PHILIPS

PRODUCT SURVEY

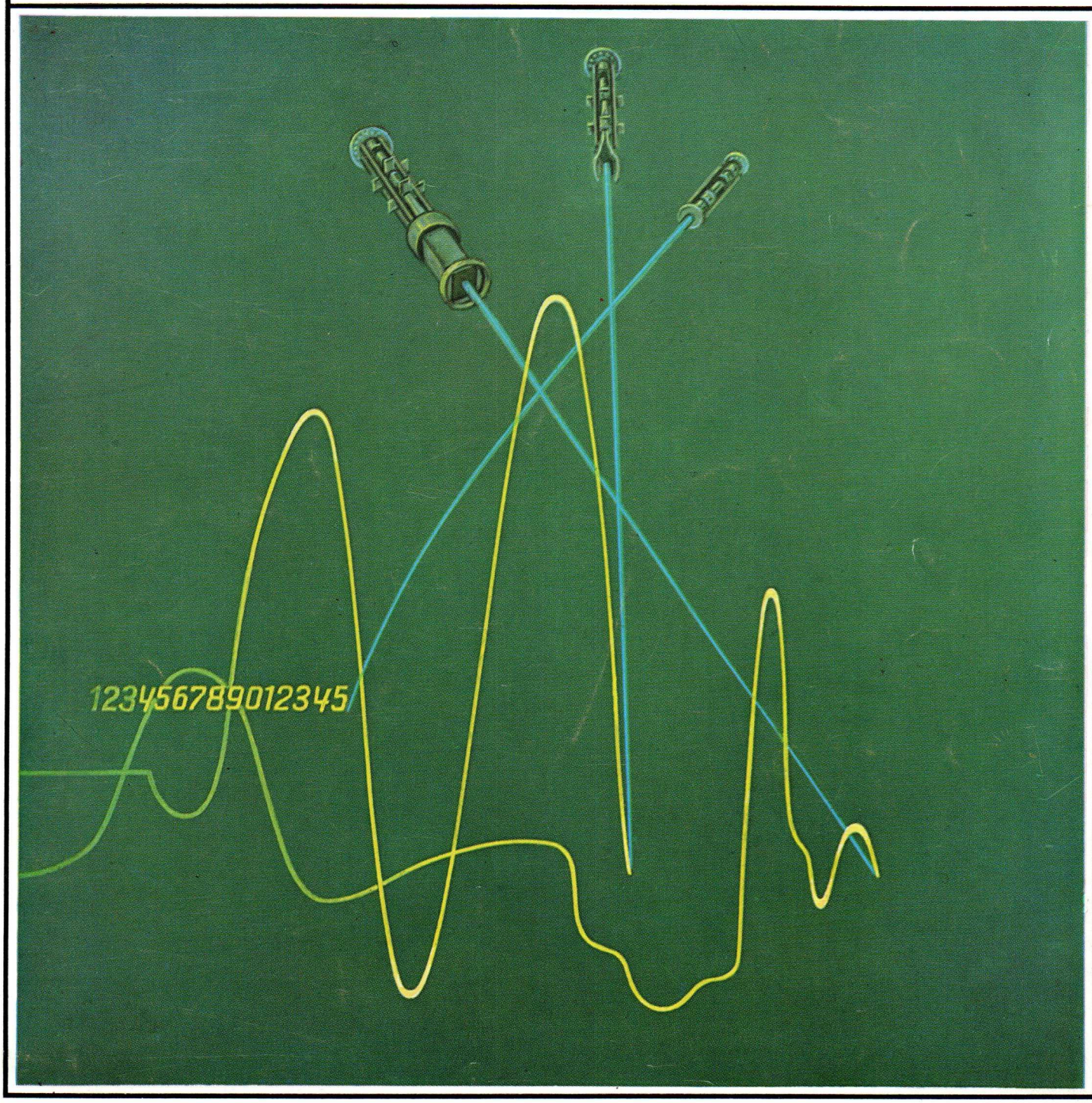
ELECTRONIC COMPONENTS AND MATERIALS

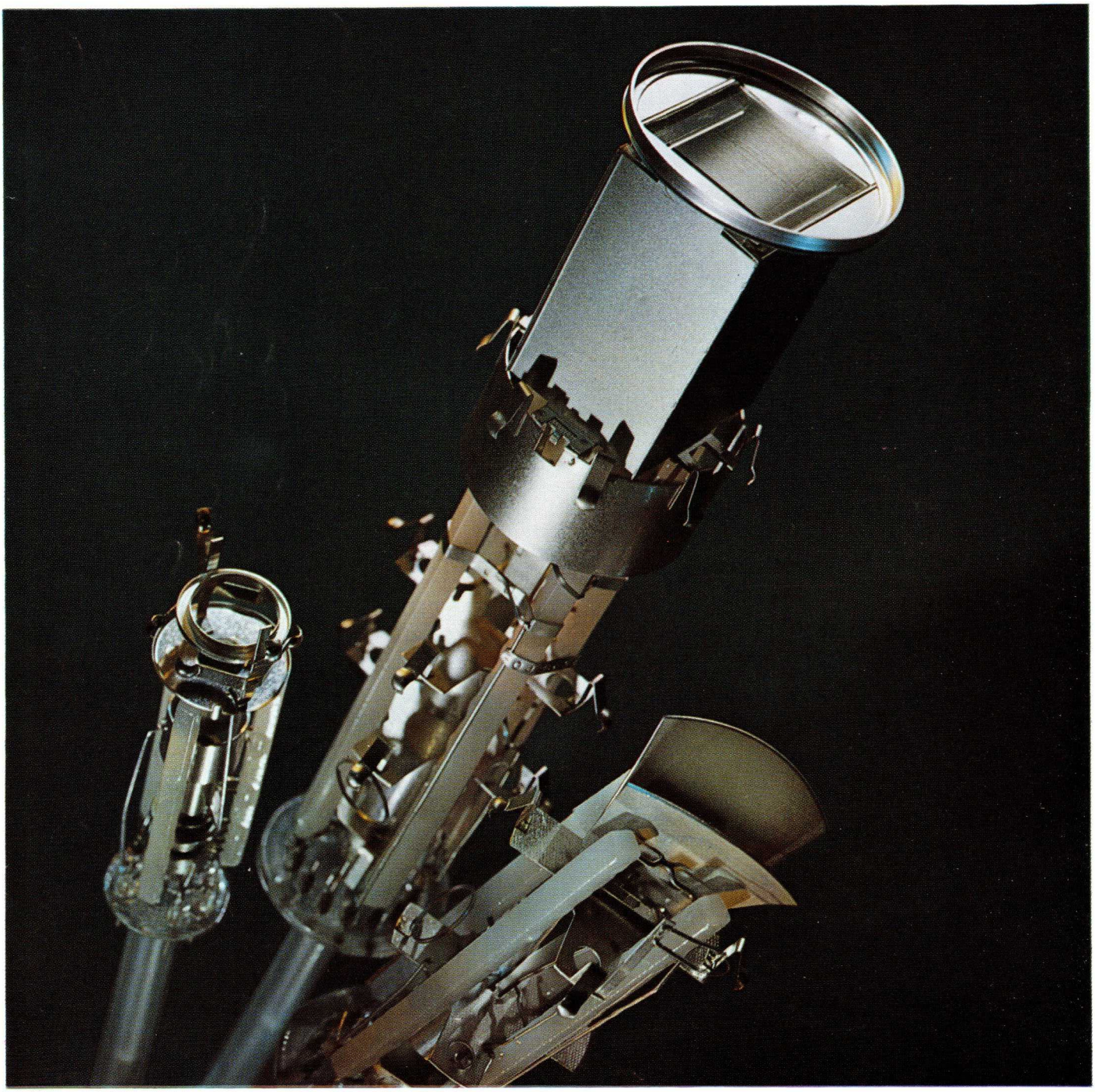
INSTRUMENT CATHODE-RAY TUBES

MONITOR TUBES

FLYING SPOT SCANNERS

1971





INTRODUCTION

There's more in cathode ray tubes these days than meets the eye. Once upon a time a simple gun, a set of deflection plates, and a fluorescent screen were enough. Admittedly there isn't much more than that in our mono-accelerator tubes, except precision and a lot of experience; but the others are quite another matter. Precision and experience are there in even greater measure, but also incorporated are post-deflection accelerator systems, mesh screens, and delay line systems or sectioned y-deflection plates. Built-in edge lighted graticules are common, too; and, speaking of mesh screens, they've come down in the world; whereas they were once an expensive adjunct, you will now find them in our medium price range.

Our range of monitor tubes is also comprehensive, it includes tubes for every purpose from high definition studio monitoring to industrial or medical displays: resolution now extends to 1100 lines with very high brightness factors.

Apart from their original purpose of converting optical images to electrical signals in tv studios, flying spot scanners are being increasingly used in data processing systems and in identification systems for, amongst other things, signatures. With the growth of interest in educational aids, projection tubes are being used for large screen presentation in closed circuit tv systems. Our range includes colour projection tubes as well as black and white. Flying spot scanners and projection tubes are listed at the end of the Survey.

Prices are not what they were, and here mass production and automation have played a major part in bringing costs down. And it's thanks to automation that we can maintain such close correspondence between tubes of a given type. Mass production engenders precision, but so does having the strictest quality control team in the world breathing down the back of one's neck! One way and another we're kept on our toes.

Another point worth noting is that from basic research to finished product, everything, glass, guns, and phosphors are our own produce, subject to our own exacting standards; and more important, conceived and produced for a specific end product, whether it be a simple mono-accelerator tube or one of our most advanced high frequency tubes.

Our tubes are backed by an excellent application laboratory service that from time to time publishes its findings in the form of Application Informations and Application Notes. But whenever a customer is faced with an application problem not covered in these we are pleased to offer our help: It is part of our service.

In this Survey we have divided instrument tubes into three rough classifications: mono-accelerator tubes; post-deflection accelerator tubes; high frequency tubes. They appear in that order in the following pages and are succeeded by monitor tubes, flying spot scanners and projection tubes.

MONO-ACCELERATOR INSTRUMENT TUBES

These tubes are intended for the large proportion of applications that make no very great demands as regards bandwidth; their needs are often met by a non p.d.a. tube that has the concomitant advantages of reliability, excellent geometry, and a well defined trace. This type of tube is being increasingly used for digital register display in calculators and business machines.
Beam blanking by means of a special electrode has always meant a reduction of useful beam current and, if image distortion (caused by spot shift) were to be avoided, has placed severe demands on the flatness of the unblanking pulse. Now, thanks to our introduction of inexpensive beam-blanking circuits a special electrode is no longer necessary. *
In this range the D7-190, D10-160, and D13-480 * are outstanding. They are up-to-date flat-faced tubes based on the same gun, which means that components are fabricated in large series, keeping costs to a minimum while maintaining exceptional tolerance standards.
Particular advantages of this series are:
— Rugged construction
— Compactness
— High current efficiency
— High control grid sensitivity

* Application Information on this subject is available from your tube supplier.

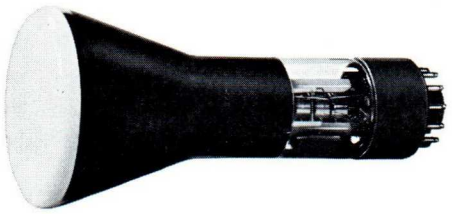
DG7-31, DG7-32

7 cm (3″) monitor tubes;

low accelerator voltage.

The DG7-31 has asymmetrical x deflection. and symmetrical y deflection.
The DG7-32 has symmetrical x and y deflection.

Contrast is improved by a conductive layer between screen and phosphor; connecting this layer to the accelerator electrode prevents electrostatic image distortion.



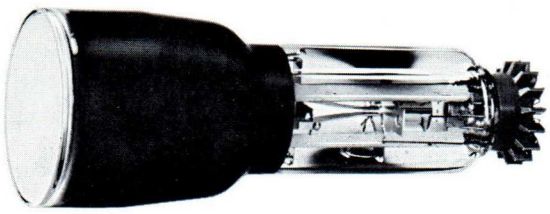
TYPICAL OPERATING CONDITIONS

Accelerator voltage		500 V	
Deflection factors	vertical	21 V/cm	
	horizontal	37 V/cm	
Useful scan in both directions	min.	65 mm	
Line width		0.4 mm	
Heater		6.3 V, 300 mA	
Overall length	max.	172 mm	
Base	duodecal	12 p.	

D7-190 . .

7 cm (3″) flat faced tube for inexpensive oscilloscopes and monitors;

symmetrical x and y deflection.



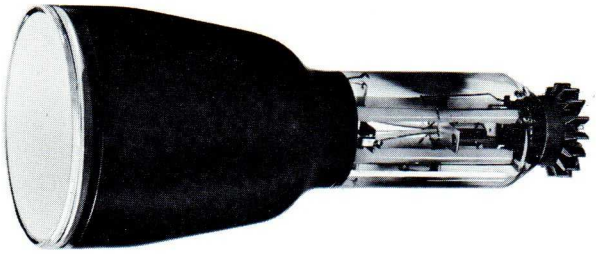
TYPICAL OPERATING CONDITIONS

Accelerator voltage		1000 V	
Deflection factors	vertical	11.5 V/cm	
	horizontal	29 V/cm	
Useful scan	vertical	min. 50 mm	
	horizontal	min. 60 mm	
Line width		0.28 mm	
Heater		6.3 V, 300 mA	
Overall length	max.	225 mm	
Base		14 p. all glass	
Available phosphors		GH, GM	

D10-160 . .

10 cm (4″) flat faced tube for inexpensive oscilloscopes and read-out devices;

symmetrical x and y deflection.



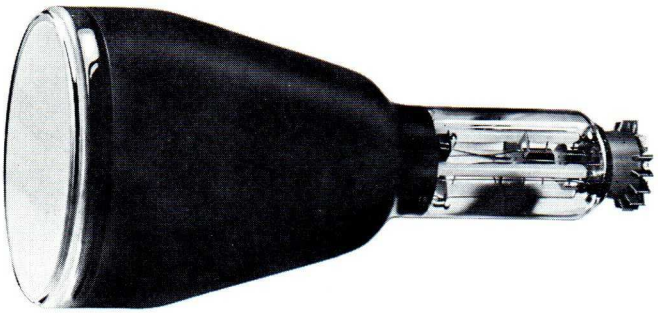
TYPICAL OPERATING CONDITIONS

Accelerator voltage		1500 V			
Deflection factors	vertical	13.7 V/cm			
	horizontal	32 V/cm	Heater		6.3 V, 300 mA
Useful scan	vertical	min. 60 mm	Overall length		max. 260 mm
	horizontal	min. 80 mm	Base		14 p. all glass
Line width		0.27 mm	Available phosphors		GH, GM

D13-480 . .

13 cm (5″) flat faced tube for inexpensive oscilloscopes and read-out devices;

symmetrical x and y deflection.



TYPICAL OPERATING CONDITIONS

Accelerator voltage		2000 V			
Deflection factors	vertical	14.4 V/cm			
	horizontal	31.3 V/cm	Heater		6.3 V, 300 mA
Useful scan	vertical	min. 80 mm	Overall length		max. 310 mm
	horizontal	min. 100 mm	Base		14 p. all glass
Line width		0.3 mm	Available phosphors		GH, GM

POST-DEFLECTION ACCELERATOR TUBES

These tubes are generally intended for those applications calling for greater bandwidth than is offered by mono-accelerator tubes, and which consequently demand brighter spots and more sensitive deflection systems.

Tubes worth noting in the range are D14-120, D14-121, D14-160 (rectangular screen), and D10-170 (circular). These are equipped with a mesh between deflection plates and p.d.a. electrode, to counter the lens effect of the post acceleration field and to allow a greater ratio between the p.d.a. and acceleration voltages. Hitherto meshes have been confined to the more expensive tubes, but the combination of automation and large scale production allows us to include them in the medium price range. What has been noted about beam-blanking circuits for mono-accelerator tubes, also applies to the post-deflection accelerator tubes.

The D14-160 has been developed from the D14-120. It is a little longer and is supplied complete with coils for image rotation and orthogonality correction. It has a much more sharply defined trace in the screen centre that allows writing speeds up to 80 MHz.

Most tubes in the range that operate above 4 kV are fitted with a metal backed screen to brighten the image.

D10-170GH

10 cm (4″) flat faced tube;

post-deflection acceleration electrode with mesh, symmetrical x and y deflection.

TYPICAL OPERATING CONDITIONS

Accelerator voltage		1000 V
Post-accelerator voltage		6000 V
Deflection factors	vertical	3.5 V/cm
	horizontal	13 V/cm
Useful scan	vertical	min. 60 mm
	horizontal	min. 80 mm
Line width		0.42 mm

Heater	6.3 V, 300 mA
Overall length	max. 335 mm
Base	14 p. all glass
Available phosphor	GH

D14-120 . . , D14-121 . . ,

14 cm (5½″ diagonal) flat faced rectangular tube;

post-deflection acceleration electrode with mesh, metal-backed screen, symmetrical x and y deflection.

The D14-121 . . has side connections to the deflection plates and is intended for transistorized oscilloscopes up to 50 MHz.

TYPICAL OPERATING CONDITIONS

Accelerator voltage		1500 V
Post-accelerator voltage		10000 V
Deflection factors	vertical	4.2 V/cm
	horizontal	15.5 V/cm
Useful scan	vertical	min. 80 mm
	horizontal	min. 100 mm
Line width		0.4 mm

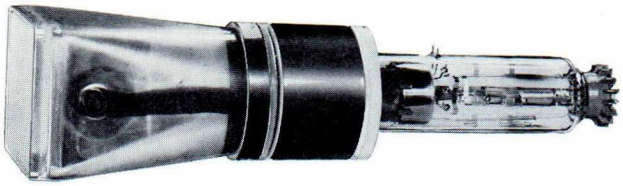
Heater	6.3 V, 300 mA
Overall length	max. 385 mm
Base	14 p. all glass
Available phosphors	GH, GM

D14-160 . . /09

14 cm (5½″ diagonal) flat faced rectangular tube;

post-deflection acceleration electrode with mesh, metal-backed screen, symmetrical x and y deflection. edge-lit internal graticule

The D14-160 . . is similar to the D14-120 . . except that it is developed for better centre line-width and is fitted with a set of coils for image rotation and orthogonality correction. Suitable for oscilloscopes up to 80 MHz.



TYPICAL OPERATING CONDITIONS

Accelerator voltage		1500 V
Post-accelerator voltage		10000 V
Deflection factors	vertical	4.1 V/cm
	horizontal	15.2 V/cm
Useful scan	vertical	min. 80 mm
	horizontal	min. 100 mm
Line width		0.3 mm

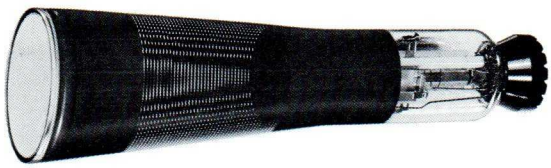
Heater	6.3 V, 300 mA
Overall length	max. 417.5 mm
Base	14 p. all glass
Available phosphors	GH, GM

D.7-11

7 cm (3″) flat faced tube for small, service oscilloscopes;

high sensitivity,
helical post-deflection acceleration,
symmetrical x and y deflection.

Low heater consumption makes the D.7-11 especially suitable for transistorized equipment.



TYPICAL OPERATING CONDITIONS

Accelerator voltage		1200 V/300 V
Post-accelerator voltage		1200 V
Deflection factors	vertical	3.65 V/cm
	horizontal	10.7 V/cm
Useful scan	vertical	min. 40 mm
	horizontal	min. 60 mm
Line width		0.65 mm

Heater	6.3 V, 95 mA
Overall length	max. 296 mm
Base	14 p. all glass
Available phosphors	H, N, P

D13-27 . .

13 cm (5″) flat faced tube;

helical post-deflection acceleration electrode,
beam blanking electrode,
symmetrical x and y deflection.

TYPICAL OPERATING CONDITIONS

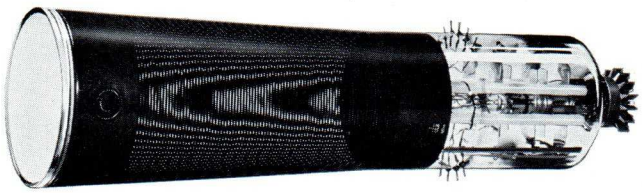
Accelerator voltage		1500 V
Post-accelerator voltage		3000 V
Deflection factors	vertical	11.5 V/cm
	horizontal	24 V/cm
Useful scan	vertical	min. 80 mm
	horizontal	full
Line width		0.25 mm

Heater	6.3 V, 300 mA
Overall length	max. 350 mm
Base	14 p. all glass
Available phosphors	GH, GM

E10-12 . . , E10-130 . .

10 cm (4″) double-gun flat faced tubes;

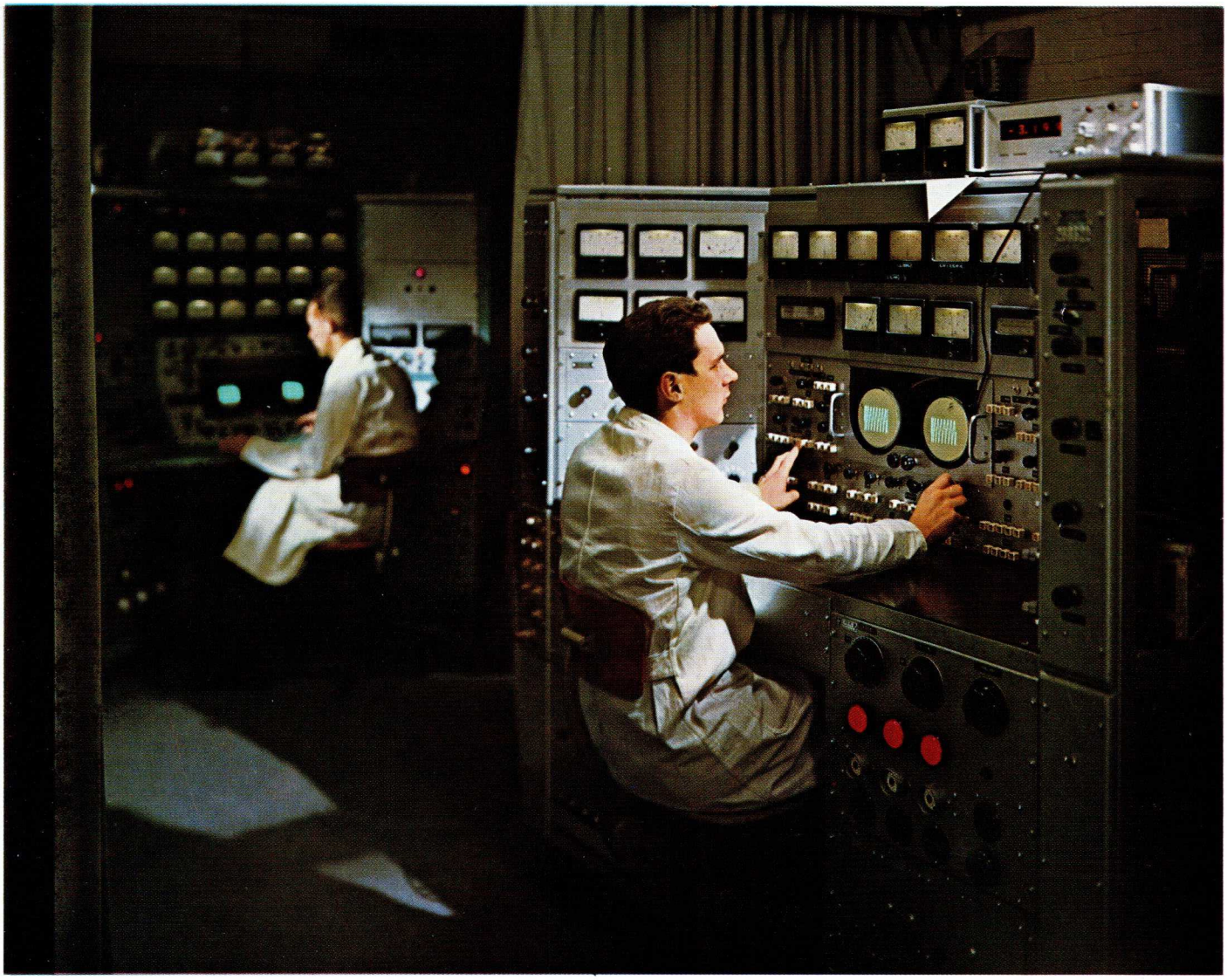
helical post-deflection acceleration electrode,
beam blanking electrode,
metal-backed screen (E10-130 . . only).



TYPICAL OPERATING CONDITIONS

		E10-12 . .	E10-130 . .
Accelerator voltage		1000	1000 V
Post-accelerator voltage		3000	4000 V
Deflection factors	vertical	7	7.4 V/cm
	horizontal	15	17 V/cm
Useful scan	vertical	min. 70	70 mm
	horizontal	full	full
Line width		0.5	0.4 mm

Heater	6.3 V, 300 mA
Overall length	max. 410 mm
Base	14 p. all glass
Available phosphors	GH, GM, GP

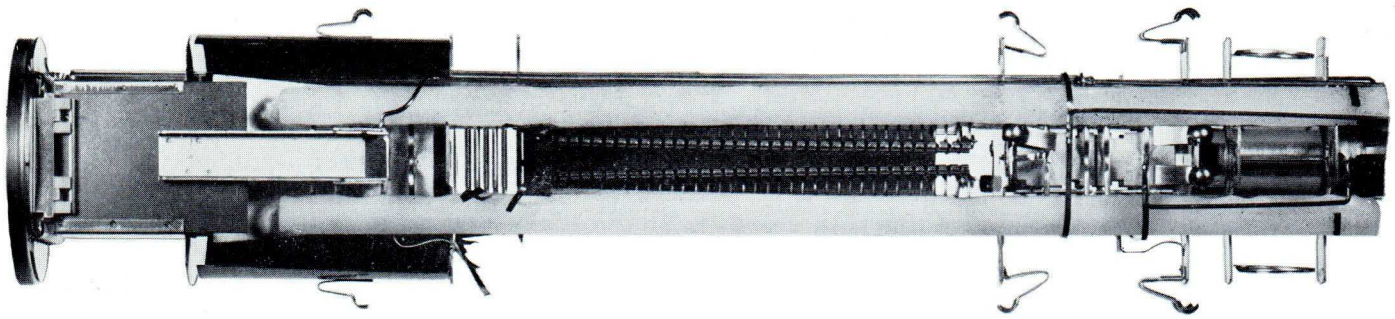


Part of the quality control procedure

HIGH FREQUENCY INSTRUMENT TUBES

The moment someone announces a really advanced oscilloscope - someone else demands one twice as fast - with twice the screen area, a brighter trace - and goodness knows what else. It's a hard struggle to keep up, particularly for the tube maker! For one thing tube deflection systems must be able to handle very high frequencies and must, in any case, be exceptionally sensitive. Beam densities, too, must be adapted to give a clear trace at high writing speeds. For us it means producing tubes that give the oscilloscope makers a bit of leeway.
Our latest all-purpose high-frequency tube *, the D13-500, is more than a step ahead of current demand. It has a vertical deflection system good for 800 MHz (sensitivity - 2 V/cm), a 6 cm x 10 cm display, and brightness to match. The delay line deflection system is separated from the p.d.a. system by a mesh; vertical sensitivity and scan are doubled by an electrostatic quadrupole lens. The aluminized face is flat, rectangular with a 13 cm diagonal, and incorporates an internal graticule for parallax-free measurement. Neck mounted coils allow trace alignment, vertical shift, and orthogonality correction.
The D13-450 is also a rectangular faced tube *, but intended for transistorized oscilloscopes with a bandwidth of 100 MHz to 250 MHz. The internal graticule can be illuminated by a special light conductor: Alignment, shift, and orthogonality correction are catered for by neck mounted coils.
The D10-200 has basically the same gun but because it is a smaller tube is more suitable for very compact equipment.

* Application Information on this subject is available from your tube supplier.



Gun of the D13-500 . ./01 showing the delay-line vertical deflection system.

D10-200GH/07

10 cm (4″ diagonal) rectangular flat faced tube;

post-deflection acceleration electrode with mesh,
metal-backed screen,
sectioned y-plates,
edge-lit internal graticule.
symmetrical x and y deflection.

The tube is intended for frequencies in the range 100 MHz to 250 MHz. It is provided with coils for orthogonality correction, vertical shift and image rotation.

TYPICAL OPERATING CONDITIONS

Accelerator voltage		1500 V
Post-accelerator voltage		15000 V
Deflection factors	vertical	3.5 V/cm
	horizontal	12 V/cm
Useful scan	vertical	min. 50 mm
	horizontal	min. 80 mm
Line width		0.35 mm

Heater	6.3 V, 300 mA
Overall length	max. 405 mm
Base	14 p. all glass

D13-450GH/01

13 cm (5″ diagonal) rectangular flat faced tube;

post-deflection acceleration electrode with mesh,
metal-backed screen,
sectioned y-plates,
edge-lit internal graticule,
symmetrical x and y deflection.

The tube is suitable for transistorized oscilloscopes with a bandwidth from 100 to 250 MHz; it is provided with coils for orthogonality correction, shift of scanned area and picture rotation.

TYPICAL OPERATING CONDITIONS

Accelerator voltage		1500 V
Post-accelerator voltage		15000 V
Deflection factors	vertical	3 V/cm
	horizontal	9.9 V/cm
Useful scan	vertical	min. 60 mm
	horizontal	min. 100 mm
Line width		0.40 mm

Heater	6.3 V, 300 mA
Overall length	max. 459 mm
Base	14 p. all glass

D13-500 . . /01

13 cm (5″ diagonal) rectangular flat faced tube;

post-deflection acceleration electrode with mesh,
metal-backed screen,
vertical deflection by a symmetrical helix system,
vertical scan magnification by an electrostatic quadrupole lens,
symmetrical x deflection,
edge-lit internal graticule.

An all-purpose oscilloscope tube with high sensitivity and large useful scan, capable of displaying signals up to 800 MHz; it has coils for alignment, vertical shift and orthogonality correction.

TYPICAL OPERATING CONDITIONS

Accelerator voltage		2500 V
Post-accelerator voltage		15000 V
Deflection factors	vertical	2 V/cm
	horizontal	15 V/cm
Useful scan	vertical	min. 60 mm
	horizontal	min. 100 mm
Line width		0.35 mm

Heater	6.3 V, 300 mA
Overall length	max. 493 mm
Base	14 p. all glass
Available phosphors	BE, GH

MONITOR TUBES

Tubes for data display, closed circuit television, large screen oscilloscopes, television camera viewfinders, and television monitors must meet similar standards – high resolution, high quality, stable and predictable characteristics, and not least important, assured long term availability. It is really only in screen phosphors that the requirements differ. In television, of course, white is mostly used, but in the other applications there is a preference for other phosphors.
Experience, confirmed by ergonomic analysis, shows that green is the least tiring colour for operators and observers, and therefore promotes error free reading. A flicker-free picture, too, is less tiring, so a slower decay is to be preferred. Another point in favour of green is that it gives a pleasing and professional appearance to the final product. For these reasons we recommend the GH and GR phosphors for data display. They are both green, but the GR has the longer persistence and is thus more suitable for slower repetition rates. For medical system monitors and other lower speed application where a longer decay is needed we recommend the GR or GM phosphors. The GM is the slower to decay and has a purplish blue flash and yellowish green persistence.
Our range includes tubes from 17 cm to 38 cm, with deflection angles from 70° to 110°; particular attention being drawn to the M17-140W, the M17-141W, and the M24-100W. The first two are rectangular flat-faced tubes intended primarily as camera viewfinders but, because of their excellent resolution, recommended for use anywhere where the display of fine detail is important. The last named, the M24-100W has been developed with the small data display market particularly in mind. Although white is the standard phosphor for tubes in this range, we shall be happy to supply tubes with any of the above mentioned phosphors against special order.

M17-140W, M17-141W

Rectangular picture tubes for use as television camera view finder, and high resolution display;

17 cm (7″) diagonal,
70° deflection angle,
flat faced,
metal-backed screen,
very high resolution,
bonded face plate } **M17-141W only**
metal mounting band }

TYPICAL OPERATING CONDITIONS

	M17-140W	M17-141W
Final accelerator voltage	14	16 kV
First accelerator voltage	400	600 V
Grid No. 1 voltage	-30 to -62	-40 to -90 V
Resolution at screen centre	min. 1000	1100 lines

Heater	6.3 V, 300 mA
Overall length M17-140W	max. 234 mm
M17-141W	max. 240 mm
Neck diameter	28 mm
Base	B8H

M24-100W

Rectangular picture tube for use as precision monitor and data display tube;

24 cm (9½″) diagonal,
90° deflection angle,
high resolution,
low-wattage heater.

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	14 kV	Heater	6.3 V, 300 mA
First accelerator voltage	600 V	Overall length	max. 260 mm
Grid No. 1 voltage	-32 to -85 V	Neck diameter	28 mm
Resolution at screen centre	900 lines	Base	B8H

M31-120W

Rectangular picture tube for use as monitor and data display tube;

31 cm (12″) screen diameter,
110° deflection angle,
metal-backed screen,
low-wattage heater,
integral protection.

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	11 kV	Heater	11 V, 75 mA
First accelerator voltage	250 V	Overall length	max. 233 mm
Grid No. 1 voltage	-35 to -69 V	Neck diameter	20 mm
Resolution at screen centre	min. 850 lines	Base	7 p. miniature

M38-120W

Rectangular picture tube for use as precision monitor and data display tube;

38 cm (15″) screen diameter,
110° deflection angle,
metal-backed screen,
integral protection.

TYPICAL OPERATING CONDITIONS

Final accelerator voltage	16 kV	Heater	6.3 V, 300 mA
First accelerator voltage	400 V	Overall length	max. 279.5 mm
Grid No. 1 voltage	-40 to -85 V	Neck diameter	28 mm
Resolution at screen centre	min. 650 lines	Base	B8H

FLYING SPOT SCANNER TUBES

Since the publication of last year's Survey there has been a quiet revolution in flying spot scanners. As far as spectral emission and fast decay are concerned, all other flying spot scanners for colour television are obsolete ! The reason is the new GU phosphor we recently introduced. It is a mixture of two new phosphors developed by our chemical research group. One – Cerium activated Yttrium Aluminium oxide – is a unique red phosphor that peaks at 510 nm and has a persistence less than 100 ns. With it the red channel signal to noise ratio is at least twice as good as with any competing phosphor.

The other entirely new phosphor has been added to give a similar order of improvement in the blue channel. It is Cerium activated Yttrium silicate a highly efficient blue phosphor of extremely short persistence. The combination, the GU phosphor, is unlikely to be equalled for a very long time.

Q13-110GU Q13-110BA

13 cm (5″) flying spot scanner tubes;

useful screen diameter min. 108 mm,
high resolution,
40° deflection angle,
magnetic deflection,
magnetic focusing,
metal-backed screen.
Q13-110BA with purplish blue phosphor of very short persistence.
Q13-110GU with white phosphor of short persistence.

TYPICAL OPERATING CONDITIONS

Accelerator voltage	25 kV	Heater	6.3 V, 300 mA
Grid No. 1 voltage	−50 to −100 V	Overall length	max. 347 mm
Resolution at screen centre	1000 lines	Base	duodecal 7 p.

MW13-38, MG13-38
MY13-38
MU13-38

13 cm (5″) projection tubes;

useful screen area 92 x 69 mm,
47° deflection angle,
high brightness,
magnetic deflection,
magnetic focusing.

MW13-38 for large screen projection of black and white television pictures.

MG 13-38, MY 13-38, MU 13-38 for large screen projection of colour television pictures.

TYPICAL OPERATING CONDITIONS

Accelerator voltage	50 kV
Grid No. 1 voltage	−100 to −170 V
Heater	6.3 V, 300 mA
Overall length	max. 374 mm
Base	duodecal 7 p.

SCREEN PHOSPHORS AND EQUIVALENTS

Designation			Colour		Persistence	Typical use
Pro-Electron		Jedec	Fluores-cence	Phosphor-escence		
new	old					
BE	B	P11	blue	blue	medium short	oscillography and photography
GH	H	P31	green	green	medium short	general purpose oscillography
GJ	G	P1	yellowish-green	yellowish-green	medium	general purpose oscillography
GM	P	P7	purplish-blue	yellowish-green	long	low-speed oscillography
GP	N	P2	bluish-green	green	medium short	medium-speed oscillography, photography
GR	—	P39	green	green	long	monitoring and display devices
GU	—	—	white	white	very short	colour flying spot scanners
BA	C	—	purplish-blue	— —	very short	flying spot scanners
W	W	P4	white	— —	medium short	television and monitoring devices

COMPLETE TYPE RANGE AND STATUS CODE

Type No.	Phosphors	Status
D.3-91	H	C
D.7-5	B, G, P	C
D.7-6	B, G, P	C
D.7-11	B, H, N, P	D
D.7-31	G	D
D.7-32	G	D
D.7-36	B, G, N, P	O
D.7-78	B. H, N, P	C
D7-190 . .	GH, GM	D
D.10-6	B, G, P	O
D10-11 . .	GH, GM, GP	M
D10-12 . .	GH, GM, GP	M
D.10-74	G	O
D.10-78	B, H, N, P	O
D10-160 . .	GH, GM	D
D10-170 . .	GH	D
D10-200 . ./07	GH	D
D.13-2	B, G, P	O
D13-15 . .	GH, GM, GP	O
D13-16 . .	GH, GM, GP	M
D13-16 . ./01	GH	M
D13-19 . .	GH, GM, GP	O
D13-21 . .	GH, GM, GP	O
D13-23 . .	GH	O
D13-26 . .	GH, GM, GP	C
D13-26 . ./01	GH, GM, GP	C

Type No.	Phosphors	Status
D13-27 . .	GH, GM	D
D.13-32	G, H, P	O
D.13-34	B, G, H, N, P	O
D13-49 . .	BE	O
D13-450 . ./01	GH	D
D13-480 . .	GH, GM	D
D13-500 . ./01	GH	D
D14-120 . .	GH, GM, GP	D
D14-121 . .	GH, GM, GP	D
D14-160 . ./09	GH, GM	D
E10-12 . .	GH, GM, GP	D
E10-130 . .	GH, GM, GP	D
M.13-16	C, K	O
M.13-38	G, U, Y, W	D
M17-140 .	W	D
M17-141 .	W	D
M21-11 .	W	M
M21-12 .	W	M
M24-100 .	W	N
M28-12 .	W	M
M31-120 . .	W	D
M36-11 .	W	O
M36-13	W	O
M36-16 .	W	O
M38-120 . .	W	D
Q13-110 . .	BA, GU	D

Other phosphors are available to special order.

Status code:

N: new design type.
Recommended for new designs, but not necessarily available in full production quantities at the date this Survey is published.

D: design type.
Recommended for design and available in full production quantities.

C: current type.
Available for equipment production and for replacement.
Not recommended for design.

M: maintenance type.
Available for maintenance only.

O: obsolescent type.
Available until stocks are exhausted.

Part of the life testing equipment in our Quality Control Laboratory.

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