

# New Technical Notes

Macintosh



®

Developer Support

## Color Monitor Connections

### Hardware

Revised by: Jim Luther &amp; Wayne Correia

February 1991

Written by: Mark Baumwell

July 1987

This Technical Note describes how to connect the Macintosh II Video Card, Macintosh IIci built-in video, and Macintosh LC video to third-party monitors.

**Changes since February 1990:** Added pinout description for the Macintosh LC external video connector and a Macintosh LC to VGA monitor adapter cable. Standardized signal names throughout Note.

Table 1 documents the pinout descriptions of the Macintosh II Video Cards and the Macintosh IIci built-in video:

| Pin Number | Signal Name | Signal Description                |
|------------|-------------|-----------------------------------|
| 1          | RED.GND     | Red ground                        |
| 2          | RED.VID     | Red video signal                  |
| 3          | /CSYNC      | Composite synchronization signal  |
| 4          | SENSE0      | Monitor sense signal 0            |
| 5          | GRN.VID     | Green video signal (with sync)    |
| 6          | GRN.GND     | Green ground                      |
| 7          | SENSE1      | Monitor sense signal 1            |
| 8          | n.c.        | Not connected                     |
| 9          | BLU.VID     | Blue video signal                 |
| 10         | SENSE2      | Monitor sense signal 2            |
| 11         | C&VSYNC.GND | Ground for CSYNC and VSYNC        |
| 12         | /VSYNC      | Vertical synchronization signal   |
| 13         | BLU.GND     | Blue ground                       |
| 14         | HSYNC.GND   | HSYNC ground                      |
| 15         | /HSYNC      | Horizontal synchronization signal |
| Shell      | CHASSIS.GND | Chassis ground                    |

A slash (/) at the beginning of a signal name indicates that the signal is active low.

## **Table 1—Macintosh II Video Card and Macintosh IIfx Built-in Video**

**Note:** The Macintosh II High-Resolution Display Video Card is the newer replacement for the original four- and eight-bit Macintosh II Video Card (M0211 and M5640). This new card is sold in four- and eight-bit configurations (M0322 and M0324, respectively). The external video connector on the early version of the Macintosh II Video Card did not have the signals SENSE0, SENSE1, and SENSE2.

**Note:** The newer Macintosh II Video Cards and Macintosh IIfx built-in video require that pin 4 (SENSE0) be connected to Ground to signal the connection of a 640 x 480 monitor. Do not connect pins 7 or 10 as they are unused on original Macintosh II Video Cards and there are built-in pullup resistors on the newer Macintosh II Video Card and Macintosh IIfx to terminate these pins when not in use.

Table 2 documents the pinout descriptions of the Macintosh LC video connector:

| Pin Number | Signal Name      | Signal Description   |
|------------|------------------|--|
| 1          | RED.GND          | Red ground   |
| 2          | RED.VID          | Red video signal   |
| 3,15       | /CSYNC or /HSYNC | Composite synchronization signal if Apple monitor. Horizontal synchronization signal if VGA monitor. |
| 4          | SENSE0           | Monitor sense signal 0   |
| 5          | GRN.VID          | Green video signal   |
| 6          | GRN.GND          | Green ground   |
| 7          | SENSE1           | Monitor sense signal 1 (grounded internally)   |
| 8          | n.c.             | Not connected  |
| 9          | BLU.VID          | Blue video signal  |
| 10         | SENSE2           | Monitor sense signal 2   |
| 11         | C&VSYNC.GND      | Ground for CSYNC and VSYNC   |
| 12         | /VSYNC           | Vertical synchronization signal  |
| 13         | BLU.GND          | Blue ground  |
| 14         | HSYNC.GND        | HSYNC ground   |
| Shell      | CHASSIS.GND      | Chassis ground   |

A slash (/) at the beginning of a signal name indicates that the signal is active low.

**Table 2–Macintosh LC External Video Connector**

**Note:** The Macintosh LC does not supply vertical synchronization with the Green video signal (pin 5). The vertical synchronization signal is supplied on pin 12.

**Note:** The Macintosh LC requires that pin 4 (SENSE0) be connected to Ground to signal the connection of a 640 x 480 monitor. The Macintosh LC requires that pin 4 and 10 (SENSE0 and SENSE2) be connected to Ground to signal the connection of a 512 x 384 monitor (i.e., the Macintosh 12" RGB Display). The Macintosh LC requires that pin 10 (SENSE2) be connected to Ground to signal

the connection of a VGA monitor. Pin 7 (SENSE1) is grounded in the Macintosh LC.

## Macintosh II to Sony Multiscan (CPD-1302)

To connect a Macintosh II to a Sony Multiscan monitor, you need to make an adapter cable from the video card to the monitor (which has a 9-pin D-type connector). Following is the pinout description for the adapter cable (using the automatic sync-on-green configuration):

| Macintosh II<br>Video Card Pin | Sony<br>Pin | Signal Name                    |
|--------------------------------|-------------|--------------------------------|
| 1                              | 1           | Ground                         |
| 2                              | 3           | Red video signal               |
| 4                              | 1           | SENSE0 Grounded                |
| 5                              | 4           | Green video signal (with sync) |
| 9                              | 5           | Blue video signal              |

## Macintosh II to NEC MultiSync (JC-140IP3A)

To connect a Macintosh II to a NEC MultiSync monitor, you need to make an adapter cable from the video card to the monitor (which has a 9-pin D-type connector). Following is the pinout description for the adapter cable (using the automatic sync-on-green configuration):

| Macintosh II<br>Video Card Pin | NEC<br>Pin | Signal Name                    |
|--------------------------------|------------|--------------------------------|
| 1                              | 6,7,8,9    | Ground                         |
| 2                              | 1          | Red video signal               |
| 4                              | 6,7,8,9    | SENSE0 Grounded                |
| 5                              | 2          | Green video signal (with sync) |
| 9                              | 3          | Blue video signal              |

The monitor must be set to Analog mode and Manual mode. This adaptor cable also works with an equivalent monitor such as the Taxan Super Vision 770.

## Macintosh LC to VGA

The Macintosh LC can supply a 640 x 480, VGA timed signal for use with VGA monitors by using an adapter cable. The standard Macintosh LC supports VGA to 16 colors, and with the optional 512K VRAM SIMM, the VGA monitor is supported to 256 colors.

**Note:** The Macintosh LC supplies signals capable of driving TTL level inputs. However, some low impedance input VGA monitors do not work with the Macintosh LC.

To connect a Macintosh LC to a VGA monitor, you need to make an adapter cable from the Macintosh LC video connector to the VGA monitor. Following is the pinout description for the adapter cable:

| Macintosh LC<br>Video Connector | VGA<br>Pin | Signal Name                   |
|---------------------------------|------------|-------------------------------|
| 1                               | 6          | Red ground                    |
| 2                               | 1          | Red video signal              |
| 5                               | 2          | Green video signal            |
| 6                               | 7          | Green ground                  |
| 9                               | 3          | Blue video signal             |
| 13                              | 8          | Blue ground                   |
| 15                              | 13         | /HSYNC                        |
| 12                              | 14         | /VSYNC                        |
| 14                              | 10         | HSYNC ground                  |
| 7,10                            | nc         | SENSE1 & SENSE2 tied together |

VGA monitors are identified by shorting pin 7 to pin 10 on the Macintosh LC video connector. The Macintosh LC grounds pin 7 on its video connector, which results in pulling down pin 10 and gives the correct monitor ID for a VGA monitor.

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**Further Reference:**

- Guide to the Macintosh Family Hardware, Second Edition
- d e v e l o p, “Macintosh Display Card 8•24 GC: The Naked Truth,” July 1990