

PICKUP-STORAGE TUBE TYPE-7383 (PERMACHON)

The WL-7383 is a 1" pickup-storage tube designed for high resolution, long storage continuous readout applications. Storage is excellent both in terms of resolution and duration of the stored image. The WL-7383 can be operated in a standard vidicon camera (with modifications) and offers a gray scale rendition comparable to conventional pickup tubes. The tube possesses signal integrating properties. It is convenient for many practical purposes to regard the tube as a sensitive photographic film in determining the exposure time of the scene whose image is to be stored. The tube when allowed to view at very low light levels offers a noticeable improvement on the performance of the human eye.

The Permachon may also be used in reduced-bandwidth-transmission applications not requiring storage by employing scan frame times of approximately 25 seconds. Slow scan operation can only be achieved by maintaining continuous, stationary, light-information on the input during readout. No integration of information occurs during this mode of operation.

ELECTRICAL:

Cathode	Coated Unipotential
Heater:	
Voltage (ac or dc)	6.3 $\pm$ 10% Volts
Current	0.6 Ampere
Direct Interelectrode Capacitance:	
Signal Electrode to all other Electrodes ..	4.5 μ fd
Spectral Response	from 3000 to 7000 Angstroms
Photoconductive Layer:	
Orientation of Tube to Scan	Proper orientation is obtained when the horizontal scan is essentially parallel to the plane passing through the tube axis and short index pin.
Focus Method	Magnetic
Deflection Method	Magnetic

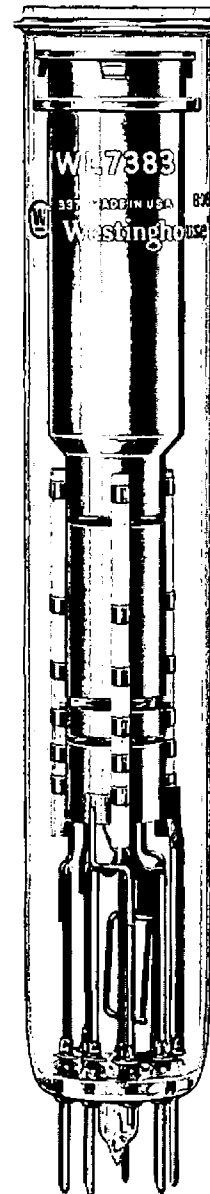
MECHANICAL:

Overall Length	6-1/4" $\pm$ 1/4"
Greatest Diameter	1.125" $\pm$ 0.010"
Bulb	T-8
Base	Small-Button, 8-Pin (JEDEC E8-11)
Operating Position	Any

MAXIMUM RATINGS:

Absolute Maximum System

Signal-Electrode Voltage	15 max. Volts
Grids 4 & 5 Voltage	350 max. Volts
Grid 3 Voltage	350 max. Volts
Grid 2 Voltage	350 max. Volts
Grid 1 Voltage:	
Negative Bias Value	125 max. Volts
Positive Bias Value	0 max. Volts
Heater-Cathode Voltage:	
Heater Negative with Respect to Cathode ...	125 max. Volts
Heater Positive with Respect to Cathode ...	10 max. Volts
Ambient Temperature	45 max. °C



TYPICAL OPERATION AND CHARACTERISTICS:

For Scanned Area of $1/2'' \times 3/8''$

Signal-Electrode Voltage▲	6 to 14	Volts
Grid No.4 (Decelerator) & Grid No.3 &		
Grid 5 (Beam Focus) Voltage	250	Volts
Grid 2 (Accelerator) Voltage	300	Volts
Grid 1 Voltage:		
(For Picture Cutoff)□	-45 to -100	Volts
Dark Current†	0.1 - 0.7	μampere
Initial Signal Current‡	0.3 - 1.0	μampere
Holding Signal Current§	0.2 - 0.9	μampere
Min. Peak-to-Peak Blanking Voltage:§		
When Applied to Grid 1	40	Volts
When Applied to Cathode	10	Volts
Field Strength at Center of Focusing Device	40	Gausses
Field Strength of Adjustable Alignment Coil	0 to 4	Gausses
Approx. Storage Time:▲		
600 TV Line Resolution®	5	Minutes
450 TV Line Resolution®	10	Minutes

Sensitivity■

▲ Optimum storage is achieved by operating about 12 volts. Storage time is decreased as signal electrode voltage is decreased.

□ With no blanking voltage on Grid 1.

† For signal electrode voltages from 6 to 14 volts, and after integration.

‡ Holding signal current, obtained during read-out, will normally be less than initial signal current, obtained during write (optical input). For 0.6 foot-candle faceplate illumination during write initial signal current varies from 0.3 to 1.0 μa and holding signal current from 0.2 to 0.9 μa as target voltage is varied from 6 to 14 volts. However, after integration holding signal current approaches initial signal current.

§ The target voltage, measured with respect to ground, will vary with type of blanking used. If cathode blanking is used in the camera, the higher DC cathode impedance will provide a lower cathode to target potential or effective target potential. Dark current and signal current are high in the permachon compared to a vidicon. With cathode blanking used in a standard camera it is often possible to cut off the Permachon when grid bias is set too low. Under these conditions, no picture would be obtained regardless of target voltage setting.

For this reason, grid blanking is recommended. It is possible to operate with cathode blanking but then grid bias and target voltage settings are more critical.

® Number of lines just resolvable, in vertical wedge of EIA chart imaged on $1/2'' \times 3/8''$ scanned area, while displayed on a monitor which does not limit resolution.

■ The sensitivity of the Permachon is such that with 19 foot-candles illumination on the faceplate, saturation is reached in less than 10 milliseconds exposure time. With 1.9 foot-candles the necessary exposure time is 0.5 seconds and with 0.19 foot-candles, it is 2.6 seconds.

With exposure times of approximately 10 milliseconds, the contrast of the stored image is somewhat less than normal. Shorter exposure times will result in saturation using higher light intensities with significant loss of contrast of the stored image.

EQUIPMENT DESIGN NOTES

The camera housing should incorporate features not usually found in TV cameras. The camera housing should be light tight. The most convenient place to install the erasing light source may be within the camera housing. Considering the Permachon as photographic film, provision must be made for intermittent exposure during writing times and complete light cutoff during readout.

If the apparent storage of the Permachon is shorter than normal, this may be due to either equipment limitations, which may be corrected, or, to improper mode of operation.

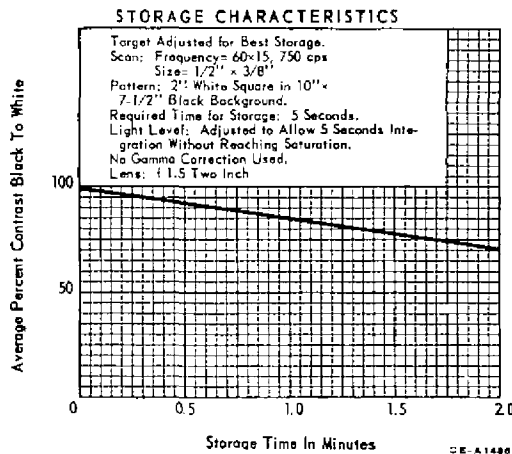
Equipment design factors which can result in apparent low storage include target voltage supply impedance and excessive temperature. Any high impedance in series with the target load (usually 50K approx.) should be removed from the circuit. Such an impedance will result in undesirable target voltage limiting. Automatic target voltage adjustment circuits should also be removed or disabled. Overheating of the Permachon can result in loss of storage. The associated circuitry should be heat shielded such that the ambient temperature around the Permachon does not exceed 45 °C.

The high output signal from the Permachon can result in amplifier overload in commercial vidicon cameras. Reduction of target load impedance is one possible way of preventing amplifier overload but results in a degradation of signal-to-noise ratio. A more satisfactory solution is to reduce the gain of the system or inject the signal after the very-low-level pre-amplifier stage. The method used will depend on where, in the amplifier, the overload is taking place.

PERFORMANCE NOTES

Storage Time: Operating conditions may be selected to vary the storage time from less than one second to more than 10 minutes with continuous electrical read-out. Using standard television scan rates, 4×10^4 electrical images may be taken from a single exposure. Toward the end of the longer storage times, a slight decrease in contrast and apparent resolution is noticeable. Resolution of 600 TV lines with 8 shades of gray can be maintained for approximately 5 minutes.

The degradation of stored display which initially occurs appears as a loss of contrast, with black areas turning to white rather than a worsening of resolution.



Resolution: As was stated under Storage Time, a usable resolution of 600 TV lines is obtainable. Significantly higher resolution can be obtained by increasing accelerator potential and focus field. The operating conditions required will vary with the application. Modification of associated equipment will usually be required. For further data, write to Westinghouse Electronic Tube Division, Sales Dept., Elmira, N.Y. outlining your specific requirements.

SET UP INSTRUCTIONS

The following notes are given to aid in the setting up of the tube and to advise of some unusual precautions which must be taken.

1. With shutter open, adjust deflection to obtain proper scan size.
A standard 6198A or 6326A may be used for this adjustment.
2. Adjust target to 6 volts.
3. A f 1.5 - 2 inch lens is satisfactory.
4. Close shutter.
5. Adjust grid one control in a more positive direction until target is charged. A wiping effect is noted when charged condition is reached.

6. Adjust alignment to obtain best uniformity of landing.
7. Scene brightness need not exceed 5 foot candles.
8. Stop lens to approximately f 8 and open shutter.
9. If highlights go negative as observed on a monitor, adjust grid one for increase in beam current.
The scene illumination and exposure time will determine the lens stop.
10. Focus optically and electrically, erasing as often as necessary.
11. To erase:
 - (a) Shut off beam and remove lens.
 - (b) Flash target with light of at least 20 foot candles.
12. Replace lens and turn up beam.
13. Open diaphragm until desired contrast is obtained on monitor.
14. Close shutter - - picture should be stored.

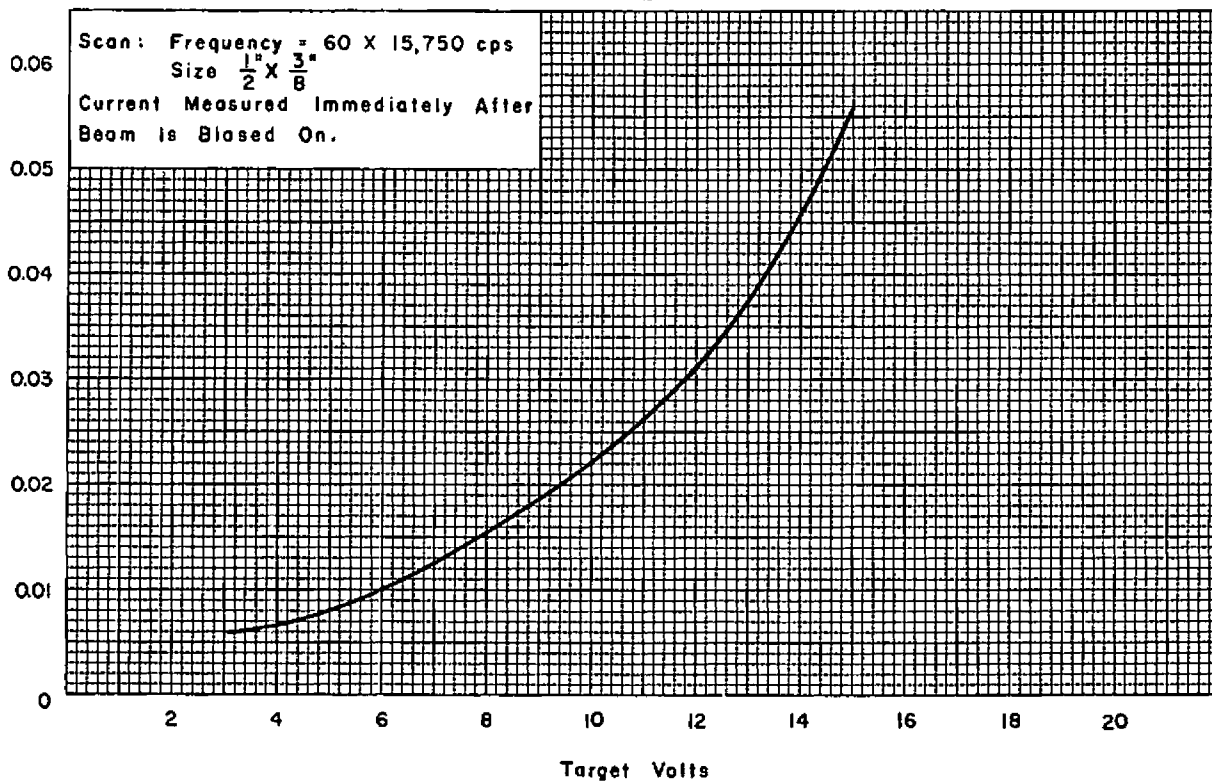
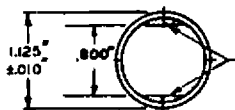
The optimum target voltage will vary from tube to tube. If not adjusted properly a short storage or poor contrast picture is possible. If storage is short, increase target voltage to a maximum of 15 volts.

Erase: There are two ways in which erasure can be accomplished:

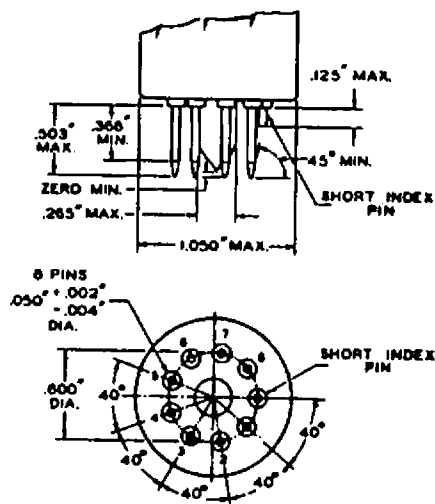
1. The face of the tube is flooded uniformly with light. This process may be carried out in less than a second with about 20 foot candles or with a single intense flash of approximately 5×10^{-4} seconds duration. Associated with this method, which finds the most general application, is the need to allow time for priming the storage layer after erasure and before the next exposure to visual information. Five frames of normal television scanning are sufficient for this priming action. Thus, the process of erasure and priming together need not occupy more than about 1/5 of a second. Complete erasure is obtained if the electron beam is blanked off during the light pulse.

2. The information may be erased by switching off the beam. This method may, however, occupy 5 to 10 seconds.

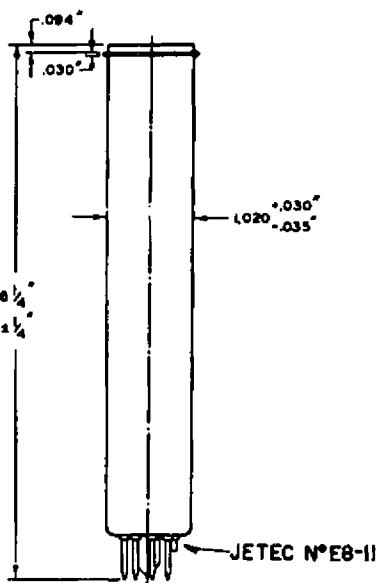
AVERAGE DARK CURRENT CHARACTERISTIC

8 PIN BASE
JETEC N°E8-II

STRAIGHT SIDES OF
MASKED PORTIONS ARE
PARALLEL TO PLANE
PASSING THROUGH TUBE
AXIS AND SHORT INDEX
PIN



BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT PINS WILL FIT A FLAT PLATE GAUGE HAVING THICKNESS OF $\frac{1}{4}$ " AND 0 HOLES $0.0700" \pm 0.0005"$ SO LOCATED ON A $0.6000" \pm 0.0002"$ DIA. CIRCLE THAT THE DISTANCE ALONG THE CHORD BETWEEN ANY TWO ADJACENT HOLE CENTERS IS $0.2000" \pm 0.0005"$. GAUGE IS PROVIDED WITH CENTER HOLE HAVING DIAMETER OF $0.200" \pm 0.001"$ AND SAME CENTER AS THE PIN CIRCLE.



CE-A1350

