

# DEVELOPMENT SAMPLE DATA

This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily imply that the device will go into production

L14-111GH/55

## INSTRUMENT CATHODE-RAY TUBE

14 cm diagonal, rectangular flat-faced direct-view storage tube with variable persistence and internal graticule, intended for oscilloscope applications.

### QUICK REFERENCE DATA

Final accelerator voltage	$V_{g10(l)}$	8,5	kV
Display area (10 x 8 divisions of 9 mm)		90 x 72	mm <sup>2</sup>
Deflection coefficient			
horizontal	$M_x$	9,5	V/div
vertical	$M_y$	4,1	V/div
Writing speed		2,5	div/ $\mu$ s

### SCREEN

Metal backed phosphor

	colour	persistence (non-store mode)	persistence (store mode)
L14-111GH/55	green	medium-short	variable

blue binder, tab 4

Useful screen dimensions	min.	90 x 72	mm
Useful scan			
horizontal	min.	90	mm
vertical	min.	72	mm
Spot eccentricity in horizontal and vertical directions	max.	6	mm

The scanned raster can be shifted and aligned with the internal graticule by means of correction coils fitted around the tube by the manufacturer.

### HEATING

#### Writing section

Indirect by a.c. or d.c.; parallel supply

Heater voltage	$V_f$	6,3	V
Heater current	$I_f$	300	mA

#### Viewing section

Indirect by d.c.; parallel supply

Heater voltage	$V_{f'}$	6,3	V
Heater current	$I_{f'}$	300	mA
Heater voltage	$V_{f''}$	6,3	V
Heater current	$I_{f''}$	300	mA

*Verzella:  
Maart '79*



**PHILIPS**

February 1978

**MECHANICAL DATA****Mounting position** any

The tube should not be supported by the base alone and under no circumstances should the socket be allowed to support the tube. The tags near the screen should not be subjected to mechanical stress.

**Net mass** approx. 1,1 kg**Base** 14 pin, all glass**Dimensions and connections**

See also outline drawing, pages 4 and 5

Overall length (socket included) max. 445 mm

Face dimensions max. 100 x 120 mm

**Accessories**

Socket (supplied with tube) type 55566

Side contact connector (14 required) type 55561

**FOCUSING** electrostatic**DEFLECTION** double electrostatic

x-plates symmetrical

y-plates symmetrical

Angle between x and y-traces 90°

Angle between x-trace and x-axis of  
the internal graticule 0°

See also Correction coils

## OPERATING NOTES

## Modes of operation

*Store mode*

- a. Dynamic erasure (variable persistence)

Dynamic erasure can be achieved by applying erasing pulses of positive polarity to the backing electrode. The pulse amplitude required is approximately 9V (< 15 V) and the persistence of a stored display can be controlled by varying the duty factor of these pulses.

- b. Static erasure.

If no dynamic erasing pulses are applied, the storage time is limited by the potential shift of the storage layer due to landing of positive ions. In order to erase a stored display, the backing electrode should first be connected to the collector electrode voltage and then returned to its original potential for about 100 ms; after that, an erasing pulse of positive polarity and a duration of not less than 300 ms should be applied. For the adjustment of the amplitude of this pulse see Procedure of adjustment.

*Non-store mode*

For non-store operation, it is sufficient to make the backing electrode about 35 V negative with respect to the viewing gun cathodes. The viewing guns should not be switched off in this mode of operation since slight variations in raster geometry and deflection sensitivity might otherwise be caused. Care should be taken, especially when switching from store mode to non-store mode, that excessive writing beam current is avoided, as otherwise the storage layer may be damaged.

## Procedure of adjustment

- a. Adjust the cathode current of each viewing gun to 0,4 mA by means of its control grid voltage.
- b. Adjustment of the erasing pulse amplitude (static erasure)

The pulse amplitude should be just sufficient to suppress any background illumination at the centre of the display area ( this adjustment should be done under low ambient light conditions). Data on storage time and maximum writing speed are based on erasure to "just black". A larger pulse amplitude (erasure to "blacker than black") yields a longer storage time at the expense of maximum writing speed. On the other hand, writing speed can be increased if some background illumination is tolerated. To erase to "just black" the amplitude of this pulse is approximately 9 V.

- c. Adjustment of the collimator voltage

With dynamic erasing pulses applied and a persistence control setting that yields a convenient background illumination intensity, the collimator voltage is adjusted for optimum background uniformity. This voltage will be approximately 80 V with respect to the viewing gun cathode potential. If this voltage is too high or too low, there is a decrease of intensity at the four corners or at the centres of the vertical edges of the display area respectively. For a good erasure of the display, the collimator voltage should be as low as possible.

## CAPACITANCES

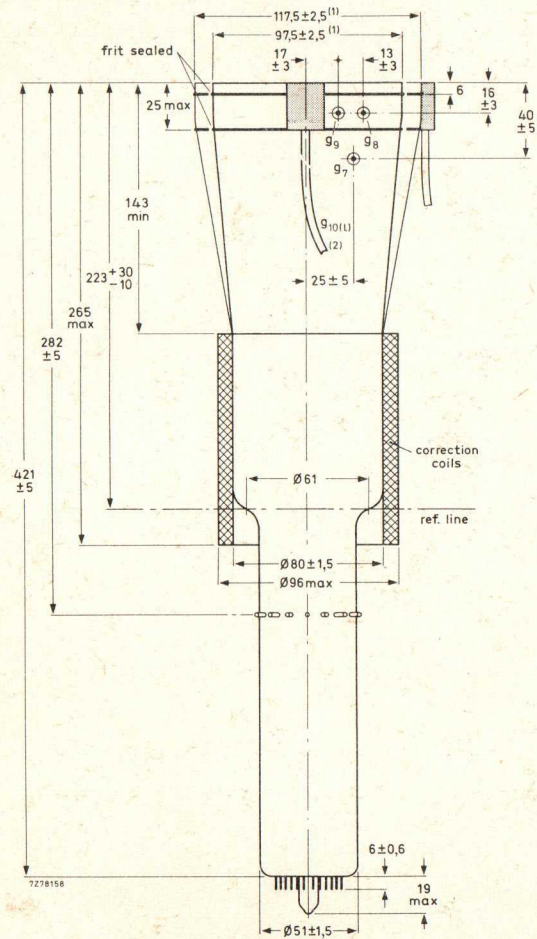
x <sub>1</sub> to all other elements except x <sub>2</sub>	C <sub>x1(x2)</sub>	6,5	pF
x <sub>2</sub> to all other elements except x <sub>1</sub>	C <sub>x2(x1)</sub>	6,5	pF
y <sub>1</sub> to all other elements except y <sub>2</sub>	C <sub>y1(y2)</sub>	3	pF
y <sub>2</sub> to all other elements except y <sub>1</sub>	C <sub>y2(y1)</sub>	3	pF
x <sub>1</sub> to x <sub>2</sub>	C <sub>x1x2</sub>	2,5	pF
y <sub>1</sub> to y <sub>2</sub>	C <sub>y1y2</sub>	2	pF
g <sub>1</sub> to all other elements	C <sub>g1</sub>	5,5	pF
g <sub>1'</sub> to all other elements	C <sub>g1'</sub>	5,5	pF
g <sub>1''</sub> to all other elements	C <sub>g1''</sub>	5,5	pF
k to all other elements	C <sub>k</sub>	4,5	pF
k' to all other elements	C <sub>k'</sub>	5	pF
k'' to all other elements	C <sub>k''</sub>	5	pF
g <sub>7</sub> to all other elements	C <sub>g7</sub>	40	pF
g <sub>9</sub> to all other elements	C <sub>g9</sub>	75	pF

DEVELOPMENT SAMPLE DATA



DIMENSIONS AND CONNECTIONS

Dimensions in mm



- (1) The bulge at the frit seal may increase the indicated maximum dimensions by not more than 3 mm.
- (2) Minimum length of cable: 420 mm.

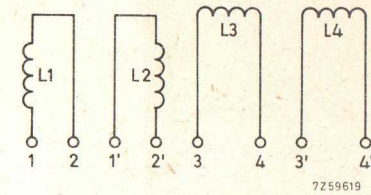


Fig. 1.

**Orthogonality (coils L3 and L4)**

The current required under typical operating conditions without a mu-metal shield being used is max. 20 mA for complete correction of orthogonality. It will be 30% to 50% lower with shield, depending on the shield diameter. The resistance of the coil is approx. 225 Ω.

**Image rotation (coils L1 and L2)**

The image rotation coils are wound concentrically around the tube neck. Under typical operating conditions 22 ampere-turns are required for maximum rotation of 5°. Both coils have 850 turns. This means that a current of max. 12,5 mA per coil is required which can be obtained by using a 12 V supply when the coils are connected in series or a 6 V supply when they are in parallel.

**Connecting the coils**

The coils have been connected to 8 solder tags according to Fig. 2.

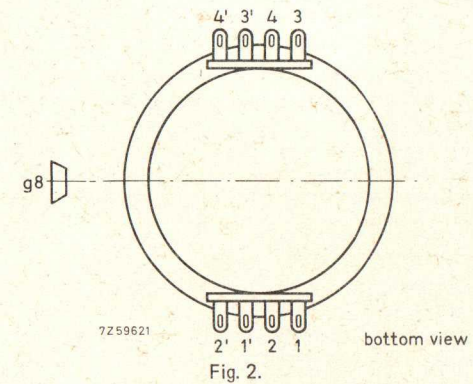


Fig. 2.

With L3 and L4 connected in series according to Fig. 3 a current in the direction indicated will produce a clockwise rotation of the vertical trace and an anti-clockwise rotation of the horizontal trace.

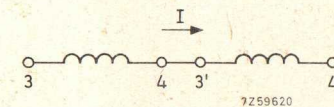
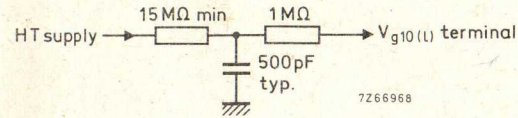


Fig. 3.

DEVELOPMENT SAMPLE DATA

NOTES

1. These values are valid at cut-off of both flood guns and the writing gun. The H.T. unit must be capable of supplying 0,5 mA. To protect the tube against excessive surge current during erasure, an adequately dimensioned RC-network must be connected in series with the screen terminal lead.



2. This voltage should be equal to the mean y-plate potential. The mean x and y-plate potentials should be equal for optimum spot quality.
3. The collimator electrode voltage should be adjusted for optimum uniformity of background illumination.
4. The voltage  $V_{g2'}$ ,  $V_{g2''}$  should be equal to the mean x-plate potential.
5. Measured with the shrinking raster method in the centre of the screen under typical operating conditions, adjusted for optimum spot size at a beam current  $I_b = 10 \mu A$  (measured against x-plates).
6. The writing speed is defined as the maximum speed at which a written trace is just visible, starting from a background which is just black. The indicated value is guaranteed for the total graticule area, with the exception of maximum 5% in each corner. The writing speed can be increased to approx. 2,5 div/ $\mu s$  if some background is tolerated.
7. The storage time is defined as the time required for the brightness of the unwritten background to rise from just zero brightness (viewing-beam cut-off) to 10% of saturated brightness. At reduced intensity (by pulsing the flood beams) the storage time can be increased.
8. The sensitivity at a deflection less than 75% of the useful scan will not differ from the sensitivity at a deflection of 25% of the useful scan by more than the indicated value.
9. A graticule, consisting of concentric rectangles of 88 mm x 70 mm and 86 mm x 68,5 mm is aligned with the electrical x-axis of the tube. With optimum corrections applied, a raster will fall between these rectangles.

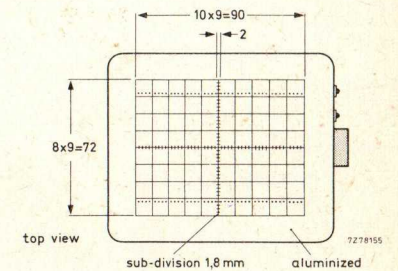
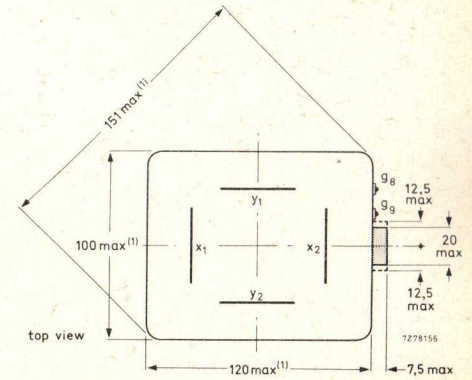
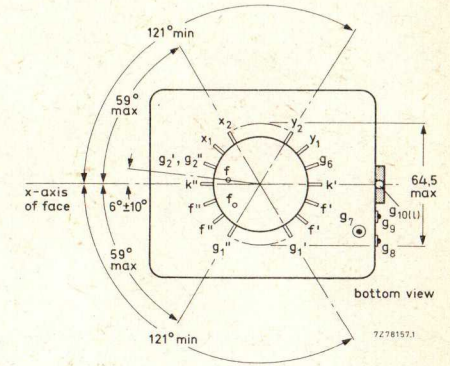
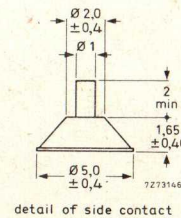
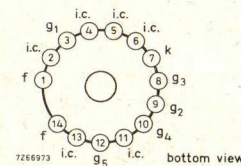
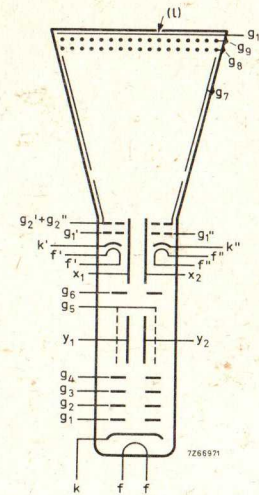
CORRECTION COILS

General

The L14-111GH/55 is provided with a coil unit (see Fig. 1) consisting of:

- a pair of coils L3 and L4 which enable the angle between the x and y-traces at the centre of the screen to be made exactly 90° (orthogonality correction);
- a pair of coils L1 and L2 for image rotation which enable the alignment of the x-trace with the x-lines of the graticule.

DEVELOPMENT SAMPLE DATA



Colour of graticule: brown-black  
 Line width 0,15 mm  
 Dot diameter 0,3 mm

**TYPICAL OPERATION** (for notes see page 8)**Conditions****Writing section** (voltages with respect to writing gun cathode k)

Final accelerator voltage	$V_{g10}^{(k)}$	8500	V	note 1
Geometry control electrode voltage	$V_{g6}$	$1500 \pm 100$	V	
Deflection plate shield voltage	$V_{g5}$	1500	V	note 2
Astigmatism control electrode voltage	$V_{g4}$	$1500 \pm 50$	V	
Focusing electrode voltage	$V_{g3}$	400 to 600	V	
First accelerator voltage	$V_{g2}$	1500	V	
Control grid voltage for visual extinction of focused spot	$V_{g1}$	-40 to -80	V	

**Viewing section** (voltages with respect to viewing gun cathodes k' and k'')

Final accelerator voltage	$V_{g10}^{(k)}$	7050	V	note 1
Backing electrode voltage, storage operation	$V_{g9}$	0 to 5	V	
non-storage operation	$V_{g9}$	-35	V	
Collector voltage	$V_{g8}$	150	V	
Collimator voltage	$V_{g7}$	30 to 120	V	note 3
First accelerator voltage	$V_{g2}', V_{g2}''$	50	V	note 4
Control grid voltage for cut-off	$V_{g1}', V_{g1}''$	-30 to -70	V	
Cathode current (each viewing gun)	$I_{k'}, I_{k}''$	0,4	mA	

**Performance**

Useful scan				
horizontal		min. 90	mm	
vertical		min. 72	mm	
Deflection coefficient				
horizontal	$M_x$	9,5	V/div	
		max. 10,5	V/div	
vertical	$M_y$	4,1	V/div	
		max. 4,4	V/div	
Line width at the centre of the screen	l.w.	0,35	mm	note 5
Writing speed in store mode		greater than 250	div/ms	note 6
Storage time		greater than 1,5	min	note 7
Deviation of linearity of deflection		max. 2	%	note 8
Geometry distortion		see note 9		
Grid drive for 10 $\mu$ A beam current		$\approx 25$	V	

**LIMITING VALUES** (Absolute maximum rating system)**Writing section** (voltages with respect to writing gun cathode k)

Final accelerator voltage	$V_{g10}^{(k)}$	max. 9500	V
		min. 7000	V
Geometry control electrode voltage	$V_{g6}$	max. 2100	V
Deflection plate shield voltage	$V_{g5}$	max. 2000	V
		max. 2100	V
		min. 1200	V
Astigmatism control electrode voltage	$V_{g4}$	max. 2100	V
		min. 1200	V
Focusing electrode voltage	$V_{g3}$	max. 1000	V
First accelerator voltage	$V_{g2}$	max. 2000	V
		min. 1250	V
Control grid voltage			
positive	$V_{g1}$	max. 0	V
negative	$-V_{g1}$	max. 200	V
Cathode to heater voltage			
positive	$V_{kf}$	max. 125	V
negative	$-V_{kf}$	max. 125	V
Voltage between astigmatism control electrode and any deflection plate	$V_{g4/x}$	max. 500	V
	$V_{g4/y}$	max. 500	V
Average grid drive		max. 30	V

**Viewing section** (voltages with respect to viewing gun cathodes k' and k'' unless otherwise specified)

Final accelerator voltage	$V_{g10}^{(k)}$	max. 8000	V
		min. 5500	V
Backing electrode voltage, storage operation	$V_{g9}$	max. 5	V
		min. 0	V
		max. 50	V
non-storage operation	$-V_{g9}$	min. 25	V
Collector voltage	$V_{g8}$	max. 180	V
		min. 120	V
Collimator voltage	$V_{g7}$	max. 200	V
		min. 0	V
First accelerator voltage	$V_{g2}', V_{g2}''$	max. 60	V
		min. 40	V
Cathode to heater voltage			
positive	$V_{k'f}, V_{k''f''}$	max. 125	V
negative	$-V_{k'f'}, -V_{k''f''}$	max. 125	V
Control grid voltage			
positive	$V_{g1}', V_{g1}''$	max. 0	V
negative	$-V_{g1}', -V_{g1}''$	max. 200	V

DEVELOPMENT SAMPLE DATA

## INSTRUMENT CATHODE-RAY TUBE

14 cm diagonal, rectangular flat-faced direct-view storage tube with variable persistence and internal graticule, intended for oscilloscope applications.

## QUICK REFERENCE DATA

Final accelerator voltage	$V_{g10}^{(k)}$	8,5	kV
Display area (10 x 8 divisions of 9 mm)		90 x 72	mm <sup>2</sup>
Deflection coefficient			
horizontal	$M_x$	9,5	V/div
vertical	$M_y$	4,1	V/div
Writing speed		2,5	div/ $\mu$ s

## OPTICAL DATA

Screen		metal backed phosphor	
type		GH, colour green	
persistence, non-store mode		medium-short	
persistence, store mode		variable	
Useful screen dimensions		min. 90 x 72	mm
Useful scan			
horizontal	min.	90	mm
vertical	min.	72	mm
Spot eccentricity in horizontal and vertical directions		max. 6	mm

The scanned raster can be shifted and aligned with the internal graticule by means of correction coils fitted around the tube by the manufacturer.

## HEATING

## Writing section

Indirect by a.c. or d.c.; parallel supply			
Heater voltage	$V_f$	6,3	V
Heater current	$I_f$	300	mA

## Viewing section

Indirect by d.c.; parallel supply			
Heater voltage	$V_{f'}$	6,3	V
Heater current	$I_{f'}$	300	mA
Heater voltage	$V_{f''}$	6,3	V
Heater current	$I_{f''}$	300	mA

blue binder, tab 4



**MECHANICAL DATA****Mounting position** any

The tube should not be supported by the base alone and under no circumstances should the socket be allowed to support the tube. The tags near the screen should not be subjected to mechanical stress.

**Net mass** approx. 1,1 kg**Base** 14 pin, all glass**Dimensions and connections**

See also outline drawing, pages 4 and 5

Overall length (socket included) max. 445 mm

Face dimensions max. 100 x 120 mm

**Accessories**

Socket (supplied with tube) type 55566

Side contact connector (14 required) type 55561

**FOCUSING** electrostatic**DEFLECTION** double electrostatic

x-plates symmetrical

y-plates symmetrical

Angle between x and y-traces 90°

Angle between x-trace and x-axis of the internal graticule 0°

See also Correction coils

## OPERATING NOTES

## Modes of operation

*Store mode*

- a. Dynamic erasure (variable persistence)

Dynamic erasure can be achieved by applying erasing pulses of positive polarity to the backing electrode. The pulse amplitude required is approximately 9V (< 15 V) and the persistence of a stored display can be controlled by varying the duty factor of these pulses.

- b. Static erasure.

If no dynamic erasing pulses are applied, the storage time is limited by the potential shift of the storage layer due to landing of positive ions. In order to erase a stored display, the backing electrode should first be connected to the collector electrode voltage and then returned to its original potential for about 100 ms; after that, an erasing pulse of positive polarity and a duration of not less than 300 ms should be applied. For the adjustment of the amplitude of this pulse see Procedure of adjustment.

*Non-store mode*

For non-store operation, it is sufficient to make the backing electrode about 35 V negative with respect to the viewing gun cathodes. The viewing guns should not be switched off in this mode of operation since slight variations in raster geometry and deflection sensitivity might otherwise be caused. Care should be taken, especially when switching from store mode to non-store mode, that excessive writing beam current is avoided, as otherwise the storage layer may be damaged.

## Procedure of adjustment

- a. Adjust the cathode current of each viewing gun to 0,4 mA by means of its control grid voltage.

- b. Adjustment of the erasing pulse amplitude (static erasure)

The pulse amplitude should be just sufficient to suppress any background illumination at the centre of the display area ( this adjustment should be done under low ambient light conditions). Data on storage time and maximum writing speed are based on erasure to "just black". A larger pulse amplitude (erasure to "blacker than black") yields a longer storage time at the expense of maximum writing speed. On the other hand, writing speed can be increased if some background illumination is tolerated. To erase to "just black" the amplitude of this pulse is approximately 9 V.

- c. Adjustment of the collimator voltage

With dynamic erasing pulses applied and a persistence control setting that yields a convenient background illumination intensity, the collimator voltage is adjusted for optimum background uniformity. This voltage will be approximately 80 V with respect to the viewing gun cathode potential. If this voltage is too high or too low, there is a decrease of intensity at the four corners or at the centres of the vertical edges of the display area respectively. For a good erasure of the display, the collimator voltage should be as low as possible.

## CAPACITANCES

x <sub>1</sub> to all other elements except x <sub>2</sub>	C <sub>x1(x2)</sub>	6,5	pF
x <sub>2</sub> to all other elements except x <sub>1</sub>	C <sub>x2(x1)</sub>	6,5	pF
y <sub>1</sub> to all other elements except y <sub>2</sub>	C <sub>y1(y2)</sub>	3	pF
y <sub>2</sub> to all other elements except y <sub>1</sub>	C <sub>y2(y1)</sub>	3	pF
x <sub>1</sub> to x <sub>2</sub>	C <sub>x1x2</sub>	2,5	pF
y <sub>1</sub> to y <sub>2</sub>	C <sub>y1y2</sub>	2	pF
g <sub>1</sub> to all other elements	C <sub>g1</sub>	5,5	pF
g <sub>1'</sub> to all other elements	C <sub>g1'</sub>	5,5	pF
g <sub>1''</sub> to all other elements	C <sub>g1''</sub>	5,5	pF
k to all other elements	C <sub>k</sub>	4,5	pF
k' to all other elements	C <sub>k'</sub>	5	pF
k'' to all other elements	C <sub>k''</sub>	5	pF
g <sub>7</sub> to all other elements	C <sub>g7</sub>	40	pF
g <sub>9</sub> to all other elements	C <sub>g9</sub>	75	pF

