Quadro Sync II

User Guide

Document Change History

DU-08348-001_v07

Version	Date	Authors	Description of Change
01	February 6, 2017	JK, DT, TS	Initial release
02	September 18, 2017	JK	Updated release timeline
03	October 3, 2017	JK, TS	Miscellaneous format changes
04	October 2020	JK, TS	Miscellaneous word changes
05	January 2022		Miscellaneous. changes
06	February 2, 2024	DK, SN	Miscellaneous. changes
07	July 31, 2024	VO, DV	Miscellaneous. changes

Table of Contents

Introduction 1

Terminology 1

Getting Started 1

- Quadro Sync II Card Overview 1
- In the Box 2

Installation System Requirements 3

- Quadro Sync II Card Install 4
- NVIDIA RTX Enterprise Driver 5

Working with Quadro Sync II 7

Synchronization Configuration 8

- Connecting Nodes in a Visualization Cluster 8
  - Visualization Cluster Setup Order 9
  - Windows Driver Configuration 10
  - Enabling Framelock 11
  - Configure Framelock Clients 12
  - Restarting a Visualization Cluster 13
  - Quadro Sync II TTL Sync Generator Output 13
  - Configure for BNC Output 13
- Linux Driver Configuration 15
  - Set Driver Security to Allow Remote Management 15
  - Configure Framelock 16
- Configuring Quadro Sync II from the command line 18
  - Windows ConfigureQsync command line tool 18
- Linux nvidia-settings command line tool 18

Syncing Timing Server to an External Timing Source 19

- External Timing Sources 19
  - Synchronize to an External Sync Source for Windows 20
  - Synchronize to an External Sync Source for Linux 21
- Synchronizing Different Resolutions 22
- Sync Multiply and Divide 22

Monitoring Display Synchronization 24

- Board-Level Status Indicator 24
  - Framelock and Stereo Sync Status LEDs 25
  - Framelock Connector LEDs 27
- System Topology Viewer for Windows 28

Sync Timing Tolerance 30

Miscellaneous FAQ 31
Frequently Asked Questions 31
Compliance and Certifications 33
Important Safety Information 34

List of Figures

Figure 1. Quadro Sync II Overview 1
Figure 2. Installing and Connecting the Quadro Sync II Card 4
Figure 3. NVIDIA RTX /Quadro Driver Download 6
Figure 4. Framelock Connections on Timing Server 9
Figure 5. Configure Server Settings 14
Figure 6. Board Level Status Indicators 25
Figure 7. Framelock and Stereo Sync Status LEDs 26
Figure 8. System Topology Viewer for Windows 28

List of Tables

Table 1. Framelock and Stereo Sync Status LEDs 26
Table 2. Framelock LED Status 27
Table 3. Examples for Sync Timing Tolerance 30
Table 4. Symbols on Equipment 35

Introduction

The NVIDIA® Quadro® Sync II card is designed as an add-on card for NVIDIA RTX™/Quadro series GPUs.). The NVIDIA Quadro Sync II card fits into a free PCI Express slot within the system. The card does not use any electrical or data connection through the PCIe bus.

The Quadro Sync II card provides the following functionalities for Quadro Pascal series graphics boards and later:

- Synchronizes up to eight GPUs in a single system with two Quadro Sync II cards
- Allows displays driven by one or more GPUs to be synchronized to an external Synchronization source.
- Supports External Sync up to 1000 Hz*.
- Can generate a synchronization output signal for other systems with Quadro Sync II cards.
- Creates a group of synchronized displays driven by a single or multiple systems.
- Enables Mosaic with Synchronization.

With Firmware 2.18 or higher:

- Sync multiply and divide: sync displays to a multiple or divisor of an external sync signal.
- Improved sync locking speed.
- Sync different resolutions with the same refresh rate between Quadro Sync boards in the same or different system.

Terminology

- **External Sync**
  External Sync refers to a sync signal generated external to the system and used as a reference to synchronize the frame update of displays attached to the system.
- **Framelock**
  Framelock occurs when multiple displays are synchronized so that the start and end of the frame align for all displays.
- **Mosaic**
  Mosaic creates one large desktop of monitors and appears as a single Desktop to the operating system. Taskbars span across the monitors and applications maximize across the Mosaic configuration.
- **SLI**
  SLI is an acronym referring to an NVIDIA technology called *Scalable Link Interface* that allows multiple GPUs to be linked together to improve rendering performance. SLI implements multiple algorithms to improve performance, such as *Alternate Frame Rendering (AFR)* or *Split Frame Rendering (SFR)*.
  - Explicit SLI
    Graphics APIs have evolved to give applications significantly more control over GPU resources. Vulkan and DirectX 12 are often referred to as *explicit* APIs, meaning that an application explicitly controls the GPU instead of the driver. This explicit application control also applies to SLI where with Vulkan and DirectX 12, applications can implement whatever scaling algorithm is best for their needs. This is referred to as *explicit SLI*.
  - Implicit SLI
    The SLI SFR and AFR algorithms were a GPU driver feature and transparent to applications, meaning that applications would benefit from improved rendering performance without modification. This is called implicit SLI.
- **Swap Barrier**
  A *swapbarrier* refers to a mechanism where multiple displays or *swapgroups* on multiple systems are synchronized so that all displays across all systems update the displayed frame simultaneously. The term swapbarrier is also used to define an API interface within a graphics API, such as OpenGL.

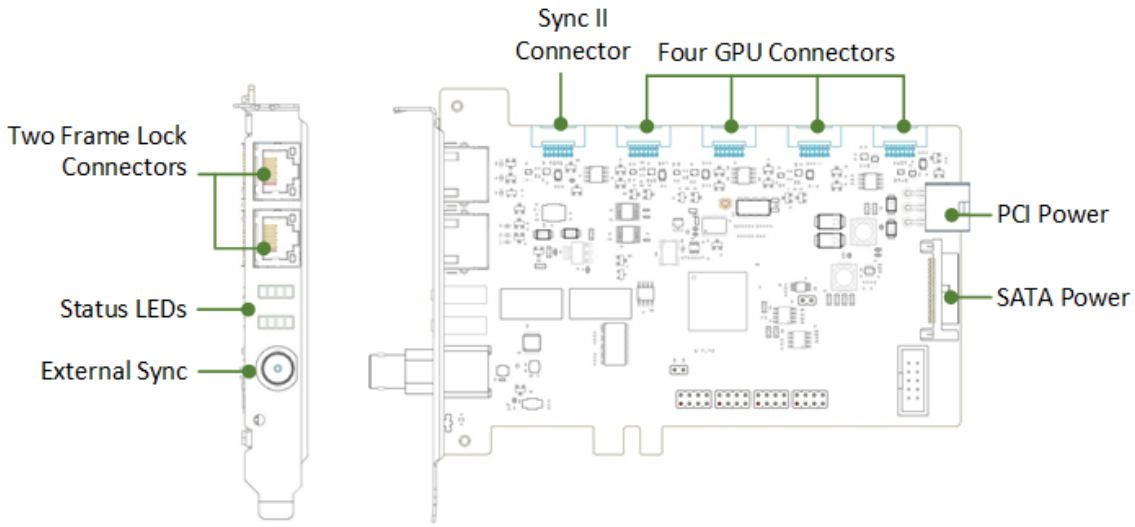
- **Swap Group**
  A *swapgroup* refers to a group of displays in a single system where all displays in the group will update the displayed frame simultaneously. The term swapgroup is also used to define an API interface within a graphics API, such as OpenGL.
- **SwapReady**
  Swapready is a hardware signal created by the GPU used to synchronize a group of GPUs so that all the GPUs in the group update the display image simultaneously, regardless of how long each GPU took to render.
- **Synchronized Mosaic**
  Creates one large desktop of monitors and appears as a single desktop to the operating system with all the monitors synchronized at the same time. This will ensure no “tearing” across monitors on the setup.
  - For two GPU configurations with NVLINK, GPUs can share the sync timing signal needed to synchronize Mosaic across the two GPUs. This helps eliminate “tearing” when using two GPUs in the Mosaic.
  - For two plus GPU configurations, a Quadro Sync II card is needed to synchronize Mosaic across all the GPUs.
- **Bi-level and Tri-level Frame Sync**
  Bi-level and Tri-level sync refers to industry-standard sync types for Standard Definition (SD) and High Definition (HD) digital video, respectively, and represents the start of a digital video frame. Bi-level and tri-level syncs are often referred to as “composite sync”. This term means that the sync and video data are transmitted on the same video signal.

Getting Started

Quadro Sync II Card Overview

The Quadro Sync II card is an accessory to the NVIDIA RTX and NVIDIA Quadro Professional GPUs. On the top edge of the card are five connectors that can connect to four GPUs and a second Quadro Sync II card (see Figure 1). The flexible cables to make these connections are included in the box; four 12-inch cables and two 24-inch cables.

Figure 1. Quadro Sync II Overview



For high vibration environments, self-latching/locking cable connectors are used, which hold all cables securely in place on both the Quadro Sync II card and NVIDIA RTX/Quadro GPU. Since the SATA power connector has no physical retention, the board has a hole that can be used to secure the cable with a cable tie.

In the Box

Quadro Sync II Card
12-Inch Short Sync Cables (Four)
24-Inch-Long Sync Cables (Two)
Quick Start Guide

Installation System Requirements

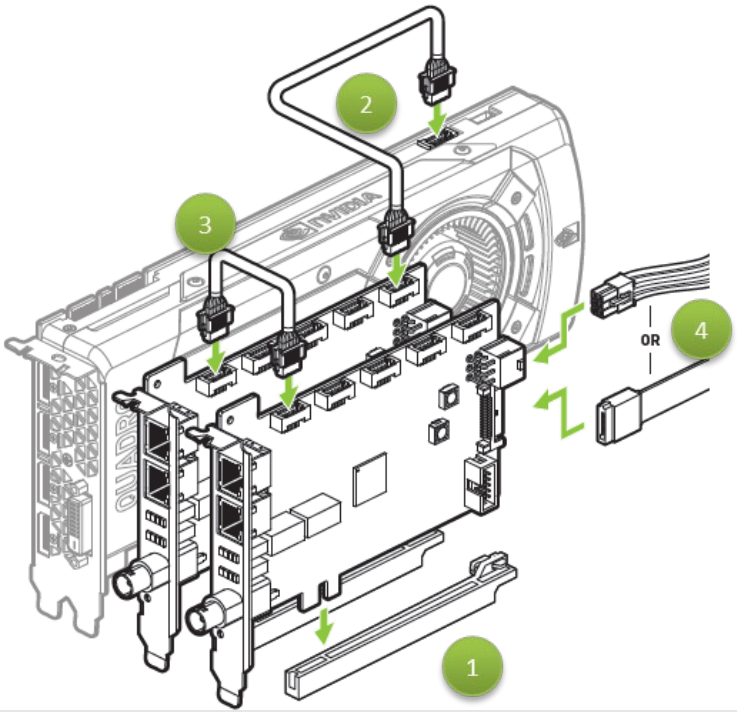
- NVIDIA RTX/Quadro Pascal-series graphics boards and later; 4000-class and above.
  - The Quadro Sync II card supports up to four matching NVIDIA RTX/Quadro graphics processing units (GPUs). Each GPU is connected to the card through an internal flexible cable.
  - Two Quadro Sync II cards are supported in a single workstation synchronizing up to eight NVIDIA RTX/Quadro GPUs. Two Quadro Sync II cards require an internal flexible cable connection between the boards.
  - For a current list of the NVIDIA RTX/Quadro GPU boards compatible with Sync, go to https://www.nvidia.com/en-us/design-visualization/solutions/quadro-sync/.
- Operating Systems
  - Windows 10/11: 64 bit
  - Linux: 64 bit
- Driver
  - R440 branch and newer display drivers support single Quadro Sync II with MOSAIC topologies.
- Chassis Requirements
  - Single free PCIe slot
  - Six-pin PCI or SATA power connector

Quadro Sync II Card Install

Prior to installing the Quadro Sync II card, be sure to power down the machine and unplug the power cord.
Use the following steps and Figure 2 as a reference to install the Quadro Sync II Card

1. Place the Quadro Sync II card in a free PCI Express slot on the motherboard. (1)
   Note the PCIe edge fingers may not bottom out in the PCIe slot.

Figure 2. Installing and Connecting the Quadro Sync II Card



2. Connect up to four NVIDIA RTX/Quadro cards to the Quadro Sync II card GPU connectors (2) (in Figure 2) using the included cables.

> **Note:** There is no order requirement when connecting the NVIDIA RTX/Quadro cards to the Quadro Sync II card GPU connectors.

3. Connect power to the Quadro Sync II card using either a 6-pin PCIe or SATA power cable (4) in Figure 2).

If adding a second Quadro Sync II card for a Dual Quadro Sync II configuration:

4. Install a second Quadro Sync II card in a nearby PCIe slot.
5. Connect up to four Quadro cards to the Quadro Sync II card GPU connectors (2) in Figure 2) using the included cables.

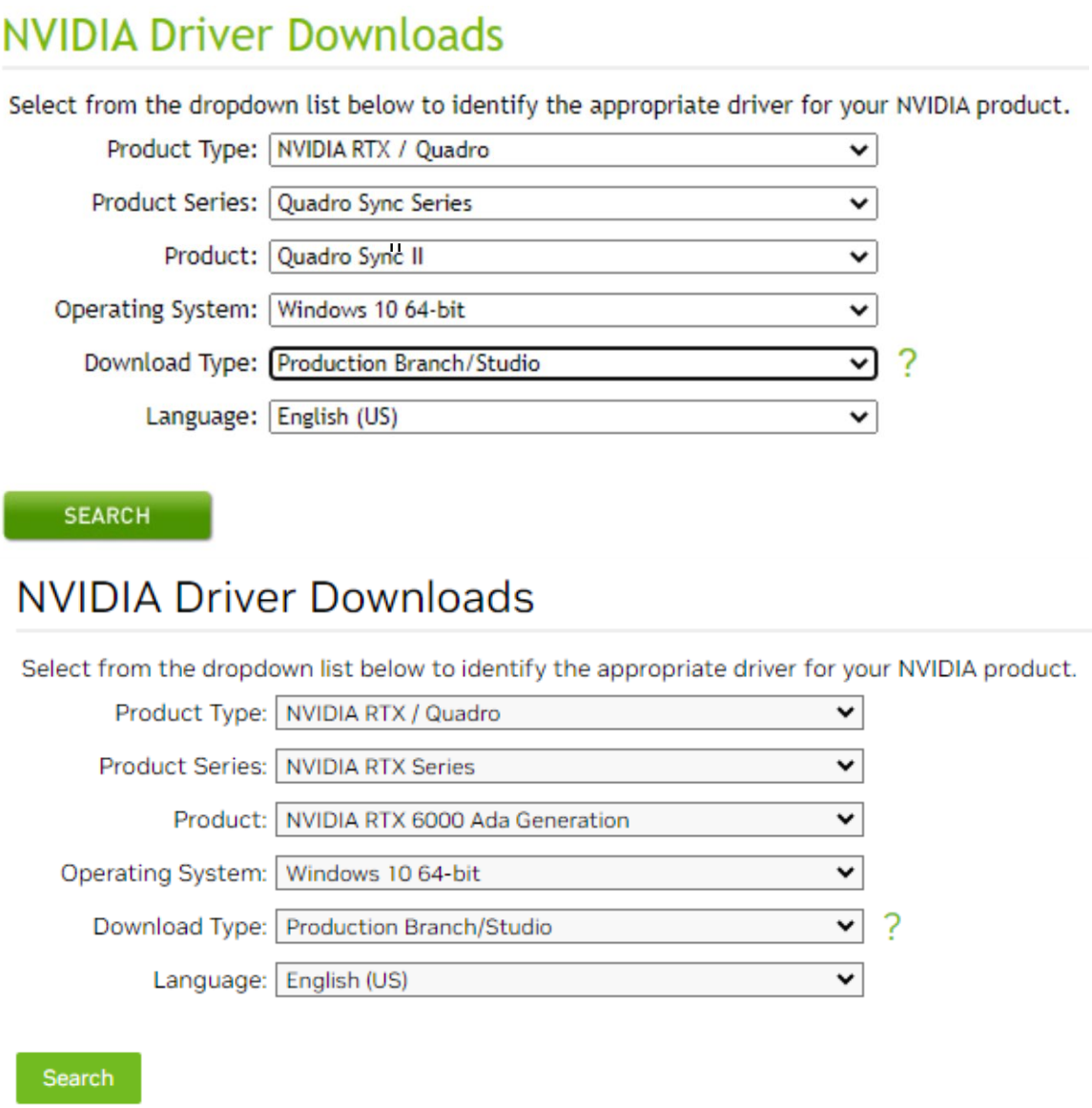
6. Connect power to the second Quadro Sync II card using either a 6-pin PCIe or SATA power cable (4 in Figure 2.)
7. Connect one Quadro Sync II card to the other Quadro Sync II card (3 in Figure 2) using the included cables between the Sync II connectors. This dual configuration enables up to eight GPUs in a single system.

> **Note:** There is an order requirement when connecting the second Quadro Sync II card: CON0 (closest to the PCIE bracket) should be used to connect both cards, as shown in Figure 2.
>
> When using a Quadro Sync II card in a system that supports NVIDIA SLI®, an SLI bridge does not need to be connected unless you are planning to use SLI-specific features like SLI Frame Rendering or SLI Anti-Aliasing. These SLI modes are not compatible with most of Sync's features.
>
> Contact mailto:QuadroSVS@nvidia.com with questions if you are considering these types of configurations.

NVIDIA RTX Enterprise Driver

Quadro Sync II card does not require a dedicated driver; all the files needed to operate it are included in the latest NVIDIA RTX/Quadro Driver. Drivers are available on the NVIDIA Web site at http://www.nvidia.com/drivers. When choosing the drivers for use with Quadro Sync II, select the following from the pull-down lists (see Figure 3).

Figure 3. NVIDIA RTX /Quadro Driver Download



Working with Quadro Sync II

The Quadro Sync II card is used in many applications, including digital signage displays, location-based entertainment exhibits, flight simulators, Power Walls, visualization CAVEs, Info Walls, and so forth. All these installations are typically complex, and architecture decisions can impact performance and reliability. For questions on how to architect systems with Quadro Sync II card or Mosaic, contact QuadroSVS@nvidia.com.

Synchronization Configuration

Framelock refers to when multiple displays are synchronized so that the start and end of the frame align for all displays.

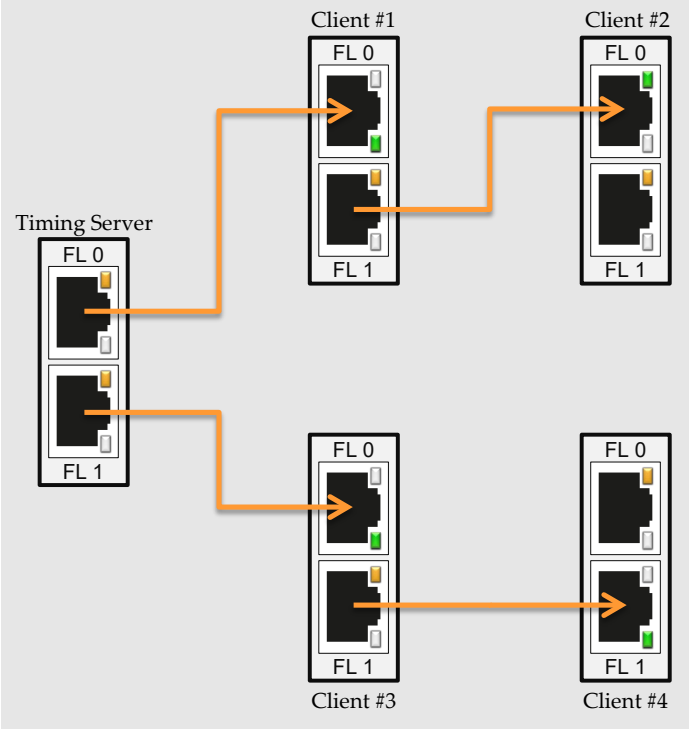
Connecting Nodes in a Visualization Cluster

If using the multi-node synchronization features of the Quadro Sync II cards, the Quadro Sync II cards in each node in the cluster need to be connected. To enable all the synchronization features that Quadro Sync II provides (such as framelock, stereo sync, and swap/present barrier) it is recommended to connect all the nodes using CAT-5 Ethernet cables (not included). It is recommended that you use high-quality cables and use the shortest length possible for your installation. Do *not* use Ethernet hubs or switches to branch or extend the signal. Quadro Sync II cards are not compatible with TCP/IP protocols, and the card will not operate if it is connected to networking equipment.

Caution: Do not connect the Quadro Sync II card to TCP/IP networking equipment.

Choose one node as the timing server to control the timing on all the other nodes. From the timing server, connect a CAT 5 cable between the framelock connectors on the timing server and a client machine, it does not matter which RJ45 connector you use. For large clusters, it is recommended to create two signal chains off the timing server as shown in Figure 4.

Figure 4. Framelock Connections on Timing Server



Visualization Cluster Setup Order

When configuring a visualization cluster, the order of operations for configuration is important. It is recommended to enable framelock last, after any other driver configuration, for example:

1. Start with the Timing Server
    a. If using a G-SYNC display, disable G-SYNC.
    b. Enable stereo with the correct stereo mode if using stereo.
    c. If using Mosaic, configure Mosaic before enabling framelock.
    d. Enable framelock as the timing server.

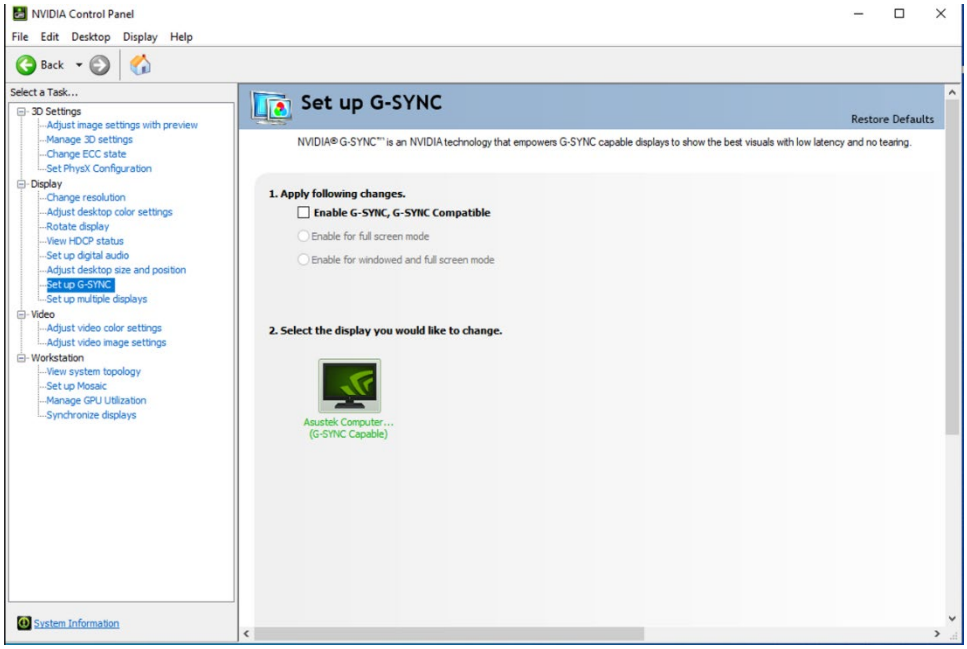
2. Configure each client machine.
    a. If using a G-SYNC display, disable G-SYNC.
    b. Enable stereo with the correct stereo mode if using stereo.
    c. If using Mosaic, configure Mosaic before enabling framelock.
    d. Enable framelock on each machine as timing clients.

Windows Driver Configuration

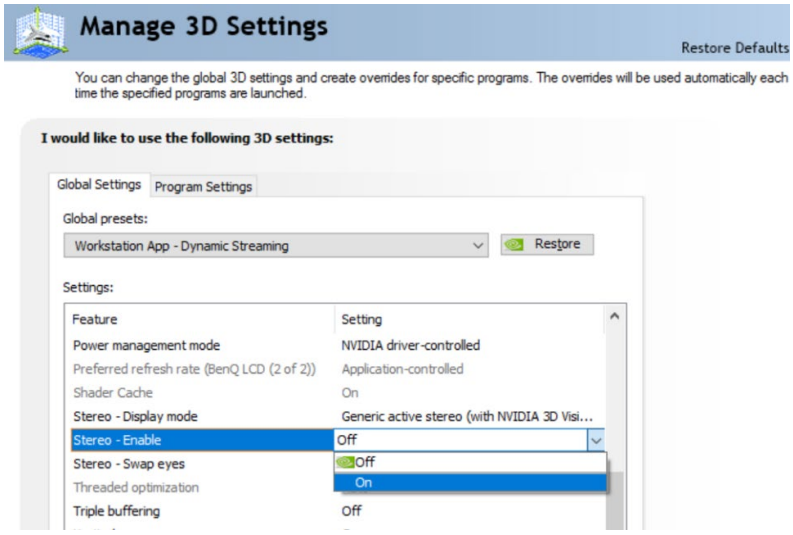
Before configuring any of the synchronization modes, use the **NVIDIA Control Panel** to change the settings for G-SYNC, Stereo, and Mosaic, as appropriate.

1. Open the NVIDIA Control Panel and select **Manage 3D Settings**.
2. If using G-SYNC display, disable G-SYNC in the NVIDIA Control Panel.

This page is only present when a G-SYNC monitor is connected.



3. Select **On** to enable Stereo under **Stereo Enable**.



4. If using Mosaic, set up the Mosaic configuration before enabling synchronization.

Enabling Framelock

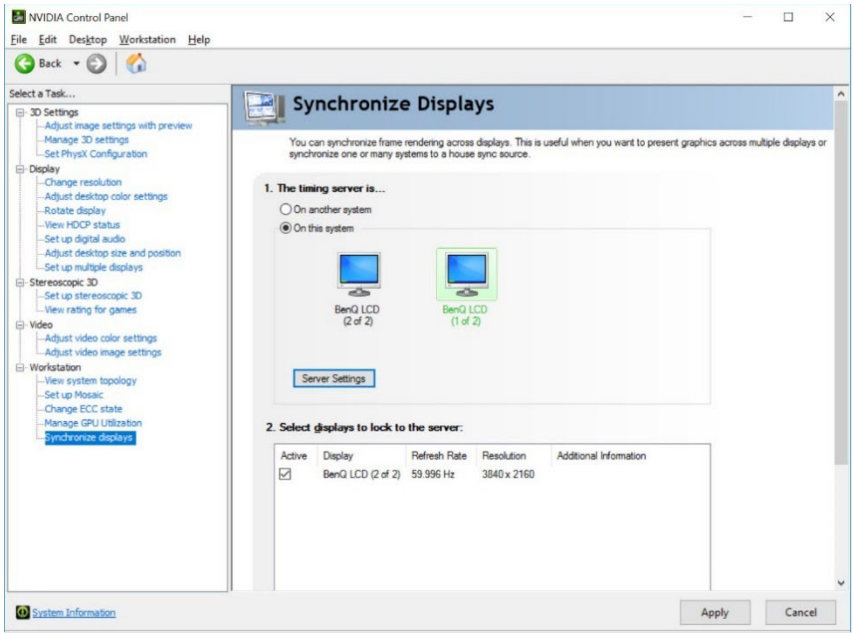
When enabling Framelock across a cluster, you must define a display as the timing server that all the clients connect to. Following the guidelines given in the “Connecting Nodes in a Visualization Cluster” section. It is recommended that this node be in the middle of the timing chain for large clusters (see Figure 4).

For best results synchronizing the cluster, configure the Timing Server first, and then the client machines so you can verify each client synchronizes correctly as you add it. Each client should detect the incoming sync signal from the timing server when you add it to the cluster.

Configure Framelock Server

To enable Framelock on the timing server, open the **Synchronize Displays** tab in the **NVIDIA Control Panel**.

1. Open the **NVIDIA Control Panel** and select **Synchronize Displays** from the left menu.
2. Select the **On this system** radio button under “**The timing server is” ...** on the right side of the menu.



When the system has multiple displays, the driver automatically selects the primary display to be the timing server and all other displays are the clients. To change the configuration, select the icon of the display that you want to be the timing server.

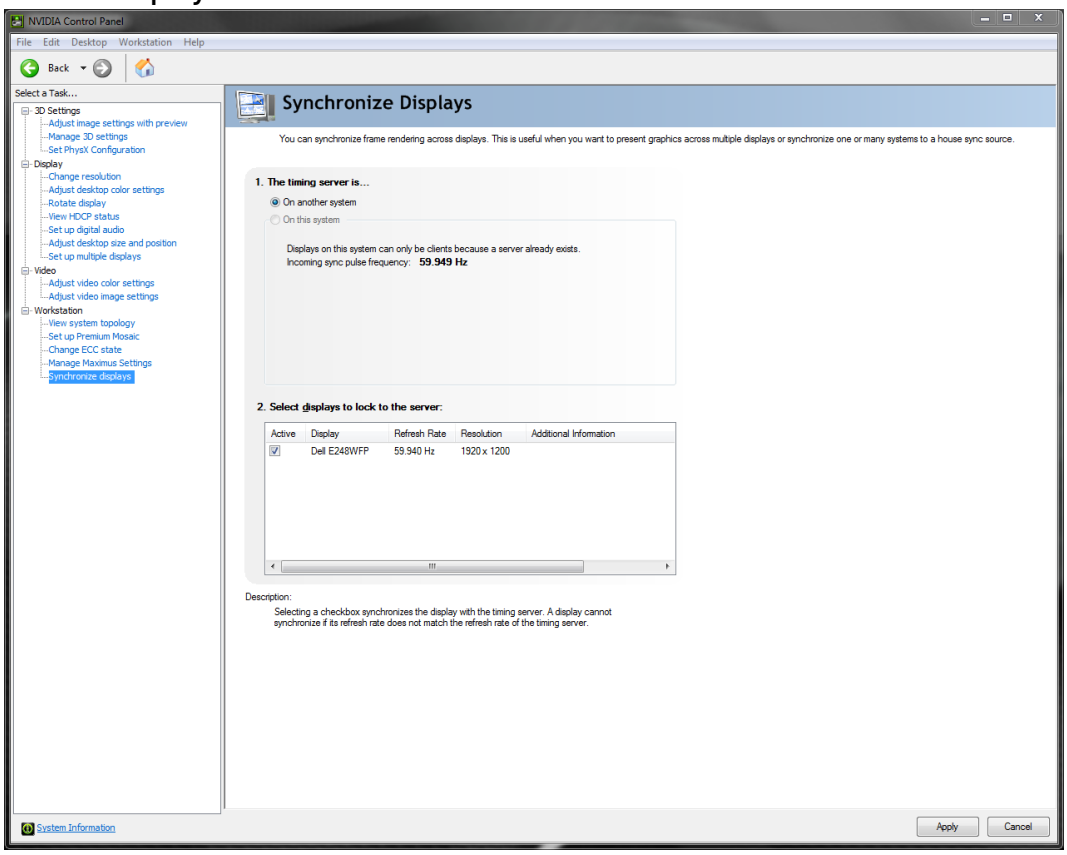
Note: The **Server** node refers to the node used as the Timing Server. There can only be one Timing Server in a cluster. All other nodes are commonly referred to as **clients**.

3. Click **Apply**.

Configure Framelock Clients

The client machines are also configured through the **Synchronize Displays** menu on the **NVIDIA Control Panel**. Since there is already a timing server in the cluster, when you open the control panel, it should detect the incoming signal from the timing server and only offer the option to synchronize as timing clients.

1. Open the **NVIDIA Control Panel** and select **Synchronize Displays** from the left menu.
2. Select the displays to synchronize from those listed under
   "Select displays to lock to the server"



Note: The Quadro Sync II card requires the timings of all displays to be within ±50 ppm to properly synchronize.

3. Click **Apply**

4. During the synchronization process, the displays may blink as they adjust their timing. A confirmation dialog window will appear that must be acknowledged to accept the new synchronization settings; otherwise, the settings will be reverted. The Status LEDs on the Quadro Sync II card and in the System Topology Viewer in the Control Panel report the state of the synchronization (see the LED information below).

   Disable Framelock by reversing the process.

Restarting a Visualization Cluster

Like configuration, a cluster should be re-started in the following order to minimize the synchronization time:

1. Restart the Timing Server.
2. Wait till the Timing Server is back up and outputting the signal as indicated by the LEDs or the Nvidia Control Panel. (Refer to Table 2 Framelock LED Status)
3. Restart all the client machines.

Depending on the configuration, it can take many minutes for a cluster to fully synchronize

Quadro Sync II TTL Sync Generator Output

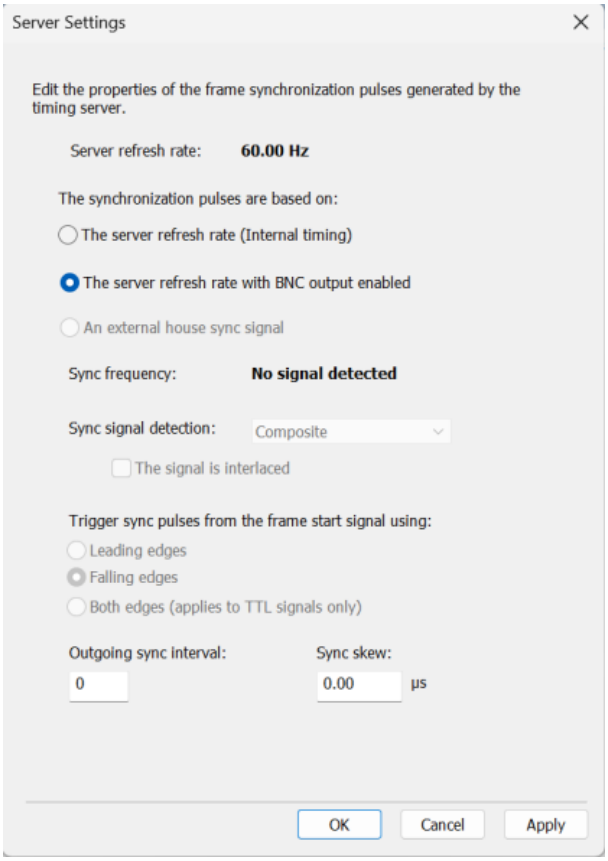
The Quadro Sync II card supports the generation of TTL Sync output using the onboard BNC connector. The output is locked to the framelock signal generated by the Quadro Sync II card.

The rate of the output signal will be that of the display selected as the timing server. The output can be used to synchronize compatible third-party equipment using a TTL sync signal but note that the output signal is a short duty cycle signal (for example, only ~200 ns duration for a 60 Hz signal).

Configure for BNC Output

1. Open the **NVIDIA Control Panel and f**ollow the same steps as in the Windows Driver Configuration above
2. After the **Synchronize Displays** step, click the **Server Settings** button
3. Click the radio button **The server refresh rate with BNC output enabled**.

Figure 5. Configure Server Settings



4. Select **OK**.

ⓘ	**Caution:** If the BNC port is configured as a Sync output, *do not* connect it to a Sync Generator. Doing so may damage the Quadro Sync II card and the Sync Generator.

Linux Driver Configuration

The NVIDIA Control Panel on Linux allows one node to manage all nodes in the cluster. The security settings need to be set properly for the cluster to work properly, or client nodes may not be added.

Set Driver Security to Allow Remote Management

Any X Server can be added to the framelock group if the system supporting it is configured to support framelock and is connected through an RJ45 cable to the other systems in the framelock group.

The system running nvidia-settings can communicate with the X server that is to be included for framelock. This means that either:

- The server must be listening over TCP and the system's firewall is permissive enough to allow remote X11 display connections.

Or

- An alternative mechanism is configured, such as `ssh(1)`, forwarding between the machines.

For listening over TCP, verify that the `-nolisten tcp` command line option was not used when starting the X server. You can find the X server command line with a command such as

```
% ps ax | grep X
```

If `-nolisten tcp` is on the X server command line, consult your Linux distribution documentation for details on how to properly remove this option.

For example, distributions configured to use the GDM login manager may need to set `"DisallowTCP=false"` in the GDM configuration file (e.g., `/etc/gdm/custom.conf`, `/etc/X11/gdm/gdm.conf`, or `/etc/gdb/gdb.conf`; the exact configuration file name and path varies by the distribution) or, distributions configured to use the KDM login manager may have the line

```
ServerArgsLocal=-nolisten tcp
```

in their `kdm file` (e.g., `/etc/kde3/kdm/kdmrc`). This line can be commented out by prepending with "`#`".

The system running nvidia-settings has display privileges on the X server that is to be included in the cluster.

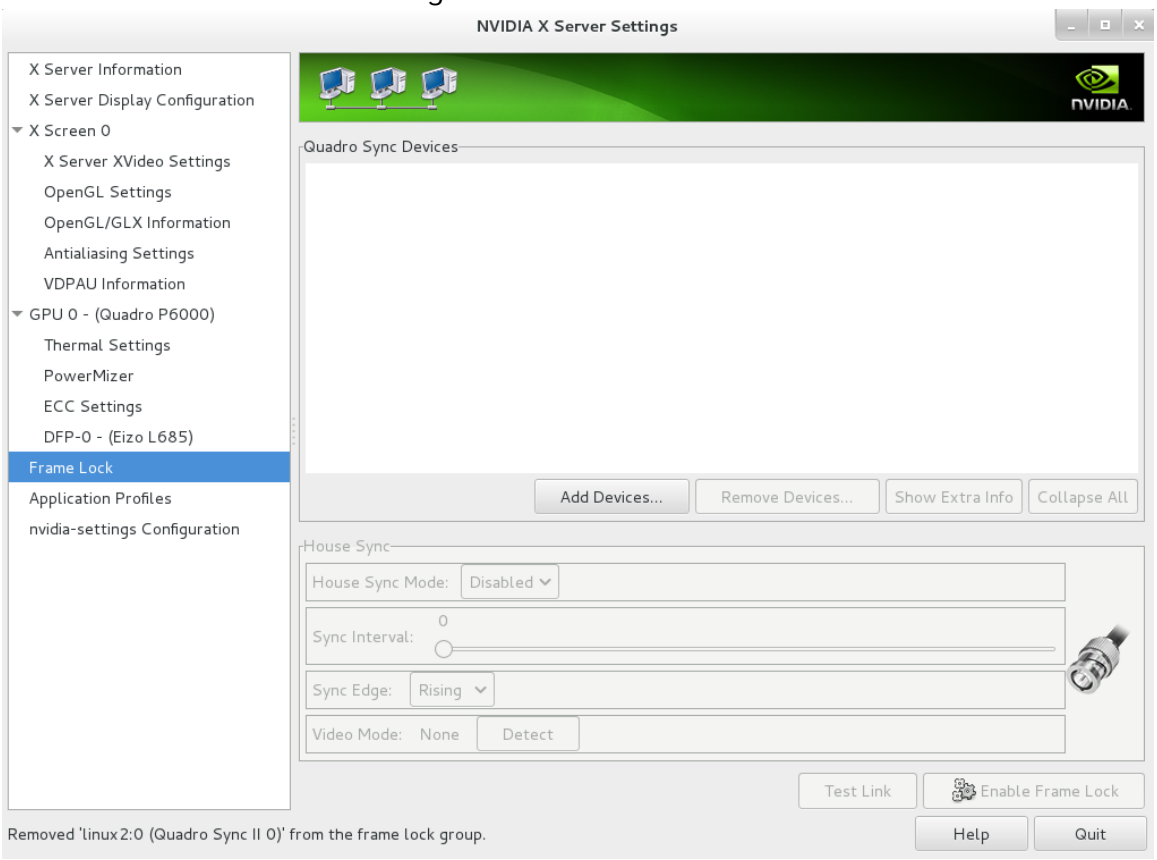
A system can gain display privileges on a remote system by executing

```
% xhost +
```

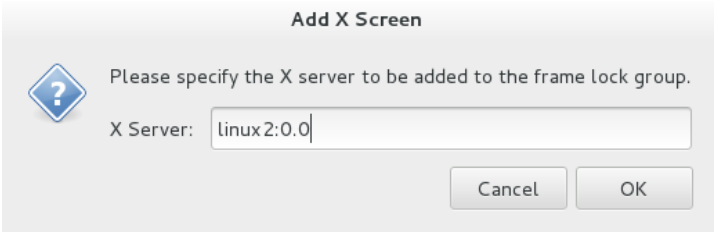
on the remote system. See the `xhost(1)` man page for details.

Configure Framelock

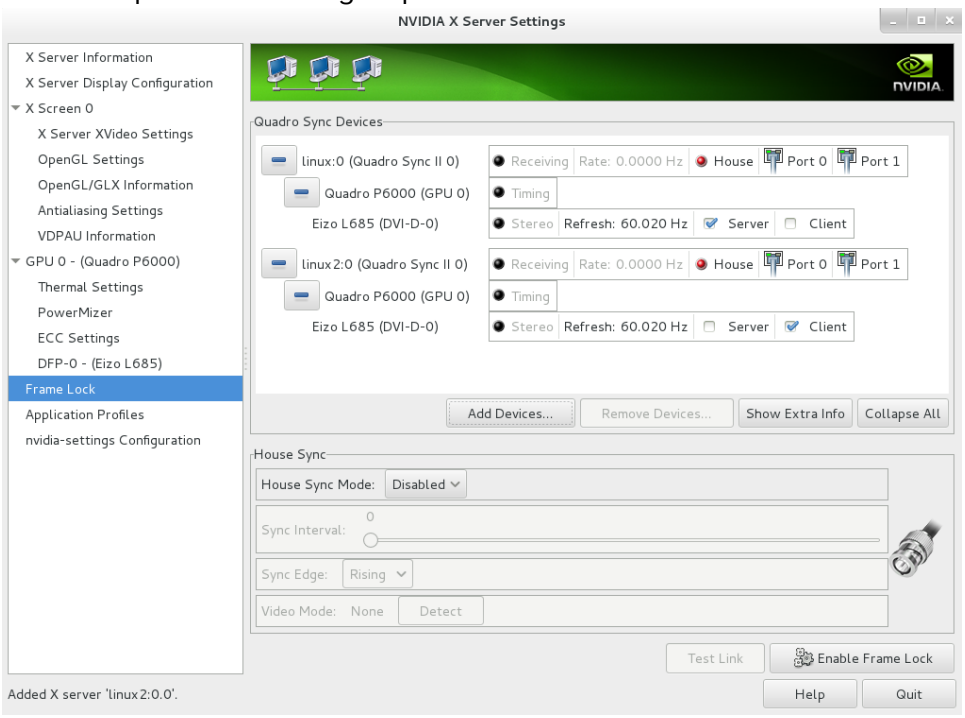
1. Open the **NVIDIA X Server Settings** on the server machine.
2. Select **Framelock** from the left menu.
3. Select **Add Devices...** from the right menu.



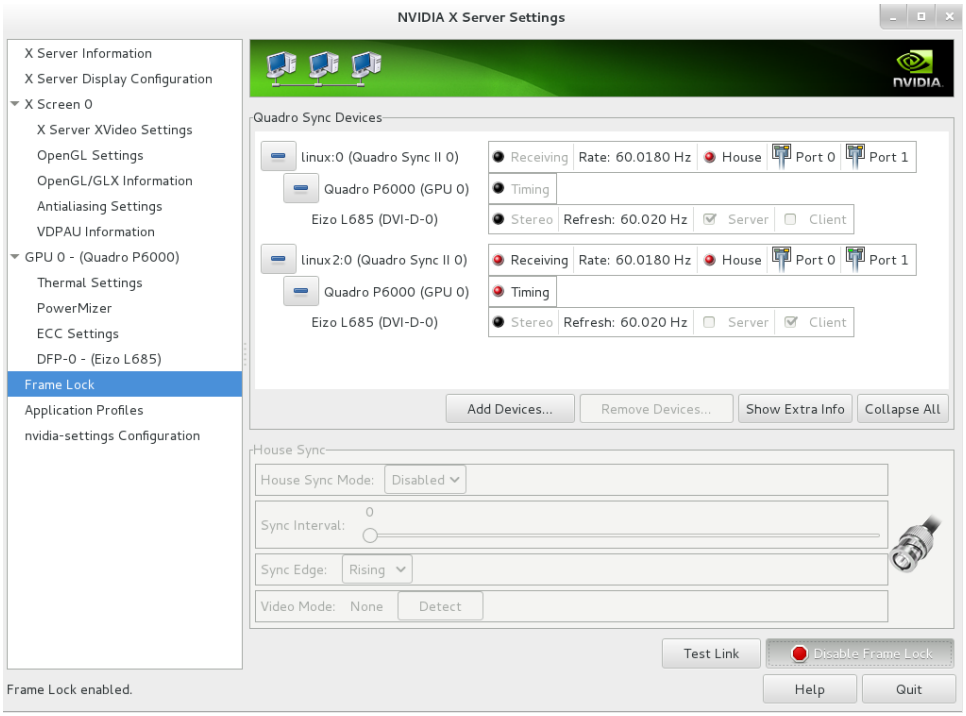
4. Enter the name of the `hostname/ip address` and `XServer ID` of the XServer you want to add. For example: `localhost:0.0` or in this case our machine named `viz0:0.0`.



5. Select the display that is the Server and those that are clients. There can only be one server per Framelock group.



6. Add the other nodes in the same way as Step 2 and set the Client displays as desired. Click 'Enable Framelock.'



Configuring Quadro Sync II from the command line

Windows ConfigureQsync command line tool

On Windows, the configuration may be done with the configureQsync command line tool to ease configuration automation. The tool is downloaded from: https://www.nvidia.com/en-us/drivers/qsync-utility/

The output from 'configureQsync2.exe help' provides the full help output, but an example command line for a simple configuration would be:

```
configureQsync2.exe enable server source=VSYNC display=0,0 display=1,0
```

This would enable a system to act as a timing server synchronized to the vertical sync pulse of GPU0, with the display on GPU1 acting as the timing client.

Linux nvidia-settings command line tool

On Linux, the configuration can be done at the command line using the nvidia-settings application that is installed with the driver. This tool can be used to query the current state, change the settings, and enable and disable framelock.

To query the current state:

nvidia-settings –V all –q gpus

From the output of the above command, you can query the framelock configuration for a particular display, e.g.:

nvidia-settings –q [dpy:6]/FramelockDisplayConfig

The FramelockDisplayConfig variable can then be set to 1 for a timing client or 2 for a timing server, e.g.:

nvidia-settings –a [dpy:6]/FramelockDisplayConfig=2

Then framelock is enabled with this command:

nvidia-settings –a [gpu:0]/FramelockEnable=1

Syncing Timing Server to an External Timing Source

Only the Timing Server should be connected to the external sync source. If other nodes are part of the cluster, they should be connected to the Timing Server using the RJ45 cable connectors. The Swap Barrier signal is sent over the RJ45 connector, so applications using this capability require this connection.

External Timing Sources

The Quadro Sync II card supports three types of external timing sources through the BNC connector on the bracket.

- TTL: 3.3 V, 50% duty cycle, high impedance
- Bi-Level Composite (NTSC/PAL): 75 Ω impedance
- Tri-Level Composite (HDTV): 75 Ω impedance
  - SMPTE Standard 240 compliant

Caution: Using timing signal Voltages above specification, +3.3 V for TTL, ±300 mV for Composite will damage the Quadro Sync II card.

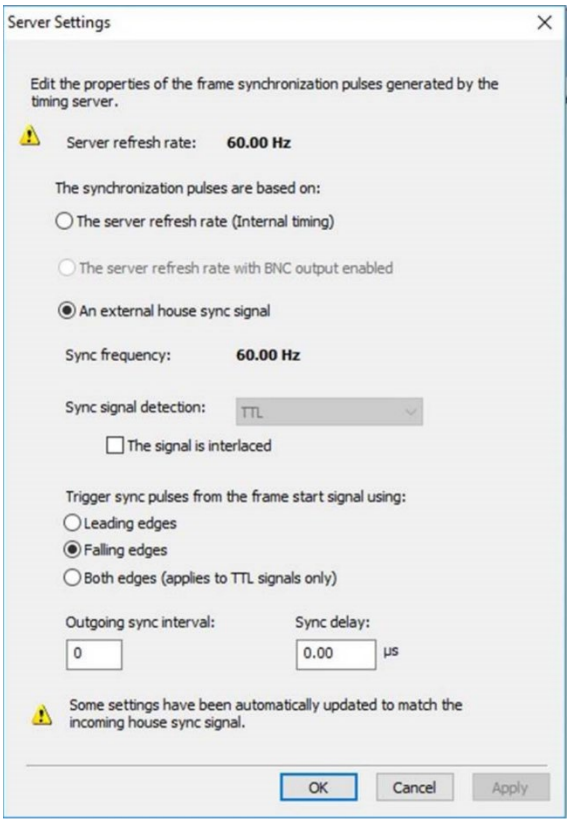
Note: When using TTL Sync, it is important to use a high-quality signal generator. Variances in the external sync frequency will cause the displays to blink as they adjust their timings to follow the wandering input signal.

Caution: If the BNC port is configured as a Sync output, DO NOT connect to an External Timing Source. This may cause damage to the Quadro Sync II card and the External Timing Source.

When a valid signal is connected to the BNC connector, the LED below it lights solid green. Once the Quadro Sync II card is using the external signal the same LED flashes green at the rate of the incoming sync signal.

When using an external sync signal, both Windows and Linux identify the incoming sync type. There are extra settings available to adjust how the card converts the external sync to the internal sync:

- For TTL signals, select which edge of the external sync pulse triggers the internal pulse: leading edge, falling edge, or both edges.
- Identify that the incoming signal is interlaced.
- Set a **Sync Interval** defining how many incoming external sync pulses need to be received before the Quadro Sync II card sends an internal pulse.
  - The default value is 0, meaning every external packet is sent internally.
  - Setting 1 will cause the Quadro Sync II card to send every other received pulse causing the internal sync pulses to run at half the speed of the external
- Define a start **Sync Delay** in µSeconds between the external signal and internal sync pulses.

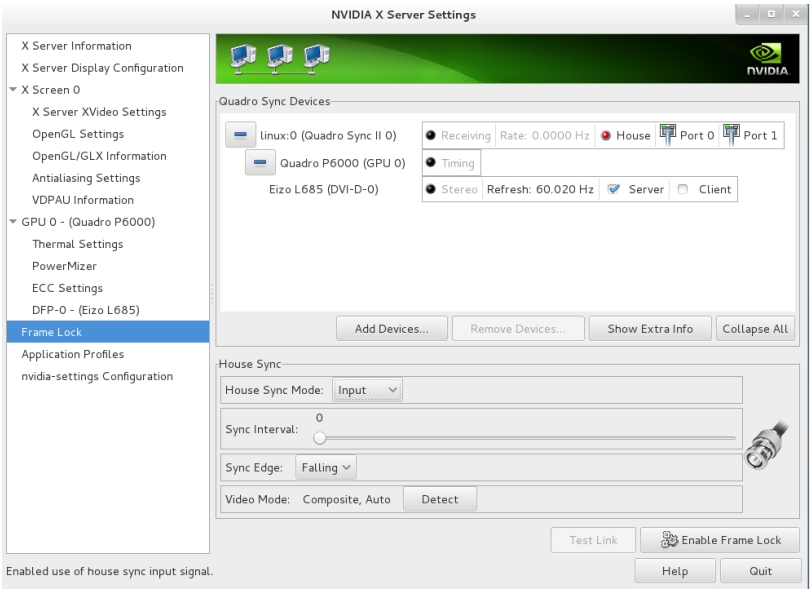


Synchronize to an External Sync Source for Windows

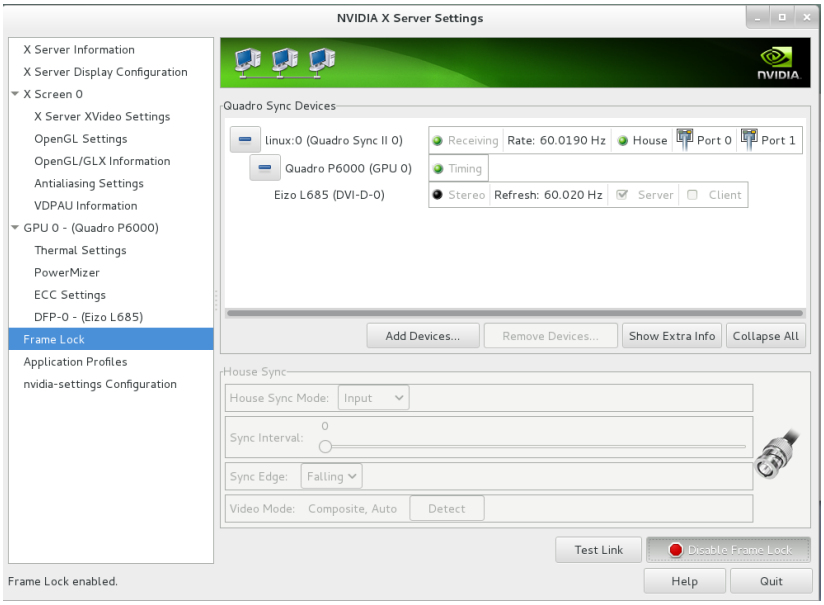
1. Open the NVIDIA Control Panel.
2. Select **Synchronize Displays**.
3. Click the **Server Settings** button.
4. Click **An external house sync signal**.
5. Adjust the other options as needed.
6. Press **OK**.

Synchronize to an External Sync Source for Linux

1. Open the **NVIDIA X Server Settings**.
2. Select **Framelock** from the left menu.
3. Select **Add Device** if needed and configure a display to be the timing server.
4. Select **Input** within **House Sync Mode** drop-down box and define any other options needed.



5. Select **Enable Framelock**.
   Once enabled, the UI reflects the status in the Device list, and the House Sync options are grayed out until Framelock is disabled.



Synchronizing Different Resolutions

With the 2.18 firmware and above updates to the Quadro Sync II card, different resolutions can be synchronized if they are using the same refresh rates. The current limitations of this feature are:

- Each system will support up to two different resolutions if the refresh rates are the same (within 50 PPM).
- The displays of the same resolution must be connected to the same Quadro Sync card, and the Quadro Sync II cards must be connected on CON0 as shown in Figure 2.
- *This is currently limited to two Quadro Sync II cards per system.*
- Configuration must be done with the configureQsync2 tool on Windows.

There are no special commands to synchronize different resolutions, but the driver will only allow it if the above restrictions are met.

Sync Multiply and Divide

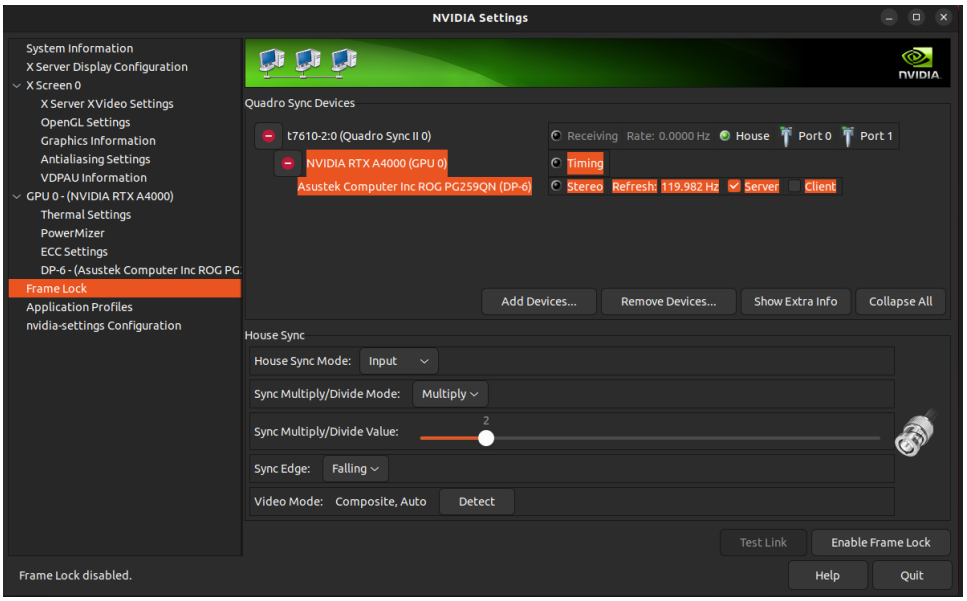
With the 2.18 firmware and above updates to the Quadro Sync II card, displays can be synchronized to an integer multiple or divisor of an external sync source. For example, with an external sync source of 60 Hz, displays with a refresh rate of 120Hz can be synchronized using a sync multiple of 2.

The possible values range from 1 to 8 for both multiplying and dividing the rate of the external sync source.

On Windows, this feature requires the use of the configureQsync2.exe tool, with example syntax of:

```
configureQsync2.exe enable server source=HOUSESYNC multiplier=2 display=0,0


On Linux, the nvidia-settings GUI can be used to control multiplier and divider:
```


NVIDIA Settings
System Information
X Server Display Configuration
X Screen 0
X Server XVideo Settings
OpenGL Settings
Graphics Information
Antialiasing Settings
VDPAU Information
GPU 0 - (NVIDIA RTX A4000)
Thermal Settings
PowerMizer
ECC Settings
DP-6 - (Asustek Computer Inc ROG PG
Frame Lock
Application Profiles
nvidia-settings Configuration
NVIDIA
Quadro Sync Devices
t7610-2:0 (Quadro Sync II 0)
NVIDIA RTX A4000 (GPU 0)
Asustek Computer Inc ROG PG259QN (DP-6)
Receiving
Rate: 0.0000 Hz
House
Port 0
Port 1
Timing
Stereo
Refresh: 119.982 Hz
Server
Client
Add Devices...
Remove Devices...
Show Extra Info
Collapse All
House Sync
House Sync Mode:
Input
Sync Multiply/Divide Mode:
Multiply
Sync Multiply/Divide Value:
2
Sync Edge:
Falling
Video Mode:
Composite, Auto
Detect
Test Link
Enable Frame Lock
Frame Lock disabled.
Help
Quit

Monitoring Display Synchronization

Board-Level Status Indicator

When working with synchronized displays it can often be difficult to verify that all the displays are correctly synchronized. The Quadro Sync II card provides both card and driver-level indicators for the synchronization status information.

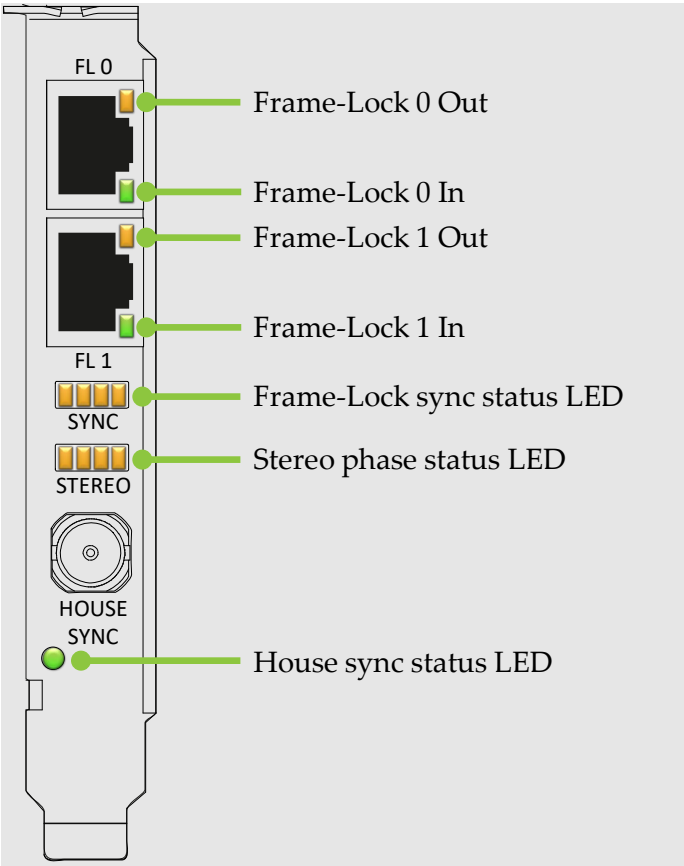
The bracket of the Quadro Sync II card has multiple LEDs to provide configuration and status information.

At system start-up, all LEDs turn on and stay on until the graphics driver loads. Once the driver loads, the LEDs start to show the status of the card and GPUs.

If the LEDs do not turn on at startup, verify that external power is correctly connected and providing power.

See Figure 6 for the location of the LEDs.

Figure 6. Board Level Status Indicators



Note: If the bracket's LEDs do not turn on at system start-up, shut down the system and verify that the external power to the Quadro Sync II card is connected and operating correctly.

Framelock and Stereo Sync Status LEDs

The two rows of status LEDs provide information on the current state of synchronization of the card. There is one LED for each of the GPUs that can be connected.

The top row of LEDs, "Frame-Lock Sync status" shows the synchronization status of the connected GPU (see Figure 7 and Table 1 for Sync and Stereo LEDs).

Figure 7. Framelock and Stereo Sync Status LEDs

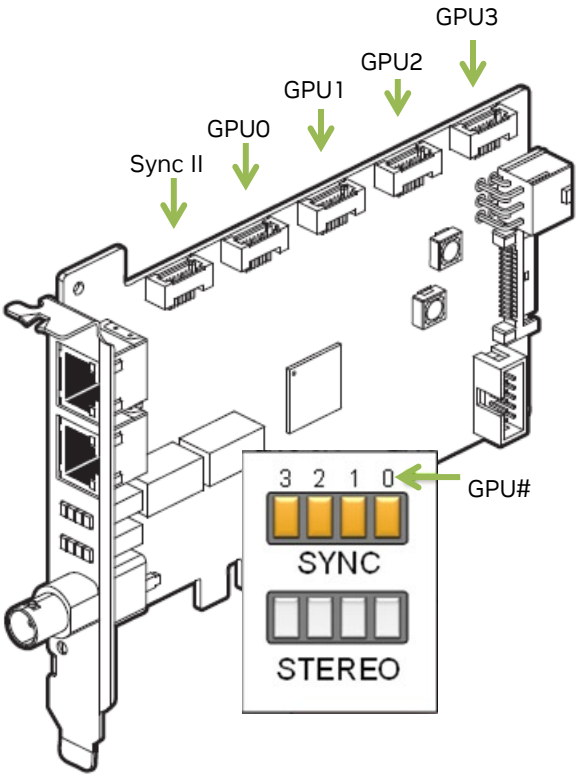


Table 1. Framelock and Stereo Sync Status LEDs

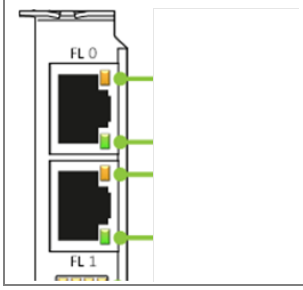
SYNC LED Status	
	GPU Not connected
	GPU present but not synchronized
	GPU synchronized
	GPU is synchronized but within 5% of the threshold of losing sync
	GPU is synchronizing

STEREO LED Status	
	Stereo not active/no GPU
	Stereo locked
	Stereo in process of locking

Framelock Connector LEDs

The Framelock connector LEDs on the RJ45 ports indicate the state of the Quadro Sync II card. The LEDs indicate if the port is receiving a Framelock signal or sending a Framelock signal. The ports auto-configure so different nodes in the cluster may have different LED configurations. See Table 2 for the meaning of the LEDs.

Table 2. Framelock LED Status

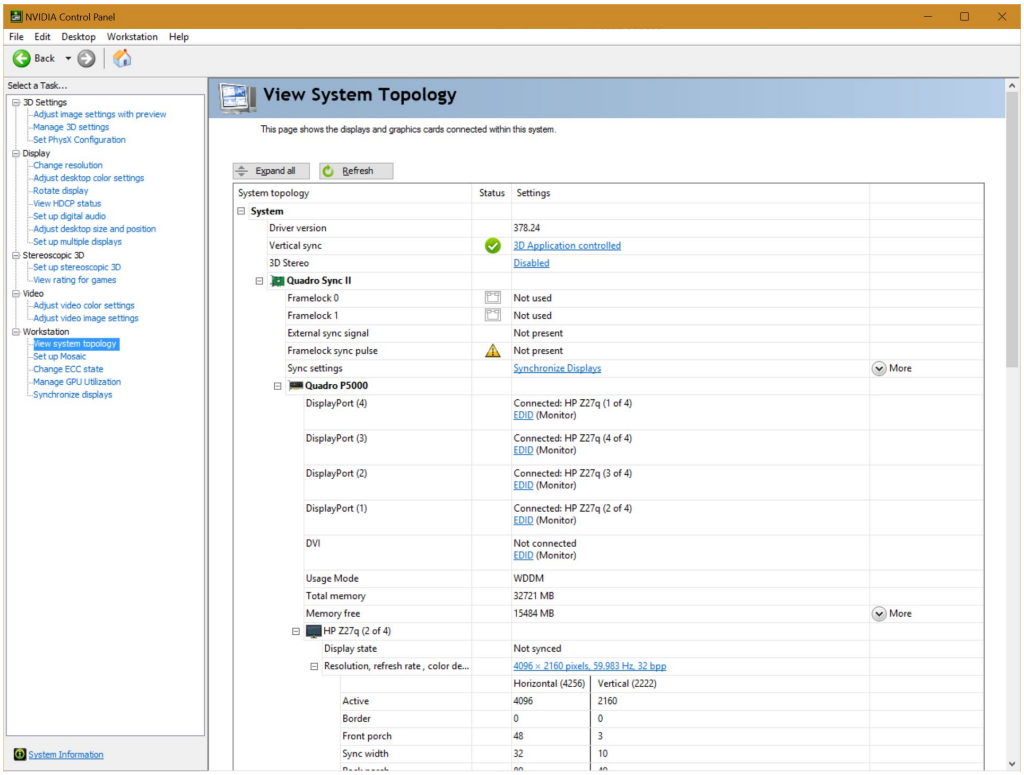
Framelock LEDs	Status	Meaning
Framelock 0 Out Framelock 0 In Framelock 1 Out Framelock 1 In 		Port is an output, but no signal is present.
		Port is an input, but no signal is detected.
		Port is an output sending a signal; the frequency of the blinking is the refresh rate of the signal.
		Port is an input and receiving a signal, the frequency of the blinking is the refresh rate of the signal.

When connecting the Framelock ports, the timing server sends outputs on both ports and all the other nodes configure themselves to one output and one input when they connect to the timing server.

System Topology Viewer for Windows

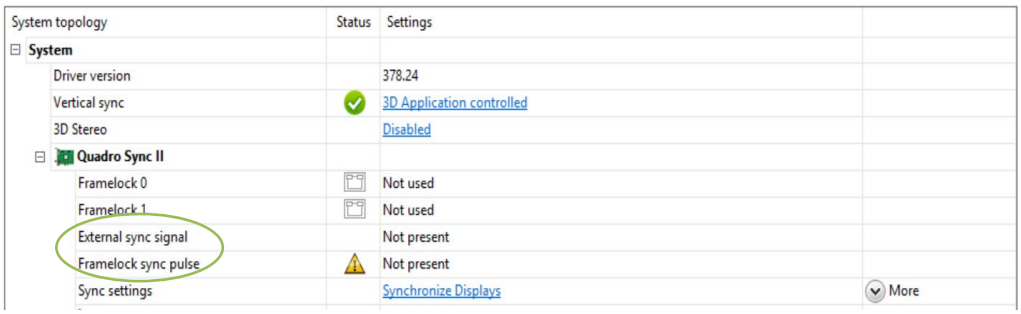
The System Topology Viewer provides a single screen overview of the GPU displays and synchronization status (Figure 8).

Figure 8. System Topology Viewer for Windows

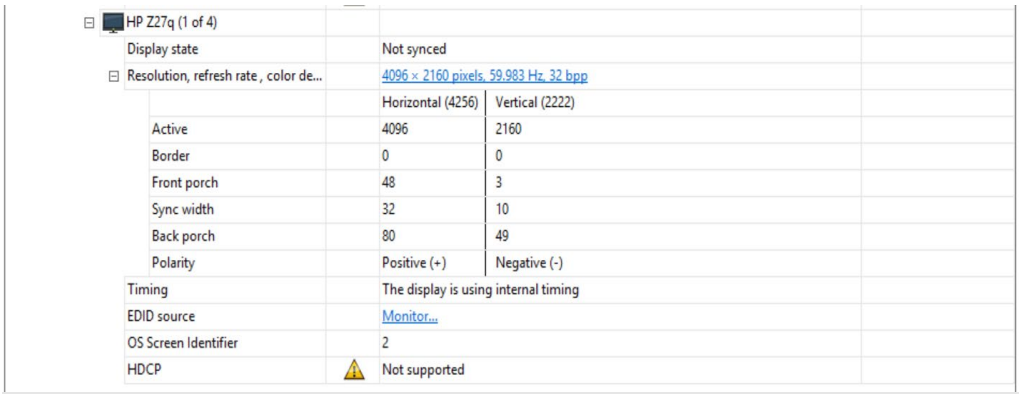


Use the following procedure to use the topology viewer:

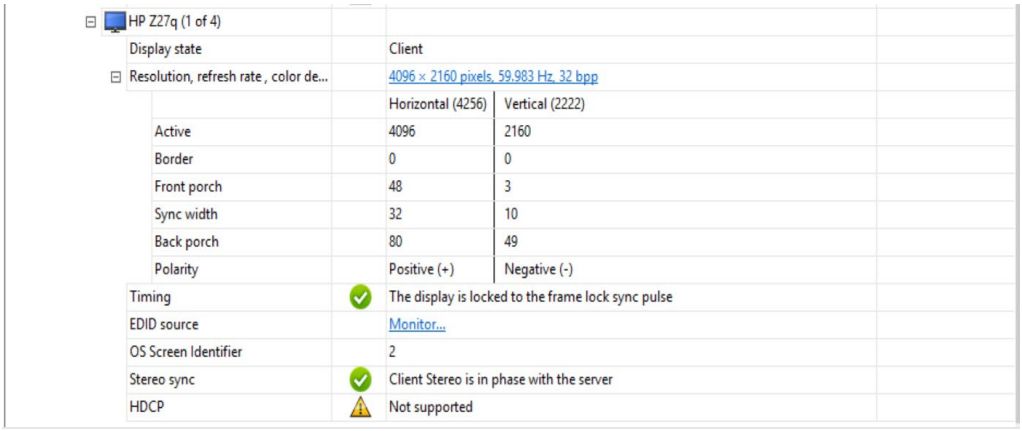
1. Open the NVIDIA Control Panel
2. Select **View System Topology** from the left menu to display the Viewer. With multiple GPUs and displays, maximize the control panel.
3. Verify that the Framelock sync pulse and External sync signal settings are as expected.



4. Scroll down to the individual displays within the GPUs.
5. Verify the **Timing** entry for the Server is locked to the internal or external timing.



6. Verify the other displays are **locked** to the sync pulse and that **Client Stereo is in phase** if using stereo.



Note that the topology can be saved to a file in JSON format with the ‘Save Logfile’ button, which is useful for comparing states between systems.

Sync Timing Tolerance

The Quadro Sync II card can align displays and sync sources up to ±50 ppm difference in the display timings. If the timings are outside this range, the card cannot synchronize them. The Framelock status LEDs on the card indicate that the card is approaching these limits.

To calculate the PPM, use this formula:

PPM = abs(Display_Timing – Reference_Timing)/Reference_Timing * 1.0E+6

See Table 3 for sync timing tolerance limits.

Table 3. Examples of Sync Timing Tolerance

Display Refresh Rate (Hz)	Low (Hz)	High (Hz)
200.000	199.996	200.004
120.000	119.9976	120.0024
100.000	99.998	100.002
60.000	59.9988	60.0012
50.000	49.999	50.001

Miscellaneous FAQ

Frequently Asked Questions

Can the Quadro Sync II card be used with a Quadro M “Maxwell” or K “Kepler” series GPUs.

No.

Can you use the fifth port on the Quadro Sync II card to synchronize a fifth GPU?

No.

Can two GPUs be synchronized with NVLINK bridge on supported GPUs?

Sort of. It is true that the NVLink bridge includes some of the same synchronization signals that Quadro Sync uses, however, these are only active when the NVLink’d GPUs are configured in Mosaic mode, and only the GPUs in the NVlink pair are synchronized. It is also not possible to synchronize these GPUs to an external sync.

Mosaic works without NVLink, can multi-GPUs be synchronized using the PCIe bus rather than using a ribbon cable?

No, for Sync functions to work, the Quadro Sync II card needs to be physically connected to the GPU. Even though Mosaic mode can be enabled when GPUs are connected through the PCIe bus, it is not synchronized. If the GPUs are connected to a Quadro Sync II card Mosaic will be synchronized.

Can you configure and monitor a Quadro Sync II card remotely on a Windows System?

Yes, you can use NVWMI to configure the Quadro Sync II card remotely. NVWMI also supports Sync Event monitoring.

Do you support different lengths of internal cables with the Quadro Sync II card?

Yes, the Quadro Sync II card ships with four 12” and two 24” sync cables.

What is the difference between Quadro Sync and Quadro Sync II cards?

The Quadro Sync II card provides the following new functionality over the Quadro Sync card:

- Compatibility with Quadro P-series graphics boards and later (The board is not compatible with older GPU generation series graphics boards).
- Five on-board connections. The fifth connection is to be used as the connector to a second Quadro Sync II card in a common chassis.
- Synchronization of up to eight GPUs in a common chassis when used with a second Quadro Sync II card.
- TTL Sync Generation output through the BNC connector.
- Support for up to four sync “chains” in a single system when two Quadro Sync II cards are used in a single system.

What order do I need to connect the GPUs to the Quadro Sync II card?

Connect the Quadro Sync II card and up to four NVIDIA RTX/Quadro cards with included cables. On the GPU make sure to connect to the connector labeled “SYNC.” There is no need to connect the GPU to the connectors on the Quadro Sync II card in any order.

Does it matter which connector I use when connecting two Quadro Sync II cards together?

Only when using two Quadro Sync II cards in a system. In that case, each Quadro Sync II card must be connected to the other Quadro Sync II card using the CON0 connector as shown in Figure 2. When a system uses only one Quadro Sync II card, any connector can be used to connect to the GPU.

Compliance and Certifications

The Quadro Sync II card is compliant with the following regulations:

- Australian Communications Authority and Radio Spectrum Management Group of New Zealand (C-Tick)
- Bureau of Standards, Metrology and Inspection (BSMI)
- China Compulsory Certification (CCC)
- Conformité Européenne (CE)
- Federal Communications Commission (FCC) – Class B
- Interference-Causing Equipment Standard (ICES)
- Imaging Science Foundation (ISF)
- Korean Communication Commissions (KCC)
- Underwriters Laboratories (UL, CUL)
- Voluntary Control Council for Interference (VCCI)

Important Safety Information

NVIDIA products are designed to operate safely when installed and used according to the product instructions and general safety practices. The guidelines included in this document explain the potential risks associated with equipment operation and provide important safety practices designed to minimize these risks. By carefully following the information contained in this document, and the specific instructions provided with your product, you can protect yourself from hazards and create a safer environment.

The product is designed and tested to meet IEC-60950-1, the Standard for the Safety of Information Technology Equipment. This also covers the national implementation of IEC-60950-1-based safety standards worldwide, e.g., UL-60950-1. These standards reduce the risk of injury from the following hazards:

- **Electric shock**: Hazardous voltage levels contained in parts of the product
- **Fire:** Overload, temperature, material flammability
- **Mechanical:** Sharp edges, moving parts, instability
- **Energy:** Circuits with high energy levels (240-volt amperes) or potential as burn hazards
- **Heat**: Accessible parts of the product at hot temperatures
- **Chemical**: Chemical fumes and vapors
- **Radiation**: Noise, ionizing, laser, ultrasonic waves

Retain and follow all product safety and operating instructions. Always refer to the documentation supplied with your equipment. Observe all warnings on the product and in the operating instructions.

ⓘ	**Caution:** Failure to follow these safety instructions could result in fire, electric shock, or other injury or damage.

To reduce the risk of bodily injury, electric shock, fire, and damage to the equipment observe the safety labels included on the equipment.

Table 4. Symbols on Equipment

Sign	Meaning
	This symbol in conjunction with any of the following symbols indicates the presence of a potential hazard. The potential for injury exists if warnings are not observed. Consult your documentation for specific details
	This symbol indicates the presence of hazardous energy circuits or electric shock hazards. Refer all servicing to qualified personnel. **WARNING:** To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades, and servicing to qualified personnel.
	This symbol indicates the presence of electric shock hazards. The area contains no user or field serviceable parts. Do not open for any reason. **WARNING:** To reduce the risk of injury from electric shock hazards, do not open this enclosure.

Notice

This document is provided for information purposes only and shall not be regarded as a warranty of a certain functionality, condition, or quality of a product. NVIDIA Corporation (“NVIDIA”) makes no representations or warranties, expressed or implied, as to the accuracy or completeness of the information contained in this document and assumes no responsibility for any errors contained herein. NVIDIA shall have no liability for the consequences or use of such information or for any infringement of patents or other rights of third parties that may result from its use. This document is not a commitment to develop, release, or deliver any Material (defined below), code, or functionality.

NVIDIA reserves the right to make corrections, modifications, enhancements, improvements, and any other changes to this document, at any time without notice.

Customer should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

NVIDIA products are sold subject to the NVIDIA standard terms and conditions of sale supplied at the time of order acknowledgement, unless otherwise agreed in an individual sales agreement signed by authorized representatives of NVIDIA and customer (“Terms of Sale”). NVIDIA hereby expressly objects to applying any customer general terms and conditions with regards to the purchase of the NVIDIA product referenced in this document. No contractual obligations are formed either directly or indirectly by this document.

NVIDIA products are not designed, authorized, or warranted to be suitable for use in medical, military, aircraft, space, or life support equipment, nor in applications where failure or malfunction of the NVIDIA product can reasonably be expected to result in personal injury, death, or property or environmental damage. NVIDIA accepts no liability for inclusion and/or use of NVIDIA products in such equipment or applications and therefore such inclusion and/or use is at the customer’s own risk.

NVIDIA makes no representation or warranty that products based on this document will be suitable for any specified use. Testing of all parameters of each product is not necessarily performed by NVIDIA. It is customer’s sole responsibility to evaluate and determine the applicability of any information contained in this document, ensure the product is suitable and fit for the application planned by customer, and perform the necessary testing for the application to avoid a default of the application or the product. Weaknesses in the customer’s product designs may affect the quality and reliability of the NVIDIA product and may result in additional or different conditions and/or requirements beyond those contained in this document. NVIDIA accepts no liability related to any default, damage, costs, or problem which may be based on or attributable to: (i) the use of the NVIDIA product in any manner that is contrary to this document or (ii) customer product designs.

No license, whether expressed or implied, is granted under any NVIDIA patent right, copyright, or other NVIDIA intellectual property right under this document. Information published by NVIDIA regarding third-party products or services does not constitute a license from NVIDIA to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property rights of the third party, or a license from NVIDIA under the patents or other intellectual property rights of NVIDIA.

Reproduction of information in this document is permissible only if approved in advance by NVIDIA in writing, reproduced without alteration and in full compliance with all applicable export laws and regulations, and accompanied by all associated conditions, limitations, and notices.

THIS DOCUMENT AND ALL NVIDIA DESIGN SPECIFICATIONS, REFERENCE BOARDS, FILES, DRAWINGS, DIAGNOSTICS, LISTS, AND OTHER DOCUMENTS (TOGETHER AND SEPARATELY, “MATERIALS”) ARE BEING PROVIDED “AS IS.” NVIDIA MAKES NO WARRANTIES, EXPRESSED, IMPLIED, STATUTORY, OR OTHERWISE WITH RESPECT TO THE MATERIALS, AND EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT NOT PROHIBITED BY LAW, IN NO EVENT WILL NVIDIA BE LIABLE FOR ANY DAMAGES, INCLUDING WITHOUT LIMITATION ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES, HOWEVER CAUSED AND REGARDLESS OF THE THEORY OF LIABILITY, ARISING OUT OF ANY USE OF THIS DOCUMENT, EVEN IF NVIDIA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Notwithstanding any damages that a customer might incur for any reason whatsoever, NVIDIA’s aggregate and cumulative liability towards the customer for the products described herein shall be limited in accordance with the Terms of Sale for the product.

VESA DisplayPort

DisplayPort and DisplayPort Compliance Logo, DisplayPort Compliance Logo for Dual-mode Sources, and DisplayPort Compliance Logo for Active Cables are trademarks owned by the Video Electronics Standards Association in the United States and other countries.

HDMI

HDMI, the HDMI logo, and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

OpenCL

OpenCL is a trademark of Apple Inc. used under license to the Khronos Group Inc.

Trademarks

NVIDIA, the NVIDIA logo, Quadro, and SLI are trademarks and/or registered trademarks of NVIDIA Corporation in the U.S. and other countries. Other company and product names may be trademarks of the respective companies with which they are associated.

Copyright

©2017 - 2024 NVIDIA Corporation. All rights reserved.

NVIDIA Corporation | 2788 San Tomas Expressway, Santa Clara, CA 95051
http://www.nvidia.com