Video-88PCI-16/32Plus

nVIDIA TNT2 Vanta ™
nVIDIA RIVA TNT2 M64 ™

User's Manual

version 4.00

Contents

Introduction

The nVIDIA TNT2 / Vanta™ and nVIDIA TNT2 / M64™ are highly integrated 3D/2D graphics processors. Leveraging the RIVA TnT2 core technology, nVIDIA TNT2 chipsets delivers break-through 3D and 2D graphics performance. In addition to its outstanding graphics capabilities, these nVIDIA TNT2 processors provide complete support for video, software and hardware DVD playback, as well as support for the latest system technology such as flat panel display. nVIDIA TNT2's display drivers are WHQL certified for windows 2000, windows NT 4.0, windows®95/98. Video-88PC-16 and Video-88PCI-32Plus are full-featured graphics solutions for lower profile desktops.

Great output, reasonable performance

Like other TNT2 cards, the Video-88PCI-16 and Video-88PCI-32Plus offer exceptional image quality at upto 1600x1200 pixel resolution. Even at high resolution and color depth, the windows displays are sharp and glitch-free. On 3D performance, games play beautifully with vibrant colors and no noticeable rendering errors. Video-88PCI-16 and Video-88PCI-32Plus did impressively well in games performance, topping the chart in Frames-Per-Second performance.

The power to propel you ahead

Now for the manufacturer don't have to sacrifice one feature in order to gain superiority in another. Video-88PCI-16 and Video-88PCI-32Plus both video cards deliver unique performance across the board, regardless of the application - 3D Games, Productivity and Lifestyle Applications, VRML, Web Browsing, Video Conferencing, Video Capture and Playback and more. Equally important, all popular PC standards are supported, including VGA, SVGA, Direct3D and DVD. Video-88PCI-16 and Video-88PCI-32Plus (nVIDIA TNT2) technologies have the graphics fired up to launch you ahead of the competition right from the start.

Video-88PCI-16 (nVIDIA TNT2 / Vanta™), 16MB video memory onboard.

Video-88PCI-32Plus (nVIDIA TNT2 / M64™), 32MB video memory onboard.

Features

Video-88PCI-16 (nVIDIA TNT2 / Vanta™) and Video-88PCI-32Plus (nVIDIA TNT2 / M64™) are fulfilling of all the requirements of the mainstream PC graphics market.

Graphics Architecture

Video-88PCI-16 and Video-88PCI-32Plus (nVIDIA TNT2) architectures process 2 pixels-per-clock cycle enabling single-pass multi-texturing. nVIDIA TNT2's 32-bit color pipeline, 24-bit Z-buffering, 8-bit stencil buffer and per-pixel mip-mapping precision delivers unsurpassed quality and performance allowing developers to write standards based applications with stunning visual effects and realism.

2D Acceleration

Video-88PCI's 2D rendering engine exploits the internal wide cache RAMs and 256-bit data paths to deliver industry-leading Windows acceleration performance. The 64-bit graphics engine is optimized for single cycle operation into the 64-bit SDRAM/SGRAM interface supporting over 1.0 Gbyte/s throughput. Acceleration functions are optimized for minimal software overhead on key GDI calls and demands of DirectDraw in Windows 9x including optimized Direct framebuffer (DFB) access with write-combining. Other features include:

- Accelerated primitives including BLT, indexed DIB, color translation, transparent BLT, stretchBLT, points lins, lines, polylines, polygons, fills, patterns, arbitrary rectangular clipping and fast text rendering from a hardware font cache
- pipeline optimized for multiple color depths including 8, 15, 16, 24, and 32 bits per pixel
- DMA Pusher allows the 2D graphics pipeline to load rendering methods optimizing Vanta/host multi-tasking
- Execution of all 256 Raster Operations (as defined by Microsoft Windows) at 8, 15, 16, 24, and 32-bit color depths
- True color hardware cursor
- Hardware color dithering

- Multi buffering (Double, Triple, Quad buffering) for smooth animation

3D Graphics Processor

The nVIDIA TNT2's 3D triangle setup and rendering pipeline represents a major advance graphics device integration. The nVIDIA TNT2 3D pipeline maintains the highest vertex, Z-buffer, texture filtering and rendering accuracy and yet maintains super high rendering throughput to achieve visually stunning interactive 3D:

- Optimized Direct3D acceleration
- Complete DirectX 6.0 support
- 100% hardware triangle setup
- Twin texel (TNT) 32-bit graphics pipeline
  - 2 texture mapped, Lit pixels per clock
  - Single pass multi-texturing support
  - Square and non-square texture support
- Texture Blend support examples:
  - Multi-texture
  - Bump map
  - Texture modulation
  - Light maps
  - Reflection maps
  - Detail textures
  - Environmental maps
  - Procedural textures

Support for Standards

- Multimedia support for MS-DOS, Windows 9x, and Windows NT™4.0
- Windows 95 and Windows 98 Display Driver, Direct3D, DirectVideo, ActiveX, DirectDraw and Open GL ICD for Windows 98, Windows NT

- VGA and SVGA: Video-88PCI-16 and Video-88PCI-32Plus (nVIDIA TNT2) both video cards have an industry standard 32-bit VGA core and BIOS support. In PCI configuration space the VGA can be enable and disable independently of the GUI.
- VESA DDC2B+, DPMS, VBE 2.0 supported

Video

Video-88PCI-16 and Video-88PCI-32Plus are accelerate full motion video playback under DirectDraw using hardware overlay scaling and color space conversion integrated into the Palette-DAC pipeline. This overlay pipeline features smooth up and down scaling with multitap X and Y sub-pixel interpolation, optional edged enhancement and per-pixel color keying. Interlaced video is double buffered at 60Hz with both odd and even fields displayed.

VIDEO SCALER PIPELINE

Video scaler pipeline performs stretching of video images in any arbitrary factor in both horizontal and vertical directions. The video scaler pipeline consists of the following stages:

1 Vertical stretching

2 Filtering

3 Color space conversion

4 Horizontal stretching

Vertical stretching

Vertical stretching is performed on pixels prior to color conversion. The video scaler linearly interpolates the pixels in the vertical direction using an internal buffer which stores the previous line of pixel information.

Filtering

After vertical interpolation, the pixels are horizon-tally filtered using an edge-enhancement or a smoothing filter. The edge-enhancement filter enhances picture transition information to prevent loss of image clarity following the smoothing filtering stage. The smoothing filter is a low-pass filter that reduces the noise in the source image.

Color space conversion

The video overlay pipeline logic converts images from YUV 4:2:2 format to 24-bit RGB true-color. The default color conversion coefficients convert from YCrCb to gamma corrected RGB. Saturation controls make sure

that the conversion does not exceed the output range. Four control flags in the color converter provides 16 sets of color conversion coefficients to allow adjustment of the hue and saturation. The brightness of each R G B component can also be individually adjusted, similar to the brightness controls of the monitor.

Horizontal stretching

Horizontal stretching is done in 24-bit RGB space after color conversion. Each component is linearly interpolated using a triangle 2-tap filter.

Windowing and panning

Video images are clipped to a rectangular window by a pair of registers specifying the position and width. By programming the video start address and the video pitch, the video overlay logic also supports a panning window that can zoom into a portion of the source image.

Video composition

With the color keying feature enabled, a programmable key in the graphics pixel stream allows selection of either the video or the graphics output on a pixel by pixel basis. Color keying allows any arbitrary portions of the video to overlay the graphics. With color keying disabled and video overlay turned on, the video output overlays the graphics in the video window.

Interlaced video

The video overlay can display both non-interlaced and interlaced video. Traditional video overlay hardware typically drops every other field of an interlaced video stream, resulting in a low frame rate. Some solutions have attempted to overcome the this problem by de-interlacing the fields into a single frame. This however introduces motion artifacts. Fast moving objects appearing in different positions in different fields, when de-interlaced, introduces visible artifacts which look like hair-like lines projecting out of the object.

System Requirement

- Intel Pentium® II or compatible system with PCI Bus Extension Slot
- CD-ROM drive, Double speed or faster
- Hard Drive with at least 10MB Free space

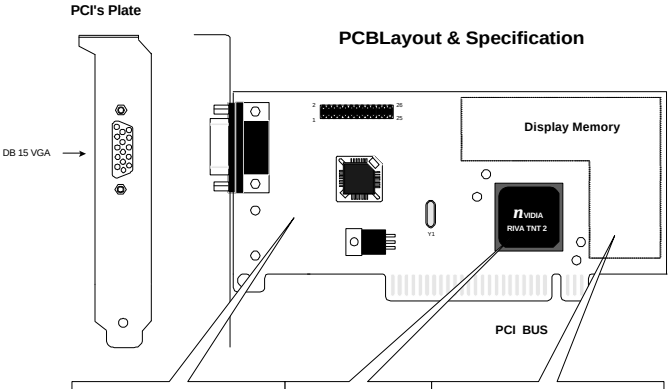
- MS Windows® 95/98 or Windows NT™4.0 operating system
- USB supplemental driver for mainboard's core-logic chipset

Check List

- ☑ Video-88PCI-16 Accelerator, or Video-88PCI-32Plus Accelerator
- ☑ Software & Documents CD
- ☑ Quick Start Guide (Printed)

Hardware Description

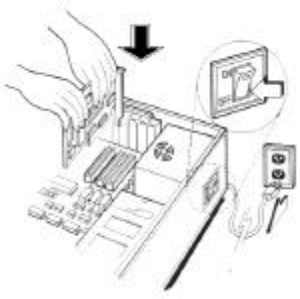
PCB Layout



Product / PCB Reversion		Chipset	Memory Model / Size	
Video-88PCI-16	82088K	nVIDIA RIVA TNT2 Vanta	1M*16x8	16 MB
Video-88PCI-32Plus	82088K	nVIDIA RIVA TNT2 Model 64	4M*16x4	32 MB
Video-88PCI-16	82088M	nVIDIA RIVA TNT2 Vanta	1M*32x4	16 MB
Video-88PCI-16	82088N	nVIDIA RIVA TNT2 Vanta	2M*32x2	16 MB
Video-88PCI-32Plus	82088N	nVIDIA RIVA TNT2 Model 64	2M*32x4	32 MB

Hardware Installation

Installation Procedures



!! WARNING !!

Discharge static electricity by touching the **GROUND** such as metal part of your case connected with good power ground before you handle the electronic circuit boards.

The manufacturer assumes no liability for any damage, caused directly or indirectly, by improper installation of any components by unauthorized service personnel. If you do not feel comfortable performing the installation, consult with a qualified computer technician.

Steps:

1. Turn OFF all powers to your system, including any peripherals (printer, external drives, modem, etc.).
2. Disconnect the power cord and the monitor cable from the back of the computer.
3. Unfasten the cover mounting screws on your system and remove the system cover. Refer to your system user manual for instructions to determine the location of the mounting screws.
4. Remove the retaining screw that holds the slot cover in place. Slide the slot cover out and put the screw aside (you will need it to secure the adapter).

5. To install the adapter in PCI expansion slot, carefully line up the gold-fingered edge connector on the adapter directly above the expansion slot connector on the motherboard. Then press the adapter into place, completely. Use the (remaining) screw you removed to secure the adapter retaining bracket in place.

6. Replace the computer cover. Secure the cover with the mounting screws you removed in Step 3.

You have now completed the installation of your new graphics adapter on your system.

Very Important Note:

Before software installation for the video adapter, you have to install USB driver for the mainboard's PCI bridge functions. Otherwise, video driver installation won't go through probably.

Software Installation

Microsoft Windows®9x

Welcome screen from Video-88' CD

This CD supports Windows®95,and Windows®98 autorun feature. "Welcome" menu will appear automatically on the screen after the CD is inserted to the CD-ROM drive.

1. Start Windows® 9x with VGA or SVGA drive detected.
2. Insert the display Driver CD into your CD-ROM drive (e.g. X:).
3. Autorun file pops up "Welcome" screen (**Master Installer**) from Jaton' CD.
4. Click on the "Display Driver" selection bar.
5. Switch to "Settings" tab, then click on " Advance" button.

6. Click on “Change”, then “Have Disk”.

7. Browse to “X: \V-88\Win9x\Jaton.INF” (X is the letter of your CD-ROM drive), and click OK.

8. The display device selected “**Video-88AGP/PCI-8/16, nVIDIA Vanta/Vanta LT**”, or “**Video-88PCI-32Plus, nVIDIA RIVA TNT2 M64**” then press on OK button.

9. Close and apply to finish PCI’s display driver installation.

10. Restart Windows to complete installation.

Microsoft NT™4.0

1. SELECT the “Display” icon in control panel and then SELECT the “Settings” page.

2. SELECT “Display Type...” button in the “Settings” page.

3. SELECT “Change...” button from the Adapter type section.

4. SELECT “Have Disk...” button from the Change Display page.

5. Microsoft Windows NT 4.0 will prompt you for the correct path where the video drivers are located. ENTER the path “X:\V-88\Winnt4\” where X: is the CD ROM drive where the Software & Documents CD has been inserted.

6. If the driver selected “**Video-88AGP/PCI-8/16, nVIDIA Vanta/Vanta LT**”, or “**Video-88PCI-32Plus, nVIDIA RIVA TNT2 M64**” is listed under the Display list, SELECT the “OK” button to continue.

7. Once the driver files are copied, RESTART Microsoft Windows NT 4.0 for the changes to take effect.

8. SELECT the desired color palette (the number of colors), desktop area (resolution), and refresh frequency in the

settings page of Display Properties and then SELECT the "Test" button in the same page to determine whether your selection works properly. SELECT "Apply" to active the selected mode.

Note: The procedure of display driver installation it required setup with service pack3 (Microsoft® Windows NT™4.0) first.

Technical Assistance

Q: Why is the display shifted or changed sizes when I switch display modes?
Explain and Suggestion:
Some monitors lack auto-sizing features or just do not synchronize properly to the video board output. In some cases, horizontal and vertical display adjustments may be necessary. Use the monitor control panel functions to adjust screen.
In other cases, mode type and refresh rate adjustments may be necessary. Use the utility program, which provided by video card manufacturer or production developer. To centering the display with normal type (mode 3), and to reduce (decrease) the refresh rate with the monitor's specification.

Q: What kind monitors can display 800x600 mode or higher resolution mode?
Explain and Suggestion:
To display 800x600 resolution at 60Hz refresh rate, the monitor must be capable of synchronizing a 31.5KHz horizontal scan rate (e.g., NEC 2A, 3D). At 72Hz refresh rate, the monitor must be capable of synchronizing a 48.0KHz scan rate (e.g., Sony HG 1304, NEC 4D, 5D, Seiko 1450).
To display 1024x768 interlaced mode; the monitor must be capable of synchronizing a 35.5KHz horizontal scan rate (e.g., NEC 3D, Seiko 1430 or 1440). To display 1024x768 non-interlaced mode at 60Hz, the monitor must be capable of synchronizing a 48.7KHz scan rate (e.g., Sony HG 1304, NEC 4D, 5D, Seiko 1450).
To display 1024x768 non-interlaced mode at 70Hz, the monitor must be capable of synchronizing a 56.4KHz scan rate (e.g., NEC 4D).

Q: Windows screen won't come up, it kicks back to DOS prompt. Why?

Explain and Suggestion:
Windows® 95
Inadvertently, certain configuration files (e.g., msdos.sys, and command.com) have been changed in the system. Proceed to correct that, is re-boot the system with a system (Windows® 95) formatted floppy diskette.
There are many reasons to causing the system booting-up with un-appropriated steps. Base on Microsoft support wizard on their WEBsite, there are many technical articles to help users with this subject, such as troubleshooting with VXD errors, virus, Fatal exceptions, etc., more details cover on each issue are descriptive and familiar with, and exclusively further to our support.

Q: System hangs-up after installing video driver.
Explain and Suggestion:
Today, most video drivers are developed for 32-bit processing and may require a channel to Code/Decode. Conflict between device drivers and TSR (terminate-and-stay-resident) programs will inverted the display, and are particularly effectual at crashing computer. The most effective way to check for conflicts is to replace with the original video driver, or delete and re-install the current video driver to the system.
Accomplishing IRQs (Interrupt Request Query) settings or troubleshooting the conflicts on hardware source may necessary. Most PCI video cards designed for Plug-n-Play, that means video card IRQ's setup which controls by main board's (motherboard) circuitry and BIOS. Physically pulling out other devices from system, and re-starts the computer. Confirm and modify your IRQ addresses with qualified computer technician.

Q: Multiple images or unreadable screen after loading video driver.
Explain and Suggestion:
There are a variety of reasons why the display might be distorted. One common reason is a monitor mis-match. Some older multifrequency monitors are unable to switch video modes without being turned off, then turned on again.
If the problem occurring in windows, make sure that you have loaded that proper video driver, and that the driver is compatible with the monitor being used. Try re-configuring your application software to use a compatible video mode. If problem persist in windows, load the standard generic VGA driver. The generic VGA driver should function properly with virtually every video board and VGA (or SVGA) monitor available.
If that is an unsatisfactory solution, you may have to upgrade to a monitor that supports the desired video mode.
Some new monitors are also synchronizing this problem because built-in DDC (Data-Digital-Channel) feature. Sometime that DDC automatically

setup the display frequency without loading video driver. Try to turn it off, or change settings of monitor type in your system.

Q: Selection of color, resolution and refresh rate combination that always backs to default after restart the system.
Explain and Suggestion:
Accordingly, there must be a bug (defected source-code) in video driver, or in the system. Debug the source-code or fix the error in video driver, that should be done by the driver developer. Likewise, upgrade the video driver from the manufacturer or from the original software developer is necessary.

Frequently Asked Questions (FAQ)

Q1 Why do we need 3D graphics capability in our PC?
Answer
3D technology is becoming increasingly important (and common) not only in games, but also in other applications such as VRML, which allows 3D scene descriptions in Web applications. 3D technology is used for image editing, modeling, and an increasing number of in home and business applications. In games, as well as other applications, 3D acceleration not only allows better visual qualities and more realistic scenery attributes than software alone, but it also allows a higher frame rate, which translates into a more interactive experience for the end user.

Q2 What does “Rendering Engine” mean?
Answer
“Rendering Engine” generically applies to the part of the graphics engine that draws 3D primitives, usually triangles. In most implementations, the rendering engine is responsible for interpolation of edges and "filling in" the triangle.

Q3 What does the set-up engine do in a graphics controller?
Answer
A set-up engine allows drivers to pass triangles in the form of raw vertex information; whereas, most common designs force triangles to be pre-processed for the rendering engine in terms of delta values for edges, color, and texture.

Q4 Why does a 3D graphics chip need to have both a rendering engine and a setup engine?
Answer
Any “3D application”, a game, VRML, or modeling package, can benefit from 3D rendering. This is especially true of applications that uses texturing extensively, because texturing and texture filtering are very intensive operations at the pixel level in terms of CPU operations and

demands for memory bandwidth. Without a set-up engine in a graphics controller, the CPU has to calculate the delta values for edges, color, and textures; the drivers need to handle ten (10) times more extensive data. This results in slower 3D pipeline operations between the CPU and the graphics controller.

Q5 If we use powerful CPUs, such as a Pentium™ 200, can a standard 2D graphics card achieve 3D performance?
Answer
Yes and no. Software rendering can take advantage of "tricks" learned by force of necessity through years of trial and error. With such stratagems, the speed of software rendering for simple scenes can approach that of low-level hardware 3D rendering. On the other hand, as scenes become more complex (or frame sizes become larger), there are conflicts between using the CPU for high-level game logic, geometry, lighting, and rendering, all of which increase their demands. No current CPU or system can perform advanced quality-enhancements (bilinear filtering and alpha blending) in real time. Even general case texture mapping with RGB lighting is too much for the current CPU generation.

Q6 What does "software 3D" mean?
Answer
Software 3D is generally used to mean using non-specific (2D) hardware in conjunction with the CPU to render for 3D applications. Some of these techniques allow usable 3D applications when high-powered and/or MMX™-equipped CPU's are employed along with special-case software optimization techniques. As stated above, SW 3D can achieve credible results with today's (software optimized) applications, but the rising popularity of good 3D hardware at the consumer price level is inexorably compelling the public to expect hardware level scene enhancements and frame rates.

Q7 What is “SGRAM”?
Answer
Synchronous Graphics Random Access Memory (SGRAM) is a new and improved type of memory, custom-designed for graphics use.

Q8 What is the advantage of as compared to ordinary DRAM?
Answer
 is now capable of running at much higher speeds than Fast Page Mode or EDO DRAM. Also, is able to execute a small number of frequently executed operations, such as buffer clears, specific to graphics applications, independently of the controller.

Pinout and Sync Frequencies

Analog Color Display Pinouts (DB 15)

PIN	FUNCTION
1	Red Video[1]
2	Green Video[1]
3	Blue Video[1]
4	Not Used
5	Ground
6	Red Return (ground)
7	Green Return (ground)
8	Blue Return (ground)
9	Vcc (+5v DDC Power)
10	Sync Return (ground)
11	Monitor ID (not used)
12	SDA (DDC support)
13	Horizontal Sync
14	Vertical Sync
15	SCL (DDC support)

Note: Analog monochrome type monitors use green video for all video input and ignore red and blue video.

Conversion Table: Pin Adapters

If you will be using a 9-to-15-pin adapter cable to link your 9-pin monitor connector to the 15 pin accelerator card connector, check Table carefully before you install the cable. The 9-to-15 pin adapter cables are available from a variety of sources, but they need to match the specifications in Table to work properly with your new card.
The adapter cable requires a D-shaped 9 pin female connector and a D-shaped 15 pin male connector.

9-to-15 Pin Conversion Table

9 PIN SIGNALS	PIN NO.	15 PIN SIGNALS	PIN NO.
Red	1	Red	1
Green	2	Green	2
Blue	3	Blue	3
Horz Sync	4	Horz Sync	13
Vert Sync	5	Vert Sync	14
Red Ground	6	Return Red	6
Green Ground	7	Return Green	7
Blue Ground	8	Return Blue	8
Sync Ground	9	Digital Ground	10
		Ground	5

Analog Video Signals

Black Level = 0 V
Full Intensity (White) Level = +0.7 V

Technical Support

In the event you have a technical problem with this product, please read the README files in the software CD_ROM. Updated drivers are available through Jaton Web site. Have following information handy when you contact technical support:

- ☑ Name of the product.
- ☑ Software Driver and Version.
- ☑ System Information, such as CPU speed, BIOS version, Monitor Specification, etc.
- ☑ Description of the problems including any error messages.

Telephone:	(408) 934-9369 9-5 PST Mon. - Fri.
FAX:	(408) 942-6699
email:	vgasupport@jaton.com
URL	www.jaton.com

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AUG 1999, Rev. A

FCC SHIELDED CABLE WARNING:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation,
"SHIELD INTERFERENCE CABLE (S) MUST BE USED ACCORDING TO FCC 15.27©."
CAUTION:
Changes or modifications not expressly approved by the Manufacturer could void your authority to operate this equipment in accordance with FCC rules and regulations.

SOFTWARE LICENSE AGREEMENT:

The Company grants the customer a non-exclusive, non-transferable license to use the software in this package for internal use on a single computer system. No other license of any kind is granted to any part of the product or any of the intellectual property therein.

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Manufacturer warrants that the products sold hereunder are free from defects in material and workmanship for a period of two (2) years from manufacturing date. This limited warranty applies only to the original purchaser of Jaton Product and is not transferable. This limited warranty does not apply if failure to the Product Registration, or over thirty (30) days from purchase (original invoice date). This Limited Warranty

does not cover any incompatibilities due to the user's computer, hardware, software or any related system configuration in which the Jaton Products interfaces. Proof of purchase will be requiring before any consideration by Manufacturer occurs.

Other Limits.

The forgoing is in lieu of all other warranties, expressed or implied. Including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Manufacturer does not warrant against damages or defects arising out of improper or abnormal use of handling of the products; against defects or damages arising from improper installation (where installation is by persons other than Manufacturer), against defects in products or components not manufactured or installed by Manufacturer, or against damages result from non-manufacturer made products or components. This warranty does not apply if the Product has been damaged by accident, abuse, nor misuse. This warranty also does not apply to products upon which repairs have been affected or attempted by persons other than pursuant to written authorization by Manufacturer.

Exclusive Obligation.

This warranty is exclusive. The sole and exclusive obligation of Manufacturer shall repair or replace the defective products in the manner and for the period provided above. Manufacturer shall not have any other obligation with respect to the Products or any part thereof, whether based on contract, tort, and strict liability or otherwise. Under no circumstances, whether based on this Limited Warranty or otherwise, Manufacturer shall not be liable for incidental, special, or consequential damage.

Other Statements.

Manufacturer's employees or representatives' **ORAL OR OTHER WRITTEN STATEMENTS DO NOT CONSTITUE WARRANTIES**, shall not be relied upon by Buyer, and are not a part of the contract for sale or this Limited Warranty.

Terms and Conditions.

Direct Jaton Customer:	This warranty applies only for a period of two (2) years from purchase date of Jaton original invoice.
Reseller/ Vendor:	This warranty applies only for a period of two (2) years from manufacturing date.
Registered User:	This warranty applies only for a period of two (2) years from purchase date and register within 30 days of purchase date from legal reseller.
Others:	If the products do not conform to this Limited Warranty (as herein above described), Manufacturer should charge services such as repair, replacement whether based on its costs. Shipping and installation of the replacement Products or replacement parts shall be at User's expanse.

Services agreement:

(1) All applicants shall completed service request form from Manufacturer.
(2) All returned checks would be charged a $20.00 fee by Manufacturer.
(3) All repair and replacement services allow 4-6 weeks from the date of receiving by Manufacturer.
(4) All products without warranties require service processing fee $20 (payment in advance), which is not refundable.

Entire Obligation.

This Limited Warranty states the entire obligation of Manufacturer with respect to the Products. If any part of this Limited Warranty is determined to be void or illegal, the remainder shall remain in force and effect. Some states do not allow limitation of implied warranties, or exclusive or limitation on product incidental or consequential damages, so above limitation may not apply to you. This warranty gives you specific legal rights. You may have other rights, which may vary from state to state.
This warranty applies only to this product, and is governed by the law of the State of California.

Reducing Warranty Claim Rejections.

To reduce the potential of incurring damages not covered by Manufacturers warranties, we strongly recommend the following:

- Read your manuals before installing peripherals and/or before making changes to the machine's configuration;
- Ask your dealer if there are any known problems with the system requirements or installation procedures for any add-on products that your are purchasing;
- Buy industry standard products where compatibility issue are more likely to surface;
- If you are unsure about installation for a new product, contact your dealer's service department.

We believe it is important for you to know and understand what your warranty coverage provides and what it does not.

We also want you to be aware that most hardware warranties only relate to the function of the hardware. In most cases, no assurances are given by the manufacturer that the hardware item will work in conjunction with any other hardware item. If a computer product is not working because it is not compatible with another product, or because it has not been properly installed and set-up, the manufacturer does not pay for the service time. To help avoid these inconveniences, contact a professional consultant that one can help you determine the possibility of incompatibility issue before you purchase add-on or accessories.

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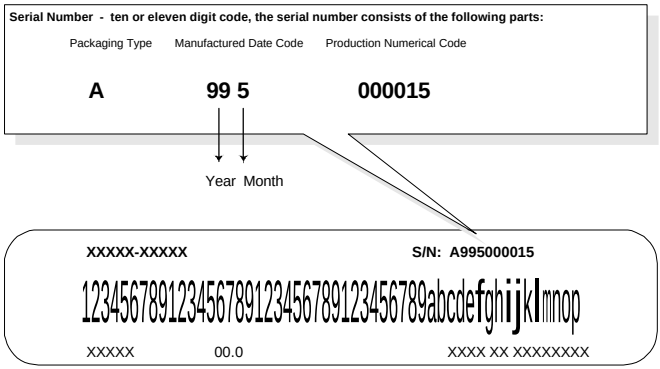

Product Label and Manufactured Date Code