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NVIDIA Quadro Grayscale Solutions

Medical and Diagnostic Imaging

NVIDIA Quadro Grayscale Solutions

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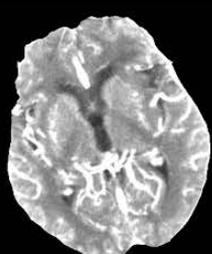


Medical or scientific imaging often requires more than 256 shades of gray

- 8-bit delivers up to 256 shades of gray
- 10-bit delivers up to 1,024 shades of gray
- 12-bit delivers up to 4,096 shades of gray

Human eyesight routinely perceives superior image quality with 10- or 12-bit displays

NVIDIA Quadro by PNY products enjoy wide acceptance in the grayscale ecosystem



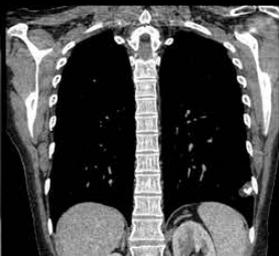
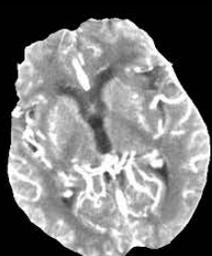
NVIDIA Quadro Grayscale System Requirements

Microsoft Windows

- Windows XP currently supports 10- or 12-bit grayscale imaging
- Windows 7 support in driver release 276.28 or later

Applications Programming Interface (API) support

- Grayscale software must be written to the OpenGL API



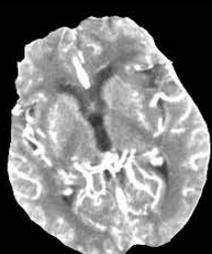
NVIDIA Quadro Grayscale Products

Best in class performance and grayscale support

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Quadro 6000 VCQ6000-PB		Recommended for medical and scientific imaging applications that require processing of massive 2D grayscale images and complex 3D geometries Requires DisplayPort to DVI-DL adapter to drive 10MP displays
Quadro 5000 VCQ5000-PB		Recommended for medical and scientific imaging applications that require processing of large 2D grayscale images and complex 3D geometries Requires DisplayPort to DVI-DL adapter to drive 10MP displays
Quadro 4000 VCQ4000-PB		Recommended for medical and scientific imaging applications that integrate 3D data with 2D grayscale images Requires DisplayPort to DVI-DL adapter to drive 10MP displays
Quadro 2000D VCQ2000D-PB		Recommended for most medical and scientific imaging display applications Dual DVI-DL connectors can drive 10- or 12-bit grayscale displays at resolutions up to 10MP No auxiliary power required



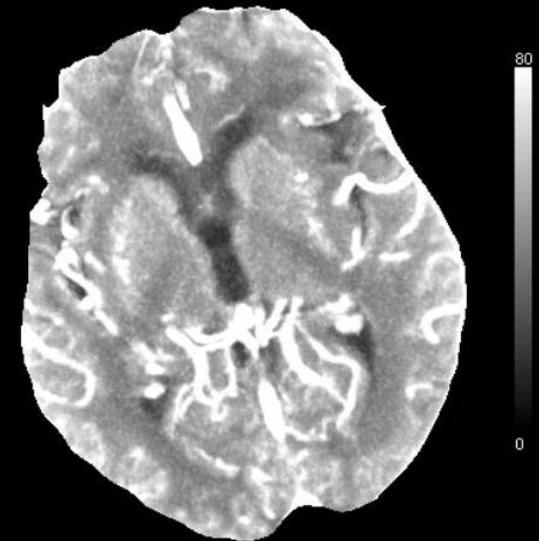
NVIDIA Quadro Grayscale Products

Specifications at a glance

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	Quadro 2000D	Quadro 4000	Quadro 5000	Quadro 6000
				
CUDA Cores	192	256	352	448
GPU Memory	1GB GDDR5	2GB GDDR5	2.5GB GDDR5 ECC	6GB GDDR5 ECC
Memory Width	128-bit	256-bit	320-bit	384-bit
Memory Bandwidth	41.6GB/sec	89.6GB/sec	120GB/sec	144GB/sec
PCI-Express	x16 Gen 2	x16 Gen 2	x16 Gen 2	x16 Gen 2
Precision	FP64 IEEE 754	FP64 IEEE 754	FP64 IEEE 754	FP64 IEEE 754
Display Connectors	2 DVI-DL	2 DP + DVI-DL + ST	2 DP + DVI-DL + ST	2 DP + DVI-DL + ST
Maximum Power	62W	142W	152W	204W



NVIDIA Quadro 2000D by PNY

Built for diagnostic imaging

Frame Buffer	1GB GDDR5
Memory Interface	128-bit
Memory Bandwidth	41.6GB/sec
CUDA Processor Cores	192
Max Power Consumption	62W
Number of Slots	1
DVI Dual-Link	2
3D Vision Pro	Yes (USB)
DirectX	11.0
Shader Model	5.0
OpenGL	4.1
Thermal	Active Fansink
MSRP	\$599
PNY Part Number	VCQ2000D-PB



Item Includes

DVI to VGA adapters (2)

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NVIDIA Quadro 4000 by PNY

Interactively view and process diagnostic images

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Frame Buffer	2GB GDDR5
Memory Interface	256-bit
Memory Bandwidth	89.6GB/sec
CUDA Processor Cores	256
Max Power Consumption	142W
Auxiliary Power	Yes
Number of Slots	1
Display Connectors	DVI-DL + DP + DP +ST
3D Vision Pro	Yes
DirectX	11.0
Shader Model	5.0
OpenGL	4.1
Thermal	Active Fansink
MSRP	\$1,199
PNY Part Number	VCQ4000-PB



Item Includes
DVI to VGA adapter DP to DVI Single-Link adapter ¹
Stereo connector bracket
Auxiliary power cable

¹ DisplayPort to DVI-DL adapter is strongly recommended for medical applications

NVIDIA Quadro 5000 by PNY

Diagnostic imaging and visualization engine

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Frame Buffer	2.5GB GDDR5 ECC
Memory Interface	320-bit
Memory Bandwidth	120GB/sec
CUDA Processor Cores	352
Max Power Consumption	152W
Auxiliary Power	Yes
Number of Slots	2
Display Connectors	DVI-DL + DP + DP +ST
3D Vision Pro	Yes
DirectX	11.0
Shader Model	5.0
OpenGL	4.1
Thermal	Active Fansink
MSRP	\$2,499
PNY Part Number	VCQ5000-PB



Item Includes
DVI to VGA adapter DP to DVI Single-Link adapter ¹
Auxiliary power cable



¹ DisplayPort to DVI-DL adapter is strongly recommended for medical applications

NVIDIA Quadro 6000 by PNY

Ultimate real-time diagnostic imaging processing

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Frame Buffer	6GB GDDR5 ECC
Memory Interface	384-bit
Memory Bandwidth	144GB/sec
CUDA Processor Cores	448
Max Power Consumption	204W
Auxiliary Power	Yes 2
Number of Slots	2
Display Connectors	DVI-DL + DP + DP +ST
3D Vision Pro	Yes
DirectX	11.0
Shader Model	5.0
OpenGL	4.1
Thermal	Active Fansink
MSRP	\$4,999
PNY Part Number	VCQ6000-PB



Item Includes
DVI to VGA adapter DP to DVI Single-Link adapter ¹
Two 6-pin auxiliary power cables

¹ DisplayPort to DVI-DL adapter is strongly recommended for medical applications

Quadro Plex Grayscale Solutions

Recommended for advanced visualization and projection use

	Quadro Plex 2200 D2	Quadro Plex 7000
CUDA Cores	480 240 per GPU	1024 512 per GPU
GPU Clock	610 MHz	1544 MHz
Memory Clock	800 MHz	2004 MHz
Memory Bandwidth	204 GB/s 102 GB/s per board	356 GB/s 178 GB/s per board
GPU Memory	8 GB 4 GB per board	12GB 6GB per board
Display Connectors	DVI-DL + DVI-DL + DP + Stereo	DVI-DL + DVI-DL + Stereo
3D Vision Pro	Yes	Yes
Desktop Orientation	Vertical	Horizontal
Stackable	No	Yes
Rackable	Yes Requires VCSRMK	Yes Requires VCSRMK7



Quadro Plex 2200 D2



Quadro Plex 7000

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Multi-GPU Solutions



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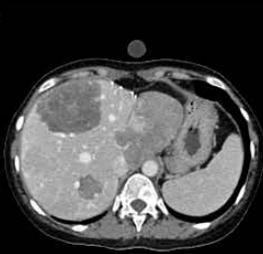
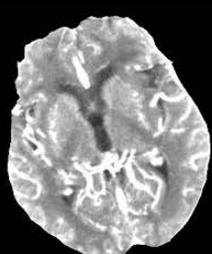
NVIDIA Quadro by PNY

Compatible with leading medical grayscale displays

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	Panel	Resolution	Grayscale Depth	Supported
NDS Surgical Imaging	Dome E2	1600 x 1200 at 60 Hz 1200 x 1600 at 60 Hz	10- and 12-bit	Yes
	Dome E3	2048 x 1536 at 60 Hz 1536 x 2048 at 60 Hz	10- and 12-bit	Yes
	Dome E5	2560 x 2048 at 50 Hz 2048 x 2560 at 50Hz	10- and 12-bit	Yes
	Dome Z10 10MP ¹	4096 x 2560 at 50 Hz 2560 x 4096 at 50 Hz	10- and 12-bit	Yes
	Dome Z10 5MP ²	2560 x 2048 at 50 Hz 2048 x 2560 at 50 Hz	10- and 12-bit	Yes
Eizo	GS 520	2560 x 2048 at 50 Hz 2048 x 2560 at 50 Hz	10-bit	Yes
NEC	MD205MG	2560 x 2048 at 57 Hz 2048 x 2560 at 57 Hz	10-bit	Yes
	MD205MG-1	2560 x 2048 at 57 Hz 2048 x 2560 at 57 Hz	10-bit	Yes
	MD213MG	2048 x 1536 at 60 Hz 1536 x 2048 at 60 Hz	10-bit	Yes
	MD21GS-3MP	2048 x 1536 at 60 Hz 1536 x 2048 at 60 Hz	10-bit	Yes
	MD21GS-2MP	1600 x 1200 at 60 Hz 1200 x 1600 at 60 Hz	10-bit	Yes
Wide	1F2105MP	2560 x 2048 at 50 Hz 2048 x 2560 at 50 Hz	10-bit	Yes



¹ Operating in 10MP mode

² Operating in 5MP mode

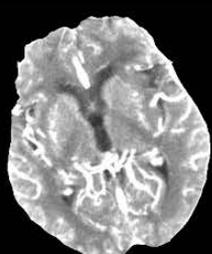
NVIDIA Quadro Display Connectors

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Supports unique NVIDIA grayscale pixel packing technology

DVI-SL DVI Single-Link DVI-DL DVI Dual-Link	
•	NVIDIA grayscale pixel packing technology allows up to 2560 x 2048 5MP images to be sent over a DVI Single-Link connector, which is normally restricted to 1920 x 1200
•	10MP grayscale images up to 4096 x 2560 are supported by NVIDIA pixel packing technology when two DVI Single-Link connectors are available
DisplayPort	
•	Requires DP to DVI adapter, a DVI-SL adapter is supplied with all DisplayPort Quadro products, a recommended 3 rd party DVI-DL adapter is strongly preferred for diagnostic imaging



Quadro Grayscale and Side Display Compatibility

		Grayscale Quadro GPU*				
		Quadro 2000D	Quadro 4000	Quadro 5000	Quadro 6000	Quadro Plex
Side Display NVS or Quadro GPU	NVS 295	✓	✓	✓	✓	✓
	NVS 300	✓	✓	✓	✓	✓
	NVS 420	✓	✓	✓	✓	✓
	NVS 450	✓	✓	✓	✓	✓
	Quadro FX 380 LP	✓	✓	✓	✓	✓
	Quadro 600	✓	✓	✓	✓	✓
	Quadro 2000D	✓	✓	✓	✓	✓
	Quadro 4000	✓	✓	✓	✓	✓
	Quadro 5000	✓	✗	✗	✗	✓
	Quadro 5000	✓	✗	✗	✗	✓



* System attributes such as PCIe slot availability will determine viable configurations, mixed GPUs must be G80 or later

NVIDIA Quadro Dual 5MP Display Configuration

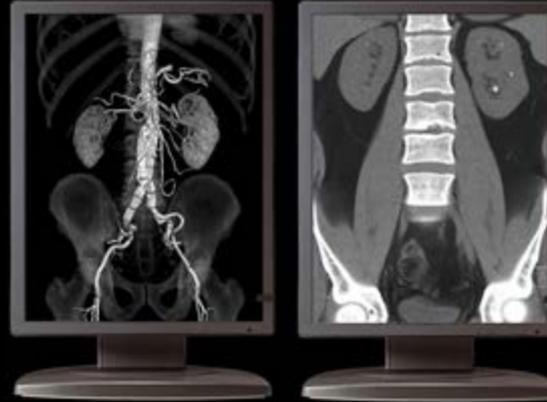
Side Display(s)



NVS or Quadro GPU



Grayscale Displays



Grayscale Quadro GPU



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- Generally a mid-range to high-end Quadro GPU drives two 5MP grayscale displays, one or more side displays are driven by an entry-level Quadro or NVS GPU based on PCIe x16 slot availability



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NVIDIA Quadro Dual 5MP Display Options

		System Configuration Parameters*
Total Resolution	10MP	5120 x 2048 landscape 4096 x 2560 portrait
Grayscale Display	Quadro 6000	PCIe x16 with open adjacent slot, optional DP to DVI-DL adapter (PNY 91008126) required
	Quadro 5000	PCIe x16 with open adjacent slot, optional DP to DVI-DL adapter (PNY 91008126) required
	Quadro 4000	PCIe x16, optional DP to DVI-DL adapter (PNY 91008126) required
	Quadro 2000D	PCIe x16 with dual DVI-DL connectors optimized for grayscale applications
Side Display PCIe x1	NVS 420	PCIe x1 version ideal for single x16 PCIe slot systems where x16 slot is occupied by grayscale GPU
	NVS 300	PCIe x1 version ideal for single x16 PCIe slot systems where x16 slot is occupied by grayscale GPU
	NVS 295	PCIe x1 version ideal for single x16 PCIe slot systems where x16 slot is occupied by grayscale GPU
Side Display PCIe x16	Quadro 4000	PCIe x16, recommended for systems with two or more PCIe x16 slots
	Quadro 2000D	PCIe x16, recommended for systems with two or more PCIe x16 slots
	Quadro 600	PCIe x16, recommended for systems with two PCIe x16 slots
	FX 380 LP	PCIe x16, recommended for systems with two PCIe x16 slots
	NVS 450	PCIe x16, recommended for systems with two PCIe x16 slots

- Generally a mid-range to high-end Quadro GPU drives two 5MP grayscale displays, one or more side displays are driven by an entry-level Quadro or NVS GPU based on PCIe x16 slot availability



* System attributes such as PCIe slot availability will determine viable configurations, mixed GPUs must be G80 or later

NVIDIA Quadro Quad 5MP Display Configuration

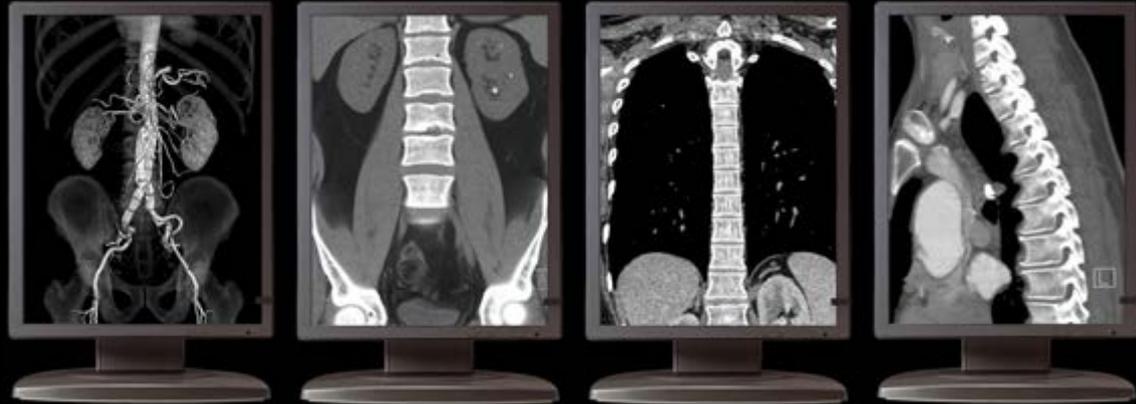
Side Display(s)



NVS or Quadro GPU



Grayscale Displays



Grayscale Quadro GPU 1



Grayscale Quadro GPU 2



- Generally two mid-range to high-end Quadro GPUs drive four 5MP grayscale displays, one or more side displays are driven by an entry-level Quadro or NVS GPU based on PCIe x16 slot availability



NVIDIA Quadro Quad 5MP Display Options

		System Configuration Parameters*
Total Resolution	20MP	10,240 x 2048 landscape 8192 x 2560 portrait
Grayscale Display	Quadro 6000 (2)	PCIe x16 with open adjacent slot, optional DP to DVI-DL adapter (PNY 91008126) required
	Quadro 5000 (2)	PCIe x16 with open adjacent slot, optional DP to DVI-DL adapter (PNY 91008126) required
	Quadro 4000 (2)	PCIe x16, optional DP to DVI-DL adapter (PNY 91008126) required
	Quadro 2000D (2)	PCIe x16 with dual DVI-DL connectors optimized for grayscale applications
Side Display PCIe x1	NVS 420	PCIe x1 version ideal for single x16 PCIe slot systems where x16 slot is occupied by grayscale GPU
	NVS 300	PCIe x1 version ideal for single x16 PCIe slot systems where x16 slot is occupied by grayscale GPU
	NVS 295	PCIe x1 version ideal for single x16 PCIe slot systems where x16 slot is occupied by grayscale GPU
Side Display PCIe x16	Quadro 4000	PCIe x16, recommended for systems with two or more PCIe x16 slots
	Quadro 2000D	PCIe x16, recommended for systems with two or more PCIe x16 slots
	Quadro 600	PCIe x16, recommended for systems with two PCIe x16 slots
	FX 380 LP	PCIe x16, recommended for systems with two PCIe x16 slots
	NVS 450	PCIe x16, recommended for systems with two PCIe x16 slots

- Generally two mid-range to high-end Quadro GPUs drive four 5MP grayscale displays, one or more side displays are driven by an entry-level Quadro or NVS GPU based on PCIe x16 slot availability



* System attributes such as PCIe slot availability will determine viable configurations, mixed GPUs must be G80 or later

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