSPHOR SCREENS

Phosphor Screen

GW/P42 PERSISTENCE AND BUILD-UP



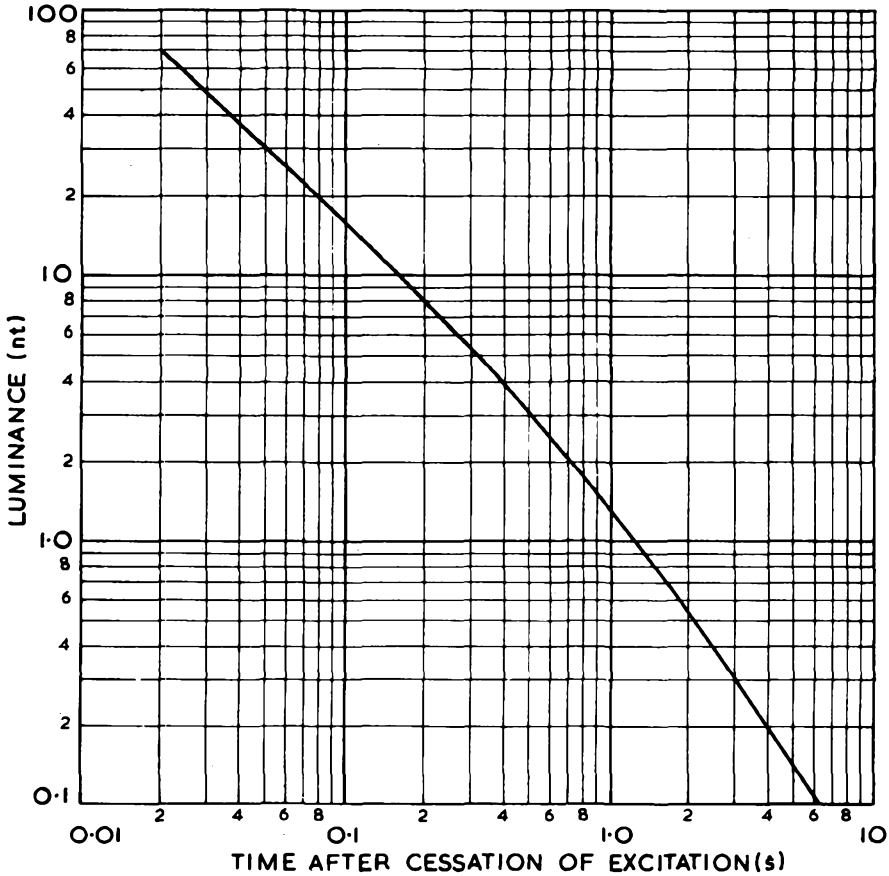


GW/P42 PERSISTENCE

FINAL ANODE VOLTAGE = 15 kV

Excitation: single 20ms raster at 1μA/cm²

Measured as average luminance of raster on C.R.T. with aluminised screen.



GX
P44

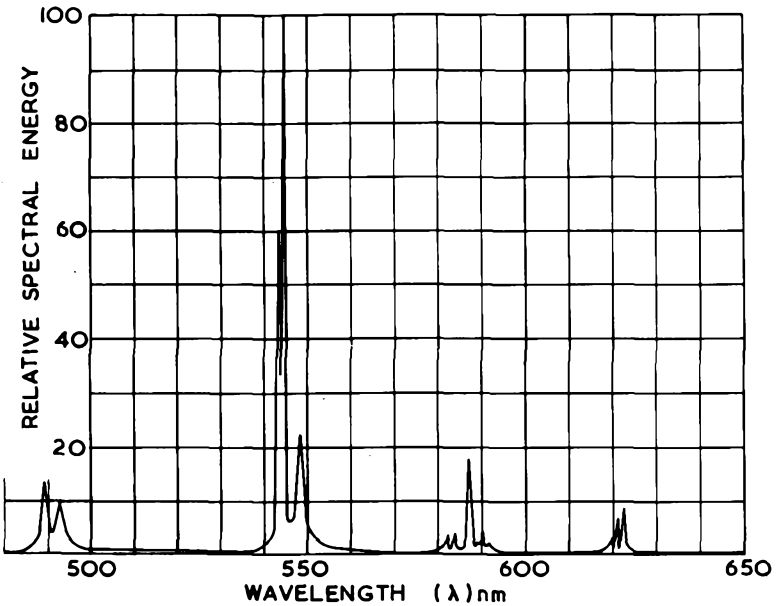
Phosphor Screen

RELATIVE SPECTRAL ENERGY DISTRIBUTION OF TYPICAL CRT SCREEN TYPE GX / P44

CIE CO-ORDINATES

X = 0·300

Y = 0·596

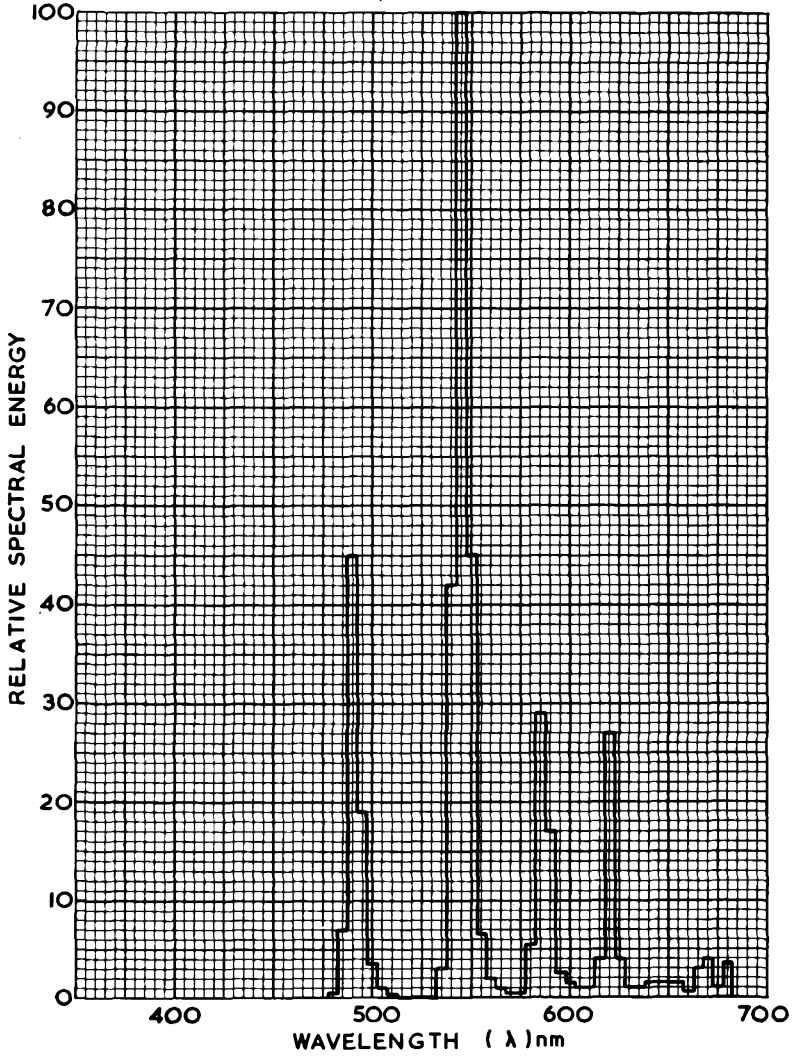


Phosphor Screen

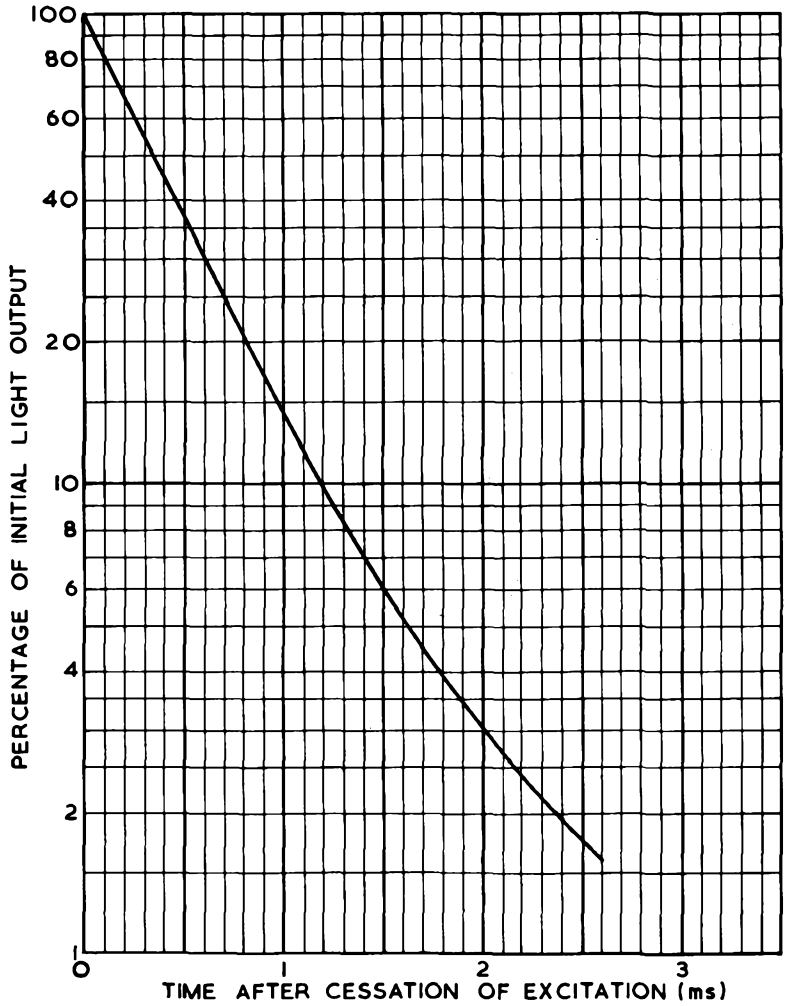
GX
P44

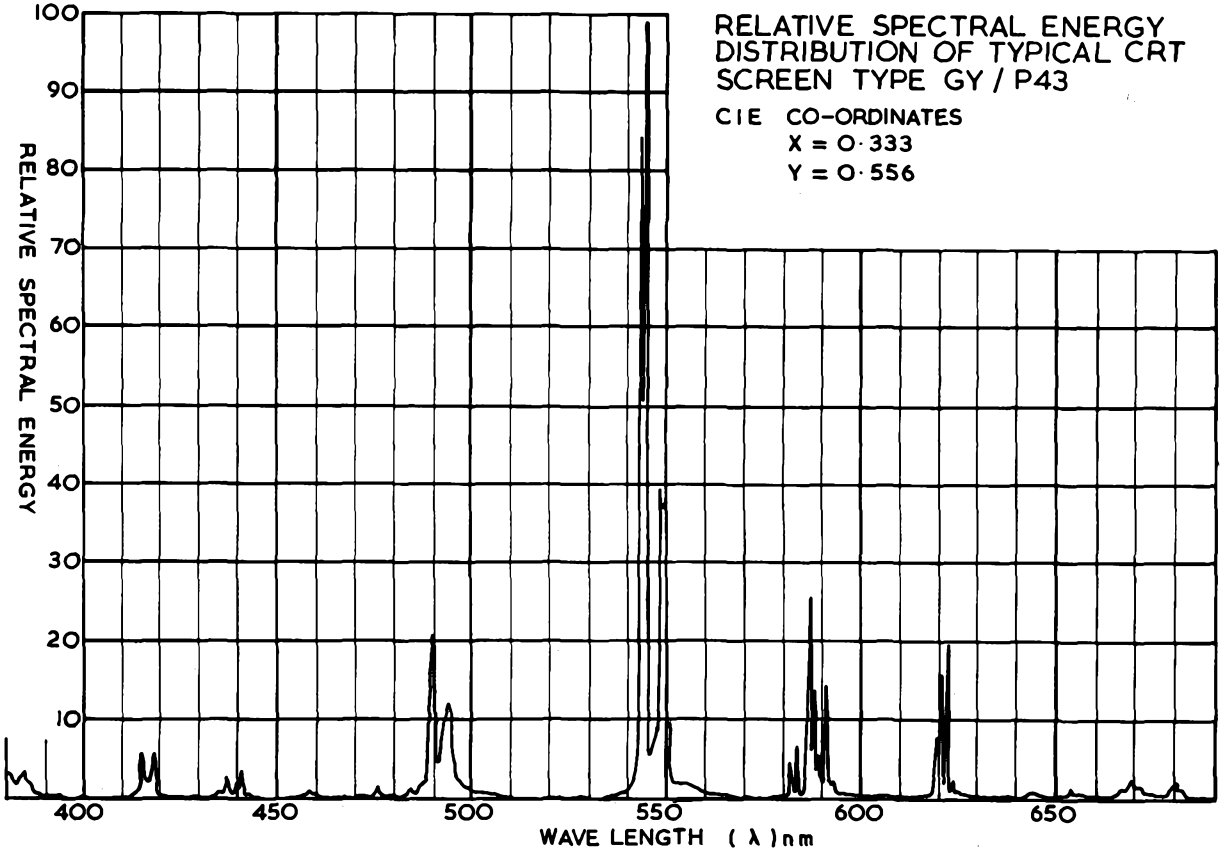
RELATIVE SPECTRAL ENERGY DISTRIBUTION OF TYPICAL CRT SCREEN TYPE GX / P44 MEASURED IN 5nm BANDWIDTHS.

FINAL ANODE VOLTAGE 15 kV
FINAL ANODE CURRENT 20 μA



GX / P44 PERSISTENCE
FINAL ANODE VOLTAGE = 20 kV
PULSED SPOT

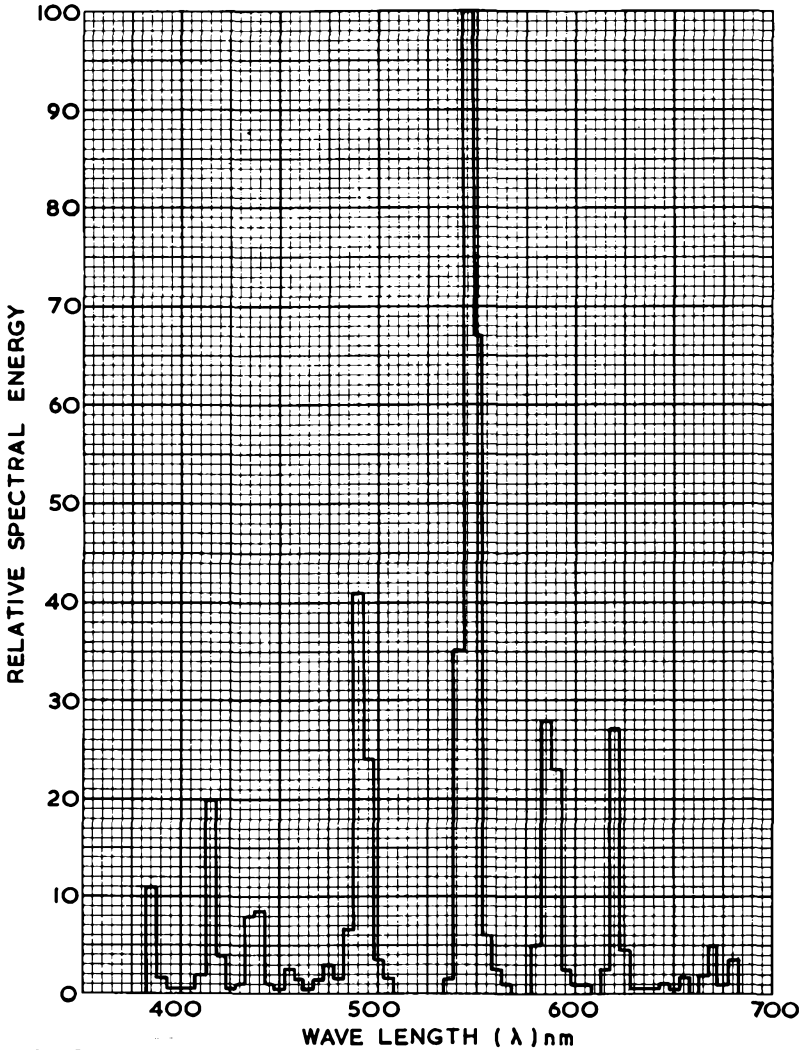




PHOSPHOR SCREENS

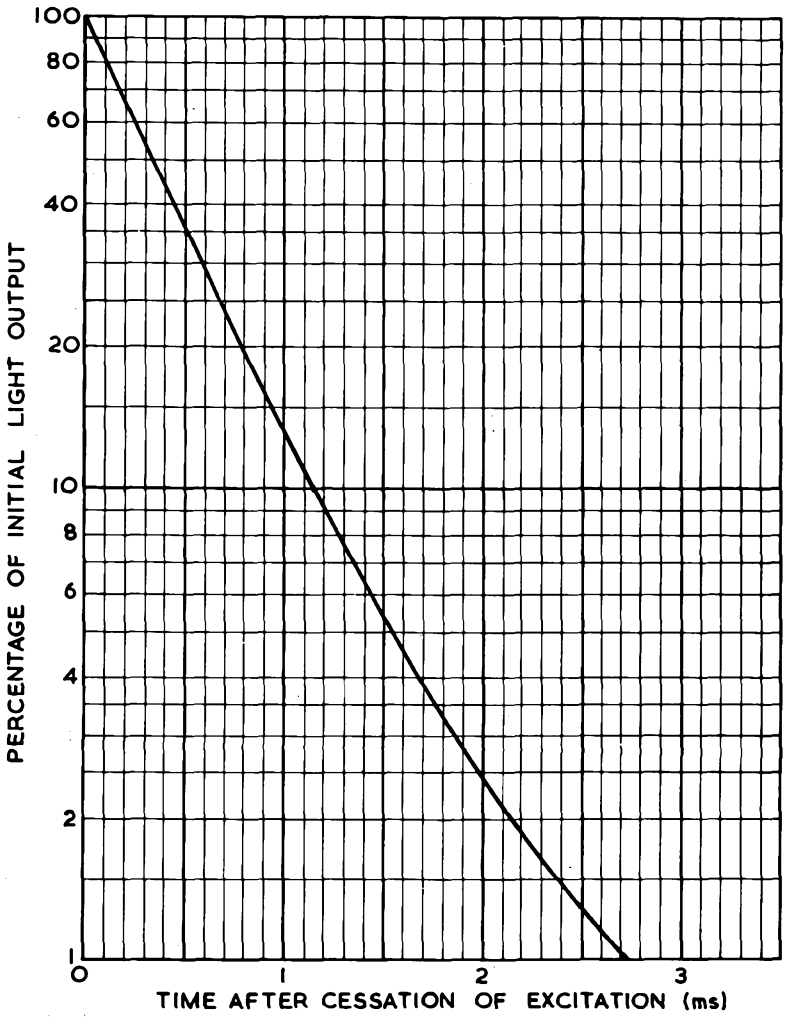
RELATIVE SPECTRAL ENERGY DISTRIBUTION OF TYPICAL CRT SCREEN TYPE GY/P43 MEASURED IN 5nm BANDWIDTHS.

FINAL ANODE VOLTAGE = 15 kV
FINAL ANODE CURRENT = 20 μA



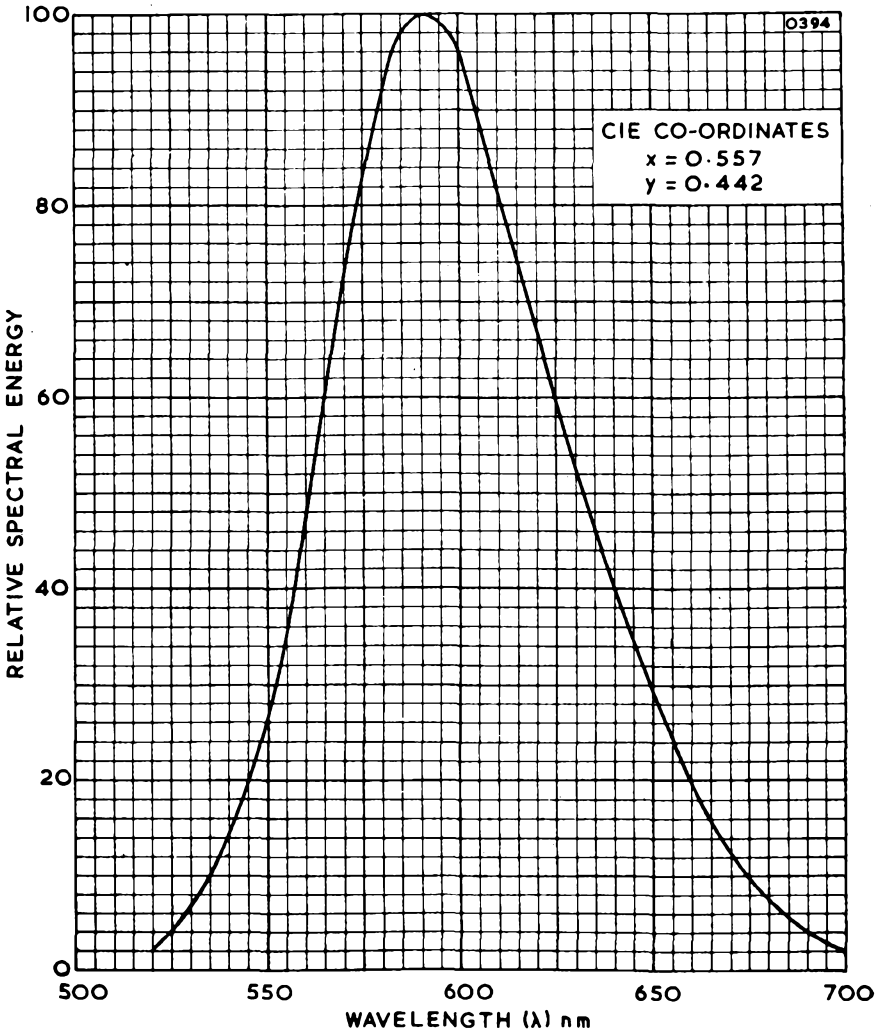
GY/P43 PERSISTENCE

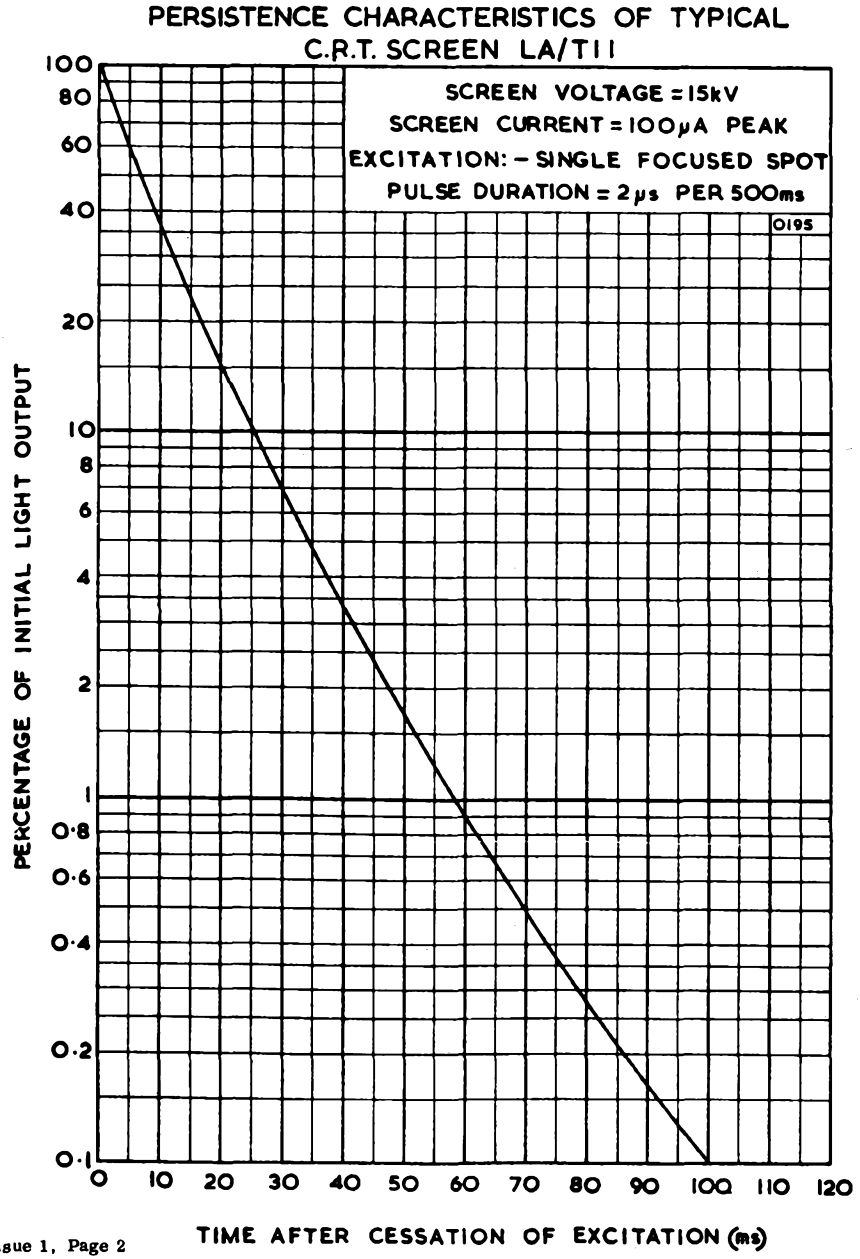
FINAL ANODE VOLTAGE = 20 kV
PULSED SPOT



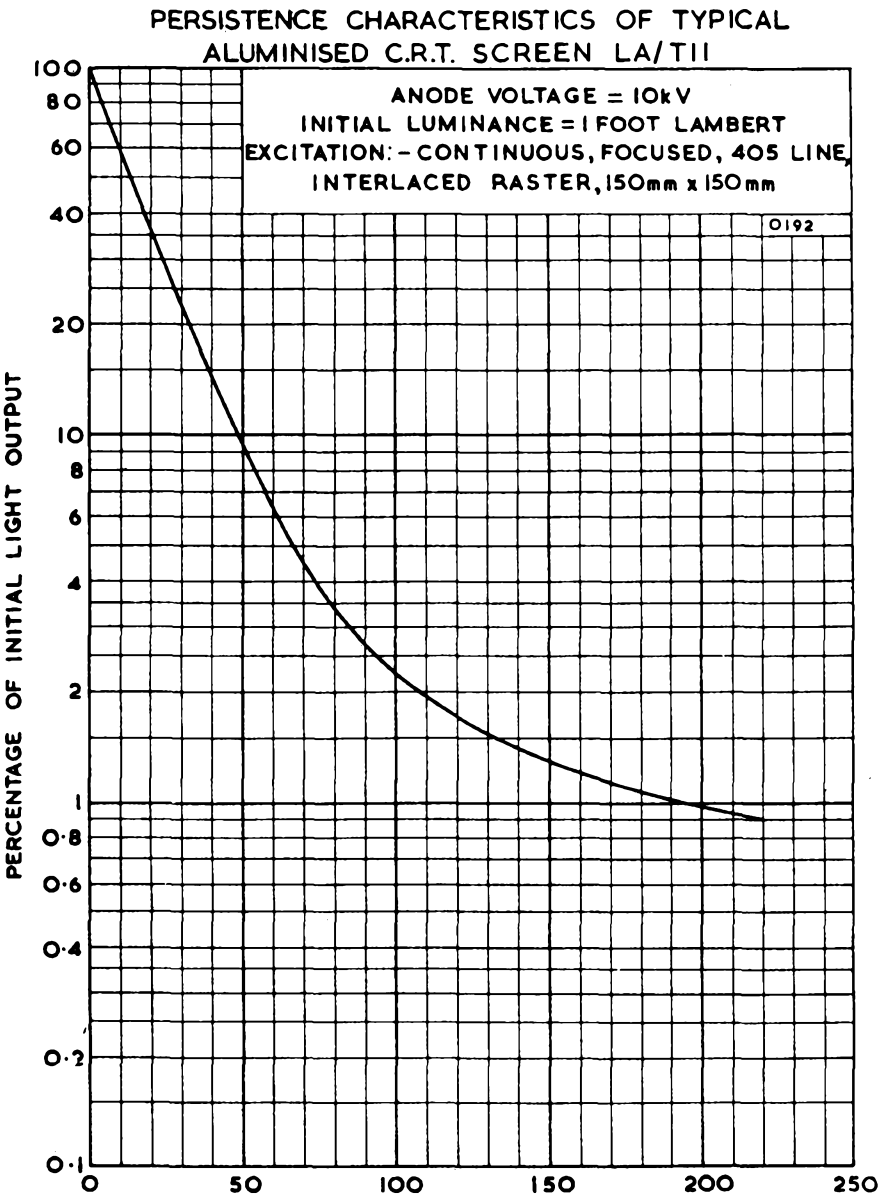
Phosphor Screen

RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE LA/T11




PERSISTENCE CHARACTERISTICS OF TYPICAL C.R.T. SCREEN LA/T11
SCREEN VOLTAGE = 15kV
SCREEN CURRENT = 100μA PEAK
EXCITATION: – SINGLE FOCUSED SPOT
PULSE DURATION = 2μs PER 500ms
0195
PERCENTAGE OF INITIAL LIGHT OUTPUT
100
80
60
40
20
10
8
6
4
2
1
0·8
0·6
0·4
0·2
0·1
0
10
20
30
40
50
60
70
80
90
100
110
120
TIME AFTER CESSATION OF EXCITATION (ms)

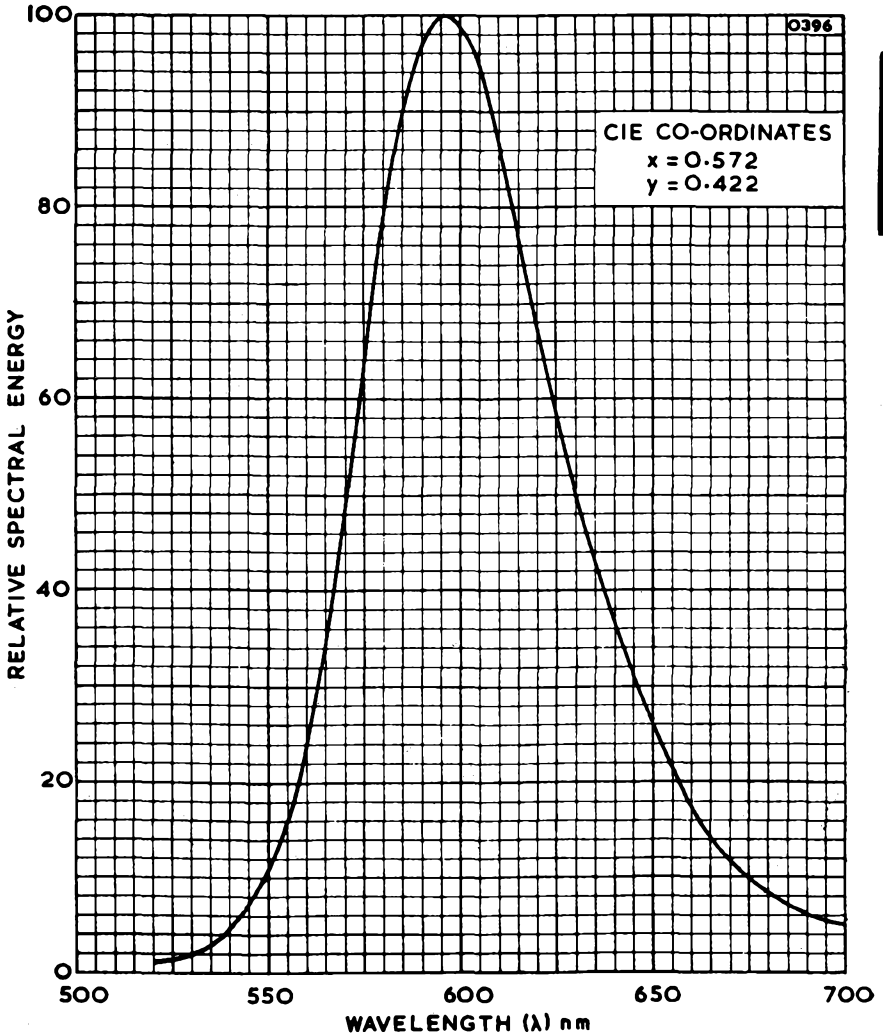
Phosphor Screen



Phosphor Screen

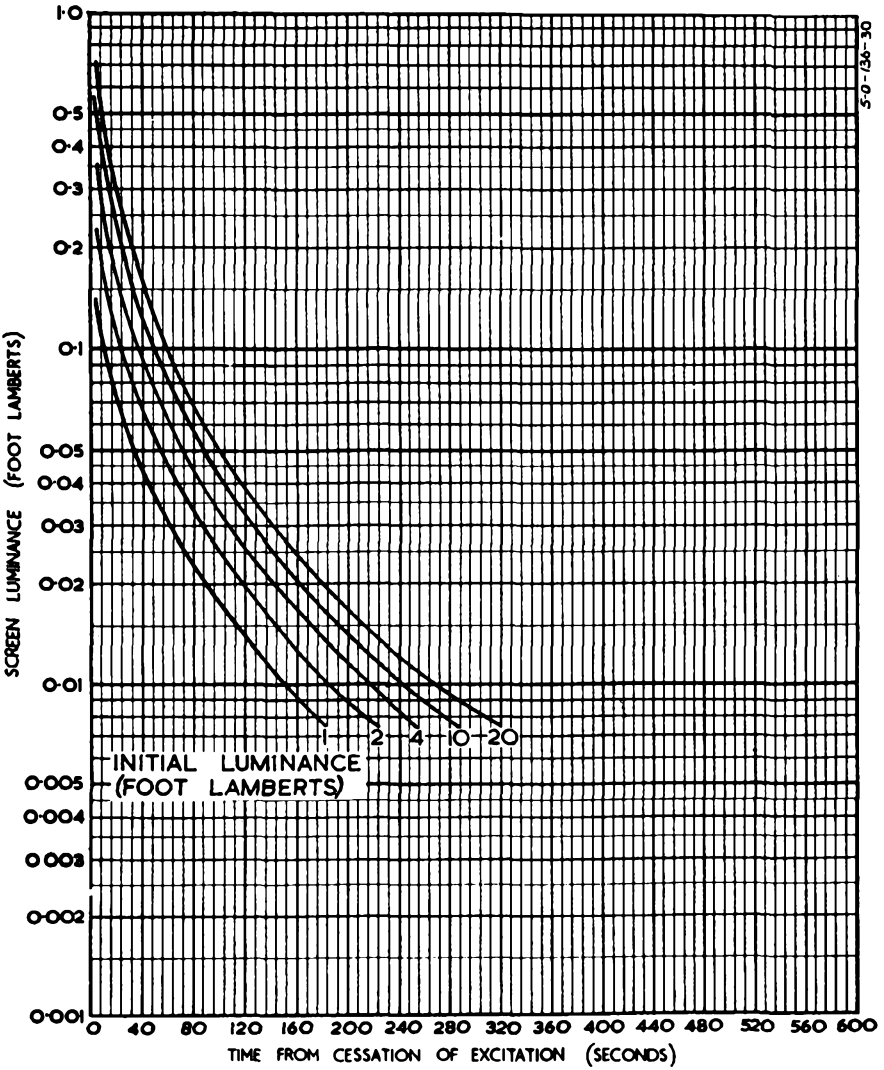
LC
T7

RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE LC/T7



Phosphor Screen

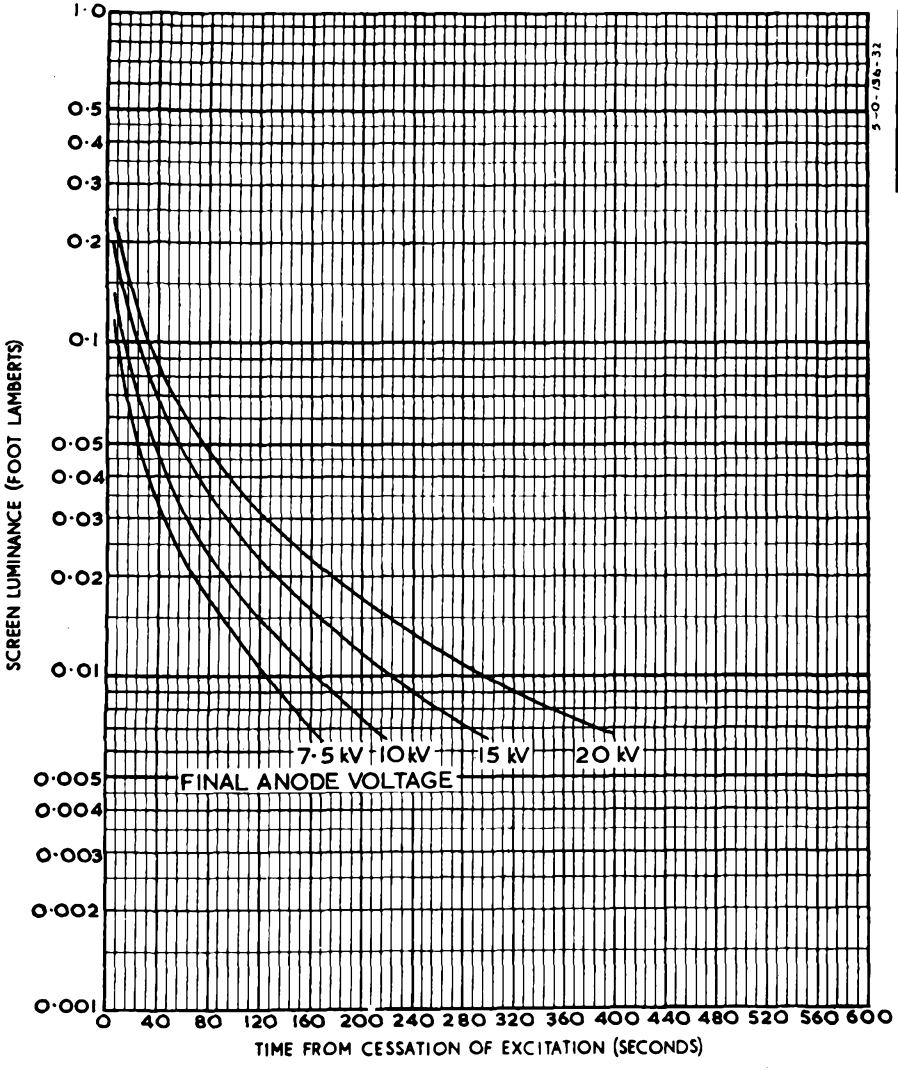
PERSISTENCE CHARACTERISTICS of typical aluminised CRT screen.
Excitation—Continuous, focused, 405 line, interlaced raster, 150 mm × 150 mm.
Final Anode Voltage—10 kV.
Note—This screen is liable to burn if a stationary or slow-moving spot is used even with low values of beam current.



Phosphor Screen

LC
T7

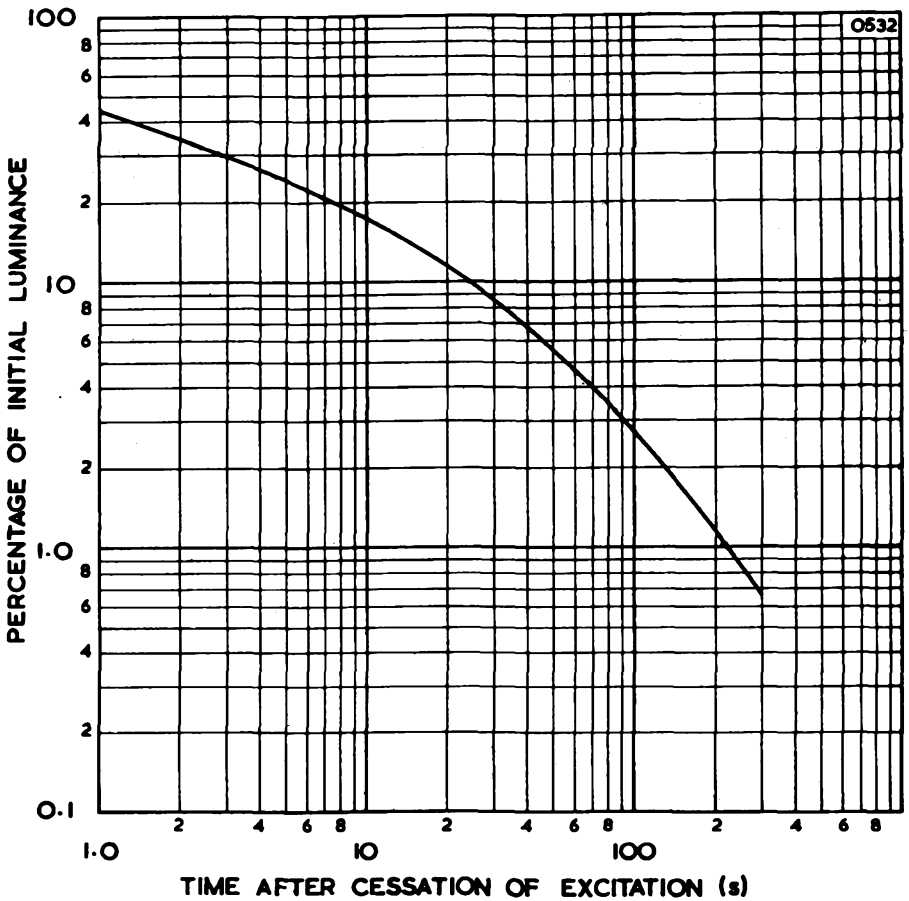
PERSISTENCE CHARACTERISTICS of typical aluminised C.R.T. screen.
Excitation—Continuous, focused, 405 line, interlaced raster, 150 mm × 150 mm.
Initial Luminance—1 Foot Lambert.
Note—This screen is liable to burn if a stationary or slow-moving spot is used even with low values of beam current.



Phosphor Screen

LC/T7 PERSISTENCE

FINAL ANODE VOLTAGE = 15kV
INITIAL LUMINANCE = 1 FOOT LAMBERT (3·43nt)
Excitation: continuous focused raster
Measured on C.R.T. with aluminised screen

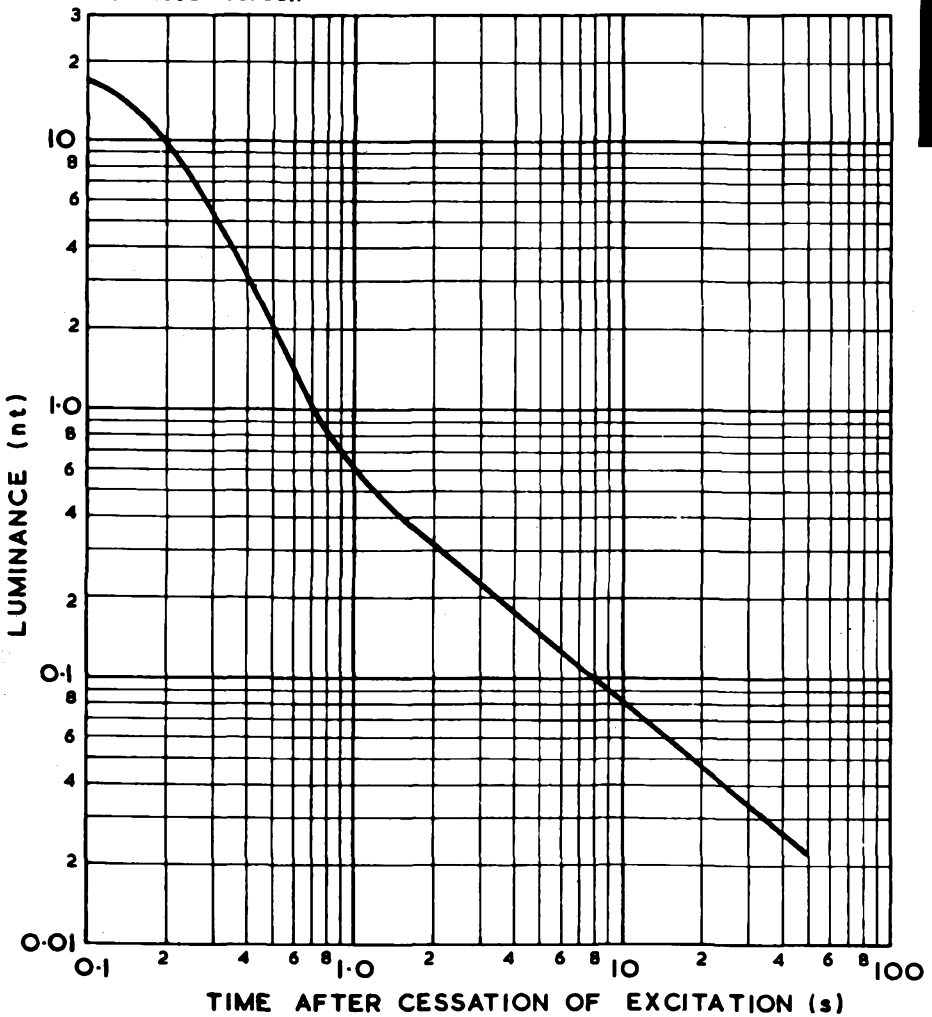


LC/T7 PERSISTENCE

FINAL ANODE VOLTAGE = 15kV

Excitation: single 20 ms raster at 1μA/cm²

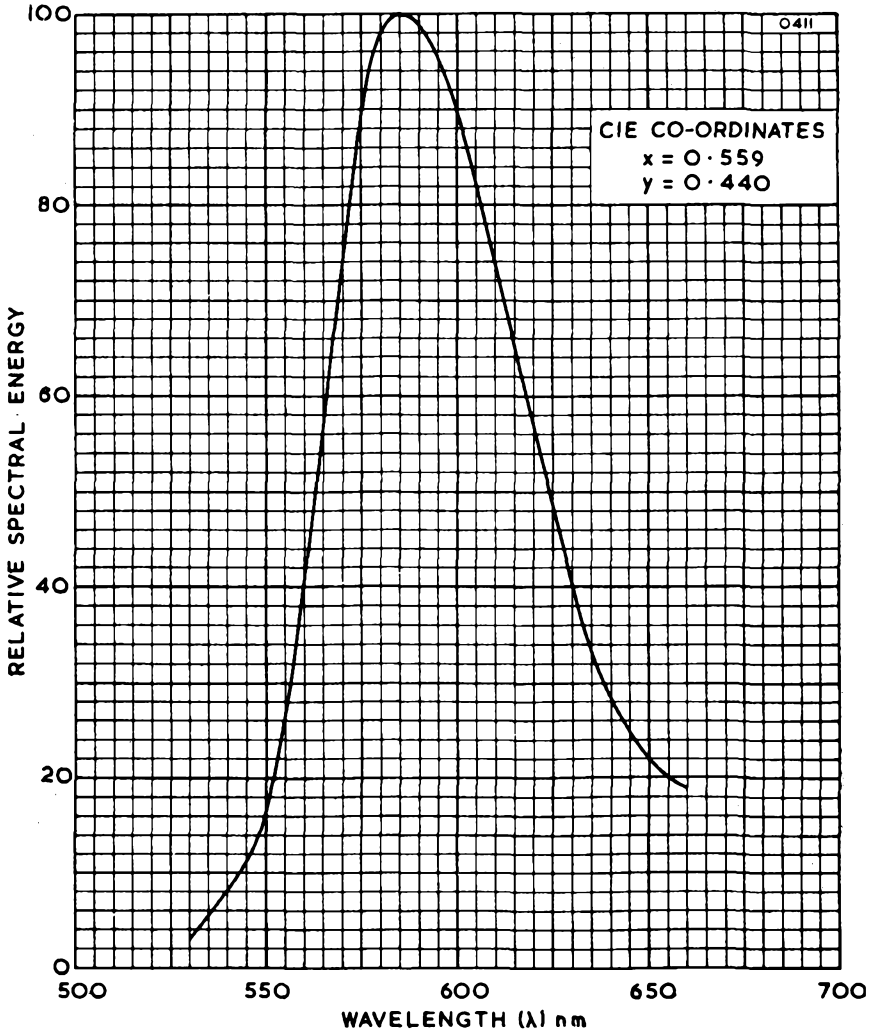
Measured as average luminance of raster on C.R.T. with aluminised screen



LD
P33
T15

Phosphor Screen

RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE LD/P33/T15



Phosphor Screen

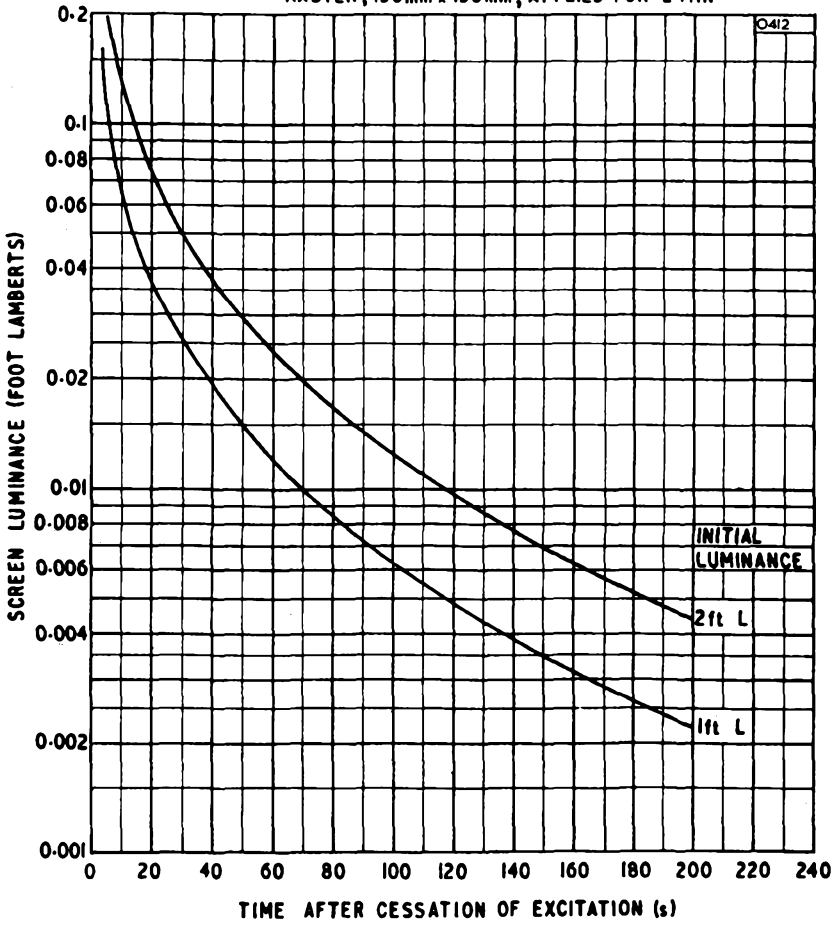
LD
P33
T15

Note—This screen is liable to burn if a stationary or slow-moving spot is used even with low valves of beam current.

PERSISTENCE CHARACTERISTICS OF TYPICAL ALUMINISED C.R.T. SCREEN LD/P33/T15

FINAL ANODE VOLTAGE = 15kV

EXCITATION:- CONTINUOUS, UNFOCUSED, 405 LINE, INTERLACED RASTER, 150mm x 150mm, APPLIED FOR 2 MIN



LD
P33
T15

Phosphor Screen

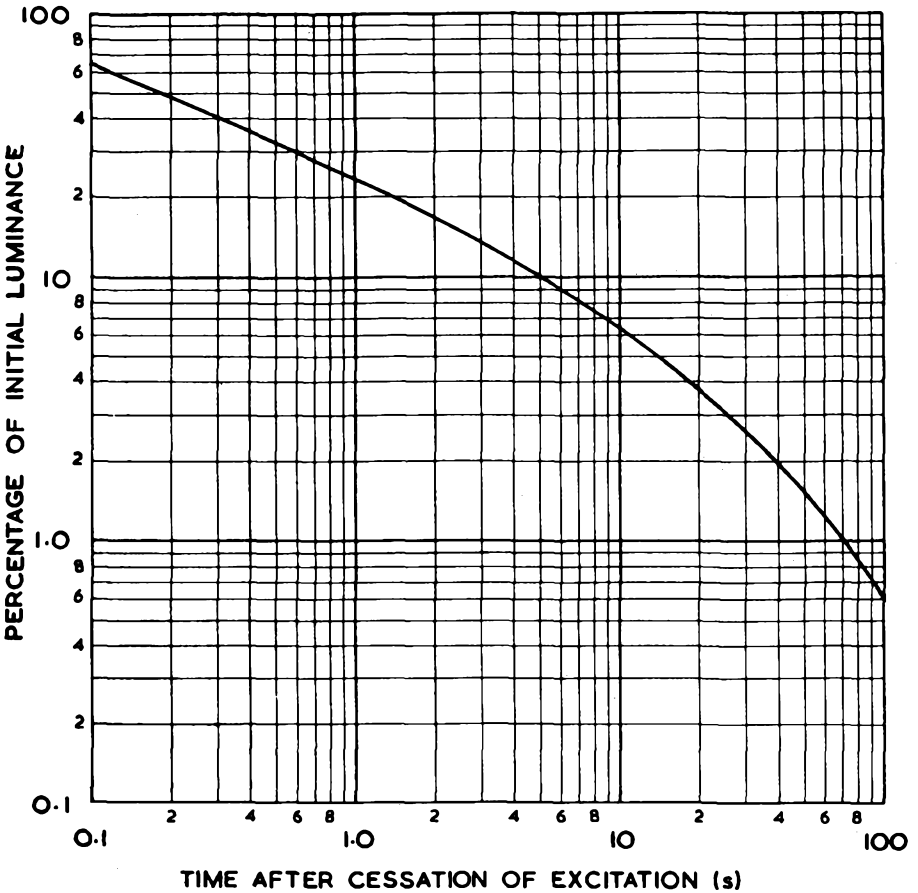
LD/P33/T15 PERSISTENCE

FINAL ANODE VOLTAGE = 15kV

INITIAL LUMINANCE = 1 FOOT LAMBERT (3·43nt)

Excitation: continuous focused raster

Measured on C.R.T. with aluminised screen

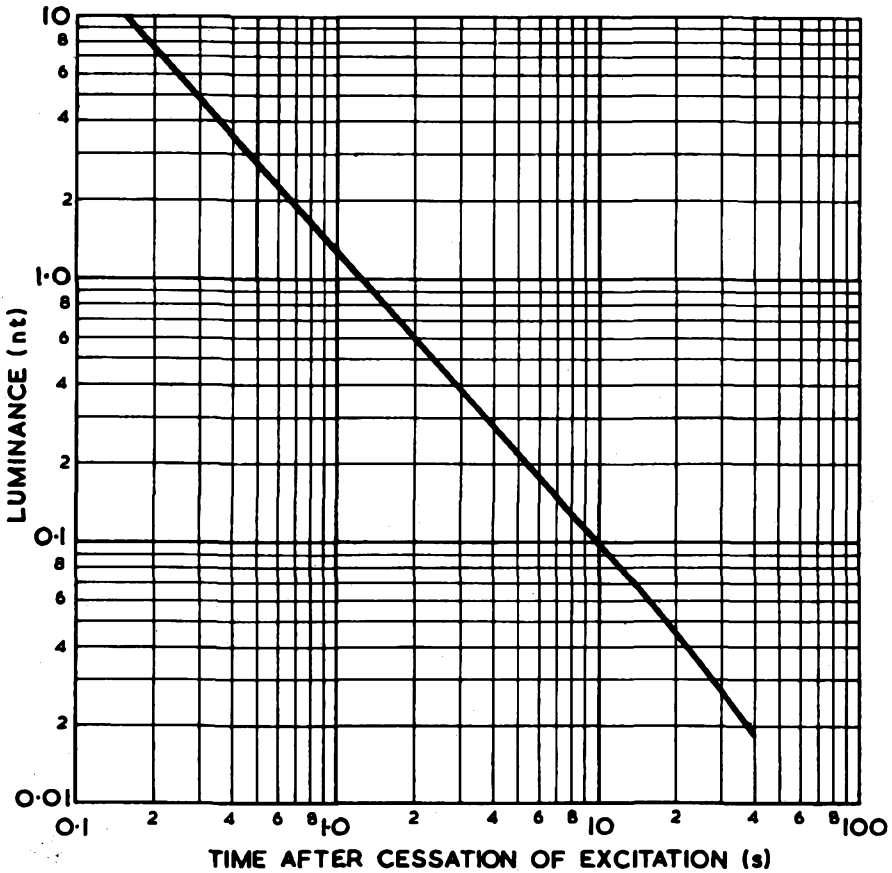


LD/P33/T15 PERSISTENCE

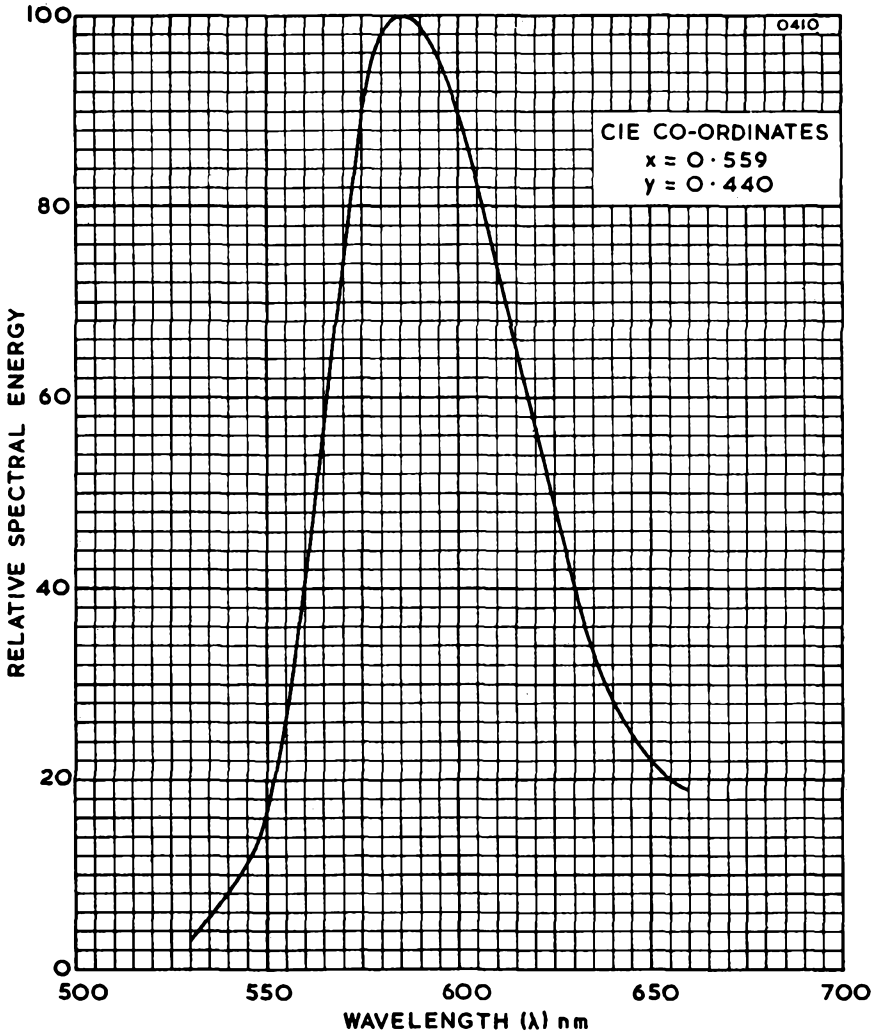
FINAL ANODE VOLTAGE = 15 kV

Excitation: single 20ms raster at 1μA/cm²

Measured as average luminance of raster on C.R.T. with aluminised screen.



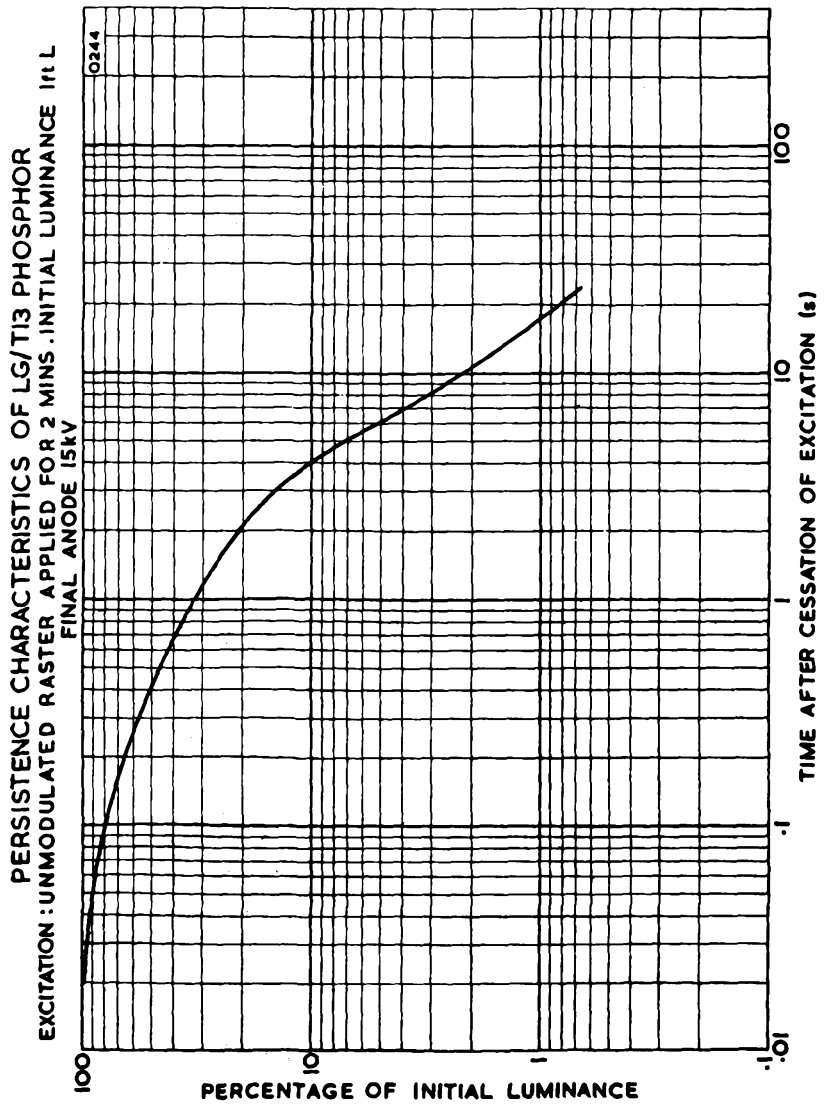
RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE LG/T13



Phosphor Screen

LG
T13

Note—This screen is liable to burn if a stationary or slow-moving spot is used even with low values of beam current.



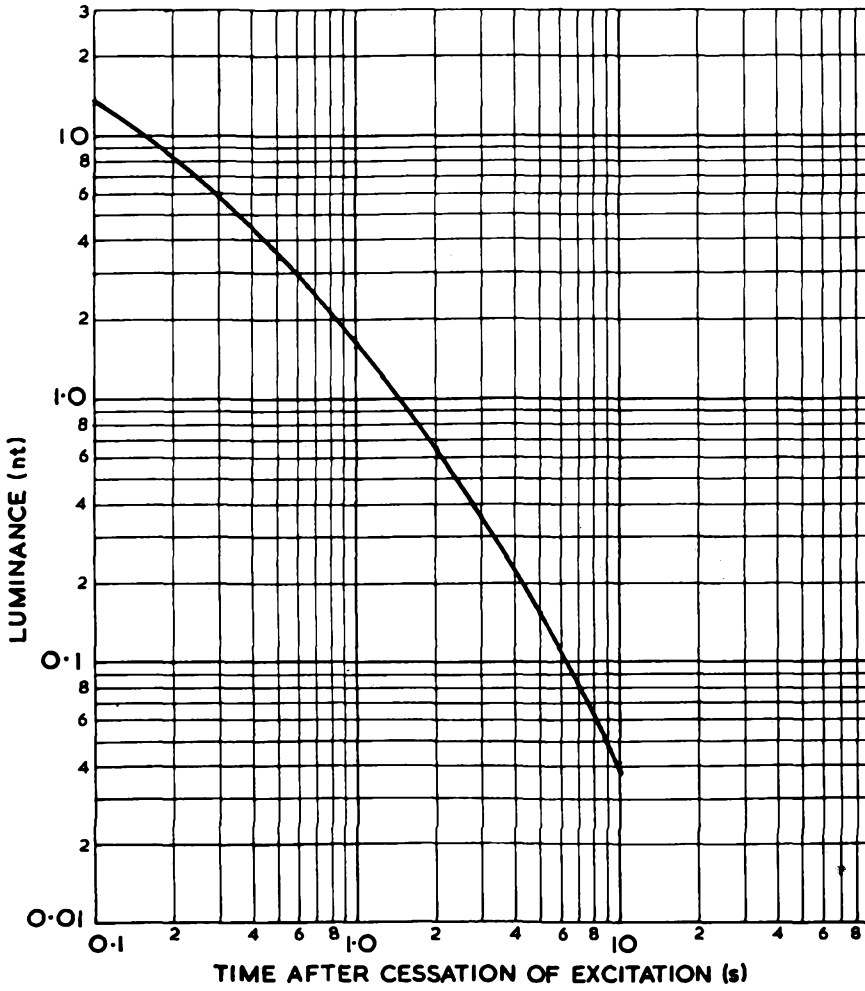
Phosphor Screen

LG/T13 PERSISTENCE

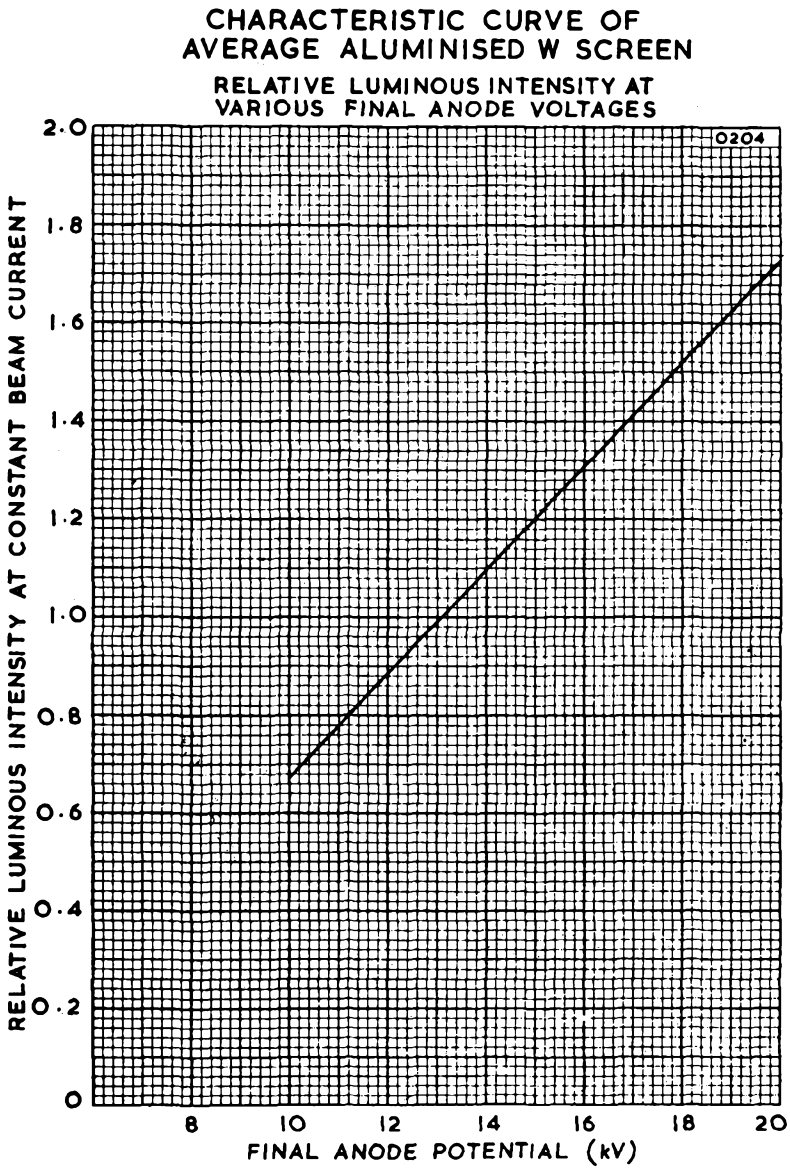
FINAL ANODE VOLTAGE = 15kV

Excitation: single 20ms raster at 1μA/cm²

Measured as average luminance of raster on C.R.T. with aluminised screen

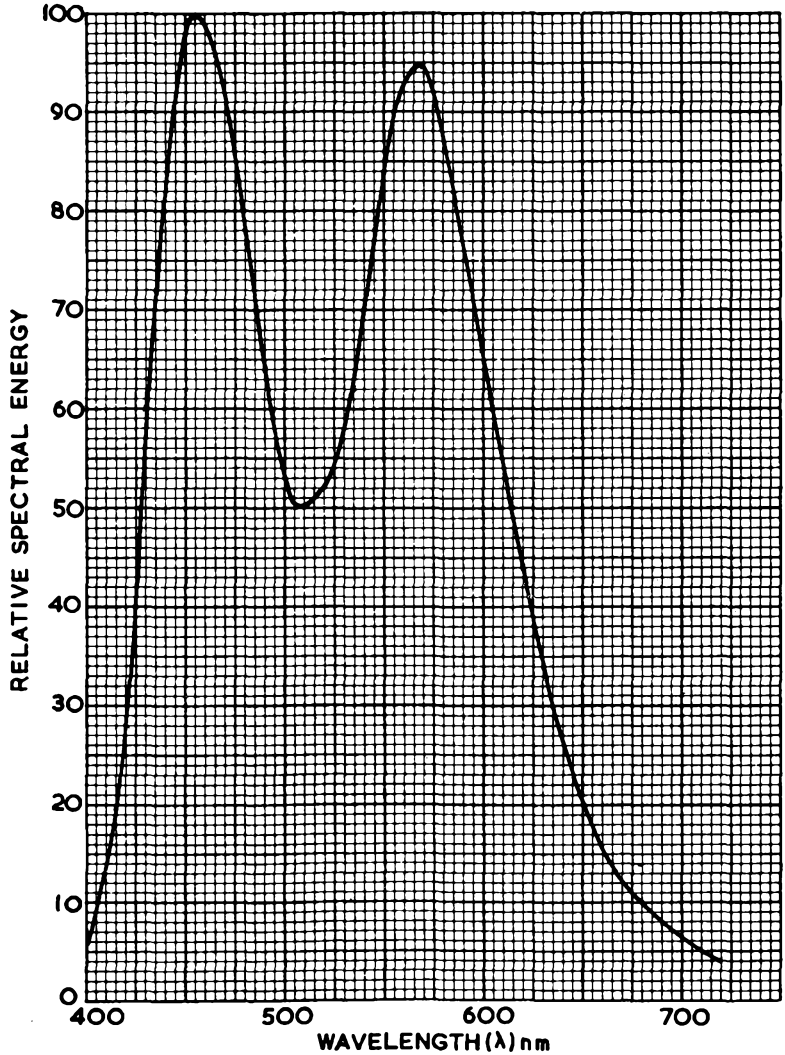


ALUMINISED W SCREEN CHARACTERISTIC



RELATIVE SPECTRAL ENERGY DISTRIBUTION
OF TYPICAL C.R.T. SCREEN TYPE WA

THIS SCREEN IS A VISUAL MATCH TO THE STANDARD
LIGHT SOURCE D6500



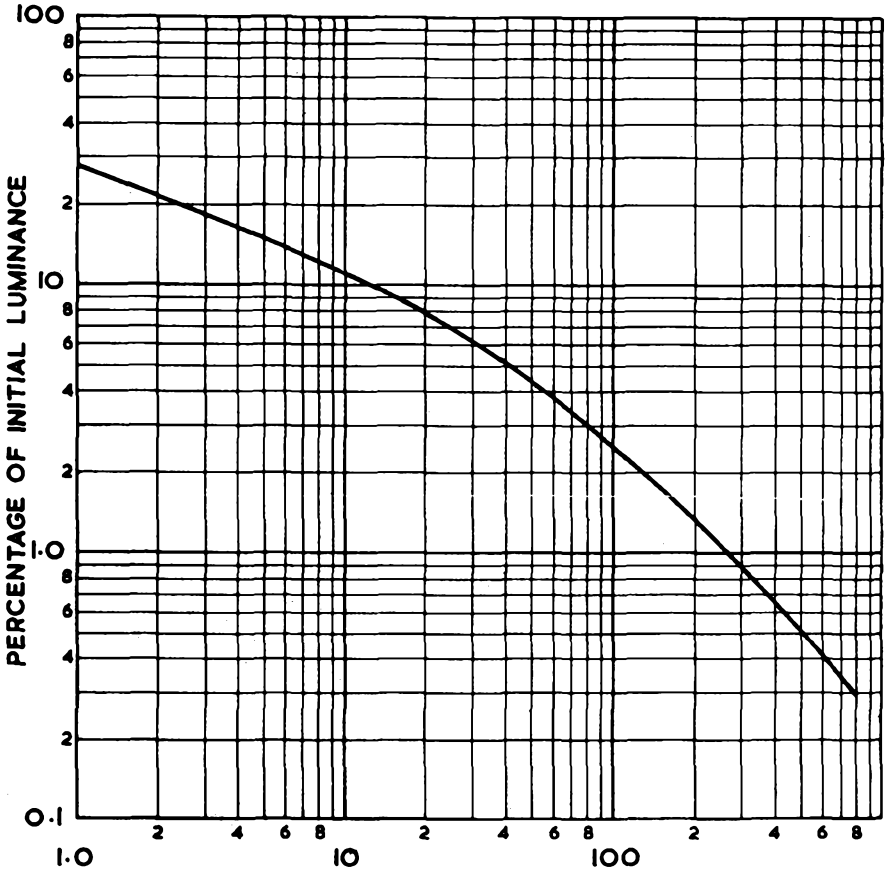
WA PERSISTENCE

FINAL ANODE VOLTAGE = 15kV

INITIAL LUMINANCE = 1 FOOT LAMBERT (3·43nt)

Excitation: continuous focused raster

Measured as average luminance of raster on C.R.T. with aluminised screen

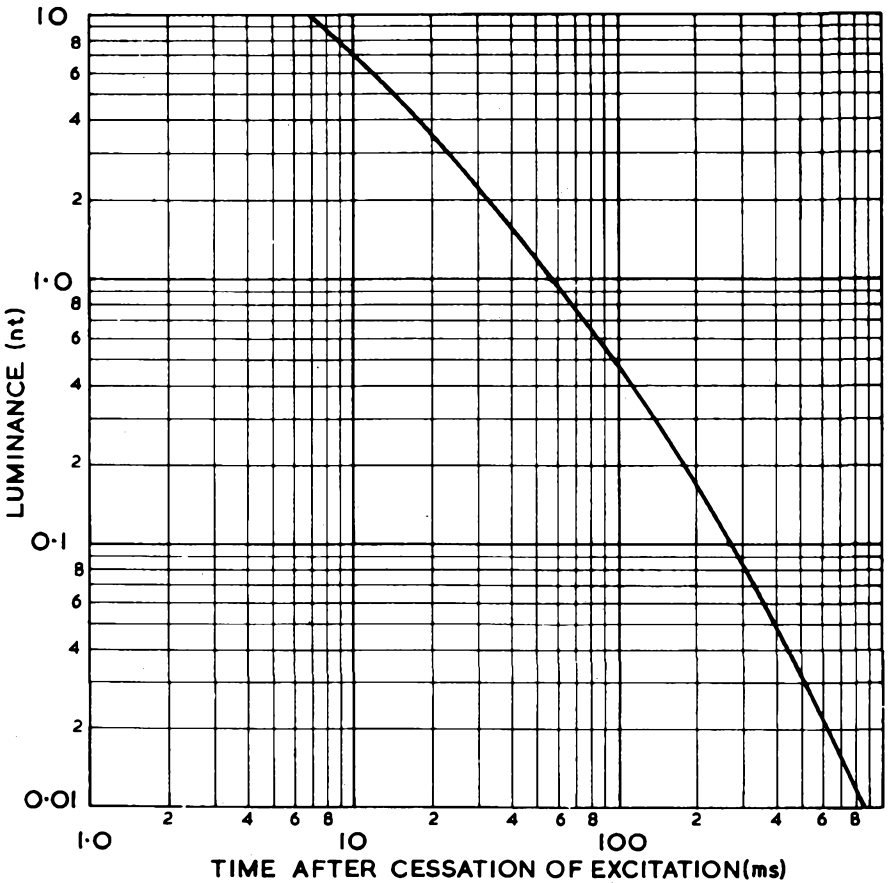


WA PERSISTENCE

FINAL ANODE VOLTAGE = 15kV

Excitation: single 20ms raster at 1μA/cm²

Measured as average luminance of raster on C.R.T. with aluminised screen.



GRATICULES GAUGES, BASES CAPS, SOCKETS & SCAN COILS

The facilities and organisation provided by Thorn Radio Valves and Tubes Limited meet the requirements of the M.O.D. (P.E.) Defence Standard 05-21 and BS 9000.

HEALTH AND SAFETY AT WORK ACT, 1974

Attention is drawn to the recommendations under this heading in the Operational Recommendations.

WARNING

These tubes should be used in accordance with their published ratings, and in conformity with the Operational Recommendations of the company's data handbook. The company will not entertain claims for loss or damage where this advice has been disregarded.

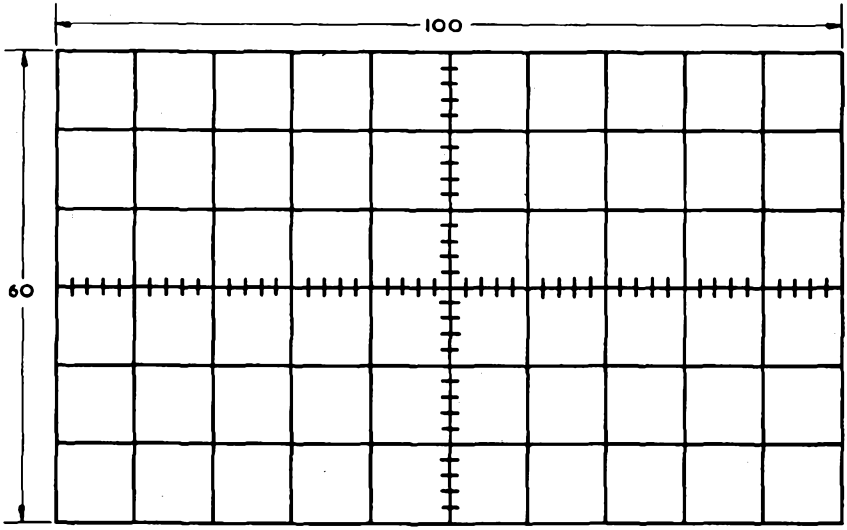
Thorn Radio Valves and Tubes Limited
Mollison Avenue - Brimsdown - Enfield - Middlesex EN3 7NS

BRIMAR

Graticule

Type 26

DETAILS OF GRATICULE



All dimensions in mm

Not to be scaled

This dual purpose internal graticule is suitable for direct view or for illumination with an appropriate light guide.

Graticule type 26 normally used on tubes with 13 cm diagonal .

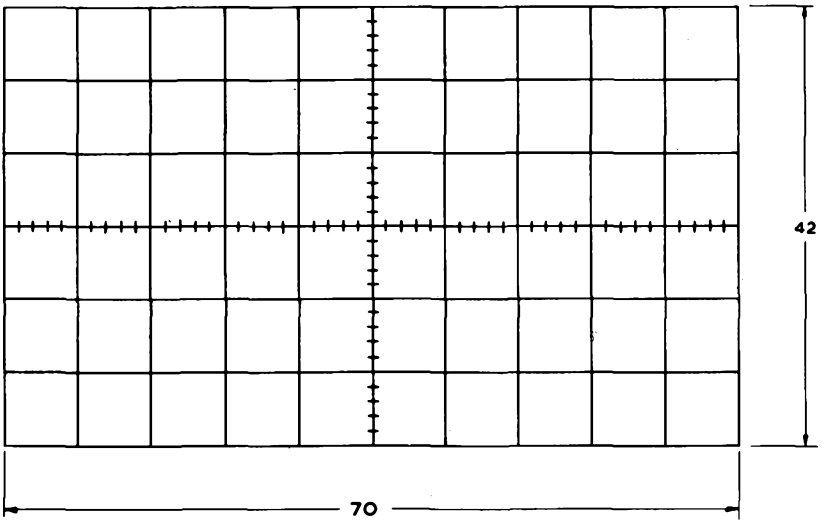
The graticule x and y axes will be on tube face axes ± 2°.

The centre of the graticule will be within 1 mm of the mechanical centre of the face.

BRIMAR

Type 32 Graticule

DETAILS OF GRATICULE



Dimensions in mm Not to be scaled

This dual purpose internal graticule is suitable for direct view or for illumination with an appropriate light guide.

Graticule type 32 normally used on tubes with 10 cm diagonal.

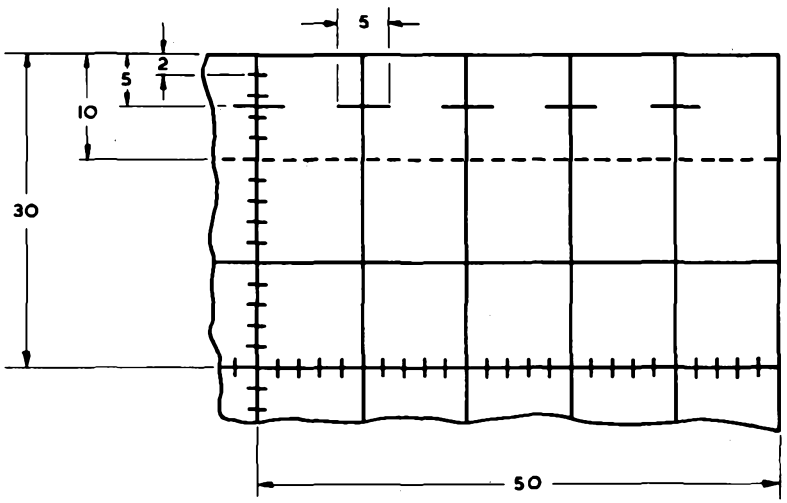
The graticule X and Y axes will be on the tube face axes ± 2°.

The centre of the graticule will be within 1 mm of the mechanical centre of the face.

Graticule

Type 34

DETAIL OF ONE QUADRANT OF GRATICULE



All dimensions in mm

Not to be scaled

This dual purpose internal graticule is suitable for direct view or for illumination with an appropriate light guide.

Graticule type 34 normally used on tubes with 13 cm diagonal.

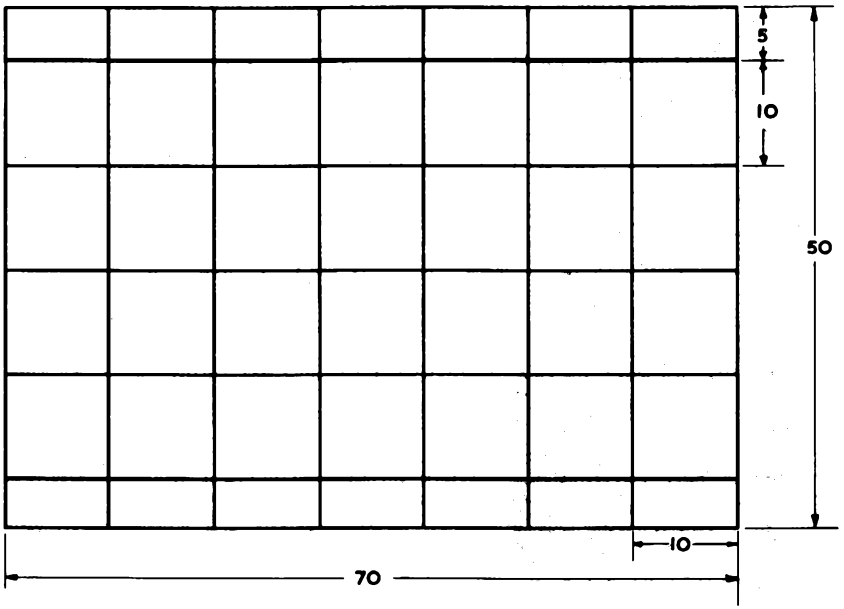
The graticule x and y axes will be on tube face axes ± 2°.

The centre of the graticule will be within 1 mm of the mechanical centre of the face.

BRIMAR

Type 42 Graticule

DETAILS OF GRATICULE



All dimensions in mm Not to be scaled

This dual purpose internal graticule is suitable for direct view or for illumination with an appropriate light guide.

Graticule type 42 normally used on tubes with a 10 cm diagonal.

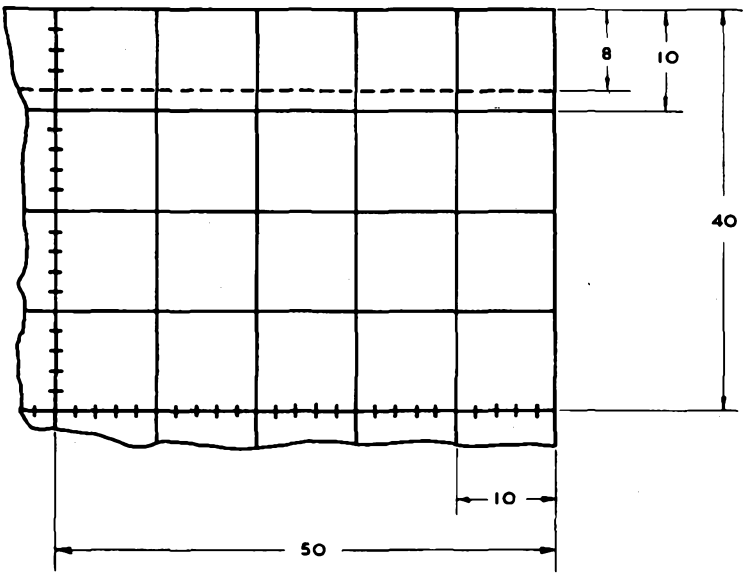
The graticule axes will be on the tube face axes ± 2°.

The centre of the graticule will be within 1 mm of the mechanical centre of the face.

Graticule

Type 50
Type 51

DETAIL OF ONE QUADRANT OF GRATICULE



All dimensions in mm

Not to be scaled

GRATICULES GAUGES, BASES & CAPS, SOCKETS SCAN COILS

GRATICULE 50

This dual purpose internal graticule is suitable for direct view or for illumination with an appropriate light guide.

Square with 10 mm side. x and y axes, with markers at 10% and 90%.

Graticule 100 mm x 80 mm normally used on tubes with 14 and 15 cm diagonal.

The graticule x and y axes will be on the tube face axes $\pm$ 2°.

The centre of the graticule will be within 1 mm of the mechanical centre of the face.

GRATICULE 51 : Bonded face-plate light guide.

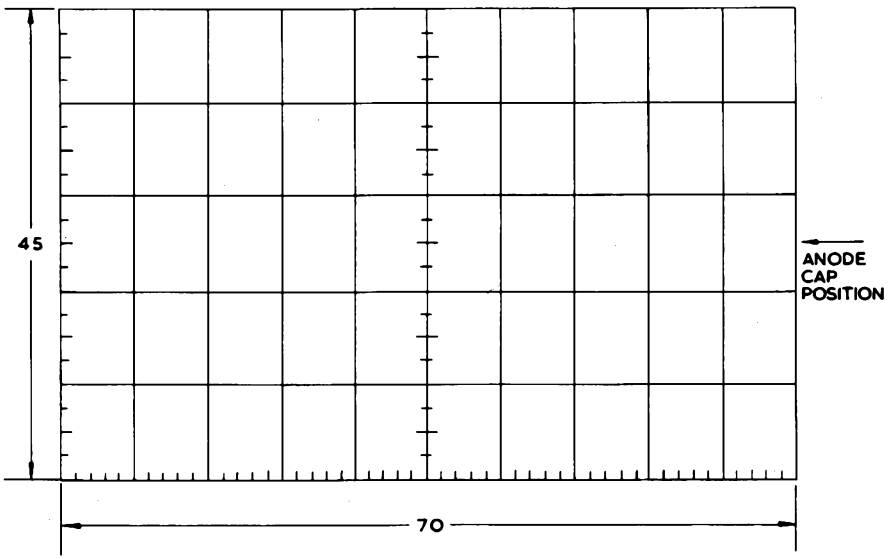
Tubes with graticule designation 51 (e.g. D14-280GH/51) have a 50 graticule together with a bonded face-plate to provide an alternative method of light injection and hence illumination of the graticule.

The bonded face-plate increases the tube overall length.

BRIMAR

Type 58 Graticule

DETAILS OF GRATICULE



All dimensions in mm Not to be scaled

This dual purpose internal graticule is suitable for direct view or for illumination with an appropriate light guide.

Graticule type 58 normally used on tubes with 10 cm diagonal.

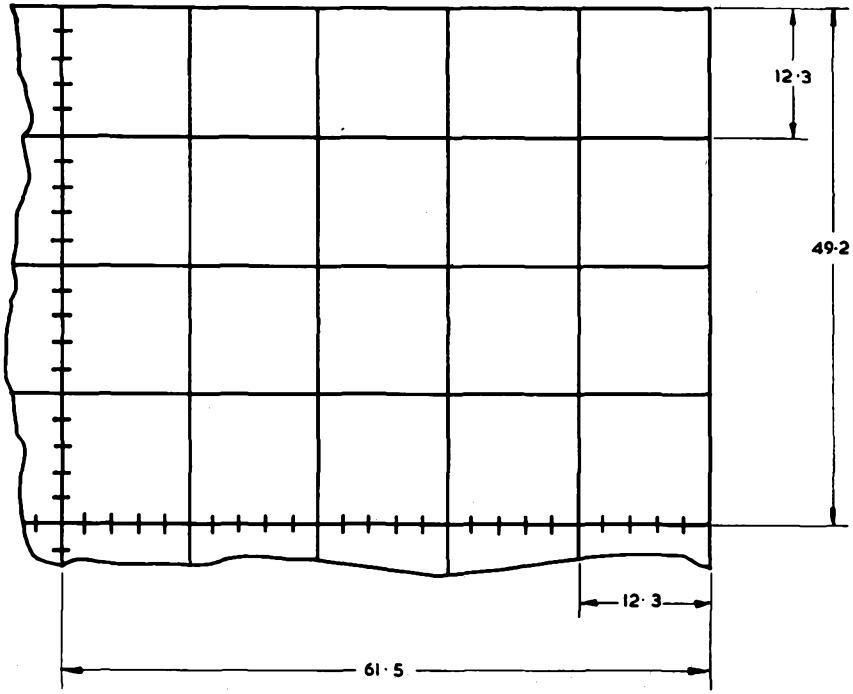
The graticule X and Y axes will be on the tube face axes ± 2°.

The centre of the graticule will be within 1 mm of the mechanical centre of the face.

Graticule

Type 70

DETAIL OF ONE QUADRANT OF GRATICULE



All dimensions in mm

Not to be scaled

This dual purpose internal graticule is suitable for direct view or for illumination with an appropriate light guide.

Squares with 12.3 mm side. x and y axes.

Graticule normally used on tubes with 18 cm diagonal.

The graticule x and y axes will be on the tube face axes ± 2°.

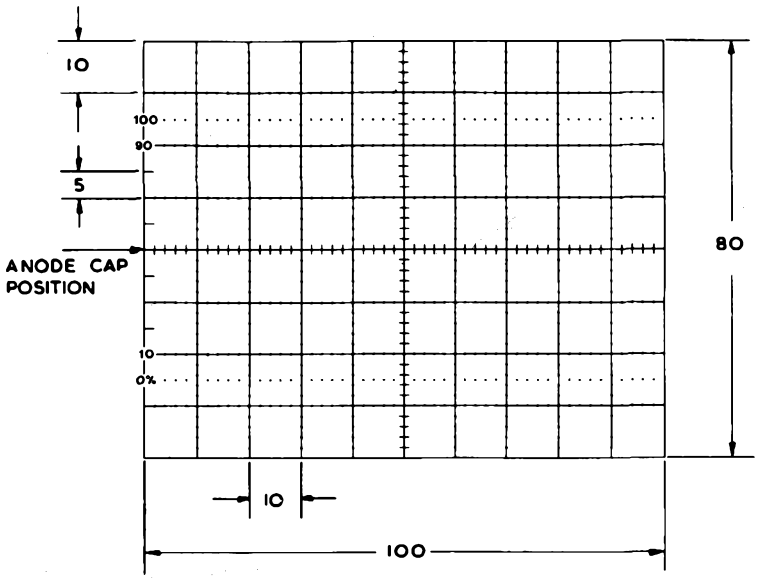
The centre of the graticule will be within 1 mm of the mechanical centre of the face.

BRIMAR

Type 82
Type 98

Graticule

DETAILS OF GRATICULE



All dimension in mm

Not to be scaled

This dual purpose internal graticule is suitable for direct view or for illumination with an appropriate light guide.

The graticule X and Y axes will be on the tube face axes ± 2°.

The centre of the graticule will be within 1 mm of the mechanical centre of the face.

Type 98

This is the standard graticule suitable for most 14 cm diagonal tube types.

Type 82

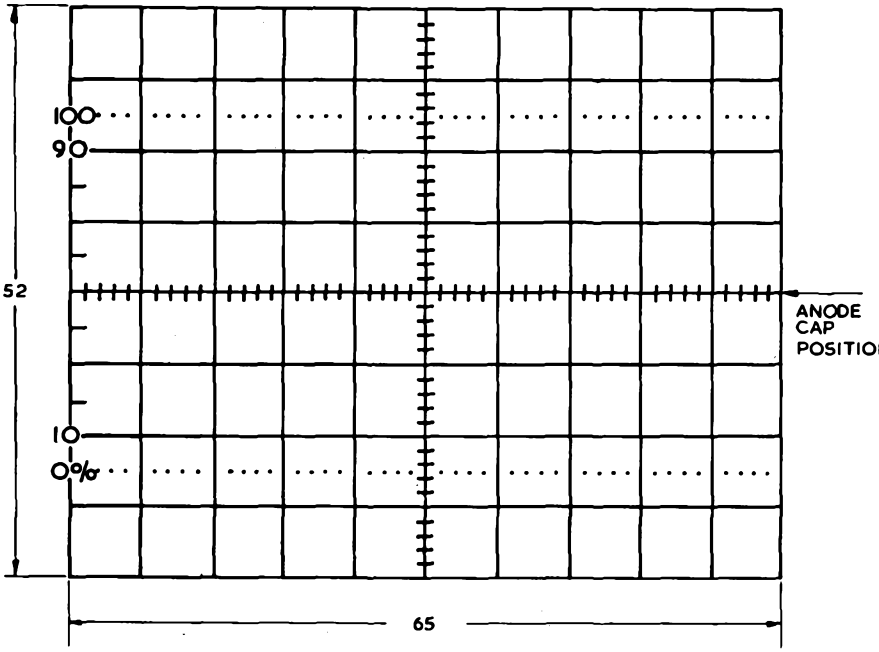
This graticule is specially designed for use on certain mesh p.d.a. tubes, for example, D14-280GH/82 and D14-310GH/82.

BRIMAR

Graticule

Type 90

DETAILS OF GRATICULE



All dimensions in mm

Not to be scaled

This dual purpose internal graticule is suitable for direct view or for illumination with an appropriate light guide.

Graticule type 90 normally used on tubes with 10 cm diagonal.

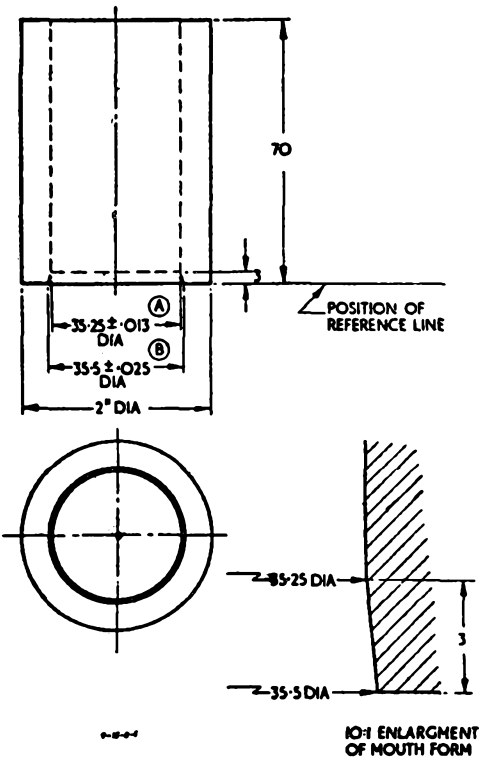
The graticule X and Y axes will be on the tube face axes ± 2°.

The centre of the graticule will be within 1 mm of the mechanical centre of the face.

Gauge No. 6

Reference Line Gauge

For C.R. Tubes having a Nominal Neck Diameter of 34·5 mm



All dimensions in mm unless otherwise stated.

NOTE 1—Deflector Yoke Design

The internal dimensions of the yoke must never be smaller than the maximum internal dimensions of the gauge.

NOTE 2—Tolerances

The tolerances shown are initial manufacturing limits. The figures given below are the maximum allowable limits for wear :

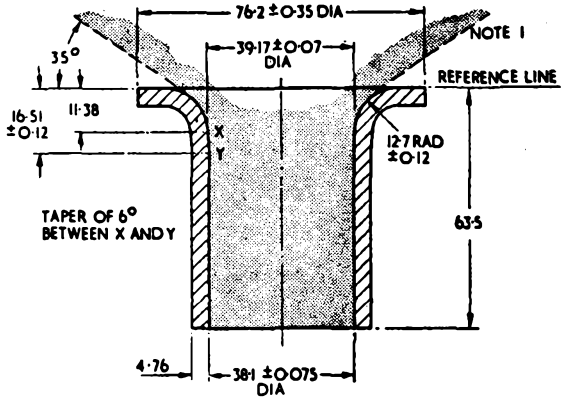
(A) + 0·059 (B) + 0·075

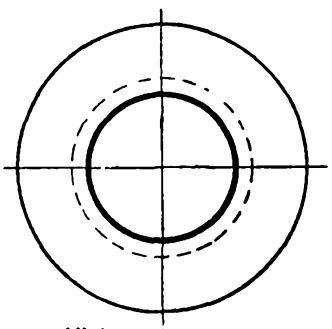
BRIMAR

Reference Line Gauge

Gauge No. 12

For C.R. Tubes having a Nominal Neck Diameter of 36·5mm.





All dimensions in mm

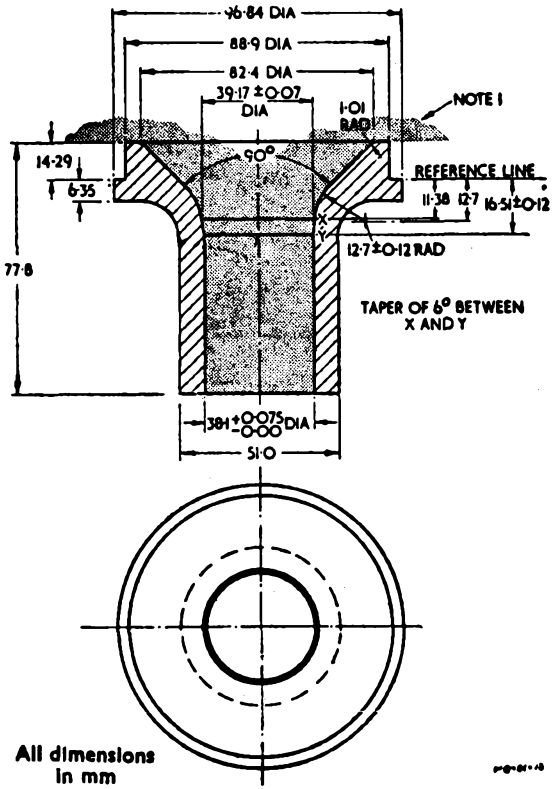
NOTE 1—Deflector Yoke Design

The inner surface of the yoke must not extend into the shaded region and the internal dimensions of the yoke must never be smaller than the maximum internal dimensions of the gauge.

Gauge No. 13

Reference Line Gauge

For C.R. Tubes having a Nominal Neck Diameter of 36·5 mm



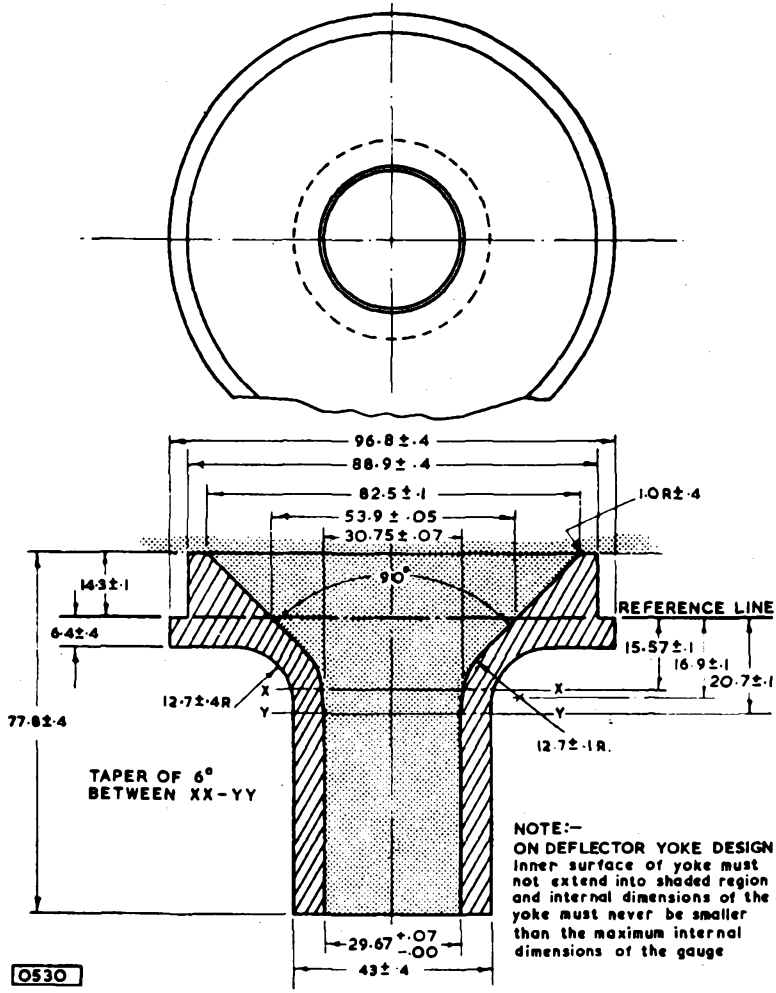
NOTE 1—Deflector Yoke Design

The inner surface of the yoke must not extend into the shaded region and the internal dimensions of the yoke must never be smaller than the maximum internal dimensions of the gauge.

Reference Line Gauge

Gauge No. 15

A NECK GAUGE FOR CATHODE RAY TUBES
HAVING A NOMINAL NECK DIAMETER OF 28·5mm
AND DEFLECTION ANGLE (PICTURE DIAGONAL) 90°



All dimensions in mm

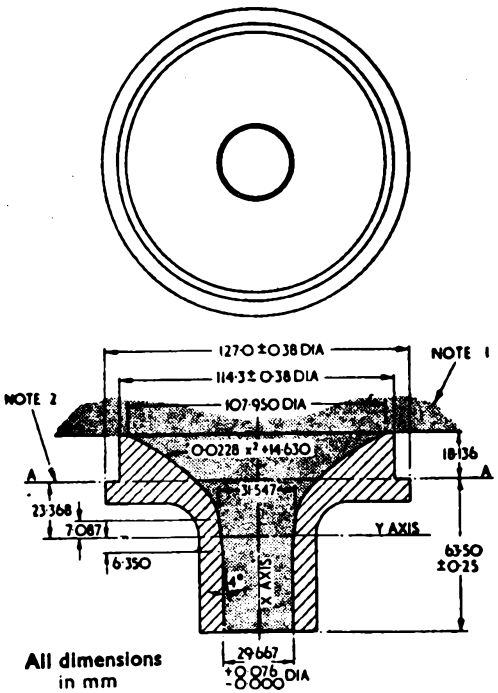
Not to be scaled

GRATICULES
GAUGES, BASES
& CAPS, SOCKETS
SCAN COILS

Gauge No. 16

Reference Line Gauge

For C.R. Tubes having a nominal Neck Diameter of 28.5 mm
Deflection Angle 110° approx. (Picture Diagonal)



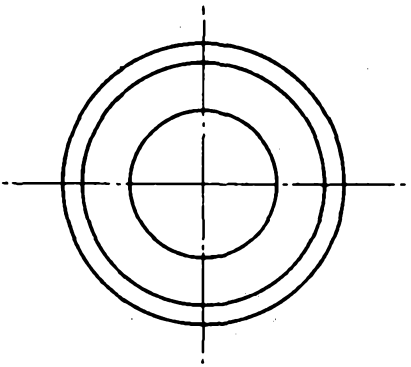
NOTE 1.—Deflector Yoke Design.
The inner surface of the yoke must not extend into the shaded region and the internal dimensions of the yoke must never be smaller than the maximum internal dimensions of the gauge.

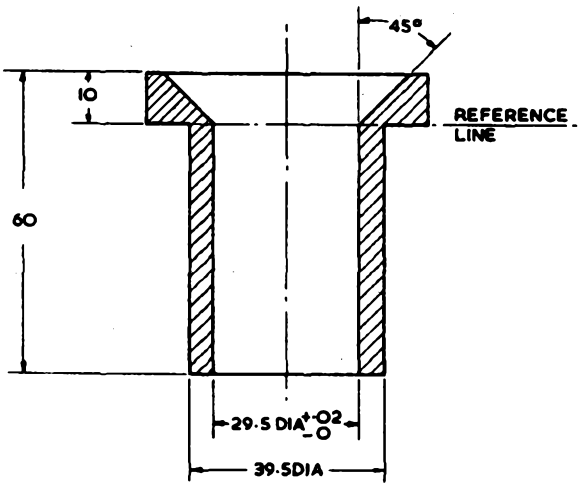
NOTE 2.—Reference Line.
The Reference Line is determined by the plane "A-A" when the gauge is seated against the funnel.

Reference Line Gauge

Gauge No. 18

NECK DIAMETER 28·5 NOMINAL





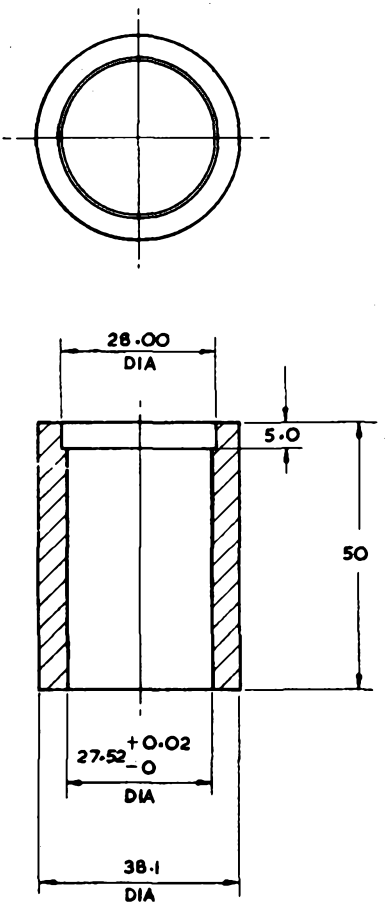
All dimensions in mm

Not to be scaled

BRIMAR

Gauge No. 19

Reference Line Gauge



All dimensions in mm

Not to be scaled

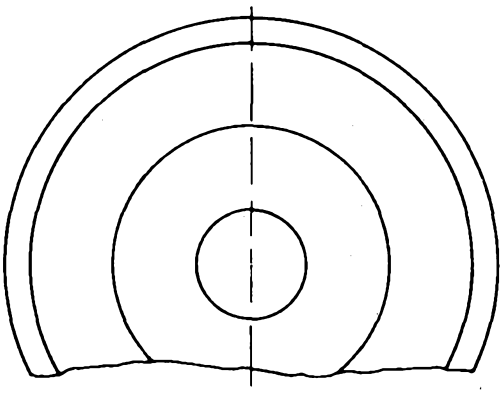
Thorn Radio Valves and Tubes Limited

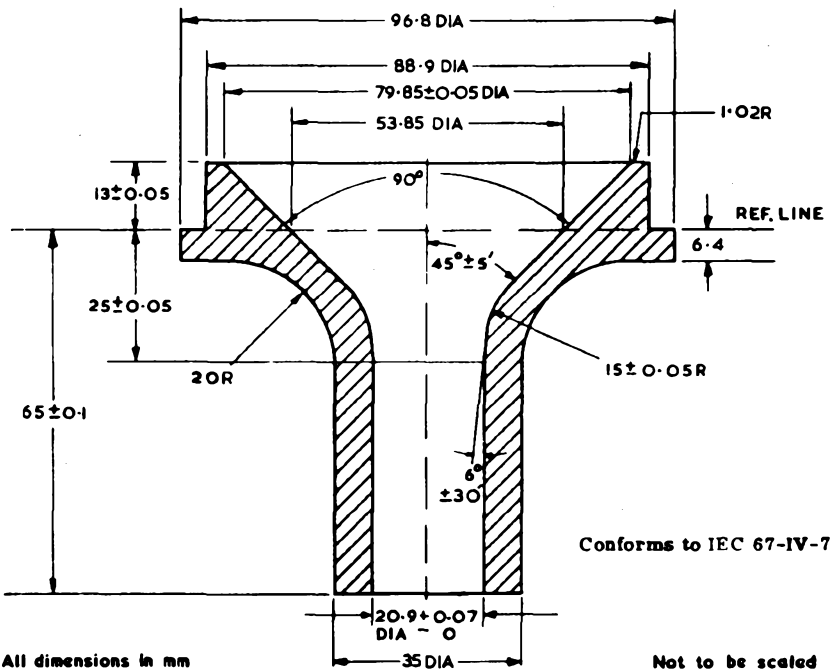
BRIMAR

Reference Line Gauge

Gauge No 20

NECK DIAMETER 20 NOMINAL DEFLECTION ANGLE 90°





Conforms to IEC 67-IV-7

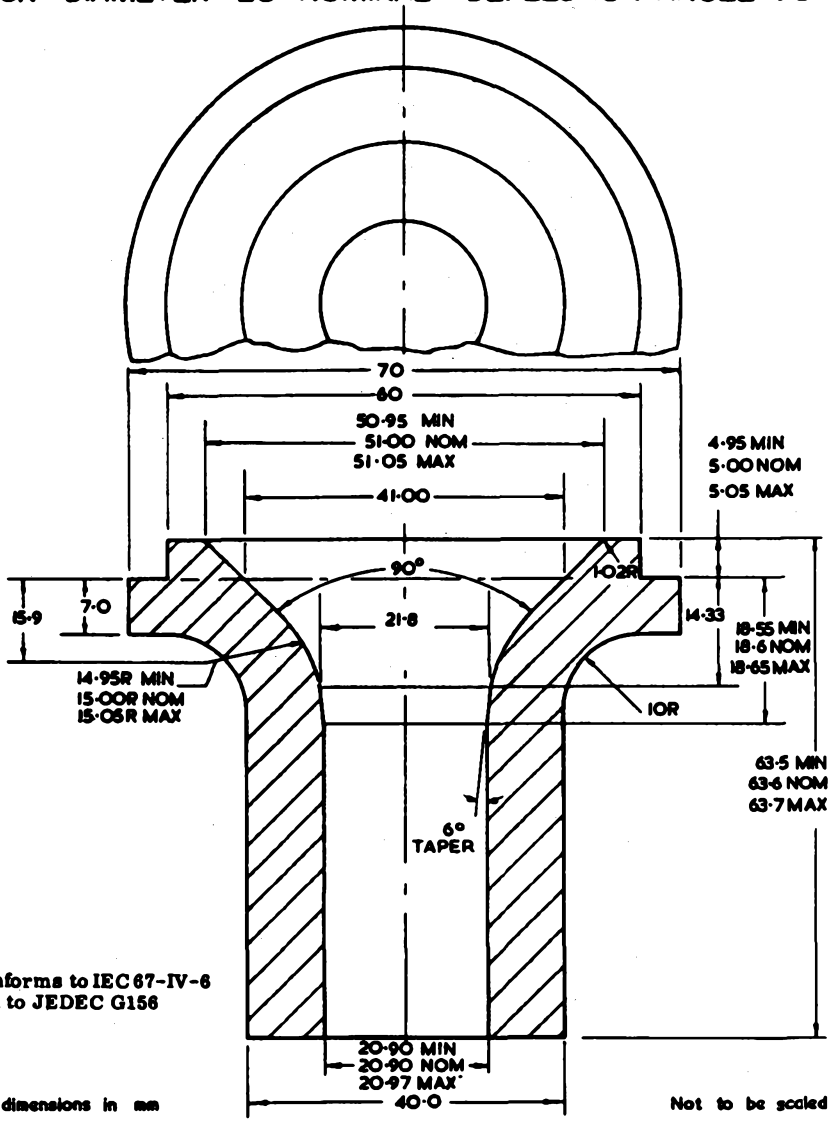
All dimensions in mm

Not to be scaled

Gauge No 21

Reference Line Gauge

NECK DIAMETER 20 NOMINAL DEFLECTION ANGLE 90°



Conforms to IEC 67-IV-6 and to JEDEC G156

All dimensions in mm

Not to be scaled

Thorn Radio Valves and Tubes Limited

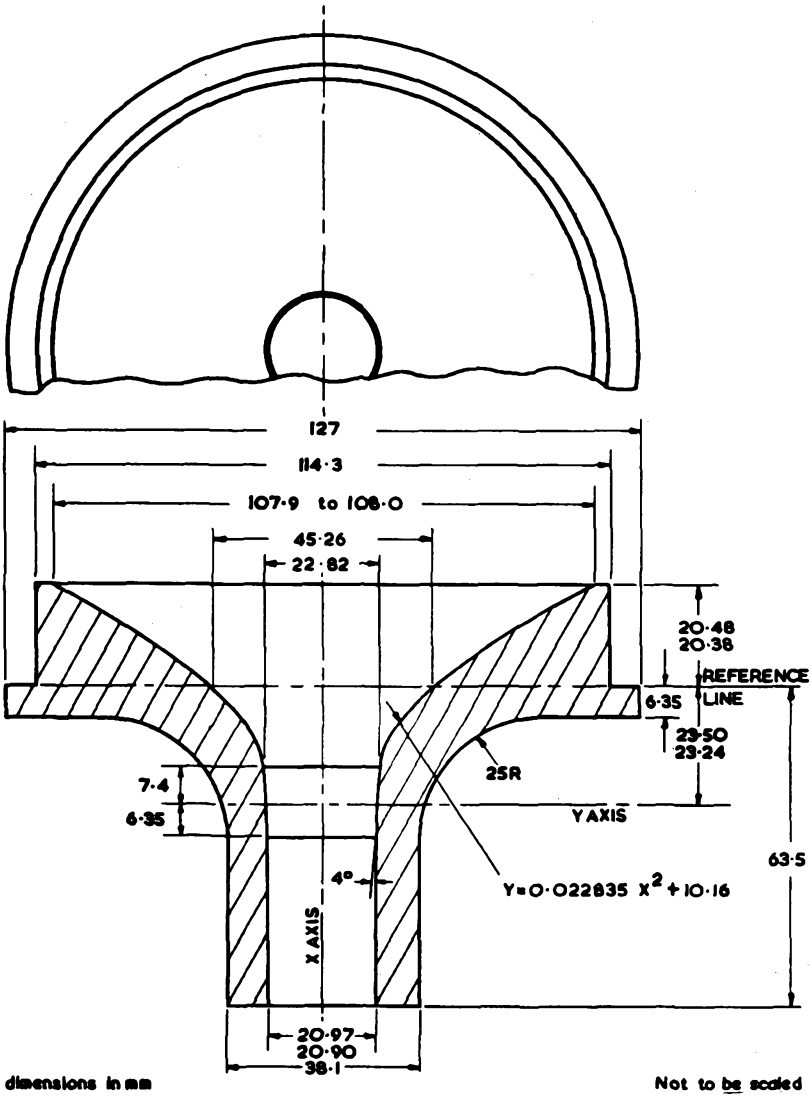
BRIMAR

Reference Line Gauge

Gauge No. 22

NECK DIAMETER 20 NOMINAL

DEFLECTION ANGLE 110°



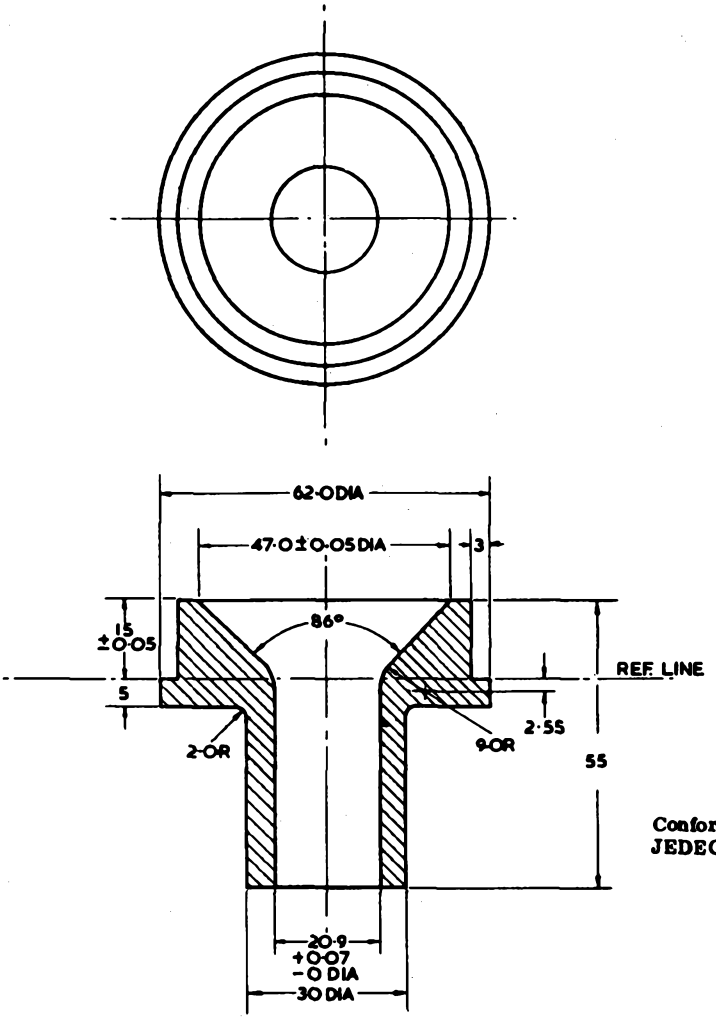
All dimensions in mm

Not to be scaled

Gauge No 23

Reference Line Gauge

NECK DIAMETER 20 NOMINAL DEFLECTION ANGLE 70°



Conforms to JEDEC G-154

All dimensions in mm

Not to be scaled

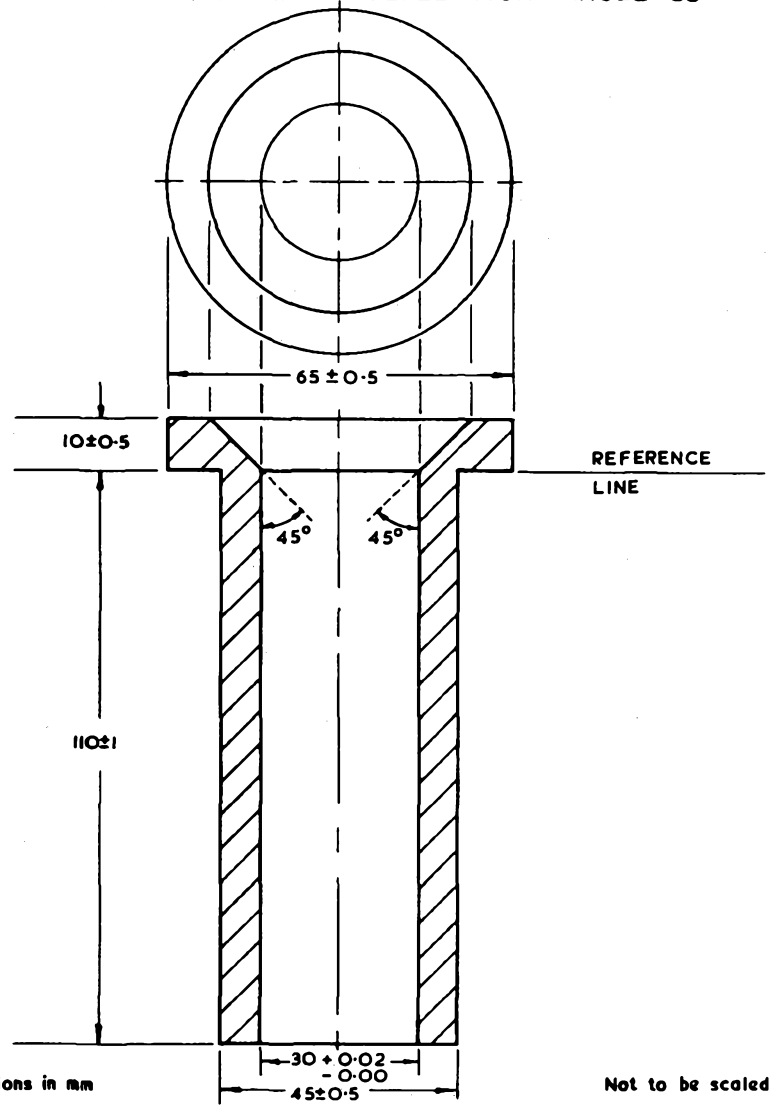
Thorn Radio Valves and Tubes Limited

BRIMAR

Reference Line Gauge

Gauge No. 31

NECK DIAMETER 28 NOMINAL DEFLECTION ANGLE 53°



All dimensions in mm

Not to be scaled

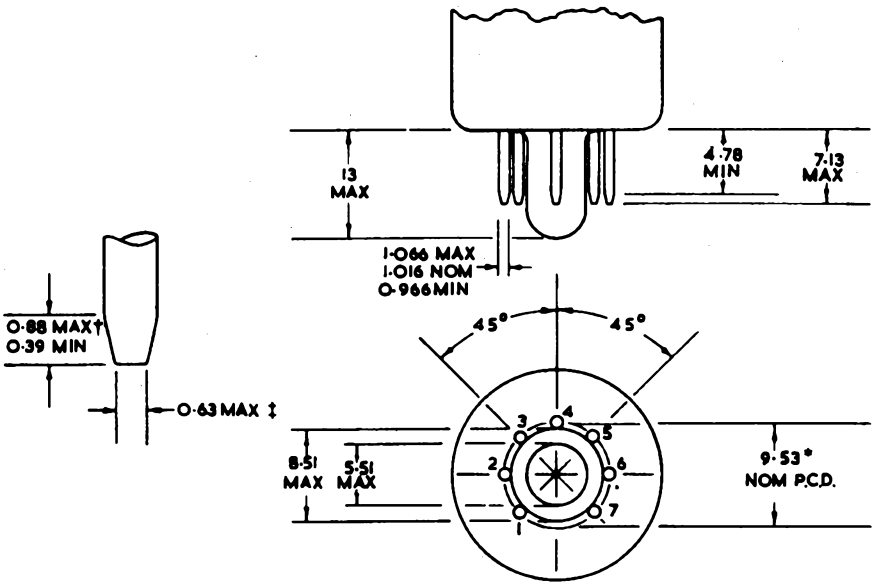
GRATICULES GAUGES, BASES & CAPS, SOCKETS SCAN COILS

Thorn Radio Valves and Tubes Limited

BRIMAR

B7G/D

Base



All dimensions in mm Third angle projection Not to be scaled

The drawing shows the numbering of the pins as seen from their free ends.

* The dimensions fixing the position of the pins refer to the fixed ends of the pins. The disposition may be checked by the appropriate gauge.

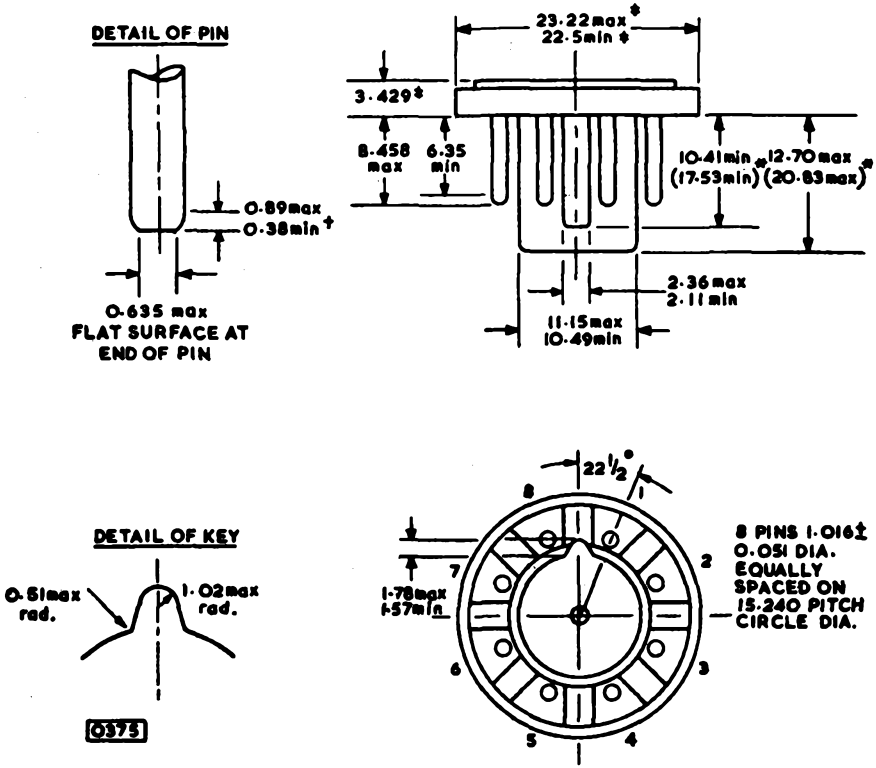
† This dimension may vary within the limits shown around the periphery of any individual pin. The surface of the pin is convex or conical in shape and is not brought to a sharp point.

‡ This surface is flat.

Conforms to JEDEC E7-91.

Base

B8H



All dimensions in mm. Not to be scaled.

The millimetre dimensions are derived from the original inch dimensions.

The drawing shows the numbering of the pins as seen from their free ends.

* Dimensions for variant B8H base.

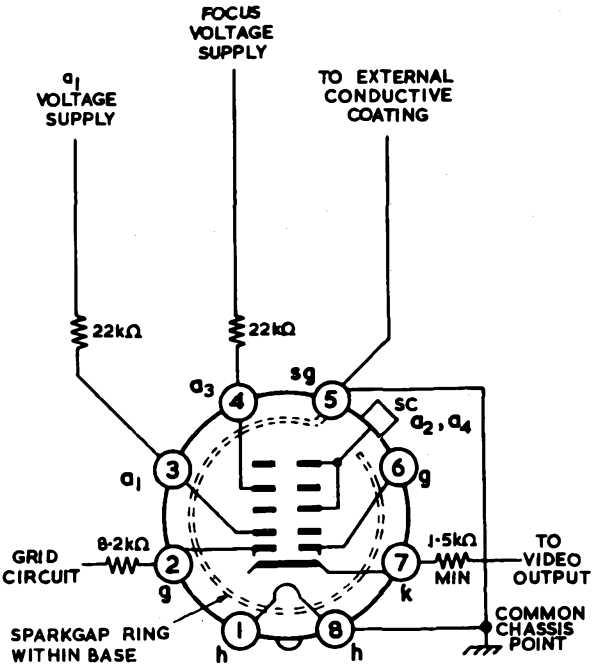
† This dimension may vary within the limits shown around the periphery of any individual pin. This surface of the pin shall be convex or conical in shape and shall not be brought to a sharp point.

‡ These dimensions illustrate current practice and are not regarded as compatibility features.

Note:

Base pin positions are held to tolerances such that the base will fit a flat-plate gauge having a thickness of 9·525 mm and eight equally spaced holes of 1·397 ± 0·013 mm diameter located on a 15·240 ± 0·013 mm diameter circle. The gauge is also provided with a centre hole to provide 0·254 mm diametric clearance for the spigot and key. Pin fit in the gauge shall be such that the entire length of pins will, without undue force, enter into and disengage from the gauge.

B8H SPARKGUARD R C.R.T. BASE CONNECTIONS



ELECTRICAL CONNECTIONS
VIEW FROM FREE END OF BASE PINS

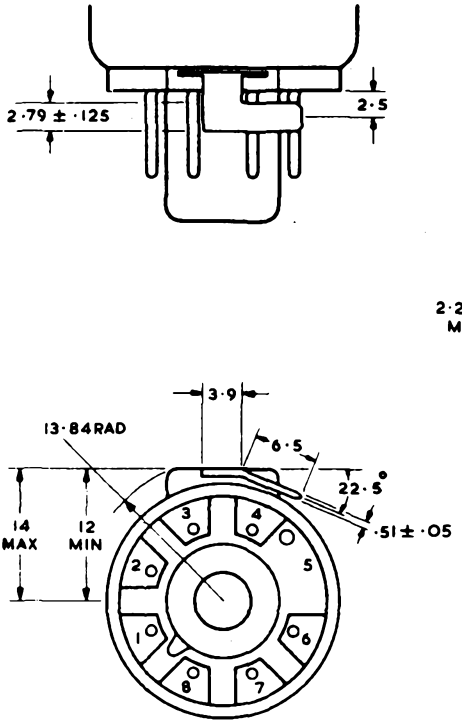
A metal ring within the B8H base, which is taken out to pin 5 (sg), forms a spark gap to all other tube electrodes thus providing flashover protection for all external electrode circuits and components.

All leads must be as short and direct as possible. The external conductive coating should be connected to pin 5 only, with no other connection to chassis.

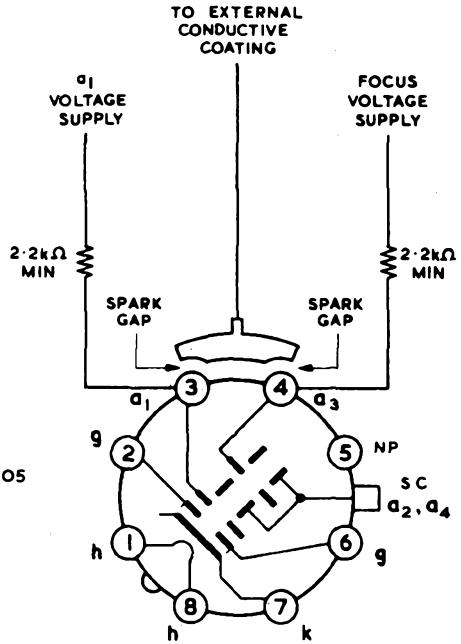
The resistors, preferably carbon composition type, in series with the supply leads should be such as to have a minimum surface leakage path between leads of 10 mm.

Tube types with the above sparkguard base have a suffix R after the type number and should only be used if the circuit modifications as above are incorporated.

B8H SPARKGUARD S C.R.T. BASE



VIEW FROM FREE END



ELECTRICAL CONNECTIONS

A metal plate within the B8H base, which is taken out to a flat, side, earthing tag, forms a spark gap to the first anode and focus electrode. The plastic of Sparkguard S is coloured black.

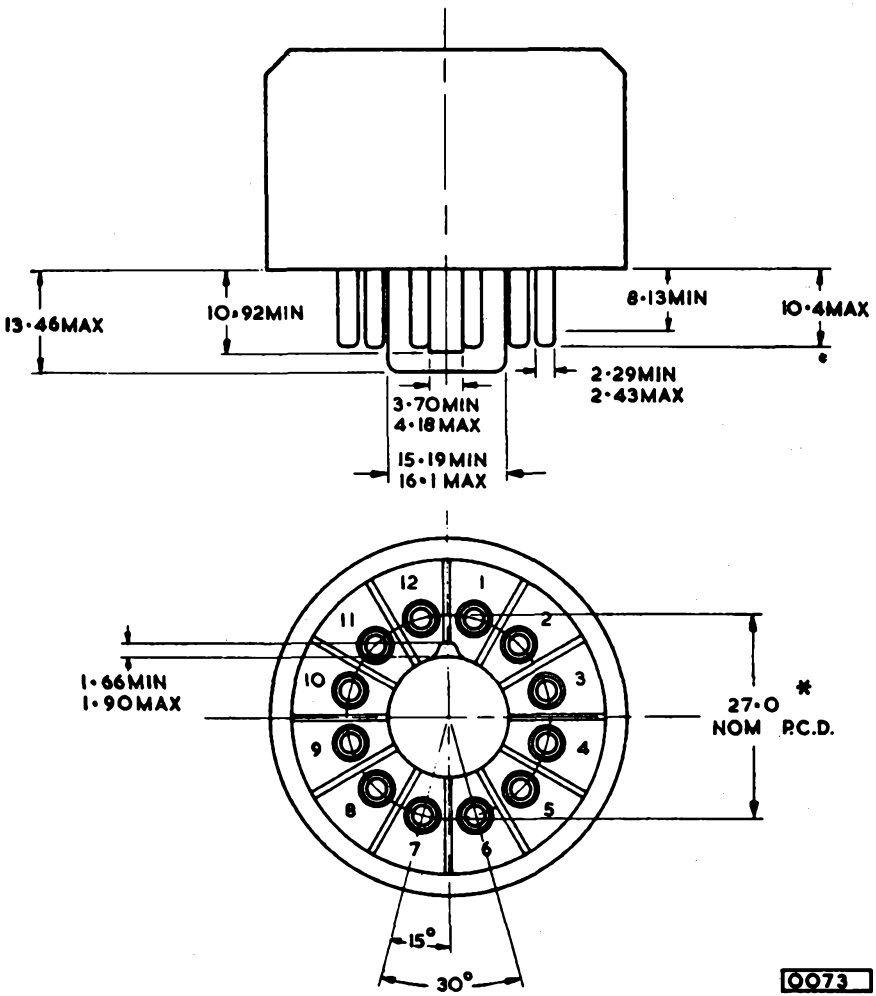
Tube types fitted with this base have a suffix S after the type number. Sparkguard S tubes can be used in any set without circuit modification, but in sets designed for Sparkguard R protection the side tag must be bonded to pin 5 on the socket.

It is recommended that the earthing tag should be returned to the external conductive coating by the shortest possible route. The resistors of 2.2kΩ placed in series with the supply leads to the first anode and focus electrode should be such as to have a minimum surface leakage path between leads of 10 mm (e.g. at least 1/2 W size).

Connection to the earthing tag should be made by means of a push-on connector so that the connection may be removed whilst the deflector coil and other neck components are being fitted to the tube. An example of a suitable connector is the AMP "110 Series Faston Receptacle "(AMP of Great Britain Ltd., Terminal House, Stanmore, Middlesex).

B12A

Base



All dimensions in mm.

Not to be scaled.

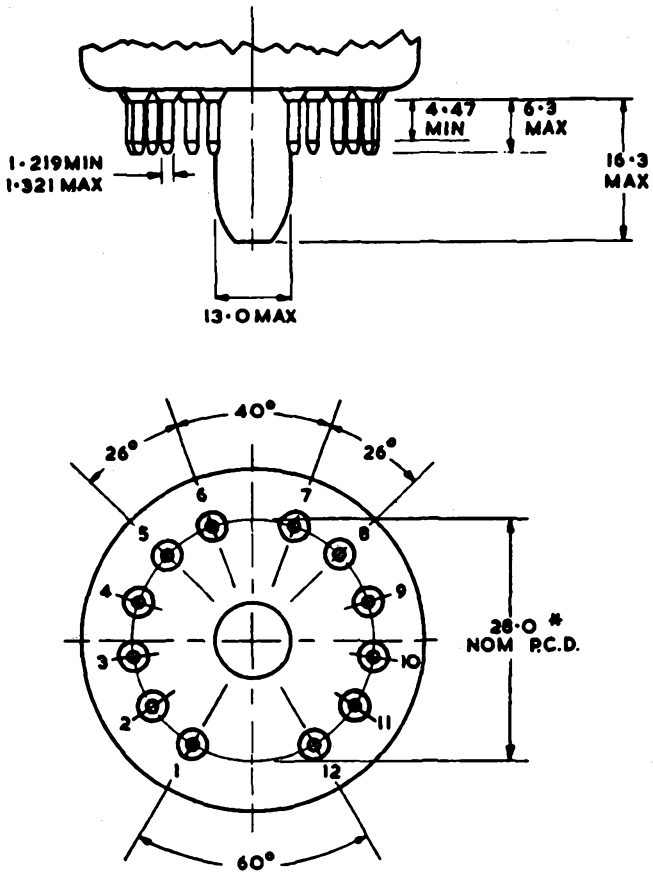
Notes

*The dimensions fixing the positions of the pins refer to the fixed ends of the pins. The pin disposition may be checked only by means of the appropriate gauge.

The drawing shows the numbering of the pins as seen from their free ends.

Base

B12F



All dimensions in mm.

Not to be scaled.

Notes

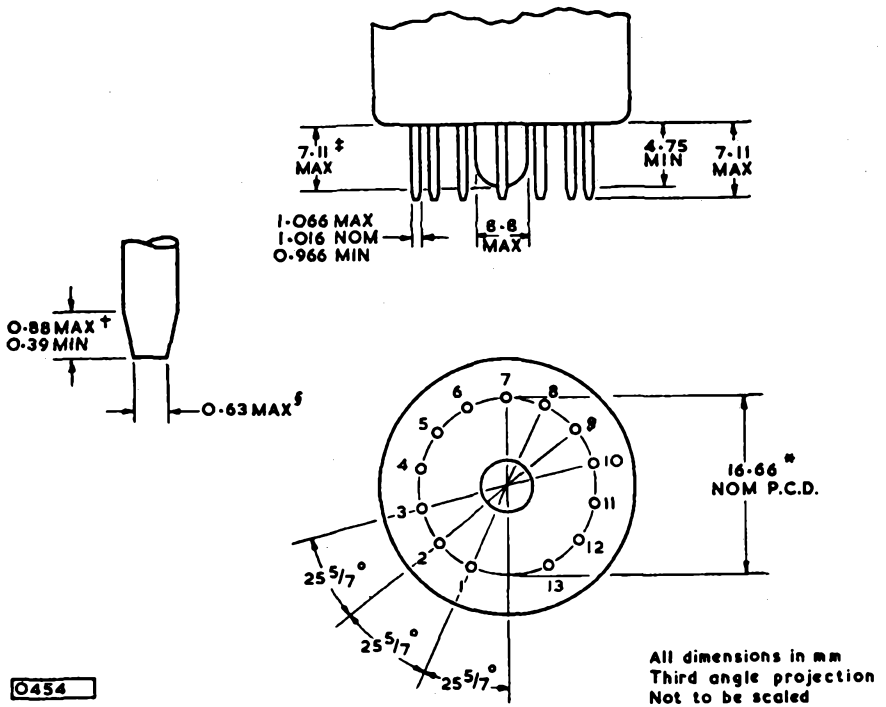
*The dimensions fixing the positions of the pins refer to the fixed ends of the pins. The pin disposition may be checked only by means of the appropriate gauge.

†This surface of the pin shall be convex or conical in shape and shall not be brought to a sharp point.

The drawing shows the numbering of the pins as seen from their free ends.

B13B BASE

(CONFORMS TO IEC 67-I-37a)



All dimensions in mm
Third angle projection
Not to be scaled

The drawing shows the numbering of the pins as seen from their free ends.

* The dimensions fixing the position of the pins refer to the fixed ends of the pins. The pin disposition may be checked by the appropriate gauge.

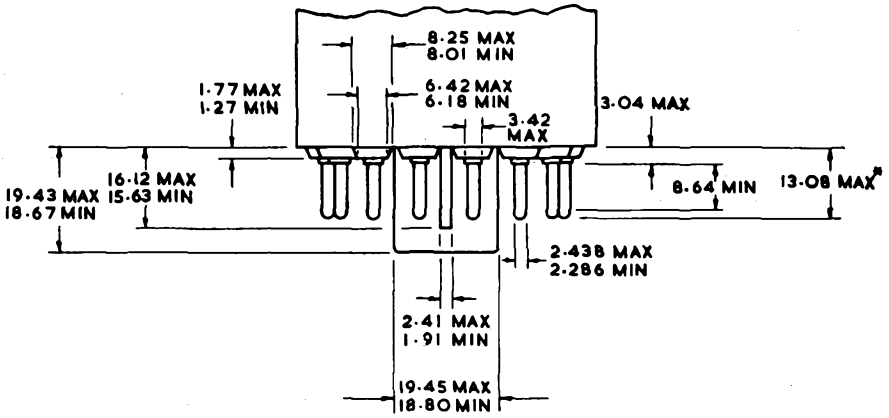
† This surface of the pin is convex or conical in shape and is not brought to a sharp point.

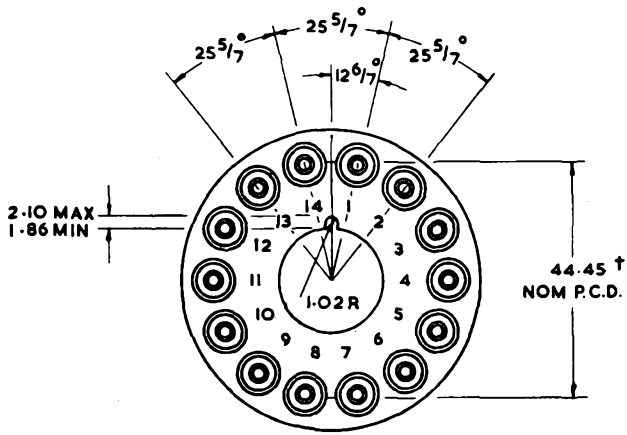
§ This surface is flat.

‡ The tubulation should not project beyond the length of the pins. In some tube types, however, the tubulation does project beyond the length of the pins. Where this happens the maximum length of the tubulation is given on the tube outline drawing.

Base B14A

Conforms to B.S. B14A, I.E.C. 67-1-16a, JEDEC B14-38 and B14-45





All dimensions in mm | Third angle projection | Not to be scaled

The drawing shows the numbering of the pins as seen from their free ends.

* This dimension may be increased by 0.76 mm max. for solder.

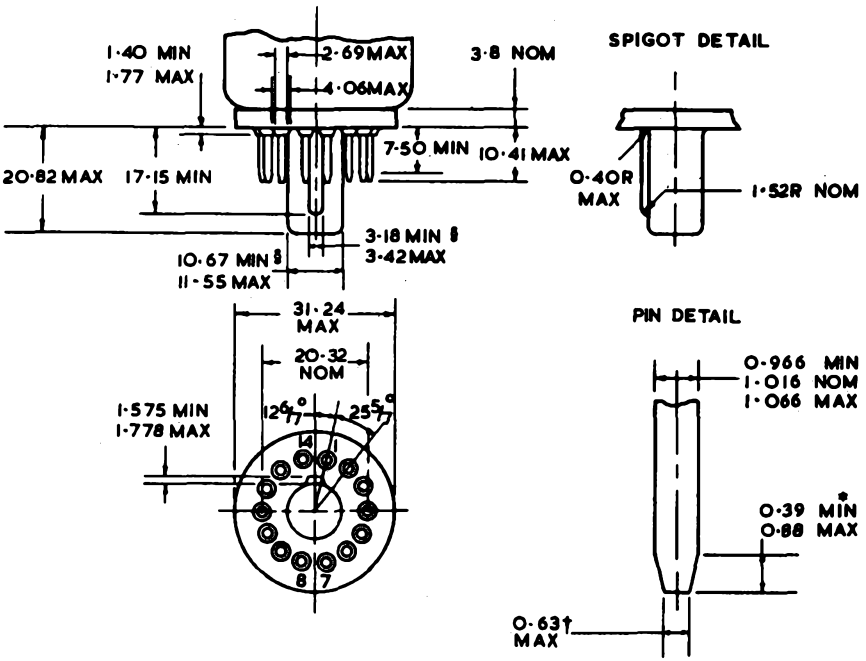
† The dimensions fixing the positions of the pins refer to the fixed ends of the pins. The pin disposition may be checked by the appropriate gauge.

Any projections on the under surface of the base other than those shown, such as a rim or external barriers, shall have a height not exceeding 2.79 mm.

B14G

Base

Conforms to I.E.C. 67-I-47a, JEDEC B14-243



All dimensions in mm Third angle projection Not to be scaled

The drawing shows the numbering of the pins as seen from their free ends. The pin disposition may be checked by the appropriate gauge.

There is a second type with a shorter spigot having the following dimensions.

Type 2: Spigot length = 14.8 mm MAX
Key length = 11.8 mm MIN

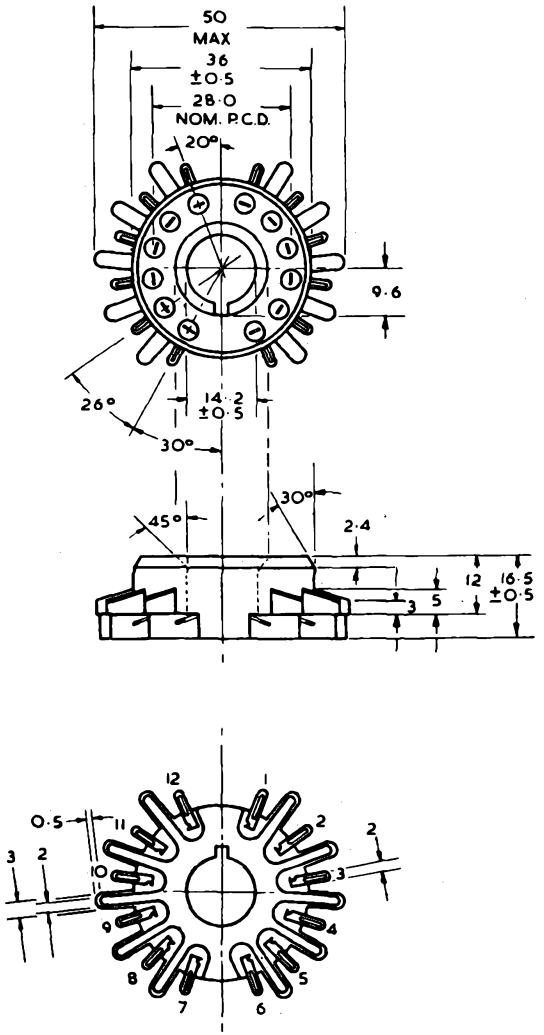
* This dimension may vary within the limits shown around the periphery of any individual pin. This surface of the pin shall be convex or conical in shape and shall not be brought to a sharp point.

† This surface shall be flat.

§ The dimensions given include any necessary taper.

Socket

B12F



All dimensions in mm

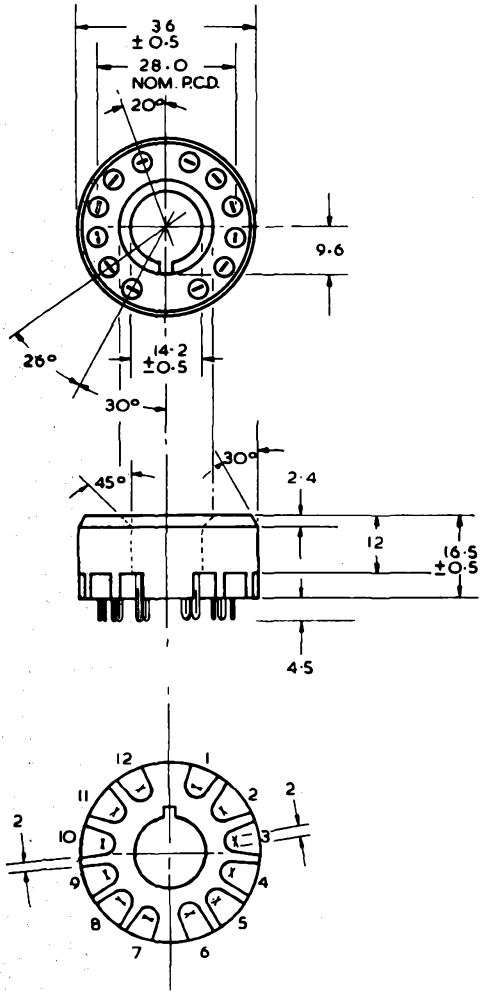
Not to be scaled

GRATICULES
GAUGES BASES
& CAPS SOCKETS
SCAN COILS

BRIMAR

B12FPC

Socket



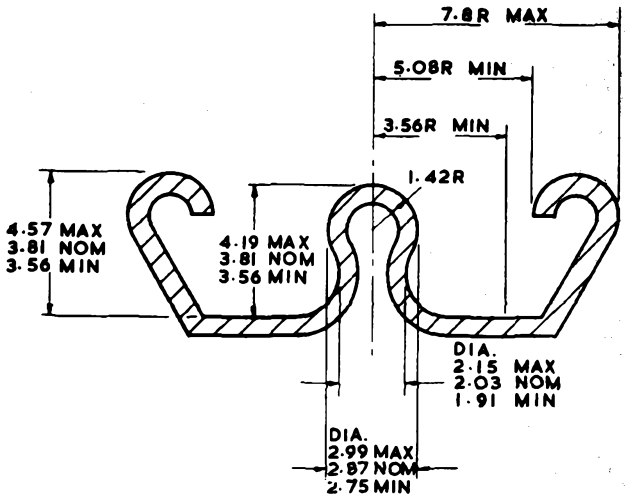
All dimensions in mm

Not to be scaled

Thorn Radio Valves and Tubes Limited

Cap

CT7



All dimensions in mm

Not to be scaled

Notes

1. This drawing is for illustration only. The shape may be varied provided the specified dimensions are adhered to.
2. When attaching or detaching the connector, the total force required should not exceed 36N (8lbf) applied perpendicular to the plane of the cap rim.
3. Conforms to IEC 67-III-3 and JEDEC J1-22.

CT7 SEAL TOLERANCES

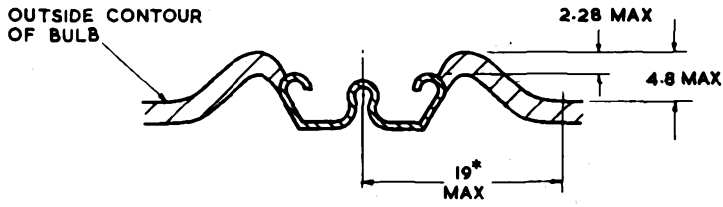


FIGURE 1

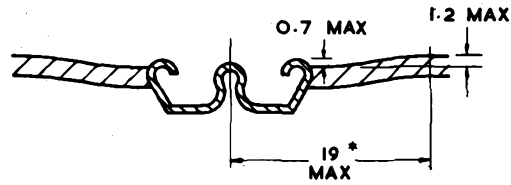


FIGURE 2

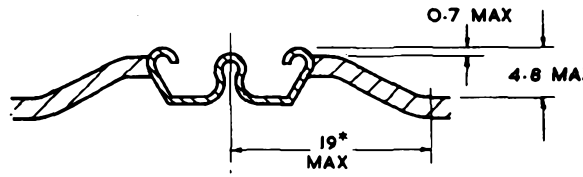


FIGURE 3

All dimensions in mm **Not to be scaled**

Notes

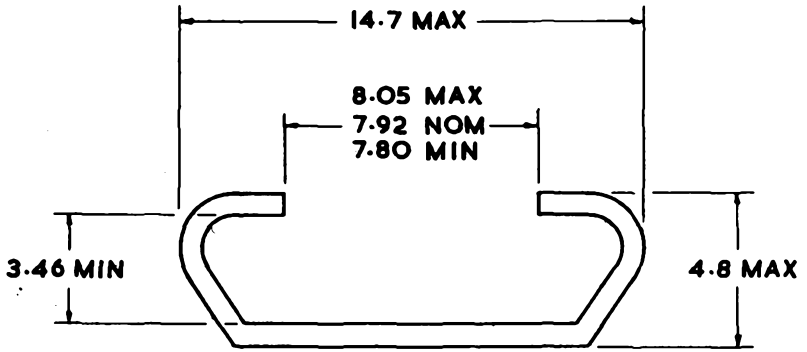
* Protrusion of glass around cap above bulb contour is limited to area bounded by circle concentric with cap axis and having radius of 19 mm maximum.

The shape of the cap is for illustration purposes only.

Angle between plane of the rim of cap and plane tangent to original contour of bulb at centre of cap will not be more than 10°.

Cap

CT8



All dimensions in mm

Not to be scaled

Notes

1. This drawing is for illustration only. The shape may be varied provided the specified dimensions are adhered to.
2. When attaching or detaching the connector, the total force required should not exceed 35 N (8 lbf) applied perpendicular to the plane of the cap rim.
3. Conforms to IEC 67-III-2 and JEDEC J1-21.

CT8 SEAL TOLERANCES

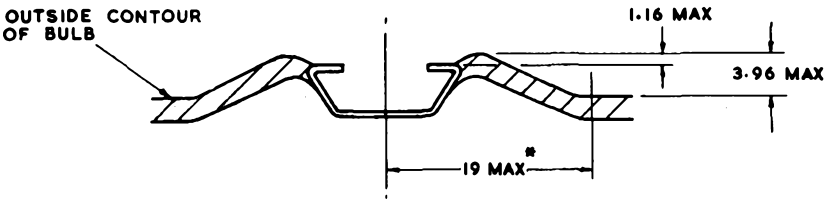


FIGURE 1

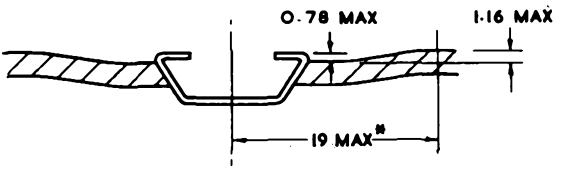


FIGURE 2

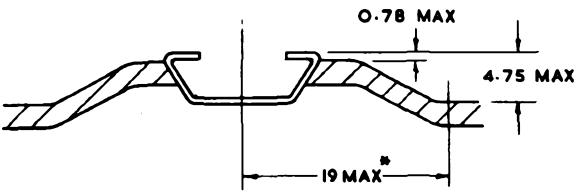


FIGURE 3

All dimensions in mm Not to be scaled

Notes

* Protrusion of glass around cap above bulb contour is limited to area bounded by circle concentric with cap axis and having radius of 19 mm max.

The shape of the cavity cap is for illustration purposes only.

Angle between plane of the rim of cap and plane tangent to original contour of bulb at centre of cap will not be more than 10°.

Scan Coils

TBY 1

PRELIMINARY DATA

GENERAL

Scan coils designed for 70°, 90° and 110° tubes with 28 mm diameter necks.

A short ferrite ring is used with saddle and toroidal wound coils. Shift rings and a clamp assembly are provided.

TBY1 has two picture shape correction rod magnets mounted on the x axis for adjustment by the user. This type is not suitable for tubes with diagonals smaller than 24 cm.

RATINGS

Maximum voltage between line and field coils (50 Hz)	2.0	kV
Maximum operating temperature	100	°C

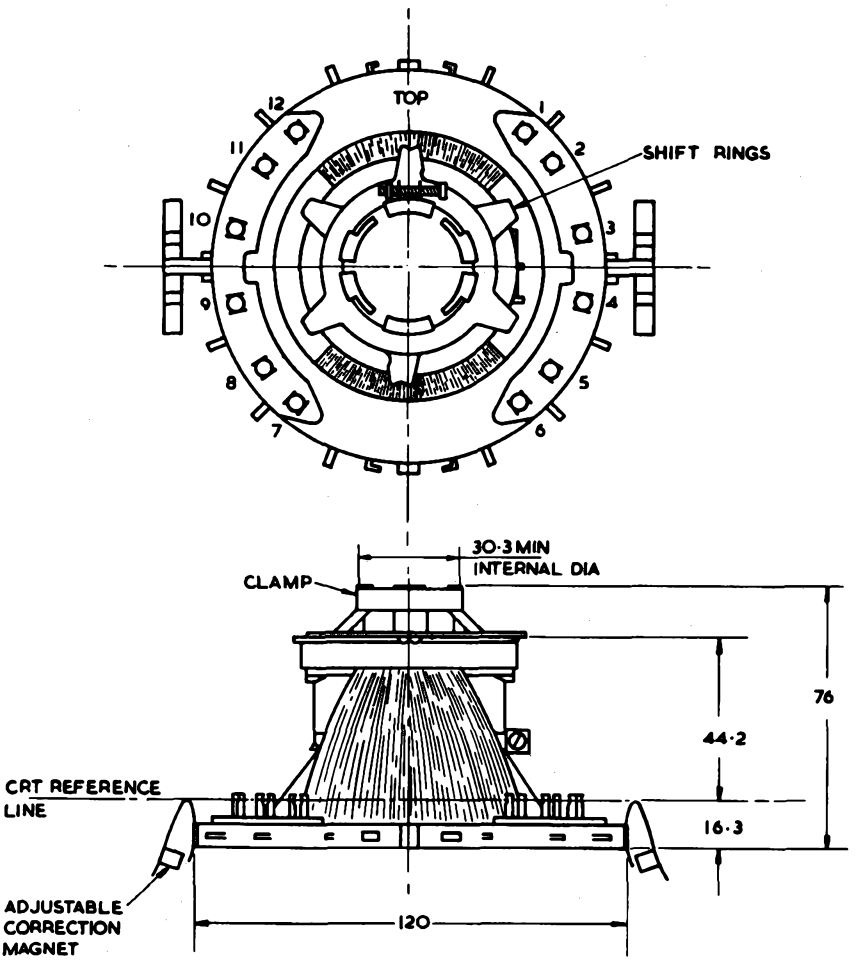
ELECTRICAL DATA*		X Axis	Y Axis	
Type of winding		Saddle	Toroidal	
Inductance at 1 kHz (Tolerance ± 5%)		2.9	7.6	mH
Resistance at 20°C (Tolerance ± 6%)		4.1	3.2	Ω
Deflection current, peak to peak, (Tolerance ± 5%)		1.4	0.92	A
for the following deflection		272	205	mm
Rectangularity between x and y traces †		90° ± 1.0°		
Maximum adjustment of shift ring (dia.)		60		mm
Raster distortion §				
Test raster parallel to sides of rectangle to within		3.0		mm
Maximum pincushion distortion	LHS	1.6		mm
	RHS	3.0		mm
Maximum barrel distortion	LHS	3.0		mm
	RHS	1.6		mm
Maximum pincushion or barrel distortion top or bottom		3.0		mm

* Applies, where applicable, to an M38-101.. tube operating at 15 kV

† To meet this limit, a coupling coil has occasionally to be fitted to the assembly. This is wired in series with the line coils and adjusted at the factory to limit the coupling factor to less than 0.001.

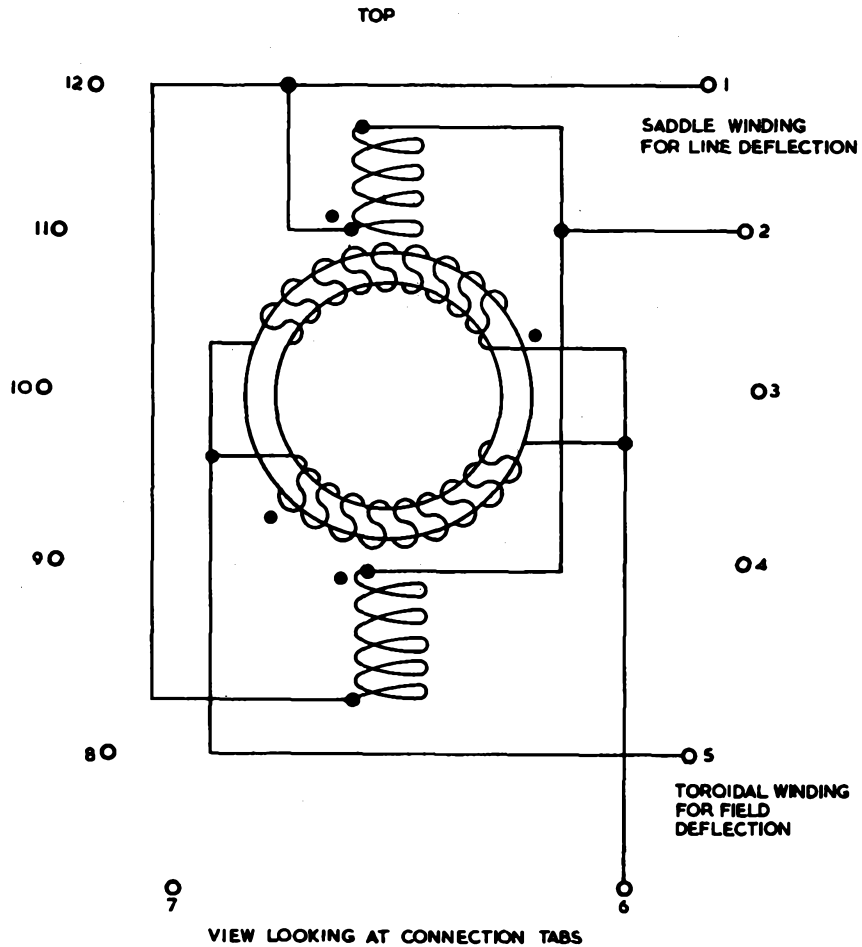
§ Comparison of a test raster and rectangle of height 90% of the tube minimum screen height and aspect ratio 4:3.

BRIMAR



All dimensions in mm

Not to be scaled


TOP
120
1
SADDLE WINDING
FOR LINE DEFLECTION
110
2
100
3
90
4
80
5
TOROIDAL WINDING
FOR FIELD
DEFLECTION
7
6
VIEW LOOKING AT CONNECTION TABS

TBY2 Scan Coils

PRELIMINARY DATA

GENERAL

Scan coils designed for 70° flat faced tubes with 28 mm diameter necks. These coils are particularly suitable for smaller tubes giving adequate clearance of the EHT connector. A short ferrite ring is used with saddle and toroidal wound coils. Shift rings and a clamp assembly are provided.

TBY2 has fixed picture shape correction rod magnets mounted within the plastic moulding.

To reduce raster distortion additional magnets may be placed on the pegs around the periphery of the plastic moulding.

RATINGS

Maximum voltage between line and field coils (50 Hz)	2.0	kV
Maximum operating temperature	100	°C

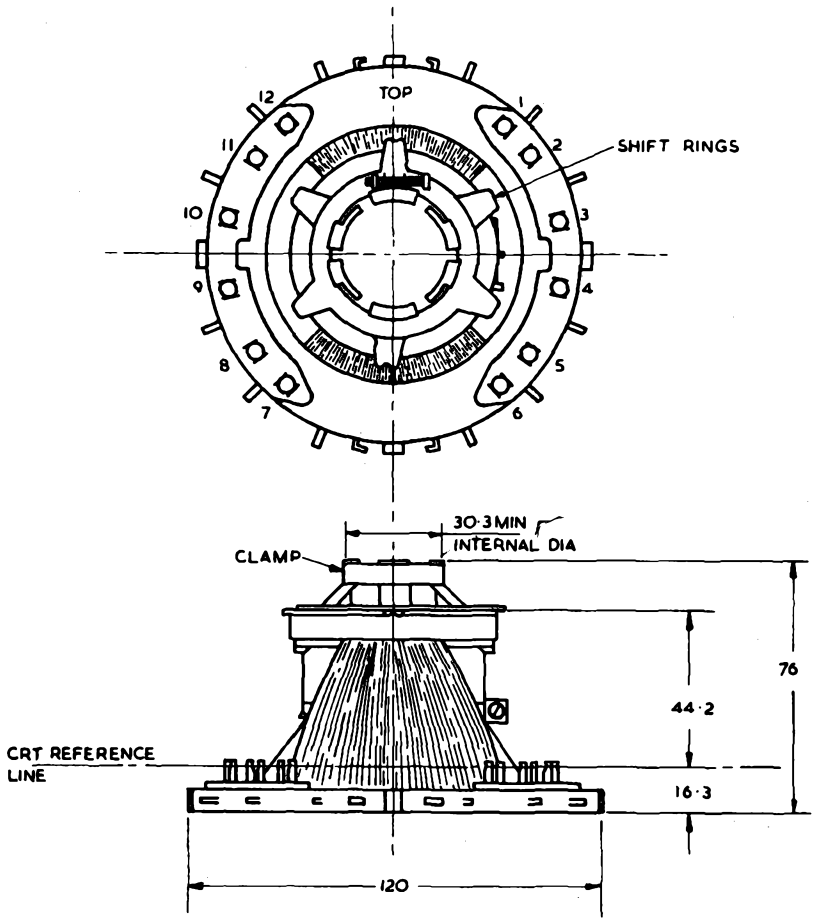
ELECTRICAL DATA*

	X Axis	Y Axis	
Type of winding	Saddle	Toroidal	
Inductance at 1 kHz (Tolerance ± 5%)	2.9	7.6	mH
Resistance at 20°C (Tolerance ± 6%)	4.1	3.2	Ω
Deflection current, peak to peak, (Tolerance ± 5%)	1.35	0.87	A
for the following deflection	127	95	mm
Rectangularity between x and y traces †	90° ± 1.0°		
Maximum adjustment by shift ring (diameter)	60		mm
Raster distortion §			
Test raster parallel to sides of rectangle to within			mm
Maximum pincushion distortion LHS			mm
RHS			mm
Maximum barrel distortion LHS			mm
RHS			mm
Maximum pincushion or barrel distortion top or bottom			mm

* Measured, where applicable, on an M17-10.. tube operating at 14kV

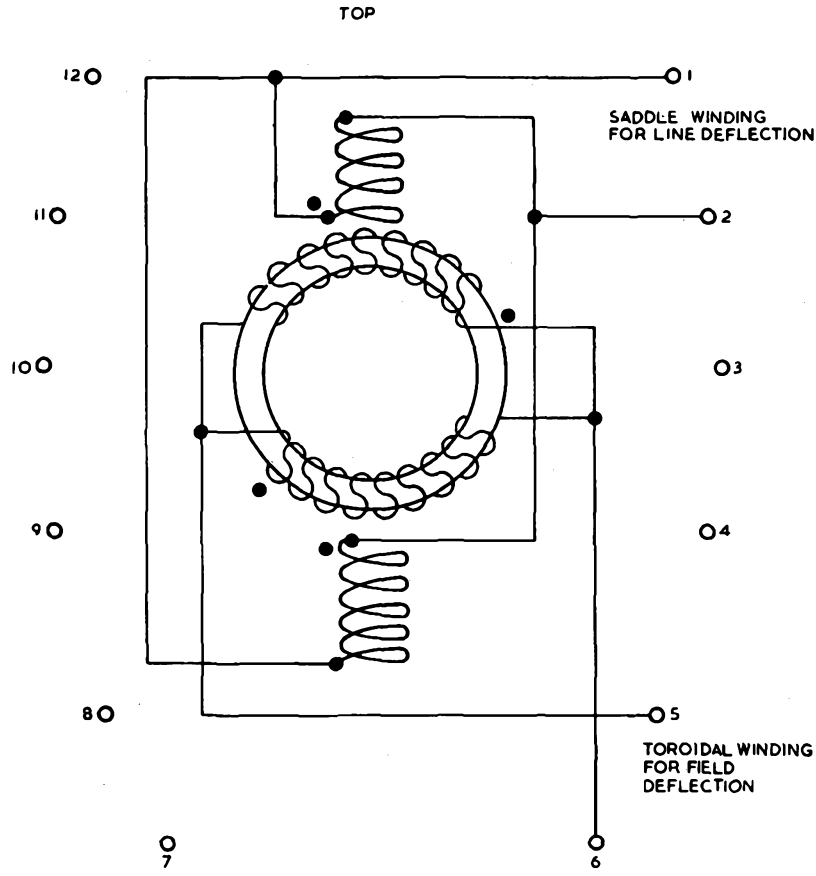
† To meet this limit, a coupling coil has occasionally to be fitted to the assembly. This is wired in series with the line coils and adjusted at the factory to limit the coupling factor to less than 0.001.

§ Comparison of a test raster and rectangle of height 90% of the tube minimum screen height and aspect ratio 4:3.



All dimensions in mm

Not to be scaled


TOP
12
1
SADDLE WINDING
FOR LINE DEFLECTION
11
2
10
3
9
4
8
5
TOROIDAL WINDING
FOR FIELD
DEFLECTION
7
6
VIEW LOOKING AT CONNECTION TABS

Deflection Component

TBY3

GENERAL - SCAN COILS

Scan coils can be used for 70°, 90° and 110° tubes with 20 mm diameter necks.

A short ferrite ring is used with saddle wound line and toroidal wound field coils. Shift rings and a neck clamp assembly are provided.

These scan coils are for use in low voltage transistor deflection circuits.

To reduce raster distortion picture shape correction magnets may be placed on the pegs around the periphery of the plastic moulding.

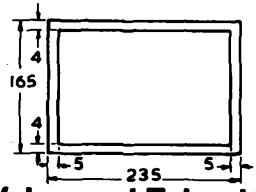
ELECTRICAL DATA	Tube Type	Anode Volts (kV)	X Axis	Y Axis	
Type of winding			Saddle	Toroidal	
Inductance at 1 kHz (Tol. X ± 5%, Y ± 8%)			0.258	30	mH
Resistance at 20°C (Tol. X ± 5%, Y ± 8%)			0.55	16.7	Ω
Deflection current, peak to peak, for full screen deflection					
	M14-100	10	3.6	0.36	A
	M19-100	10	4.0	0.42	A
	M23-110	10	4.1	0.42	A
	M28-12	12	4.5	0.45	A
	M31-120	11	5.1	0.53	A
	M31-190	12	4.5	0.44	A
	M38-160	13	5.5	0.56	A

Rectangularity between x and y traces 90° ± 1.0°

Suitable field and line scanning circuits are shown in TBK3 sheets.

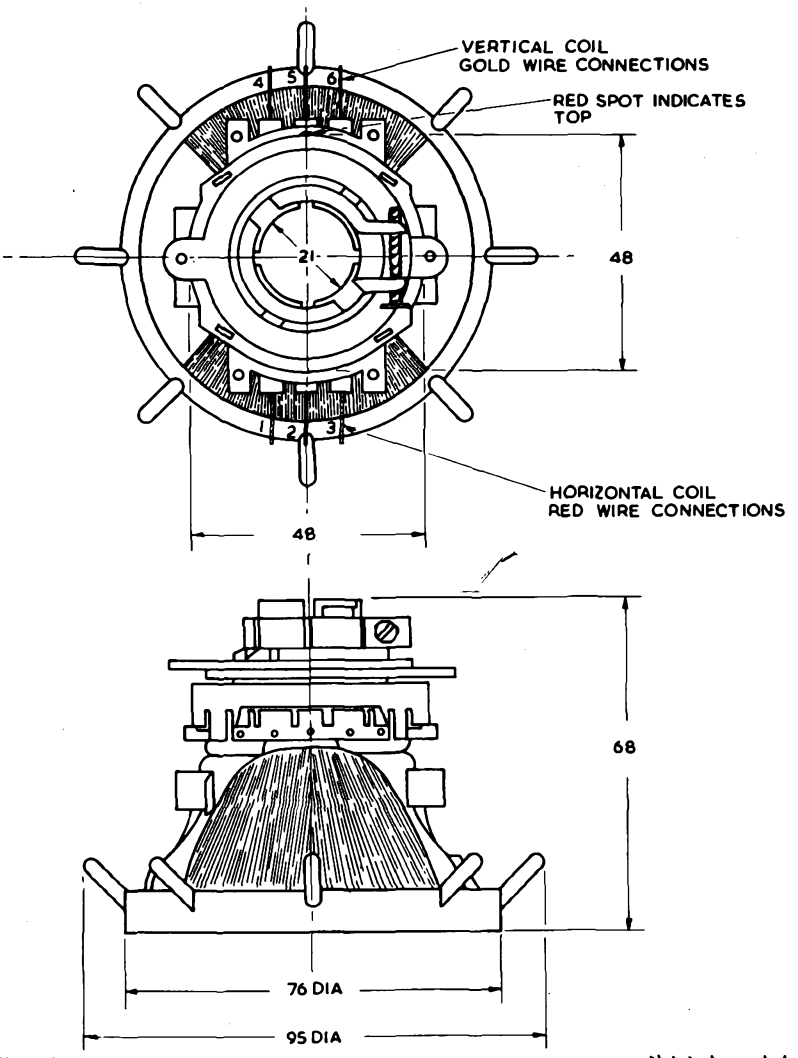
Raster distortion

The edges of a test raster for M31-120.. can be contained between two concentric rectangles.



All dimensions in mm

BRIMAR


VERTICAL COIL
GOLD WIRE CONNECTIONS
RED SPOT INDICATES
TOP
4
5
6
21
48
1
2
3
HORIZONTAL COIL
RED WIRE CONNECTIONS
48
68
76 DIA
95 DIA
All dimensions in mm
Not to be scaled
4
5
6
VERTICAL COIL
3
PIN 2
NO CONNECTION
1
HORIZONTAL COIL

Deflection Component

TBY5

GENERAL - SCAN COILS

Scan coils can be used for 70°, 90° and 110° tubes with 20 mm diameter necks.

A short ferrite ring is used with saddle wound line and toroidal wound field coils. Shift rings and a neck clamp assembly are provided.

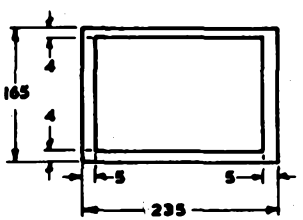
These scan coils are for use in low voltage transistor deflection circuits. The TBY5 is a version of the TBY3 with a low impedance field winding to permit operation with an integrated circuit drive amplifier.

To reduce raster distortion picture shape correction magnets may be placed on the pegs around the periphery of the plastic moulding.

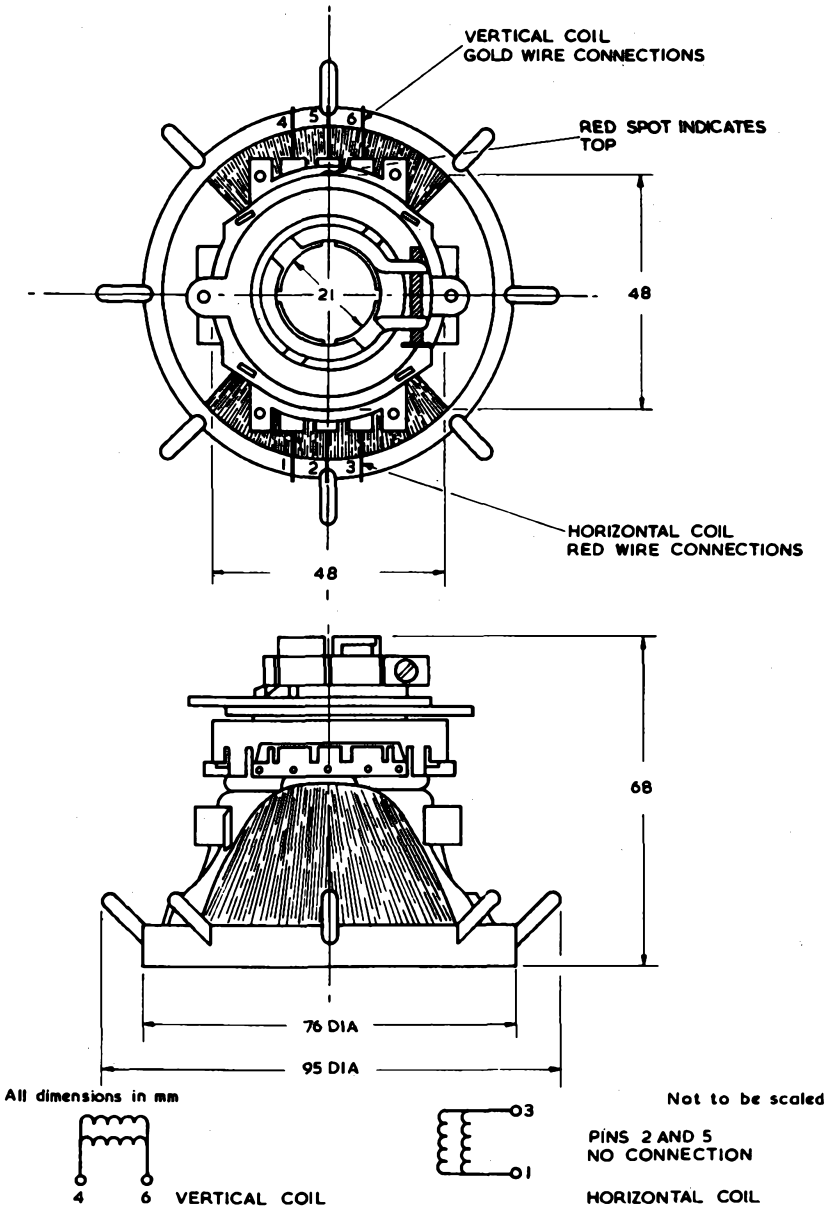
ELECTRICAL DATA	Tube Type	Anode Volts (kV)	X Axis Saddle	Y Axis Toroidal	
Type of winding					
Inductance at 1 kHz (Tol. X ± 5%, Y ± 8%)			0.258	7	mH
Typical resistance at 20°C			0.55	3.1	Ω
Deflection current, peak to peak, for full screen deflection	M14-100	10	3.6	0.79	A
	M19-100	10	4.0	0.91	A
	M23-110	10	4.1	0.91	A
	M28-12	12	4.5	0.97	A
	M31-120	11	5.1	1.16	A
	M31-190	12	4.5	0.97	A
	M38-160	13	5.5	1.22	A
Rectangularity between x and y traces			90° ± 1.0°		

Raster distortion

The edges of a test raster for M31-120.. can be contained between two concentric rectangles.



All dimensions in mm


VERTICAL COIL
GOLD WIRE CONNECTIONS
RED SPOT INDICATES
TOP
4
5
6
1
2
3
21
48
HORIZONTAL COIL
RED WIRE CONNECTIONS
48
68
76 DIA
95 DIA
All dimensions in mm
Not to be scaled
4
6
VERTICAL COIL
3
1
PINS 2 AND 5
NO CONNECTION
HORIZONTAL COIL

Deflection Component

TBY7

PRELIMINARY DATA

GENERAL -SCAN COILS

Scan coils can be used for 70°, 90° and 110° tubes with 20 mm diameter necks.

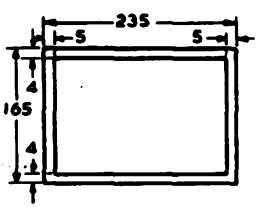
A short ferrite ring is used with saddle wound line and toroidal wound field coils. Shift rings and a neck clamp assembly are provided.

The reduce raster distortion picture shape correction magnets may be placed on the pegs around the periphery of the plastic moulding.

ELECTRICAL DATA	Tube Type	Anode Volts (kV)	X Axis Saddle	Y Axis Toroidal	
Type of winding					
Inductance at 1 kHz (Tol. X ± 5%, Y ± 8%)			4.1	32	mH
Resistance at 20°C (Tol. X ± 5%, Y ± 8%)			8.8	16.0	Ω
Deflection current, peak to peak, for full screen deflection					
	M14-100	10	0.9	0.4	A
	M19-100	10	1.0	0.4	A
	M23-110	10	1.0	0.4	A
	M28-12	12	1.1	0.5	A
	M31-120	11	1.3	0.5	A
	M31-190	12	1.1	0.4	A
	M38-160	13	1.4	0.6	A
Rectangularity between x and y traces			90° ± 1.0°		

Raster distortion

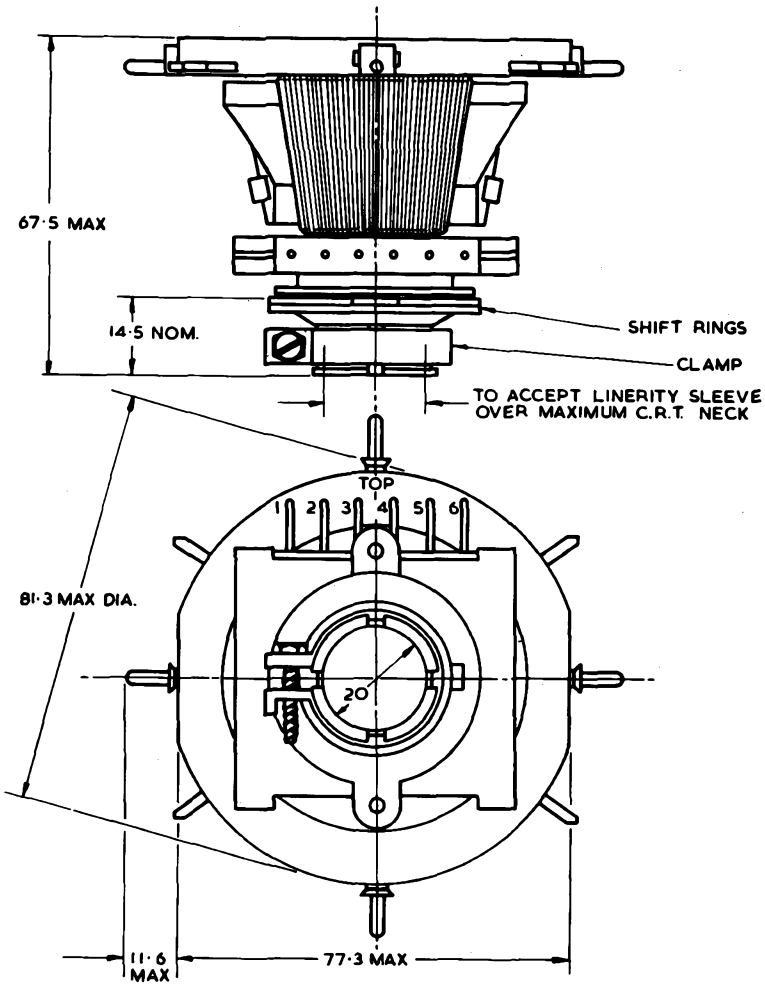
The edges of a test raster for nominal M31-120.. the corrected raster shape can be contained between two concentric rectangles.



All dimensions in mm

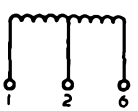
BRIMAR

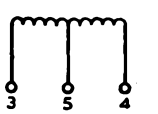
TBY7 Deflection Component



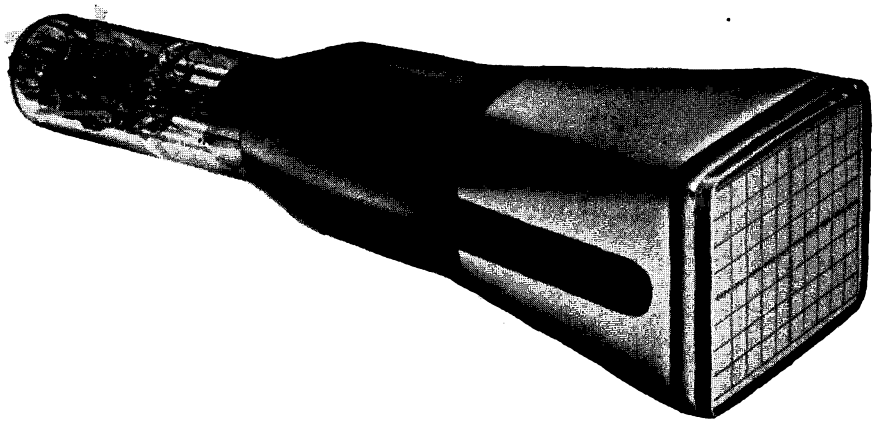
All dimensions in mm

Not to be scaled





OSCILLOSCOPE TUBES



The facilities and organisation provided by Thorn Radio Valves and Tubes Limited meet the requirements of the M.O.D. (P.E.) Defence Standard 05-21 and BS 9000.

HEALTH AND SAFETY AT WORK ACT, 1974

Attention is drawn to the recommendations under this heading in the Operational Recommendations.

WARNING

These tubes should be used in accordance with their published ratings, and in conformity with the Operational Recommendations of the company's data handbook. The company will not entertain claims for loss or damage where this advice has been disregarded.

Thorn Radio Valves and Tubes Limited
Mollison Avenue - Brimsdown - Enfield - Middlesex EN3 7NS

BRIMAR

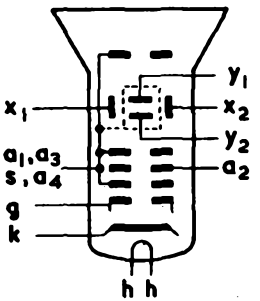
Instrument Tube

D3-130..

GENERAL

This 1 inch diameter low voltage instrument tube with electrostatic focus and deflection is for use as a general purpose indicating device.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min	
First, third and fourth anode voltage	$V_{a1+a3+a4}$	1.5		kV
Second anode voltage	V_{a2}	1.2	-	kV
Negative grid voltage	$-V_g$	200	0	V
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
Grid to cathode resistance	R_{g-k}	1.5	-	MΩ
Average cathode current	$I_{k(av)}$	200	-	μA
Heater to cathode voltage	V_{h-k}	± 125	-	V

All voltages referred to cathode unless otherwise stated.

TUBE WEIGHT (approximate) - 43 g

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D3-130GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

OSCILLOSCOPE TUBES

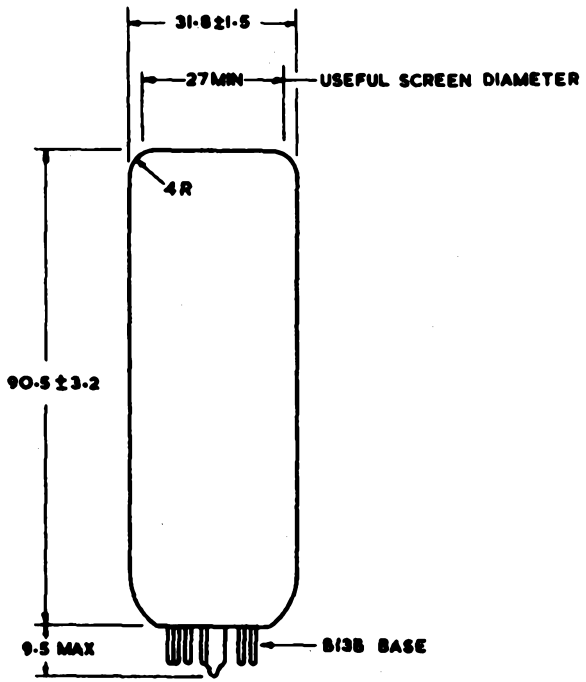
INTER-ELECTRODE CAPACITANCES

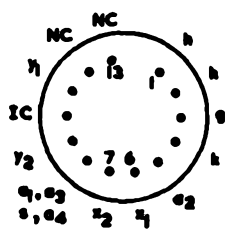
Cathode and heater to all	$c_{k,h-all}$	2.5	pF
Grid to all	c_{g-all}	6.5	pF
Grid to x_1;x_2,y_1,y_2 plates	$c_{g-x1,x2,y1,y2}$	1.9	pF
x_1 plate to x_2 plate	c_{x1-x2}	1.1	pF
y_1 plate to y_2 plate	c_{y1-y2}	0.4	pF
x_1 plate to all, less x_2 plate	$c_{x1-all,less\ x2}$	3.0	pF
x_2 plate to all, less x_1 plate	$c_{x2-all,less\ x1}$	3.0	pF
y_1 plate to all, less y_2 plate	$c_{y1-all,less\ y2}$	3.0	pF
y_2 plate to all, less y_1 plate	$c_{y2-all,less\ y1}$	2.7	pF
x_1,x_2 to y_1,y_2 plates	$c_{x1,x2-y1,y2}$	0.3	pF

TYPICAL OPERATION - voltages with respect to cathode

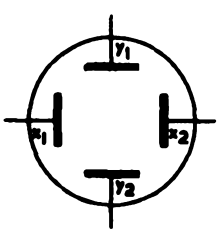
First, third and fourth anode voltage	$V_{a1+a3+a4}$	500	1000	V
Mean deflector plate potential*		500	1000	V
Second anode voltage for focus	V_{a2}	24 to 72	48 to 144	V
Grid voltage for spot cut-off	V_g	-10 to -24	-20 to -48	V
x deflection coefficient	D_x	40 to 60	80 to 120	V/cm
y deflection coefficient	D_y	29 to 44	58 to 88	V/cm

* This tube is designed for symmetrical operation.





VIEW FROM PINS FREE END
(PINS 6&7 AT BOTTOM)

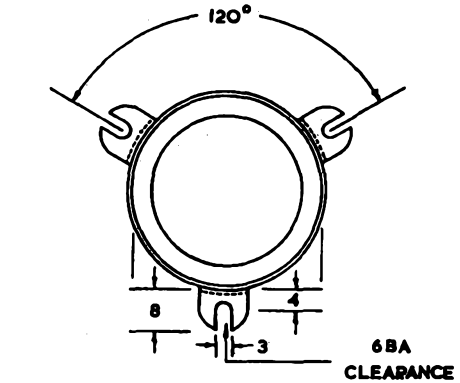


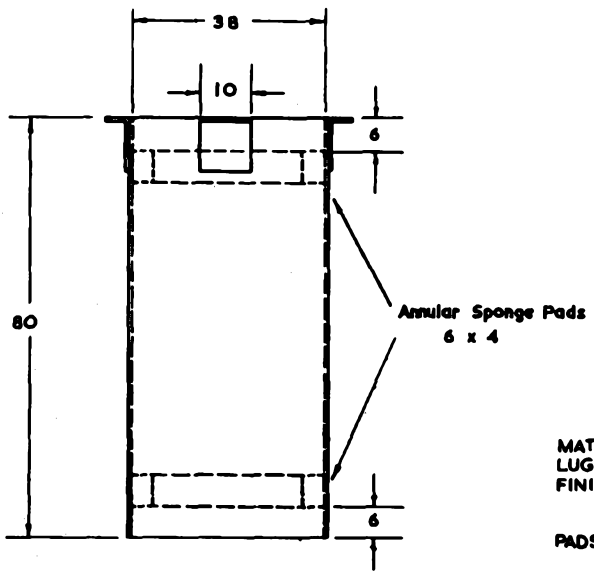
VIEW FROM SCREEN END
(PINS 6&7 AT BOTTOM)

All dimensions in mm

Not to be scaled

Magnetic Shield MS2





MATERIAL	0·35 ±0·05 Mumetal
LUGS	0·8±0·05 Mild steel
FINISH	Silver hammer outside (except on face of mounting backets)
PADS	Soft sponge closed cell neoprene
METAL TOLERANCES	±0·5 Unless otherwise stated
	Third angle projection
	All dimensions in mm
	Not to be scaled

BRIMAR

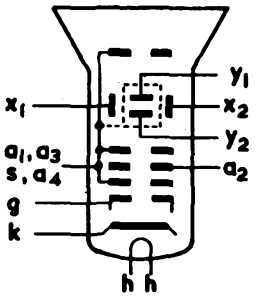
Oscilloscope Tube

D7-200..

GENERAL

This 3 inch diagonal rectangular oscilloscope tube is primarily intended for use in inexpensive oscilloscopes and monitoring devices. The tube has sufficient deflector sensitivity to permit transistor driven deflection.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min		
First, third and fourth anode voltage	$V_{a1+a3+a4}$	2000		V	←
Second anode voltage	V_{a2}	600	-	V	
Negative grid voltage	$-V_g$	200	0	V	
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V	
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V	
x-plate to third anode resistance	R_{x-a3}	2.0	-	MΩ	
y-plate to third anode resistance	R_{y-a3}	2.0	-	MΩ	
Grid to cathode resistance	R_{g-k}	1.5	-	MΩ	
Average cathode current	$I_{k(av)}$	200	-	μA	
Heater to cathode voltage	V_{h-k}	± 125	-	V	

All voltages referred to cathode unless otherwise stated.

TUBE WEIGHT (approximate) - 100 g

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D7-200GH) giving a green trace of medium short persistence. Other phosphors can be made available to special order. For optimum performance with W phosphor, the tube should be used as near the maximum final anode voltage as possible. ←

OSCILLOSCOPE TUBES

INTER-ELECTRODE CAPACITANCES

Cathode and heater to all	$c_{k,h\text{-all}}$	3.0	pF
Grid to all	$c_{g\text{-all}}$	6.5	pF
Grid to x_1, x_2, y_1, y_2 plates	$c_{g\text{-}x1,x2,y1,y2}$	1.0	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	0.5	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.3	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	3.0	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	3.0	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	3.0	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	3.0	pF
x_1, x_2 to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.3	pF

TYPICAL OPERATION - voltages with respect to cathode

			†	
First, third and fourth anode voltage	$V_{a1+a3+a4}$	1000	1800	V
Mean deflector plate potential*		1000	1800	V
Second anode voltage for focus	V_{a2}	65 to 200	115 to 355	V
Grid voltage for spot cut-off (approx)	V_g	-25 to -50	-45 to -90	V
x plate deflection coefficient	D_x	21 to 29	37 to 52	V/cm
y plate deflection coefficient	D_y	25 to 35	45 to 63	V/cm
Minimum useful screen area		5 by 4	5 by 4	cm^2
Line width at centre, measured by shrinking raster, at 25 μA cathode current		0.3	0.25	mm

* This tube is designed for symmetrical operation.

† Recommended for W phosphor.

NOTES

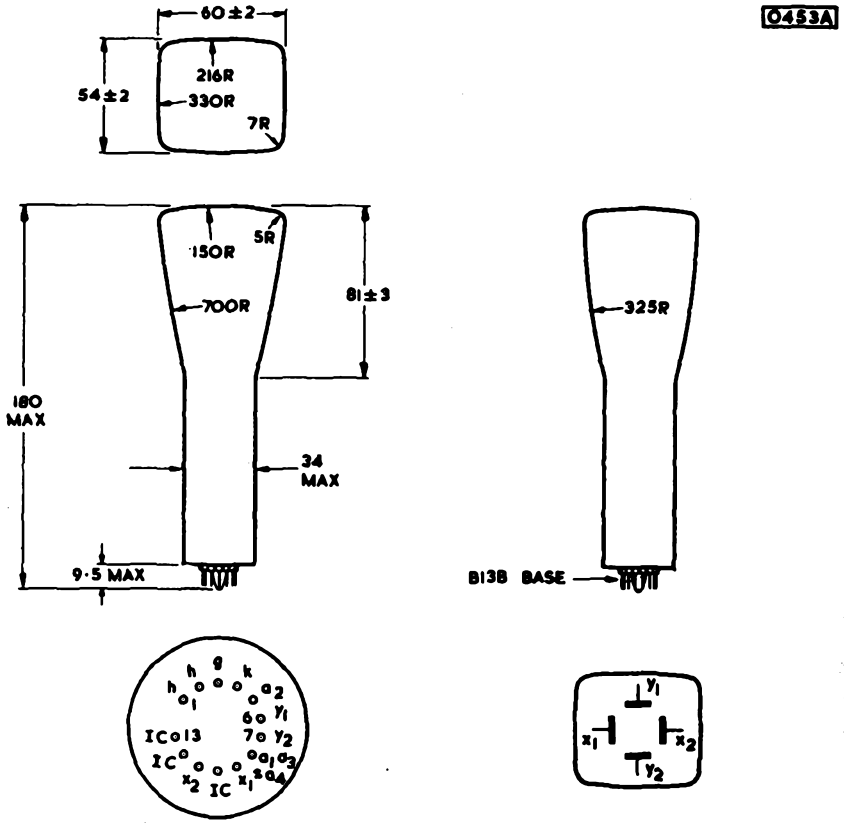
Rectangularity of x and y traces 90° ± 3°.

The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 3°.

The undeflected focused spot will lie within an 8 mm diameter circle central to the tube face.

Adequate magnetic shielding is required and to avoid screen charging and hand effects it is recommended that the tube is operated with the final anodes at earthy potential.

For critical requirements any residual astigmatism may be corrected by adjustment of the final anode to mean x-plate potential within the range ± 30V.



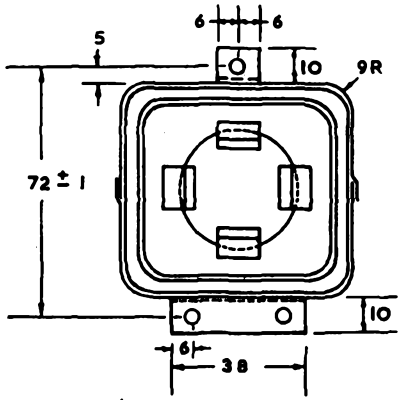
VIEW FROM PINS FREE END (PIN 3 AT TOP)

VIEW FROM SCREEN END (PIN 3 AT TOP)

All dimensions in mm **Not to be scaled**

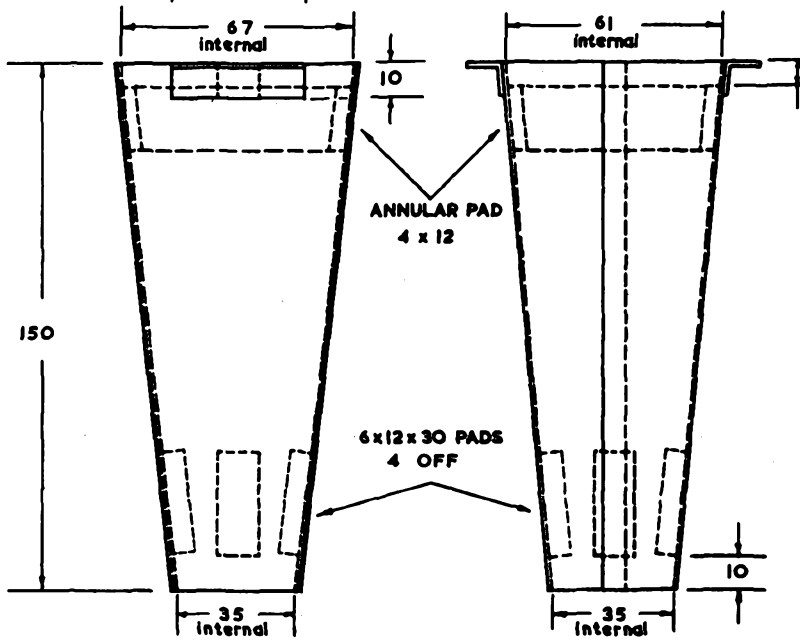
It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Magnetic Shield MS3



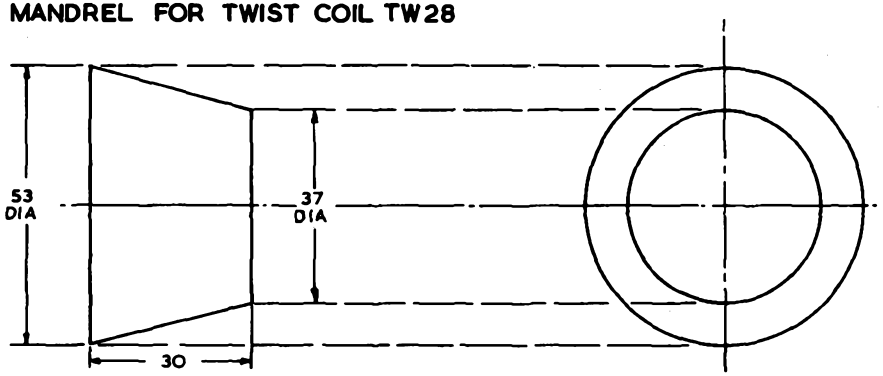
SHIELD	0·4 thick Mumetal
BRACKETS	0·8 thick Mumetal drilled 4BA clearance
FINISH	Matt black paint (except face of mounting brackets)
TOLERANCES	± 0·4 on metalwork dimensions
PADS	Soft Sponge Neoprene

All dimensions in mm



Tube Coil TW28 D7-200..

MANDREL FOR TWIST COIL TW28



All dimensions in mm

Not to be scaled

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS3 for D7-200..

WINDING

1200 turns of 0.080 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from the smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approximately 600 Ω
Twist coefficient approximately 4mA/degree measured on a typical D7-200..tube with V_{a1} = 2kV.

FITTING

The completed twist coil should be pushed hard onto the tube, with the lead out wires at one corner. Secure to tube in two places with suitable adhesive tape.

BRIMAR

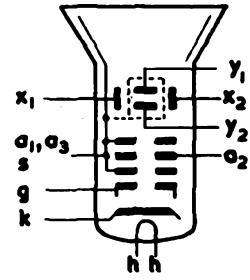
D7-201..

Oscilloscope Tube

GENERAL

This 7 cm diagonal rectangular oscilloscope tube is primarily intended for use in inexpensive oscilloscopes and monitoring devices. The tube has sufficient deflector sensitivity to permit transistor driven deflection.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.12	A



ABSOLUTE RATINGS

		Max	Min	
First and third anode voltage	V_{a1+a3}	2000	700	V
Second anode voltage	V_{a2}	600	-	V
Negative grid voltage	$-V_g$	200	1.0	V
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x-plate to third anode resistance	R_{x-a3}	2.0	-	MΩ
y-plate to third anode resistance	R_{y-a3}	2.0	-	MΩ
Grid to cathode resistance	R_{g-k}	1.5	-	MΩ
Average cathode current	$I_{k(av)}$	200	-	μA
Heater to cathode voltage	V_{h-k}	±125	-	V

All voltages referred to cathode unless otherwise stated.

TUBE WEIGHT (approximate) - 150 g

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D7-201GH) giving a green trace of medium short persistance. Other phosphors can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

INTER-ELECTRODE CAPACITANCES

Cathode and heater to all	$c_{k,h\text{-all}}$	3.0	pF
Grid to all	$c_{g\text{-all}}$	7.0	pF
Grid to x_1, x_2, y_1, y_2 plates	$c_{g\text{-}x1,x2,y1,y2}$	1.0	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	1.2	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.1	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	3.0	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	3.0	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	3.0	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	3.0	pF
x_1, x_2 to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.3	pF

TYPICAL OPERATION - voltages with respect to cathode

First and third anode voltage	V_{a1+a3}	1200	1800	V
Mean deflector plate potential*		1200	1800	V
Second anode voltage for focus	V_{a2}	80 to 250	115 to 355	V
Grid voltage for spot cut-off	V_g	-30 to -60	-45 to -90	V
x plate deflection coefficient	D_x	29 to 37	44 to 56	V/cm
y plate deflection coefficient	D_y	14 to 18	21 to 28	V/cm
Minimum useful screen area		5 by 4	5 by 4	cm^2
Line width at centre, measured by shrinking raster, at 10 μA beam current		0.24	0.20	mm
Grid drive to 10 μA beam current		18	17	V

NOTES

The undeflected focused spot will lie within an 8 mm diameter circle central to the tube face.

Raster distortion : the edges of a test raster will fall between two concentric rectangles 5 cm x 4 cm and 4.85 cm x 3.88 cm.

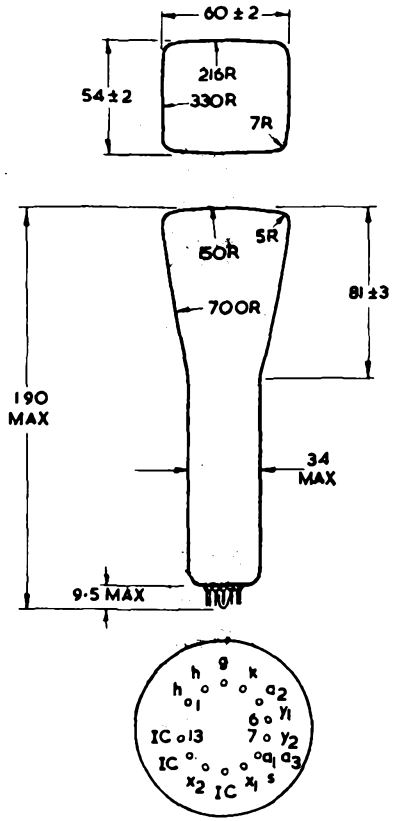
Rectangularity of x and y traces 90° $\pm$ 1.5°.

The horizontal trace will be parallel with the major axis of the rectangular face-plate to within $\pm$ 3°.

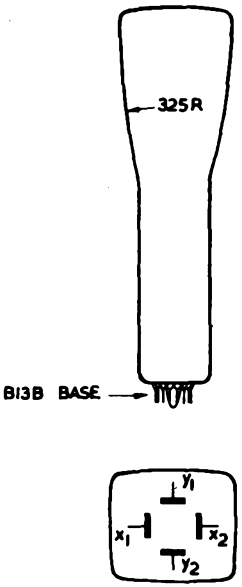
For critical requirements any residual astigmatism may be corrected by adjustment of the final anode to mean x-plate potential within the range $\pm$ 30V.

Adequate magnetic shielding is required and to avoid screen charging and hand effects it is recommended that the tube is operated with the final anodes at earthy potential.

* This tube is designed for symmetrical operation.



VIEW FROM PINS FREE END
(PIN 3 AT TOP)



VIEW FROM SCREEN END
(PIN 3 AT TOP)

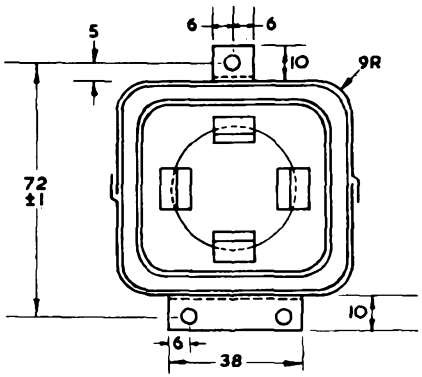
All dimensions in mm

Not to be scaled

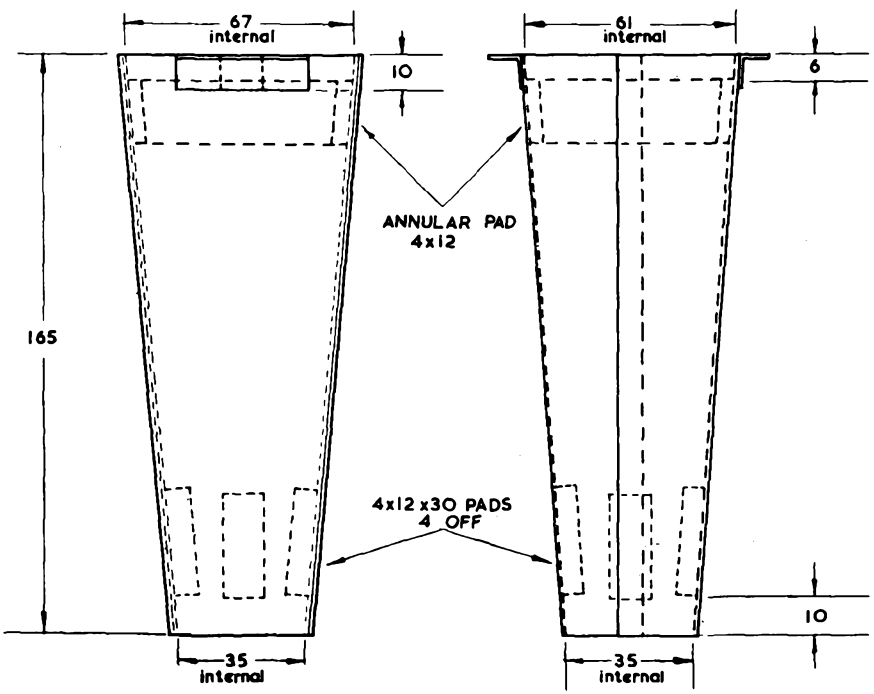
It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Tolerance on base pin 3 position with respect to minor axis of the rectangular faceplate ± 5°.

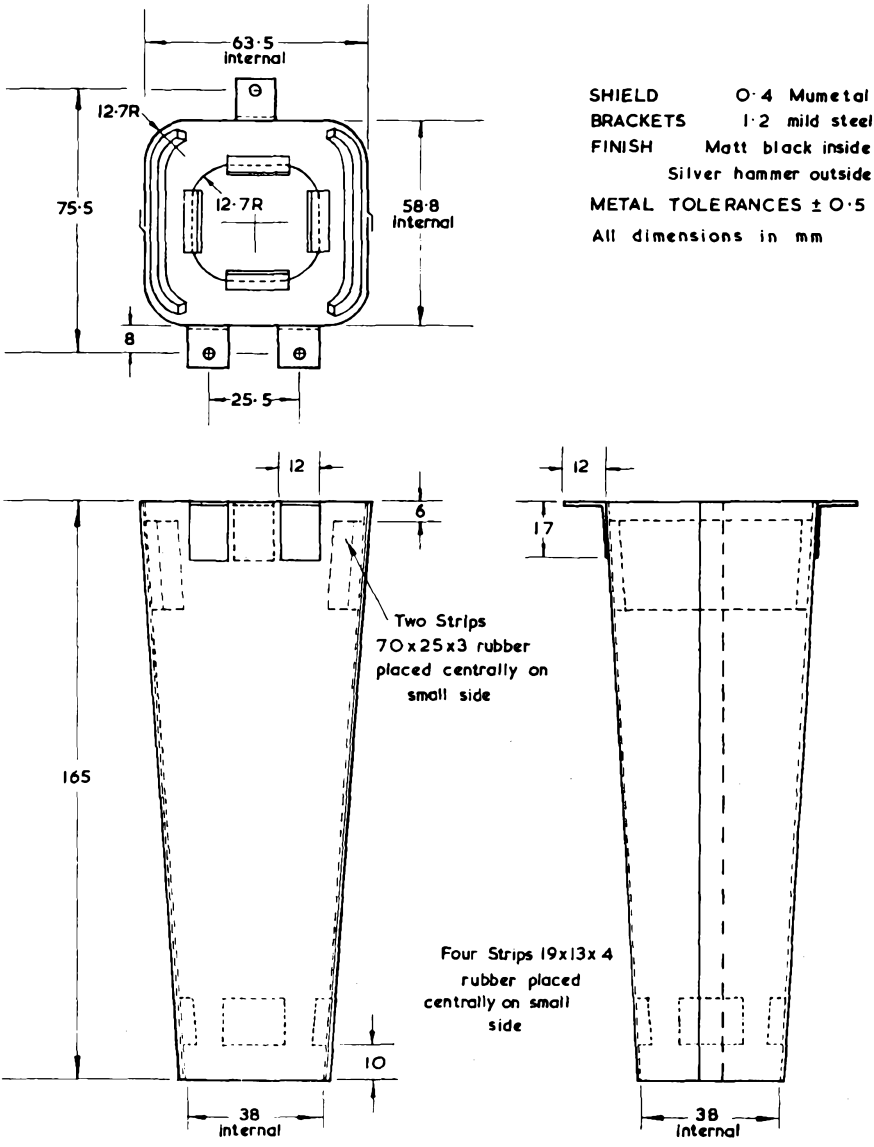
Magnetic Shield MS33



SHIELD 0·4 thick Mumetal
BRACKETS 0·8 thick Mumetal drilled 4BA clearance
FINISH Matt black paint (except face of mounting brackets)
TOLERANCES ± 0·4 on metalwork dimensions
PADS Soft Sponge Neoprene
All dimensions in mm



Magnetic Shield MS34



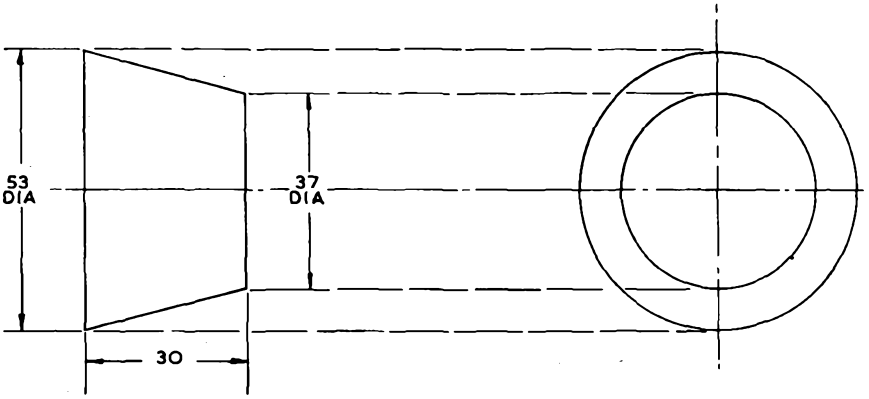
SHIELD	0·4 Mumetal
BRACKETS	1·2 mild steel
FINISH	Matt black inside
	Silver hammer outside

METAL TOLERANCES ± 0·5

All dimensions in mm

Tube Coil TW 28 D7-201..

MANDREL FOR TWIST COIL TW28



All dimensions in mm

Not to be scaled

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS33 for D7-201..

WINDING

1200 turns of 0.080 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approximately 600Ω
Twist coefficient approximately 4mA/degree measured on a typical D7-201.. tube with V_{a1} = 2kV.

FITTING

The completed twist coil should be pushed hard onto the tube, with the lead out wires at one corner. Secure to tube in two places with suitable adhesive tape.

OSCILLOSCOPE TUBES

BRIMAR

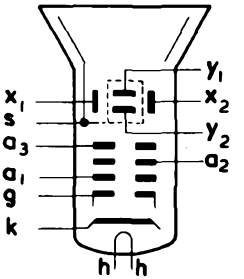
D9-110..

Oscilloscope Tube

GENERAL

This 9 *cm* diagonal rectangular short oscilloscope tube is primarily intended for use in inexpensive oscilloscopes and monitoring devices. The tube has sufficient deflector sensitivity to permit transistor drive deflection.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.12	A



ABSOLUTE RATINGS - voltages with respect to cathode		Max	Min	
First anode voltage	V_{a1}	2200	800	V
Second anode voltage	V_{a2}	800	-	V
Third anode voltage	V_{a3}	2250	750	V
Negative grid voltage	$-V_g$	200	1.0	V
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
Heater to cathode voltage	V_{h-k}	± 125		V
x-plate to third anode resistance	R_{x-a3}	2.0	-	MΩ
y-plate to third anode resistance	R_{y-a3}	2.0	-	MΩ
Grid to cathode resistance	R_{g-k}	1.5	-	MΩ
Peak cathode current	$i_{k(pk)}$	500	-	μA

PHOSPHOR SCREEN

This tube is usually supplied with GH phosphor (D9-110GH) giving a green trace of medium short persistence. Other phosphors can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-all}}$	5.5	pF
Heater and cathode to all	$c_{h,k\text{-all}}$	3.8	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	1.2	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.4	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	4.2	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	4.0	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	3.4	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	3.4	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.8	pF

TYPICAL OPERATION - voltages with respect to cathode.

Mean deflector plate potential*		1500	2000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1500†	2000†	V
Second anode voltage for optimum focus	V_{a2}	230 to 380	300 to 510	V
First anode voltage	V_{a1}	1500	2000	V
Shield voltage for optimum raster shape	V_s	1500†	2000†	V
Control grid voltage for cut-off	V_{g1}	-30 to -65	-40 to -87	V
x deflection coefficient	D_x	21 to 26	28 to 34.8	V/cm
y deflection coefficient	D_y	9.6 to 12	12.8 to 16	V/cm
Minimum useful screen area		6.6 x 4.0	6.6 x 4.0	cm^2
Grid drive to 10 μA beam current		13	13	V
Line width at 10 μA beam current Shrinking raster measurement at centre		0.31	0.27	mm

* This tube is designed for symmetrical operation.

† The required voltage will not differ from the quoted value by more than ± 50V.

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle of 5 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 6.6 cm x 4.0 cm and 6.46 cm x 3.88 cm.

Rectangularity of x and y axes is 90° ± 1°.

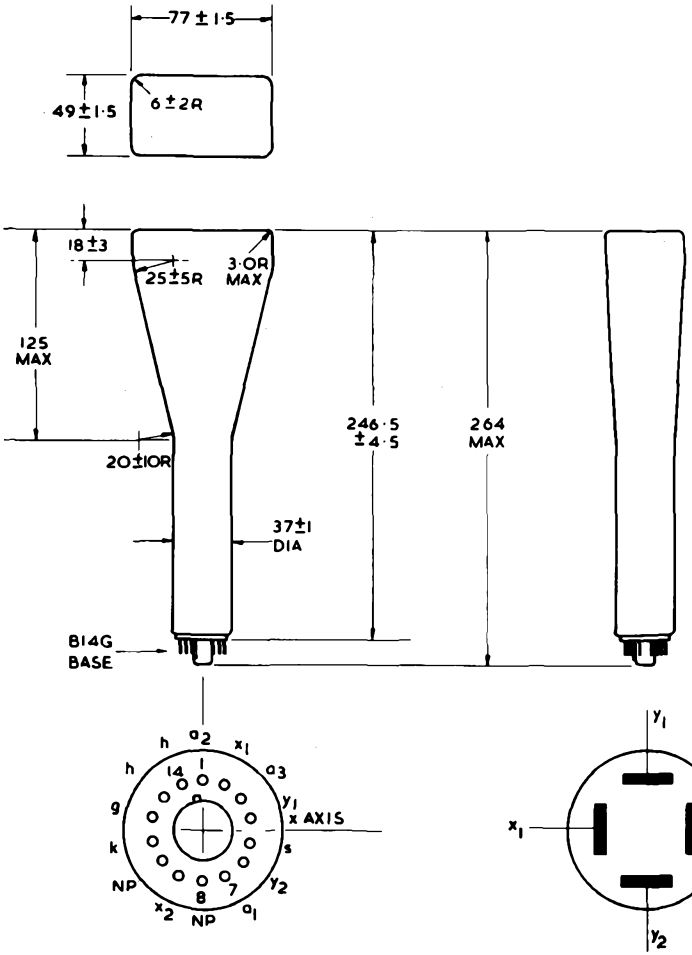
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. The mean y plate potential should never differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) 600 g

MOUNTING POSITION - unrestricted.



VIEWED FROM PINS FREE END (PIN 1 AT TOP)

VIEWED FROM SCREEN END (PIN 1 AT TOP)

All dimensions in mm

Not to be scaled

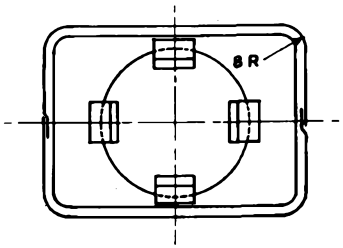
It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

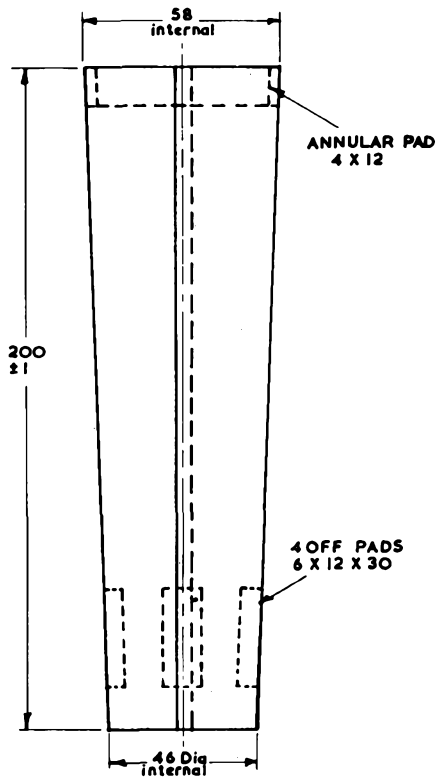
Tolerance on base pin 1 position with respect to tube y axis ± 5°

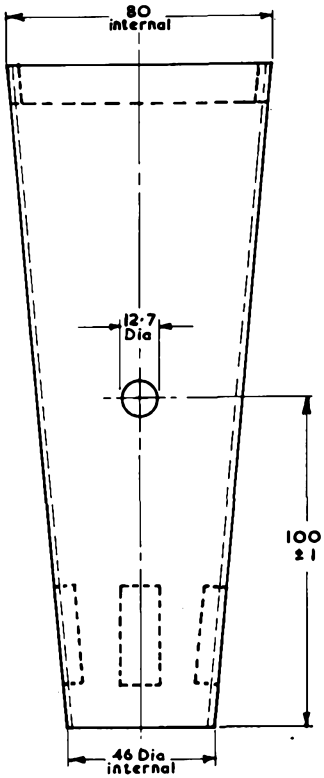
D9-110 ..

Magnetic Shield MS65

MATERIAL 0·35 ± 0·05 Mumetal
FINISH Silver hammer outside
PADS Soft sponge closed cell neoprene
METAL TOLERANCES ± 0·5 Unless othewise stated
Third angle projection
All dimensions in mm
Not to be scaled

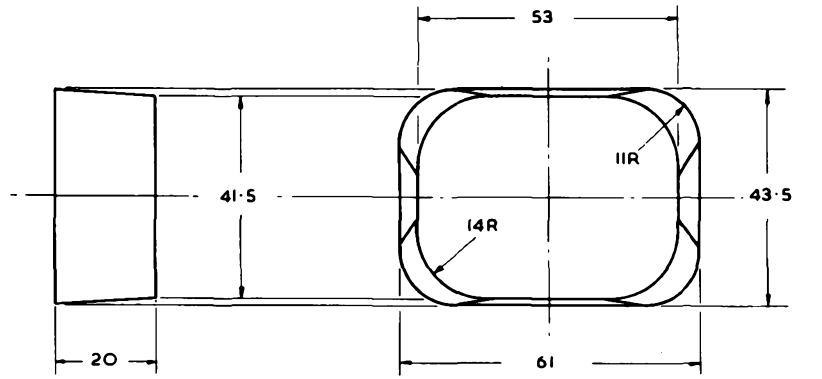






Tube Coil TW50 D9-110..

MANDREL FOR TWIST COIL TW50



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood to dimensions given above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS65 for D9-110..

WINDING

1000 turns of 0.14 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 210 Ω. Current required for ± 5° twist is ± 20 mA measured on a typical D9-110.. with V_{a1} = 2.0 kV.

FITTING

The completed twist coil should be pushed onto the tube from the base end as far as it will travel and fastened with adhesive tape.

OSCILLOSCOPE TUBES

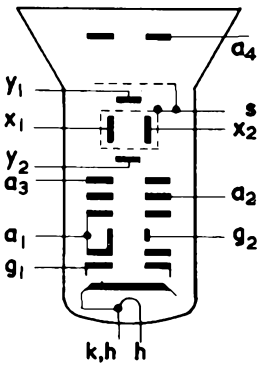
D10-210..

Oscilloscope Tube

GENERAL

This is a very short 7 x 5 cm^2 rectangular tube with high deflection sensitivity designed for general purpose and portable oscilloscopes. The mesh p.d.a. system allows the tube to be transistor driven for medium bandwidth applications without additional electrode voltages. A means of beam blanking at anode potential which avoids d.c. coupling to the grid is incorporated.

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	10	5.0	kV
Third anode voltage	V_{a3}	1.25	0.5	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.25	0.5	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		10:1	-	

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D10-210GH) giving a green trace of medium short persistence. Other phosphors can be made available to special order.

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-all}}$	10	pF
Grid 2 to all	$c_{g2\text{-all}}$	11	pF
Grid 2 to Grid 1	$c_{g2\text{-}g1}$	0.7	pF
Grid 1 to x_1, x_2, y_1 and y_2 plates	$c_{g1\text{-}x1,x2,y1,y2}$	1.2	pF
Heater and cathode to all	$c_{h,k\text{-all}}$	3.5	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	1.9	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	0.9	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	5.7	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	5.7	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	5.4	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	5.1	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{ - }y1,y2}$	0.4	pF

TYPICAL OPERATION - voltages with respect to cathode

Fourth anode voltage	V_{a4}	6.0	10	kV
Mean deflector plate potential		600	1000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	475 to 600	875 to 1000	V
Second anode voltage for optimum focus	V_{a2}	100 to 220	160 to 380	V
First anode voltage	V_{a1}	600	1000	V
Shield voltage for optimum raster shape	V_s	600 to 725	1000 to 1125	V
Beam blanking voltage for cut-off	V_{g2}	550†	920†	V
Control grid voltage for cut-off	V_{g1}	-30 to -55	-50 to -90	V
x plate deflection coefficient	D_x	11.2 to 13.8	18.6 to 23	V/cm
y plate deflection coefficient	D_y	8.0 to 10	13.4 to 16.6	V/cm
Minimum screen area		7 x 5	7 x 5	cm^2
Line width at centre	at 5μA beam current	0.65	0.6	mm
Line width at edge		1.0	0.95	mm
Line width at centre measured by shrinking raster		0.35	0.32	mm

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle 5 mm radius from the geometric centre of the tube face.

The total scanned area is 7 cm x 5 cm measured about a point ± 3 mm from the centre of the tube face. The edges of a test raster will fall between two concentric rectangles 7 cm x 5 cm and 6.75 cm x 4.8 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield and should not extend more than 100 mm from the face. 40 ampere turns will suffice with provision for reversing the current if necessary.

The deflection coefficient (for both x and y plates) at 75% deflection of the useful scan shall not differ by more than 2% from the deflection coefficient over 10% deflection.

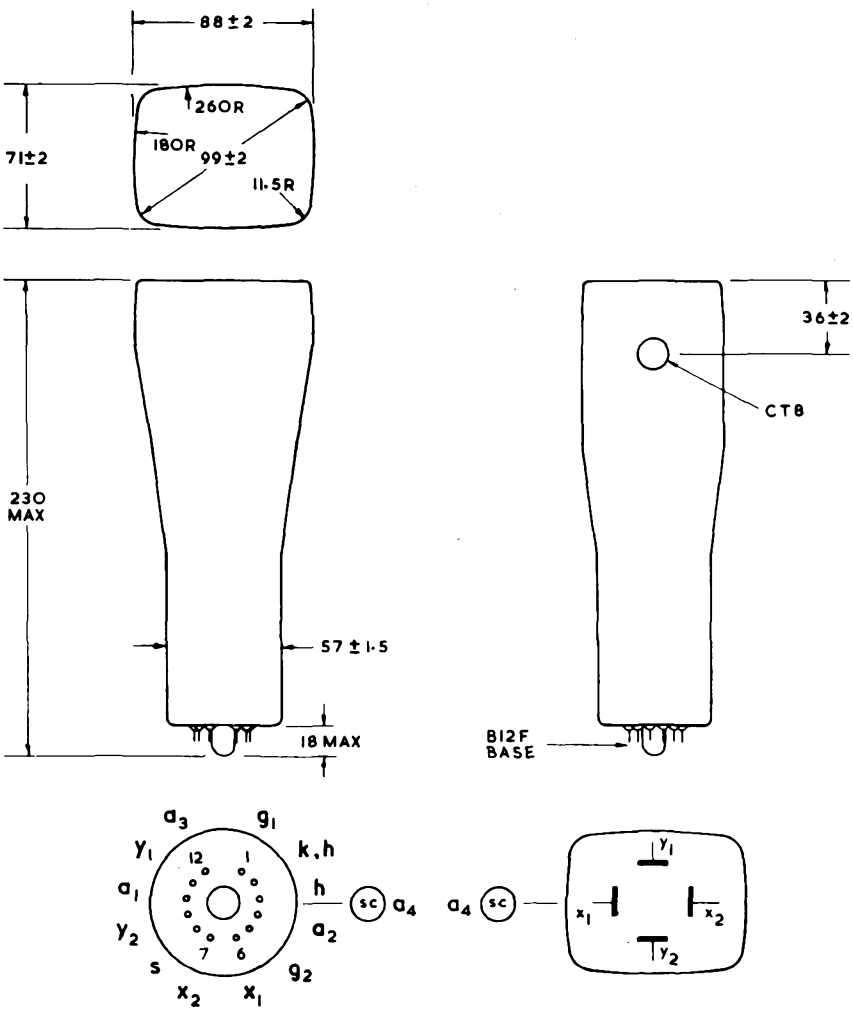
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50 V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) - 500 g

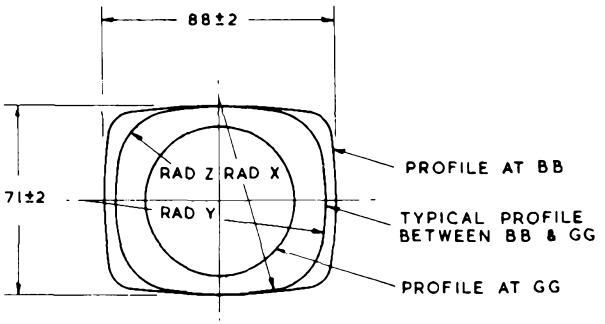
MOUNTING POSITION - unrestricted

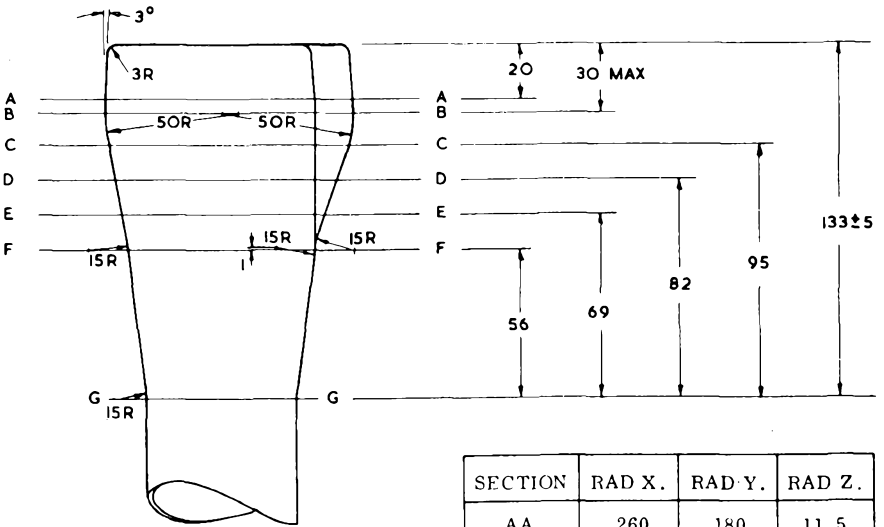


All dimensions in mm

Not to be scaled

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

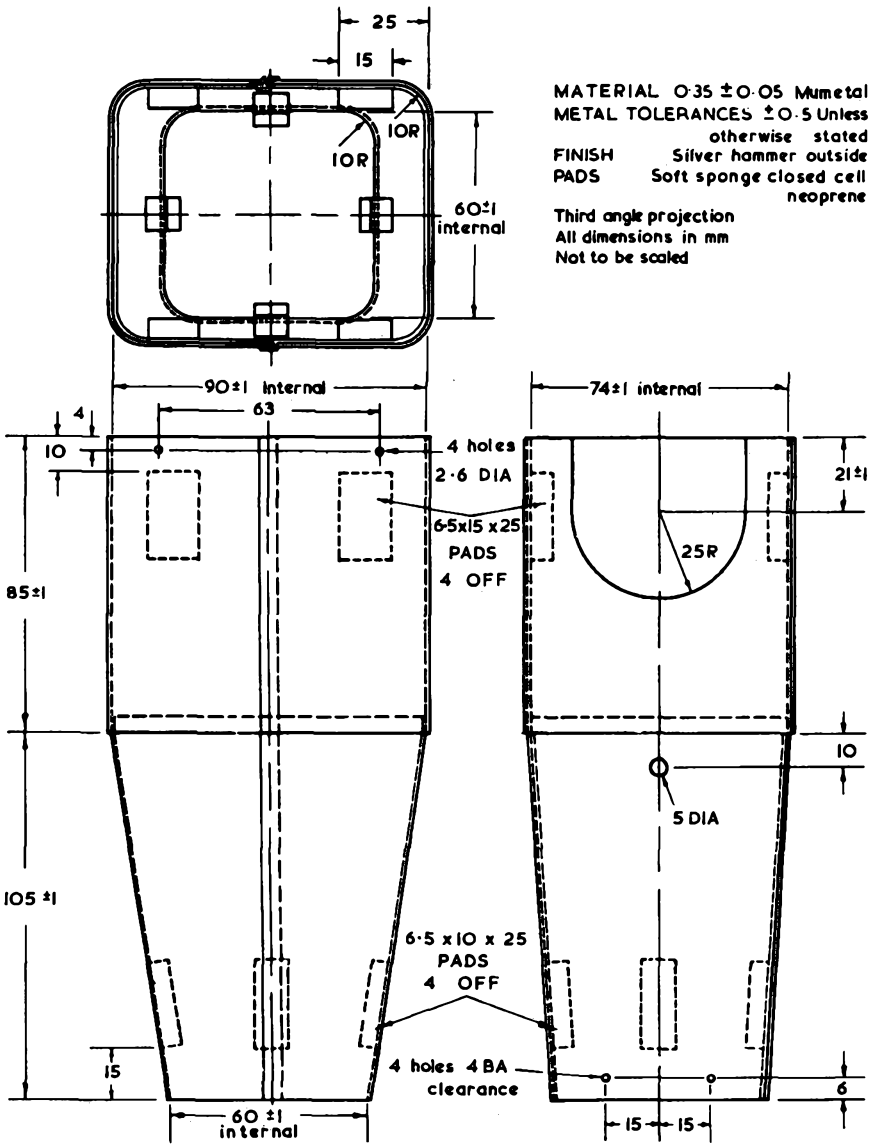




SECTION	RAD X.	RAD Y.	RAD Z.
AA	260	180	11.5
BB	260	180	11.5
CC	220	140	15.4
DD	159	91	22.3
EE	116	55.2	30.1
FF	35.5	35.5	35.5
GG	28.5	28.5	28.5

Magnetic Shield MS6

D10-210..

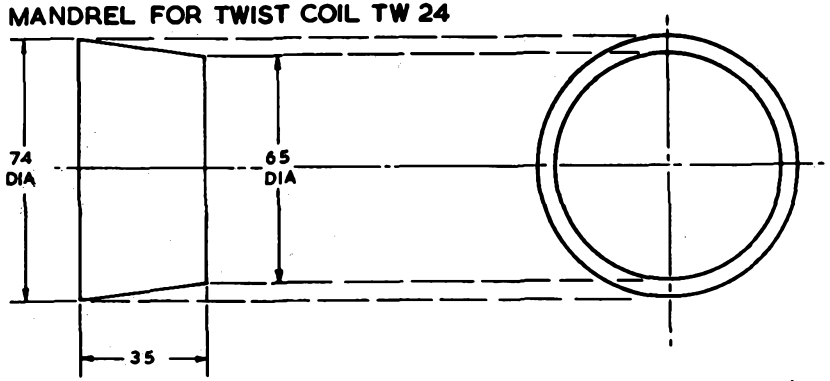


OSCILLOSCOPE TUBES

BRIMAR

Tube Coil TW24

MANDREL FOR TWIST COIL TW 24



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS6 for D10-210..

WINDING

960 turns of 0.125 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 270 Ω. Twist coefficient approximately 5.5 mA/degree measured on typical D10-210.. with V_{a4} = 10 kV and V_{a1} = 1.0 kV.

FITTING

The completed twist coil should be pushed hard onto the tube with the lead-out wires in the middle of the short side of the tube on the same side as the cavity cap and sealed to the tube with suitable adhesive tape.

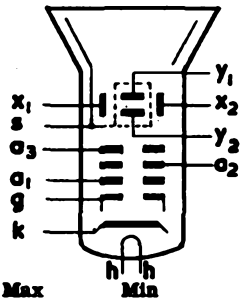
Oscilloscope Tube

D10-230..

GENERAL

This 10 cm diameter short oscilloscope tube is primarily intended for use in inexpensive oscilloscopes and monitoring devices. The tube has sufficient deflector sensitivity to permit transistor driven deflection.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - voltages with respect to cathode		Max	Min	
First anode voltage	V_{a1}	2200	800	V
Second anode voltage	V_{a2}	800	-	V
Third anode voltage	V_{a3}	2250	750	V
Negative grid voltage	$-V_g$	200	1.0	V
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
Heater to cathode voltage	V_{h-k}	± 125	–	V
x plate circuit impedance	Z_x	100	-	kΩ
y plate circuit impedance	Z_y	100	-	kΩ
Grid to cathode resistance	R_{g-k}	1.5	-	MΩ
Peak cathode current	$i_{k(pk)}$	500	-	μA

PHOSPHOR SCREEN

This tube is usually supplied with GH phosphor (D10-230GH) giving a green trace of medium short persistance. Other phosphors can be made available to special order.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

OSCILLOSCOPE TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid to all	$C_{g\text{-all}}$	8.2	pF
Heater and cathode to all	$C_{h,k\text{-all}}$	2.3	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	1.7	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.3	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	5.0	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	4.8	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	3.6	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	3.7	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	0.7	pF
g to x_1, x_2, y_1 and y_2 plates	$C_{g\text{-}x1,x2,y1,y2}$	0.6	pF

TYPICAL OPERATION - voltages with respect to cathode.

Mean deflector plate potential*		1500	2000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1500†	2000†	V
Second anode voltage for optimum focus	V_{a2}	120 to 250	160 to 335	V
First anode voltage	V_{a1}	1500	2000	V
Shield voltage for optimum raster shape	V_s	1500†	2000†	V
Control grid voltage for cut-off	V_g	- 22 to - 52	- 30 to - 70	V
x deflection coefficient	D_x	21 to 26	28 to 34.8	V/cm
y deflection coefficient	D_y	13 to 16	17.3 to 21.4	V/cm
Minimum useful screen area (Diagonal 9 cm)		8.0 x 6.4	8.0 x 6.4	cm^2
Grid drive to 10 μA beam current		10	11	V
Line width at 10 μA beam current Shrinking raster measurement at centre		0.31	0.27	mm

* This tube is designed for symmetrical operation.

† The required voltage will not differ from the quoted value by more than $\pm$ 30V.

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle of 5 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 7.0 cm x 5.4 cm and 6.84 cm x 5.26 cm.

Rectangularity of x and y axes is 90° ± 1°.

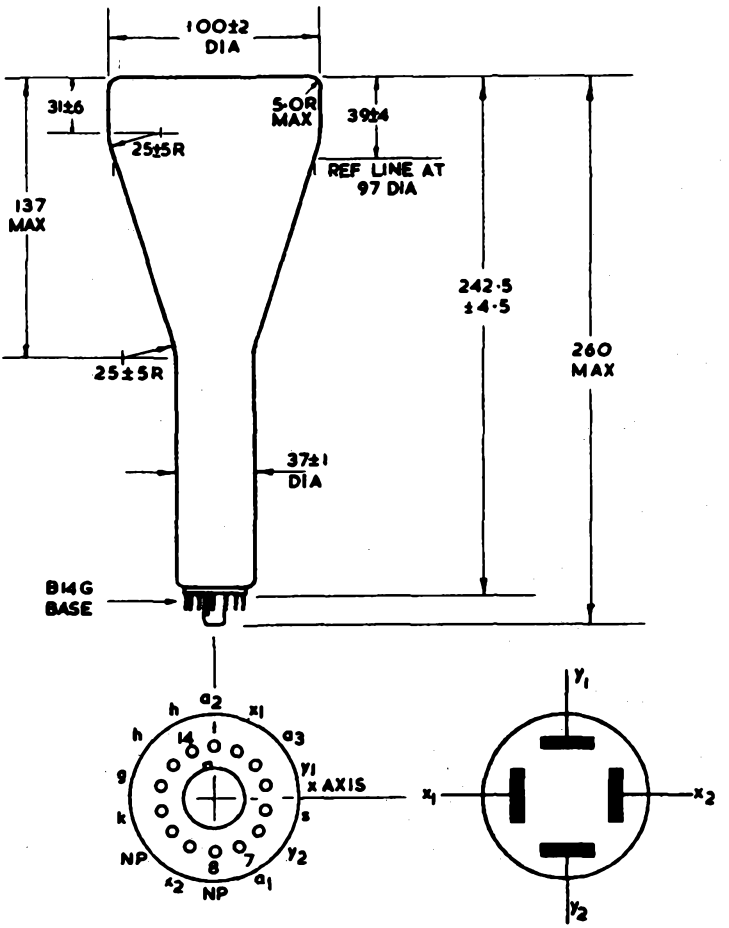
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under any circumstances the mean y plate potential should never differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) 400 g

MOUNTING POSITION - unrestricted.



VIEWED FROM PINS FREE END (PIN 1 AT TOP)

VIEWED FROM SCREEN END (PIN 1 AT TOP)

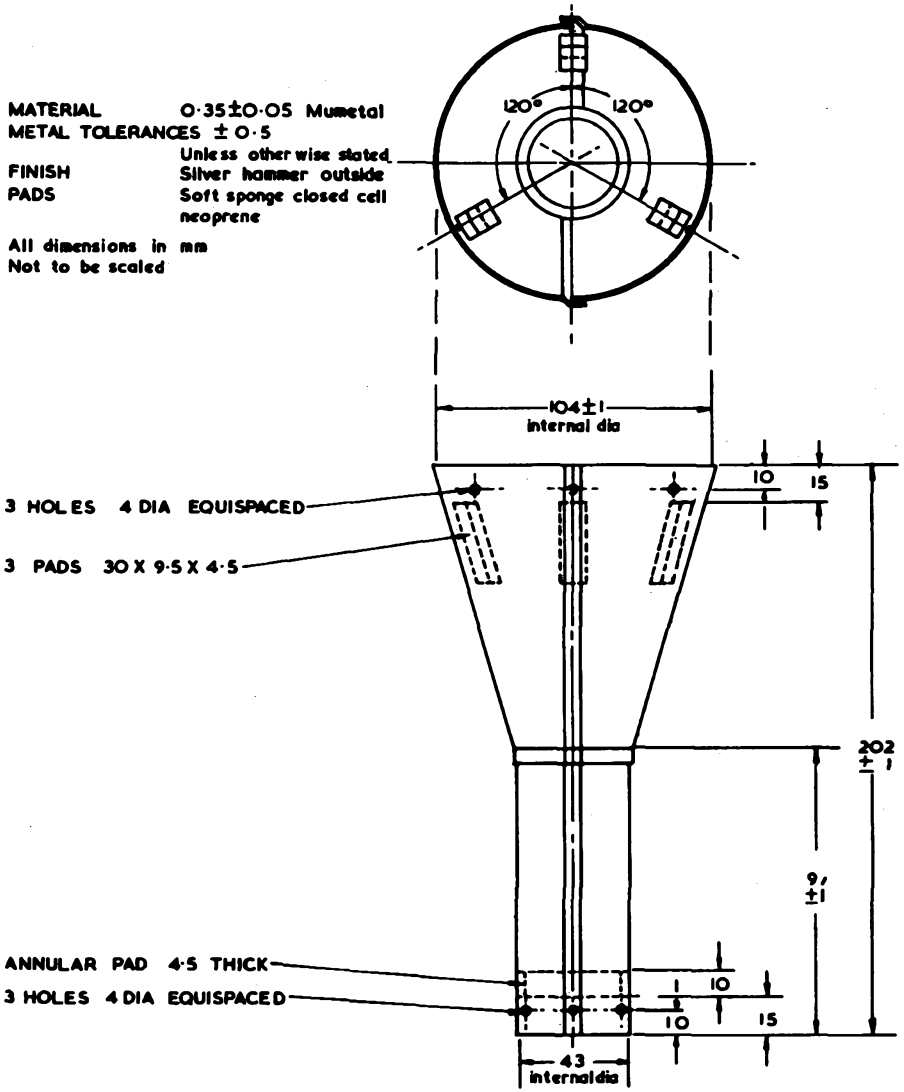
All dimensions in mm Not to be scaled

It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

Tolerance on base pin 1 position with respect to tube y axis ± 5°

Magnetic Shield MS41

EXAMPLE OF TYPICAL SHIELD



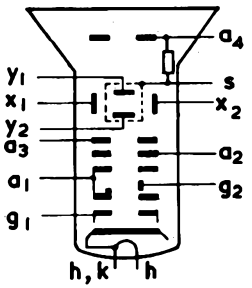
D10-240..

Oscilloscope Tube

GENERAL

This 10 cm diagonal rectangular, p.d.a. tube with electrostatic focusing and deflection is designed for medium bandwidth applications and is capable of being deflected by transistor circuits. It incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater Voltage	V_h	6.3	V
Heater Current	I_h	0.12	A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	3.5	1.5	kV
Third anode voltage	V_{a3}	1.75	0.75	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.75	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate circuit impedance	Z_x	100	-	kΩ
y plate circuit impedance	Z_y	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3} nom)		2:1		
Helix resistance		-	20	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D10-240GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

INTER-ELECTRODE CAPACITANCES

Grid to all	$C_{g1\text{-all}}$	9.5	pF
Grid 2 to all	$C_{g2\text{-all}}$	9.0	pF
Heater and cathode to all	$C_{h,k\text{-all}}$	3.5	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	2.0	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.5	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	6.2	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	5.9	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	4.7	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	4.7	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	0.6	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,x2,y1,y2}$	1.0	pF
Grid 1 to Grid 2	$C_{g1\text{-}g2}$	0.5	pF

TYPICAL OPERATION - voltages with respect to cathode.

Fourth anode voltage	V_{a4}	2.0	3.0	kV
Mean deflector plate potential		1000	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1000*	1500*	V
Second anode voltage for optimum focus	V_{a2}	175 to 350	260 to 525	V
First anode voltage	V_{a1}	1000	1500	V
Shield voltage for optimum raster shape	V_s	1000*	1500*	V
Beam blanking voltage for cut-off	V_{g2}	935†	1400†	V
Control grid voltage for cut-off	V_{g1}	-35 to -70	-50 to -100	V
x deflection coefficient	D_x	21.6 to 26.4	32.4 to 39.6	V/cm
y deflection coefficient	D_y	8.3 to 10.2	12.4 to 15.3	V/cm
Minimum screen area		7 x 5	7 x 5	cm^2
Line width at 10 μA beam current				
Shrinking raster measurement at centre		0.27	0.20	mm
Shrinking raster measurement at edge		0.42	0.33	mm
Grid drive for 10 μA beam current (approx.)		25	25	V

* The required voltage will not differ from the quoted value by more than ± 50V

† The beam is is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The following applies for the typical operation conditions.

The undeflected spot will fall in a circle of 5 mm radius about the centre of the tube face.

The edges of a test raster will fall between two concentric rectangles 7cm x 5cm and 6.86cm x 4.88cm. Rectangularity of x and y axes is 90° ± 1°.

The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield. and should not be less than 50 mm from the face or extend more than 105 mm from the face. The ampere turns required will be equal to $16\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV), with provision for reversing the current if necessary.

The deflection coefficient (for both x and y plates) at 75% deflection of the useful scan shall not differ by more than 2% from the deflection coefficient over 10% deflection.

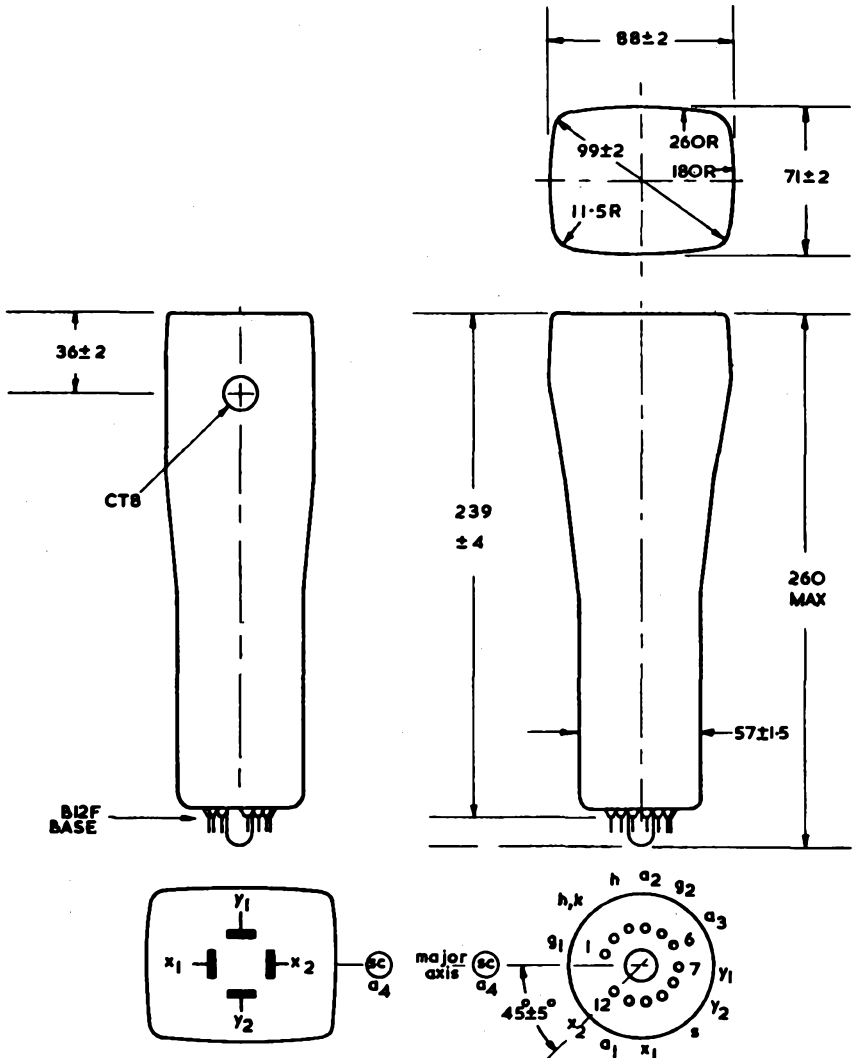
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under any circumstances the mean y plate potential should never differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

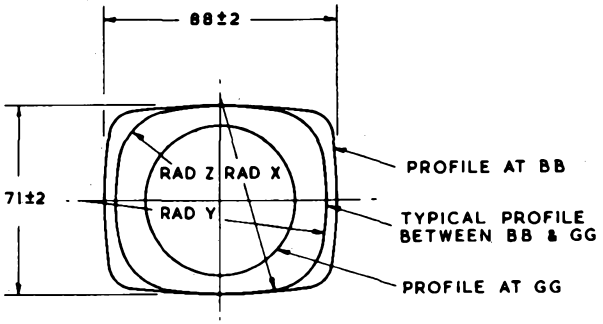
TUBE WEIGHT (approximate) - 570g

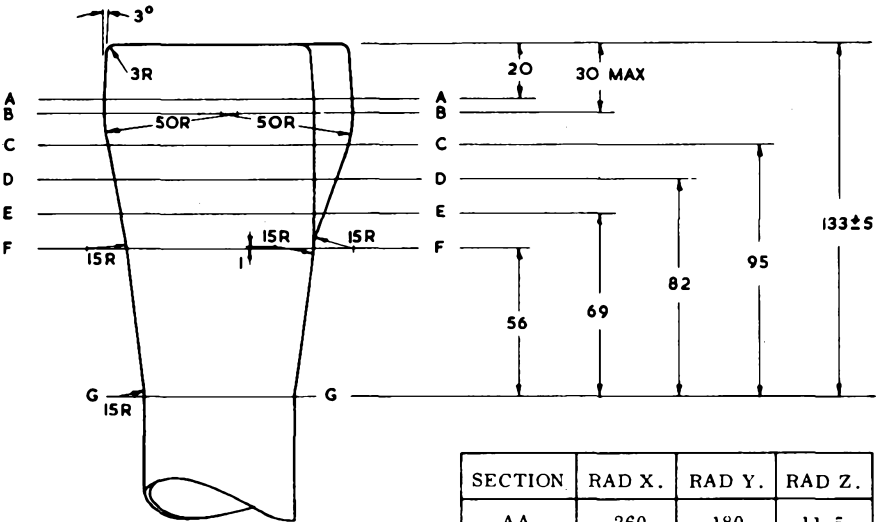
MOUNTING POSITION unrestricted.



All dimensions in mm Third angle projection Not to be scaled

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.



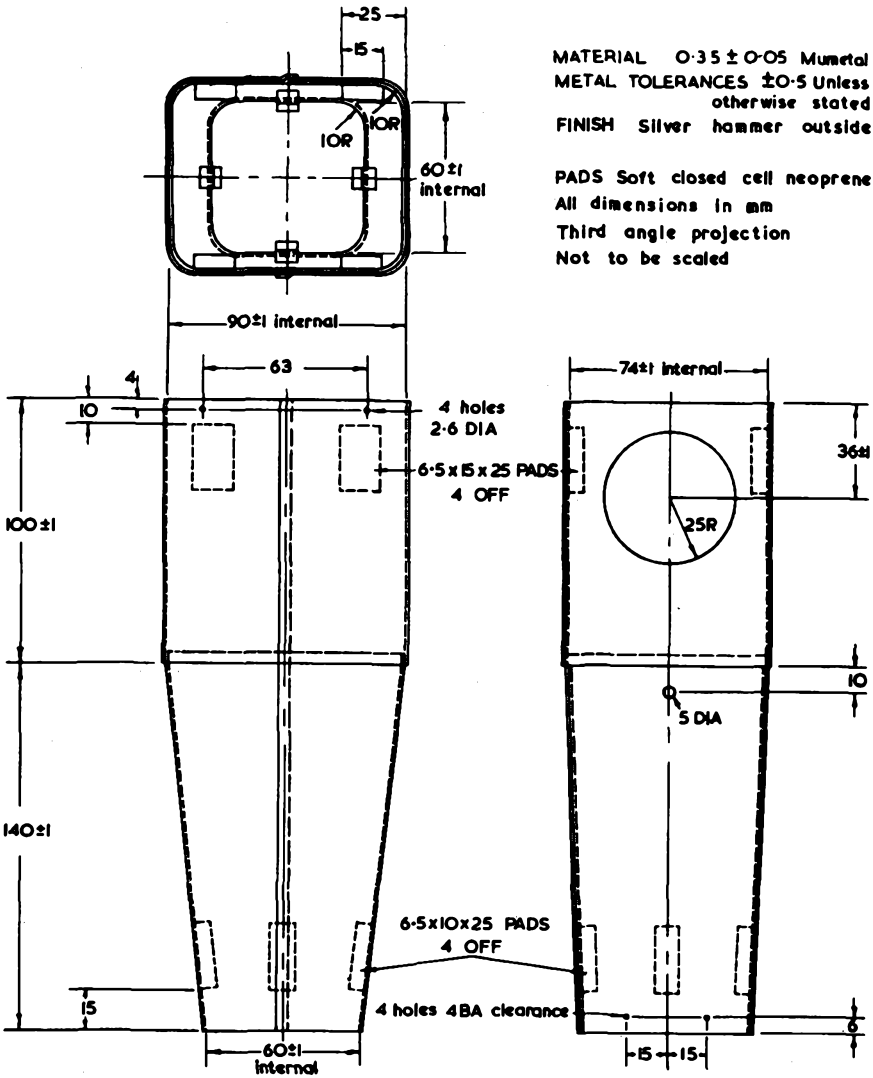


SECTION	RAD X.	RAD Y.	RAD Z.
AA	260	180	11.5
BB	260	180	11.5
CC	220	140	15.4
DD	159	91	22.3
EE	116	55.2	30.1
FF	35.5	35.5	35.5
GG	28.5	28.5	28.5

Magnetic Shield MS7

D10-240..

EXAMPLE OF TYPICAL SHIELD



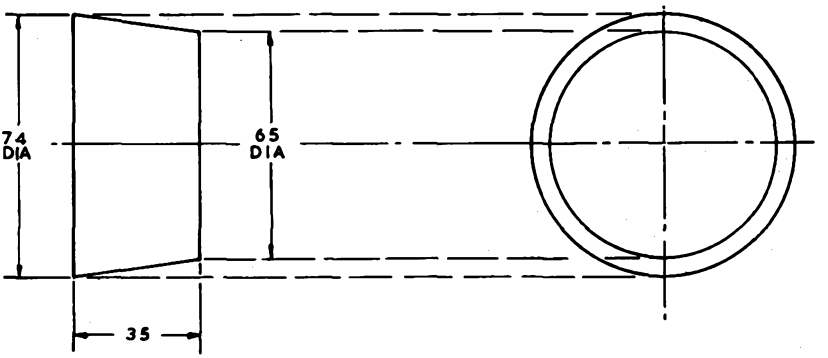
MATERIAL 0·35 ± 0·05 Mumetal
METAL TOLERANCES ±0·5 Unless otherwise stated
FINISH Silver hammer outside

PADS Soft closed cell neoprene
All dimensions in mm
Third angle projection
Not to be scaled

OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW33



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS7 for D10-240..

WINDING

900 turns of 0.10 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 420 Ω. Twist coefficient approximately 5.6 mA/degree measured on typical D10-240.. with V_{a4} = 3 kV and V_{a1} = 1.5 kV.

FITTING

The completed twist coil should be pushed hard onto the tube with the lead-out wires in the middle of the short side of the tube on the same side as the cavity cap and sealed to the tube with suitable adhesive tape.

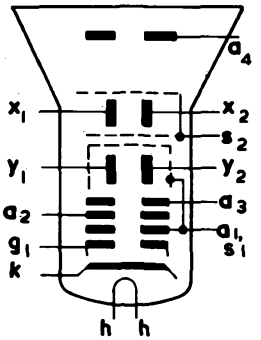
Oscilloscope Tube D10-293..

PRELIMINARY DATA

GENERAL

This 6.8cm x 5.6cm rectangular aluminised tube with electrostatic focusing and deflection uses a mesh p.d.a. to achieve high deflection sensitivity and high brightness without additional electrode control voltages. The tube is designed for transistor deflection medium to high bandwidth applications.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.12	A



ABSOLUTE RATINGS

		Max.	Min.	
Fourth anode voltage	V_{a4}	10	4.0	kV
Third anode voltage	V_{a3}	2.25	0.8	kV
Second anode voltage	V_{a2}	1.0	-	kV
First anode voltage	V_{a1}	2.2	0.75	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Peak x plate to third anode voltage	$V_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$V_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	100	-	kΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		7:1	-	

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D10-293GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

OSCILLOSCOPE TUBES

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-}all}$	10	pF
Heater and cathode to all	$c_{h,k\text{-}all}$	4.5	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	1.0	pF
y1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.5	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-}all,\ less\ x2}$	8.0	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-}all,\ less\ x1}$	8.0	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-}all,\ less\ y2}$	5.0	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-}all,\ less\ y1}$	5.0	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,\ x2\text{-}y1,y2}$	0.8	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$c_{g1\text{-}x1,\ x2,\ y1,\ y2}$	0.6	pF

TYPICAL OPERATION - Voltages with respect to cathode

Fourth anode voltage	V_{a4}	6.0	kV
Mean deflector plate potential		1000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	970 to 1030	V
Second anode voltage for optimum focus	V_{a2}	180 to 340	V
First anode and y shield voltage	V_{a1+s1}	1000	V
Shield 2 voltage for optimum raster shape	V_{s2}	900 to 1050	V
Control grid voltage for cut-off	V_{g1}	-26 to -52	V
x deflection coefficient	D_x	10.5 to 12.8	V/cm
y deflection coefficient	D_y	3.8 to 4.8	V/cm
Line width at 10μA beam current			
Shrinking raster measurement at centre		0.32	mm
Microscope measurement at centre		0.55	mm
Microscope measurement at edge		0.8	mm
Grid Drive to 10μA beam current (approx.)		17	V

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 5 mm radius about the centre of the tube face.

Raster distortion: The edges of a test raster will fall between two concentric rectangles 6.8 cm x 5.6 cm and 6.55 cm x 5.4 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 80mm from the face and should not extend more than 130 mm from the face. The ampere turns required will be equal to $14\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV) with provision for reversing the current. The sensitivity (for both x and y plates) at 75% deflection of the useful scan will not differ by more than 2% from the sensitivity over 25% deflection.

It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

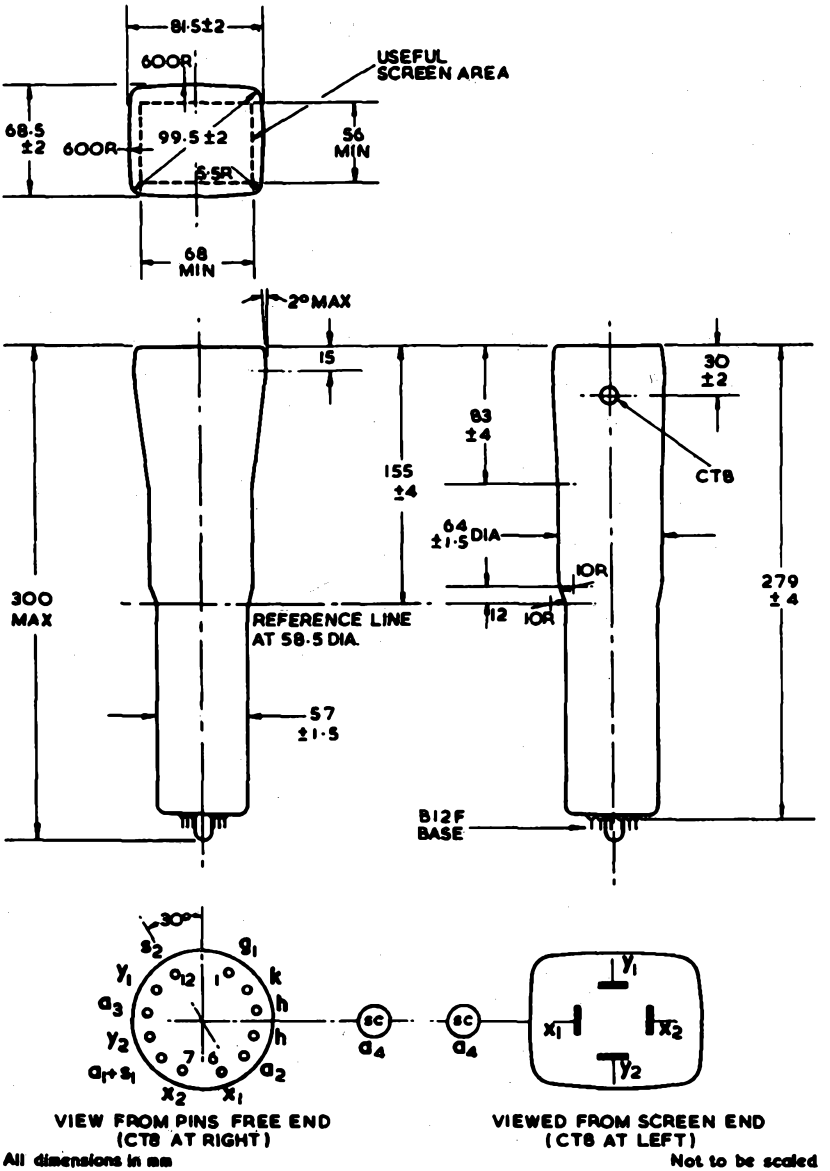
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) - 700 g.

MOUNTING Position unrestricted

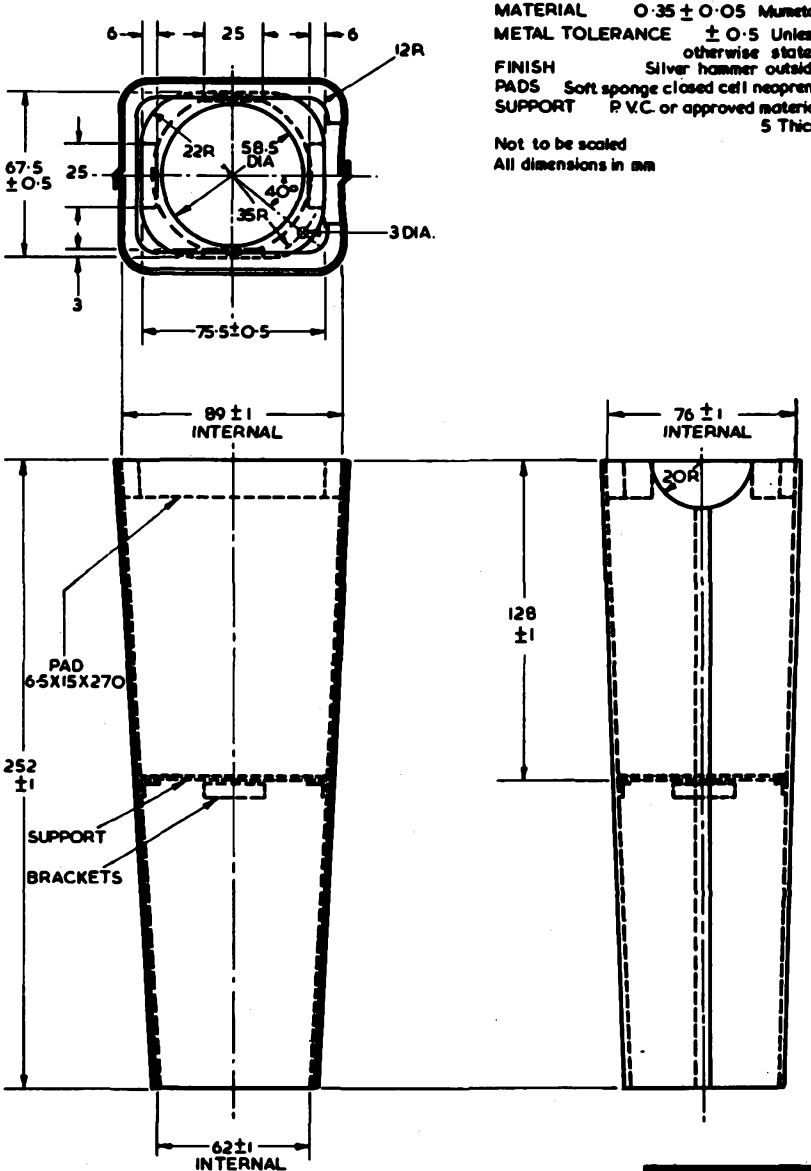
It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.


81·5±2
600R
USEFUL SCREEN AREA
68·5 ±2
600R
99·5 ±2
56 MIN
2·5R
68 MIN
2° MAX
15
155 ±4
83 ±4
30 ±2
CTB
64 ±1·5 DIA
10R
12
10R
300 MAX
REFERENCE LINE AT 58·5 DIA.
279 ±4
57 ±1·5
B12F BASE
30°
VIEW FROM PINS FREE END (CTB AT RIGHT)
VIEWED FROM SCREEN END (CTB AT LEFT)
All dimensions in mm
Not to be scaled

Magnetic Shield MS 83

D10-293..

EXAMPLE OF TYPICAL SHIELD



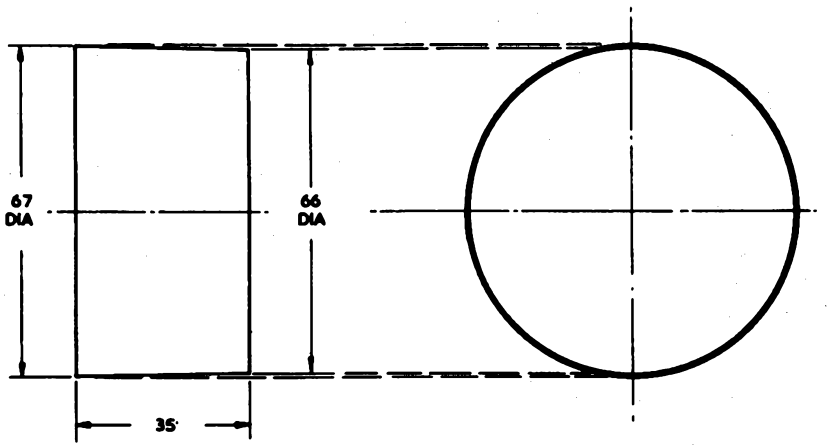
MATERIAL 0·35 ± 0·05 Mumetal
METAL TOLERANCE ± 0·5 Unless otherwise stated
FINISH Silver hammer outside
PADS Soft sponge closed cell neoprene
SUPPORT P.V.C. or approved material 5 Thick

Not to be scaled
All dimensions in mm

OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW56



All dimensions in mm Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS 83 for D10-293..

WINDING

900 turns of 0.125 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance 260 Ω ± 10 %. Twist coefficient approximately 8 mA/degree measured on typical D10-293.. with V_{a4} = 6 kV and V_{a1} = 1.0 kV.

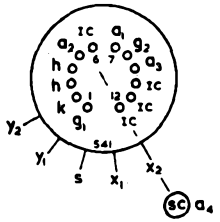
FITTING

The completed twist coil should be pushed hard onto the tube with the lead-out wires in the middle of the short side of the tube on the same side as the cavity cap and sealed to the tube with suitable adhesive tape.

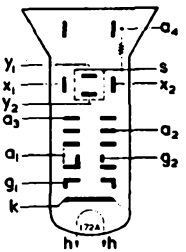
Oscilloscope Tube

D13-330H

Maintenance Type



Base B12F, Cap CT8



GENERAL

This 5 in. diagonal rectangular tube with electrostatic focusing and deflection is designed for medium bandwidth applications and is capable of being deflected by transistor circuits. It incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid. The standard phosphor is GH, but phosphor types GL, GM and BE are also available.

Heater Voltage	V_h	6·3	V
Heater Current	I_h	0·3	A

ABSOLUTE RATINGS

		Max	Min	
Fourth Anode Voltage	V_{a4}	7·0	2·5	kV
Third Anode Voltage	V_{a3}	1·75	0·6	kV
Second Anode Voltage	V_{a2}	1·0	0	kV
First Anode Voltage	V_{a1}	1·75	0·6	kV
Negative Control Grid Voltage	$-V_{g1}$	200	1·0	V
Beam Blanking Voltage	V_{g2}	2·0	0·5	kV
Peak x-plate to Third Anode Voltage	$v_{x-a3(pk)}$	500	—	V
Peak y-plate to Third Anode Voltage	$v_{y-a3(pk)}$	500	—	V
Peak Heater to Cathode Voltage	$v_{h-k(pk)}$	250	—	V
x-plate to Third Anode Resistance	R_{x-a3}	5·0	—	MΩ
y-plate to Third Anode Resistance	R_{y-a3}	100	—	kΩ
Control Grid to Cathode Resistance	R_{g1-k}	1·5	—	MΩ
Second Anode Current	I_{a2}	10	—	μA
P.D.A. Ratio (V_{a4}/V_{a3})		4 : 1		
Helix Resistance		—	50	MΩ

All voltages referred to cathode unless otherwise stated.

INTER-ELECTRODE CAPACITANCES

Grid to all	C_{g-all}	8·0	pF
Cathode to all	C_{k-all}	3·5	pF
x_1 plate to x_2 plate	C_{x1-x2}	1·2	pF
y_1 plate to y_2 plate	C_{y1-y2}	4·5	pF
x_1 plate to all less x_2 plate	$C_{x1-all,\ less\ x2}$	3·5	pF
x_2 plate to all less x_1 plate	$C_{x2-all,\ less\ x1}$	3·5	pF
y_1 plate to all less y_2 plate	$C_{y1-all,\ less\ y2}$	5·0	pF
y_2 plate to all less y_1 plate	$C_{y2-all,\ less\ y1}$	5·0	pF
Grid 1 and Cathode to x_1, x_2, y_1 and y_2 plates	$C_{g1,\ k-x1,\ x2,\ y1,\ y2}$	0·2	pF

BRIMAR

TYPICAL OPERATION—Voltages with respect to cathode.

Fourth Anode Voltage	V_{a4}	3·0	4·0	6·0	kV
Mean Deflector Plate Potential		750	1000	1500	V
Third Anode Voltage for astigmatism correction	V_{a3}	750*	1000*	1500*	V
Second Anode Voltage for focus	V_{a2}	50 to 200	75 to 275	100 to 400	V
First Anode Voltage	V_{a1}	750	1000	1500	V
Interplate shield voltage for optimum raster shape	V_s	750*	1000*	1500*	V
Beam Blanking Voltage for cut-off	V_{g2}	700†	930†	1400†	V
Control Grid Voltage for cut-off	V_{g1}	−30 to −50	−40 to −70	−60 to −105	V
x-plate sensitivity	S_x	6·15 to 7·85	8·2 to 10·5	12·3 to 15·75	V/cm
y-plate sensitivity	S_y	7·8 to 10·1	10·5 to 13·5	15·75 to 20·3	V/cm
Minimum screen area (x × y)		10 × 6	10 × 6	10 × 6	cm²
Line Width at centre‡		0·5	0·45	0·4	mm
Line Width at edge‡		0·9	0·8	0·8	mm

* The required voltage will not differ from the quoted value by more than ±50 V.

† The beam is unblanked when $V_{g2} - V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

‡ At 5·0μA beam current.

Raster Distortion and Alignment

The total scanned area is 10 cm × 6 cm measured from the centre of the tube face. Raster distortion will not be greater than 2%. The edges of a test raster will fall between two concentric rectangles 10 cm × 6 cm and 9·8 cm × 5·8 cm. Rectangularity of x and y axes is 90°±1°.

The horizontal trace will be parallel with the axes of the rectangular face-plate to within ±5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 90 mm from the face and should not extend more than 175 mm from the face. 34 ampere turns will suffice, with provision for reversing the current if necessary.

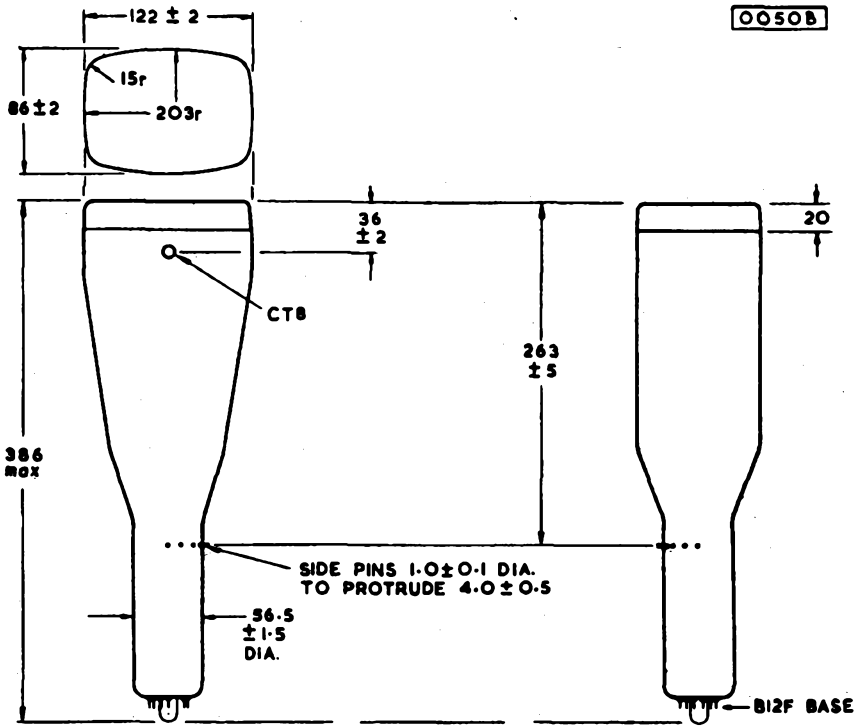
Magnetic Shielding

Adequate magnetic shielding is required. In addition, due attention should be paid to the position of the tube relative to transformers and chokes.

Approximate Net Tube Weight—0·9 kg (1 lb 15 oz)

Oscilloscope Tube

D13-330H



VIEW FROM PINS FREE END

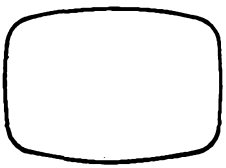
VIEWED FROM SCREEN END
(CT8 AT TOP)

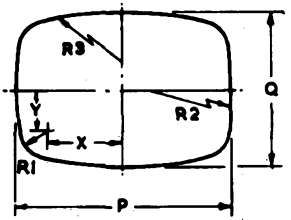
Tolerance on all side pin positions ±5°

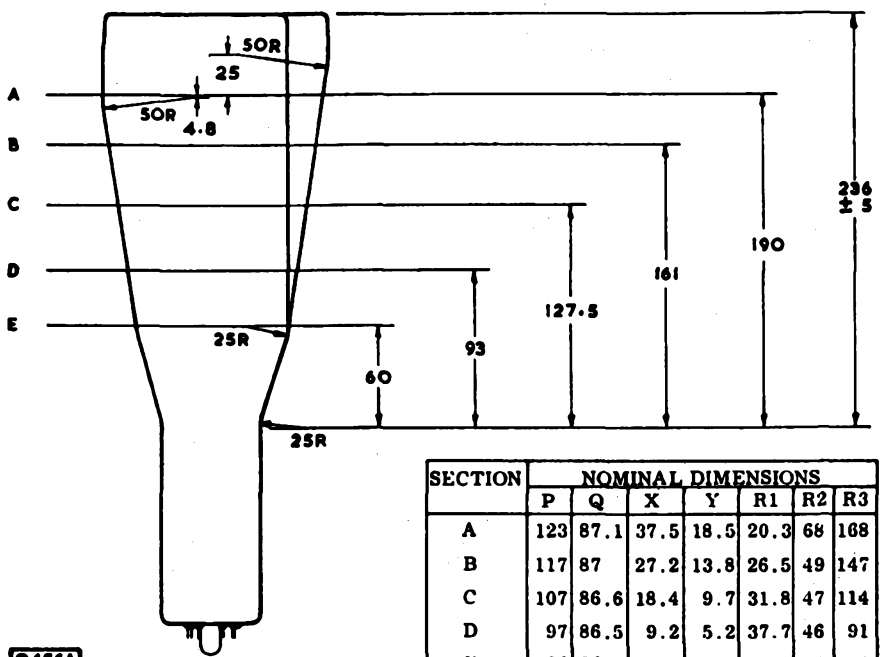
All dimensions in mm. Third angle projection. Not to be scaled.

Mounting Position—Unrestricted

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.







SECTION	NOMINAL DIMENSIONS						
	P	Q	X	Y	R1	R2	R3
A	123	87.1	37.5	18.5	20.3	68	168
B	117	87	27.2	13.8	26.5	49	147
C	107	86.6	18.4	9.7	31.8	47	114
D	97	86.5	9.2	5.2	37.7	46	91
E	86	86	-	-	-	43	43

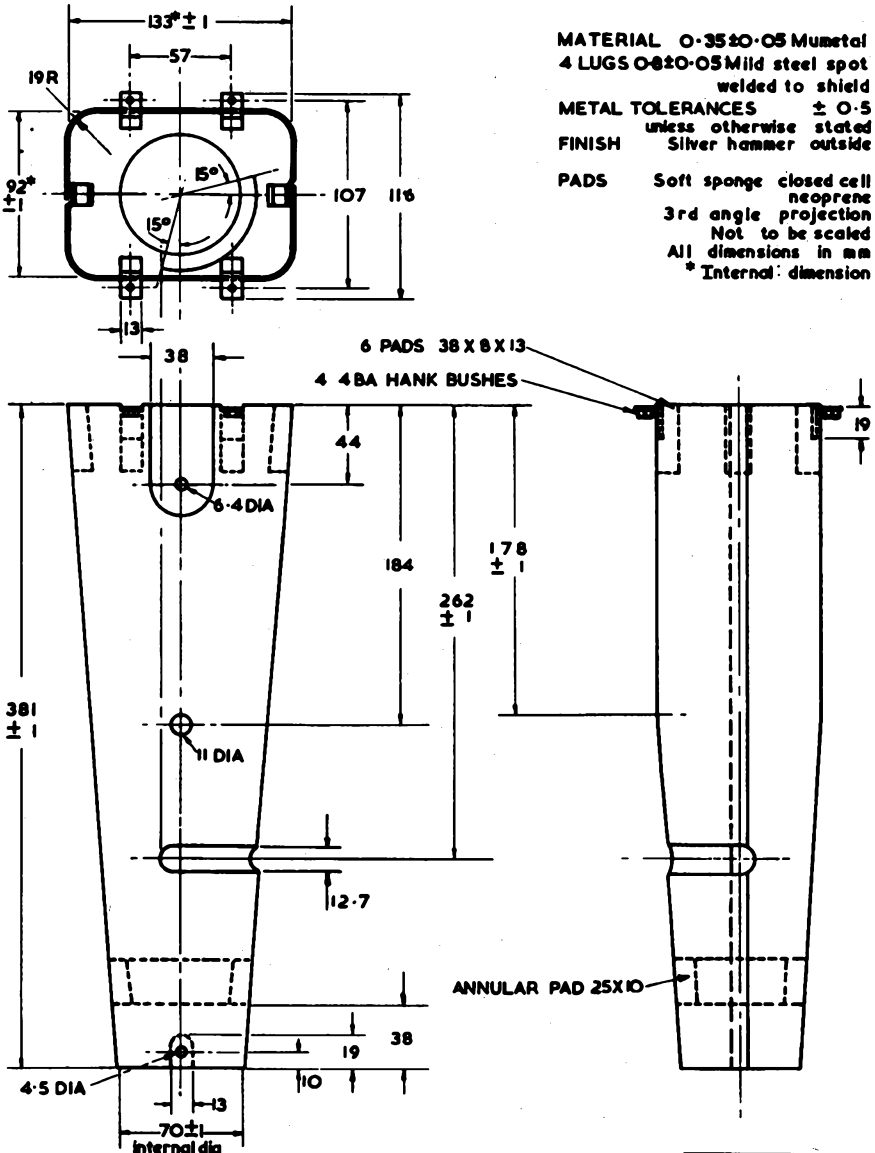
All dimensions in mm.

Not to be scaled.

Magnetic Shield MS27

D13-33..

EXAMPLE OF TYPICAL SHIELD



MATERIAL 0·35±0·05 Mumetal
4 LUGS 0·8±0·05 Mild steel spot welded to shield
METAL TOLERANCES ± 0·5 unless otherwise stated
FINISH Silver hammer outside

PADS Soft sponge closed cell neoprene

3rd angle projection
Not to be scaled
All dimensions in mm
* Internal dimension

OSCILLOSCOPE TUBES

BRIMAR

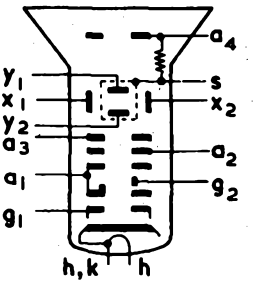
D13-47..

Oscilloscope Tube

GENERAL

This 5 inch diagonal rectangular tube with electrostatic focusing and deflection is designed for medium bandwidth applications and is capable of being deflected by transistor circuits. It incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater Voltage	V_h	6.3	V
Heater Current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	7.0	2.5	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		4 : 1		
Helix resistance		-	50	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D13-47GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

INTER-ELECTRODE CAPACITANCES

Grid to all	$c_{g1\text{-all}}$	10	pF
Grid 2 to all	$c_{g2\text{-all}}$	10	pF
Heater and cathode to all	$c_{h,k\text{-all}}$	4.0	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	2.1	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.6	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	7.0	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	6.7	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	5.0	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	5.0	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.8	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$c_{g1\text{-}x1,x2,y1,y2}$	1.3	pF
Grid 1 to Grid 2	$c_{g1\text{-}g2}$	0.6	pF

TYPICAL OPERATION - voltages with respect to cathode.

Fourth anode voltage	V_{a4}	3.0	4.0	6.0	kV
Mean deflector plate potential		750	1000	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	750*	1000*	1500*	V
Second anode voltage for optimum focus	V_{a2}	125 to 300	175 to 400	260 to 600	V
First anode voltage	V_{a1}	750	1000	1500	V
Shield voltage for optimum raster shape	V_s	750*	1000*	1500*	V
Beam blanking voltage for cut-off	V_{g2}	700†	935†	1400†	V
Control grid voltage for cut-off	V_{g1}	-25 to -50	-35 to -65	-50 to -95	V
x deflection coefficient	D_x	10.5 to 13.2	14.5 to 17.5	21 to 26.2	V/cm
y deflection coefficient	D_y	5.0 to 6.2	6.7 to 8.3	10 to 12.5	V/cm
Minimum screen area		10 x 6	10 x 6	10 x 6	cm^2
Line width at centre } at 5 μA		0.5	0.45	0.4	mm
Line width at edge } beam current		0.9	0.8	0.8	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The total screen area is 10 cm x 6 cm measured about a point ± 3 mm from the centre of the tube face. The undeflected spot will fall in a circle of 6 mm radius about the centre of the tube face. The edges of a test raster will fall between two concentric rectangles 10 cm x 6 cm and 9.8 cm x 5.85 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 90 mm from the face and should not extend more than 175 mm from the face. 24 ampere turns will suffice, with provision for reversing the current if necessary.

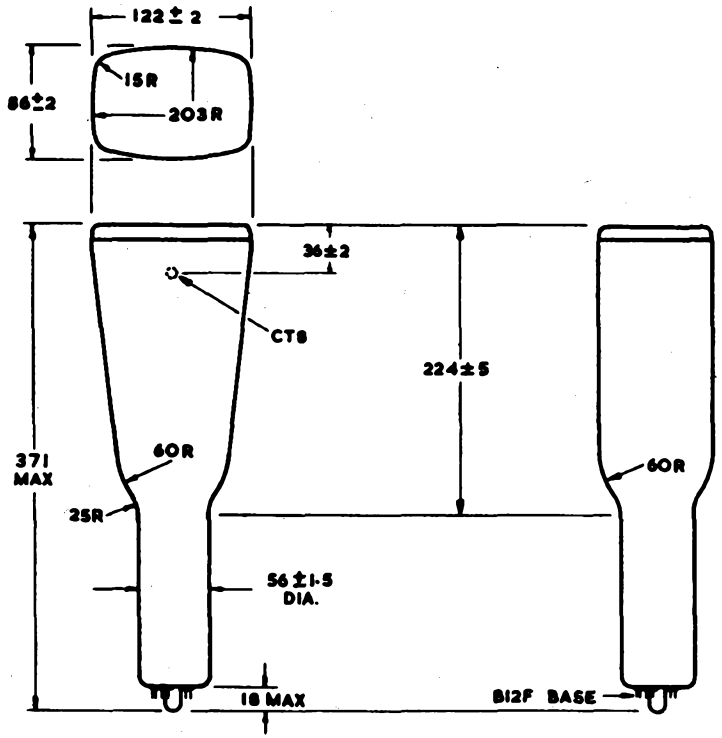
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under any circumstances the mean y plate potential should never differ from the mean x plate potential by more than 50V when the tube is operated at 4 kV.

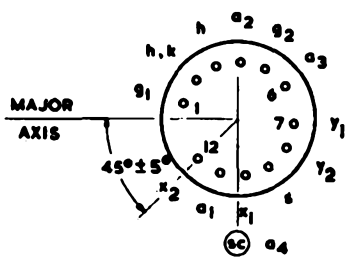
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

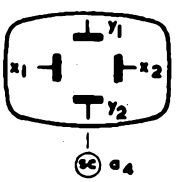
TUBE WEIGHT (approximate) - 960 g

MOUNTING POSITION unrestricted.





VIEW FROM PINS FREE END
(CT8 AT BOTTOM)

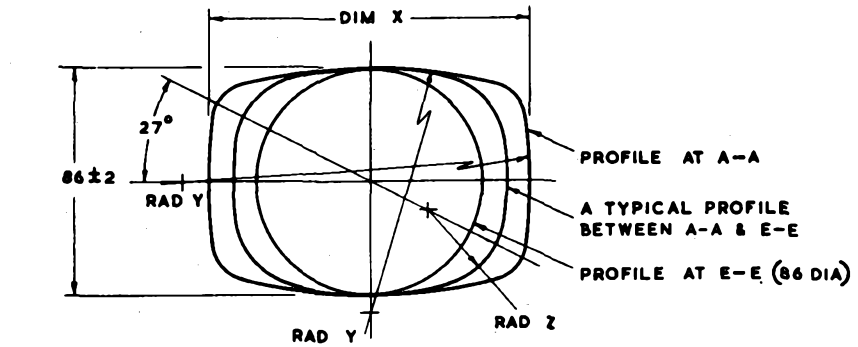


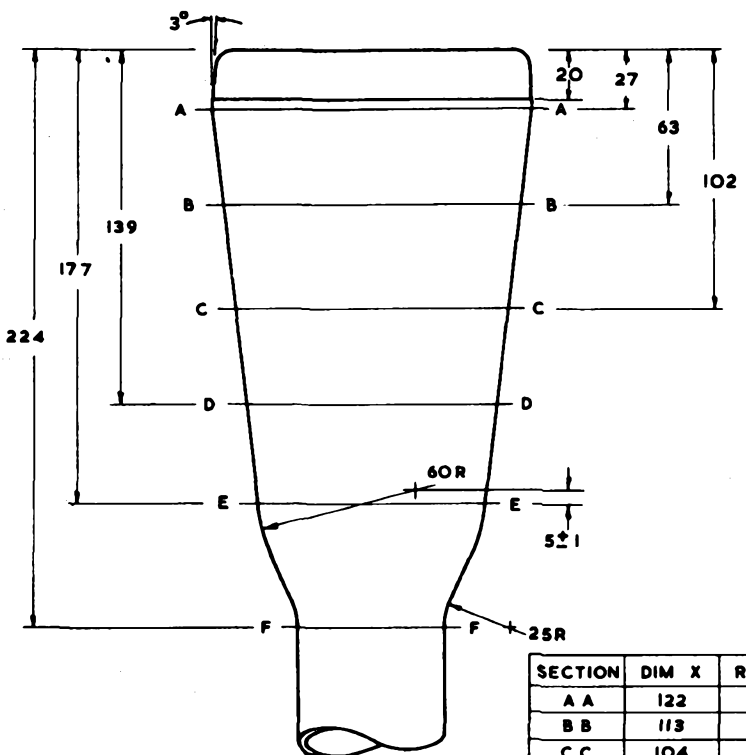
VIEWED FROM SCREEN END
(CT8 AT BOTTOM)

All dimensions in mm Third angle projection Not to be scaled

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

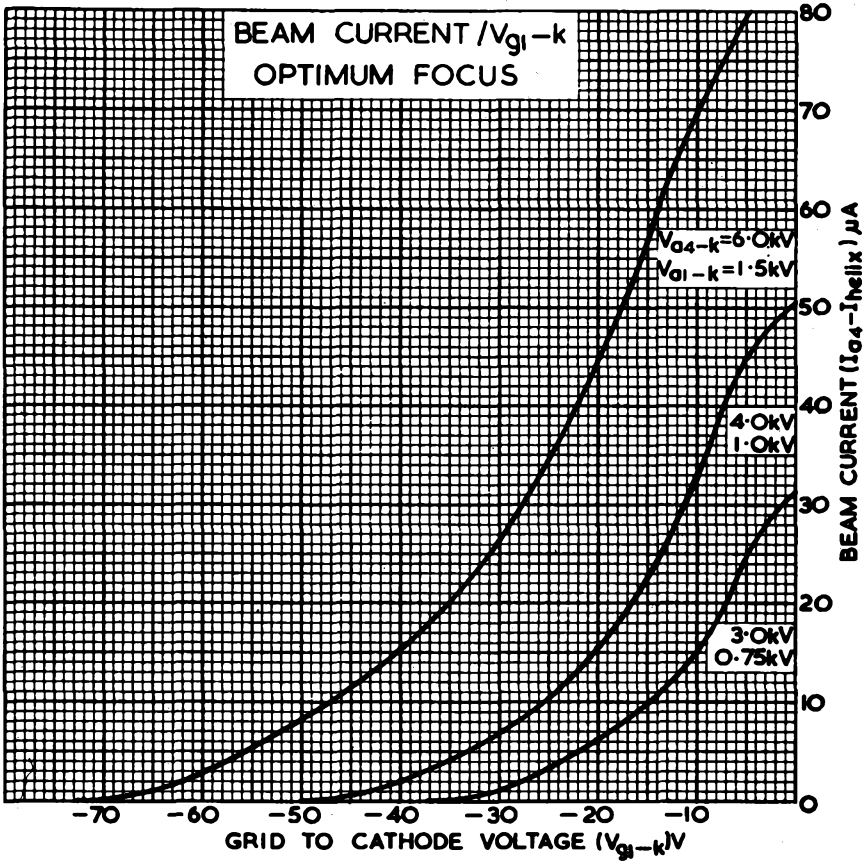
Oscilloscope Tube

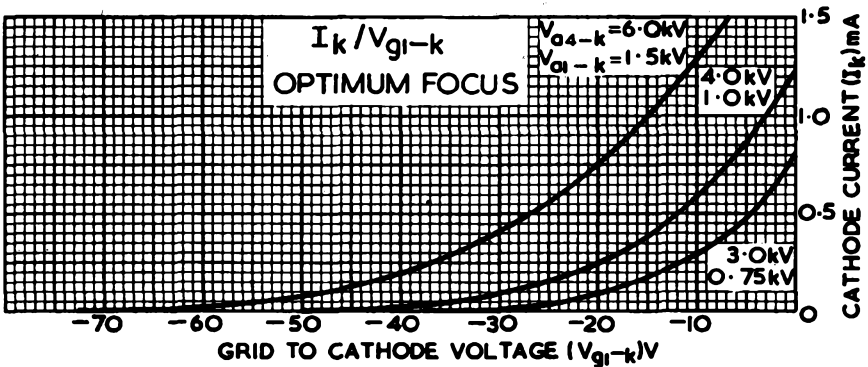




SECTION	DIM X	RAD Y	RAD Z
A A	122	203	15
B B	113	163	22
C C	104	123	29
D D	95	83	36
E E	86	43	43
F F	56	28	28

All dimensions in mm Third angle projection Not to be scaled

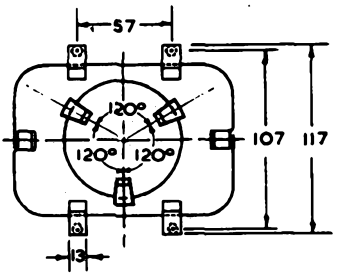

BEAM CURRENT / V_{g1-k}
OPTIMUM FOCUS
V_{a4-k}=6·0kV
V_{a1-k}=1·5kV
4·0kV
1·0kV
3·0kV
0·75kV
BEAM CURRENT (I_{a4}-I_{helix}) μA
0
10
20
30
40
50
60
70
80
−70
−60
−50
−40
−30
−20
−10
GRID TO CATHODE VOLTAGE (V_{g1-k})V

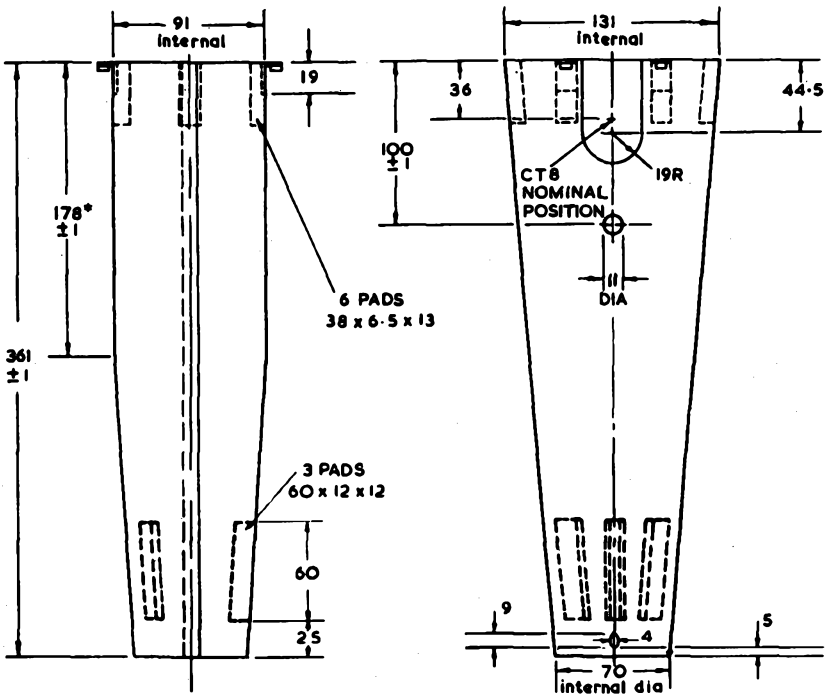

I_k / V_{g1-k}
OPTIMUM FOCUS
V_{a4-k}=6·0kV
V_{a1-k}=1·5kV
4·0kV
1·0kV
3·0kV
0·75kV
CATHODE CURRENT (I_k)mA
0
0·5
1·0
1·5
−70
−60
−50
−40
−30
−20
−10
GRID TO CATHODE VOLTAGE (V_{g1-k})V

Magnetic Shield MS23

MATERIAL 0·35 ±0·05 Mumetal
4 LUGS 0·8 ±0·05 Mild steel spotwelded to shield
Each lug has M4 or 4BA hank bushes fitted
METAL TOLERANCES ± 0·5 Unless otherwise stated
FINISH Silver hammer outside

PADS Soft sponge closed cell neoprene
All dimensions in mm
Not to be scaled



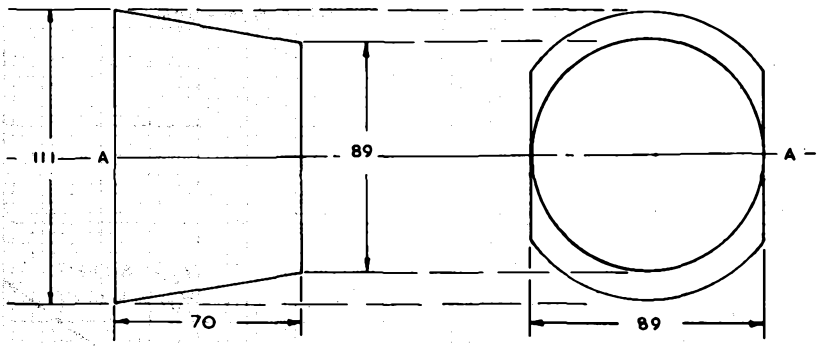


* Dimensions at this length are 92 outside x 102 outside with approx. 30R.

BRIMAR

Tube Coil TW 30 D13-47..

MANDREL FOR TWIST COIL TW 30



All dimensions in mm

Not to be scaled

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS23 for D13-47..

WINDING

1150 turns of 0.16 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.

Start and finish of winding to be brought out on 450 mm long thin flexible lead wires at position A.

Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

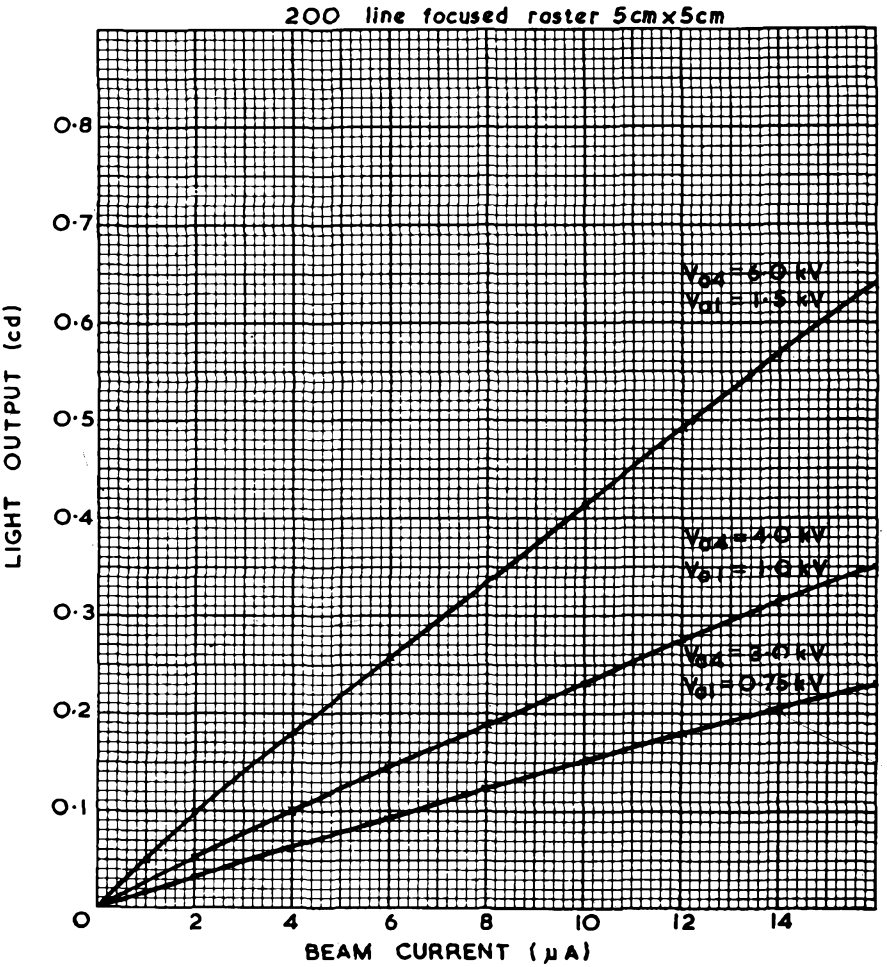
ELECTRICAL CHARACTERISTICS

Resistance approx. 300 Ω. Twist coil coefficient approx. 4.5 mA/degree measured on a typical D13-47.. with V_{a1} = 1.5kV V_{a4-k} = 6 kV.

FITTING

The completed twist coil should be pushed hard onto the tube with the lead out wires coming out through the appropriate hole in the shield and secured in two places with suitable adhesive tape.

TYPICAL LIGHT OUTPUT
GH/P31 PHOSPHOR SCREEN



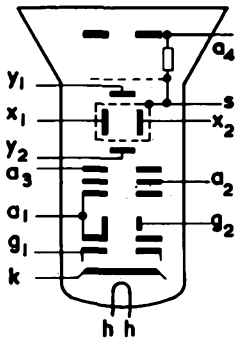
Oscilloscope Tube

D13-51..

GENERAL

This is a short, rectangular, aluminised, all electrostatic tube providing a 10 cm x 6 cm display. High brightness and deflection sensitivity are achieved with a mesh p.d.a. system without additional electrode control voltages. The tube is designed for transistor deflection high bandwidth applications and incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	.A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	15.5	5.0	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak heater to cathode voltage	$v_{h-k(pk)}$	250	-	V
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x-plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y-plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		11:1	5:1	
Helix resistance		-	100	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D13-51GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

OSCILLOSCOPE TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-all}}$	9.5	pF
Grid 2 to all	$C_{g2\text{-all}}$	8.9	pF
Heater and cathode to all	$C_{h,k\text{-all}}$	4.0	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	1.8	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.7	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	4.1	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	4.1	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	2.8	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	2.8	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{ - }y1,y2}$	0.5	pF
Grid 1 to grid 2	$C_{g1\text{-}g2}$	0.6	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,x2,y1,y2}$	0.012	pF

TYPICAL OPERATION - Voltages with respect to cathode

Fourth anode voltage	V_{a4}	7.5	10	15	kV
Mean deflector plate potential		750	1000	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	750*	1000*	1500*	V
Second anode voltage for optimum focus	V_{a2}	20 to 130	30 to 150	45 to 230	V
First anode voltage	V_{a1}	750	1000	1500	V
Shield voltage for optimum raster shape	V_s	750*	1000*	1500*	
Beam blanking voltage for cut-off	V_{g2}	710 to 790†	955 to 1045†	1435 to 1565†	V
Control grid voltage for cut-off	V_{g1}	-37 to -68	-50 to -90	-75 to -135	V
x deflection coefficient	D_x	8.2 to 11.3	11 to 15	16.5 to 22.5	V/cm
y deflection coefficient	D_y	3.4 to 4.5	4.5 to 6.0	6.8 to 9.0	V/cm
Minimum useful screen area		10 x 6	10 x 6	10 x 6	cm^2
Line width at centre (at 5μA beam current)		0.65	0.6	0.55	mm
Line width at edge (at 5μA beam current)		1.1	1.05	1.0	mm
Line width at centre measured by shrinking raster (at 5μA beam current)		0.40	0.34	0.30	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 6 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 10 cm x 6 cm and 9.80 cm x 5.85 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 90 mm from the face and should not extend more than 150 mm from the face. 45 ampere turns for 10 kV operation or 54 ampere turns for 15 kV operation will suffice, with provision for reversing the current if necessary. The sensitivity (for both x and y plates) at 75% deflection of the useful scan shall not differ by more than 2% from the sensitivity over 10% deflection.

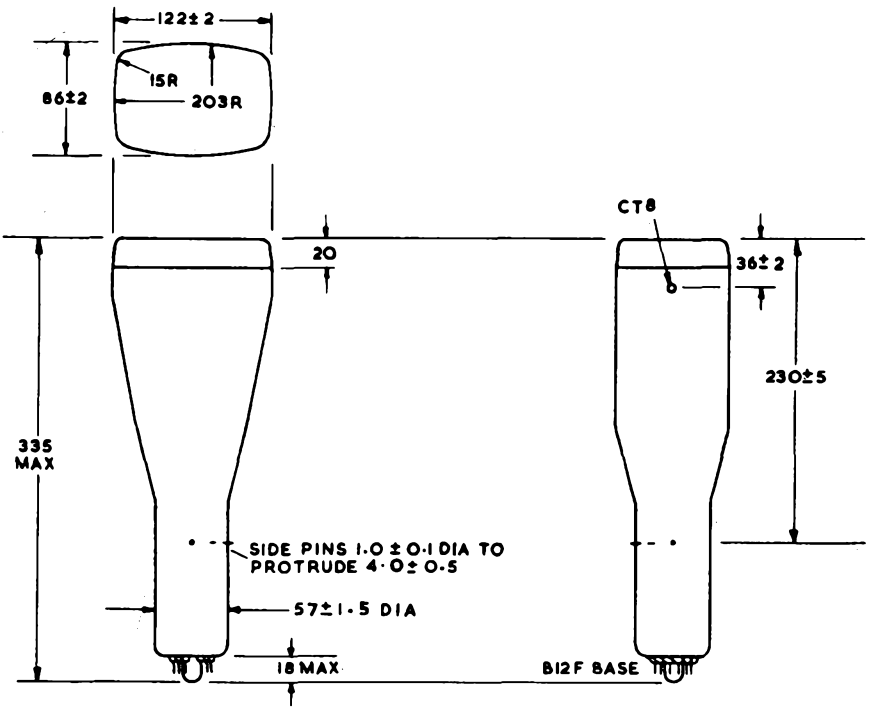
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

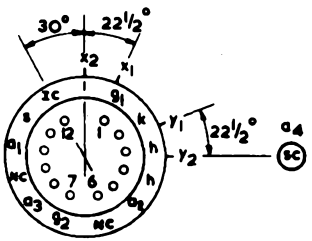
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

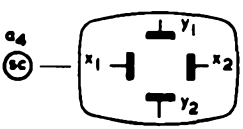
TUBE WEIGHT (approximate) - 880 g

MOUNTING POSITION - unrestricted





VIEW FROM PINS FREE END
(CT8 AT RIGHT)



VIEWED FROM SCREEN END
(CT8 AT LEFT)

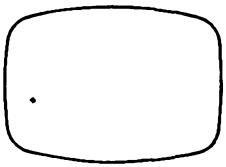
All dimensions in mm **Not to be scaled**

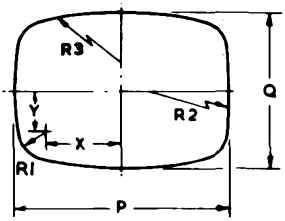
It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

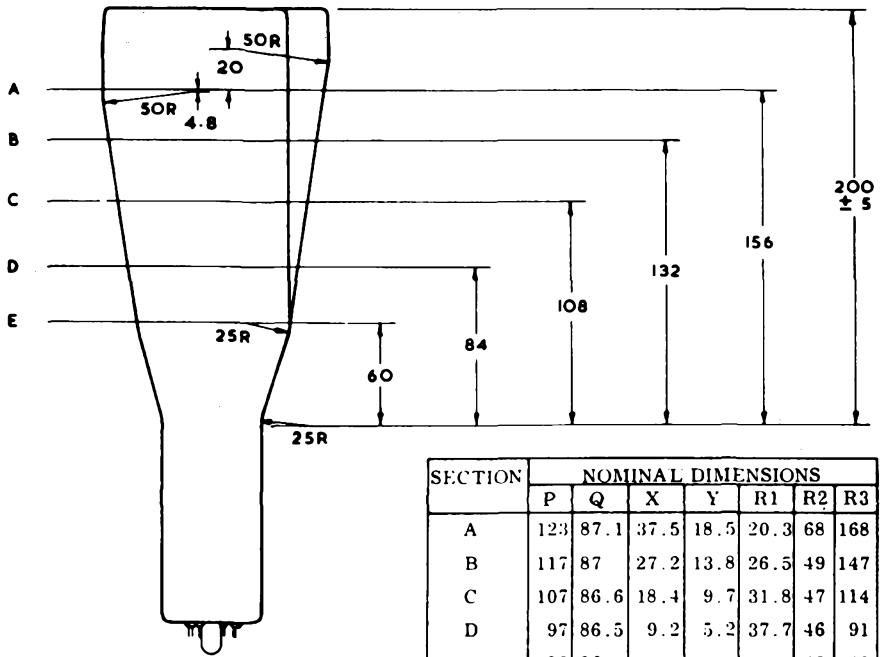
Tolerance on all side pin positions ± 5°.

Oscilloscope Tube

D13-51..





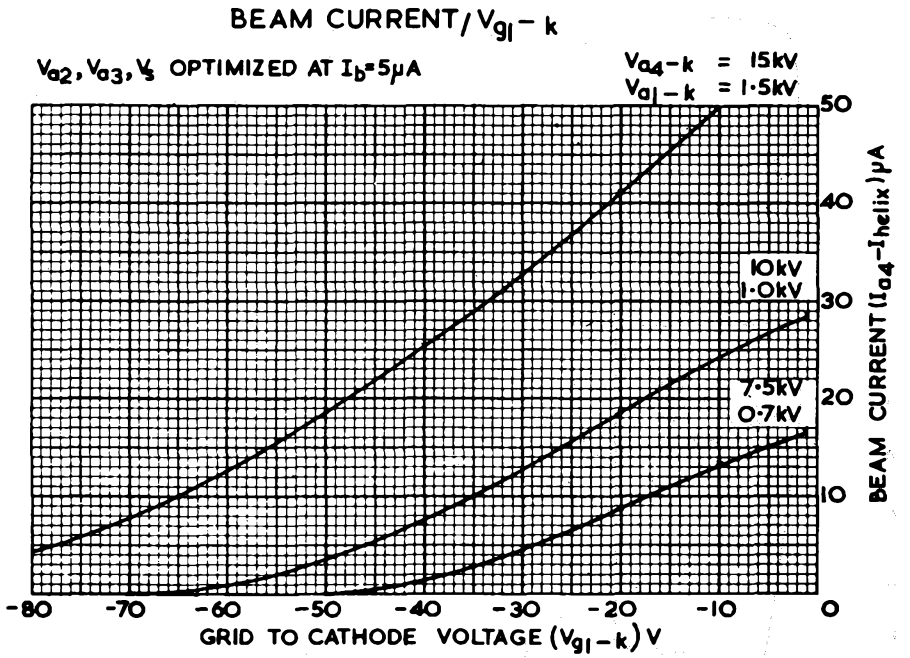


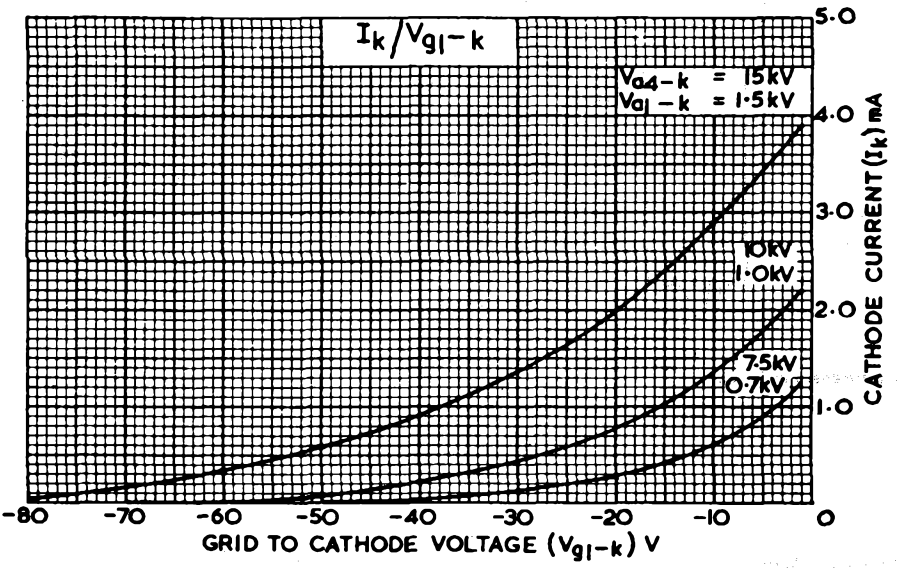
SECTION	NOMINAL DIMENSIONS						
	P	Q	X	Y	R1	R2	R3
A	123	87.1	37.5	18.5	20.3	68	168
B	117	87	27.2	13.8	26.5	49	147
C	107	86.6	18.4	9.7	31.8	47	114
D	97	86.5	9.2	5.2	37.7	46	91
E	86	86	-	-	-	43	43

All dimensions in mm

Not to be scaled

OSCILLOSCOPE TUBES

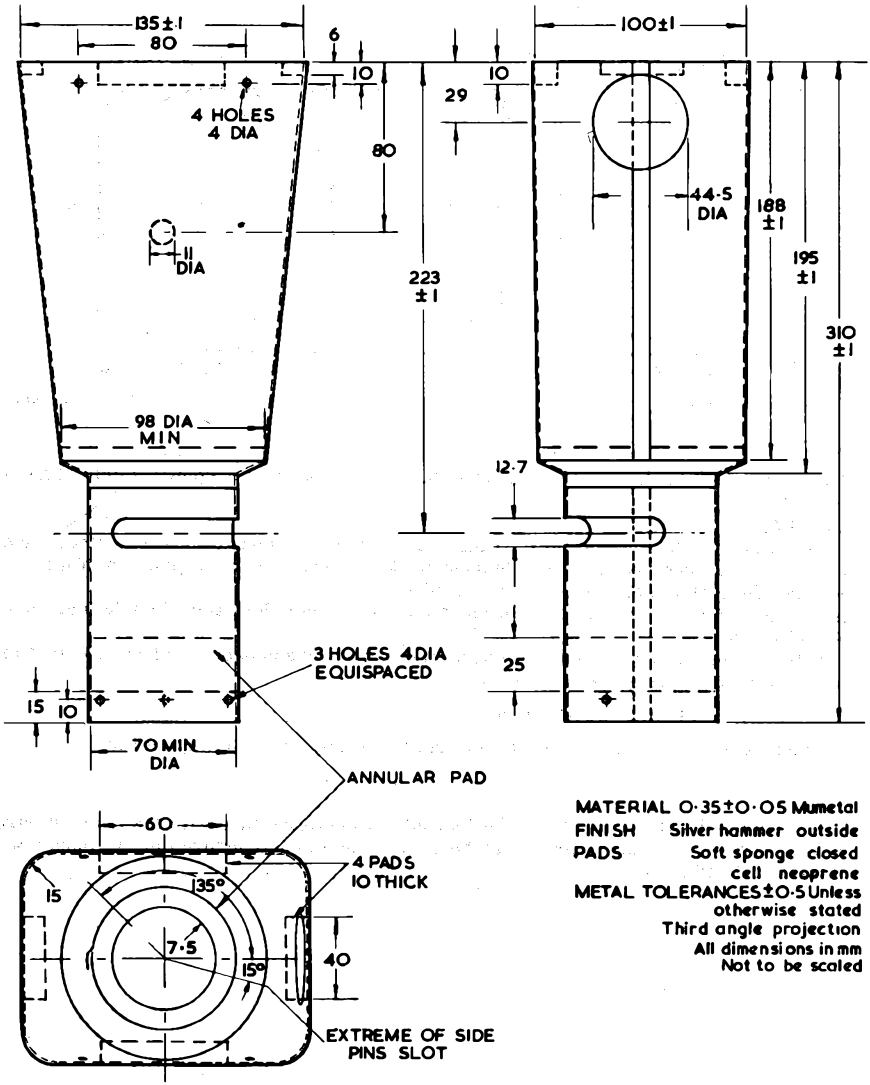

BEAM CURRENT / V_{g1-k}
V_{a2}, V_{a3}, V_s OPTIMIZED AT I_b=5μA
V_{a4-k} = 15kV
V_{g1-k} = 1·5kV
10kV
1·0kV
7·5kV
0·7kV
50
40
30
20
10
BEAM CURRENT ($I_{a4}-I_{helix}$) μA
-80 -70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g1-k}) V


I_k / V_{g1-k}
V_{a4-k} = 15kV
V_{g1-k} = 1·5kV
10kV
1·0kV
7·5kV
0·7kV
5·0
4·0
3·0
2·0
1·0
CATHODE CURRENT (I_k) mA
-80 -70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g1-k}) V

Magnetic Shield MS36

D13-51..

EXAMPLE OF TYPICAL SHIELD



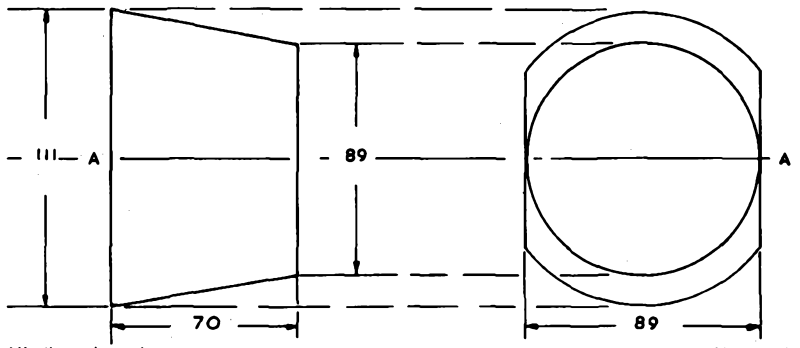
MATERIAL 0·35±0·05 Mumetal
FINISH Silver hammer outside
PADS Soft sponge closed cell neoprene
METAL TOLERANCES ±0·5 Unless otherwise stated
Third angle projection
All dimensions in mm
Not to be scaled

OSCILLOSCOPE TUBES

BRIMAR

Tube Coil TW21

MANDREL FOR TWIST COIL TW21



All dimensions in mm

Not to be scaled

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS36 for D13-51..

WINDING

1150 turns of 0.2 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.

Start and finish of winding to be brought out on 450 mm long thin flexible lead wires at position A.

Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 215 Ω. Twist coil coefficient approx. 7.0 mA/degree.

FITTING

The completed twist coil should be pushed hard onto the tube with the lead out wires coming out through the appropriate hole in the shield and secured in two places with suitable adhesive tape.

BRIMAR

Oscilloscope Tube D13-471..

The D13-471.. oscilloscope tube has a 6.3 V 0.12 A heater otherwise it is identical to the D13-47..

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D13-471GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

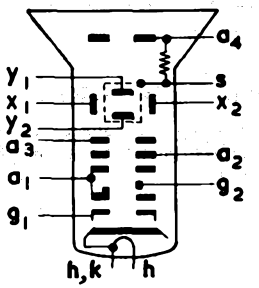
BRIMAR

D13-600.. Oscilloscope Tube

GENERAL

This short 5 inch diameter flat-faced tube with electrostatic focusing and deflection is designed for general purpose applications and is capable of being deflected by transistor circuits. It incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	4.0	1.5	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x-plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y-plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		2.2:1		
Helix resistance		-	15	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D13-600GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-all}}$	9.5	pF
Grid 2 to all	$C_{g2\text{-all}}$	10	pF
Heater and cathode to all	$C_{h,k\text{-all}}$	3.5	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	2.2	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.6	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	6.3	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	6.3	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	5.2	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	5.0	pF
x_1, x_2 plate to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	0.8	pF
Grid 1 to grid 2	$C_{g1\text{-}g2}$	0.6	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,x2,y1,y2}$	1.4	pF

TYPICAL OPERATION - voltages with respect to cathode.

Fourth anode voltage	V_{a4}	2.0	3.0	kV
Mean deflector plate potential		1000	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1000*	1500*	V
Second anode voltage for optimum focus	V_{a2}	200 to 340	300 to 500	V
First anode voltage	V_{a1}	1000	1500	V
Shield voltage for optimum raster shape	V_s	1000*	1500*	V
Beam blanking voltage for cut-off	V_{g2}	935†	1405†	V
Control grid voltage for cut-off	V_{g1}	-35 to -65	-50 to -95	V
x-deflection coefficient	D_x	14 to 18	21 to 27	V/cm
y-deflection coefficient	D_y	6.6 to 8.5	10 to 12.7	V/cm
Minimum screen area (corners cut-off)		10 x 8	10 x 8	cm^2
Line width at centre-using microscope	at 10μA beam current	0.55	0.5	mm
Line width at edge-using microscope		0.85	0.82	mm
Line width at centre measured by shrinking raster		0.28	0.25	mm

* The required voltage will not differ from the quoted value by more than ± 75V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 6 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.75 cm x 7.8 cm.

Rectangularity of x and y axes is 90° ± 1°.

It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

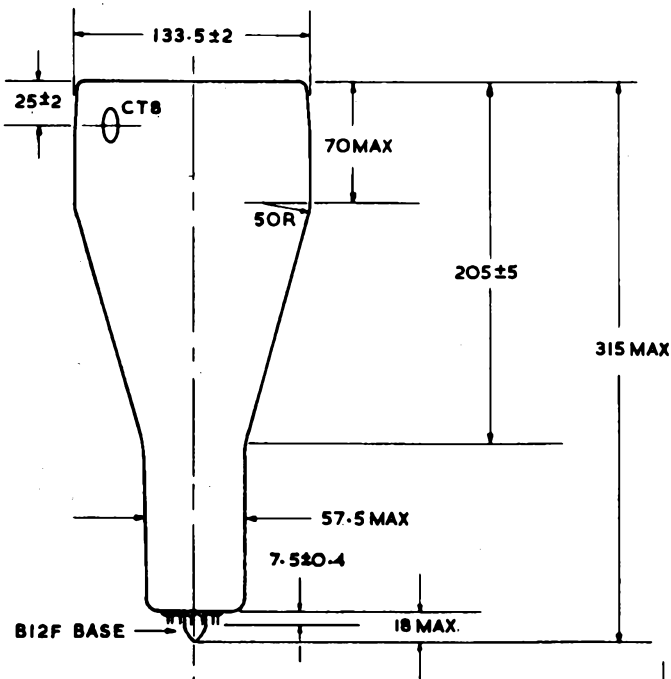
Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

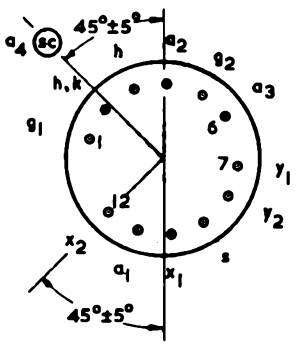
TUBE WEIGHT (approximate) 950g

MOUNTING POSITION - unrestricted

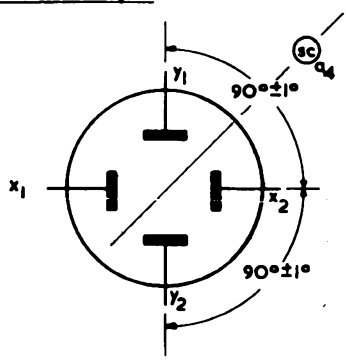
Oscilloscope Tube

D13-600..





VIEWED FROM PINS FREE END



VIEWED FROM SCREEN END

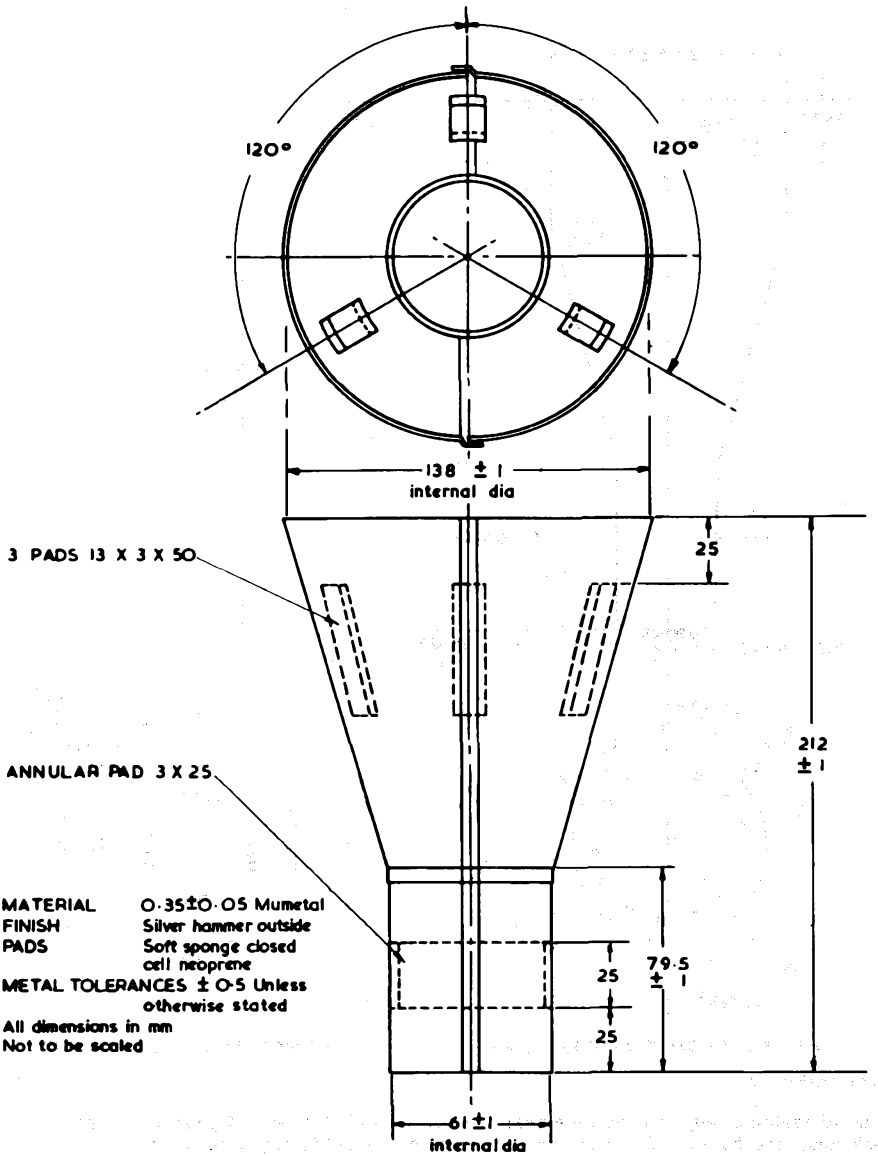
All dimensions in mm

Not to be scaled

It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

Connecting leads should not be soldered directly to the tube pins.

EXAMPLE OF TYPICAL SHIELD



Oscilloscope Tube

D13-601..

The D13-601.. oscilloscope tube has a 6.3 V 0.12A heater otherwise it is identical to the D13-600..

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D13-601GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

BRIMAR

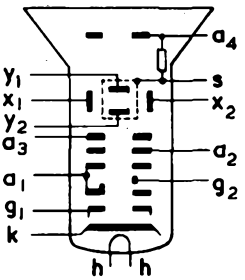
D13-610..

Oscilloscope Tube

GENERAL

This 13 cm diameter round tube with electrostatic focusing and deflection is designed for medium bandwidth applications and is capable of being deflected by transistor circuits. It incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater Voltage	V_h	6.3	V
Heater Current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	7.0	2.5	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3} nom.)		4:1		
Helix resistance		-	50	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D13-610GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

INTER-ELECTRODE CAPACITANCES

Grid to all	$c_{g1\text{-all}}$	10	pF
Grid 2 to all	$c_{g2\text{-all}}$	9.0	pF
Cathode to all	$c_{k\text{-all}}$	3.5	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	2.8	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	2.0	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	5.7	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	5.6	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	4.7	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	4.5	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.7	pF
Grid 1 to x_1, x_2 plates	$c_{g1\text{-}x1,x2}$	0.5	pF
Grid 1 to y_1, y_2 plates	$c_{g1\text{-}y1,y2}$	0.5	pF
Grid 1 to Grid 2	$c_{g1\text{-}g2}$	0.6	pF

TYPICAL OPERATION - voltages with respect to cathode.

Fourth anode voltage	V_{a4}	3.0	4.0	4.5	kV
Mean deflector plate potential		1.0	1.0	1.5	kV
Third anode voltage for optimum astigmatism correction	V_{a3}	1.0*	1.0*	1.5*	V
Second anode voltage for optimum focus	V_{a2}	170 to 380	175 to 400	255 to 570	V
First anode voltage	V_{a1}	1.0	1.0	1.5	kV
Shield voltage for optimum raster shape	V_s	1.0*	1.0*	1.5*	kV
Beam blanking voltage for cut-off	V_{g2}	935†	935†	1400†	V
Control grid voltage for cut-off	V_{g1}	-35 to -65	-35 to -65	-50 to -95	V
x deflection coefficient	D_x	12.5 to 15.8	14.5 to 17.5	18.8 to 23.7	V/cm
y deflection coefficient	D_y	6.8 to 8.7	7.1 to 8.9	10.2 to 13.1	V/cm
Minimum screen area (corners cut-off)		10 x 8	10 x 6	10 x 8	cm^2
Line width at 10μA beam current Shrinking raster measurement at centre		.39	.36	.33	mm
Shrinking raster measurement at edge		.48	.50	.44	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 8 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.75 cm x 7.8 cm at a p.d.a. ratio of 3:1.

Rectangularity of x and y axes is 90° ± 1°.

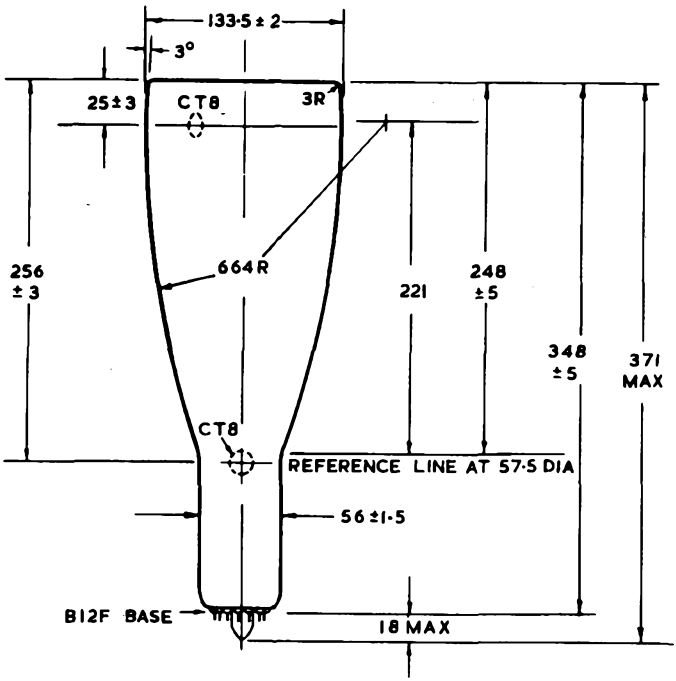
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

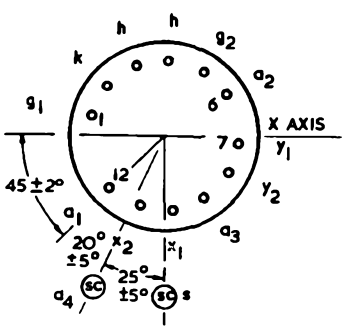
MAGNETIC SHIELDING

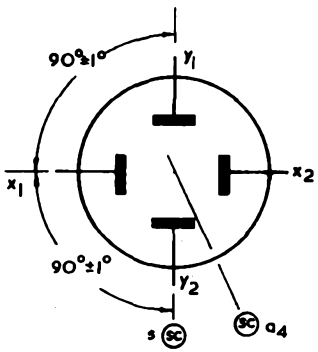
Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) 1.2 kg

MOUNTING POSITION - unrestricted







All dimensions in mm

Not to be scaled

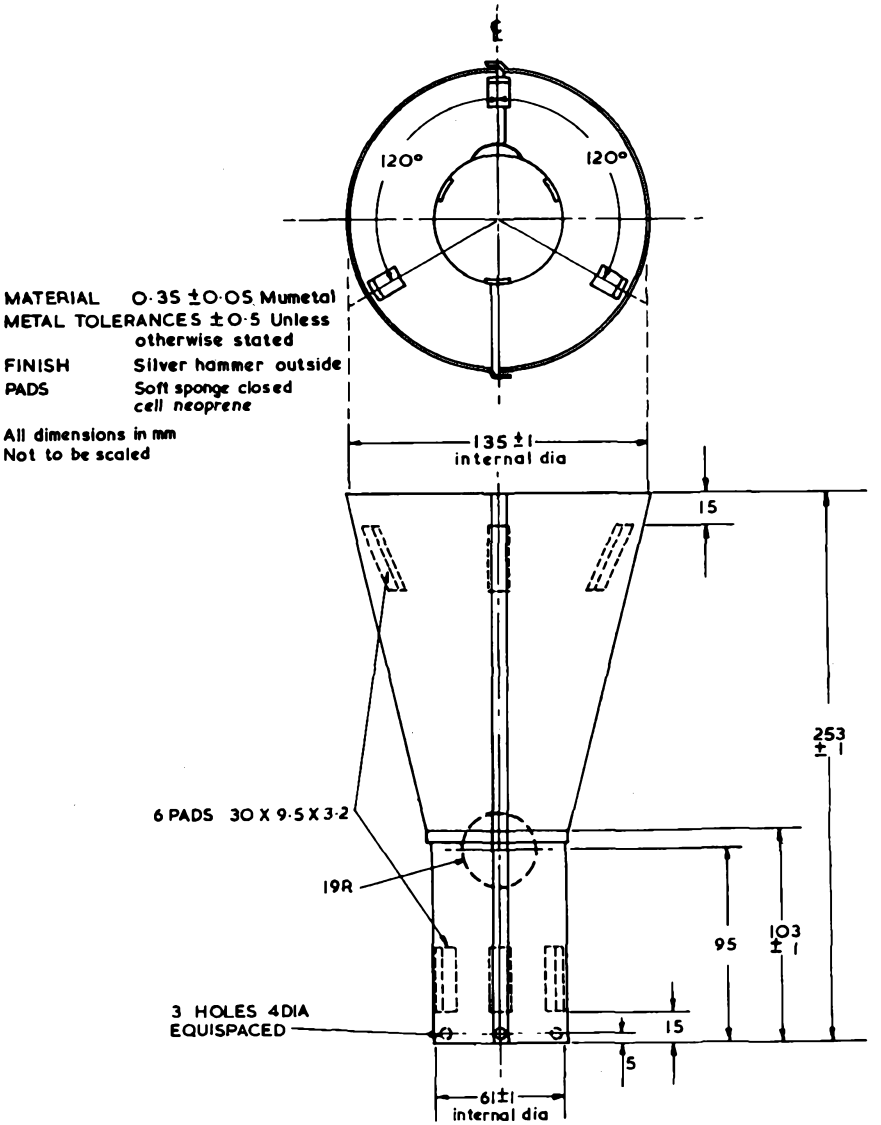
It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

Connecting leads should not be soldered directly to the tube pins.

D13-610..

Magnetic Shield MS49

EXAMPLE OF TYPICAL SHIELD



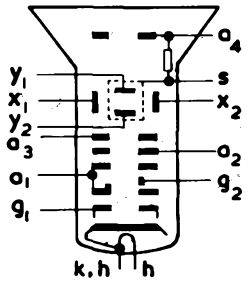
Oscilloscope Tube

D13-611..

GENERAL

This 13 cm diameter round tube with electrostatic focusing and deflection is designed for medium bandwidth applications and is capable of being deflected by transistor circuits. It incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater Voltage	V_h	6.3	V
Heater Current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	7.0	2.5	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	100	-	kΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3} nom.)		4:1		
Helix resistance		-	50	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D13-611GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-all}}$	10	pF
Grid 2 to all	$C_{g2\text{-all}}$	9.0	pF
Heater and Cathode to all	$C_{h,k\text{-all}}$	4.0	pF
x1 plate to x2 plate	$C_{x1\text{-}x2}$	2.0	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.4	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	6.1	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	5.8	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	4.6	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	4.8	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	0.6	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,x2,y1,y2}$	1.0	pF
Grid 1 to Grid 2	$C_{g1\text{-}g2}$	0.5	pF
Anode 4 to coating M (approx.)	$C_{a4\text{-}M}$	300	pF

TYPICAL OPERATION - voltages with respect to cathode.

Fourth anode voltage	V_{a4}	3.5	4.0	4.5	kV
Mean deflector plate potential		1.0	1.0	1.5	kV
Third anode voltage for optimum astigmatism correction	V_{a3}	1.0*	1.0*	1.5*	V
Second anode voltage for optimum focus	V_{a2}	170 to 380	175 to 400	255 to 570	V
First anode voltage	V_{a1}	1.0	1.0	1.5	kV
Shield voltage for optimum raster shape	V_s	1.0*	1.0*	1.5*	kV
Beam blanking voltage for cut-off	V_{g2}	935†	935†	1400†	V
Control grid voltage for cut-off	V_{g1}	-35 to -70	-35 to -70	-50 to -105	V
x deflection coefficient	D_x	14.1 to 16.9	14.5 to 17.5	18.8 to 23.7	V/cm
y deflection coefficient	D_y	7.0 to 8.9	7.1 to 8.9	10.2 to 13.1	V/cm
Minimum screen area (corners cut-off)		10 x 8	10 x 6	10 x 8	cm^2
Line width at 10μA beam current					
Shrinking raster measurement at centre		.37	.36	.33	mm
Shrinking raster measurement at edge		.48	.50	.44	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 7 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.75 cm and 7.8 cm at a p.d.a. ratio of 3.5 : 1.

Rectangularity of x and y axes is 90° ± 1 .

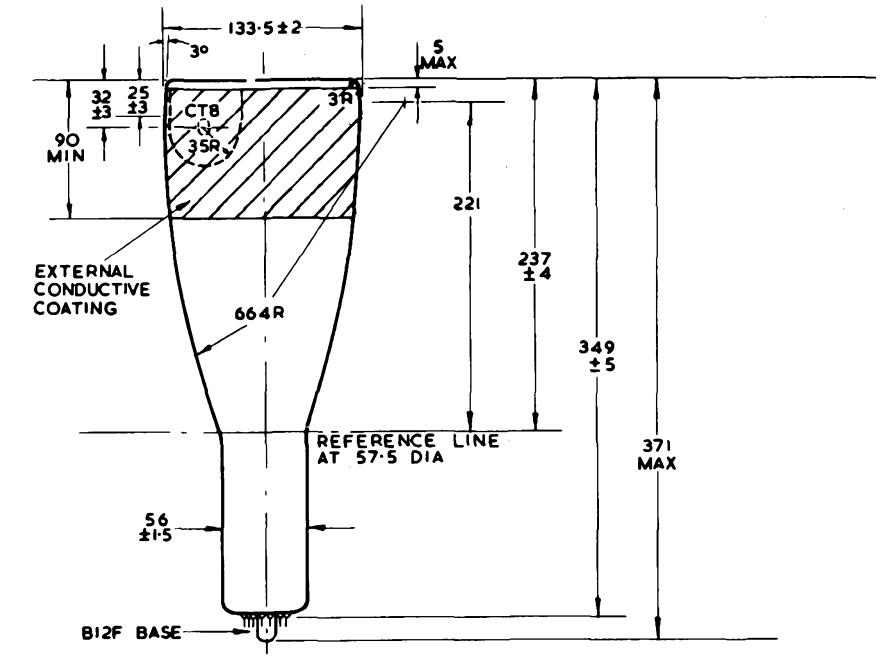
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

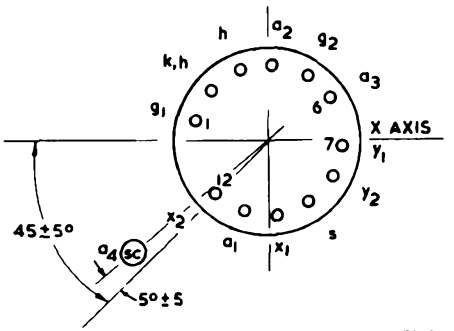
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

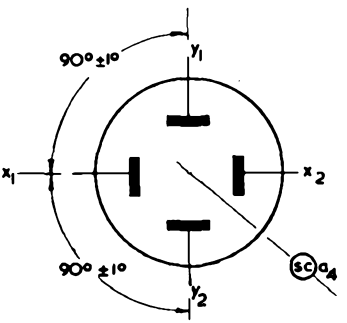
TUBE WEIGHT (approximate) 1.2 kg

MOUNTING POSITION - unrestricted





VIEWED FROM PINS FREE END



VIEWED FROM SCREEN END

All dimensions in mm

Not to be scaled

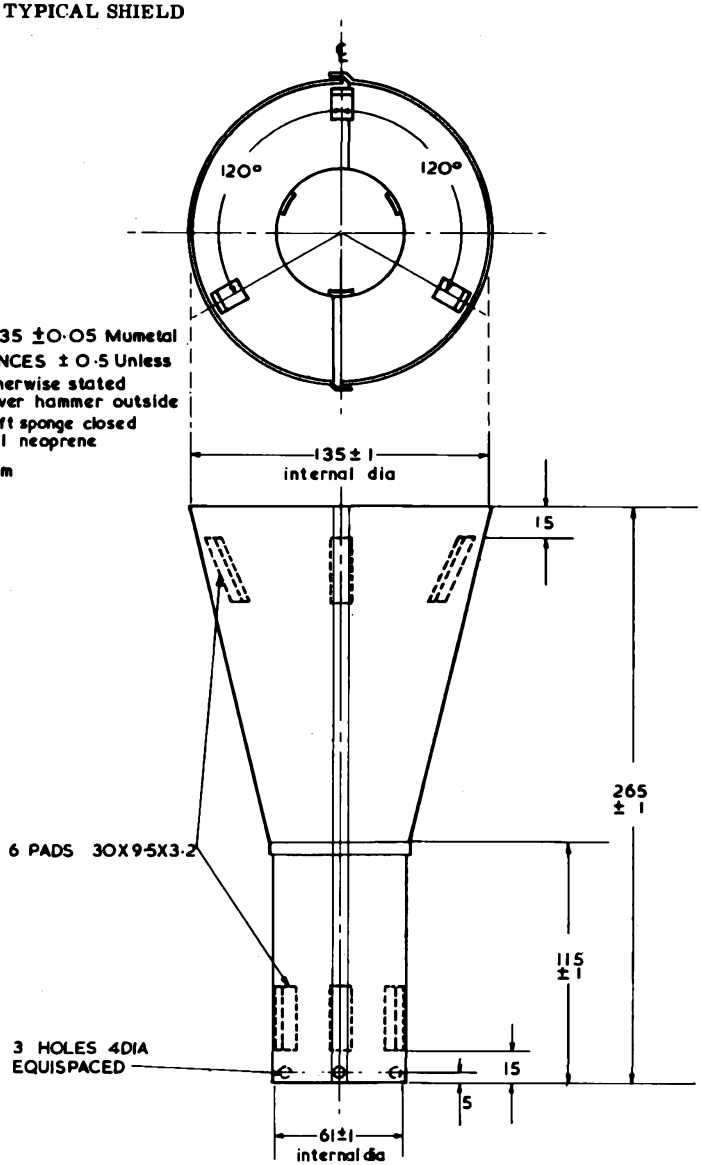
It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

Connecting leads should not be soldered directly to the tube pins.

Magnetic Shield MS 50

D13-611..

EXAMPLE OF TYPICAL SHIELD



MATERAL 0·35 ±0·05 Mumetal
METAL TOLERANCES ± 0·5 Unless otherwise stated
FINISH Silver hammer outside
PADS Soft sponge closed cell neoprene

All dimensions in mm
Not to be scaled

OSCILLOSCOPE TUBES

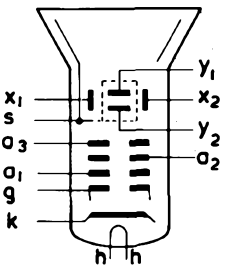
D13-630..

Oscilloscope Tube

GENERAL

This 13 cm diameter oscilloscope tube is primarily intended for use in inexpensive oscilloscopes and monitoring devices. The tube has sufficient deflector sensitivity to permit transistor driven deflection.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - voltages with respect to cathode

		Max	Min	
First anode voltage	V_{a1}	2200	1250	V
Second anode voltage	V_{a2}	800	-	V
Third anode voltage	V_{a3}	2250	1200	V
Negative grid voltage	$-V_g$	200	1.0	V
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
Heater to cathode voltage	V_{h-k}	± 125		V
x-plate to third anode resistance	R_{x-a3}	2.0	-	MΩ
y-plate to third anode resistance	R_{y-a3}	2.0	-	MΩ
Grid to cathode resistance	R_{g-k}	1.5	-	MΩ
Peak cathode current	$i_{k(pk)}$	500	-	μA

PHOSPHOR SCREEN

This tube is usually supplied with GH phosphor (D13-630GH) giving a green trace of medium short persistence. Other phosphors can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-all}}$	8.2	pF
Heater and cathode to all	$c_{h,k\text{-all}}$	2.3	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	1.7	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.3	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	5.0	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	4.8	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	3.6	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	3.7	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.7	pF

TYPICAL OPERATION - voltages with respect to cathode

Mean deflector plate potential*		1500	2000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1500 †	2000†	V
Second anode voltage for optimum focus	V_{a2}	125 to 220	170 to 290	V
First anode voltage	V_{a1}	1500	2000	V
Shield voltage for optimum raster shape	V_S	1500 †	2000†	V
Control grid voltage for cut-off	V_{g1}	-22 to -52	-30 to -70	V
x deflection coefficient	D_x	14.3 to 17.5	19 to 23	V/cm
y deflection coefficient	D_y	9.0 to 11.3	12.0 to 15.0	V/cm
Minimum useful screen area (Diagonal 11.4 cm)		10 x 8.0	10 x 8.0	cm^2
Grid drive to 10μA beam current (approx)		10	11	V
Line width at 10μA beam current Shrinking raster measurement at centre		0.40	0.35	mm

* This tube is designed for symmetrical operation.

† The required voltage will not differ from the quoted value by more than ± 30V.

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle of 7 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 8.5 cm x 7.0 cm and 8.3 cm x 6.88 cm.

Rectangularity of x and y axes is 90° ± 1°.

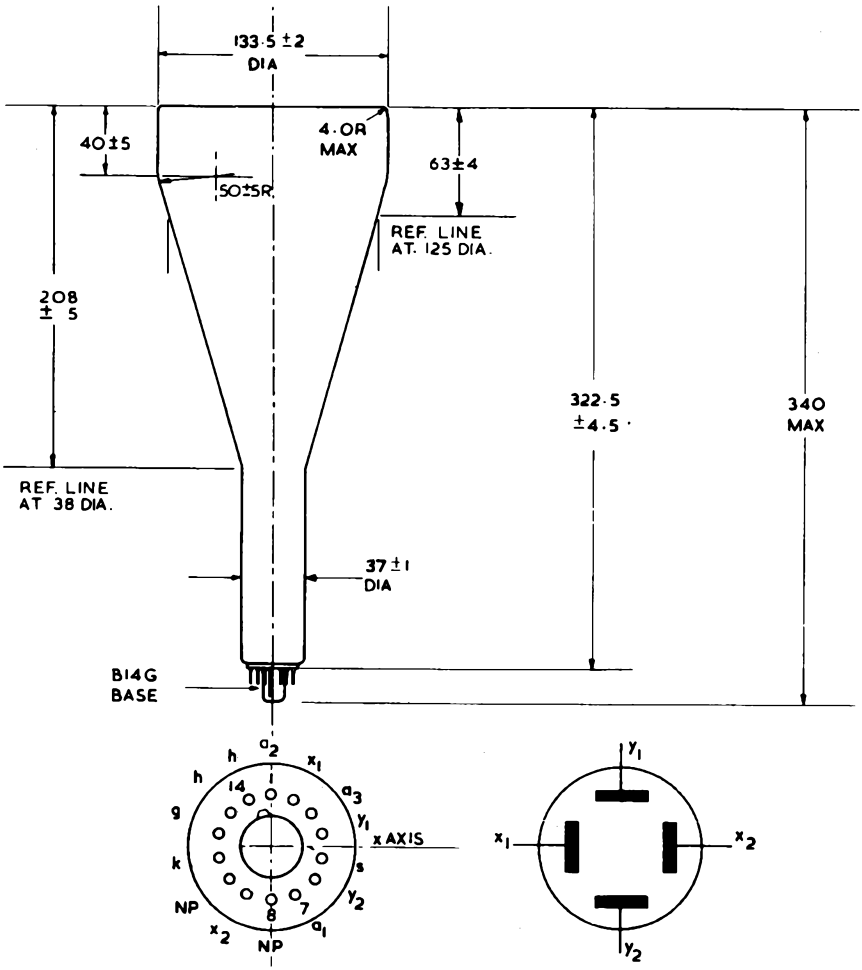
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) 900 g

MOUNTING POSITION - unrestricted.



VIEWED FROM PINS FREE END
(PIN 1 AT TOP)

VIEWED FROM SCREEN END
(PIN 1 AT TOP)

All dimensions in mm. Not to be scaled

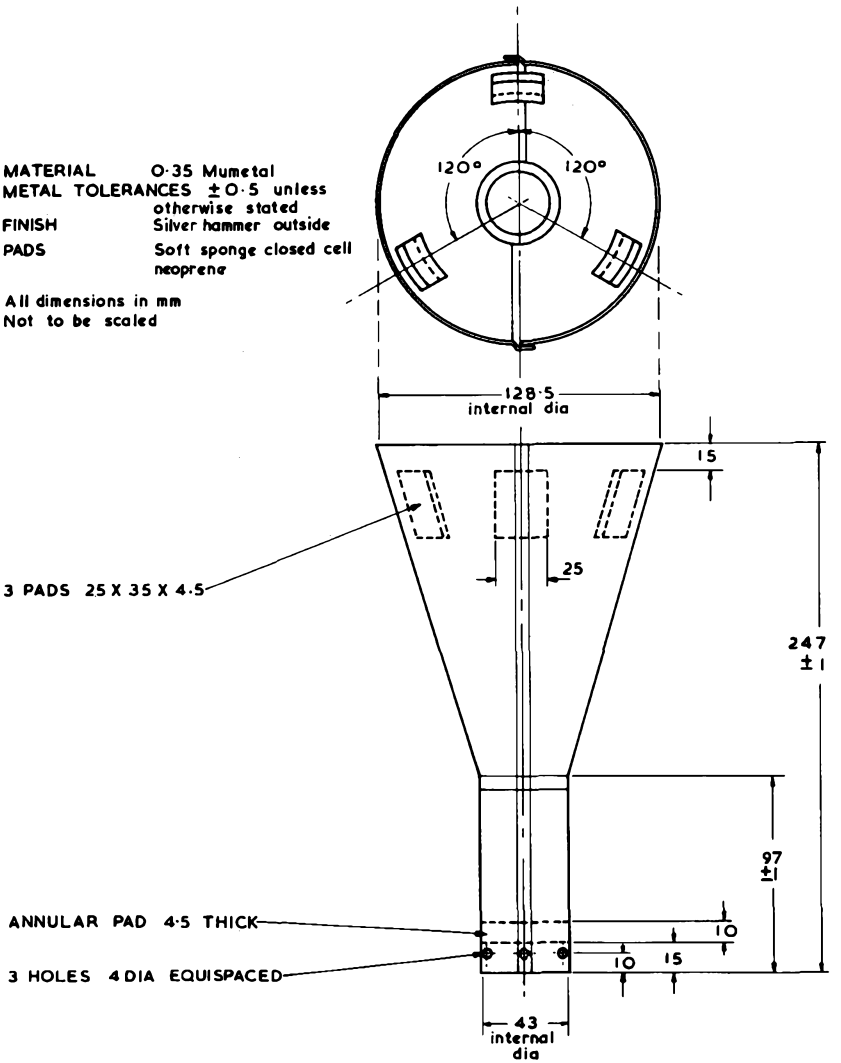
It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

Tolerance on base pin 1 position with respect to tube y axis ± 5°

D13 - 630..

Magnetic Shield MS43

EXAMPLE OF TYPICAL SHIELD



BRIMAR

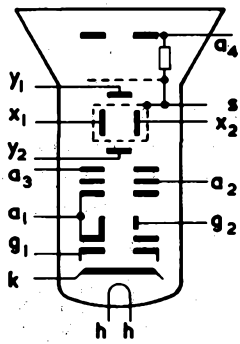
Oscilloscope Tube

D14-150..

GENERAL

This 10 cm x 8 cm rectangular aluminised tube with elcctrostatic focusing and deflection uses a mesh p.d.a. to achieve high deflection sensitivity and very high brightness without additional electrode control voltages. The tube is designed for transistor scan high bandwidth applications, and incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater voltage	V_h	6.3 V
Heater current	I_h	0.3 A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	16	5.0	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x-plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y-plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		11:1		
Helix resistance		-	100	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D14-150GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

OSCILLOSCOPE TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-all}}$	9.5	pF
Grid 2 to all	$C_{g2\text{-all}}$	8.9	pF
Heater and cathode to all	$C_{h,k\text{-all}}$	4.0	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	1.9	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.7	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	3.9	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	3.9	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	2.8	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	2.8	pF
Grid 1 to grid 2	$C_{g1\text{-}g2}$	0.7	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,x2,y1,y2}$	0.012	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	0.5	pF

TYPICAL OPERATION - Voltages with respect to cathode

Fourth anode voltage	V_{a4}	10	12	15	kV
Mean deflector plate potential		1000	1200	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1000*	1200*	1500*	V
Second anode voltage for optimum focus	V_{a2}	25 to 180	30 to 200	40 to 250	V
First anode voltage	V_{a1}	1000	1200	1500	V
Shield voltage for optimum raster shape	V_s	970 to 1070	1170 to 1270	1470 to 1570	V
Beam blanking voltage for cut-off	V_{g2}	960 to 1040†	1150 to 1250†	1435 to 1565†	V
Control grid voltage for cut-off	V_{g1}	-40 to -75	-50 to -90	-60 to -115	V
x deflection coefficient	D_x	9.2 to 12.1	11 to 14.5	13.8 to 18	V/cm
y deflection coefficient	D_y	3.8 to 5.0	4.6 to 6.0	5.8 to 7.5	V/cm

Line width at centre	at 5μA beam current	0.75	0.7	0.65	mm
Line width at edge		1.1	1.0	0.9	mm
Line width at centre measured by shrinking raster		0.42	0.39	0.35	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 8 mm radius about the centre of the tube face.

Raster distortion will not be greater than 2%. The edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.80 cm x 7.84 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 70 mm from the face and should not extend more than 175 mm from the face. 45 ampere turns for 10 kV operation or 54 ampere turns for 15 kV operation will suffice, with provision for reversing the current if necessary. The sensitivity (for both x and y plates) at 75% deflection of the useful scan shall not differ by more than 2% from the sensitivity over 10% deflection.

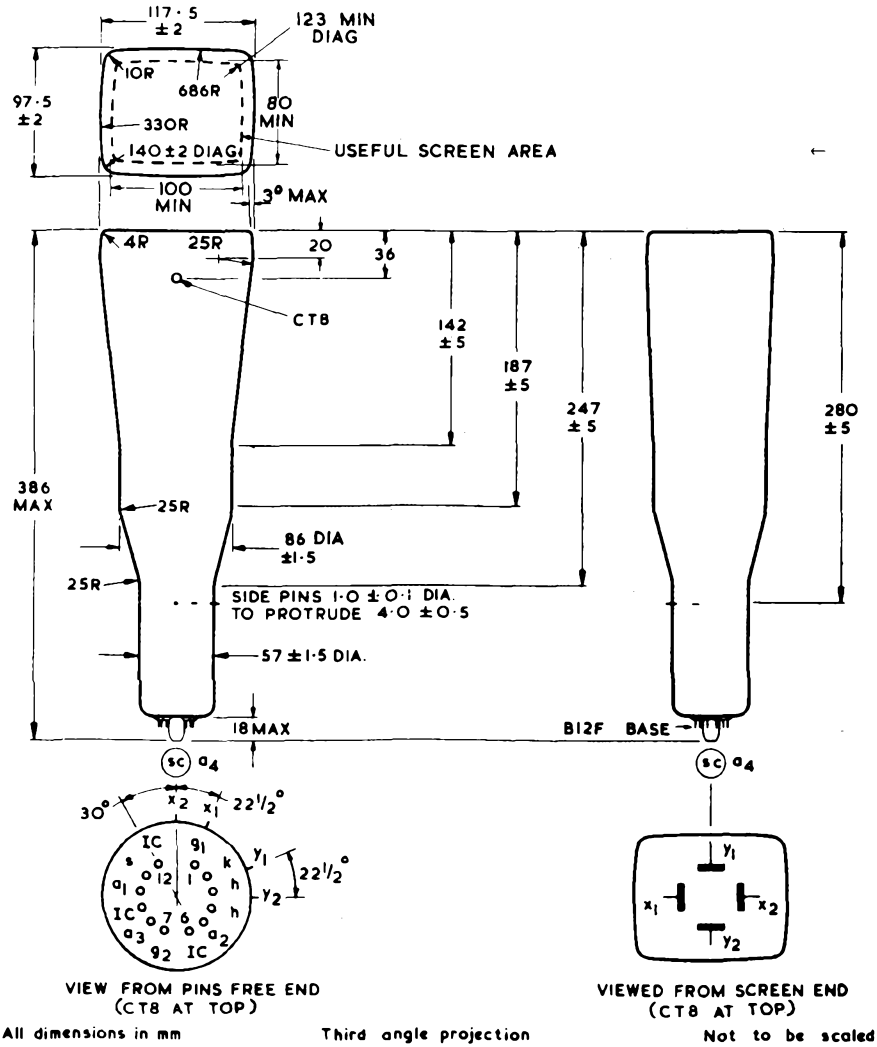
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) - 1.3 kg

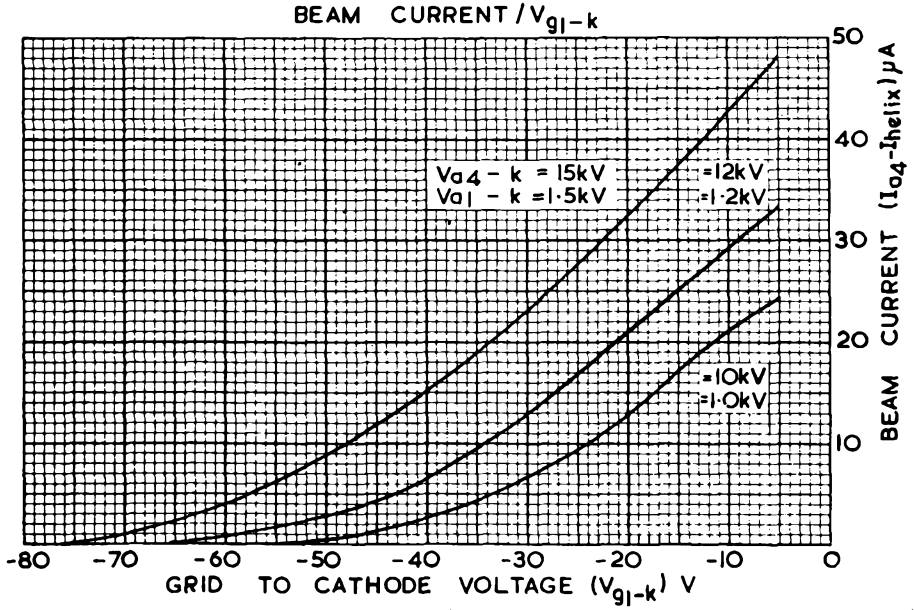
MOUNTING POSITION- unrestricted

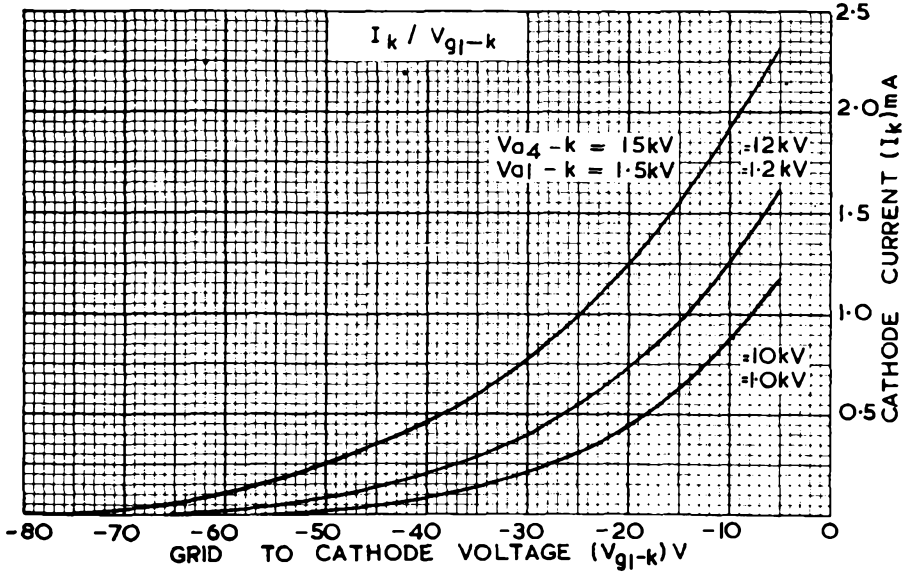


All dimensions in mm Third angle projection Not to be scaled

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Tolerance on all side pin positions ± 5°.

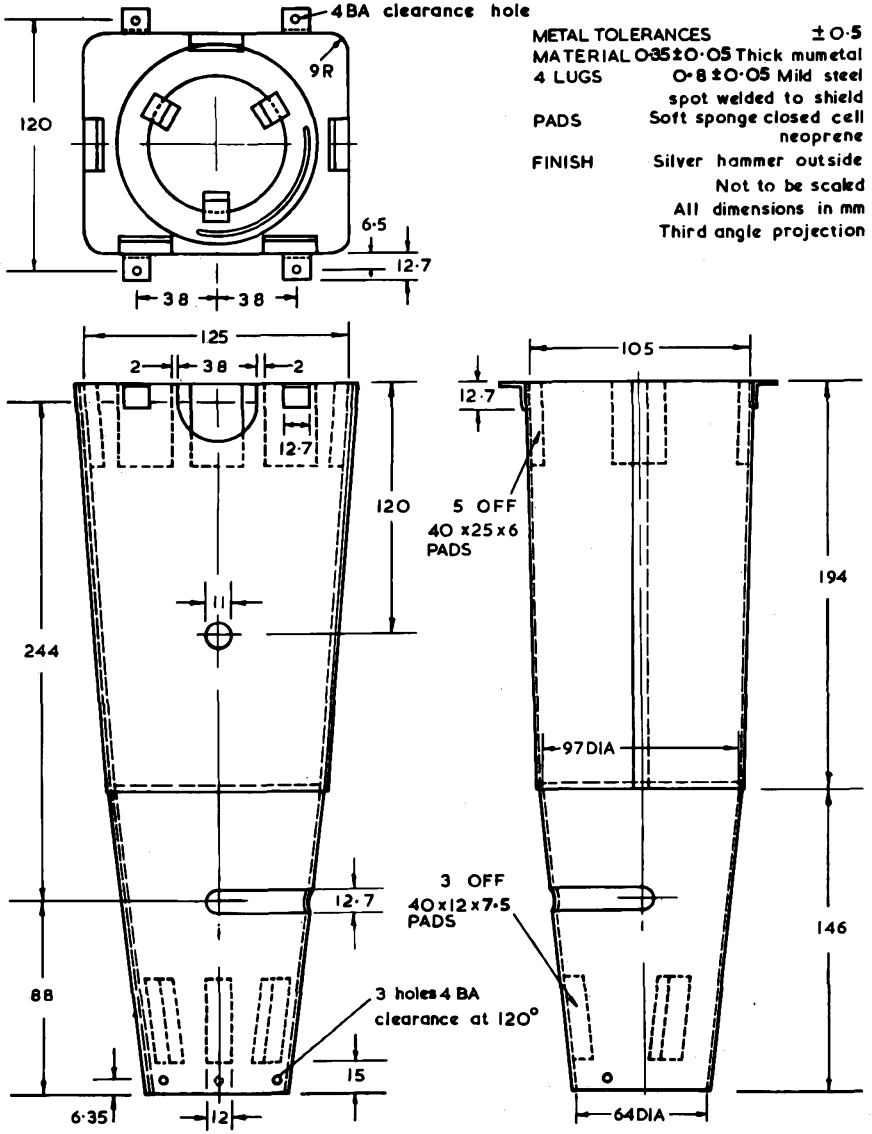

BEAM CURRENT / V_{g1-k}
V_{a4} - k = 15kV
V_{a1} - k = 1·5kV
=12kV
=1·2kV
=10kV
=1·0kV
50
40
30
20
10
BEAM CURRENT (I_{a4}-I_{helix}) μA
-80 -70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g1-k}) V


I_k / V_{g1-k}
V_{a4} - k = 15kV
V_{a1} - k = 1·5kV
=12kV
=1·2kV
=10kV
=1·0kV
2·5
2·0
1·5
1·0
0·5
CATHODE CURRENT (I_k) mA
-80 -70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g1-k}) V

D14-150..

Magnetic Shield MS9

EXAMPLE OF TYPICAL SHIELD



METAL TOLERANCES	±0·5
MATERIAL 0·35±0·05 Thick mumetal	
4 LUGS	0·8±0·05 Mild steel spot welded to shield
PADS	Soft sponge closed cell neoprene
FINISH	Silver hammer outside
	Not to be scaled
	All dimensions in mm
	Third angle projection

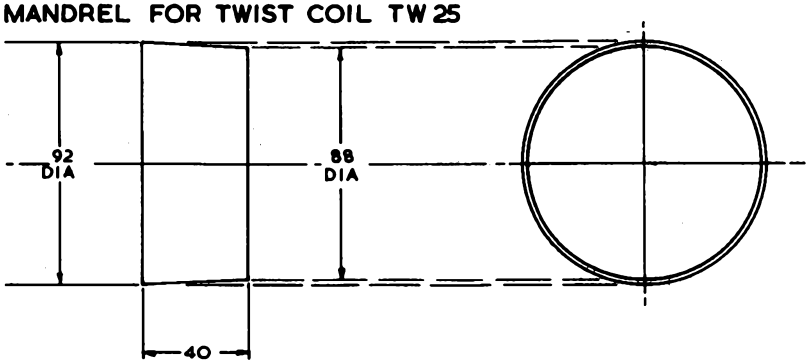
Thorn Radio Valves and Tubes Limited

BRIMAR

Tube Coil TW25

D14-150..

MANDREL FOR TWIST COIL TW25



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS9 for D14-150..

WINDING

1400 turns of 0.20 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from larger end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 230 Ω. Twist coefficient approximately 7 mA/degree measured on typical D14-150.. with V_{a4} = 15 kV and V_{a1} = 1.5 KV.

FITTING

The completed twist coil should be pushed onto the tube and secured to tube in two places with suitable adhesive tape.

BRIMAR

D14-170..
D14-171..

Oscilloscope Tube

OBSOLESCENT TYPES

The D14-170.. is replaced by the D14-172..

The D14-171.. is replaced by the D14-173..

The D14-172.. and the D14-173.. differ from the obsolescent tubes by having a 'squared-up' face-plate with a larger diagonal dimension.

BRIMAR

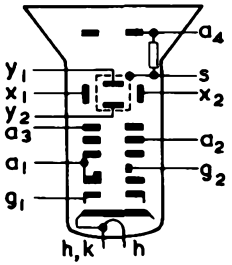
Oscilloscope Tube

D14-172..

GENERAL

This short 10 cm x 8 cm rectangular tube with electrostatic focusing and deflection is designed for general purpose applications and is capable of being deflected by transistor circuits. It incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS		Max	Min	
Fourth anode voltage	V_{a4}	4.0	1.5	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		2.2:1		
Helix resistance		-	15	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D14-172GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

OSCILLOSCOPE TUBES

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-}all}$	10	pF
Grid 2 to all	$C_{g2\text{-}all}$	10	pF
Heater and cathode to all	$C_{h,k\text{-}all}$	4.0	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	2.1	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.4	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-}all,less\ x2}$	6.9	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-}all,less\ x1}$	6.6	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-}all,less\ y2}$	5.1	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-}all,less\ y1}$	5.1	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	0.8	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,x2,y1,y2}$	1.4	pF
Grid 1 to grid 2	$C_{g1\text{-}g2}$	0.7	pF

TYPICAL OPERATION - voltages with respect to cathode.

Fourth anode voltage	V_{a4}	2.0	3.0	kV
Mean deflector plate potential		1000	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1000*	1500*	V
Second anode voltage for optimum focus	V_{a2}	180 to 380	270 to 570	V
First anode voltage	V_{a1}	1000	1500	V
Shield voltage for optimum raster shape	V_s	1000*	1500*	V
Beam blanking voltage for cut-off	V_{g2}	935†	1405†	V
Control grid voltage for cut-off	V_{g1}	-35 to -65	-50 to -95	V
x deflection coefficient	D_x	15.7 to 18.7	23.5 to 28	V/cm
y deflection coefficient	D_y	7.4 to 9.7	11 to 14.3	V/cm
Line width at centre-using microscope	at 10μA beam current	0.55	0.49	mm
Line width at edge-using microscope		0.90	0.88	mm
Line width at centre measured by shrinking raster		0.28	0.25	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle of 5 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.75 cm x 7.8 cm.

Reetangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 90 mm from the face and should not extend more than 165 mm from the face. 26 ampere turns will suffice, with provision for reversing the current if necessary.

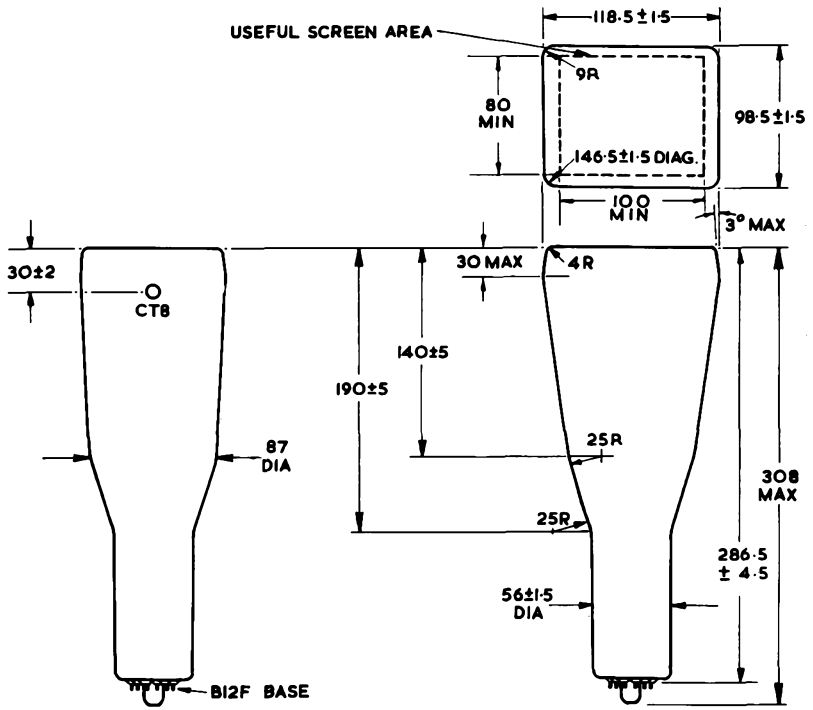
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under any circumstances the mean y plate potential should never differ from the mean x plate potential by more than 50V when the tube is operated at 3 kV.

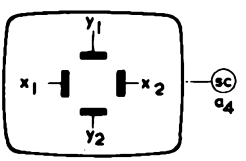
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

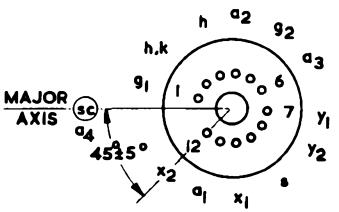
TUBE WEIGHT (approximate) 1.0 kg

MOUNTING POSITION - unrestricted.





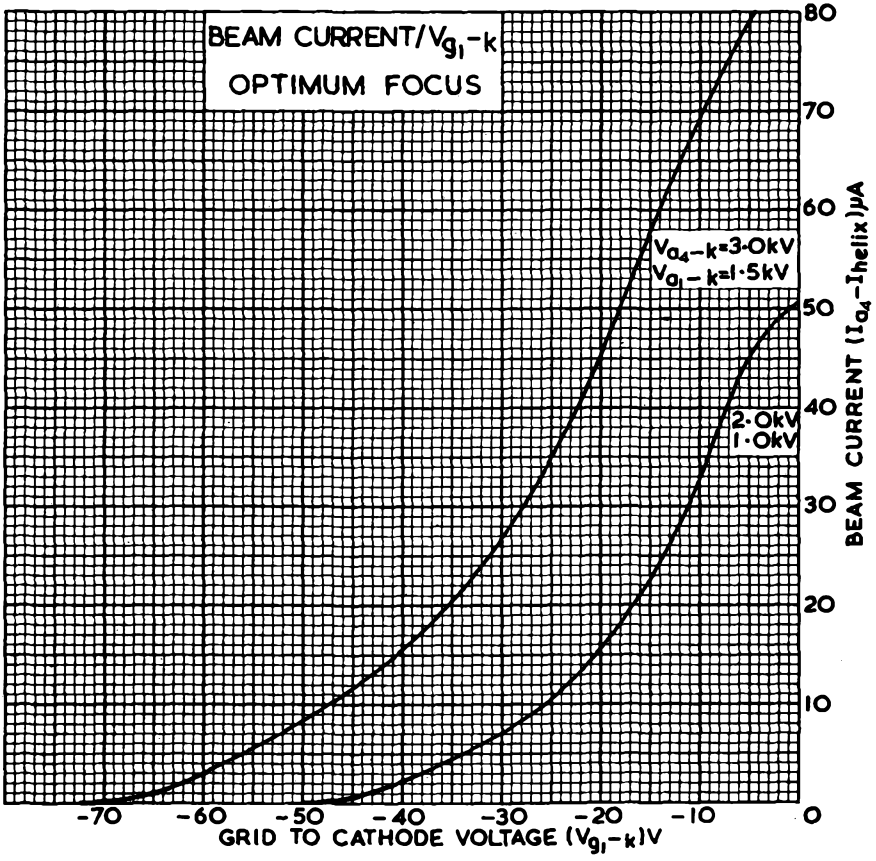
VIEWED FROM SCREEN END
(CT8 AT RIGHT)

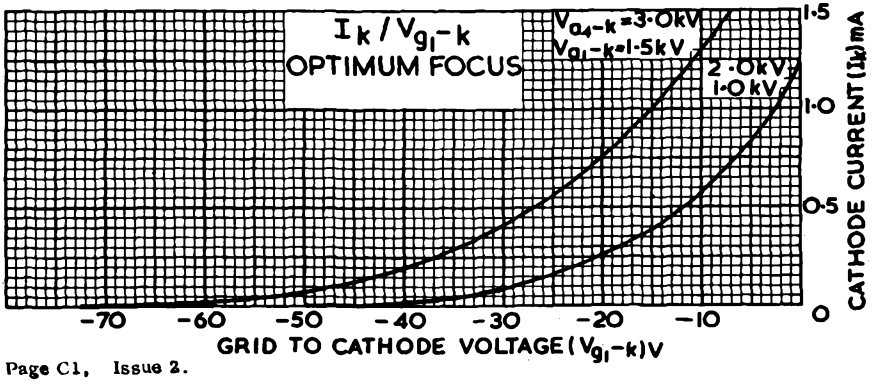


VIEW FROM PINS FREE END
(CT8 AT LEFT)

All dimensions in mm **Third angle projection** **Not to be scaled**

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.


BEAM CURRENT/V_{g_1}-k
OPTIMUM FOCUS
V_{a_4}-k=3·0kV
V_{g_1}-k=1·5kV
2·0kV
1·0kV
80
70
60
50
40
30
20
10
0
BEAM CURRENT (I_{a_4}-I_{helix})μA
-70
-60
-50
-40
-30
-20
-10
GRID TO CATHODE VOLTAGE (V_{g_1}-k)V

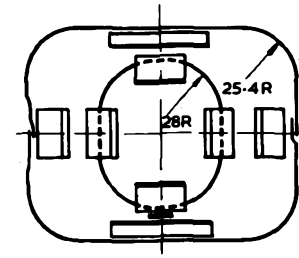

I_k / V_{g_1}-k
OPTIMUM FOCUS
V_{a_4}-k=3·0kV
V_{g_1}-k=1·5kV
2·0kV
1·0kV
1·5
1·0
0·5
0
CATHODE CURRENT (I_k)mA
-70
-60
-50
-40
-30
-20
-10
GRID TO CATHODE VOLTAGE (V_{g_1}-k)V

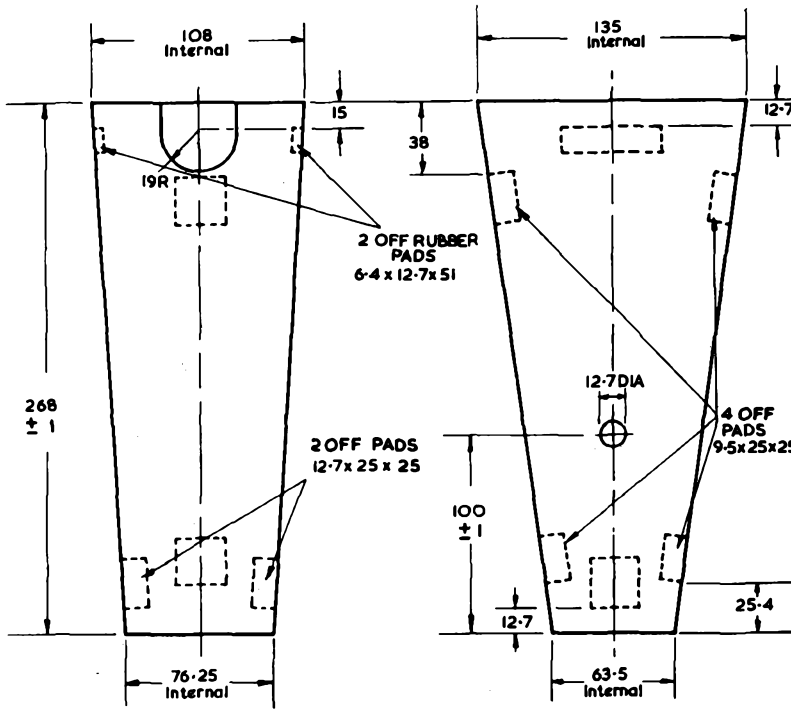
D14-172..

Magnetic Shield MS15

MATERIAL	0·35 ± 0·05 Mumetal
FINISH	Silver hammer outside
PADS	Soft sponge closed cell neoprene
METAL TOLERANCES	± 0·5 Unless otherwise stated

Third angle projection
All dimensions in mm
Not to be scaled

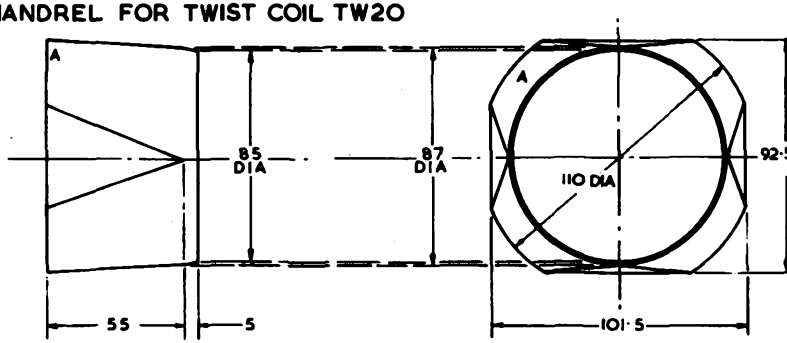




BRIMAR

Tube Coil TW 20 D14-172..

MANDREL FOR TWIST COIL TW20



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a shaped truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS15 for D14-172..

WINDING

575 turns of 0.28 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires at position A on drawing.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 50 Ω. Current required for ± 5° twist is ±42 mA measured on typical D14-172.. with V_{a4} = 3 kV and V_{a1} = 1.5 kV.

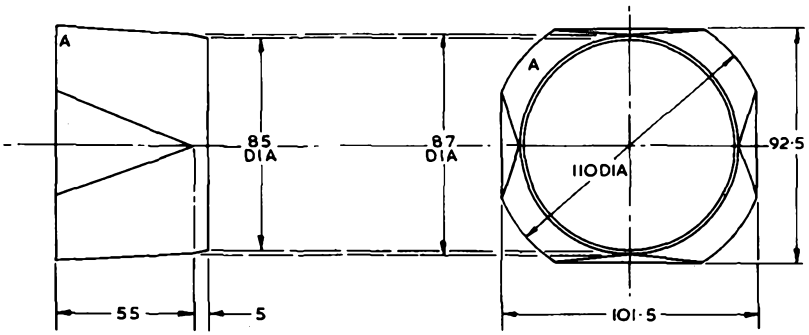
FITTING

The completed twist coil should be pushed onto the tube from the base end as far as it will travel and locked in position with adhesive tape.

OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW26



All dimensions in mm Not to be scaled

MANDREL

Shaped from wood in the form of a shaped truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS15 for D14-172..

WINDING

2500 turns of 0.125 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

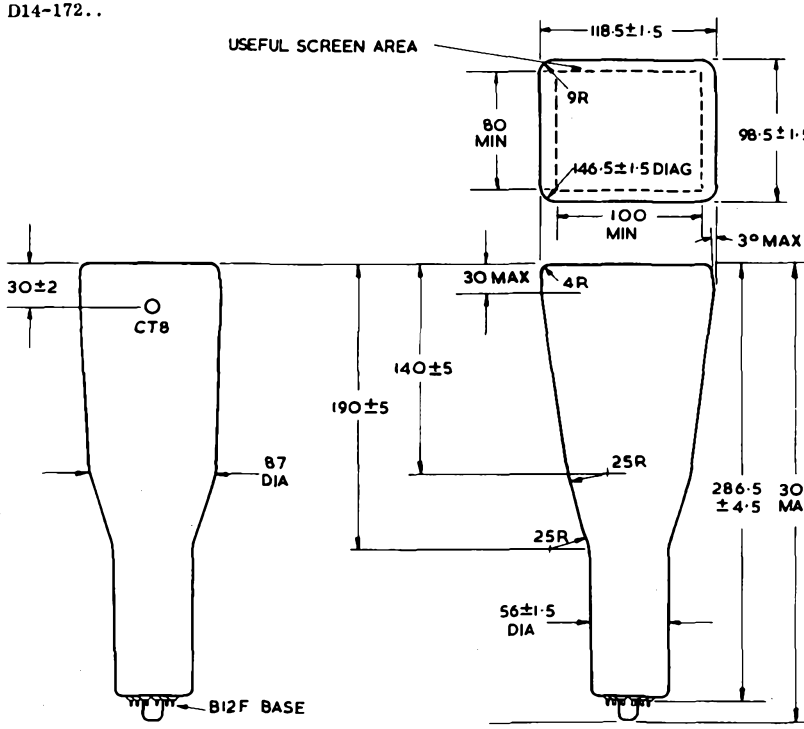
ELECTRICAL CHARACTERISTICS

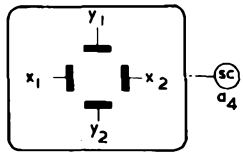
Resistance approx. 1060 Ω. Current required for ± 5° twist is ± 10 mA measured on typical D14-172.. with V_{a4} = 3kV and V_{a1} = 1.5 kV.

FITTING

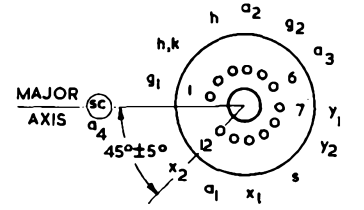
The completed twist coil should be pushed onto the tube from the base end as far as it will travel and locked in position with adhesive tape.

This D14-173.. tube has a 6.3V, 0.12A heater otherwise it is identical to the D14-172..





VIEWED FROM SCREEN END (CT8 AT RIGHT)



VIEW FROM PINS FREE END (CT8 AT LEFT)

All dimensions in mm Third angle projection Not to be scaled

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

BRIMAR

D14-180..

Oscilloscope Tube

MAINTENANCE TYPE

The D14-181.. is the replacement type for the D14-180..

The D14-180.. and D14-181.. differ only in the back cone region with the cylindrical region approximately 10 mm further from the face on the D14-181..

Oscilloscope Tube

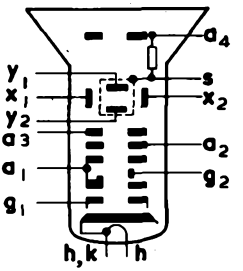
D14-181..

PRELIMINARY DATA

GENERAL

This 10cm x 8cm rectangular tube with electrostatic focusing and deflection is designed for medium bandwidth applications and is capable of being deflected by transistor circuits. It incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max.	Min.	
Fourth anode voltage	V_{a4}	7.0	2.5	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		4.3:1		
Helix resistance		-	50	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D14-181GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

OSCILLOSCOPE TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-}all}$	10	pF
Grid 2 to all	$c_{g2\text{-}all}$	10	pF
Heater and cathode to all	$c_{h,k\text{-}all}$	4.0	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	2.1	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.4	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-}all,\ less\ x2}$	6.9	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-}all,\ less\ x1}$	6.6	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-}all,\ less\ y2}$	5.1	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-}all,\ less\ y1}$	5.1	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.8	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$c_{g1\text{-}x1,x2,y1,y2}$	1.4	pF
Grid 1 to grid 2	$c_{g1\text{-}g2}$	0.7	pF

TYPICAL OPERATION - voltages with respect to cathode

Fourth anode voltage	V_{a4}	3.0	4.0	6.0	kV
Mean deflector plate potential		750	1000	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	750*	1000*	1500*	V
Second anode voltage for optimum focus	V_{a2}	125 to 300	175 to 400	260 to 600	V
First anode voltage	V_{a1}	750	1000	1500	V
Shield voltage for optimum raster shape	V_s	750*	1000*	1500*	V
Beam blanking voltage for cut-off	V_{g2}	700†	935†	1400†	V
Control grid voltage for cut-off	V_{g1}	-25 to -50	-35 to -65	-50 to -95	V
x deflection coefficient	D_x	10.6 to 12.8	14.1 to 17	21.2 to 25.5	V/cm
y deflection coefficient	D_y	5.0 to 6.6	6.7 to 8.7	10 to 13.1	V/cm
Minimum screen area		10 x 8	10 x 8	10 x 8	cm^2
Line width at centre-using microscope	at 5μA beam current	0.52	0.47	0.42	mm
Line width at edge-using microscope		0.94	0.89	0.84	mm
Line width at centre measured by shrinking raster		0.31	0.28	0.25	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 8 mm radius about the centre of the tube face. The edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.8 cm x 7.8 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 90 mm from the face and should not extend more than 195 mm from the face. The ampere turns required will be equal to $12\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV), with provision for reversing the current if necessary.

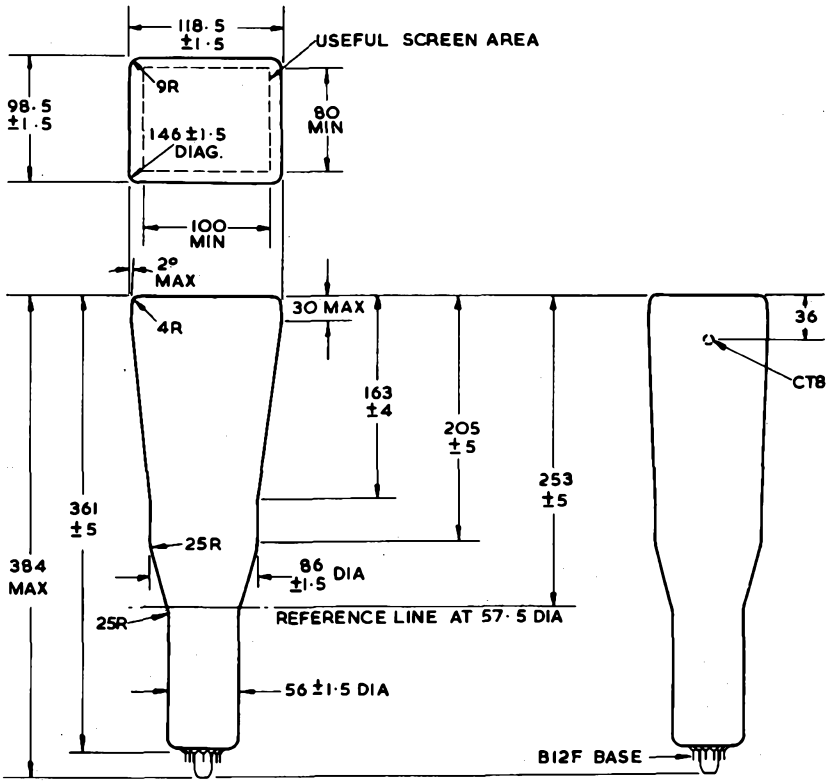
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate by more then 50V when the tube is operated at 4kV.

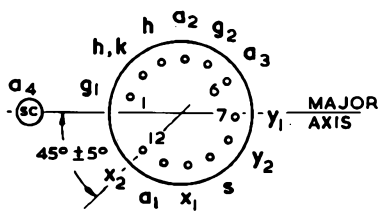
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

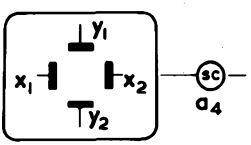
TUBE WEIGHT (approximate) 1.1 kg

MOUNTING POSITION - unrestricted.





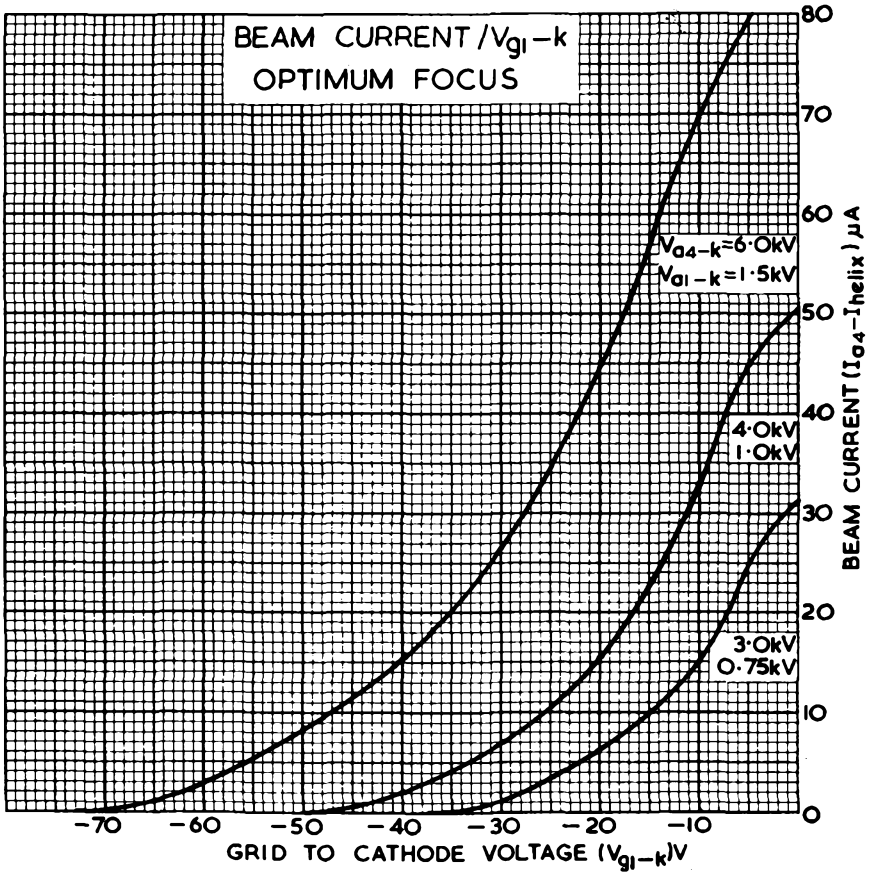
VIEW FROM PINS FREE END (CT8 AT LEFT)

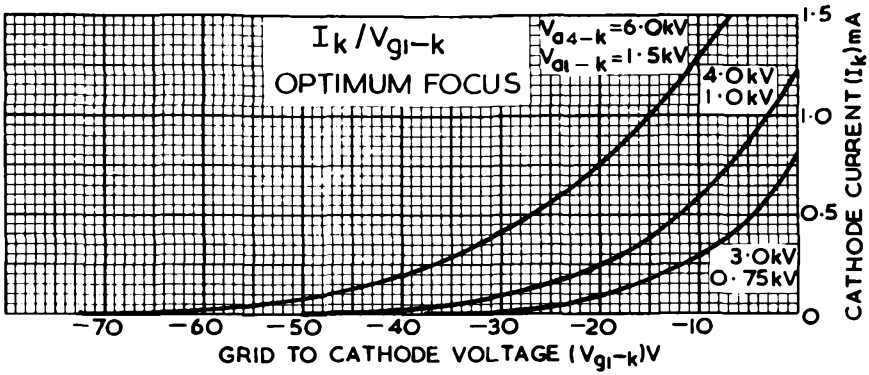


VIEWED FROM SCREEN END (CT8 AT RIGHT)

All dimensions in mm Third angle projection Not to be scaled

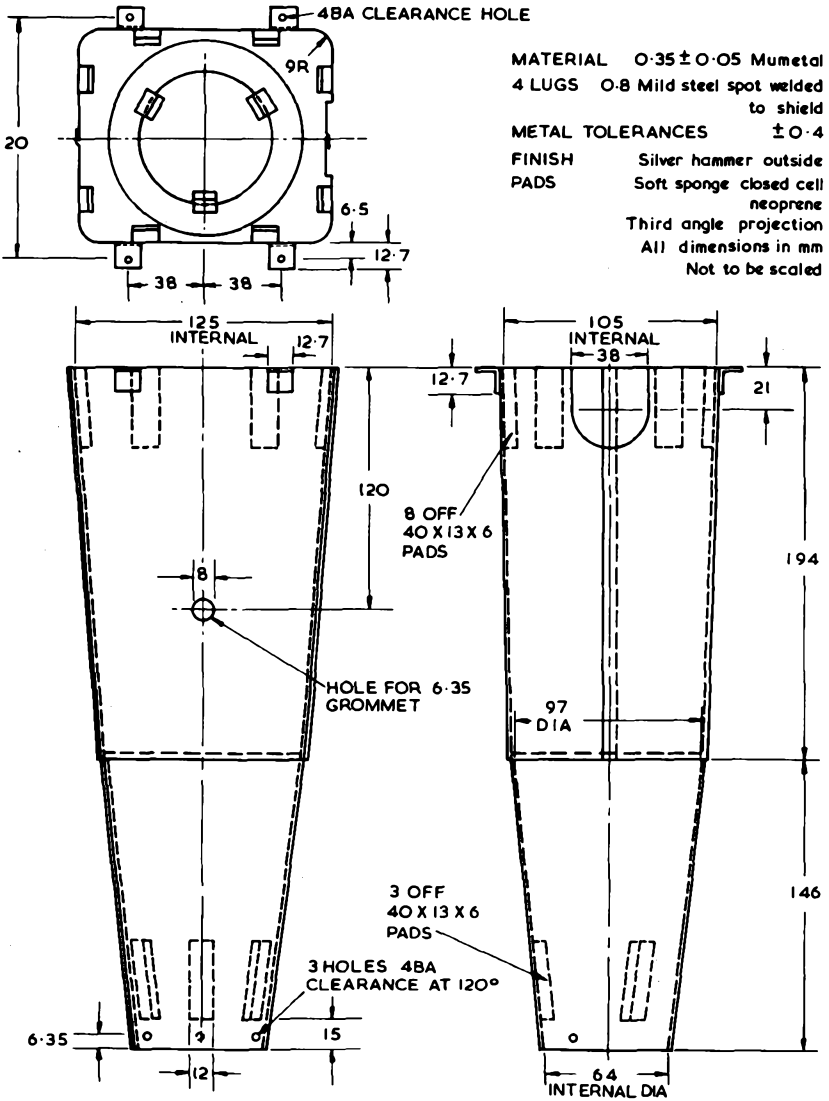
It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.


BEAM CURRENT / V_{g1-k}
OPTIMUM FOCUS
V_{a4-k}=6·0kV
V_{a1-k}=1·5kV
4·0kV
1·0kV
3·0kV
0·75kV
80
70
60
50
40
30
20
10
0
BEAM CURRENT ($I_{a4}-I_{helix}$) μA
−70 −60 −50 −40 −30 −20 −10
GRID TO CATHODE VOLTAGE (V_{g1-k})V


I_k / V_{g1-k}
OPTIMUM FOCUS
V_{a4-k}=6·0kV
V_{a1-k}=1·5kV
4·0kV
1·0kV
3·0kV
0·75kV
1·5
1·0
0·5
0
CATHODE CURRENT (I_k) mA
−70 −60 −50 −40 −30 −20 −10
GRID TO CATHODE VOLTAGE (V_{g1-k})V

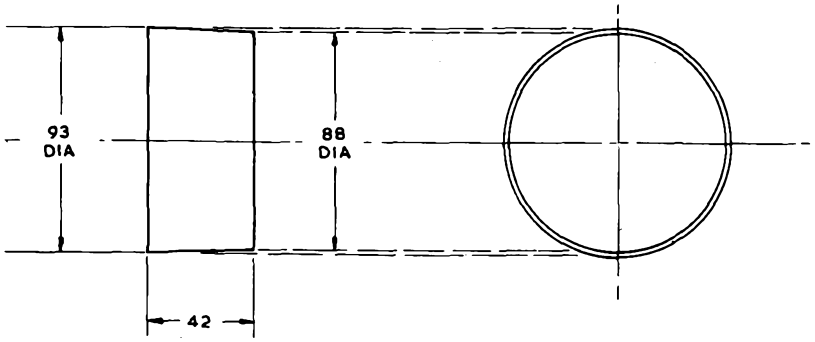
D14-181.. Magnetic Shield MS 20

EXAMPLE OF TYPICAL SHIELD



Tube Coil TW 23 D14-181..

MANDREL FOR TWIST COIL TW23



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS20 for D14-181..

WINDING

1200 turns of 0.16 mm Lewmex Grade 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel. Start and finish of winding to be brought out on 450 mm long thin flexible lead wire from larger end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper, and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 300Ω. Twist coefficient approximately 5mA/degree measured on typical D14-181.. with V_{a4} = 6 kV and V_{a1} = 1.5 kV.

FITTING

The completed twist coil should be pushed onto the tube from the base end as far as it will travel and locked in position with adhesive tape.

OSCILLOSCOPE TUBES

BRIMAR

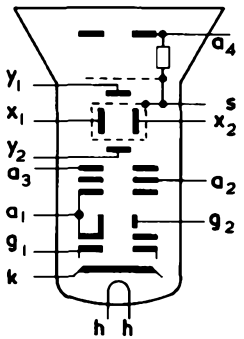
D14-200..

Oscilloscope Tube

GENERAL

This 10 cm x 8 cm rectangular aluminised tube with electrostatic focusing and deflection uses a mesh p.d.a. to achieve high deflection sensitivity and high brightness without additional electrode control voltages. The tube is designed for transistor deflection high bandwidth applications, and incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max.	Min.	
Fourth anode voltage	V_{a4}	16	5.0	kV
Third anode voltage	V_{a3}	1.75	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.75	0.6	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Beam blanking voltage	V_{g2}	2.0	0.5	kV
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x-plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y-plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		11:1	-	
Helix resistance		-	100	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D14-200GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-all}}$	9.5	pF
Grid 2 to all	$C_{g2\text{-all}}$	8.9	pF
Heater and cathode to all	$C_{h,k\text{-all}}$	4.0	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	1.9	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.7	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	3.9	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	3.9	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	2.8	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	2.8	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	0.5	pF
Grid 1 to grid 2	$C_{g1\text{-}g2}$	0.7	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,x2,y1,y2}$	0.012	pF

TYPICAL OPERATION

Voltages with respect to cathode

Fourth anode voltage	V_{a4}	10	12	15	kV
Mean deflector plate potential		1000	1200	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1000*	1200*	1500*	V
Second anode voltage for optimum focus	V_{a2}	25 to 180	30 to 200	40 to 250	V
First anode voltage	V_{a1}	1000	1200	1500	V
Shield voltage for optimum raster shape	V_s	970 to 1070	1170 to 1270	1470 to 1570	V
Beam blanking voltage for cut-off	V_{g2}	960 to 1040†	1150 to 1250†	1435 to 1565†	V
Control grid voltage for cut-off	V_{g1}	-40 to -75	-50 to -90	-60 to -115	V
x deflection coefficient	D_x	9.2 to 11.8	11 to 14.2	13.8 to 17.7	V/cm
y deflection coefficient	D_y	3.6 to 4.5	4.3 to 5.4	5.4 to 6.8	V/cm
Minimum screen area		10 x 8	10 x 8	10 x 8	cm^2
Line width at 5μA beam current					
Shrinking raster measurement at centre		0.47	0.41	0.39	mm
Microscope measurement at centre		0.80	0.73	0.70	mm
Microscope measurement at edge		1.0	0.98	0.96	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

OSCILLOSCOPE TUBES

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 8 mm radius about the centre of the tube face.

Raster distortion will not be greater than 2%. The edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.80 cm x 7.84 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 70 mm from the face and should not extend more than 195 mm from the face. The ampere turns required will be equal to $14\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV), with provision for reversing the current if necessary. The sensitivity (for both x and y plates) at 75% deflection of the useful scan shall not differ by more than 2% from the sensitivity over 10% deflection.

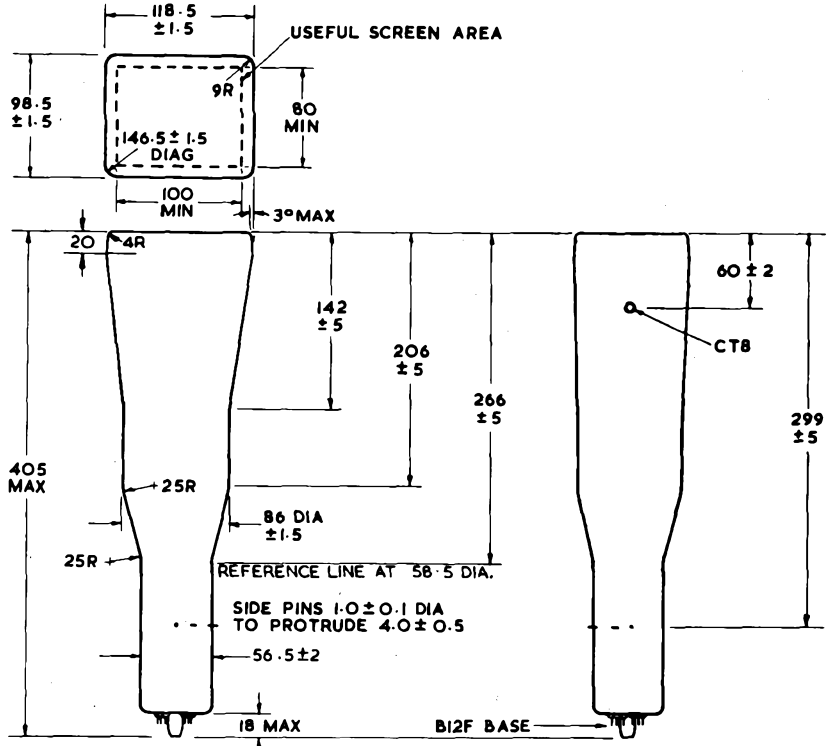
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

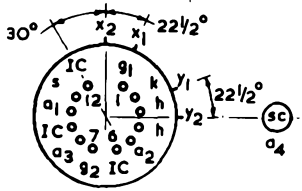
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

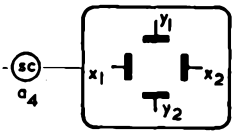
TUBE WEIGHT (approximate) - 1.3 kg

MOUNTING POSITION - unrestricted





VIEW FROM PINS FREE END (CT8 AT RIGHT)

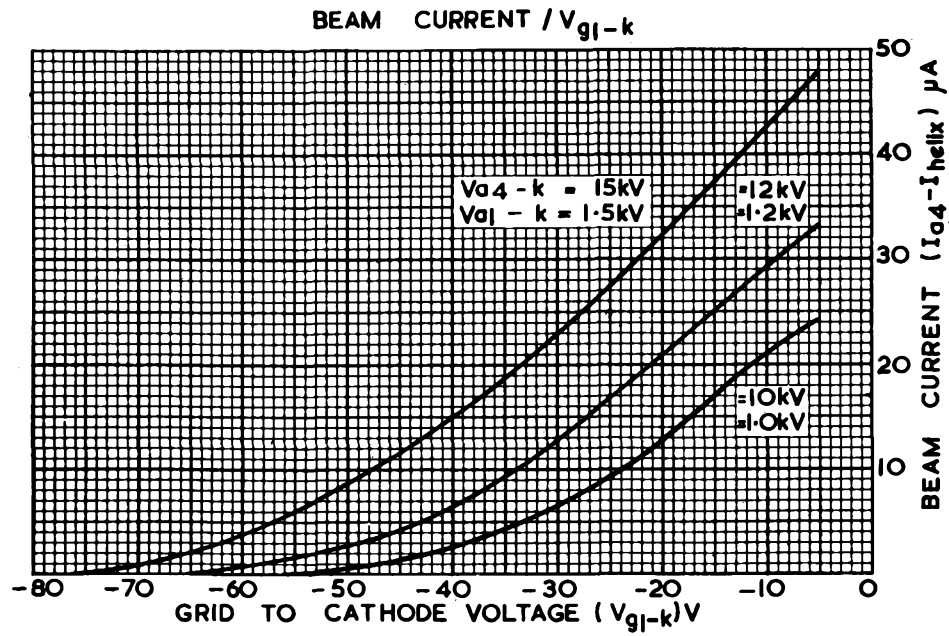


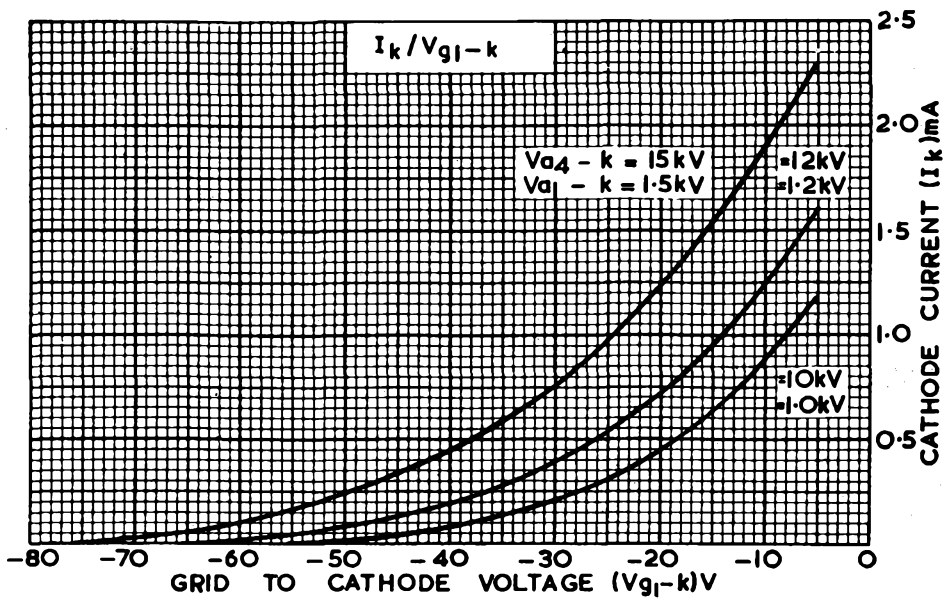
VIEWED FROM SCREEN END (CT8 AT LEFT)

All dimensions in mm Not to be scaled

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Tolerance on all side pin positions ± 5°.

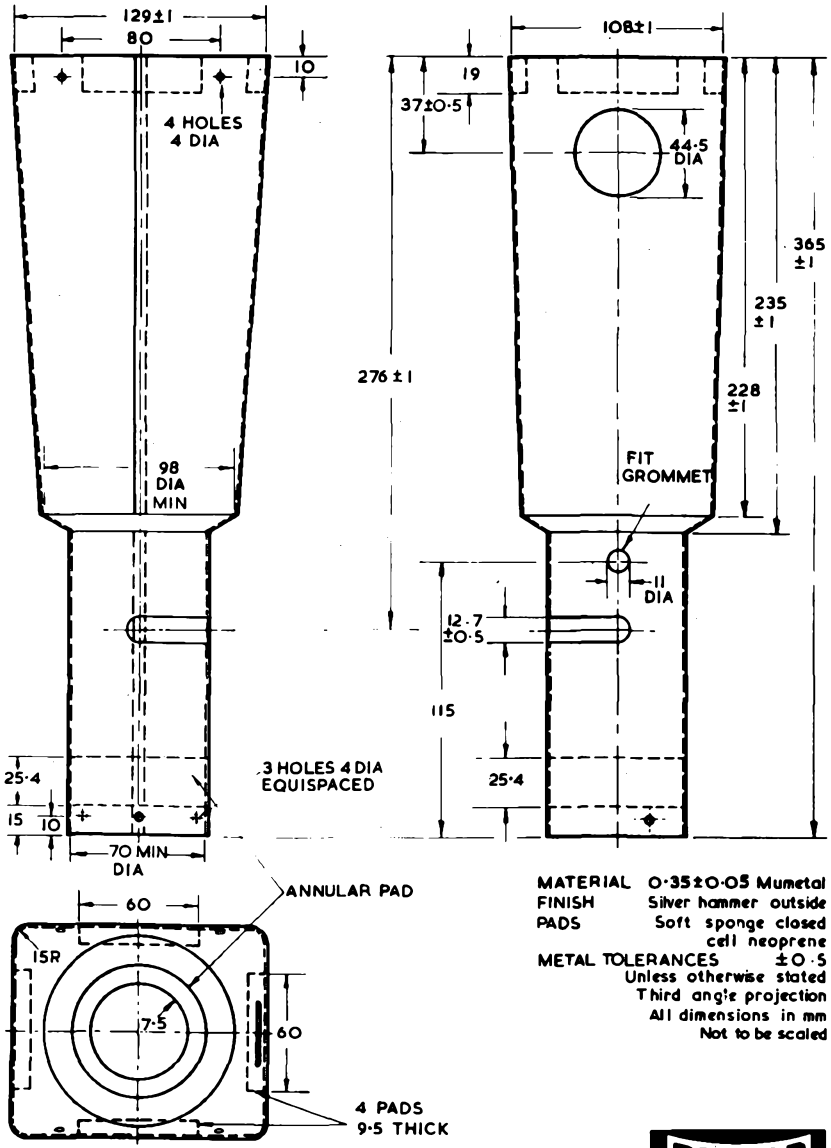

BEAM CURRENT / V_{g1-k}
V_{a4-k} = 15kV
V_{a1-k} = 1·5kV
=12kV
=1·2kV
=10kV
=1·0kV
50
40
30
20
10
BEAM CURRENT (I_{a4}-I_{helix}) μA
-80 -70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g1-k})V


I_k / V_{g1-k}
V_{a4-k} = 15kV
V_{a1-k} = 1·5kV
=12kV
=1·2kV
=10kV
=1·0kV
2·5
2·0
1·5
1·0
0·5
CATHODE CURRENT (I_k)mA
-80 -70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g1-k})V

Magnetic Shield MS11

D14-200..

EXAMPLE OF TYPICAL SHIELD

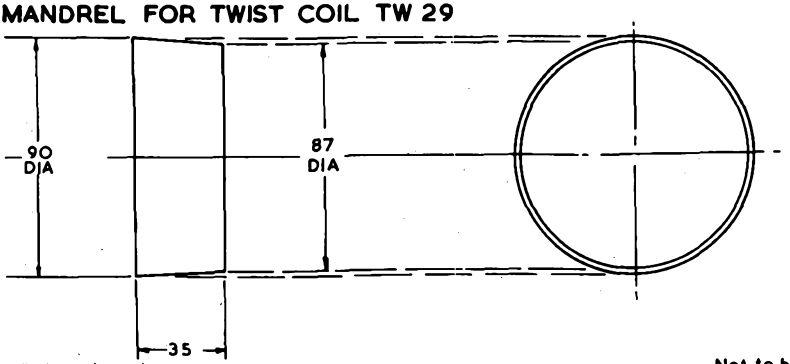


MATERIAL 0·35±0·05 Mumetal
FINISH Silver hammer outside
PADS Soft sponge closed cell neoprene
METAL TOLERANCES ±0·5
Unless otherwise stated
Third angle projection
All dimensions in mm
Not to be scaled

OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW 29



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS11 for D14-200..

WINDING

1600 turns of 0.140 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.

Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.

Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 550 Ω. Twist coefficient approximately 7 mA/degree measured on typical D14-200.. with V_{a4} = 15 kV and V_{a1} = 1.5 kV.

FITTING

The completed twist coil should be pushed onto the tube and secured to tube in two places with suitable adhesive tape.

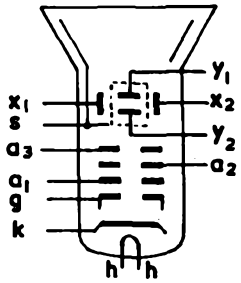
Oscilloscope Tube

D14-270..

GENERAL

This 10cm x 8cm display rectangular oscilloscope tube is primarily intended for use in inexpensive oscilloscopes and monitoring devices. The tube has sufficient deflector sensitivity to permit transistor driven deflection.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.12	A



ABSOLUTE RATINGS - voltages with respect to cathode

		Max.	Min.	
First anode voltage	V_{a1}	2200	1250	V
Second anode voltage	V_{a2}	800	-	V
Third anode voltage	V_{a3}	2250	1200	V
Negative grid voltage	$-V_g$	200	1.0	V
Peak x-plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y-plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
Heater to cathode voltage	V_{h-k} ±	125		V
x-plate to third anode resistance	R_{x-a3}	2.0	-	MΩ
y-plate to third anode resistance	R_{y-a3}	2.0	-	MΩ
Grid to cathode resistance	R_{g-k}	1.5	-	MΩ
Peak cathode current	$i_{k(pk)}$	500	-	μA

OSCILLOSCOPE TUBES

PHOSPHOR SCREEN

This tube is usually supplied with GH phosphor (D14-270GH) giving a green trace of medium short persistence. Other phosphors can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-all}}$	8.2	pF
Heater and cathode to all	$c_{h,k\text{-all}}$	3.8	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	1.7	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.3	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	5.0	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	4.8	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	3.6	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	3.7	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.7	pF

TYPICAL OPERATION - voltages with respect to cathode

Mean deflector plate potential*		1500	2000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1500†	2000†	V
Second anode voltage for optimum focus	V_{a2}	125 to 220	170 to 290	V
First anode voltage	V_{a1}	1500	2000	V
Shield voltage for optimum raster shape	V_s	1500†	2000†	V
Control grid voltage for cut-off	V_{g1}	-22 to -52	-30 to -70	V
x deflection coefficient	D_x	14.3 to 17.5	19 to 23	V/cm
y deflection coefficient	D_y	9 to 11.3	12 to 15	V/cm
Minimum useful screen area		10 x 8.0	10 x 8.0	cm^2
Grid drive to 10μA beam current		10	11	V
Line width at 10μA beam current Shrinking raster measurement at centre		0.4	0.35	mm

* This tube is designed for symmetrical operation.

† The required voltage will not differ from the quoted value by more than ± 30V.

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle of 7mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 8.5 cm x 7.0 cm and 8.3 cm x 6.88 cm.

Rectangularity of x and y axes is 90° ± 1°.

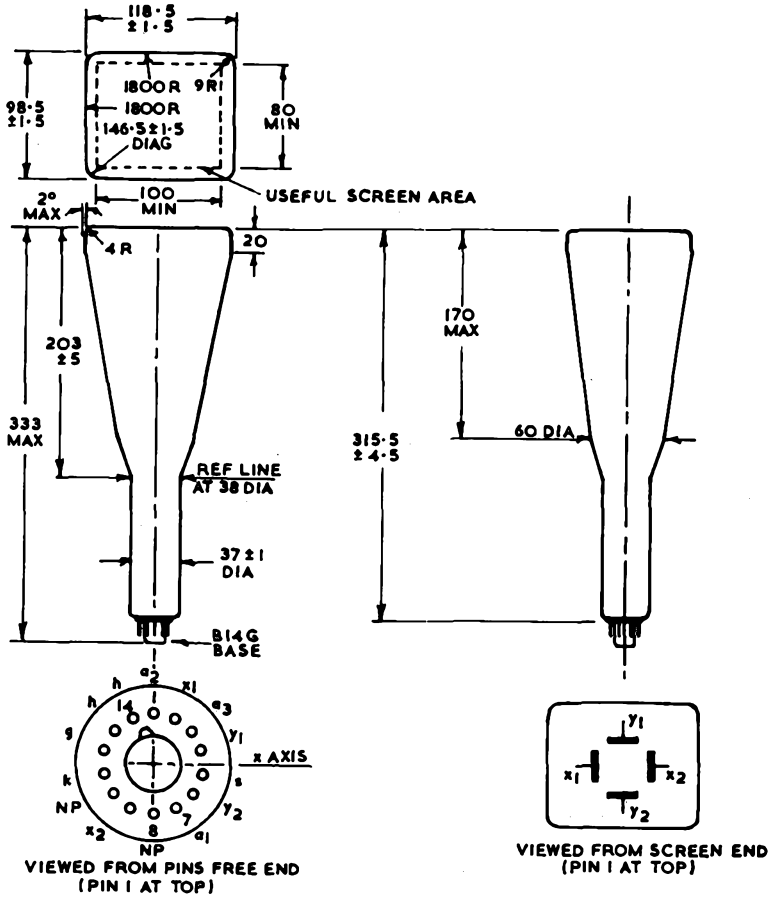
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) 1.2 kg

MOUNTING POSITION - unrestricted.



All dimensions in mm

Not to be scaled

It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

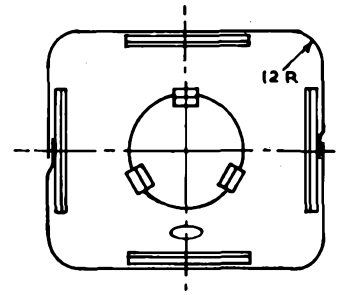
Tolerance on base pin 1 position with respect to tube y axis ± 5°

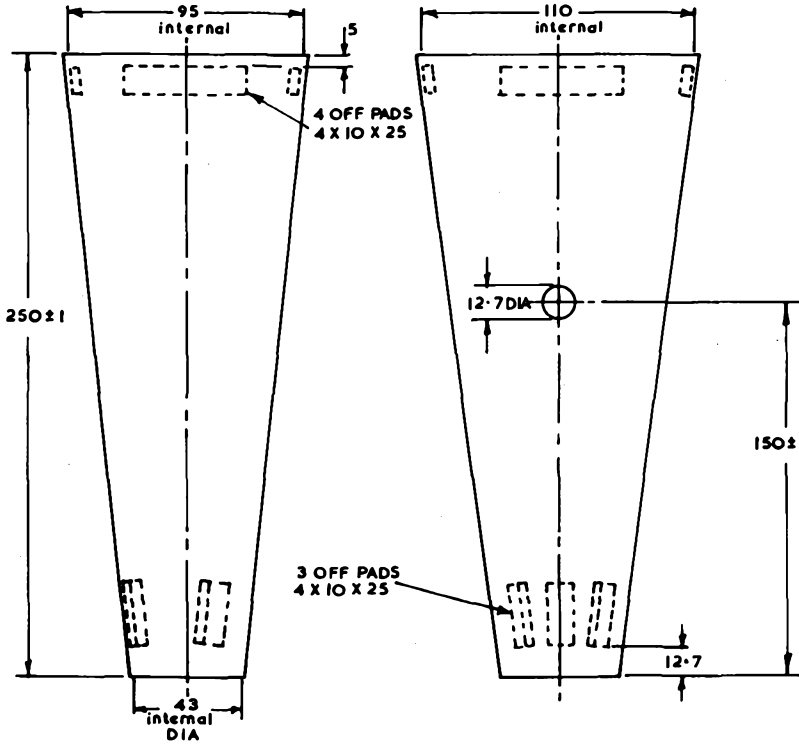
Magnetic Shield MS70

D14-270..

MATERIAL	0·35 ± 0·05 Mumetal
FINISH	Silver hammer outside
PADS	Soft sponge closed cell neoprene
METAL TOLERANCES	±0·5 Unless othewise stated

Third angle projection
All dimensions in mm
Not to be scaled

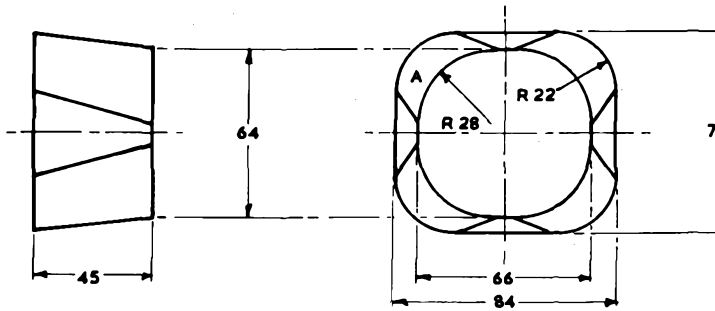




OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW52



All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a shaped truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS70 for D14-270..

WINDING

1000 turns of 0.14 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires at position A on drawing.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 300Ω. Current required for ± 5° twist is ± 20 mA measured on typical D14-270.. with V_{a1} = 1.5 kV.

FITTING

The completed twist coil should be pushed onto the tube from the base end as far as it will travel and locked in position with adhesive tape.

Oscilloscope Tube

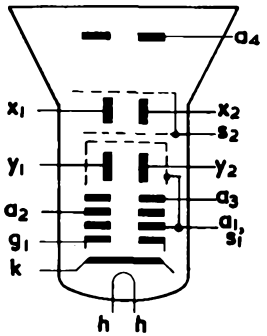
D14-280..

PRELIMINARY DATA

GENERAL

This 10cm x 8cm rectangular aluminised tube with electrostatic focusing and deflection uses a mesh p.d.a. to achieve high deflection sensitivity and high brightness without additional electrode control voltages. The tube is designed for transistor deflection medium to high bandwidth applications.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	13	8.0	kV
Third anode voltage	V_{a3}	2.2	1.2	kV
Second anode voltage	V_{a2}	1.0	-	kV
First anode voltage	V_{a1}	2.2	1.1	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	100	-	kΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		7:1	-	

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D14-280GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

OSCILLOSCOPE TUBES

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-all}}$	9.5	pF
Heater and cathode to all	$c_{h,k\text{-all}}$	3.5	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	2.0	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.5	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less }x2}$	6.0	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less }x1}$	6.0	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less }y2}$	5.0	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less }y1}$	5.0	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.8	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$c_{g1\text{-}x1,x2,y1,y2}$	0.8	pF

TYPICAL OPERATION - Voltages with respect to cathode

Fourth anode voltage	V_{a4}	10	12	kV
Mean deflector plate potential		1500	2000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1470 to 1530	1970 to 2030	V
Second anode voltage for optimum focus	V_{a2}	320 to 480	420 650	V
First anode and shield 1 voltage	V_{a1+s1}	1500	2000	V
Shield 2 voltage for optimum raster shape	V_{s2}	1400 to 1500	1900 to 2000	V
Control grid voltage for cut-off	V_{g1}	-40 to -80	-53 to -106	V
x deflection coefficient	D_x	10.5 to 13	14 to 17.4	V/cm
y deflection coefficient	D_y	4.2 to 5.2	5.6 to 6.9	V/cm
Minimum screen area		10 x 8	10x8	cm^2
Line width at 10μA beam current				
Shrinking raster measurement at centre		0.38	0.35	mm
Microscope measurement at centre		0.75	0.64	mm
Microscope measurement at edge		1.0	0.9	mm
Grid Drive to 10μA beam current (approx.)		18	19	V

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 8 mm radius about the centre of the tube face.

Raster distortion : The edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.80 cm x 7.84 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 130 mm from the face and should not extend more than 195 mm from the face. The ampere turns required will be equal to $14/\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV) with provision for reversing the current. The sensitivity (for both x and y plates) at 75% deflection of the useful scan will not differ by more than 2% from the sensitivity over 25% deflection.

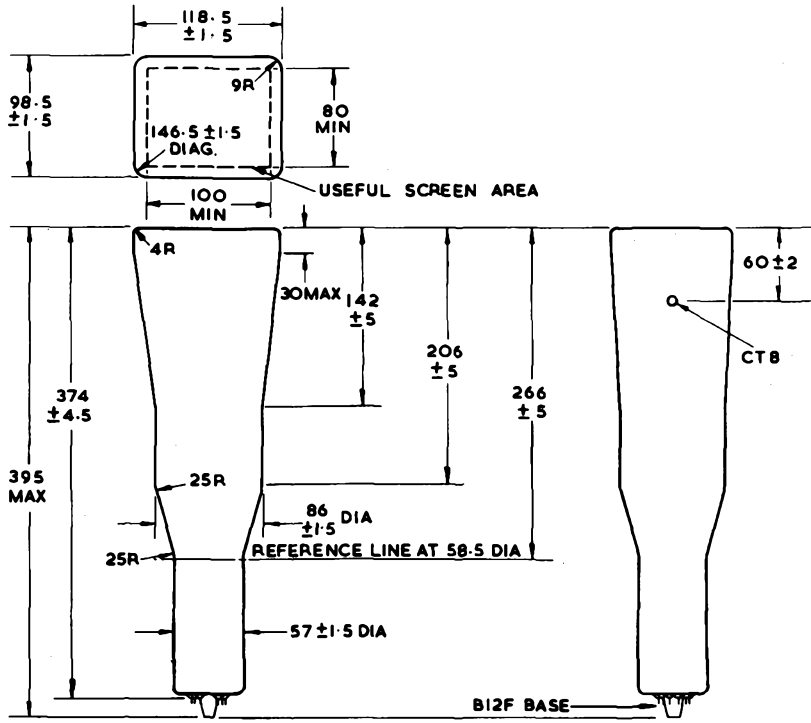
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) - 1.4 kg

MOUNTING POSITION - unrestricted



All dimensions in mm

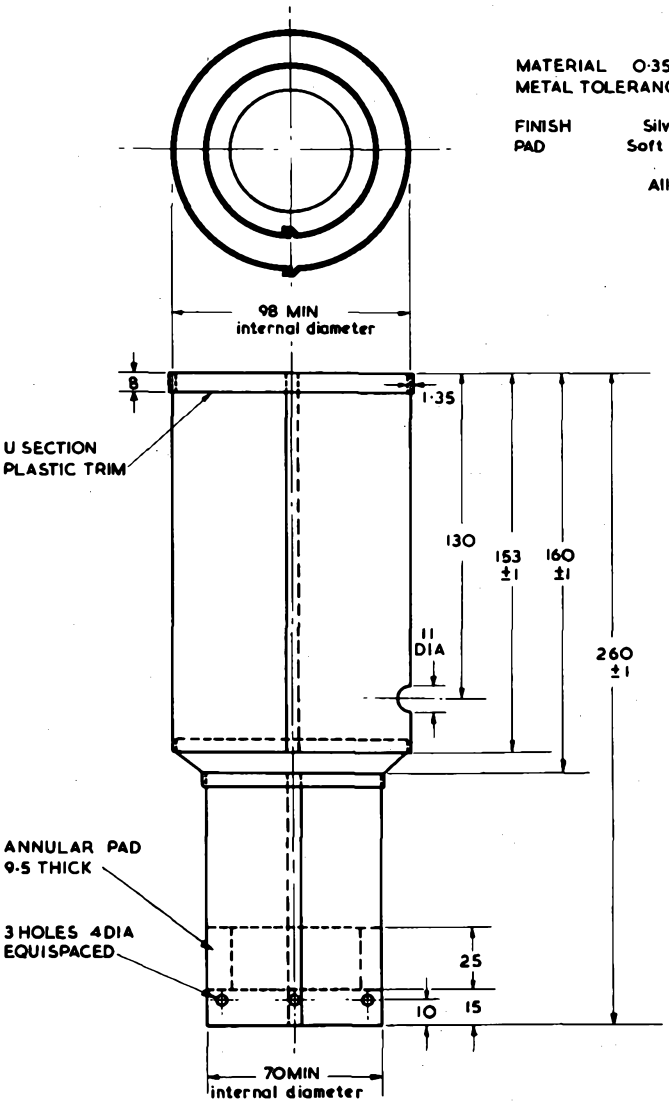
Not to be scaled

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Magnetic Shield MS72

D14-280..

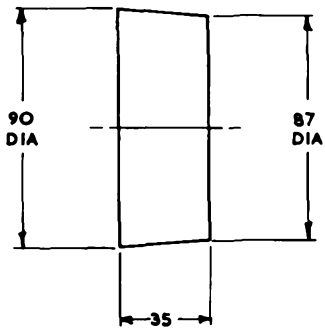
EXAMPLE OF TYPICAL SHIELD

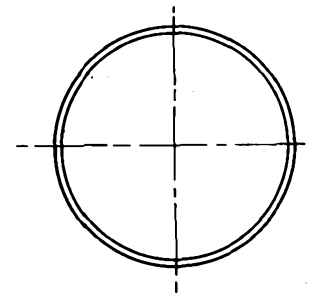


OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW29





All dimensions in mm

Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil, is designed to be used in conjunction with magnetic shield MS72 for D14-280..

WINDING

1600 turns of 0.140 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 550 Ω. Twist coefficient approximately 6.5 mA/degree measured on typical D14-280.. with V_{a4}= 12kV and V_{a1}= 2.0 kV.

FITTING

The completed twist coil should be pushed onto the tube and secured to tube in two places with suitable adhesive tape.

Oscilloscope Tube

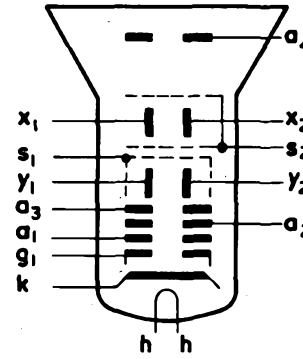
D14-310..

PRELIMINARY DATA

GENERAL

This 10cm x 8cm rectangular aluminised tube with electrostatic focusing and deflection uses a mesh p.d.a. to achieve high deflection sensitivity and very high brightness without additional electrode control voltages. The tube is designed for transistor deflection high bandwidth and high writing speed applications.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	18	8.0	kV
Third anode voltage	V_{a3}	2.25	1.0	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	2.2	1.0	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		9:1	-	

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D14-310GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

If this tube is operated at voltages in excess of 18 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

INTER - ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-all}}$	9.0	pF
Heater and cathode to all	$c_{h,k\text{-all}}$	5.0	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	3.5	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.5	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	5.0	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	5.0	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	3.5	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	3.5	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.2	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$c_{g1\text{-}x1,x2,y1,y2}$	0.05	pF

TYPICAL OPERATION - Voltages with respect to cathode

Fourth anode voltage	V_{a4}	10	12	16	kV
Mean deflector plate potential		1250	1500	2000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1210 to 1290	1460 to 1540	1960 to 2040	V
Second anode voltage for optimum focus	V_{a2}	315 to 450	380 to 540	505 to 720	V
First anode voltage	V_{a1}	1250	1500	2000	V
y shield voltage	V_{s1}	1250	1500	2000	V
Shield voltage for optimum raster shape	V_{s2}	1180 to 1280	1420 to 1520	1905 to 2005	V
Control grid voltage for cut-off	V_{g1}	-30 to -55	-35 to -66	-48 to -88	V
x deflection coefficient	D_x	9.1 to 11.6	11 to 14	14.6 to 18.6	V/cm
y deflection coefficient	D_y	2.8 to 3.6	3.4 to 4.3	4.5 to 5.8	V/cm
Minimum screen area		10 x 8	10 x 8	10 x 8	cm^2
Line width at 10μA beam current					
Shrinking raster measurement at centre		0.34	0.31	0.28	mm
Microscope measurement at centre		0.60.	0.50	0.44	mm
Microscope measurement at edge		0.70	0.65	0.60	mm
Grid Drive to 10μA beam current(approx.)		23	23.5	24	V

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 8 mm radius about the centre of the tube face.

Raster distortion will not be greater than 2%. The edges of a test raster will fall between two concentric rectangles 10 cm x 8 cm and 9.80 cm x 7.84 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 90 mm from the face and should not extend more than 200 mm from the face. The ampere turns required will be equal to $14\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV) with provision for reversing the current. The sensitivity (for both x and y plates) at 75% deflection of the useful scan shall not differ by more than 2% from the sensitivity over 10% deflection.

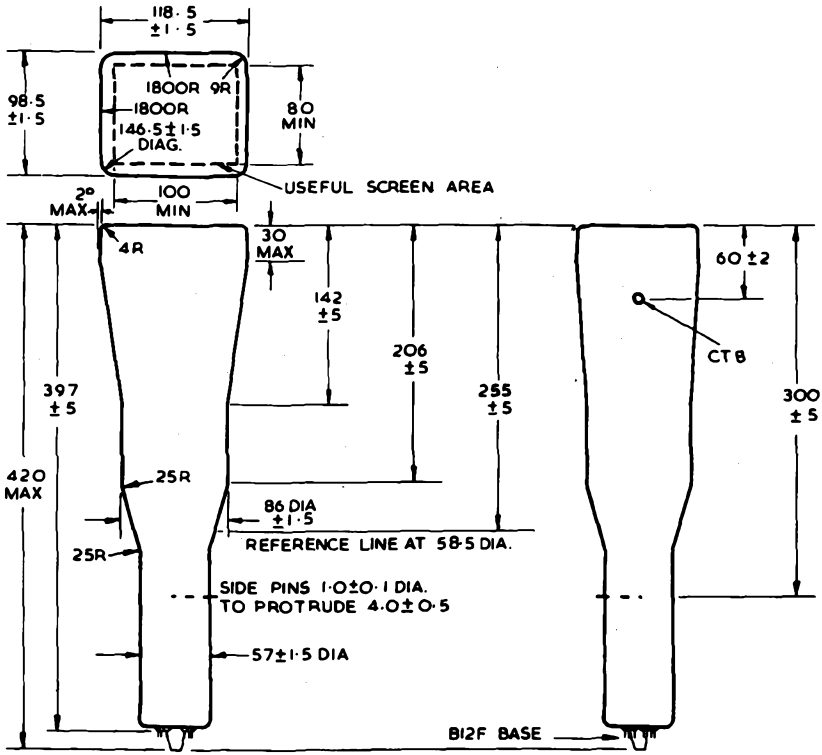
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

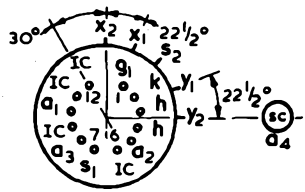
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

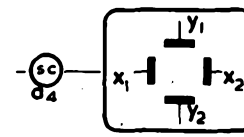
TUBE WEIGHT (approximate) - 1.4 kg

MOUNTING POSITION - unrestricted





VIEW FROM PINS FREE END (CT8 AT RIGHT)



VIEWED FROM SCREEN END (CT8 AT LEFT)

All dimensions in mm

Not to be scaled

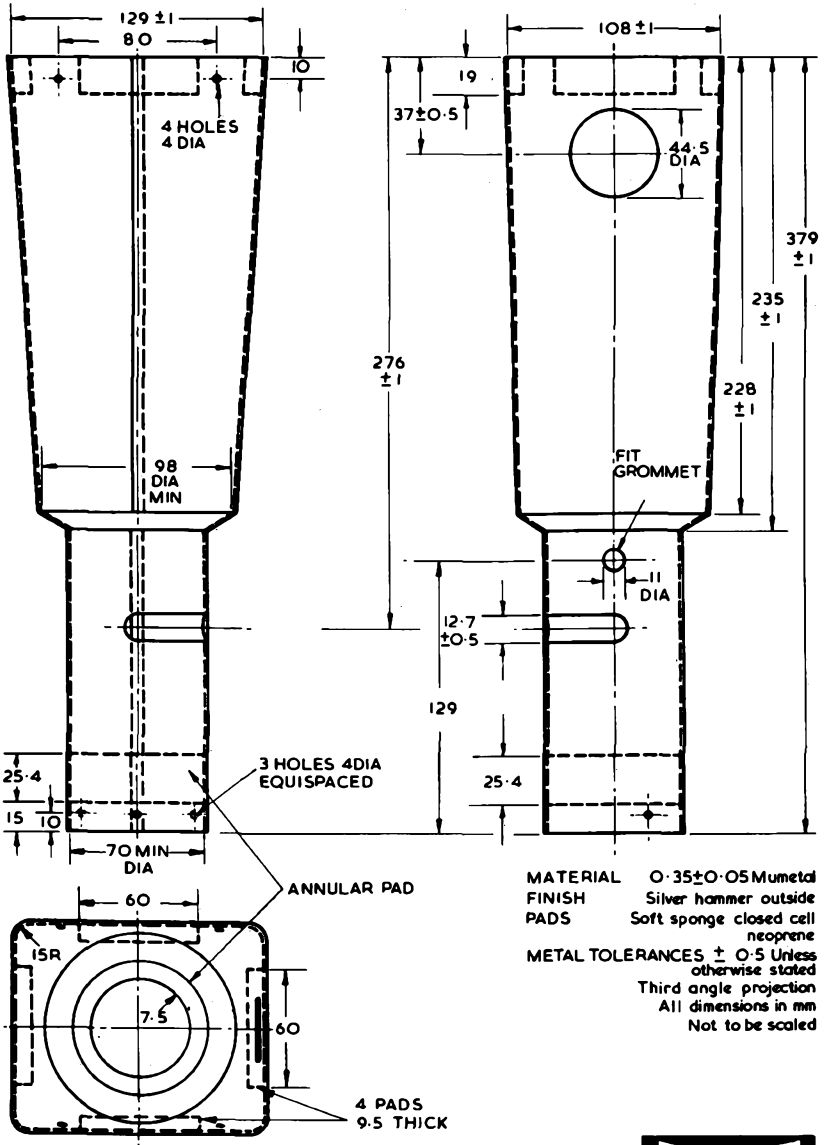
It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Tolerance on all side pin positions ± 5°.

Magnetic Shield MS1

D14-310..

EXAMPLE OF TYPICAL SHIELD

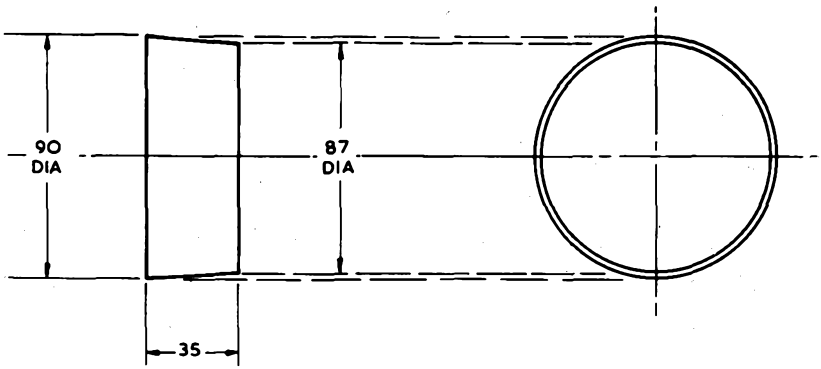


MATERIAL 0·35±0·05 Mumetal
FINISH Silver hammer outside
PADS Soft sponge closed cell neoprene
METAL TOLERANCES ± 0·5 Unless otherwise stated
Third angle projection
All dimensions in mm
Not to be scaled

OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW29



All dimensions in mm Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS1 for D14-310..

WINDING

1600 turns of 0.140 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 550 Ω. Twist coefficient approximately 7 mA/degree measured on typical D14-310..with V_{a4} = 12 kV and V_{a1} = 1.5 kV.

FITTING

The completed twist coil should be pushed onto the tube and secured to tube in two places with suitable adhesive tape.

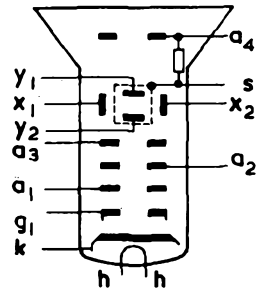
Oscilloscope Tube

D16-100..

GENERAL

This 10 cm x 10 cm square faced tube with electrostatic focusing and deflection is designed for use as an x-y plotter. The tube incorporates spiral post deflection acceleration.

Heater voltage	V_h	6.3 V
Heater current	I_h	0.3 A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	6.0	1.5	kV
Third anode voltage	V_{a3}	2.3	0.7	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	2.2	0.7	kV
Negative grid voltage	$-V_{g1}$	200	1.0	V
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		3.2:1		
Helix resistance		-	50	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D16-100GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

OSCILLOSCOPE TUBES

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-all}}$	10.5	pF
Cathode to all	$C_{k\text{-all}}$	3.5	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	2.3	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.0	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	6.2	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	6.4	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	5.4	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	5.2	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	1.2	pF
Grid 1 to x_1, x_2 plates	$C_{g1\text{-}x1,x2}$	0.8	pF
Grid 1 to y_1, y_2 plates	$C_{g1\text{-}y1,y2}$	0.8	pF

TYPICAL OPERATION - voltages with respect to cathode.

Fourth anode voltage	V_{a4}	2.5	4.0	4.5	kV
Mean deflector plate potential		1250	2000	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1200 to 1300	1925 to 2075	1425 to 1575	V
Second anode voltage for optimum focus	V_{a2}	250 to 450	400 to 720	280 to 580	V
First anode voltage	V_{a1}	1250	2000	1500	V
Shield voltage for optimum raster shape	V_s	1200 to 1300	1925 to 2075	1425 to 1575	V
Control grid voltage for cut-off	V_{g1}	-45 to -85	-72 to -135	-53 to -105	V
x deflection coefficient	D_x	13.5 to 17	21.6 to 27.2	18.5 to 23.5	V/cm
y deflection coefficient	D_y	13.5 to 17	21.6 to 27.2	18.5 to 23.5	V/cm
Line width at 10 μA beam current					
Shrinking raster measurement at centre		0.50	0.31	0.32	mm
Shrinking raster measurement at corner		0.68	0.58	0.58	mm
Grid drive for 10 μA beam current (approx.)		28	26	27	V

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 6 mm radius about the centre of the tube face.

Raster distortion : the edges of a test raster will fall between two concentric squares 10 cm x 10 cm and 9.74 cm x 9.74 cm at a p.d.a. ratio not greater than 2:1.

Rectangularity of x and y axes is 90° ± 1°.

The horizontal trace will be parallel with the axis of the rectangular face-plate to within ±5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 100 mm from the face and should not extend more than 170 mm from the face. The ampere turns required will be equal to $13\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV) with provision for reversing the current. The sensitivity (for both x and y plates) at 75% deflection of the useful scan will not differ by more than 2% from the sensitivity over 10% deflection.

It is not advisable that the deflector plates be run asymmetrically, or severe raster distortion may result and the focus quality cannot be guaranteed. It is preferable that the tube be operated with mean x and y potentials equal, otherwise the raster distortion and focus quality will suffer and the limits for V_{a3} and V_s will differ from specification.

It is recommended that the maximum p.d.a. ratio is not exceeded as this may reduce scan area.

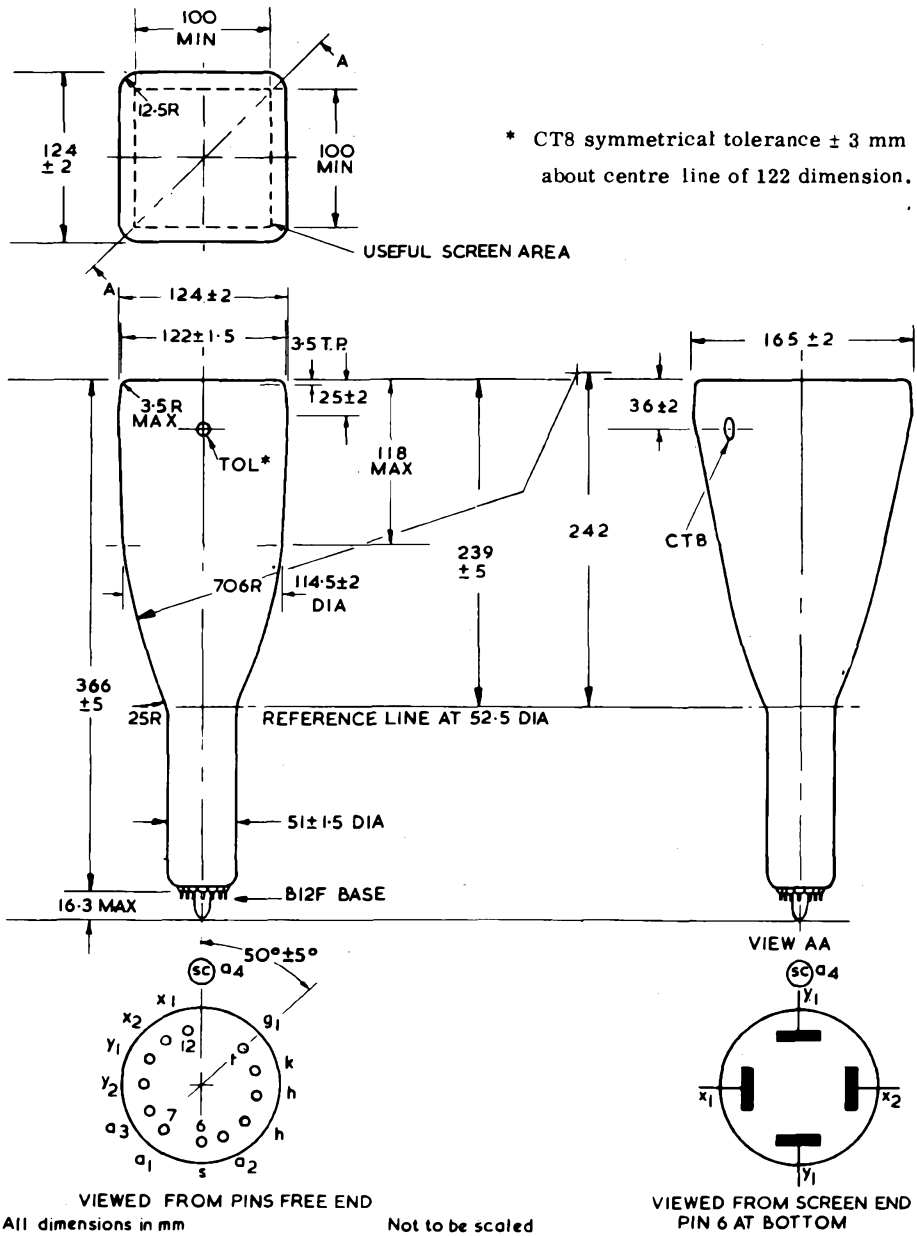
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) 1.2 kg

MOUNTING POSITION - unrestricted

It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.



* CT8 symmetrical tolerance ± 3 mm about centre line of 122 dimension.

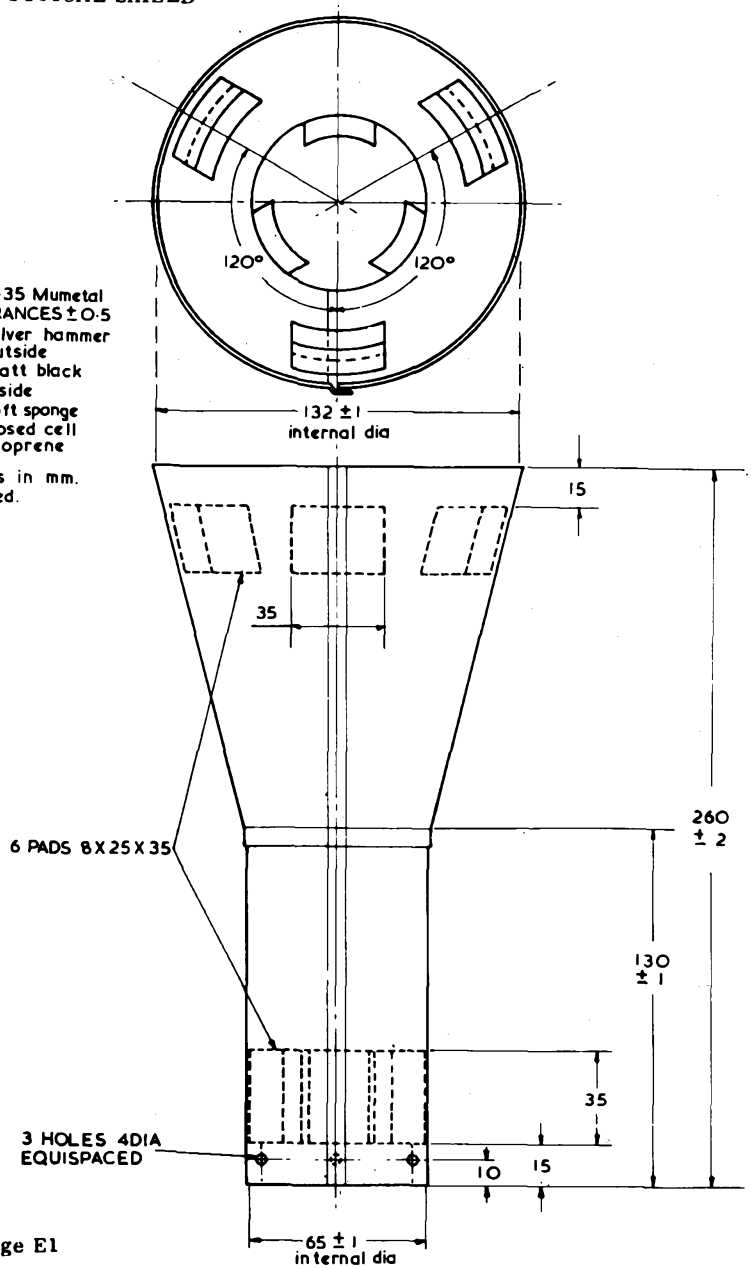
All dimensions in mm

Not to be scaled

Magnetic Shield MS45

D16-100..

EXAMPLE OF TYPICAL SHIELD

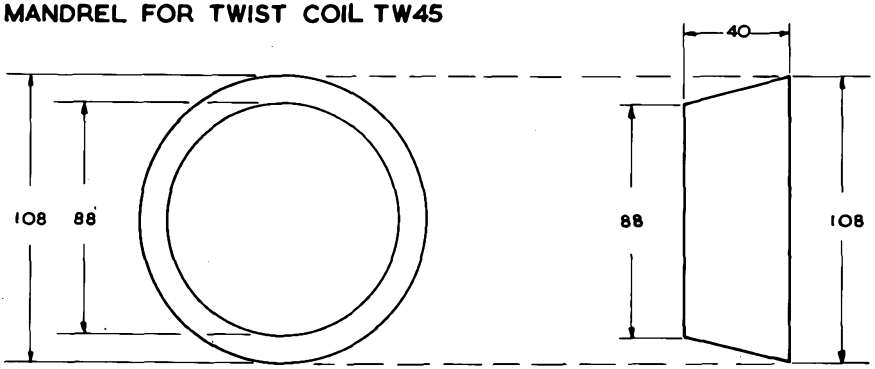


MATERIAL 0·35 Mumetal
METAL TOLERANCES ± 0·5
FINISH Silver hammer outside
Matt black inside
PADS Soft sponge closed cell neoprene

All dimensions in mm.
Not to be scaled.

OSCILLOSCOPE TUBES

MANDREL FOR TWIST COIL TW45



All dimensions in mm

SHIELD

This twist coil is designed to be used in conjunction with Magnetic Shield MS45 for D16-100..

WINDING

1500 turns of 0.140 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 590 Ω. Twist coefficient approx, 3.4 mA/degree measured on a typical D16-100.. with V_{a1} = 2.0 kV and V_{a4-k} = 4.0 kV.

FITTING

The completed twist coil should be pushed hard on to the tube and secured in two places with suitable adhesive tape.

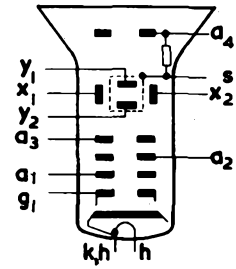
Oscilloscope Tube

D16-110..

GENERAL

This square faced tube with 10 cm x 10 cm display area has spiral p.d.a., electrostatic focusing and deflection. The tube is designed for medium band-width applications and is capable of being deflected by transistor circuits.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS		Max	Min	
Fourth anode voltage	V_{a4}	7.0	2.5	kV
Third anode voltage	V_{a3}	1.8	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.8	0.6	kV
Negative grid voltage	$-V_{g1}$	200	1.0	V
Peak x plate to third anode voltage	$V_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$V_{y-a3(pk)}$	500	-	V
x plate to third anode resistance		100	-	kΩ
y plate to third anode resistance		100	-	kΩ
Control grid to cathode resistance		1.5	-	MΩ
Second anode current		10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		4.5:1		
Helix resistance		-	50	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D16-110GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

OSCILLOSCOPE TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$c_{g1\text{-all}}$	12	pF
Heater and cathode to all	$c_{h,k\text{-all}}$	7.0	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	2.4	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	1.5	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all,less x2}}$	6.3	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all,less x1}}$	6.6	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all,less y2}}$	5.0	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all,less y1}}$	5.0	pF
x_1, x_2 plates to y_1, y_2 plates	$c_{x1,x2\text{-}y1,y2}$	0.7	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$c_{g1\text{-}x1,x2,y1,y2}$	1.4	pF

TYPICAL OPERATION - voltages with respect to cathode.

Fourth anode voltage	V_{a4}	4.0	6.0	kV
Mean deflector plate potential		1000	1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1000*	1500*	V
Second anode voltage for optimum focus	V_{a2}	175 to 400	260 to 600	V
First anode voltage	V_{a1}	1000	1500	V
Shield voltage for optimum raster shape	V_s	1000*	1500*	V
Control grid voltage for cut-off	V_{g1}	-27 to -53	-40 to -80	V
x deflection coefficient	D_x	14.5 to 18.5	21.8 to 27.8	V/cm
y deflection coefficient	D_y	8.5 to 10.7	12.8 to 16.1	V/cm
Minimum screen area		10 x 10	10 x 10	cm^2
Line width at 10 μA beam current Shrinking raster measurement at centre		0.30	0.24	mm
Grid drive to 10 μA beam current		17	17	V

* The required voltage will not differ from the quoted value by more than ± 50V.

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 6 mm radius about the centre of the tube face.

Raster distortion : the edges of a test raster will fall between two concentric squares 10 cm x 10 cm and 9.7 cm x 9.7 cm.

Rectangularity of x and y axes is 90° ± 1°.

The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 160 mm from the face and should not extend more than 215 mm from the face. The ampere turns required will be equal to $13\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV) with provision for reversing the current. The sensitivity (for both x and y plates) at 75% deflection of the useful scan will not differ by more than 2% from the sensitivity over 10% deflection.

It is not advisable that the deflector plates be run asymmetrically, or severe raster distortion may result and the focus quality cannot be guaranteed. It is preferable that the tube be operated with mean x and y potentials equal, otherwise the raster distortion and focus quality will suffer and the limits for V_{a3} and V_s will differ from specification.

It is recommended that the maximum p.d.a. ratio is not exceeded as this may reduce scan area.

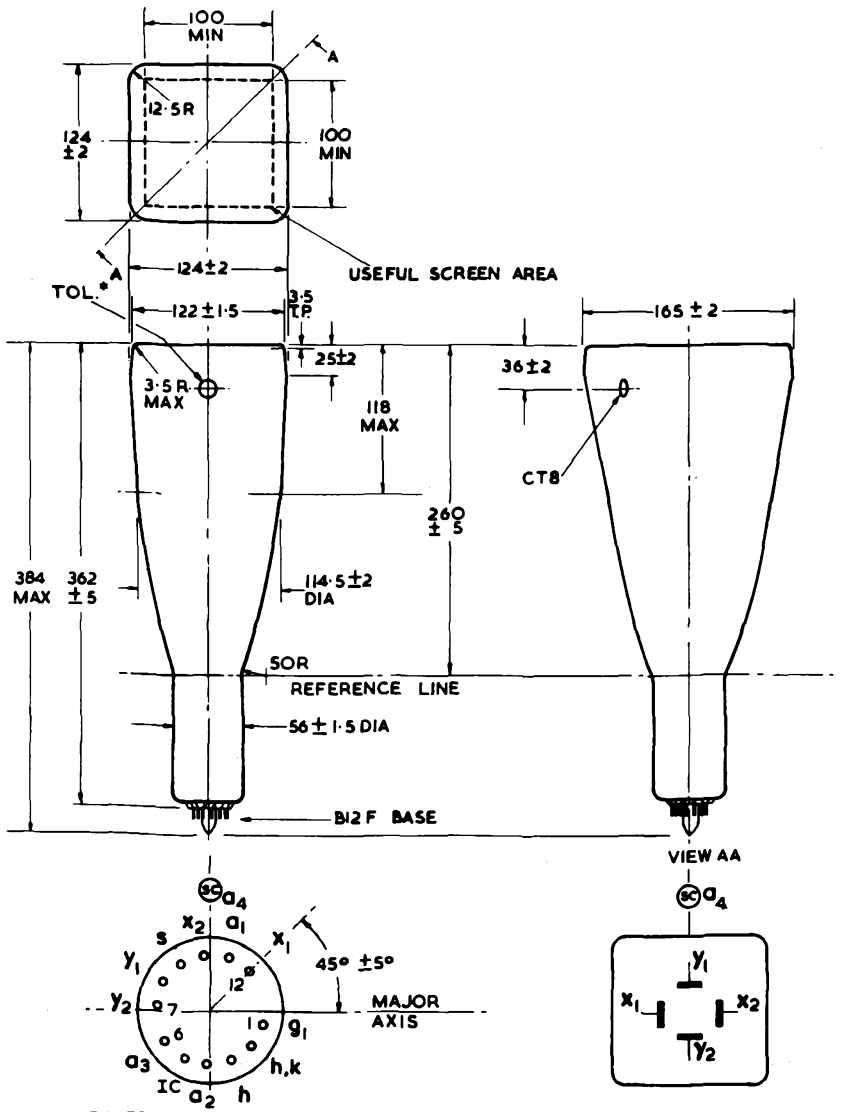
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) 1.2 kg

MOUNTING POSITION - unrestricted

It is advisable to support the tube near the screen and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.



All dimensions in mm

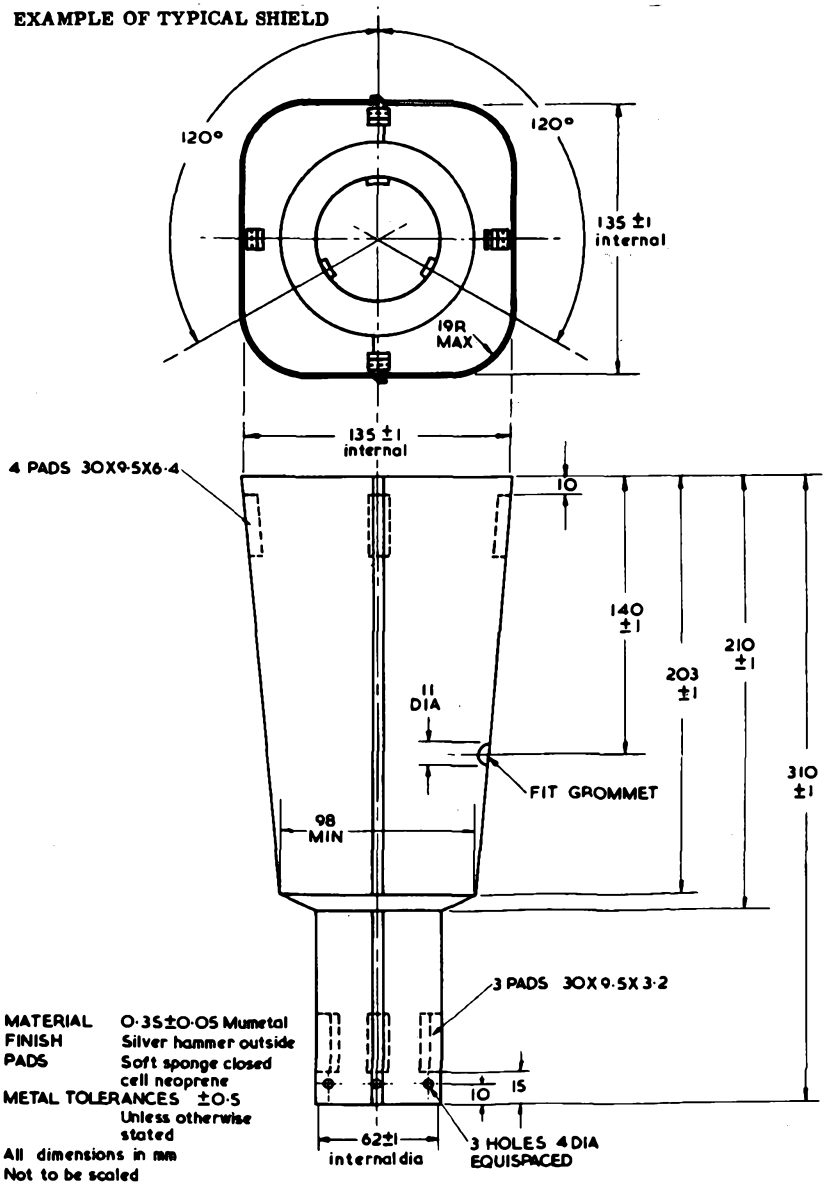
Not to be scaled

* CT8 symmetrical tolerance ±3 mm about centre line of 122 dimension on CT8 side.

Magnetic Shield MS63

D16-110..

EXAMPLE OF TYPICAL SHIELD



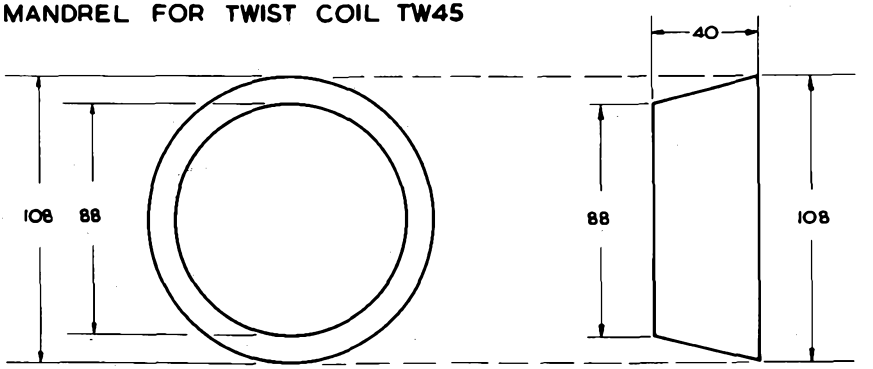
MATERIAL	0·35±0·05 Mumetal
FINISH	Silver hammer outside
PADS	Soft sponge closed cell neoprene
METAL TOLERANCES	±0·5 Unless otherwise stated

All dimensions in mm
Not to be scaled

OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW45



All dimensions in mm Not to be scaled

SHIELD

This twist coil is designed to be used in conjunction with Magnetic Shield MS63 for D16-110..

WINDING

1500 turns of 0.140 mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 590 Ω. Twist coefficient approx. 4.0 mA/degree measured on a typical D16-110.. with V_{a1} = 1.5 kV and V_{a4-k} = 6.0 kV.

FITTING

The completed twist coil should be pushed hard on to the tube and secured in two places with suitable adhesive tape.

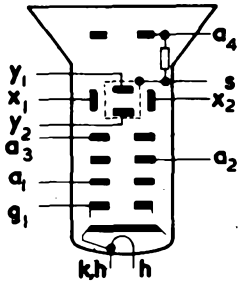
Oscilloscope Tube

D18-130..

GENERAL

This short rectangular tube with 12 cm x 10 cm display area, spiral p.d.a., electrostatic focusing and deflection is designed for general purpose applications. It is capable of being deflected by transistor circuits.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS		Max	Min	
Fourth anode voltage	V_{a4}	4.0	1.5	kV
Third anode voltage	V_{a3}	1.8	0.6	kV
Second anode voltage	V_{a2}	1.0	0	kV
First anode voltage	V_{a1}	1.8	0.6	kV
Negative grid voltage	$-V_{g1}$	200	1.0	V
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate circuit impedance	Z_x	100	-	kΩ
y plate circuit impedance	Z_y	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		2.2:1		
Helix resistance		-	15	MΩ

All voltages referred to cathode unless otherwise stated

OSCILLOSCOPE TUBES

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D18-130GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-all}}$	10	pF
Heater and cathode to all	$C_{h,k\text{-all}}$	4.5	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	2.3	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.2	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	6.3	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	5.9	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	4.8	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	4.9	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	0.6	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,x2,y1,y2}$	0.9	pF

TYPICAL OPERATION - voltages with respect to cathode.

Fourth anode voltage	V_{a4}	3.0	kV
Mean deflector plate potential		1500	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1500*	V
Second anode voltage for optimum focus	V_{a2}	270 to 570	V
First anode voltage	V_{a1}	1500	V
Shield voltage for optimum raster shape	V_s	1500*	V
Minimum useful screen area		12 x 10	cm^2
Control grid voltage for cut-off	V_{g1}	-40 to -80	V
x deflection coefficient	D_x	23 to 29	V/cm
y deflection coefficient	D_y	13 to 16.5	V/cm
Line width at 10 μA beam current			
Shrinking raster measurement at centre		0.25	mm
Microscope measurement at centre		0.49	mm

* The required voltage will not differ from the quoted value by more than $\pm$ 50V.

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle of 7.5 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 12 cm x 10 cm and 11.7 cm x 9.75 cm.

Rectangularity of x and y axes is 90° ± 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield approximately 80 mm from the face and should not extend more than 130 mm from the face.

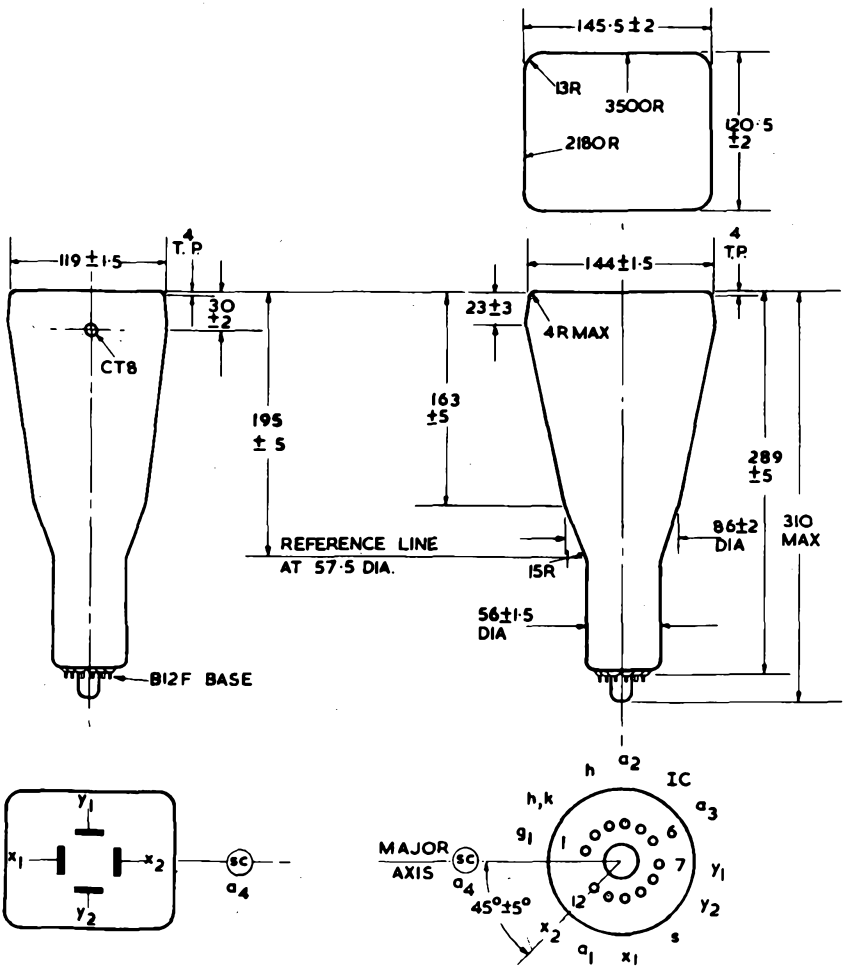
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under any circumstances the mean y plate potential should never differ from the mean x plate potential by more than 50V when the tube is operated at 3 kV.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

MOUNTING POSITION - unrestricted.

TUBE WEIGHT (approximate) 1.4 kg



All dimensions in mm. Third angle projection. Not to be scaled

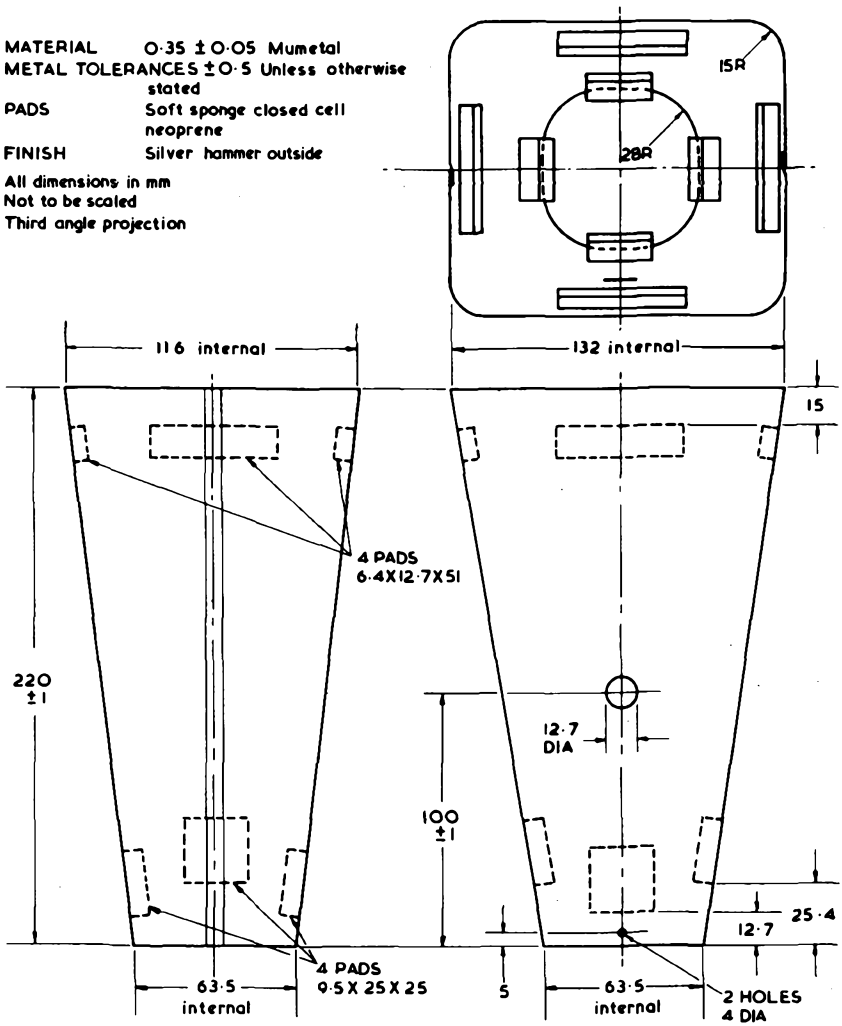
It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Magnetic Shield MS 61

D18-130..

MATERIAL	0·35 ± 0·05 Mumetal
METAL TOLERANCES	±0·5 Unless otherwise stated
PADS	Soft sponge closed cell neoprene
FINISH	Silver hammer outside

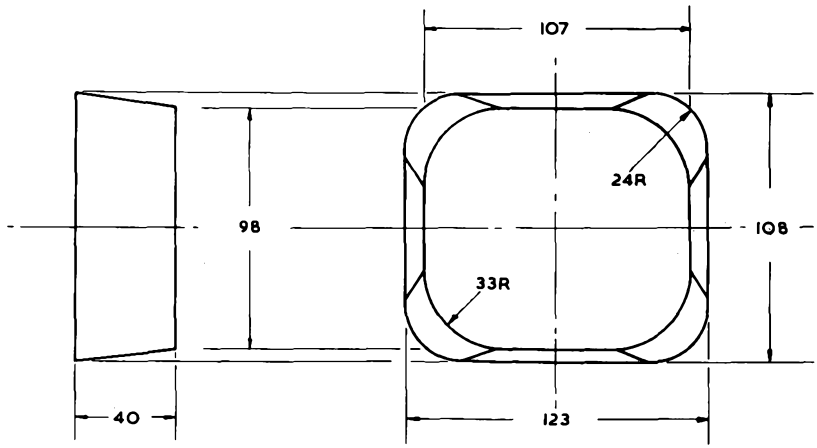
All dimensions in mm
Not to be scaled
Third angle projection



OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW48



All dimension in mm Not to be scaled

MANDREL

Shaped from wood to dimensions given above.

SHIELD

This twist coil is designed to be used in conjunction with magnetic shield MS61 for D18-130..

WINDING

2000 turns of 0.14 mm Lewmex Grade 1 or 2 wire, or approved alterative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 900 Ω. Current required for ± 5° twist is ± 9.5 mA measured on a typical D18-130.. with $V_{a\text{-}1}$ = 3.0 kV and V_{a1} = 1.5 kV.

FITTING

The completed twist coil should be pushed onto the tube from the base end as far as it will travel and fastened with adhesive tape.

Oscilloscope Tube

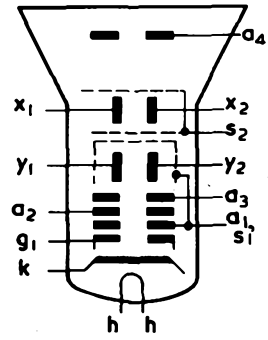
D18-160 ..

PRELIMINARY DATA

GENERAL

This 12 cm x 10 cm rectangular aluminised tube with electrostatic focusing and deflection uses a mesh p.d.a. to achieve high deflection sensitivity and high brightness without additional electrode control voltages. The tube is designed for transistor deflection medium to high bandwidth applications.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	13	8.0	kV
Third anode voltage	V_{a3}	2.5	1.4	kV
Second anode voltage	V_{a2}	1.0	-	kV
First anode voltage	V_{a1}	2.5	1.4	kV
Negative control grid voltage	$-V_{g1}$	200	1.0	V
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
x plate to third anode resistance	R_{x-a3}	100	-	kΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3})		7: 1	-	

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D18-160GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

OSCILLOSCOPE TUBES

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-all}}$	9.5	pF
Heater and cathode to all	$C_{h,k\text{-all}}$	3.5	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	2.0	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.5	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less } x2}$	6.0	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less } x1}$	6.0	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less } y2}$	5.0	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less } y1}$	5.0	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	0.8	pF
Grid 1 to x_1, x_2, y_1, y_2 plates	$C_{g1\text{-}x1,\ x2,y1,y2}$	0.8	pF

TYPICAL OPERATION - Voltages with respect to cathode

Fourth anode voltage	V_{a4}	12	kV
Mean deflector plate potential		2000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1970 to 2030	V
Second anode voltage for optimum focus	V_{a2}	420 to 660	V
First anode and shield 1 voltage	V_{a1+s1}	2000	V
Shield 2 voltage for optimum raster shape	V_{s2}	1950 to 2050	V
Control grid voltage for cut-off	V_{g1}	-40 to -80	V
x deflection coefficient	D_x	11.0 to 14.2	V/cm
y deflection coefficient	D_y	4.3 to 5.8	V/cm
Minimum screen area		12x10	cm^2
Line width at 10μA beam current			
Shrinking raster measurement at centre		0.35	mm
Microscope measurement at centre		0.65	mm
Microscope measurement at edge		0.9	mm
Grid Drive to 10μA beam current (approx.)		18	V

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 10 mm radius about the centre of the tube face.

Raster distortion: The edges of a test raster will fall between two concentric rectangles 120 mm x 100 mm and 117 mm x 97.5 mm.

Rectangularity of x and y axes is 90° + 1°. The horizontal trace will be parallel with the axis of the rectangular face-plate to within ± 5°. A twist coil will be required to effect accurate alignment. This should be mounted inside the magnetic shield between 200 mm and 250 mm from the face.
The ampere turns required will be equal to $14\sqrt{V_{a4}}$ (where V_{a4} is quoted in kV) with provision for reversing the current. The sensitivity (for both x and y plates) at 75% deflection of the useful scan will not differ by more than 2% from the sensitivity over 25% deflection.

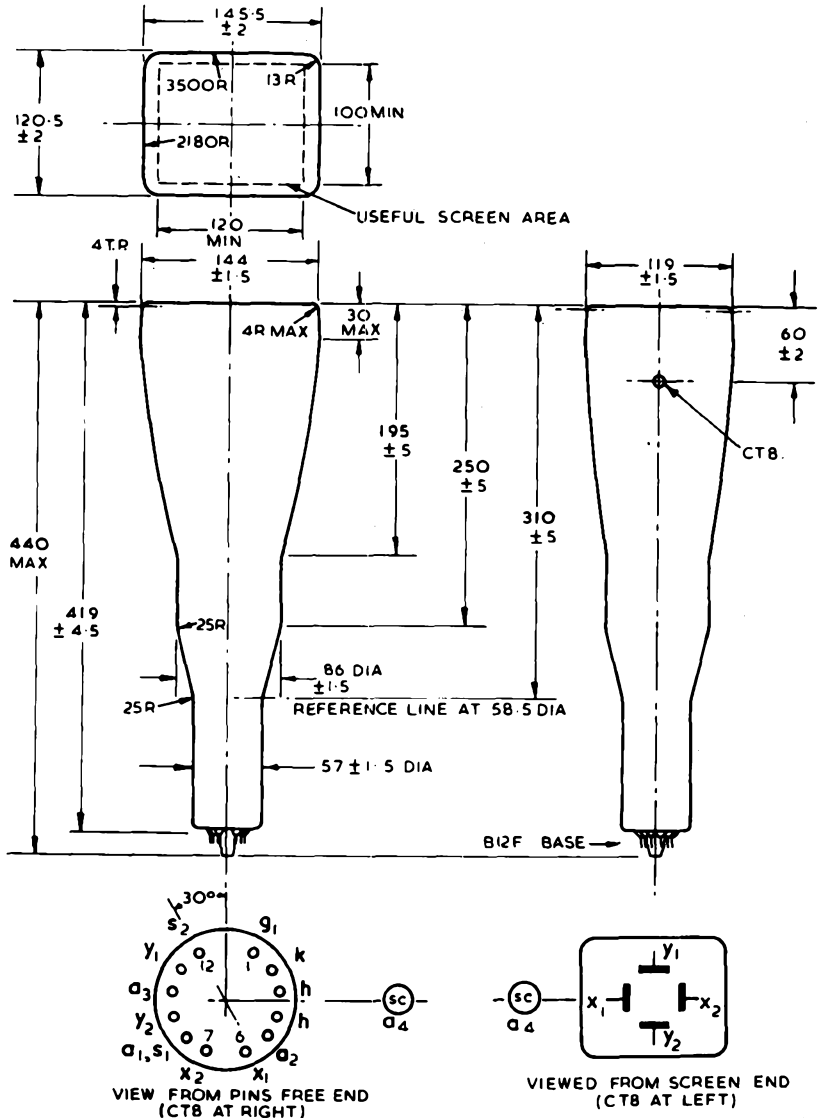
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) - 2.1 kg

MOUNTING POSITION - unrestricted



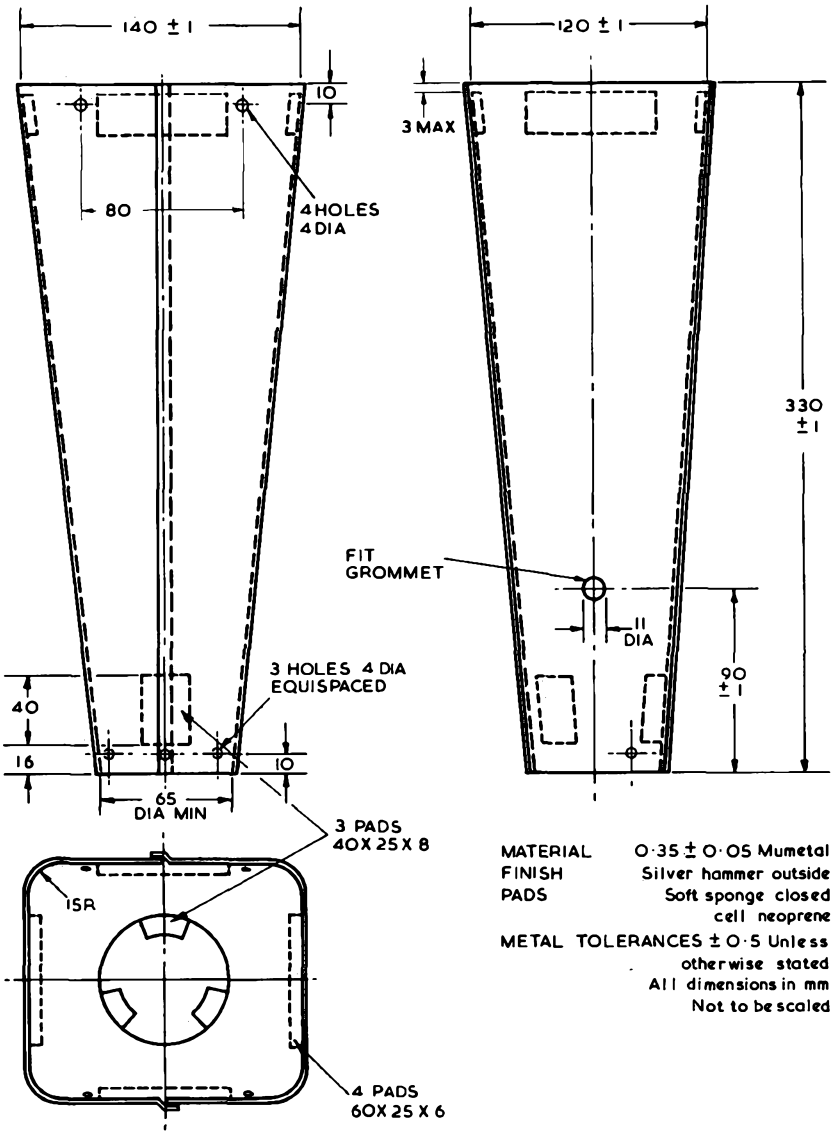
All dimensions in mm

Not to be scaled

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Magnetic Shield MS 84

D18-160..



MATERIAL	0·35 ± 0·05 Mumetal
FINISH	Silver hammer outside
PADS	Soft sponge closed cell neoprene

METAL TOLERANCES ± 0·5 Unless otherwise stated

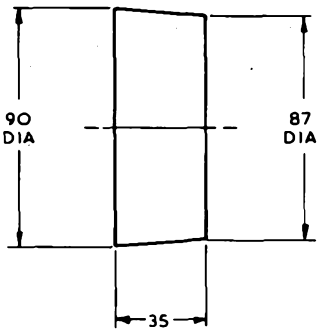
All dimensions in mm

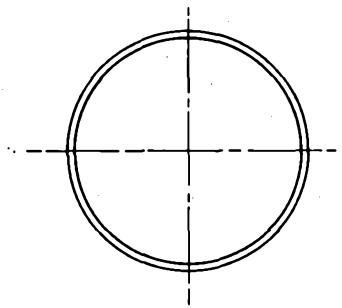
Not to be scaled

OSCILLOSCOPE TUBES

BRIMAR

MANDREL FOR TWIST COIL TW29





All dimensions in mm Not to be scaled

MANDREL

Shaped from wood in the form of a truncated circular cone, dimensions as above.

SHIELD

This twist coil, is designed to be used in conjunction with magnetic shield MS84 for D18-160..

WINDING

1600 turns of 0.140mm Lewmex Grade 1 or 2 wire, or approved alternative, layer wound on the adhesive side of adhesive backed crepe paper to give 5 mm margins between the coil and each edge of the mandrel.
Start and finish of winding to be brought out on 450 mm long thin flexible lead wires from smaller end of winding.
Varnish, if necessary, cover with adhesive backed crepe paper and ensure that the edges of the coil are sealed in place.

ELECTRICAL CHARACTERISTICS

Resistance approx. 550Ω. Twist coefficient approximately 6.5 mA/degree measured on typical D18-160.. with V_{a4} = 12kV and V_{a1} = 2.0 kV.

FITTING

The completed twist coil should be pushed onto the tube and secured to tube in two places with suitable adhesive tape.

Oscilloscope Tube

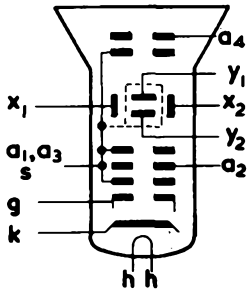
D21-10..

MAINTENANCE TYPE

GENERAL

This 21 cm (8.5 inch) diameter tube with electrostatic focusing and deflection has a large display area and can operate at a p.d.a. ratio of 2:1.

Heater voltage	V_h	6.3 V
Heater current	I_h	0.3 A



ABSOLUTE RATINGS

Maximum fourth anode voltage	$V_{a4(max)}$	6.6	kV
Maximum first and third anode voltage	$V_{a1+a3(max)}$	3.3	kV
Maximum second anode voltage	$V_{a2(max)}$	2.0	kV
Maximum negative grid voltage	$-V_{g(max)}$	220	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum peak x plate to third anode voltage	$v_{x-a3(pk)max}$	500	V
Maximum peak y plate to third anode voltage	$v_{y-k(pk)max}$	500	V
Maximum peak heater to cathode voltage	$v_{h-k(pk)max}$	150	kΩ
Maximum x plate to third anode resistance	$R_{x-a3(max)}$	100	kΩ
Maximum y plate to third anode resistance	$R_{y-a3(max)}$	100	kΩ
Maximum grid to cathode resistance	$R_{g-k(max)}$	1.5	MΩ
Maximum p.d.a. ratio		2:1	

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D21-10GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

Type D21-10GH is the commercial version of the CV9315.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Grid to all	c_{g-all}	8.0	pF
Cathode to all	c_{k-all}	10	pF
x_1 plate to x_2 plate	c_{x1-x2}	4.0	pF
y_1 plate to y_2 plate	c_{y1-y2}	2.0	pF
x_1 plate to all, less x_2 plate	$c_{x1-all,less\ x2}$	8.0	pF
x_2 plate to all, less x_1 plate	$c_{x2-all,less\ x1}$	8.0	pF
y_1 plate to all, less y_2 plate	$c_{y1-all,less\ y2}$	6.0	pF
y_2 plate to all, less y_1 plate	$c_{y2-all,less\ y1}$	6.0	pF

TYPICAL OPERATION - voltages with respect to cathode

Fourth anode voltage	V_{a4}	4.0	6.0	kV
First and third anode and shield voltage	$V_{a1+a3+s}$	2.0	3.0	kV
Second anode voltage	V_{a2}	540 to 800	800 to 1200	V
Grid voltage for cut-off	V_g	-24 to -56	-36 to -84	V
x deflection coefficient	D_x	23 to 32	34.5 to 48	V/cm
y deflection coefficient	D_y	19 to 27	28.5 to 40.5	V/cm
Minimum screen area		15 x 15	15 x 15	cm^2

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle of 10 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 12.5 cm x 12.5 cm and 12.25 cm x 12.25 cm.

Rectangularity of x and y axes is 90° ± 1°.

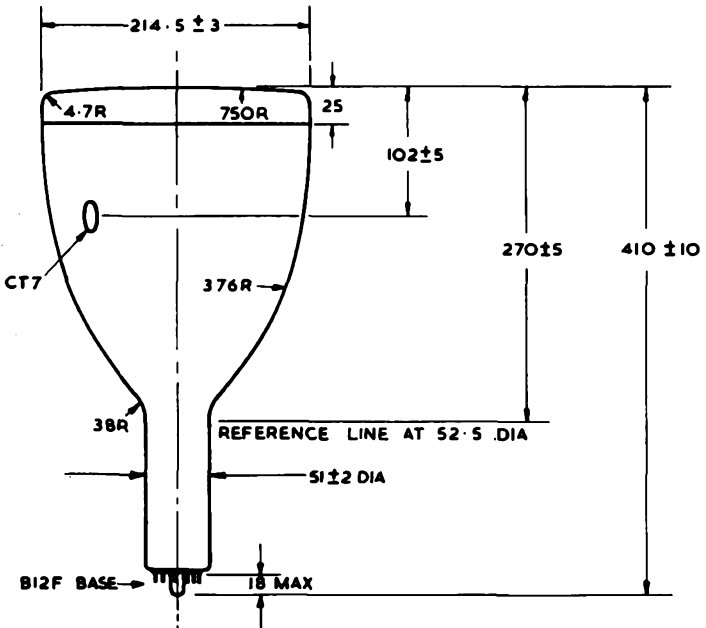
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. The mean y plate potential should never differ from the mean x plate potential by more than 50V.

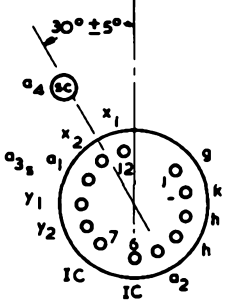
MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

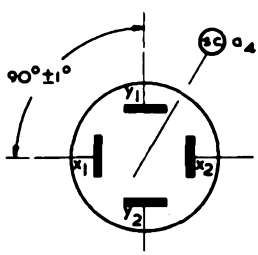
TUBE WEIGHT (approximate) 2.4 kg

MOUNTING POSITION - unrestricted





VIEW FROM PINS FREE END



VIEWED FROM SCREEN END
(PIN 6 AT BOTTOM)

All dimension in mm

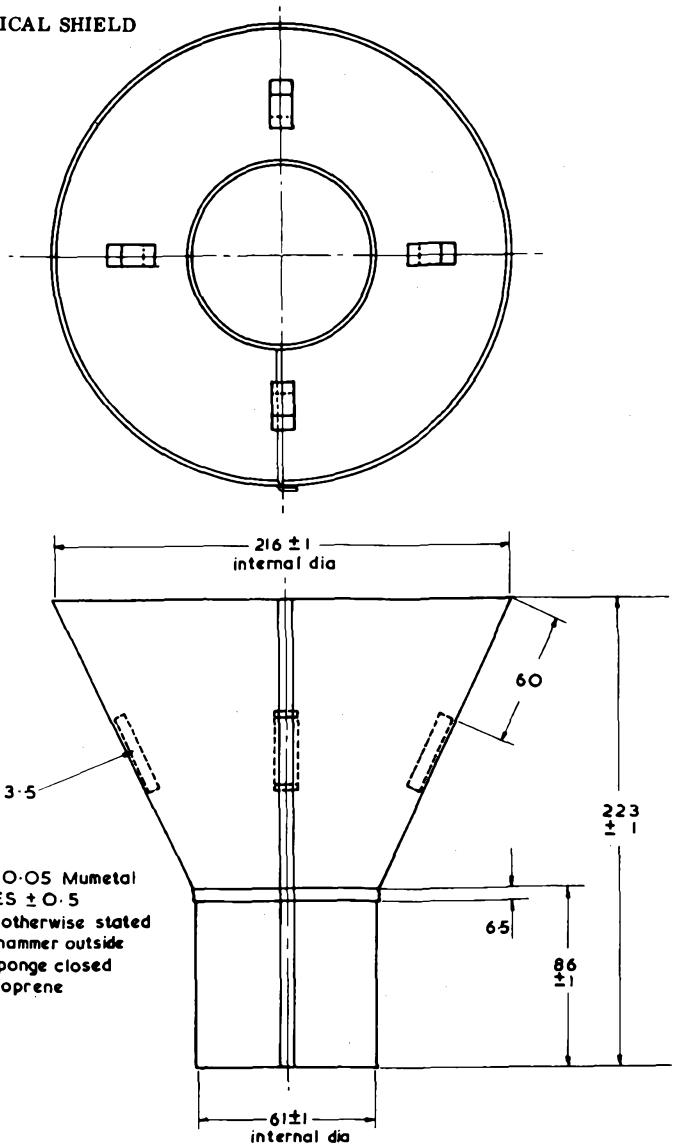
Not to be scaled

Connecting leads should not be soldered directly to tube pins.

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

Magnetic Shield MS 52

EXAMPLE OF TYPICAL SHIELD



MATERIAL 0·35 ± 0·05 Mumetal
METAL TOLERANCES ± 0·5
Unless otherwise stated
FINISH Silver hammer outside
PADS Soft sponge closed cell neoprene

All dimensions in mm
Not to be scaled

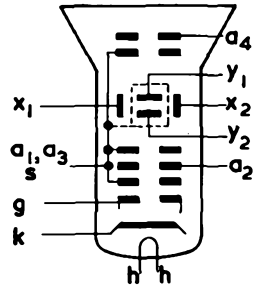
Oscilloscope Tube

D21-102..

GENERAL

This 21 cm (8.5 inch) diameter aluminised tube with electrostatic focusing and deflection has a large display area and can operate at a p.d.a. ratio of 2:1.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

Maximum fourth anode voltage	$V_{a4(max)}$	6.6	kV
Maximum first and third anode voltage	$V_{a1+a3(max)}$	3.3	kV
Maximum second anode voltage	$V_{a2(max)}$	2.0	kV
Maximum negative grid voltage	$-V_{g(max)}$	220	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum peak x plate to third anode voltage	$v_{x-a3(pk)max}$	500	V
Maximum peak y plate to third anode voltage	$v_{y-k(pk)max}$	500	V
Maximum peak heater to cathode voltage	$v_{h-k(pk)max}$	150	V
Maximum x plate to third anode resistance	$R_{x-a3(max)}$	100	kΩ
Maximum y plate to third anode resistance	$R_{y-a3(max)}$	100	kΩ
Maximum grid to cathode resistance	$R_{g-k(max)}$	1.5	MΩ
Maximum p.d.a. ratio		2:1	

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (D21-102GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

INTER-ELECTRODE CAPACITANCES

Grid to all	$c_{g\text{-all}}$	8.0	pF
Cathode to all	$c_{k\text{-all}}$	10	pF
x_1 plate to x_2 plate	$c_{x1\text{-}x2}$	4.0	pF
y_1 plate to y_2 plate	$c_{y1\text{-}y2}$	2.0	pF
x_1 plate to all, less x_2 plate	$c_{x1\text{-all, less x2}}$	8.0	pF
x_2 plate to all, less x_1 plate	$c_{x2\text{-all, less x1}}$	8.0	pF
y_1 plate to all, less y_2 plate	$c_{y1\text{-all, less y2}}$	6.0	pF
y_2 plate to all, less y_1 plate	$c_{y2\text{-all, less y1}}$	6.0	pF

TYPICAL OPERATION - voltages with respect to cathode

Fourth anode voltage	V_{a4}	6.0	kV
First and Third anode and shield voltage	$V_{a1+a3+s}$	3.0	kV
Second anode voltage	V_{a2}	800 to 1200	V
Grid voltage for cut-off	V_g	-36 to -84	V
x deflection coefficient	D_x	34.5 to 48	V/cm
y deflection coefficient	D_y	28.5 to 40.5	V/cm
Minimum screen area (corners cut)		15 x 15	cm^2

RASTER DISTORTION AND ALIGNMENT

The undeflected spot will fall in a circle of 10 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 12.5 cm x 12.5 cm and 12.25 cm x 12.25 cm.

Rectangularity of x and y axes is $90° \pm 1°$.

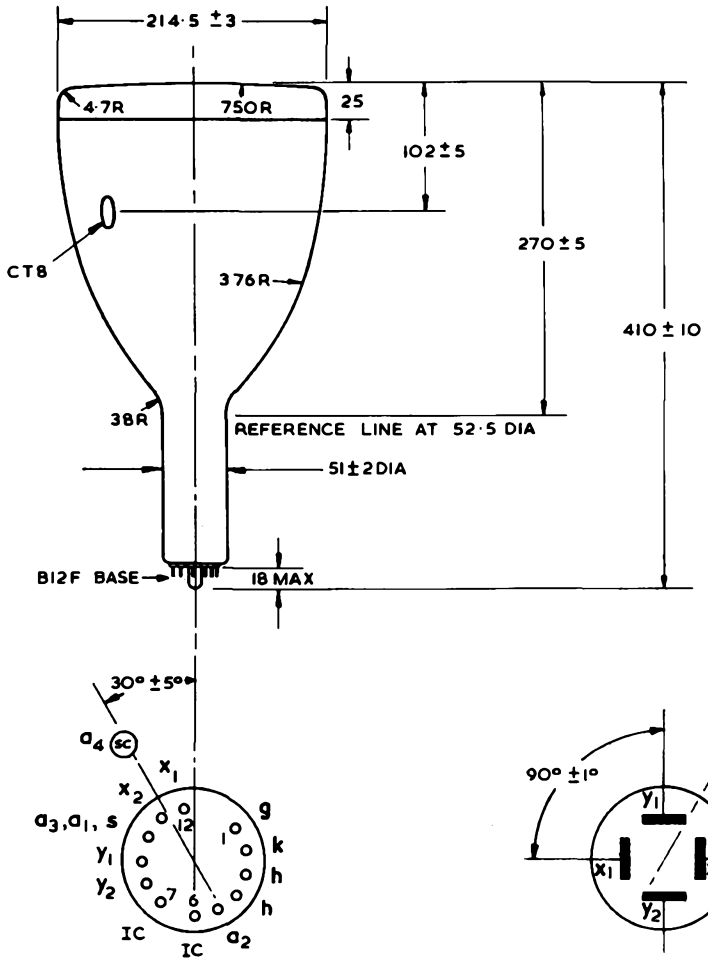
It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. The mean y plate potential should never differ from the mean x plate potential by more than 50V.

MAGNETIC SHIELDING

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

TUBE WEIGHT (approximate) 2.4 kg

MOUNTING POSITION - unrestricted



VIEW FROM PINS FREE END

VIEWED FROM SCREEN END
(PIN 6 AT BOTTOM)

All dimensions in mm

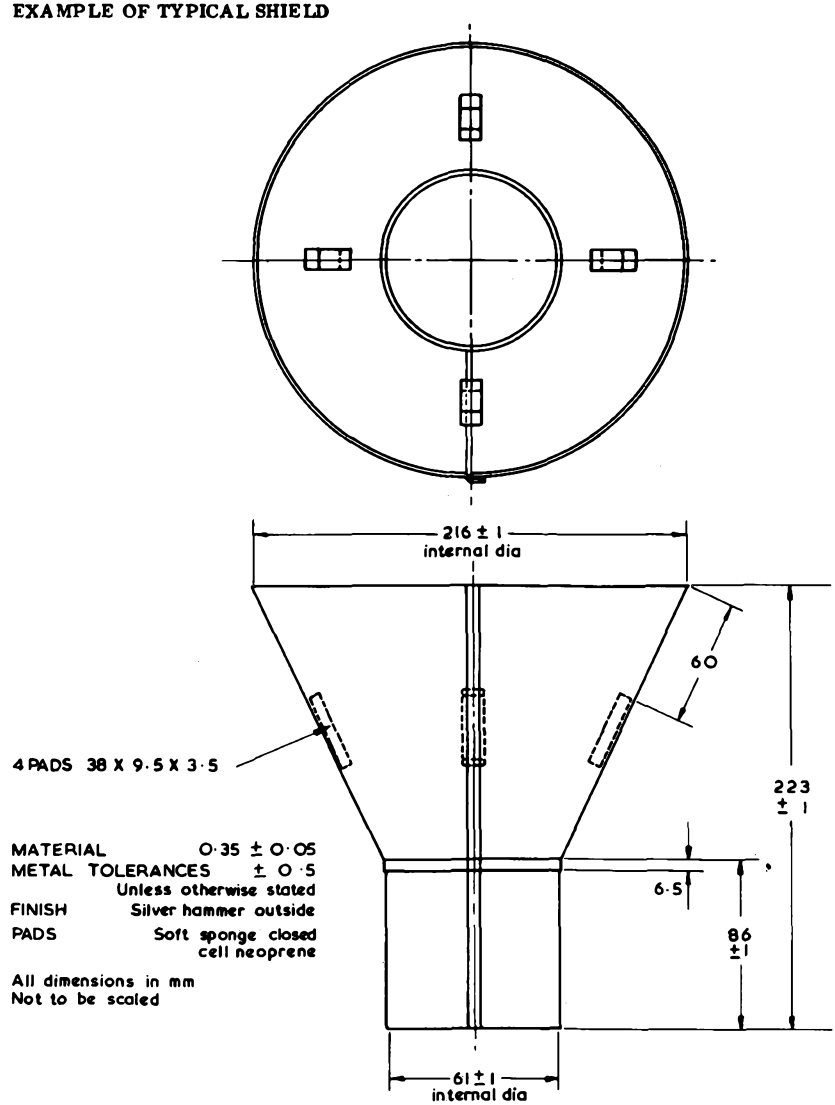
Not to be scaled

Connecting leads should not be soldered directly to tube pins.

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

D21-102 .. Magnetic Shield MS 52

EXAMPLE OF TYPICAL SHIELD



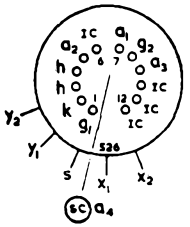
MATERIAL	0·35 ± 0·05
METAL TOLERANCES	± 0·5
	Unless otherwise stated
FINISH	Silver hammer outside
PADS	Soft sponge closed cell neoprene

All dimensions in mm
Not to be scaled

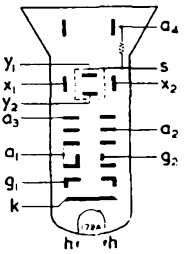
Oscilloscope Tube

SE4D

Maintenance Type



Base B12F, Cap CT8



GENERAL

This 4 inch diameter tube incorporates a means of beam blanking at anode potential which avoids d.c. coupling to the grid. The screen is not aluminised. The standard phosphor for this tube is P31, but P7 and P11 can be supplied to special order.

Heater Voltage	V_h	6·3	V
Heater Current	I_h	0·3	A

ABSOLUTE RATINGS

Maximum Fourth Anode Voltage	$V_{a4(max)}$	7·0	kV
Minimum Fourth Anode Voltage	$V_{a4(min)}$	2·0	kV
Maximum Third Anode Voltage	$V_{a3(max)}$	2·0	kV
Maximum Second Anode Voltage	$V_{a2(max)}$	500	V
Maximum First Anode Voltage	$V_{a1(max)}$	1·7	kV
Maximum Negative Control Grid Voltage	$-V_{g1(max)}$	300	V
Minimum Negative Control Grid Voltage	$-V_{g1(min)}$	1·0	V
Maximum x plate to Third Anode Voltage	$V_{x-a3(max)}$	500	V
Maximum y plate to Third Anode Voltage	$V_{y-a3(max)}$	500	V
Maximum Peak Heater to Cathode Voltage	$V_{h-k(pk)max}$	250	V
Maximum x plate to Third Anode Resistance	$R_{x-a3(max)}$	5·0	MΩ
Maximum y plate to Third Anode Resistance	$R_{y-a3(max)}$	100	kΩ
Maximum Control Grid to Cathode Resistance	$R_{g1-k(max)}$	1·5	MΩ
Minimum Helix Resistance		50	MΩ
Maximum P.D.A. Ratio		4:1	

All votages referred to cathode unless otherwise stated.

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	C_{g1-all}	8·5	pF
Grid 1 to Grid 2	C_{g1-g2}	0·3	pF
Grid 2 to all	C_{g2-all}	6·7	pF
Cathode to all	C_{k-all}	3·2	pF
x_1 plate to x_2 plate	C_{x1-x2}	1·7	pF
y_1 plate to y_2 plate	C_{y1-y2}	1·3	pF
x_1 and x_2 plates to y_1 and y_2 plates	$C_{x1,x2-y1,y2}$	0·5	pF
x_1 plate to all, less x_2 plate	$C_{x1-all,\ less\ x2}$	3·3	pF
x_2 plate to all, less x_1 plate	$C_{x2-all,\ less\ x1}$	3·3	pF
y_1 plate to all, less y_2 plate	$C_{y1-all,\ less\ y2}$	3·2	pF
y_2 plate to all, less y_1 plate	$C_{y2-all,\ less\ y1}$	3·2	pF
Grid 1 to x_1, x_2, y_1 and y_2 plates	$C_{g1-x1,x2,y1,y2}$	0·03	pF

The SE4D/P31 is also known as the CV8299.
The SE4D/T14 is also known as the CV8300.

TYPICAL OPERATION—Voltages with respect to cathode.

Fourth Anode Voltage	V_{a4}	3·0	4·0	6·0	kV
Mean Deflector Plate Potential		750	1000	1500	V
Third Anode Voltage for astigmatism correction	V_{a3}	750*	1000*	1500*	V
Second Anode Voltage for focus	V_{a2}	60 to 160	80 to 200	80 to 300	V
First Anode Voltage	V_{a1}	750	1000	1500	V
Interplate Shield Voltage for optimum raster shape	V_s	700 to 800	950 to 1050	1450 to 1550	V
Control Grid Voltage for visual cut-off	V_{g1}	−27 to −50	−35 to −65	−53 to −98	V
Beam Blanking Voltage	V_{g2}	695†	930†	1395†	V
Maximum x plate Deflection Coefficient	$D_{x(max)}$	19	25	37·5	V/cm
Maximum y plate Deflection Coefficient	$D_{y(max)}$	5·0	7·5	11·25	V/cm
Maximum Second Anode Current	$I_{a2(max)}$	10	10	10	μA
Maximum Fourth Anode Current	$I_{a4(max)}$	75	100	150	μA
Minimum Screen Area		5 x 8	5 x 8	5 X 8	cm
Line Width		0·5	0·4	0·35	mm

* The required voltage will not differ from the quoted value by more than ± 50V.

† The beam is unblanked when $V_{g2}=V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

Raster Distortion

At the recommended P.D.A. ratios, over the nominally useful screen area, raster distortion will not be greater than 2 per cent. Raster geometry can be adjusted by varying the interplate shield voltage (V_s) with respect to the mean deflector plate potential. It is essential to ensure that the correct raster shape has been achieved by this means before adjusting for optimum focus.

Deflection of the spot is proportional to the voltage applied to the deflector plates within ± 2 per cent.

Rectangularity of x and y axes is 90° ± 1°.

The Deflector System

Both x and y plates are designed for symmetrical operation. Should the tube be required to operate asymmetrically, some degradation of focus and trace geometry will result.

If the mean plate potentials for both x and y plates are the same, the third anode voltage for astigmatism correction will be within ± 50 V of the mean plate potential.

If the x plate mean potential differs considerably from that of the y, greater variation of the third anode voltage (V_{a3}) and the interplate shield voltage (V_s) will be required, and the x and y sensitivities will decrease.

The y plate mean potential should not be allowed to become greater than that of the x or severe deflection defocusing will result.

The deflection system is designed to intercept part of the beam, so that low impedance deflector plate drive is desirable.

Magnetic Shielding

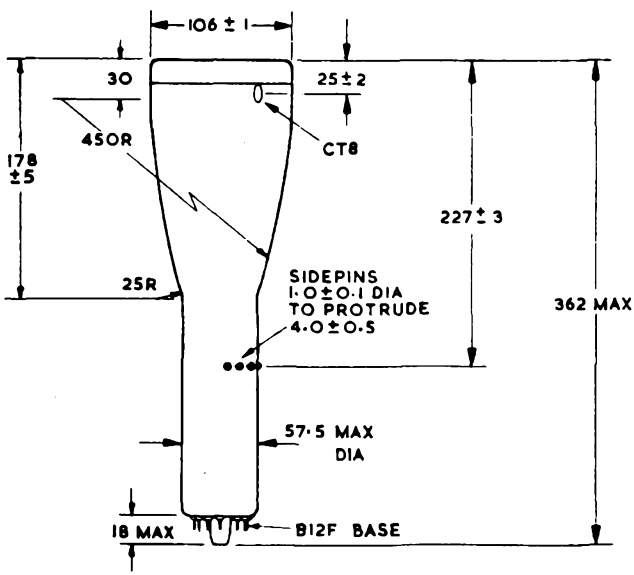
Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

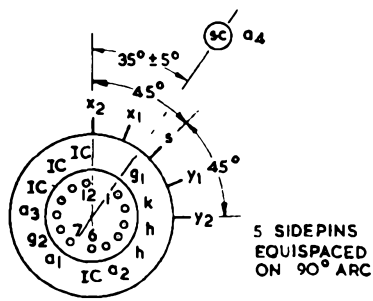
Net Tube Weight—0·8 kg (1¾ lb)

Oscilloscope Tube

SE4D

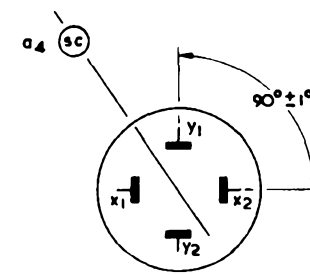
Q48J





5 SIDEPINS EQUISPACED ON 90° ARC

VIEW FROM PINS FREE END



VIEWED FROM SCREEN END (PIN 6 AT BOTTOM)

All dimensions in mm.

Not to be scaled.

Mounting Position—Unrestricted.

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Tolerance on all side pin positions ± 5°.

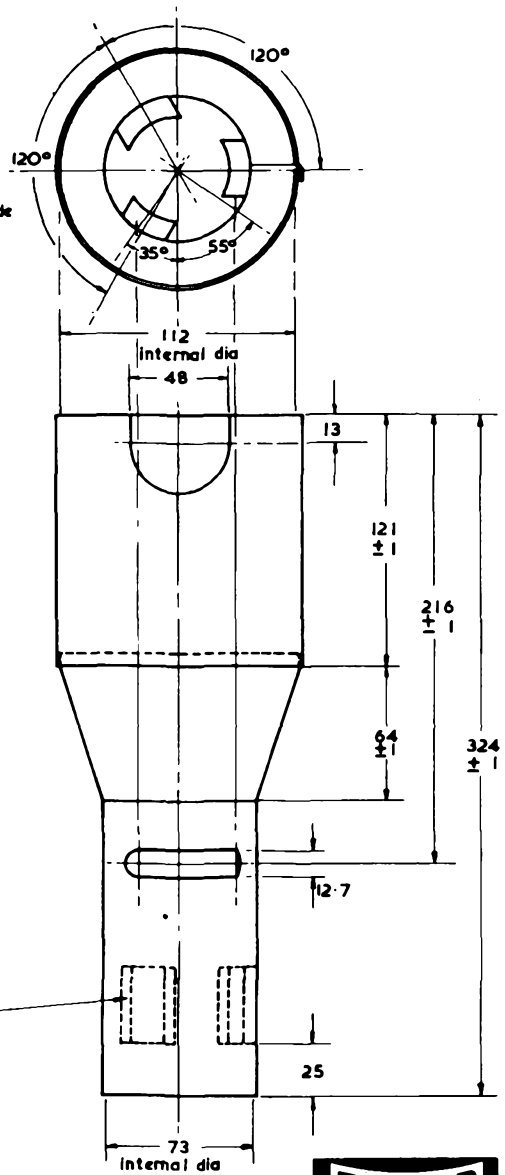
OSCILLOSCOPE TUBES

Magnetic Shield MS55

EXAMPLE OF TYPICAL SHIELD

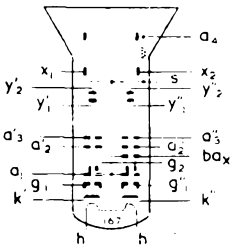
MATERIAL	0·35 Mumetal
METAL TOLERANCES	±0·5 unless otherwise stated
FINISH	Silver hammer outside
PADS	Soft sponge closed cell neoprene.

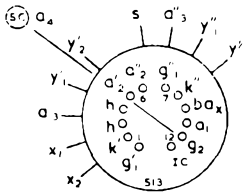
All dimensions in mm
Not to be scaled



Oscilloscope Tube

SE5/2A





Base B12F, Cap CT8

GENERAL

This 5 in. diameter screen cathode ray tube has two electron guns, common x plates and a spiral post deflection accelerator. The tube has a common beam alignment electrode and a separate beam blanking electrode on each gun.

The standard phosphor screen is P31(GH), and screen types P2(GL), P7(GM) and P11(BE) are available to special order.

Heater Voltage	V_h	6·3	V
Heater Current	I_h	0·6	A

ABSOLUTE RATINGS

		Max	Min	
Fourth Anode Voltage	V_{a4}	8·0	2·5	kV
Third Anode Voltage	V_{a3}	2·0	0·7	kV
Second Anode Voltage	V_{a2}	1·0	0	kV
First Anode Voltage	V_{a1}	1·7	0·7	kV
Negative Control Grid Voltage	$-V_{g1}$	200	1·0	V
Beam Blanking Voltage	V_{g2}	1·8	0·55	kV
Peak x plate to Third Anode Voltage	$v_{x\text{-}a3(pk)}$	500	–	V
Peak y plate to Third Anode Voltage	$v_{y\text{-}a3(pk)}$	500	–	V
x plate to Third Anode Resistance	$R_{x\text{-}a3}$	5·0	–	MΩ
y plate to Third Anode Resistance	$R_{y\text{-}a3}$	100	–	kΩ
Control Grid to Cathode Resistance	$R_{g1\text{-}k}$	1·5	–	MΩ
Second Anode Current (each gun)	i_{a2}	10	–	μA
P.D.A. Ratio (V_{a4}/V_{a3})		4·0		
Post Deflection Helix Resistance		–	60	MΩ

All voltages referred to cathode unless otherwise stated.

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-}all}$	7·6*	pF
Cathode to all	$C_{k\text{-}all}$	5·4*	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	3·05	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1·9*	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-}all,\ less\ x2}$	3·8	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-}all,\ less\ x1}$	3·8	pF
y'_1 plate to all, less y'_2 plate	$C_{y'1\text{-}all,\ less\ y'2}$	3·05	pF
y'_2 plate to all, less y'_1 plate	$C_{y'2\text{-}all,\ less\ y'1}$	4·0	pF
y''_1 plate to all, less y''_2 plate	$C_{y''1\text{-}all,\ less\ y''2}$	4·0	pF
y''_2 plate to all, less y''_1 plate	$C_{y''2\text{-}all,\ less\ y''1}$	3·05	pF
Grid 1 and Cathode to x_1, x_2, y_1 and y_2 plates	$C_{g1,k\text{-}x1,x2,\ y1,\ y2}$	0·5*	pF

* Each gun.

Net Tube Weight (approx) 1·15 kg (2·5 lb)

BRIMAR

TYPICAL OPERATION

All voltages referred to cathode unless otherwise stated.

Fourth Anode Voltage	V_{a4}	3·0	4·0	6·0	kV
Third Anode to Mean y plate Voltage for astigmatism correction	$V_{a3\text{-}y(av)}$	±50	±50	±50	V
Second Anode Voltage for Focus (Range)	V_{a2}	75 to 250	100 to 300	150 to 450	V
First Anode Voltage	V_{a1}	750	1000	1500	V
Interplate Shield to Mean x plate Voltage for optimum raster shape	$V_{s\text{-}x(av)}$	±50	±50	±50	V
Mean Plate Potentials		750	1000	1500	V
Control Grid Voltage for cut-off	V_{g1}	−35 to −55	−45 to −75	−65 to −110	V
Beam Blanking to First Anode Voltage	$V_{g2\text{-}a1}$	−50*	−70*	−100*	V
Beam Alignment to First Anode Voltage for coincidence of vertical traces	$V_{bax\text{-}a1}$	±50	±50	±50	V
Minimum Screen Area (each gun)		5 × 10	5 × 10	5 × 10	cm^2
Minimum Overlap		4·0	4·0	4·0	cm
Minimum x plate Sensitivity	$S_{x(min)}$	16·5	22	33	V/cm
Minimum y plate Sensitivity	$S_{y(min)}$	5·5	7·0	10·5	V/cm
Line Width (Centre)		0·6	0·5	0·5	mm
Line Width (Edge)		1·2	1·0	1·0	mm

* The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

Raster Distortion and Alignment

Total scanned area is 6cm (y) × 10cm (x) minimum, measured about a centre ± 3mm from the centre of the tube face.

Angle between axes of deflecting plates is 90° ± 1°.

Angle between axes of two guns is 1° maximum.

The undeflected spots will lie within two rectangles 6 mm × 4 mm, the 6 mm side being vertical, whose centres lie on the vertical centre line of the face, displaced 6 mm above and below the horizontal centre line.

Coincidence of the two vertical traces at the centre of the tube may be achieved by varying the voltage on the beam alignment electrode.

The vertical traces, when deflected in the x direction, will register to one line width. Full deflection registration will be obtained by varying the cathode voltage of one gun with respect to the other. The variation in cathode voltage required will not be greater than ± 1 per cent of V_{a3}.

Raster distortion on each raster will not be greater than 2 per cent. The edges of a test raster scanned by one gun will fall between two concentric rectangles 100 mm × 50 mm and 102 mm × 51 mm.

The individual mean y plate potentials should not differ by more than 10V, and the difference between these and the mean x plate potential should be as low as possible. Unless these conditions are met, raster distortion, linearity and sensitivity cannot be guaranteed, and the voltages required for a_3 and the interplate shield (s) will differ from those specified.

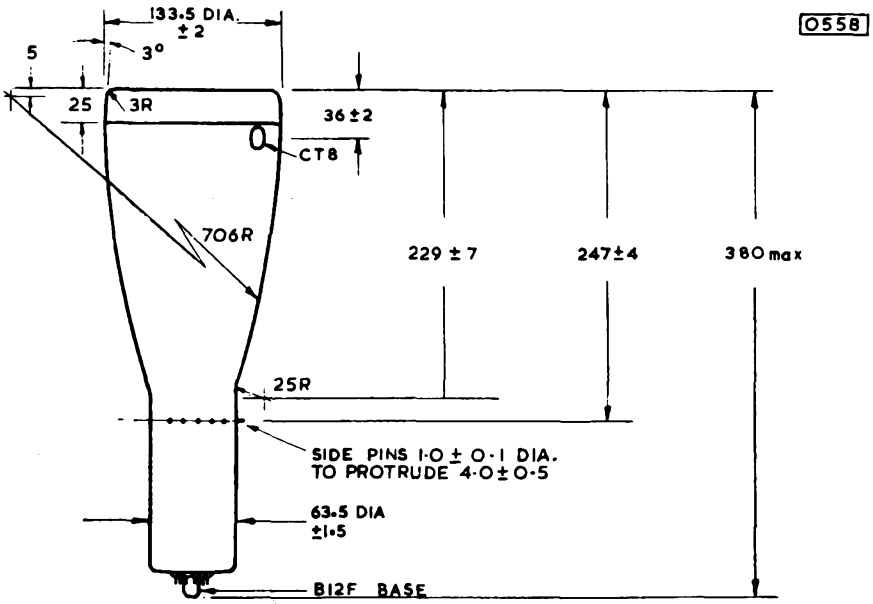
It is advisable that the y deflector plate drive impedance should be as low as possible, as the y plates intercept part of the beam near the edge of the scan area.

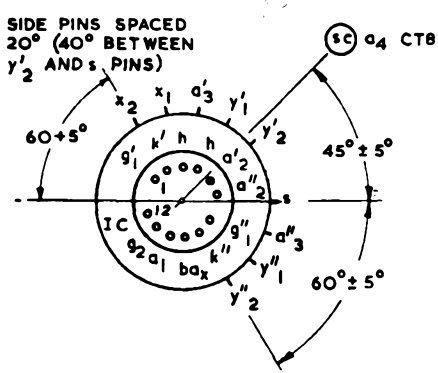
Magnetic Shielding

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

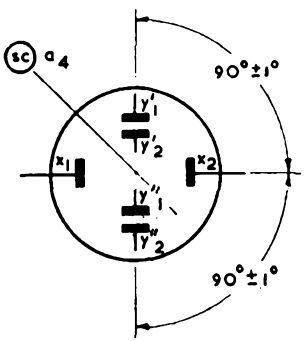
Oscilloscope Tube

SE5/2A





VIEWED FROM PINS FREE END



VIEWED FROM SCREEN END (PIN 3 UPPERMOST)

All dimensions in mm.

Not to be scaled.

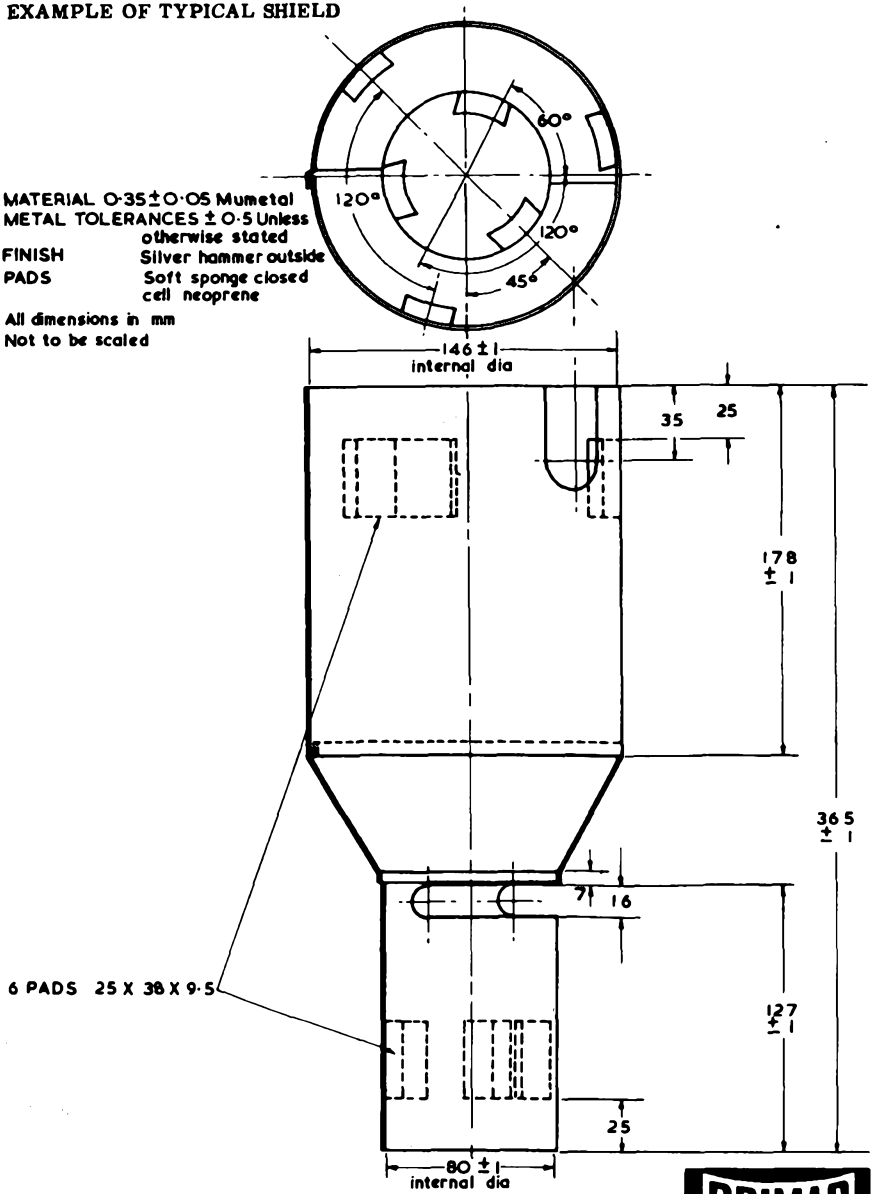
Mounting Position—Unrestricted.

It is advisable to support the tube near the screen, and at a second point on the parallel neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base. Connecting leads should not be soldered directly to the tube pins.

Tolerance on all side pin positions ± 5°.

Magnetic Shield MS58

EXAMPLE OF TYPICAL SHIELD



MATERIAL 0·35 ± 0·05 Mumetal
METAL TOLERANCES ± 0·5 Unless otherwise stated
FINISH Silver hammer outside
PADS Soft sponge closed cell neoprene

All dimensions in mm
Not to be scaled

BRIMAR

Oscilloscope Tube

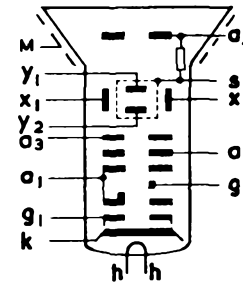
SE5F/..

Maintenance Type

GENERAL

This short 13 cm diameter flat-faced tube with electrostatic focusing and deflection is designed for general purpose applications. It has a large screen area coupled with good performance and the added facility of beam blanking at anode potential which avoids d.c. coupling to the grid.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

		Max	Min	
Fourth anode voltage	V_{a4}	5.0	1.5	kV
Third anode voltage	V_{a3}	2.5	0.6	kV
Second anode voltage	V_{a2}	500	0	V
First anode voltage	V_{a1}	2.5	0.7	kV
Negative grid voltage	$-V_{g1}$	300	1.0	V
Beam blanking voltage	V_{g2}	2.5	0.5	kV
Peak x plate to third anode voltage	$v_{x-a3(pk)}$	500	-	V
Peak y plate to third anode voltage	$v_{y-a3(pk)}$	500	-	V
Peak heater to cathode voltage	$v_{h-k(pk)max}$	250	-	V
x plate to third anode resistance	R_{x-a3}	5.0	-	MΩ
y plate to third anode resistance	R_{y-a3}	100	-	kΩ
Control grid to cathode resistance	R_{g1-k}	1.5	-	MΩ
Second anode current	I_{a2}	10	-	μA
P.D.A. ratio (V_{a4}/V_{a3} nom.)		2: 1		
Helix resistance		-	15	MΩ

All voltages referred to cathode unless otherwise stated.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (SE5F/GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

Note : Prior to 1972 this tube was produced without external conductive coating.

OSCILLOSCOPE TUBES

INTER-ELECTRODE CAPACITANCES

Grid 1 to all	$C_{g1\text{-all}}$	8.0	pF
Grid 2 to all	$C_{g2\text{-all}}$	10	pF
Cathode to all	$C_{k\text{-all}}$	4.75	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	2.75	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.5	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	6.0	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	6.0	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	6.5	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	6.5	pF
x_1, x_2 plates to y_1, y_2 plates	$C_{x1,x2\text{-}y1,y2}$	1.5	pF
Grid 1 & cathode to x_1 & x_2 plates	$C_{g1,k\text{-}x1,x2}$	0.9	pF
Grid 1 & cathode to y_1 & y_2 plates	$C_{g1,k\text{-}y1,y2}$	0.5	pF
Anode 4 to coating M (approx.)	$C_{a4\text{-}M}$	400	pF

TYPICAL OPERATION.- Voltages with respect to cathode

Fourth anode voltage	V_{a4}	2.0	3.0	4.0	kV
Mean deflector plate potential		1000	1500	2000	V
Third anode voltage for optimum astigmatism correction	V_{a3}	1000*	1500*	2000*	V
Second anode voltage for optimum focus	V_{a2}	50 to 200	75 to 250	80 to 360	V
First anode voltage	V_{a1}	1000	1500	2000	V
Shield voltage for optimum raster shape	V_s	1000*	1500*	2000*	V
Beam blanking voltage for cut-off	V_{g2}	950†	1430†	1900†	V
Control grid voltage for cut-off	V_{g1}	-30 to -55	-45 to -80	-56 to -100	V
x deflection coefficient	D_x	18.6 to 23.5	28 to 35	37 to 47	V/cm
y deflection coefficient	D_y	7.4 to 10	11 to 15	14.5 to 20	V/cm
Minimum screen area (corners cut-off)		8 x 10	8 x 10	8 x 10	cm^2
Line width at centre at 10 μA beam current measured by microscope		0.6	0.5	0.4	mm

* The required voltage will not differ from the quoted value by more than $\pm$50V.

† The beam is unblanked when $V_{g2} = V_{a1}$. This grid 2 electrode should not be used as a brilliance control.

RASTER DISTORTION AND ALIGNMENT

The following data applies for the typical operation conditions.

The undeflected spot will fall in a circle of 6 mm radius about the centre of the tube face.

Raster distortion: the edges of a test raster will fall between two concentric rectangles 10 cm x 6 cm and 9.80 cm x 5.88 cm.

Raster geometry can be adjusted by varying the interplate shield voltage (V_S) with respect to the mean deflector plate potential. The interplate shield voltage (V_S) for optimum raster shape will be within ± 50V of the mean deflector plate potential, though differing from the third anode voltage (V_{a3}). It is essential to ensure that the correct raster shape has been achieved by this means before adjusting for optimum focus.

For an 8 cm x 10 cm raster the corners will be cut to 120 mm minimum diameter.

Rectangularity of X and Y axes is 90° ± 1°.

Both X and Y plates are designed for symmetrical operation. Should the tube be required to operate asymmetrically, some degradation of focus and trace geometry will result.

It is preferable that the mean x and y plate potentials are equal otherwise some deterioration in performance will occur. Under no circumstances should the mean y plate potential differ from the mean x plate potential by more than 50V.

The Y plate mean potential should not be allowed to become greater than that of the X or severe deflection defocusing will result.

The deflector system is designed to intercept part of the beam, so that low impedance deflector plate drive is desirable.

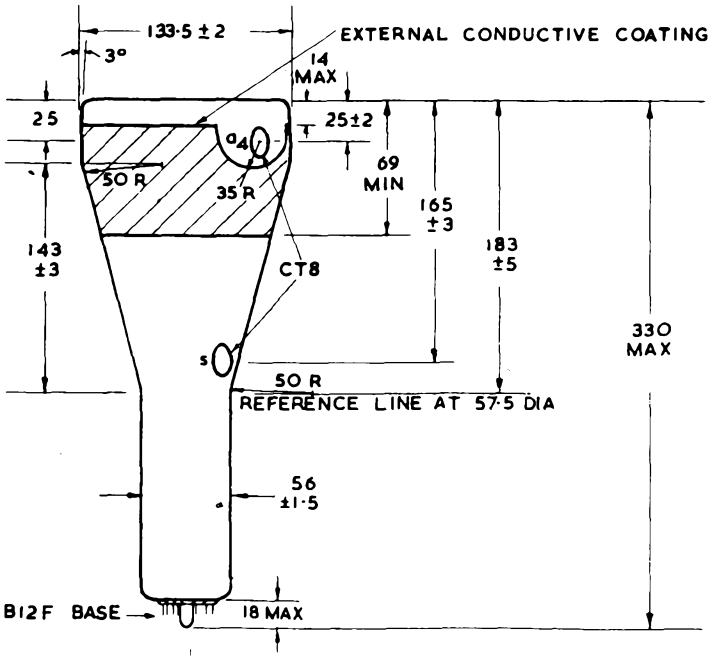
SHIELDING

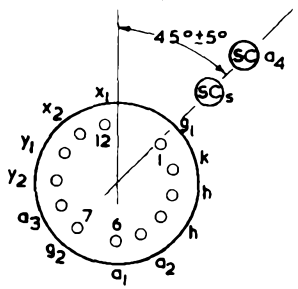
Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

The primary object of the external conductive coating is as an electrostatic shield and and in use this coating should be earthy.

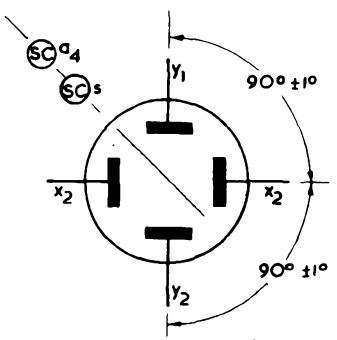
TUBE WEIGHT (approximate) 1.0 kg (2.25 lb)

MOUNTING POSITION - unrestricted





VIEWED FROM PINS FREE END



VIEWED FROM SCREEN END
PIN 6 AT BOTTOM

All dimensions in mm

Not to be scaled.

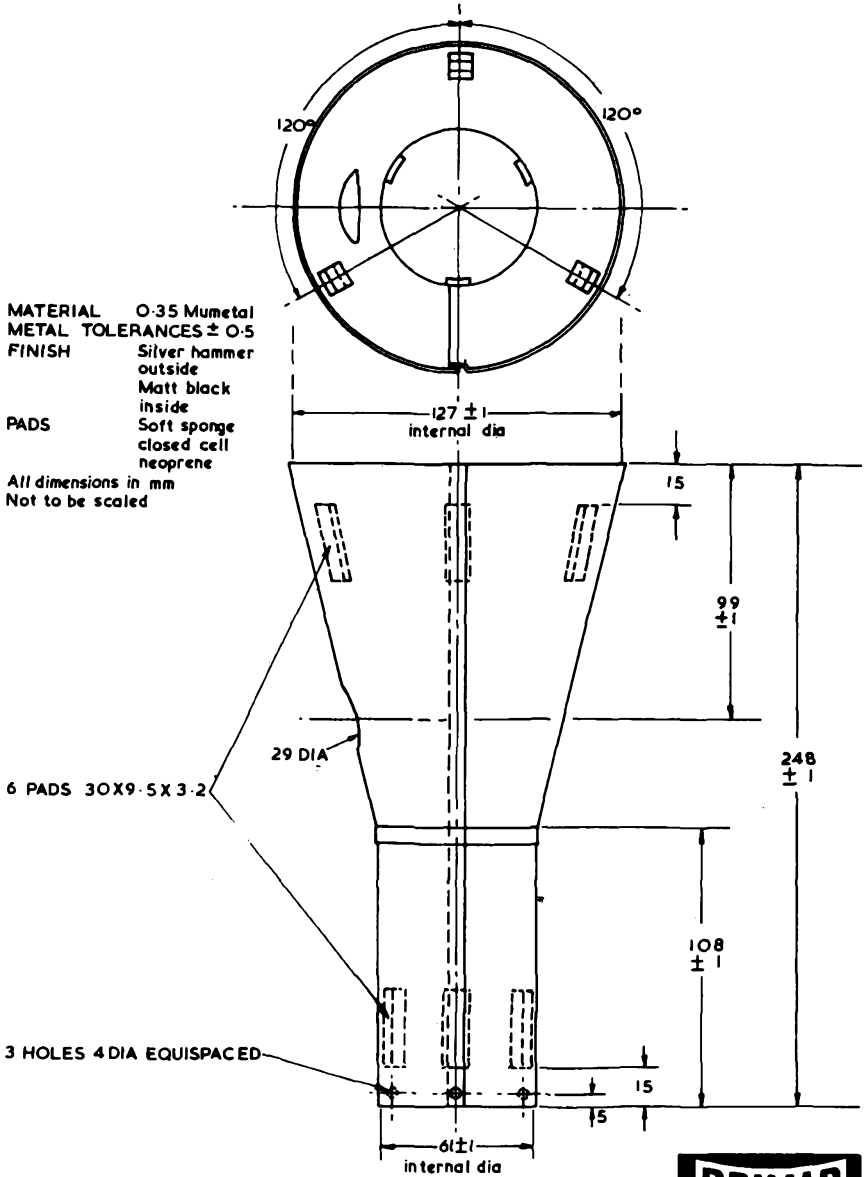
It is advisable to support the tube near the screen and at a second point on the neck near the base. The tube should not be subjected to any stress from the use of clamps and should not be suspended by the base.

Connecting leads should not be soldered directly to the tube pins.

Magnetic Shield MS 59

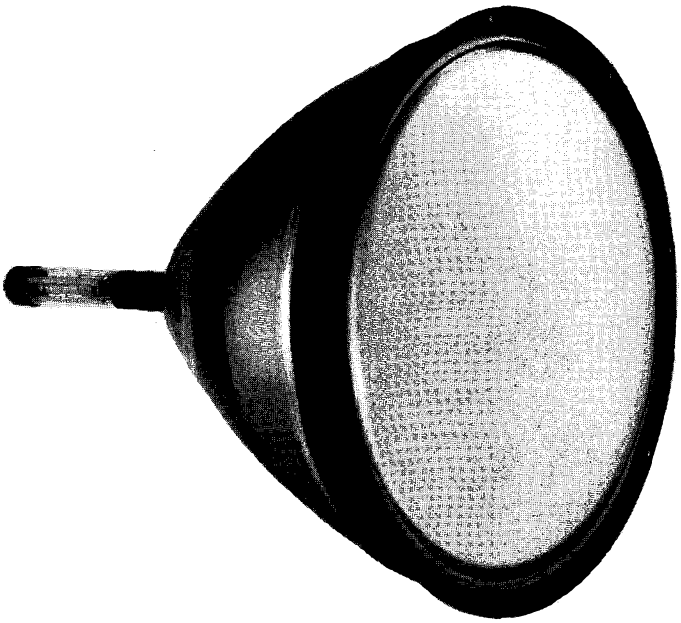
SE5F

EXAMPLE OF TYPICAL SHIELD



OSCILLOSCOPE TUBES

RADAR TUBES



The facilities and organisation provided by Thorn Radio Valves and Tubes Limited meet the requirements of the M.O.D. (P.E.) Defence Standard 05-21 and BS 9000.

HEALTH AND SAFETY AT WORK ACT, 1974

Attention is drawn to the recommendations under this heading in the Operational Recommendations.

WARNING

These tubes should be used in accordance with their published ratings, and in conformity with the Operational Recommendations of the company's data handbook. The company will not entertain claims for loss or damage where this advice has been disregarded.

Thorn Radio Valves and Tubes Limited
Mollison Avenue - Brimsdown - Enfield - Middlesex EN3 7NS

BRIMAR

Radar Tube

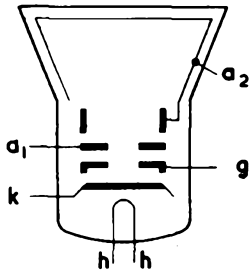
CV429

Maintenance Type

GENERAL

Round flat face 12 inch tube, 50° deflection
Magnetic focus and deflection
Straight tetrode gun, non ion trap
Aluminised screen, orange trace
LC phosphor, very long persistence

Heater Voltage	V_h	6.3	V
Heater Current	I_h	0.3	A



ABSOLUTE RATINGS - voltages referred to cathode

Maximum second anode voltage	$V_{a2(max)}$	15.5	kV
Minimum second anode voltage	$V_{a2(min)}$	9.0	kV
Maximum first anode voltage	$V_{a1(max)}$	600	V
Minimum first anode voltage	$V_{a1(min)}$	250	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	150	V
Maximum beam current	$I_{b(max)}$	50	μA

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	<12	pF
Grid to all	c_{g-all}	<12	pF

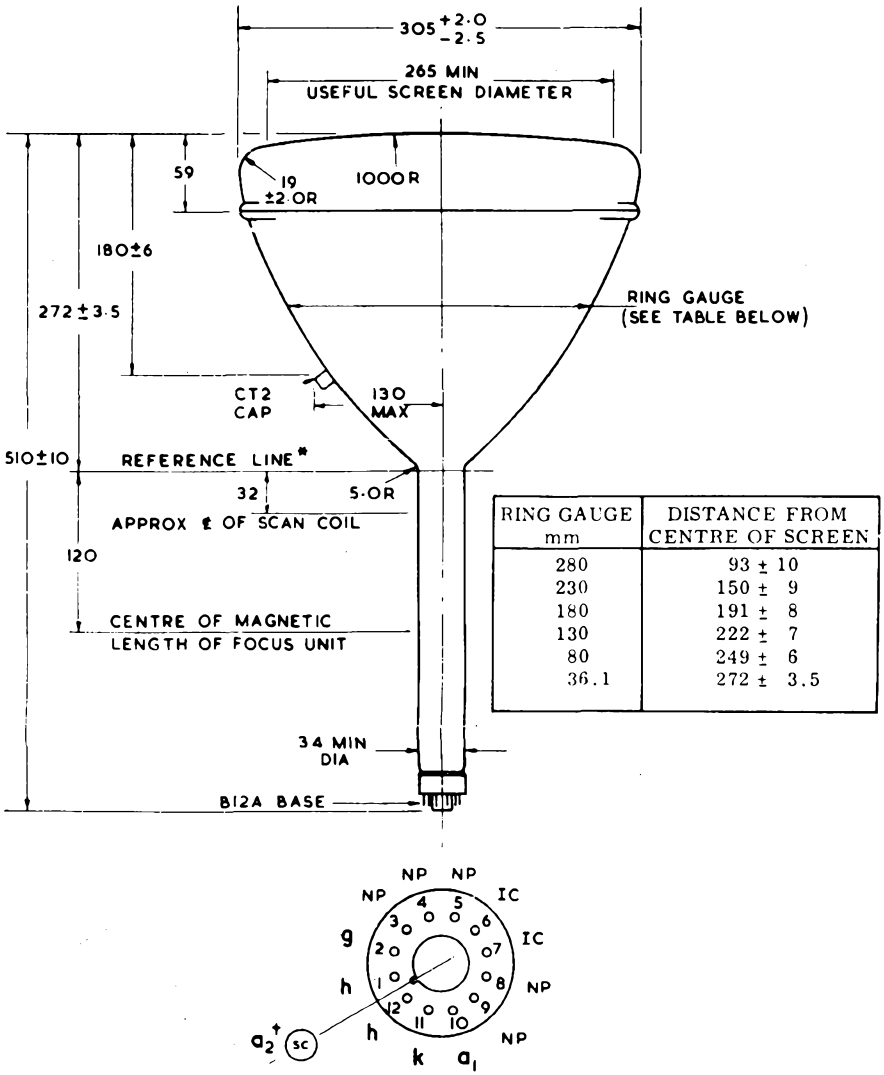
TYPICAL OPERATION - grid modulation, voltages referred to cathode

Second anode voltage	V_{a2}	15	kV
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off	V_{g-k}	-30 to -90	V
Average peak to peak modulating voltage for modulation up to 50 μA		24	V
Maximum deviation of unfocused and undeflected spot from centre of screen		15	mm
Maximum unfocused spot diameter for 50 μA beam current		15	mm
Maximum line width for 50 μA beam current*		0.4	mm
LC screen persistence to 10% (approximate)		25	s

* Measured on T.V. raster with frame scan expanded.

The LC screen is liable to burn even at low values of beam current if operated with a stationary or slow-moving spot.

RADAR TUBES



RING GAUGE mm	DISTANCE FROM CENTRE OF SCREEN
280	93 ± 10
230	150 ± 9
180	191 ± 8
130	222 ± 7
80	249 ± 6
36.1	272 ± 3.5

All dimensions in mm

Not to be scaled

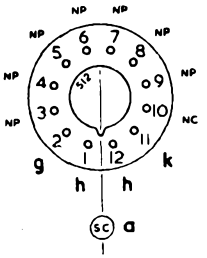
* Reference line is the line where a 36.1 diameter ring gauge 100 mm long will stop against bulb.

† Anode cap in line with spigot ± 15°.

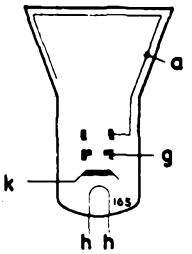
Compass Tube

CV5119

Maintenance Type



B12A (5 Pin) Base, CT8 Cap



GENERAL

Round Flat Face	—6 in. Diameter	Treated to reduce Specular Reflection	
Internal Compass Scale	—Uniformly graduated	Aluminised Screen	—Green Trace
T1 Phosphor	—Medium Persistence	Magnetic Focus and Deflection	
	High Brightness Level		

Heater Voltage	V_h	6·3	V
Heater Current	I_h	0·6	A

RATINGS

Maximum Anode Voltage	$V_{a(max)}$	10*	kV
Minimum Anode Voltage	$V_{a(min)}$	7·5	kV
Maximum Heater to Cathode Voltage, Heater Negative (d.c.)	$V_{h-k(max)}$	150	V

* 10 kV is a design centre rating, the absolute maximum of 12·5 kV must not be exceeded.

INTER-ELECTRODE CAPACITANCES †

Cathode to all	C_{k-all}	5·3	pF
Grid to all	C_{g-all}	4·7	pF

† These capacitances include an AEI wafer type duodecal holder.

TYPICAL OPERATION—Grid Modulation (Voltages referred to cathode)

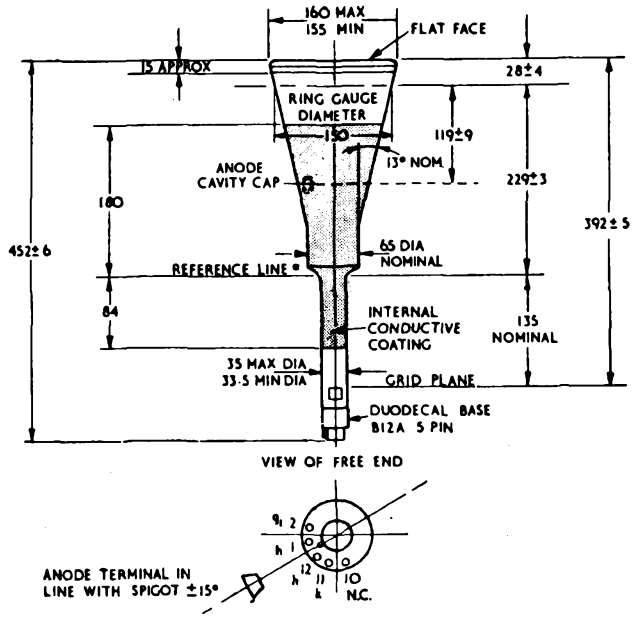
Anode Voltage	V_a	9·5	kV
Grid to Cathode Voltage for cut-off of 140 mm focused line	V_g	−43 to −93	V
Average Peak to Peak Modulating Voltage for modulation up to 150 μA		30	V
Maximum Peak to Peak Modulating Voltage for modulation of limit CRT up to 150 μA		35	V

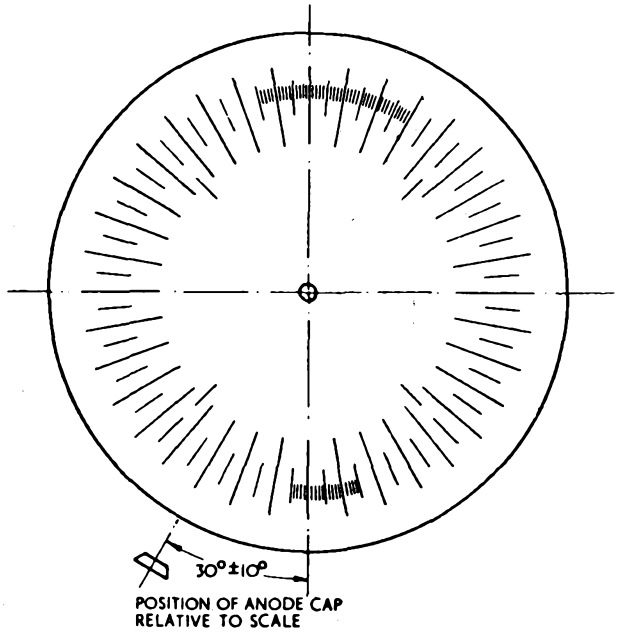
Note

A resistance should be inserted in the anode circuit in order to limit the discharge current to 100 mA max. in the event of a flash-over inside the tube.

Tube Weight (approx)—Net 2¼ lb Packed 16¼ lb

RADAR TUBES





*Determined by Reference Line Gauge No. 6.

This scale is uniformly graduated.

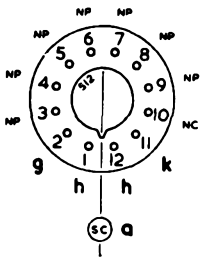
All dimensions in mm.

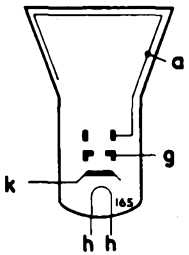
Not to be scaled.

Compass Tube

CV5203

Maintenance Type





B12A (5 Pin) Base, CT8 Cap

GENERAL

Round Flat Face —6 in. Diameter		Treated to reduce Specular Reflection	
Internal Compass Scale		Graduated with Octantal Correction	
Aluminised Screen—Green Trace		T1 Phosphor—Medium Persistence	
Magnetic Focus and Deflection		High Brightness Level	
Heater Voltage	V_h	6·3	V
Heater Current	I_h	0·6	A

RATINGS

Maximum Anode Voltage	$V_{a(max)}$	10*	kV
Minimum Anode Voltage	$V_{a(min)}$	7·5	kV
Maximum Heater to Cathode Voltage, Heater Negative (d.c.)	$V_{h-k(max)}$	150	V

* 10 kV is a design centre rating, the absolute maximum of 12·5 kV must not be exceeded.

INTER-ELECTRODE CAPACITANCES †

Cathode to all	C_{k-all}	5·3	pF
Grid to all	C_{g-all}	4·7	pF

† These capacitances include an AEI wafer type duodecal holder.

TYPICAL OPERATION—Grid Modulation (Voltages referred to cathode)

Anode Voltage	V_a	9·5	kV
Grid to Cathode Voltage for cut-off of 140 mm focused line	V_g	−43 to −93	V
Average Peak to Peak Modulating Voltage for modulation up to 150 μA		30	V
Maximum Peak to Peak Modulating Voltage for modulation of limit CRT up to 150 μA		35	V

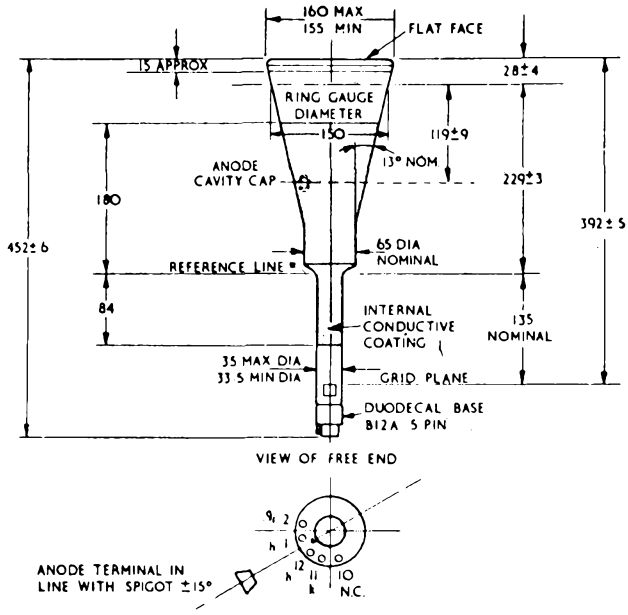
Note

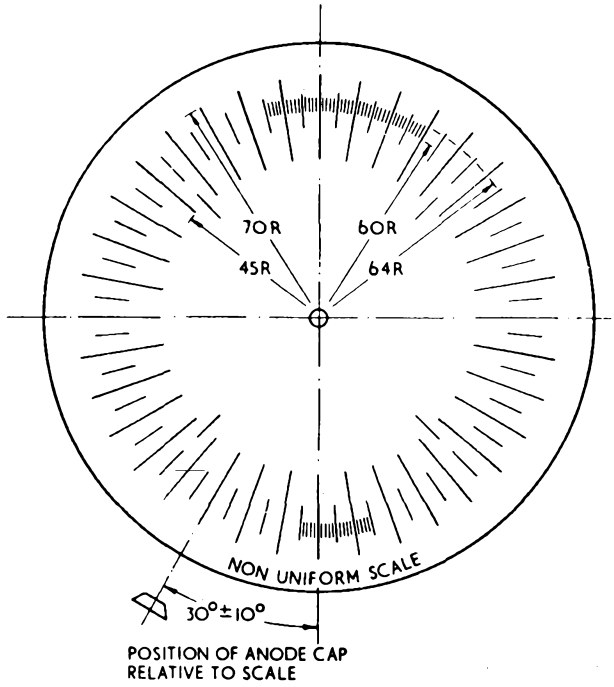
A resistance should be inserted in the anode circuit in order to limit the discharge current to 100 mA max. in the event of a flash-over inside the tube.

Tube Weight (approx)—Net 2¼ lb Packed 16¼ lb

RADAR TUBES

BRIMAR





* Determined by Reference Line Gauge No. 6.

This scale has octantal corrections.

All dimensions in mm
Not to be scaled.

Radar Tube

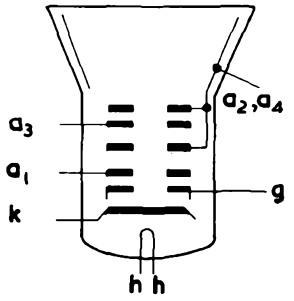
F10-100..

PRELIMINARY DATA

GENERAL

Round face, 10 cm tube, 30° deflection
36.5 mm maximum neck diameter
Electrostatic focus, magnetic deflection
Straight gun
Clear glass

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	8.0	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	4.0	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	550	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	250	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$V_{h-k(pk)max}$	400*	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

All voltages referred to cathode

* During a warming up period not exceeding 45 seconds.

PHOSPHOR SCREEN

This type is usually supplied with LD phosphor (F10-100LD) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

RADAR TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.5	pF
Grid to all	c_{g-all}	10	pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode.

Second and fourth anode voltage	$V_{a2+a4-k}$	5.0	kV
First anode voltage	V_{a1-k}	400	V
Third anode voltage range for focus	V_{a3-k}	0 to 400	V
Grid to cathode voltage range for cut-off of raster	V_{g-k}	-40 to -77	V
LD screen raster persistence to 10% (approx.)		4.0	s

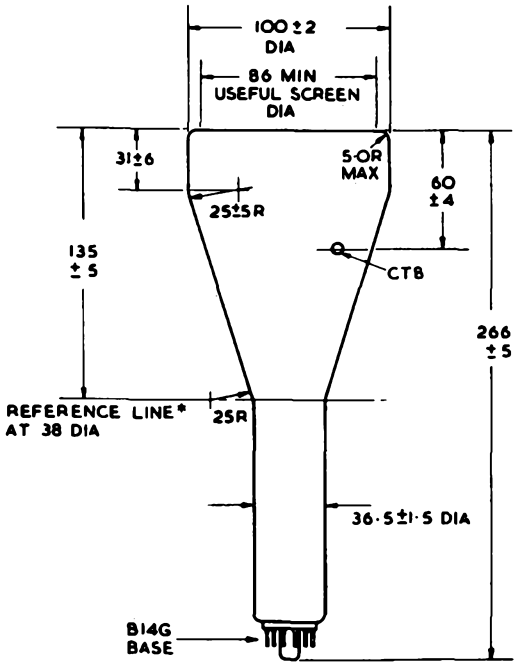
TYPICAL OPERATION - Cathode modulation, voltages referred to grid

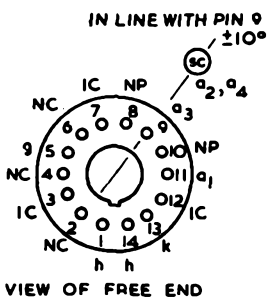
Second and fourth anode voltage	$V_{a2+a4-g}$	5.0	kV
First anode voltage	V_{a1-g}	400	V
Third anode voltage range for focus	V_{a3-g}	0 to 400	V
Cathode to grid voltage range for cut-off of raster	V_{k-g}	36 to 66	V
LD screen raster persistence to 10% (approx.)		4.0	s

The LD screen is liable to burn even at low values of beam current if operated with a stationary or slow moving spot.

TUBE WEIGHT (approximate) - 400 g

MOUNTING POSITION - unrestricted





All dimensions in mm

Not to be scaled

* Gauge 38 mm internal diameter, 50 mm long to slide freely over neck.

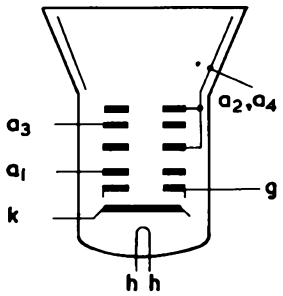
F15-101..

Radar Tube

GENERAL

Round face, 15 cm tube, 53° deflection
29.4 mm maximum neck diameter
Electrostatic focus, magnetic deflection
Straight gun, aluminised screen
Clear glass

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	7.5	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	550	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	250	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$v_{h-k(pk)max}$	400§	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

All voltages referred to cathode

† $I_{a2+a4} = 0$

§ During a warming up period not exceeding 45 seconds.

PHOSPHOR SCREEN

This type is usually supplied with LD phosphor (F15-101LD) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	6.5	8.0	pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode.

Second and fourth anode voltage	$V_{a2+a4-k}$	9.0	kV
First anode voltage	V_{a1-k}	400	V
Third anode voltage range for focus	V_{a3-k}	0 to 400	V
Average peak to peak picture modulating voltage for 200 μA cathode current		29	V
Grid to cathode voltage range for cut-off of raster	V_{g-k}	-40 to -77	V
LD screen raster persistence to 10% (approx.)		4.0	s

TYPICAL OPERATION - Cathode modulation, voltages referred to grid

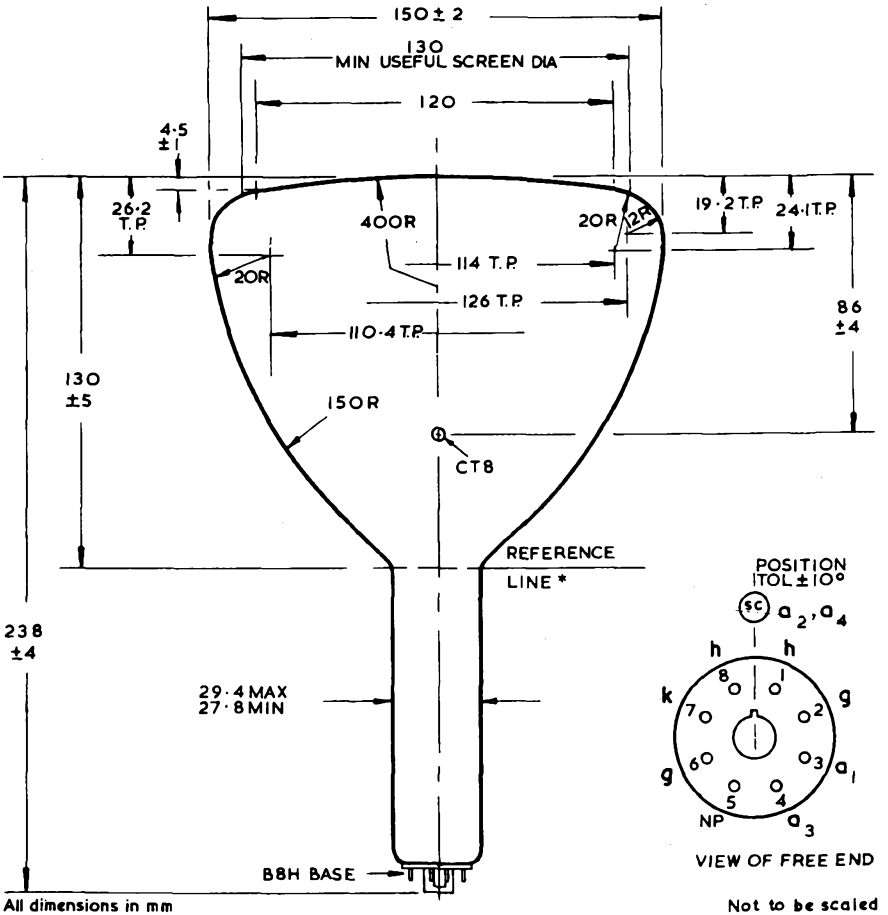
Second and fourth anode voltage	$V_{a2+a4-g}$	9.0	kV
First anode voltage	V_{a1-g}	400	V
Third anode voltage range for focus	V_{a3-g}	0 to 400	V
Average peak to peak picture modulating voltage for 200 μA cathode current		25	V
Cathode to grid voltage range for cut-off of raster	V_{k-g}	36 to 66	V
LD screen raster persistence to 10% (approx.)		4.0	s

The LD screen is liable to burn even at low values of beam current if operated with stationary or slow moving spot.

TUBE WEIGHT (approximate) - 0.6 kg

MOUNTING POSITION - unrestricted

Radar Tube



A straight line passing centrally through the neck will pass within ± 2 mm of the centre of the screen.

* Determined by reference gauge No. 31

GENERAL

Round face, 16 cm (6 inch) tube, 37° deflection.

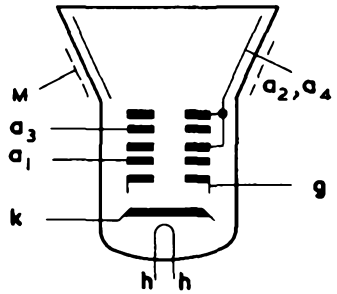
Electrostatic focus, magnetic deflection

Straight gun, aluminised screen

Clear glass, external conductive coating

29.4 mm maximum neck diameter.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage range	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	600	V
Minimum first anode voltage	$V_{a1(min)}$	300	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Maximum positive grid voltage	$V_{g(max)}$	0	V
Maximum heater to cathode voltage	$V_{h-k(max)}$		
heater negative (d.c.)		200	V
heater positive (d.c.)		125	V
Maximum peak heater to cathode voltage	$V_{h-k(pk)max}$		
heater negative		300	V
heater positive		250	V
Maximum third anode current	$I_{a3(max)}$	± 15	μA
Maximum first anode current	$I_{a1(max)}$	± 15	μA
Maximum heater to cathode resistance	$R_{h-k(max)}$	1.0	MΩ
Maximum grid to cathode resistance	$R_{g-k(max)}$	1.5	MΩ
Maximum grid to cathode impedance (50 Hz)	$Z_{g-k(max)}$	500	kΩ
Maximum cathode to earth impedance (50 Hz)	$Z_{k-e(max)}$	100	kΩ

RADAR TUBES

PHOSPHOR SCREEN

This tube is usually supplied with LD phosphor (F16-101LD) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	< 6.0	pF
Grid to all	c_{g-all}	< 10	pF
Anodes 2 and 4 to external conductive coating, M (approx.)	$c_{a2+a4-M}$	750	pF

TYPICAL OPERATION

Second and fourth anode voltage	V_{a2+a4}	14	kV
Third anode voltage range for focus	V_{a3}	0 to 400	V
First anode voltage	V_{a1}	500	V
Grid to cathode voltage for visual extinction of focused spot	V_{g-k}*	-27 to -44	V
Cathode to grid voltage for visual extinction of focused spot	V_{k-g}*	25 to 40	V
Average peak to peak modulating voltage for modulation up to 150 μA		25 †	V
Line width at I_{a2+a4} = 50 μA		0.3	mm
LD screen persistence to 10% (approximate)		4.0	s

The LD screen is liable to burn even at low values of beam current if operated with a stationary or slow-moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 milliröntgens per hour, the window will normally provide adequate protection.

* For grid modulation, all voltages are measured with respect to the cathode. For cathode modulation, all voltages are measured with respect to the grid.

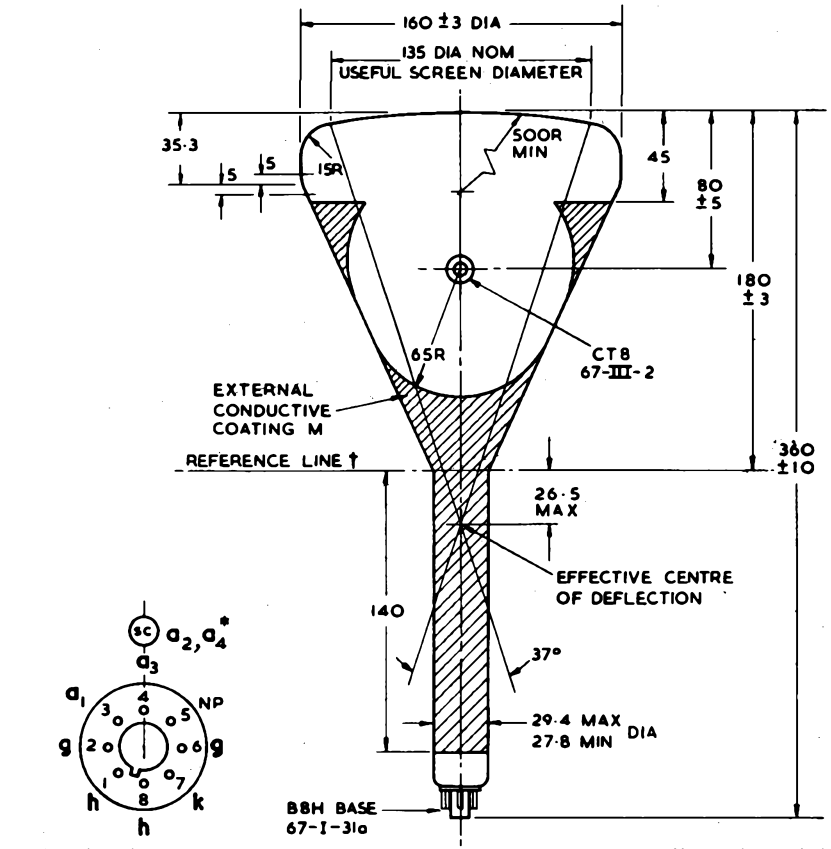
† Grid modulation from spot cut-off.

TUBE WEIGHT (approximate) - 1.2 kg (2 lb 10 oz)

MOUNTING - unrestricted

The tube should not be supported by the base alone and under no circumstances should the socket be used to support the tube.
The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.
When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.

Tubes incorporating a B8H Sparkguard base will have a suffix letter after the type number. For details of the Sparkguard bases see separate sheets.



All dimensions in mm

Not to be scaled

* Anode cap in line with pin 4 ± 10°.

† Determined by Reference Gauge No. 18. (See T.D.S. 5-0-91-18).

There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The projected neck axis shall pass within 3.5 mm of the geometric centre of the tube face.

The eccentricity of the neck axis with respect to a line perpendicular to the geometric centre of the tube face shall not exceed 3.0 mm at the deflection centre and at a point 100 mm from the reference line.

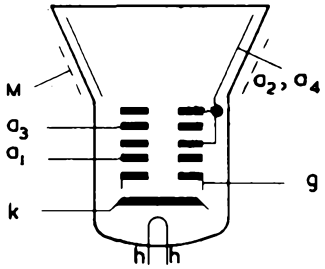
F21-10..

Radar Tube

GENERAL

Round face, 21cm tube, 41° deflection
Electrostatic focus, magnetic deflection
Straight gun, aluminised screen
Clear glass, external conductive coating
35.5 mm maximum neck diameter

Heater voltage	V_h	6.3*	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18 †	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage range	V_{a3}	+1000 to -300	V
Maximum first anode voltage	$V_{a1(max)}$	800	V
Minimum first anode voltage	$V_{a1(min)}$	400	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Minimum peak negative grid voltage	$-v_{g(min)}$	1.0	V
Maximum heater to cathode voltage	$V_{h-k(max)}$		
heater negative (d.c.)		200	V
heater positive (d.c.)		125	V
Maximum peak heater to cathode voltage	$v_{h-k(pk)max}$		
heater negative		300	V
heater positive		250	V
Maximum first anode current	$I_{a1(max)}$	±15	μA
Maximum third anode current	$I_{a3(max)}$	±15	μA
Maximum heater to cathode resistance	$R_{h-k(max)}$	1.0	MΩ
Maximum grid to cathode resistance	$R_{g-k(max)}$	1.5	MΩ
Maximum grid to cathode impedance (50 Hz)	$Z_{g-k(max)}$	500	kΩ
Maximum cathode to earth impedance (50 Hz)	$Z_{k-e(max)}$	100	kΩ

* For series operation the surge heater voltage must not exceed 9.5V r.m.s. when the the supply is switched on. When used in a series heater chain a current limiting device may be necessary in the circuit to ensure that this voltage is not exceeded.

† Adequate precautions should be taken to ensure that the equipment is protected from damage which may be caused by a possible high voltage flashover within the cathode ray tube.

PHOSPHOR SCREEN

This tube is usually supplied with LD phosphor (F21-10LD) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	C_{k-all}	< 6.0	pF
Grid to all	C_{g-all}	< 10	pF
Anodes 2 and 4 to external conductive coating M (approx.)	$C_{a2+a4-M}$	1000	pF

TYPICAL OPERATION

Second and fourth anode voltage	V_{a2+a4}	14	kV
Third anode voltage range for focus	V_{a3}	0 to 400	V
First anode voltage	V_{a1}	600	V
Grid to cathode voltage for visual extinction of focused spot	V_{g-k}*	-32 to -48	V
Cathode to grid voltage for visual extinction of focused spot	V_{k-g}*	30 to 45	V
Average peak to peak modulating voltage for modulation up to 150 μA		25 †	V
LD screen persistence to 10% (approximate)		4.0	s

The LD screen is liable to burn even at low values of beam current if operated with stationary or slow moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 milli-röntgens per hour, the window will normally provide adequate protection.

* For grid modulation, all voltages are measured with respect to the cathode. For cathode modulation, all voltages are measured with respect to the grid.

† Grid modulation from spot cut-off.

TUBE WEIGHT (approximate) - 2.6 kg (5 lb 10 oz)

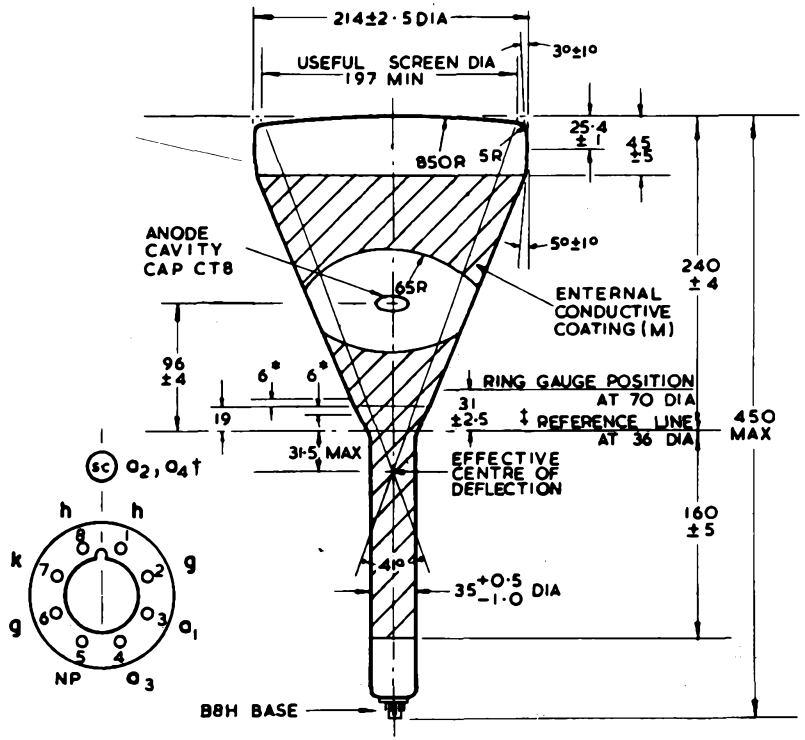
MOUNTING - unrestricted

The tube should not be supported by the base alone and under no circumstances should the socket be used to support the tube.

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.

Tubes incorporating a B8H Sparkguard base will have a suffix letter after the type number. For details of the Sparkguard bases see separate sheets.



All dimensions in mm

Not to be scaled

* Weld is contained within this area (12 mm)

† Anode cap in line with spigot ± 10°.

‡ Gauge 36 mm I/D x 100 mm long to slide freely over neck.

There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

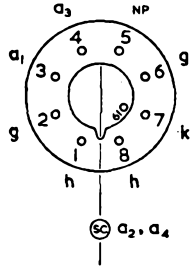
The projected neck axis shall pass within 3.5 mm of the geometric centre of the tube face.

The eccentricity of the neck axis with respect to a line perpendicular to the geometric centre of the tube face shall not exceed 4.0 mm at the deflection centre and 4.5 mm at a point 102 mm from the reference line.

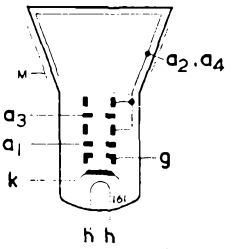
Radar Tube

F21-12LC

Maintenance Type



B8H Base, CT8 Cap



GENERAL

Round Face	—8½ in. Diameter	Deflection Angle	—65° Diameter
Electrostatic Focus	—Magnetic Deflection	Aluminised Screen	—Orange Trace
Straight Gun	—Non Ion Trap	LC Phosphor	—Very Long Persistence

External Conductive Coating

Heater Voltage	V_h	6·3* V
Heater Current	I_h	0·3 A

ABSOLUTE RATINGS

Maximum Second and Fourth Anode Voltage	$V_{a2,a4(max)}$	18†	kV
Minimum Second and Fourth Anode Voltage	$V_{a2,a4(min)}$	10	kV
Maximum Third Anode Voltage (Range)	$V_{a3(max)}$	+1000 to −300	V
Maximum First Anode Voltage	$V_{a1(max)}$	800	V
Minimum First Anode Voltage	$V_{a1(min)}$	400	V
Maximum Heater to Cathode Voltage,	$V_{h-k(max)}$		
Heater Negative (d.c.)		200	V
Heater Positive (d.c.)		125	V
Maximum Peak Heater to Cathode Voltage,	$V_{h-k(pk)max}$		
Heater Negative		300	V
Heater Positive		250	V
Maximum Negative Grid Voltage	$-V_{g(max)}$	150	V
Minimum Peak Negative Grid Voltage	$-V_{g(pk)min}$	1·0	V
Maximum First Anode Current	$I_{a1(max)}$	±15	μA
Maximum Third Anode Current	$I_{a3(max)}$	±15	μA
Maximum Heater to Cathode Resistance	$R_{h-k(max)}$	1·0	MΩ
Maximum Grid to Cathode Resistance	$R_{g-k(max)}$	1·5	MΩ
Maximum Grid to Cathode Impedance (f=50 Hz)	$Z_{g-k(max)}$	500	kΩ
Maximum Cathode to Earth Impedance (f=50 Hz)	$Z_{k-e(max)}$	100	kΩ

All voltages referred to cathode.

* For series operation the surge heater voltage must not exceed 9·5V R.M.S. when the supply is switched on. When used in a series heater chain a current limiting device may be necessary in the circuit to ensure that this voltage is not exceeded.

† Adequate precautions should be taken to ensure that the associated equipment is protected from damage which may be caused by a possible high voltage flashover within the cathode ray tube.

Tubes incorporating a B8H sparkguard base will have a suffix S after the type number. For details of the sparkguard base see separate sheet.

RADAR TUBES

INTER-ELECTRODE CAPACITANCES

Grid to all	$C_{g\text{-}all}$	<10	pF
Cathode to all	$C_{k\text{-}all}$	<6·0	pF
Anode 2 and Anode 4 to External Conductive Coating (approx.)	$C_{a2,a4\text{-}M}$	750	pF

TYPICAL OPERATION

Second and Fourth Anode Voltage	$V_{a2,a4}$	14	kV
Third Anode Voltage for Focus (Range)	V_{a3}	0 to 400	V
First Anode Voltage	V_{a1}	600	V
Grid to Cathode Voltage for visual extinction of focused spot	$V_{g\text{-}k}$*	−32 to −48	V
Cathode to Grid Voltage for visual extinction of focused spot	$V_{k\text{-}g}$*	30 to 45	V
Average Peak to Peak Modulating Voltage for modulation up to 150μA		25†	V
LC Screen Persistence		200‡	s

The LC screen is liable to burn even at low values of beam current if operated with stationary or slow-moving spot.

* For grid modulation, all voltages are measured with respect to the cathode. For cathode modulation, all voltages are measured with respect to the grid.

† Grid modulation from spot cut-off.

‡ Persistence is defined as the time taken from the cessation of continuous excitation for the luminance to decay from 1 foot lambert to approximately 1% of that value.

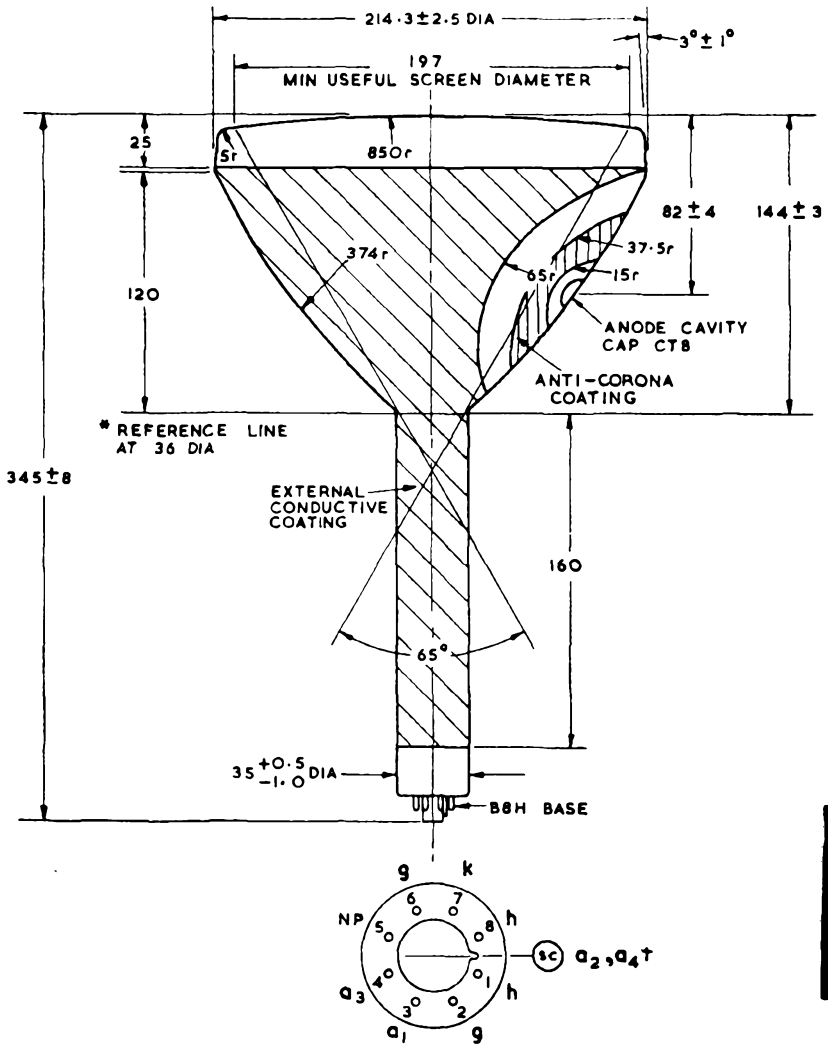
MOUNTING POSITION : Any

The tube should not be supported by the base alone. Under no circumstances should the socket be used to support the tube.

Tube Weight (approx.)—Net 1·7 kg (3 lb 12 oz)

Note

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0·5 milliröntgens per hour, the window will normally provide adequate protection.



All dimensions in mm. Not to be scaled.

Notes

* Gauge 36 mm I/D × 100 mm long to slide freely over neck.

† Anode cap in line with base key, tolerance ± 15°.

The tube should not be handled in the region of the anti-corona coating.

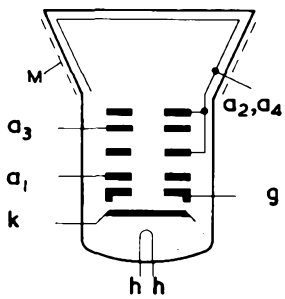
F21-130..

Radar Tube

GENERAL

Round face, 21 cm dia.tube 60° deflection.
Clear glass. Aluminised screen.
Electrostatic focus, magnetic deflection
29.4 mm maximum neck diameter.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage range	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	550	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Maximum peak negative grid voltage	$-v_{g(pk)max}$	400	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$v_{h-k(pk)max}$	400*	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

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

PHOSPHOR SCREEN

This type is usually supplied with LD phosphor (F21-13OLD)giving an orange trace of very long persistence. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix letter after the type number. For details of the Sparkguard bases see separate sheets.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.0*	pF
Grid to all	c_{g-all}	6.5*	pF
Anodes 2 and 4 to external conductive coating M (approx.)	$c_{a2+a4-M}$	800	pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode.

Second and fourth anode voltage	V_{a2+a4}	14	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	0 to + 400	V
Grid to cathode voltage range for cut-off of spot	V_g	-34 to -78	V
LD screen persistence to 10% (approx.)		4.0	s

The LD screen is liable to burn even at low values of beam current if operated with a stationary or slow-moving spot.

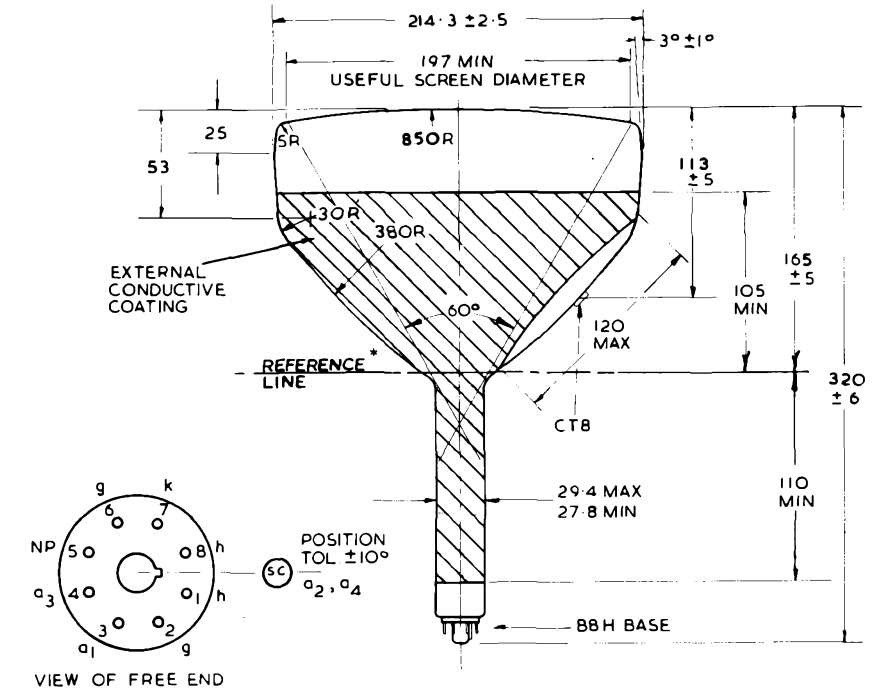
If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

MOUNTING

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 3 kg

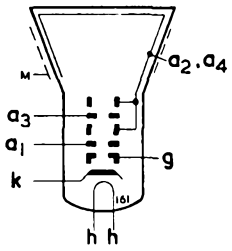


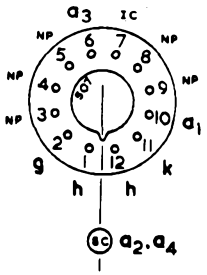
There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

* Determined by reference line gauge No. 15 (See T.D.S. No. 5-0-91-15)

Radar Tube

F22-10LD





B12A (7 pin) Base, CT8 Cap

GENERAL

Round Face	—9 in. Diameter	Deflection Angle	—60° Diameter
Electrostatic Focus	—Magnetic Deflection	Aluminised Screen	—Orange Trace
Straight Gun	—Non Ion Trap	LD Phosphor	—Long Persistence

External Conductive Coating

Heater Voltage	V_h	6·3 V
Heater Current	I_h	0·3 A

RATINGS

Maximum Second and Fourth Anode Voltage	$V_{a2,a4(max)}$	15* kV
Minimum Second and Fourth Anode Voltage	$V_{a2,a4(min)}$	8·0 kV
Maximum Third Anode Voltage	$V_{a3(max)}$	±500 V
Maximum First Anode Voltage	$V_{a1(max)}$	500 V
Maximum Heater to Cathode Voltage, Heater Negative (d.c.)	$V_{h-k(max)}$	200 V
Maximum Peak Heater to Cathode Voltage, Heater Negative	$V_{h-k(pk)max}$	400†‡ V

* 15kV is a design centre rating, the absolute rating of 16·5 kV must not be exceeded.

† Absolute rating.

‡ During a warming-up period not exceeding 1 minute.

INTER-ELECTRODE CAPACITANCES

Cathode to All	C_{k-all}	7·0§ pF
Grid to All	C_{g-all}	9·0§ pF
Anode 2 and Anode 4 to External Conductive Coating	$C_{a2,a4-M}$	750 approx pF

§ These capacities include a typical duodecal holder.

TYPICAL OPERATION—Grid Modulation (Voltages referred to cathode)

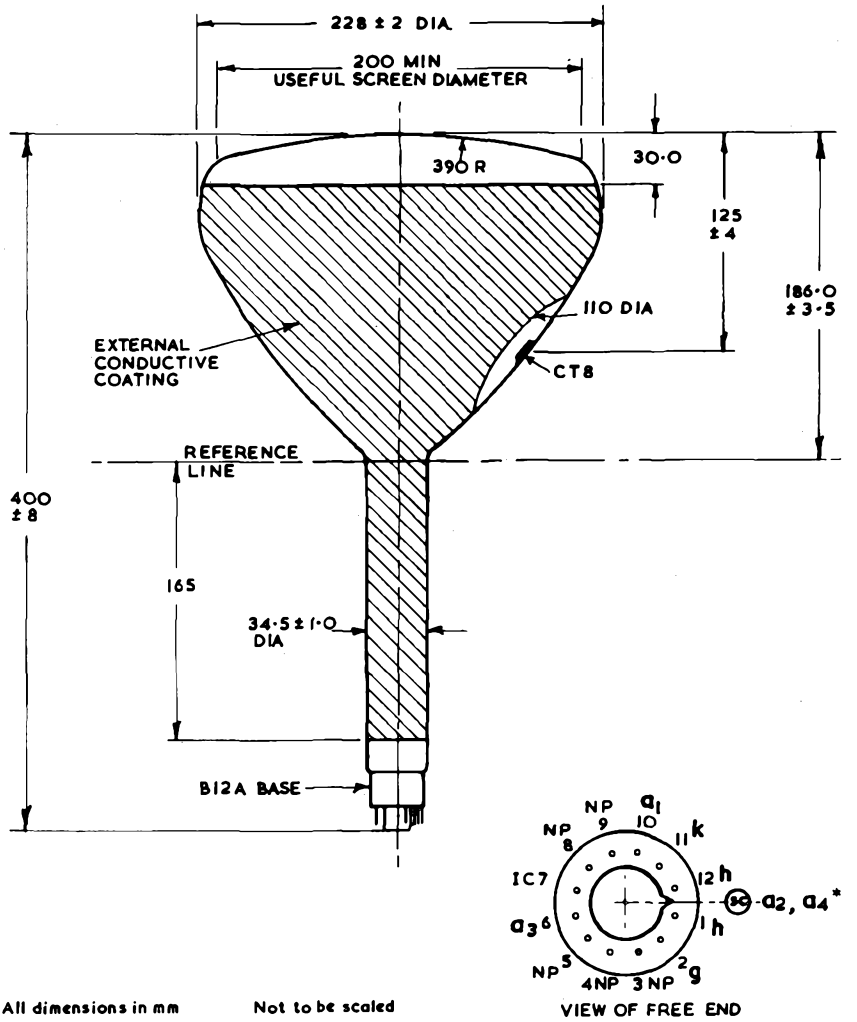
Second and Fourth Anode Voltage	$V_{a2,a4}$	12	kV
First Anode Voltage	V_{a1}	300	V
Third Anode Voltage for Focus (Range)	V_{a3}	−300 to +300	V
Grid to Cathode Voltage for Cut-off of Raster	V_g	−30 to −78	V
Average Peak to Peak Modulating Voltage for Modulation up to 150μA		24	V
Line Width (I_{a2+a4}=50μA)		0·4 to 0·6	mm
LD Screen Persistence to 10% (approximate)		4·0	s

The LD screen is liable to burn even at low values of beam current if operated with stationary or slow-moving spot.

MOUNTING POSITION—Unrestricted

Net Tube Weight (approx) 2·7 kg (6 lb)

RADAR TUBES



All dimensions in mm Not to be scaled

* Anode cap in line with spigot ± 15°

There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The projected neck axis shall pass within 3.5 mm of the geometric centre of the tube face. Neck eccentricity with respect to the geometric centre of the tube face shall not exceed 4.0 mm at the deflection centre and 4.5 mm at 102 mm from the reference line.

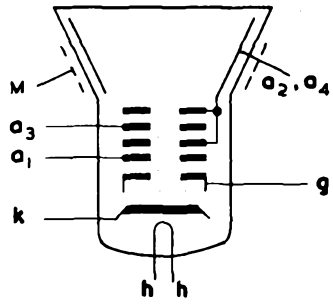
Radar Tube

F22-11..

GENERAL

Round face, 22 cm tube, 60° deflection
Electrostatic focus, magnetic deflection
Straight gun, non ion trap
External conductive coating
Aluminised screen

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	16.5	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	8.0	kV
Maximum third anode voltage range	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	400†	V

† During a warming-up period not exceeding 1 minute.

PHOSPHOR SCREEN

This type is usually supplied with LD phosphor (F22-11LD) giving an orange trace of very long persistence. Other phosphor screens can be made available to special order.

RADAR TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	7.0*	pF
Grid to all	c_{g-all}	9.0*	pF
Anodes 2 and 4 to external conductive coating, M (approx.)	$c_{a2+a4-M}$	750	pF

* Including a typical duodecal holder.

TYPICAL OPERATION - grid modulation (voltages referred to cathode)

Second and fourth anode voltage	V_{a2+a4}	12	kV
Third anode voltage range for focus	V_{a3}	-300 to +300	V
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-30 to -78	V
Average peak to peak modulating voltage for modulation up to 150 μA		24	V
Line width at I_{a2+a4} = 50 μA		0.4 to 0.6	mm
LD screen persistence to 10% (approximate)		4.0	s

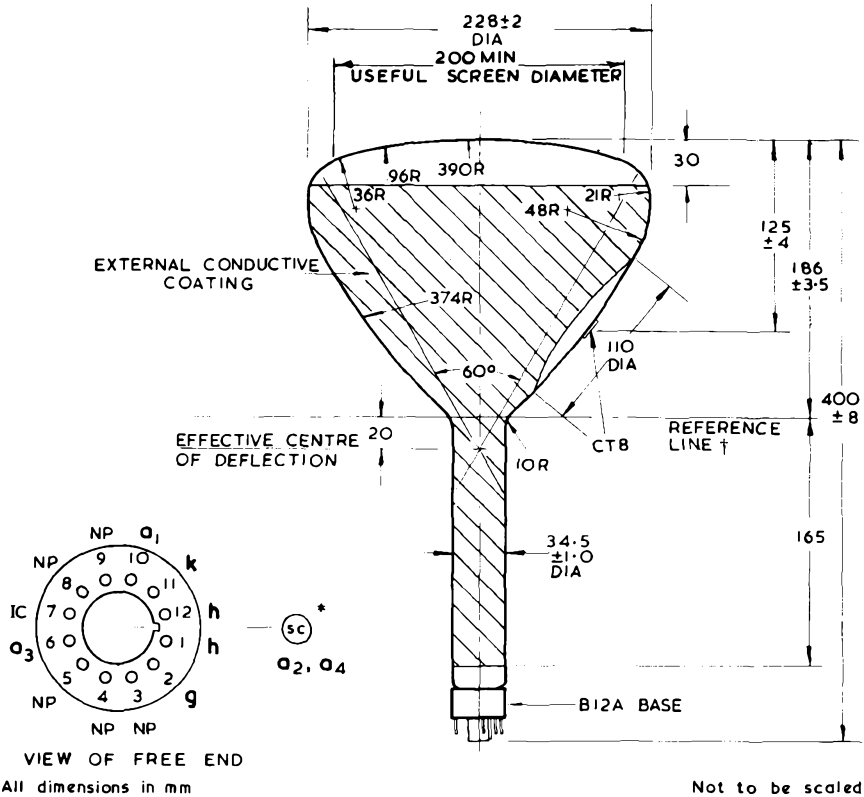
The LD screen is liable to burn even at low values of beam current if operated with a stationary or slow moving spot.

TUBE WEIGHT (approximate) - 2.7 kg (6 lb)

MOUNTING POSITION - unrestricted

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return path of the external conductive coating (M) should be made in a manner appropriate to the protection system employed.



All dimensions in mm

Not to be scaled

* Anode cap in line with spigot ± 10°. † Determined by 36.1 diameter ring gauge.

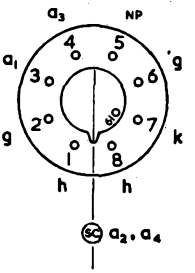
There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The projected neck axis shall pass within 3.5 mm of the geometric centre of the tube face.

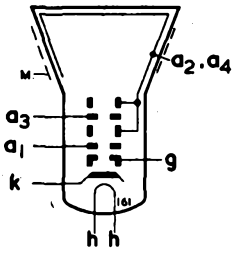
The eccentricity of the neck axis with respect to a line perpendicular to the geometric centre of the tube face shall not exceed 1.0 mm at the deflection centre and 1.5 mm at a point 102 mm from the reference line.

F31—10LC
F31—10LD

Radar Tube



B8H Base, CT8 Cap



GENERAL

Round Face	—12 in. Diameter	Deflection Angle	—40° Diameter
Electrostatic Focus	—Magnetic Deflection	Aluminised Screen	—Orange Trace
Straight Gun	—Non Ion Trap	LC Phosphor	—Very Long Persistence
External Conductive Coating		LD Phosphor	—Long Persistence

Heater Voltage	V_h	6·3	V
Heater Current	I_h	0·3	A

RATINGS.

Maximum Second and Fourth Anode Voltage	$V_{a2,a4(max)}$	16*	kV
Minimum Second and Fourth Anode Voltage	$V_{a2,a4(min)}$	12	kV
Maximum Third Anode Voltage Range	$V_{a3(max)}$	+1000 to −300	V
Maximum First Anode Voltage	$V_{a1(max)}$	800	V
Maximum Heater to Cathode Voltage, Heater Negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum Peak Heater to Cathode Voltage, Heater Negative	$V_{h-k(pk)max}$	300†‡	V
Minimum Negative Grid Voltage	$-V_{g(min)}$	1·0	V
Maximum Negative Grid Voltage	$-V_{g(max)}$	200	V
Maximum Grid to Cathode Resistance	$R_{g-k(max)}$	1·5	MΩ

All voltages referred to cathode.

* 16 kV is a design centre rating, the absolute rating of 18·5 kV must not be exceeded.

† Absolute rating.

‡ During a warming-up period not exceeding 1 minute.

INTER-ELECTRODE CAPACITANCES

Grid to all	C_{g-all}	<10	pF
Cathode to all	C_{k-all}	< 6·0	pF
Anode 2 and Anode 4 to External Conductive Coating (approx)	$C_{a2,a4-M}$	2500	pF

TYPICAL OPERATION—Grid Modulation (Voltages referred to Cathode)

Second and Fourth Anode Voltage	$V_{a2,a4}$	15	kV
First Anode Voltage	V_{a1}	600	V
Third Anode Voltage for focus (Range)	V_{a3}	−300 to +300	V
Grid to Cathode Voltage for visual extinction of focused spot	V_g	−40 to −85	V
Average Peak to Peak Modulating Voltage for modulation up to 150 μA		25	V
Persistence of LC screen		200§	s
Persistence of LD screen		100§	s

The LC and LD screens are liable to burn even at low values of beam current if operated with stationary or slow moving spot.

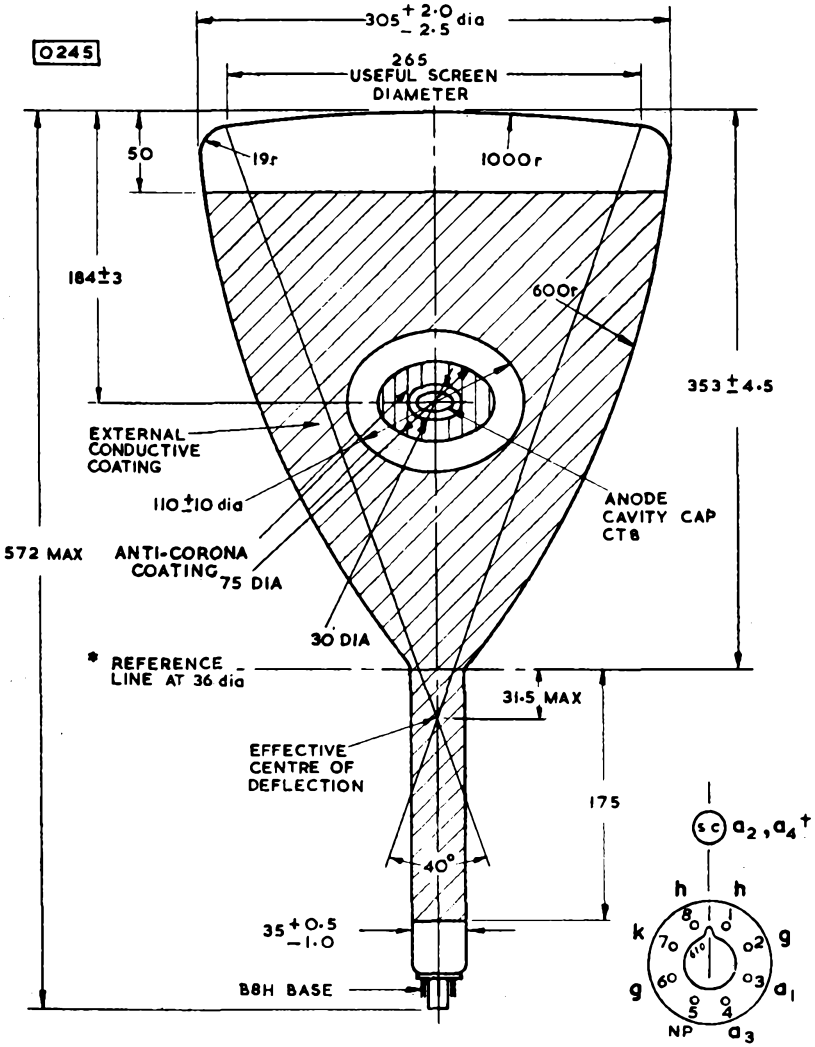
If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0·5 milliröntgens per hour, the window will normally provide adequate protection.

§ Persistence is defined as the time taken from the cessation of continuous excitation for the luminance to decay from 1 foot lambert to approximately 1% of that value.

MOUNTING POSITION—Unrestricted

Net Tube Weight (approx)—13 lb 8 oz (6·2 kg)

Tubes incorporating a B8H sparkguard base will have a suffix S after the type number. For details of the sparkguard base see separate sheet.



All dimensions in mm. Not to be scaled.

* Gauge 36 mm I/D 100 mm long to slide freely over neck.

† Anode cap in line with base key, tolerance ±15°.

The projected neck axis shall pass within 3·5 mm of the geometric centre of the tube. Neck eccentricity with respect to the geometric centre of the tube face shall not exceed 4·0 mm at the deflection centre and 4·5 mm at 102 mm from the reference line.

The tube should not be handled in the region of the anti-corona coating.

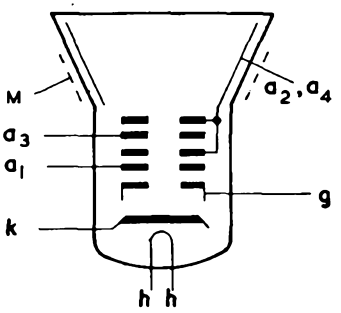
Radar Tube

F31-11..

GENERAL

Round face, 12 inch tube, 50° deflection
Electrostatic focus, magnetic deflection
Straight gun, non ion trap
External conductive coating
Aluminised screen

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	8.0	kV
Maximum third anode voltage	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Minimum first anode voltage	$V_{a1(min)}$	200	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage	$V_{h-k(max)}$	150	V
Maximum heater to cathode resistance	$R_{h-k(max)}$	100	kΩ
with separate heater transformer		1.0	MΩ

PHOSPHOR SCREEN

This tube is usually supplied with either LC phosphor (F31-11LC) giving an orange trace of very long persistence or LD phosphor (F31-11LD) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

The F31-11LD is also known as the CV5819.

RADAR TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	< 8.0	pF
Grid to all	c_{g-all}	< 8.0	pF
Anodes 2 and 4 to external conductive coating, M (approx.)	$c_{a2+a4-M}$	1500	pF

TYPICAL OPERATION - Grid modulation (voltages referred to cathode)

Second and fourth anode voltage	V_{a2+a4}	14	kV
Third anode voltage range for focus	V_{a3}	-300 to +300	V
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off	V_g	-30 to -70	V

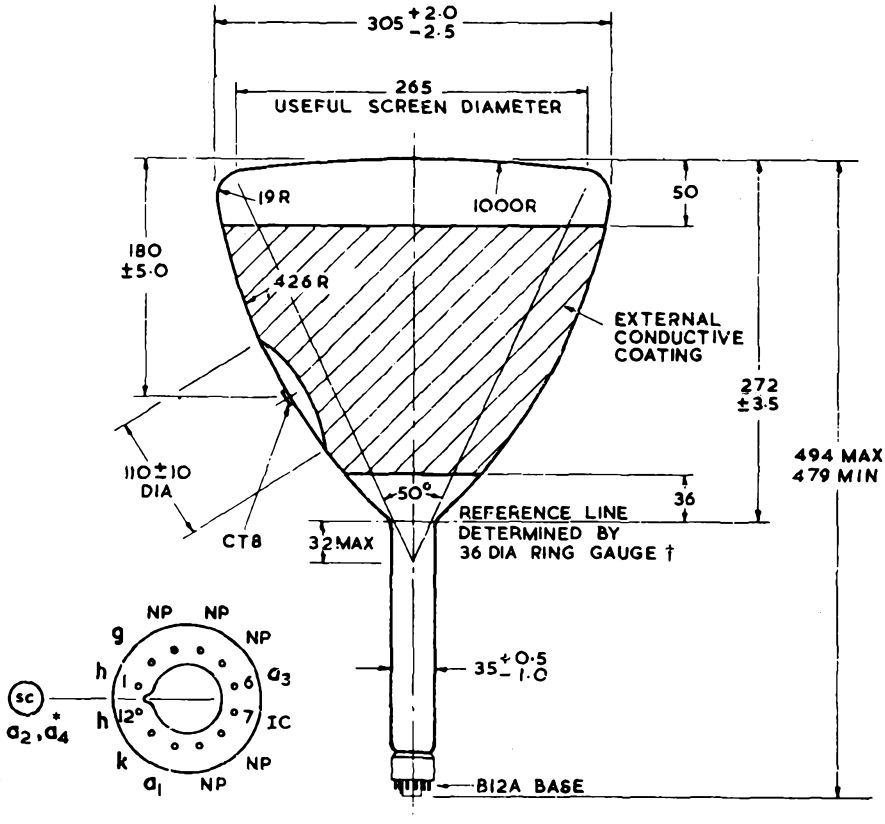
LC screen persistence to 10% (approximate)	25	s
LD screen persistence to 10% (approximate)	4.0	s

The LC and LD screens are liable to burn even at low values of beam current if operated with stationary or slow moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 milliröntgens per hour, the window will normally provide adequate protection.

TUBE WEIGHT (approximate) - 5.4 kg (12 lb)

MOUNTING POSITION - unrestricted



All dimensions in mm **Not to be scaled**

* Anode cap in line with spigot ± 15°.

† Gauge 36 mm I/D x 100 mm long to slide freely over neck.

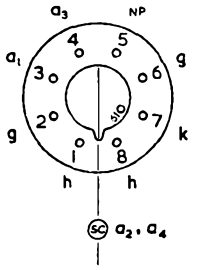
There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The projected neck axis shall pass within 3.5 mm of the geometric centre of the tube face.

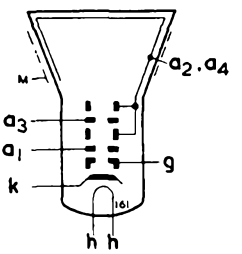
The eccentricity of the neck axis with respect to a line perpendicular to the geometric centre of the tube face shall not exceed 4.0 mm at the deflection centre and 4.5 mm at a point 102 mm from the reference line.

F31–12..

Radar Tube



B8H Base, CT8 Cap



GENERAL

Round Face	—12 inch Diameter	Deflection Angle	—40° Diameter
Electrostatic Focus	—Magnetic Deflection	Aluminised Screen	—Orange Trace
Straight Gun	—Non Ion Trap	LC Phosphor	—Very Long Persistence

External Conductive Coating

Heater Voltage	V_h	6·3	V
Heater Current	I_h	0·3	A

RATINGS

Maximum Second and Fourth Anode Voltage	$V_{a2,a4(max)}$	16*	kV
Minimum Second and Fourth Anode Voltage	$V_{a2,a4(min)}$	12	kV
Maximum Third Anode Voltage Range	$V_{a3(max)}$	+1000 to −300	V
Maximum First Anode Voltage	$V_{a1(max)}$	800	V
Maximum Heater to Cathode Voltage, Heater Negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum Peak Heater to Cathode Voltage, Heater Negative	$V_{h-k(pk)max}$	300†‡	V
Minimum Negative Grid Voltage	$-V_{g(min)}$	1·0	V
Maximum Negative Grid Voltage	$-V_{g(max)}$	200	V
Maximum Grid to Cathode Resistance	$R_{g-k(max)}$	1·5	MΩ

All voltages referred to cathode.

* 16 kV is a design centre rating, the absolute rating of 18·5 kV must not be exceeded.

† Absolute rating.

‡ During a warming-up period not exceeding 1 minute.

INTER-ELECTRODE CAPACITANCES

Grid to all	C_{g-all}	<10	pF
Cathode to all	C_{k-all}	< 6·0	pF
Anode 2 and Anode 4 to External Conductive Coating (approx)	$C_{a2,a4-M}$	2500	pF

PHOSPHOR SCREEN

This type is usually supplied with LC phosphor (F31-12LC) giving an orange trace of very long persistence. Other phosphor screens can be made available to special order.

TYPICAL OPERATION—Grid Modulation (Voltages referred to Cathode)

Second and Fourth Anode Voltage	$V_{a2,a4}$	16	kV
First Anode Voltage	V_{a1}	600	V
Third Anode Voltage for focus (Range)	V_{a3}	−150 to +450	V
Grid to Cathode Voltage for visual extinction of focused spot	V_g	−44 to −70	V
Average Peak to Peak Modulating Voltage for modulation up to 150 μA		25	V
Persistence of LC screen		200§	s

The LC screen is liable to burn even at low values of beam current if operated with stationary or slow moving spot.

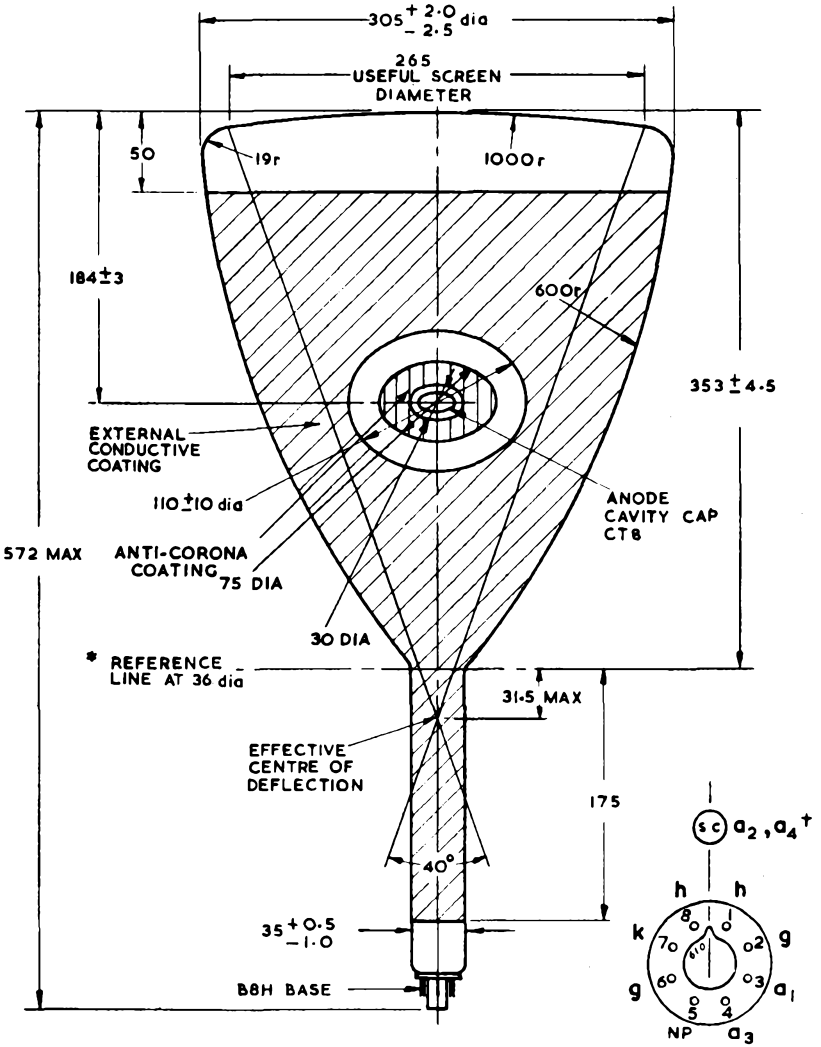
If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0·5 milliröntgens per hour, the window will normally provide adequate protection.

§ Persistence is defined as the time taken from the cessation of continuous excitation for the luminance to decay from 1 foot lambert to approximately 1% of that value.

MOUNTING POSITION—Unrestricted

Net Tube Weight (approx)—6·2 kg (13 lb 8 oz)

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number.
For details of the Sparkguard S base see separate sheet.



All dimensions in mm. Not to be scaled.

* Gauge 36 mm I/D 100 mm long to slide freely over neck.

† Anode cap in line with base key, tolerance ±15°.

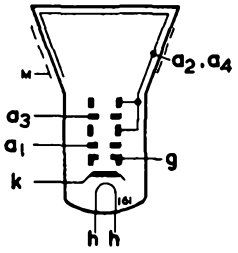
The projected neck axis shall pass within 3·5 mm of the geometric centre of the tube. Neck eccentricity with respect to the geometric centre of the tube face shall not exceed 4·0 mm at the deflection centre and 4·5 mm at 102 mm from the reference line.

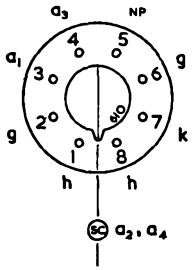
The tube should not be handled in the region of the anti-corona coating.

Radar Tube

F31—13LC

Maintenance Type





B8H Base, CT8 Cap

GENERAL

Round Face	—12 in. Diameter	Deflection Angle	—40° Diameter
Electrostatic Focus	—Magnetic Deflection	Aluminised Screen	—Orange Trace
Straight Gun	—Non Ion Trap	LC Phosphor	—Very Long Persistence
		External Conductive Coating	

Heater Voltage	V_h	6·3	V
Heater Current	I_h	0·3	A

RATINGS

Maximum Second and Fourth Anode Voltage	$V_{a2,a4(max)}$	16*	kV
Minimum Second and Fourth Anode Voltage	$V_{a2,a4(min)}$	12	kV
Maximum Third Anode Voltage Range	$V_{a3(max)}$	+1000 to −300	V
Maximum First Anode Voltage	$V_{a1(max)}$	800	V
Maximum Heater to Cathode Voltage, Heater Negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum Peak Heater to Cathode Voltage, Heater Negative	$v_{h-k(pk)max}$	300†‡	V
Minimum Negative Grid Voltage	$-V_{g(min)}$	1·0	V
Maximum Negative Grid Voltage	$-V_{g(max)}$	200	V
Maximum Grid to Cathode Resistance	$R_{g-k(max)}$	1·5	MΩ

All voltages referred to cathode.

* 16 kV is a design centre rating, the absolute rating of 18·5 kV must not be exceeded.

† Absolute rating.

‡ During a warming-up period not exceeding 1 minute.

INTER-ELECTRODE CAPACITANCES

Grid to all	c_{g-all}	<10	pF
Cathode to all	c_{k-all}	< 6·0	pF
Anode 2 and Anode 4 to External Conductive Coating (approx)	$c_{a2,a4-M}$	2500	pF

TYPICAL OPERATION—Grid Modulation (Voltages referred to Cathode)

Second and Fourth Anode Voltage	$V_{a2,a4}$	15	kV
First Anode Voltage	V_{a1}	600	V
Third Anode Voltage for focus (Range)	V_{a3}	−300 to +300	V
Grid to Cathode Voltage for visual extinction of focused spot	V_g	−40 to −85	V
Average Peak to Peak Modulating Voltage for modulation up to 150 μA		25	V
Line Width ($I_{a2} + {}_{a4} = 50\mu A$)		0·5 to 0·7	mm
Persistence of LC screen		200§	s

The LC screen is liable to burn even at low values of beam current if operated with stationary or slow moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0·5 milliröntgens per hour, the window will normally provide adequate protection.

§ Persistence is defined as the time taken from the cessation of continuous excitation for the luminance to decay from 1 foot lambert to approximately 1% of that value.

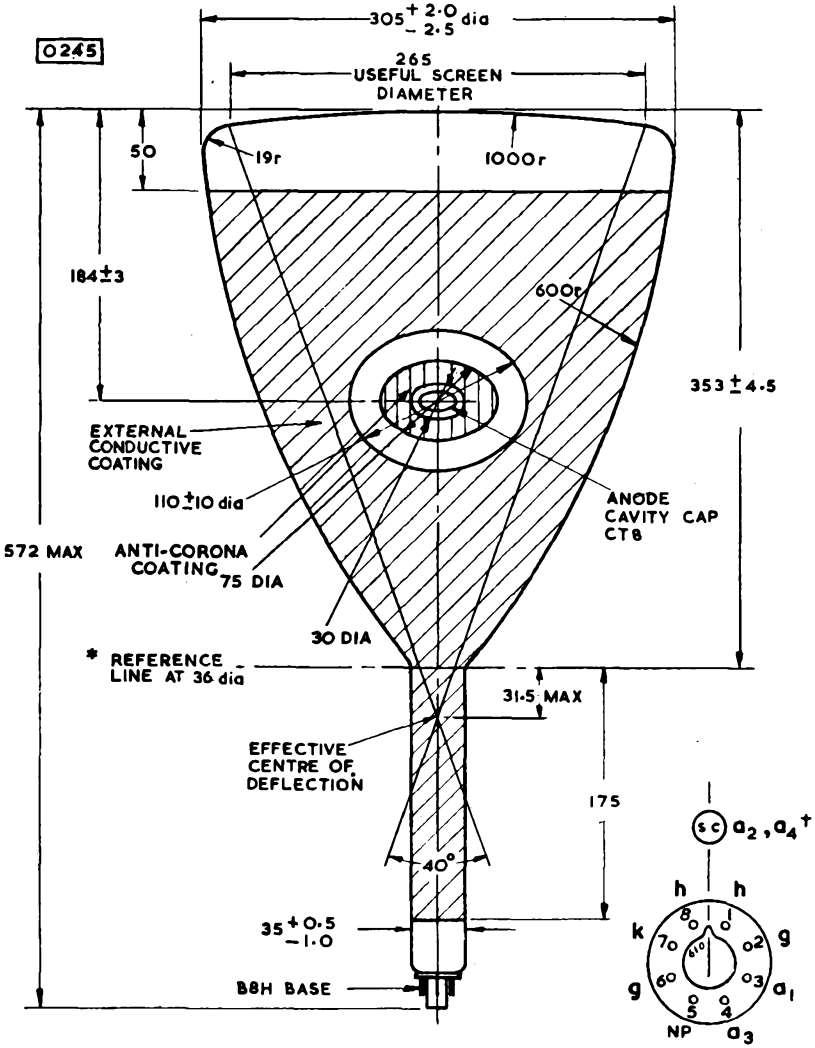
MOUNTING POSITION—Unrestricted

Net Tube Weight (approx)—13 lb 8 oz (6·2 kg)

Tubes incorporating a B8H sparkguard base will have a suffix S after the type number. For details of the sparkguard base see separate sheet.

Radar Tube

F31—13LC



All dimensions in mm. Not to be scaled.

* Gauge 36 mm I/D 100 mm long to slide freely over neck.

† Anode cap in line with base key, tolerance ±15°.

The projected neck axis shall pass within 3·5 mm of the geometric centre of the tube. Neck eccentricity with respect to the geometric centre of the tube face shall not exceed 4·0 mm at the deflection centre and 4·5 mm at 102 mm from the reference line.

The tube should not be handled in the region of the anti-corona coating.

F31-14..

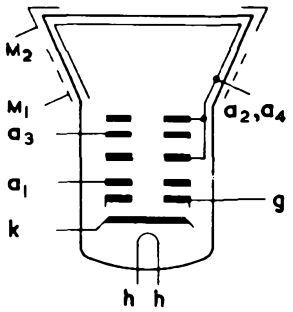
Radar Tube

Maintenance Type

GENERAL

Rectangular face, 12 inch, 110° diagonal
Rimband reinforced envelope
29.4mm maximum neck diameter
Electrostatic focus, magnetic deflection
Straight gun, aluminised screen
Grey glass, 50% transmission (approx.)
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3*	A



DESIGN CENTRE RATINGS

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10.5	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	550	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	250	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$v_{h-k(pk)max}$	400§	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

All voltages referred to cathode

* In a series heater chain the CRT should always be connected at the chassis end.

† The absolute rating of 16.5 kV must not be exceeded.

§ During a warming up period not exceeding 45 seconds.

PHOSPHOR SCREEN

This type is usually supplied with LD phosphor (F31-14LD) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix letter after the type number. For details of the Sparkguard bases see separate sheets.

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	6.5	8.0	pF
Anodes 2 and 4 to coating M_1 (approx.)	$c_{a2+a4-M_1}$		450	pF
Anodes 2 and 4 to band M_2 (approx.)	$c_{a2+a4-M2}$		150	pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode.

Second and fourth anode voltage	$V_{a2+a4-k}$	12	kV
First anode voltage	V_{a1-k}	400	V
Third anode voltage range for focus	V_{a3-k}	0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	200	μA
Average peak to peak picture modulating voltage		29	V
Grid to cathode voltage range for cut-off of raster	V_{g-k}	-40 to -77	V
LD screen persistence to 10% (approx.)		4.0	s

TYPICAL OPERATION - Cathode modulation, voltages referred to grid

Second and fourth anode voltage	$V_{a2+a4-g}$	12	kV
First anode voltage	V_{a1-g}	400	V
Third anode voltage range for focus	V_{a3-g}	0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	200	μA
Average peak to peak picture modulating voltage		25	V
Cathode to grid voltage range for cut-off of raster	V_{k-g}	36 to 66	V
LD screen persistence to 10% (approx.)		4.0	s

The LD screen is liable to burn even at low values of beam current if operated with stationary or slow moving spot.

PICTURE CENTRING

Maximum magnet flux density at centre of neck should not be less than	15	Gs
Maximum distance of centre of magnetic field from reference line	53	mm

DEFLECTION ANGLES

Height 80° Width 99° Diagonal 110°

MOUNTING

This tube is intended for 'push-through' presentation without masking, but if a mask is used it should be flexible enough to take up small variations in fixing and bulb contours .

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

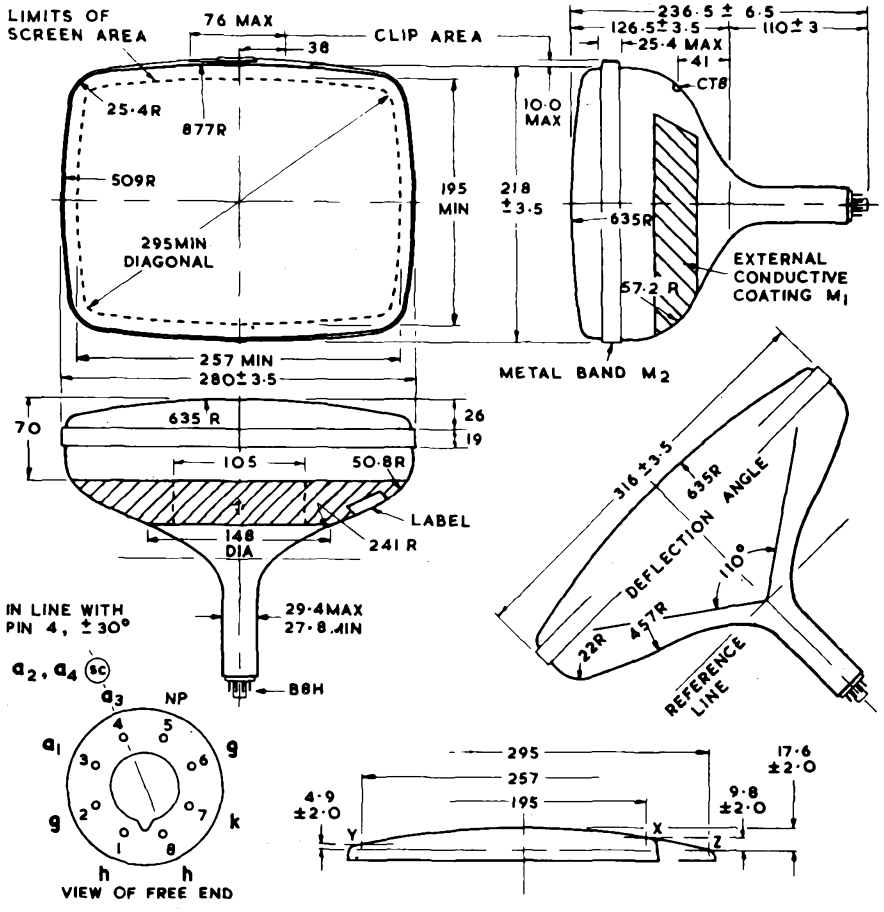
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle of 44 mm diameter which is centred on the perpendicular from the centre of the face.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal rimband (M_2) should be connected directly to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c. / d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 2.7 kg (6.0 lb)



All dimensions in mm

Not to be scaled

† Determined by Reference Gauge No.16. (JEDEC No. 126)

RADAR TUBES

F31-111..

Radar Tube

The F31-111.. is the F31-11.. with increased line width.

PHOSPHOR SCREEN

This type is usually supplied with an LC phosphor (F31-111LC) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

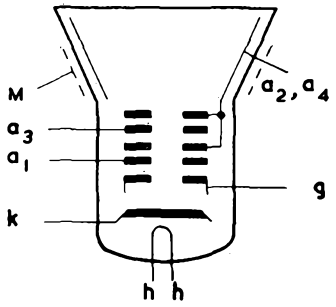
Radar Tube

F31-112..

GENERAL

Round face, 12 inch tube, 50° deflection
Electrostatic focus, magnetic deflection
Straight gun, aluminised screen
Clear glass, external conductive coating
35.5 mm maximum neck diameter

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -300	V
Maximum first anode voltage	$V_{a1(max)}$	800	V
Minimum first anode voltage	$V_{a1(min)}$	400	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage	$V_{h-k(max)}$		
heater negative (d.c.)		200	V
heater positive (d.c.)		150	V
Maximum peak heater to cathode voltage	$V_{h-k(pk)max}$		
heater negative		300	V
heater positive		250	V
Maximum heater to cathode resistance	$R_{h-k(max)}$	1.0	MΩ
Maximum grid to cathode resistance	$R_{g-k(max)}$	1.5	MΩ
Maximum grid to cathode impedance (50 Hz)	$Z_{g-k(max)}$	500	kΩ
Maximum cathode to earth impedance (50 Hz)	$Z_{k-e(max)}$	100	kΩ

RADAR TUBES

PHOSPHOR SCREEN

This tube is usually supplied with LD phosphor (F31-112LD) giving an orange trace of very long persistence. Other phosphors can be made available to special order. .

NECK LENGTH

This tube has an extended neck length to accomodate an auxiliary high frequency deflector coil.

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.5	pF
Grid to all	c_{g-all}	7.5	pF
Anodes 2 and 4 to external conductive coating, M (approx.)	$c_{a2+a4-M}$	1500	pF

TYPICAL OPERATION

Second and fourth anode voltage	V_{a2+a4}	14	kV
Third anode voltage range for focus	V_{a3}	0 to 400	V
First anode voltage	V_{a1}	600	V
Grid to cathode voltage for visual extinction of focused spot	V_{g-k}*	-32 to -48	V
Cathode to grid voltage for visual extinction of focused spot	V_{k-g}*	30 to 45	V
Average peak to peak modulating voltage for modulation up to 150 μA		25 †	V
LC screen persistence to 10% (approximate)		25	s
LD screen persistence to 10% (approximate)		4.0	s

The LC and LD screens are liable to burn even at low values of beam current if operated with stationary or slow moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 milliröntgens per hour, the window will normally provide adequate protection.

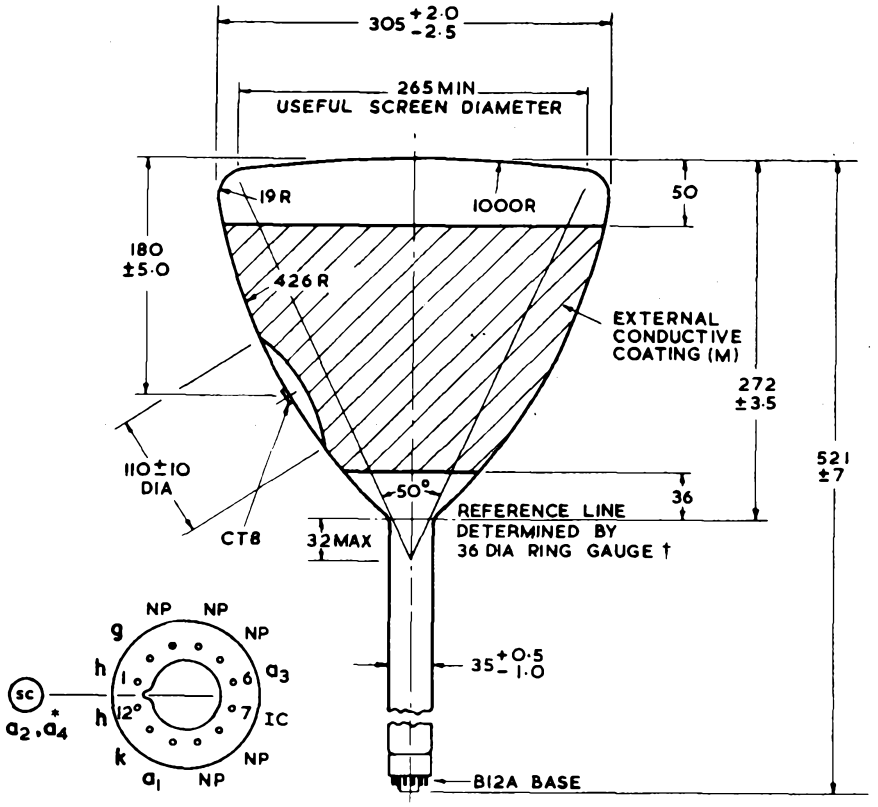
* For grid modulation, all voltages are measured with respect to the cathode. For cathode modulation, all voltages are measured with respect to the grid.

† Grid modulation from spot cut-off.

TUBE WEIGHT (approximate) - 5.4 kg (12 lb)

MOUNTING - unrestricted

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.
When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.



All dimensions in mm **Not to be scaled**

* Anode cap in line with spigot ± 10°.

† Gauge 36 mm I/D x 100 mm long to slide freely over neck.

There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The projected neck axis shall pass within 3.5 mm of the geometric centre of the tube face.

The eccentricity of the neck axis with respect to a line perpendicular to the geometric centre of the tube face shall not exceed 4.0 mm at the deflection centre and 4.5 mm at a point 102 mm from the reference line.

It is recommended that the deflector coil assembly including "position" and "write" coils should not extend further than 100 mm from the reference line otherwise there may be undesirable interaction with the tube gun.

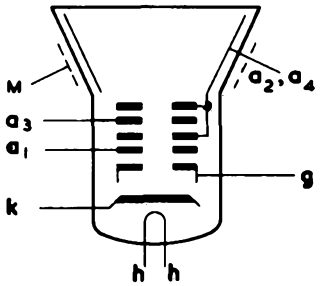
F41-12 ..

Radar Tube

GENERAL

Round face, 16 inch tube, 50° deflection
Electrostatic focus, magnetic deflection
Straight gun, non ion trap
Clear glass
External conductive coating
Aluminised screen
35.5 mm maximum neck diameter

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	20	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	400*	V

* During a warming up period not exceeding one minute.

PHOSPHOR SCREEN

This tube is usually supplied with LC phosphor (F41-12LC) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	c_{k-all}	3.5	4.5	pF
Grid to all	c_{g-all}	7.0	7.5	pF
Anodes 2 and 4 to external conductive coating, M	$c_{a2+a4-M}$		1200	pF

* Holder capacitance balanced out.

† Total capacitances including a typical B12A duodecal holder.

TYPICAL OPERATION - Grid modulation (voltages referred to cathode)

Second and fourth anode voltage	V_{a2+a4}	15	kV
Third anode voltage range for focus	V_{a3}	-300 to +300	V
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off of raster	V_g	-40 to -80	V
Average peak to peak modulating voltage for modulation up to 150 μA		24	V
LC screen persistence to 10% (approximate)		25	s

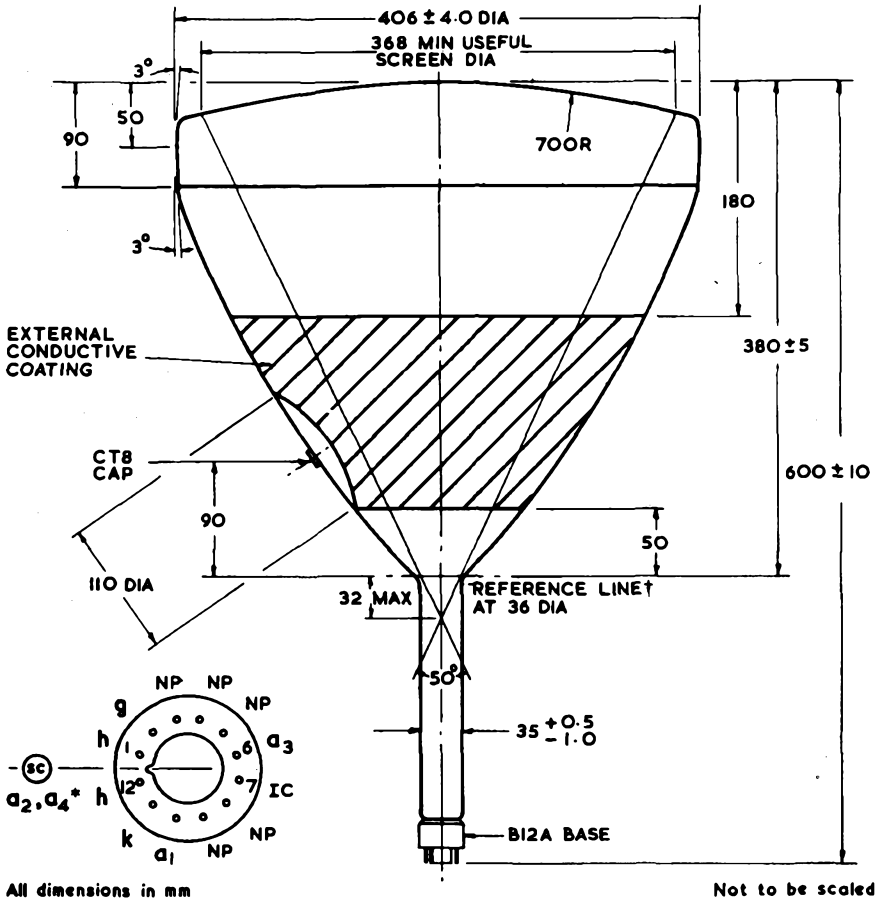
The LC screen is liable to burn even at low values of beam current if operated with a stationary or slow moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 milliröntgens per hour, the window will normally provide adequate protection.

TUBE WEIGHT (approximate) - 11.8 kg (26 lb)

MOUNTING POSITION - unrestricted

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.
When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.



All dimensions in mm

Not to be scaled

*. Anode cap in line with spigot ± 10°

† Gauge 36 I/D x 100 long to slide freely over neck.

There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

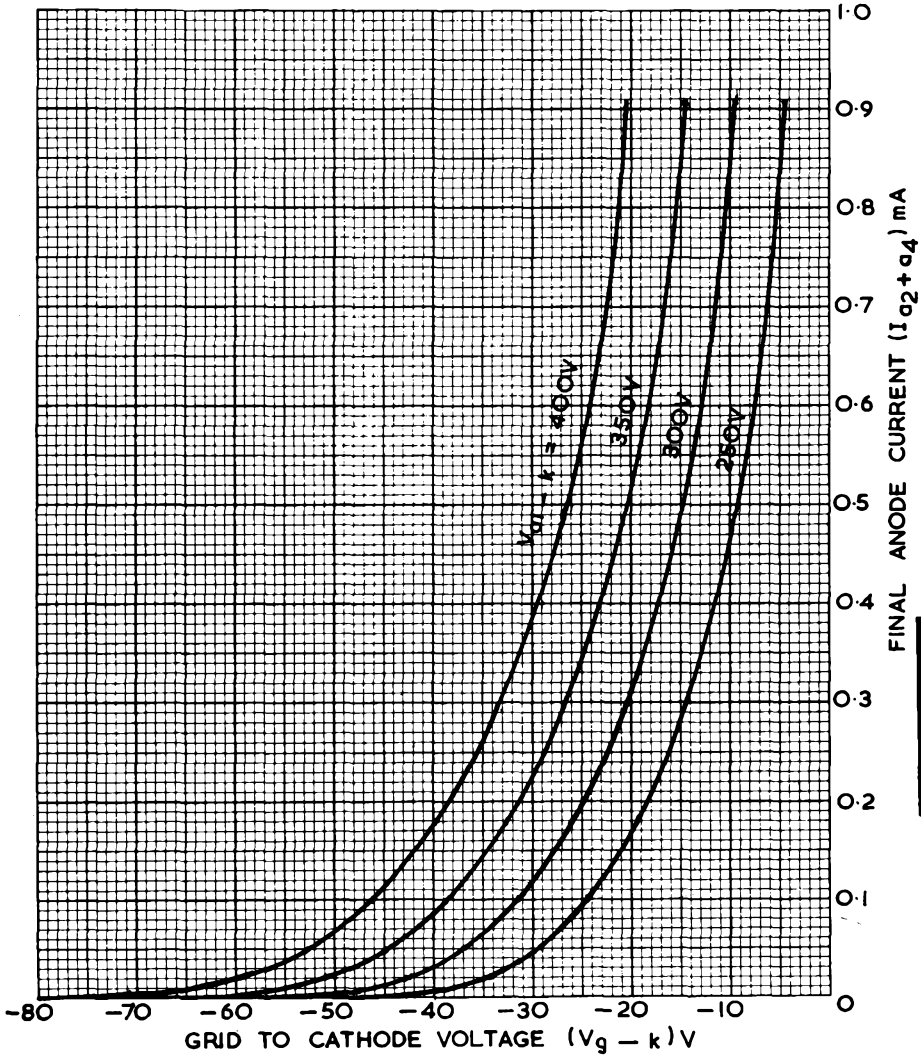
The projected neck axis shall pass within 4.0 mm of the geometric centre of the tube face. The eccentricity of the neck axis with respect to a line perpendicular to the geometric centre of the tube face shall not exceed 4.5 mm at the deflection centre and 5.0 mm at a point 102 mm from the reference line.

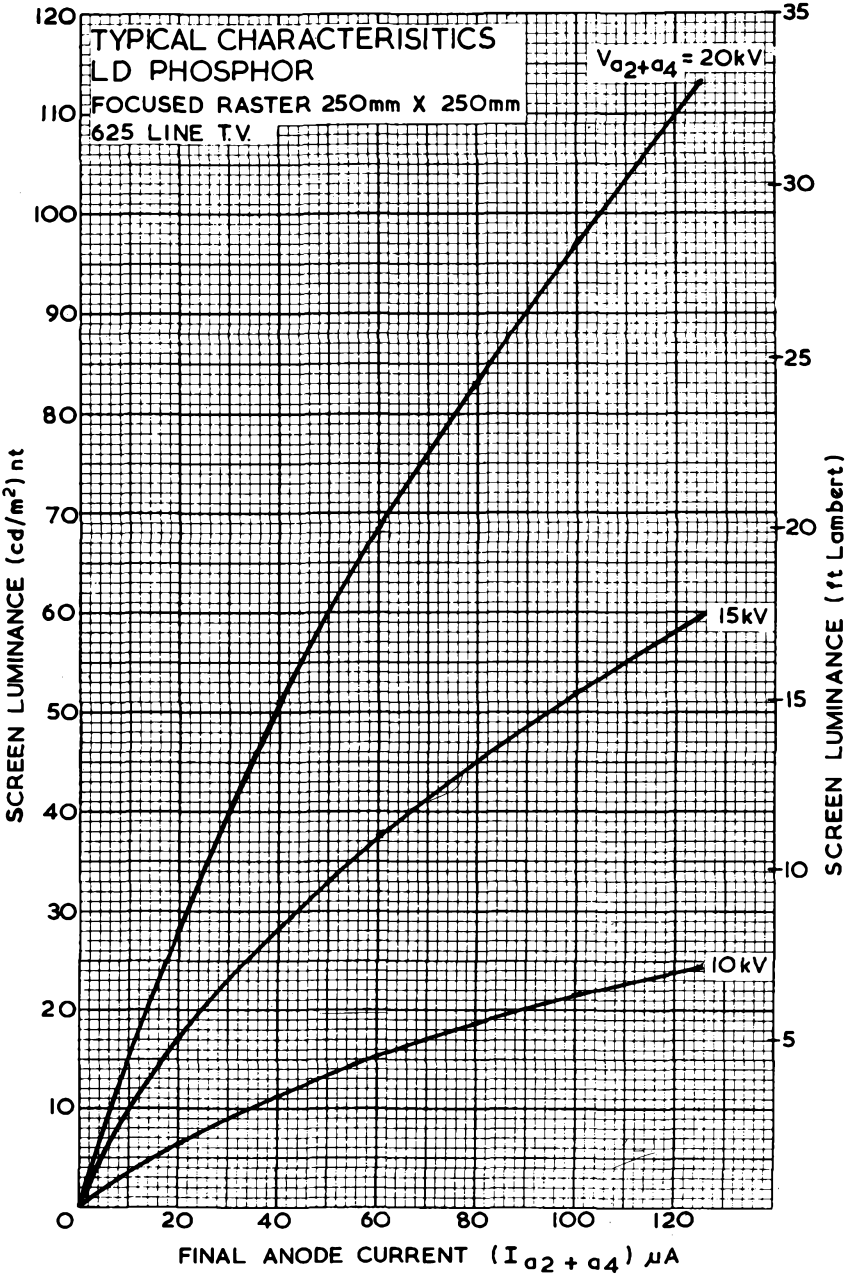
GRID MODULATION I_{a2+a4} / V_{g-k}

V_{a2+a4} = 10 to 20 kV

FIGURES FOR EXTINCTION OF FOCUSED SPOT

V_{a1-k}	250	300	350	400
V_{g-k}	−50	−60	−70	−80




TYPICAL CHARACTERISITICS
LD PHOSPHOR
FOCUSED RASTER 250mm X 250mm
625 LINE T.V.
V_{a2+a4} = 20kV
15kV
10kV
SCREEN LUMINANCE (cd/m²) nt
SCREEN LUMINANCE (ft Lambert)
FINAL ANODE CURRENT (I_{a2+a4}) μA
0
10
20
30
40
50
60
70
80
90
100
110
120
5
10
15
20
25
30
35

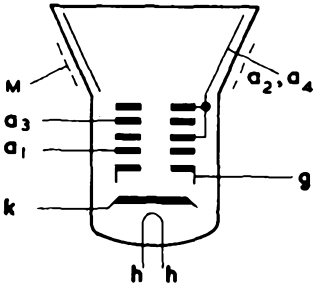
Radar Tube

F41-13..

GENERAL

Round face, 16 inch tube, 50° deflection
Electrostatic focus, magnetic deflection
Straight gun, non ion trap
Clear glass
External conductive coating
Aluminised screen
35.5 mm maximum neck diameter

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	20	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	400*	V

* During a warming up period not exceeding one minute.

PHOSPHOR SCREEN

This tube is usually supplied with LC phosphor (F41-13LC) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

RADAR TUBES

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	c_{k-all}	3.5	4.5	pF
Grid to all	c_{g-all}	7.0	7.5	pF
Anodes 2 and 4 to external conductive coating, M	$c_{a2+a4-M}$		1200	pF

* Holder capacitance balanced out.

† Total capacitances including a typical B12A duodecal holder.

TYPICAL OPERATION - Grid modulation (voltages referred to cathode)

Second and fourth anode voltage	V_{a2+a4}	15	kV
Third anode voltage range for focus	V_{a3}	-300 to +300	V
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off of raster	V_g	-40 to -64	V
Average peak to peak modulating voltage for modulation up to 150 μA		24	V
LC screen persistence to 10% (approximate)		25	s

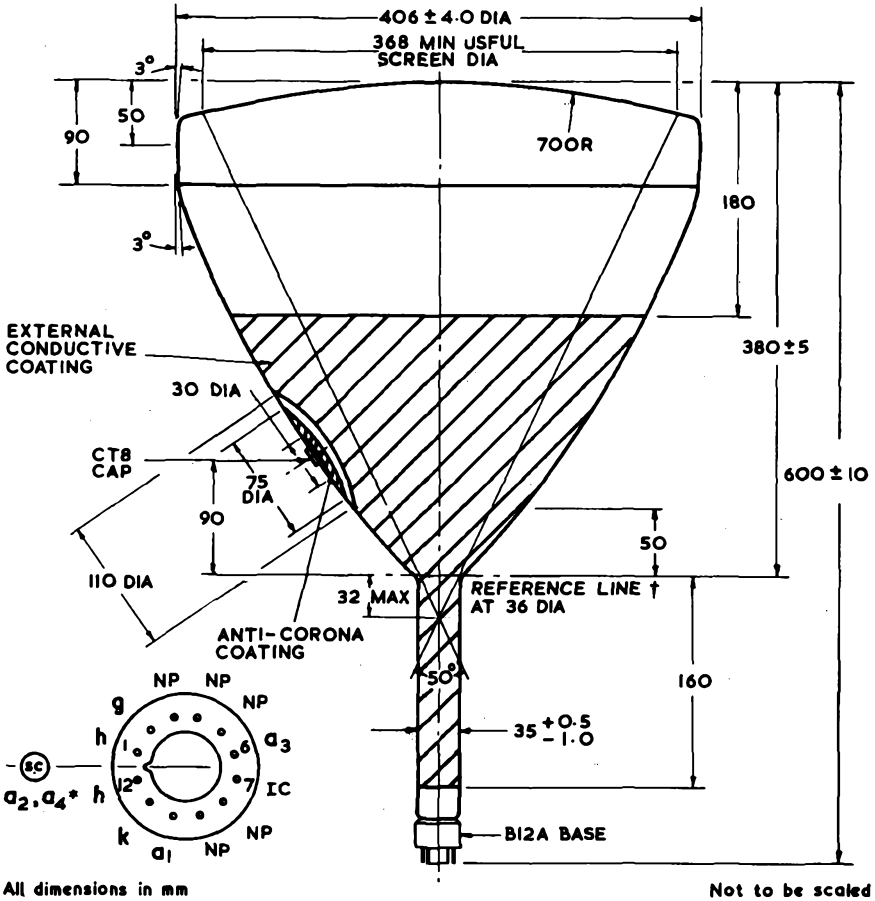
The LC screen is liable to burn even at low values of beam current if operated with a stationary or slow moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 milliröntgens per hour, the window will normally provide adequate protection.

TUBE WEIGHT (approximate) - 11.8 kg (26 lb)

MOUNTING POSITION - unrestricted

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.
When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.



All dimensions in mm

Not to be scaled

* Anode cap in line with spigot ± 10°

† Gauge 36 I/D x 100 long to slide freely over neck.

The tube should not be handled in the region of the anti-corona coating.

The projected neck axis shall pass within 4.0 mm of the geometric centre of the tube face. The eccentricity of the neck axis with respect to a line perpendicular to the geometric centre of the tube face shall not exceed 4.5 mm at the deflection centre and 5.0 mm at a point 102 mm from the reference line.

The external conductive coating of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

Radar Tube

The F41-14.. is the F41-12.. with an increased line width* of 0.5 to 0.7 mm at $I_{a2} + a4 = 50\ \mu A$.

* Microscope measurement.

TUBE WEIGHT (approximate) - 11.8 kg (26 lb)

PHOSPHOR SCREEN

This type is usually supplied with LC phosphor (F41-14LC) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

For all other data please see the F41-12.. data sheets.

Radar Tube

F41-120..

OBSOLETE TYPE

The F41-12.. is the replacement type for the F41-120..

The F41-120..is the F41-12.. with a grey glass face-plate having a light transmission of approximately 52%.

TUBE WEIGHT (approximate) - 9.0 kg (20 lb)

PHOSPHOR SCREEN

This type is usually supplied with LC phosphor (F41-120LC) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

For all other data please see the F41-12.. data sheets.

BRIMAR

F41-121..

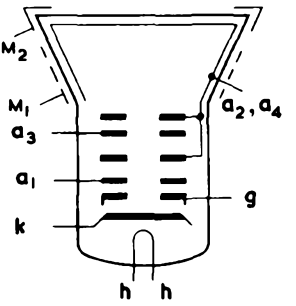
Radar Tube

Maintenance Type

GENERAL

Round face, 16 inch tube, 50° deflection
Metal mounting frame
Electrostatic focus, magnetic deflection
Straight gun, non ion trap
External conductive coating
Aluminised screen

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	20	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$v_{h-k(pk)max}$	400*	V

* During a warming up period not exceeding one minute.

PHOSPHOR SCREEN

This tube is usually supplied with either LC phosphor (F41-121LC) giving an orange trace of very long persistence or GR phosphor (F41-121GR) giving a yellowish-green trace of very long persistence. Other phosphors can be made available to special order.

INTER-ELECTRODE CAPACITANCES		*	†	
Cathode to all	$c_{k\text{-all}}$	3.5	4.5	pF
Grid to all	$c_{g\text{-all}}$	7.0	7.5	pF
Anodes 2 and 4 to external conductive coating, M_1	$c_{a2+a4\text{-}M1}$	1200		pF
Anodes 2 and 4 to mounting frame, M_2	$c_{a2+a4\text{-}M2}$	250		pF

* Holder capacitance balanced out.
† Total capacitances including a typical B12A duodecal holder.

TYPICAL OPERATION - Grid modulation (voltages referred to cathode)

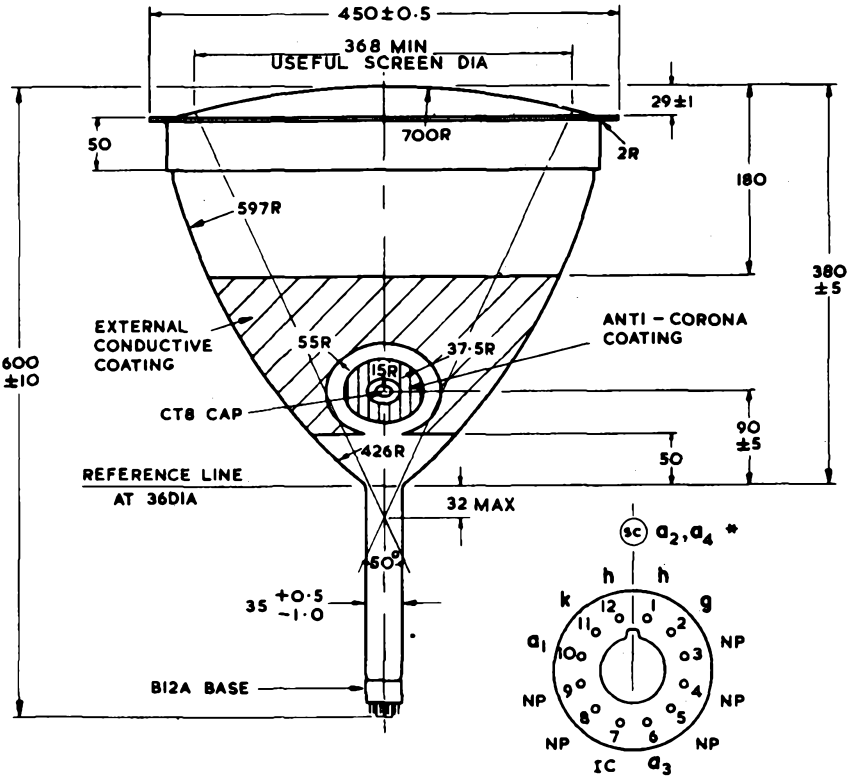
Second and fourth anode voltage	V_{a2+a4}	15	kV
Third anode voltage range for focus	V_{a3}	-300 to +300	V
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off of raster	V_g	-40 to -80	V
Average peak to peak modulating voltage for modulation up to 150 μA		24	V
LC screen persistence to 10% (approximate)		25	s

The LC screen is liable to burn even at low values of beam current if operated with stationary or slow moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 milliröntgens per hour, the window will normally provide adequate protection.

TUBE WEIGHT (approximate) - 12 kg

MOUNTING POSITION - unrestricted



All dimensions in mm

Not to be scaled

* Anode cap in line with spigot ± 10°.

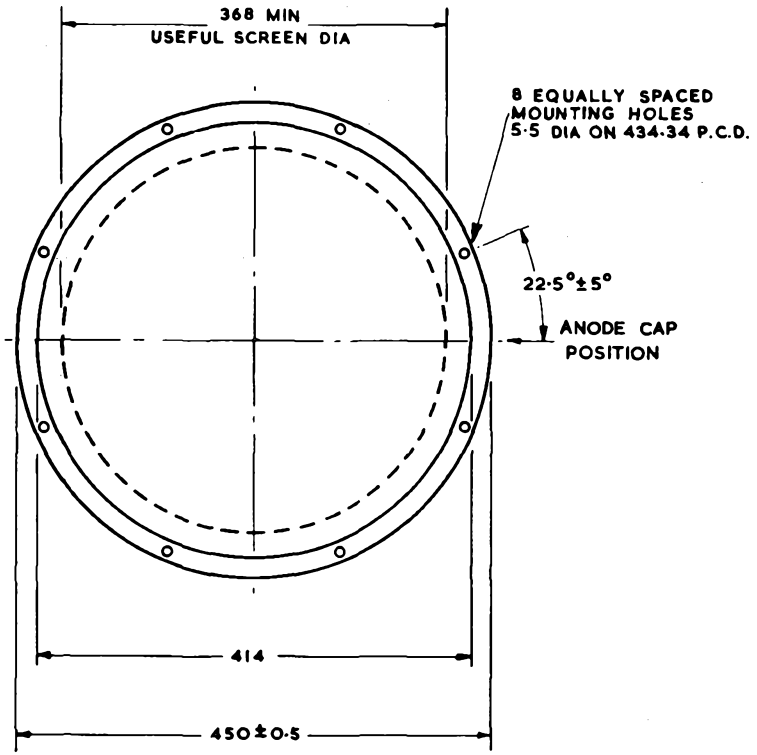
The tube should not be handled in the region of the anti-corona coating .

For details of the mounting frame see following page.

The external conductive coating of this tube should be connected to chassis.
The capacitance between this coating and the final anode may be used to provide smoothing for the e.h.t. supply.

MOUNTING FRAME

14 SWG (2·03 mm) METAL



All dimensions in mm

Not to be scaled

F41-122..

Radar Tube

OBSOLETE TYPE

The F41-123.. is the replacement type for the F41-122..

The F41-122..is the F41-123.. with a grey glass face-plate having a light transmission of approximately 52%.

TUBE WEIGHT (approximate) - 9.0 kg (20 lb)

PHOSPHOR SCREEN

This type is usually supplied with LG phosphor (F41-122LG) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

For all other data please see the F41-123.. data sheets.

BRIMAR

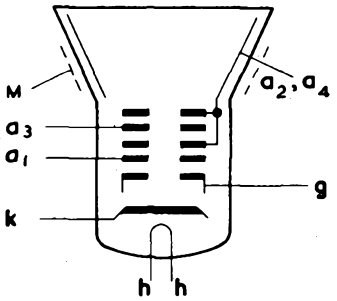
Radar Tube

F41-123..

GENERAL

Round face, 16 inch tube, 50° deflection
Electrostatic focus, magnetic deflection
Straight gun, non ion trap
Clear glass
External conductive coating
Aluminised screen
35.5 mm maximum neck diameter

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	20	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	400*	V

* During a warming up period not exceeding one minute.

PHOSPHOR SCREEN

This tube is usually supplied with LG phosphor (F41-123LG) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

NECK LENGTH

This tube has an extended neck length to accommodate an auxiliary high frequency deflector coil.

RADAR TUBES

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

		*		†	
Cathode to all	c_{k-all}	3.5		4.5	pF
Grid to all	c_{g-all}	7.0		7.5	pF
Anodes 2 and 4 to external conductive coating, M	$c_{a2+a4-M}$		1200		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B12A duodecal holder.

TYPICAL OPERATION - Grid modulation (voltages referred to cathode)

Second and fourth anode voltage	V_{a2+a4}	15	kV
Third anode voltage range for focus	V_{a3}	-300 to +300	V
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off of raster	V_g	-40 to -80	V
Average peak to peak modulating voltage for modulation up to 150 μA		24	V
LG screen persistence to 10% (approximate)		4.0	s

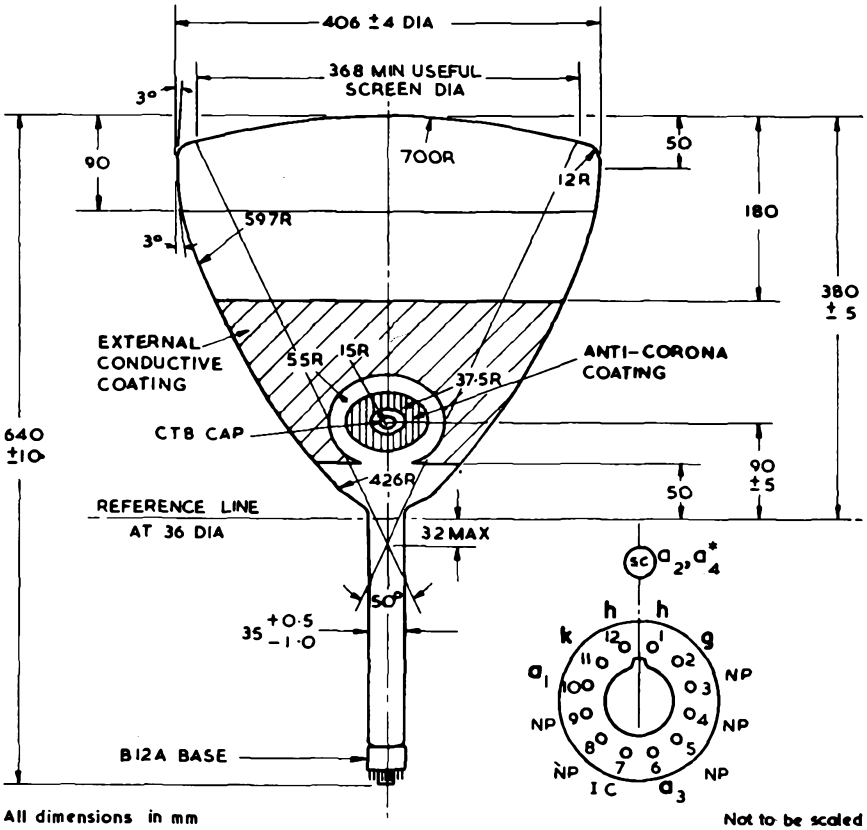
The LG screen is liable to burn even at low values of beam current if operated with a stationary or slow moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 milliröntgens per hour, the window will normally provide adequate protection.

TUBE WEIGHT (approximate) - 11.8 kg (26 lb)

MOUNTING POSITION - unrestricted

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.
When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.



All dimensions in mm

Not to be scaled

* Anode cap in line with spigot ± 10°.

The tube should not be handled in the region of the anti-corona coating.

The projected neck axis shall pass within 4.0 mm of the geometric centre of the tube face.

The eccentricity of the neck axis with respect to a line perpendicular to the geometric centre of the tube face shall not exceed 4.5 mm at the deflection centre and 5.0 mm at a point 102 mm from the reference line.

It is recommended that the deflector coil assembly including "position" and "write" coils should not extend further than 95 mm from the reference line otherwise there may be undesirable interaction with the tube gun.

F41-124..

Radar Tube

The F41-124.. is the F41-123.. with a third anode voltage range for focus of 0 to 400 V.

PHOSPHOR SCREEN

This type is usually supplied with LC phosphor (F41-124LC)giving an orange trace of very long persistence. Other phosphors can be made available to special order.

For all other data please see F41-123.. data sheets.

Radar Tube

F41-130..

OBSOLETE TYPE

The F41-13.. is the replacement type for the F41-130..

The F41-130. is the F41-13.. with a grey glass face-plate having a light transmission of approximately 52%.

TUBE WEIGHT (approximate) - 9.0 kg (20 lb)

PHOSPHOR SCREEN

This type is usually supplied with LC phosphor (F41-130LC) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

For all other data please see the F41-13.. data sheets.

BRIMAR

F41-140..

Radar Tube

OBSOLETE TYPE

The F41-14.. is the replacement type for the F41-140..

The F41-140..is the F41-14..with a grey glass face-plate having a light transmission of approximately 52%.

TUBE WEIGHT (approximate) 9.0 kg (20 lb)

PHOSPHOR SCREEN

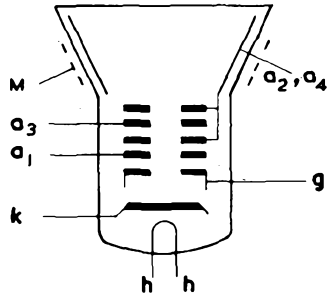
This type is usually supplied with LC phosphor (F41-140LC) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

For other data please see the F41-14.. data sheets.

GENERAL

Round face, 16 inch tube, 50° deflection
Electrostatic focus, magnetic deflection
Straight gun, non ion trap
Clear glass.
External conductive coating
Aluminised screen
35.5 mm maximum neck diameter

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	20	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$v_{h-k(pk)max}$	400*	V

* During a warming up period not exceeding one minute.

PHOSPHOR SCREEN

This tube is usually supplied with LC phosphor (F41-141LC) giving an orange trace of very long persistence. Other phosphors can be made available to special order.

RADAR TUBES

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	$c_{k\text{-all}}$	3.5	4.5	pF
Grid to all	$c_{g\text{-all}}$	7.0	7.5	pF
Anodes 2 and 4 to external conductive coating, M	$c_{a2+a4\text{-M}}$		1400	pF

* Holder capacitance balanced out.

† Total capacitances including a typical B12A duodecal holder.

TYPICAL OPERATION - Grid modulation (voltages referred to cathode)

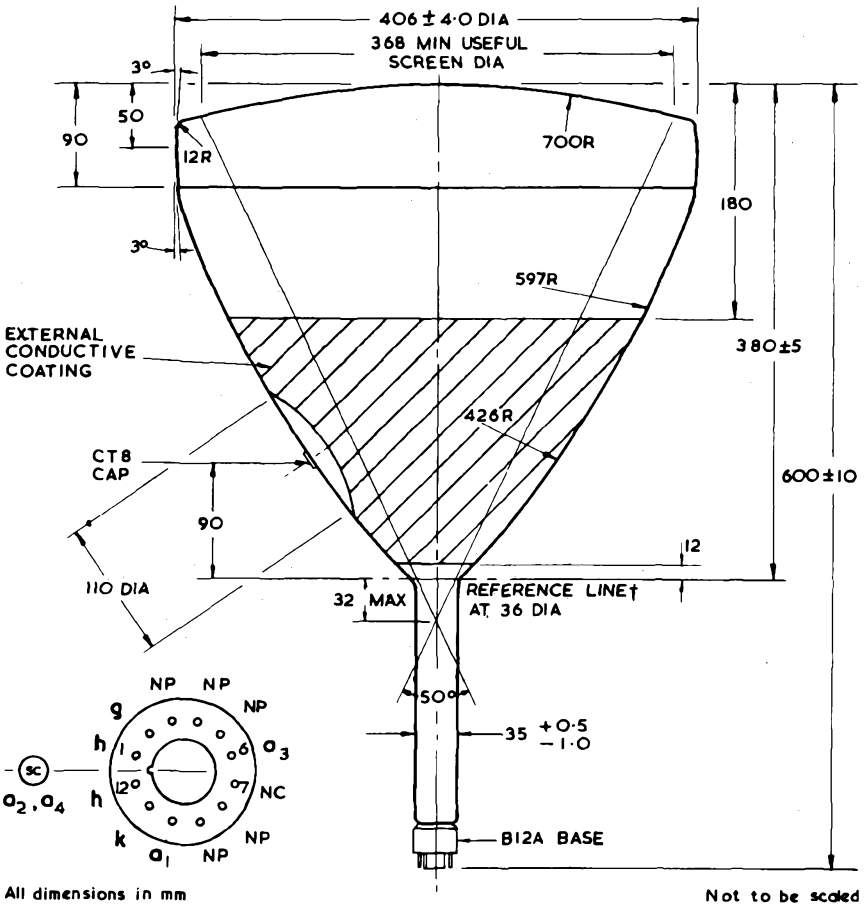
Second and fourth anode voltage	V_{a2+a4}	18	kV
Third anode voltage range for focus	V_{a3}	-300 to +300	V
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off of raster	V_g	-40 to -80	V
Average peak to peak modulating voltage for modulation up to 150 μA		24	V
Line width at 50 μA beam current microscope measurement		0.5 to 0.7	mm
LC screen persistence to 10% (approximate)		25	s

The LC screen is liable to burn even at low values of beam current if operated with stationary or slow moving spot.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 milliröntgens per hour, the window will normally provide adequate protection.

TUBE WEIGHT (approximate) - 9 kg (20 lb)

MOUNTING POSITION - unrestricted



* Anode cap in line with spigot ± 15°

† Gauge 36 I/D x 100 long to slide freely over neck.

There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The projected neck axis shall pass within 4.0 mm of the geometric centre of the tube face. The eccentricity of the neck axis with respect to a line perpendicular to the geometric centre of the tube face shall not exceed 4.5 mm at the deflection centre and 5.0 mm at a point 102 mm from the reference line.

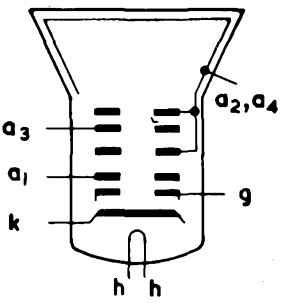
7ABP33A

Radar Tube

GENERAL

Round face 7 inch tube, 50° deflection
Electrostatic focus, magnetic deflection
Straight gun, non ion trap
Aluminised screen, orange trace
P33(LD)phosphor, very long persistence

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS (voltages referred to cathode)

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	11	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	6.0	kV
Maximum third anode voltage range	$V_{a3(max)}$	+1100 to -550	V
Maximum first anode voltage	$V_{a1(max)}$	770	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Maximum positive grid voltage	$V_{g(max)}$	0	V
Maximum peak positive grid voltage	$v_{g(pk)max}$	0	V
Maximum peak heater to cathode voltage heater negative or positive	$v_{h-k(pk)max}$	200	V
Maximum grid to cathode resistance	$R_{g-k(max)}$	1.5	MΩ

Other phosphors are available to special order.

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	5.0	pF
Grid to all	c_{g-all}	6.0	pF

TYPICAL OPERATION - grid modulation (voltages referred to cathode)

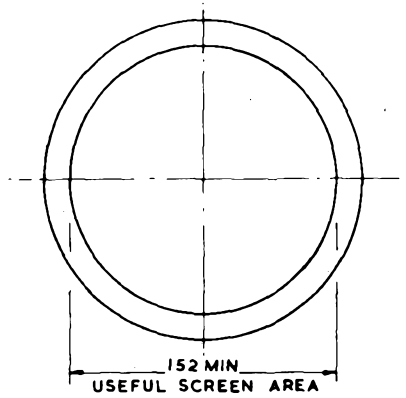
Second and fourth anode voltage	V_{a2+a4}	7.0	kV
Third anode voltage range for focus	V_{a3}	0 to 250	V
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for visual extinction of focused spot	V_{g-k}	-28 to -72	V
P33 (LD) screen persistence to 10% (approximate)		3.0	s

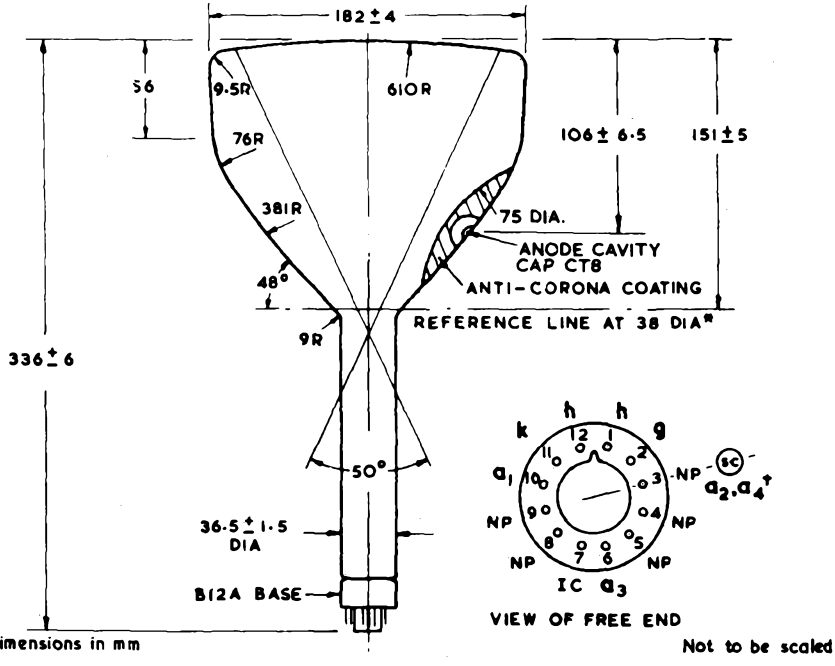
The P33(LD) screen is liable to burn even at low values of beam current if operated with stationary or slow moving spot.

TUBE WEIGHT (approximate) - 1.6 kg (3.5 lb)

MOUNTING POSITION - unrestricted

RADAR TUBES



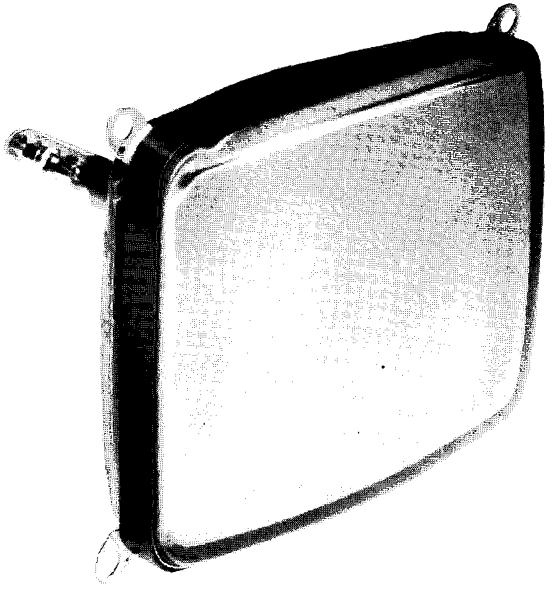


* Gauge 38 mm I/D 50 mm long to slide freely over neck.

† Anode cap in line with pin 3 ± 10°

The tube should not be handled in the region of the anti-corona coating.

DATA DISPLAY & MONITOR TUBES



The facilities and organisation provided by Thorn Radio Valves and Tubes Limited meet the requirements of the M.O.D. (P.E.) Defence Standard 05-21 and BS 9000.

HEALTH AND SAFETY AT WORK ACT, 1974

Attention is drawn to the recommendations under this heading in the Operational Recommendations.

WARNING

These tubes should be used in accordance with their published ratings, and in conformity with the Operational Recommendations of the company's data handbook. The company will not entertain claims for loss or damage where this advice has been disregarded.

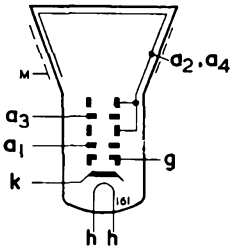
Thorn Radio Valves and Tubes Limited
Mollison Avenue - Brimsdown - Enfield - Middlesex EN3 7NS

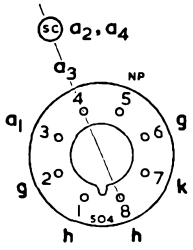
BRIMAR

Data Display or Monitor Tube

CV6198

Maintenance Type





Base B8H, Cap CT8

GENERAL

Rectangular Face	—8½ in. Diagonal	Deflection Angle	—90° Diagonal
Electrostatic Focus	—Magnetic Deflection	Aluminised Screen	—Orange Trace
LG Phosphor	—Very Long Persistence	External Conductive Coating	
	Heater Voltage	V_h 11·5 V	
	Heater Current	I_h 0·15 A	

RATINGS

Maximum Second and Fourth Anode Voltage	$V_{a2,a4(max)}$	16*	kV
Minimum Second and Fourth Anode Voltage	$V_{a2,a4(min)}$	8·0	kV
Maximum Third Anode Voltage	$V_{a3(max)}$	± 700	V
Maximum First Anode Voltage	$V_{a1(max)}$	500	V
Maximum Heater to Cathode Voltage, Heater Negative (d.c.)	$V_{h-k(max)}$	200	V

*16 kV is a design centre rating, the absolute rating of 18 kV must not be exceeded.
All voltages referred to cathode.

INTER-ELECTRODE CAPACITANCES

		¶	§	
Grid to all	C_{g-all}	7·0	8·5	pF
Cathode to all	C_{k-all}	3·0	3·5	pF
Anode 2 and Anode 4 to External Conductive Coating (approx)	$C_{a2,a4-M}$	400		pF

¶ Inter-electrode capacitance with holder balanced out.
§ Inter-electrode capacitance including a typical B8H holder.

TYPICAL OPERATION—Grid Modulation (all voltages referred to cathode)

Second and Fourth Anode Voltage	$V_{a2,a4}$	14	kV
First Anode Voltage	V_{a1}	400	V
Third Anode Voltage for Focus (Range)	V_{a3}	0 to 400	V
Grid to Cathode Voltage for cut-off of Raster	V_g	−30 to −72	V
Average Peak to Peak Modulating Voltage for Modulation up to 150μA		24	V
LG Screen Persistence to 10% (approximate)		4·0	s

The LG screen is liable to burn even at low values of beam current if operated with a stationary or slow-moving spot.

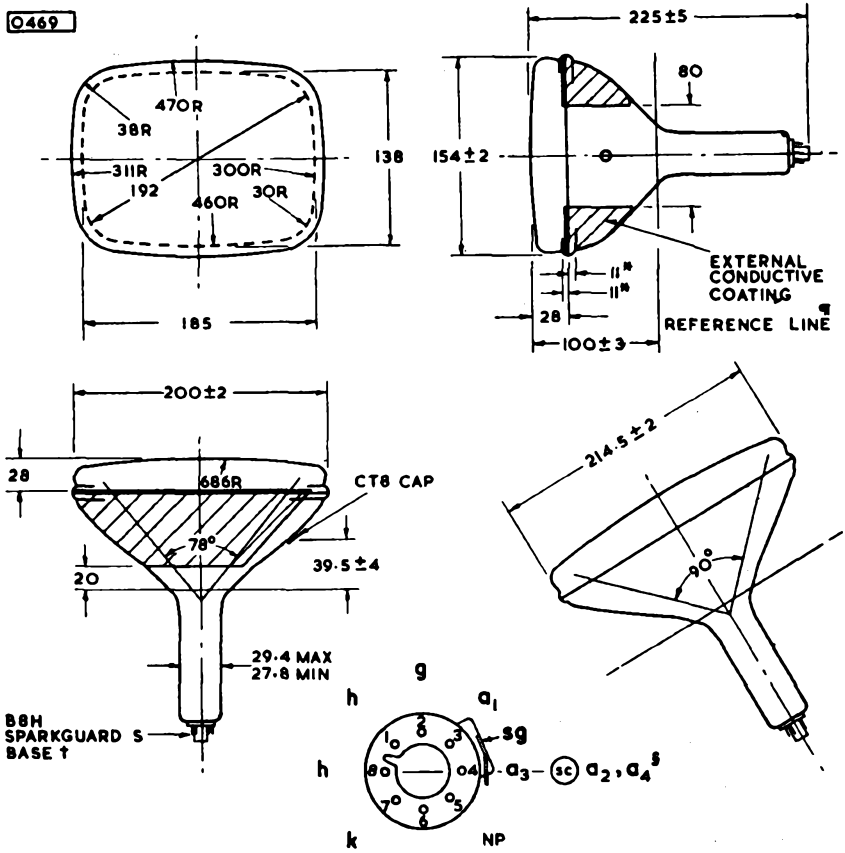
Note

This tube can be supplied with a number of different phosphors as requested.

This tube is fitted with a B8H Sparkguard S base, details of which are given on a separate sheet.

Net Tube Weight (approx)—1·36 kg (3 lb).

DATA DISPLAY & MONITOR TUBES



All dimensions in mm

Not to be scaled

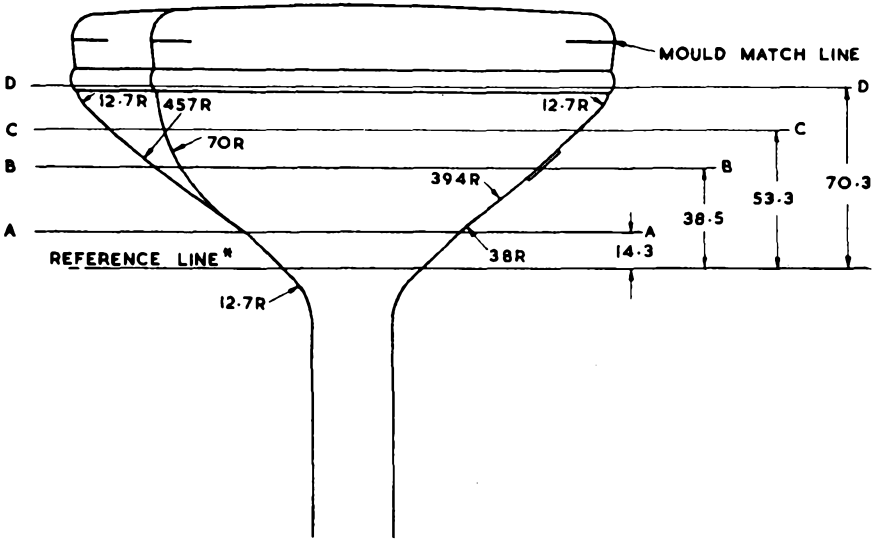
There is an annular region of anti-corona coating with an external diameter of 60 mm surrounding the CT8 cap, the tube should not be handled in this region.

* During the face sealing operation the glass in this area (total 22 mm) may be disturbed. As the shape of the contour within this area may be either convex or concave the bulb should not be gripped within this region unless special precautions are taken (such as the use of resilient packing material).

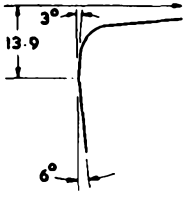
† The socket for the B8H button base should not be rigidly mounted, it should have flexible leads and be allowed to move freely. The design of the socket should be such that the wiring cannot impress lateral strains through the socket contacts on the base.

§ Anode cap in line with pin 4 ± 30°.

¶ Determined by Reference Gauge No. 15.



0470



MOULD MATCH DETAIL

MAXIMUM CONE SIZES AT POINTS A-A, B-B, C-C, D-D			
SEC'N	MAJOR AXIS	MINOR AXIS	DIAG'L
A-A	82.4	82.4	82.4
B-B	146	134	153
C-C	180	149	193
D-D	201	155	216

All dimensions in mm

Not to be scaled

* Determined by Reference Line Gauge No. 15.

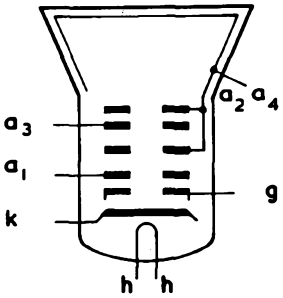
M8-100.. Data Display or Monitor Tube

PRELIMINARY DATA

GENERAL

Rectangular face-plate 82 mm x 32 mm
Ruggedised gun construction
Electrostatic focus, magnetic deflection
Flying lead connections to base and anode
Aluminised screen, clear glass
20.7 mm maximum neck diameter.

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	12	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	8	kV
Maximum third anode voltage	$V_{a3(max)}$	-50 to +500	V
Maximum first anode voltage	$V_{a1(max)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	100	V
Minimum negative grid voltage	$-V_{g(min)}$	1*	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	110	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	130	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

PHOSPHOR SCREEN

This type is usually supplied with GX phosphor (M8-100GX). This is a line spectrum phosphor giving a yellowish green fluorescence of medium persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - 180 g

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	C_{k-all}	4.0*	pF
Grid to all	C_{g-all}	7.0*	pF

* Lead capacitance balanced out.

TYPICAL OPERATION - Grid modulation (Voltage referred to cathode)

Second and fourth anode voltage	$V_{a2+a4-k}$	10	kV
First anode voltage	V_{a1-k}	250	V
Third anode voltage range for focus	V_{a3-k}	0 to 350	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-35 to -69	V
Typical line width at 30μA beam current shrinking raster measurement at tube face centre		0.25	mm

TYPICAL OPERATION - Cathode modulation (Voltage referred to grid)

Second and fourth anode voltage	$V_{a2+a4-g}$	10	kV
First anode voltage	V_{a1-g}	250	V
Third anode voltage range for focus	V_{a3-g}	0 to 350	V
Cathode to grid voltage for cut-off of raster	V_{k-g}	32 to 58	V

Characteristic curves as M23-110..

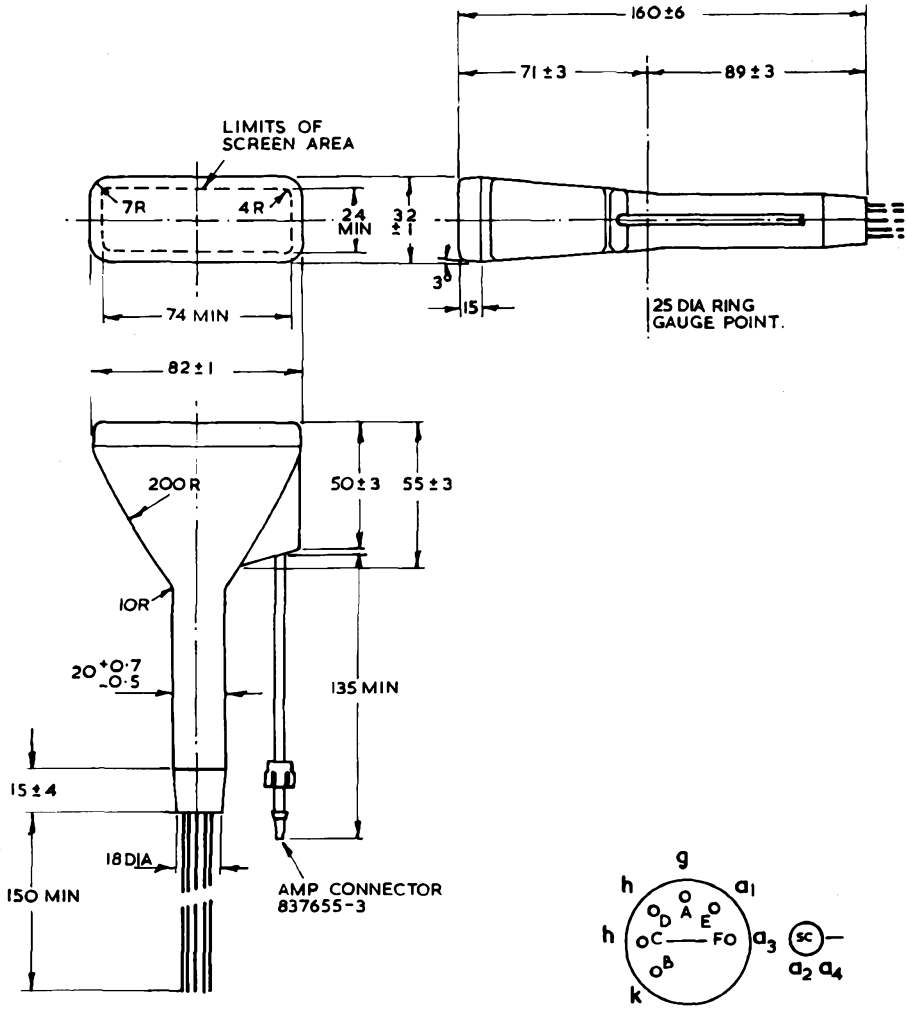
MOUNTING

The tube can be mounted in any position.

When flashover protection is incorporated the chassis return path should be made in a manner appropriate to the protection system employed.

ENVIRONMENTAL TESTS CAPABILITIES

Temperature range:	Operational	-15°C to + 85°C
	Storage	-54°C to + 85°C
Vibration endurance		5 to 55 Hz 1.5g maximum 55 to 2000 Hz 1.0g constant
Bump and shock		6 bumps, 6g, 11ms, half sine wave, all three axes
Tropical environment		95% relative humidity cycled 38°C to 50°C. total 48 hrs
Altitude:	Operational	5000m
	Non operational	6000m



All dimensions in mm

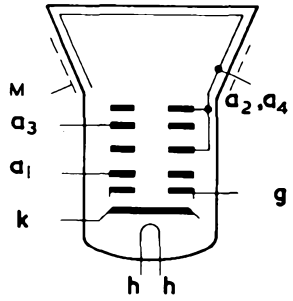
VIEW OF FREE END.

Data Display or Monitor Tube M14-100..

GENERAL

Rectangular face, 14 cm, 70° diagonal
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 62% transmission (approx)
20.7 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	8	kV
Maximum third anode voltage	$V_{a3(max)}$	-50 to +500	V
Maximum first anode voltage	$V_{a1(max)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	100	V
Minimum negative grid voltage	$-V_{g(min)}$	1*	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	110	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	130	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M14-100W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - 400 g

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.0*	pF
Grid to all	c_{g-all}	4.0*	pF
Anodes 2 and 4 to coating M (min.)	$c_{a2+a4-M(min)}$	200	pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation (Voltage referred to cathode)

Second and fourth anode voltage	$V_{a2+a4-k}$	10	kV
First anode voltage	V_{a1-k}	250	V
Third anode voltage range for focus	V_{a3-k}	0 to 350	V
Average peak to peak picture modulating voltage up to 100 μA		24	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-35 to -69	V

TYPICAL OPERATION - Cathode modulation (Voltage referred to grid)

Second and fourth anode voltage	$V_{a2+a4-g}$	10	kV
First anode voltage	V_{a1-g}	250	V
Third anode voltage range for focus	V_{a3-g}	0 to 350	V
Average peak to peak picture modulating voltage up to 100 μA		20	V
Cathode to grid voltage for cut-off of raster	V_{k-g}	32 to 58	V

MOUNTING

There is an annular region of anti-corona coating surrounding the CT8 cap, the tube should not be handled in this region.

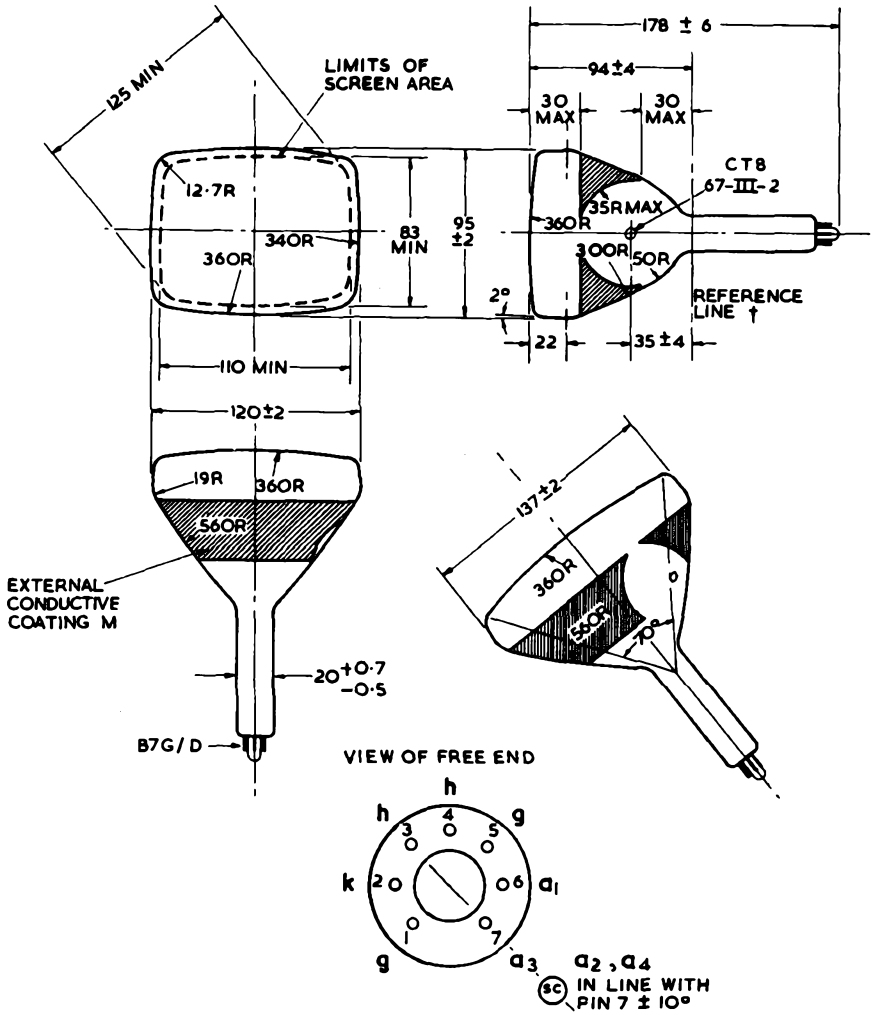
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

The external conductive coating of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return path should be made in a manner appropriate to the protection system employed.

Characteristic curves as M23-110..

Data Display or Monitor Tube M14-100..

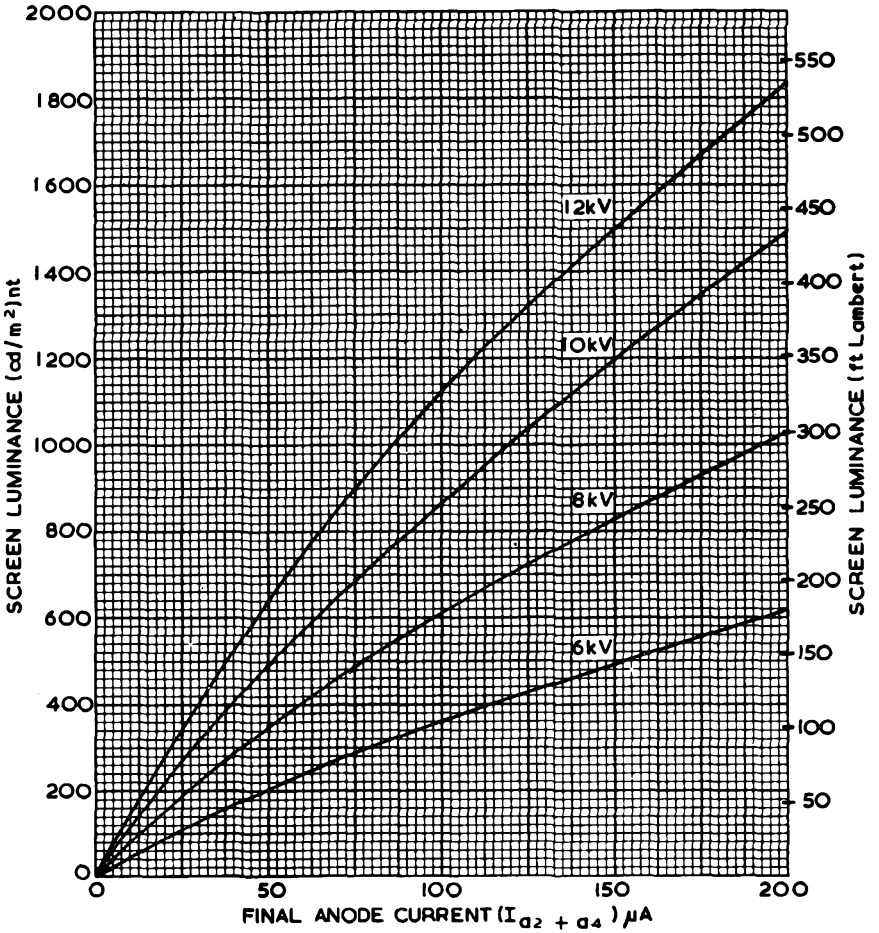


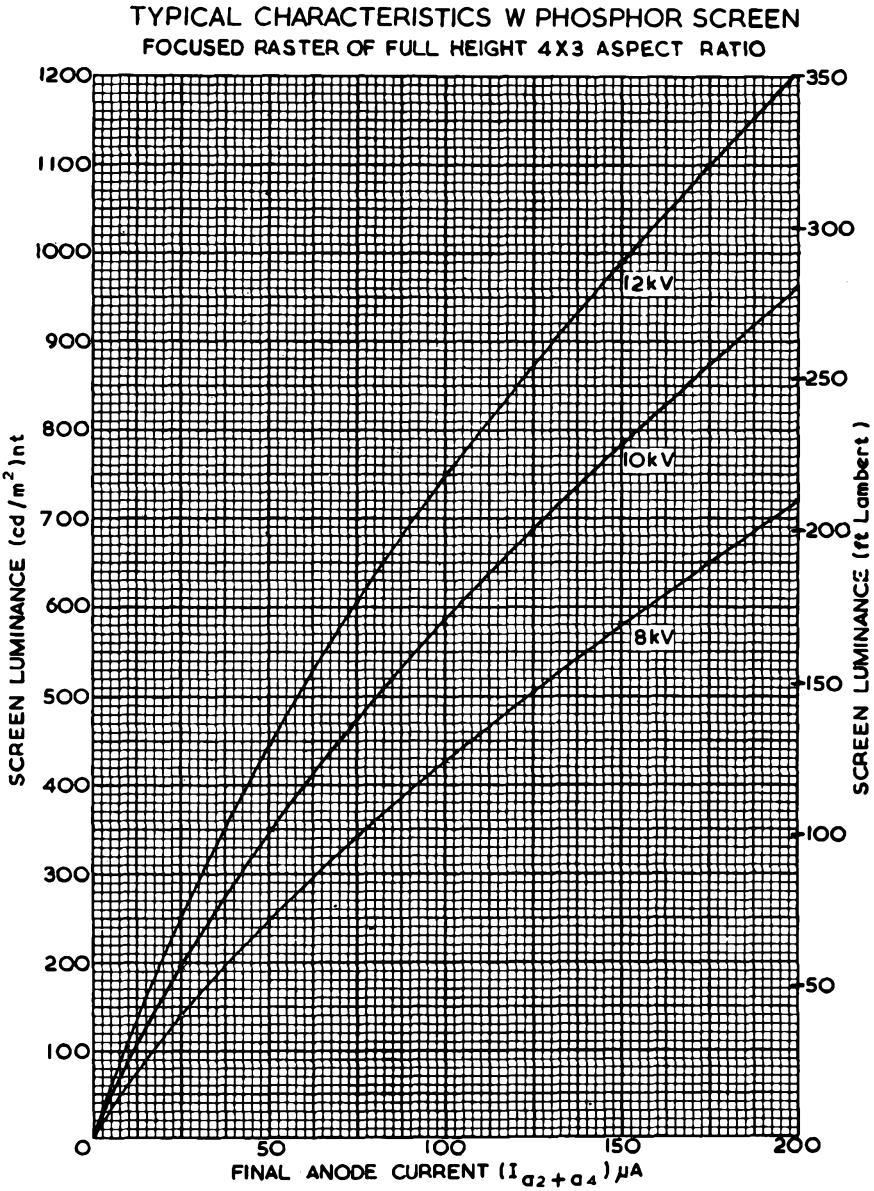
All dimensions in mm

Not to be scaled

† Determined by reference line gauge No. 23

TYPICAL CHARACTERISTICS
GH PHOSPHOR SCREEN
FOCUSED RASTER OF FULL HEIGHT
4 x 3 ASPECT RATIO



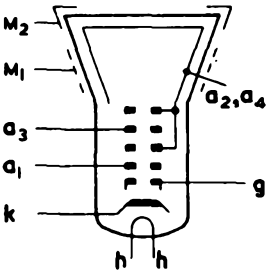

TYPICAL CHARACTERISTICS W PHOSPHOR SCREEN
FOCUSED RASTER OF FULL HEIGHT 4X3 ASPECT RATIO
SCREEN LUMINANCE (cd/m²)nt
SCREEN LUMINANCE (ft Lambert)
FINAL ANODE CURRENT (I_{a2+a4}) μA
12kV
10kV
8kV
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
50
100
150
200
350
300
250
200
150
100
50

M16-100.. Data Display or Monitor Tube

GENERAL

Rectangular flat face, 6 inch 70° diagonal tube
Ruggedised construction, metal mounting frame
Electrostatic focus, magnetic deflection
Flying lead connections for base and anode
Aluminised screen, external conductive coating
Clear glass. 27.4 ± 0.05 mm neck diameter.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - All voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	12	kV
Maximum third anode voltage	$V_{a3(max)}$	1000	V
Maximum negative third anode voltage	$-V_{a3(max)}$	500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V

TYPICAL OPERATION - Grid modulation, voltages with respect to cathode

Second and fourth anode voltage	V_{a2+a4}	14	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	0 to 400	V
Grid to cathode voltage for cut-off of raster	V_g	-31 to -71	V

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M16-100W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

Type M16-100W is the commercial version of the CV6244.

BRIMAR

INTER-ELECTRODE CAPACITANCES - Lead capacitances balanced out

Cathode to all	C_{k-all}	4.0	pF
Grid to all	C_{g-all}	15	pF
Anode 2 and anode 4 to coating M_1 (minimum)	$C_{a2+a4-M1(min)}$	350	pF
Anode 2 and anode 4 to frame M_2 (minimum)	$C_{a2+a4-M2(min)}$	80	pF

TUBE WEIGHT (approximate) - 1.0 kg

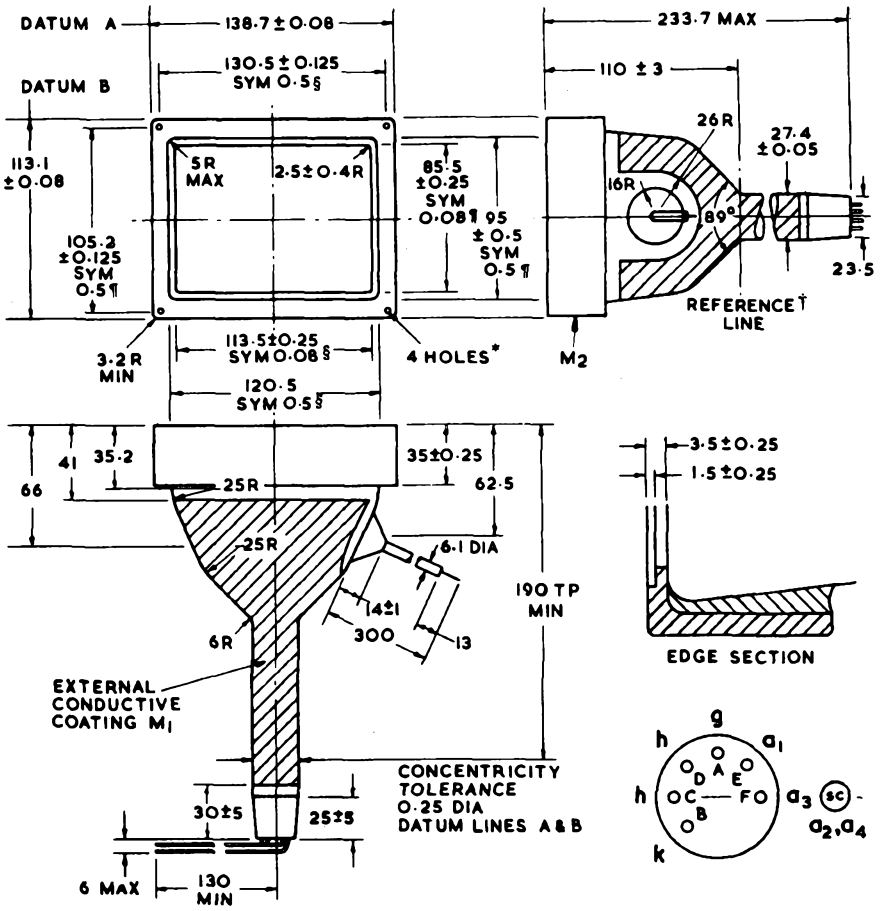
ENVIRONMENTAL TEST CAPABILITIES

Storage and operational temperature range	-30°C to +55°C
Vibration endurance	10 to 60 Hz displacement ± 0.15 mm 60 to 2000 Hz 2g all three axes for a specified time
Centrifuge	13g all three axes 2 minutes each
Bump and shock	40g all three axes for specified number of bumps
Tropical environment	95% relative humidity, cycled 20°C to 40°C, total 10 days
Mould growth	To BS2011 Test 2J severity 28 days
Salt mist	To BS2011 Test 2K 92.5% humidity, 35°C, total 28 days
Solar heat	Continuous cycling 30°C to 84°C total 5 days

NOTE

The external conductive coating of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

Data Display or Monitor Tube



All dimensions in mm

Not to be scaled

Frame finish - black anodised.
Minimum useful screen area 113 x 85

* Tapped 6 - 32UNC x 7.0 deep.

† Determined by Reference Line Gauge No. 19

§ Symmetrical tolerance width Datum A.

¶ Symmetrical tolerance width Datum B.

Data Display or Monitor Tube M17-10..

The M17-10.. monitor tube has a 11.5V, 0.15A heater otherwise it is identical to the M17-12..

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M17-10W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

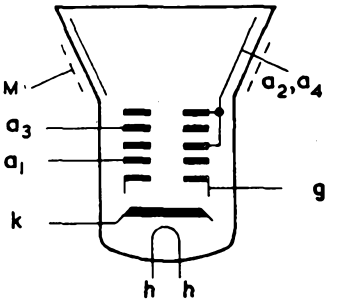
For all other data please see M17-12.. data sheets.

M17-12.. Data Display or Monitor Tube

GENERAL

Rectangular face, 7 inch, 70° diagonal
Electrostatic focus, magnetic deflection
Aluminised screen, clear glass
29.4 mm maximum neck diameter
Straight gun, non ion trap
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3*	A



DESIGN CENTRE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	16†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	12	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Maximum peak negative grid voltage	$-v_{g(pk)max}$	400	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$v_{h-k(pk)max}$	400§	V
Maximum impedance, grid to cathode(50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* In a series heater chain the CRT should always be connected at the chassis end.

† The absolute rating of 18 kV must not be exceeded.

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

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M17-12W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	6.5	8.0	pF
Anodes 2 and 4 to coating M (approx.)	$c_{a2+a4-M}$	350		pF

* Holder capacitance balanced out. † Total capacitances including typical holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode.

Second and fourth anode voltage	$V_{a2+a4-k}$	14	kV
First anode voltage	V_{a1-k}	400	V
Third anode voltage range for focus	V_{a3-k}	0 to 400	V
Grid to cathode voltage range for cut-off of raster	V_{g-k}	-38 to -78	V

TYPICAL OPERATION - Cathode modulation, voltages referred to grid

Second and fourth anode voltage	$V_{a2+a4-g}$	14	kV
First anode voltage	V_{a1-g}	400	V
Third anode voltage range for focus	V_{a3-g}	0 to 400	V
Cathode to grid voltage range for cut-off of raster	V_{k-g}	35 to 68	V

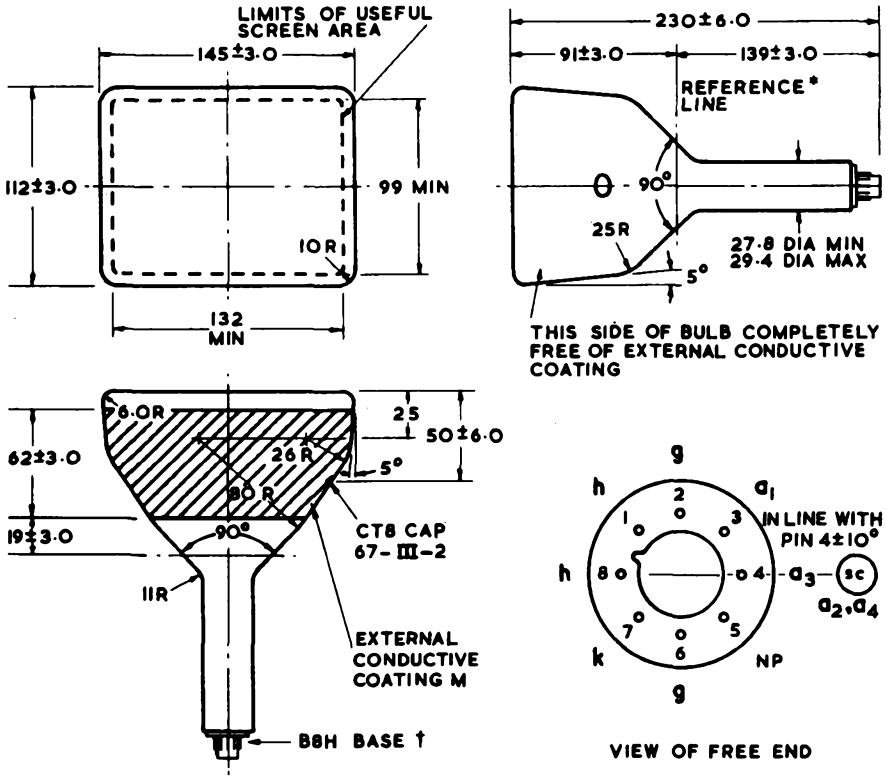
If this tube is operated at voltages in excess of 16 kV x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

MOUNTING

The tube can be mounted in any position.
The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.
When flashover protection is incorporated the chassis return path of the external conductive coating should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 650g

Data Display or Monitor Tube

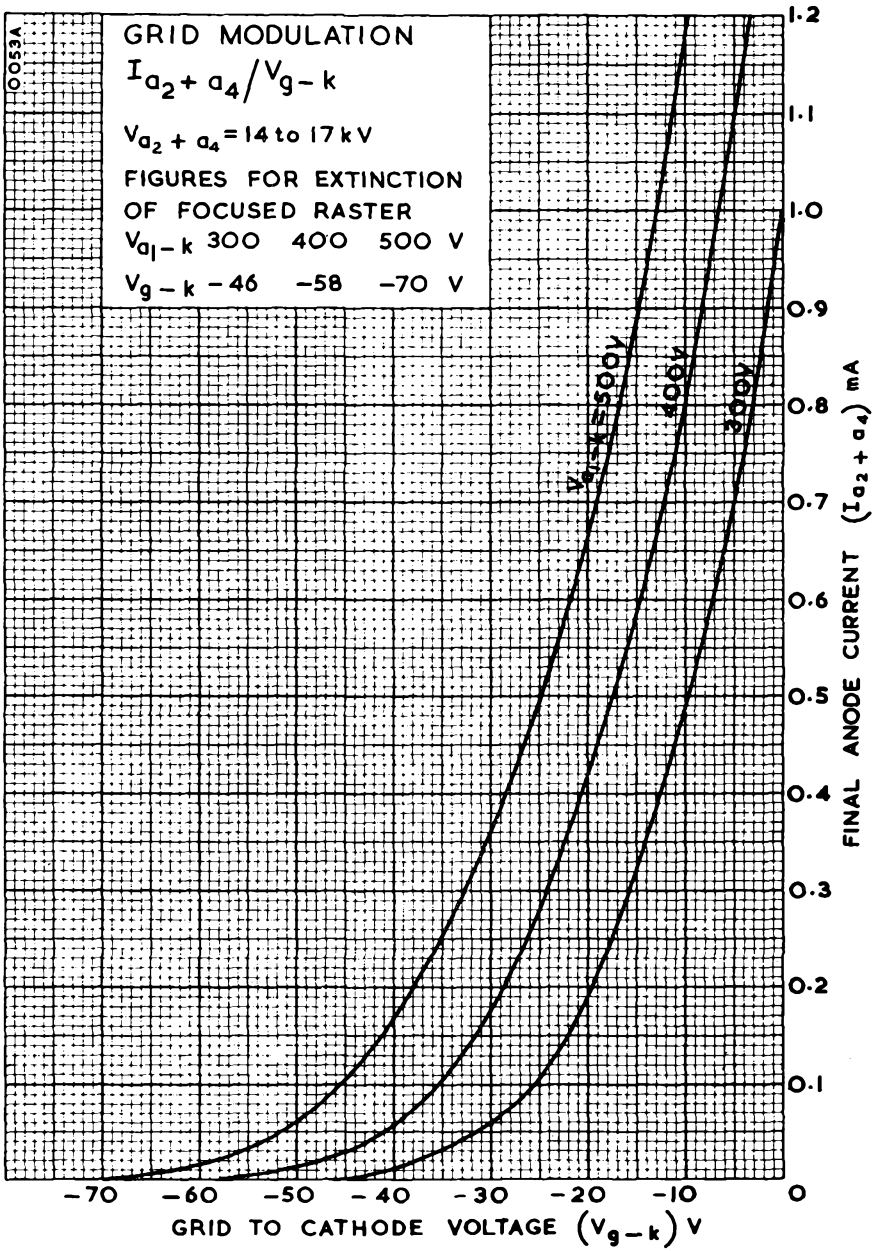


All dimensions in mm **Not to be scaled**

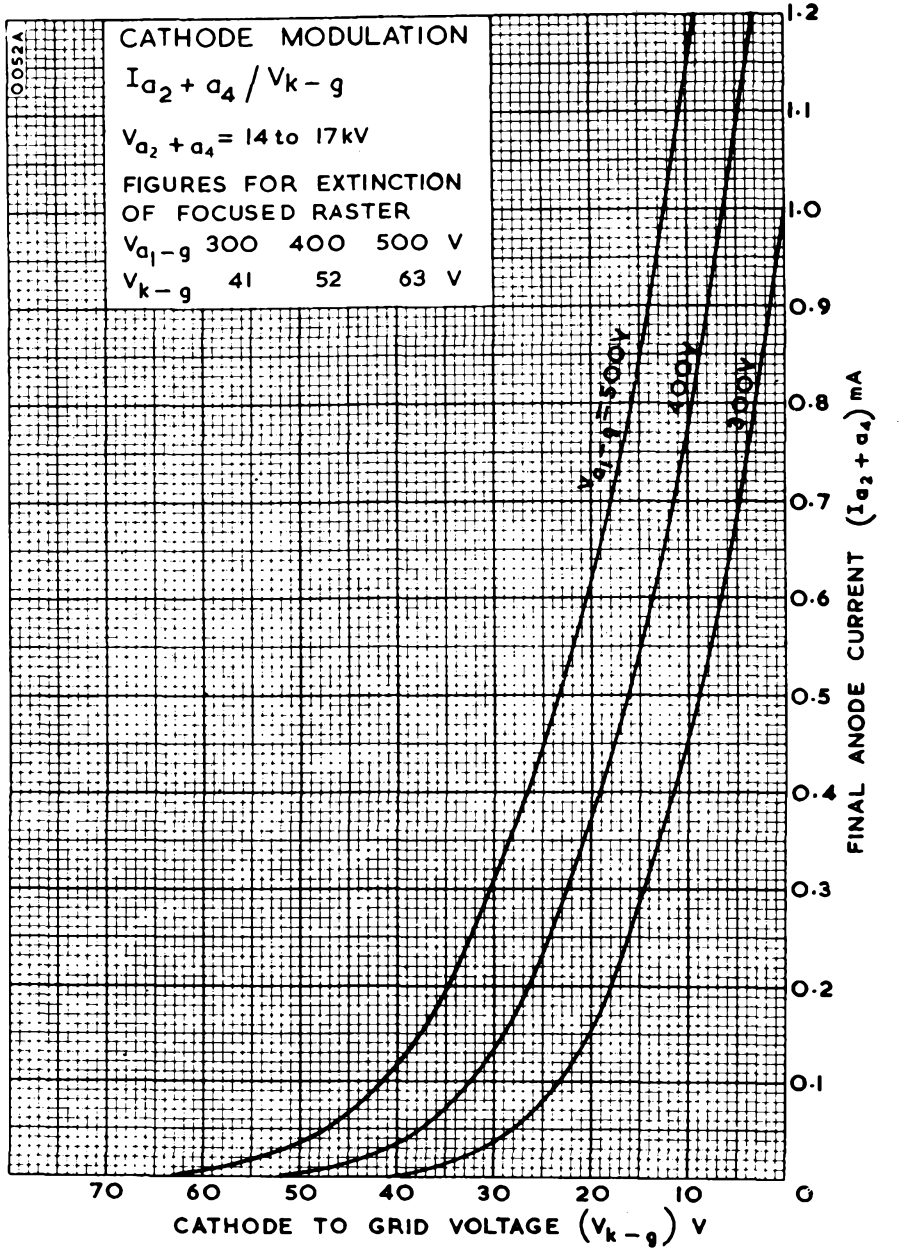
There is an annular region of anti-corona coating with an external diameter of 60 mm surrounding the CT8 cap, the tube should not be handled in this region.

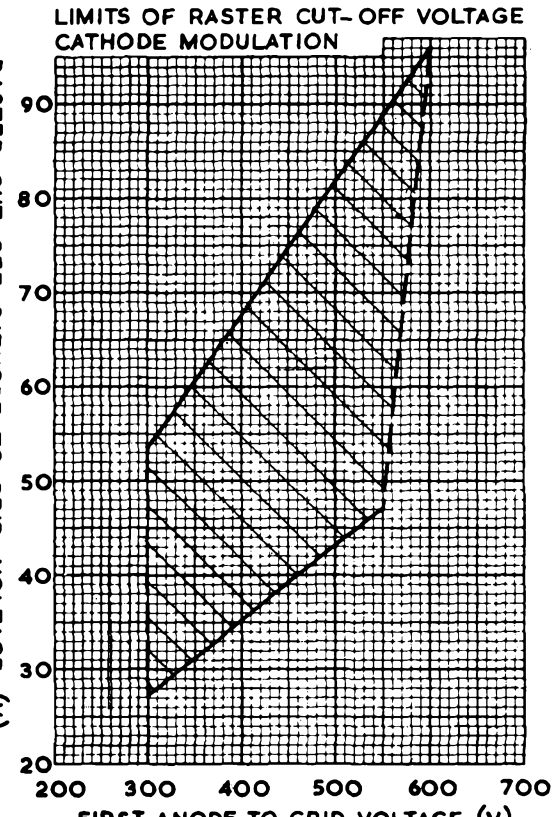
* Determined by reference line gauge No. 15

† The tube socket should not be rigidly mounted, it should have flexible leads and be allowed to move freely.


0053A
GRID MODULATION
$I_{a_2+a_4}/V_{g-k}$
$V_{a_2+a_4}$ = 14 to 17 kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-k} 300 400 500 V
V_{g-k} −46 −58 −70 V
500V
400V
300V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT ($I_{a_2+a_4}$) mA
−70 −60 −50 −40 −30 −20 −10 0
GRID TO CATHODE VOLTAGE (V_{g-k}) V

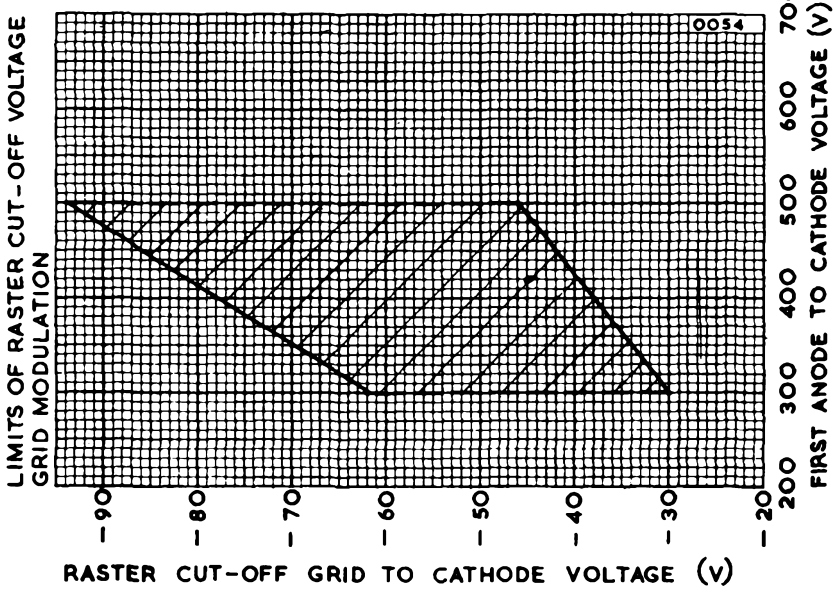
Data Display or Monitor Tube




LIMITS OF RASTER CUT-OFF VOLTAGE
CATHODE MODULATION
RASTER CUT-OFF CATHODE TO GRID VOLTAGE (V)
90
80
70
60
50
40
30
20
200
300
400
500
600
700
FIRST ANODE TO GRID VOLTAGE (V)

Data Display or Monitor Tube

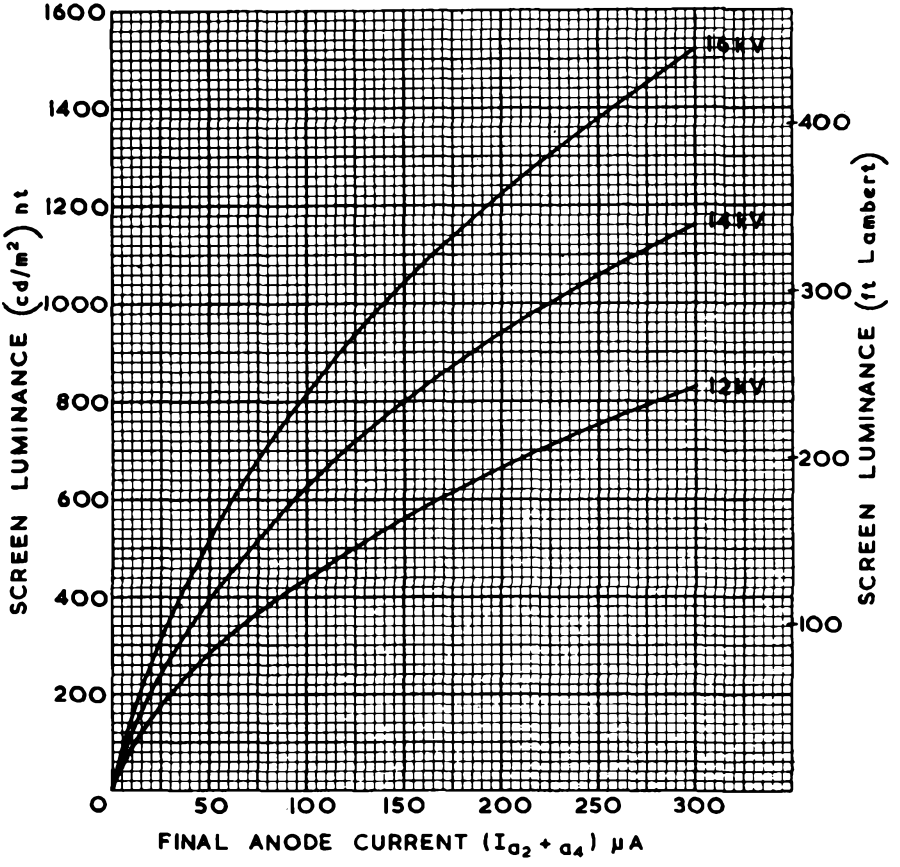
M17-12..



TYPICAL CHARACTERISTICS

W PHOSPHOR

FOCUSED RASTER OF FULL HEIGHT
4 x 3 ASPECT RATIO

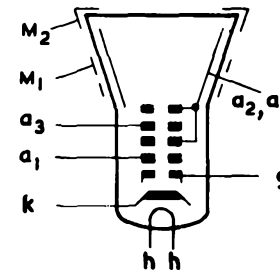


Data Display or Monitor Tube M17-15..

GENERAL

Rectangular face, 7 inch 70° diagonal
Bonded face-plate with mounting frame
Electrostatic focus, magnetic deflection
Straight gun, aluminised screen
29.4 mm maximum neck diameter
Clear glass, external conductive coating

Heater voltage	V_h	11.5	V
Heater current	I_h	0.15	A



DESIGN CENTRE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	16*	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	12	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Maximum peak negative grid voltage	$-v_{g(pk)max}$	400	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$v_{h-k(pk)max}$	400†	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* The absolute rating of 18 kV must not be exceeded.

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

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M17-15W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

DATA DISPLAY & MONITOR TUBES

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	6.5	8.0	pF
Anodes 2 and 4 to coating M_1 (approx.)	$c_{a2+a4-M1}$		200	pF
Anodes 2 and 4 to frame M_2 (approx.)	$c_{a2+a4-M2}$		80	pF

* Holder capacitance balanced out. † Total capacitances including typical holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode.

Second and fourth anode voltage	$V_{a2+a4-k}$	14	kV
First anode voltage	V_{a1-k}	400	V
Third anode voltage range for focus	V_{a3-k}	0 to 400	V
Grid to cathode voltage range for cut-off of raster	V_{g-k}	-38 to -78	V

TYPICAL OPERATION - Cathode modulation, voltages referred to grid

Second and fourth anode voltage	$V_{a2+a4-g}$	14	kV
First anode voltage	V_{a1-g}	400	V
Third anode voltage range for focus	V_{a3-g}	0 to 400	V
Cathode to grid voltage range for cut-off of raster	V_{k-g}	35 to 68	V

Characteristic curves as M17-12..

If this tube is operated at voltages in excess of 16 kV x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

MOUNTING

The tube can be mounted in any position.

The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

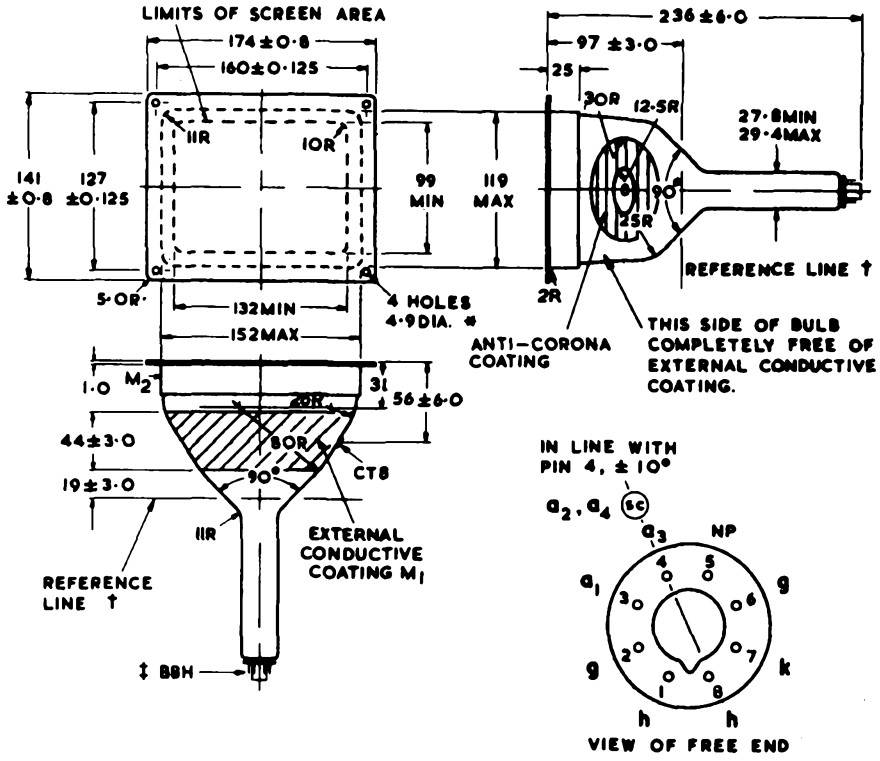
The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal frame (M_2) should be connected directly to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c./d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 1.1 kg

Data Display or Monitor Tube M17-15..



All dimensions in mm

Not to be scaled

There is an annular region of anti-corona coating with an external diameter of 60 mm surrounding the CT8 cap, the tube should not be handled in this region.

* It is recommended that 2BA bolts be used for mounting the tube.

† Determined by reference line gauge No. 15

M17-152BE Data Display or Monitor Tube

The M17-152BE is the M17-15BE with a fine grain and minimal blemish screen for medical applications.

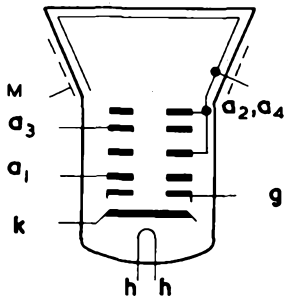
For all other information please see the data sheets for type M17-15..

Data Display or Monitor Tube M19-100..

GENERAL

Rectangular face, 19 cm, 90° diagonal
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 65% transmission (approx)
20.7 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	8.0	kV
Maximum third anode voltage	$V_{a3(max)}$	-50 to +500	V
Maximum first anode voltage	$V_{a1(max)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	100	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0*	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	110	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	130	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M19-100W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - 800g

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

DATA DISPLAY & MONITOR TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.0*	pF
Grid to all	c_{g-all}	4.0*	pF
Anodes 2 and 4 to coating M (min.)	$c_{a2+a4-M(min)}$		pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation (Voltage referred to cathode)

Second and fourth anode voltage	$V_{a2+a4-k}$	10	kV
First anode voltage	V_{a1-k}	250	V
Third anode voltage range for focus	V_{a3-k}	0 to 350	V
Average peak to peak picture modulating voltage up to 100 μA		24	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-35 to -69	V

TYPICAL OPERATION - Cathode modulation (Voltage referred to grid)

Second and fourth anode voltage	$V_{a2+a4-g}$	10	kV
First anode voltage	V_{a1-g}	250	V
Third anode voltage range for focus	V_{a3-g}	0 to 350	V
Average peak to peak picture modulating voltage up to 100 μA		20	V
Cathode to grid voltage for cut-off of raster	V_{k-g}	32 to 58	V

MOUNTING

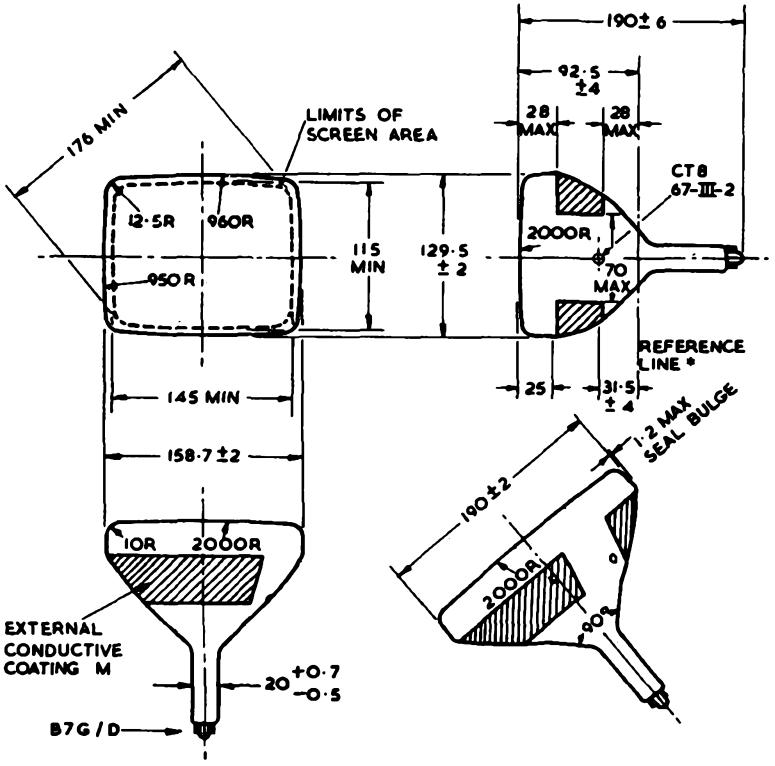
There is a region of anti-corona coating surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

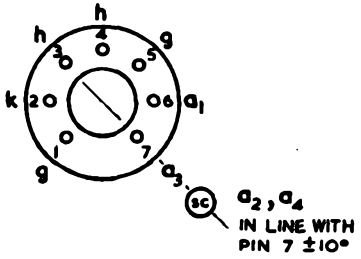
The external conductive coating of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return path should be made in a manner appropriate to the protection system employed.

Characteristic curves as M23-110..



VIEW OF FREE END



All dimensions in mm

Not to be scaled

* Determined by reference line gauge No. 21 (See T.D.S. 5-0-91-21)

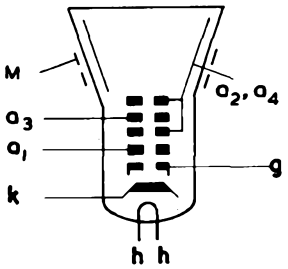
M21-13.. Data Display or Monitor Tube

MAINTENANCE TYPE

GENERAL

Rectangular face, 21 cm 90° diagonal tube
Electrostatic focus, magnetic deflection
Straight gun, aluminised screen
29.4 mm maximum neck diameter
Clear glass, external conductive coating

Heater voltage	V_h	11.5	V
Heater current	I_h	0.15	A



DESIGN CENTRE RATINGS - voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	16*	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	8.0	kV
Maximum third anode voltage	$V_{a3(max)}$	± 700	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	200	V

* 16 kV is a design centre rating, the absolute rating of 18 kV must not be exceeded.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 millirontgens per hour, the window will normally provide adequate protection.

PHOSPHOR SCREEN

This type is usually supplied with LC phosphor (M21-13LC) giving an orange trace of very long persistence or with W (television white) phosphor. Other phosphor screens can be made to special order.

Tube incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

INTER-ELECTRODE CAPACITANCES		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	6.5	8.0	pF
Anodes 2 and 4 to coating M (approx.)	$c_{a2+a4-M}$	400		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode				
Second and fourth anode voltage	V_{a2+a4}	12		kV
First anode voltage	V_{a1}	400		V
Third anode voltage range for focus	V_{a3}	0 to	400§	V
Grid to cathode voltage range for cut-off of raster	V_g	-30 to	-72	V
Average peak to peak modulating voltage final anode current = 150 μA		24		V
LC screen persistence to 10% (approx.)		20		s

The LC screen is liable to burn even at low values of beam current if operated with a stationary or slow-moving spot.

§ The change of spot size with variation of focus voltage is small and the limit of 0 to 400V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus a voltage of at least -100V to +500V will be required.

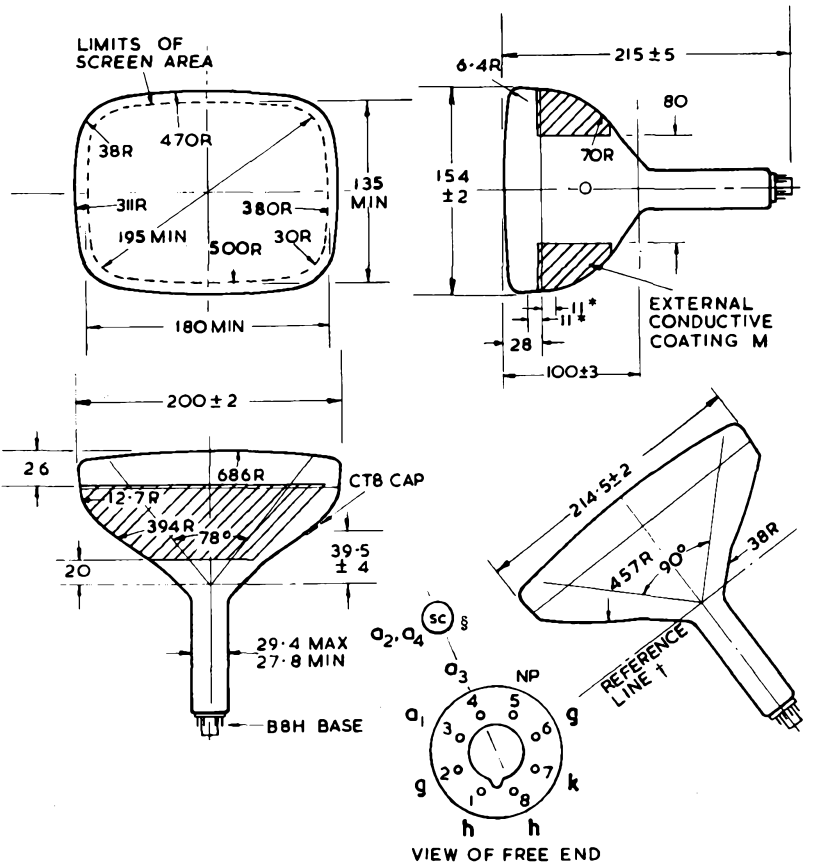
MOUNTING

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The design of the socket should be such that the wiring cannot impress lateral strains through the socket contacts on the base. The bottom circumference of the base shell will fall within a circle of 44 mm diameter which is centred on the perpendicular from the centre of the face.

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 1.3 kg



All dimensions in mm

Not to be scaled

* During the face sealing operation the glass in this area (total 22 mm) may be disturbed. As the shape of the contour within this area may be either convex or concave the bulb should not be gripped within this region unless special precautions are taken (such as the use of resilient packing material).

† Determined by Reference Gauge No. 15

§ Anode a_2, a_4 cap in line with pin 4 tolerance ± 10°

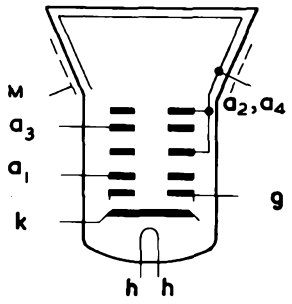
There is an annular region of anti-corona coating with an external diameter of 60 mm surrounding the CT8 cap, the tube should not be handled in this region.

Data Display or Monitor Tube M23-110..

GENERAL

Rectangular face, 23 cm, 90° diagonal
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 50% transmission (approx)
20.7 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	8.0	kV
Maximum third anode voltage	$V_{a3(max)}$	-50 to +500	V
Maximum first anode voltage	$V_{a1(max)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	100	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0*	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	110	V
Maximum peak heater to cathode voltage heater negative	$v_{h-k(pk)max}$	130	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M23-110W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - 1.4 kg

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.0*	pF
Grid to all	c_{g-all}	4.0*	pF
Anodes 2 and 4 to coating M (min.)	$c_{a2+a4-M(min)}$	300	pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation (Voltage referred to cathode)

Second and fourth anode voltage	$V_{a2+a4-k}$	10	kV
First anode voltage	V_{a1-k}	250	V
Third anode voltage range for focus	V_{a3-k}	0 to 350	V
Average peak to peak picture modulating voltage up to 100 μA		21	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-35 to -69	V

TYPICAL OPERATION - Cathode modulation (Voltage referred to grid)

Second and fourth anode voltage	$V_{a2+a4-g}$	10	kV
First anode voltage	V_{a1-g}	250	V
Third anode voltage range for focus	V_{a3-g}	0 to 350	V
Average peak to peak picture modulating voltage up to 100 μA		18	V
Cathode to grid voltage for cut-off of raster	V_{k-g}	32 to 58	V

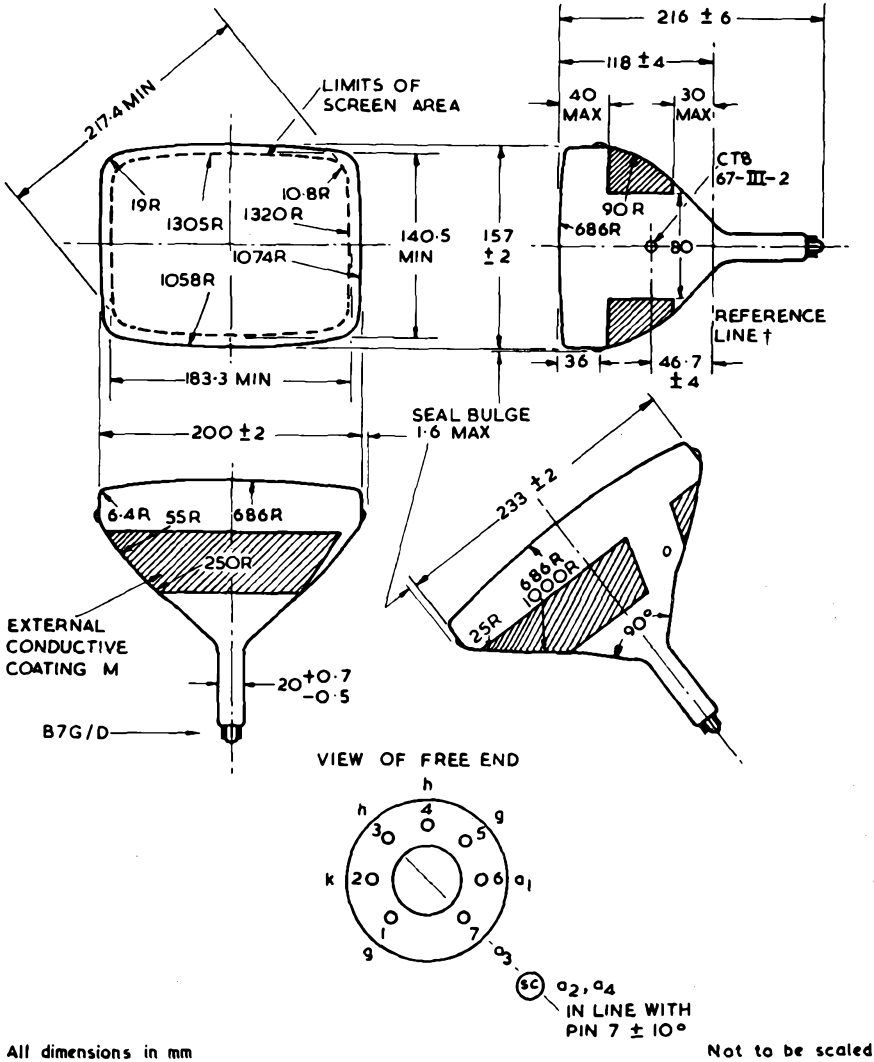
MOUNTING

There is a region of anti-corona coating surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

The external conductive coating of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return path should be made in a manner appropriate to the protection system employed.



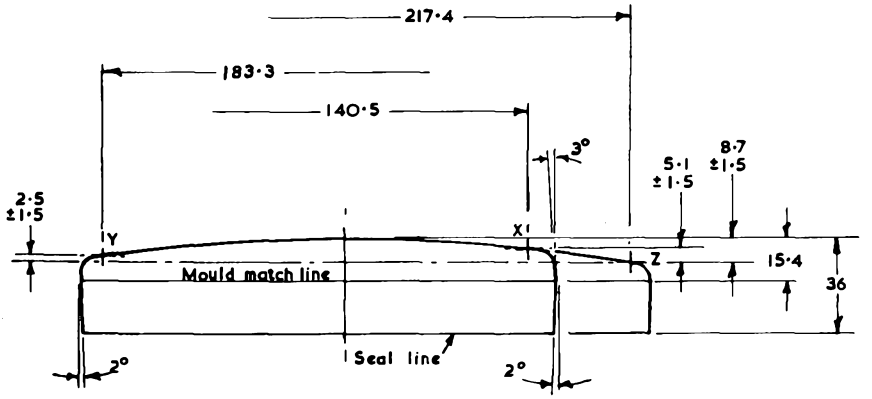
All dimensions in mm

Not to be scaled

† Determined by reference line gauge No. 21

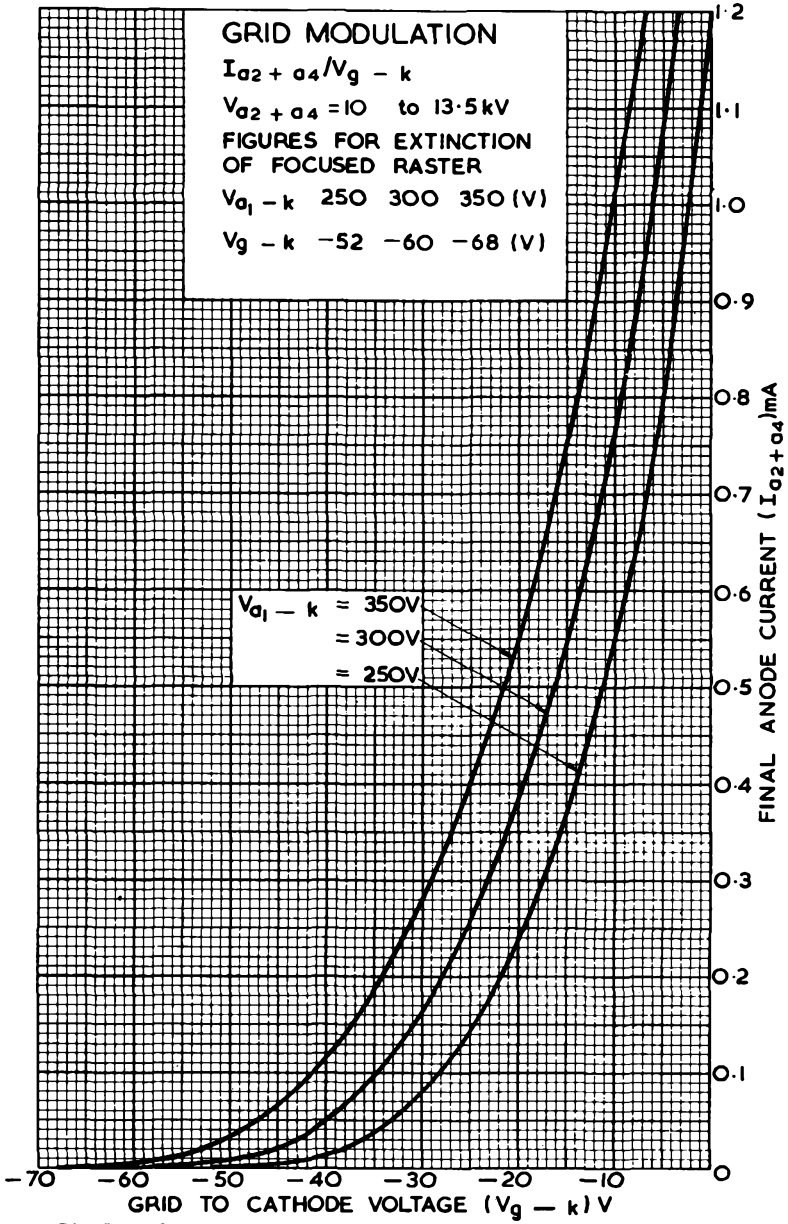
Minimum usefull screen area 242 cm^2

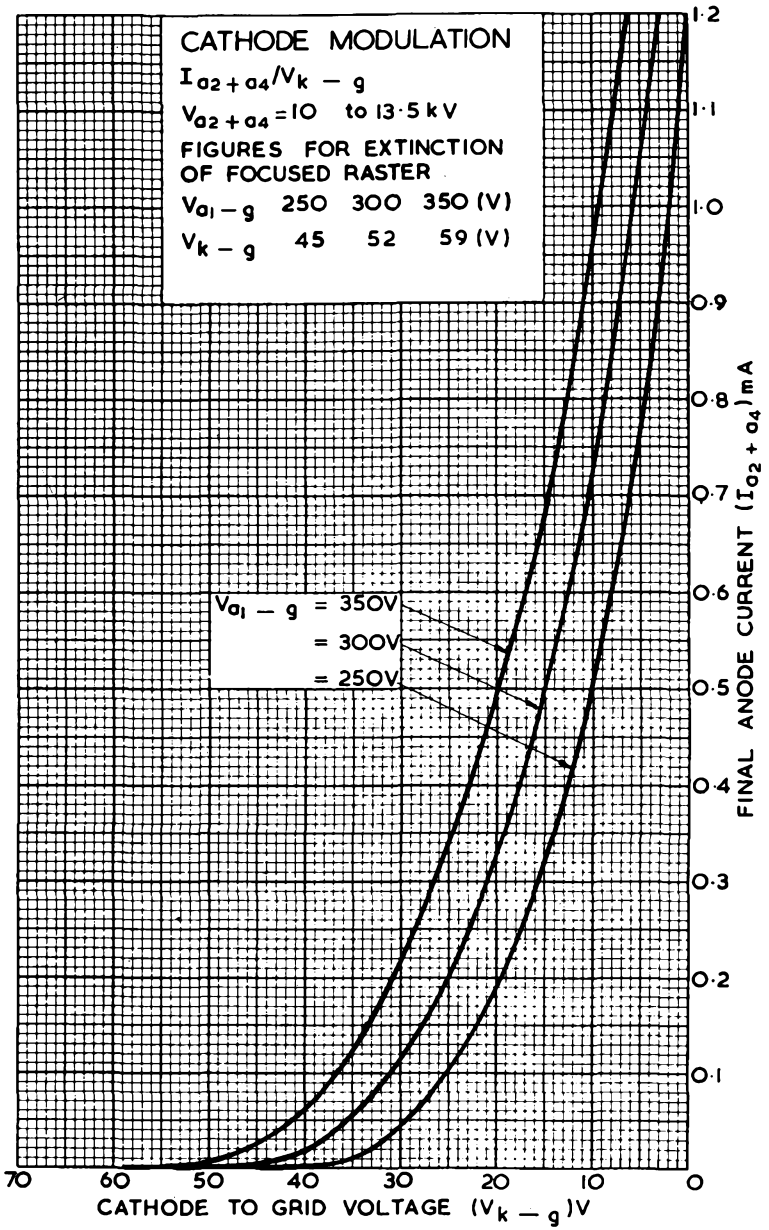
DATA DISPLAY & MONITOR TUBES



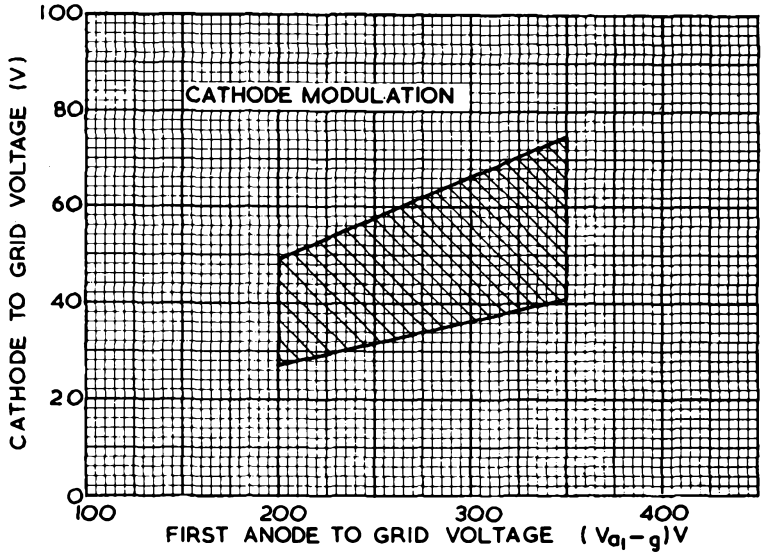
All dimensions in mm

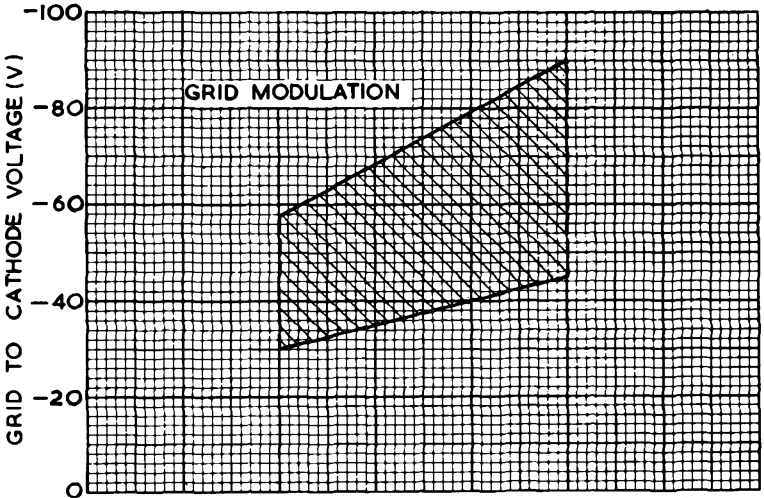
Not to be scaled


GRID MODULATION
$I_{a2+a4}/V_g - k$
V_{a2+a4} = 10 to 13·5kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
$V_{a_1} - k$ 250 300 350 (V)
$V_g - k$ −52 −60 −68 (V)
$V_{a_1} - k$ = 350V
= 300V
= 250V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT (I_{a2+a4})mA
−70 −60 −50 −40 −30 −20 −10
GRID TO CATHODE VOLTAGE ($V_g - k$) V


CATHODE MODULATION
$I_{a2+a4}/V_k - g$
V_{a2+a4} = 10 to 13·5 kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
$V_{a1} - g$ 250 300 350 (V)
$V_k - g$ 45 52 59 (V)
$V_{a1} - g$ = 350V
= 300V
= 250V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
FINAL ANODE CURRENT (I_{a2+a4}) mA
70 60 50 40 30 20 10 0
CATHODE TO GRID VOLTAGE ($V_k - g$) V

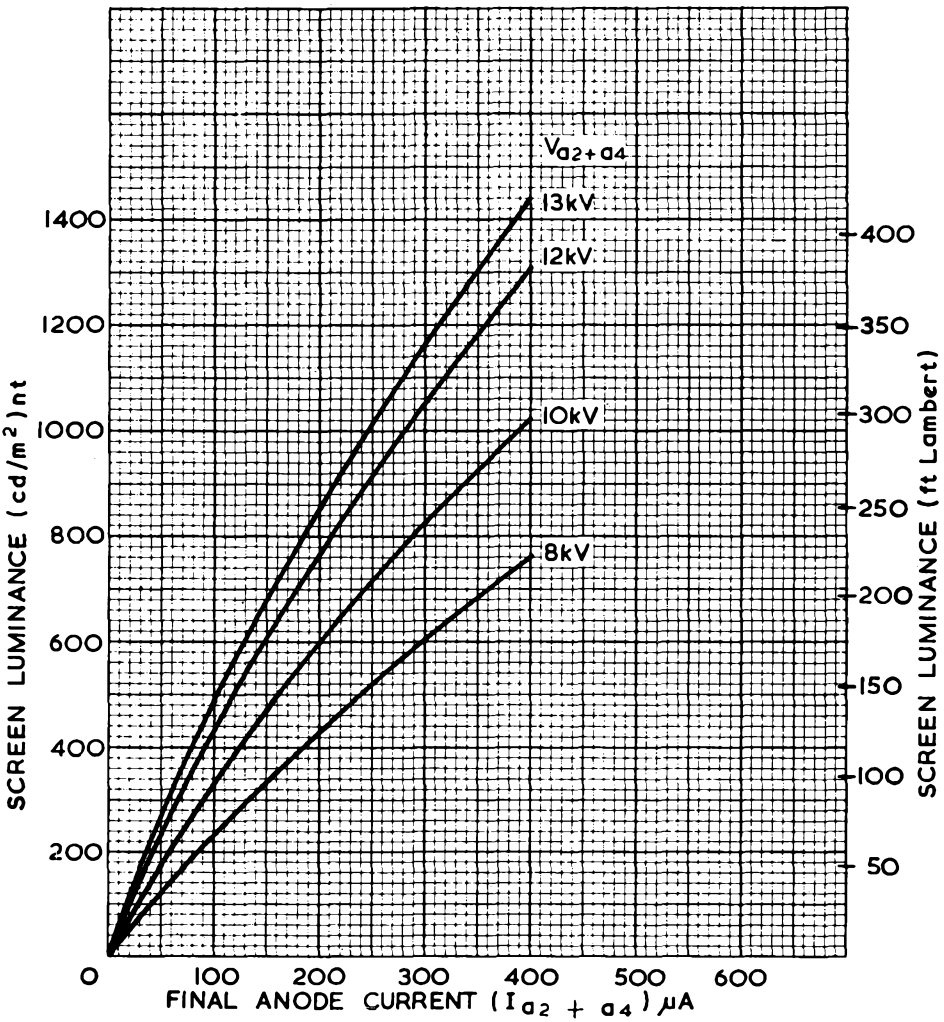
LIMITS OF RASTER CUT-OFF VOLTAGE





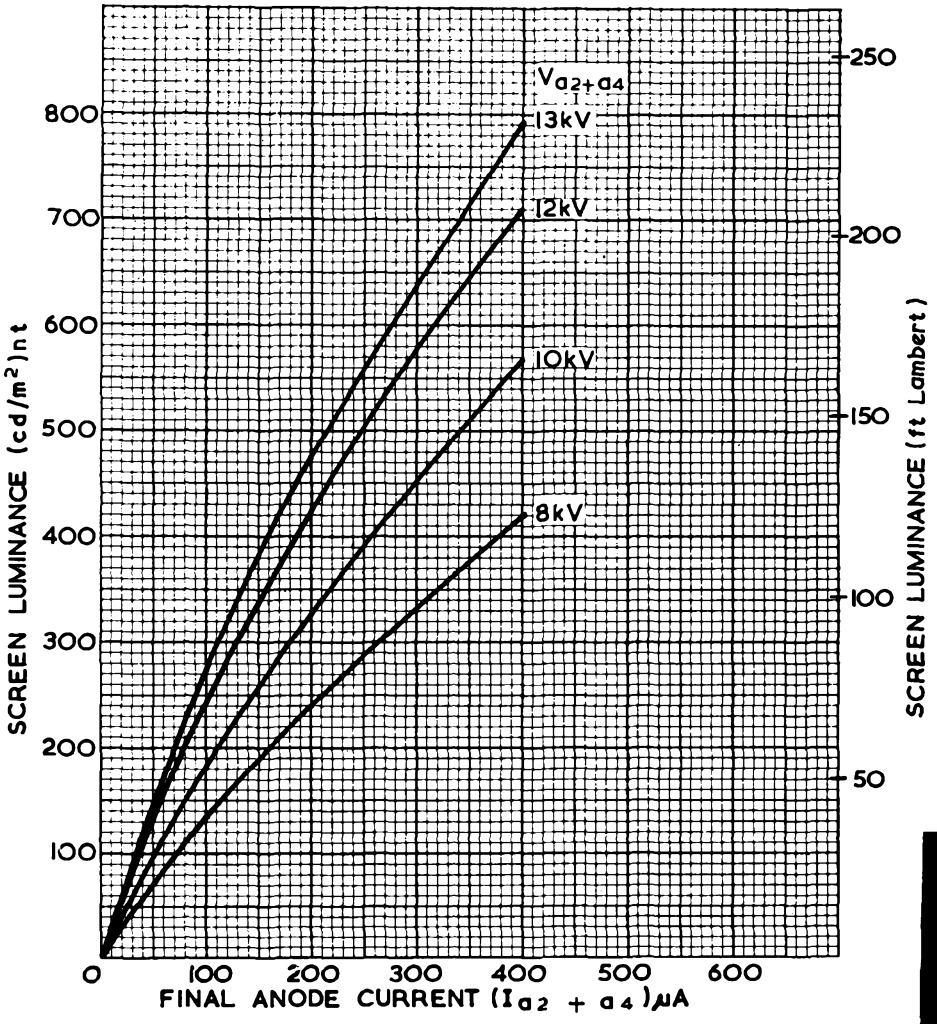
TYPICAL CHARACTERISTICS GH PHOSPHOR SCREEN

FOCUSED RASTER OF FULL HEIGHT 4X3 ASPECT RATIO



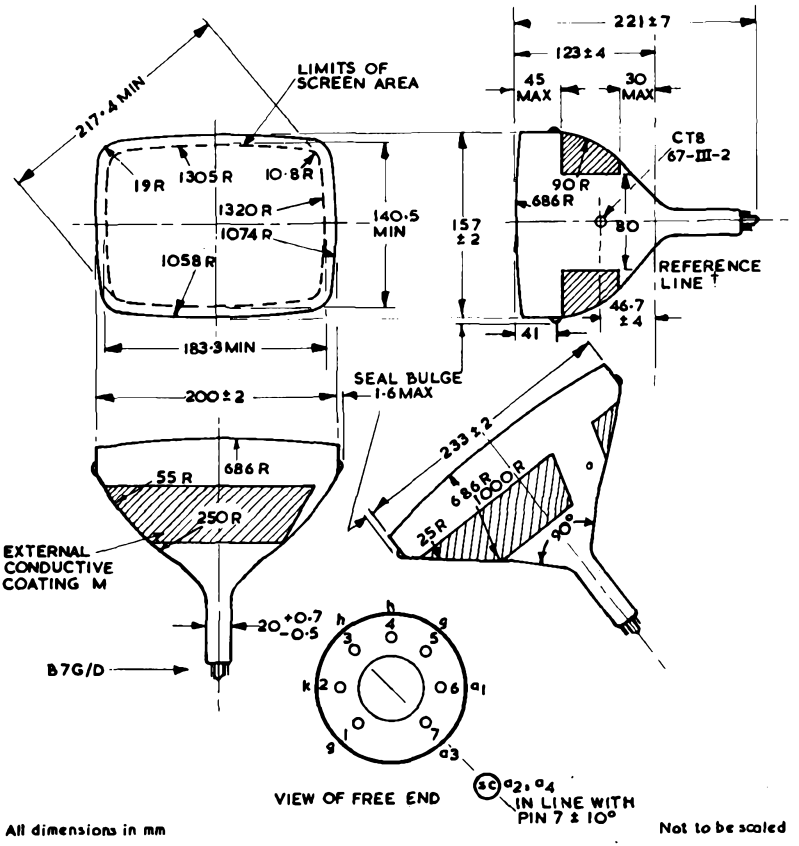
TYPICAL CHARACTERISTICS W PHOSPHOR SCREEN

FOCUSED RASTER OF FULL HEIGHT 4 X 3 ASPECT RATIO



M23-111.. Data Display or Monitor Tube

The M23-111.. is the M23-110.. with a tinted bonded face-plate giving a total glass transmission of approximately 30%. The external surface is treated to reduce specular reflection

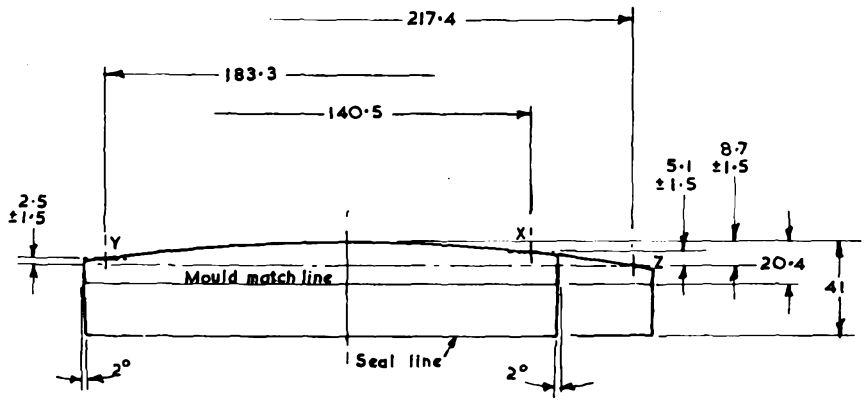


† Determined by reference line gauge No. 21

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M23-111W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - net 1.7kg



All dimensions in mm

Not to be scaled

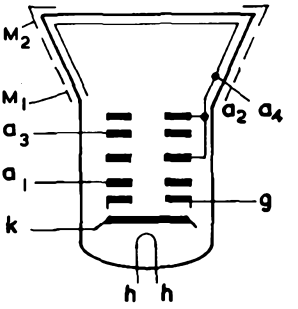
M23-112.. Data Display or Monitor Tube

PRELIMINARY DATA

GENERAL

Rectangular face, 23 cm, 90° diagonal
Rimguard III reinforced envelope *
Integral mounting lugs
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 50% transmission (approx)
20.7 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	8.0	kV
Maximum third anode voltage	$V_{a3(max)}$	-50 to +500	V
Maximum first anode voltage	$V_{a1(max)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	100	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0 †	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	110	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	130	V
Maximum impedance, grid to cathode (50Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

† A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M23-112GH) giving a Green trace of medium short persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - 1.5kg

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.0*	pF
Grid to all	c_{g-all}	4.0*	pF
Anodes 2 and 4 to coating M_1(min.)	$c_{a2-a4M_1(min)}$	300	pF
Anodes 2 and 4 to metal M_2(approx)	$c_{a2-a4-M_2}$	100	pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation (Voltage referred to cathode)

Second and fourth anode voltage	$V_{a2+a4-k}$	10	kV
First anode voltage	V_{a1-k}	250	V
Third anode voltage range for focus	V_{a3-k}	0 to 350	V
Average peak to peak picture modulating voltage up to 100 μA		24	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-35 to -69	V

TYPICAL OPERATION - Cathode modulation (Voltage referred to grid)

Second and fourth anode voltage	$V_{a2+a4-g}$	10	kV
First anode voltage	V_{a1-g}	250	V
Third anode voltage range for focus	V_{a3-g}	0 to 350	V
Average peak to peak picture modulating voltage up to 100 μA		20	V
Cathode to grid voltage for cut-off of raster	V_{k-g}	32 to 58	V

MOUNTING

Any mask used in the mounting of this tube should be flexible enough to take up small variations in fixing and bulb contours.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

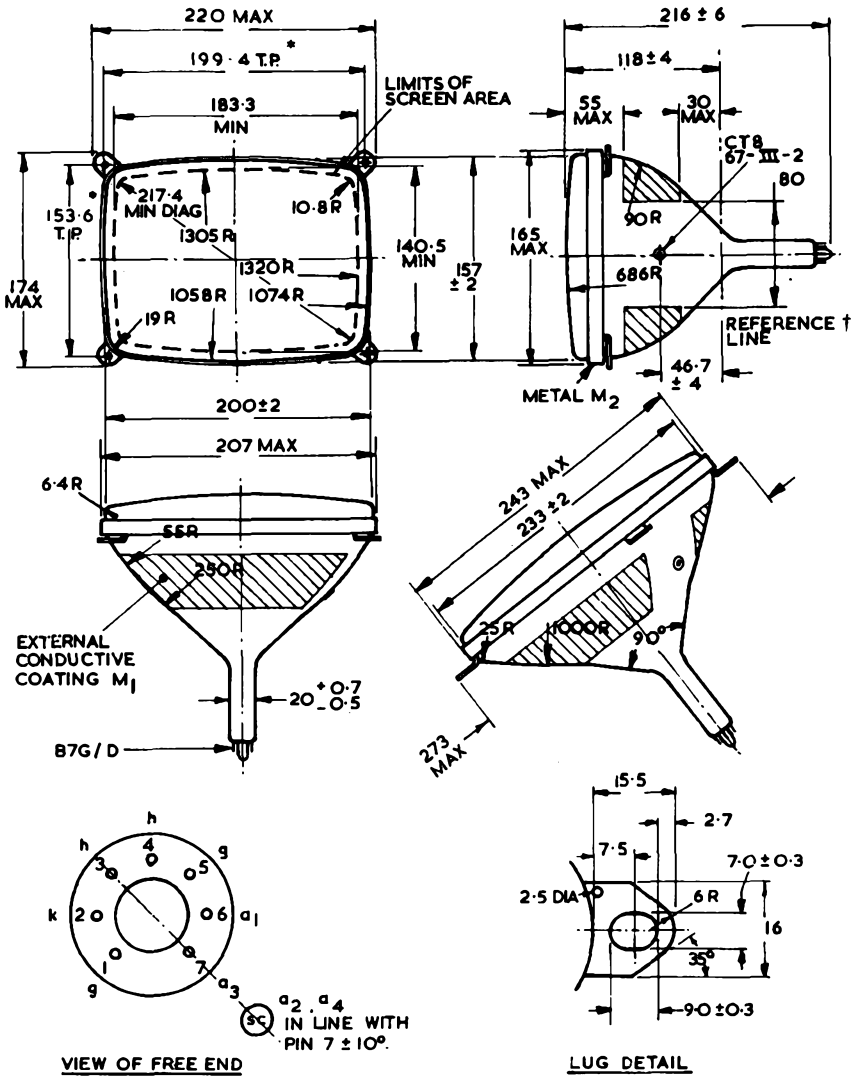
The metal (M_2) should be connected to the chassis in an a.c. receiver operating from an isolating transformer, or via a suitable leakage path in an a.c./d.c. receiver, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

There is a region of anti-corona coating surrounding the CT8 cap, the tube should not be handled in this region.

Characteristic curves as M23-110..

M23-112.. Data Display or Monitor Tube



VIEW OF FREE END

LUG DETAIL

All Dimensions in mm.

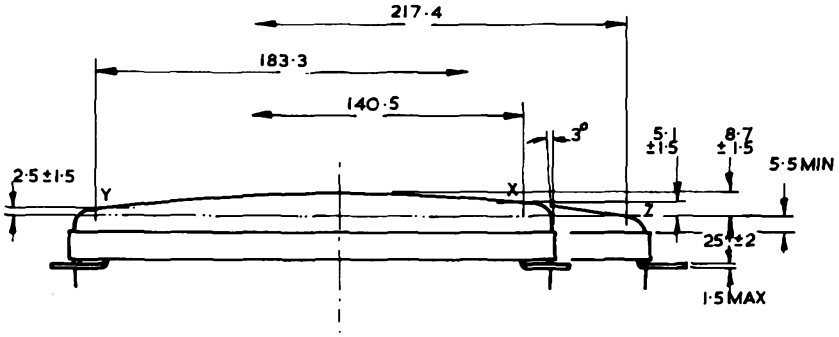
Not to be scaled.

Minimum screen area 242 cm^2

* The bolts to be used for mounting the tube must lie within circles of 4.0 mm diameter centred on these true positions. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs

† Determined by reference line gauge No. 21.

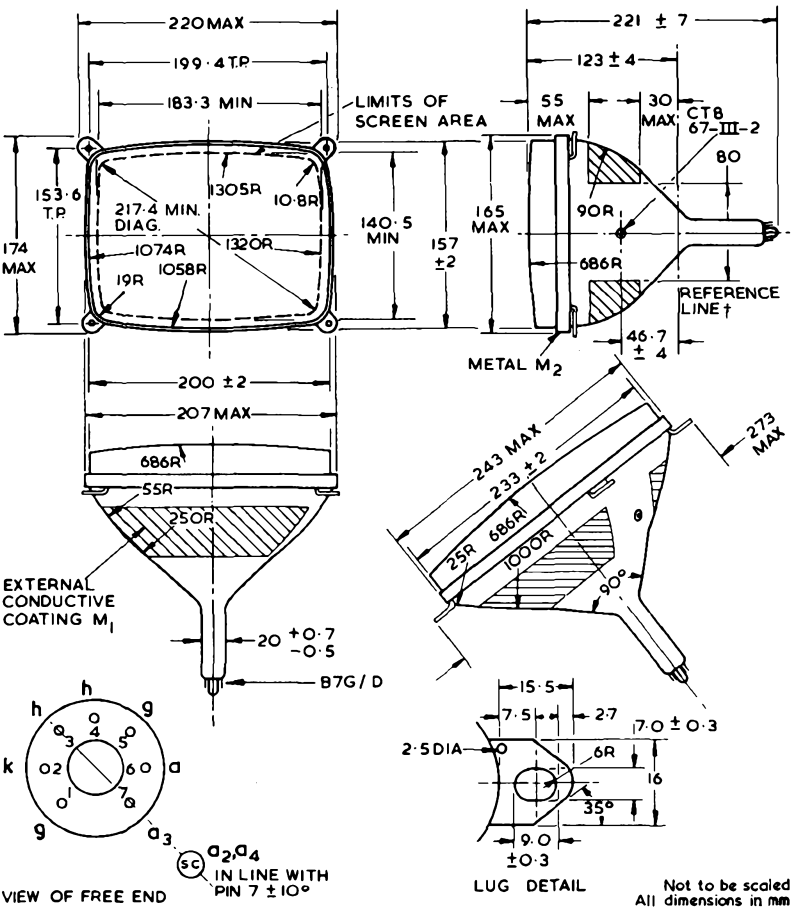
Data Display or Monitor Tube M23-112..



All Dimensions in mm. Not to be scaled.

M23-113.. Data Display or Monitor Tube

The M23-113.. is the M23-112.. with a tinted bonded face-plate giving a total glass transmission of approximately 30%. The external surface is treated to reduce specular reflection.



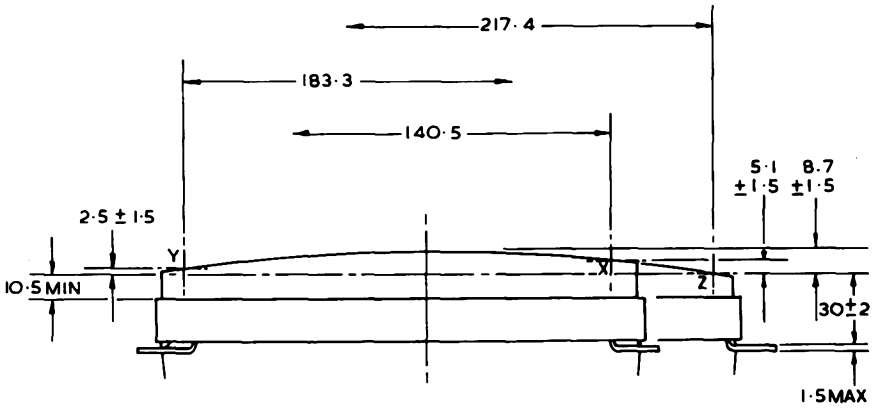
† Determined by reference line gauge No.21

PHOSPHOR SCREEN

This type is usually supplied with GV phosphor (M23-113GV) giving a green trace of very long persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - net 1.8kg.

Data Display or Monitor Tube M23-113..



All dimensions in mm

Not to be scaled

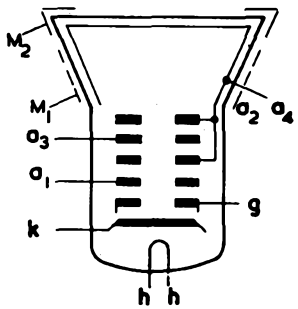
DATA DISPLAY & MONITOR TUBES

M24-120 .. Data Display or Monitor Tube

GENERAL

Rectangular face, 24 cm, 90° diagonal
Rimguard reinforced envelope*
Integral mounting lugs
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 52% transmission (approx.)
29.4 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage range	$V_{a3(max)}$	± 700	V
Maximum first anode voltage	$V_{a1(max)}$	600	V
Minimum first anode voltage	$V_{a1(min)}$	200	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0†	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	250	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

† A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M24-120W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

* This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	6.5	7.5	pF
Anodes 2 and 4 to coating M_1 (approx.)	$c_{a2+a4-M1}$		400	pF
Anodes 2 and 4 to metal M_2 (approx.)	$c_{a2+a4-M2}$		125	pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode

Second and fourth anode voltage	V_{a2+a4}	12 to 16	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	0 to 400 §	V
Grid to cathode voltage for cut-off of raster	V_g	-38 to -82	V
Typical line width at 50 μA (Shrinking raster)		0.2	mm

§ The change of spot size with variation of focus voltage is small and the limit of 0 to 400 V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus a voltage range of at least -100V to +500V will be required.

MOUNTING

If a mask is used with this tube it should be flexible enough to take up small variations in fixing and bulb contours.

There is a region of anti-corona coating surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

The bolts for mounting the tube must lie within circles of 4 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

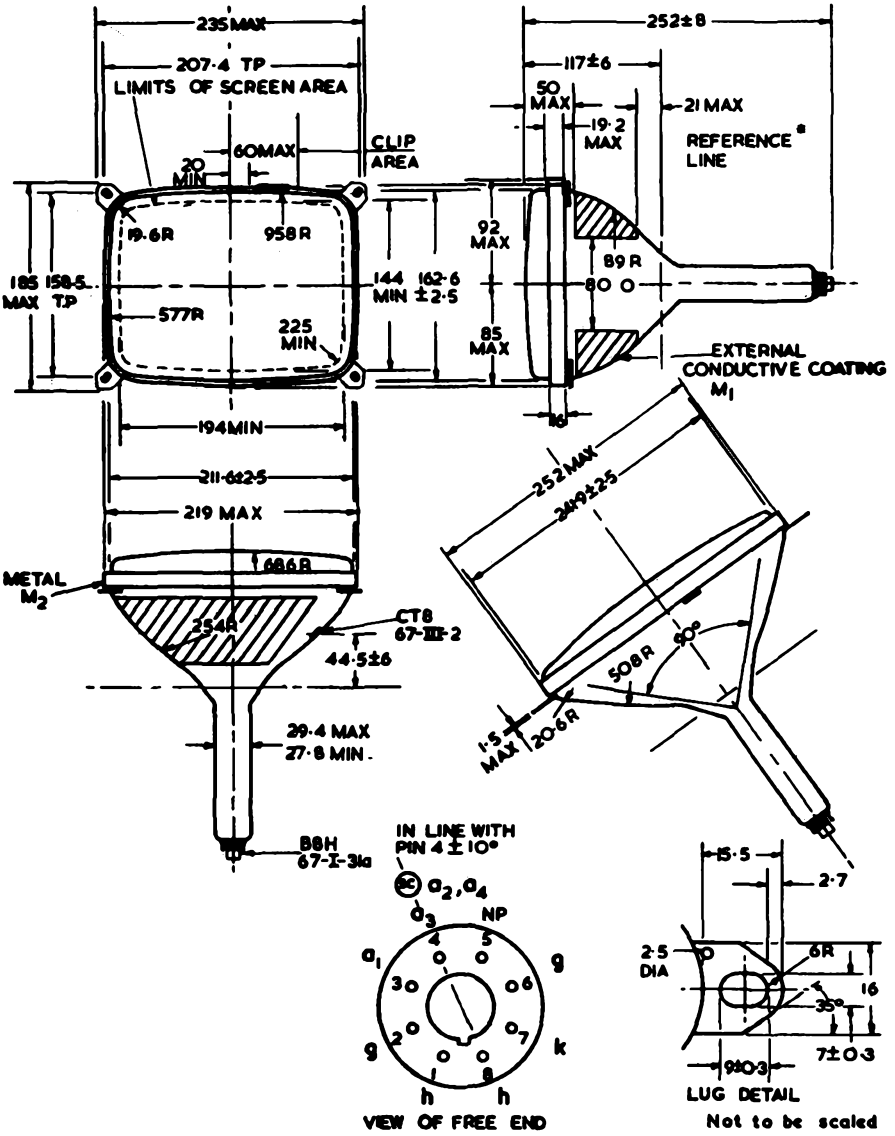
The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal frame (M_2) should be connected to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c./d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

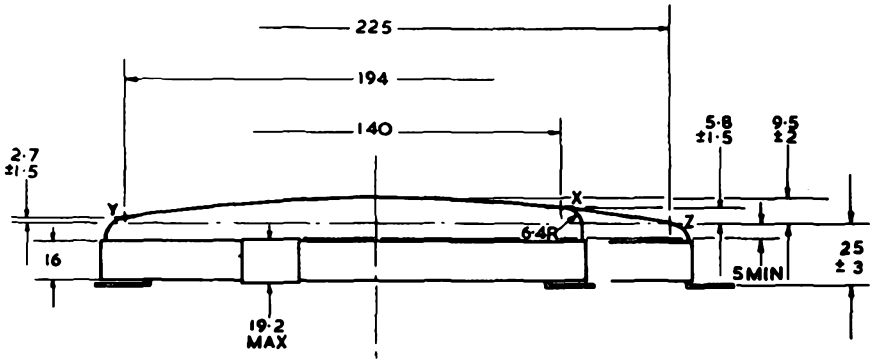
TUBE WEIGHT (approximate) 1.8 kg

M24-120.. Data Display or Monitor Tube



* Determined by reference line gauge No. 15 (See T.D.S. 5-0-91-15)

Data Display or Monitor Tube M24-120..



All dimensions in mm

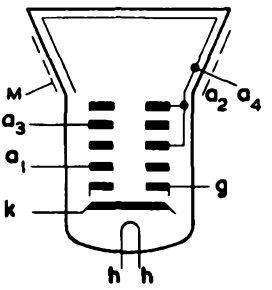
Not to be scaled

M24-121.. Data Display or Monitor Tube

GENERAL

Rectangular face, 24 cm, 90° diagonal
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 52% transmission (approx.)
29.4 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage range	$V_{a3(max)}$	± 700	V
Maximum first anode voltage	$V_{a1(max)}$	600	V
Minimum first anode voltage	$V_{a1(min)}$	200	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0†	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	250	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

† A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M24-121W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

The M24-121.. is the M24-120.. without implosion protection.

BRIMAR

INTER-ELECTRODE CAPACITANCES		*	†	
Cathode to all	c_{k-all}	8.0	3.5	pF
Grid to all	c_{g-all}	6.5	7.5	pF
Anodes 2 and 4 to coating M (approx.)	$c_{a2+a4-M}$	400		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode			
Second and fourth anode voltage	V_{a2+a4}	12 to 16	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	0 to 400 §	V
Grid to cathode voltage for cut-off of raster	V_g	-38 to -82	V
Typical line width at 50 μA (Shrinking raster)		0.2	mm

§ The change of spot size with variation of focus voltage is small and the limit of 0 to 400 V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus a voltage range of at least -100V to +500V will be required.

MOUNTING

If a mask is used with this tube it should be flexible enough to take up small variations in bulb contours.

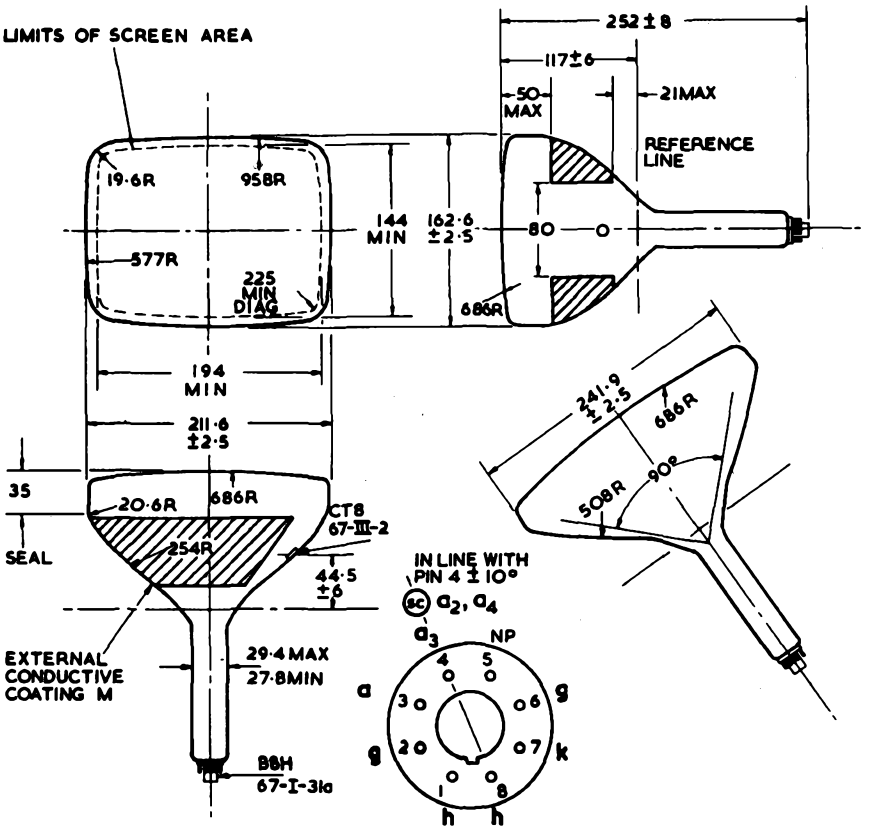
There is a region of anti-corona coating surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return path should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) 1.7 kg



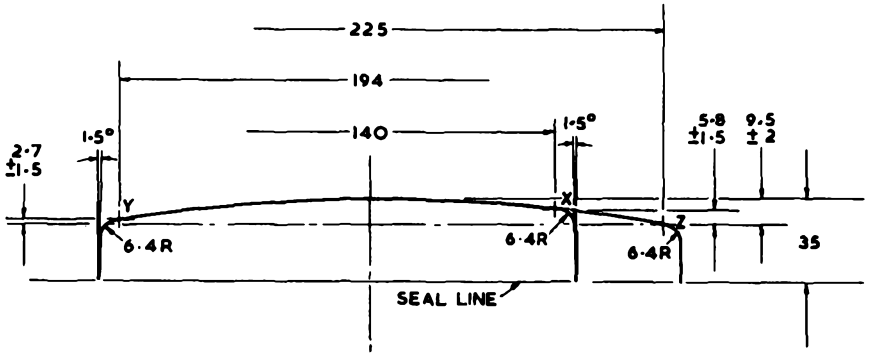
All dimension in mm

Not to be scaled

* During the face sealing operation the glass in this area may be disturbed and the shape may be either convex or concave. The bulb should not be gripped within this region unless special precautions are taken, such as, the use of resilient packing material.

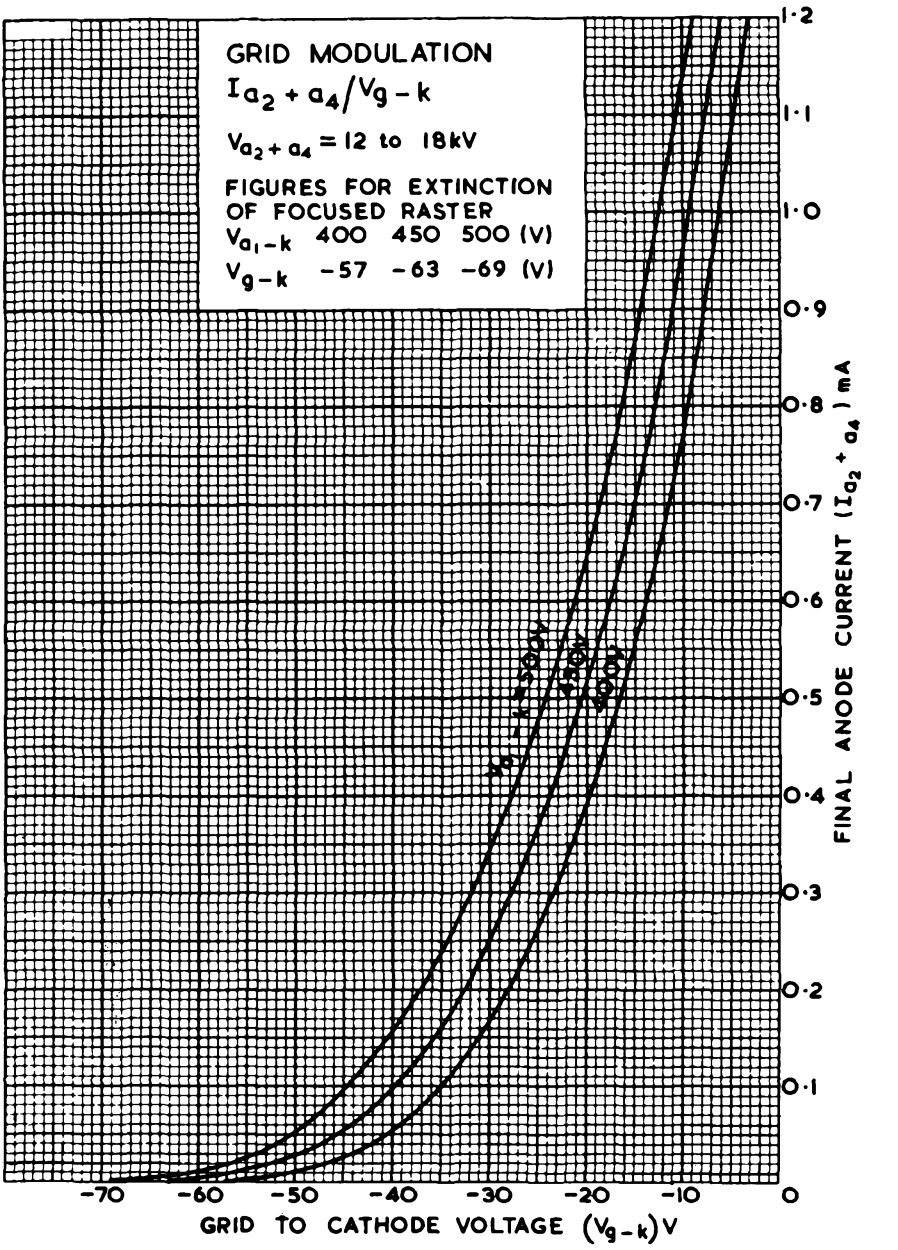
† Determined by reference line gauge No. 15.

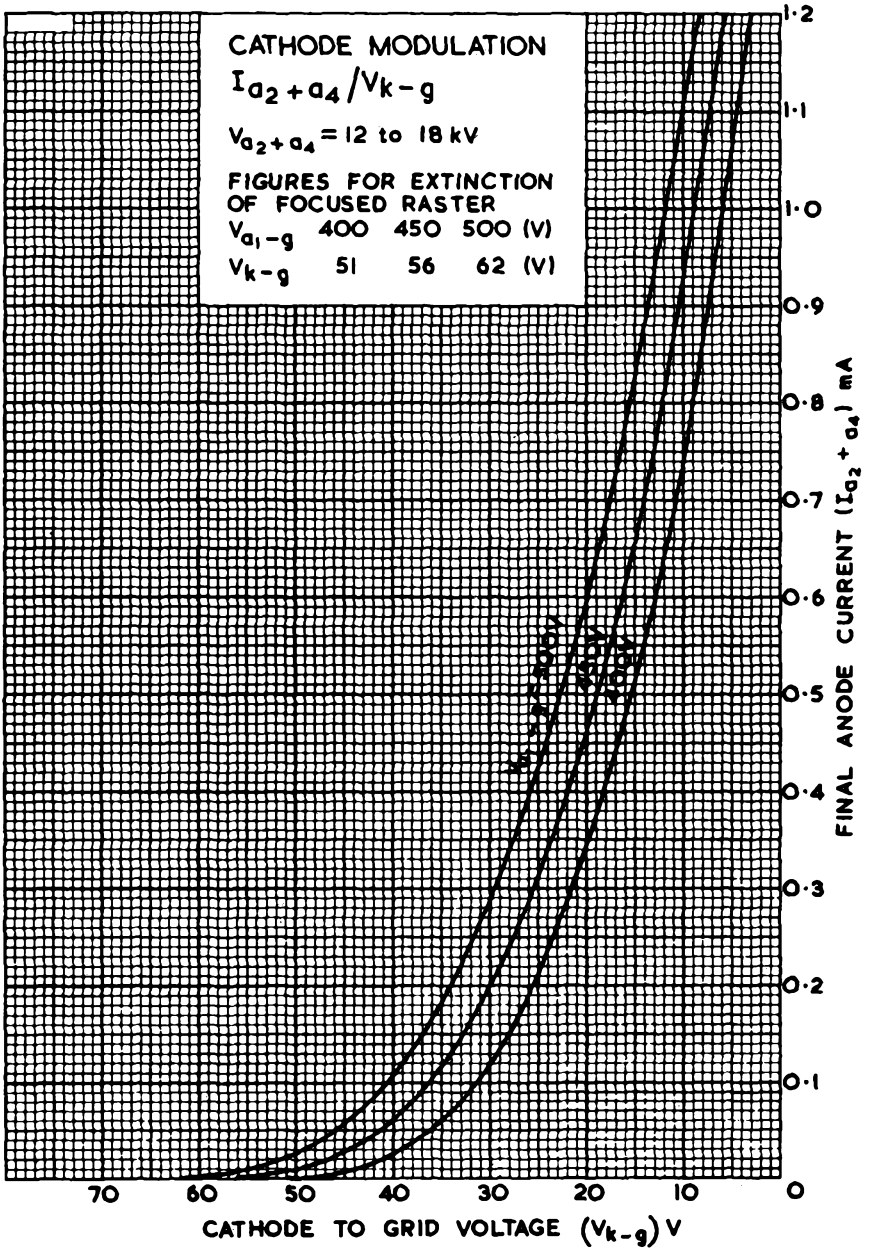
Data Display or Monitor Tube M24-121..

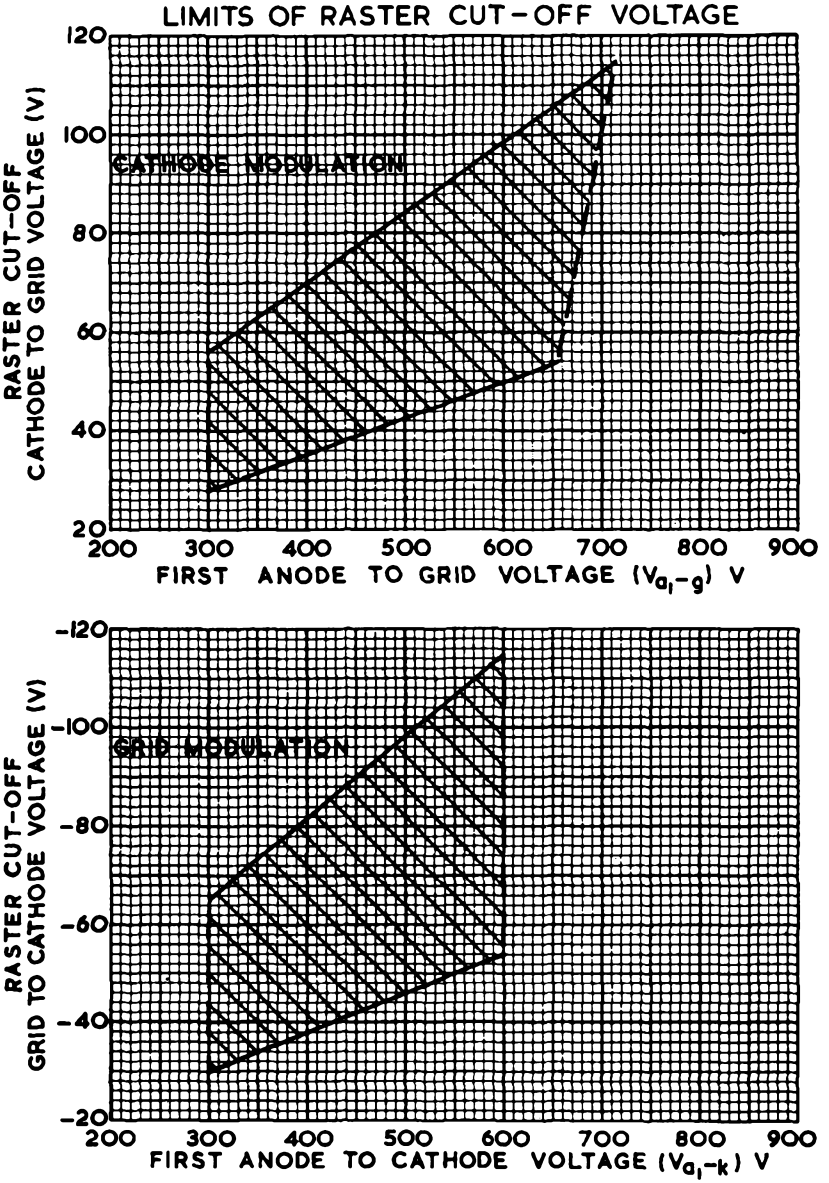


All dimensions in mm

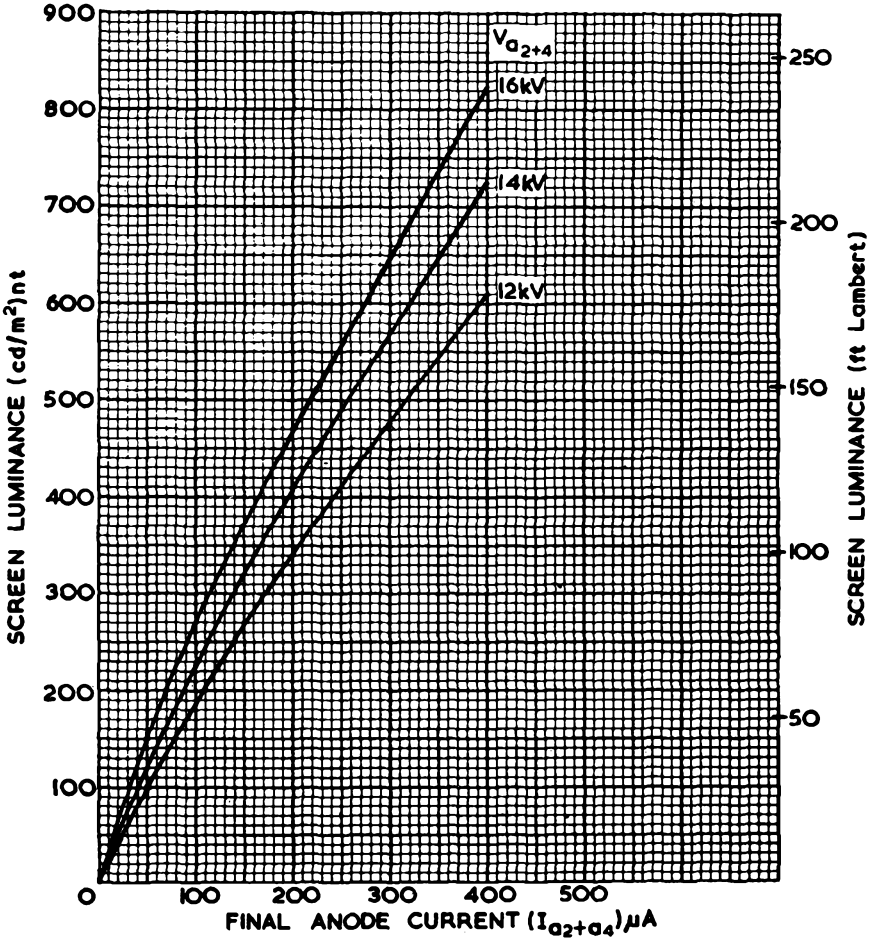
Not to be scaled


GRID MODULATION
$I_{a_2 + a_4} / V_{g-k}$
$V_{a_2 + a_4}$ = 12 to 18kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-k} 400 450 500 (V)
V_{g-k} -57 -63 -69 (V)
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT ($I_{a_2 + a_4}$) mA
-70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g-k}) V


CATHODE MODULATION
$I_{a_2+a_4}/V_{k-g}$
$V_{a_2+a_4}$ = 12 to 18 kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-g} 400 450 500 (V)
V_{k-g} 51 56 62 (V)
$V_{a_2+a_4}$ = 400V
450V
500V
FINAL ANODE CURRENT ($I_{a_2+a_4}$) mA
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
70
60
50
40
30
20
10
0
CATHODE TO GRID VOLTAGE (V_{k-g}) V


LIMITS OF RASTER CUT-OFF VOLTAGE
RASTER CUT-OFF
CATHODE TO GRID VOLTAGE (V)
120
100
80
60
40
20
CATHODE MODULATION
200
300
400
500
600
700
800
900
FIRST ANODE TO GRID VOLTAGE (V_{a_1-g}) V
RASTER CUT-OFF
GRID TO CATHODE VOLTAGE (V)
-120
-100
-80
-60
-40
-20
GRID MODULATION
200
300
400
500
600
700
800
900
FIRST ANODE TO CATHODE VOLTAGE (V_{a_1-k}) V

TYPICAL CHARACTERISTICS
W PHOSPHOR SCREEN
FOCUSED RASTER OF FULL HEIGHT
4 x 3 ASPECT RATIO



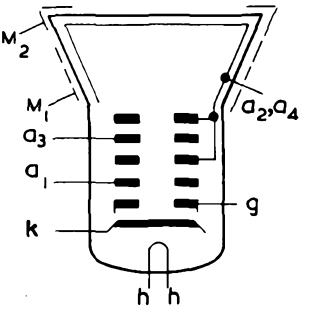
M24-130.. Data Display or Monitor Tube

PRELIMINARY DATA

GENERAL

Rectangular face, 24 cm, 90° diagonal
Bonded face-plate treated to reduce specular reflection. Ruggedised gun construction
Rimguard reinforced envelope with mounting lugs
Flying lead connections for base and anode
Electrostatic focus, magnetic deflection
Grey glass, 32% transmission (approx.)
29.4 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage range	$V_{a3(max)}$	± 700	V
Maximum first anode voltage	$V_{a1(max)}$	600	V
Minimum first anode voltage	$V_{a1(min)}$	200	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0†	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	200	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	250	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

† A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

PHOSPHOR SCREEN

This type is usually supplied with GJ phosphor (M24-130GJ) giving a yellowish-green trace of medium persistence. Other phosphor screens can be made available to special order.

This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

		*	
Maximum cathode to all	c_{k-all} (max)	5.0	pF
Maximum grid to all	c_{g-all} (max)	16	pF
Minimum anodes 2 and 4 to coating M_1	$c_{a2+a4-M1}$ (min)	550	pF
Minimum anodes 2 and 4 to metal M_2	$c_{a2+a4-M2}$ (min)	100	pF

* Flying leads capacitance balanced out.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode

Second and fourth anode voltage	V_{a2+a4}	12 to 16	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	0 to 400 §	V
Grid to cathode voltage for cut-off of raster	V_g	-38 to -82	V
Typical line width at 50 μA (Shrinking raster)		0.2	mm

§ The change of spot size with variation of focus voltage is small and the limit of 0 to 400 V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus a voltage range of at least -100V to +500V will be required.

MOUNTING

Ifa mask is used with this tube it should be flexible enough to take up small variations in fixing and bulb contours.

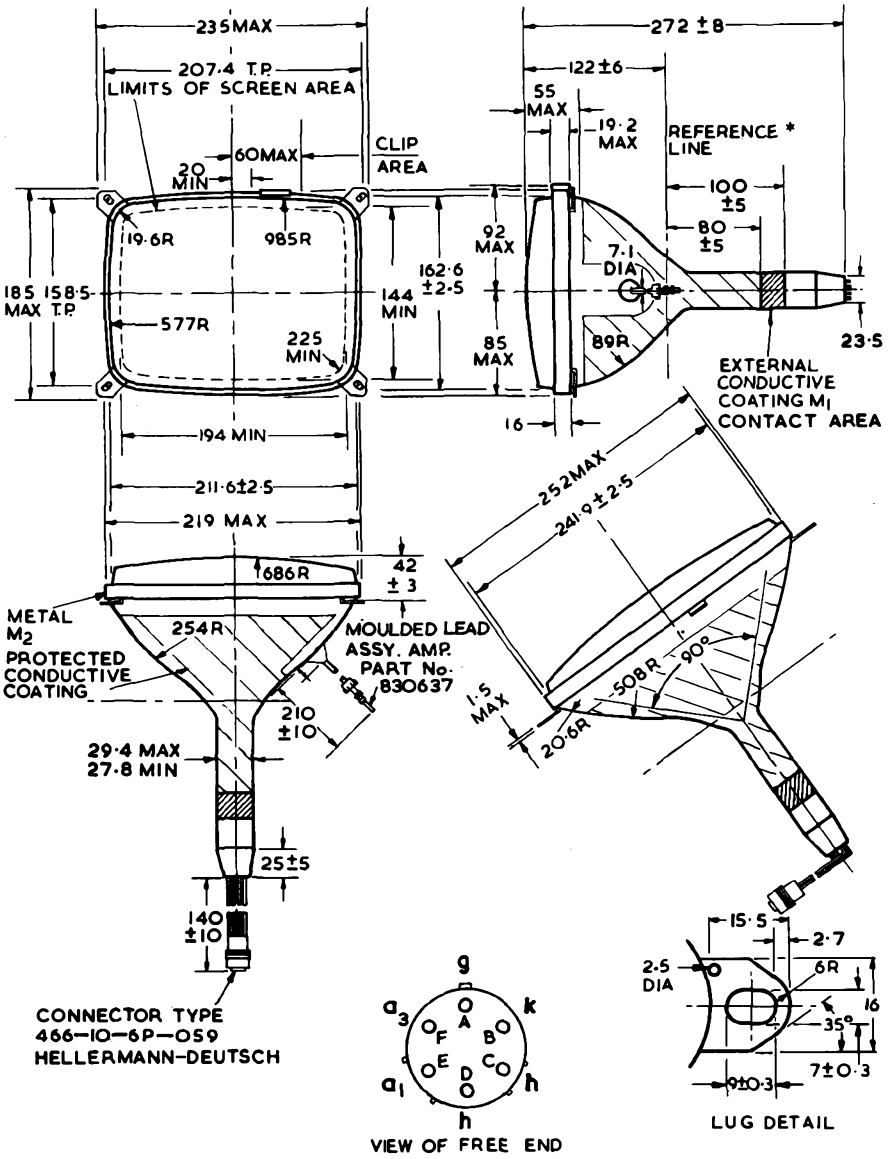
The bolts for mounting the tube must lie within circles of 4 mm diameter centred on the true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal frame (M_2) should be connected to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c./d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M1 and M2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - 2.2kg



All dimension in mm

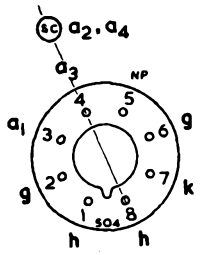
Not to be scaled

* Determined by reference line gauge No. 15

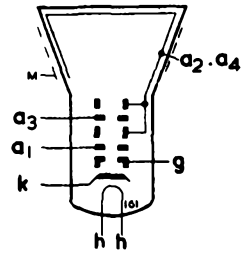
Monitor Tube

M28-11W

Maintenance Type



Base B8H, Cap CT8



GENERAL

Rectangular Face	—11 in. Diagonal	Deflection Angle	—90° Diagonal
Aluminised Screen	—Silver Activated Phosphor	Electrostatic Focus	—Magnetic Deflection
Grey Glass	—58% Transmission (approx)	Straight Gun	—Non Ion Trap
		External Conductive Coating	

Heater Voltage	V_h	11·5	V
Heater Current	I_h	0·15	A

DESIGN CENTRE RATINGS

Maximum Second and Fourth Anode Voltage	$V_{a2,a4(max)}$	18*	kV
Minimum Second and Fourth Anode Voltage	$V_{a2,a4(min)}$	12	kV
Maximum Third Anode Voltage	$V_{a3(max)}$	±700	V
Maximum First Anode Voltage	$V_{a1(max)}$	500	V
Maximum Negative Grid Voltage	$-V_{g(max)}$	200	V
Minimum Negative Grid Voltage	$-V_{g(min)}$	1·0	V
Maximum Heater to Cathode Voltage, Heater Negative (d.c.)	$V_{h-k(max)}$	200	V

* 18kV is a design centre rating, the absolute rating of 20kV must not be exceeded.

All voltages referred to cathode.

INTER-ELECTRODE CAPACITANCES

		¶	§	
Grid to all	C_{g-all}	7·0	8·5	pF
Cathode to all	C_{k-all}	3·0	3·5	pF
Anode 2 and Anode 4 to External Conductive Coating (approx)	$C_{a2,a4-M}$	700		pF

¶ Holder capacitance balanced out.

§ Total capacitances including a typical B8H holder.

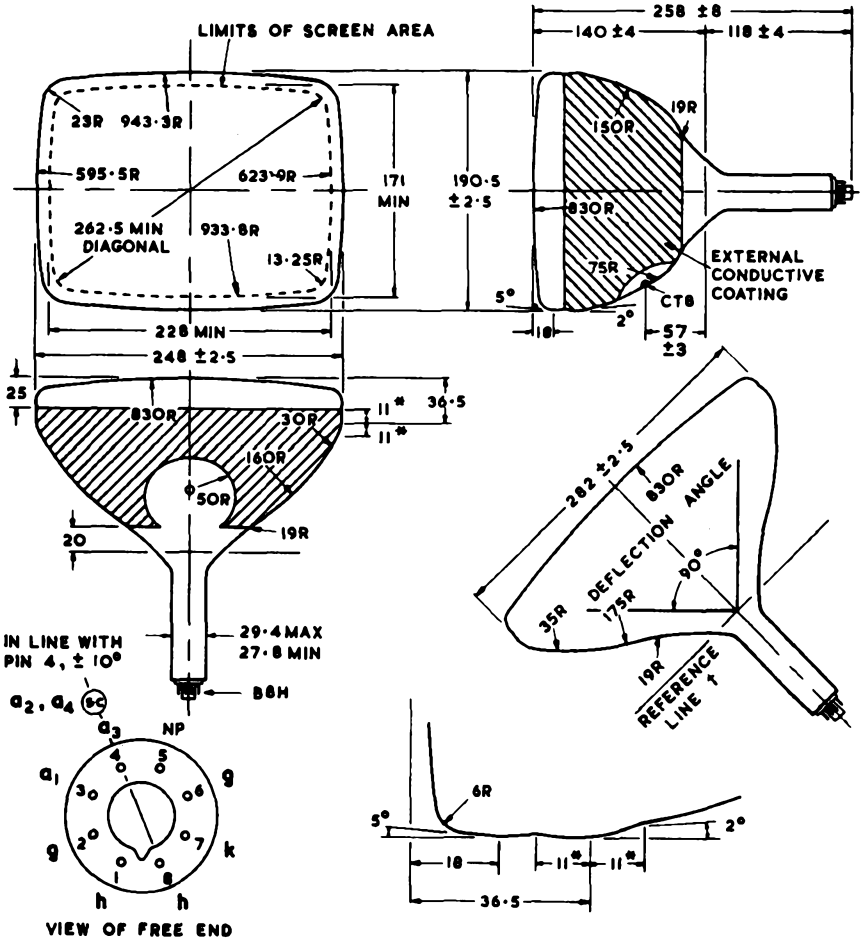
TYPICAL OPERATION—Grid Modulation (all voltages referred to cathode)

Second and Fourth Anode Voltage	$V_{a2,a4}$	14	kV
First Anode Voltage	V_{a1}	400	V
Third Anode Voltage for Focus (Range)	V_{a3}	0 to 400	V
Grid to Cathode Voltage for cut-off of raster	V_g	−40 to −76	V
Average Peak to Peak Modulating Voltage (Final Anode current = 200μA)		29	V

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0·5 milliröntgens per hour, the window will normally provide adequate protection.

Tubes incorporating a B8H sparkguard base will have a suffix S after the type number. For details of the sparkguard base see separate sheet.

DATA DISPLAY & MONITOR TUBES



All dimensions in mm

Not to be scaled

* During the face sealing operation the glass in this area (total 22mm) may be disturbed. As the shape of the contour within this area may be either convex or concave the bulb should not be gripped within this region unless special precautions are taken (such as the use of resilient packing material).

† Determined by T.D.S. Reference Gauge No. 91-15 (See T.D.S. 5-0-91-15)

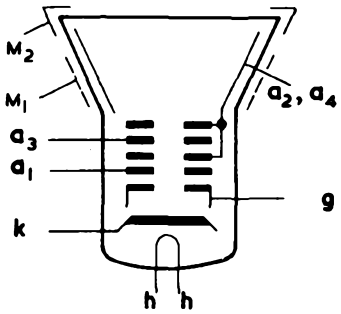
There is an annular region of anti-corona coating with diameters of 25 mm and 60 mm surrounding the CT8 cap, the tube should not be handled in this region. The external conductive coating of this tube should be connected to chassis. The capacitance between this coating and the final anode may be used to provide smoothing for the e.h.t. supply.

Data Display or Monitor Tube M28-12..

GENERAL

Rectangular face, 28 cm, 90° diagonal
Rimguard III reinforced envelope
Integral mounting lugs
Electrostatic focus, magnetic deflection
Aluminised screen.
Grey glass, 58% transmission (approx.)
20 mm neck diameter
External conductive coating

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	14*	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	7.5	kV
Maximum third anode voltage	$V_{a3(max)}$	-50 to + 500	V
Maximum first anode voltage	$V_{a1(max)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	100	V
Maximum peak negative grid voltage	$-v_{g(pk)max}$	350†	V
Maximum positive grid voltage	V_g	0§	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	110	V
Maximum peak heater to cathode voltage, heater negative	$v_{h-k(pk)max}$	130	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* $I_{a2+a4} = 0$

† Maximum pulse duration 22% of one cycle with a maximum of 1.5 ms.

§ A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M28-12W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

DATA DISPLAY & MONITOR TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.0*	pF
Grid to all	c_{g-all}	4.0*	pF
Anodes 2 and 4 to coating M_1 (approx.)	$c_{a2+a4-M1}$	600	pF
Anodes 2 and 4 to shell M_2 (approx.)	$c_{a2+a4-M2}$	125	pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation (Voltage referred to cathode)

Second and fourth anode voltage	$V_{a2+a4-k}$	11	13	kV
First anode voltage	V_{a1-k}	250	350	V
Third anode voltage range for focus	V_{a3-k}	0 to 350	50 to 400	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-35 to -69	-46 to -91	V

TYPICAL OPERATION - Cathode modulation (Voltage referred to grid)

Second and fourth anode voltage	$V_{a2+a4-g}$	11	13	kV
First anode voltage	V_{a1-g}	250	350	V
Third anode voltage range for focus	V_{a3-g}	0 to 350	50 to 400	V
Cathode to grid voltage for cut-off of raster	V_{k-g}	32 to 58	44 to 80	V

MOUNTING

Any mask used in the mounting of this tube should be flexible enough to take up small variations in fixing and faceplate contours.

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

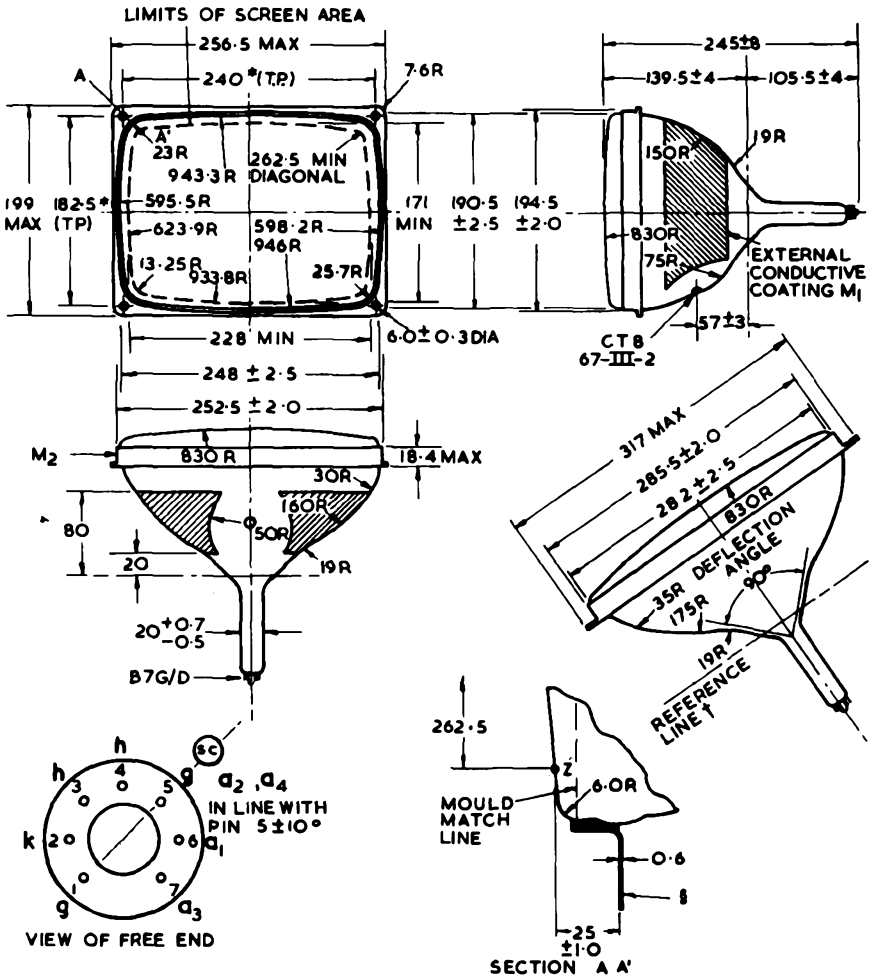
The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal shell (M_2) should be connected directly to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c./d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - 2.2 kg

Data Display or Monitor Tube M28-12..



All dimensions in mm

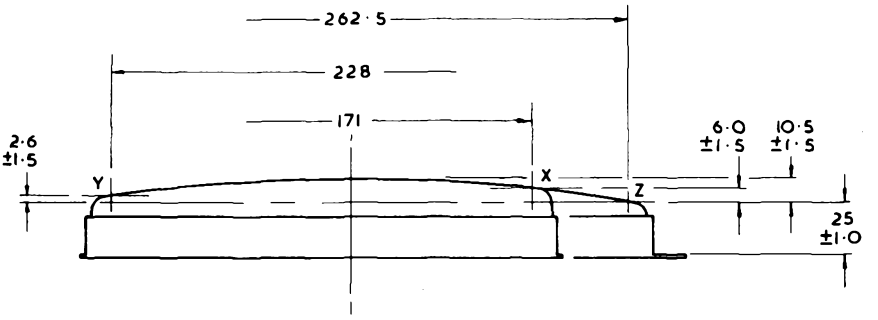
Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 5.0 mm diameter centred on these true positions.

† Determined by reference line gauge No. 20 (See T.D.S. No. 5-0-91-20)

§ Maximum departure from flatness of the rim is 1.0 mm.

M28-12.. Data Display or Monitor Tube



All dimensions in mm

Not to be scaled

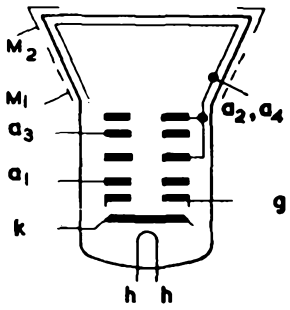
Characteristic curves as M31-190..

Data Display or Monitor Tube M28-13..

GENERAL

Rectangular face, 11 inch, 90° diagonal
Rimguard III reinforced envelope*
Integral mounting lugs
Electrostatic focus, magnetic deflection
Straight gun. Aluminised screen
Grey glass, 58% transmission (approx.)
29.4 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	11.5	V
Heater current	I_h	0.15	A



DESIGN CENTRE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18 †	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	12	kV
Maximum third anode voltage	$V_{a3(max)}$	± 700	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	200	V

† The absolute rating of 20kV must not be exceeded.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M28-13W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

* This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

INTER-ELECTRODE CAPACITANCES

		*		†	
Cathode to all	c_{k-all}	3.0		3.5	pF
Grid to all	c_{g-all}	7.0		8.5	pF
Anodes 2 and 4 to coating M_1 (approx.)	$c_{a2+a4-M1}$		600		pF
Anodes 2 and 4 to frame M_2 (approx.)	$c_{a2+a4-M2}$		125		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode

Second and fourth anode voltage	V_{a2+a4}		14		kV
First anode voltage	V_{a1}		400		V
Third anode voltage range for focus	V_{a3}	0	to	400	V
Grid to cathode voltage for cut-off of raster	V_g	-40	to	-76	V
Average peak to peak modulating voltage for 200 μA final anode current			29		V
Typical line width§ at 100 ft-L (343 nt), 155 μA			0.3		mm

§ Using shrinking raster method.

MOUNTING

This tube is intended for 'push-through' presentation without masking, but if a mask is used it should be flexible enough to take up small variations in fixing and bulb contours.

There is an annular region of anti-corona coating with external diameter of 60 mm surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

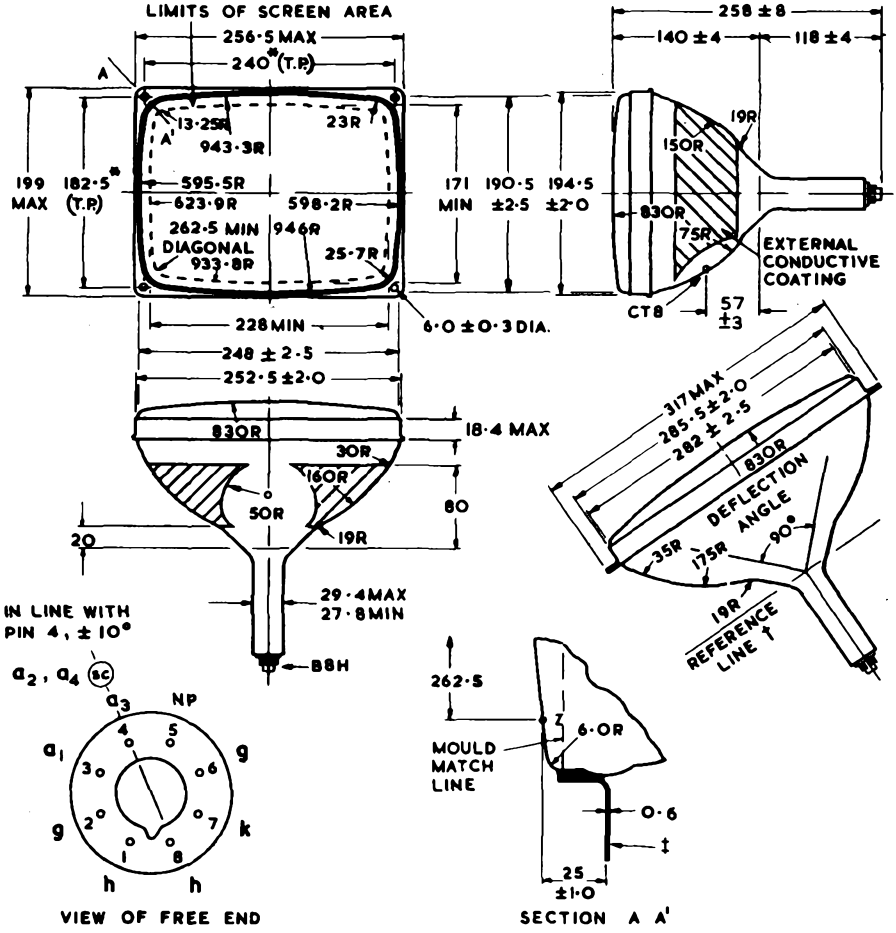
The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal frame (M_2) should be connected directly to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c./d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 2.1 kg

Data Display or Monitor Tube M28-13..



All dimensions in mm

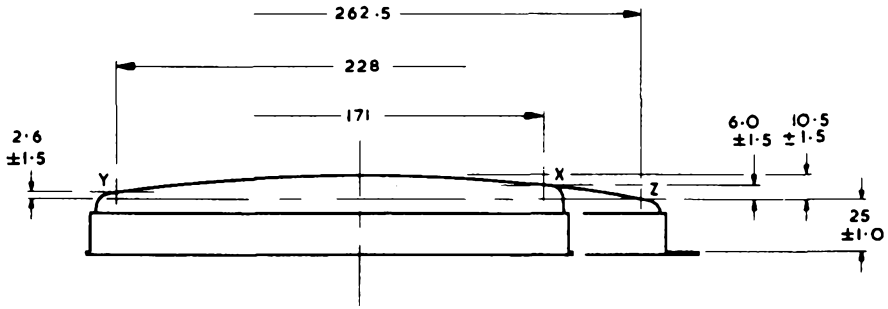
Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 5.0 mm diameter centred on these true positions.

† Determined by reference line gauge No. 15 (See T.D.S. No. 5-0-91-15).

‡ Maximum departure from flatness of the rim is 1.0 mm.

Data Display or Monitor Tube

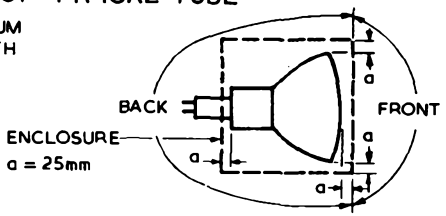


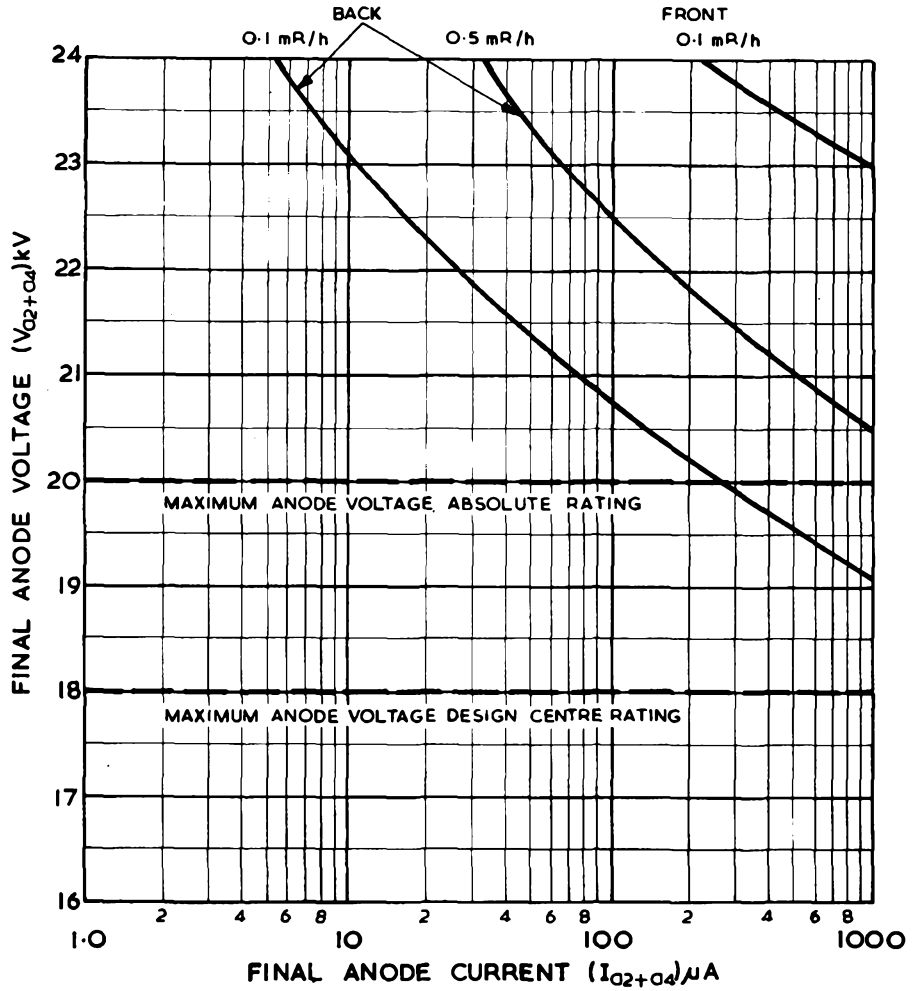
All dimensions in mm

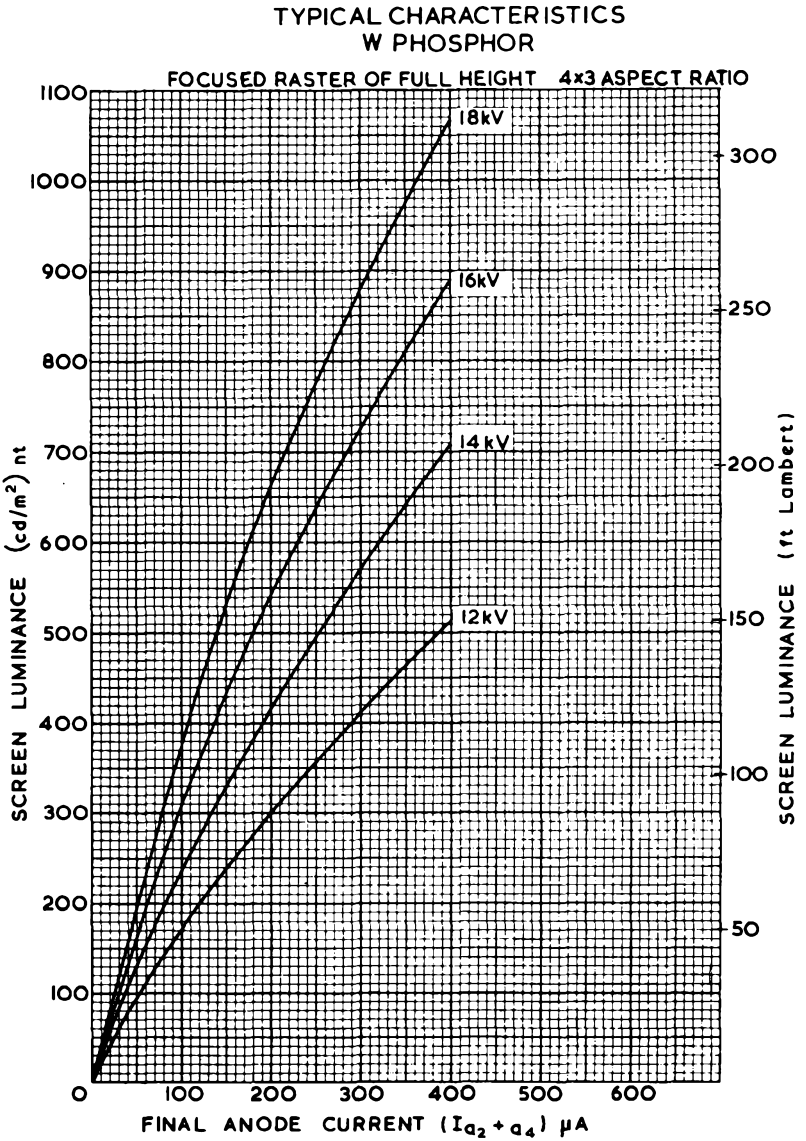
Not to be scaled

X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM



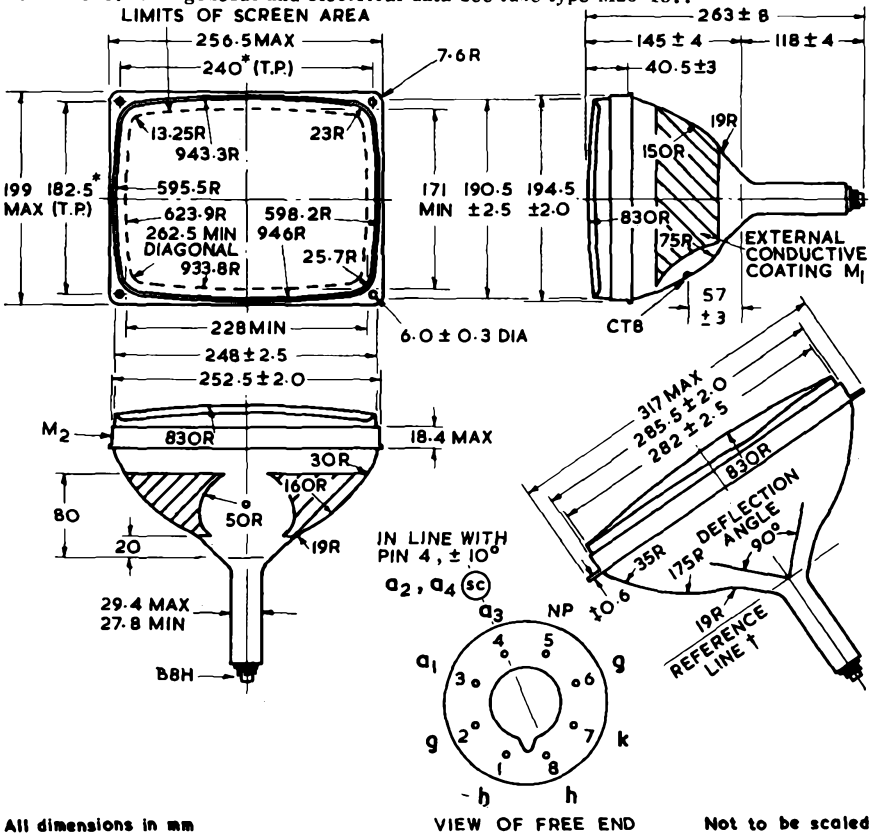



TYPICAL CHARACTERISTICS
W PHOSPHOR
FOCUSED RASTER OF FULL HEIGHT 4x3 ASPECT RATIO
18kV
16kV
14kV
12kV
SCREEN LUMINANCE (cd/m²) nt
SCREEN LUMINANCE (ft Lambert)
FINAL ANODE CURRENT (Ig2 + g4) µA
0
100
200
300
400
500
600
700
800
900
1000
1100
50
100
150
200
250
300

Data Display or Monitor Tube M28-131..

MAINTENANCE TYPE

The M28-131.. is the M28-13.. with a bonded face-plate treated to reduce specular reflections. For general and electrical data see tube type M28-13..



All dimensions in mm — VIEW OF FREE END — Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 5.0 mm diameter centred on these true positions.

† Determined by reference line gauge No. 15.

‡ Maximum unflatness of the rim is 1.0 mm.

PHOSPHOR SCREEN

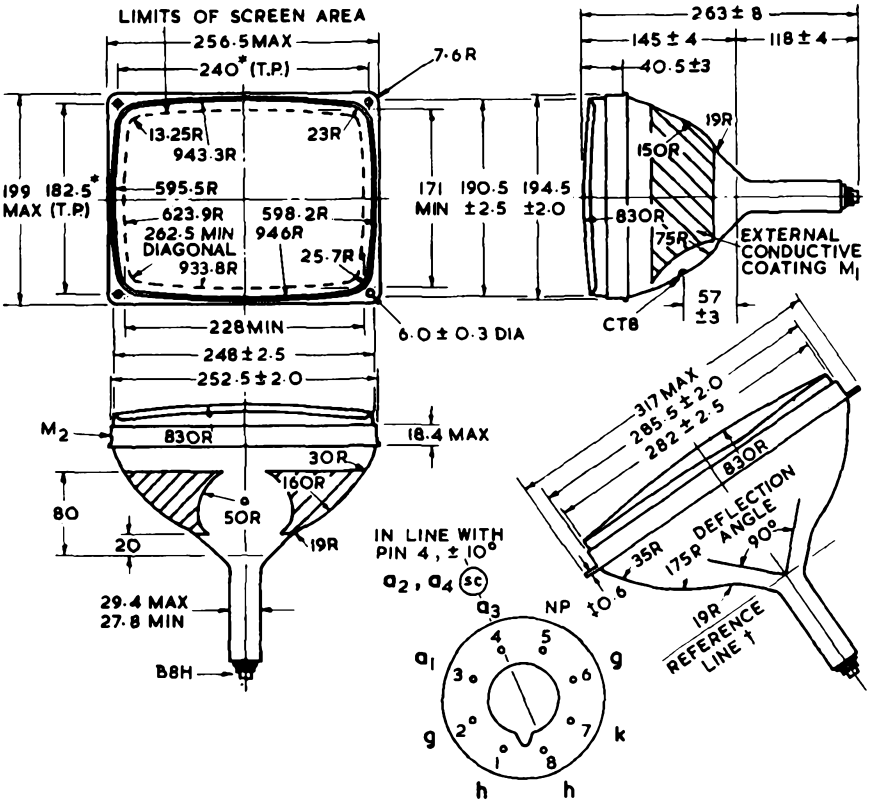
This type is usually supplied with GR phosphor (M28-131GR) giving a yellowish-green trace of very long persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - 2.5 kg

DATA DISPLAY & MONITOR TUBES

M28-132.. Data Display or Monitor Tube

The M28-132.. is the M28-13.. with a tinted bonded face-plate treated to reduce specular reflections. The total centre glass transmission is approximately 35%. For other general and electrical data see tube type M28-13..



All dimensions in mm VIEW OF FREE END Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 5.0 mm diameter centred on these true positions.

† Determined by reference line gauge No. 15. (See T.D.S. No. 5-0-91-15)

‡ Maximum unflatness of the rim is 1.0 mm.

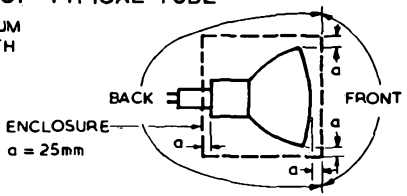
PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M28-132GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

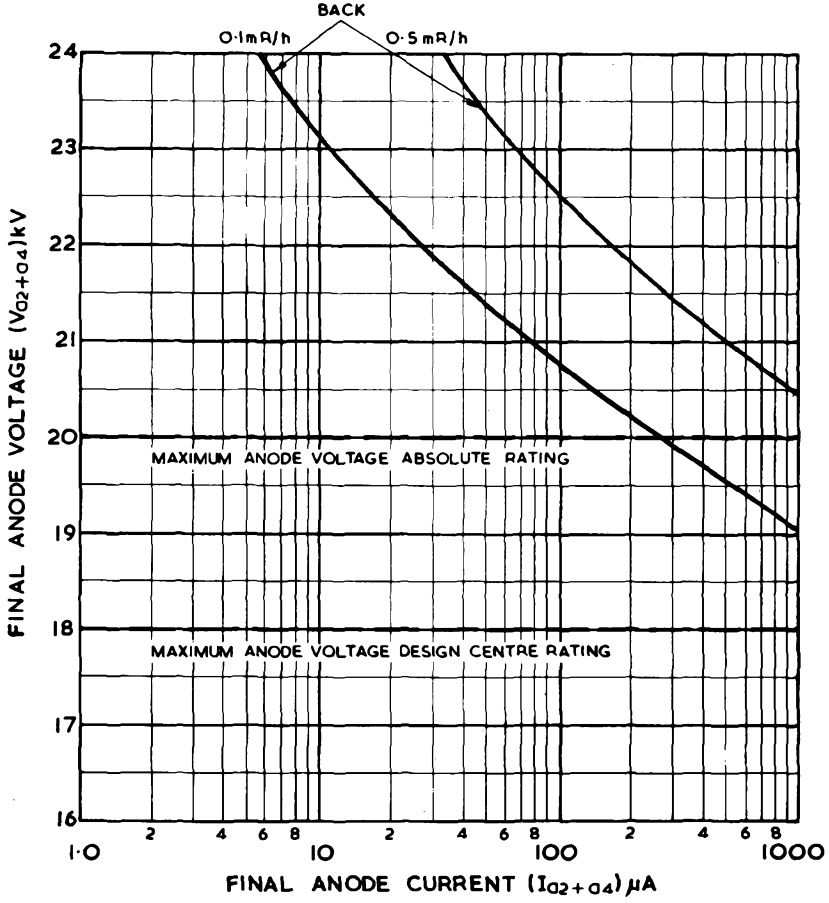
TUBE WEIGHT (approximate) 2.5 kg

X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM

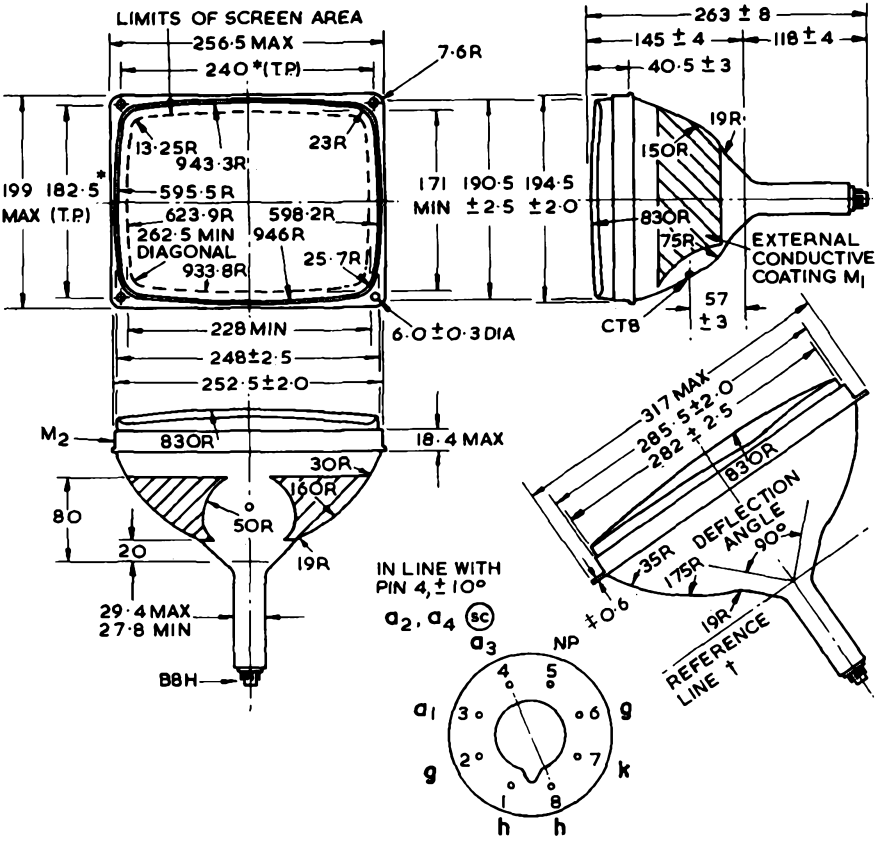


UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1 mR/h



M28-133.. Data Display or Monitor Tube

The M28-133.. is the M28-13.. with a tinted bonded face-plate treated to reduce specular reflections. The total centre glass transmission is approximately 18%. For other general and electrical data see tube type M28-13..



All dimensions in mm — VIEW OF FREE END — Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 5.0 mm diameter centred on these true positions.

† Determined by reference line gauge No. 15

‡ Maximum unflatness of the rim is 1.0mm.

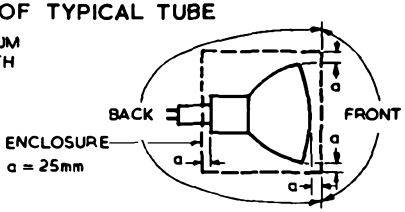
PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M28-133GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

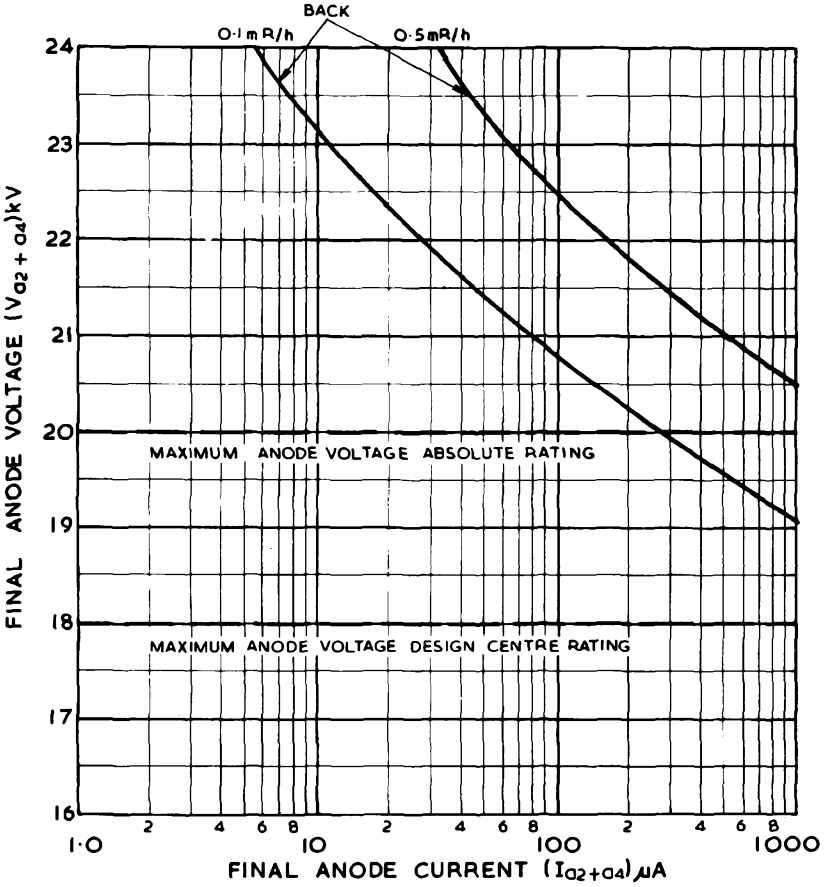
TUBE WEIGHT (approximate) 2.5 kg.

X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM



UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1mR/h



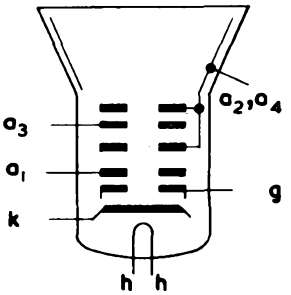
M31-100.. Data Display or Monitor Tube

Maintenance Type

GENERAL

Rectangular face, 31 cm , 70° diagonal tube
Bonded faceplate treated to reduce specular reflections. Aluminised screen.
Electrostatic focus, magnetic deflection
38 mm maximum neck diameter
Grey glass, 50% transmission (approx.)
Straight gun, non ion trap

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage	$V_{a3(max)}$	+ 800	V
Maximum first anode voltage	$V_{a1(max)}$	800	V
Maximum negative grid voltage	$-V_{g(max)}$	180	V
Maximum positive grid voltage	$V_{g(max)}$	0	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	200	V

If this tube is operated at voltages in excess of 18 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M31-100GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

The M31-100GH is also known as the CV6237.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode

Second and fourth anode voltage	V_{a2+a4}	12	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	0 to +400	V
Grid to cathode voltage for cut-off of raster	V_g	-30 to -70	V

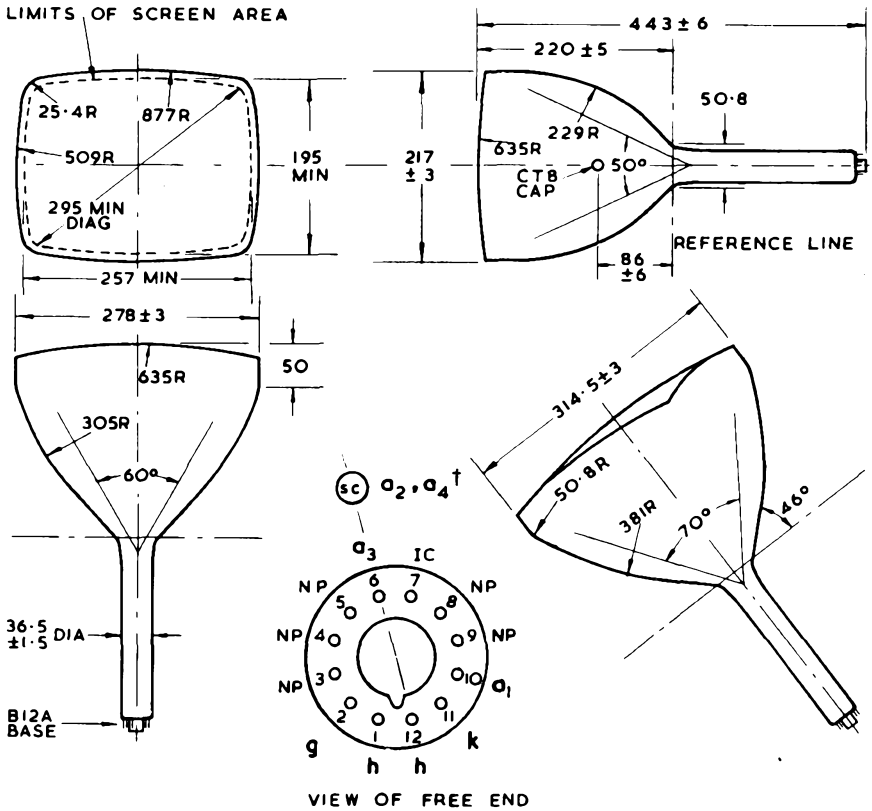
INTER-ELECTRODE CAPACITANCES		*	†	
Cathode to all	c_{k-all}	3.5	4.5	pF
Grid to all	c_{g-all}	7.0	7.5	pF

* Holder capacitance balanced out.

† Total capacitance including a typical holder.

TUBE WEIGHT (approximate) - 4.4 kg

M31-100.. Data Display or Monitor Tube



All dimensions in mm

Not to be scaled

* Determined by reference line gauge No. 12 (See T.D.S. No. 5-0-91-12)

† Anode a_2, a_4 cap in line with pin 6, tolerance ± 10°

The socket for the base should not be rigidly mounted, it should have flexible leads and be allowed to move freely.

There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

Data Display or Monitor Tube M31-101..

Maintenance Type

The M31-101.. is the M31-100.. with an increased neck length to permit the use of an additional high frequency deflector coil ("write" coil) for data display applications.

The neck length of this tube is 264 mm making the overall length 484 ± 6 mm.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M31-101GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

For all other data please see M31-100.. data sheets.

DATA DISPLAY & MONITOR TUBES

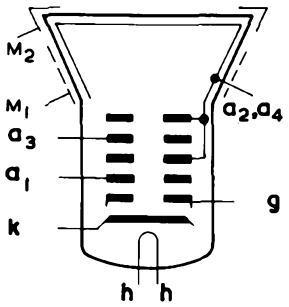
BRIMAR

M31-120.. Data Display or Monitor Tube

GENERAL

Rectangular face, 31 cm (12 in), 110° diagonal
Rimguard III reinforced envelope**
Integral mounting lugs, 20 mm dia. neck
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 50% transmission (approx.)
Straight gun, non ion trap
External conductive coating

Heater voltage	V_h	11	V
Heater current	I_h	140	mA



DESIGN CENTRE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10.5*	kV
Maximum third anode voltage - range	$V_{a3(max)}$	-50 to +500	V
Maximum first anode voltage	$V_{a1(max)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	100	V
Maximum peak negative grid voltage	$-v_{g(max)}$	350§	V
Maximum positive grid voltage	$V_{g(max)}$	0¶	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	110	V
Maximum peak heater to cathode voltage, heater negative	$v_{h-k(pk)max}$	130	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

All voltages referred to cathode

† The absolute rating of 16.5 kV must not be exceeded.

* Absolute minimum rating is 8.5 kV.

§ Maximum pulse duration 22% of one cycle with a maximum of 1.5 ms.

¶ A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

** This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M31-120W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.0*	pF
Grid to all	c_{g-all}	4.0*	pF
Anodes 2 and 4 to coating M_1(min.)	$c_{a2+a4-M1(min.)}$	450	pF
Anodes 2 and 4 to shell M_2 (approx.)	$c_{a2+a4-M2}$	200	pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation (Voltages referred to cathode)

Second and fourth anode voltage	$V_{a2+a4-k}$	12	kV
First anode voltage	V_{a1-k}	250	V
Third anode voltage range for focus	V_{a3-k}	0 to 350	V
Final anode current (peak)	$i_{a2+a4(pk)}$	250	μA
Average peak to peak picture modulating voltage		33	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-35 to -69	V

TYPICAL OPERATION - Cathode modulation (Voltage referred to grid)

Second and fourth anode voltage	$V_{a2+a4-g}$	12	kV
First anode voltage	V_{a1-g}	250	V
Third anode voltage range for focus	V_{a3-g}	0 to 350	V
Final anode current (peak)	$i_{a2+a4(pk)}$	250	μA
Average peak to peak picture modulating voltage		26	V
Cathode to grid voltage for cut-off of raster	V_{k-g}	32 to 58	V

This data should be read in conjunction with Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

PICTURE CENTRING

Maximum magnet flux density at centre of neck should not be less than	15	Gs
Maximum distance of centre of magnetic field from reference line	44	mm

DEFLECTION ANGLES

Height 80° Width 99° Diagonal 110°

MOUNTING

This tube is intended for 'push-through' presentation without masking, but if a mask is used it should be flexible enough to take up small variations in fixing and bulb contours.

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

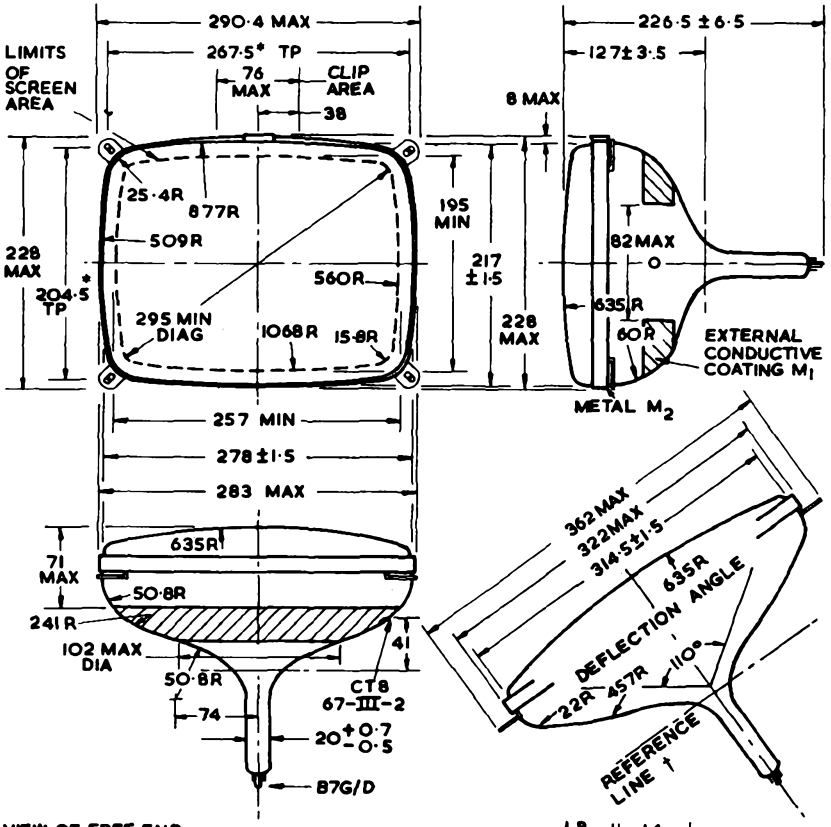
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle of 44 mm diameter which is centred on the perpendicular from the centre of the face.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal shell (M_2) should be connected to the chassis in an a.c. receiver operating from an isolating transformer, or via a suitable leakage path in an a.c./d.c. receiver, for example 2 MΩ.

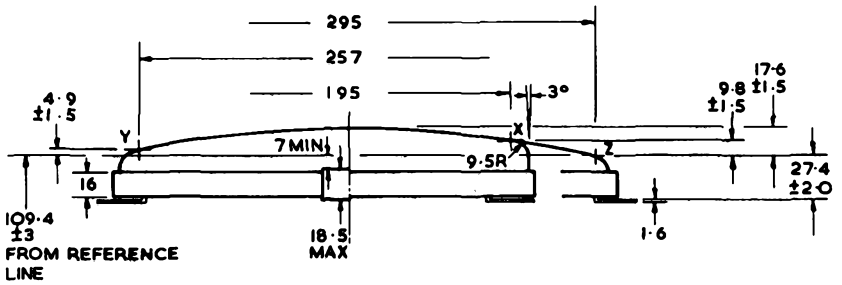
When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

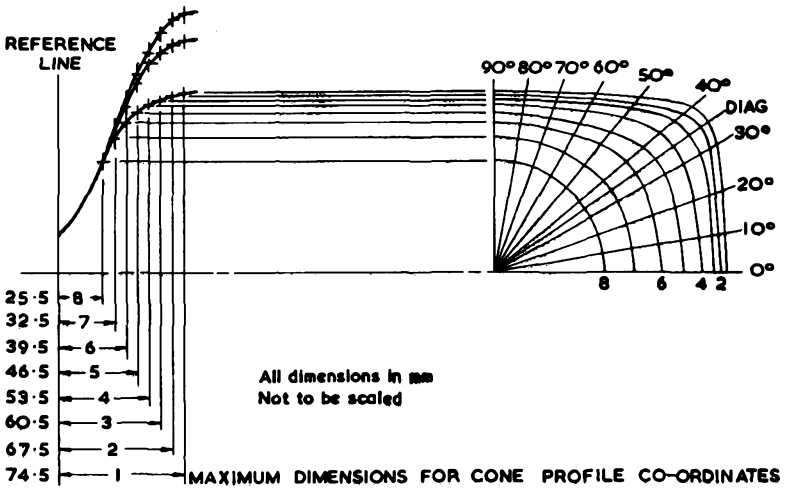
TUBE WEIGHT (approximate) - net 3.0 kg (6.5 lb)



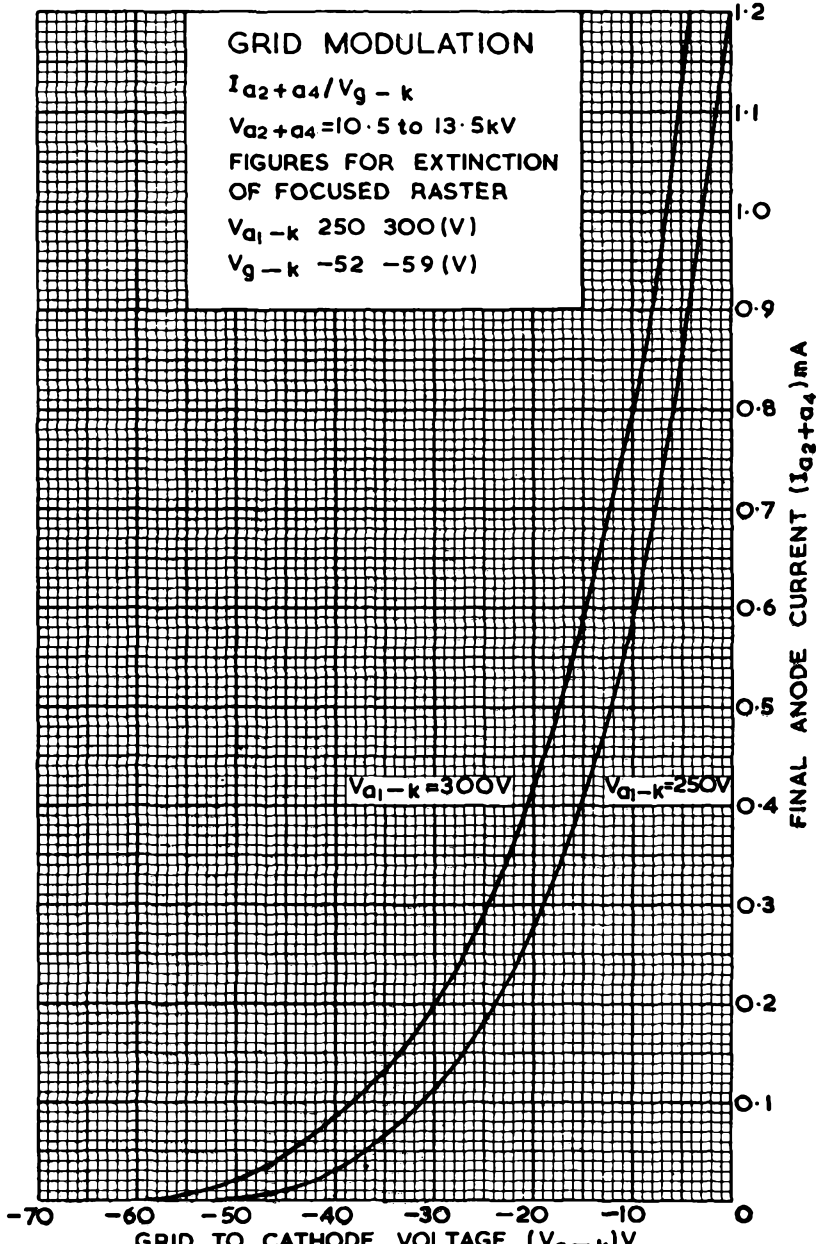
* The bolts to be used for mounting the tube must lie within circles of 7.0 mm diameter centred on these true positions. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs.

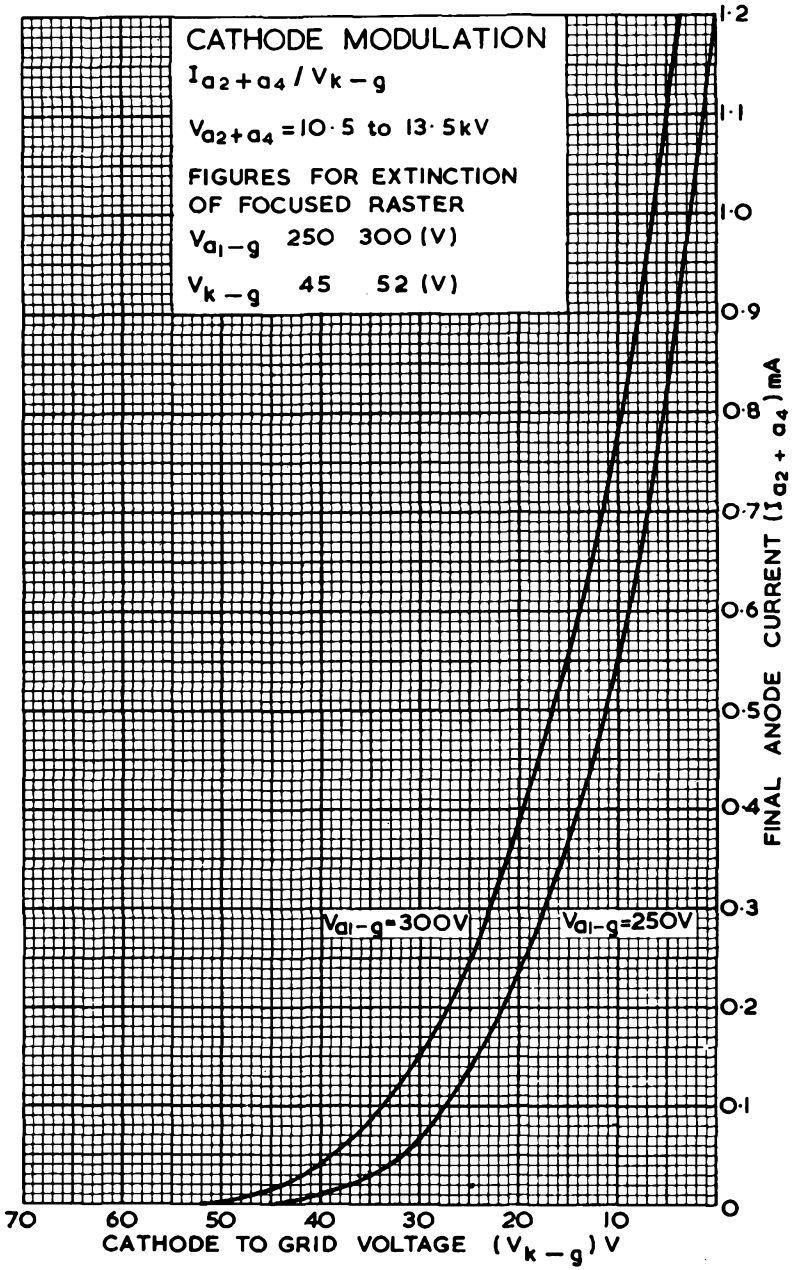
† Determined by reference line gauge No. 22. (See T.D.S. 5-0-91-22)

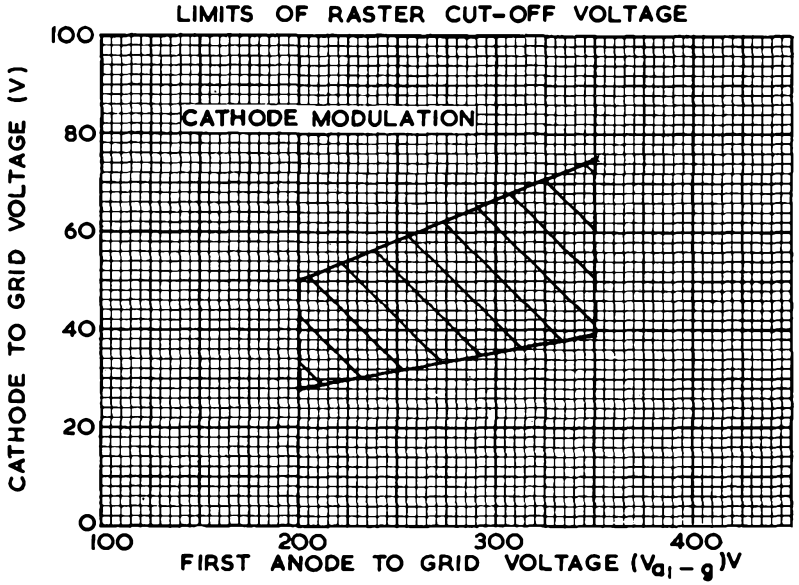


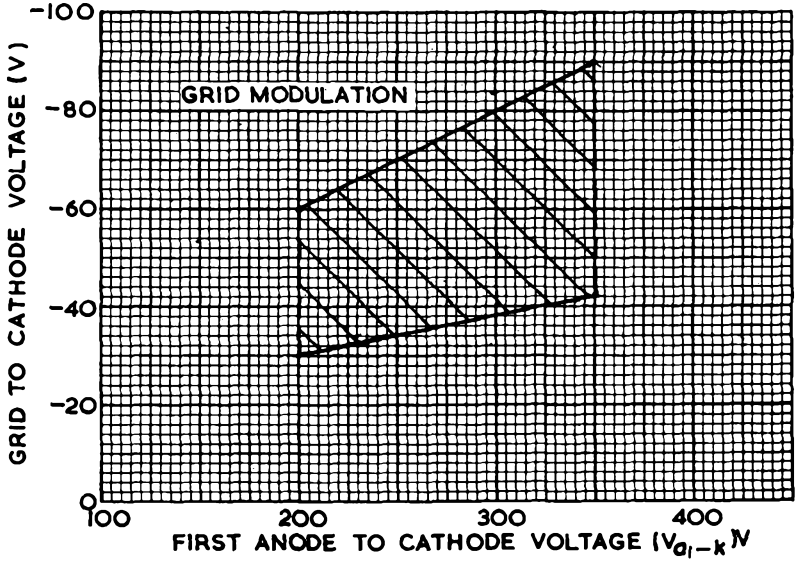


Reference Plane No.	0° Major	10°	20°	30°	Diag.	40°	50°	60°	70°	80°	90° Minor
1	140.2	141.5	146.0	154.0	157.8	154.6	136.7	123.5	115.5	111.0	109.6
2	137.8	139.2	143.4	151.1	154.1	151.5	134.3	121.6	113.7	109.4	108.1
3	133.9	134.8	137.8	143.0	145.3	143.2	129.4	118.4	111.1	107.3	106.0
4	127.3	127.7	129.3	132.0	133.2	132.1	122.3	113.2	107.2	103.8	102.6
5	116.4	116.8	117.7	119.2	120.0	119.3	112.8	105.9	101.5	98.6	98.1
6	103.0	103.2	103.8	104.8	105.2	104.7	101.5	97.0	94.2	92.5	91.9
7	87.0	87.1	87.2	87.4	87.8	87.1	85.9	84.6	83.6	83.0	82.8
8	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3


GRID MODULATION
I_{a2+a4}/V_{g-k}
V_{a2+a4}=10·5 to 13·5kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-k} 250 300(V)
V_{g-k} −52 −59(V)
V_{a_1-k}=300V
V_{a_1-k}=250V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT ($I_{a_2+a_4}$)mA
−70 −60 −50 −40 −30 −20 −10 0
GRID TO CATHODE VOLTAGE (V_{g-k})V

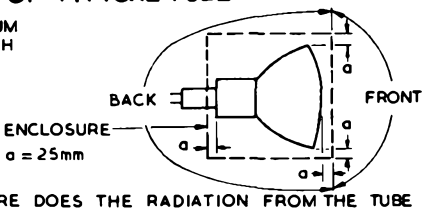

CATHODE MODULATION
I_{a2+a4} / V_{k-g}
V_{a2+a4} = 10·5 to 13·5kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a1-g} 250 300 (V)
V_{k-g} 45 52 (V)
V_{a1-g}=300V
V_{a1-g}=250V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT (I_{a2+a4}) mA
70 60 50 40 30 20 10
CATHODE TO GRID VOLTAGE (V_{k-g}) V


LIMITS OF RASTER CUT-OFF VOLTAGE
CATHODE MODULATION
CATHODE TO GRID VOLTAGE (V)
100
80
60
40
20
0
100
200
300
400
FIRST ANODE TO GRID VOLTAGE (V_{a_1-g})V


GRID MODULATION
GRID TO CATHODE VOLTAGE (V)
-100
-80
-60
-40
-20
0
100
200
300
400
FIRST ANODE TO CATHODE VOLTAGE (V_{a_1-k})V

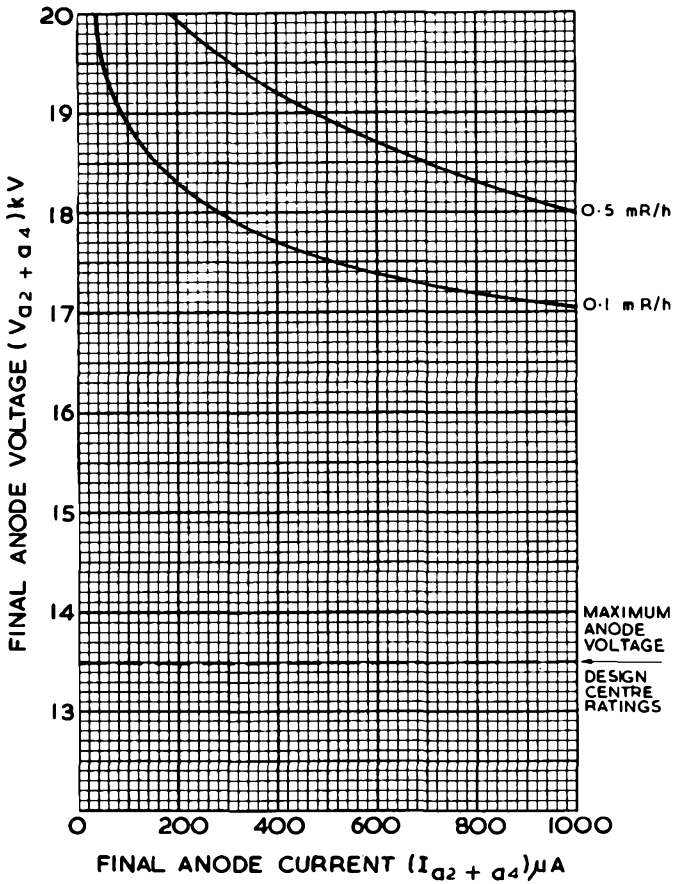
X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM



UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1 mR/h

RADIATION FROM BACK OF TUBE



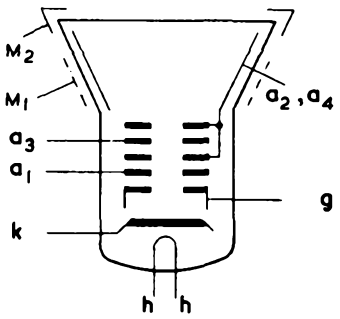
Data Display or Monitor Tube M31-182..

Maintenance Type

GENERAL

Rectangular face, 12 inch, 110° diagonal
Rimguard III reinforced envelope
Integral mounting lugs
Electrostatic focus, magnetic deflection
Aluminised screen. Bonded face-plate
Face treated to reduce reflections
Grey glass, 50% transmission (approx.)
29.4 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3*	A



DESIGN CENTRE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10.5	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	550	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Maximum peak negative grid voltage	$-v_{g(pk)max}$	400	V
Maximum positive grid voltage	$V_{g(max)}$	0¶	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	250	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$v_{h-k(pk)max}$	400§	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* In a series heater chain the CRT should always be connected at the chassis end.

† The absolute rating of 16.5 kV must not be exceeded.

¶ A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage

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

PHOSPHOR SCREEN

This type is usually supplied with LG phosphor (M31-182LG) giving an orange trace of very long persistence. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

BRIMAR

INTER-ELECTRODE CAPACITANCES		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	6.5	8.0	pF
Anodes 2 and 4 to coating M_1 (min)	$c_{a2+a4-M1\,(min)}$		450	pF
Anodes 2 and 4 to frame M_2 (approx.)	$c_{a2+a4-M2}$		200	pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode.

Second and fourth anode voltage	$V_{a2+a4-k}$		12	kV
First anode voltage	V_{a1-k}		400	V
Third anode voltage range for focus	V_{a3-k}		0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	200	350	μA
Average peak to peak picture modulating voltage		29	36	V
Grid to cathode voltage range for cut-off of raster	V_{g-k}		-40 to -77	V
LG screen persistence to 10% (approx.)			3.0	s

TYPICAL OPERATION - Cathode modulation, voltages referred to grid

Second and fourth anode voltage	$V_{a2+a4-g}$		12	kV
First anode voltage	V_{a1-g}		400	V
Third anode voltage range for focus	V_{a3-g}		0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	200	350	μA
Average peak to peak picture modulating voltage		25	31	V
Cathode to grid voltage range for cut-off of raster	V_{k-g}		36 to 66	V
LG screen persistence to 10% (approx.)			3.0	s

The LG screen is liable to burn even at low values of beam current if operated with stationary or slow moving spot.

This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

PICTURE CENTRING

Maximum magnet flux density at centre of neck should not be less than	15	Gs
Maximum distance of centre of magnetic field from reference line	53	mm

DEFLECTION ANGLES

Height	80°	Width	99°	Diagonal	110°

MOUNTING

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle of 44 mm diameter which is centred on the perpendicular from the centre of the face.

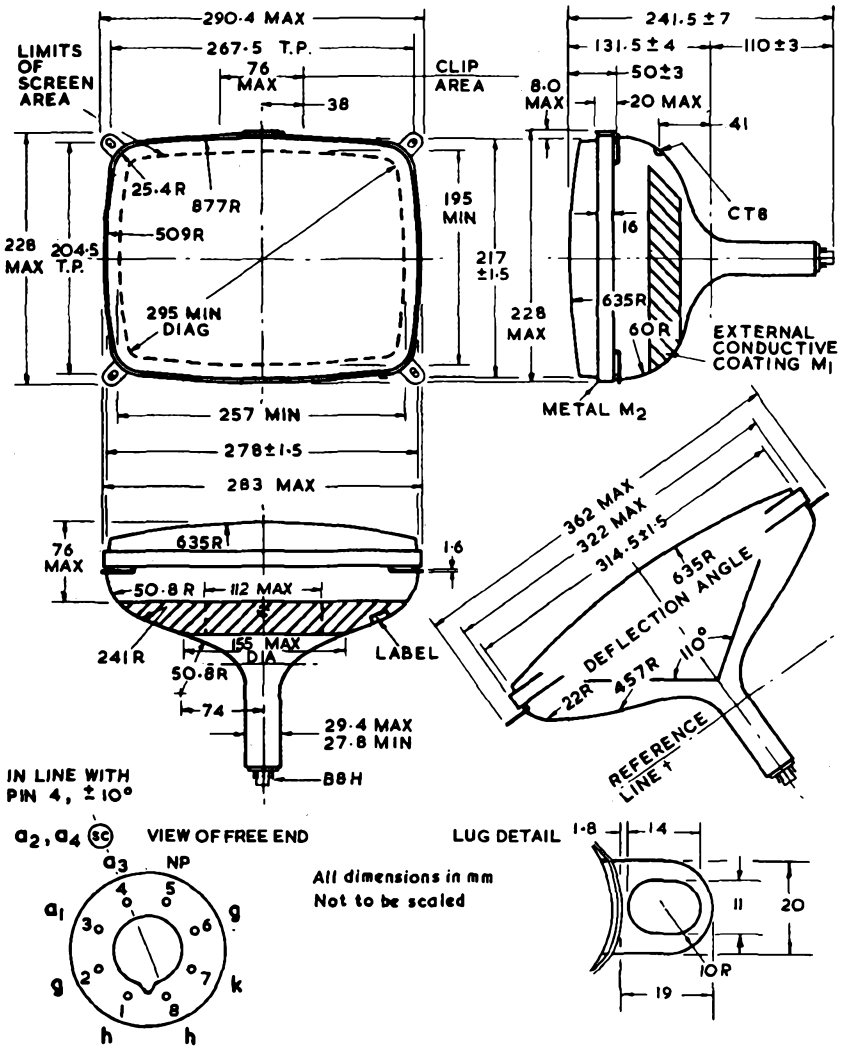
The bolts to be used for mounting must lie within circles of 6.5 mm diameter centred on the true positions of the lug holes. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal frame (M_2) should be connected to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c./d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 3.4 kg (7.5 lb)



† Determined by reference line gauge No. 16. (B.S.RL4 : IEC67-IV-3 : JEDEC126)

Minimum screen area 477 cm^2

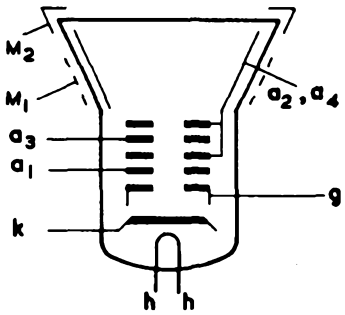
Monitor Tube

M31–184..

GENERAL

Rectangular face, 12 inch, 110° diagonal
Rimguard III reinforced envelope
Integral mounting lugs
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 50% transmission (approx.)
Straight gun, non ion trap
External conductive coating

Heater voltage	V_h	6.3	V
Heater voltage	I_h	0.3*	A



DESIGN CENTRE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	16†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10.5	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	550	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Maximum peak negative grid voltage	$-v_{g(pk)max}$	400**	V
Maximum positive grid voltage	$V_{g(max)}$	0¶	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	250	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$v_{h-k(pk)max}$	400§	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* In a series heater chain the CRT should always be connected at the chassis end.

† The absolute rating of 18 kV must not be exceeded.

¶ A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

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

** Maximum pulse duration 22% of one cycle with a maximum of 1.5 ms.

PHOSPHOR SCREEN

This type is usually supplied with a W phosphor (M31-184W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

BRIMAR

INTER-ELECTRODE CAPACITANCES		*		†	
Cathode to all	c_{k-all}	3.0		3.5	pF
Grid to all	c_{g-all}	6.5		8.0	pF
Anodes 2 and 4 to coating M_1 (min)	$c_{a2+a4-M1(min)}$		450		pF
Anodes 2 and 4 to shell M_2 (approx.)	$c_{a2+a4-M2}$		200		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION Grid modulation (Voltage referred to cathode)					
Second and fourth anode voltage	$V_{a2+a4-k}$		15		kV
First anode voltage	V_{a1-k}		400		V
Third anode voltage range for focus	V_{a3-k}	0	to 400		V
Final anode current (peak)	$i_{a2+a4(pk)}$	200		350	μA
Average peak to peak picture modulating voltage		29		36	V
Grid to cathode voltage for cut-off of raster	V_{g-k}		-40 to -77		V

TYPICAL OPERATION Cathode modulation (Voltage referred to grid)					
Second and fourth anode voltage	$V_{a2+a4-g}$		15		kV
First anode voltage	V_{a1-g}		400		V
Third anode voltage range for focus	V_{a3-g}	0	to 400		V
Final anode current (peak)	i_{a2+a4}	200		350	μA
Average peak to peak picture modulating voltage		25		31	V
Cathode to grid voltage for cut-off of raster	V_{k-g}		36 to 66		V

This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

PICTURE CENTRING

Maximum magnet flux density at centre of neck should not be less than	15	Gs
Maximum distance of centre of magnetic field from reference line	53	mm

DEFLECTION ANGLES

Height 80° Width 99° Diagonal 110°

MOUNTING

This tube is intended for 'push-through' presentation without masking, but if a mask is used it should be flexible enough to take up small variations in fixing and bulb contours.

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

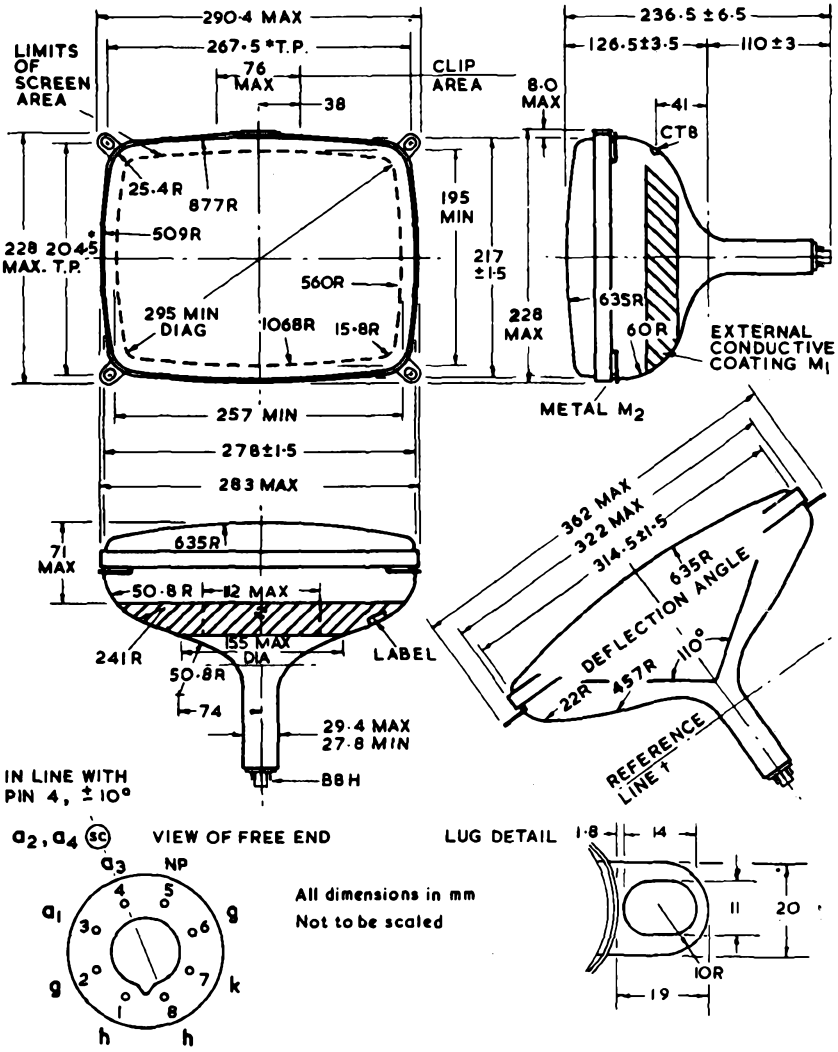
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle of 44 mm diameter which is centred on the perpendicular from the centre of the face.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal rimband (M_2) should be connected directly to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c. / d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 3.0 kg (6.5 lb)



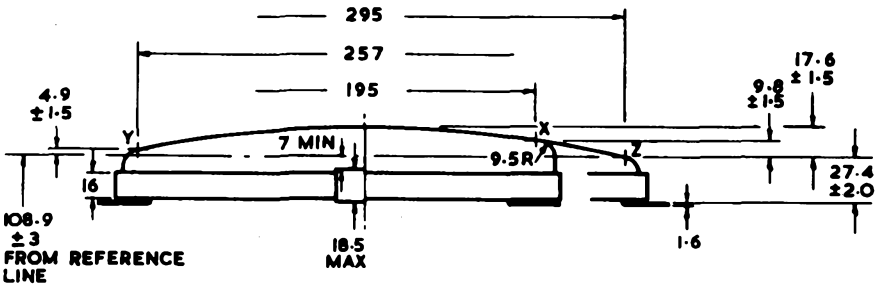
* The bolts to be used for mounting the tube must lie within circles of 6.5 mm diameter centred on these true positions. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs.

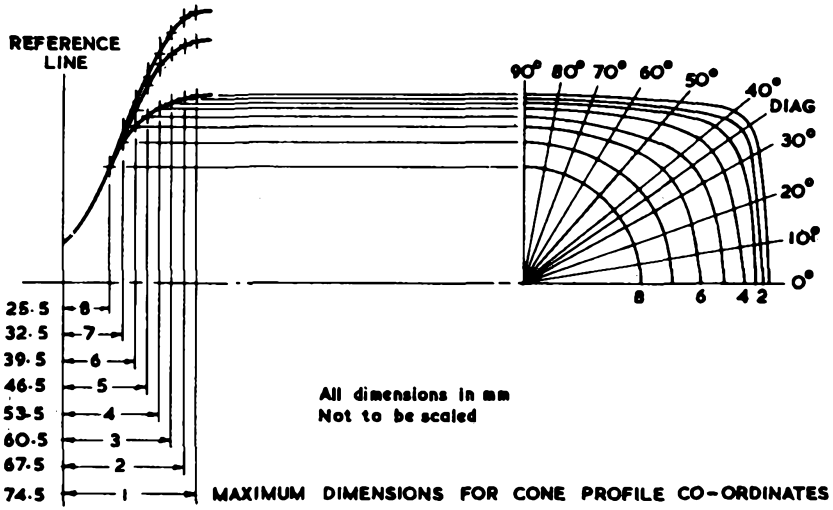
† Determined by reference line gauge No.16. (B.S.RL4 : IEC67-IV-3 : JEDEC126)

Minimum screen area 477 cm^2

Monitor Tube

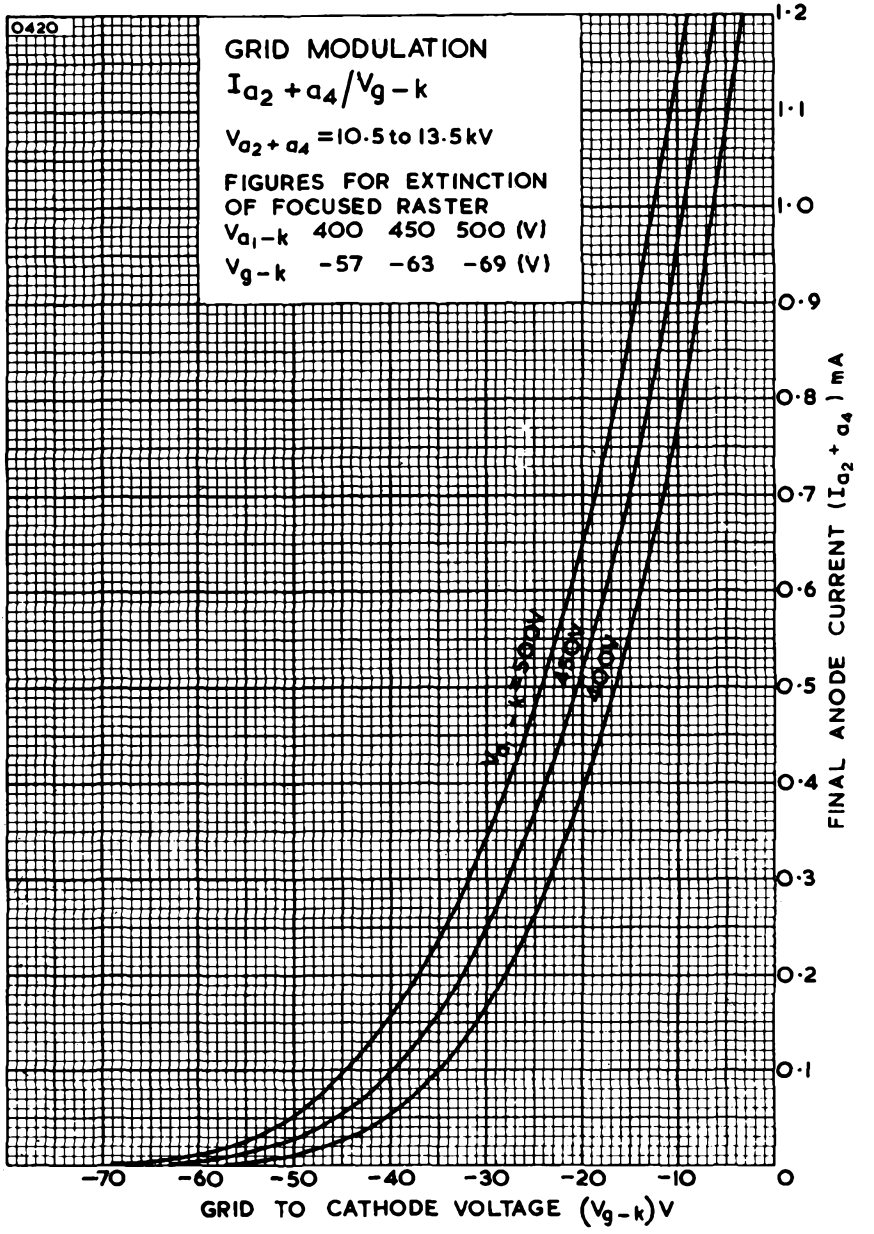
M31-184..

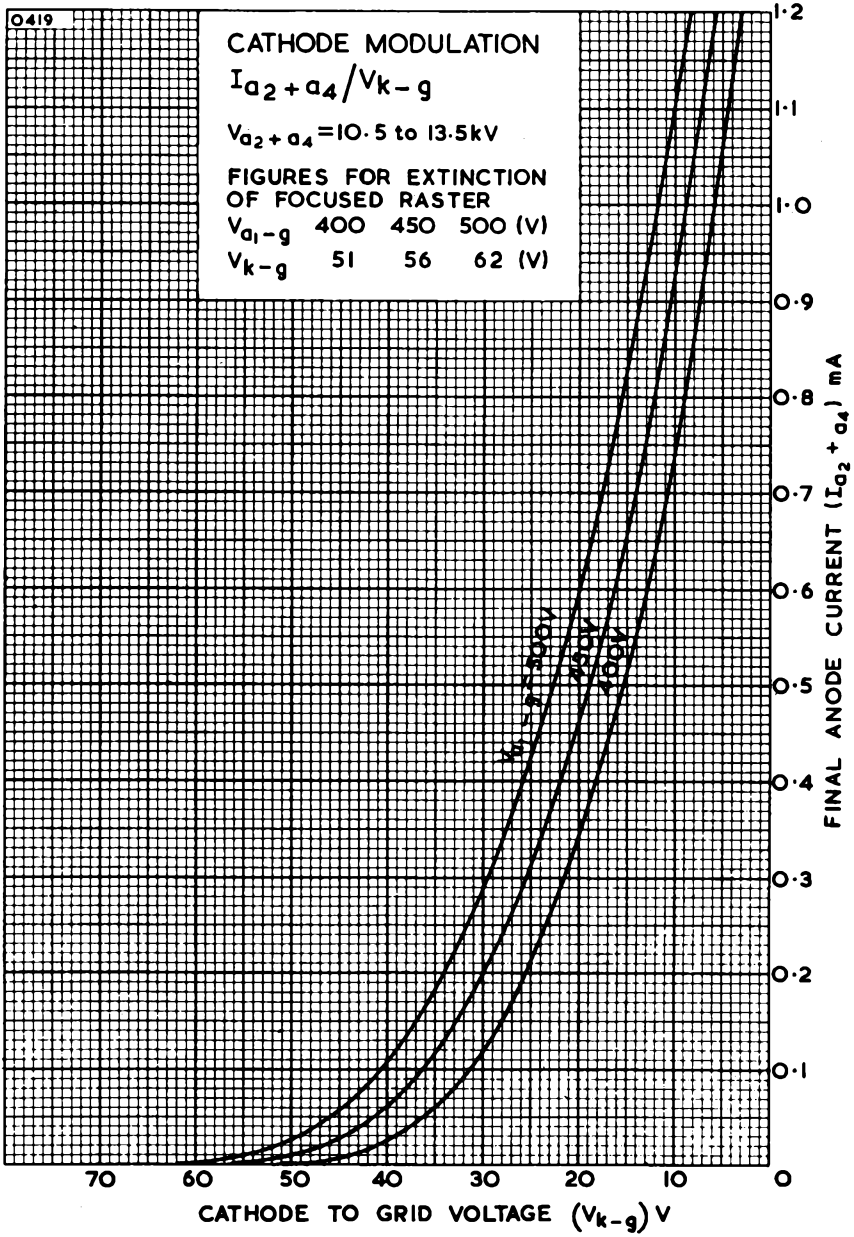


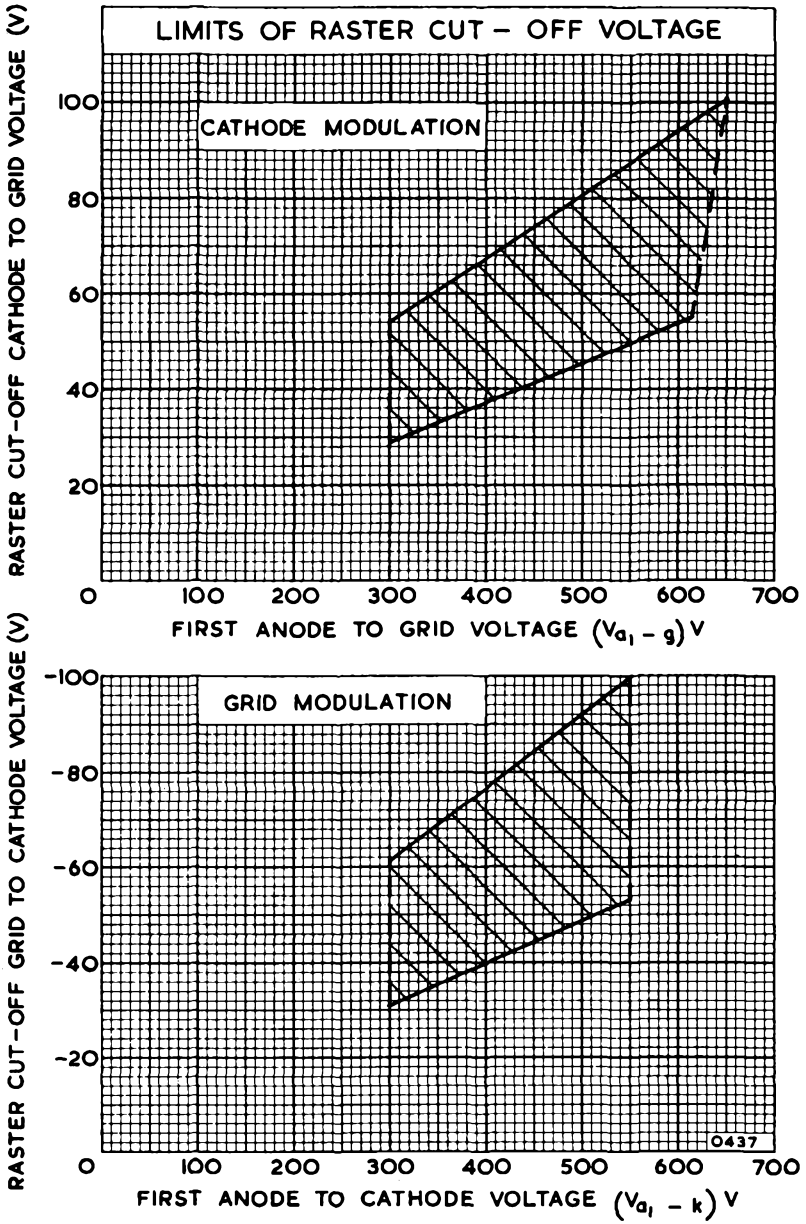


MAXIMUM DIMENSIONS FOR CONE PROFILE CO-ORDINATES

Reference Plane No.	0° Major	10°	20°	30°	Diag.	40°	50°	60°	70°	80°	90° Minor
1	140.2	141.5	146.0	154.0	157.8	154.6	136.7	123.5	115.5	111.0	109.6
2	137.8	139.2	143.4	151.1	154.1	151.5	134.3	121.6	113.7	109.4	108.1
3	133.9	134.8	137.8	143.0	145.3	143.2	129.4	118.4	111.1	107.3	106.0
4	127.3	127.7	129.3	132.0	133.2	132.1	122.3	113.2	107.2	103.8	102.6
5	116.4	116.8	117.7	119.2	120.0	119.3	112.8	105.9	101.5	98.6	98.1
6	103.0	103.2	103.8	104.8	105.2	104.7	101.5	97.0	94.2	92.5	91.9
7	87.0	87.1	87.2	87.4	87.8	87.1	85.9	84.6	83.6	83.0	82.8
8	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3	68.3

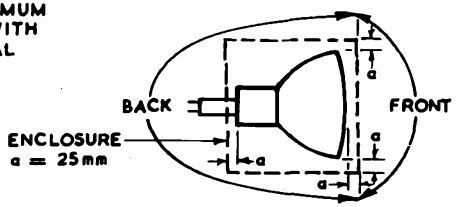

0420
GRID MODULATION
$I_{a_2+a_4}/V_{g-k}$
$V_{a_2+a_4}$ = 10·5 to 13·5 kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-k} 400 450 500 (V)
V_{g-k} -57 -63 -69 (V)
400V
450V
500V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT ($I_{a_2+a_4}$) mA
-70
-60
-50
-40
-30
-20
-10
0
GRID TO CATHODE VOLTAGE (V_{g-k}) V


0419
CATHODE MODULATION
$I_{a_2+a_4}/V_{k-g}$
$V_{a_2+a_4}$ = 10·5 to 13·5kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-g} 400 450 500 (V)
V_{k-g} 51 56 62 (V)
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
FINAL ANODE CURRENT ($I_{a_2+a_4}$) mA
70 60 50 40 30 20 10 0
CATHODE TO GRID VOLTAGE (V_{k-g}) V

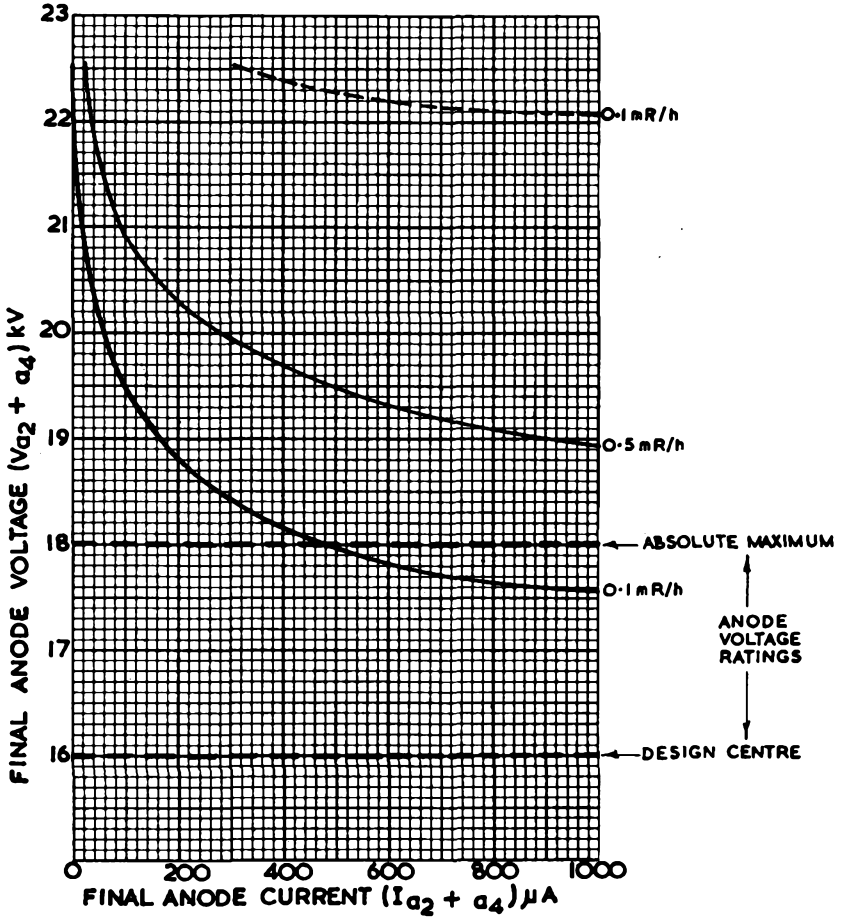

LIMITS OF RASTER CUT – OFF VOLTAGE
CATHODE MODULATION
RASTER CUT-OFF CATHODE TO GRID VOLTAGE (V)
100
80
60
40
20
0
100
200
300
400
500
600
700
FIRST ANODE TO GRID VOLTAGE (Va1 – g) V
GRID MODULATION
RASTER CUT-OFF GRID TO CATHODE VOLTAGE (V)
-100
-80
-60
-40
-20
0437
FIRST ANODE TO CATHODE VOLTAGE (Va1 – k) V

X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM.

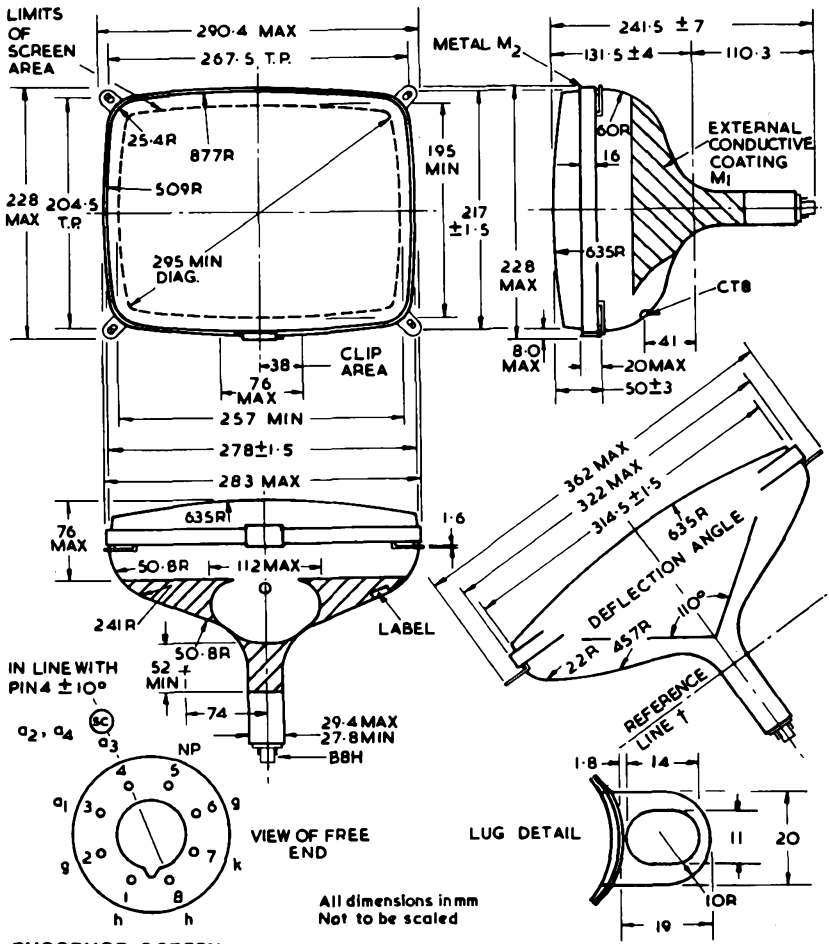


RADIATION FROM FRONT OF TUBE - - - -
RADIATION FROM BACK OF TUBE ———



M31-185.. Data Display or Monitor Tube

The M31-185.. is the M31-182.. with a tinted bonded faceplate giving a total glass transmission of approximately 15%. The M31-185.. has external conductive coating dimensions as shown below which also differ from the M31-182..



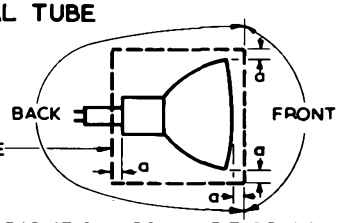
PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M31-185GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

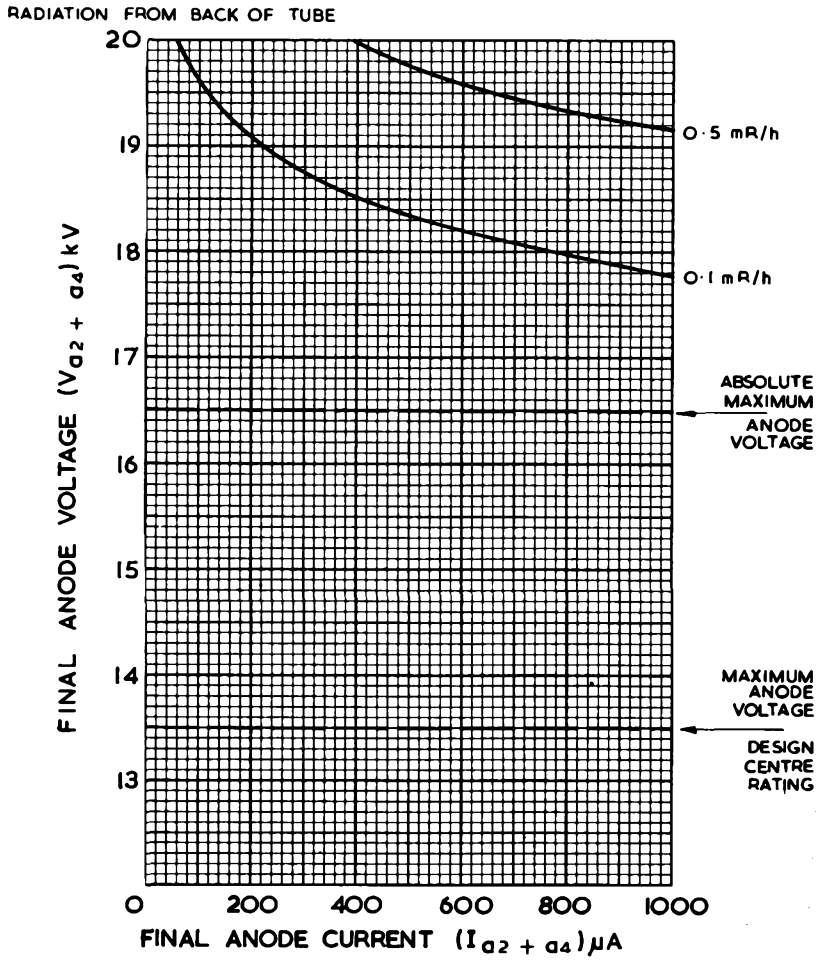
† Determined by reference line gauge No.16. (B.S.RL4: IEC67-IV-3: JEDEC126)
Minimum screen area 477 cm^2

X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM



UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1 mR/h

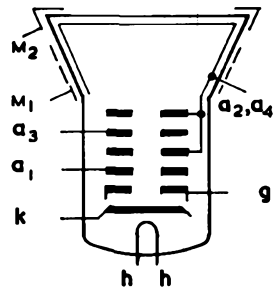


M31-190.. Data Display or Monitor Tube

GENERAL

Rectangular face, 31 cm (12in), 90° diagonal
Rimguard III reinforced envelope**
Integral mounting lugs, 20 mm dia. neck
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 50% transmission (approx.)
Straight gun, non ion trap
External conductive coating

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



DESIGN CENTRE RATINGS Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10.5*	kV
Maximum third anode voltage - range	$V_{a3(max)}$	-50 to +500	V
Maximum first anode voltage	$V_{a1(max)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	100	V
Maximum peak negative grid voltage	$-v_{g(max)}$	350§	V
Maximum positive grid voltage	$V_{g(max)}$	0¶	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	110	V
Maximum peak heater to cathode voltage, heater negative	$v_{h-k(pk)max}$	130	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

All voltages referred to cathode

† The absolute rating of 16.5kV must not be exceeded.

* Absolute minimum rating is 8.5 kV.

§ Maximum pulse duration 22% of one cycle with a maximum of 1.5 ms.

¶ A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

** This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M31-190GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	3.0*	pF
Grid to all	c_{g-all}	4.0*	pF
Anodes 2 and 4 to coating M_1	$c_{a2+a4-M1}$	700	pF
Anodes 2 and 4 to shell M_2 (approx.)	$c_{a2+a4-M2}$	200	pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation (Voltages referred to cathode)

Second and fourth anode voltage	$V_{a2+a4-k}$	12	kV
First anode voltage	V_{a1-k}	250	V
Third anode voltage range for focus	V_{a3-k}	0 to 350	V
Average peak to peak picture modulating voltage up to 250μA		33	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-35 to -69	V

TYPICAL OPERATION - Cathode modulation (Voltages referred to grid)

Second and fourth anode voltage	$V_{a2+a4-g}$	12	kV
First anode voltage	V_{a1-g}	250	V
Third anode voltage range for focus	V_{a3-g}	0 to 350	V
Average peak to peak picture modulating voltage up to 250μA		26	V
Cathode to grid voltage for cut-off of raster	V_{k-g}	32 to 58	V

This data should be read in conjunction with Operational Recommendations for Industrial Cathode Ray Tubes.

MOUNTING

Any mask used in the mounting of this tube should be flexible enough to take up small variations in fixing and bulb contours.

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

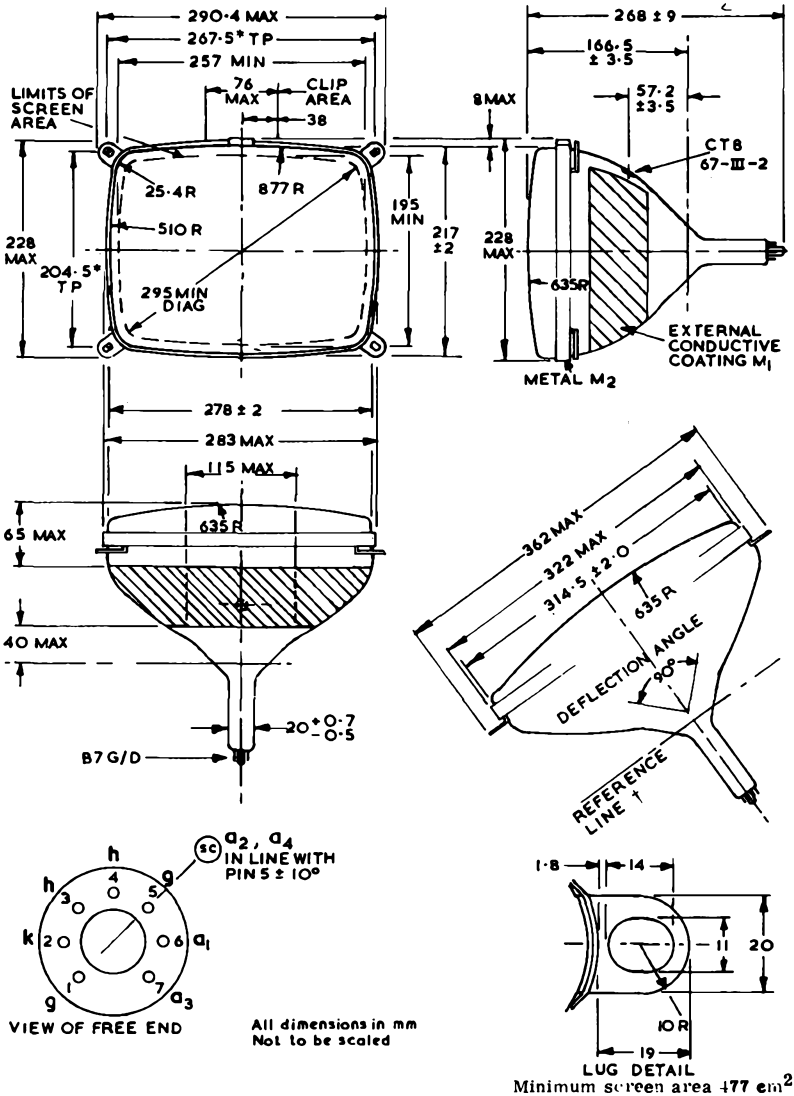
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle of 36 mm diameter which is centred on the perpendicular from the centre of the face.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal shell (M_2) should be connected to the chassis in an a.c. receiver operating from an isolating transformer, or via a suitable leakage path in an a.c./d.c. receiver, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

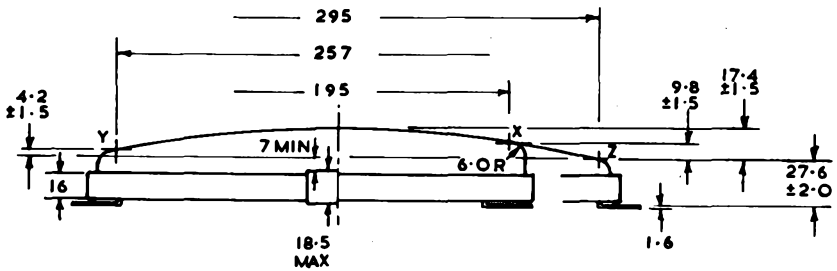
TUBE WEIGHT (approximate) - net 3.0 kg (6.5lb)

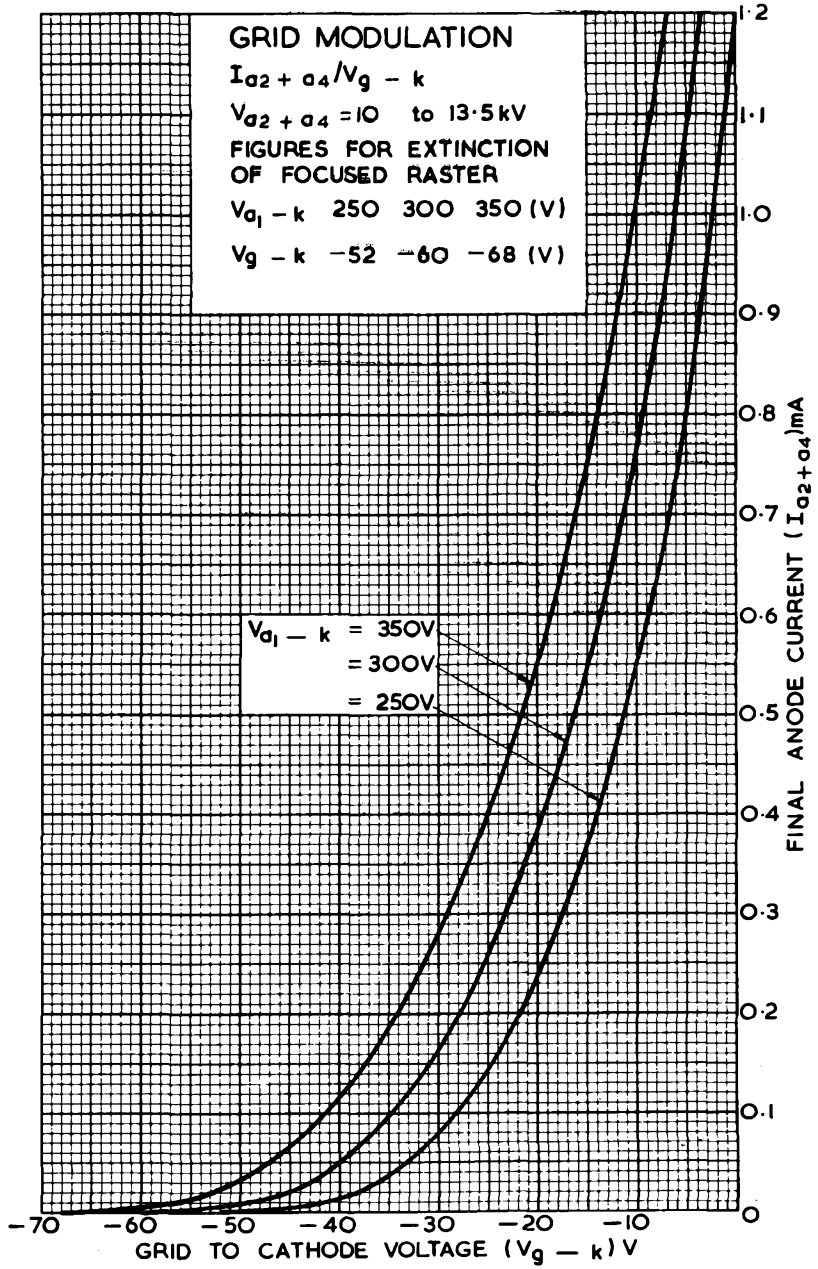


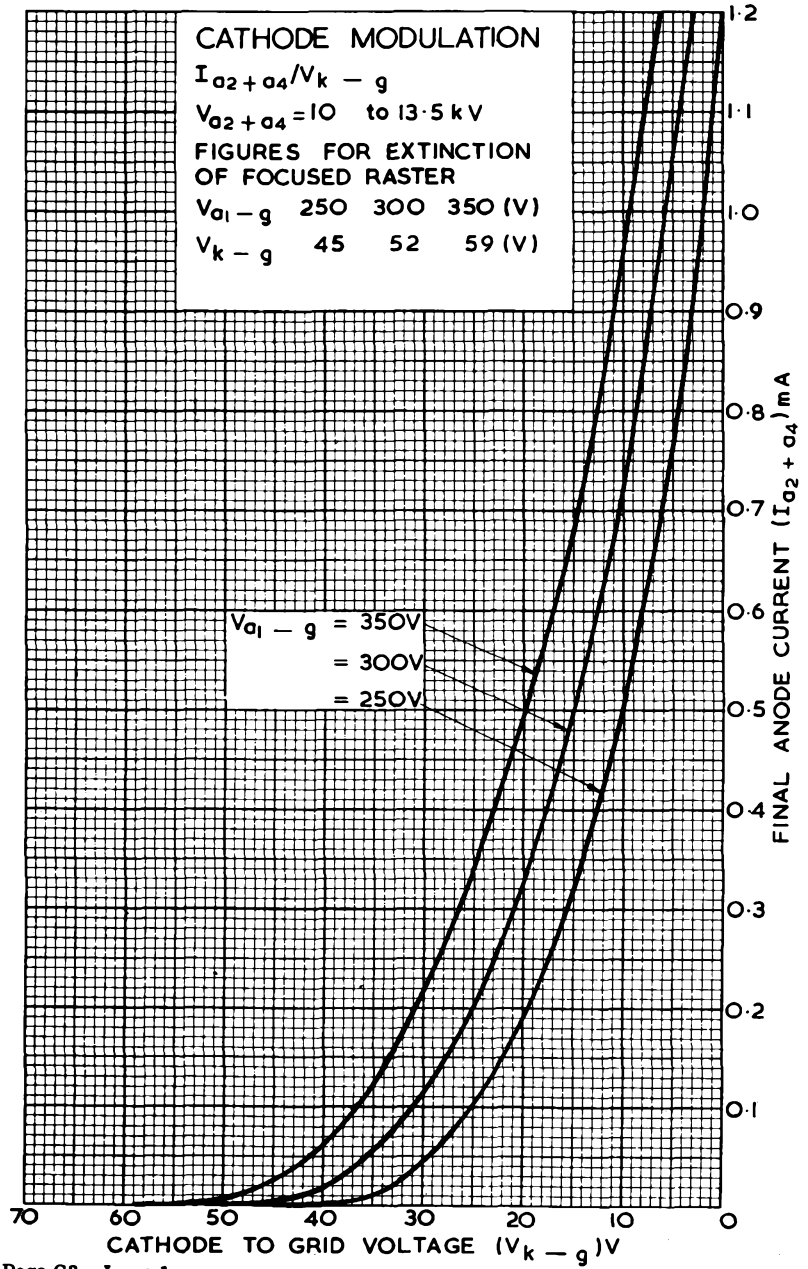
Minimum screen area 477 cm^2

* The bolts to be used for mounting the tube must lie within circles of 7.0mm diameter centred on these true positions. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs.

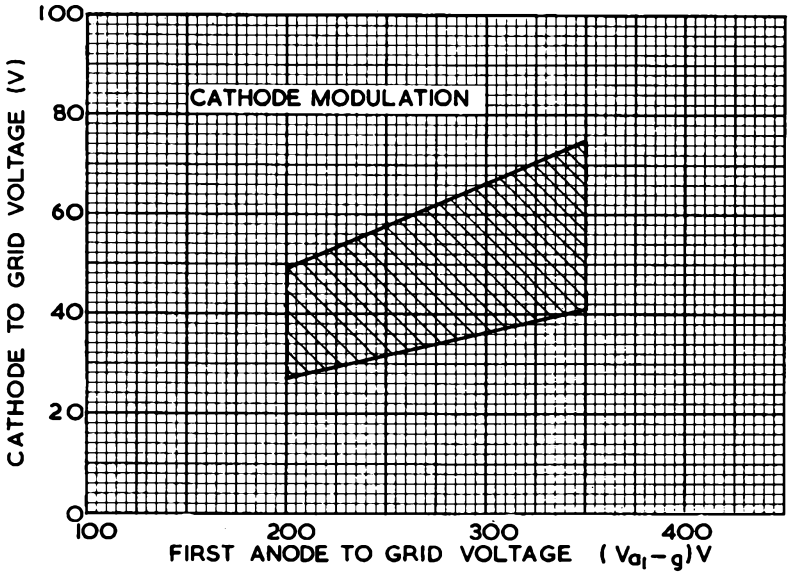
† Determined by reference line gauge No. 20. (See T.D.S. 5-0-91-20)

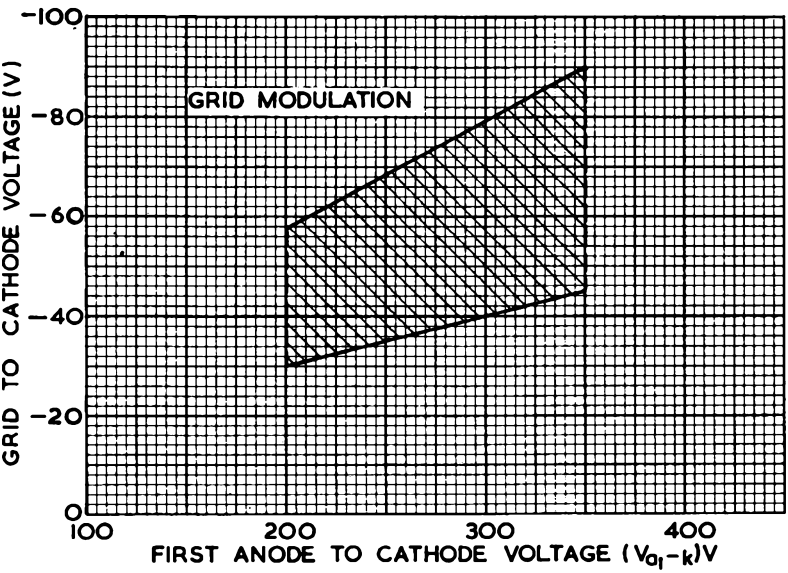

295
257
195
4·2
±1·5
9·8
±1·5
17·4
±1·5
Y
X
Z
7 MIN
6·0 R
16
27·6
±2·0
18·5
MAX
1·6


GRID MODULATION
$I_{a2+a4}/V_g - k$
V_{a2+a4} = 10 to 13·5 kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
$V_{a_1} - k$ 250 300 350 (V)
$V_g - k$ −52 −60 −68 (V)
$V_{a_1} - k$ = 350V
= 300V
= 250V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT (I_{a2+a4}) mA
−70 −60 −50 −40 −30 −20 −10
GRID TO CATHODE VOLTAGE ($V_g - k$) V


CATHODE MODULATION
$I_{a2+a4}/V_k - g$
V_{a2+a4} = 10 to 13·5 kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
$V_{a1} - g$ 250 300 350 (V)
$V_k - g$ 45 52 59 (V)
$V_{a1} - g$ = 350V
= 300V
= 250V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
FINAL ANODE CURRENT (I_{a2+a4}) mA
70
60
50
40
30
20
10
0
CATHODE TO GRID VOLTAGE ($V_k - g$) V

LIMITS OF RASTER CUT-OFF VOLTAGE

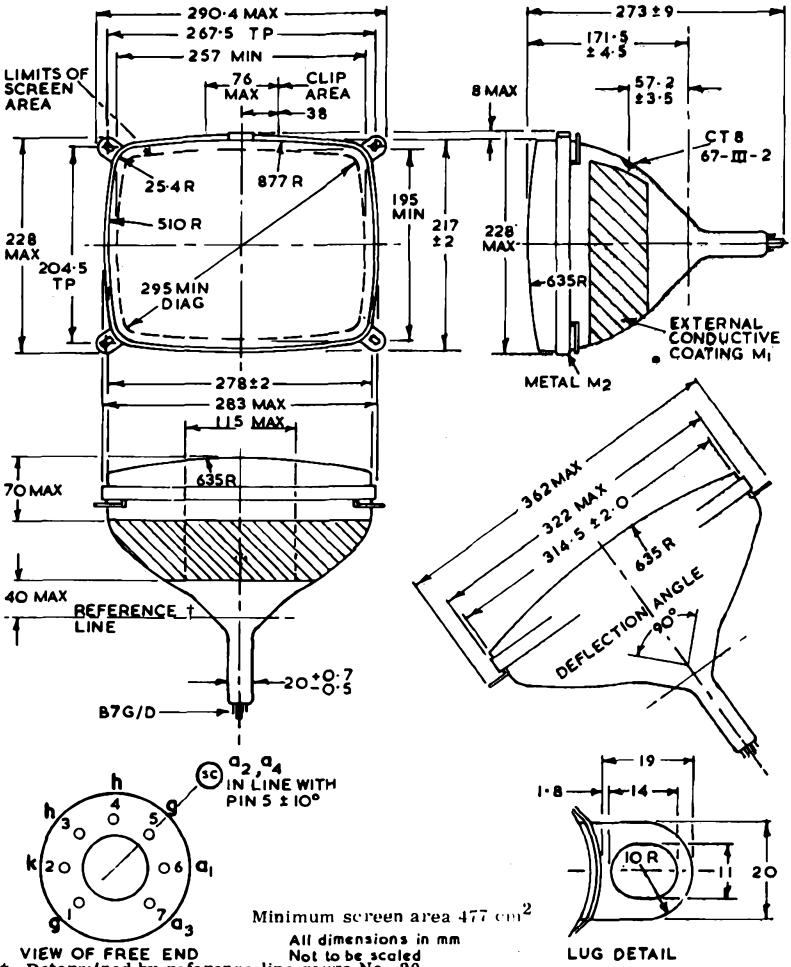




M31-191..

Data Display or Monitor Tube

The M31-191.. is the M31-190.. with a tinted bonded face-plate giving a total glass transmission of approximately 15% and the surface treated to reduce specular reflections.



Minimum screen area 477 cm^2

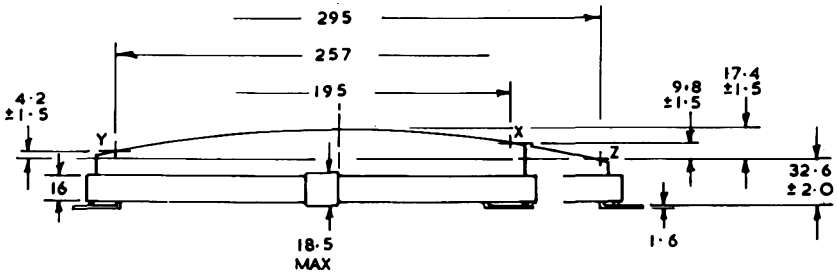
All dimensions in mm
Not to be scaled

† Determined by reference line gauge No. 20

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M31-191GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - net 3.6 kg

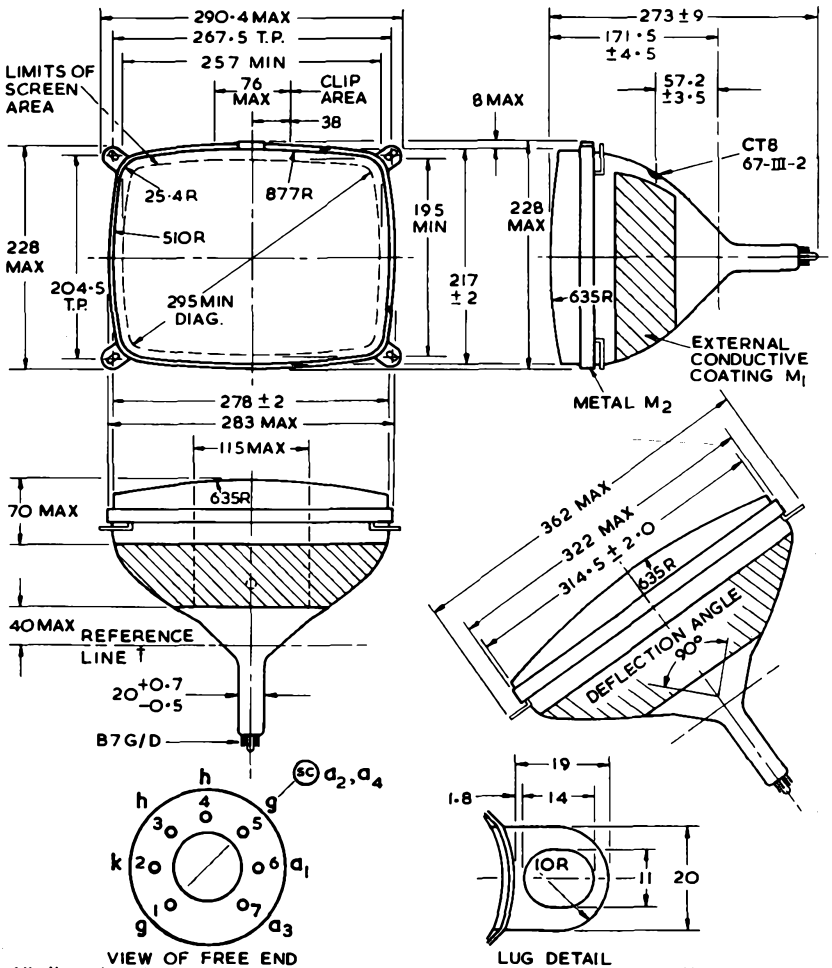


MOUNTING

The bolts to be used for mounting the tube must lie within circles of 7.0 mm diameter centred on the lug holes true positions. One of the four lugs may deviate 2.0mm maximum from the plane through the other three lugs.

M31-192.. Data Display or Monitor Tube

The M31-192.. is the M31-190.. with a bonded face-plate giving a total glass transmission of approximately 50%.



All dimensions in mm

Not to be scaled

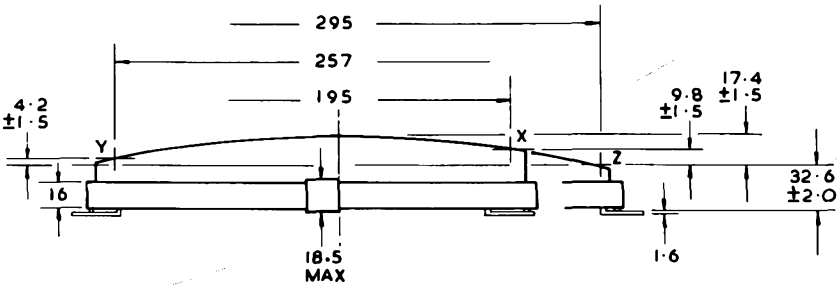
Minimum screen area 477 cm^2

† Determined by reference line gauge No. 20

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M31-192W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate)-net 3.6 kg



MOUNTING

The bolts to be used for mounting the tube must lie within circles of 7.0 mm diameter centred on the lug holes true positions. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs.

M31-212..

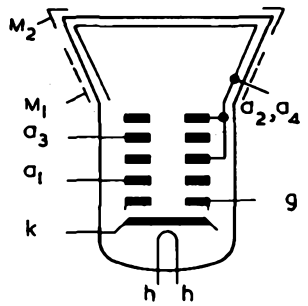
Data Display Tube

PRELIMINARY DATA

GENERAL

Rectangular face, 31cm (12in). 90° diagonal tube specifically designed for high character density data display applications.
Bonded tinted face-plate treated to reduce specular reflection.** Aluminised screen.
Integral mounting lugs, 20 mm dia. neck.
Electrostatic focus, magnetic deflection.
Grey glass, 15% total transmission (approx).
External conductive coating.

Heater voltage	V_h	11	V
Heater current	I_h	75	mA



DESIGN CENTRE RATINGS Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	13.5 †	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10.5 *	kV
Maximum third anode voltage - range	$V_{a3(max)}$	-50 to +500	V
Maximum first anode voltage	$V_{a1(max)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	100	V
Maximum peak negative grid voltage	$-V_{g(max)}$	350 §	V
Maximum positive grid voltage	$V_{g(max)}$	0 ¶	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	110	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	130	V
Maximum impedance, grid to cathode (50Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

All voltages referred to cathode

† The absolute rating of 16.5kV must not be exceeded.

* Absolute minimum rating is 8.5 kV.

§ Maximum pulse duration 22% of one cycle with a maximum of 1.5 ms.

¶ A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

**This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M31-212GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all	C_{k-all}	3.0*	pF
Grid to all	C_{g-all}	4.0*	pF
Anodes 2 and 4 to coating M_1	$C_{a2+a4-M1}$	700	pF
Anodes 2 and 4 to shell M_2 (Approx)	$C_{a2+a4-M2}$	200	pF

* Holder capacitance balanced out.

TYPICAL OPERATION - Grid modulation (Voltages referred to cathode)

Second and fourth anode voltage	$V_{a2+a4-k}$	12	kV
First anode voltage	V_{a1-k}	300	V
Third anode voltage for best overall focus*	V_{a3-k}	0 to 350	V
Drive for peak beam current of 200μA		32	V
Grid to cathode voltage for cut-off of raster	V_{g-k}	-40 to -79	V

TYPICAL OPERATION - Cathode modulation (Voltages referred to grid)

Second and fourth anode voltage	$V_{a2+a4-g}$	12	kV
First anode voltage	V_{a1-g}	350	V
Third anode voltage for best overall focus*	V_{a3-g}	0 to 350	V
Drive for peak beam current of 200μA		28	V
Cathode to grid voltage for cut-off of raster	V_{k-g}	41 to 75	V

* RESOLUTION IN DATA DISPLAYS

The spot performance over the screen is sufficiently uniform to permit a focus setting within this range which allows rapid and positive recognition of alpha-numeric characters of density 2000 max. (i.e. character size 2.8 mm x 5 mm minimum) If it is required to pass through the point of focus at any point on the screen a focus range of -50V to 400V with respect to cathode should be provided.

This data should be read in conjunction with Operational and Safety Recommendations for Industrial Cathode Ray Tubes

MOUNTING

Any mask used in the mounting of this tube should be flexible enough to take up small variations in fixing and bulb contours.

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the JCT8 cap, the tube should not be handled in this region.

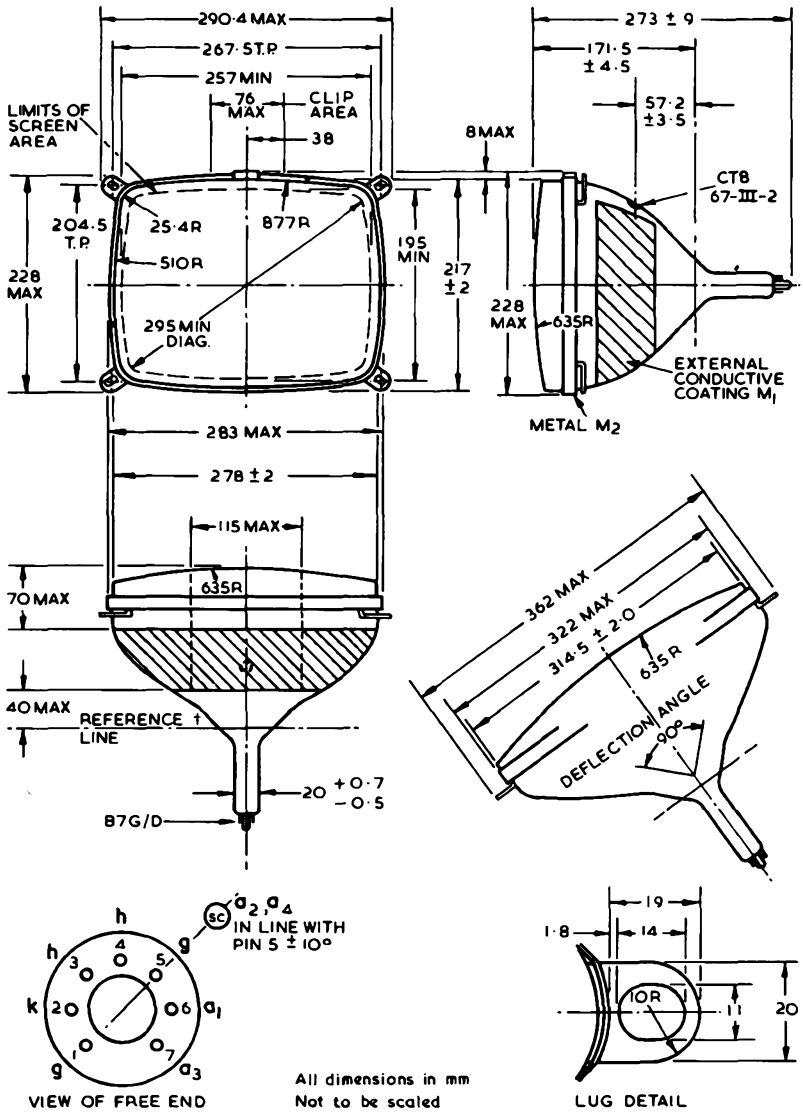
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle of 36 mm diameter which is centred on the perpendicular from the centre of the face.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal shell (M_2) should be connected to the chassis in an a.c. receiver operating from an isolating transformer, or via a suitable leakage path in an a.c./d.c. receiver, for example 2 MΩ.

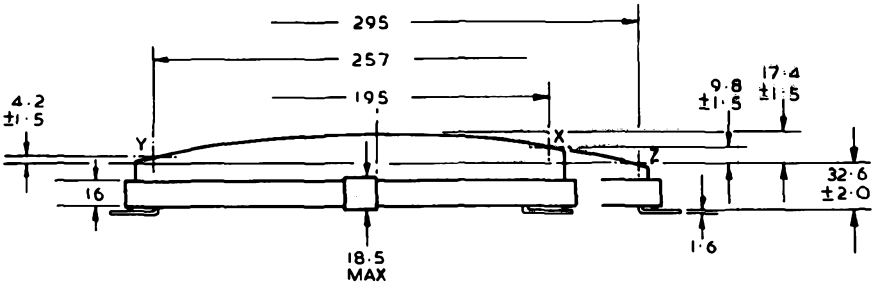
When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 3.6 kg.



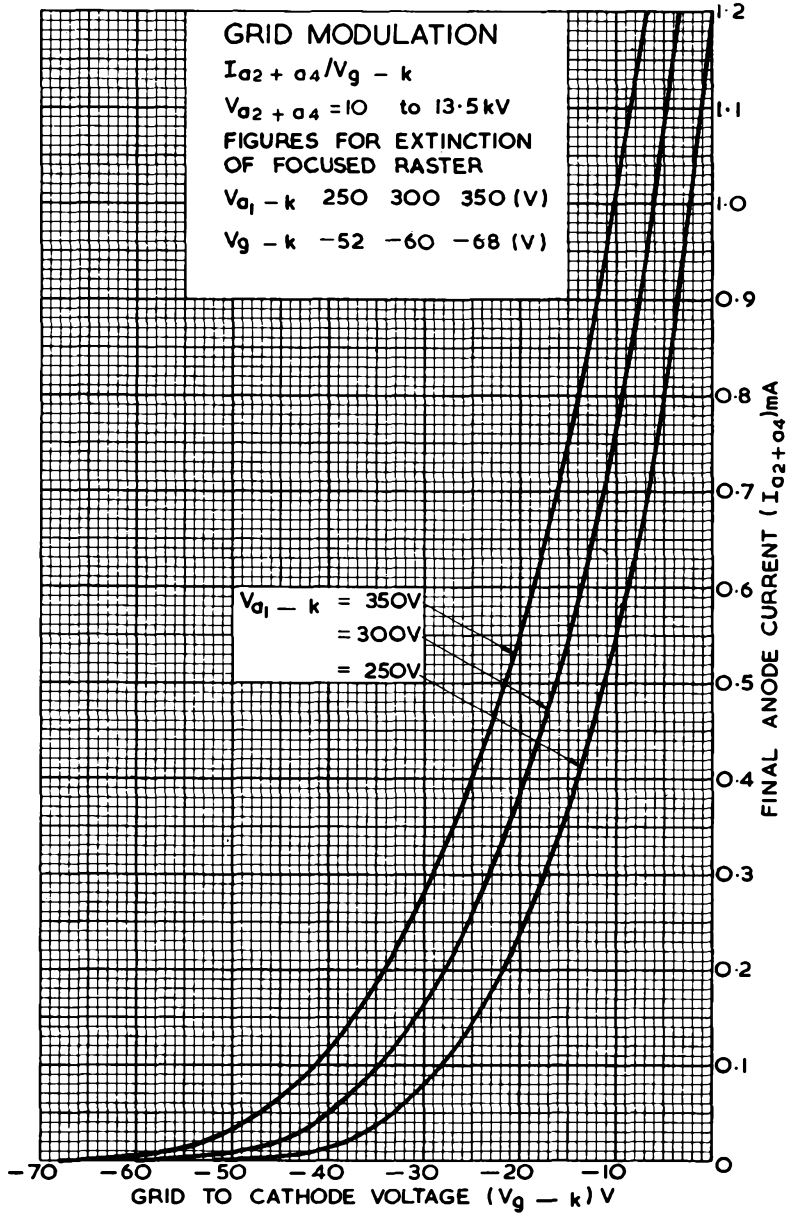
Minimum screen area 477 cm^2

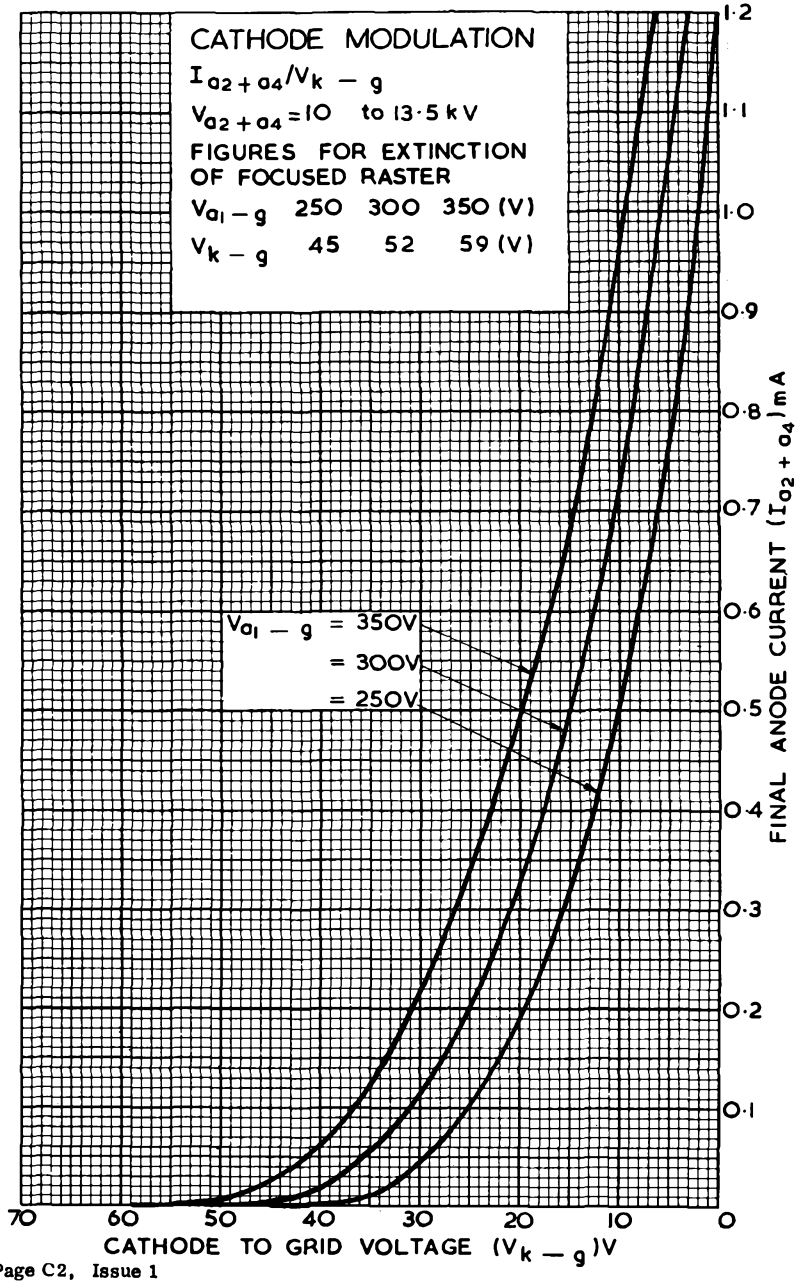
† Determined by reference line gauge No. 20



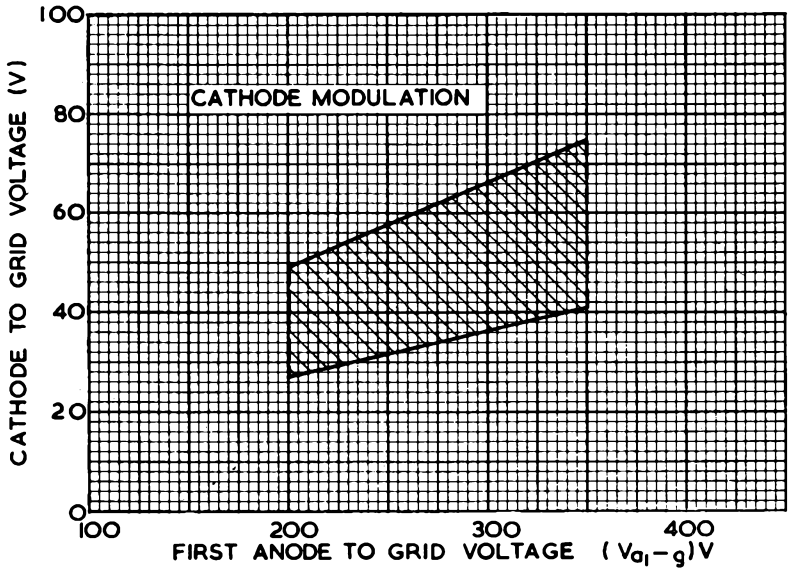
MOUNTING

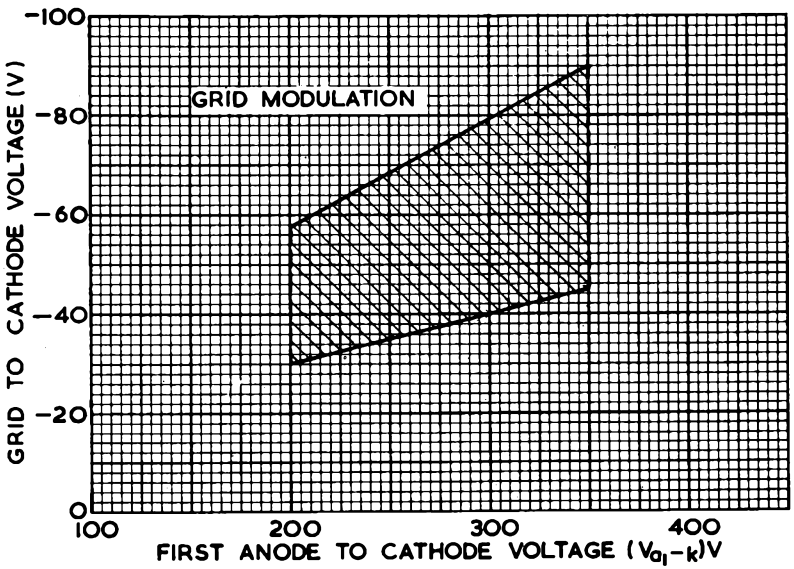
The bolts to be used for mounting the tube must lie within circles of 7.0 mm diameter centred on the lug holes true positions. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs.


GRID MODULATION
$I_{a2+a4}/V_g - k$
V_{a2+a4} = 10 to 13·5kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
$V_{a_1} - k$ 250 300 350 (V)
$V_g - k$ −52 −60 −68 (V)
$V_{a_1} - k$ = 350V
= 300V
= 250V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT (I_{a2+a4})mA
−70 −60 −50 −40 −30 −20 −10
GRID TO CATHODE VOLTAGE ($V_g - k$) V


CATHODE MODULATION
I_{a2+a4}/V_{k-g}
V_{a2+a4} = 10 to 13·5 kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a1-g} 250 300 350 (V)
$V_k - g$ 45 52 59 (V)
V_{a1-g} = 350V
= 300V
= 250V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
FINAL ANODE CURRENT (I_{a2+a4}) mA
70 60 50 40 30 20 10 0
CATHODE TO GRID VOLTAGE (V_{k-g}) V

LIMITS OF RASTER CUT-OFF VOLTAGE

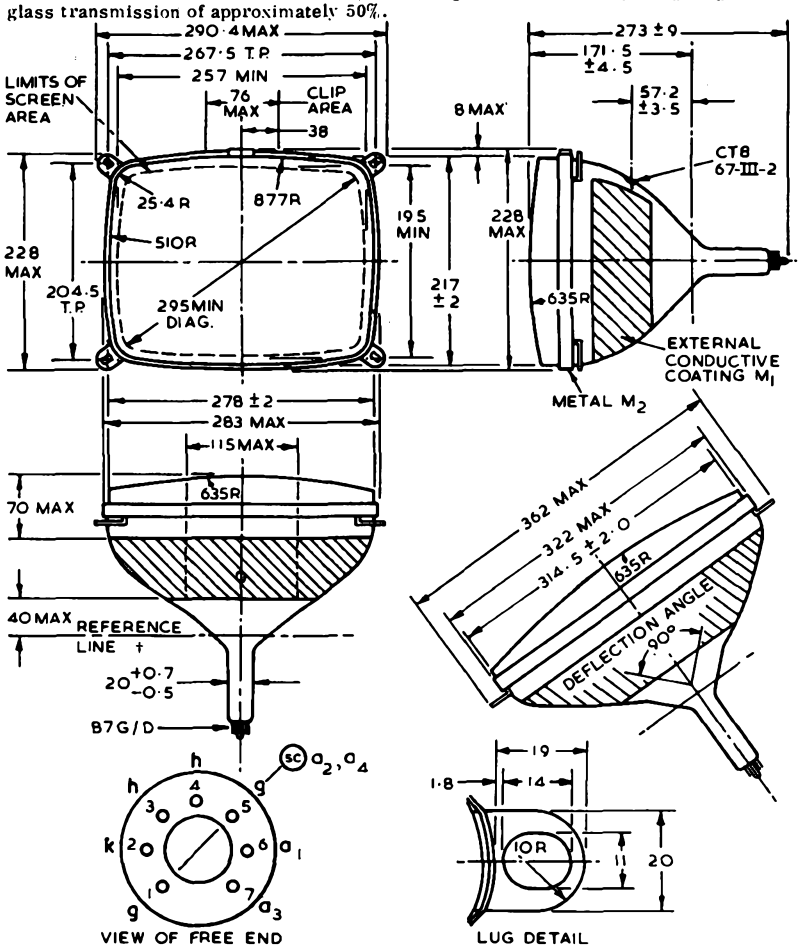




M31-213..

Data Display Tube

The M31-213.. is the M31-212.. with a clear glass bonded face-plate giving a total glass transmission of approximately 50%.



All dimensions in mm

Not to be scaled

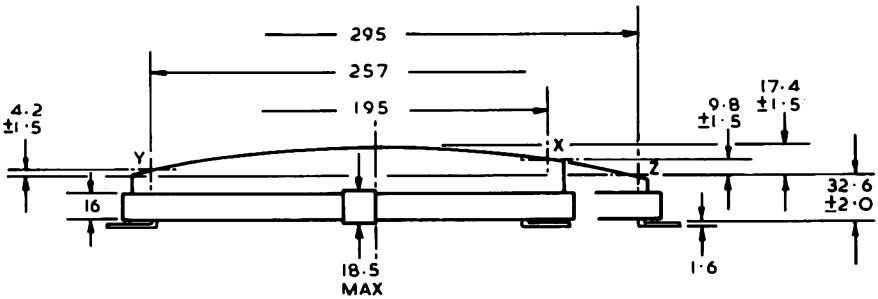
† Determined by reference line gauge No. 20.

Minimum screen area 477 cm^2

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M31-213GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

TUBE WEIGHT (approximate) - net 3.6 kg.



MOUNTING

The bolts to be used for mounting the tube must lie within circles of 7.0 mm diameter centred on the lug holes true positions. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs.

M36-141.. Data Display or Monitor Tube

GENERAL

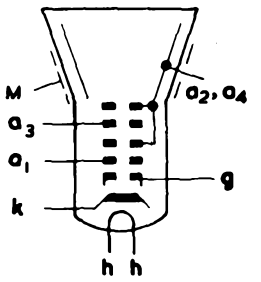
Rectangular face, 36 cm 70° diagonal tube

Grey glass, 60% transmission (approx.)

Electrostatic focus, magnetic deflection

Straight gun, aluminised screen

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3*	A



ABSOLUTE RATINGS - voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	180	V
Maximum peak heater to cathode voltage heater negative	$V_{h-k(pk)max}$	400†	V

* In a series heater chain the C.R.T. should always be connected at the chassis end.

† During a warming up period not exceeding one minute.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M36-141W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

If this tube is operated at voltages in excess of 18 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range. The normal glass protective viewing window may provide such a safeguard. If the radiation measured in contact with this window does not exceed 0.5 millirontgens per hour, the window will normally provide adequate protection.

INTER-ELECTRODE CAPACITANCES

Cathode to all	C_{k-all}	7.0*	pF
Grid to all	C_{g-all}	9.0*	pF
Anodes 2 and 4 to external conductive coating, M (approximate)	$C_{a2+a4-M}$	1300	pF

* Total capacitances including a typical holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode

Second and fourth anode voltage	V_{a2+a4}	12	kV
First anode voltage	V_{a1}	300	V
Third anode voltage range for focus	V_{a3}	-200 to +200†	V
Grid to cathode voltage for cut-off of raster	V_g	-30 to -72	V
Average peak to peak modulating voltage for modulation up to 150 μA		24	V

† The change of spot size with variation of focus voltage is small and the limit of ±200V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus a voltage of at least ±300V will be required.

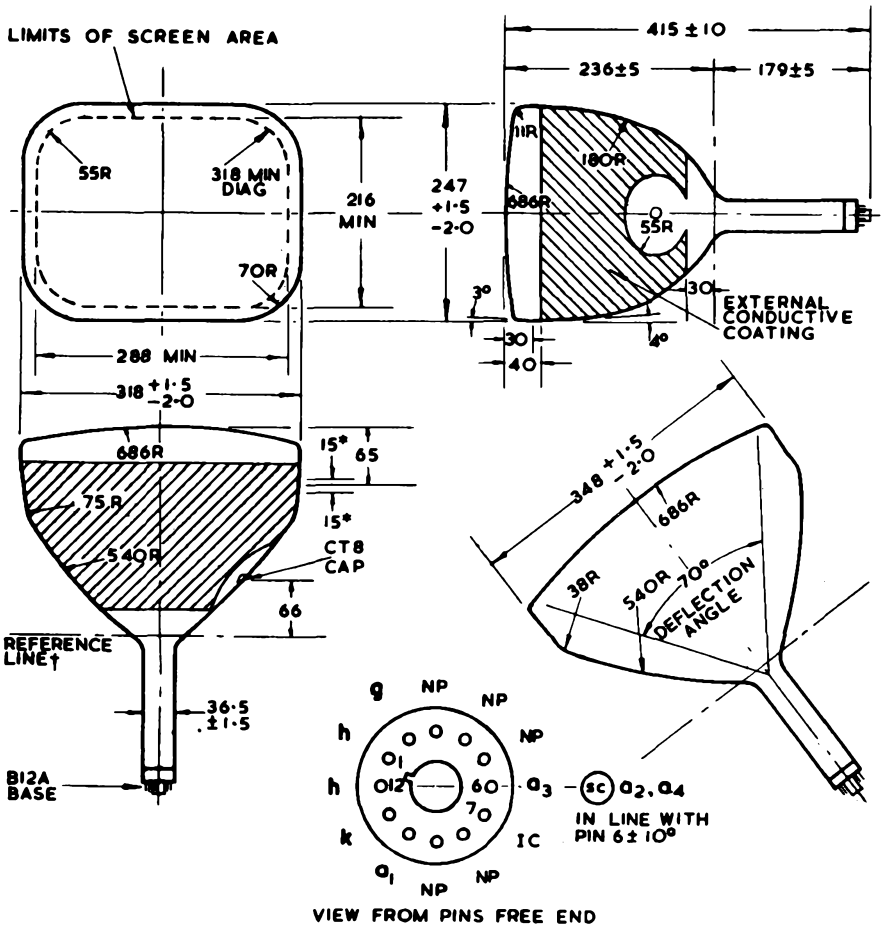
MOUNTING

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - 4.7 kg

Data Display or Monitor Tube



All dimensions in mm

Not to be scaled

There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

* During the face sealing operation the glass in this area (Total 30 mm) may be disturbed. As the shape of the contour within this area may be either convex or concave, the bulb should not be gripped within this region unless special precautions are taken (such as the use of resilient packing material).

† Determined by Reference line gauge No. 12.(See T.D.S. No. 5-0-91-12).

Data Display or Monitor Tube

M36-142..

Maintenance Type

GENERAL

Rectangular face, 14 inch 70° diagonal

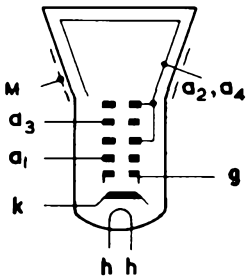
Bonded faceplate protection

Grey glass 60% transmission (approx)

Electrostatic focus, magnetic deflection

Straight gun, aluminised screen

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	10	kV
Maximum third anode voltage	$V_{a3(max)}$	± 500	V
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	180	V
Maximum peak heater to cathode voltage heater negative	$v_{h-k(pk)max}$	400*	V

* During a warming up period not exceeding one minute.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M36-142W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode

Second and fourth anode voltage	V_{a2+a4}	14	kV
First anode voltage	V_{a1}	300	V
Third anode voltage range for focus	V_{a3}	-200 to +200†	V
Grid to cathode voltage for cut-off of raster	V_g	-30 to -72	V
Average peak to peak modulating voltage for modulation up to 150 μA		24	V

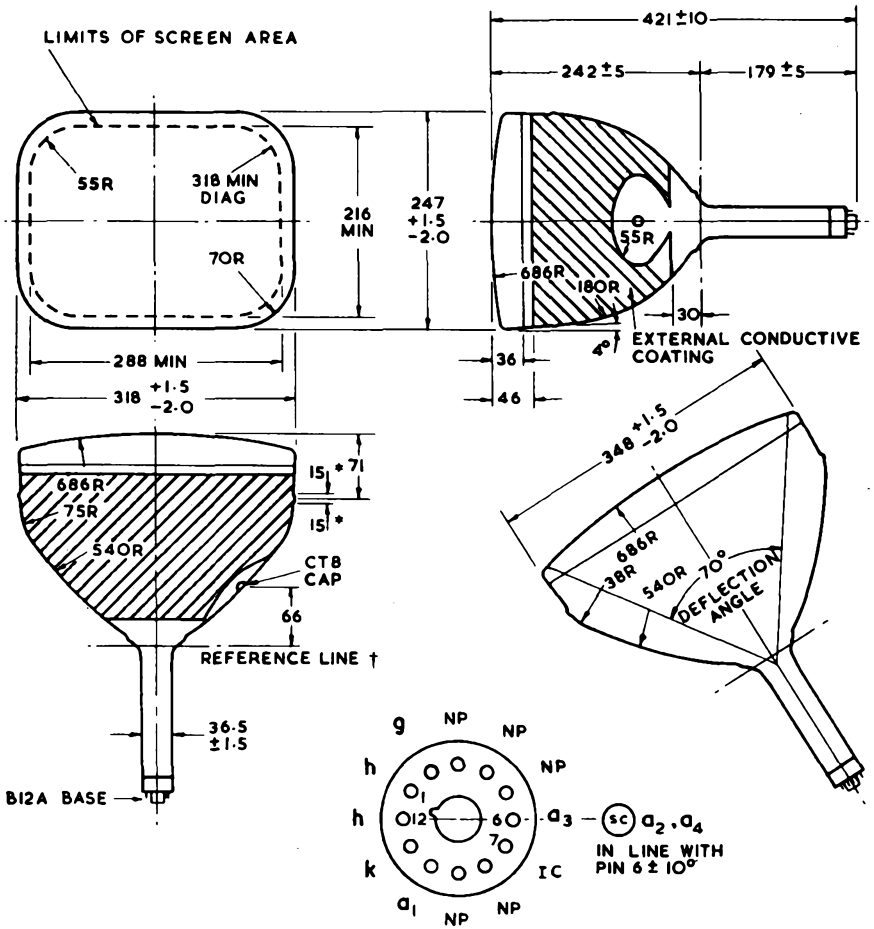
† The change of spot size with variation of focus voltage is small and the limit of ± 200V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus a voltage of at least ± 300V will be required.

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	7.0	pF
Grid to all	c_{g-all}	9.0	pF
Anodes 2 and 4 to external conductive coating, M (approximate)	$c_{a2+a4-M}$	1300	pF

TUBE WEIGHT (approximate) - 5.4 kg

Data Display or Monitor Tube M36-142..



All dimensions in mm

Not to be scaled

There is an annular region of anti-corona coating with an external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

* During the face sealing operation the glass in this area (Total 30 mm) may be disturbed. As the shape of the contour within this area may be either convex or concave, the bulb should not be gripped within this region unless special precautions are taken (such as the use of resilient packing material).

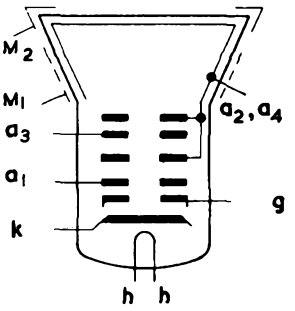
† Determined by Reference line gauge No. 12.

M38-100.. Data Display or Monitor Tube

GENERAL

Rectangular face, 15 inch, 90° diagonal
Rimguard III reinforced envelope
Integral mounting lugs
Electrostatic focus, magnetic deflection
Straight gun. Aluminised screen
Grey glass, 50% transmission (approx)
29.4 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	11.5	V
Heater current	I_h	0.15	A



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	20†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	12	kV
Maximum third anode voltage	$V_{a3(max)}$	± 700	V
Maximum first anode voltage	$V_{a1(max)}$	600	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage. heater negative (d.c.)	$V_{h-k(max)}$	200	V

† $I_{a2+a4} = 0$

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M38-100W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

INTER-ELECTRODE CAPACITANCES		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	6.5	7.5	pF
Anodes 2 and 4 to coating M_1 (approx)	$c_{a2+a4-M1}$	700		pF
Anodes 2 and 4 to frame M_2 (approx)	$c_{a2+a4-M2}$	250		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode

Second and fourth anode voltage	V_{a2+a4}	16		kV
First anode voltage	V_{a1}	400		V
Third anode voltage range for focus	V_{a3}	0 to	400 §	V
Grid to cathode voltage for cut-off of raster	V_g	-38 to	-82	V

§ The change of spot size with variation of focus voltage is small and the limit of 0 to 400 V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus a voltage of at least -100V to +500V will be required.

MOUNTING

This tube is intended for 'push-through' presentation without masking, but if a mask is used it should be flexible enough to take up small variations in fixing and bulb contours.

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

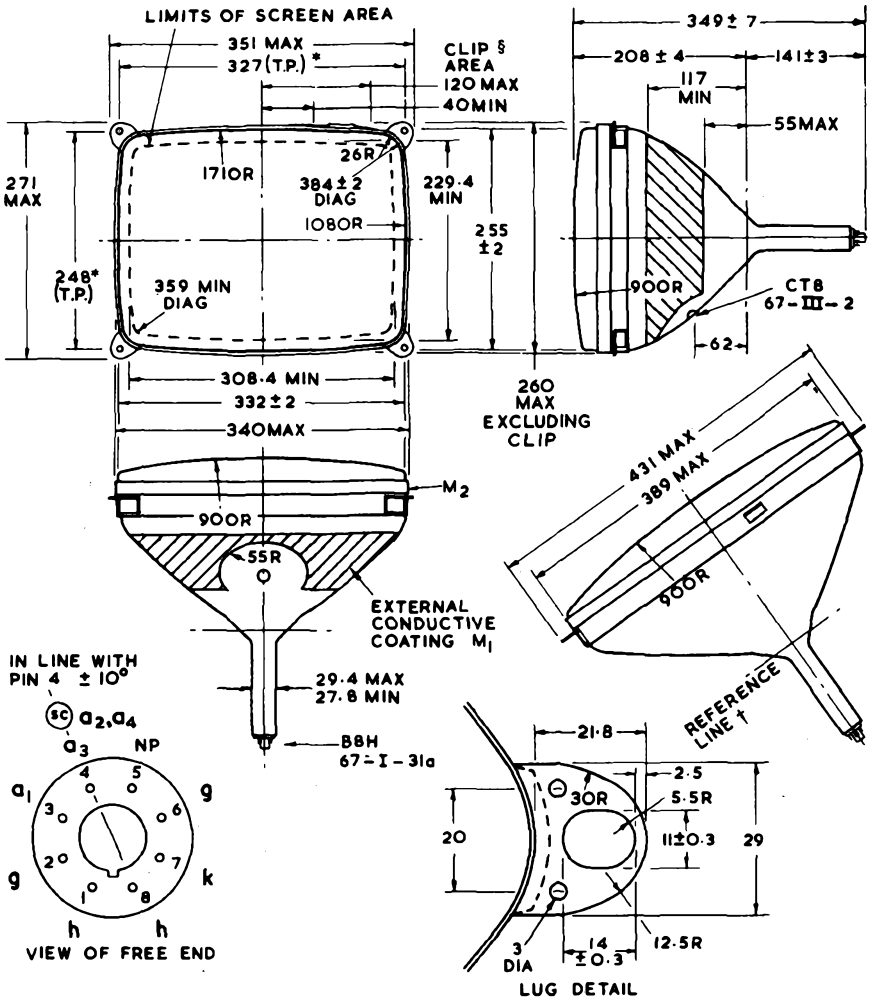
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal frame (M_2) should be connected directly to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c./d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 5.7 kg (12.5 lb)



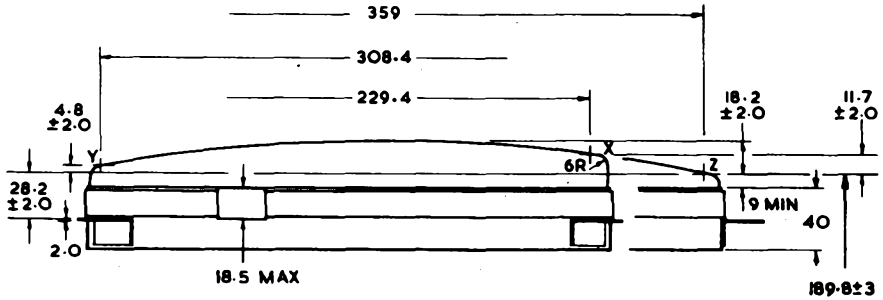
All dimensions in mm — Not to be scaled

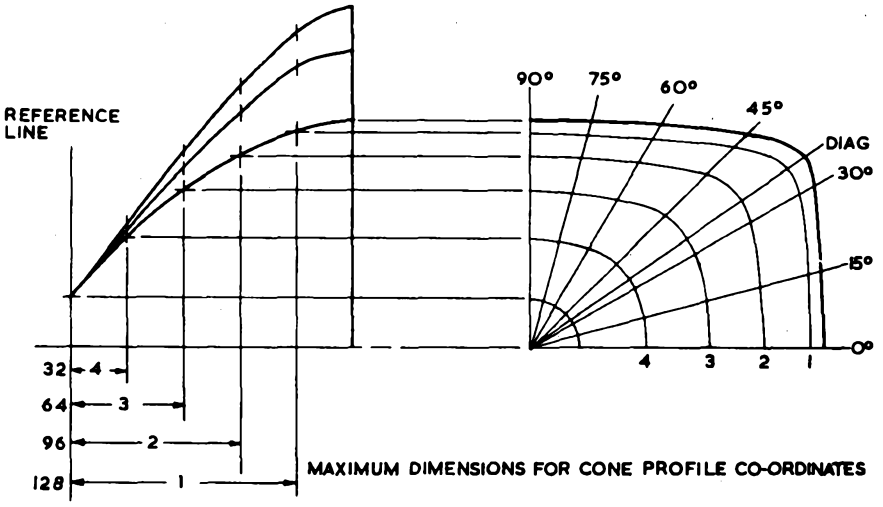
* The bolts to be used for mounting the tube must lie within the circles of 6.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 15.(See T.D.S. No. 5-0-91-15).

§ Total thickness of shell, tension band and clip 8 mm maximum.

Data Display or Monitor Tube M38–100..

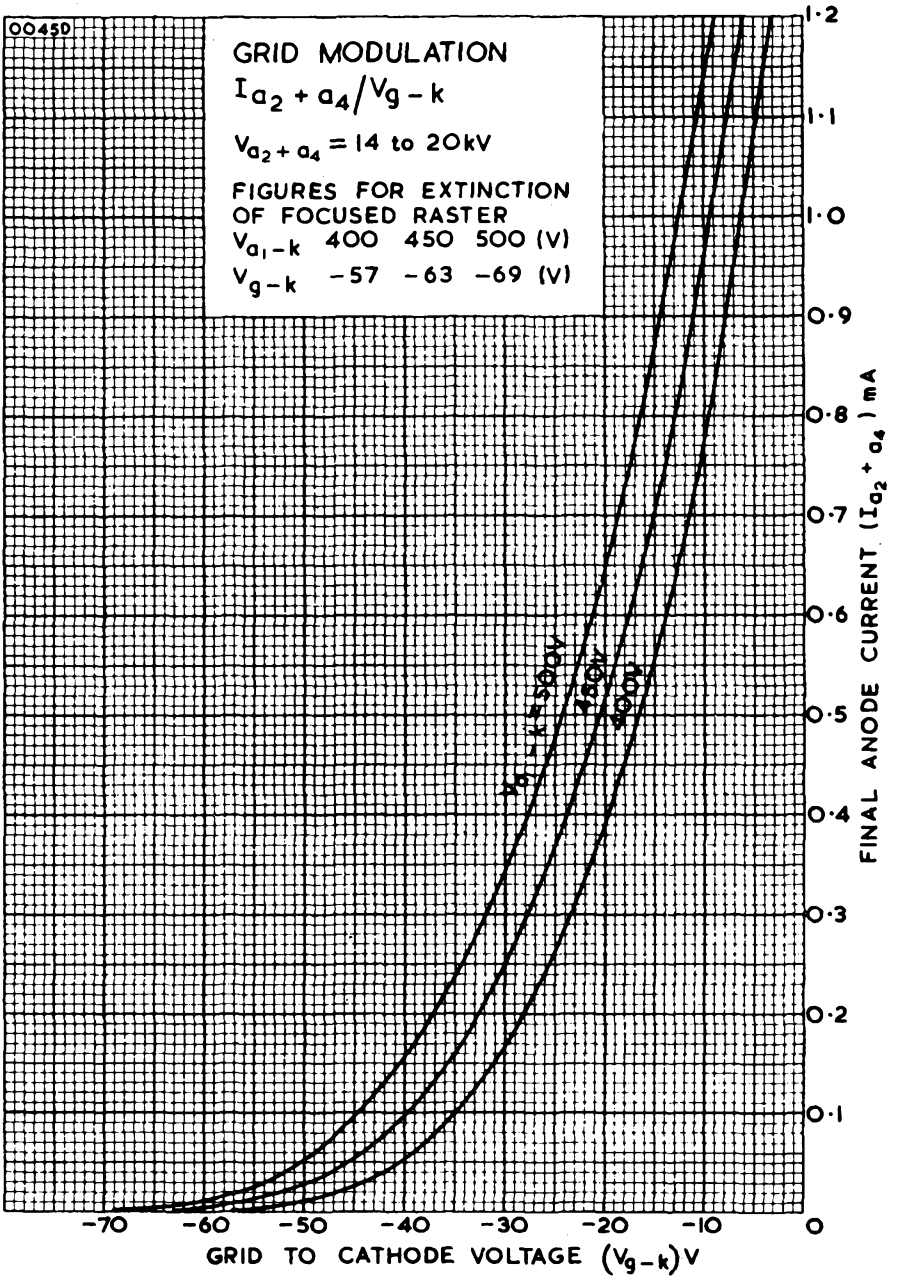


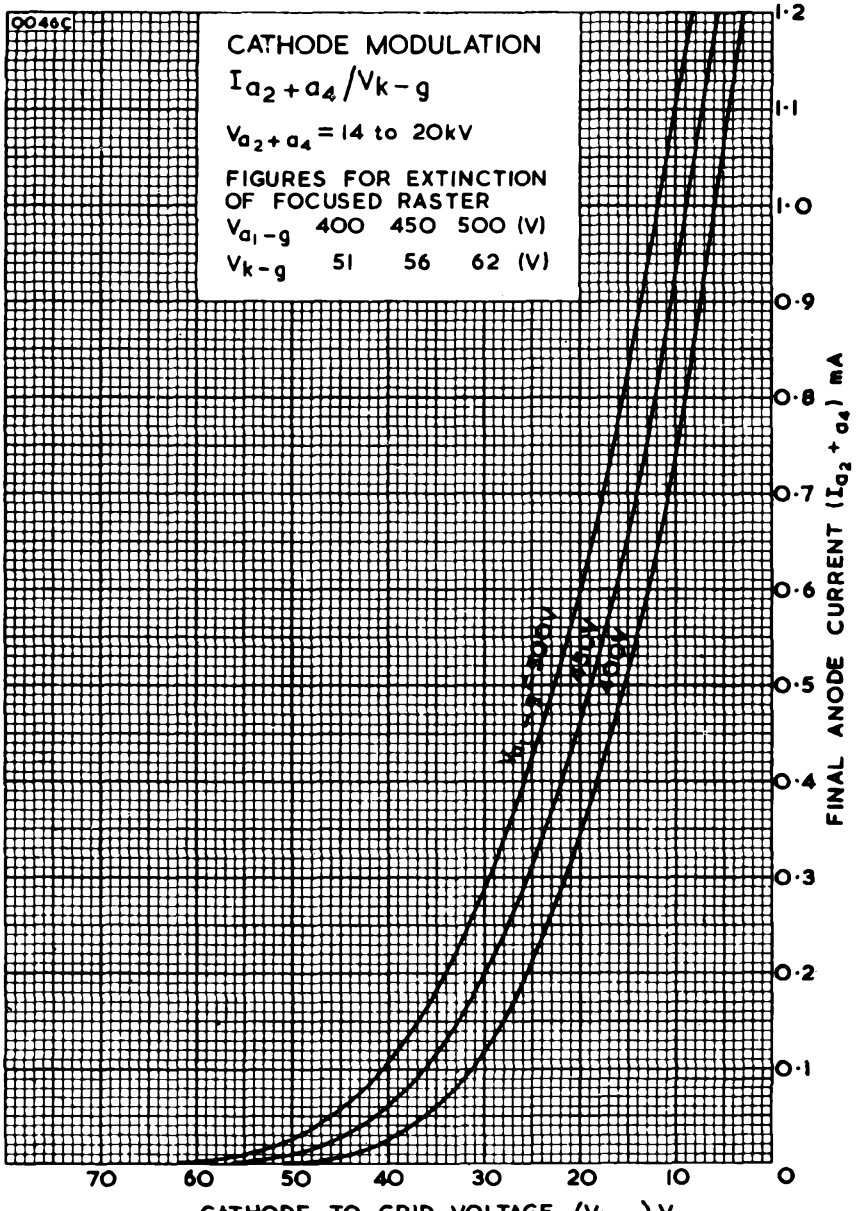


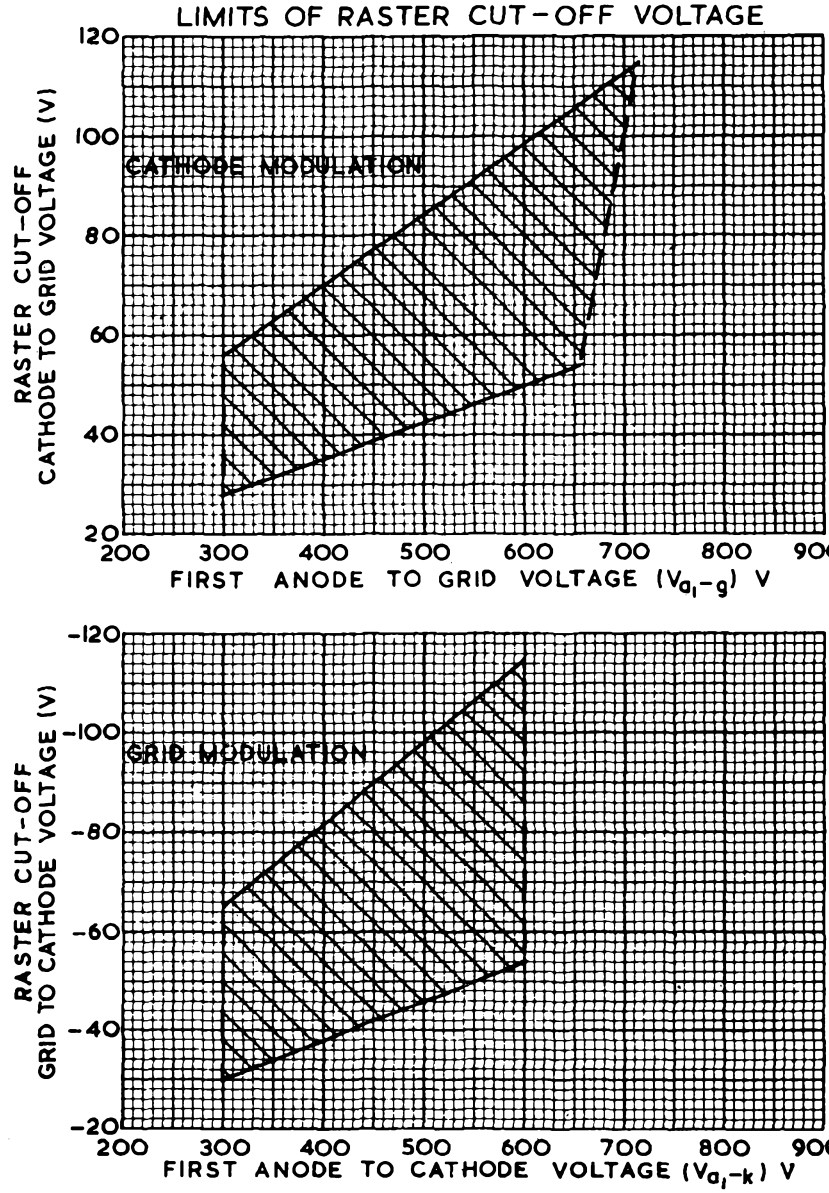
Reference Plane No.	0° Major	15°	30°	Diag.	45°	60°	75°	90° Minor
1	160.7	164.9	177.6	181.6	165.9	140.5	127.9	124.0
2	134.0	136.6	145.5	148.0	139.3	122.0	112.6	109.7
3	103.0	104.8	110.3	111.3	107.9	97.7	92.0	90.5
4	66.8	67.4	69.3	69.4	69.0	66.0	64.0	63.5

All dimensions in mm

Not to be scaled

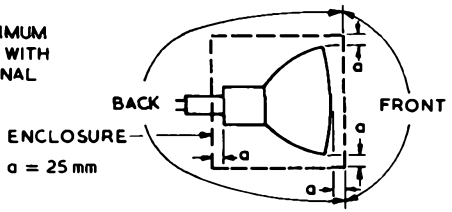

00450
GRID MODULATION
$I_{a_2} + a_4 / V_{g-k}$
$V_{a_2+a_4}$ = 14 to 20kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-k} 400 450 500 (V)
V_{g-k} −57 −63 −69 (V)
400V
450V
500V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT ($I_{a_2} + a_4$) mA
−70 −60 −50 −40 −30 −20 −10 0
GRID TO CATHODE VOLTAGE (V_{g-k})V

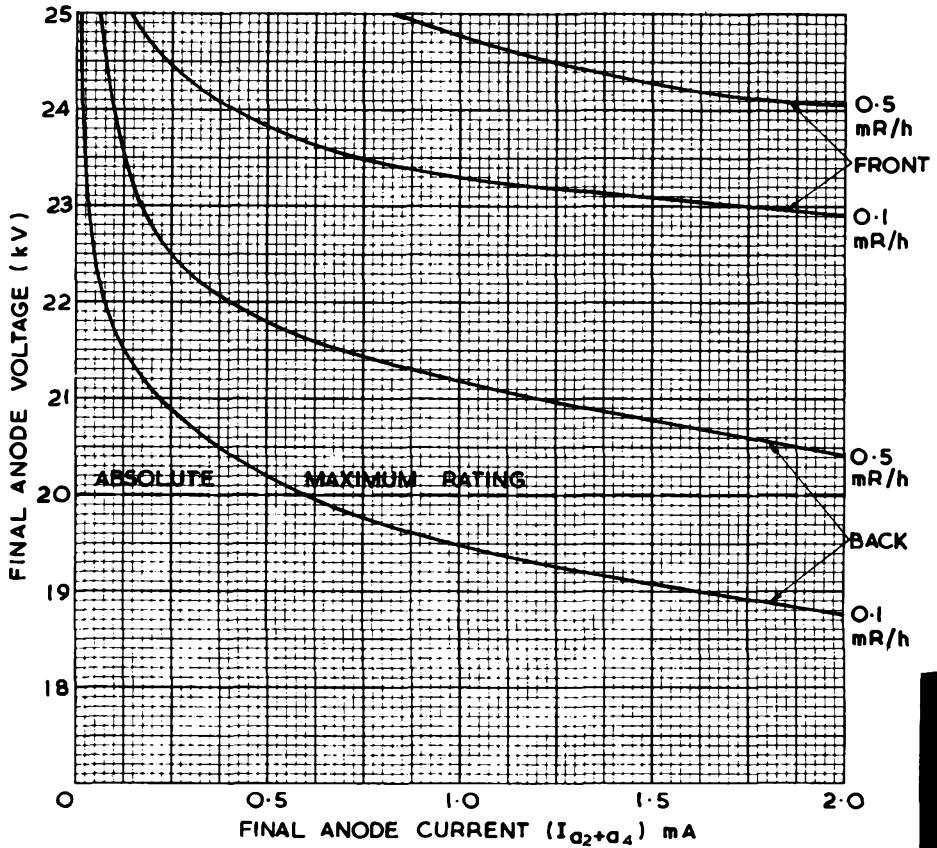

00466C
CATHODE MODULATION
$I_{a_2+a_4}/V_{k-g}$
$V_{a_2+a_4}$ = 14 to 20kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-g} 400 450 500 (V)
V_{k-g} 51 56 62 (V)
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT ($I_{a_2+a_4}$) mA
70
60
50
40
30
20
10
0
CATHODE TO GRID VOLTAGE (V_{k-g}) V


LIMITS OF RASTER CUT-OFF VOLTAGE
CATHODE MODULATION
RASTER CUT-OFF
CATHODE TO GRID VOLTAGE (V)
120
100
80
60
40
20
200
300
400
500
600
700
800
900
FIRST ANODE TO GRID VOLTAGE (V_{a_1-g}) V
GRID MODULATION
RASTER CUT-OFF
GRID TO CATHODE VOLTAGE (V)
-120
-100
-80
-60
-40
-20
FIRST ANODE TO CATHODE VOLTAGE (V_{a_1-k}) V

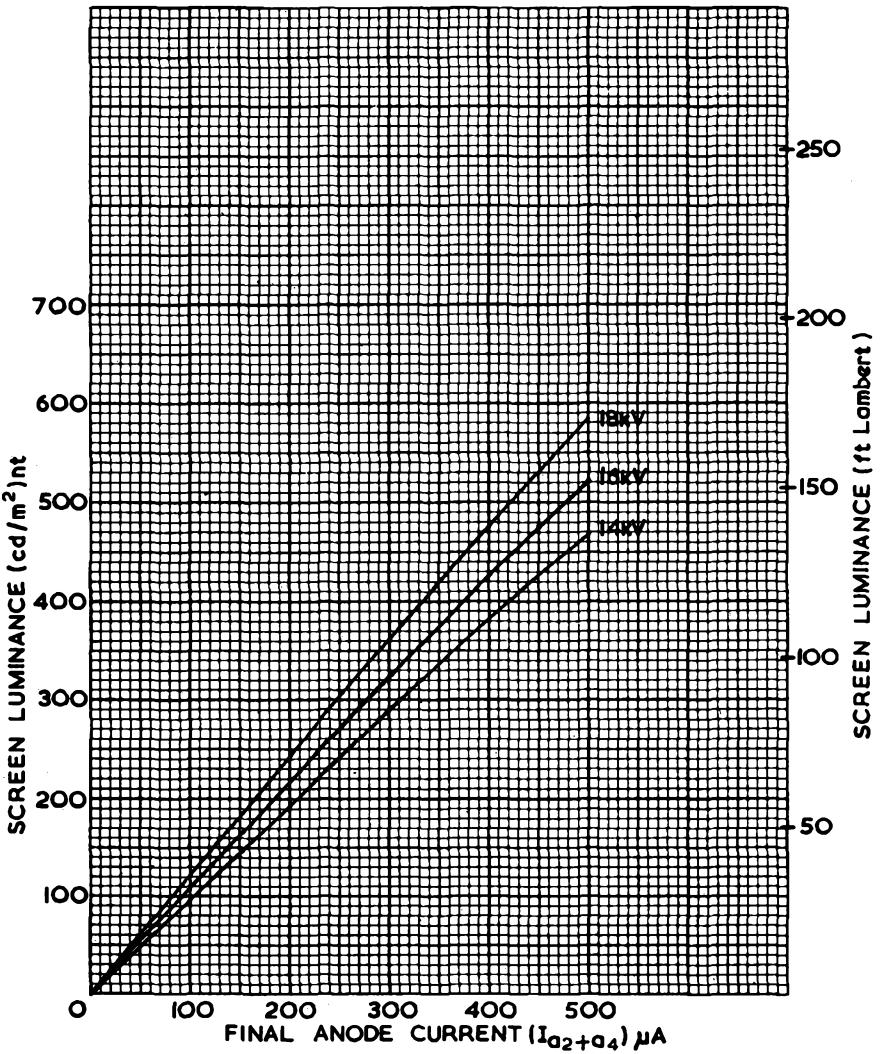
X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM





TYPICAL CHARACTERISTICS
GJ PHOSPHOR SCREEN
FOCUSED RASTER OF FULL HEIGHT
4 x 3 ASPECT RATIO

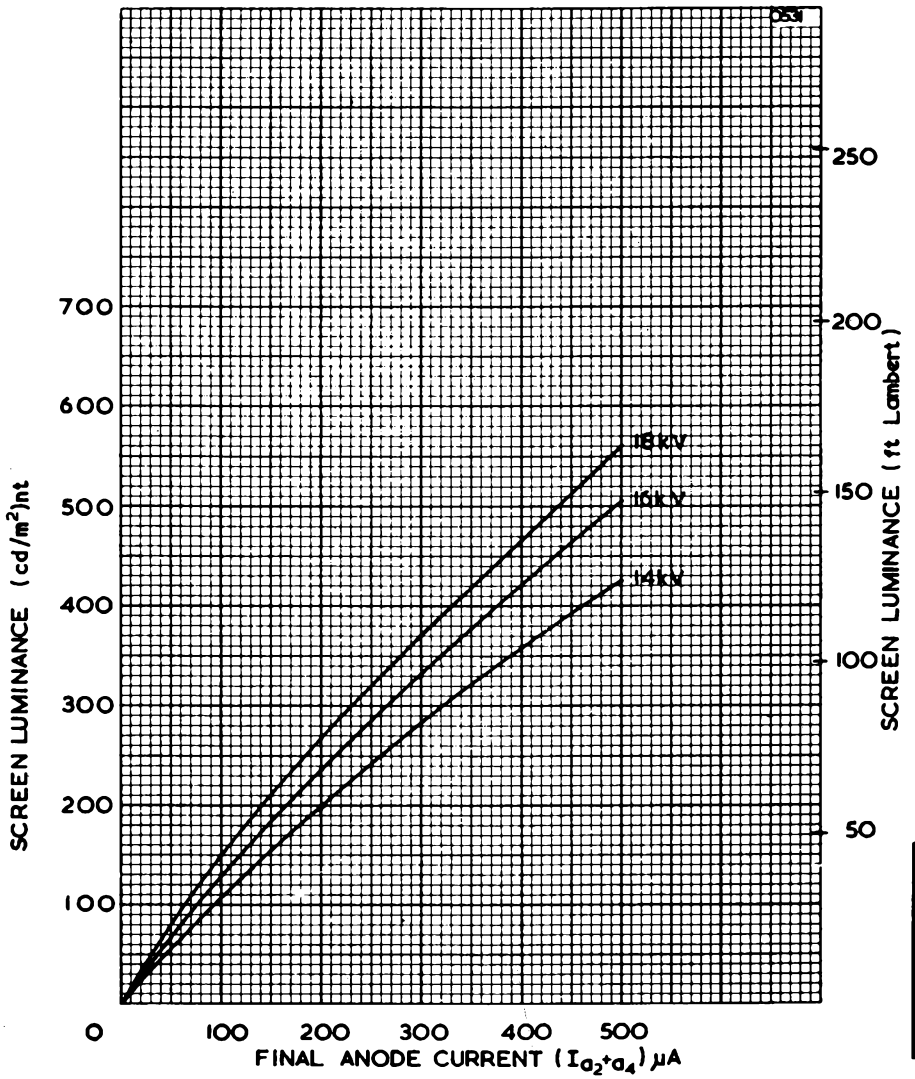


TYPICAL CHARACTERISTICS

W PHOSPHOR SCREEN

FOCUSED RASTER OF FULL HEIGHT

4 x 3 ASPECT RATIO



M38-101.. Data Display or Monitor Tube

The M38-101.. is the M38-100.. with an increased neck length to permit the use of an additional high frequency deflector coil ("write" coil) for data display applications.

The neck length of this tube is 163 ± 3 mm making the overall length 371 ± 7 mm

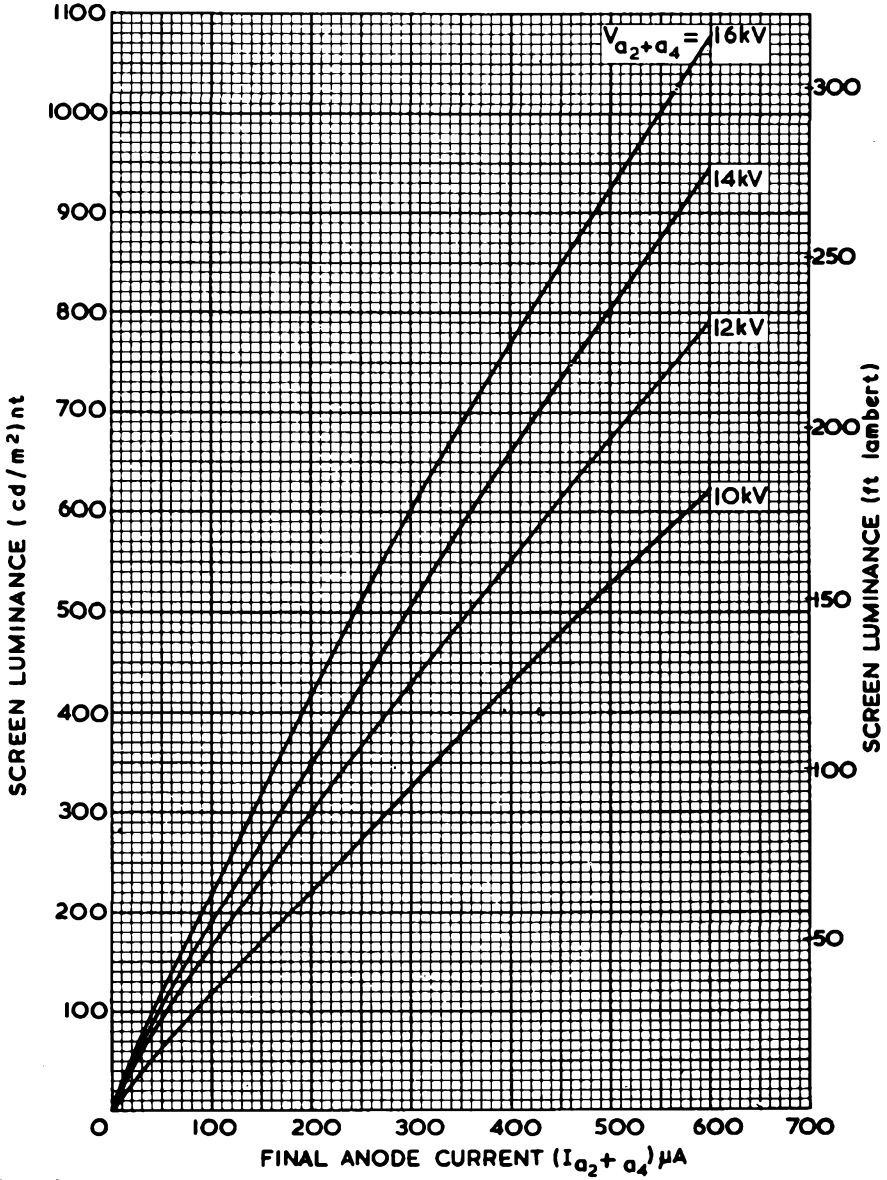
It is recommended that the deflector coil assembly including "position and write" coils should not extend further than 60 mm from the reference line otherwise there may be undesirable interaction with the tube gun.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M38-101GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

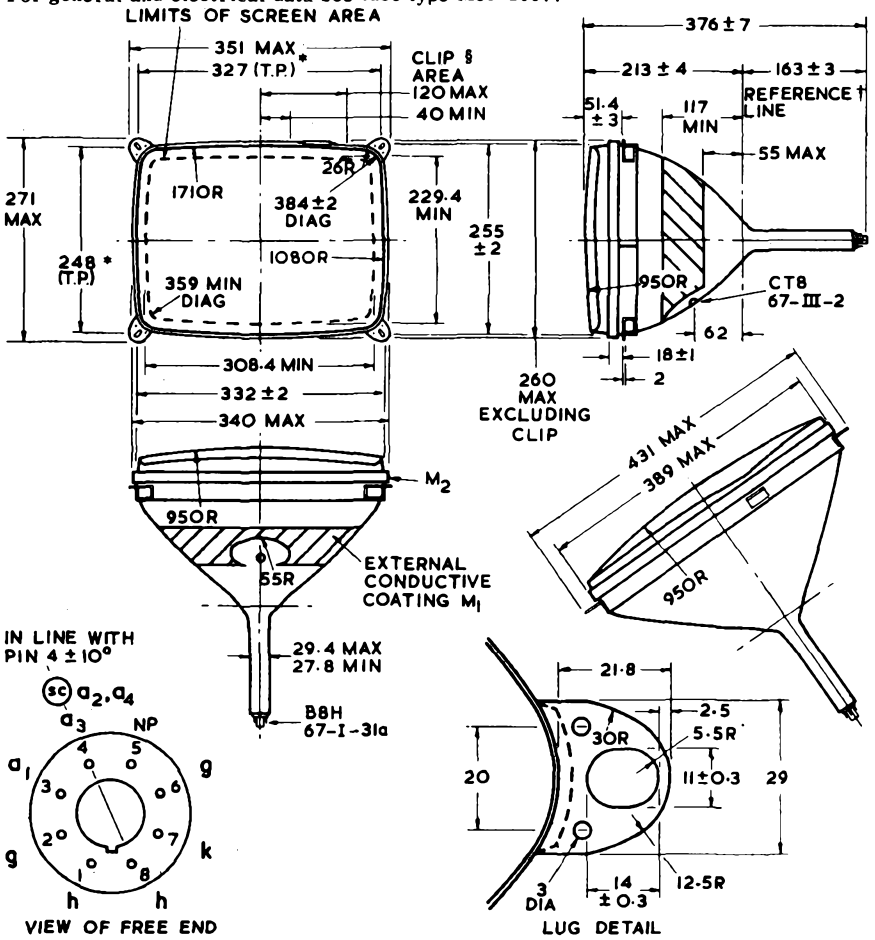
TYPICAL CHARACTERISTICS GH PHOSPHOR SCREEN

Focused raster of full height 4x3 aspect ratio



M38-102.. Data Display or Monitor Tube

The M38-102.. is the M38-101.. with a bonded face-plate to reduce specular reflections. For general and electrical data see tube type M38-100..



All dimensions in mm TUBE WEIGHT (approx) - net 6.0 kg **Not to be scaled**

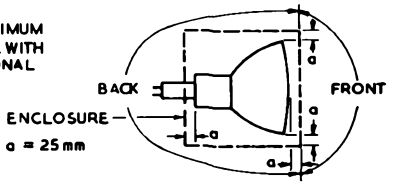
* The bolts to be used for mounting the tube must lie within the circles of 6.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 15. (See T.D.S. No. 5-0-91-15).

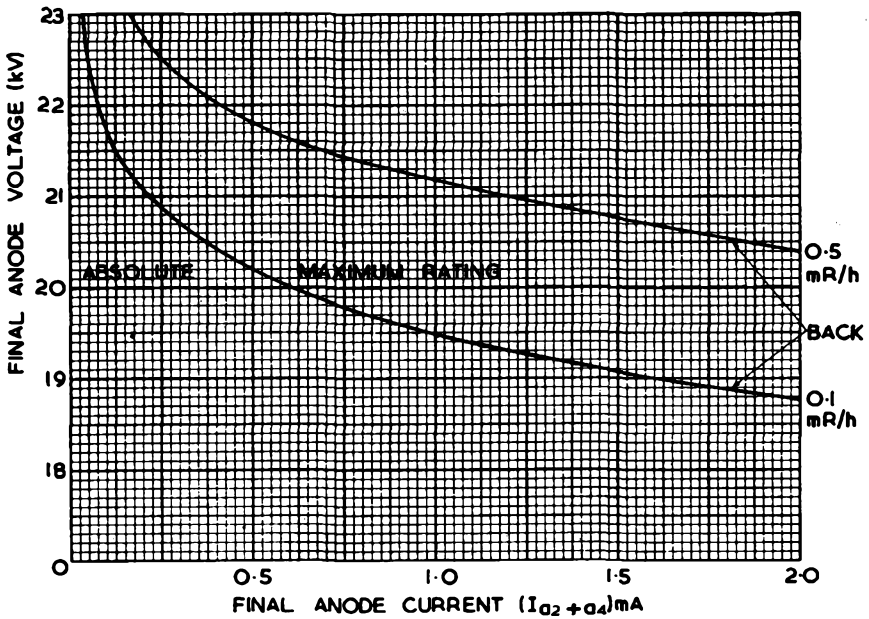
§ Total thickness of frame, tension band and clip 8 mm maximum. The clip will not project in front of the frame dimension.

X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM

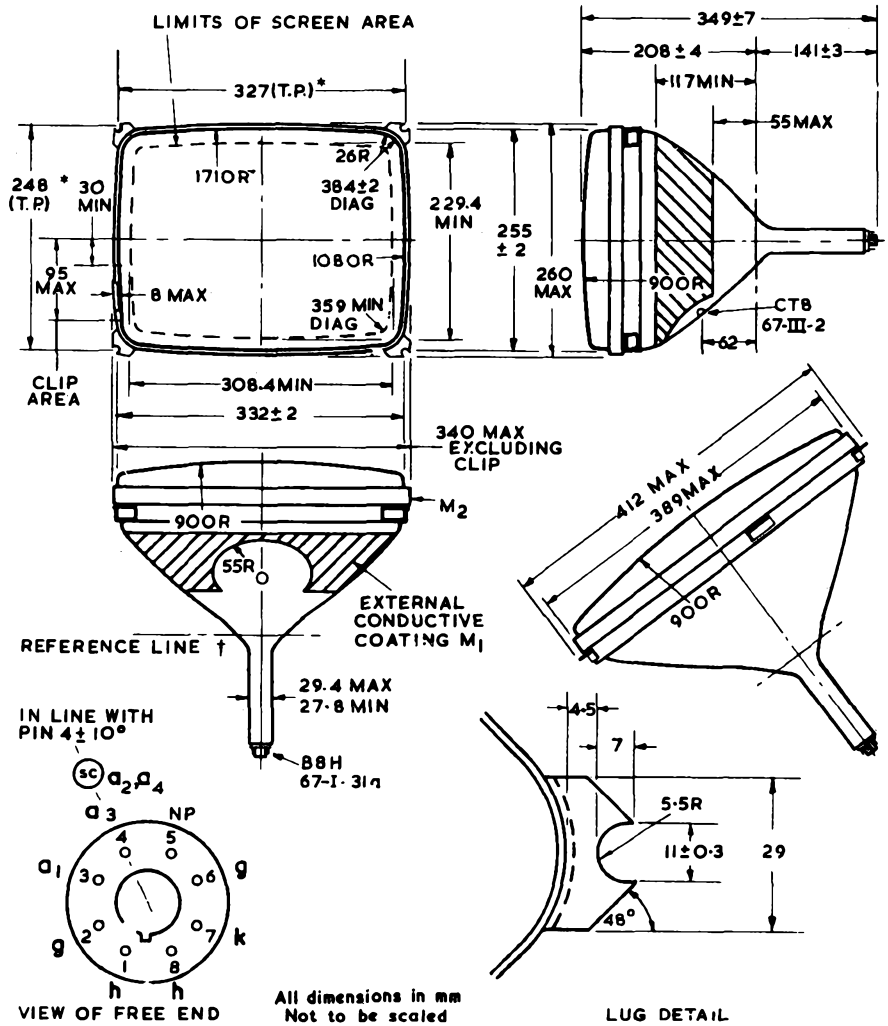


UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1 mR/h



M38-103.. Data Display or Monitor Tube

For general and electrical data on the M38-103.. see tube type M38-100.., the tubes differ only in lug shape and tension band clip position.

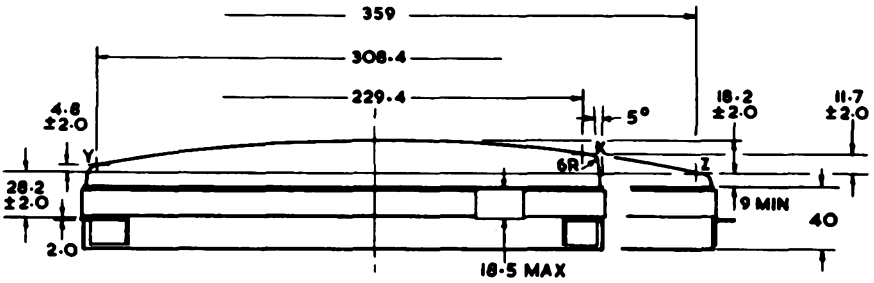


* The bolts to be used for mounting the tube must lie within the circles of 6.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 15 (See T.D.S. No. 5-0-91-15).

TUBE WEIGHT (approx.) - net 5.3 kg

Data Display or Monitor Tube M38-103..

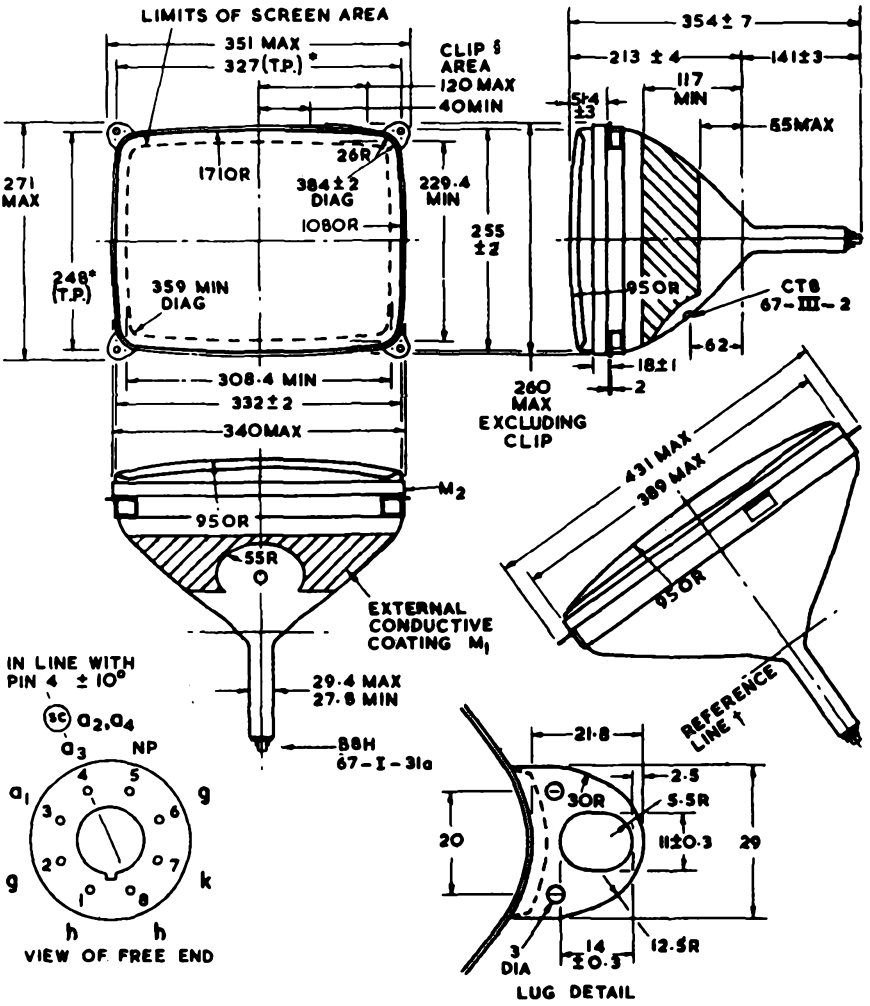


All dimensions in mm

Not to be scaled

M38-104.. Data Display or Monitor Tube

The M38-104.. is the M38-100.. with a bonded face-plate to reduce specular reflections. For general and electrical data see tube type M38-100..



All dimensions in mm TUBE WEIGHT (approx.) - net 6.0 kg Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 6.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 15. (See T.D.S. No. 5-0-91-15).

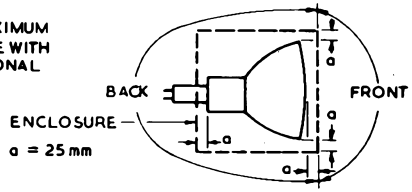
§ Total thickness of frame tension band and clip 8 mm maximum. The clip will not project in front of the frame dimension.

This type is usually supplied with GR phosphor. Other screens available to special order.

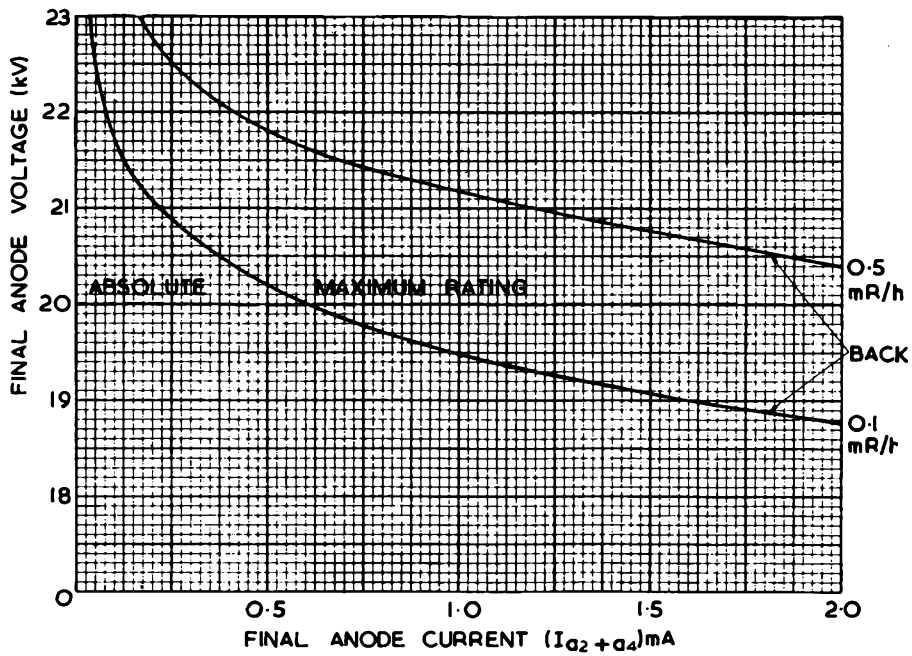
BRIMAR

X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM

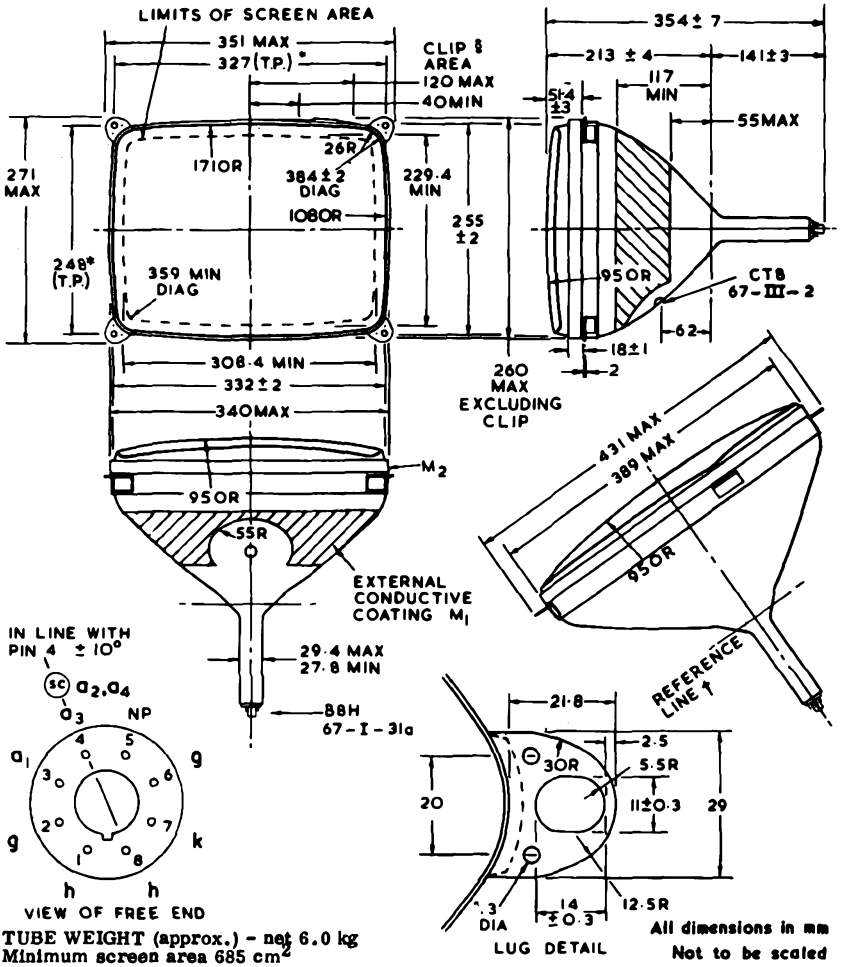


UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1 mR/h



M38-105.. Data Display or Monitor Tube

The M38-105.. is the M38-100.. with a tinted bonded face-plate.
The total centre glass transmission is approximately 15% and the surface is treated to reduce specular reflection. For general and electrical data see tube type M38-100..



TUBE WEIGHT (approx.) – net 6.0 kg
Minimum screen area 685 cm²

All dimensions in mm
Not to be scaled

This type is usually supplied with W phosphor. Other screens available to special order.

* The bolts to be used for mounting the tube must lie within the circles of 6.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

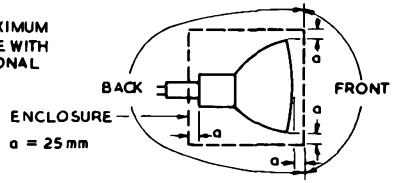
† Determined by reference line gauge No. 15.

§ Total thickness of frame tension band and clip 8 mm maximum. The clip will not project in front of the frame dimension.

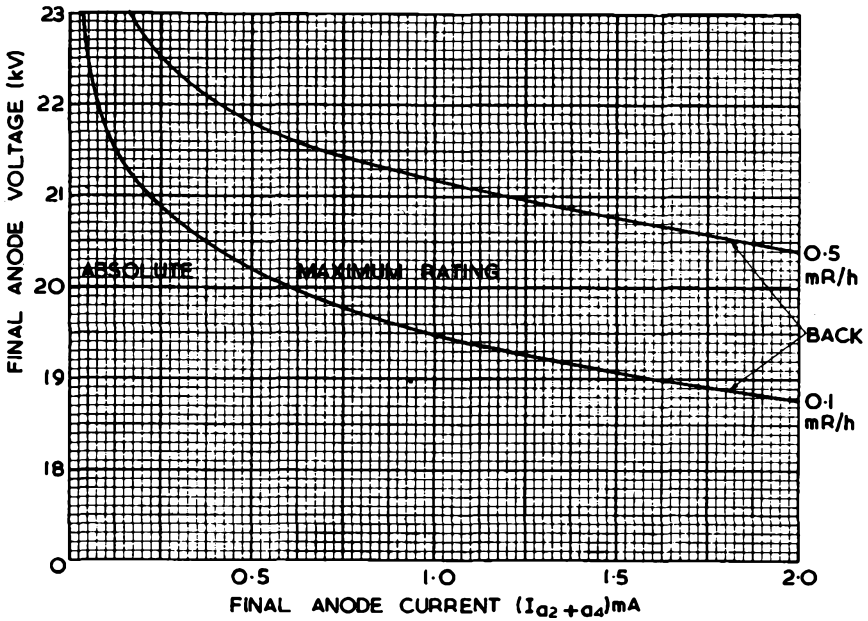
Data Display or Monitor Tube M38-105

X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM



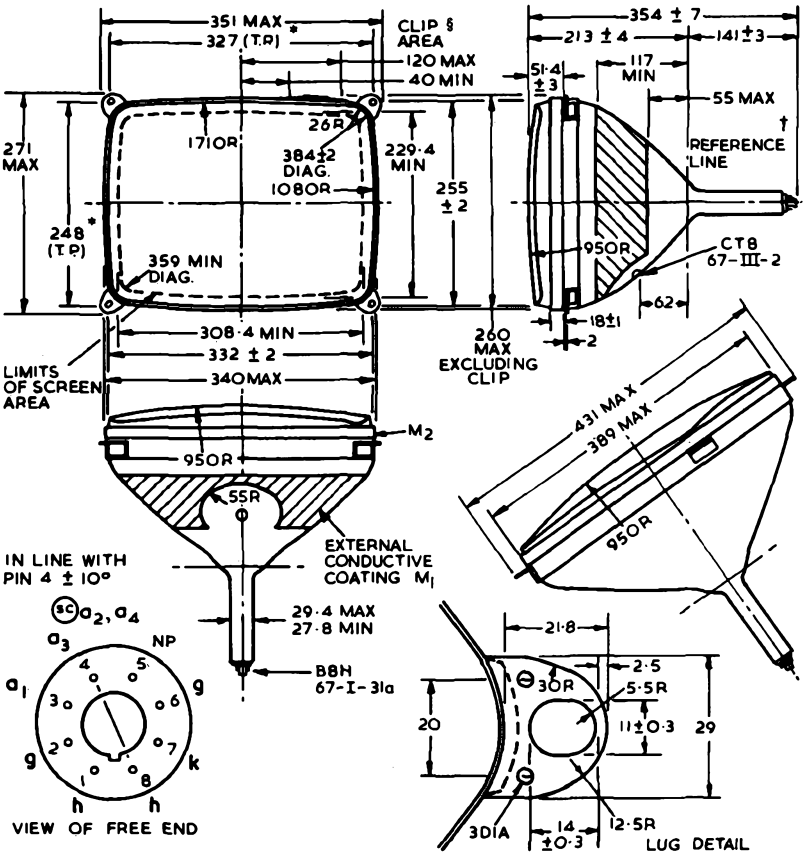
UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1 mR/h



DATA DISPLAY & MONITOR TUBES

M38-106.. Data Display or Monitor Tube

The M38-106.. is the M38-100.. with a tinted bonded face-plate.
The total centre glass transmission is approximately 30% and the surface is treated to reduce specular reflection. For general and electrical data see tube type M38-100..



All dimensions in mm — Not to be scaled

Minimum screen area 685 cm^2. TUBE WEIGHT (approx.) - net 6.0 kg.

* The bolts to be used for mounting the tube must lie within the circles of 6.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 15.

§ Total thickness of frame tension band and clip 8 mm maximum. The clip will not project in front of the frame dimension.

This type is usually supplied with GH Phosphor. Other screens available to special order.

Data Display or Monitor Tube

MAINTENANCE TYPE

M38-111..

The M38-111.. is the M38-113.. with a bonded face-plate and with external conductive coating. The overall length is 438 ± 8 mm.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M38-111GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

For all other information please see the data sheets for type M38-113..

BRIMAR

M38-112.. Data Display or Monitor Tube

Maintenance Type

The M38-112.. is the M38-111.. without a bonded faceplate thus making the overall length 433 ± 8 mm and the faceplate radius 900 mm.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M38-112GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

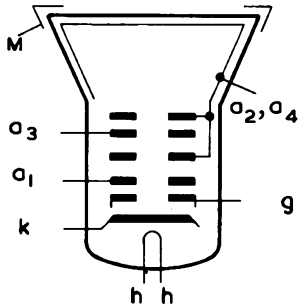
For all other information please see the data sheets for type M38-111..

Data Display or Monitor Tube M38-113..

GENERAL

Rectangular face, 15 inch, 90° diagonal tube
Rimguard III reinforced envelope *
Integral mounting lugs
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 50% transmission (approx.)
Straight gun, non ion trap
38 mm maximum neck diameter

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS -Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	16	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	12	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000	V
Maximum first anode voltage	$V_{a1(max)}$	800	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PHOSPHOR SCREEN

This type is usually supplied with GH phosphor (M38-113GH) giving a green trace of medium short persistence. Other phosphor screens can be made available to special order.

NECK LENGTH

This tube has an extended neck length to accommodate an auxiliary high frequency deflector coil.

* This tube meets the requirements for intrinsically safe tube laid down in the section of I.E.C. Publication 65 dealing with implosion.

This data should be read in conjunction with Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

DATA DISPLAY & MONITOR TUBES

BRIMAR

INTER-ELECTRODE CAPACITANCES		*	†	
Cathode to all	c_{k-all}	3.5	4.5	pF
Grid to all	c_{g-all}	7.0	7.5	pF
Anodes 2 and 4 to frame M (approx)	$c_{a2+a4-M}$		250	pF

* Holder capacitance balanced out.

† Total capacitance including a typical holder.

TYPICAL OPERATION	Grid modulation, voltages referred to cathode		
Second and fourth anode voltage	V_{a2+a4}	15	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for centre focus	V_{a3}	0 to 400§	V
Grid to cathode voltage for cut-off of raster	V_g	-30 to -70	V

§ The change of spot size with variation of focus voltage is small and the limit of 0 to 400 V is such that an acceptable focus quality is obtain within this range. If it is required to pass through the point of focus a voltage of a least -100V to +500V will be required. The voltage for corner focus will be greater than at the face centre by approximately 500 V with a suitably designed deflection yoke.

MOUNTING

Any mask used in the mounting of this tube should be flexible enough to take up small variations in fixing and faceplate contours.

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

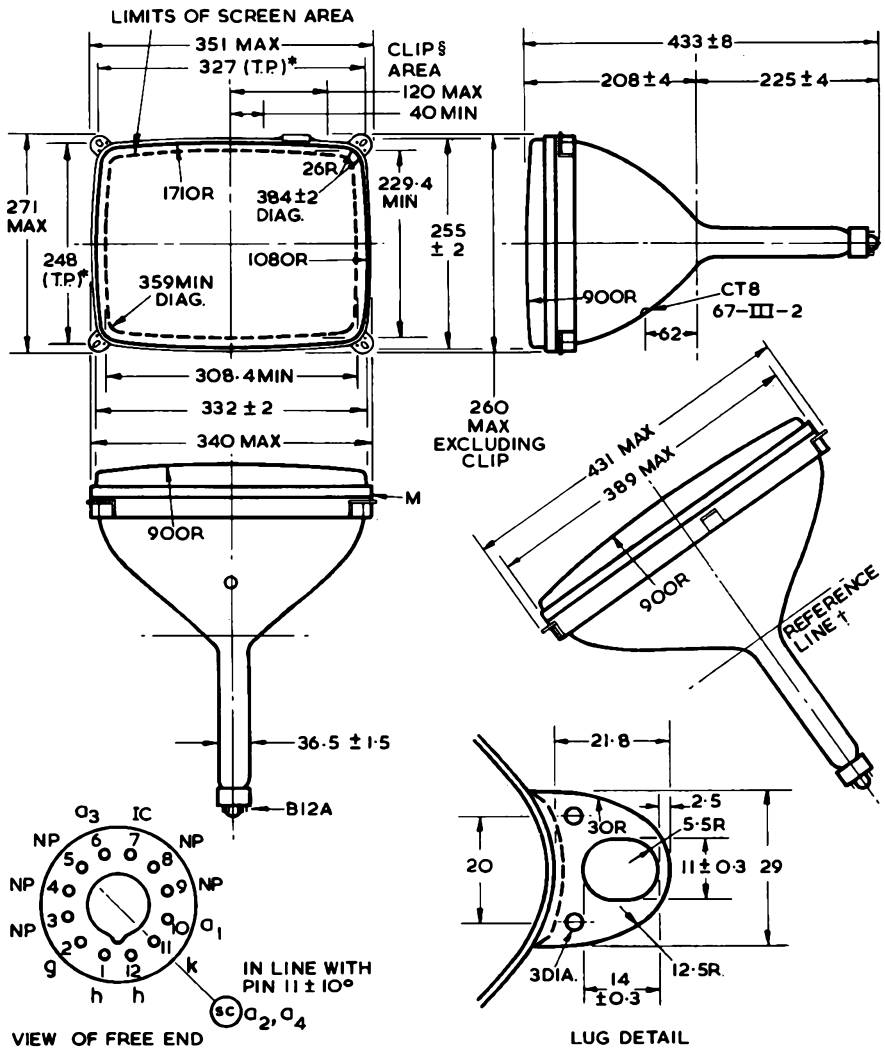
It is recommended that the deflector coil assembly including "position and write" coils should not extend further than 70 mm from the reference line otherwise there may be undesirable interaction with the tube gun.

The metal frame (M) should be connected directly to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in non isolated equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - 5.5 kg

Data Display or Monitor Tube M38-113..



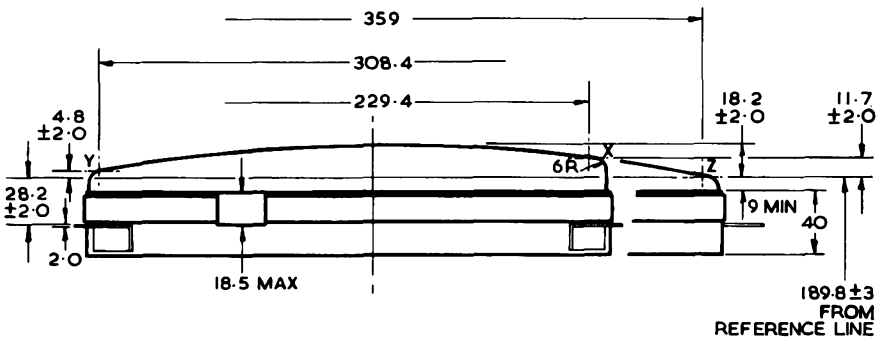
All dimensions in mm

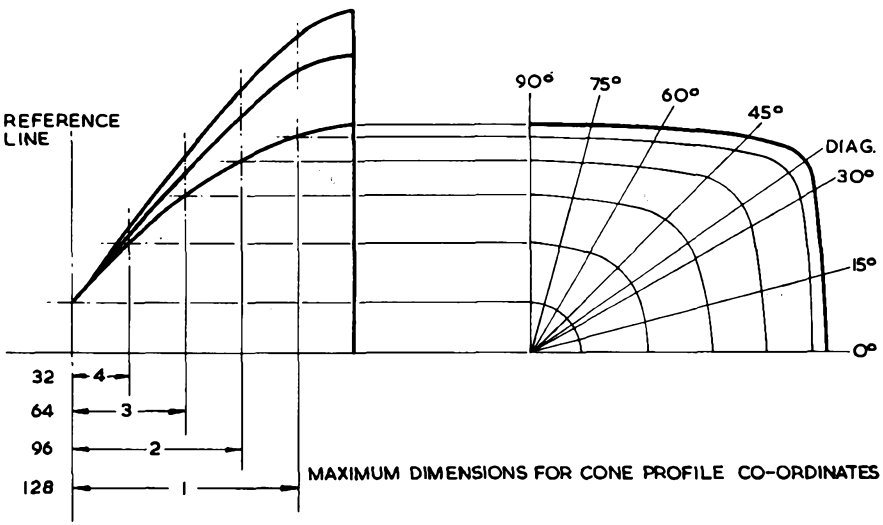
Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 6.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 13.

§ Total thickness of frame, tension band and clip 8 mm maximum. The clip will not project in front of the frame dimension.





All dimensions in mm

Not to be scaled

Reference Plane No.	0° Major	15°	30°	Diag.	45°	60°	75°	90° Minor
1	160.7	164.9	177.6	181.6	165.9	140.5	127.9	124.0
2	134.0	136.6	145.5	148.0	139.3	122.0	112.6	109.7
3	103.0	104.8	110.3	111.3	107.9	97.7	92.0	90.5
4	66.8	67.4	69.3	69.4	69.0	66.0	64.0	63.5

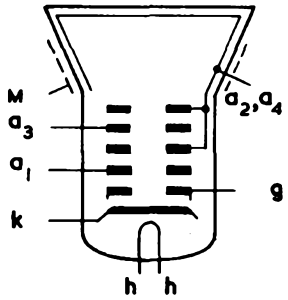
Data Display or Monitor Tube

M38-120..

GENERAL

Rectangular face, 38 cm, 110° diagonal
Electrostatic focus, magnetic deflection
Straight gun. Aluminised screen
Grey glass, 50% transmission (approx.)
29.4 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	13	kV
Maximum third anode voltage range	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	550	V
Minimum first anode voltage	$V_{a1(min)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage,	$V_{h-k(max)}$		
heater negative (d.c.)		250	V
heater positive (d.c.)		135	V
Maximum peak heater to cathode voltage	$V_{h-k(pk)max}$		
heater negative		300	V
heater positive		180	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	100	kΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M38-120W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	$c_{k\text{-all}}$	3.0	3.5	pF
Grid to all	$c_{g\text{-all}}$	7.0	8.5	pF
Anodes 2 and 4 to coating M (approx.)	$c_{a2+a4\text{-}M}$	600		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode

Second and fourth anode	V_{a2+a4}	16	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	0 to 400 §	V
Grid to cathode voltage for cut-off of raster	V_g	-40 to -85	V

This tube will resolve 650 lines measured at a beam current of 100 μA

§ The change of spot size with variation of focus voltage is small and the limit of 0 to 400 V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus a voltage of at least -100V to +500V will be required.

RESOLUTION OPTIMISATION

For optimum overall resolution an external beam steering magnet may be required. Adjustment of the magnet should not be such that a general reduction of brightness or shading of the raster occurs. Typically the flux density at neck centre should be adjustable from 0 to 0.8 mT (0 to 8 gauss).

MOUNTING

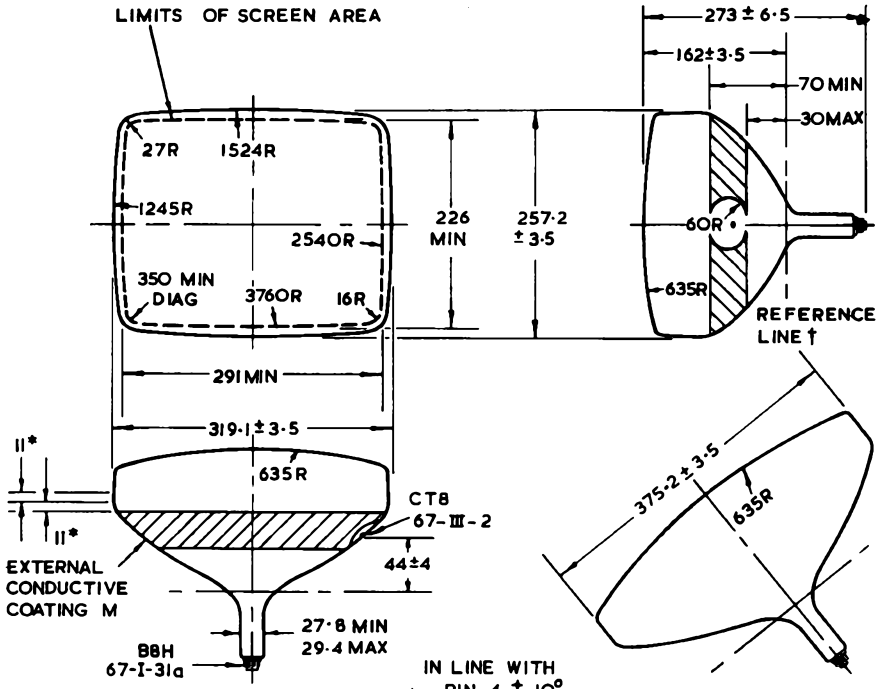
There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

The external conductive coating (M) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return path of M should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 4.5 kg



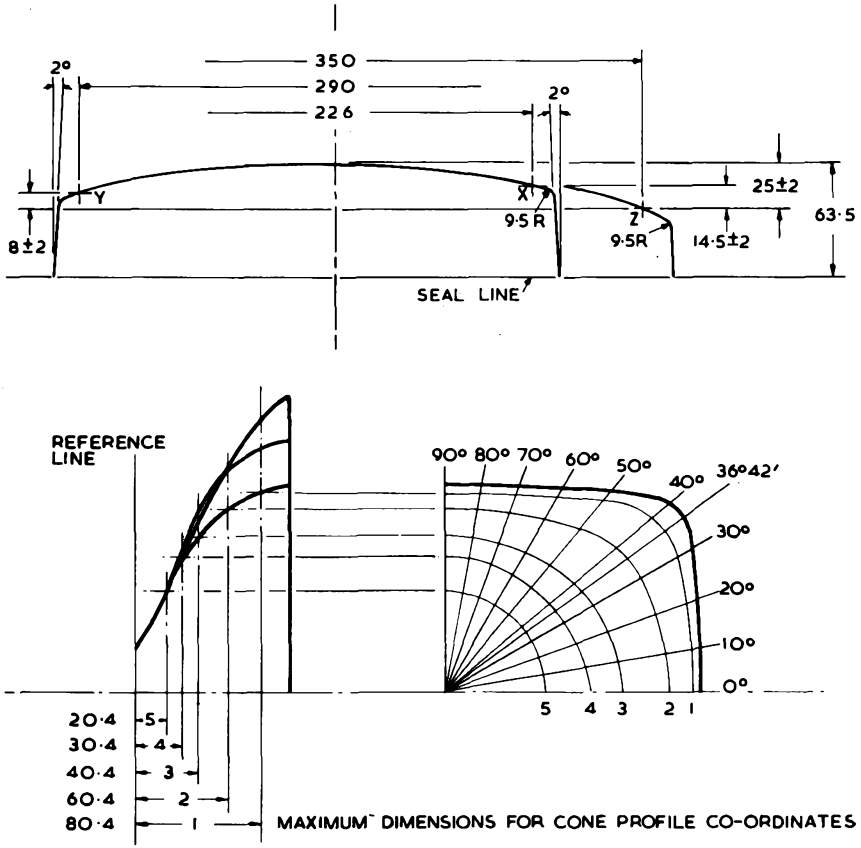
All dimensions in mm

VIEW OF FREE END

Not to be scaled

* During the face sealing operation the glass in this area (± 11 mm) may be disturbed and the shape may be either convex or concave. The bulb should not be gripped within this region unless special precautions are taken, such as, the use of resilient packing material.

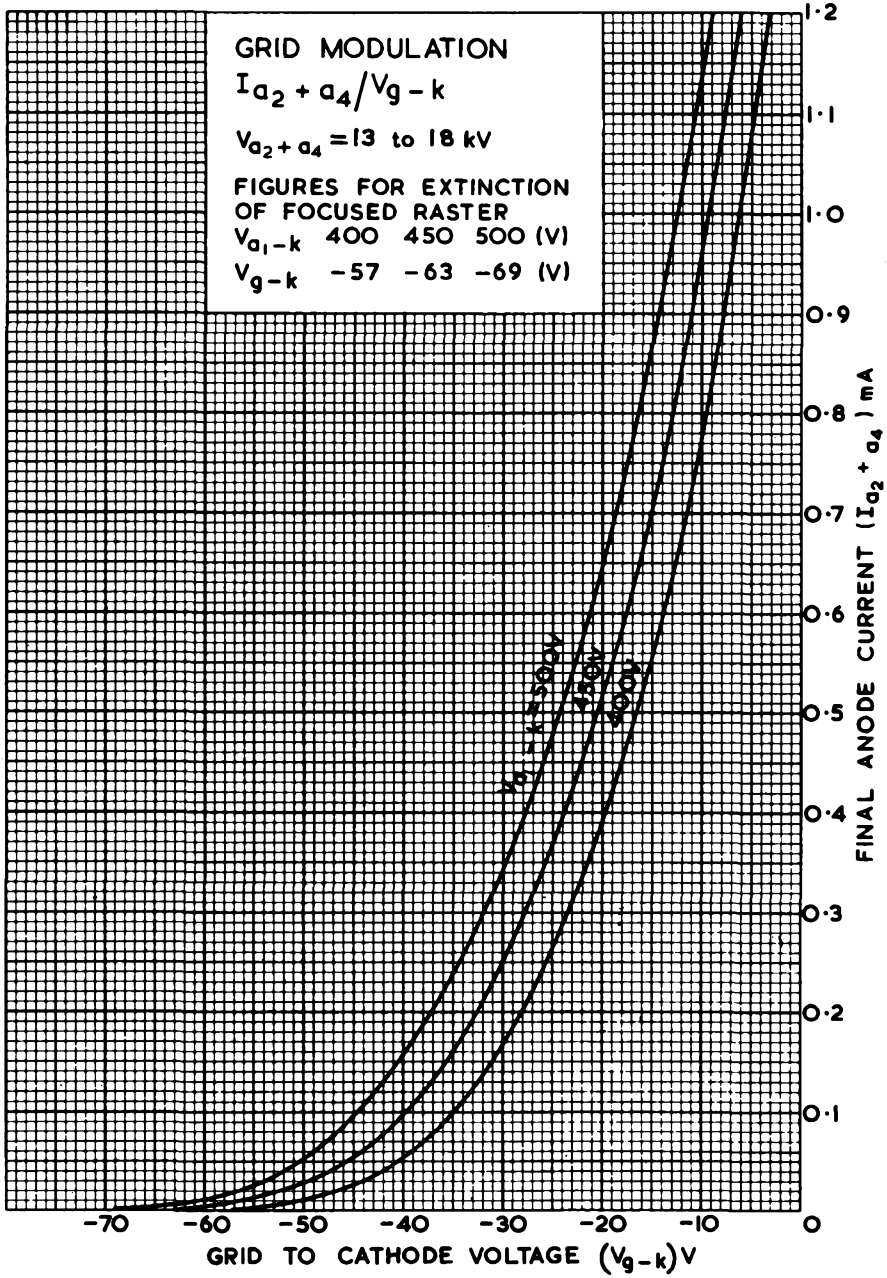
† Determined by reference line gauge No. 16 (B.S. RL4 : IEC 67-IV-3 : JEDEC 126).

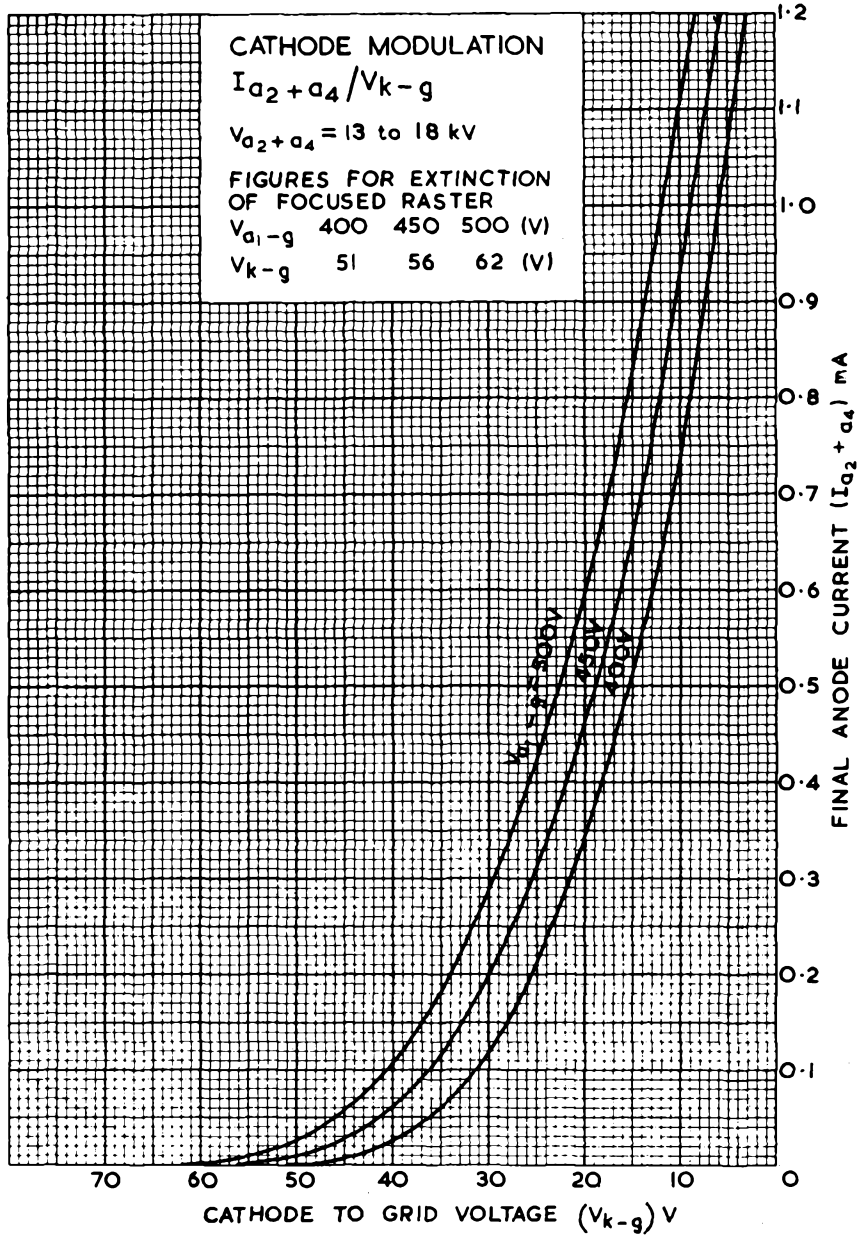


All dimensions in mm

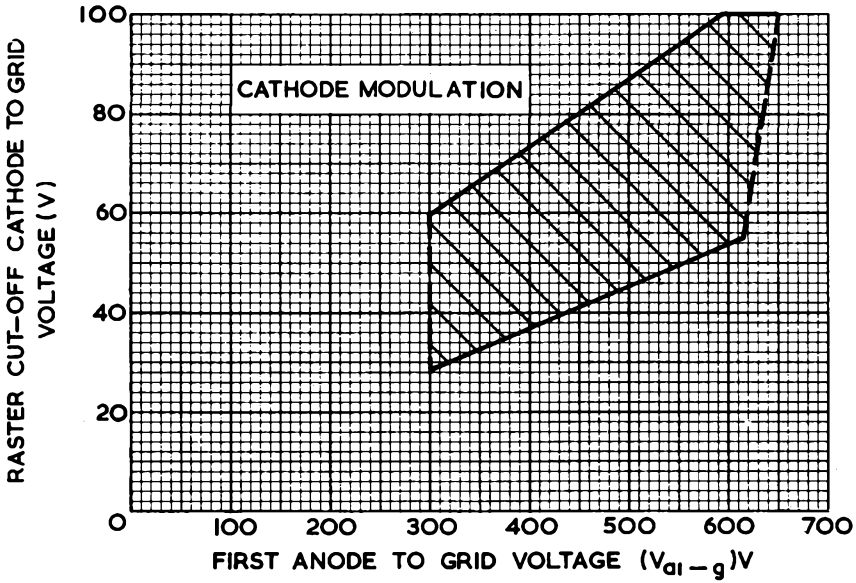
Not to be scaled

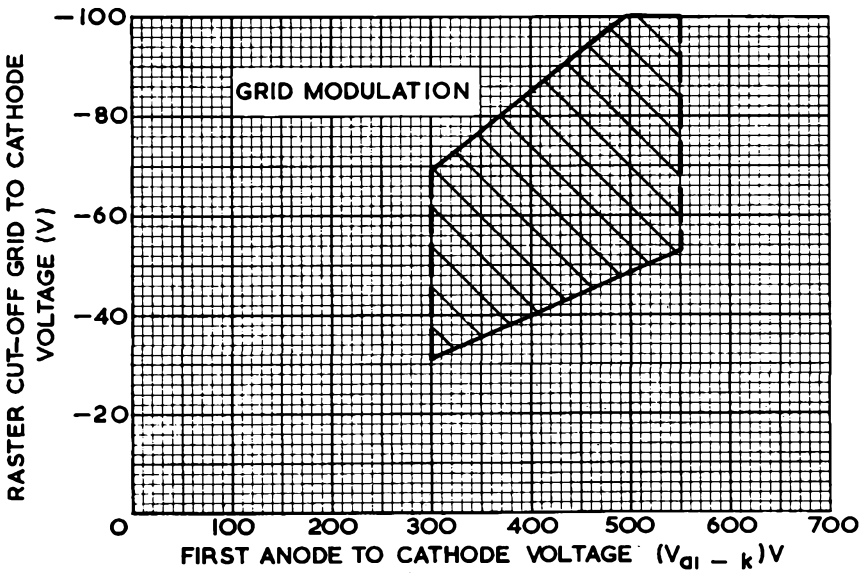
Reference Plane No.	0° Major	10°	20°	30°	36°42' Diag.	40°	50°	60°	70°	80°	90° Minor
1	155	157	162	170	173	171	156	141	131	126	124
2	140	141	143	143	141	140	134	126	119	116	115
3	112	112	110	108	106	105	104	102	101	99	99
4	90	89	88	86	86	86	85	85	86	86	85
5	63	64	63	63	63	63	63	64	64	64	64


GRID MODULATION
$I_{a_2} + a_4 / V_{g-k}$
$V_{a_2+a_4}$ = 13 to 18 kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-k} 400 450 500 (V)
V_{g-k} -57 -63 -69 (V)
18 kV
16 kV
13 kV
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT ($I_{a_2} + a_4$) mA
-70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g-k})V


CATHODE MODULATION
$I_{a_2+a_4}/V_{k-g}$
$V_{a_2+a_4}$ = 13 to 18 kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-g} 400 450 500 (V)
V_{k-g} 51 56 62 (V)
V_{a_1-g}=500V
450V
400V
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT ($I_{a_2+a_4}$) mA
70
60
50
40
30
20
10
0
CATHODE TO GRID VOLTAGE (V_{k-g}) V

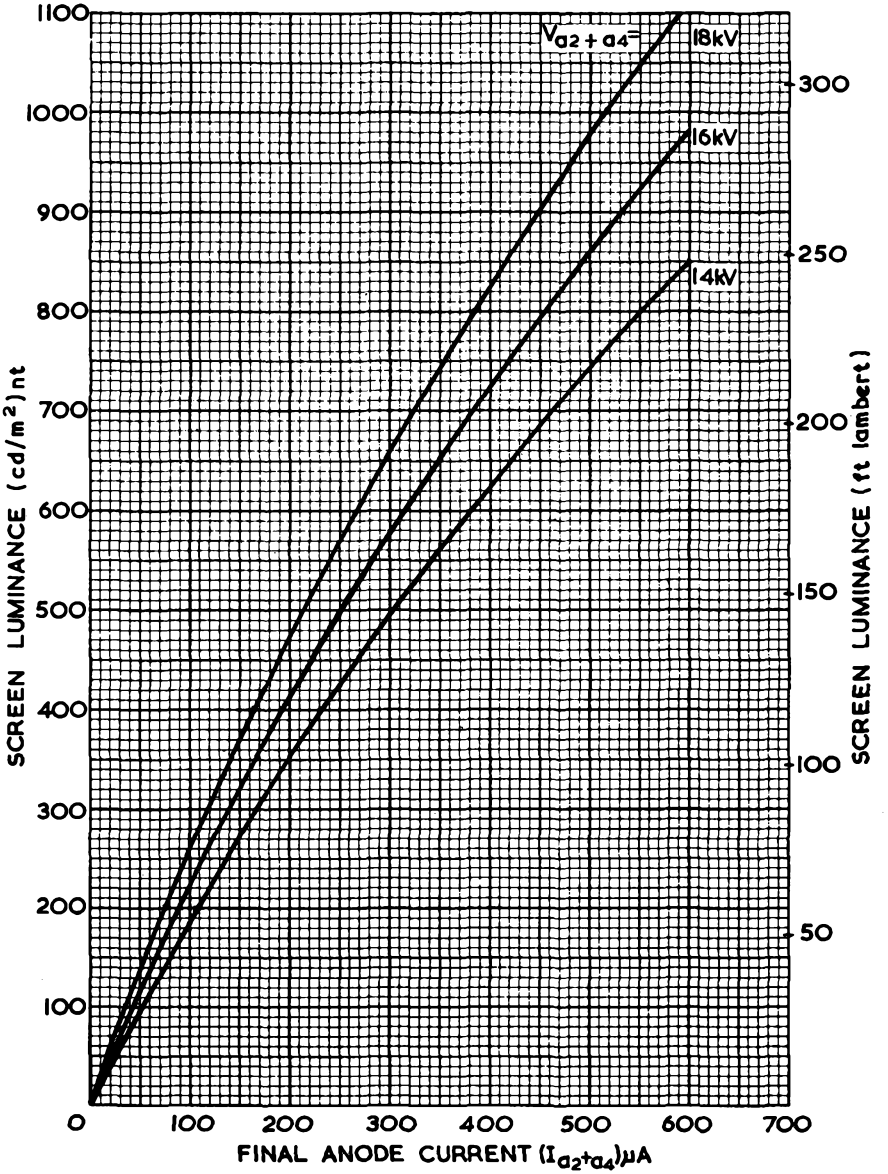
LIMITS OF RASTER CUT-OFF VOLTAGE





TYPICAL CHARACTERISTICS GH PHOSPHOR SCREEN

Focused raster of full height 4x3 aspect ratio

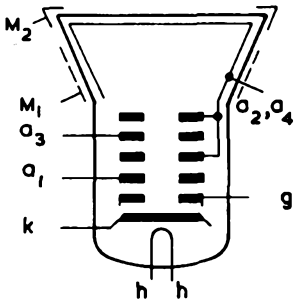


Data Display or Monitor Tube M38-121..

GENERAL

Rectangular face, 38 cm, 110° diagonal
Rimguard IV reinforced envelope
Integral mounting lugs
Electrostatic focus, magnetic deflection
Straight gun. Aluminised screen
Grey glass, 50% transmission (approx.)
29.4 mm maximum neck diameter
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	13	kV
Maximum third anode voltage range	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	550	V
Minimum first anode voltage	$V_{a1(min)}$	350	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage,	$V_{h-k(max)}$		
heater negative (d.c.)		250	V
heater positive (d.c.)		135	V
Maximum peak heater to cathode voltage	$V_{h-k(pk)max}$		
heater negative		300	V
heater positive		180	V
Maximum impedance, grid to cathode(50 Hz)	$Z_{g-k(max)}$	100	kΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor (M38-121W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.
This data should be read in conjunction with Operational Recommendations for Industrial Cathode ray tubes.

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	7.0	8.5	pF
Anodes 2 and 4 to coating M_1 (approx.)	$c_{a2+a4-M1}$		600	pF
Anodes 2 and 4 to metal M_2 (approx.)	$c_{a2+a4-M2}$		250	pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltages referred to cathode

Second and fourth anode	V_{a2+a4}	16	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	0 to 400 §	V
Grid to cathode voltage for cut-off of raster	V_g	-40 to -85	V

This tube will resolve 650 lines measured at a beam current of 100 μA

§ The change of spot size with variation of focus voltage is small and the limit of 0 to 400 V is such that an acceptable focus quality is obtained within this range. If it is required to pass through the point of focus a voltage of at least -100V to +500V will be required.

RESOLUTION OPTIMISATION

For optimum overall resolution an external beam steering magnet may be required. Adjustment of the magnet should not be such that a general reduction of brightness or shading of the raster occurs. Typically the flux density at neck centre should be adjustable from 0 to 0.8 mT (0 to 8 gauss).

MOUNTING

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

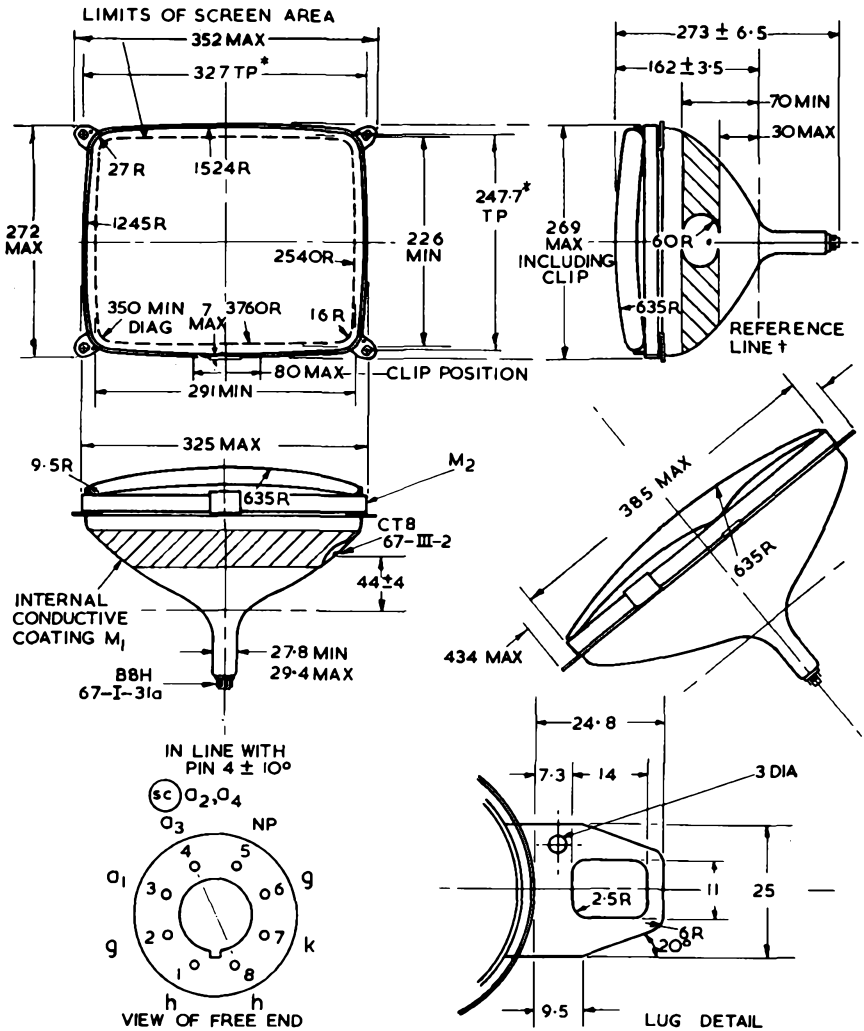
The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal (M_2) should be connected to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c./d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 4.7 kg

Data Display or Monitor Tube M38-121..



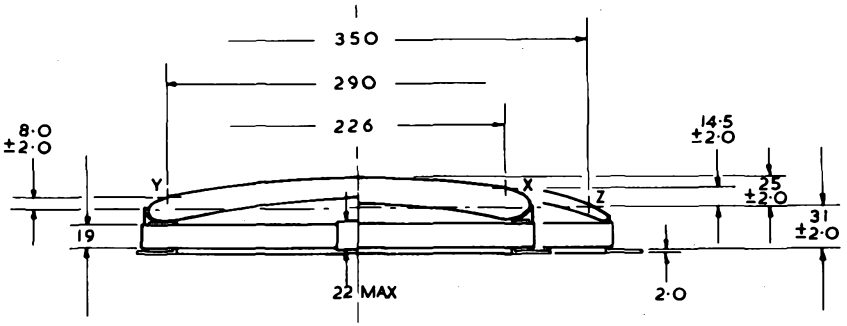
All dimensions in mm

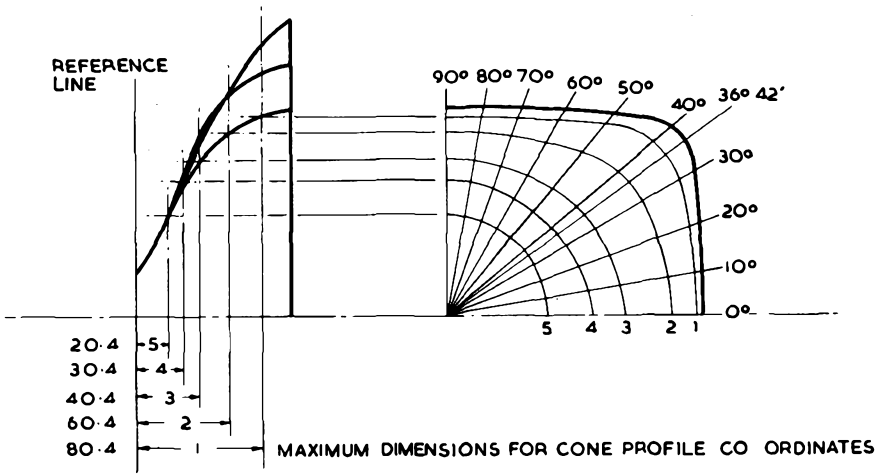
Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 7.5mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 16 (B.S. RL4 : IEC 67-IV-3 : JEDEC 126).

Minimum useful screen area 646 cm^2





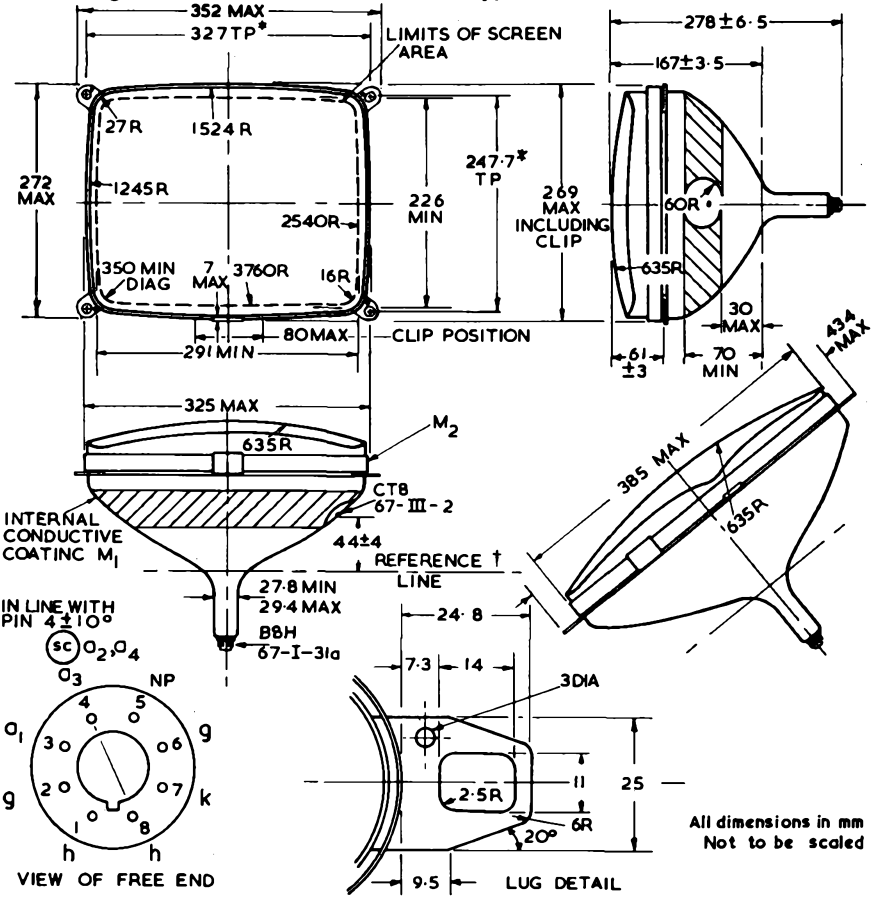
All dimensions in mm

Not to be scaled

Reference Plane No.	0° Major	10°	20°	30°	36°42' Diag.	40°	50°	60°	70°	80°	90° Minor
1	155	157	162	170	173	171	156	141	131	126	124
2	140	141	143	143	141	140	134	126	119	116	115
3	112	112	110	108	106	105	104	102	101	99	99
4	90	89	88	86	86	86	85	85	86	86	85
5	63	64	63	63	63	63	63	64	64	64	64

Data Display or Monitor Tube M38-122..

The M38-122.. is the M38-120.. with a tinted bonded face-plate, reinforced envelope, and integral mounting lugs. The total centre glass transmission is approximately 15% and the surface is treated to reduce specular reflections.
For other general and electrical data see tube type M38-120..



TUBE WEIGHT (approximate) 5.5 kg

* The bolts to be used for mounting the tube must lie within the circles of 7.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 16 (B.S. RL4 : IEC 67-IV-3 : JEDEC 126).

Minimum useful screen area 646 cm^2

DATA DISPLAY & MONITOR TUBES

BRIMAR

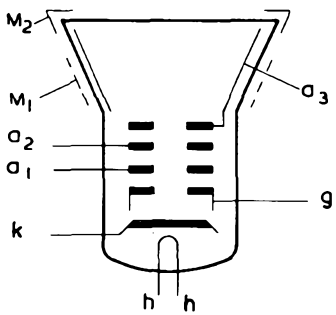
M38-142.. Data Display or Monitor Tube

PRELIMINARY DATA

GENERAL

Rectangular face, 38 cm, 110° diagonal
Rimguard IV reinforced envelope
Integral mounting lugs
High voltage electrostatic focus
Magnetic deflection
Grey glass, 50% transmission (approx.)
Aluminised screen
External conductive coating
29.4 mm maximum neck diameter

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - Voltages referred to cathode

Maximum third anode voltage	$V_{a3(max)}$	20*	kV
Minimum third anode voltage	$V_{a3(min)}$	14	kV
Maximum second anode voltage	$V_{a2(max)}$	5.0	kV
Maximum first anode voltage	$V_{a1(max)}$	770	V
Maximum negative grid voltage	$-V_{g(max)}$	155	V
Minimum negative grid voltage	$V_{g(max)}$	-1 ¶	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	250	V
Maximum peak heater to cathode voltage, heater negative	$v_{h-k(pk)max}$	400 §	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ
Maximum peak cathode current	$i_{k(pk)max.}$	0.5	mA

¶ A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

§ During a warming-up period not exceeding 45 seconds. * $I_{a3} = 0$

PHOSPHOR SCREEN

This type is usually supplied with a W phosphor (M38-142W) giving a television white trace of medium short persistence. Other phosphor screens can be made available to special order.

This data should be read in conjunction with Operational and Safety Recommendations for Industrial Cathode ray tubes.

BRIMAR

INTER-ELECTRODE CAPACITANCES

Cathode to all (max)	$C_{k\text{-all (max)}}$	7.0	pF
Grid to all (max)	$C_{g\text{-all (max)}}$	10	pF
Anode 3 to coating M (approx.)	$C_{a3\text{-}M}$	600	pF

DEFLECTION ANGLES

Height 76° Width 93° Diagonal 110°

TYPICAL OPERATION - Grid modulation voltages referred to cathode

Third anode voltage	V_{a3}	17	kV
First anode voltage	V_{a1}	450	V
Second anode voltage for centre focus (nom)	V_{a2}	4.0	kV
Grid to cathode voltage for cut-off of raster	V_g	-35 to -85	V
Typical line width at 50 μA beam current shrinking raster measurements at face centre		0.2	mm

Note: To obtain best overall performance, a dynamic focus voltage variation of approximately 450V is required between the centre of the screen and any corner.

* In operation the second anode current will vary with beam current. To avoid focus variation the supply impedance should be kept low.

MOUNTING

There is an annular region of anti-corona coating with external diameter of 75 mm surrounding the CT8 cap, the tube should not be handled in this region.

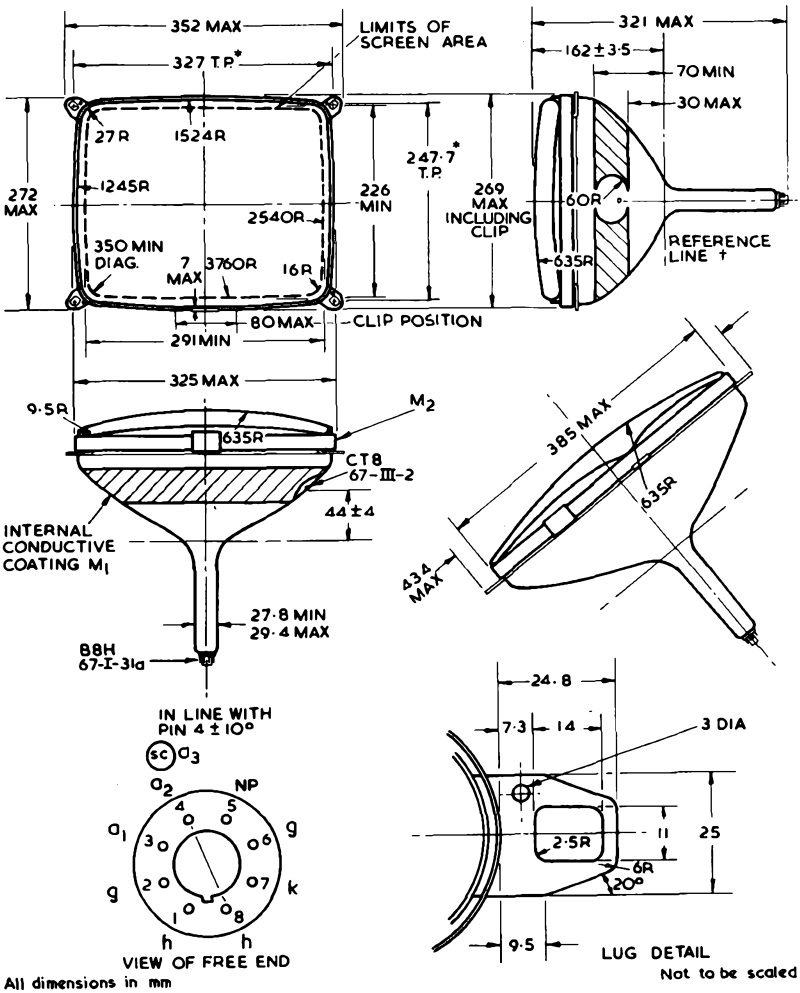
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal (M_2) should be connected to the chassis in a.c. equipment operating from an isolating transformer, or via a suitable leakage path in a.c./d.c. equipment, for example 2 MΩ.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

TUBE WEIGHT (approximate) - net 4.7 kg.



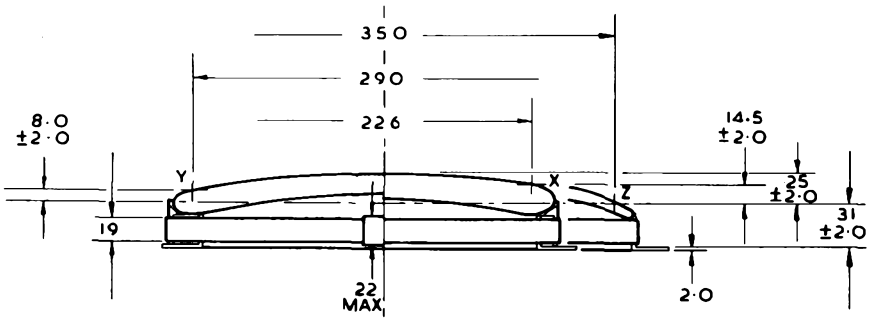
All dimensions in mm

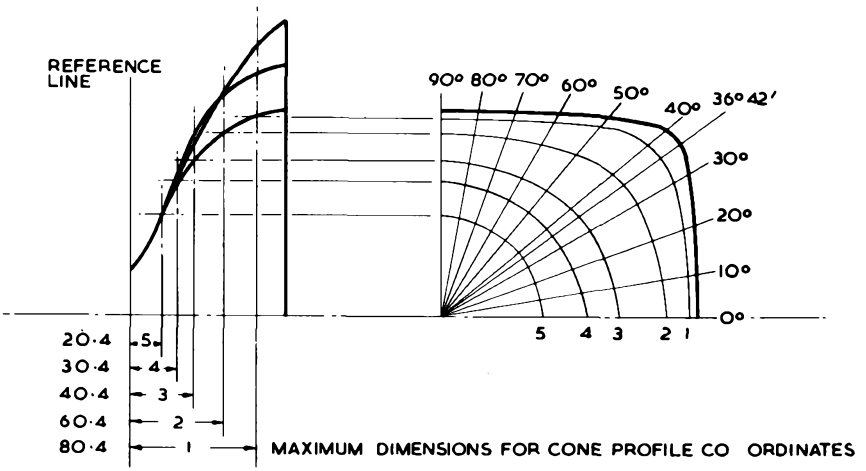
* The bolts to be used for mounting the tube must lie within the circles of 7.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 16(B.S. RL4 : IEC 67-IV-3 : JEDEC 126).

Minimum useful screen area 646 cm^2

Data Display or Monitor Tube M38-142..





All dimensions in mm

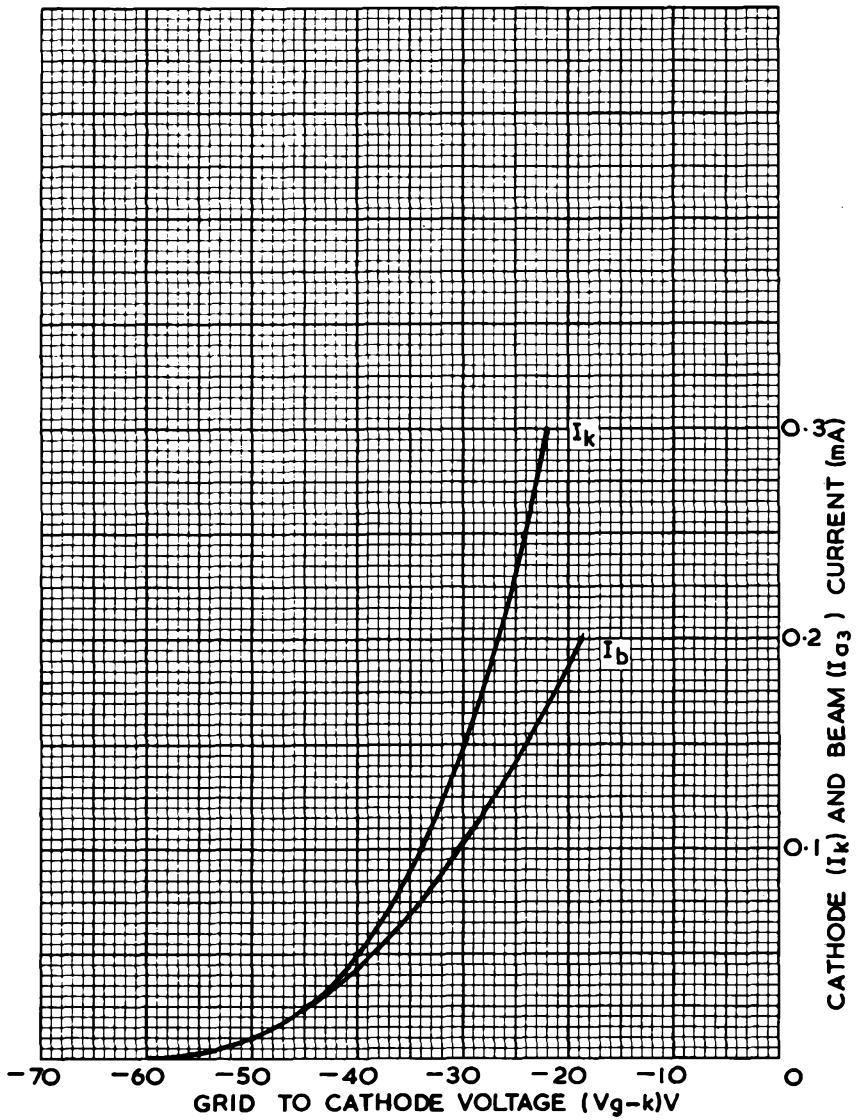
Not to be scaled

Reference Plane No.	0° Major	10°	20°	30°	36°42' Diag.	40°	50°	60°	70°	80°	90° Minor
1	155	157	162	170	173	171	156	141	131	126	124
2	140	141	143	143	141	140	134	126	119	116	115
3	112	112	110	108	106	105	104	102	101	99	99
4	90	89	88	86	86	86	85	85	86	86	85
5	63	64	63	63	63	63	63	64	64	64	64

GRID MODULATION

$I_k, I_{a3} / V_{g-k}$ V_{a3} = 17k V V_{a1} = 450V

OPTIMUM FOCUS

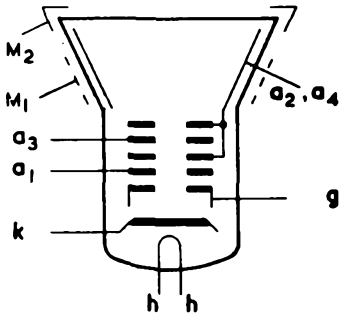


Data Display or Monitor Tube M44-120..

GENERAL

Rectangular face, 17 inch, 110° diagonal
Rimguard III reinforced envelope
Integral mounting lugs
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 48% transmission (approx.)
Straight gun, non ion trap
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3*	A



DESIGN CENTRE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	13	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	700	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Maximum peak negative grid voltage	$-v_{g(pk)max}$	400**	V
Maximum positive grid voltage	$V_{g(max)}$	0¶	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	250	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$v_{h-k(pk)max}$	400§	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* In a series heater chain the CRT should always be connected at the chassis end.

† $I_{a2+a4} = 0$. ** Maximum pulse duration 22% of one cycle with a max. of 1.5 ms.

¶ A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

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

PHOSPHOR SCREEN

This type is usually supplied with either a GR phosphor (M44-120GR) giving a yellowish-green trace of very long persistence or a W (television white) phosphor. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

INTER-ELECTRODE CAPACITANCES

		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	7.0	8.5	pF
Anodes 2 and 4 to coating M_1 (approx.)	$c_{a2+a4-M1}$	700 to 1300		pF
Anodes 2 and 4 to shell M_2 (approx.)	$c_{a2+a4-M2}$	200		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltage referred to cathode

Second and fourth anode voltage	$V_{a2+a4-k}$	16	16	kV
First anode voltage ¶	V_{a1-k}	400	500	V
Third anode voltage range for focus	V_{a3-k}	0 to 400	0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	500	500	μA
Average peak to peak picture modulating voltage		40.5	45	V
Grid to cathode voltage limits for cut-off of raster	V_{g-k}	-40 to -77	-50 to -93	V
GR screen raster persistence to 10% (approx.)		2.0		s

TYPICAL OPERATION - Cathode modulation, voltage referred to grid

Second and fourth anode voltage	$V_{a2+a4-g}$	16	16	kV
First anode voltage ¶	V_{a1-g}	400	500	V
Third anode voltage range for focus	V_{a3-g}	0 to 400	0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	500	500	μA
Average peak to peak picture modulating voltage		35.5	39.5	V
Cathode to grid voltage limits for cut-off of raster	V_{k-g}	36 to 66	45 to 80	V
GR screen raster persistence to 10% (approx.)		2.0		s

¶ Within this range a higher first anode voltage will provide improved focus performance.

If this tube is operated at voltages in excess of 18 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

Data Display or Monitor Tube M44-120..

PICTURE CENTRING

Maximum magnet flux density at centre of neck should not be less than	17	Gs
Maximum distance of centre of magnetic field from reference line	53	mm

DEFLECTION ANGLES

Height 83° Width 100° Diagonal 110°

MOUNTING

This tube is intended for 'push-through' presentation without masking, but if a mask is used it should be flexible enough to take up small variations in fixing and bulb contours.

There is an annular region of anti-corona coating with external diameter of 100 mm surrounding the CT8 cap, the tube should not be handled in this region.

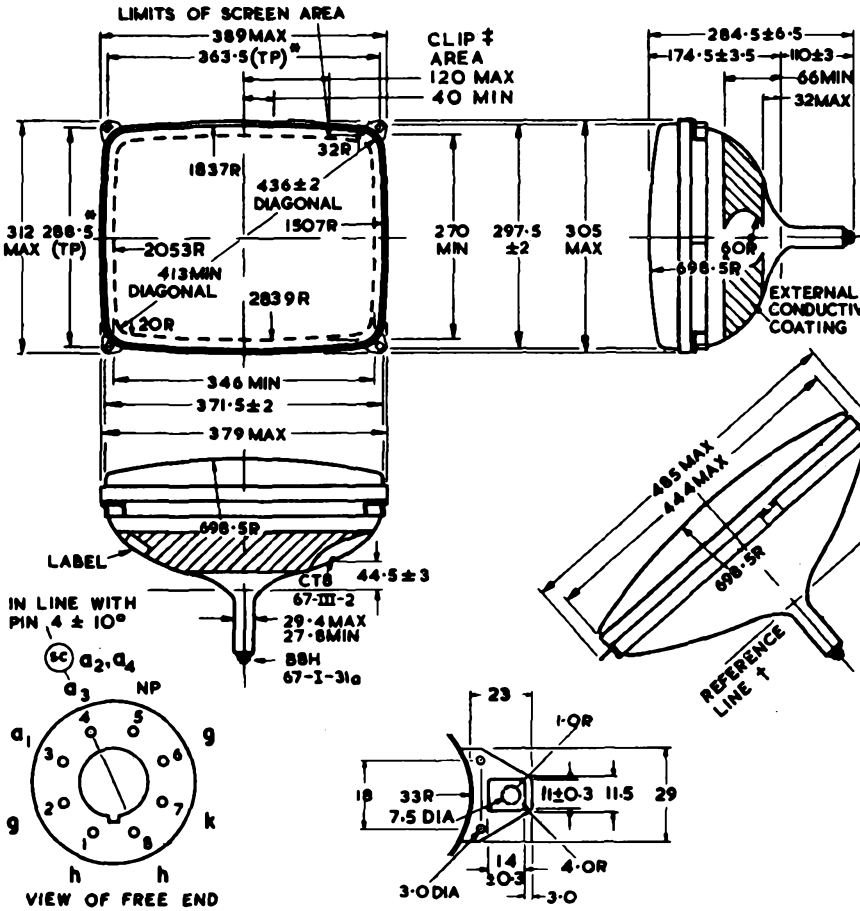
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle of 44 mm diameter which is centred on the perpendicular from the centre of the face.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal frame (M_2) should be connected directly to the chassis in an a.c. receiver operating from an isolating transformer, or via a suitable leakage path in an a.c./d.c. receiver, for example 2 MΩ.

TUBE WEIGHT (approximate) - net 5.5 kg (12 lb)

Characteristic curves as M50-120..



All dimensions in mm

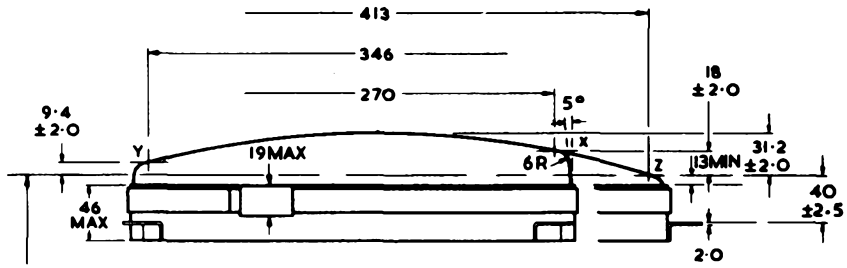
Not to be scaled

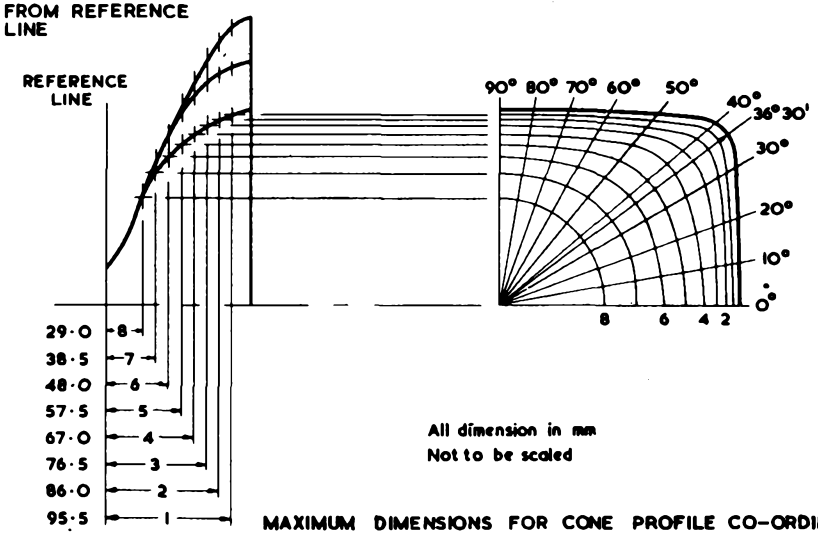
* The bolts to be used for mounting the tube must lie within the circles of 7.5 mm. diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 16 (B.S. RL4 : IEC 67-IV-3:JEDEC 126)

‡ Total thickness of shell, tension band and clip 8 mm maximum.

Data Display or Monitor Tube M44-120..





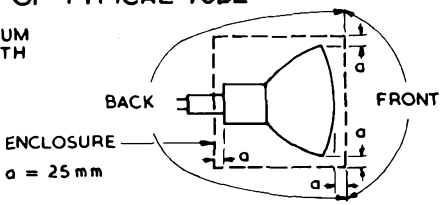
MAXIMUM DIMENSIONS FOR CONE PROFILE CO-ORDINATES

Reference Plane No.	0° Major	10°	20°	30°	36°30' Diag.	40°	50°	60°	70°	80°	90° Minor
1	181.0	183.0	190.0	202.5	210.8	209.0	182.5	164.5	153.0	147.1	145.0
2	175.8	177.8	184.2	195.7	199.0	197.3	177.0	159.7	148.6	142.9	141.0
3	168.8	170.2	175.4	183.6	184.8	183.6	170.1	154.0	143.6	138.1	136.2
4	158.7	159.2	161.9	166.3	168.1	167.7	159.2	144.9	136.7	131.9	130.1
5	144.1	144.6	146.2	148.7	149.9	149.3	144.0	134.2	127.3	123.5	122.4
6	127.3	127.3	128.8	130.7	131.2	130.8	126.8	121.0	116.5	114.2	113.2
7	107.5	107.8	108.7	109.5	109.5	109.4	107.7	104.8	102.3	101.0	100.3
8	82.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8

M44-120.. Data Display or Monitor Tube

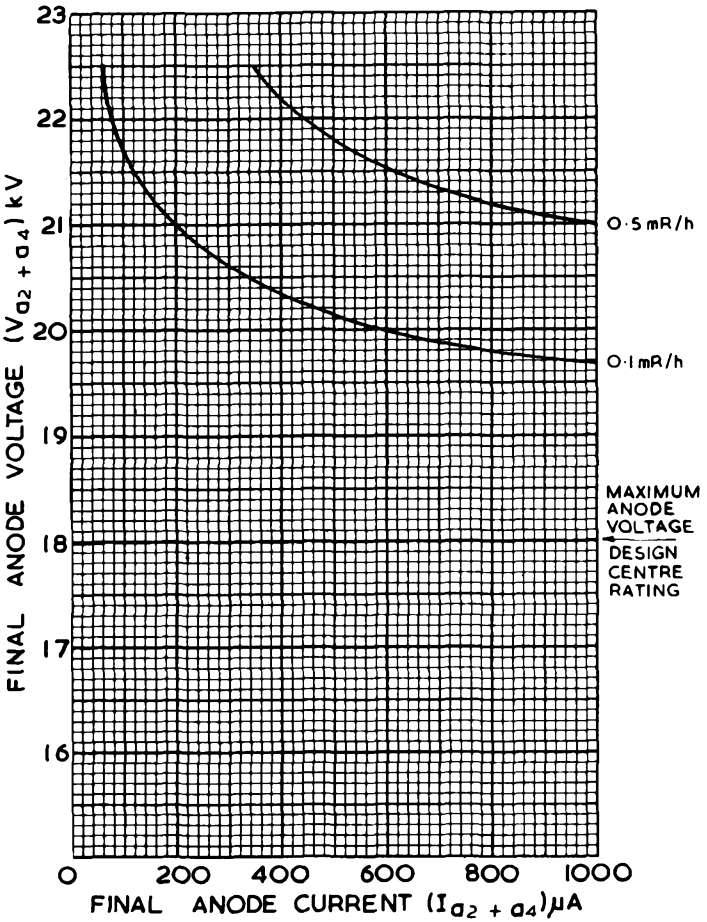
X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM.

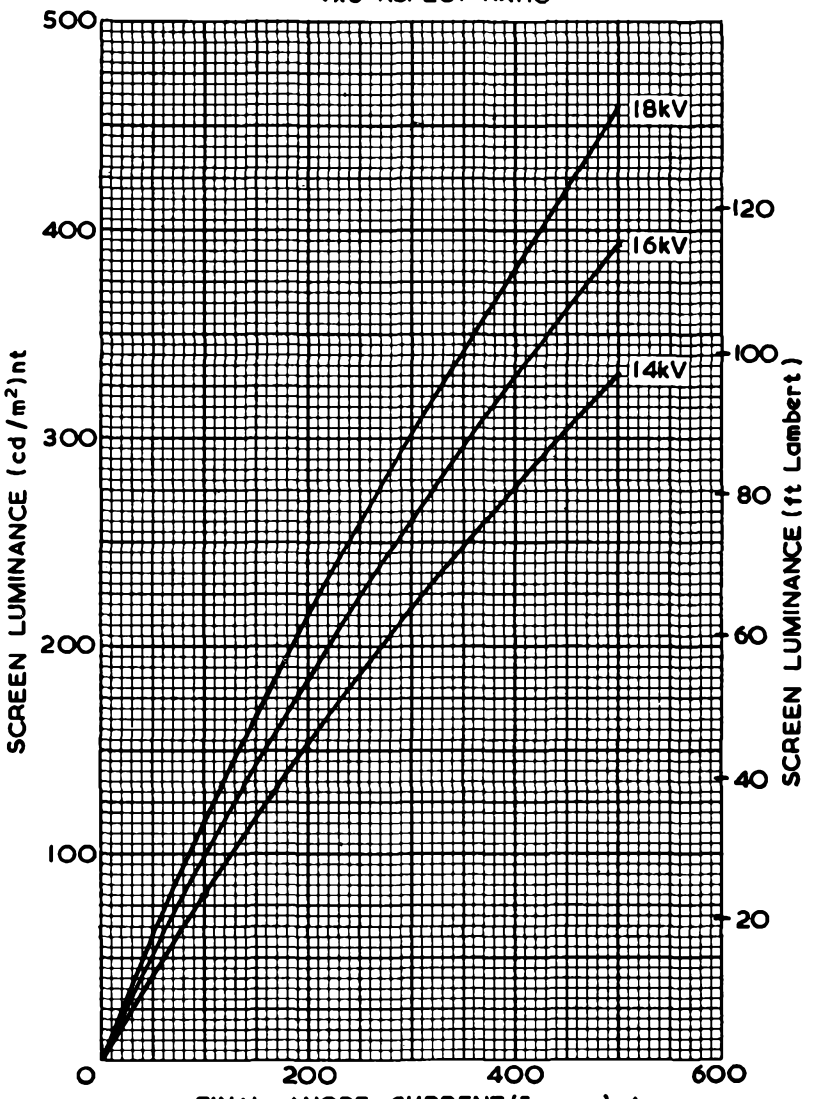


UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1mR/h

RADIATION FROM BACK OF TUBE



TYPICAL CHARACTERISTICS
W PHOSPHOR SCREEN
FOCUSED RASTER OF FULL HEIGHT
4x3 ASPECT RATIO

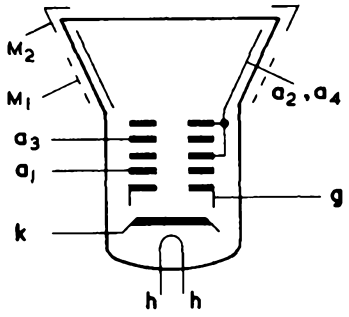


M50-120.. Data Display or Monitor Tube

GENERAL

Rectangular face, 20 inch, 110° diagonal
Rimguard III reinforced envelope
Integral mounting lugs
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 45% transmission (approx.)
Straight gun, non ion trap
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3*	A



DESIGN CENTRE RATINGS - Voltages referred to cathode

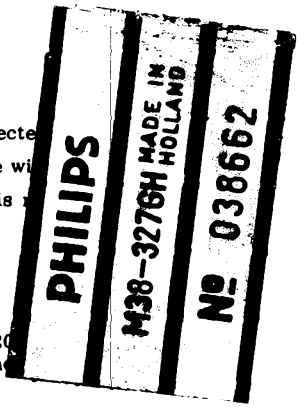
Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	20†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	13	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	700	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Maximum peak negative grid voltage	$-V_{g(pk)max}$	400**	V
Maximum positive grid voltage	$V_{g(max)}$	0¶	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	250	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$V_{h-k(pk)max}$		
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$		
Maximum resistance, grid to cathode	$R_{g-k(max)}$		

* In a series heater chain the CRT should always be connecte

† $I_{a2+a4} = 0$. **Maximum pulse duration 22% of one cycle wi

¶ A 10 kΩ grid series resistor mounted close to the tube base is
the peak grid voltage.

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



PHOSPHOR SCREEN

This type is usually supplied with either a GR phosphor (M50-12
green trace of very long persistence or a W (television white) ph
screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

BRIMAR

INTER-ELECTRODE CAPACITANCES		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	7.0	8.5	pF
Anodes 2 and 4 to coating M_1 (approx.)	$c_{a2+a4-M1}$	1000		pF
Anodes 2 and 4 to shell M_2 (approx.)	$c_{a2+a4-M2}$	350		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltage referred to cathode				
Second and fourth anode voltage	$V_{a2+a4-k}$	16	16	kV
First anode voltage ¶	V_{a1-k}	400	500	V
Third anode voltage range for focus	V_{a3-k}	0 to 400	0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	500	500	μA
Average peak to peak picture modulating voltage		40.5	45	V
Grid to cathode voltage limits for cut-off of raster	V_{g-k}	-40 to -77	-50 to -93	V
GR screen raster persistence to 10% (approx.)		2.0		s

TYPICAL OPERATION - Cathode modulation, voltage referred to grid				
Second and fourth anode voltage	$V_{a2+a4-g}$	16	16	kV
First anode voltage ¶	V_{a1-g}	400	500	V
Third anode voltage range for focus	V_{a3-g}	0 to 400	0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	500	500	μA
Average peak to peak picture modulating voltage		35.5	39.5	V
Cathode to grid voltage limits for cut-off of raster	V_{k-g}	36 to 66	45 to 80	V
GR screen raster persistence to 10% (approx.)		2.0		s

¶ Within this range a higher first anode voltage will provide improved focus performance.

If this tube is operated at voltages in excess of 20 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PICTURE CENTRING

Maximum magnet flux density at centre of neck should not be less than	17	Gs
Maximum distance of centre of magnetic field from reference line	53	mm

DEFLECTION ANGLES

Height 81° Width 98° Diagonal 110°

MOUNTING

This tube is intended for 'push-through' presentation without masking, but if a mask is used it should be flexible enough to take up small variations in fixing and bulb contours.

There is an annular region of anti-corona coating with external diameter of 100 mm surrounding the CT8 cap, the tube should not be handled in this region.

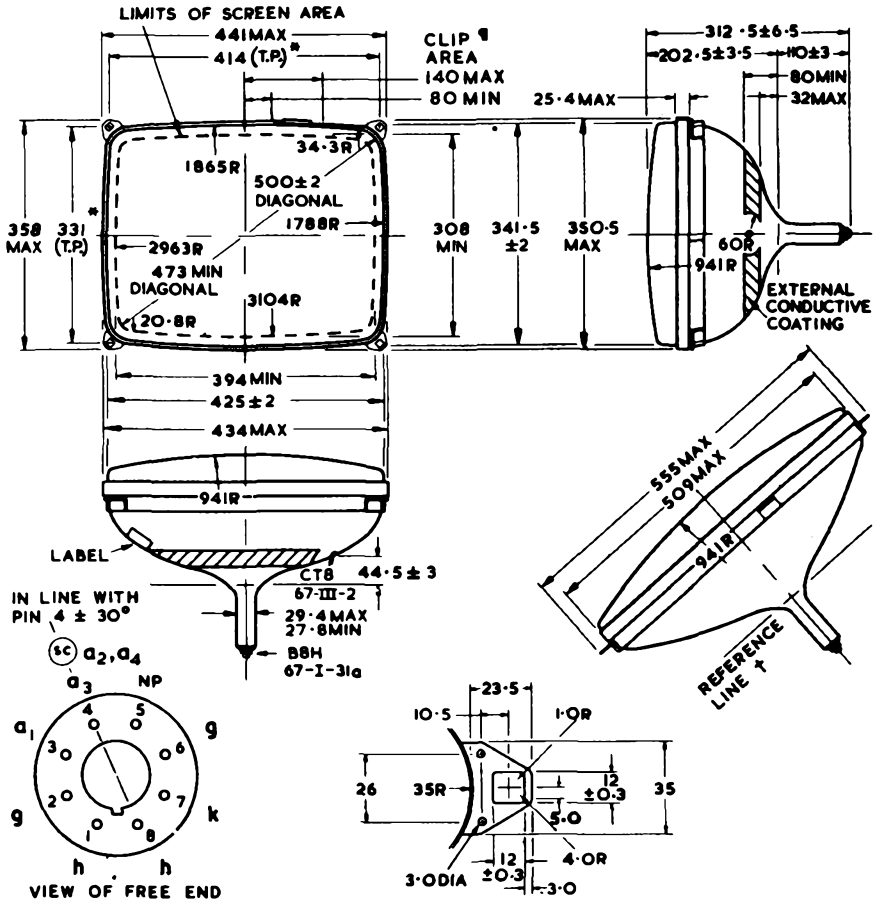
The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle of 40 mm diameter which is centred on the perpendicular from the centre of the face.

The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal frame (M_2) should be connected directly to the chassis in an a.c. receiver operating from an isolating transformer, or via a suitable leakage path in an a.c./d.c. receiver, for example 2 MΩ.

TUBE WEIGHT (approximate) - net 9.5 kg (21 lb)

Data Display or Monitor Tube M50-120..



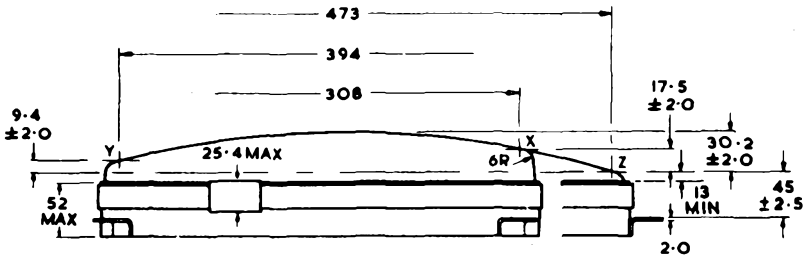
All dimensions in mm

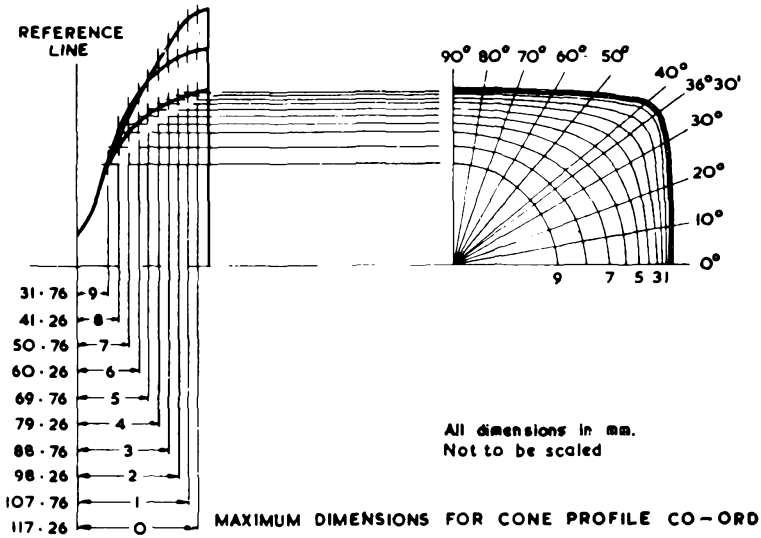
Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 8.0 mm diameter centred on these true positions. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 16 (B.S.RL4 : IEC 67-IV-3 : JEDEC 126). See T.D.S. 5-0-91-16.

¶ Total thickness of shell, tension band and clip 8.0 mm maximum.

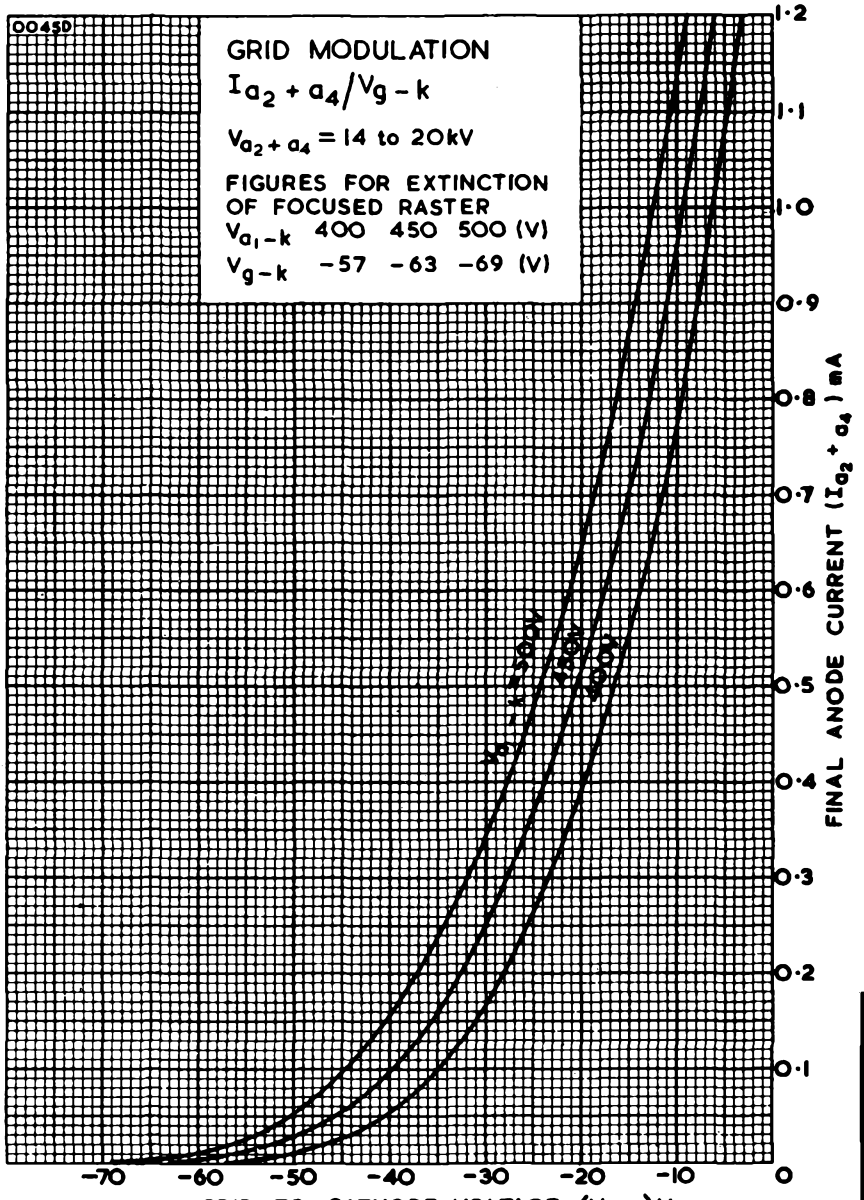




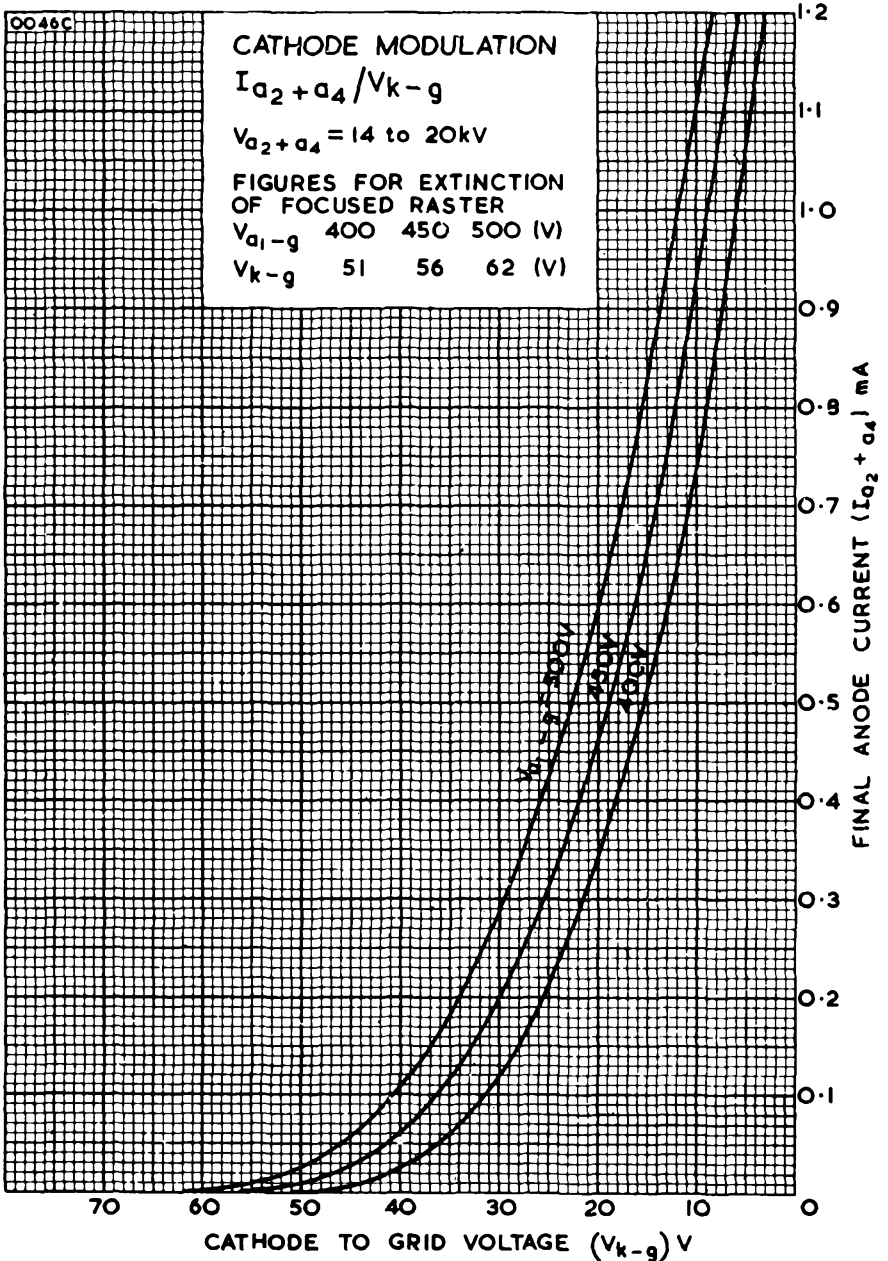
All dimensions in mm.
Not to be scaled

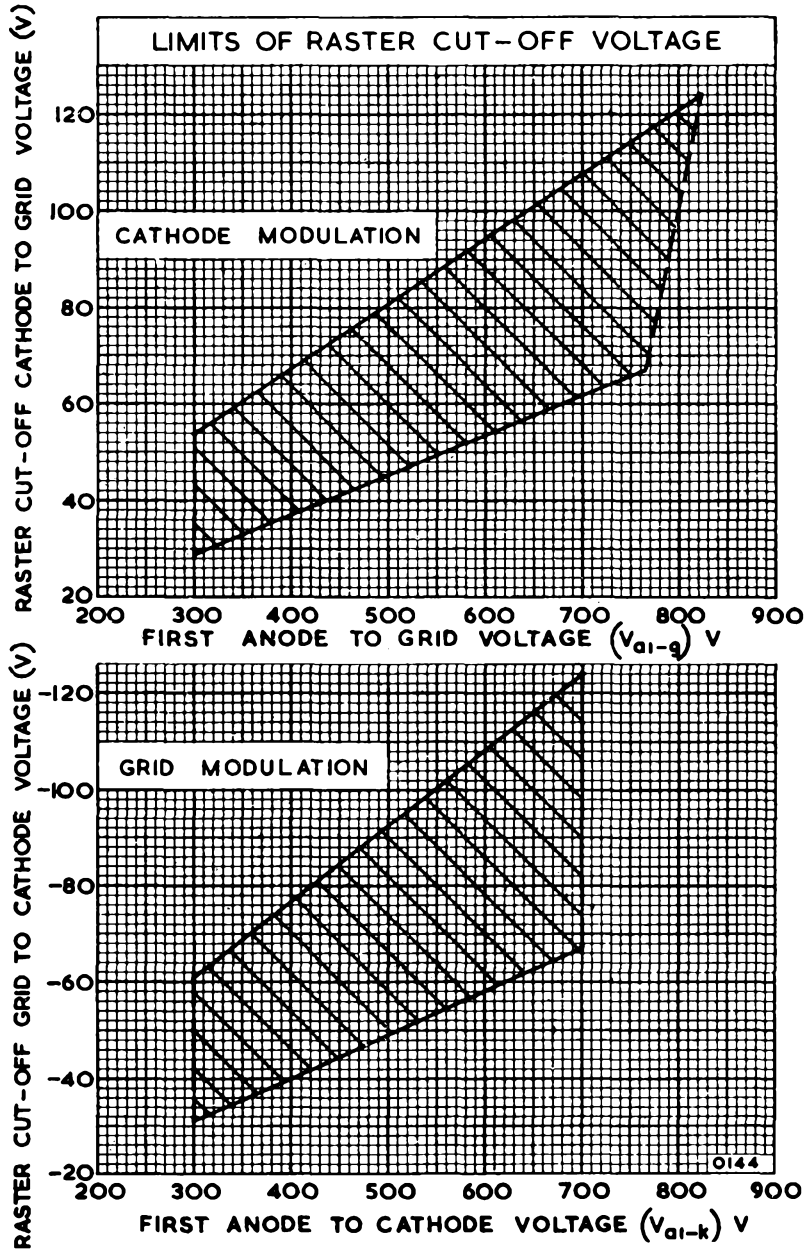
MAXIMUM DIMENSIONS FOR CONE PROFILE CO-ORDINATES

Reference Plane No.	0° Major	10°	20°	30°	36°30' Diag.	40°	50°	60°	70°	80°	90° Minor
0	210.5	213.3	222.0	237.8	247.1	243.7	213.5	192.0	178.6	171.3	168.9
1	207.0	209.6	218.0	233.4	241.2	238.1	209.5	188.5	175.0	167.8	165.5
2	202.7	205.2	212.4	225.0	228.3	225.6	202.3	183.2	170.5	163.9	162.0
3	197.1	198.8	204.4	213.0	213.9	211.6	192.7	176.4	165.3	159.2	157.8
4	190.0	191.0	194.6	198.8	198.5	196.1	181.8	168.0	159.2	153.7	152.6
5	180.9	181.4	182.7	183.6	182.0	179.7	169.2	158.5	151.3	147.0	146.2
6	168.8	168.5	168.6	167.0	164.2	162.1	154.3	147.3	142.0	139.2	138.3
7	151.5	150.4	149.5	147.2	144.8	143.4	138.2	134.0	131.2	129.0	128.5
8	130.1	128.5	126.6	125.0	123.3	122.6	120.0	118.2	116.7	116.0	115.9
9	103.4	102.5	101.0	99.6	99.2	89.2	99.1	99.1	98.9	98.7	98.4


00450
GRID MODULATION
$I_{a_2 + a_4} / V_{g-k}$
$V_{a_2 + a_4}$ = 14 to 20kV
FIGURES FOR EXTINCTION OF FOCUSED RASTER
V_{a_1-k} 400 450 500 (V)
V_{g-k} -57 -63 -69 (V)
1·2
1·1
1·0
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
FINAL ANODE CURRENT ($I_{a_2 + a_4}$) mA
-70 -60 -50 -40 -30 -20 -10 0
GRID TO CATHODE VOLTAGE (V_{g-k})V

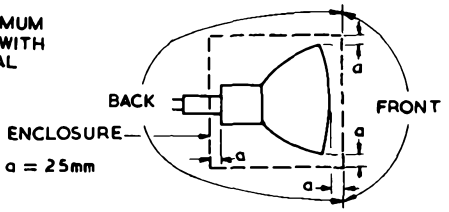
Data Display or Monitor Tube




LIMITS OF RASTER CUT-OFF VOLTAGE
CATHODE MODULATION
RASTER CUT-OFF CATHODE TO GRID VOLTAGE (V)
120
100
80
60
40
20
200 300 400 500 600 700 800 900
FIRST ANODE TO GRID VOLTAGE (Va1-g) V
GRID MODULATION
RASTER CUT-OFF GRID TO CATHODE VOLTAGE (V)
-120
-100
-80
-60
-40
-20
200 300 400 500 600 700 800 900
FIRST ANODE TO CATHODE VOLTAGE (Va1-k) V
0144

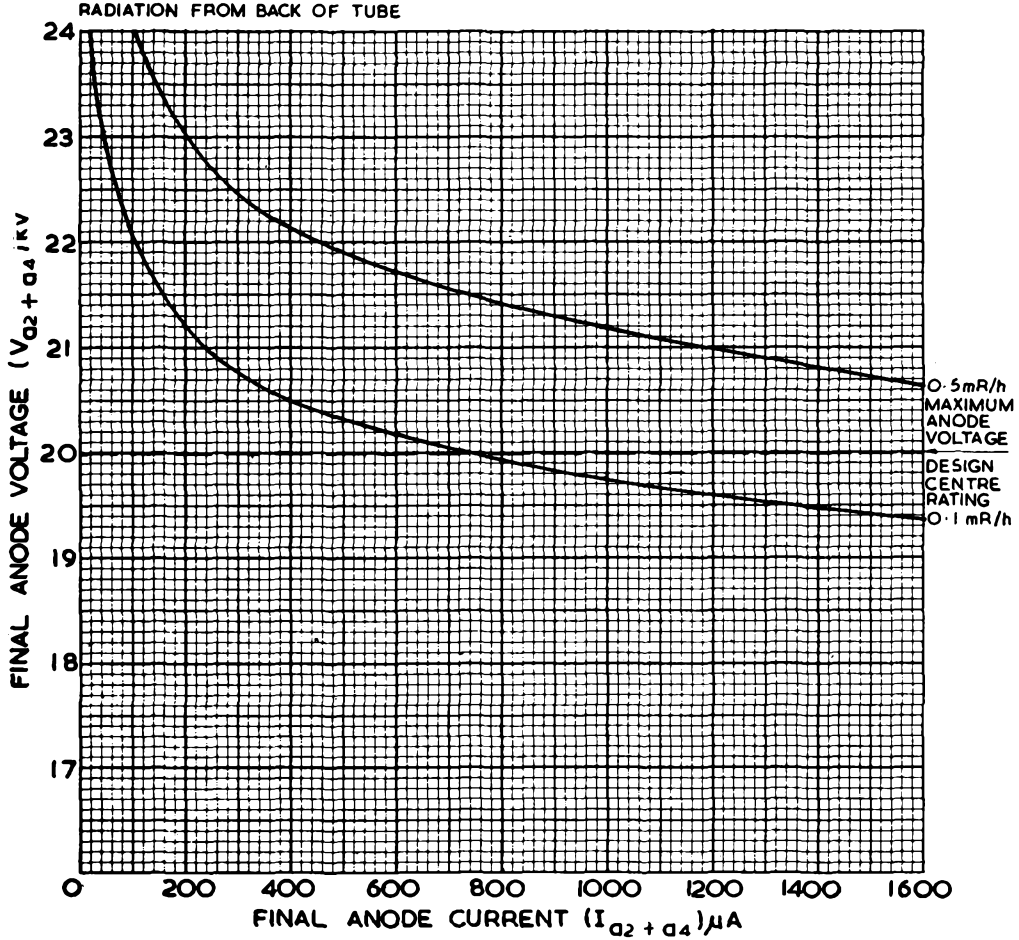
X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM

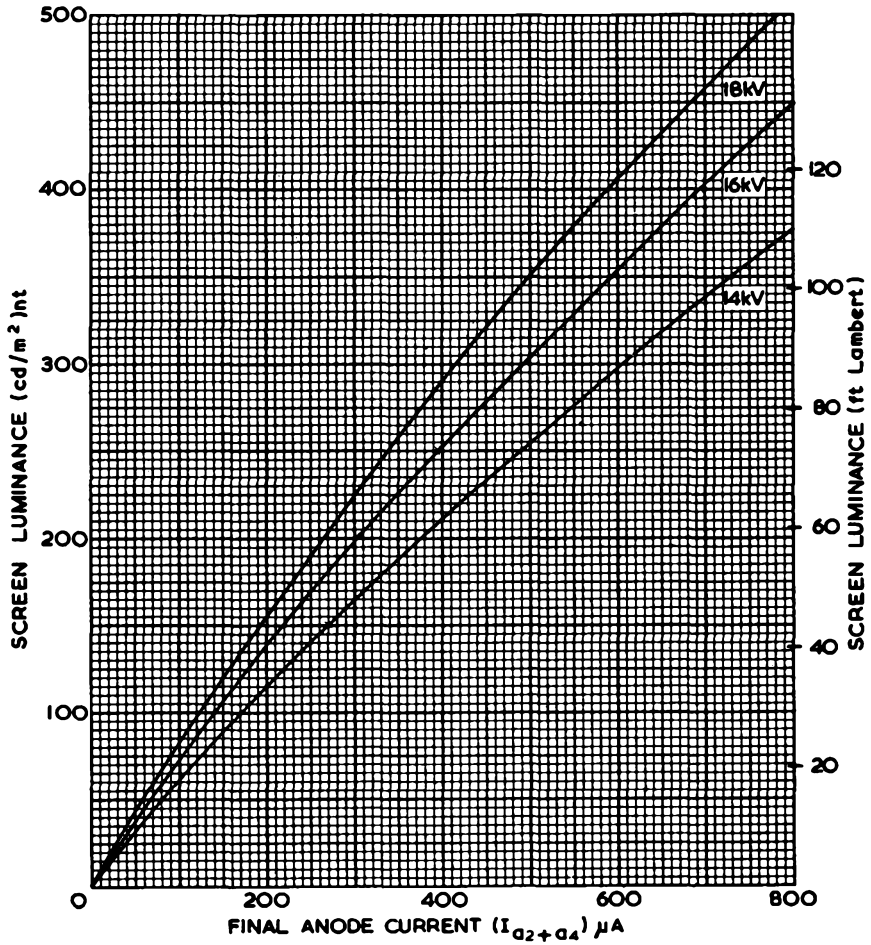


UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1 mR/h

RADIATION FROM BACK OF TUBE



TYPICAL CHARACTERISTICS
W PHOSPHOR SCREEN
FOCUSED RASTER OF FULL HEIGHT

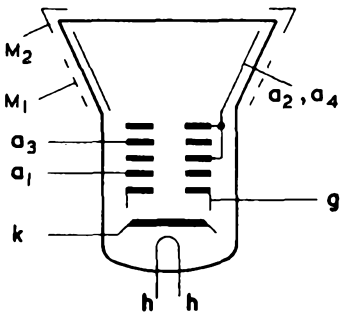


M61-120.. Data Display or Monitor Tube

GENERAL

Rectangular face, 24 inch, 110° diagonal
Rimguard III reinforced envelope
Integral mounting lugs
Electrostatic focus, magnetic deflection
Aluminised screen
Grey glass, 42% transmission (approx.)
Straight gun, non ion trap
External conductive coating

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3*	A



DESIGN CENTRE RATINGS - Voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	20†	kV
Minimum second and fourth anode voltage	$V_{a2+a4(min)}$	13	kV
Maximum third anode voltage	$V_{a3(max)}$	+1000 to -500	V
Maximum first anode voltage	$V_{a1(max)}$	700	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Maximum peak negative grid voltage	$-v_{g(pk)max}$	400**	V
Maximum positive grid voltage	$V_{g(max)}$	0¶	V
Maximum heater to cathode voltage, heater negative (d.c.)	$V_{h-k(max)}$	250	V
Maximum peak heater to cathode voltage, heater negative (absolute rating)	$v_{h-k(pk)max}$	400§	V
Maximum impedance, grid to cathode (50 Hz)	$Z_{g-k(max)}$	0.5	MΩ
Maximum resistance, grid to cathode	$R_{g-k(max)}$	1.5	MΩ

* In a series heater chain the CRT should always be connected at the chassis end.

† $I_{a2+a4} = 0$. ** Maximum pulse duration 22% of one cycle with a max. of 1.5 ms.

¶ A 10 kΩ grid series resistor mounted close to the tube base is recommended to limit the peak grid voltage.

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

PHOSPHOR SCREEN

This type is usually supplied with either a GR phosphor (M61-120GR) giving a yellowish-green trace of very long persistence or a W (television white) phosphor. Other phosphor screens can be made available to special order.

Tubes incorporating a B8H Sparkguard base will have a suffix after the type number. For details of the Sparkguard bases see separate sheets.

INTER-ELECTRODE CAPACITANCES		*	†	
Cathode to all	c_{k-all}	3.0	3.5	pF
Grid to all	c_{g-all}	7.0	8.5	pF
Anodes 2 and 4 to coating M_1 (approx.)	$c_{a2+a4-M1}$	1000		pF
Anodes 2 and 4 to shell M_2 (approx.)	$c_{a2+a4-M2}$	350		pF

* Holder capacitance balanced out.

† Total capacitances including a typical B8H holder.

TYPICAL OPERATION - Grid modulation, voltage referred to cathode				
Second and fourth anode voltage	$V_{a2+a4-k}$	16	16	kV
First anode voltage ¶	V_{a1-k}	400	500	V
Third anode voltage range for focus	V_{a3-k}	0 to 400	0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	500	500	μA
Average peak to peak picture modulating voltage		40.5	45	V
Grid to cathode voltage limits for cut-off of raster	V_{g-k}	-40 to -77	-50 to -93	V
GR screen raster persistence to 10% (approx.)		2.0		s

TYPICAL OPERATION - Cathode modulation, voltage referred to grid				
Second and fourth anode voltage	$V_{a2+a4-g}$	16	16	kV
First anode voltage ¶	V_{a1-g}	400	500	V
Third anode voltage range for focus	V_{a3-g}	0 to 400	0 to 400	V
Final anode current (peak)	$i_{a2+a4(pk)}$	500	500	μA
Average peak to peak picture modulating voltage		35.5	39.5	V
Cathode to grid voltage limits for cut-off of raster	V_{k-g}	36 to 66	45 to 80	V
GR screen raster persistence to 10% (approx.)		2.0		s

¶ Within this range a higher first anode voltage will provide improved focus performance.

If this tube is operated at voltages in excess of 20 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PICTURE CENTRING

Maximum magnet flux density at centre of neck should not be less than	17	Gs
Maximum distance of centre of magnetic field from reference line	53	mm

DEFLECTION ANGLES

Height 81° Width 98° Diagonal 110°

MOUNTING

This tube is intended for 'push-through' presentation without masking, but if a mask is used it should be flexible enough to take up small variations in fixing and bulb contours.

There is an annular region of anti-corona coating with external diameter of 100 mm surrounding the CT8 cap, the tube should not be handled in this region.

The tube can be mounted in any position. The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely. The bottom circumference of the base shell will fall within a circle of 40 mm diameter which is centred on the perpendicular from the centre of the face.

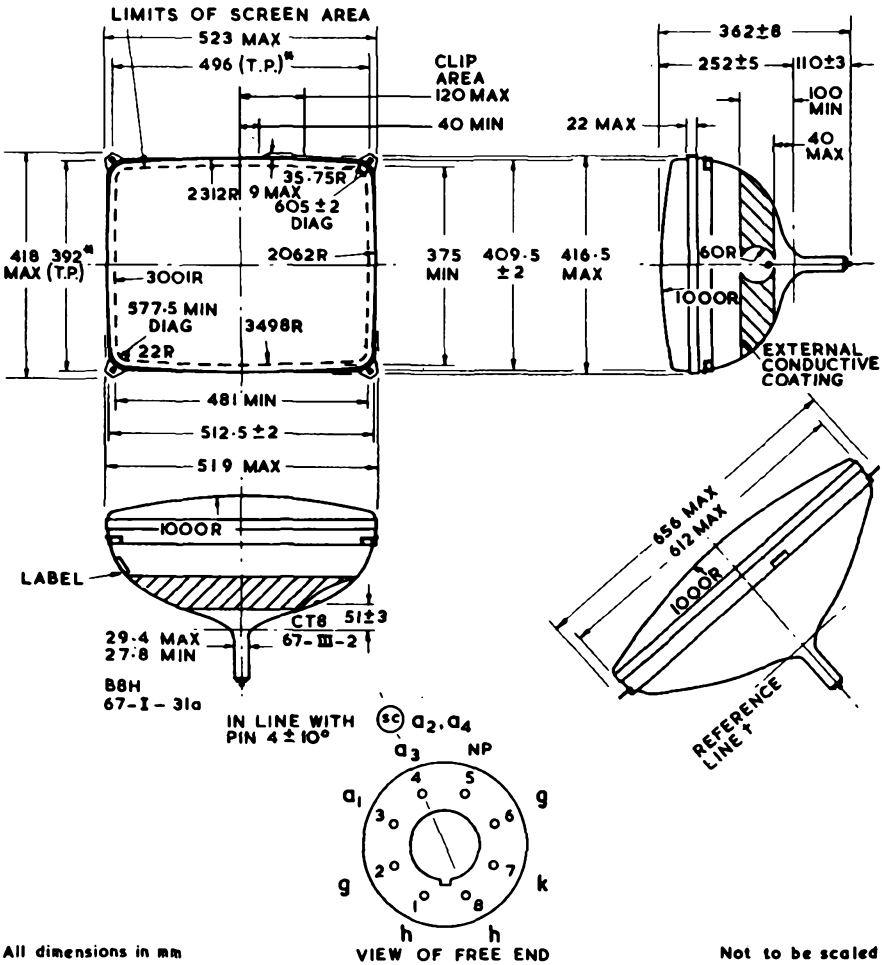
The external conductive coating (M_1) of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

The metal frame (M_2) should be connected directly to the chassis in an a.c. receiver operating from an isolating transformer, or via a suitable leakage path in an a.c./d.c. receiver, for example 2 MΩ.

TUBE WEIGHT (approximate) - net 13.2 kg (29 lb)

Characteristic curves as M50-120..

Data Display or Monitor Tube M61-120..



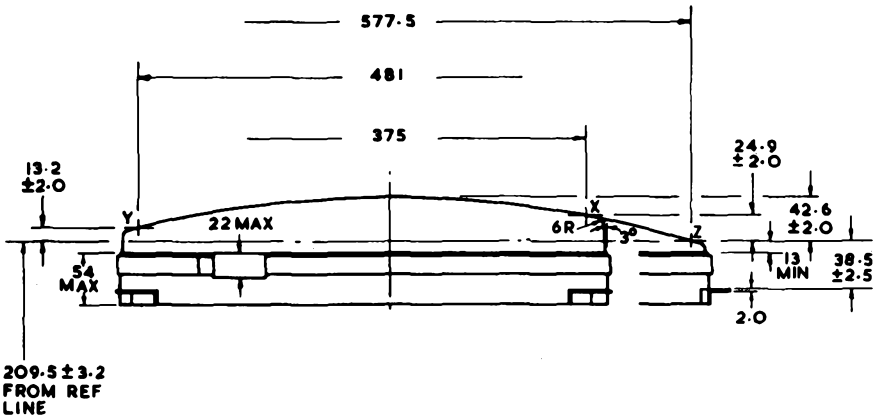
All dimensions in mm

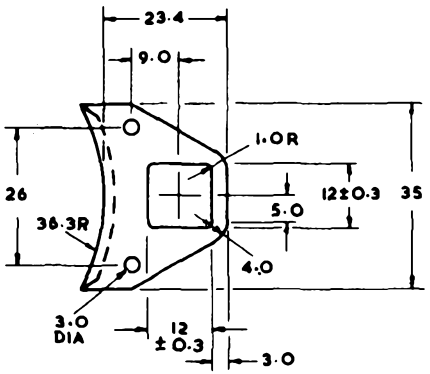
Not to be scaled

* The bolts to be used for mounting the tube must lie within the circles of 8.0 mm diameter centred on these true positions. One of the four lugs may deviate 2.0 mm maximum from the plane through the other three lugs.

† Determined by reference line gauge No. 16 (B.S.RL4 : IEC 67-IV-3 : JEDEC 126).

DATA DISPLAY & MONITOR TUBES

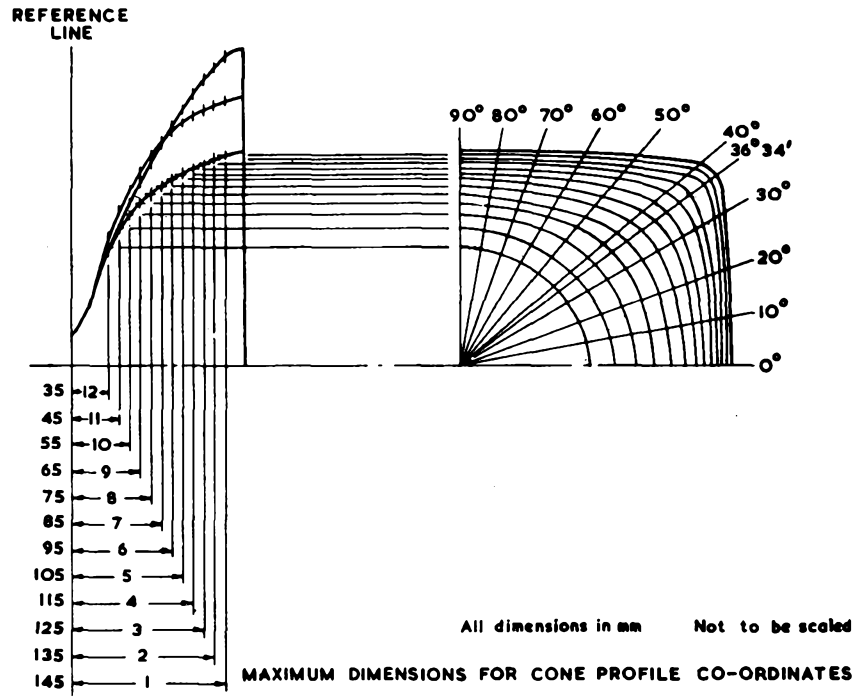




All dimensions in mm

Not to be scaled

Data Display or Monitor Tube M61-120..



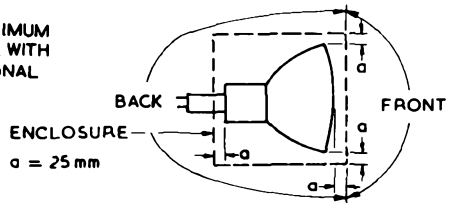
All dimensions in mm Not to be scaled

MAXIMUM DIMENSIONS FOR CONE PROFILE CO-ORDINATES

Reference Plane No.	0° Major	10°	20°	30°	36°34' Diag.	40°	50°	60°	70°	80°	90° Minor
1	250.5	254.0	265.0	284.8	293.5	288.5	252.0	226.0	210.5	201.8	199.0
2	245.5	249.0	259.4	278.0	282.1	278.0	244.5	220.5	205.5	198.0	195.0
3	241.0	243.5	252.0	263.7	269.8	266.0	237.0	215.0	201.5	193.5	191.5
4	236.5	238.5	245.0	255.8	256.0	253.5	228.8	208.5	195.8	189.0	186.5
5	229.5	231.0	236.5	243.0	242.1	240.0	219.5	201.5	189.5	184.0	181.0
6	221.0	222.0	226.0	229.0	227.0	224.0	207.0	192.5	183.0	178.0	176.0
7	210.0	210.5	213.0	214.5	210.1	209.0	195.0	183.0	174.8	170.5	169.0
8	198.0	198.0	198.0	198.0	194.0	192.5	181.0	172.5	166.0	162.5	161.0
9	183.0	181.0	180.7	180.0	176.2	175.5	168.5	161.0	155.5	152.5	151.5
10	166.0	164.0	161.7	160.0	156.5	156.5	151.5	146.0	143.5	142.0	142.0
11	146.5	144.0	141.5	140.0	134.6	135.5	131.5	129.5	128.5	128.5	128.5
12	122.0	120.2	117.0	116.0	111.5	113.5	111.0	111.0	111.0	111.0	111.5

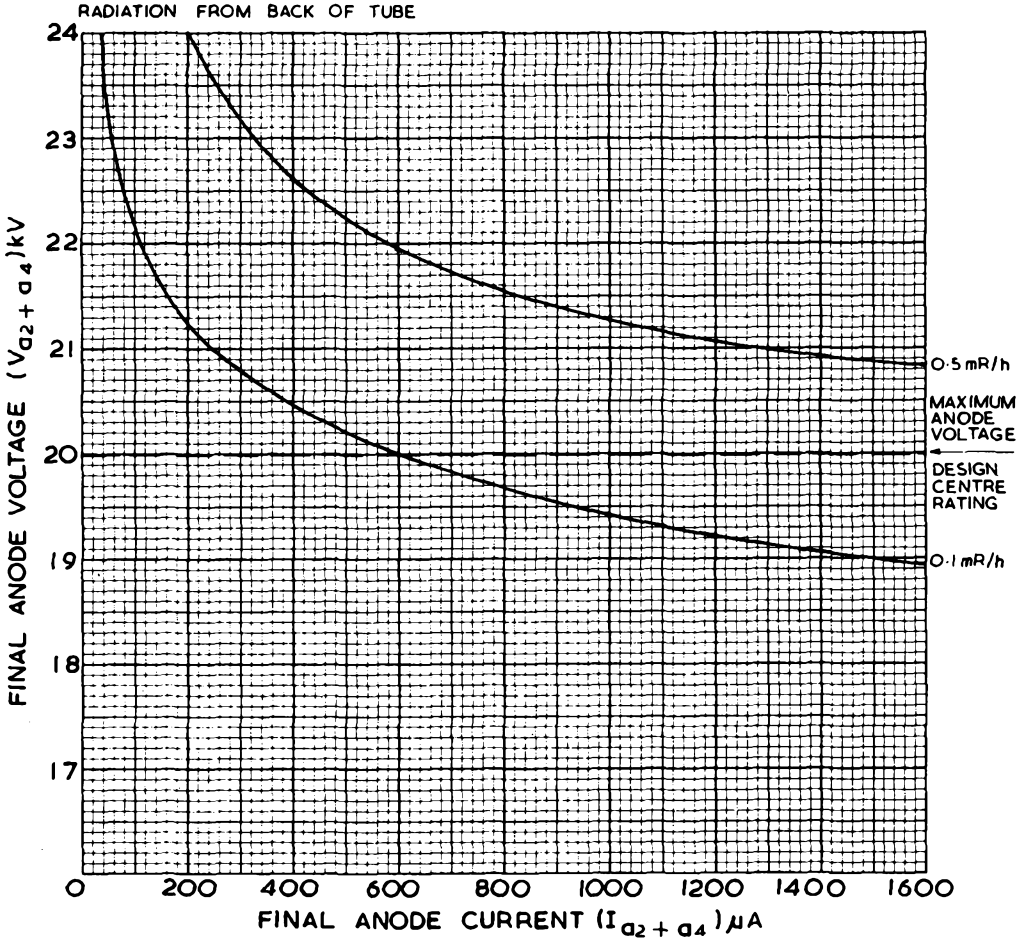
X-RAY ISO-EXPOSURE CURVES OF TYPICAL TUBE

MEASUREMENTS MADE ON LINES OF MAXIMUM RADIATION AT FRONT AND BACK OF TUBE WITH DETECTOR CENTRE 50mm FROM NOTIONAL ENCLOSURE DEFINED BY DIAGRAM

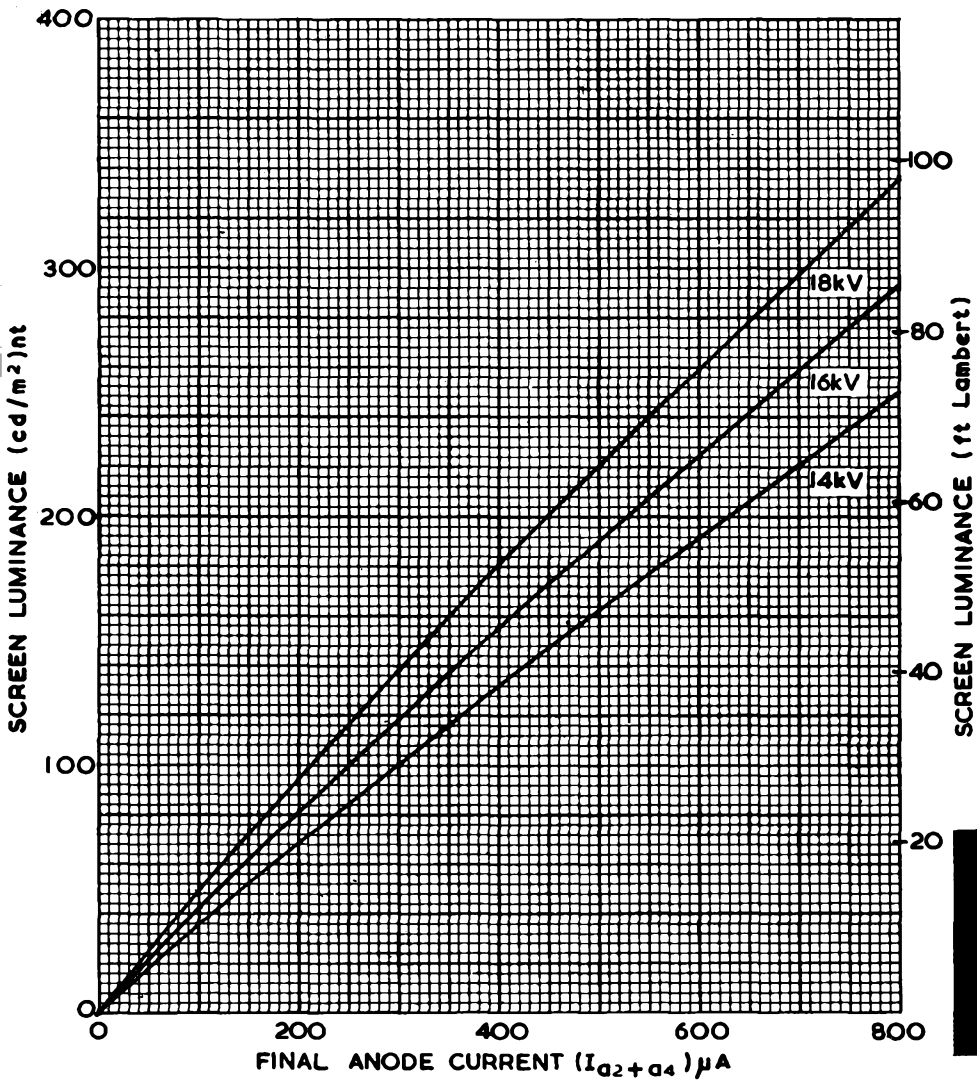


UNDER NO CONDITION REPRESENTED HERE DOES THE RADIATION FROM THE TUBE FRONT EXCEED 0·1 mR/h

RADIATION FROM BACK OF TUBE



TYPICAL CHARACTERISTICS
W PHOSPHOR SCREEN
FOCUSED RASTER OF FULL HEIGHT
4 x 3 ASPECT RATIO



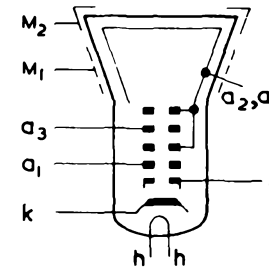
59-60/90/037 Data Display or Monitor Tube

ABRIDGED SPECIFICATION

GENERAL

Rectangular flat face, 22 cm 70° diagonal tube
Ruggedised construction, metal mounting frame
Electrostatic focus, magnetic deflection
Flying lead connections for base and anode
Aluminised screen, external conductive coating
Clear glass, 26.95 ± 0.5 mm neck diameter.

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS - All voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	20	kV
Maximum third anode voltage	$V_{a3(max)}$	800	V
Maximum negative third anode voltage	$-V_{a3(max)}$	300	V
Maximum first anode voltage	$V_{a1(max)}$	800	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	100	V

TYPICAL OPERATION- Grid modulation, voltages with respect to cathode

Second and fourth anode voltage	V_{a2+a4}	14	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	-50 to 400	V
Grid to cathode voltage for cut-off of raster	V_g	-35 to -75	V

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

PHOSPHOR SCREEN

This type is usually supplied with W phosphor giving a television white trace of medium short persistence.

INTER-ELECTRODE CAPACITANCES

Lead capacitances balanced out

Cathode to all - maximum	$C_{k\text{-all(max)}}$	8.0	pF
Grid to all - maximum	$C_{g\text{-all(max)}}$	25	pF
Anode 2 and anode 4 to all (minimum)	$C_{a2+a4\text{-all(min)}}$	250	pF

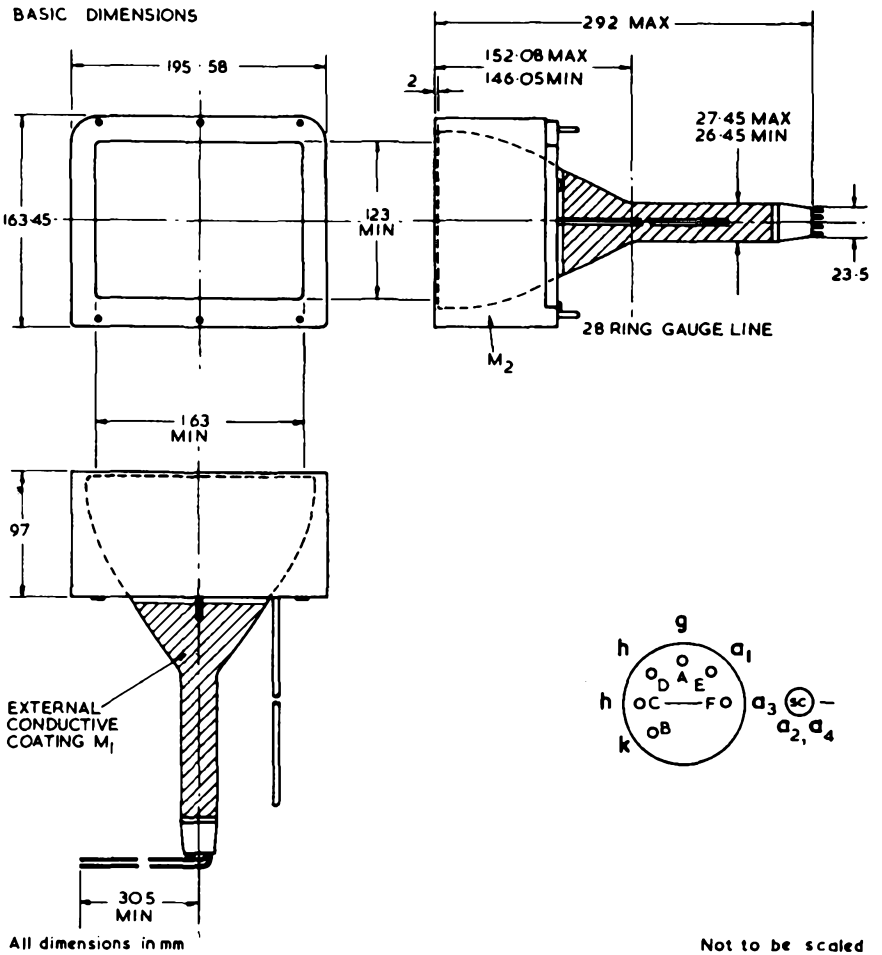
TUBE WEIGHT (maximum) - 3.25 kg

ENVIRONMENTAL TESTS CAPABILITIES

Storage and operational temperature range	-30°C to +55°C.
Vibration endurance	10 to 60 Hz displacement ± 0.15 mm 60 to 2000 Hz 2g all three axes for a specified time
Acceleration	13 g all three axes 2 minutes each
Bump and shock	40 g all three axes for specified number of bumps
Tropical environment	95% relative humidity. cycled 20°C to 35°C, total 100 hrs.
Mould growth	To BS2011 Test 2J severity 28 days
Salt mist	To BS2011 Test 2K 92.5% humidity, 35°C, total 28 days
Solar heat	Continuous cycling 30°C to 84°C total 5 days

NOTE

The external conductive coating of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply



Minimum useful screen area 162 x 122.

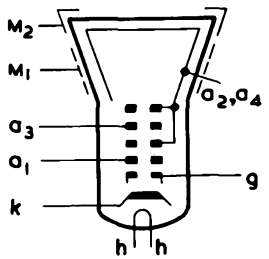
Data Display or Monitor Tube 59-60/90/074

ABRIDGED SPECIFICATION

GENERAL

Rectangular face, 38 cm, 90° diagonal
Ruggedised Construction
Rimguard III reinforced envelope*
Integral mounting lugs
Electrostatic focus, magnetic deflection
Flying lead connections for base and anode
Aluminised screen, external conductive coating
Grey glass, 50% transmission (approx)
29.4 mm maximum neck diameter

Heater voltage	V_h	6.3	V
Heater currant	I_h	0.3	A



ABSOLUTE RATINGS - All voltages referred to cathode

Maximum second and fourth anode voltage	$V_{a2+a4(max)}$	18	kV
Maximum third anode voltage	$V_{a3(max)}$	700	V
Maximum negative third anode voltage	$-V_{a3(max)}$	700	V
Maximum first anode voltage	$V_{a1(max)}$	600	V
Maximum negative grid voltage	$-V_{g(max)}$	200	V
Minimum negative grid voltage	$-V_{g(min)}$	1.0	V
Maximum heater to cathode voltage heater negative (d.c.)	$V_{h-k(max)}$	200	V

TYPICAL OPERATION -Grid modulation, voltages with respect to cathode

Second and fourth anode voltage	V_{a2+a4}	16	kV
First anode voltage	V_{a1}	400	V
Third anode voltage range for focus	V_{a3}	0 to 400	V
Grid to cathode voltage for cut-off of raster	V_g	-42 to -86	V

If this tube is operated at voltages in excess of 16 kV, x-ray radiation shielding may be necessary to avoid possible danger of personal injury from prolonged exposure at close range.

* This tube meets the requirements for intrinsically safe tubes laid down in the section of I.E.C. Publication 65 dealing with implosion.

PHOSPHOR SCREEN

This type is supplied with W phosphor giving a television white trace of medium short persistence.

This data should be read in conjuction with Brimar Operational and Safety Recommendations for Industrial Cathode Ray Tubes.

Thorn Radio Valves and Tubes Ltd. is an Approved Manufacturer of Cathode Ray Tubes to MOD (PE) Defence Standard 05-21 and BS 9000.

Thorn Radio Valves and Tubes Limited

BRIMAR

DATA DISPLAY & MONITOR TUBES

INTER-ELECTRODE CAPACITANCES

Lead capacitances balanced out

Cathode to all - maximum	$C_{k\text{-all(max)}}$	5.0	pF
Grid to all - maximum	$C_{g\text{-all(max)}}$	16	pF
Anode 2 and anode 4 to M1 (minimum)	$C_{a2+a4\text{-M1(min)}}$	800	pF
Anode 2 and anode 4 to M2 (minimum)	$C_{a2+a4\text{-M2(min)}}$	150	pF

TUBE WEIGHT (maximum) - 6kg

ENVIRONMENTAL TESTS CAPABILITIES

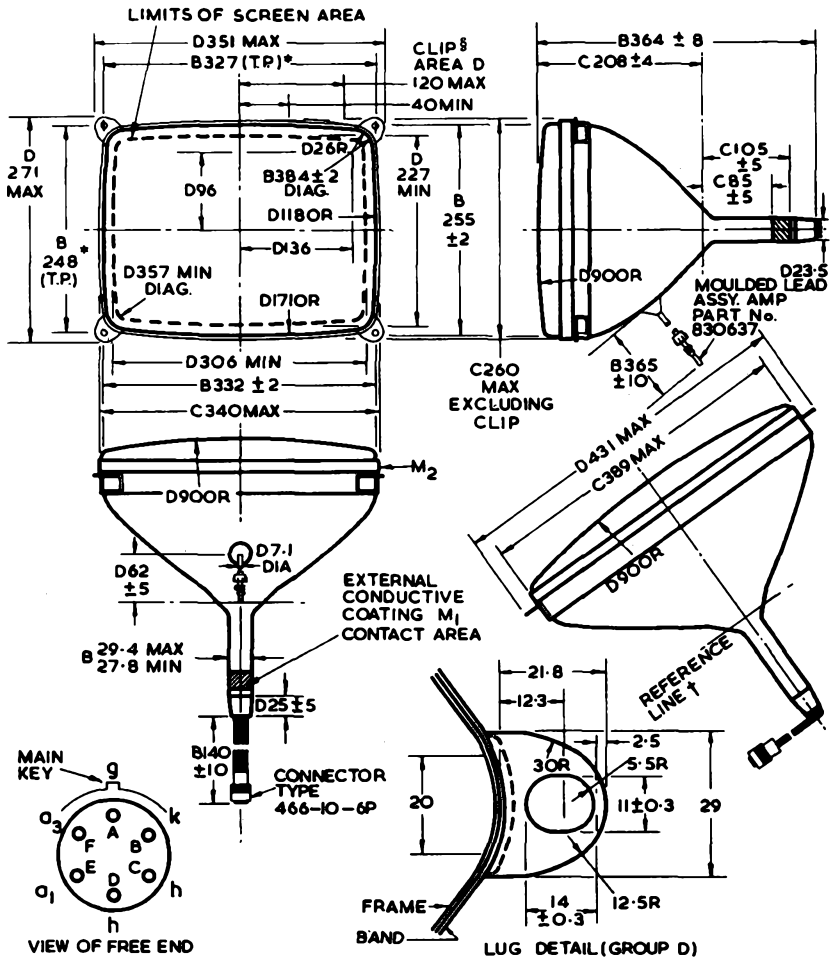
Storage temperature range	-55°C to +80°C
Operational temperature range	-40°C to +70°C
Vibration endurance	10 to 500 Hz displacement 4g 500 to 1000 Hz 0.5 g all three axes for a specified time
Acceleration	10g all three axes 15 seconds each
Bump and shock	30g all three axes for specified number of bumps
Damp heat	92.6% relative humidity. total 40°C 10 days
Mould growth	To BS2011 Test 2J severity 28 days
Salt mist	To BS2011 Test 2K 92.5% humidity, 35°C, total 3 days

NOTE

The external conductive coating of this tube should be connected to chassis. The capacitance between this coating and final anode may be used to provide smoothing for the e.h.t. supply.

When flashover protection is incorporated the chassis return paths of M_1 and M_2 should be made in a manner appropriate to the protection system employed.

INSPECTION DRAWING



All dimensions in mm

Not to be scaled

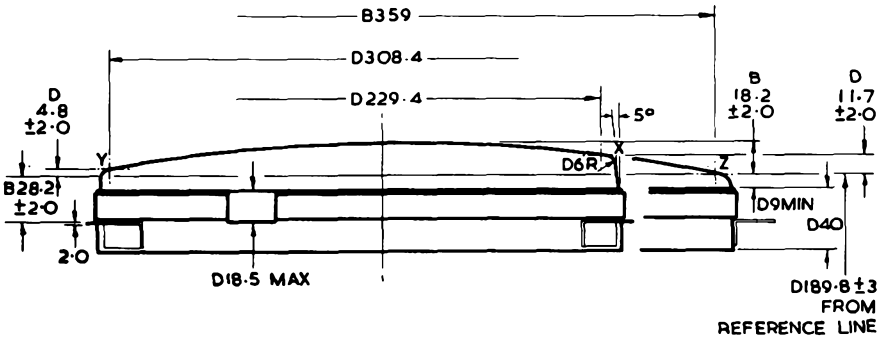
* The bolts to be used for mounting the tube must lie within the circles of 8.5 mm diameter centred on these true positions. One of the four lugs may deviate 2 mm maximum from the plane through the other three lugs (Group D).

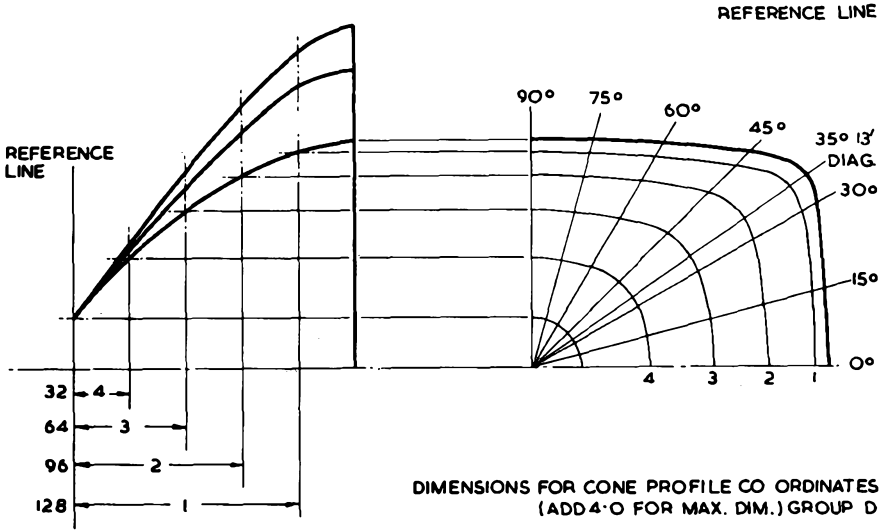
† Determined by reference line gauge

§ Total thickness of shell, tension band and clip 8 mm maximum. (Group D).

Note: Group letters are associated with each dimension.

INSPECTION DRAWING (Continued)





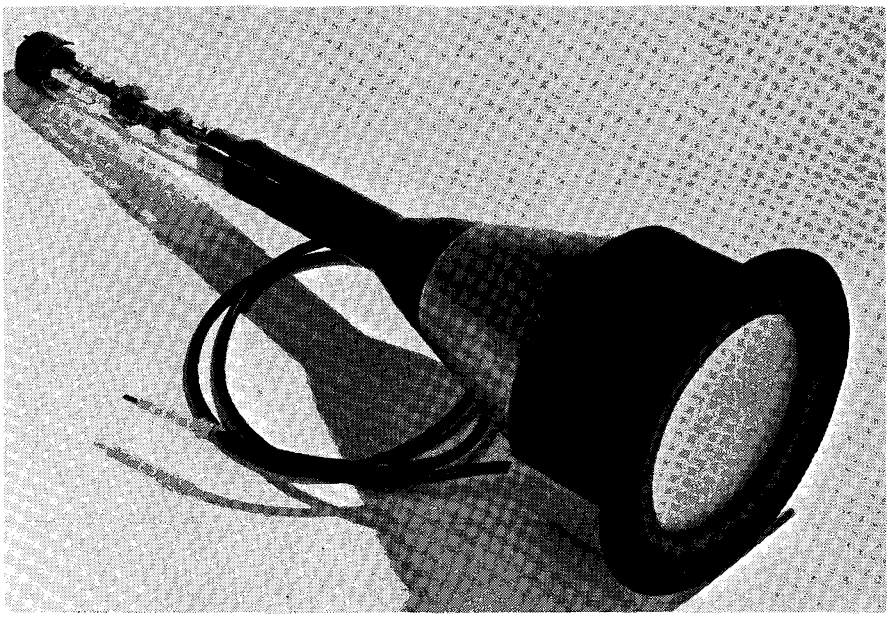
DIMENSIONS FOR CONE PROFILE CO ORDINATES
(ADD 4·0 FOR MAX. DIM.) GROUP D

All dimensions in mm

Not to be scaled

Reference Plane No.	0° Major	15°	30°	35° 13' Diag.	45°	60°	75°	90° Minor
1	156.7	160.9	173.6	177.6	161.9	136.5	123.9	120.0
2	130.0	132.6	141.5	144.0	135.3	118.0	108.6	105.7
3	99.0	100.8	106.3	107.3	103.9	93.7	88.0	86.5
4	62.8	63.4	65.3	65.4	65.0	62.0	60.0	59.5

SPECIAL TUBES



The facilities and organisation provided by Thorn Radio Valves and Tubes Limited meet the requirements of the M.O.D. (P.E.) Defence Standard 05-21 and BS 9000.

HEALTH AND SAFETY AT WORK ACT, 1974

Attention is drawn to the recommendations under this heading in the Operational Recommendations.

WARNING

These tubes should be used in accordance with their published ratings, and in conformity with the Operational Recommendations of the company's data handbook. The company will not entertain claims for loss or damage where this advice has been disregarded.

Thorn Radio Valves and Tubes Limited
Mollison Avenue - Brimsdown - Enfield - Middlesex EN3 7NS

BRIMAR

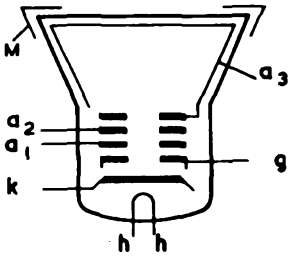
Flying-spot Scanner Tube

Q13-202..

GENERAL

Round flat face 5 inch diameter 25° tube
Mounting flange, potted anode lead
Electrostatic focus, magnetic deflection
Resolution greater than 1200 lines
Aluminised screen

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

Maximum third anode voltage	$V_{a3(max)}$	16	kV
Minimum third anode voltage	$V_{a3(min)}$	12	kV
Maximum second anode voltage range	$V_{a2(max)}$	2.5 to 5.5	kV
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Maximum heater to cathode voltage	$V_{h-k(max)}$	± 150	V
Maximum final anode current	$I_{a3(max)}$	10	μA
Maximum second anode current	$I_{a2(max)}$	600	μA
Maximum resistance grid to cathode	$R_{g-k(max)}$	1.5	MΩ

Adequate precautions should be taken to ensure that the associated circuitry and the tube are protected from damage which may be caused in the event of a high voltage flash-over within the tube.

PHOSPHOR SCREEN

This type is usually supplied with GS phosphor (Q13-202GS) giving a yellowish-green trace of very short persistence. Other phosphor screens can be made available to special order.

INTER-ELECTRODE CAPACITANCES

Cathode to all	$c_{k\text{-}all}$	4.0	pF
Grid to all	$c_{g\text{-}all}$	12	pF
Anode 3 to shell M	$c_{a3\text{-}M}$	200	pF

TYPICAL OPERATION voltages with respect to cathode.

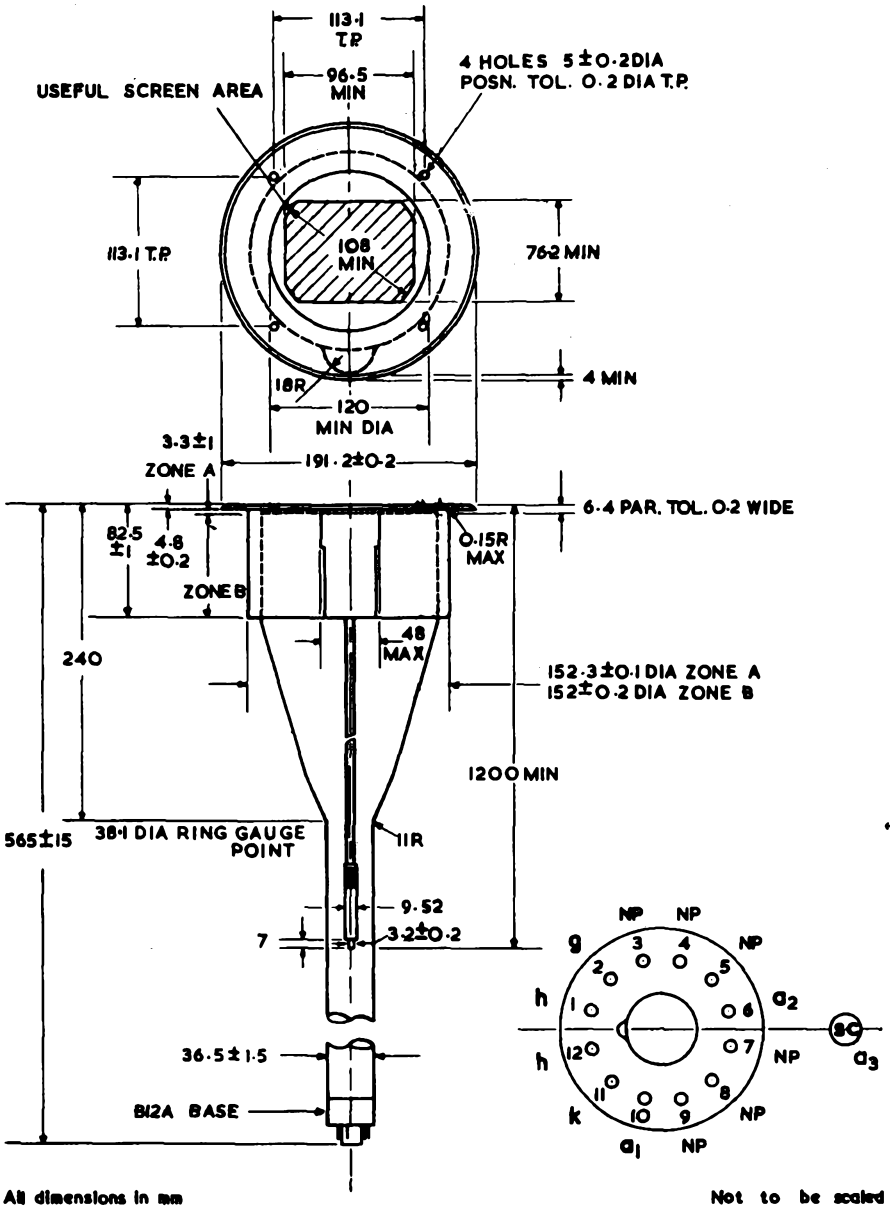
Third anode voltage	V_{a3}	15	kV
Second anode voltage range for focus	V_{a2}	3.7 to 5.2	kV
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off (I_{a3} = 0.5μA)	V_g	-30 to -70	V
Resolution by shrinking raster (I_{a3} = 4.5μA)		> 1200	lines
Maximum spot diameter at 60% peak luminance (I_{a3} = 4.5 μA)		0.07	mm
Maximum screen noise (peak to peak)		30*	%
Typical radiant output (I_{a3} = 4.5 μA)		250	μW
GS screen persistence to 10% (approx.)		0.9	μs

* Measured with 0.07mm spot at a writing speed of 25 m/s and with a detector bandwidth of 1.5 MHz.

TUBE WEIGHT (approximate) - 2.0 kg

Flying-spot Scanner Tube

Q13-202..



All dimensions in mm

Not to be scaled

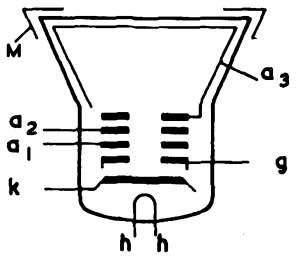
Q13-203..

Flying-spot Scanner Tube

GENERAL

Round flat face 5 inch diameter 25° tube
Mounting flange, potted anode lead
Electrostatic focus, magnetic deflection
Resolution greater than 1600 lines
Aluminised screen

Heater voltage	V_h	6.3	V
Heater current	I_h	0.3	A



ABSOLUTE RATINGS

Maximum third anode voltage	$V_{a3(max)}$	16	kV
Minimum third anode voltage	$V_{a3(min)}$	12	kV
Maximum second anode voltage range	$V_{a2(max)}$	2.5 to 5.5	kV
Maximum first anode voltage	$V_{a1(max)}$	500	V
Maximum negative grid voltage	$-V_{g(max)}$	150	V
Maximum heater to cathode voltage	$V_{h-k(max)}$	± 150	V
Maximum final anode current	$I_{a3(max)}$	10	μA
Maximum second anode current	$I_{a2(max)}$	600	μA
Maximum resistance grid to cathode	$R_{g-k(max)}$	1.5	MΩ

Adequate precautions should be taken to ensure that the associated circuitry and the tube are protected from damage which may be caused in the event of a high voltage flash-over within the tube.

PHOSPHOR SCREEN

This type is usually supplied with GT phosphor (Q13-203GT) giving a bluish-green trace of very short persistence. Other phosphor screens can be made available to special order.

INTER-ELECTRODE CAPACITANCES

Cathode to all	c_{k-all}	4.0	pF
Grid to all	c_{g-all}	12	pF
Anode 3 to shell M	c_{a3-M}	200	pF

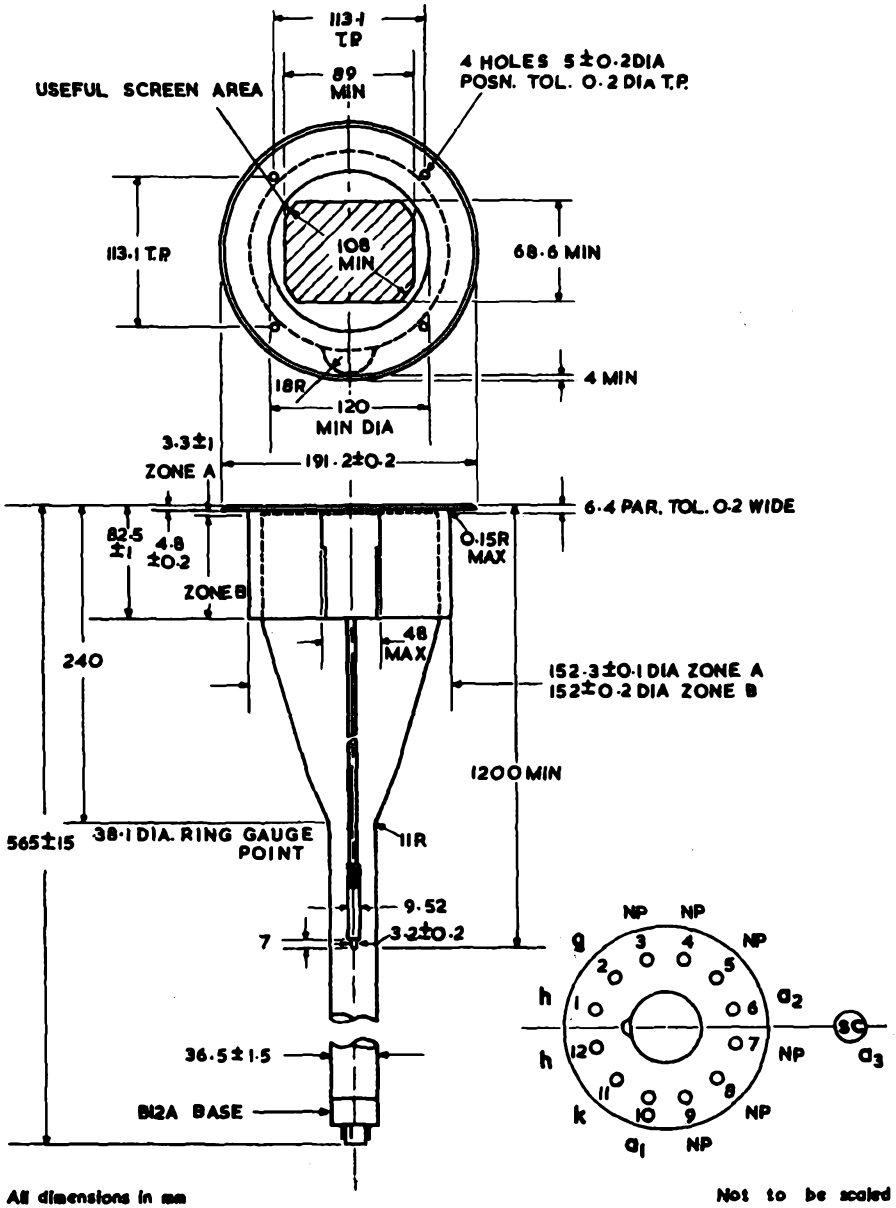
TYPICAL OPERATION - voltages with respect to cathode.

Third anode voltage	V_{a3}	15	kV
Second anode voltage range for focus	V_{a2}	3.7 to 5.2	kV
First anode voltage	V_{a1}	300	V
Grid to cathode voltage for cut-off (I_{a3} = 0.5 μA)	V_g	-30 to -70	V
Resolution by shrinking raster (I_{a3} = 4.5 μA)		> 1600	lines
Maximum spot diameter at 60% peak luminance (I_{a3} = 4.5 μA)		0.05	mm
Maximum screen noise (peak to peak)		45*	%
Typical radiant output power (I_{a3} = 4.5 μA)		250	μW
GT screen spot persistence to 10% (approx.)		0.9	μs

TUBE WEIGHT (approximate) - 2.0 kg

* Measured with 0.05mm spot at a writing speed of 25 m/s and with a detector bandwidth of 1.5 MHz.

Flying-spot Scanner Tube



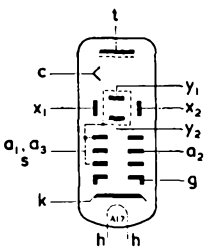
All dimensions in mm

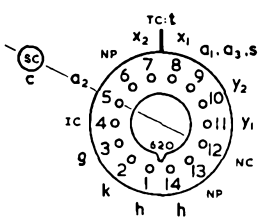
Not to be scaled

Monoscope Tube

XR1000

Maintenance Type





Base B14A, Cap CT7

GENERAL

This monoscope is used for electrical generation of alpha-numeric characters and symbols. The output signals are generated by scanning the individual characters and symbols which are arranged in an array, typically 8 × 8, on a target. The electron gun has electrostatic focus and deflection.

This device has applications in business and data processing equipment for cathode ray tube display.

Heater Voltage	V_h	6·3	V
Heater Current	I_h	0·3	A

ABSOLUTE RATINGS

Maximum Target Voltage	$V_{t(max)}$	2850	V
Maximum Collector Voltage	$V_{c(max)}$	2850	V
Maximum First and Third Anode Voltage	$V_{a1+a3(max)}$	2850	V
Maximum Second Anode Voltage	$V_{a2(max)}$	1100	V
Maximum Collector to Target Voltage	$V_{c-t(max)}$	20	V
Maximum Peak x-plate to Third Anode Voltage	$V_{x-a3(pk)max}$	550	V
Maximum Peak y-plate to Third Anode Voltage	$V_{y-a3(pk)max}$	550	V
Maximum Grid Voltage			
Negative Value	$-V_{g(max)}$	220	V
Positive D.C. and Peak Value	$V_{g(pk)max}$	0	V
Maximum Peak Heater to Cathode Voltage	$V_{h-k(pk)max}$	±200	V
Maximum Grid to Cathode Resistance	$R_{g-k(max)}$	1·5	MΩ
Maximum Resistance in any Deflection Electrode circuit*		5·0	MΩ

All voltages measured with respect to cathode unless otherwise stated.
* It is recommended that the deflecting electrode circuit resistances be approximately equal.

INTER-ELECTRODE CAPACITANCES

Grid to all	C_{g-all}	10·6	pF
Cathode to all	C_{k-all}	5·1	pF
Collector to all	C_{c-all}	5·7	pF
Target to all	C_{t-all}	2·3	pF
x_1 plate to x_2 plate	C_{x1-x2}	1·5	pF
y_1 plate to y_2 plate	C_{y1-y2}	2·7	pF
x_1 plate to all, less x_2 plate	$C_{x1-all, less\ x2}$	6·9	pF
x_2 plate to all, less x_1 plate	$C_{x2-all\ less\ x1}$	6·4	pF
y_1 plate to all, less y_2 plate	$C_{y1-all, less\ y2}$	8·6	pF
y_2 plate to all, less y_1 plate	$C_{y2-all, less\ y1}$	8·3	pF

The target used with this tube is indicated by a letter suffix to the type number.

TYPICAL OPERATION AND CHARACTERISTICS

Target Voltage	V_t	1200	V
First and Third Anode Voltage	V_{a1+a3}	1200	V
Mean Deflector Plate Potential		1200*	V
Minimum Collector to Target Potential	$V_{c\text{-}t(min)}$	3·0	V
Second Anode Voltage for Focus	V_{a2}	150 to 515	V
Grid to Cathode Voltage for beam cut-off	V_g	−25 to −65	V
Deflection voltage per symbol area (8 × 8 array)			
Vertical direction (nominal)		9·0	V
Horizontal direction (nominal)		6·5	V
Voltage required for full beam deflection† (nominal)			
Between centres of lowest and highest rows		90	V
Between centres of extreme left and right columns		55	V
Target Load Resistance		500	Ω
Typical Peak Output Signal		5·0	μA

* If the mean deflector plate potential differs from the first and third anode voltage the quality of focus will deteriorate.

† Undeflected beam normally at centre of target pattern.

Notes: The electron beam should be cut-off when no raster is being scanned otherwise a blemish may be produced by a change in the secondary emission of the target. It is recommended that no character be used in such a way that it has a usage factor greater than ten times the average.

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

PRINCIPLE OF OPERATION

In operation a smaller raster is generated just large enough to scan a single character on the target. The scan circuit also selects and positions the beam on the character to be generated.

As the electron beam lands on the target surface secondary emission electrons are produced and are attracted to the collector which is held at a slightly more positive voltage. The secondary emission from the printed character is lower than from the surrounding target surface where the secondary emission ratio is considerably greater than unity. Hence when the beam lands on the character the target current falls.

The changes of the target current through the load resistance produce the output video voltage signal. By synchronisation of scan and scan position any entire character can be recreated on the final display cathode ray tube. Using suitable circuitry any individual monoscope target character or any sequence of characters can be selected and displayed as required.

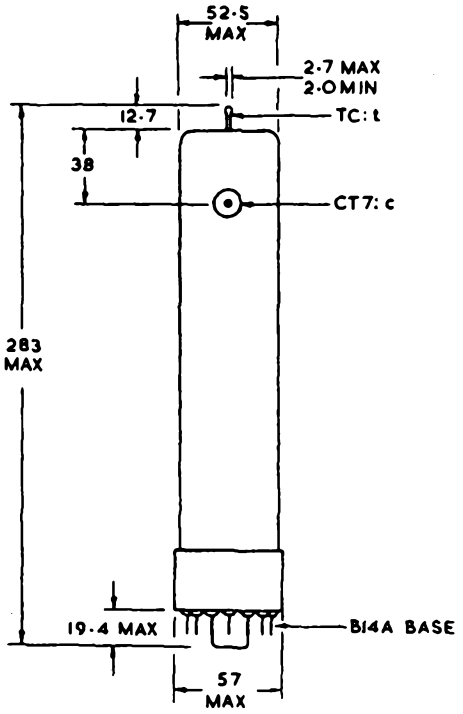
Characters can be " read out " from the monoscope at a rate exceeding 60,000 characters per second, corresponding to the rate required for a display of approximately 1,000 characters refreshed at 50 fields per second, with due allowance made for retrace times in the display. The resolution capability is adequate for a display of this complexity.

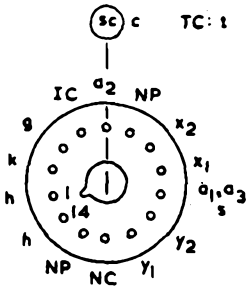
Approximate Net Tube Weight—380g (0·84 lb.)

Monoscope Tube

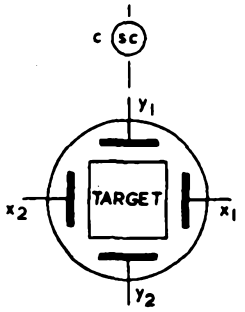
XR1000

Q417





VIEW FROM PINS FREE END
(PIN 5 AT TOP)



VIEWED FROM PINS FREE END
(PIN 5 AT TOP)

All dimensions in mm.

Not to be scaled

Care should be taken to avoid bending the target pin as this may cause misalignment of the target.

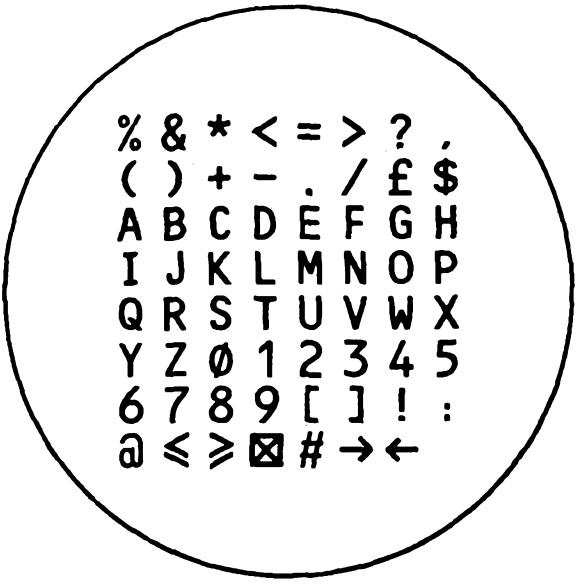
XR1000A

Monoscope Tube

Maintenance Type

MONOSCOPE

TARGET "A"
TYPICAL TARGET
USING ECMA FOUNT OCR-B



0446

Alignment of Traces

A positive voltage on y_1 deflects beam towards top row.
A positive voltage on x_2 deflects beam towards left hand column.
Angle between x and y traces 90° ± 1°.
Angle between trace and target symbols ± 1°.

See XR1000 data for tube electrical and mechanical details.

Monoscope Tube

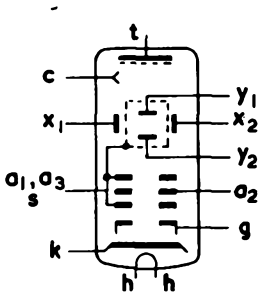
XR1002

Maintenance Type

GENERAL

This monoscope is used for electrical generation of alpha-numeric characters and symbols. The output signals are generated by scanning the individual characters and symbols which are arranged in an array, typically 8 x 8, on a target. The electron gun has electrostatic focus and deflection. This device has applications in business and data processing equipment for cathode ray tube display.

Heater Voltage	V_h	6.3	V
Heater Current	I_h	0.3	A



ABSOLUTE RATINGS

Maximum target voltage	$V_{t(max)}$	2850	V
Maximum collector voltage	$V_{c(max)}$	2850	V
Maximum collector to target voltage	$V_{c-t(max)}$	20	V
Maximum first and third anode voltage	$V_{a1+a3(max)}$	2850	V
Maximum second anode voltage	$V_{a2(max)}$	1100	V
Maximum peak x plate to third anode voltage	$V_{x-a3(pk)max}$	550	V
Maximum peak y plate to third anode voltage	$V_{y-a3(pk)max}$	550	V
Maximum grid voltage			
negative value	$-V_{g(max)}$	220	V
positive d.c. and peak value	$V_{g(pk)max}$	0	V
Maximum peak heater to cathode voltage	$V_{h-k(pk)max}$	± 200	V
Maximum grid to cathode resistance	$R_{g-k(max)}$	1.5	MΩ
Maximum resistance in any deflection electrode circuit*		5.0	MΩ

All voltages measured with respect to cathode unless otherwise stated.

* It is recommended that the deflecting electrode circuit resistances be approximately equal.

The target used with this tube is indicated by a letter suffix to the type number.

INTER-ELECTRODE CAPACITANCES

Grid to all	$C_{g\text{-all}}$	10.6	pF
Cathode to all	$C_{k\text{-all}}$	5.1	pF
Collector to all	$C_{c\text{-all}}$	5.7	pF
Target to all	$C_{t\text{-all}}$	2.3	pF
x_1 plate to x_2 plate	$C_{x1\text{-}x2}$	2.7	pF
y_1 plate to y_2 plate	$C_{y1\text{-}y2}$	1.5	pF
x_1 plate to all, less x_2 plate	$C_{x1\text{-all, less x2}}$	8.6	pF
x_2 plate to all, less x_1 plate	$C_{x2\text{-all, less x1}}$	8.3	pF
y_1 plate to all, less y_2 plate	$C_{y1\text{-all, less y2}}$	6.4	pF
y_2 plate to all, less y_1 plate	$C_{y2\text{-all, less y1}}$	6.9	pF

TYPICAL OPERATION AND CHARACTERISTICS

Target voltage	V_t	1200	V
First and third anode voltage	V_{a1+a3}	1200	V
Mean deflector plate voltage		1200†	V
Minimum collector to target voltage	$V_{c\text{-t(min)}}$	3.0	V
Second anode voltage for focus	V_{a2}	150 to 515	V
Grid to cathode voltage for beam cut-off	V_g	-25 to -65	V
Deflection voltage per symbol area (8 x 8 array)			
Vertical direction (nominal)		6.5	V
Horizontal direction (nominal)		9.0	V
Voltage required for full beam deflection* (nominal)			
Between centres of lowest and highest rows		55	V
Between centres of extreme left and right columns		90	V
Target load resistance		500	Ω
Typical peak output signal		1.5	μA

* Undeflected beam normally at centre of target pattern.

† If the mean deflector plate potential differs from the first and third anode voltage the quality of focus will deteriorate.

CAUTION

The electron beam should be cut-off when no raster is being scanned otherwise a blemish may be produced by a change in the secondary emission of the target. It is recommended that no character be used in such a way that it has a usage factor greater than ten times the average.

NOTE

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

Monoscope Tube XR1002

PRINCIPLE OF OPERATION

In operation a small raster is generated just large enough to scan a single character on the target. The scan circuit also selects and positions the beam on the character to be generated.

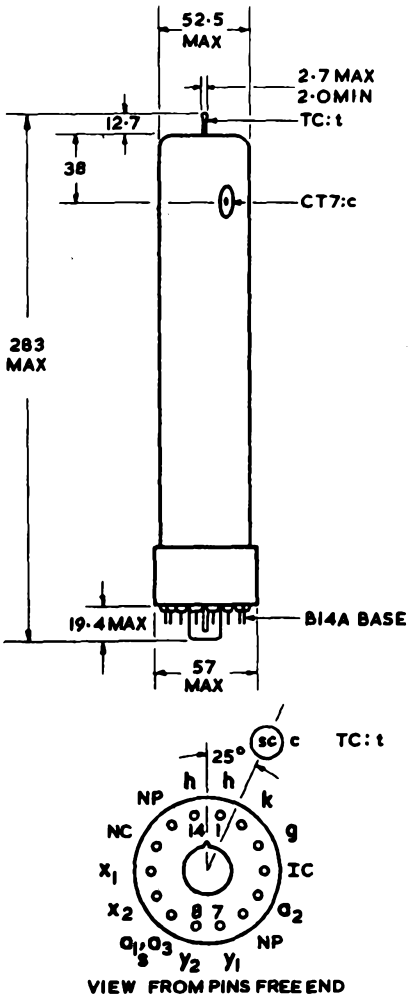
As the electron beam lands on the target surface secondary emission electrons are produced and are attracted to the collector which is held at a slightly more positive voltage. The secondary emission from the printed character is lower than from the surrounding target surface where the secondary emission ratio is considerably greater than unity. Hence when the beam lands on the character the target current falls.

The changes of the target current through the load resistance produce the output video voltage signal. By synchronisation of scan and scan position any entire character can be recreated on the final display cathode ray tube. Using suitable circuitry any individual monoscope target character or any sequence of characters can be selected and displayed as required.

Characters can be "read out" from the monoscope at a rate exceeding 60,000 characters per second, corresponding to the rate required for a display of approximately 1,000 characters refreshed at 50 fields per second, with due allowance made for retrace times in the display. The resolution capability is adequate for a display of this complexity.

TUBE WEIGHT (approximate) 380 g (0.84 lb)

Monoscope Tube

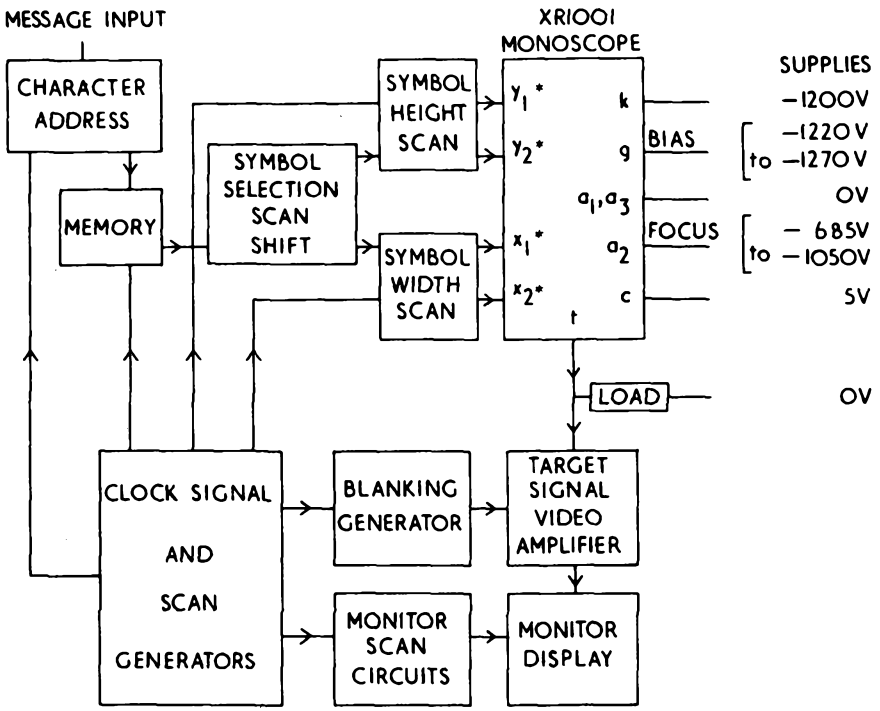


All dimensions in mm

Not to be scaled

Care should be taken to avoid bending the target pin as this may cause misalignment of the target.

OPERATIONAL BLOCK DIAGRAM



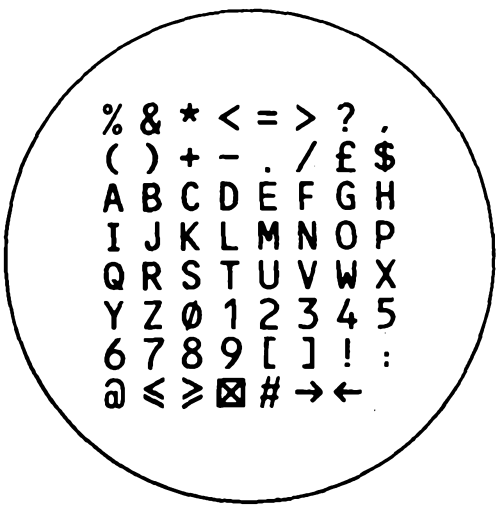
* Zero mean voltage

XR1002A

Maintenance Type

Monoscope Tube

TARGET "A"
TYPICAL TARGET
USING ECMA FOUNT OCR-B



Alignment of Traces

A positive voltage on y_1 deflects beam towards top row.
A positive voltage on x_2 deflects beam towards left hand column.
Angle between x and y traces 90 ± 1 .
Angle between trace and target symbols ± 1 .

See XR1002 data for tube electrical and mechanical details.

Monoscope Tube

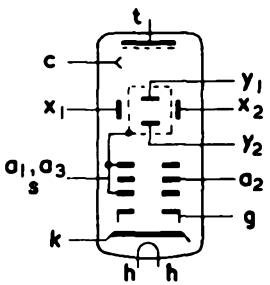
XR1003

Maintenance Type

GENERAL

This monoscope is used for electrical generation of alpha-numeric characters and symbols. The output signals are generated by scanning the individual characters and symbols which are arranged in an array, typically 8 x 8, on a target. The electron gun has electrostatic focus and deflection. This device has applications in business and data processing equipment for cathode ray tube display.

Heater Voltage	V_h	6.3	V
Heater Current	I_h	0.3	A



ABSOLUTE RATINGS

Maximum target voltage	$V_{t(max)}$	2850	V
Maximum collector voltage	$V_{c(max)}$	2850	V
Maximum collector to target voltage	$V_{c-t(max)}$	20	V
Maximum first and third anode voltage	$V_{a1+a3(max)}$	2850	V
Maximum second anode voltage	$V_{a2(max)}$	1100	V
Maximum peak x plate to third anode voltage	$v_{x-a3(pk)max}$	550	V
Maximum peak y plate to third anode voltage	$v_{y-a3(pk)max}$	550	V
Maximum grid voltage			
negative value	$-V_{g(max)}$	220	V
positive d.c. and peak value	$v_{g(pk)max}$	0	V
Maximum peak heater to cathode voltage	$v_{h-k(pk)max}$	± 200	V
Maximum grid to cathode resistance	$R_{g-k(max)}$	1.5	MΩ
Maximum resistance in any deflection electrode circuit*		5.0	MΩ

All voltages measured with respect to cathode unless otherwise stated.

* It is recommended that the deflecting electrode circuit resistances be approximately equal.

The target used with this tube is indicated by a letter suffix to the type number.

INTER-ELECTRODE CAPACITANCES

Grid to all	C_{g-all}	9.0	pF
Cathode to all	C_{k-all}	3.5	pF
Collector to all	C_{c-all}	5.5	pF
Target to all	C_{t-all}	2.5	pF
x_1 plate to x_2 plate	C_{x1-x2}	2.3	pF
y_1 plate to y_2 plate	C_{y1-y2}	0.9	pF
x_1 plate to all, less x_2 plate	$C_{x1-all,\ less\ x2}$	7.5	pF
x_2 plate to all, less x_1 plate	$C_{x2-all,\ less\ x1}$	7.5	pF
y_1 plate to all, less y_2 plate	$C_{y1-all,\ less\ y2}$	6.0	pF
y_2 plate to all, less y_1 plate	$C_{y2-all,\ less\ y1}$	6.5	pF

TYPICAL OPERATION AND CHARACTERISTICS

Target voltage	V_t	1200		V
First and third anode voltage	V_{a1+a3}	1200		V
Mean deflector plate voltage		1200†		V
Minimum collector to target voltage	$V_{c-t(min)}$	3.0		V
Second anode voltage for focus	V_{a2}	150 to 515		V
Grid to cathode voltage for beam cut-off	V_g	-25 to -65		V
Deflection voltage per symbol area for two arrays		8x8	12x8	
Vertical direction (nominal)		6.5	6.5	V
Horizontal direction (nominal)		9.0	6.0	V
Voltage required for full beam deflection* (nominal)				
Between centres of lowest and highest rows		55	55	V
Between centres of extreme left and right columns		90	95	V
Target load resistance		500		Ω
Typical peak output signal		2.5		μA

* Undeflected beam normally at centre of target pattern.

† If the mean deflector plate potential differs from the first and third anode voltage the quality of focus will deteriorate.

CAUTION

The electron beam should be cut-off when no raster is being scanned otherwise a blemish may be produced by a change in the secondary emission of the target. It is recommended that no character be used in such a way that it has a usage factor greater than ten times the average.

NOTE

Adequate magnetic shielding is required. In addition due attention should be paid to the position of the tube relative to transformers and chokes.

Monoscope Tube XR1003

PRINCIPLE OF OPERATION

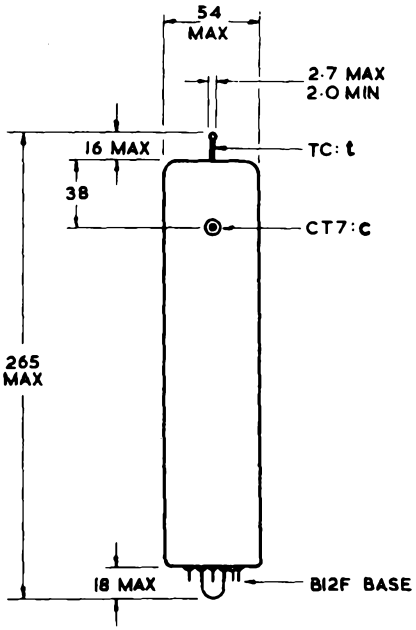
In operation a small raster is generated just large enough to scan a single character on the target. The scan circuit also selects and positions the beam on the character to be generated.

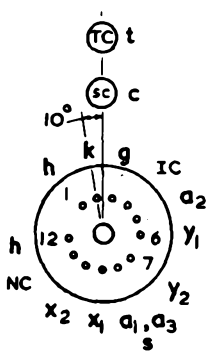
As the electron beam lands on the target surface secondary emission electrons are produced and are attracted to the collector which is held at a slightly more positive voltage. The secondary emission from the printed character is lower than from the surrounding target surface where the secondary emission ratio is considerably greater than unity. Hence when the beam lands on the character the target current falls.

The changes of the target current through the load resistance produce the output video voltage signal. By synchronisation of scan and scan position any entire character can be recreated on the final display cathode ray tube. Using suitable circuitry any individual monoscope target character or any sequence of characters can be selected and displayed as required.

Characters can be "read out" from the monoscope at a rate exceeding 60,000 characters per second, corresponding to the rate required for a display of approximately 1,000 characters refreshed at 50 fields per second, with due allowance made for retrace times in the display. The resolution capability is adequate for a display of this complexity.

TUBE WEIGHT (approximate) 330 g (0.73 lb)





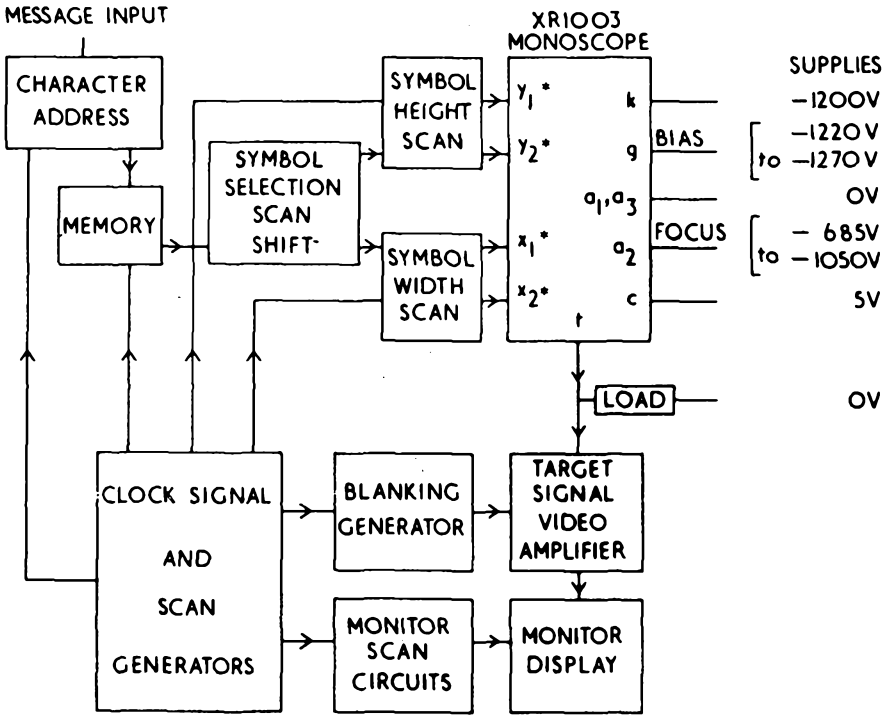
VIEW FROM PINS FREE END

All dimensions in mm

Not to be scaled

Care should be taken to avoid bending the target pin as this may cause misalignment of the target.

OPERATIONAL BLOCK DIAGRAM



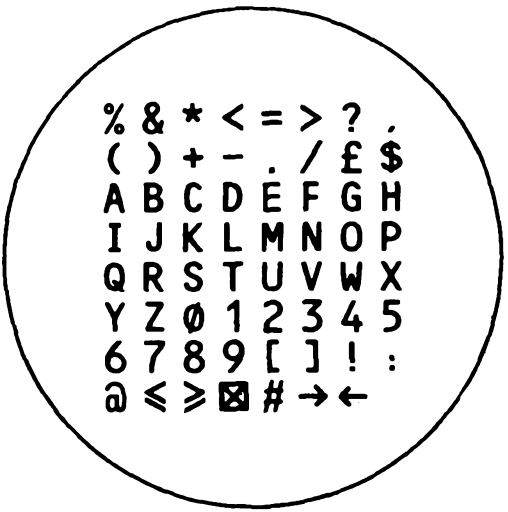
* Zero mean voltage

XR1003A

Maintenance Type

Monoscope Tube

TARGET "A"
TYPICAL TARGET
USING ECMA FOUNT OCR-B



Alignment of Traces

A positive voltage on y_1 deflects beam towards top row.
A positive voltage on x_2 deflects beam towards left hand column.
Angle between x and y traces 90° ± 1°
Angle between trace and target symbols ± 1°.

See XR1003 data for tube electrical and mechanical details.

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NOTES

NOTES

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Industrial Cathode Ray Tubes

Volume 2

Data Section
Issue 3

THORN RADIO VALVES & TUBES LIMITED

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PRICE £5.00

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