

## TEI 1114 (F8094)

### DARK FACE DIRECT VIEW STORAGE TUBE

The TEI.1114 is an electrostatic focus and deflection direct view storage tube capable of providing bright, uniform display over a 101.5 mm (4") diameter screen.

The tube has a dark face for contrast enhancement in high ambient light location and is supplied with magnetic shield.

Applications include fire control radar, airborne radar displays for weather and navigational purposes.

The tube is specially designed for airborne equipment and can be operated unpressurized at high altitude. The rugged structure makes it particularly resistant to vibration.



#### TYPICAL PERFORMANCES

|                                           |      |         |                   |
|-------------------------------------------|------|---------|-------------------|
| Writing speed .....                       |      | 1 to 10 | mm/ $\mu$ s       |
| Resolution (note 1) .....                 | min. | 21      | lines/cm          |
| Viewing time .....                        | min. | 30      | s                 |
| Erasing time .....                        | max. | 250     | ms                |
| Brightness (screen voltage = 10 kV) ..... | min. | 720     | cd/m <sup>2</sup> |
|                                           |      | or 210  | Ft-Lamberts       |
| Contrast ratio (note 2) .....             | min. | 9.2     |                   |
| Half tones .....                          |      | 5       |                   |

#### GENERAL CHARACTERISTICS

##### Electrical

|                                                   |      |               |    |
|---------------------------------------------------|------|---------------|----|
| Flood and writing gun :                           |      |               |    |
| Heater voltage .....                              |      | 6.3           | V  |
| Heater current .....                              |      | 0.6           | A  |
| Writing gun :                                     |      |               |    |
| Focusing method .....                             |      | Electrostatic |    |
| Deflection method .....                           |      | Electrostatic |    |
| Number of writing gun .....                       |      | 1             |    |
| Interelectrode capacitance :                      |      |               |    |
| Writing gun cathode k to all internal elements .. | max. | 25            | pF |
| Writing gun grid g1 to all internal elements .... | max. | 25            | pF |
| x 1 to x 2 (or D1 to D2) .....                    | max. | 20            | pF |
| y 1 to y 2 (or D3 to D4) .....                    | max. | 20            | pF |

##### Optical

|                       |                 |
|-----------------------|-----------------|
| Phosphor :            |                 |
| Type .....            | P 20 aluminized |
| Fluorescence .....    | Yellow - green  |
| Phosphorescence ..... | Yellow - green  |
| Dark face .....       | Flat            |



## Mechanical

|                                 |               |
|---------------------------------|---------------|
| Minimum useful viewing diameter | 101.5 mm (4") |
| Mounting position               | any           |
| Dimensions                      | see drawing   |
| Plugs                           | see drawing   |
| Weight                          | 3 kg (6.7 Lb) |

## OPERATING CONDITIONS

### Absolute ratings

Unless otherwise stated, voltages are given with respect to ground.

#### FLOOD GUN

|                                                 |            |    |
|-------------------------------------------------|------------|----|
| Heater f' voltage                               | 5.7 to 6.9 | V  |
| Cathode k' voltage                              | 0          | V  |
| Grid g'1 voltage (control grid or Wehnelt)      | 0 to -125  | V  |
| Grid g'2 voltage (accelerating electrode)       | max. 150   | V  |
| Grid g'3 voltage (first collimating electrode)  | max. 200   | V  |
| Grid g'4 voltage (second collimating electrode) | max. 300   | V  |
| Grid g'5 voltage (collecting electrode)         | max. 300   | V  |
| Grid g'6 voltage (backing electrode)            | max. 20    | V  |
| Viewing screen g'7 voltage                      | max. 11.0  | kV |

#### WRITING GUN

|                                                    |                  |    |
|----------------------------------------------------|------------------|----|
| Heater f voltage                                   | 5.7 to 6.9       | V  |
| Cathode k voltage negative value                   | max. 3.0         | kV |
|                                                    | min. 1.0         | kV |
| Grid g1 voltage (control grid or Wehnelt) (note 3) | 0 to -125        | V  |
| Grids g2 and g4 voltage (accelerating electrodes)  | connected to g'2 |    |
| Grid g3 voltage (focusing electrode) (note 3)      | max. 3.0         | kV |
| Peak heater to cathode voltage                     | ± 180            | V  |

### Typical operation

Unless otherwise stated, voltages are given with respect to ground.

#### FLOOD GUN

|                            |                 |    |
|----------------------------|-----------------|----|
| Cathode k' voltage         | 0               | V  |
| Grid g'1 voltage           | adjust 0 to -30 | V  |
| Grid g'2 voltage           | 100             | V  |
| Grid g'3 voltage           | adjust 15 to 40 | V  |
| Grid g'4 voltage           | adjust 25 to 50 | V  |
| Grid g'5 voltage           | 120             | V  |
| Grid g'6 voltage           | 2.0             | V  |
| Viewing screen g'7 voltage | 10.0            | kV |

#### WRITING GUN

|                                        |                   |      |
|----------------------------------------|-------------------|------|
| Cathode k voltage                      | -2.0              | kV   |
| Grid g1 voltage (for cut-off) (note 3) | adjust 30 to -60  | V    |
| Grids g2 and g4 voltage                | connected to g'2  |      |
| Grid g3 voltage (note 3)               | adjust 280 to 660 | V    |
| Deflection factor :                    |                   |      |
| Horizontal                             | 9.0 to 15.4       | V/cm |
| Vertical                               | 9.0 to 15.4       | V/cm |

### NOTES

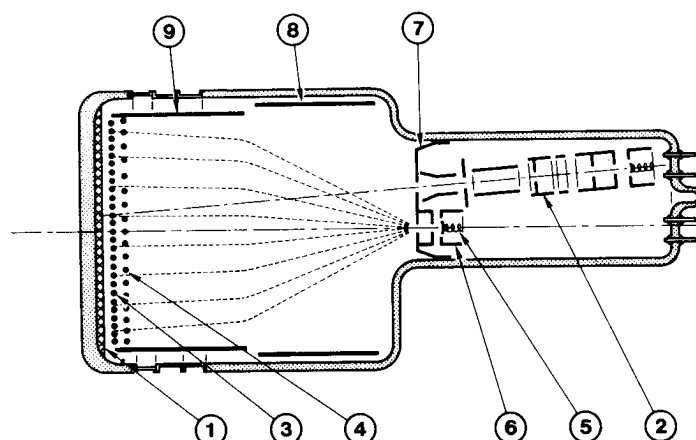
- 1 - Resolution measured by shrinking raster method with a written brightness of 75 % of maximum brightness.
- 2 - Contrast ratio is defined as equilibrium brightness of a trace divided by background brightness, the viewing screen operating under 10 000 lux illumination.
- 3 - With respect to writing gun cathode.



## PHYSICAL DESCRIPTION AND OPERATING PRINCIPLE

The TEI.1114 consists of four basic assemblies :

- 1 - The storage unit  
the components of which are a collecting electrode and a fine metallic mesh called the backing electrode on which is deposited a dielectric material.
- 2 - The viewing screen  
made of aluminized P 20 phosphor, provides the visual output.
- 3 - The writing gun  
located in the neck of the tube generates fast electrons. The high velocity beam scans the storage surface and creates a charge pattern by secondary emission from the dielectric material. Electrostatic focusing and deflection are employed.
- 4 - The flood gun  
does not scan the screen but produces a wide angle low velocity electron beam which approaches the storage mesh normally and at a constant current density over the useful area owing to the collimation electrodes.



- 1 - Viewing screen
- 2 - Writing gun
- 3 - g'6 (backing electrode)
- 4 - g'5 (collecting electrode)
- 5 and 6 - Flood gun
- 7 - g'2 (accelerating electrode)
- 8 - g'3 (1 st collimating electrode)
- 9 - g'4 (2 nd collimating electrode)

In the unwritten state, the dielectric surface of the backing electrode is negatively charged and the low energy flood electrons issued from the flood gun are repelled back to the collecting electrode.

In writing operation, the writing gun scans the storage surface and creates positive charges pattern by secondary emission of the dielectric material, the secondary electrons being attracted to the collecting electrode.

Low velocity electrons from the flood gun approach the storage surface normally and flood the entire useful area. They penetrate through the backing electrode in areas where pattern has been written and are then accelerated to the viewing screen where they produce a corresponding picture on the phosphor.

Since the number of electrons passing through the backing electrode is determined by the amount of written charges, intermediate gray shades may be reproduced.

The image can be erased by applying a short positive pulse to the backing electrode. The display decay may be controlled by varying duration, amplitude and rate of continuous series of positive pulses.

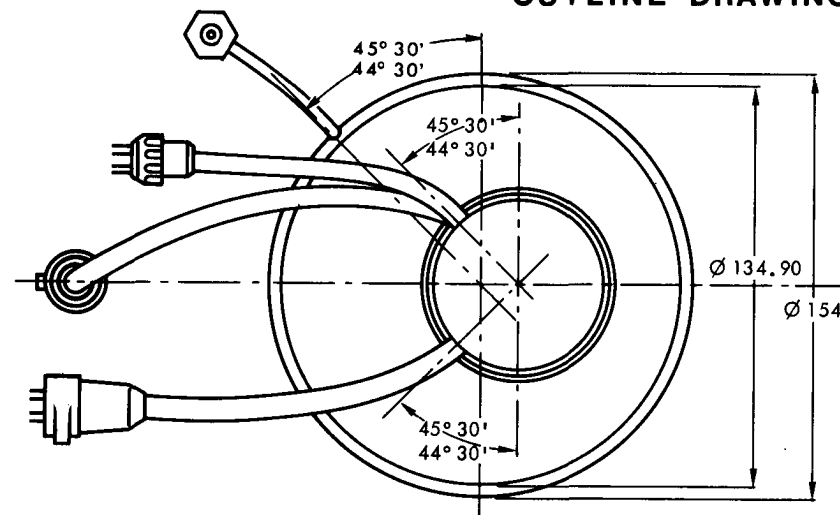
## OPERATIONAL RECOMMENDATIONS

- 1 - The writing gun cannot be allowed to write continuously without appropriate erasure otherwise the storage surface may be damaged.
- 2 - The tube should be handled screen upwards to avoid particles falling on the storage elements.



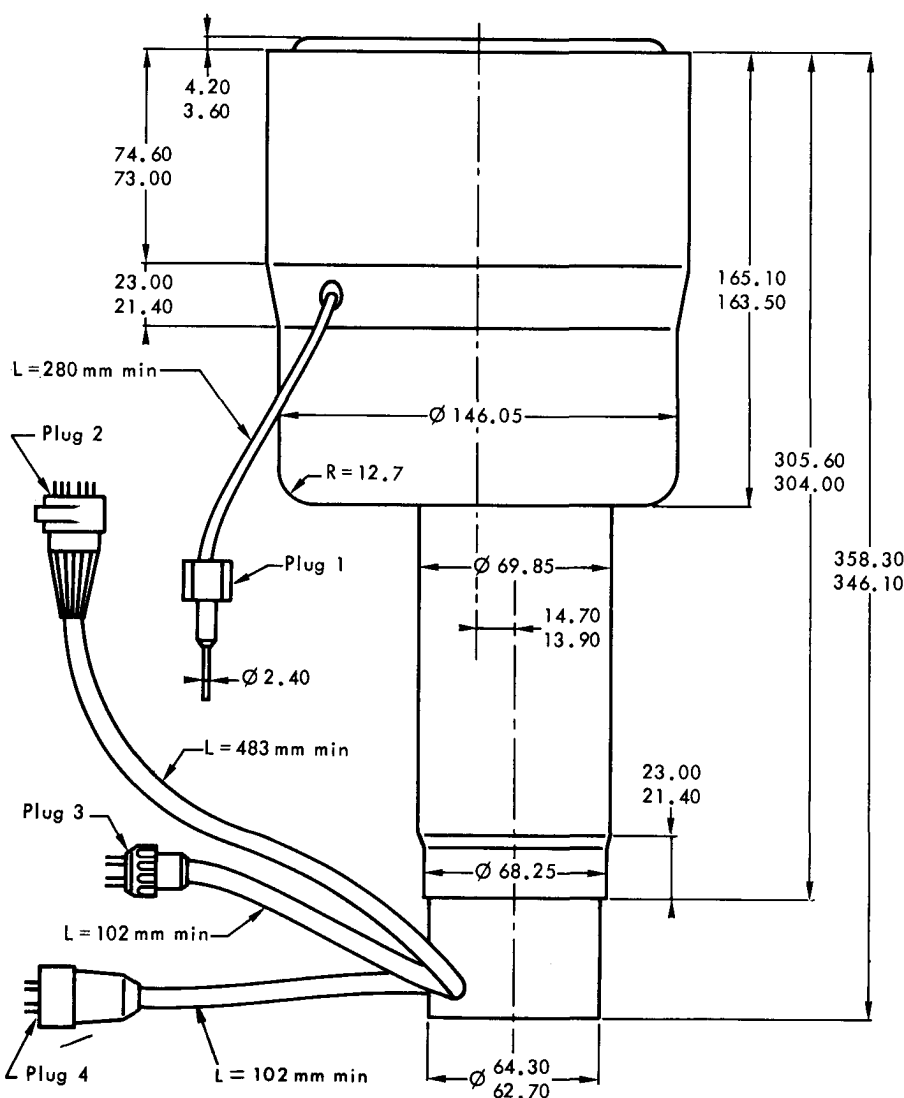
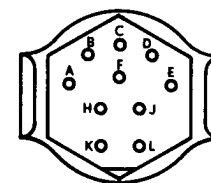
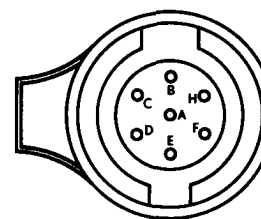
**THOMSON-CSF**  
GROUPEMENT TUBES ELECTRONIQUES

# OUTLINE DRAWING



PLUGS 2 and 4

PLUG 3



## PLUGS IDENTIFICATION

### Plug 1 :

g'7 Viewing screen

### Plug 2 :

A : k' Flood gun cathode  
B : g'6 Backing electrode  
C : g'5 Collecting electrode  
D : g'3 1st collimating electrode  
E : g'4 2nd collimating electrode  
F : g'2 + g'4 + g'2 Writing and flood guns accelerating electrodes  
H : g'1 Flood gun control electrode

### Plug 3 :

A : y2 Vertical deflection plate  
B : y1 Vertical deflection plate  
D : x2 Horizontal deflection plate  
E : x1 Horizontal deflection plate  
K : f' k' Flood gun heater and cathode  
L : f' Flood gun heater

### Plug 4 :

B : k Writing gun cathode  
C : g1 Writing gun control electrode  
D : g3 Writing gun focusing electrode  
E : f Writing gun heater  
F : f Writing gun heater

Dimensions in mm.

