"HOW is HP's NVIDIA Quadro fx 3800 different?"

A Navigation Chart for Graphics Card Cooling and Acoustics

The NVIDIA Quadro FX 3800 professional 3D graphics card delivers high-end workstation graphics for CAD, DCC and visualization applications. The NVIDIA Quadro FX 3800 replaces the NVIDIA Quadro FX 3700 to provide high-performance visual computing in a *single-slot* PCI-Express design. An important challenge to providing high-performance graphics within a single PCI-Express slot is designing a cooling solution to effectively manage the thermal requirements of the Graphics Processing Unit (GPU). Excessive heat can result in lower performance, shorter maximum life-span, and may produce intermittent problems such as system freezes or crashes.

Air cooling solutions utilize *heat sinks* to increase the surface area of the GPU and other components and improve cooling efficiency. Adding a fan assembly accelerates heat dissipation by increasing the amount of cooler, ambient air moving across the heat sink. While a cooling solution with a fan provides efficient cooling, it also generates noise by creating air turbulence. Higher fan speeds can create objectionable and distracting noise levels and tones. Working in tandem, the heat sink and fan must balance the need to remove generated heat with the need to minimize fan sound levels.

While NVIDIA's Quadro FX 4800 and Quadro FX 5800 share the same GPU architecture with the Quadro FX 3800, the FX 4800 and FX 5800 are *dual-slot* PCI-Express designs. A dual-slot graphics card can employ a thicker fan and heat sink that will not fit in a single-slot implementation. A thicker fan can move more air over the heat sink than a thinner fan running at an equivalent speed. Therefore, in order to dissipate a comparable amount of heat, the Quadro FX 3800's thinner fan potentially must run at higher speeds producing higher sound levels.

Generic NVIDIA Quadro FX 3800 – Rowing Upstream

HP Workstation components are validated to insure the lowest acoustic sound levels while maximizing performance and reliability. During qualification testing of the Quadro FX 3800, the composite acoustic measurement of the Generic Quadro FX 3800 was found to be almost *twice* as loud as the Quadro FX 3700.

The large increase in the acoustic signature was traced to a key design change in the Generic Quadro FX 3800 cooling solution. While the location of the fan assembly on the Quadro FX 3700 is near the front of the chassis, the location of the fan assembly on the Generic Quadro FX 3800 is closest to the rear of the chassis. The change was made to accommodate a slightly thicker fan to meet the standard cooling requirements set by a common set of industry computer chassis. The design change results in two undesirable consequences:

1. With the fan moved to the rear of the chassis, the heat sink moved to the front of the chassis requiring the fan to move air towards the front of the chassis. Pushing heated exhaust air against the standard front-to-back airflow and back into the chassis heats up other system components increasing the overall thermal load and noise level of the system.
2. With the fan assembly at the rear of the chassis, the fan inlet must use the heated exhaust air of all the system components to cool the GPU. The fan inlet is not able to take advantage of fresh, cool air provided by the front-to-back airflow. Using heated exhaust air to cool the GPU requires the fan speed to increase to provide additional airflow which in turn raises the card's noise level.

The combination of these two issues creates a circle flow of exhaust air. The graphics fan inlet brings in heated, exhaust air to cool the GPU and pushes it back into the chassis to potentially be used again as intake air. The Generic Quadro FX 3800's fan must run faster to compensate for the lack of fresh air, elevating the noise levels beyond HP Workstation's strict acoustic standards.

HP's NVIDIA Quadro FX3800 – Wind in the Sails

HP workstation chassis are designed to take fresh air from the front of the system and provide *front-to-back* airflow across system components. The heated exhaust air is expelled out the back of the chassis. By positioning the fan air inlet as close to the front of the chassis as possible, a graphics card can take advantage of the cooler air provided by the front-to back airflow. Cooler air pulled into the fan inlet will more effectively cool the graphics card and keep fan speeds and sound levels low.

HP worked closely with NVIDIA to *re-design* the Quadro FX 3800 cooling solution and move the fan and inlet to a position closer to the front of the chassis, consistent with its predecessor, the Quadro FX 3700. The HP Quadro FX 3800 cooling solution is made possible by HP Workstation's superior chassis airflow design which can consistently supply cooler air to the fan inlet. The cooler air allows the new cooling design to employ a slightly thinner fan and still insure the fan, running at slower speeds, can keep the card cool under a heavy graphics work load. There are no additional changes required to the Generic Quadro FX 3800 card to employ the new cooling design. The Generic and HP versions of the graphics cards are identical with the exception of the heat sink and fan assemblies.

With the new cooling solution design, the composite acoustic measurement of the HP Quadro FX 3800 is slightly better than the Quadro FX 3700! In addition, the new cooling solution is no longer pushing graphics exhaust air against the standard airflow and burdening system components with an additional thermal load. The result is a well balanced solution offering a high-performance graphics compute engine in a single-slot implementation with the lowest acoustic levels possible.

NVIDIA and other OEMs will continue to ship the Generic Quadro FX3800 card with the original cooling design potentially producing sound levels and tones twice as loud as the Quadro FX 3700. HP's Quadro FX 3800 cooling solution provides HP Workstation customers the same high performance graphics solution with a proven and trusted cooling design and a much lower acoustic signature.

The Quadro FX 3800 is supported on the following HP Personal Workstations: HP Z400, HP Z600, HP Z800, HP xw4600, and HP xw9400.