NVIDIA.

ION™

Reviewer's Guide

ASRock® ION™

Quick Product Overview

Powered by the NVIDIA ION GPU, ASRock® ION 330 desktop PC systems are amazingly small, affordable, and energy efficient PCs that deliver a premium experience. Features like DirectX® 10 graphics, NVIDIA® CUDA™ technology, and HD video are now possible in a PC that is just a fraction of the size of a typical desktop computer.

KEY ION FEATURES	ASRock® ION™ ION 330-BD	Intel® 945G	NVIDIA Advantage
Certified for Windows 7	✔	—	WHQL-certified by Microsoft
Certified Vista Premium	✔	—	WHQL-certified by Microsoft
Next-Generation Graphics	✔	—	10x the graphics performance
Mainstream 3D Gaming	✔	—	Games are actually playable
Support for 800MHz DDR2 Memory	✔	—	More memory speed
Dual Channel Memory	✔	—	More memory bandwidth
Real-Time Video Transcode	✔	—	Powered by NVIDIA CUDA
Full 720p & 1080p HD	✔	—	Fully accelerated by the GPU
Advanced Digital Connectivity	✔	—	Supports both DVI & HDMI
HDMI 7.1 LPCM Audio	✔	—	Can pass 7.1 channel audio through a receiver
Blu-ray Playback	✔	—	GPU accelerated by CyberLink PowerDVD
Dual Monitor Support	✔	—	Drive two large-screen panels

Table of Contents

ASRock® ION Series™ System

Small Size. Big Performance.

Although consumers are looking for a great value for their next PC, they still want PCs capable of handling multi-media content like video, photos, and games at some point during the use of their computer.

The ASRock ION platform delivers full HD video capabilities, mainstream 3D gaming, and performance for typical desktop applications. All of this is made possible by the incredible graphics processing performance of NVIDIA® ION™ coupled with a low-power Intel Atom processor.

Ultra-Slim Design

Figure 1: ASRock ION Platform

The ASRock ION is the first ION platform system that has passed Windows 7 logo submission. It combines the NVIDIA ION graphics processor with a low-power dual-core Intel Atom 330 CPU, sports a dual-channel memory design, and is made of 100% Japan-made high-quality capacitors. The box is painted with high gloss paint that is visible over 90-degrees and there are no venting holes.

10x Faster Graphics

The highly integrated NVIDIA ION GPU delivers 10X faster graphics performance than other small desktop PCs with Atom CPU and Intel integrated graphics, resulting in extraordinary multimedia entertainment and high-definition quality. Certified for Windows Vista Premium, NVIDIA ION ensures access to complex video with full graphics support.

With ION, the ASRock ION platform transforms your living room into a family entertainment hub for high definition video and popular PC games.

Full 1080p HD Support

Watch the latest movie releases in full 1080p HD video with true-fidelity eight-channel audio. Leave the competition in the dust in today's most popular mainstream 3D games. And enjoy a full Windows 7 or Windows Vista Premium experience on a system that provides much more bang for the buck than similarly-priced PCs. Why settle for a basic PC when you can have a compact, low-power, full PC experience optimized with NVIDIA ION?

Premium Windows Experience

ION series ASRock systems deliver a premium Windows experience. Watch 1080p HD movies, play DirectX 10 games at great frame rates, and enjoy all the 3D capabilities of Microsoft Windows Vista Premium and upcoming Windows 7. This space-saving, quiet system can be built into a fully functional home office PC or as a living room PC for casual gaming on your television.

Key Benefits

- ✓ **Small Design**

- ✓ **Integrated with Super-Multi DVD ROM (ION 330) / Blu-ray ROM (ION 330-BD)**

- ✓ **All Solid Capacitors**

- ✓ **Acoustic 26dB**

- ✓ **Energy Star 5.0 Level Compliant**

- ✓ **Windows Vista Home Premium experience**

- ✓ **10x Faster Graphics than competitive graphics solutions with Atom CPU**

- ✓ **DirectX 10 graphics with advanced digital display connectivity**

- ✓ **HDMI, DVI and eSATA ports**

- ✓ **Support for 800MHz DDR2 Dual-Channel Memory**

- ✓ **Premium 1080p HD video with true-fidelity 5.1 / 7.1 channel audio**

- ✓ **Full support for 24-bit 8-channel LPCM uncompressed audio through HDMI**

- ✓ **Great mainstream gaming experience on popular games like Portal, LEGO Batman, Sims 3, and Wall-E**

- ✓ **Accelerated video enhancement and transcoding using NVIDIA® CUDA™ technology**

- ✓ **CUDA technology unlocks the processing power of the GPU to accelerate video transcoding and run the most compute-intensive applications**

ASRock ION SKUs & Specifications

Table 1: Product SKUs & Specifications

Model	White	Black
ION™ 330 SuperMulti DVD Drive	YES	YES
ION™ 330-BD Blu-ray Combo Drive	Not Available	YES
System	ASRock ION 330	
CPU	Intel Atom 330 soldered on system	
CPU Cores	2 (Dual-Core) with Hyper-threading (4 threads)	
CPU FSB	533 MHz	
GPU / Chipset	NVIDIA ION™	
GPU Engine Clock	**450 MHz**	
Shader Clock	**1100 MHz**	
DirectX Support	**DirectX 10**	
Memory Type	**Dual-Channel DDR2**	
Memory DIMM Sockets	**2 DDR2 SDRAM**	
Memory Speed	**800 MHz**	
Maximum Memory Size	**4 GB**	
Hard Disk Drive	**2.5" HDD, 5400RPM, 320GB**	
DVD / Blu-ray	**DVD Super Multi** (Slim type) **or** **Blu-ray COMBO ROM** (Slim type) (ION 330-BD Only)	

Model	White	Black
Display Connectors	**1 x HDMI™** **1 x D-Sub VGA** **1 x DVI** (with bundled HDMI to DVI Adapter)	
# of Monitors Supported	**2**	
USB Ports	**6** (USB 2.0)	
HDTV Support	720p, 1080i, **1080p**	
HDMI Digital Audio	**5.1 Channel / 7.1 Channel** PCM & Non-decoded Dolby Digital/DTS	
HD Audio	**HHD Audio 5.1 Channel** 1 HD Audio Port (Line-in, Line-out, Mic-in)	
Digital S/PDIF Outputs	**1 S/PDIF Optical**	
Ethernet	**Gigabit Ethernet** 10/100/1000 Mbps	
Windows Vista Premium Ready	**Yes**	
Windows 7 Drivers	**Yes**	
Acoustic	**Below 26dB**	
Power	**65W / 19V Adapter**	
Size	195mm(W) x 70mm(H) x 186mm(L)	
Volume (Liters)	**2.5L**	
Weight	**1.7Kg**	

Full 1080p Video with 7.1-Channel Audio

The ASRock ION is a small and fully capable desktop PC that offers advanced graphic capabilities for full enjoyment of multimedia content in high definition. ASRock ION is a true entertainment center for the entire family, not only offering immediate access to music, video, and images, but also providing full playback of 1080p content and the ability to play the most popular mainstream games.

CyberLink PowerDVD 9

A full version of PowerDVD 9 with Blu-ray playback capabilities is available on the Press FTP for your evaluation with the ASRock ION unit. Cyberlink has optimized PowerDVD 9 for GPUs that support the third generation of NVIDIA PureVideo HD (VP3) technology, which includes the NVIDIA ION.

Quicktime SD & HD Acceleration

Apple Quicktime standard definition and high definition (.MOV) files utilize the NVIDIA GPU acceleration built into Cyberlink PowerDVD versions 8 and 9.

To use this benefit, simply drag the Quicktime .MOV file onto the PowerDVD icon, or use the PowerDVD interface to select the file on your hard drive, and it will play back flawlessly, even at full 1080p resolution.

Media Player Classic Homecinema

Media Player Classic (MPC) is a freeware player that uses the traditional Windows Media Player 6.4 interface, but is packed with modern features. Features include support for many video and audio formats, and full support for NVIDIA GPU hardware acceleration.

One of the popular file formats supported by Media Player Classic is Matroska, the extensible open standard Audio/Video container. Matroska is usually found as .MKV files (matroska video) and .MKA files (matroska audio).

With Media Player Classic properly configured, the ASRock ION can play large .MKV files, up to 1080p resolution, using NVIDIA GPU hardware acceleration. The movie file is able to play both the video and audio smoothly without any skipping/stuttering while keeping even a single-core Atom CPU load at a minimum.
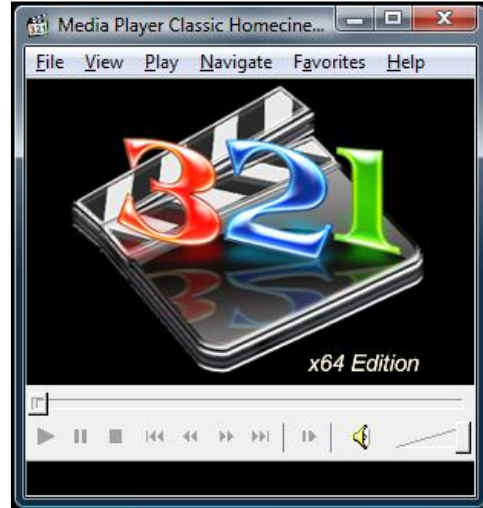
Configuring Media Player Classic for .MKV Files

1. Download and install a copy of **Media Player Classic Home Cinema** at:
   http://mpc-hc.sourceforge.net/

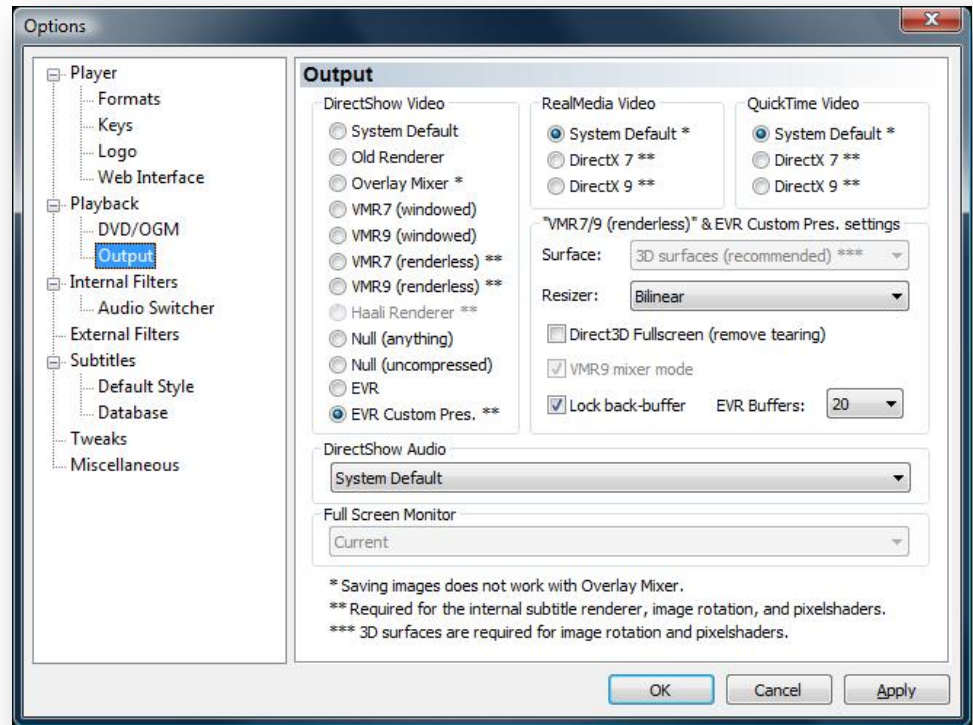2. Open MPC, go to the **View** menu option, and select **Options**.

Figure 2: Windows Media Player Classic Options — Output

3. Click the **Output** setting on the left located under the **Playback** option as shown in **Figure 2**.

4. In the **DirectShow Video** section of **Output**, select the **EVR Custom Pres.** Option if you plan to use subtitles, otherwise selecting just EVR is fine.
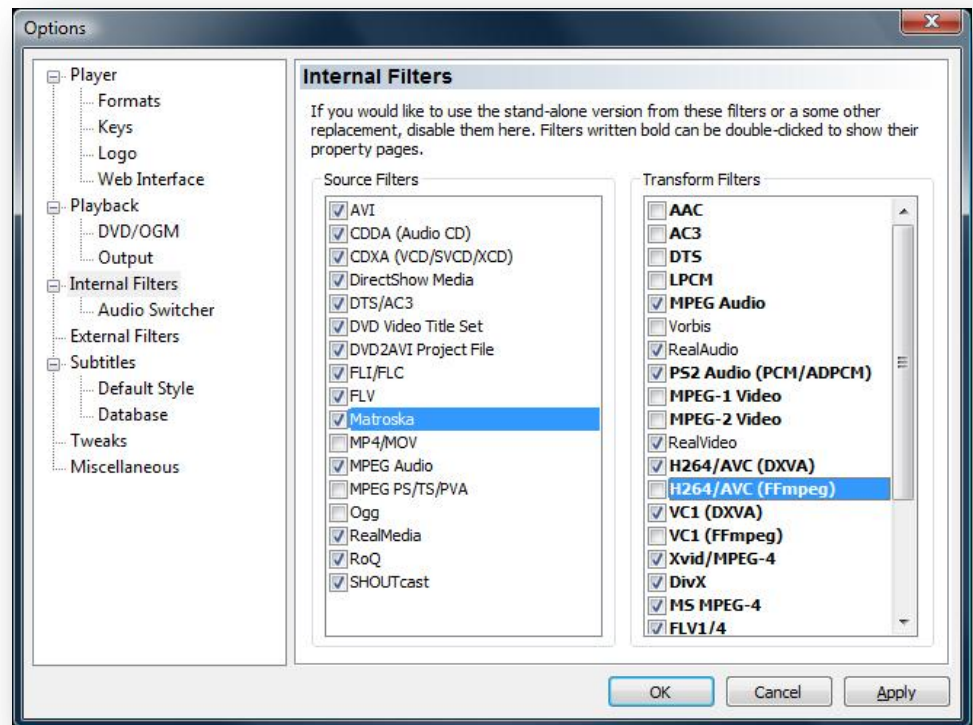
Figure 3: Windows Media Player Classic Options — Internal Filters

5. Next, click the *Internal Filters* option as shown in **Figure 3**.

6. Disable all *(FFmpeg)* filters in the *Transform Filters* section as shown in **Figure 3** by removing the checkmarks.

7. Enable the following settings in the *Transform Filters* section:

    • *H264/AVC (DXVA)* transform filter ENABLED

    • *VC1 (DXVA)* transform filter ENABLED

    • *Matroska* source filter ENABLED

8. Click *OK* to save options.

9. Playback of .MKV files should now take advantage of the NVIDIA ION graphics processor.

    Sample .MKV files can be downloaded from the DivX website at
    http://www.divx.com/en/downloads/divx-7-showcase

7.1 LPCM Audio Support

NVIDIA ION GPUs allow the home theater to be experienced as it should be—with unmatched audio fidelity and full 24-bit 8-channel, lossless codec support.


Figure 4: ION GPUs Offer Full 7.1 LPCM Audio Support

NVIDIA makes it possible to watch Blu-ray HD content with full support for 7.1 LPCM audio stream over HDMI. With NVIDIA ION GPUs, it just works. Unfortunately, users of Intel integrated solutions are forced to use stereo TV audio only because of various HDCP incompatibilities with external audio receivers.
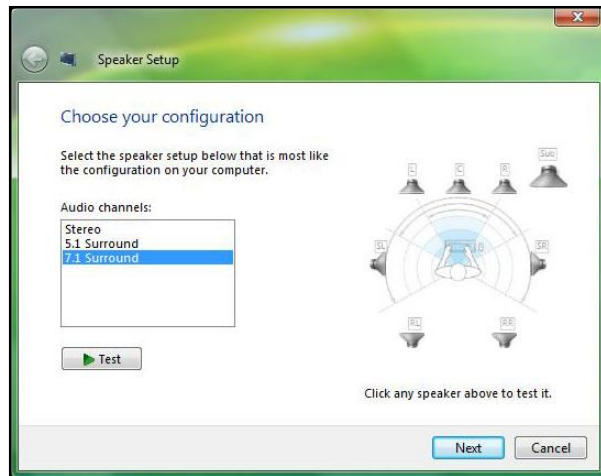
Enabling 5.1 / 7.1 Channel HDMI Audio in Vista

Follow these instructions for enabling 5.1 and 7.1 channel audio in Widows Vista.

1. **Install the latest 1.00.0.55 HDMI Audio Driver or newer version located on the Press FTP**.

2. Launch the **Sound Properties** from within the Windows Vista Control Panel

3. You should see **NVIDIA HDMI Output** as one of the playback device selections.
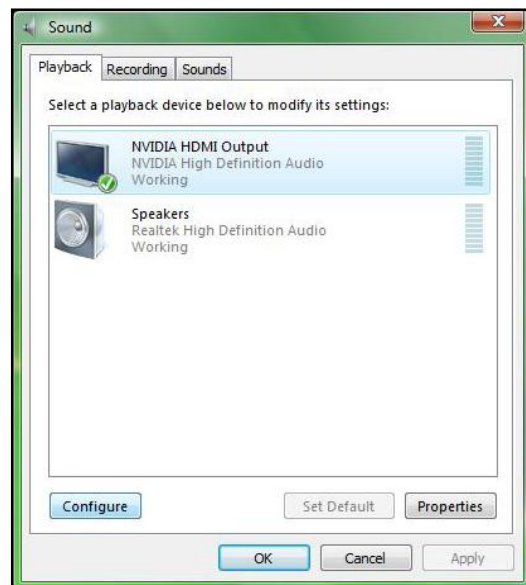
4. Click the **Configure** button.

5. Choose either **5.1 Surround** or **7.1 Surround** depending on the speaker configuration of your stereo system.

6. Click **Next** and finish the selection process to save your settings.

NOTE: You must have the ASRock ION connected via HDMI to a 5.1/7.1 Receiver for this option to be available.

Enabling 5.1 / 7.1 Channel Audio in CyberLink PowerDVD 9

Follow these instructions for enabling 7.1 channel audio in CyberLink PowerDVD 8.

Figure 5: Accessing the configuration settings in Cyberlink PowerDVD

1. **Download CyberLink PowerDVD 9 from the Press FTP.**

2. Access the Cyberlink PowerDVD *Configuration Settings* by clicking the tool button as showin in **Figure 5**.

3. Select the *Audio* tab.

4. Once inside the configuration, select the *Use HDMI (current Vista setting)* option in the Speaker environment section as show in the dialog to the right.
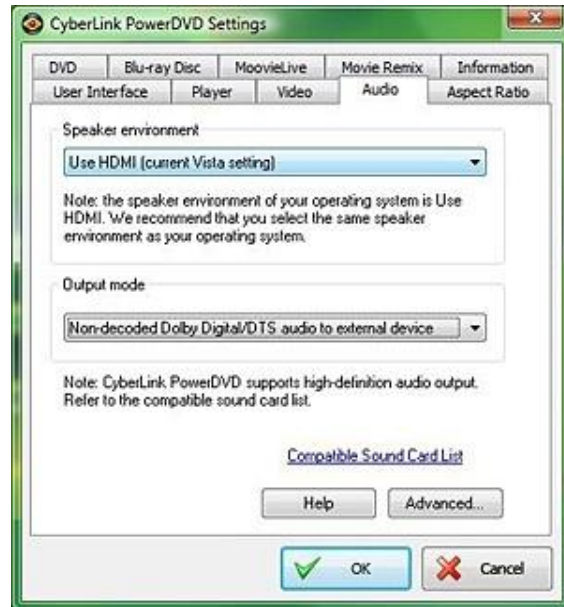
5. For *Output mode*, select *Non-decoded Dolby Digital/TDS audio to external device* if the receiver supports this mode. If not, select *PCM decoded by PowerDVD* instead.

Battlefield Heroes

Figure 6: Battlefield Heroes

Battlefield Heroes will be the first Battlefield game to be released under Electronic Arts' new "Play 4 Free" model in which the game is released publicly for free with revenue being generated from advertising and micropayments.

Key Features

- **Battlefield Heroes™** is a **free cartoon-style shooter** for the PC that plays great on the **NVIDIA ION graphics processor,** delivering 39.2 FPS at 1024 x 768 and 36.4 FPS at 1280 x 1024 using Low Quality settings.

- Combining **classic gameplay** with **brand new innovations**, it's a totally new experience

- **Cartoon-style graphics** bring the fun back to shooters

- **Third person camera** so your Hero is centre-stage!

- **Create your own unique war Hero** with extensive character customisation system

- MMO-like **special abilities** add strategic depth to combat

GamePlay

Armies consist of the National and the Royalist Army. The National Army resembles a Nazi Germany style faction, while the Royalist is a British/American faction. Players can create several characters to provide a good idea of both classes in both factions. Vehicles include jeeps, tanks and planes, all useable by players.
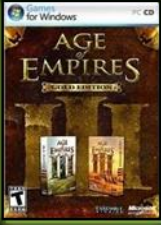
Battlefield Heroes was designed with a conquest mode that provides teams with 50 tickets and eventually one flag at the start of the round. Killing enemies and holding more flags than the opposing army will progressively reduce their number of tickets. The game also features matchmaking, to keep players of the same level together.

Support for 3D Mainstream Games

The game titles below represent mainstream games that casual gamers play. While top enthusiast games require discrete GPUs, these types of games play very well on NVIDIA ION, and we encourage you to check them out and compare to competitive integrated graphics solutions.

Test results are from the NVIDIA ION 330 system running Windows Vista x32 vs. an Intel 330 Atom-based system running Windows Vista x32. All results at 1024x768 resolution, low settings.

Table 2: Game Playability. The yellow X represents frame rates under 20 FPS, the red X that the game will not run, and the green checkmark represents frame rates above 27 FPS at the lowest resolutions.

GAMES		NVIDIA ION	intel 945GC EXPRESS CHIPSET
AGE OF EMPIRES III		✔	✘
BATTLEFIELD 2		✔	✘
BATTLEFIELD HEROES		✔	✘
BATTLEFIELD VIETNAM		✔	✘
CALL OF DUTY 4		✔	✘

Game		
CIVILIZATION IV: COLONIZATION	✔	✘
COMMAND & COMQUER: RED ALERT 3	✔	✘
FATE: UNDISCOVERED REALMS	✔	✘
IRON MAN	✔	✘
LEGO: BATMAN	✔	✘
PORTAL	✔	✘

		✔	✘
SIMS 3		✔	✘
SPORE		✔	✘
WALL-E		✔	✘
WARCRAFT III: BATTLE CHEST		✔	✘
WORLD OF WARCRAFT		✔	✘

NVIDIA® CUDA™ Technology

The 16 parallel processors built into ION are harnessed by CUDA™ Software to accelerate a broad range of compute intensive applications, vastly improving your PC's ability to work with visual content such as video encoding.

Badaboom

The Badaboom™ Media Converter from Elemental Technologies, Inc. formats video and audio files for a variety of devices using a process called transcoding. With NVIDIA CUDA technology, Badaboom enables users to painlessly convert video in multiple formats and view them on their portable media devices - all in a convenient, intuitive application.

Video compression divides frames into blocks of pixels which dual-core and quad-core CPUs process serially. NVIDIA ION GPUs contain 16 processing cores that enable tasks to be parallelized for faster processing...

How it works

The Badaboom Media Converter converts digital audio and video of commonly distributed formats to formats that are necessary for various portable devices. This conversion includes the unpacking and decompression of audio and video, re-formatting the media for the desired device, and then re-compressing into a new file.

The video processing is done using the NVIDIA graphics processing unit (GPU), which accelerates the task. By taking advantage of the multiple stream processors in the NVIDIA ION,transcoding speed is greatly improved compared to Atom CPUs.

Figure 7: CUDA Accelerates Video Transcoding

Badaboom's high quality baseline H.264 encoder and 2 channel stereo output are specifically targeted at portable media devices such as the Apple iPod and Sony Playstation Portable.

The Badaboom 1.1.1 features that add versatility and enhanced performance to the application include:

- **Support for additional input file formats and containers:** DivX, Xvid, MPEG-1, VC-1, AVI, MKV, MOV, MP4, WMV, FRAPS, and AAC Audio,. The file formats supported by Badaboom 1.0 will still be supported as well.

- **New output profiles:** YouTube, Blackberry Bold and Microsoft Zune have been added. User-customizable outputs are still available as well.

- **H.264 Main profile output:** Provides even higher quality output than version 1.0, especially useful when outputting at resolutions higher than 480p. Baseline profile is still supported.

- **1920x1080 (1080p) output:** The largest standard ATSC video resolution is now available as an output option, which provides great video quality when combined with Main profile.

Downloading Badaboom Media Converter

Badaboom Media Converter 1.1.1: Trial Edition version (30 free transcodes within 30 days) is already installed on the ASRock ION review unit. You can also download it from:

http://www.nvidia.com/content/graphicsplus/us/download.asp

Files are also on the Press FTP site.

Testing with Badaboom

Complete instructions for testing Badaboom can be found in the **Elemental_Badaboom_for_ION_Reviewer's_Guide.pdf** file located on the press FTP.

Badaboom offers output files optimized for various devices.

1. Launch Badaboom.exe.
2. Select "Browse File" from the left hand column. Badaboom accepts MPEG2 files as input, including in the clear .VOB files. Output is H.264.
3. Select the input video file.
4. Select "Start" at the bottom of the application.
   a. The output file will be saved in the user's Video directory (C:\Documents and Settings\USERNAME\My Documents\My Videos)

MotionDSP vReveal

Consumer-generated video has a lot of problems. Low-resolution sources like cell phone cameras capture videos with poor detail, shakiness, pixilation, and other artifacts. Even high resolution sources (like digital still cameras in "video" mode) record videos that are shaky, dark, and rife with noise artifacts like pixilation and graininess.

vReveal is a consumer video enhancement application that makes it easy to dramatically improve the quality of these consumer generated videos with the use of CUDA. vReveal features an adaptation of the CSI-style video enhancement technology behind MotionDSP's Ikena, the high-powered forensic software used by law enforcement and intelligence agencies.

Benefits

- Easy to use consumer application that uses CUDA to enhance bad consumer-generated video

- MotionDSP run 5x faster on GPUs than on CPUs, allowing for real-time video enhancement

How does it work?

A video is a series of many snapshots. For every second of video, there are multiple frames (between 5 and 30 per second) that each provide a slightly different view of the subjects in the scene. The vReveal powerful super-resolution algorithms use the information from these multiple views to reconstruct and enhance the scene with better, cleaner detail.

Single, non-enhanced frame   Multi-Frame Analysis   Reconstructed, enhanced frame

Videos get reconstructed with the best possible information for each pixel. Sophisticated motion-tracking across multiple frames enables very effective stabilization. vReveal's video enhancement algorithms are inherently parallel and run best on massively parallel NVIDIA GPUs.

Installation

Download vReveal and the demo file folder to your PC and install vReveal. When you first run the program, select "Let me select the specific folders to scan".

Navigate to the demo file folder and check the box that lies to the left of it. This will import all of your demo clips into vReveal.

Demo Instructions

Demo 1: Dark & Noisy

1. Download file **MVI_5286.AVI** from the Press FTP and Open. It is a dark and noisy video of baby Maya in a baby seat on a wood floor. You will see a preview of the video playing on the right side of vReveal.
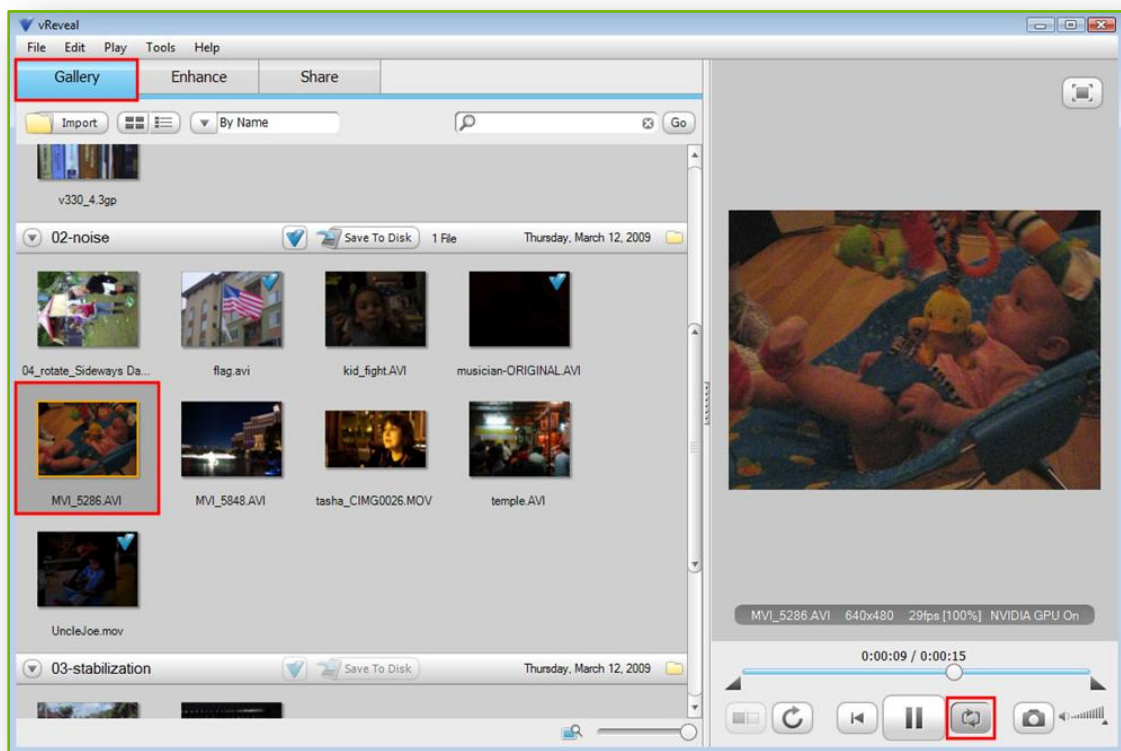
2. Click the **Repeat** button to loop the video and **Enhance** tab to enhance.
3. Move the **Fill Light** slider to add brightness. Note that this also raises the level of the noise.
4. Apply **Clean** to remove the noise. Click the split screen button to show the difference between the two clips.
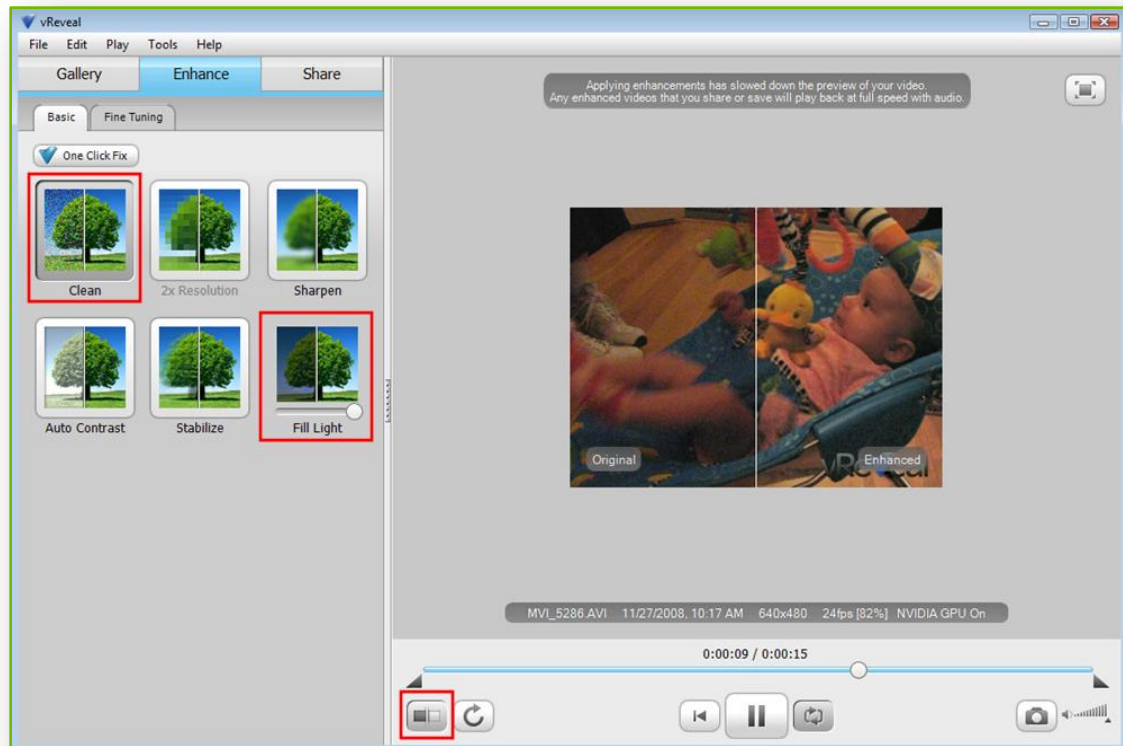
Demo 2: Stabilization & Noise Reduction

Open File **Stabilization2.AVaI**. It is jittery and noisy video of a school recital. Once the video is playing, go straight into the Enhance section to enhance the video.

1. Apply Clean. You'll see immediate improvement.

   Apply split-screen and point out the removal of noise from the curtains and the removal of jaggies from the kids' faces.
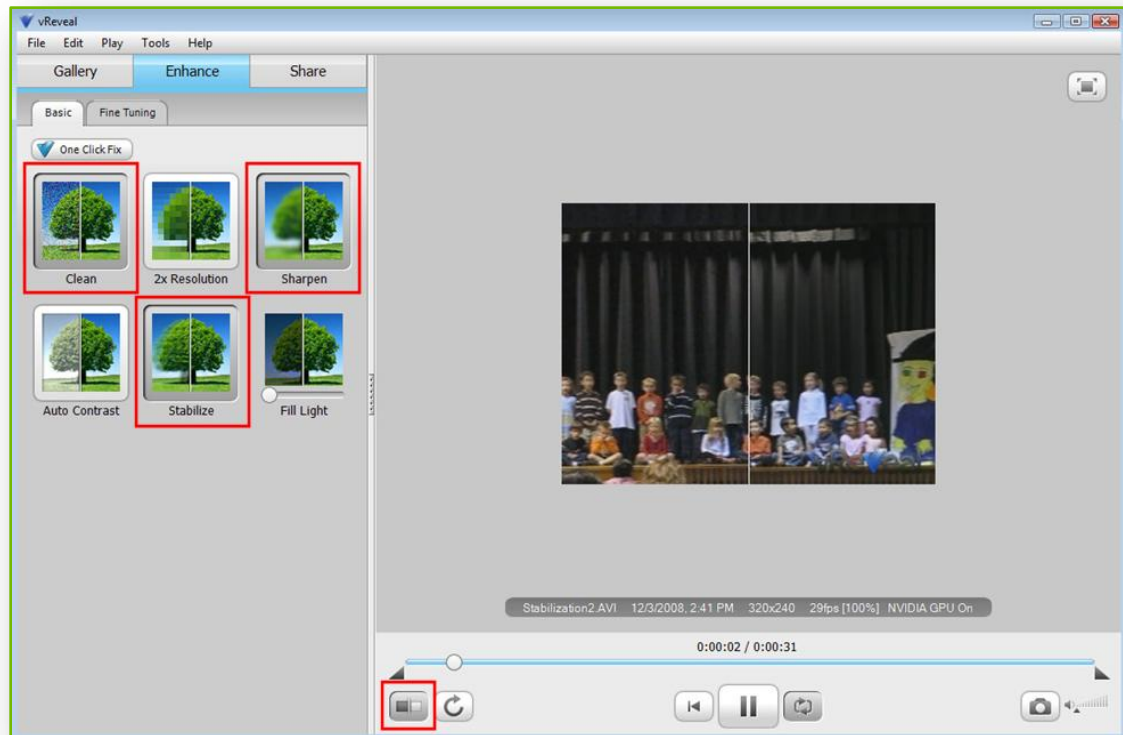
2. Apply **Sharpen** to improve detail in kids' faces. (Removing noise removed apparent sharpness.) You can play with level of Sharpness from Fine Tuning controls.
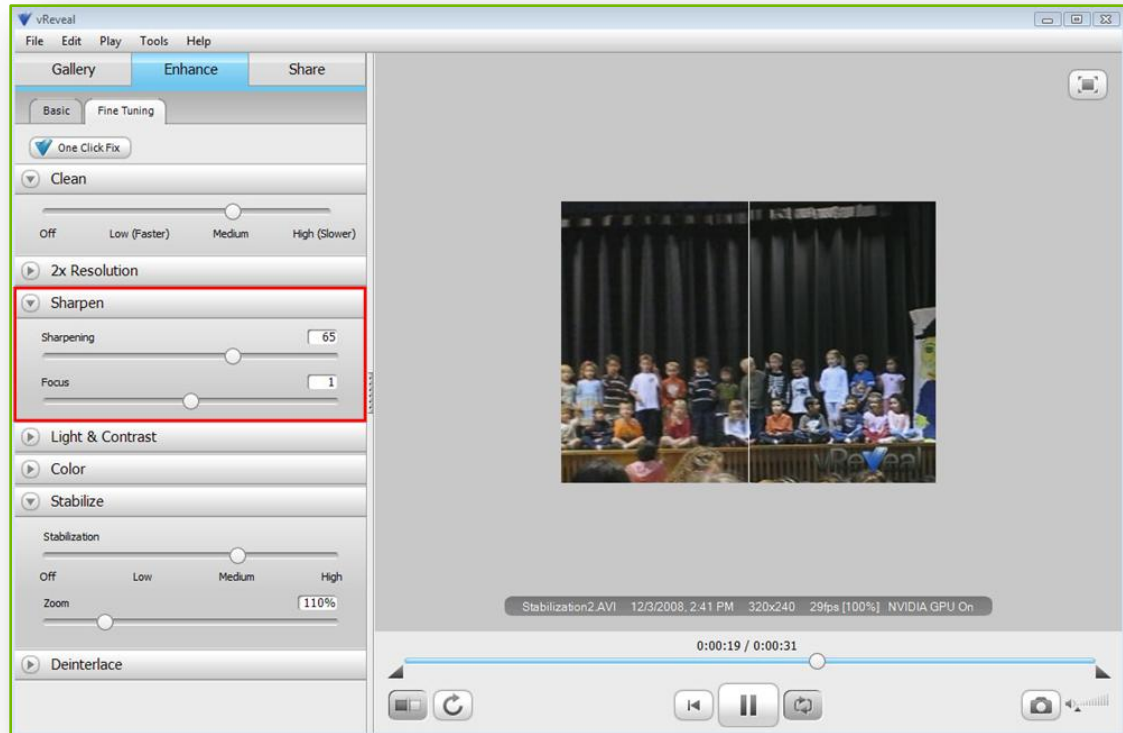
3. Also from Basic, apply **Stabilize** to remove jitter.

4. Point out preview frame rate in the upper-right and CPU utilization from Windows task manager. Turn off GPU usage from Movie --> Use GPU (or CTRL+G shortcut) and watch preview frame rate go down and utilization go up.

Demo 3: Darky and Noisy Music Scene

1. Open File **musician-ORIGINAL.AVI**. It is a completely dark video of guitar-playing musician.
2. Raise **Fill Light** to reveal the image from the blackness. Point out the level of noise has also been dramatically increased. You can also use Auto-Contrast to contrast the image further out of the darkness. If using Auto-contrast, do not use fill light in this scene.
3. Apply **Clean** to remove majority of the noise.

4.   Apply split-screen for dramatic before vs. after.
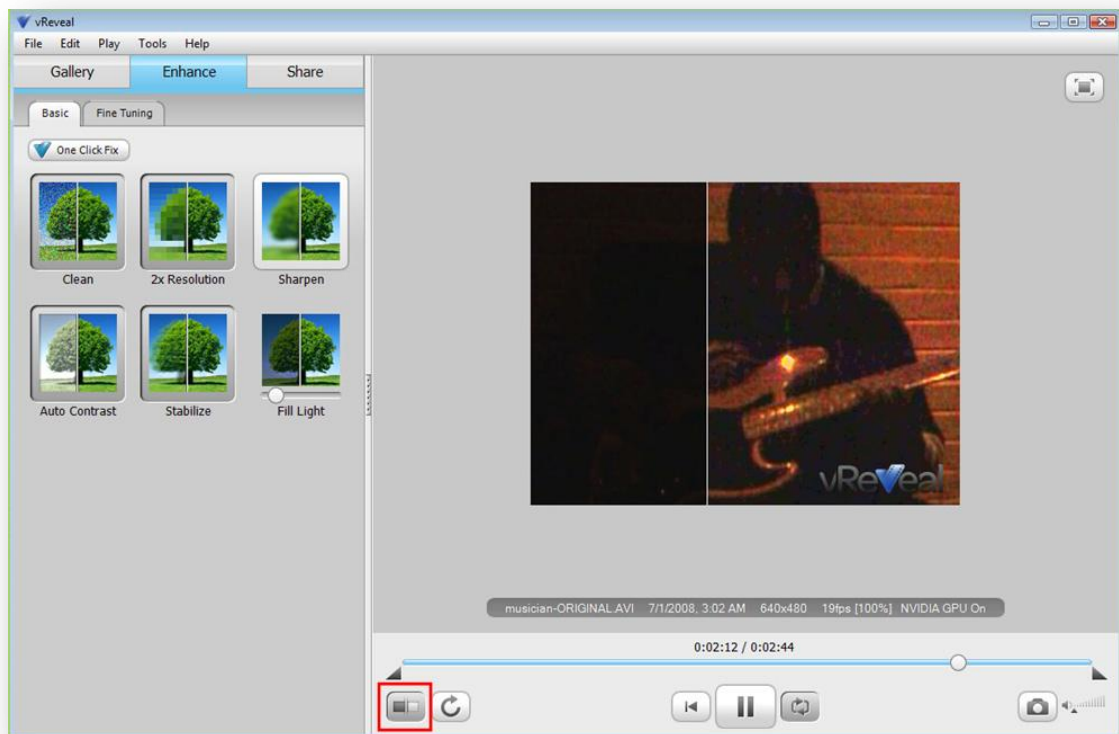
Nero Move it

Simply transfer your music, videos, and photos to enjoy online or on portable devices.

Nero Move it solves one of the most common problems facing consumers today – too many devices and too many pieces of digital content in a range of file formats that simply aren't compatible. Nero Move it is the first product of its kind providing one hassle-free solution for consumers and the fastest way to transfer content from device-to-device.

NVIDIA CUDA support

Nero Move it v1.5 now features NVIDIA® CUDA-accelerated video encoding when transcoding files to AVC/H.264 format.

Review Copy

If you would like to test the CUDA functionality of Nero Move it, please contact Nero directly using the contact information below:

> **Narine Galstian**
> Senior Vice President, Marketing
> ngalstian@nero.com

Testing with Nero Move it

Complete instructions for testing MotionDSP vReveal can be found in the ***Nero_MoveIt_CUDA_ION_Benchmark_Guide.PDF*** file located on the press FTP.

NVIDIA ION Graphics Processor

Specifications

Product Name:　　　NVIDIA® ION™ graphics processor

Family Name:　　　NVIDIA® ION™

Table 3: NVIDIA ION Graphics Processor Specifications

Memory Interface	DDR3-1066 DDR2-800
DirectX 10 Support	Yes
Graphics Cores	16
Core/Shader Clocks	450/1100 MHz
Texture Fill Rate	3.6 Billion/second
Max. Anti-Aliasing (AA) Sample Rate	16x
RAMDACs	300MHz
Max. High-Dynamic Range (HDR) Precision	128-bit
Max. Analog Resolution	2048 x 1536
Max Digital Resolution	2560 x 1600
NVIDIA PureVideo® HD	Yes With Full HD decode (1080i/p)
Display options	HDMI, dual-link DVI, DP, or VGA (any 2)
PCI-Express 2.0	20 lanes 1 x16 4 x1
SATA drives	6
SATA speed	3Gb/s
RAID	0,1
Networking	10/100/1000
USB ports	12 / 2C

PCI Slots	5
Audio	HDA (Azalia)

Block Diagram

Figure 8: NVIDIA ION Graphics Processor Block Diagram

ASRock ION Architecture

DC-in
S/PDIF Optical
HD 5.1 Audio
Gigabit Ethernet
6 x USB 2.0
HDMI with HDCP
System Fan
VGA
High Gloss Paint
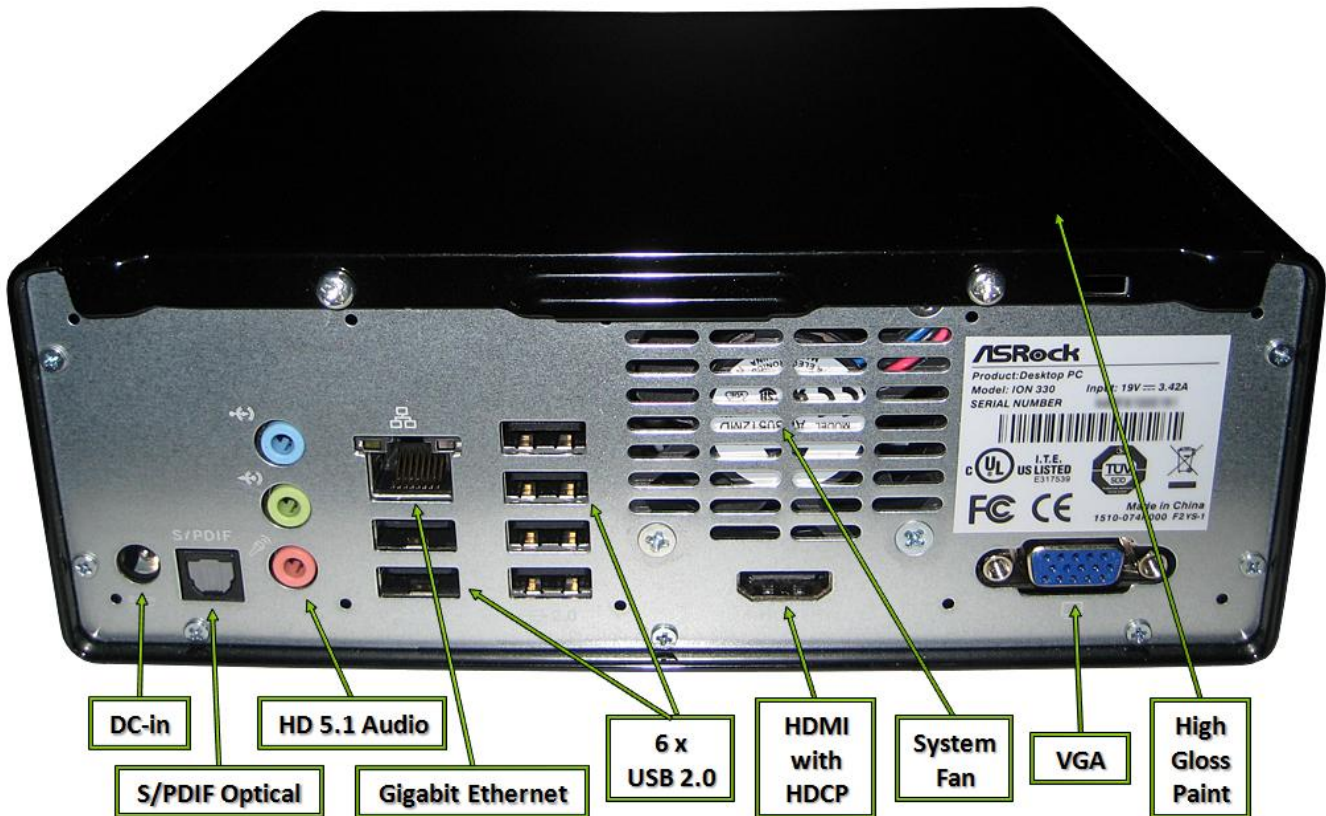
Figure 9: ASRock ION System Connectors

ION Media and Communications Processor

The NVIDIA ION Platform is powered by the NVIDIA® GeForce® 9400 GPU, that transforms low-cost Intel Atom-based PC designs into a premium experience. It is fully Windows Vista Premium compliant, and supports Premium DirectX 10 graphics with advanced digital display connectivity. Below are the features built into the NVIDIA GeForce 9400 GPU that powers the ION platform:

16 Dedicated GPU Cores

NVIDIA GeForce 9400 GPUs for Intel redefine the entry-level PC gaming experience. With a revolutionary unified architecture and 16 dedicated GPU cores, they deliver unprecedented performance and detailed environments.

NVIDIA® CUDA™ technology

The 16 parallel processors built into ION are harnessed by CUDA™ Software to accelerate a broad range of compute intensive applications, vastly improving your PC's ability to work with visual content such as video encoding.

Full Microsoft DirectX 10 Support

A DirectX 10 GPU with full Shader Model 4.0 support delivers unparalleled levels of graphics realism and film-quality effects. NVIDIA® ION graphics processors include 16 dedicated graphics cores to deliver the best visual experience.

Built for Microsoft Windows Vista

The fourth-generation NVIDIA GPU architecture built for Vista offers the best possible experience with Windows Aero 3D graphical user interface.

NVIDIA Lumenex™ Engine

Delivers stunning image quality and floating point accuracy with ultra-fast frame rates and a blistering 3.6 billion/second texture fill rate.

16× Antialiasing Technology

High-quality antialiasing at up to 16× sample rates obliterates jagged edges.

128-bit Floating Point High Dynamic-Range (HDR) Lighting

Twice the precision of prior generations for incredibly realistic lighting effects—now with support for anti-aliasing.

OpenGL 2.0 Optimizations and Support

Ensures top-notch compatibility and performance for OpenGL applications.

300 MHz RAMDAC

Blazing-fast RAMDAC supports display with high, ergonomic refresh rates up to and including 2048 × 1536 at 75 Hz.

NVIDIA® nView® Multi-Display Technology

Advanced technology provides the ultimate in viewing flexibility and control for multiple digital and analog monitors.

NVIDIA® PowerMizer® System Extensions

The dedicated PowerMizer® microcontroller intelligently monitors application and device activity to seamlessly adapt performance to suit the task at hand. By matching the performance to the application, PowerMizer ensures the ION graphics processor provides the longest battery life possible.

NVIDIA® PureVideo® HD Technology

NVIDIA ION graphics processors include a dedicated PureVideo® HD processor that offloads all the complex and demanding video decoding from the power-hungry CPU. With this purpose-built HD video post processing engine, ION processors bring clear and crisp 1080p high-definition video to life, with true-fidelity 7.1 audio, accurate color, and precise image scaling for movies and video while using less power for longer viewing on-the-go.

High-Definition H.264, VC-1, and MPEG-2 Hardware Acceleration

100% hardware decode of all H.264, VC-1, and MPEG-2 video frees CPU bandwidth for other tasks.

Integrated HDMI™ technology with HDCP

On system HDMI connector designed to meet the output protection management (HDCP) and security specifications of the Blu-ray Disc and HD DVD formats, allowing the playback of encrypted movie content on PCs when connected to HDCP-compliant displays.

Spatial-Temporal De-Interlacing

Smoothes video and DVD playback on progressive displays to deliver a crisp, clear picture that rivals high-end home theater systems.

Video Scaling and Filtering

High-quality scaling and filtering technology delivers a clear, clean image at any window size, including full-screen HDTV resolutions.

Inverse Telecine (3:2 & 2:2 Pulldown Correction)

Recovers original film images from films-converted-to-video (DVDs, 1080i HD content), providing more accurate movie playback and superior picture quality.

Bad Edit Correction

When videos are edited after they have been converted from 24 to 25 or 30 frames, the edits can disrupt the normal 3:2 or 2:2 pulldown cadence. PureVideo uses advanced processing techniques to detect poor edits, recover

the original content, and display excellent picture detail frame after frame for smooth, natural looking video.

Contrast and Color Enhancement

PureVideo Contrast and Color Enhancement Controls help make actors' faces appear natural, rather than washed out and pale, when playing videos on LCD and CRT displays. Display gamma correction ensures videos are not too dark, overly bright, or washed out regardless of the video format or display.

HD Movie Player Integration

PureVideo HD technology powers the world's leading HD movie player software applications, providing the optimal HD DVD and Blu-ray movie experience. The dedicated video processor supports full HD decode at 1080i/p resolutions.

High Definition Audio (HDA)

High definition audio brings consumer electronics quality sound to the PC delivering high quality sound from multiple channels. Using HDA, systems can deliver 192 kHz/32-bit quality for eight channels, supporting new audio formats.

NVIDIA Native Gigabit Ethernet Technology

The industry's fastest Ethernet performance eliminates network bottlenecks and improves overall system efficiency and performance.

Reference Scores

Reference Configuration

Table 4: Benchmark Reference Hardware/Software Configuration

Reference Configuration		ASRock® ION™ 330-BD	Intel® 945G D945GCLF2
System	Model	ASRock ION 330 Dual Core	Intel D945GCLF2 Dual Core 330
	System	ASRock ION	Intel D945GCLF2
	Northbridge	NVIDIA ION	Intel 945GC
	Southbridge	NVIDIA ION	ICH7
Processor	Model	Intel Atom 330 (Desktop)	Intel Atom 330 (Desktop)
	Speed	1.6 GHz	1.6 GHz
	L2 Cache per core	512 KB	512 KB
	# of Cores	2 (Double)	2 (Double)
Memory	Memory Type	DDR2	DDR2
	Size/ Config (MB)	2 x 1024 (2048 MB)	1 x 2048 MB
	Speed (MHz)	800 MHz	533 MHz
	Tcl	5	4
	Trcd	5	4
	Trp	5	4
	Tras	18	12
	Trc	23	16
	1T/2T	2T	2T
	Channels	Dual	Single
GPU	Driver	NVIDIA GeForce 186.18 Release	15.8.3.1504
OS	Version	Windows Vista Ultimate x86 SP1	Windows Vista Ultimate x86 SP1

Application / Synthetic Reference Scores

This section contains system application reference scores. Please use these results to compare with your own to ensure accurate numbers.

Table 5: Application & Synthetic Reference Scores

Application & Synthetic Reference Scores		ASRock® ION™ 330-BD	Intel® 945G D945GCLF2
3D Mark 2006 v. 1.1.0	**3DMark Score 10x7 - No AA,AF**	**1640**	**157**
	SM2.0 Score	615	72
	HDR/SM3.0 Score	653	**Does Not Run**
	CPU Score	818	786
	3DMark Score 12x10 - No AA,AF	**1388**	**139**
	SM2.0 Score	527	64
	HDR/SM3.0 Score	524	**Does Not Run**
	CPU Score	819	791
	3DMark Score 16x12 - No AA,AF	**1163**	**130**
	SM2.0 Score	442	60
	HDR/SM3.0 Score	423	**Does Not Run**
	CPU Score	816	789
3D Mark Vantage v. 1.1.0	**3DMark Score entry (1024x768, 1x/1x)**	**2483.51**	**DX10 Not Supported**
	Game Score	**2956**	**DX10 Not Supported**
	Game1 (Jane Nash)	**8.3**	**DX10 Not Supported**
	Game2 (New Calico)	**9.1**	**DX10 Not Supported**
	CPU Score	**1679**	**DX10 Not Supported**
	CPU1 (plans/s)	**229.3**	**DX10 Not Supported**
	CPU2 (steps/s)	**2.3**	**DX10 Not Supported**
	Texture Fill	**50.2**	**DX10 Not Supported**
	Color Fill	**0.4**	**DX10 Not Supported**
	POM	**1.6**	**DX10 Not Supported**
	GPU Cloth	**3.7**	**DX10 Not Supported**
	GPU Particles	**2.8**	**DX10 Not Supported**
	Perlin Noise	**2.2**	**DX10 Not Supported**

Application & Synthetic Reference Scores		ASRock® ION™ 330-BD	Intel® 945G D945GCLF2
	3DMark Score performance (1280x1024, 1x/1x)	404	DX10 Not Supported
	Game Score	323	DX10 Not Supported
	Game1 (Jane Nash)	0.9	DX10 Not Supported
	Game2 (New Calico)	1.0	DX10 Not Supported
	CPU Score	1693	DX10 Not Supported
	CPU1 (plans/s)	229.9	DX10 Not Supported
	CPU2 (steps/s)	2.4	DX10 Not Supported
	3DMark Score performance (1280x1024, 1x/1x) PhysX Enabled	403	DX10 Not Supported
	Game Score	312	DX10 Not Supported
	Game1 (Jane Nash)	0.8	DX10 Not Supported
	Game2 (New Calico)	1.0	DX10 Not Supported
	CPU Score	3395	DX10 Not Supported
	CPU1 (plans/s)	224.6	DX10 Not Supported
	CPU2 (steps/s)	10.7	DX10 Not Supported
Kribibench 1.1	Textured Spongeexplo (FPS)	1.96	1.93
	Textured Ultra (FPS)	0.65	0.61
Lame 3.97	MB/sec	0.76	0.77
Movie Maker	Average Encode Time (sec)	133	142
PCMark 2005 Professional v1.2	PCMarks	2222	2102
	CPU	1924	1874
	Memory	2285	2323
	Graphics	1783	702
	HDD	4902	4670
PCMark Vantage	PCMark Suite	1818	0
	Memories Suite	1414	479
	TV and Movies Suite	1531	1333
	Gaming Suite	1709	App Crashed
	Music Suite	1829	1487
	Communications Suite	1374	1454
	Productivity Suite	1608	1799
	HDD Test Suite	3385	3409
POV-Ray 3.6	Pixels Per Second	829.63	821.61
RazorLame 1.1.5	MB/sec	0.92	0.92
SiSoftware Sandra 2009	Dhrystone ALU (MIPS)	8	8
	Whetstone iSSE3 (GFLOPS)	7	7
	Memory Bandwidth: Integer (GB/s)	3	3

Application & Synthetic Reference Scores		ASRock® ION™ 330-BD	Intel® 945G D945GCLF2
	Memory Bandwidth: Float (GB/s)	**2.7**	2
	Cache/Memory Bandwidth (GB/s)	**7.3**	5.6
	Memory Latency: Random Access (ns)	**145**	190
WinAce 2.11	MB/sec	**72.66**	79.28
WINSAT	Video Mem BandWidth (MB/sec)	**2663.10**	1202.45
	Direct3D9 Alpha Blend Perfomance	**29.82**	11.06
	Direct3D9 Texture Load Perfomance	**63.33**	8.07
	Direct3D9 ALU Perfomance	**4.6**	4.4
	Memory score	**4.3**	**4.3**
	Cpu score	4.1	**4.2**
	Cpu EncDec score	**4.5**	4.4
	Video encode score	**4.0**	2.3
	Graphics score	**4.8**	3.0
	Gaming score	**5.4**	**5.4**
	Disk score	**4.6**	4.4

Game Reference Scores

This section contains system game reference scores. Please use these results to compare with your own to ensure accurate numbers.

Table 6: Game Reference Scores

Game Reference Scores Average Frames per Second (FPS)		ASRock® ION™ 330-BD	Intel® 945G D945GCLF2	% DIFF
Company of Heroes: Opposing Fronts v2.3 (DX10)	800 x 600	**30.7**	**Game Crashed**	—
	1024 x 768	**28.1**	**Game Crashed**	—
	1280 x 1024	**24.1**	**Game Crashed**	
Doom 3 (OpenGL)	800 x 600	**28.1**	4.4	**538.6%**
	1024 x 768	**27.9**	3.8	**634.2%**
	1280 x 1024	**27.5**	3.1	**787.1%**
Half-Life 2	800 x 600	**30.6**	**Game Crashed**	—

Game Reference Scores Average Frames per Second (FPS)		ASRock® ION™ 330-BD	Intel® 945G D945GCLF2	% DIFF
	1024 x 768	24.7	Game Crashed	—
	1280 x 1024	24.1	Game Crashed	—
Left 4 Dead	800 x 600 – Indoor	35.9	Game Crashed	—
	1024 x 768 – Indoor	35.6	Game Crashed	—
	1280 x 1024 – Indoor	28.1	Game Crashed	—
	800 x 600 – Outdoor	25.0	Game Crashed	—
	1024 x 768 – Outdoor	29.1	Game Crashed	—
	1280 x 1024 – Outdoor	25.4	Game Crashed	—
Lego: Batman	800 x 600	208.4	56.5	268.8%
	1024 x 768	183.3	54.8	234.5%
	1280 x 1024	146.0	51.7	182.4%
Portal	800 x 600	45.0	11.1	305.4%
	1024 x 768	43.1	10.1	326.7%
	1280 x 1024	30.7	7.7	298.7%
Quake 4 (OpenGL)	800 x 600	26.8	5.7	370.2%
	1024 x 768	26.6	5.7	366.7%
	1280 x 1024	26.3	5.3	396.2%
Sims 3	800 x 600	65.4	9.7	583.5%
	1024 x 768	55.8	9.2	476.1%
	1280 x 1024	45.0	8.7	418.4%
Splinter Cell Chaos Theory	800 x 600	47.1	Game Crashed	—
	1024 x 768	41.0	Game Crashed	—
	1280 x 1024	27.8	Game Crashed	—
	800 x 600	46.8	Game Crashed	—
	1024 x 768	39.2	Game Crashed	—
	1280 x 1024	27.2	Game Crashed	—
Supreme Commander	800 x 600 – Low	39.9	Game Crashed	—
	1024 x 768 – Low	34.2	Game Crashed	—
	1280 x 1024 – Low	25.3	Game Crashed	—
	800 x 600 – Composite Score	11865.0	Game Crashed	—
	1024 x 768 – Composite Score	11621.0	Game Crashed	—
	1280 x 1024 – Composite Score	10763.0	Game Crashed	—
Wall-E	800 x 600	34.7	16.5	110.3%
	1024 x 768	31.3	9.8	219.4%
	1280 x 1024	21.8	7.1	207.0%

Benchmarking Guide

Benchmarking Essentials

Windows XP vs. Vista

When comparing a Windows XP-based netbook to ION with Windows Vista, keep in mind that Vista requires a larger memory footprint.

TDR RegKey

The TDRDelay is the number of seconds that the GPU is allowed to delay the preempt request from the scheduler. This is effectively the timeout threshold.

It is important to set the TDRDelay registry key to 300 to get the most performance out of 3DMark Vantage.

Use the following instructions to do this:

1. Copy the following text into a .TXT file called "tdr.txt".

   Windows Registry Editor Version 5.00
   [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\GraphicsDrivers]
   "TdrDelay"=dword:00000300

2. Rename the "tdr.txt" file to "tdr.reg"

3. Place the file on the desktop and double-click it. This will modify the registry entry.

Clean Uninstall of NVIDIA GeForce Drivers

NVIDIA always recommends uninstalling older drivers before installing new ones, especially when testing on a drive image that was previously used on another platform.

Use registry and driver cleaning tools such as Driver Cleaner to remove pre-installed driver remnants, and/or follow these steps:

1. Uninstall NVIDIA driver using one of two methods:

a. Open **Control Panel**, then open **Programs and Features**, select **NVIDIA Drivers**, choose **remove only the following**, and select **NVIDIA Display Driver**.

Or

b. Right click on **Desktop**, select **Personalize**, then **Display Settings**, then click the **Advanced Settings** button, then the **Properties** button, and finally the **Uninstall** button.

2. After uninstalling the NVIDIA driver, reboot into standard Microsoft VGA driver mode

3. Go to **Start** > **Run** > and type **"regedit"**—select HKey Local Machine/System/CurrentControlSet/Control/Video and delete ALL keys. Also go into HKey Local Machine/System/ControlSet001, 002, 003 (if they exist), and delete any keys down the /Control/Video paths similar to above.

4. Install the latest driver from NVIDIA.COM

5. Reboot

Benchmarking with FRAPS

Many benchmarks require the use of FRAPS, a utility that allows you to benchmark applications and games that do not have a built-in benchmark mode. FRAPS displays the frame rate in a corner of the screen for DirectX or OpenGL games. It manually determines the average frame rate between two points in a game, and sends the results to a text file.

The problem encountered when testing with FRAPS is that it is difficult to set up a test that will be consistent and repeatable. Because you have to start and stop FRAPS manually, it is nearly impossible to begin and end the benchmark at the exact same frame every time.

The same scene must be used on every card you test to ensure an equal amount of work is done, so it is best to use games that have the ability to save segments of the game or to test cut scenes to ensure repeatable results. You should also use segments that are one minute in length or longer for best results.

Note: There is a small overhead associated with drawing the frame rate on screen, generally a loss of 1 FPS (1% to 2% of the total). This may vary depending on your system configuration. You can turn the FPS display off to avoid the overhead.

Obtaining FRAPS

You can obtain a copy of FRAPS from: **http://www.fraps.com**

Using FRAPS
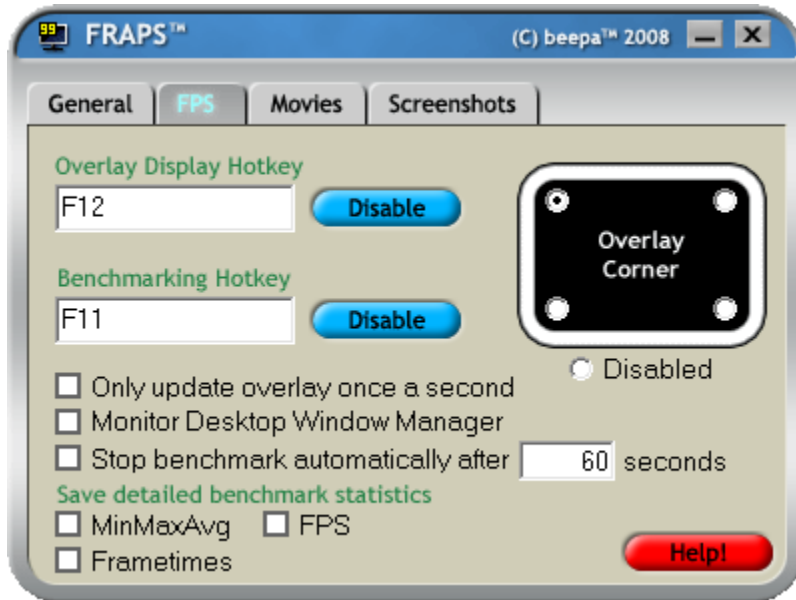
1. Double-click the FRAPS icon to start the utility

2. Launch the game to be benchmarked

3. Start the game or load a save game

4. Start measuring the frame rate by pressing F11

5. Play the game for at least 60 seconds

6. Stop measuring the frame rate by pressing F11 again

Performance data (average frame rate) is located within the FRAPS.LOG file located in the utility's installed directory

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