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Macintosh II Screen And NTSC Video Camera Synchronization

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TOPIC -----

This article discusses methods of synchronizing video camera output with the Macintosh II screen. Read the entire article, including warnings, before attempting any of the procedures described.

There is another article that describes VideoSync, a software product from Apple which may be a solution as well. Search under "VideoSync" for more info.

DISCUSSION -----

Some video boards currently provide NTSC output. However, these conversions do not solve the problem of screen flicker that a camera records. The problem is inherent in NTSC and PAL standards, because they impose limitations based on screen resolutions and display rates.

Screen flicker, as recorded by video cameras, occurs because the scan rates of NTSC and PAL video cameras are slower than the scan rates of high resolution RGB monitors like the Macintosh II monitor. PAL rates of 50 Hz make the flickering image worse.

RESETTING TO RS-170 MODE

Parameters on the Macintosh II video card can be set for an RS-170 mode. RS-170 is an interlaced 59.97 Hz signal. While the board is capable of a 60 Hz RS-170 Mode (nearer to the NTSC rate), the problem of screen refresh remains. At the 60 Hz setting, the card operates an interlace scan that causes fields to be updated at 30 Hz (because of the odd and even retrace of lines that occurs in 60 Hz interlace mode). This produces an NTSC signal on the green pin without the color burst (black and white video).

This signal is not compatible with Apple High Resolution Monitors, but can be viewed in color from a MultiSync monitor or an Apple Color RGB monitor when the red, green, and blue video lines are connected.

ANOTHER SOLUTION

Because of the extended retrace time of 60Hz interlace, the phosphor decay rate of most monitors causes the phosphors to "turn off" long before the phosphor is rescanned. This causes flickering. To correct this, do either of two things:

- Use high persistence phosphors (Princeton Graphics and Commodore carry long persistence phosphor displays).
- Set the video card to display 60 Hz non-interlace (progressive scan). This cannot be done through software. It is possible only by a hardware modification to the card.

THE MODIFICATION

NOTE: For those lacking the technical resources for this modification, TVA Production Services provides a computer synchronization service. TVA has been synching computers since 1983 and has the experience necessary to successfully synchronize your computer.

You will need a new pixel clock (to replace the 30.24 Mhz clock on the video card) or an external pixel clock generator. If you have a variable clock generator, you can probably do the necessary slowing of the video signal. Simply remove the oscillator from the card and substitute your pixel clock signal.

However, this will not synchronize the camera to the screen. As a result, a visible horizontal retrace line might appear from the offset of the two timings. The best method is to use an external adjustable clock and "tune" it to move the retrace line off the screen. Finally, reset to the proper clock timing.

You may have noticed that a clock is not the same as the sync. The clock is the master timing device that controls each pixel period and all timing parameters--including vertical and horizontal scans. The vertical sync is normally 66.67 Hz and the horizontal sync is 35Khz on a Macintosh II video card. A 59.94 Hz non-interlaced screen for the Macintosh II video needs an oscillator (pixel clock) of 27.188807 Mhz.

If you do not want to remove the clock, do two things. First, ground pin 14 of the J3 connector on the card (pins 1,2,3,5,7,9, and 11 of J3 are grounds). Second, connect the external clock to pin 4 of the J3 connector. This will cause the external clock to be selected over the Macintosh II video card's 30.24 Mhz oscillator. Most signal synthesizers provide a BNC signal function-out connector.

Note: The J3 connector is not the external port but a connector on the video card. Usually, it is located under the serial number sticker.

The generator must be on for the video card to function. Set the waveform for a 5-volt square wave at 27.188807 MHz. This method also voids your warranty. The pinouts and signal descriptions of the Macintosh II Video Card are in the article, "Macintosh II Video Signals."

On an Apple High Resolution RGB Monitor, using a 27.188807 MHz clock, the video locks at 59.94 Hz, but still needs to be adjusted for horizontal sync.

WARNING: This technique voids any warranty on the monitor and may result in damage to the monitor and even physical injury to an untrained technician.

To make this adjustment, tune the H-Hold pot on the main logic board of the monitor. If the display fails to black, it is probably because the H-Hold pot is out of adjustment.

Note: RasterOps makes a video board which can accomplish this as well.

To locate a vendor's address and phone numbers, use the vendor name as a search string.

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