Macintosh II Video Card: Description of Pins and Signals (2/95)

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TOPIC ---

This article answers some of the questions that have arisen about connecting
third-party peripherals (monitors, projectors, video recorders) to the Macintosh
II video card.

DISCUSSION --

Only an interface cable need be created for most of the signal compatible
monitors and projectors. Some devices will need other signals than those
provided by the video port. There is another set on the card that supplies
signals not needed by the Apple High Resolution Monitors.

Before a third-party peripheral is connected, it must follow the Macintosh
video scheme. It must have:

- a bandwidth of 22 MHz or greater
- a horizontal scan rate of 35 KHz or greater
- an analog RGB video display (for color)
- reception of a TTL negative going sync signal

There are four video signals and four accompanying ground pins on the DB-15
female connector of the Macintosh II video card:

1 RED VIDEO GROUND
2 RED   (analog)
3 CSYNC *   (TTL) used by Apple Displays
4 CSYNC GROUND
5 GREEN + CSYNC   (analog) used for Mono; CSYNC unused by Apple displays
6 GREEN CSYNC GROUND
9 BLUE   (analog)
12 GREEN + CSYNC   (analog) not used
13 BLUE VIDEO GROUND

* This is composite sync (vertical and horizontal)

The Apple High Resolution Monochrome Monitor uses only the green video and the
composite sync signal lines: pins 3,4,5, and 6.

The Macintosh II video card can produce RS170 interlaced video signals as well
as the usual RS343 non-interlaced. This is a software controlled mode that
utilizes a 12.27 MHz clock. The timings for the mode follow the RS170
specifications, giving a video image similar to the Amiga computer's 400- line
mode (visible flickering). Monitors with lower scan rates than those required by
the RS343 mode can use the RS170 mode at the disadvantage inherent in lower
resolution devices. This mode is unsupported at this time, and no drivers are
available.

Here is a description of the video signals and their timings:

Horizontal SYNC:
Frequency   35 KHz
Period   1/35 KHz = 28.5714 microseconds
Back Porch   96 dots
Front Porch   64 dots
Sync   64 dots
Active video   640 dots
Blanking   224 dots (back porch + front porch + sync)
Pixel Clock   30.24 MHz (one dot = 1/30.24MHz = 33.06878ns)

Vertical SYNC:
Frequency   66.67 Hz
Back Porch   39 horizontal scan lines
Front Porch   3 lines
Sync   3 lines
Active   480 lines
Total   525 lines = 15 milliseconds

Lines are derived from 1/Scan rate = 1/35KHz = 28.5714 microseconds.

Other values:

vertical even field blanked lines   45 lines
video rise and fall times approx.   5-6 ns
video signal black level   0 volts
video signal green+csync black level   0.3 volts
video signal white level   1 volt

When tested at the connector, because the 75ohm terminating resistor within the
monitor is not loading the line, the signals will appear to range from 0-3
volts.

The above signals are for the non-interlaced RS343 standard video used by the
Apple High Resolution video monitors. Note that while the video signal voltage
levels comply with the RS343 standard, the CSYNC does not as it is a TTL
signal.

Although not present on the external video connector, there are also six more
video signals available on connector space J3 on the video card. J3 is a set of
14 holes located along the top of the video card and between the TFB and the
video port edge of the board (sometimes covered by the serial number label).

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J3 signals:
1   GROUND
2   GROUND
3   GROUND
4   EXT_PBCLCK  (EXTERNAL PIXEL BUS CLOCK)
5   GROUND
6   CLCK_SEL    (PIXEL BUS CLOCK SELECT)
8   CBLANK~     (COMPOSITE BLANKING SIGNAL)
9   GROUND
10  VSYNC~      (VERTICAL SYNC)
11  GROUND
12  HSYNC~      (HORIZONTAL SYNC)
13  VCC
14  CLCK_SEL~  (PIXEL BUS CLOCK SELECT)
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Pins 1,2,3,5,7,9,11 are tied to ground

1) Pin 4 is EXT-PBCLK. This is a tristateable clock that can be driven from a
master card onto the Mac II video card. It must be tristated except when the
video merge card or whatever is attached to the Mac II video card is trying to
drive the video with its own pixel clock.

2) Pin 6 is CLKSEL. This is an active high pin that indicates that the master
card wishes to drive the pixel clock line. This pin should be driven high only
when pin 14 is driven low and the interlace bit is set on the Macintosh II video
card. Eventually a call will be supported which will set the interlace bit in
the Macintosh II video card.

3) Pin 8 is CBLANK~. This is the composite blanking signal for the video being
driven by the Mac II video card.

4) Pin 10 is VSYNC~. This is the vertical sync signal for the video being
generated by the Mac II video card. This signal is bidirectional and can be
driven by a master to allow for genlock. The direction of this signal is under
software control. A call will soon be supported to allow for setting up the
card for genlock.

5) Pin 12 is HSYNC~. This is the horizontal sync signal for the video being
generated by the Mac II video card. This signal is bidirectional and can be
driven by a master to allow for genlock. The direction of this signal is under
software control. A call will soon be supported to allow for setting up the
card for genlock.

6) Pin 13 is VCC. No more that 100mA may be drawn from this VCC pin.

7) Pin 14 is CLKSEL~. It is an inverted version of pin 6.

Some video units require a separate horizontal and vertical sync. These can be
obtained through the signals supplied on J3.

Making a video cable: use a cable with an impedance of 75 ohm, like RG59,
particularly for long distances (over 12 feet). As for the pin considerations
for the connectors, pay attention be paid to grounding each video line as well

as the shield to its appropriate pin on the video device and card. To keep
within RFI levels, ferrite rings or beads can be attached.

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