69030

Mode Support

Application Note
Revision 1.0

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N D A
C O N F I D E N T I A L
P R E L I M I N A R Y

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Revision History

Revision	Date	By	Comment
1.0	3/15/99	EC/bjb	Initial Release

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69030 Mode Support

1 Introduction

This document provides basic information for 69030's dual pipe function as well as supported mode tables under two (CRT and Panel) display pipes. It lists modes that can be supported with various resolutions and timings under each display pipe. It also explains how to calculate bandwidth requirements for dual-pipe modes. All numbers in the mode table are preliminary and could be subsequently adjusted when the silicon is fully evaluated in the lab.

2 Three Display Configurations

69030 has two independent display pipelines to offer three display mode configurations:

- **Single-pipe Mode:** This is the 69000 compatible mode
- **Dual-pipe Simultaneous Mode:** CRT and Flat Panel display the same image but each has its own timing.

  For example, the panel can operate at 800x600x16 @ 60Hz and CRT can operate at 800x600x16 @ 75Hz.

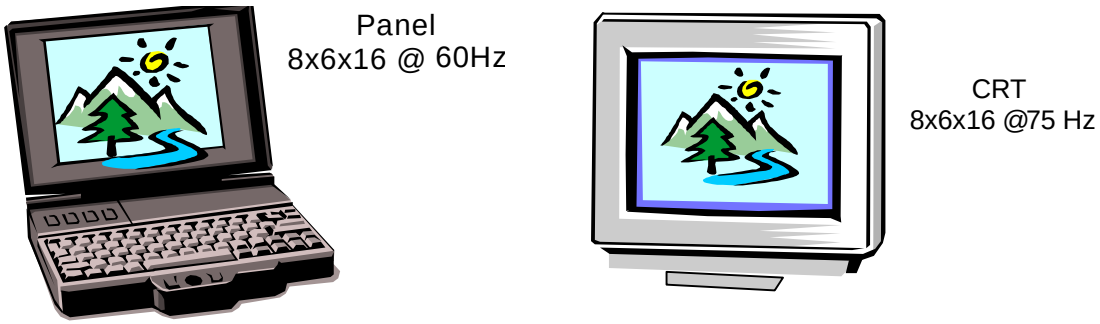

Figure 1: Dual-pipe Simultaneous Mode

- **Dual-pipe Mosaic Mode:** CRT and Flat Panel show different images, possibly with different resolutions and timings.

A. **Virtual Desktop:** Flat Panel and CRT have the same resolution and color depth, allowing a 'extended' desktop spread between two displays.

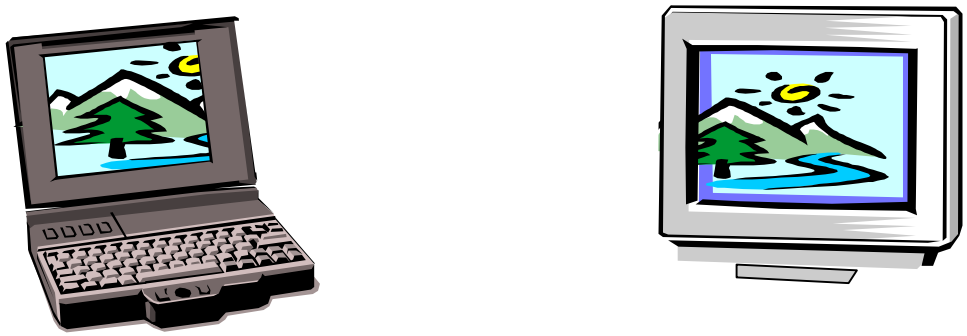

Figure 2: Dual-pipe Mosaic Mode – Virtual Desktop

B. Independent Images: Flat Panel and CRT have different (independent) images, with either the same or different resolutions and timings. This configuration gives the user the flexibility needed to use one graphics chip to display two different images under Windows 98.

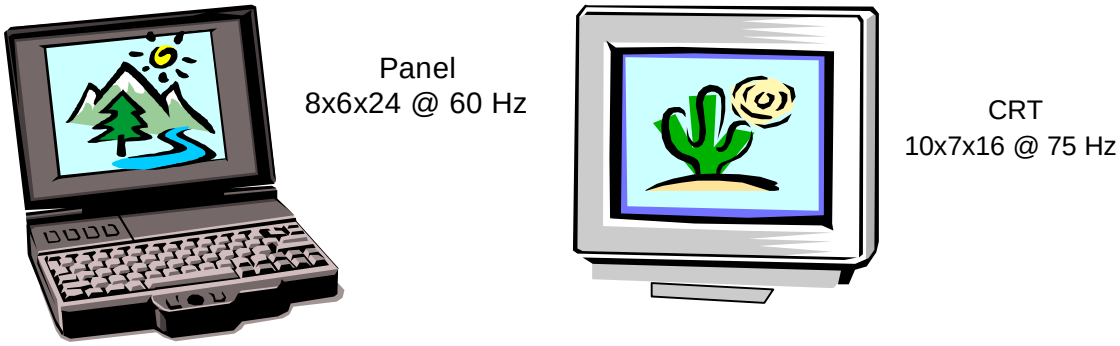

Figure 3: Dual-pipe Mosaic Mode – Independent Images

3 This is how the two pipes operate:

- **Pipe A:** (called the Panel Pipe) can do CRT only, TV* only, Panel only or Simultaneous Display.
- **Pipe B:** (called the CRT Pipe) can do either CRT only or TV only display. **Please note that only this pipe has flicker reduction (FR) circuitry for TV display.**
- Because the choice of which pipe to use is under the control of the OS/Driver/BIOS, the above description is largely transparent to the end user.

***** With an analog (RGB) TV encoder or a digital (digital data from the panel interface) TV encoder.

Two Hardware Video Windows: This can be applied to both single and dual-pipe modes. The 69030 has two "video playback/overlay" engines, which means users can open two video windows at the same time with each window showing either the same or different video streams. This capability is useful in the video conferencing applications where the two video windows can show both the hosts' and the guests'images.

4 Single Pipe Mode Support Table

A. Single-Pipe Normal Mode:

This refers to the basic, traditional single display mode, i.e., CRT (or TV) only or Panel only modes. See Table 1 for CRT or Panel (TFT) only supported mode table and Table 2 for Panel (STN) only supported mode table.

B. Single-Pipe Simultaneous Mode:

This refers to simultaneous display of the same image on both CRT and Panel, each with timings that are in some way related to or synchronized with the other. The advantages of this mode are power conservation and less of a demand on memory bandwidth as compared to those modes that use two pipelines. The disadvantages of this mode are that it cannot be used to drive two displays with highly dissimilar timings.

The following two tables show the modes supported by the 69030 based on the assumption of a 100 MHz MCLK. The total available memory is 4MB and the DCLK is 170 MHz maximum.

5 Table 1: Single-Pipe CRT or Panel (TFT) Only Mode Table

				Single Disp./No Video		SW 720x480 Video		CRT Pipe	Min. MCLK
HxV	bit /pixel	Refresh	DCLK	Bandwidth	Mem.MB	Bandwidth	Mem.MB	Bandwidth	in MHz
6x4	8	60	25.175	25.175	0.31	45.32	0.69	70.495	22.96
6x4	8	75	31.500	31.500	0.31	54.00	0.69	85.500	25.64
6x4	8	85	36.000	36.000	0.31	62.31	0.69	98.310	27.92
6x4	16	60	25.175	50.350	0.61	45.32	0.69	95.670	27.45
6x4	16	75	31.500	63.000	0.61	54.00	0.69	117.000	31.26
6x4	16	85	36.000	72.000	0.61	62.31	0.69	134.310	34.35
6x4	24	60	25.175	75.525	0.92	45.32	0.69	120.845	31.95
6x4	24	75	31.500	94.500	0.92	54.00	0.69	148.500	36.89
6x4	24	85	36.000	108.000	0.92	62.31	0.69	170.310	40.78
8x6	8	60	40.000	40.000	0.48	54.55	0.69	94.550	27.25
8x6	8	75	49.500	49.500	0.48	67.50	0.69	117.000	31.26
8x6	8	85	56.250	56.250	0.48	77.29	0.69	133.540	34.21
8x6	16	60	40.000	80.000	0.96	54.55	0.69	134.550	34.39
8x6	16	75	49.500	99.000	0.96	67.50	0.69	166.500	40.10
8x6	16	85	56.250	112.500	0.96	77.29	0.69	189.790	44.26
8x6	24	60	40.000	120.000	1.44	54.55	0.69	174.550	41.54
8x6	24	75	49.500	148.500	1.44	67.50	0.69	216.000	48.94
8x6	24	85	56.250	168.750	1.44	77.29	0.69	246.040	54.30
1kx7	8	60	65.000	65.000	0.79	69.64	0.69	134.640	34.41
1kx7	8	75	78.750	78.750	0.79	86.43	0.69	165.180	39.86
1kx7	8	85	94.500	94.500	0.79	98.90	0.69	193.400	44.90
1kx7	16	60	65.000	130.000	1.57	69.64	0.69	199.640	46.02
1kx7	16	75	78.750	157.500	1.57	86.43	0.69	243.930	53.93
1kx7	16	85	94.500	189.000	1.57	98.90	0.69	287.900	61.78
1kx7	24	60	65.000	195.000	2.36	69.64	0.69	264.640	57.63
1kx7	24	75	78.750	236.250	2.36	86.43	0.69	322.680	67.99
1kx7	24	85	94.500	283.500	2.36	98.90	0.69	382.400	78.65
12x1k	8	60	108.000	108.000	1.31	92.13	0.69	200.130	46.11
12x1k	8	75	135.000	135.000	1.31	115.17	0.69	250.170	55.04
12x1k	8	85	157.500	157.500	1.31	131.25	0.69	288.750	61.93
12x1k	16	60	108.000	216.000	2.62	92.13	0.69	308.130	65.39
12x1k	16	75	135.000	270.000	2.62	115.17	0.69	385.170	79.15
12x1k	16	85	157.500	315.000	2.62	131.25	0.69	446.250	90.06
12x1k	24	60	108.000	324.000	3.93	92.13	0.69	416.130	84.68
16x12	8	60	162.000	162.000	1.92	108.00	0.69	270.000	58.58
16x12	16	60	162.000	324.000	3.84	108.00	0.69	432.000	87.51

Notes:

1. A mode is supported if the minimum memory clock required is less than 100MHz; the total required memory is less than 4MB and the required DCLK is less than 170MHz.
2. CRT pipe is single display on CRT using software-based (SW) 720x480 video capture. The total memory or memory bandwidth requirement for CRT pipe is equal to the requirement for “single display” plus “720x480 video”. SW video capture is video data going through the PCI bus to the frame buffer, not through 69030’s video capture port (HW video capture).
3. For SW video capture, memory allocation for only a single buffer is listed in the table. Occasionally the use of two buffers is required which doubles the memory requirement to 1.38MB (0.69x2) to store the video data.

6 Table 2: Single-Pipe Panel (STN) Only Mode Table

			Single Display		HW 720x480 Video		FRC for DSTN		FP Pipe	min. MCLK
HxV	bit /pixel	Refresh	BandW	Mem.MB	BandW	Mem.MB	BandW	Mem.MB	Bandwidth	in MHz
6x4	8	60	25.175	0.31	45.32	0.69	20.140	0.120	90.635	31.12
6x4	8	75	31.500	0.31	54.00	0.69	25.200	0.120	110.700	35.07
6x4	8	85	36.000	0.31	62.31	0.69	28.800	0.120	127.110	38.25
6x4	16	60	50.350	0.61	45.32	0.69	20.140	0.120	115.810	35.62
6x4	16	75	63.000	0.61	54.00	0.69	25.200	0.120	142.200	40.69
6x4	16	85	72.000	0.61	62.31	0.69	28.800	0.120	163.110	44.68
6x4	24	60	75.525	0.92	45.32	0.69	20.140	0.120	140.985	40.11
6x4	24	75	94.500	0.92	54.00	0.69	25.200	0.120	173.700	46.32
6x4	24	85	108.000	0.92	62.31	0.69	28.800	0.120	199.110	51.11
8x6	8	60	40.000	0.48	54.55	0.69	32.000	0.190	126.550	38.38
8x6	8	75	49.500	0.48	67.50	0.69	39.600	0.190	156.600	44.29
8x6	8	85	56.250	0.48	77.29	0.69	45.000	0.190	178.540	48.60
8x6	16	60	80.000	0.96	54.55	0.69	32.000	0.190	166.550	45.53
8x6	16	75	99.000	0.96	67.50	0.69	39.600	0.190	206.100	53.13
8x6	16	85	112.500	0.96	77.29	0.69	45.000	0.190	234.790	58.64
8x6	24	60	120.000	1.44	54.55	0.69	32.000	0.190	206.550	52.67
8x6	24	75	148.500	1.44	67.50	0.69	39.600	0.190	255.600	61.97
8x6	24	85	168.750	1.44	77.29	0.69	45.000	0.190	291.040	68.69
1kx7	8	60	65.000	0.79	69.64	0.69	52.000	0.310	186.640	50.54
1kx7	8	75	78.750	0.79	86.43	0.69	63.000	0.310	228.180	58.75
1kx7	8	85	94.500	0.79	98.90	0.69	75.600	0.310	269.000	66.93
1kx7	16	60	130.000	1.57	69.64	0.69	52.000	0.310	251.640	62.15
1kx7	16	75	157.500	1.57	86.43	0.69	63.000	0.310	306.930	72.81
1kx7	16	85	189.000	1.57	98.90	0.69	75.600	0.310	363.500	83.81
1kx7	24	60	195.000	2.36	69.64	0.69	52.000	0.310	316.640	73.76
1kx7	24	75	236.250	2.36	86.43	0.69	63.000	0.310	385.680	86.87
1kx7	24	85	283.500	2.36	98.90	0.69	75.600	0.310	458.000	100.68
12x1k	8	60	108.000	1.31	92.13	0.69	86.400	0.520	286.530	70.84
12x1k	8	75	135.000	1.31	115.17	0.69	108.000	0.520	358.170	85.17
12x1k	8	85	157.500	1.31	131.25	0.69	126.000	0.520	414.750	96.56
12x1k	16	60	216.000	2.62	92.13	0.69	86.400	0.520	394.530	90.12
16x12	8	60	162.000	1.92	108.00	0.69	129.600	0.770	399.600	94.11

Notes:

1. For display using a TFT panel please refer to Table 1. Table 2 is for STN panels only. This table is only a general reference. To determine if a panel supports a mode you also need to reference the panel specifications from the panel manufacturer. Some panels will not support a refresh rate higher than 60Hz.
2. Panel pipe bandwidth requirements include hardware-based (HW) video capture through the video port and use FRC for STNDD panels.

7 Dual-Pipe Mode Support Calculation

7.1 Dual Pipe Simultaneous Mode:

- To perform a dual display on both a CRT and a flat panel with the same resolution and timing, use the single pipe mode tables to determine which modes can be supported.
- To perform a dual display on both a CRT and a flat panel with different timings, add bandwidth and memory requirements from each pipe from the above tables and see if it exceeds 100 MHz and 4MB.

  For example, you can perform a dual pipe simultaneous display on an 800x600x64K color TFT panel (60Hz) and on an 800x600x64K color CRT (75Hz):

  ⇒ 800x600x64K 60Hz TFT→ 34.39 MHz MCLK (see Table 1)
  ⇒ 800x600x64K 75Hz CRT→ 40.1 MHz MCLK (see Table 1)
  ⇒ 34.39+40.1= 74.49 , 74.49 < 100 → this configuration is supported

7.2 Dual Pipe Mosaic Mode:

The way to calculate **memory bandwidth** requirement is the same as in dual pipe simultaneous mode. For example, if you want to check if a 800x600x256 (60Hz) STN panel and a 1280x1024x256 (75Hz) CRT can be displayed simultaneously or not, this is the calculation:

⇒ 800x600x256 60Hz STN panel → 38.38 MHz MCLK (see Table 2)
⇒ 1280x1024x256 75Hz CRT → 55.04 MHz MCLK (see Table 1)
⇒ 38.38+55.04=93.42 , 93.42 < 100 → this configuration is supported

Since dual pipe mosaic mode shows two different images on two displays, you also need to calculate the **total memory** required showing the image. The total memory is limited to 4MB. Use the above example:

⇒ 800x600x256 STN panel → total memory required: 2.05MB (see Table 2, with double buffer video).
⇒ 1280x1024x256 CRT→ total memory required: 2.0MB (see Table 1, with single buffer video).
⇒ 2.05+2.0=4.05, 4.05 > 4 (MB) → this configuration exceeds total memory available.

8 Software Considerations

The following section explains what kind of dual pipe modes are supported under different operating systems:

8.1 DOS

There are no dual pipe modes supported under DOS.

8.2 Win95, NT4.0

Dual pipe simultaneous mode is supported.
Since there is no multi-display support (MDS) on Win95/NT4.0, only a “simulated dual pipe mosaic mode” (virtual desktop) is supported. This mode requires that the panel and CRT use the same resolution and color depth. The Windows desktop display will be split across these two displays.

8.3 Win98

Supports dual pipe simultaneous mode and dual pipe mosaic (independent images) mode.

8.4 NT5.0

Only dual pipe simultaneous mode is supported.

9 Highest Resolutions/Color Depths

9.1 Dual Pipe Simultaneous Mode:

The highest resolution that can be supported is 1024x768x16bpp for a CRT display (75Hz) and a TFT panel (60Hz). For a CRT (85Hz) and a STN panel (60Hz), the resolution is limited to 1024x768x8bpp.

9.2 Dual Pipe Mosaic Mode (Virtual Desktop):

The highest resolutions that can be supported are the same as those in “dual pipe simultaneous mode”

9.3 Dual Pipe Mosaic Mode (Win98 Only):

Since the resolutions on CRT and panel can be different, the limiting factor is the total memory bandwidth available. Please refer to the “dual pipe mosaic mode” bandwidth calculation method described in the previous section.

10 Other Limitations

- In DOS mode 3+ (640x400 text mode), simultaneous display of panel and TV is not supported. This limitation only applies to text mode 3+ only.
- Under Windows NT4 and NT5, none of the 1600x1200 modes are supported by the device drivers.
- There is no ‘Virtual Desktop’ support by Windows 98 drivers.

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C O N F I D E N T I A L

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