EXTREME ENVIRONMENT NON-BURN IMAGE ORTHICON TYPE WL-7198A

The WL-7198A image orthicon is a non-burn image orthicon, that is completely environmentally adapted to military applications, having high sensitivity and resolution. The WL-7198A is both mechanically and electrically interchangeable with the WL-7198 and will operate in any commercially available image orthicon camera.

The WL-7198A ruggedized design will permit operation in airborne equipment and other applications where a reliable and environmentally adapted tube is required. This tube will pass MIL-E-5272 vibration, shock, temperature and humidity specifications as detailed in data. The WL-7198A has an S-10 photosurface and the proven long-life target of the WL-7198.

This special target, developed by Westinghouse, is essentially free of after-image or picture-sticking and raster-burn throughout life when operating in the temperature range of 40 to 55°C. Resolution and grey-scale are equal to or better than the WL-7198.

In the first 50 hours of use, the WL-7198A can be cleared of target burns created by exposure of $3 \times 10^8$ foot candles maximum photocathode illumination for periods up to 1 hour duration.

The WL-7198A has a spectral response comparable to that of the human eye. Good grey-scale rendition of colors is possible inasmuch as it is insensitive to infrared rays which would otherwise cause color masking.

**ELECTRICAL:**
- **Cathode:** Coated Unipotential
- **Heater:**
  - Voltage (ac or dc): $6.3 \pm 10\%$ Volts
  - Current: 0.6 Ampere
- **Direct Interelectrode Capacitance:**
  - Anode to all other Electrodes: 12 ufd
- **Photocathode:** Semitransparent Rain Response (See Spectral Response Compared With Human Eye)
- **Rectangular Image (4x3 aspect ratio):**
  - Useful Size of:
  - Focusing Method: Magnetic
  - Deflection Method: Magnetic

**MECHANICAL:**
- **Overall Length:** 15-3/16" ± 1/16"
- **Greatest Diameter of Bulb:** 3" ± 1/16"
- **Shoulder Base:** Keyed Jumbo Annular 7-Pin
- **End Base:** Small Shell Diheptal 14-Pin (JETEC B14-45)
- **Operating Position Recommended:** Tube axis not less than 20° from the vertical with faceplate down
- **Weight (approx.):** 1 lb., 6 oz.
- **Min. Deflecting-Coil Inside Diameter:** 2-3/8"
- **Deflecting-Coil Length:** 5"
- **Focusing-Coil Length:** 10"
- **Alignment-Coil Length:** 15/16"
- **Photocathode Distance:** Inside End of Focusing Coil 1/2"

**MAXIMUM RATINGS:**

**Absolute Maximum Values:**
- **Photocathode:**
  - Voltage: -650 max. Volts
  - Illumination: 50 max. ft-c
  - Grid 6 Voltage: -650 max. Volts
- **Target Voltage:**
  - Positive Value: 10 max. Volts
  - Negative Value: 10 max. Volts
  - Grid 5 Voltage: 150 max. Volts
  - Grid 4 Voltage: 300 max. Volts
  - Grid 3 Voltage: 400 max. Volts
  - Grid 2 and Dynode 1 Voltage: 400 max. Volts
  - Grid 1 Voltage:
    - Negative Bias Value: 125 max. Volts
    - Positive Bias Value: 0 max. Volts
- **Peak Heater-Cathode Voltage:**
  - Heater Negative with Respect to Cathode: 125 max. Volts
  - Heater Positive with Respect to Cathode: 10 max. Volts
- **Anode-Supply Voltage (Note 1):** 1850 max. Volts
- **Voltage per Multiplier Stage:** 400 max. Volts

**Environmental Conditions:**
- **Operating Temperature:**
  - Of any part of bulb: 71 max. °C
  - Of bulb at large end of tube:
    - Target Section: 20 min. °C
  - Temperature Difference:
    - Between target section and any part of bulb hotter than target section: 7-1/2 max. °C
- **Shock (Note 2):** 30 max. G's
- **Vibration (Note 3):** 10 max. G's
- **Humidity:**
  - Note 4.

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WESTINGHOUSE ELECTRIC CORPORATION, ELECTRONIC TUBE DIVISION, ELMIRA, NEW YORK

from JEDEC release #4356, July 22, 1963
TYPICAL OPERATING CONDITIONS

Photocathode Voltage (Image Focus) ... -400 to -600 Volts
Grid 6 Voltage (Accelerator):
75% of Photocathode Voltage .......... -300 to -450 Volts
Target Voltage (Note 5). ............... +1 to -3 Volts
Grid 5 Voltage (Decelerator) .......... 0 to 125 Volts
Grid 4 Voltage (Beam Focus) .......... 130 to 180 Volts
Grid 2 Voltage (Note 6) .............. 225 to 330 Volts
Grid 2 and Dyad 1 Voltage .......... 300 Volts
Grid 1 Voltage for Picture Cutoff.... -45 to -115 Volts
Dynode 2 Voltage .................... 600 Volts
Dynode 3 Voltage ..................... 910 Volts
Dynode 4 Voltage ..................... 1200 Volts
Dynode 5 Voltage ..................... 1490 Volts
Anode Voltage ....................... 1550 Volts
Anode Current (dc) .................... 30 µamp
Signal-Output Current (Peak to Peak) 2 to 15 µamp
Target Temperature Range (See Text). 40 ± 2 °C
Ratio of Peak-to-Peak Highlight:
Video-Signal Current to RMS Noise Current (Approx.) .................. 25 --
Min. Peak-to-Peak Blanking Voltage 10 Volts
Field Strength at Center of Focusing
Coil (Note 7) .......................... 75 Gausses
Field Strength of Alignment
Coil (Approx.) .......................... 0 to 3 Gausses

TYPICAL PERFORMANCE
Sensitivity:
- at foot-candles
Photocathode Illumination Lines Horizontal Resolution
(Note 8) (Note 9)
3 × 10^-2 625 center min.
3 × 10^-3 525 center min.
3 × 10^-4 350 corner min.
3 × 10^-4 275 corner min.
Image Retention:
At 0 Hours (New Tube) (Note 10) 0 Sec.
At 750 Hours (Note 11) 30 Sec.

REMOVAL OF PERMANENT BURN
0 to 50 Hours of Tube Life
Procedure ............................. See Note 12
Burn-in Time (Minutes) Recovery Time (Minutes)
10 20
20 40
30 60
40 180
50 180
60 180

NOTES
1. Ratio of dynode voltages is shown under Typical Operation.
2. Under conditions specified in MIL-E-5272A Par. 4.15.2.1.
3. Under conditions specified in MIL-E-5272A Par. 4.7.1. Procedure 1 except at operating temperature only. Center horizontal resolution at 3 × 10^-2 foot-candles photocathode illumination will be at least 350 lines with 5G applied acceleration in the frequency range of 50 to 500 cycles per second.
4. Under conditions specified in MIL-E-5272A Par. 4.4.1, and Par. 4.4.3. The resistance between pins is at least 100 megohms following this test.
5. Adjustable from -3 to -5 volts with blanking voltage off.
6. Adjust to give the most uniformly shaded picture near maximum signal.
7. Direction of current should be such that a north-seeking pole is attracted to the image and of the focusing coil, with the indicator located outside of and at the image end of the focusing coil.
9. In properly adjusted TK31A image orthicon camera chain, or equivalent, with EIA (formerly RETMA) 1956 Resolution Chart.
10. After 5 minutes exposure focused on RETMA chart with tube operating 1 f stop above Knee.
11. After 30 seconds exposure focused on RETMA chart with tube operating 1 f stop above Knee.
12. Tube having burn-in of specified time is recovered by exposure to uniform white surface, under standard operating conditions, except overscan, for the specified recovery time. This procedure also removes darkened raster area due to change in scan sweeps.

SPECTRAL RESPONSE CHARACTERISTIC OF 5-10 PHOTOSURFACE
SIGNAL RESPONSE AS FUNCTION OF PHOTOCATHODE ILLUMINATION

TUNGSTEN OR
DAYLIGHT
ILLUMINATION

TYPICAL SIGNAL OUTPUT IN MICROAMPERES

10

10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1}

SMALL AREA HIGHLIGHT ILLUMINATION ON PHOTOCATHODE IN FOOT-CANDLES

SMALL SHELL DIMEPTAL 14-PIN BASE

Pin 1: Heater
Pin 2: Grid 4
Pin 3: Grid 3
Pin 4: Internal Connection
(Do NOT Use)
Pin 5: Dynode 2
Pin 6: Dynode 4
Pin 7: Anode
Pin 8: Dynode 5
Pin 9: Dynode 3
Pin 10: Dynode 1 & Grid 2
Pin 11: Internal Connection
(Do NOT Use)
Pin 12: Grid 1
Pin 13: Cathode
Pin 14: Heater

KEYED JUMBO ANNULAR 7-PIN BASE

Pin 1: Grid 6
Pin 2: Photocathode
Pin 3: Internal Connection
(Do NOT Use)
Pin 4: Internal Connection
(Do NOT Use)
Pin 5: Grid 5
Pin 6: Target
Pin 7: Internal Connection
(Do NOT Use)

Direction of Incident Light should be approximately Parallel to Tube Axis toward the Large End (Faceplate)

WESTINGHOUSE ELECTRIC CORPORATION, ELECTRONIC TUBE DIVISION, ELMIRA, NEW YORK
NOTE 1: MEASURED AT DISTANCE OF 1/32" BELOW BOTTOM OF ANNULAR BASE.

NOTE 2: DOTTED AREA IS FLAT OR EXTENDS TOWARD DIHEPTAL BASE END OF TUBE BY 0.006" MAX.

KEYED ANNULAR BASE GUIDE

ANGULAR VARIATIONS BETWEEN PINS AS WELL AS ECCENTRICITY OF NECK CYLINDER WITH RESPECT TO PHOTO CATHODE CYLINDER ARE HELD TO TOLERANCES SUCH THAT PINS AND NECK CYLINDER WILL FIT FLAT-PLATE GAGE WITH:

A - SIX HOLES HAVING DIA. OF 0.065"±0.001" AND ONE HOLE HAVING DIA. OF 0.106"±0.001" ALL HOLES HAVE DEPTH OF 0.285"±0.001".

B - SIX HOLES ARE ENLARGED BY 45° TAPER TO DEPTH OF 0.047" ALL HOLES ARE SPACED AT ANGLES OF 57°±1° ON CIRCLE DIA. OF 2.500"±0.001".

B - SIX HOLES HAVING HEIGHT OF 0.187"±0.001", CENTERED BETWEEN PIN HOLES, TO BEAR AGAINST FLAT AREAS OF BASE.

C - RIM EXTENDING OUT A MINIMUM OF 1/8" FROM 3-13/16" DIA. AND HAVING HEIGHT OF 0.126"±0.001"

D - NECK CYLINDER CLEARANCE HOLE HAVING DIA. OF 2.200"±0.001"

SMALL SHELL DIHEPTAL 14 PIN BASE
JEDEC NO B14-45

CE-A1858