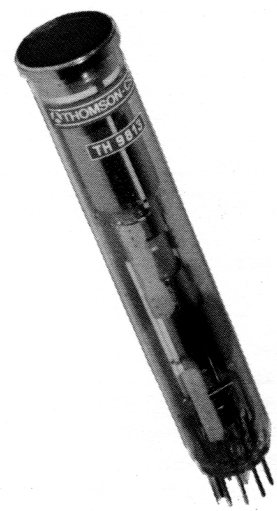
TH 9813

1" VIDICON

- ELECTROSTATIC FOCUS - MAGNETIC DEFLECTION
- EXCELLENT RESOLUTION (750 TV Lines)
- HIGH SENSITIVITY
- GOOD RASTER LINEARITY
- LOW LAG
- INDUSTRIAL C.C.T.V.

TH 9813 is a 1" (26 mn) diameter, electrostatic focus and magnetic deflection Vidicon designed for compact lightweight camera and especially for transistorized and other closed-circuit TV applications.



The focusing of the scanning electron beam is achieved through a separate electrode adjusted at proper voltage. The focusing coil used with conventional magnetic focus and deflection Vidicon is supressed.

TH 9813 exhibits all high performances obtained with conventional Vidicon, but, in addition, advantages of this new Vidicon type are the following :

- Dimensions and weight of camera are reduced ; outer diameter of Vidicon and associated deflecting yoke does not exceed 40 mm.
- Important reduction of electrical power requirements. Scanning power is reduced by a factor higher than 4 in the case of standard deflecting yoke. Smaller size, low impedance yoke can be designed and allows for more reduction in scanning power. On the other hand, power required for focus electrode is negligible.
- Excellent resolution uniformity is achieved on the entire scanned area and is maintained with high output signal current. Limiting resolution can be improved by the use of a very weak alignment magnetic field.
- Output signal uniformity is improved by a field electrode g5 with separate connection ; g5 voltage is optimum at 1.4 to 1.6 times g4 voltage. In this way beam landing error is minimized and extremely good uniformity of signal and resolution over the entire scanned area is obtained.

A limiting resolution in excess of 750 TV lines with a good resolution uniformity is obtained when the tube is operated at g5 voltage of 750 V and g4 voltage of 450 V. When the tube is operated at lower g5 and g4 voltages (g5 = 500 V – g4 = 300 V) the limiting resolution is in excess of 650 T.V. lines.

Full advantage of resolution and signal uniformity is achieved when deflecting components are properly designed and when the tube is correctly located inside. The thickness of the photoconductive layer is made very uniform and allows for constant output signal and constant dark current. When landing error due to imperfect scanning system is present, the voltage gradient across the photoconductive layer is not uniform and a signal variation (shading) is introduced which can be compensated by proper adjustment of the cathode, g1 and g2 voltages.

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The sensitivity of the TH 9813 can be equivalent to photographic film having an ASA exposure index of 1600 (33/10 DIN, 40 Sch). Satisfactory quality picture with good resolution and acceptable signal to noise ratio can be obtained at illumination of 0.4 lux (0.04 fc) on the faceplate (4 to 8 lux on the subject with an unity numerical aperture lens) giving rise to a signal current of 0.05 μA at 0.05 μA dark current. For such illuminations higher signal current is obtained by increasing dark current up to 0.1 μA value beyond which a signal saturation will occur.

Due to good design, high reliability is obtained throughout the tube life. Requirement for alignment field is reduced to a minimum by precise electron gun mounting. An extremely flat faceplate avoids all optical distortions and allows for the use of any good quality lens. Particle barriers adjacent to the field mesh allows these tubes to operate in any position.

One Watt power heater makes these Vidicons particularly suitable for transistorized equipment. The reduced heat dissipation improves the quality of the picture by lowering faceplate temperature.

On request, a variant of this tube, the Vidicon TH 9813N may be provided which is built with a non-browing glass faceplate allowing the tube to be operated in severe nuclear environnements.

GENERAL CHARACTERISTICS

Electrical

Cathode	unipotential indirectly heated oxide coated		
Heater :			
- voltage	6.3		V
- current at 6.3 V	0.135 to 0.165		A
Minimum preheating time	60		s
Output capacitance :			
- target to all other electrodes	5.0		pF
Spectral response	see curve		
Focusing method	electrostatic		
Deflection method	magnetic		

Mechanical

Overall length max.	165	mm	(6.49")
Overall diameter max.	29	mm	(1.14")
Bulb diameter max.	26.7	mm	(1.03")
Base (Ditetrar, 8 pins)	UTE 9 C 15 (JEDEC N° E8 - 11)		
Socket (note 1)	METOX N° 30.250		
Deflecting yoke and alignment coil assembly (note 2)	GERHARD BV 150/41 CLEVELAND VYA 300 or equivalent		
Photoconductive layer :			
- normal dimensions of image on target	12.7 mm x 9.5 mm		
- maximum useful diagonal diameter	17	mm	
- orientation of quality rectangle : horizontal scan parallel to the plane passing through the tube axis and short index pin (note 3)			
Mounting position	any		
Net weight, approximate	65 g		

OPERATING CONDITIONS

(All potentials are referred to cathode)

Maximum ratings : *(absolute values)*

Electrode g5 voltage (field electrode)		1 000	V
Electrode g4 voltage (wall electrode)		1 000	V
Electrode g3 voltage (focusing electrode)		300	V
Electrode g2 voltage (accelerator electrode)		350	V
Electrode g1 voltage (picture cut-off electrode) :			
- negative bias value		150	V
- positive bias value		0	V
Heater voltage	max.	6.9	V
	min.	5.7	V
Peak heater cathode voltage :			
- heater negative with respect to cathode		125	V
- heater positive with respect to cathode		10	V
Target voltage		125	V
Dark current		0.20	µA
Peak target current (note 4)		0.60	µA
Faceplate :			
- illumination		10 000	lux
		or 1 000	fc
- temperature		70	°C

Operational conditions

Scanned area 12.7 mm x 9.5 mm
Faceplate temperature 25 °C (note 5)

Electrode voltage modes :	Low	Intermediate	High	
Electrode g5 voltage	300	500	750	V
Electrode g4 voltage	180	300	450	V
Electrode g3 voltage	0 to 60	50 to 100	75 to 150	V
Electrode g2 voltage	300	300	300	V
Electrode g1 voltage (note 6)	−45 to −125	−45 to −125	−45 to −125	V
Electrode current :				
Electrode g5 current	1	1.5	2	µA
Electrode g4 current	0.06	0.1	0.15	µA
Electrode g3 current	0.001	0.0015	0.002	µA
Electrode g2 current (note 7)	600	600	600	µA
Average "gamma" between 1 and 100 lux (0.1 and 10 fc) (note 8)	0.65	0.65	0.65	
Minimum blanking peak to peak voltage :				
- applied to electrode g1	−75	−75	−75	V
- applied to cathode	+20	+20	+20	V
Limiting resolution at center of picture (note 9)	550	650	750	TV lin
M.T.F. response for 400 T.V. lines at center of picture (5 MHz-625 CCIR standard (note 10)	20	25	35	%

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Typical performance

1 - INTERMEDIATE SENSITIVITY OPERATION

(Faceplate illumintation 10 lux or 1 fc)

Dark current i_o	20	nA
Target voltage for i_o = 20 nA (note 11)	20 to 50	V
Faceplate illumination (2854 °K) (note 12)	10	lux
	or 1	fc
Signal current	210	nA
Corresponding sensitivity	175	µA/lm
Lag : (note 13)		
- maximum value	20	%
- average value	12	%

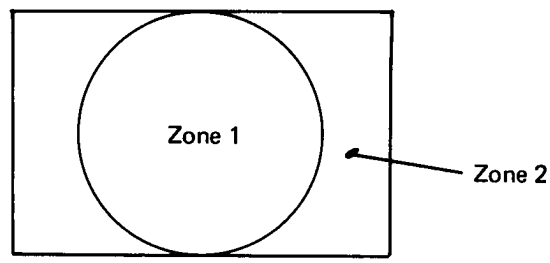
2 - HIGH SENSITIVITY OPERATION

(Faceplate illumination 1 lux or 100 mfc)

Dark current i_o	100	nA
Target voltage for i_o = 100 nA (note 11)	30 to 70	V
Faceplate illumination (2854 °K) (note 12)	1	lux
	or 100	mfc
Signal current	125	nA
Corresponding sensitivity	1 000	µA/lm
Lag : (note 13)		
- maximum value	20	%
- average value	17	%

SPURIOUS SIGNAL TEST

The test is performed using a uniformly diffused white test pattern that is separated into two zones as shown in drawing.



The tube is operated under "Typical Operation" with a dark current of 20 nanoamperes and the lens adjusted to provide a signal current of 200 nanoamperes.

Spurious signals are classified by their size which is measured in percent of raster height.

Will actually be considered as defects, blemishes of contrast greater than 50% (note 12).

Allowable spot size for each zone is shown in table :

*Ratio D / H (Percent raster height)	Number Allowed			
	Zone 1	Zone 1 + Zone 2		
		a	a + b	a + b + c
a : 0.8% < D/H ⩽ 1%	0	1	3	6
b : 0.6% < D/H ⩽ 0.8%	1			
c : 0.2% < D/H ⩽ 0.6%	3			

0.2 % and under : do not count spots of this size unless concentration causes a smudge appearance

* D : average diameter of spot

H : raster height

Smudges, streaks, mottled or grainy background having a contrast ratio greater than 15% constitute a reject.

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NOTES

1 - METOX - 86, rue de Villiers de l'isle Adam - PARIS 20ème - Téléphone : 636. 31 - 10.

2 - GERHARD KG - REICHSHEIM/ODW Germany.
CLEVELAND ELECTRONICS Inc. - 2000 Highland Road - TWINSBURG - OHIO 44 - 087.

3 - It is necessary to assure correct positioning of the tube inside the coils. An immediate test consists in observing the fine mesh grid, the wires of which should be inclined 45° with respect to scanning. Then the front end of the deflecting yoke should be positioned 20 mm from the tube faceplate.

4 - Target current is defined as total current in load resistance connected to target electrode : signal current plus dark current, dark current being the current left when illumination is subtracted.
Video amplifiers must be designed properly to handle peak target current of 0.6 μA to avoid amplifier overload and picture distortion.

5 - All these characteristics are provided for a temperature of faceplate of 25 °C, the temperature range recommended is within 20 to 30 °C. The rise of faceplate temperature is a function of ambient temperature, thermic dissipation of ambient devices and of the tube itself. Consequently, 10 °C of faceplate temperature rise implies a dark current multiplied by a factor of 2.

6 - Without blanking pulses applied on electrode g1.

7 - Power source of the equipment should be designed properly to handle this current.

8 - Average "gamma" should be defined as the slope of the rectilinear part of transfer characteristics in log coordinates.

9 - Practically, limiting resolution corresponds to the resolution measured with twin bar test card with a M.T.F. response of about 7 %.

10 - For 625 C.C.I.R. standard, line duration being 52 μs (line suppression period not included) 400 TV lines correspond to 5 MHz.

11 - Indicated range of each type of service serves only to illustrate the operating target voltage range normally encountered. The target voltage for each Vidicon must be adjusted to that value which gives the designed operating dark current.

12 - All the above mentioned illuminations assume a 2854 °K incandescent tungsten source.

13 - Lag is defined as the ratio of residual signal current measured 60 milliseconds after light excitation being removed to the initial signal current ; this value assumes 50 fields/second scanning rate.

14 - Contrast is defined as : $100 \times \frac{\text{increment in video current due to blemish}}{\text{normal signal current}}$

Figure 1

TYPICAL SPECTRAL SENSITIVITY CHARACTERISTICS

For equal values of signal current at all wavelengths
(0.02 μA signal current and 0.02 μA dark current
for scanned area of 12.7mm x 9.5mm)

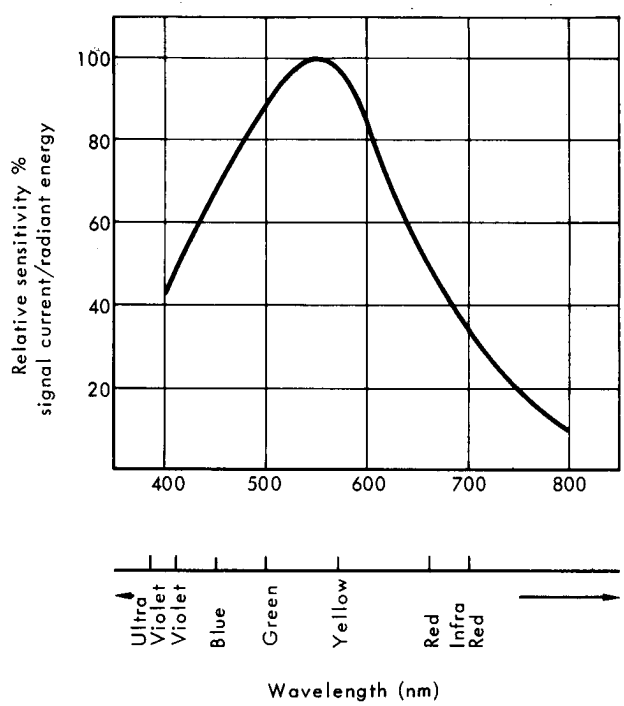

Figure 2

LIGHT TRANSFER CHARACTERISTICS

Illumination uniform over photoconductive layer scanned
area 12.7mm x 9.5mm face plate temperature 25°C

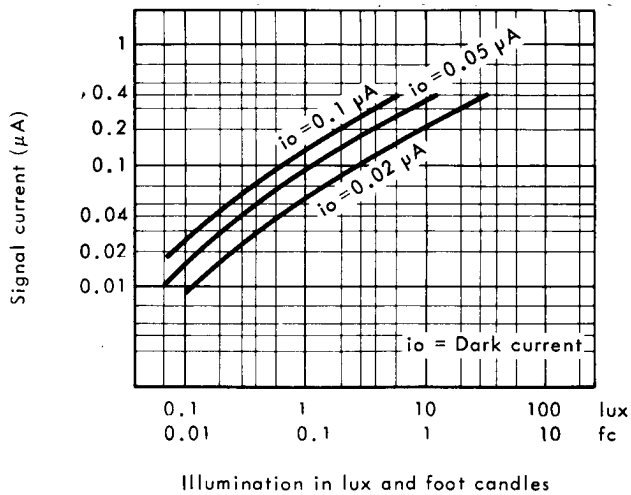

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Figure 3

MODULATION TRANSFER FUNCTION

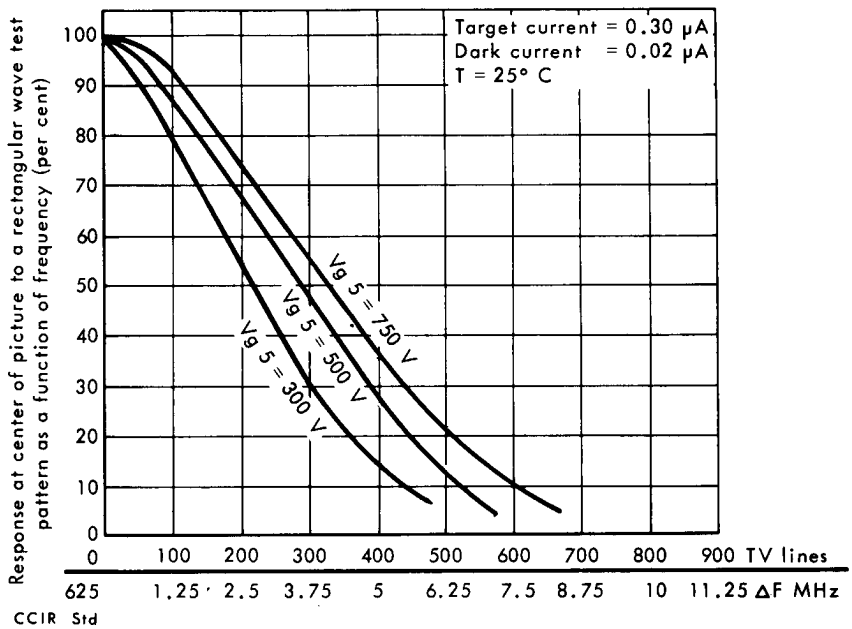


Figure 4

RANGE OF DARK CURRENT

Scanned area of photoconductive layer 12.7mm x 9.5mm

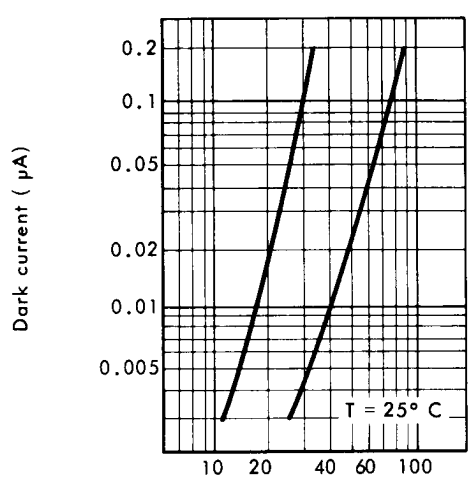


Figure 5

TYPICAL PERSISTENCE CHARACTERISTICS

Initial highlight signal current of 0.2 μA scanned area of photoconductive layer 12.7mm x 9.5mm

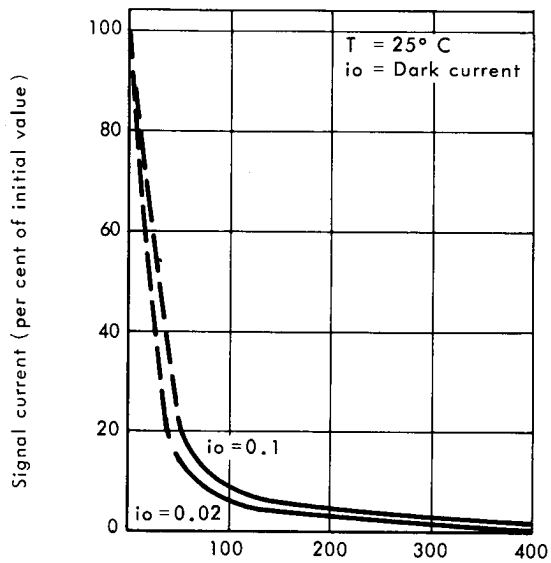
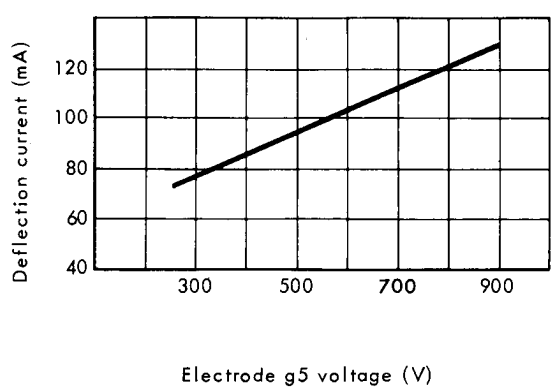


Figure 6

Deflection current as a function of electrode g4 and g5 voltage (Vg 5 = 1.5 Vg 4)

Scanned area of photoconductive layer 12.7mm x 9.5mm



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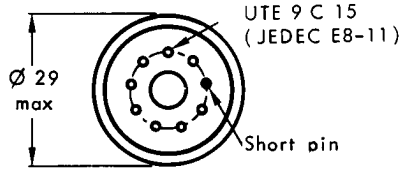
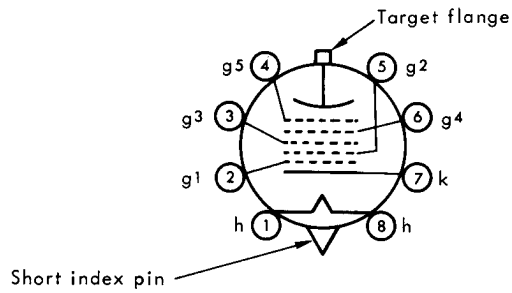
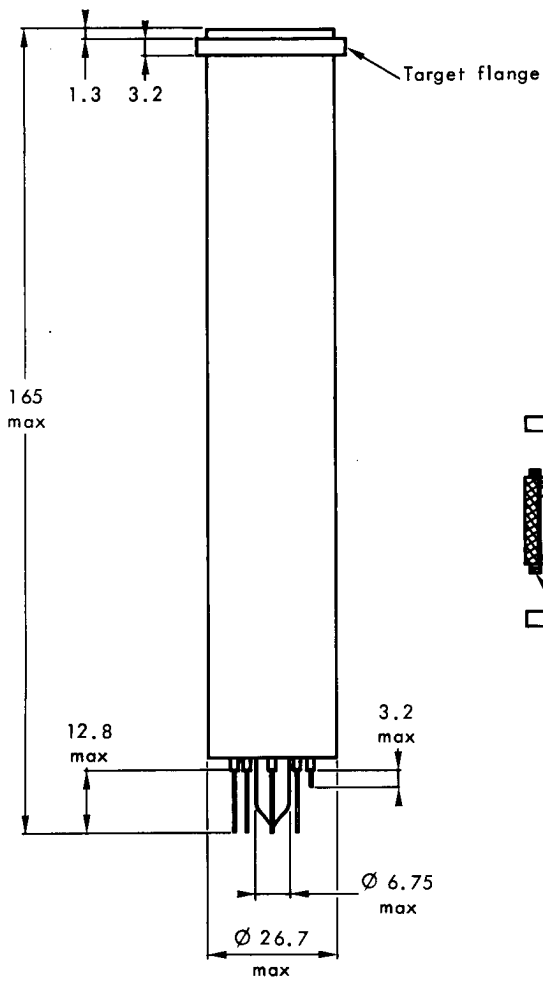
OUTLINE DRAWING

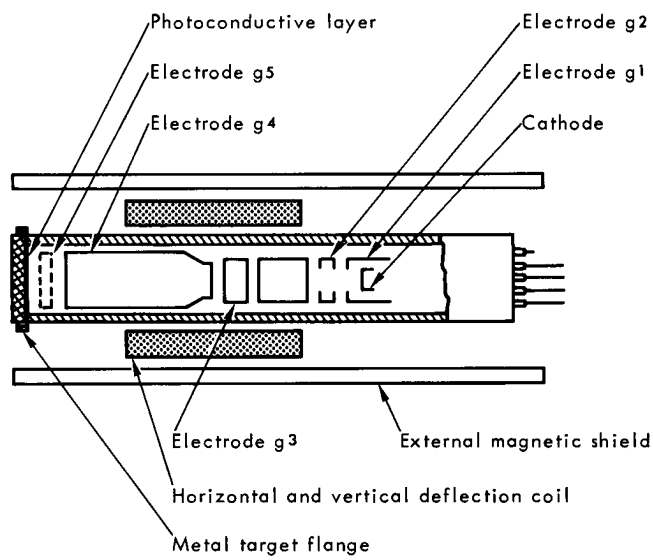


BASING DIAGRAM



1 - Heater	5 - Electrode g2
2 - Electrode g1	6 - Electrode g4
3 - Electrode g3	7 - Cathode
4 - Electrode g5	8 - Heater





Dimensions in mm.