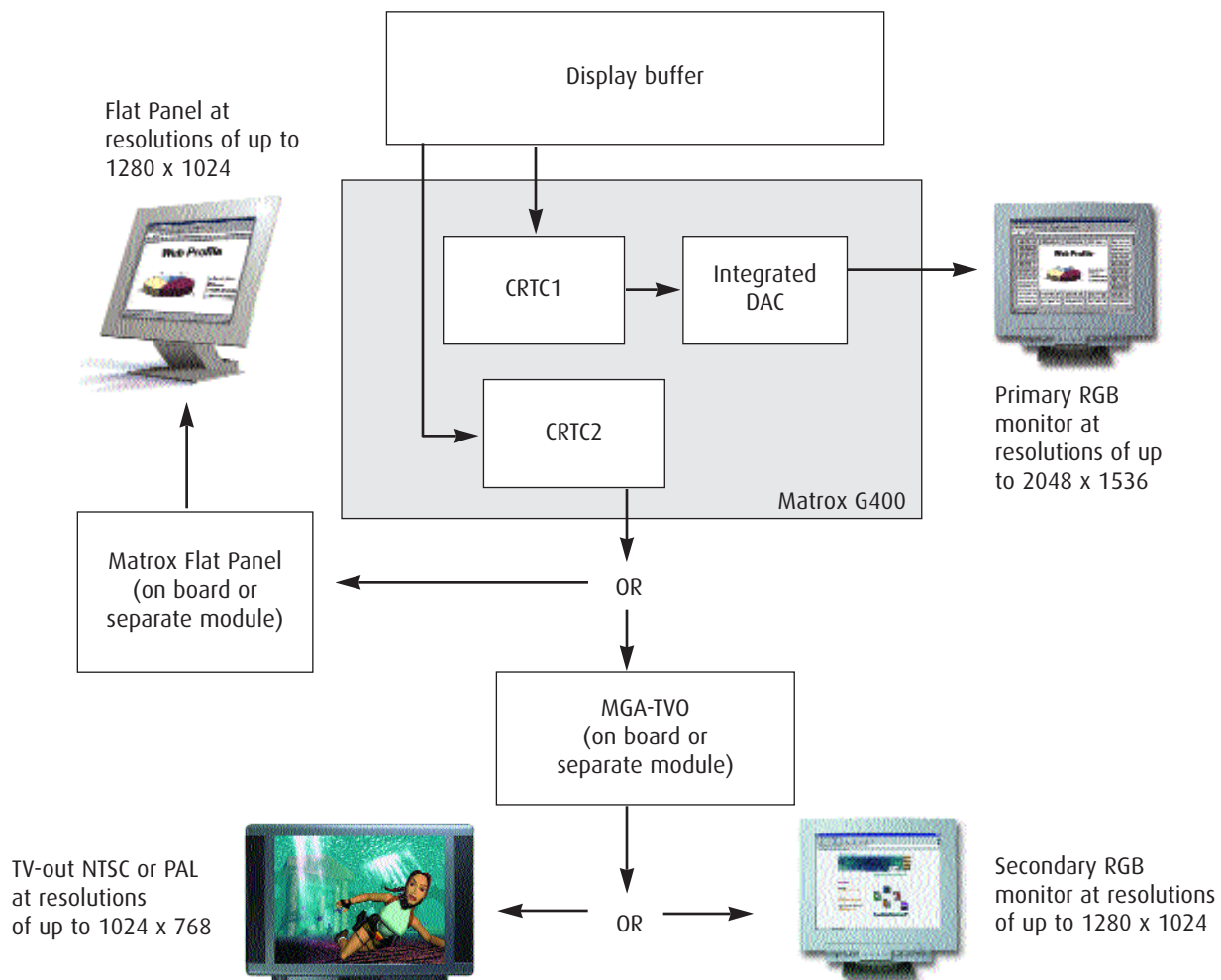# Matrox *G400*

A versatile display solution

Offering a wide range of display possibilities, the Matrox DualHead Display has the potential to revolutionize the way people use their computers, both for productivity and entertainment. DualHead Display is a new technology in the Matrox G400 which allows a single chip to ouput two physically separate images simultaneously to two different output devices. The DualHead Display is quite versatile in its ability to support simultaneous output either to two RGB monitors, to an RGB monitor and a television set, to an RGB monitor and a Digital Flat Panel or to two analog Flat Panels. DualHead Display takes advantage of a key new Windows 98 feature which allows a single board to support a Windows desktop spanning multiple monitors. In addition, unique features of DualHead Display will enhance the end user experience with DVD viewing, design applications, video editing, web browsing, home imaging and gaming.

FIGURE 1 The various configurations supported by the Matrox DualHead Display

Flat Panel at resolutions of up to 1280 x 1024

Display buffer

CRTC1

Integrated DAC

CRTC2

Matrox G400

Primary RGB monitor at resolutions of up to 2048 x 1536

Matrox Flat Panel (on board or separate module)

OR

MGA-TVO (on board or separate module)

TV-out NTSC or PAL at resolutions of up to 1024 x 768

OR

Secondary RGB monitor at resolutions of up to 1280 x 1024

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The Matrox G400 contains two separate Cathode Ray Tube Controllers (CRTCs) that form the basis of the DualHead Display capabilities. These two CRTCs can fetch data independently from different locations in the display buffer or AGP memory. In addition, the two CRTCs can read the same image at different refresh rates.

The primary CRTC is connected to the integrated up to 300 MHz RAMDAC in the Matrox G400 for high-quality output to an RGB monitor. The second CRTC can be connected to either the Matrox MGA-TVO chip or to a Digital Flat Panel Transmitter. The Matrox MGA-TVO chip is a high-quality video encoder which can output NTSC or PAL to a television set. In addition, the MGA-TVO is capable of outputting an RGB stream of up to 1280 x 1024, 32bpp at 60Hz to a second RGB monitor.

The following are some of the unique new computing environments enabled by the Matrox G400's DualHead Display:

A larger Windows desktop for an immersive Windows 98/2000 experience

Many consumers have upgraded to new computer systems equipped with 17"+ monitors and have held onto a perfectly good 14" or 15" monitor from an older system. With DualHead Display, both monitors can now be attached to a single Matrox G400-based board, meaning that the Windows 98 desktop will span both monitors for a larger viewing area. This gives users the ability to work more easily with multiple applications. Gamers will benefit from this feature because they can track Internet download status on a secondary monitor while playing a 3D game on the primary monitor, for example. Design professionals who use software such as Adobe Photoshop will appreciate the larger working environment provided by two monitors and will configure their working environment to display the canvas on the more expensive monitor and the toolbars on the secondary monitor.

DVD-Out to TV plus RGB desktop

DualHead Display enables all video streams, including DVD, to be displayed full-screen out to TV while leaving the fully workable Windows desktop on the user's primary monitor. This means that an end user could work on home finances and browse the web, for example, as they usually would on a primary monitor while watching DVD content on a television set. It is worth noting that because most video content is natively interlaced, it will actually look sharper on a television set than on a non-

interlaced RGB monitor. Besides DVD, other interesting video streams include news broadcasts (from a separate TV tuner) or video created in a video editing application. Two people could even use the same computer, with one person surfing the Internet on the primary display while the second person watches a DVD movie on TV, without any sacrifice in quality for either display.

No more flicker in TV-Out mode

One of the most important advantages of DualHead Display is its ability to output the same image to an RGB monitor and a TV, but at different refresh rates. This eliminates flicker. It also solves an annoying limitation of current 'out-to-TV' solutions where the primary monitor would have to be run at 50Hz or 60Hz to support PAL or NTSC out to TV. At such low refresh rates, users have to endure flicker on the primary display. However, with Matrox's DualHead Display technology, the primary display can be set at comfortable refresh rates, such as 100Hz, while sending the same desktop out to TV. Combined with the unique ability of the MGA-TVO video encoder chip to downscale high resolution desktops to NTSC or PAL, the end user can now output their 1024 x 768, 32bpp, 100Hz Windows desktop or 3D game to their television set.

Enhanced web browsing & home imaging

A unique feature of DualHead Display allows the user to select any region of any size on their Windows desktop and have it zoom full-screen with high quality filtering so that it appears full-screen on their secondary output. This feature is particularly useful for web browsing where thumbnail JPEGs can be zoomed full screen for easier viewing. DualHead Display also enhances the use of digital cameras and scanners for home imaging applications. With DualHead Display, specific regions of digital photographs or scanned images can be zoomed and manipulated inside the user's favorite photo editing software. Design professionals will benefit from this feature in applications such as Adobe Photoshop where pixels can be zoomed to the second display for retouching.

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RGB display plus Video-In directly on TV
DualHead Display also offers a special bypass mode whereby any video stream input to the computer can be displayed full-screen directly on the television set while the full Windows desktop is displayed on the primary RGB monitor. In the past, when an end user wanted to grab video from their camcorder, they would have no way of seeing the content of the stream during the actual grab. This bypass feature of DualHead Display rectifies the problem and results in simpler and more powerful video editing.

RGB display plus Digital Flat Panel output
Compatible with next-generation Digital Flat Panels, the Matrox G400 can support a Digital Flat Panel as the primary or secondary output. The Matrox G400 can also support two analog flat panels simultaneously for a desktop size of up to 2560 x 1024.
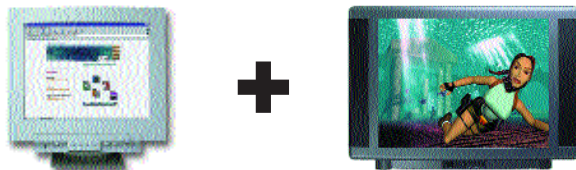
Two RGB displays

An RGB display and Digital Flat Panel

An RGB display and a TV

Two analog Flat Panels

DVD Playback

The Matrox G400 is capable of high-quality DVD playback at full resolution and frame rate, with low CPU utilization. It includes a variety of features, such as sub-picture blending, aspect ratio scaling and full-screen output to TV, that allow it to closely match the end user experience of a hardware DVD solution.

The Matrox G400 offers full hardware alpha-blended sub-picture support for the highest quality DVD playback. Like hardware DVD players, the Matrox G400 is capable of real-time aspect ratio conversion, allowing users to display 16:9 encoded DVD content full screen on standard 4:3 aspect ratio television sets. This feature eliminates the black borders at the top and bottom of the television set that would otherwise result from displaying 16:9 letterbox content on the 4:3 aspect ration television.

Using the Matrox G400's unique DualHead Display feature, users can output full screen video streams to TV independent of the Primary RGB display. This means that DVD video can be displayed full-screen out to TV while leaving the fully workable Windows desktop on the primary monitor. As a result, end users can use other applications, such as email and web browsers, on their primary monitor while watching DVD content on their television set. Alternatively, another person could be watching a DVD movie on the television, while the primary user works on the RGB desktop. Also, since most video content is natively interlaced, it will actually look sharper on a television than a non-interlaced RGB monitor. Without DualHead Display, users lose the use of the desktop when running DVD full-screen because the DVD window covers the entire desktop. When this is the case, it is not possible to utilize any of the CPU headroom available during DVD playback.

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