5. Filament Bias Voltage (Cut-off Bias)

5.1 Cut-Off Characteristics (Grid/Anode Cut-off Voltages)

Luminance (L) varies with the anode voltage (eb) as shown in Fig.12 when the grid voltage (ec) is a constant. Luminance also varies with the grid voltage as shown in Fig.13 when the anode voltage is a constant. To completely turn off the luminescence at the un-addressed display segments, a negative voltage shall be applied to the un-addressed anodes and grids with respect to the filament. These negative voltages are called anode cut-off voltage (Ebco) and grid cut-off voltage (Ecco) respectively. The cut-off voltage-varies depending on each type of display due to various differences in filament voltage and wave form. Please note that the cut-off voltage quoted in each particular specification is based upon the AC voltage being supplied via a transformer complete with center-tap.

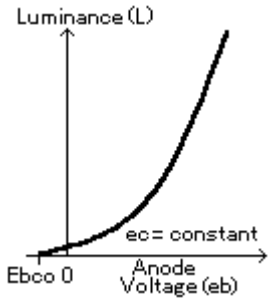

Fig.12 Anode Voltage and Luminance

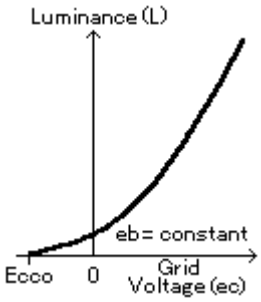

Fig.13 Grid Voltage and Luminance

5.2 Filament Bias Voltages (Ek)

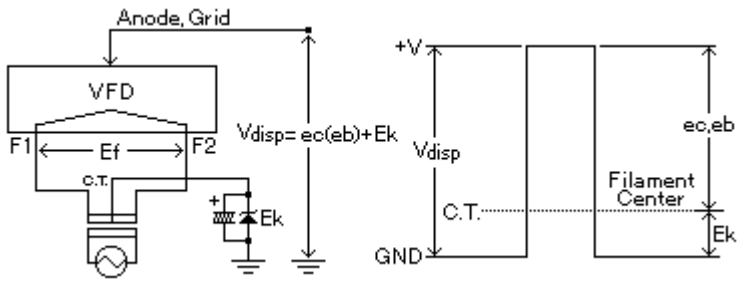

Fig.14 Cathode Bias

The filement bias voltage (Ek) is a voltage required for the anode and grid voltage to remain negative with respect to the filament, when not addressed, in order to cut off background illumination, and is applied to the filament center-tap. The total supply voltage Vdisp is ec(eb) + Ek. (In case of BD series and CL series, the Ek is included in V_{DD2}.)

In typical driving circuits, a zenor diode supplies the Ek as shown in Fig.14. The cathode bias (Ek) for filament center-tap is higher than that specified for the grid cut-off voltage (Ecco).
Usually, the Ek to be set at the same value as MIN voltage of Ecco shown in the specification or slightly large value when utilizing filament center tap (F.C.T.). If a center-tap is not available, the virtual center-tap with resistors is one of the acceptable alternatives.