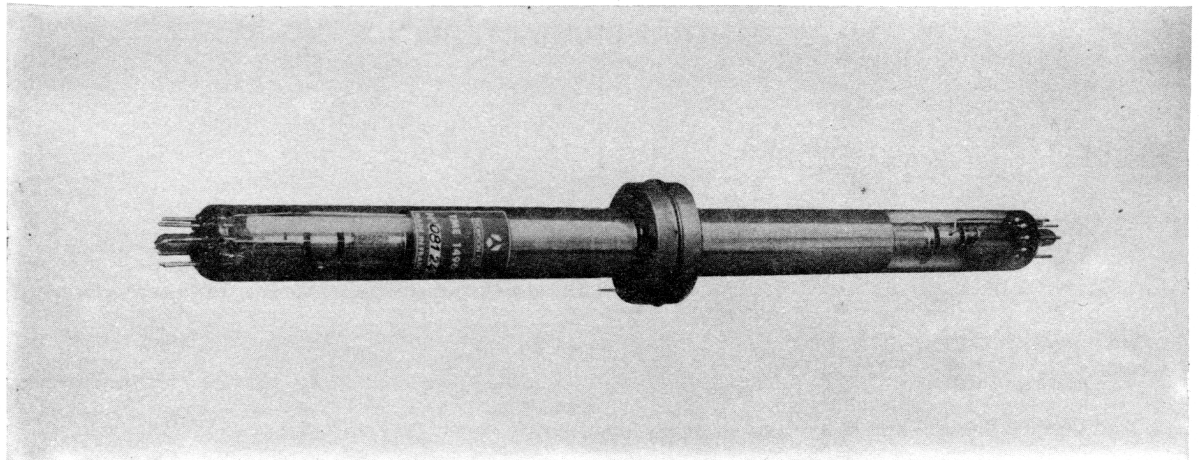




## TME 1496 DOUBLE - ENDED STORAGE TUBE

- 1" diameter dual gun miniaturized tube
- Electro - magnetic focus and deflection
  - Non destructive read - out
- Simultaneous writing and reading without cross - talk
- Resolution : 800 T.V. lines at 50% modulation
- Major application : scan conversion



The TME 1496 is a low cost, miniaturized, double - ended storage tube ; it is intended for electrical - input, electrical - output with high resolution, non destructive read - out.

The TME 1496 enables numerous operating combinations while maintaining the interesting characteristics of the single - ended TME 1238 :

- continuous read - out for a few minutes without degradation of the stored information.
- simultaneous writing and reading without cross - talk (effective isolation between reading and writing sections)
- complete or selective erasure by either writing or reading gun
- possibility of erasing during line or image retrace by either writing or reading gun in order to obtain gradual erasure
- possibility of writing by either writing or reading gun.

The TME 1496 is primarily intended for scan conversion but can be used in many other applications such as image rebuilt of slow scanned pictures, buffer memory for data recording, storage, handling and display, signal to noise ratio enhancement by integration of weak video signals.

Other significant features of the TME 1496 are its great simplicity of operation and low voltage supply requirement. It can, in addition, use for both guns : supplies, focusing and deflecting coils designed for 1" Vidicons.



**TYPICAL PERFORMANCES**

Peak output current	.....	0.2	μA
Writing time	- writing over the whole target area	40	ms
	- writing of one target diameter	50	μs
Erasing time	(erasing performed by either reading or writing gun).....		
	- erasing of the whole written image to residual less than 10 %	40	ms
Decay by line retrace erasure (by either reading or writing gun)	.....	adjustable from 1 s to 10 mn	
Storage time	- without read-out (beam cut-off)	several days	
Reading time	- for continuous read-out	5 to 10	mn
Resolution	- by orthogonal writing and reading at 50 % modulation ..	800	TV lines

**GENERAL CHARACTERISTICS**

**Electrical** : for both sides

Heater voltage	.....	6.3	V
Heater current	.....	0.6	A
Output capacitance (target or grid g5)	.....	10	pF
Focusing method	.....	electromagnetic	
Deflecting method	.....	electromagnetic	
Focusing and deflecting coils	.....	Gerhard BV-200-1 A	
	or	Cleveland VY	
	or	Celco BV-232	
	or	equivalent	

**Mechanical**

Base (for both ends)	.....	UTE 9 C 15
		(JEDEC E8 - 11)
Operating position	.....	any
Weight, approximate	.....	200 g
Dimensions	.....	see drawing



**TYPICAL OPERATING CONDITIONS**

*Unless otherwise stated, voltages are given with respect to reading cathode i.e 0.V*

**Reading gun**

**Writing gun**

Heater :		Heater :	
voltage . . . . .	6.3 ± 10 % V	voltage . . . . .	6.3 ± 10 % V
current . . . . .	0.6 A	current . . . . .	0.6 A
Cathode k voltage . . . . .	0 V	Cathode k' voltage . . . . .	-200 V
Grid g1 voltage (wehnelt) (for cut-off) . . . . .	-50 to -100 V	Grid g'1 voltage (wehnelt) w.r.t.k' (for cut-off) . . . . .	-50 to -100 V
Grid g2 (accelerator) voltage . . . . .	+450 V	Grid g'2 (accelerator) voltage . . . . .	+450 V
Grid g3 (erasing) voltage :		Grid g'3 (erasing) voltage :	
normal . . . . .	+450 V	normal . . . . .	+450 V
fast . . . . .	0 to -30 V	fast . . . . .	0 to -30 V
Grid g4 (focus) voltage . . . . .	+450 V	Grid g'4 (focus) voltage . . . . .	+400 V
Grid g5 (decelerator, collector) voltage . . . . .	+650 V	Grid g'5 (decelerator) voltage . . . . .	+650 V
	Target voltage . . . . .		+5 V

Simultaneous writing and reading are performed with the voltages listed above.

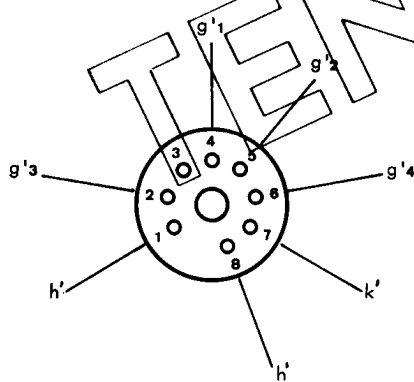
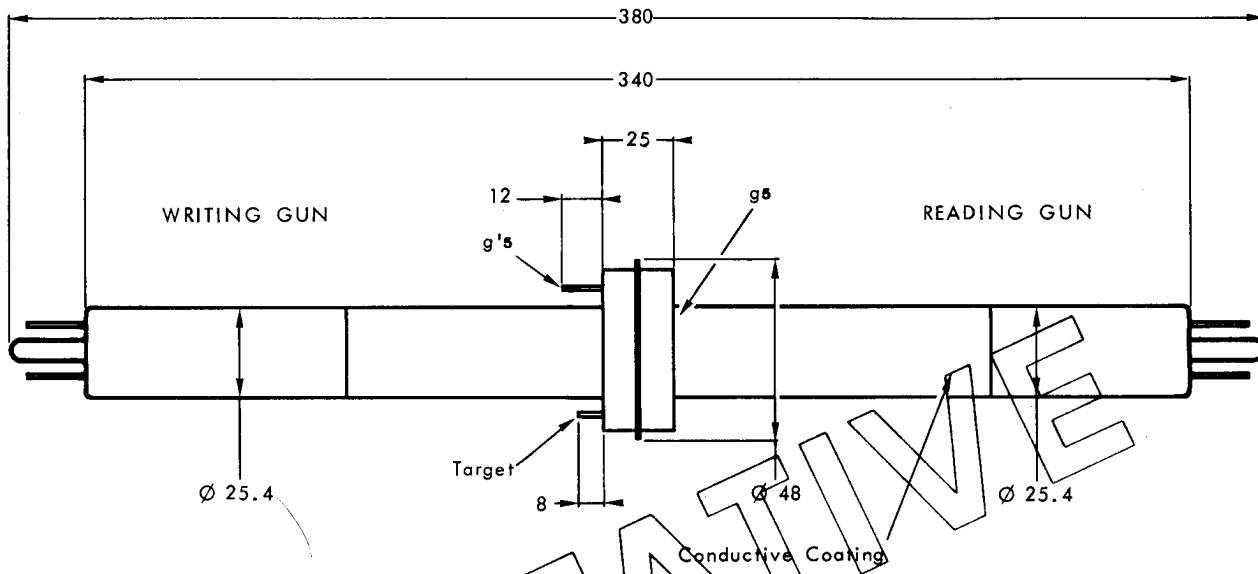
Other operating modes can be considered for which target voltage must be switched as follows :

Modes	Erasing	Erasing	Writing
	by reading gun	by writing gun	by reading gun
Target voltage	+ 15 V	- 185 V	+ 200 V

Still another possibility consists in maintaining target at fixed potential (+5 V) and in switching the cathode voltage of the operating gun.

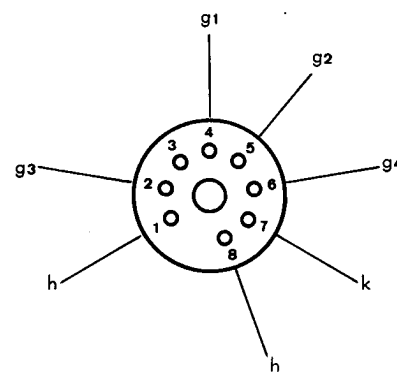


**OUTLINE DRAWING**



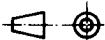
WRITING GUN BASING

(JEDEC E8-11)



READING GUN BASING

(JEDEC E8-11)





## **TME 1496 DOUBLE-ENDED STORAGE TUBE**

- 1" DIAMETER DUAL GUN MINIATURIZED SCAN-CONVERTER TUBE
  - ELECTROMAGNETIC FOCUS AND DEFLECTION
  - NON-DESTRUCTIVE READOUT
- SIMULTANEOUS WRITING AND READING WITHOUT CROSS-TALK
  - FAST ERASING BY EITHER WRITING OR READING GUN
- RESOLUTION AT 50 % MODULATION : 800 T.V. lines per diameter
  - MAJOR APPLICATION : SCAN CONVERSION



The TME 1496 is a low cost, miniaturized, double-ended storage tube ; it is intended for electrical-input, electrical-output with high resolution, non-destructive readout.

The TME 1496 enables numerous operating combinations :

- continuous readout for a few minutes without degradation of the stored information,
- simultaneous writing and reading without cross-talk (due to effective isolation between writing and reading sections),
- complete or selective erasure by either writing or reading gun,
- possibility of erasing during line or image retrace by either writing or reading gun in order to obtain gradual erasure,
- possibility of writing by either writing or reading gun.

The TME 1496 is intended for scan conversion applications such as image rebuilt of slow-scanned pictures, buffer memory for data recording, storage, handling and display, signal to noise ratio enhancement by integration of weak video signals...

Other significant features of the TME 1496 are its great simplicity of operation and low voltage supply requirement. It can, in addition, use for both guns : supplies, focusing and deflection coils designed for 1" Vidicons.



## TYPICAL PERFORMANCES

Peak output current .....	0.2 - 0.4 $\mu$ A
Writing time :	
- writing over the whole target area .....	33 - 40 ms (1 T.V. frame)
- writing of one target diameter .....	50 $\mu$ s
Erasing time : (erasing performed by either writing or reading gun)	
- erasing of the whole written image to residual less than 5 % ..	33 - 40 ms (1 T.V. frame)
- selective erasing of one target diameter .....	300 $\mu$ s
Reading time (for continuous readout) min. ....	10 mn
Decay by line retrace erasure (by either writing or reading gun) .....	adjustable from 1 s to 10 mn
Storage time (without readout) .....	several days
Resolution (by orthogonal writing and reading at 50 % modulation) ..	800 T.V. lines/dia.

## GENERAL CHARACTERISTICS

### Electrical for both sides

Heater voltage .....	6.3 V
Heater current .....	0.15 A
Output capacitances :	
- target to all other electrodes .....	15 pF
- grid g5 to all other electrodes .....	10 pF
Input capacitance :	
- grid g'1 to all other electrodes .....	10 pF
Focusing method .....	electromagnetic
Deflecting method .....	electromagnetic
Focusing and deflecting coil *	GERHARD BV. 200 - 1 A or CLEVELAND VY or CELCO BV - 232 or equivalent

### Mechanical

Base (for both ends) .....	UTE 9 C 15 (JEDEC E8 - 11)
Operating position .....	any
Weight, approx. ....	200 g
Dimensions .....	see drawing

\* It is important for best uniformity to connect focusing coils in such a manner that both magnetic fields (writing and reading) be in the same direction (see fig. 1).



**MAXIMUM RATINGS**

(Absolute values)

Unless otherwise stated, voltages are given with respect to reading cathode potential.

Reading gun			Writing gun		
Cathode k voltage	0	V	Cathode k' voltage	- 200	V
Peak heater-cathode voltage :			Peak heater-cathode voltage :		
- heater negative w.r.t. k	125	V	- heater negative w.r.t. k'	125	V
- heater positive w.r.t. k	125	V	- heater positive w.r.t. k'	125	V
Grid g1 voltage :			Grid g1' voltage (w.r.t. k') :		
- negative bias value	180	V	- negative bias value	180	V
- positive bias value	0	V	- positive bias value	0	V
Grid g2 voltage	600	V	Grid g'2 voltage	400	V
Grid g3 voltage	600	V	Grid g'3 voltage	400	V
Grid g4 voltage	600	V	Grid g'4 voltage	400	V
Grid g5 voltage	700	V	Grid g'5 voltage	500	V
Target voltage			700 V		

**TYPICAL OPERATING CONDITIONS**

Unless otherwise stated, voltages are given with respect to reading cathode potential.

Reading gun			Writing gun		
Heater :			Heater :		
- voltage	6.3 ± 10 %	V	- voltage	6.3 ± 10 %	V
- current	0.15	A	- current	0.15	A
Cathode k voltage	0	V	Cathode k' voltage	- 150	V
Grid g1 (Wehnelt) voltage (for cut-off)	- 50 to - 100	V	Grid g'1 (Wehnelt) voltage w.r.t. k' (for cut-off)	- 50 to - 100	V
Grid g2 (accelerator) voltage	+ 450	V	Grid g'2 (accelerator) voltage	+ 300	V
Grid g3 (erasing) voltage :			Grid g'3 (erasing) voltage :		
normal	+ 450	V	normal	+ 300	V
fast	0 to - 30	V	fast	- 150	V
Grid g4 (focus) voltage	+ 450	V	Grid g'4 (focus) voltage	+ 300	V
Grid g5 (decelerator, collector) voltage	+ 600	V	Grid g'5 (decelerator) voltage*	+ 380 to + 420	V
Target voltage			+ 5 V		

For erasing which can be performed by either writing or reading gun it is necessary to establish a difference of potential of + 15 V between target and the cathode of the operating gun. This can be done

- either by switching the target voltage to + 15 V (erasing by reading gun)  
or to -135 V (erasing by writing gun)
- or by maintaining target voltage at +5V and switching the cathode voltage  $V_k = -10V$  (erasing by reading gun)  
 $V_{k'} = -10V$  (erasing by writing gun)

\* The grid g'5 voltage value can vary depending on the type of coil assembly used. This value must be adjusted to achieve the best uniformity.



**PHYSICAL DESCRIPTION AND OPERATING PRINCIPLE \***

The main components of the tube are 2 electron guns (writing and reading) located on each side of a storage target assembly (Fig. 1).

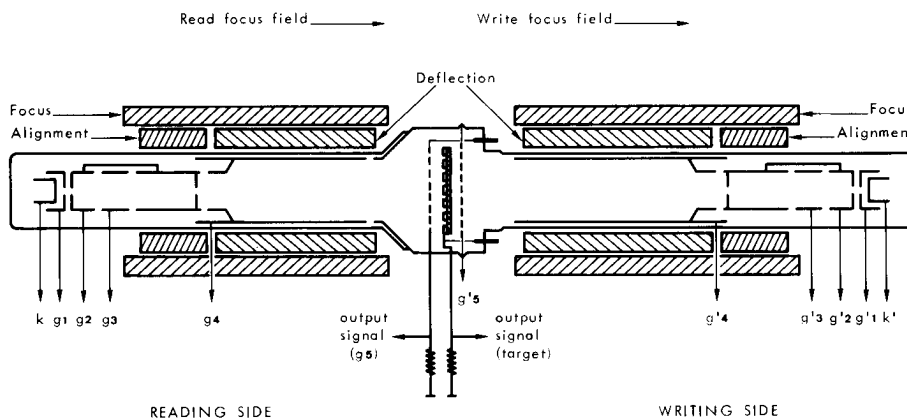


Fig. 1

The electron guns employ electromagnetic focus and deflection. They both include an additional erasing electrode which enables 2 erasing modes (normal or fast) depending on low or high beam current.

The target is of the membrane type a schematic view of which is given in Figure 2.

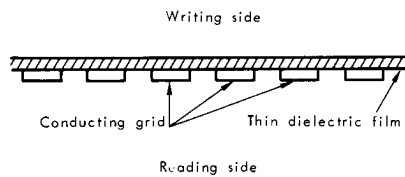


Fig. 2

The principle of operation is the charge or discharge of the storage surface according to the velocity of the primary electron beam through secondary emission of the storage surface.

The structure of the target enables coplanar control mechanism on the reading side when charges have been deposited on either side i.e. by the writing or the reading gun.

The detailed mechanism of the different operations is illustrated in the Figure 3.

**WRITING (Fig. 3a)**

We assume that, after a previous erasing, the dielectric surface facing the reading side is at - 10 V (see erasing) and that the writing beam scans the target with an intensity modulated by the signal applied to the Wehnel.

Considering that the potential difference between the target and the writing cathode is sufficiently high (about 150 V) to get a coefficient  $\delta > 1$ , positive charges are deposited which increase the potential of the written point by + 5 V for example, on the writing side. By capacitive coupling, the potential of the corresponding point on the reading side will increase by a value of about 5 V and thereby its potential is shifted from - 10 V to - 5 V.

\* Detailed considerations about "Recording Storage Tubes" principles and operations are given in the Technical Information TEV 6013 which we ask the user to refer to.



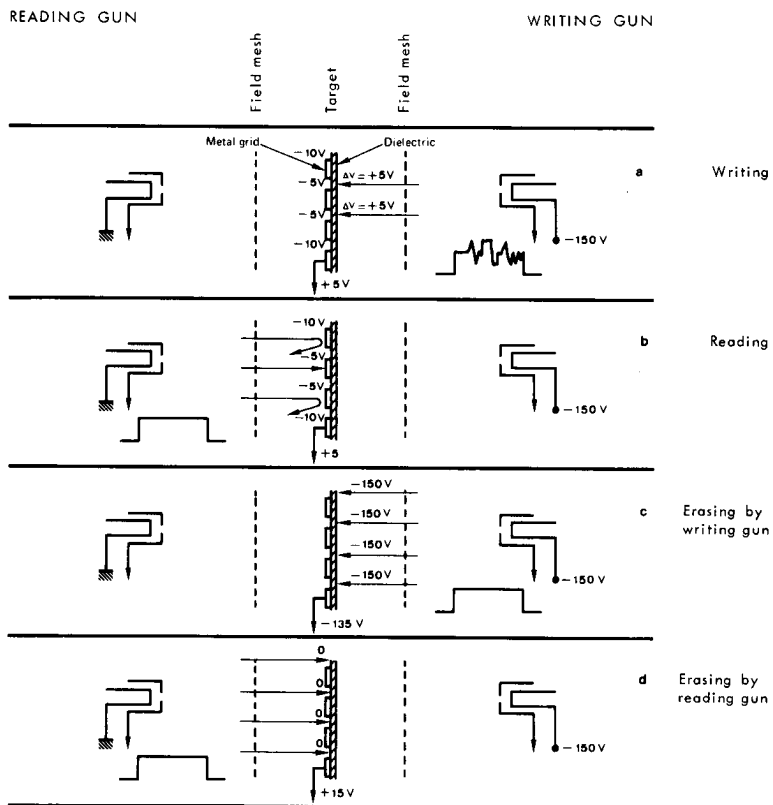


Fig. 3

### READING (Fig. 3b)

The reading is performed by scanning the target by the unmodulated reading beam. Depending on the written charge pattern the surface storage voltage varies between 0 and -10 V and output signal varies in exact correspondance. The most negative areas of the dielectric can completely cut-off the electron beam while various gray shades can be obtained in areas where the dielectric is less negative. Since the storage surface voltages are negative with respect to the read cathode voltage, the reading beam has no adverse effect on the pattern and the readout is non-destructive.

### ERASING

This can be done by using either the writing beam (Fig. 3c) or the reading beam (Fig. 3d).

In the first case, the target is at -135 V; the writing electrons landing on the dielectric (writing side) with an energy of 15 eV and giving rise to secondary emission ratio  $\delta < 1$ , the dielectric is then brought, after bombardment, to an equilibrium potential of -150 V. After switching target voltage back to +5 V, dielectric surface is then brought to a potential of -10 V.

In the second case, the target is shifted to +15 V. The capacitive coupling and the low energy electron beam causes the dielectric to be charged down to 0 V through secondary emission ratio  $\delta < 1$ . After switching target voltage back to +5 V dielectric surface is then brought to a potential of -10 V.



### OTHER OPERATING MODES

Only the major operations are described above since this tube can perform other operations corresponding to any desired application.

For example, only the writing mode achieved by the writing gun has been described. It is obvious that this operation may be achieved through the reading gun by switching, for example, of the target voltage.

It is also possible to conceive, for a radar application, a gradual variable erasure by the writing gun and automatic switching in writing mode just as the echoes begin to appear.

### OUTPUT SIGNAL (Fig. 4)

The output signal can be picked-up through either the target or the reading gun grid g5 but these signals are different from each other as shown in the Figures 4a and 4b.

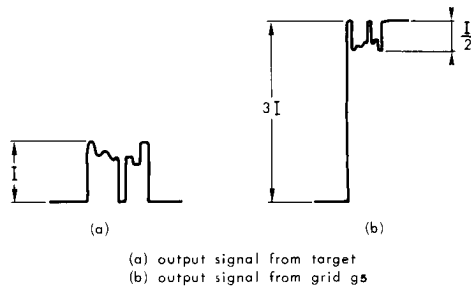


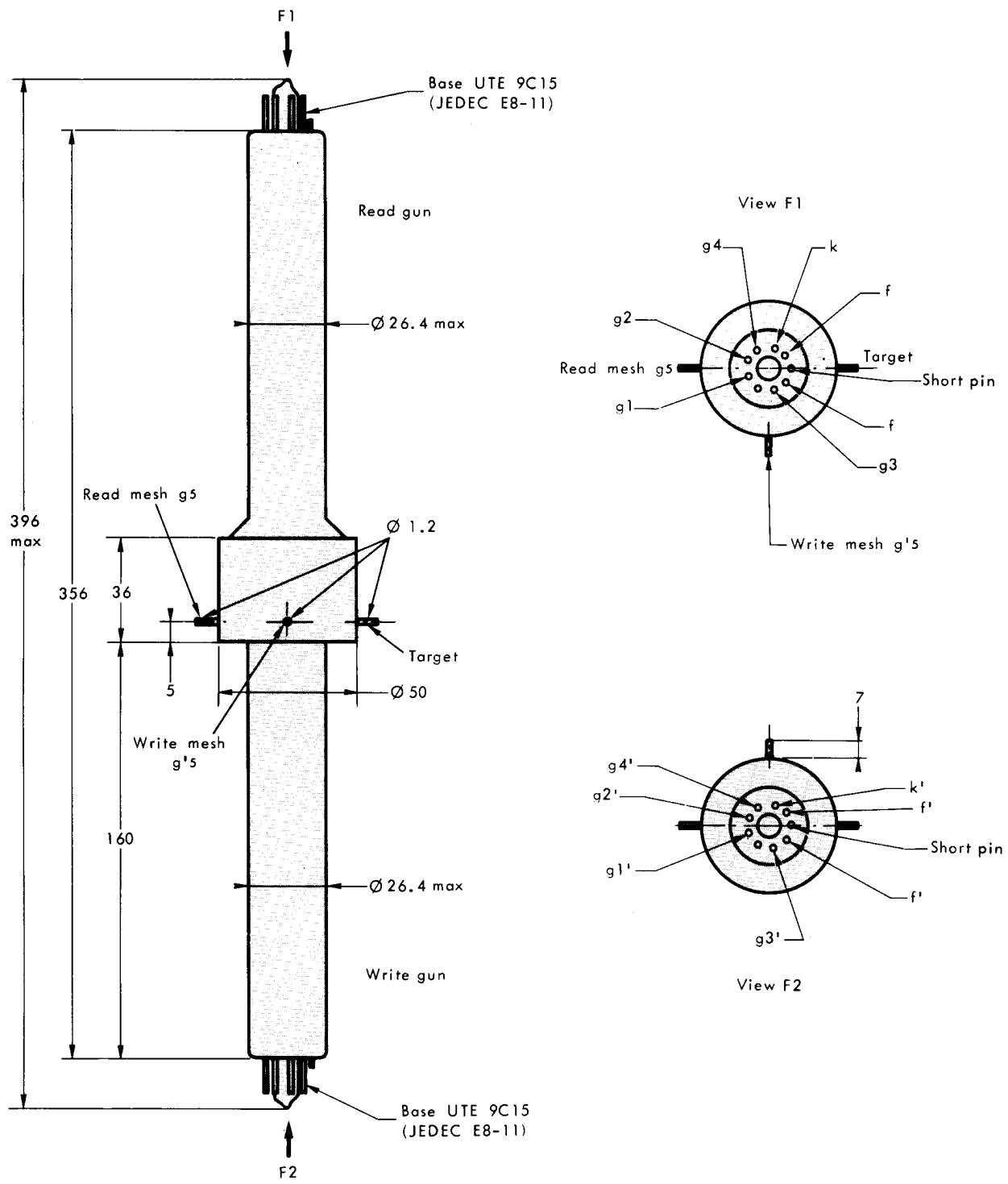
Fig. 4

As compared to the target signal, the grid g5 signal is of reversed polarity and is less convenient since it presents a pedestal level (about 3 times  $I$ ) and has only about half dynamic amplitude  $\frac{1}{2}$ .

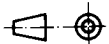
According to the above considerations, it is preferable to use the target as collector except when the crosstalk reaches an uncomfortable level.



**OUTLINE DRAWING**



Dimensions in mm.



TME 1496



**THOMSON-CSF**  
GROUPEMENT TUBES ELECTRONIQUES



**THOMSON-CSF**  
GROUPEMENT TUBES ELECTRONIQUES