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Quadra Series, Centris Series: Displays, Video Pinouts (8/93)

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TOPIC ----------

This article details how to wire the video connector sense pins to access all the supported video modes of the Macintosh Quadra series and the Macintosh Centris series.

DISCUSSION ----------

The Macintosh Centris and Quadra frame buffer determines what type of display is attached to the video connector by examining the state of 3 sense line pins. The following chart details how these three pins must be wired for each of the supported display types. For each supported display, the screen resolution (horiz. pixels X vertical pixels), bandwidth, and the vertical and horizontal scan rates are listed.

The Macintosh Quadra series and the Macintosh Centris series should support any display, whether from Apple or from another vendor, that meets one of the following specifications:

STANDARD SENSE CODES:

Display	Sense pins 10	7	4	Hor x Vert (Pixels)	Band Width (MHz)	Vert Refrsh (Hz)	Horiz Refrsh (KHz)
Apple 21 Color	0	0	0	1152 x 870	100	75	68.7
Apple Portrait	0	0	1	640 x 870	57.2832	75	68.9
12" AppleColor RGB	0	1	0	512 x 384	15.6672	60.15	24.48
Apple 2-Page Mono.	0	1	1	1152 x 870	100	75	68.7

NTSC	1	0	0	underscan-512x384	12.2727	59.94	15.7
	1	0	0	overscan- 640x480	12.2727	59.94	15.7
(To produce a color NTSC signal, a RGB-to-NTSC converter is required.)							
12" Apple High-Res Monochrome	1	1	0	640 x 480	30.24	66.7	35.0
13" AppleColor High-Res RGB	1	1	0	640 x 480	30.24	66.7	35.0
Apple 16" Color Disp. (See Note 4)				832 x 624	57.63	75	49.7
Portrait Color, such as Radius	1	0	1	640 x 870	57.2832	75	68.9

NOTES:

1) NOTE: Sense pins 4, 7, and 10 are referred to as MON.ID1, MON.ID2, and MON.ID3 in the Macintosh Quadra pinout table or SENSE0, SENSE1, and SENSE2 in pinout tables for the video connectors.

   A sense pin value of 0 means that pin should be grounded to the C&VSYNC.GND signal; a value of 1 means do not connect the pin.

2) Extended sense codes will be examined if the following sense code is detected: 1 1 1.

3) The terms 'underscan' and 'overscan' are used to describe the active video resolution for NTSC and PAL modes. Underscan means that the active video area appears in a rectangle centered on the screen with a black surrounding area. This ensures that the entire active video area always is displayed on all monitors. Overscan utilizes the entire possible video area for NTSC or PAL. However, most monitors or televisions will cause some of this video to be lost beyond the edges of the display, so the entire image will not be seen.

4) The Apple 16" Color Display should have pins 4 and 10 tied together and pin 7 should be unconnected. If used with a Macintosh Display Card, the Apple 16" Color Display also requires the Macintosh Display Card 4•8, 8•24, or 8•24 GC with revised ROMs.

EXTENDED SENSE CODES:

NOTE for extended sense codes: Sense pin pair value of 0 means those pins should be tied together (as opposed to grounding 10, 7, or 4 to pin 11); value of 1, do not connect. DON'T wire any of these pins to ground.

Display	Sense pins 4-10	10-7	7-4	Hor x Vert Pixels	Bandwidth (MHz)	Refresh (Hz)	Scan (KHz)
16-inch Color, such as E-Machines	0	1	1	832 x 624	57.2832	75	49.7

PAL

PAL has two wiring options, using the extended sense pin configuration. To produce a color PAL signal, an RGB-to-PAL converter is required.

PAL Option 1	0	0	0	underscan-640x480	14.75	50	15.625
				overscan-768x576	14.75	50	15.625
PAL Option 2	1	1	0	underscan-640x480	14.75	50	15.625
				overscan-768x576	14.75	50	15.625

This sense code also requires a diode between sense pins 10 and 7, with anode towards pin 7, cathode towards pin 10.

NOTES:
- The Macintosh Quadra 700 and 900 support PAL Option 1 at up to 8 bpp.
- The Macintosh Centris 610, 650, and Quadra 800 support PAL Option 1 at up to 16 bpp.
- The Macintosh Quadra 950 supports PAL Option 1 up to millions of colors.

VGA	1	0	1	640 x 480	25.175	59.95	31.47
Super VGA	1	0	1	800 x 600	36	56	35.16

To enable Super VGA, after configuring and connecting the monitor for VGA, open the monitor's control panel and select Options. Choose Super VGA from the dialog and restart your system.

19" Color	1	1	0	1024 x 768	80	75	60.24
No external monitor (video halted)	1	1	1				

MACINTOSH QUADRA AND CENTRIS VIDEO PINOUTS:

Pin	Signal	Description
1	RED.GND	Red Video Ground
2	RED.VID	Red Video
3	CYSNC~	Composite Sync
4	MON.ID1	Monitor ID, Bit 1 (also known as SENSE0)
5	GRN.VID	Green Video
6	GRN.GND	Green Video Ground
7	MON.ID2	Monitor ID, Bit 2 (also known as SENSE1)
8	nc	(no connection)
9	BLU.VID	Blue Video
10	MON.ID3	Monitor ID, Bit 3 (also known as SENSE2)
11	C&VSYNC.GND	CSYNC & VSYNC Ground
12	VSYNC~	Vertical Sync
13	BLU.GND	Blue Video Ground
14	HSYNC.GND	HSYNC Ground
15	HSYNC~	Horizontal Sync

Shell CHASSIS.GND   Chassis Ground

IF YOUR MONITOR IS A VGA TYPE, YOU CAN TRY THE FOLLOWING CABLE PINOUTS:

A cable wired as follows may allow many different brands of VGA monitors to work on a Macintosh Quadra. We advise you to test the monitor on a Macintosh Quadra prior to purchase to see if it meets your expectations.

Macintosh Video DB-15		VGA Connector
2	Red Video	1
1	Red Ground	6
9	Blue Video	3
13	Blue Ground	8
5	Green Video	2
6	Green Ground	7
15	Hsync	13
12	Vsync	14
14	Sync Ground	10
10	|	
7	| Connect 7 and 10 so the sense pin ID will equal VGA	

There are a few issues to keep in mind with VGA monitors:

- VGA monitors will vary depending on the vendor. Check with the vendor about Macintosh Centris and Quadra compatibility before buying, or better yet, actually try the monitor with a Centris or Quadra to see if it works and if the quality is acceptable.

- Vendors have different image quality specifications. There may be significant differences between Apple monitors and the wide range of VGA monitors. Do a side-by-side comparison of the monitors you are considering before buying.

- Many third party cable vendors have off-the-shelf cables that should work.

MACINTOSH QUADRA TO NTSC VIDEO CABLE EXAMPLE:

Most NTSC devices use a RCA-type phono-connector and the following diagram uses that as a reference point. A cable wired as follows may allow many different brands of NTSC monitors to work on a Macintosh Centris or Quadra. We advise you to test the monitor on one of these machines prior to purchase to see if it meets your expectations.

Adjust the phono-connector side to whatever type of connector is used (RCA, BNC, etc.). "Tip" is the pin in the center of the connector (the signal); the sleeve is the flange around the outer edges of the connector (the chassis ground).

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Card Connector                      RCA-Type Phono-Connector
--------------                      ------------------------
4      MON.ID1  (sense0) --|
7      MON.ID2  (sense1) --|
11     C&VSYNC.GND --------|

5      GRN.VID  ----------------> Tip (signal)
Shell  CHASSIS.GND --------------> Sleeve (ground)
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By grounding pin 4 and pin 7 to pin 11, the Macintosh Centris and Quadra CPUs are told that an interlaced (NTSC) monitor is attached. The actual black and white video signal is on pin 5 and connects to the center (Tip) of the phono-plug. The shell of the card connector connects to the sleeve of the phono-plug.

To acquire a color NTSC signal from a Quadra (or any Apple Macintosh display card), an RGB-to-NTSC converter is required, such as those available from RasterOps, Truevision, and Computer Friends. We do not have the cable requirements for any of these interface devices.

Article Change History:
5 August 1993 - Updated PAL specifications.

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