



Project “Napalm”

Product Specification -- Version 1.06





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Product Specification

1. PCB Configurations

1.1 Table of 210 Level Physical PCB Requirements used in Napalm AIC Platform:

P/N 210-level	Code Name	OEM / Retail	Form Factor	MEM Capacity	MEM Type	SLI	AGP Bridge	Bus	Max. PCB Layers	RGB DB15	NTSC / PAL Out	Digital Flat Panel	Video Side Port
PCB-1	Retail 1	Retail	ATX	64MB	2MX32	YES (2-way)	NO	AGP	6	YES	No	No	YES
PCB-2	Retail 2	Retail	ATX	32MB	1Mx32** SGRAM	YES (2-way)	NO	PCI	6	YES	No	No	YES
PCB-3	OEM 1	OEM	SFF	32MB	2MX32 SDRAM	NO	NO	AGP	4	YES	Option	Option	YES
PCB-4	Retail 3	Retail	ATX	128MB	2MX32 SDRAM	YES (4-way)	YES	AGP	8	YES	No	No	YES
PCB-5	OEM 2	OEM	SFF	16MB	1Mx32 SGRAM	NO	NO	AGP	4	YES	Option	Option	YES
PCB-6	OEM 3	OEM	ATX	64MB	4MX16 SDRAM	NO	NO	AGP	4	YES	Option	Option	No
TBD													

** 1Mx32 SGRAM supply will to firmly committed from at least two major DRAM manufacturers.

1.2. Mechanical Dimensions

The Napalm AIC Base PCB(s) should meet the minimum and maximum dimensions for an AGP/ATX chassis specification. Multiple layers may be employed for routing to ensure highest quality, reliability, and to make the product manufacture-able. All components should be placed on the component side of the PCB (if possible) for maximum assembly efficiency. There should be dedicated Power and Ground planes with no or minimal traces on these planes.

2. BOM Configurations

Table 2.1 140-level BOM Configurations and Part Numbers

P/N 140-Level	Base PCB 210-Level	Memory SD or SG	Memory Array	AGP or PCI	DFP or TV	Form factor	RGB D15	Name
TBD								

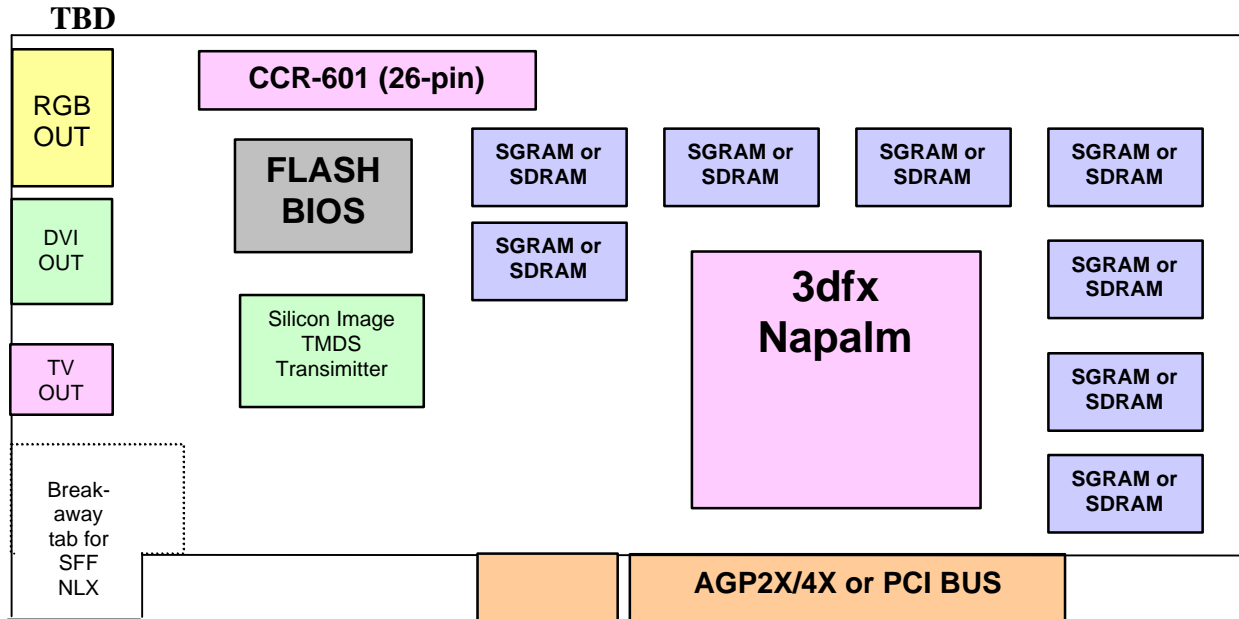
- Note: 3dfx's SFF form factor meets ATX and NLX requirements.

2.2. 110-level BOM configurations

(110 BOM configurations 3dfx Internal Data)

3. Functional Block Diagrams

3.1 CONFIGURATION EXAMPLE



4. Graphics Subsystem

4.1 Graphics Controller

The graphics subsystem of Napalm AIC will be based on 3dfx's Napalm 2D/3D graphics accelerator. Napalm will be configured in an AGP1X/2X/4X signaling environment capable of supporting all functional modes of these specifications. Memory interface will consist of SDRAM and SGRAM capable of supporting speeds of 166-200MHz (see 140 BOM configurations above).

4.2 Bus Interface

4.2.1 Bus Type

The single-Napalm boards attach to the AGP bus using a universal slot and the AGP2X/4X transfer specification within a 3.3v/1.5v-signaling environment. All aspects of the AGP 2X/4X specifications must be met including signal loading and trace route considerations.

The SLI configurations attach to the AGP bus using a universal slot and the PCI 66 protocol in a 3.3V signaling environment. The 2-way SLI boards present a dual load to the AGP port. The 4-way SLI board uses a bridge chip and presents a single load.

4.3 Local Frame Buffer Type, Configuration, and Speed

210-level P/N	Memory Type	Max. FB Size	Max. Speed	Max. # Devices
PCB-1	2MX32 SDRAM	64MB	183MHz	4
PCB-2	1Mx32 SGRAM	32MB	166MHZ	8
PCB-3	2MX32 SDRAM	32MB	166MHz	4
PCB-4	2MX32 SDRAM	128MB	166MHz	16
PCB-5	1Mx32 SGRAM	16MB	166MHz	4
PCB-6	4MX16 SDRAM	64MB	166MHz	4

4.4 Clock Generation

All necessary clocks are generated internally to the Napalm controller. The only necessary components are an external crystal oscillator circuit. Care must be taken in the design and layout of this circuit to prevent clock jitter or instability including potential clock start-up problems on power-up.

4.5. RAMDAC

The RAMDAC is internal to the Napalm graphics accelerator.

4.5.1 Clock Rate

The RAMDAC is specified to operate properly at 350MHz

4.5.2 Desired Resolutions and Refresh Rates

4.5.2.1 Table of Driver Modes for Win95, Win98, WinNT, and Win2000

Resolution	Aspect Ratio	Refresh Rates (Hz) Vertical Frequency	Color Depth (bpp)	Comments
320x200		70,85	8,16	Ddraw, SW D3D only, No Desktop, TV OUT support: NTSC and PAL; WHQL Required
320x240		60,72,75,85	8,16	Ddraw, SW D3D only, No Desktop, TV OUT support: NTSC and PAL; WHQL Required
400x300		60,72,75,85	8,16	Ddraw, SW D3D only, No Desktop, WHQL Required
512x384		60,70,75,85	8,16	Ddraw, SW D3D, D3D, Glide, OGL No Desktop, WHQL Recommended
640x400		70,85	8,16	Ddraw, SW D3D, D3D, Glide, OGL No Desktop, WHQL Requirement
640x480	4:3	60,72,75,85, 100 , 120,140,160	8,16,32	Desktop, Ddraw, (D3D, Glide, OGL) * TV OUT support: NTSC and PAL
720x480		60,72,85	8,16,32	VIDEO ONLY Ddraw only: Video, No Desktop; TV OUT support: NTSC and PAL; WHQL Requirement
720x576		72,100	8,16,32	VIDEO ONLY: Ddraw only: Video, No Desktop; TV OUT support: NTSC and PAL; WHQL Requirement MPEG2: PAL
800x600	4:3	60,72,75,85, 100 , 120,140,160	8,16,32	Desktop, Ddraw, (D3D, Glide, OGL) * TV OUT support: NTSC and PAL
960x720		60,75,85	8,16	Desktop, Ddraw, (D3D, Glide, OGL) *
1024x768	4:3	60,70,75,85, 100,120	8,16,32	Desktop, Ddraw, (D3D, Glide, OGL) *
1152x864	4:3	60,70,75,85, 100,120	8,16,32	Desktop, Ddraw, (D3D, Glide, OGL) *
1280x800	16:10	60, 75, 85, 100	8, 16, 32	Desktop, Ddraw
1280x960		60,75,85	8,16	Desktop, Ddraw, (D3D, Glide, OGL) *
1280x1024	5:4	60,75,85, 100	8,16,32	Desktop, Ddraw, (D3D, Glide, OGL) *
1600x1024	16:10	60,76,85	8,16,32	Desktop, Ddraw, (D3D, Glide, OGL) *
1600x1200	4:3	60,65,70,75,80,85, 100	8,16,32	Desktop, Ddraw, (D3D, Glide, OGL) *
1792x1344	4:3	60,75	8,16,32	Desktop, Ddraw
1800x1440		75	8,16,32	Desktop, Ddraw
1856x1392	4:3	60,75	8,16,32	Desktop, Ddraw
1920x1080	16:9	60,72, 75,85	8,16,32	Desktop, Ddraw
1920x1200	16:10	60,76,85	8,16,32	Desktop, Ddraw
1920x1440	4:3	60,75	8,16,32	Desktop, Ddraw
2046x1536	4:3	60,75	8,16,24	Desktop (60Hz only for Napalm 2000)

- Note: All refresh rates supported by Napalm unless otherwise noted.
- Note: Desktop and Ddraw supported at all color depths, HW accelerated D3D, Glide and OGL supported only at 8 and 16-bit color depths.
- Note: All refresh rates in **BOLD** will use pre-calculated GTF timings.

4.5.2.2 Table of VGA Modes in BIOS

Resolution	Aspect Ratio	Vertical Frequency (Hz)	Color Depth	Comments
320x200	-	70	2,4,8	Text (8x8 characters)
360x400	-	70	4	Text 40x25 (8x8 characters)
640x200	-	70	1,4	Text (8x8 characters)
640x350	-	70	4	Text (8x16 characters)
640x480	4:3	60	1,4	Text (8x16 characters)
720x400	-	70	4	Text 80x25 (8x8 characters)

4.5.2.3 Table of Extended TEXT Modes in BIOS

Resolution	Aspect Ratio	Vertical Frequency (Hz)	Color Depth	Comments
720x480	-	60	4	Text 80x60 (9x8 characters)
1188x344	-	70	4	Text 132x43 (9x8 characters)
1188x400	-	70	4	Text 132x25 (9x16 characters)
1188x400	-	70	4	Text 132x50 (9x8 characters)
1188x480	-	60	4	Text 132x60 (9x8 characters)

4.5.2.4 Table of Extended VGA Modes in BIOS

Resolution	Aspect Ratio	Vertical Frequency (Hz)	Color Depth	Frame Buffer Alignment
320x200	-	70	8,16,24	Banked (Windowed) + Linear
320x240	4:3	70	8,16,24	Banked + Linear
400x300	4:3	70	8,16,24	Banked + Linear
512x384	4:3	70	8,16,24	Banked + Linear
640x400	-	70	8,16,24	Banked + Linear
640x480	4:3	70	8,16,24	Banked + Linear
800x600	4:3	70	4,8,16,24	Banked + Linear (4bpp banked only)
1024x768	4:3	70	8,16,24	Banked + Linear
1280x1024	5:4	70	8,16,24	Banked + Linear

- ***This will require a VBE 3.0 BIOS. Unlimited Refresh Rates are Possible. The BIOS has the listed refresh as the default mode set. See section 12.1 for BIOS details.***

4.6 Video Side Port

4.6.1 Implementation

The 8-bit Video Input (CCIR 601 and CCIR 656) protocol and connector must be supported on the Napalm AIC product.

4.7 Power

The 3dfx Napalm is a 0.25μ device requiring +2.5v for the VDD-core supply. This voltage must be generated by an external voltage regulator, which meets the maximum current requirements of Napalm .

Consideration for varying the VDD-core voltage must be made as Napalm may require some +/- modification to this voltage for optimal performance.

4.8. DVI Interface

Napalm AIC will provide support for digital flat panels via TMDS signaling. Napalm will interface to a Silicon Image 154 and 164 transmitter through the 12-bit digital interface port. The TMDS transmitter output will connect to the digital-only 24-pin DVI connector (See DVI 1.0 spec.).

5. Bus Interface

5.1 System Bus Type

Napalm AIC will interface to the host CPU via the AGP and PCI bus. This signaling environment is 3.3v for AGP2X and 1.5V for AGP4X. It is assumed that the dual load presented by the 2-way SLI boards, while outside of the AGP2X spec., will not present a problem.

5.2 Power

The single-chip Napalm AIC must not exceed the power budget on any signal or power group specified by AGP 1.0. The 2-way SLI boards will exceed the AGP 1.0 spec and require over 30W of power. The 4-way SLI boards will exceed the AGP 1.0 spec and require over 60W of power. A simple means of supplying additional power to the SLI boards must be implemented so that end users, with no technical support, can easily install the product in any Pentium 200MMX and later PC system.

6. Video Subsystem

6.1 Table of Video Subsystem Feature Support

TV Encode NTSC / PAL	TV Tuner NTSC / PAL	Video Decoder	DVD S/W – H/W	MPEG-2 Encoder
✓	Supports 3dfx Desktop TV	Supports 3dfx Desktop TV	S/W	-

6.2 Tuner Interface

Although Napalm AIC does not contain a tuner subsystem, support for the 3dfx Desktop TV card must be insured.

6.3 Video Decoder

Napalm AIC has no on-board video decoder, but is expected to interface with video decoder boards through the CCIR-601 / CCIR 656 interface.

6.4 Video Encoder

TV-out is not an important feature in the North America market. The TV-out functionality will be driven by EC needs TBD.

Table of NTSC and PAL requirements for TV Out

Country	Color System	Priority	Lines	Field Rate (Hz)	Color Burst Frequency (Hz)	Blanking Setup ?
North America, South America, Taiwan, & Japan	NTSC - M	A	525	59.94	3.579545	Yes
Europe & Asia	PAL – BDGHI	A	625	50.00	4.43361875	No
Brazil	PAL - M	B	525	59.94	3.57561149	Yes
Paraguay & Uruguay	PAL - N	B	625	50.00	4.43361875	Yes
Argentina	PAL - Nc	B	625	50.00	3.58205625	No

The NTSC/PAL data can be stored in an EEPROM for boot to TV to function properly. Napalm may provide no support for SECAM though most SECAM Countries support PAL in their televisions for everything except broadcast signal.

6.5 MPEG-2 Encoder / Decoder

Napalm AIC should be capable of supporting video-in through the CCIR-601 / CCIR 656 interface or AGP bus from the following sources:

- DVD playback card
- DVD playback from SoftDVD players:

Player	Priority
Intervideo	A
QI	A
Medimatics	B
Zoran	A

- Video from stand alone TV tuner card via PCI-AGP bus transfer
- Video from stand alone TV tuner card via video port

6.6 DTV / HDTV / DBS Support

Napalm AIC will support PCI DTV streams decoded via an AFD software system on Pentium III CPUs or compatible data rates across PCI / AGP or through the CCIR -601 interface.

7. Audio Subsystem

N/A

8. Power Budget

The power budget for Napalm AIC is governed by the maximum power specifications set forth in the AGP4X specification for the single-chip boards, is 35W for the 2-way SLI boards, and is 65W for the 4-way SLI board. Power consumption should be minimized through careful parts selection ☺

8.1. Power Distribution

Power distribution should be as planar as possible to maximize distribution effectiveness and minimize noise coupling.

9. I/O Connectors

Napalm AIC will support the following I/O connectors:

- **HD15** VGA output and monitor detection I/O
- **DVI digital only** Provides Digital Flat Panel interface
- **Video** S-Video out (Composite video available through dongle)
- **CCIR –601/656** Video Input 2x13 header

9.1. VGA Port HD15 Connector

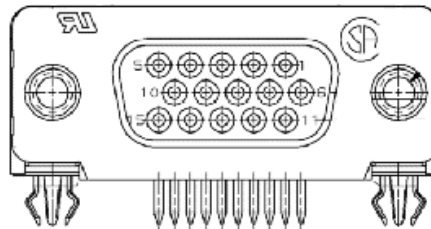


Figure 9.1 VGA Port Layout

Pin	Signal	Description	Pin	Signal	Description
1	RED	Red	9	+5V	DDC Power
2	GREEN	Green	10	SGND	Sync Ground
3	BLUE	Blue	11	ID0	Monitor ID Bit 0 (opt)
4	RES	Reserved	12	SDA	Serial Data (DDC2B)
5	GND	DDC Return	13	HSYNC	Horizontal Sync
6	GND	Red Ground	14	VSNC	Vertical Sync
7	GND	Green Ground	15	SCL	Serial Clock (DDC2B)
8	GND	Blue Ground			

Table 9.1 VGA Port Signals

9.2 DVI

See section 5.2.3.1 of DVI 1.0

Figure 9.2 Digital Flat Panel Out

Pin	Signal	Description	Pin	Signal	Description
1		see DVI 1.0 sec. 5.2.1.1	13		
2			14		
3			15		
4			16		
5			17		
6			18		
7			19		
8			20		
9			21		
11			22		
12			23		

Table 9.2 Digital Flat Panel Out Signals

9.3 Video:

TV out will be provided via an S-Video connector. Composite Video Out (RCA Jack) will still be available through a dongle as required.

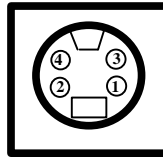


Figure 9.3.1 S-Video connector

Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	3	Luma	Brightness
2	GND	Ground	4	Chroma	Color

Table 9.3.1 S-Video Signals

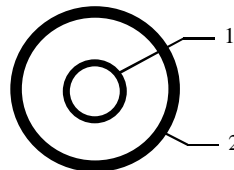


Figure 9.3.2 Composite Video-Out (RCA Jack)

Pin	Signal	Description	Pin	Signal	Description
1	CVBS	Composite Video Out	2	GND	Ground

Table 9.3.2 Composite Video-Out Jack Signals

9.4 CCIR -601 Header

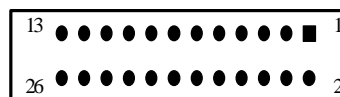


Figure 9.4 Video Input Connector Layout

Pin	Signal	Description	Pin	Signal	Description
1	GND	Ground	2	P0	VID (0)
3	GND	Ground	4	P1	VID (1)
5	GND	Ground	6	P2	VID (2)
7	EVIDEO*	VACTIVE	8	P3	VID (3)
9	ESYNC#	User-Defined	10	P4	VID (4)
11	EDCLK#	VREF	12	P5	VID (5)
13	N/C	12CCLK	14	P6	VID (6)
15	GND	Ground	16	P7	VID (7)
17	GND	Ground	18	DCLK	PIXCLK
19	GND	Ground	20	BLANK#	HREF
21	GND	Ground	22	HSYNC	N/C
23	N/C	User Defined	24	VSNC	N/C
25	N/C	12CDAT	26	GND	Ground

Table 9.4 CCIR -601 Connector Signals

10. Operating Parameters

Napalm AIC must perform to full operating specification within the following operating parameters:

10.1 Voltage Tolerances

Voltage tolerances will range +/- **10%** on all supply voltages utilized.

10.2 Ripple

Voltage ripple will range +/- **10%** on all supply voltages utilized from **0Hz – 500MHz**.

10.3 Temperature

Operating: 0 – 70 degrees C
Non-operating: -25 – 125 degrees C

10.4 Humidity

Condensing: **20% - 80%**
Non-condensing: **10% - 90%**

11. System Support

11.1 Target Platform Compatibility and Support Technology Matrix

Napalm AIC must operate correctly configured within a broad variety of processor and core logic technologies. The following table provides an overview of these matrices:

Core Logic	Processor
Intel 440BX	Pentium II (1), Celeron (3), Pentium III (2)
Intel 440ZX	Pentium II (2), Celeron (3), Pentium III (1)
Intel 440LX	Pentium II (2), Celeron (3), Pentium III (1)
Intel 440EX	Pentium II (2), Celeron (3), Pentium III (1)
Intel i820	Pentium II (2), Celeron (3), Pentium III (1)
Intel i810 Whitney	Celeron
Via MVP3	Pentium MMX, AMD K6, K6-2, K6-III, K7, Cyrix M2
ALi Alladin V	Pentium MMX, AMD K6, K6-2, K6-III, K7, Cyrix M2
ALi Alladin Pro II	Pentium MMX, AMD K6, K6-2, K6-III, K7, Cyrix M2
SiS 5601	Pentium MMX, AMD K6, K6-2, K6-III, K7, Cyrix M2
SiS 5591/5592	Pentium MMX, AMD K6, K6-2, K6-III, K7, Cyrix M2

It should also be noted that Via, ALi, and SiS are developing core logic devices to support Slot 1 based processors.

12. Software Support

12.1 BIOS

- **Note:** For all Windows 2000 requirements, 3dfx will provide support when Windows 2000 becomes available to the market
- A Flash utility for the BIOS must support flashing BIOS ROMs in multi-monitor configurations. It needs to support flashing multiple Banshees, multiple Napalms, or even the possibility of multiple Napalms and Banshees. The flash utility should be able to know the board type, and stop/prevent the user from flashing one board type with another board types ROM. An over ride option should also be provided just in case. Future versions of the Flash utility must be cross platform.

- The BIOS will be required to read the ROM to make sure the correct TV standard will boot up.
- All software will denote the company name as 3dfx with the lower case “d.”

12.1.1 VESA Support

	Windows 98	Win2000*	Windows NT
Napalm AIC provides full compliance for VESA VBE 3.0	✓	✓	✓
Napalm AIC must provide full compliance for VESA DDC	✓	✓	✓
Napalm AIC must provide full compliance for VESA DPMS	✓	✓	✓
Napalm AIC must provide compliance for EDID as defined in Product MRD	✓	✓	✓
Napalm AIC must provide compliance for supported ACPI States	✓	✓	N/A
Napalm AIC includes compliance for VESA GTF	✓	✓	✓

* Note: when available to the market

12.1.2 Additional Features

BIOS supports an 8 x14 font for graphics modes, or a TSR must be provided
132 Column mode support in BIOS (25, 43, 50 & 60)
BIOS must support Vital Product Data including Serial Number per WFM 2.0 Requirements
BIOS must be Flashable
BIOS must default to VGA mode 03h when no monitor is attached to the 15pin Video out D-Connector

12.2 Operating System Support Matrix

Support for the following operating systems is required:

Table 12.2 OS Support Matrix

OS Support	Win98	Win2000*	Win95	WinNT 4.0	BeOS
Full optimization	1 2D/D3D	4 2D/D3D	2 2D/D3D	2 2D	TBD
WHQL	1	4	3	2	TBD

12.2.2 Languages (drivers & documentation)

Language Requirements Table: Localized Drivers, Utilities and Tested w/ Localized version of OS	Priority Group for Driver localization	Win 2000*	NT 4.0	Win 98	Win 95	CD Installer	On-line Manual	Print Manual	Web Release	CD Booklet
English (US)	A	3	2	1	4	ML, Asia	ML, Asia	OEM, ML , & Asia	ML	✓
English (UK)	A	3	2	1	4	ML, Asia	ML, Asia	ML, Asia	ML	-
French (FR)	A	3	2	1	4	ML	ML	ML	ML	-
Italian (IT)	A	3	2	1	4	ML	ML	ML	ML	-
German (GR)	A	3	2	1	4	ML	ML	ML	ML	-
Spanish (SP)	A	3	2	1	4	ML	ML	ML	ML	-
Dutch (NL)	A	3	2	1	4	ML	ML	ML	ML	-
Swedish (SE)	A	3	2	1	4	ML	ML	ML	ML	-
Brazilian Portuguese (BR)	A	3	2	1	4	TBD	TBD	ML	-	-
Traditional Chinese (TW)	A	3	2	1	4	Asia	Asia	Asia	-	-
Simplified Chinese (CH)	A	3	2	1	4	Asia	Asia	Asia	-	-
Korean (KR)	A	3	2	1	4	Asia	Asia	Asia	-	-
Japanese (JP)	A	3	2	1	4	Asia	Asia	Asia	-	-
Norwegian (NO)	A	3	2	1	4	-	-	-	-	-

Language Requirements Table: Localized Drivers, Utilities and Tested w/ Localized version of OS	Priority Group for Driver localization	Win 2000*	NT 4.0	Win 98	Win 95	CD Installer	On-line Manual	Print Manual	Web Release	CD Booklet
Danish (DK)	A	3	2	1	4	-	-	-	-	-
Finnish (FI)	A	3	2	1	4	-	-	-	-	-
Arabic (AR)	A	3	2	1	4	-	-	-	-	-
Portugal Portuguese (PT)	A	3	2	1	4	-	-	-	-	-
Thai (TH)	B	3	2	1	4	-	-	-	-	-
Russian (RU)	B	3	2	1	4	-	-	-	-	-
Polish (PL)	B	3	2	1	4	-	-	-	-	-
Hebrew (IL)	B	3	2	1	4	-	-	-	-	-
Czech (CS)	B	3	2	1	4	-	-	-	-	-
Hungarian (HU)	C	3	2	1	4	-	-	-	-	-
Slovenian (SL)	C	3	2	1	4	-	-	-	-	-
Greek (GK)	C	3	2	1	4	-	-	-	-	-
Turkish (TK)	C	3	2	1	4	-	-	-	-	-

- Priority A: Required for initial launch (Retail & OEMs)
- Priority B: Per additional specific OEM requirements
- Priority C: Will not be localized
- **CD Installer** = installation program (for drivers, see sect 12.4) on Retail CD shipped with drivers
- **On-line Manual** = translated user's guide shipped on Retail CD.
- **Print Manual** = printed manual included in retail and OEM boxes.
- **CD Booklet** = 12-pages, printed, color, saddle-stitched.
- **OEM manual** = 8-pages per language, printed, black-&-white, saddle-stitched.
- **ML manual** = Multi-lingual manual for the regions of Europe, Canada, Australia, S. America, etc.; defined as (8 pages language specific + 4 pages for cover), printed, B&W, saddle-stitched.
- **Asia Manual** = language-specific (8 pages language specific + 4 pages for cover), printed, B&W, saddle-stitched.
- **3dfx Web Releases**: Specific INF installation of all drivers for Win9x, WinNT (2D, Glide, DirectX, OGL ICD) should be in kits that will be WHQL certified. The web releases should be wrapped up in a self-extracting "EXE" executable. Branding, artwork and text strings are TBD.
- **Porting to WinNT** will be dependent on availability of localized versions of WinNT. (i.e. Chinese WinNT, Traditional & Simplified is currently not available).

Gold Master CD references:

- **ML (Multilingual) CD**: English, French, Italian, German, Spanish, Swedish, Dutch, Brazilian Portuguese
- **Asia CD**: English, Japanese, Korean, Simplified Chinese, and Traditional Chinese
- All CD requirements will be specified in the appropriate SRDs (Software Requirement Document) and EP-001 (Engineering Process for Gold Master CDs), before actually being released for production (example, RT1.0 SRD, and EP-001 RT1.0)

12.2.3 Features

Table 12.2.3 Feature Requirements

Support Requirements Table	Win2000*	NT 4.0	Win98	Win95
Multiple Display Support (two cards per system)	2	1	2	N/A
Dynamic Color Depth	1	2	1	4
Resolution Changes	1	2	1	4
Refresh Rate Changes	1	2	1	4
DirectX 6.x	1	N/A	1	2
Previous Direct X (5.x)	N/A	N/A	1	2

Support Requirements Table	Win2000*	NT 4.0	Win98	Win95
Future Direct X (7.x)	1	N/A	1	3
Support for PC 98/99 Requirements – Including ACPI	1	2	1	4
GAMMA control	1	3	1	2
Intel Streaming SIMD (Vendor Supplied)	1(D3D/OGL)	2 (OGL)	1 (D3D/OGL)	N/A
AMD 3D NOW (Vendor Supplied)	1(D3D/OGL)	2 (OGL)	1 (D3D/OGL)	N/A
Service/OEM Release	1	2	1	4

12.2.4 Legacy

OS Support	OS/2 4.X	OS/2 3.X	Win 3.11	WinNT 3.51
Legacy (Contractor Supplied, English only)	4	3	1	2

- OS/2 modes and refresh rates default to the BIOS adapter settings.

12.2.4.1 Table of Driver Modes for OS/2 4.x and OS/2 3.x

Resolution	Aspect Ratio	Refresh Rates (Hz) Vertical Frequency	Color Depth (bpp)	Comments
640x480	4:3	-	8,16,24	
800x600	4:3	-	8,16,24	
1024x768	4:3	-	8,16,24	
1280x1024	5:4	-	8,16,24	

- The OS/2 Gradd Driver does not support refresh rate selection, refresh rates default to the BIOS adapter settings.

12.2.4.2 Table of Driver Modes for Windows 3.11

Resolution	Aspect Ratio	Refresh Rates (Hz) Vertical Frequency	Color Depth (bpp)	Comments
640x480	4:3	60,72,75	8,16	
800x600	4:3	60,72,75	8,16	
1024x768	4:3	60,66,72,75,76	8	
1024x768	4:3	60,70,72	16	
1280x1024	5:4	60,68, 75,76	8	

12.2.4.3 Table of Driver Modes for Windows NT 3.51

Resolution	Aspect Ratio	Refresh Rates (Hz) Vertical Frequency	Color Depth (bpp)	Comments
320x200		70,85	8,16	
320x240		60,72,85	8,16	
400x300		60,72,85	8,16	
512x384		60,72,85	8,16	
640x400		70,85	8,16	
640x480	4:3	60,72,75,85, 100,120	8,16,24	
800x600	4:3	60,72,75,85, 100,120	8,16,24	
1024x768	4:3	60,70,75,85, 100,120	8,16,24	
1280x1024	5:4	60,75,85, 100	8,16,24	
1600x1200	4:3	60,65,70,75,85	8,16,24	

- Note: All refresh rates in **BOLD** will use pre-calculated GTF timings

12.3 Feature Control Applications:

Table 12.3 Feature Control

3dfx/Edge Controls Phase I = OS focus Win98/95 Phase II = OS focus Win98/95, plus WinNT Phase III = OS focus Win98/95, plus Win2000	Phase	Win 2000*	NT 4.0	Win98	Win95
Master Control Module	I	1	2	1	N/A
Video Control Module	II	1	2	1	4
TV Out Module	I	1	2	1	4

3dfx/Edge Controls Phase I = OS focus Win98/95 Phase II = OS focus Win98/95, plus WinNT Phase III = OS focus Win98/95, plus Win2000	Phase	Win 2000*	NT 4.0	Win98	Win95
Digital Out Module	I	1	2	1	4
Information / Test Module	I	1	2	1	4
Smart Installer Module (Basic)	II	1	2	1	4
Smart Installer Module (Full)	III	1	2	1	N/A
Gamers Edge Module	II	1	N/A	1	2
Advanced Tools Module	II	1	2	1	N/A

- *Edge Controls (3dfx Tools) Phase I will be completed for 11/99 Retail Launch, WinNT Feature Controls will be completed in Phase II.*
- *Porting to WinNT will be dependent on availability of Windows Chinese NT (Traditional & Simplified).*

Visual Reality	Win2000*	NT 4.0	Win98	Win95
Napalm AIC must be compatible with supported Multimedia Product Platforms via Visual Reality	1	-	1	2

Over-clocking Notification Utility	Win2000*	NT 4.0	Win98	Win95
Napalm AIC must be provide notification to users who over-clock the Napalm beyond the recommended operating frequency per appropriate SRD	1	-	1	2

Un-Installer Utility	Win2000*	NT 4.0	Win98	Win95
Napalm AIC must be able to detect and clean out prior board driver files per appropriate SRD	1	-	1	2

12.4 Compatibility

GUI Requirements Table	Win2000*	NT 4.0	Win98	Win95
A 2D driver with full hardware accelerations	1	2	1	4

Direct Draw	Win2000*	NT 4.0	Win98	Win95
A HAL (Hardware Abstraction Layer) driver must provide full hardware acceleration of DirectX 2D & Video applications	1	N/A	1	2

Direct3D Requirements Table	Win2000*	NT 4.0	Win98	Win95
Direct3D driver must provide hardware acceleration of DirectX 3D	1	N/A	1	2
Graphics controllers that support full AGP must support the non-local graphics memory capabilities of DirectX	1	N/A	1	2
Driver must support Intel Streaming SIMD (Vendor Supplied)	1	N/A	1	2
Driver must support AMD 3D Now (Vendor Supplied)	1	N/A	1	2
Driver must support Cyrix 3D Now (Vendor Supplied)	1	N/A	1	2
Driver must support WAIT FOR VSYNS DISABLE	1	N/A	1	2

OpenGL Requirements Table	Win 2000*	NT 4.0	Win98	Win95
An OpenGL ICD/driver must provide full hardware acceleration of OpenGL applications	1	2	1	3
The OpenGL driver must pass the OpenGL compliance tests available from the Open GL committee	3	1	3	4

OpenGL Requirements Table	Win 2000*	NT 4.0	Win98	Win95
Driver must support Intel Streaming SIMD (Vendor Supplied)	1	2	1	N/A
Driver must support AMD 3D Now (Vendor Supplied)	1	2	1	N/A
Driver must support Cyrix 3D Now (Vendor Supplied)	1	2	1	N/A
Driver must support WAIT FOR VSYNC DISABLE	1	3	1	2

VGA Mode Support Requirements Table	Win2000*	NT 4.0	Win98	Win95
The driver must support graphics modes 0Dh-13h in a windowed DOS session	1	2	1	4
The driver must support all VGA modes in a full screen DOS box	1	2	1	4

Video Players Requirements Tables	Win2000*	NT 4.0	Win98	Win95
Driver must support hardware acceleration of all AVI & MPG files and provide frame rates that meet or exceed PC 98 specs	1	2	1	4
Driver must support hardware acceleration for Video for Windows Media Player and ActiveX Media Player	1	2	1	4
Compatibility with MPEG-2 SW DVD players (section 6.5)	1	N/A	1	2
Kernel Mode VPE support will be provided	1	N/A	1	2
An MPEG-2 Video CODEC (SW Player) will be provided to Interface to Visual Reality Interface	1	N/A	1	2

Installation Requirements Table	Win2000*	NT 4.0	Win98	Win95
All files must be able to be installed using an INF file	1	2	1	4
All files will adhere to the 8.3 DOS naming convention.	1	2	1	4
Driver will provide a mechanism for obtaining driver version information	1	2	1	4
A method of installation (de-installation) must be provided that requires no user interaction (SILENT INSTALL)	1	2	1	4
Drivers and controls must be remotely installable per Edge Tools MRD	1	2	1	4
Installation must recognize and discard other vendor drivers and controls per Edge Tools MRD	1	2	1	4
An unattended installation of drivers must be possible during the installation of the OS (MSBatch-Win95 or UnAttend.Txt-WinNT)	1	2	1	N/A

- See localized table (sect 12.2.2) for language requirements for CD Installer.

Configuration Requirements Table	Win2000*	NT4.0	Win98	Win95
Context sensitive help must be provided for all configurations, windows, dialogs and property sheets	1	2	1	3
Driver must support the ability to select refresh rates, resolutions and color depths using the mechanisms provided by the OS. If the OS has no mechanism, an additional application must be provided	1	2	1	3
A configuration application or registry setting must allow the ability to over-ride accelerations for 2D, 3D & video in case of driver, app or other problems.	1	2	1	3

Dynamic EDID / GTF – Timings	Win2000*	NT4.0	Win98
Driver should implement a Optimal Mode method	1	2	1

12.4.1 Interpreting EDID

The other area that needs implementation is interpreting the EDID. Many things are stored in the EDID. There is a feature byte that contains the GTF flag and the preferred timing flag. If the monitor asserts the GTF flag, it is capable of GTF timings and must have a valid range descriptor in the detailed timing section of the EDID. If the preferred bit is set a button will be available to set that mode. There are three timing sections.

Established Timings: This field consists of 17 bits with each one corresponding to a particular mode. Although some monitor manufacturers use this field to indicate timings that they have pre-adjusted, the EDID specification says that the bits can be set if the user can adjust the monitor to display that particular mode.

Standard Timings: The timings here are for VESA standard discrete monitor timings that are not included in section one. The same issue exists here about whether or not these modes are pre-adjusted for a centered display.

Detailed Timings: This section has four blocks. These blocks can hold a detailed timing, several strings and range descriptors.

For non-GTF monitors: *Optimal* is defined as the highest refresh rate for the resolution that exists in any of the three timing sections. When determining what the maximum refresh rate allowed for a given mode is, we will rely on the actual horizontal and vertical rates of the 3dfx standard modes and compare with the range descriptor (if present) and/or the rates in the registry from the monitor .INF file.

For GTF monitors: *Optimal* is defined as the highest of either the refresh rates in the EDID or the highest GTF pre-calculated mode that is inside the range of the monitor's range descriptor. When determining what the maximum refresh rate allowed for a given mode, rely on the actual horizontal and vertical rates of the 3dfx standard modes and the pre-calculated GTF modes and compare with the range descriptor and/or the rates in the registry from the monitor .INF file.

Allow the user to select any refresh rate directly, but limit *Optimal* to the above conditions.

ACPI Requirements Table

	Win2000	NT4.0	Win98	Win95
Napalm AIC will support all controller enabled power management states	1	N/A	1	N/A

13. Performance

13.1 Benchmark Suite

Table 13.1 Benchmark Support

All tests run with 85Hz default refresh rate	Target Perf. Intel 500MHz PIII, 440BX Null Driver	Target Perf. Intel 500MHz PIII, 440BX V3-2000	Target Perf. Intel 500MHz PIII, 440BX V3-3000
Win98 / Win2000 - 3D WB99/00 (1024x768) (16bpp, 16bit Z, Triple Buffer Flip Mode)	Null – TBD	Closest to Null	Closest to Null
Win98 / Win2000 - 3D WB99/00 (1024x768) (32bpp, 16bit Z, Triple Buffer Flip Mode)	n / s	n / s	n / s
Win98 – BUSINESS / HIGH-END WINMARK 99 (1024x768)	Null – TBD	Closest to Null	Closest to Null
Win98 – BUSINESS / HIGH END WINMARK 99 (1280x1024)	Null – TBD	Closest to Null	Closest to Null
Win98 / WinNT 4.0 / 5.0- BUSINESS / HIGH-END WINMARK 99 (1024x768)	Null – TBD	Closest to Null	Closest to Null
Win98 / WinNT 4.0 / 5.0- BUSINESS / HIGH END WINMARK 99 (1280x1024)	Null – TBD	Closest to Null	Closest to Null
CGW GAME GAUGE 2 (IN FPS) (800x600x16BPP)	Null – TBD	Closest to Null	Closest to Null
3D MARK 99Max - 800x600 16BPP/16-BIT Z, DOUBLE BUFFERED	Null – TBD	Closest to Null	Closest to Null
ViewPerfDX03 (10x7; 12x10)	Null – TBD	Closest to Null	Closest to Null

- Note: The null driver estimates to be calculated

14. Quality / Reliability / Compatibility

14.1 DPPM

DPPM levels will be specified for pre-production and full production as follows:

Table 14.1 DPPM Levels

Production Level	DPPM
Production ramp	1500
Full production	500

It is assumed these DPPM levels will be measured through lot audit methodologies.

14.1.2 DPPM Reduction Strategies

DPPM reduction may be realized through extensive use of ICT, thorough functional test suites, and quality control audits.

14.2 MTBF

MTBF is specified as a minimum of 87,660 hrs or 10 years of continuous operation.

14.3 H/W Compatibility

Engineering will use and own/update the following test matrices (MS XLS spreadsheets) to ensure compatibility of all *hardware* requirements:

File	Description
Island_invt.xls	Complete computer systems specifying processor and motherboard (for OEMs and Retail)
International Test Matrix 0.00.xls	International test matrix specifying HW, OS, graphics and monitor
BIOS-Games.xls	BIOS Games per modes and color depth
Motherboards_list1.xls	All motherboards test matrix (chipset, bus speed, jumper settings)

14.4 S/W Compatibility

Engineering will use and own/update the following test matrices (MS XLS spreadsheets) to ensure compatibility of all *software* requirements:

File	Description
Napalm Test Matrix 0.00.xls	All game titles (publisher, developer) specifying API, modes, and color depth
Allgames.xls	All game titles bug list
Napalm Project Win95 Matrix.xls	Microsoft Win95 WHQL test matrix
Napalm Project Win98 Matrix.xls	Microsoft Win98 WHQL test matrix
NT 40 xx-xx-99.xls	Microsoft WinNT 4.0 WHQL test matrix
Napalm Project WinNT 5 Matrix.xls	Microsoft WinNT 5.0 (Win2000) WHQL test matrix
OpenGL V3-xx-xx-99.xls	OpenGL ICD test matrix

15. Certifications / Compliance

15.1 USA

FCC Class B limits for emissions certification and markings.

15.2 ROW

This product must meet CE certifications and markings.

This product must meet C-TICK certifications and markings.

16. Manufacturing Considerations

Napalm AIC must meet or exceed all requirements for optimal manufacturing at the site in Mexico.

16.1 Component Packaging:

548 PBGA

16.2 New Technologies

New technologies associated with Napalm AIC include digital flat panel monitor support via the DFP connector and high-speed Panel Link TMDS serial digital data.

16.3 Test Coverage

The product is acceptable for release to volume manufacturing when a minimum of 95% functional test coverage is attained. The product must also have at least 95% ICT coverage to be considered released to production.

16.4 Test Plan

17. Documentation

17.1 Manuals

See section 12.2.2 for localization requirements for all documentation. All software/documentation will denote the company name as 3dfx with the lower case “d”

18. Packaging

18.1 OEM

Packaging must meet requirements set forth by the individual OEM receiving the product.

18.2 Channel

All products shipped into the Channel markets will utilize ‘white’ box configurations unless otherwise stipulated by an individual customer. Package will include the following:

18.3 Retail

All products shipped into the Retail markets will utilize new 'branded' box configurations unless otherwise stipulated by an individual customer.

Table 18.1 Napalm Packaging contents

Country	Part #	Box Type	Clam Shell	Driver CD	Color Manual English	User's Guide B/W	FCC/CE C-Tick	Warranty Card	10 Year Warr. Sticker	3 Year Warr. Sticker	Lifetime Warr. Sticker	Mkg. Insert	Lang. Sticker	Soft DVD	Game Bundle
Size & Style of PKG		14½"x3"x9 ½" Corrugated Cardboard – Flap location TBD	Large US/Euro Small Asia	Mylar Sleeve	4¼"x4¾" Multiple Page Saddle Stitch	5½"x8½" White paper stock – Saddle Stitch	4"x6" White paper stock printed front & back	4 7/8"x5 ½" In folded format. Quad-fold w/last fold scored for Mail in Card	TBD	TBD	TBD	TBD	TBD	TBD	TBD
US	110-xxxx-xxx	US/UK	Large	ML CD	Yes	None	yes	US Life	No	No	No	TBD	-	TBD	TBD
UK	111-xxxx-xxx	US/UK	Large	ML CD	Yes	None	yes	Euro 10 year	Yes	No	No	TBD	-	TBD	TBD
Canada	113-xxxx-xxx	French	Large	ML CD	Yes	ML	yes	US Life	No	No	TBD	TBD	-	TBD	TBD
North Europe	114-xxxx-xxx	North Euro	Large	ML CD	yes	ML	yes	Euro 10 year	No	No	No	TBD	-	TBD	TBD
South Europe	115-xxxx-xxx	South Euro	Large	ML CD	yes	ML	yes	Euro 10 year	No	No	No	TBD	-	TBD	TBD
France	116-xxxx-xxx	French	Large	ML CD	yes	ML	yes	Euro 10 year	No	No	No	TBD	-	TBD	TBD
Japan	112-xxxx-xxx	Japan	Small	Asia CD	yes	Japanese	yes	Asian 3 year	No	TBD	No	TBD	Asia (if US box used)	TBD	TBD
PRC	117-xxxx-xxx	PRC	Small	Asia CD	yes	Simplified Chinese	yes	Asian 3 year	No	TBD	No	TBD	Asia (if US box used)	TBD	TBD
Asian	118-xxxx-xxx	Asian	Small	Asia CD	yes	Traditional Chinese	yes	Asian 3 year	No	TBD	No	TBD	Asia (if US box used)	TBD	TBD
Korea	119-xxxx-xxx	Korea	Small	Asia CD	yes	Korean	yes	Asian 3 year	No	TBD	No	TBD	Asia (if US box used)	TBD	TBD
G1 White box	110-xxxx-028	White box	None	ML CD	no	Eng. OEM	yes	US Life	No	No	No	No	No	No	No
Euro White box	111-xxxx-208	White box	None	ML CD	no	ML	yes	Euro 10 year	No	No	No	No	No	No	No

ML CD = Multi-lingual : English, Dutch, French, German, Italian, Spanish, and Swedish **ONLY!**

Asia CD = English, Traditional Chinese, Simplified Chinese, Korean, and Japanese **ONLY!**

ML (User's Guide) = French, Italian, German, Spanish

Asean = Singapore, Malaysia, Thailand, Philippines, and Indonesia

Marketing Inserts – includes Magazines, other 3dfx products, etc.