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# **THE GLOSSARY OF CATHODE-RAY TUBE TERMS AND DEFINITIONS**

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## PREFACE

This glossary of terms and definitions was prepared by the EIA Tube Engineering Panel Advisory Council (TEPAC) JT-20 Committee on Electro-Optic Devices. In its preparation, use was made of input and suggestions received from many individuals and organizations. It is intended to be timely and comprehensive. It is hoped and expected that it will prove to be useful to those who build cathode ray tubes, to those who use them, and to all others who are interested in CRT technology.

TEP-192 supercedes and replaces TEP-92 titled "Cathode-Ray Tubes - Glossary of Terms and Definitions" (published January, 1975).

Those who have suggestions related to possible future editions of TEP-192 may address them to the Electronic Industries Association, Engineering Department, 2001 Eye Street, N.W., Washington, D.C. 20006.

GLOSSARY OF CATHODE-RAY TUBE TERMS AND DEFINITIONS

- Aberration** Distortion of the electron beam due to electron lens defects, such as astigmatism, coma and electron velocity distribution.
- Accelerator** An electrode used to increase the velocity of electrons.
- Active Line** The portion of the scanning line which can be used specifically to display information.
- Adhered Glass** See Glass, Adhered.
- Aging, Cathode** Stabilization of the emission current of the cathode by operation for a period of time.
- Aging, Phosphor** Loss of luminous efficiency as a function of total accumulated electron charge per unit area. Sometimes referred as Coulomb Aging. (See also Aging, Screen).
- Aging, Screen** Reduction in screen luminance or radiance resulting from either phosphor aging, electron or X-ray browning of the faceplate glass, or a combination of all factors caused by electron bombardment. The individual effects noted cannot be separately detected in a normal CRT. (See Aging, Phosphor).
- Air Line** An elongated blister in glass tubing or cane.
- Alignment, Electrodes** The positioning of all electrodes in the gun assembly so that:
- The geometric (z) axis of the field shaping portions of all electrodes are coincident.
  - The field shaping planes of all electrodes are truly perpendicular to the geometric (z) axis.
- Alignment, Mesh** A space-charge controlled tube in which the wires of two or more sieve type grids are substantially oriented so that they are either in the electron shadow of each other, or so disposed relative to each other as to eliminate unwanted moire patterns.
- Alignment, Mount** The relative positioning of the mount inside the neck tubing so that the geometric (z) axes of the two are coincident.
- Alignment, Neck** Centering and perpendicularity of the axis of the neck tubing relative to the CRT faceplate.
- Aluminization** The process of depositing a thin aluminum film on the inside surface of the screen and/or funnel portion of a CRT. The screen aluminization is for the purpose of electron collection and conduction as well as light reflection.
- Angle, Beam** The angle of the cone-shaped bundle of electrons emerging from the crossover point also known as the alpha angle.
- Annealing, Glass** To modify the stresses in glassware by the use of appropriate heating and cooling processes.

GLOSSARY OF CATHODE-RAY TUBE TERMS AND DEFINITIONS

|                             |                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Anode</b>                | Positive elements relative to the cathode in an electron device. Usually refers to the element with the highest positive voltage.                                                                                                                                                                                                                                     |
| <b>Anode Contact</b>        | A feedthrough usually in the form of a metallic button or wire that provides electrical contact through the envelope to the anode.                                                                                                                                                                                                                                    |
| <b>Anode Current</b>        | Total current collected by the anode.                                                                                                                                                                                                                                                                                                                                 |
| <b>Aperture, Grid</b>       | A hole in a mount element which allows the electron beam to pass through. Usually used for either lensing or beam trimming.                                                                                                                                                                                                                                           |
| <b>Aperture, Limiting</b>   | A small aperture used for reducing or limiting the electron beam diameter or for modifying its shape.                                                                                                                                                                                                                                                                 |
| <b>Aquadag</b>              | A colloidal suspension of graphite (sometimes in combination with other conductive materials) used to paint conductive layers on CRT components                                                                                                                                                                                                                       |
| <b>Arcing</b>               | The result of electrical breakdown between two elements having an excessive potential difference between them.                                                                                                                                                                                                                                                        |
| <b>Astigmatism</b>          | A focus effect in which electrons, in different axial planes, focus at different axial distances.                                                                                                                                                                                                                                                                     |
| <b>Bake, Exhaust</b>        | Heating of the tube while it is attached to a vacuum system during processing to remove occluded gases.                                                                                                                                                                                                                                                               |
| <b>Bake, Screen</b>         | The process of removing the lacquer film and some of the occluded gases in the tube envelope by heating, after aluminization.                                                                                                                                                                                                                                         |
| <b>Barrel Distortion</b>    | See Distortion, Barrel.                                                                                                                                                                                                                                                                                                                                               |
| <b>Base</b>                 | That part of an electronic tube which is attached to or is a part of the envelope, and carries the majority of pins and contacts used to connect the electrodes to the external circuit.                                                                                                                                                                              |
| <b>Bead</b>                 | <ol style="list-style-type: none"> <li>1. A glass rod used to support gun elements in the correct relation to each other.</li> <li>2. A small glass mass used to support and/or insulate parts and wires in a tube.</li> </ol>                                                                                                                                        |
| <b>Beam Angle</b>           | See Angle, Beam.                                                                                                                                                                                                                                                                                                                                                      |
| <b>Beam Current</b>         | The electron current in a beam of a CRT at any stated cross-section.                                                                                                                                                                                                                                                                                                  |
| <b>Beam Penetration CRT</b> | A tube with multiple phosphors in close association whose color and/or persistence can be altered by modulation of the screen voltage. The phosphors may be deposited separately with an electron attenuating layer between them (layer type) or as a single deposit of coated granules using several phosphors and attenuating layers between them (onionskin type). |
| <b>Bias, Cathode</b>        | A potential applied to the cathode relative to $G_1$ to control the flow of electrons through the gun.                                                                                                                                                                                                                                                                |



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|                                     |                                                                                                                                                                                                                                                                                                                                                                         |
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| <b>Bias, Fixed</b>                  | A potential between cathode and $G_1$ which is maintained constant for a particular tube. This may involve either grid or cathode bias.                                                                                                                                                                                                                                 |
| <b>Bias, Grid</b>                   | A potential, applied between cathode and $G_1$ which controls the flow of electrons through the gun.                                                                                                                                                                                                                                                                    |
| <b>Bias, Zero</b>                   | A condition of operation where the potential on $G_1$ is adjusted to a level equal to that of the cathode or vice-versa.                                                                                                                                                                                                                                                |
| <b>Black and White Picture Tube</b> | See Picture Tube, Monochrome.                                                                                                                                                                                                                                                                                                                                           |
| <b>Blanking</b>                     | Interruption (cutoff) of the electron beam during retrace.                                                                                                                                                                                                                                                                                                              |
| <b>Blemish</b>                      | A luminance or color defect in the display.                                                                                                                                                                                                                                                                                                                             |
| <b>Blister</b>                      | A bubble in the glass due to the inclusion of air or other gas with dimensions beyond established limits. Blisters .030" (.76mm) or smaller in diameter are termed "seeds".                                                                                                                                                                                             |
| <b>Body</b>                         | See Funnel.                                                                                                                                                                                                                                                                                                                                                             |
| <b>Bottle</b>                       | See Envelope.                                                                                                                                                                                                                                                                                                                                                           |
| <b>Brightness</b>                   | The attribute of visual perception by which an area appears to emit more or less light (Luminance is the physical measurement of this).                                                                                                                                                                                                                                 |
| <b>Bruise</b>                       | A crushed area on a glass surface caused by impact.                                                                                                                                                                                                                                                                                                                     |
| <b>Build-up</b>                     | The increase in luminance with time from the initiation of excitation to the point where equilibrium occurs or excitation ceases.                                                                                                                                                                                                                                       |
| <b>Bulb</b>                         | See Envelope.                                                                                                                                                                                                                                                                                                                                                           |
| <b>Bulls Eye</b>                    | A lens effect occurring in the viewing portion of a bulb usually associated with blown bulbs.                                                                                                                                                                                                                                                                           |
| <b>Burn</b>                         | <ul style="list-style-type: none"> <li>a) Destruction of a phosphor in a discrete area due to thermal overload.</li> <li>b) Destruction of a phosphor in a discrete area due to phosphor aging over normal use.</li> <li>c) Discoloration of a faceplate area due to electron browning.</li> <li>d) Discoloration of a faceplate area due to X-ray browning.</li> </ul> |
| <b>Burn-In</b>                      | The stabilization of a CRT by operation for a period of time.                                                                                                                                                                                                                                                                                                           |
| <b>Button</b>                       | See Anode Contact.                                                                                                                                                                                                                                                                                                                                                      |
| <b>Cataphoresis</b>                 | A method of electrostatically depositing negatively charged particles in a fluid medium, onto a positively charged surface, e.g. phosphor coatings, heater coatings, cathode coatings, etc.                                                                                                                                                                             |
| <b>Cathode</b>                      | An electrode that is the source of the desired electron emission.                                                                                                                                                                                                                                                                                                       |

GLOSSARY OF CATHODE-RAY TUBE TERMS AND DEFINITIONS

- Cathode Activation** The process of converting the cathode coating into an electron emitter.
- Cathode Current** The electrode current emitted from the cathode.
- Cathode Interface Layer** A semi-conducting layer between the base metal and the coating of an oxide-coated cathode.
- Cathode Ray Bulb** See Envelope.
- Cathode Ray Charge Storage Tube** See Storage Tube.
- Cathode Ray Tube** An electron beam tube in which the beam, or beams, can be focused to a desired cross section on a surface and varied in position and intensity to produce a visible or otherwise detectable pattern. Unless otherwise stated, the term cathode ray tube is reserved for devices in which the screen is cathodoluminescent and in which the output information is presented in the form of a pattern of light.
- Cataphoresis** A method of electrostatically depositing negatively charged particles in a fluid medium, onto a positively charged surface, e.g. phosphor coatings, heater coatings, cathode coatings, etc.
- Cathode Luminescence** Luminescence produced by the bombardment of high-velocity electrons on a material in a vacuum that emits luminous energy.
- Cathode** An electrode that is the source of the desired electron emission.
- CD Line** The line perpendicular to the neck axis at the junction of the bulb body and neck. This is at the beginning of the straight portion of the neck; therefore, it is the centerline of the radius which joins the body and the neck.
- Centering Coil** This electromagnetic device is used to align the electron beam of a CRT to the geometric center of the screen or prescribed location.
- Centering Magnet** Permanent magnet applied to the CRT neck that is used to align the electron beam of a CRT to the geometric center of the screen or other prescribed location.
- Chromatic Aberation** A focus effect in which electrons of different velocities focus at different axial distances from the referenced plane of a lens.
- Clipping** An unintentionally physical interference of the electron beam.
- Coating Cathode** A chemical compound which, when applied to certain base metals, and subsequently processed and aged in a vacuum, will emit electrons. The most common unactivated substance is a triple carbonate powder (consisting of barium, strontium, and calcium carbonates) which, after the "breakdown" process, become oxides. After a subsequent "activation" process (partial reduction to metallic barium) electron emission can be obtained. The barium serves to reduce the work function. The base metal is usually nickel or nickel alloy.



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GLOSSARY OF CATHODE-RAY TUBE TERMS AND DEFINITIONS

- Coating Conductive, External** Coating applied to the outside of a tube envelope for one or more of the following purposes: Prevent static charge build-up; act as an electrostatic shield; act in conjunction with internal coatings as a "filter" capacitor for the high voltage power supply.
- Coating Conductive, Internal** Coating applied to the inside surface of a tube envelope to establish a desired potential pattern.
- Coil, Deflection** An electromagnetic device used to alter the direction of an electron beam.
- Coil, Focus** See Focusing Coil
- Coil Stigmator** See Stigmator
- Color** The property of light by which an observer may distinguish between two adjacent structure free patches of light. Color may be stated in terms of luminance, dominant wavelength, and purity. Neutral color qualities such as black, white and grey that possess a zero saturation (or chroma) are called achromatic colors, colors having a finite saturation or chroma are chromatic or colored.  
NOTE: Also refer to TEPAC Publication No. 116 for specification or description of color.
- Color Picture Tube** A picture tube that produces a multi-color display.
- Coma** A lens distortion in a CRT giving a comet-like appearance to the electron beam spot.
- Coma Deflection** Unequal raster sizes produced by multiple-beam guns.
- Cone** See Funnel.
- Contamination** Impurities in the tube which can reduce cathode emission, degrade the vacuum, or cause phosphor screen blemishes.
- Contrast** The ratio of the luminance differential of the excited and non-excited portion of the phosphor screen to the sum of the luminances of the excited and non-excited portions.
- Contrast Ratio** The ratio of the luminance of the excited to the non-excited portion of the phosphor screen.
- Control Grid** A control electrode.
- Convergence** The degree to which all corresponding points are superimposed over the entire screen surface of multiple electron beam spots in a multibeam tube, such as a color kinescope during scanning. The degree of superposition at all corresponding points of the projected beams of separate projection tubes at the screen of a projection system.
- Convergence, Dynamic** The incorporation of a means (electrostatic or magnetic) for automatically converging the multiple beam spots of a color CRT over the entire screen as a function of scanning.