Explanation for the Flickering Display Using Multi-sync TV in PAL Modes

Description of Problem

When viewing display in PAL modes using multi-sync TV, we may perceive that the display has more flickering comparing with the NTSC modes.

Explanation

1. The PAL TV system has 625 lines / frame and 25 frames / second. As the electron beam is scanning with interlaced mode, we substitute a frame with two fields, then the vertical frequency in the PAL modes is 50 Hz (50 fields / second).

   However, in the NTSC TV system, it has 525 lines / frame and 30 frames / second. Therefore, the vertical frequency is 60 Hz (60 fields / second).

   The lower vertical frequency, the more flickering will be perceived.

2. The number of the total pixels in a frame can affect the flickering of the display as well.

   In a TV screen, the vertical resolution can be expressed by Nv = kNal,

   Where Nv = Number of active vertical pixels to be resolved.

   Nal = The number of active lines in a frame.

   k = Constant obtained from subjective measurement. This is called the Kell factor and is usually taken as 0.7.

   For PAL 625/50 scanning standard, there is 575 active lines / frame (50 lines are blanked).

   Nv = 0.7 x 575 = 402 pixels

   The horizontal resolution is Nh = (4/3)Nv= (4/3) x 402 = 536 pixels.

   Therefore, the number of the total pixels in a frame = 536 x 402 = 215,500 pixels (approximately).

   With the same formulas applied to NTSC 525/60 scanning standard,

   Nv = 0.7 x 485 = 339 pixels (there are 485 active lines / frame), and

   Nh = 4/3 x Nv = 4/3 x 339 = 452 pixels.

   Therefore, the number of the total pixels in a frame for NTSC = 339 x 452 = 153,200 pixels (approximately).

   From the above results, we see that PAL system has more pixels in a frame than NTSC system.

In order to overcome the facts that there are more pixels to sweep in a frame for the electron beam and with lower vertical frequency in the PAL system, normally, the real PAL TV uses a CRT with longer persistency, the intensity of the electron beam hit to a pixel decays more slowly.

With a multi-sync TV, since it doesn't use a CRT with long persistency, therefore, when a PAL mode is displayed, the flickering is by nature, more noticeable.

Tips to Lower the Flickering

The flickering will be less noticeable by adjusting the TV encoder's black level (Register BLR) to a lower value.