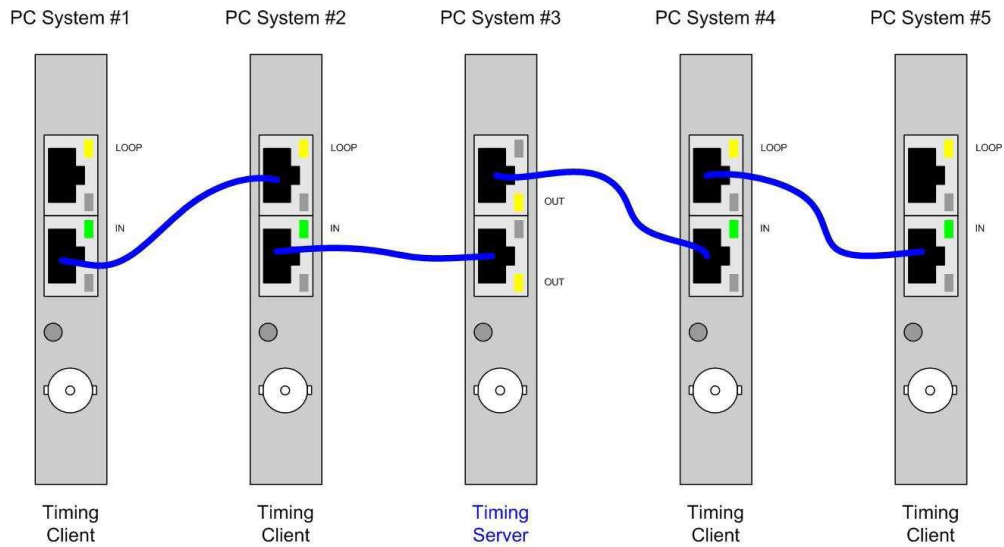# ATI FirePro S400 RJ45 External Interface

General Description

A PC system with ATI FirePro S400 module can communicate with other PC systems each containing a further S400 module. This is achieved via standard RJ45 network cabling, connected in a loop-through daisy-chain arrangement as shown in *Figure 1*.

Figure 1

Note that it is necessary for one of the ATI FirePro S400 modules to be configured (via the Catalyst Control Center) as the *Timing Server*, and the remaining systems as *Timing Clients*.
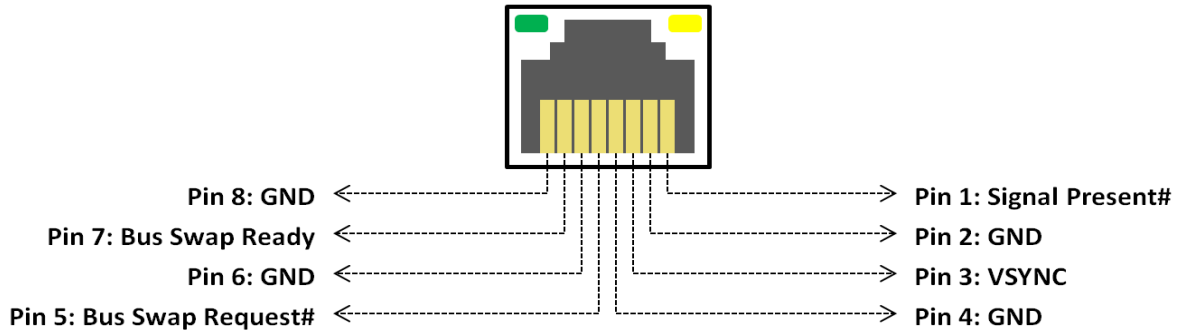
Cabling Limits

Maximum cable length between S400 modules: 10m
Maximum total cable length in daisy-chain: 50m
Maximum number of S400 modules in daisy-chain: 16

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Interface Signals

A set of timing and control signals are communicated over the RJ45 cable as specified in **Figure 2**. This enables all S400 modules connected to the link to be either *genlocked* to the timing reference, or *framelocked*, or both.

Pin 8: GND	Pin 1: Signal Present#
Pin 7: Bus Swap Ready	Pin 2: GND
Pin 6: GND	Pin 3: VSYNC
Pin 5: Bus Swap Request#	Pin 4: GND

ATI FirePro S400 RJ45 Connector Pin-Out

Figure 2

A description of each signal is provided in **Table 1**.

Table 1

Pin#	Signal	Type	Description
1	Signal Present	active high, 3.3V	Timing Server OUT and Client LOOP ports drive this signal high to indicate to external clients that genlock/framelock control is available. Client IN ports treat this as an input signal.
2	(Spare)	(High impedance)	Spare control signal for future expansion.
3	VSYNC	active high, 3.3V	Main image frame counter and timing pulse, generated by Timing Server for genlock/framelock synchronization. Output from Timing Server OUT port and Timing Client LOOP port. Input to Timing Client IN port.
4	GND	0V	Common reference
5	Bus Swap Request#	active low, 3.3V	Output from Timing Server OUT port and Client LOOP port. Input to Timing Client IN port. Falling edge from the Server indicates start of new frame rendering operation. Rising edge indicates client can swap to the new buffer and release *Bus Swap Ready* signal (if client has not already done so). Pulse length depends on framelock application.

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6	GND	0V	Common reference
7	Bus Swap Ready	active high, 3.3V	Output from Timing Client IN port. Input to Timing Server ports and Client LOOP port. Falling edge from Client indicates rendering is in progress; Rising edge indicates Client (and downstream systems) have finished rendering computations and are ready to swap to the new buffer. Clients raise this signal up after receiving the rising edge on *Bus Swap Request#*. Pulse length depends on framelock application.
8	GND	0V	Common reference

Note that the signals present on the RJ45 cables are not "Ethernet" compatible – Do not connect via network hubs or routers.
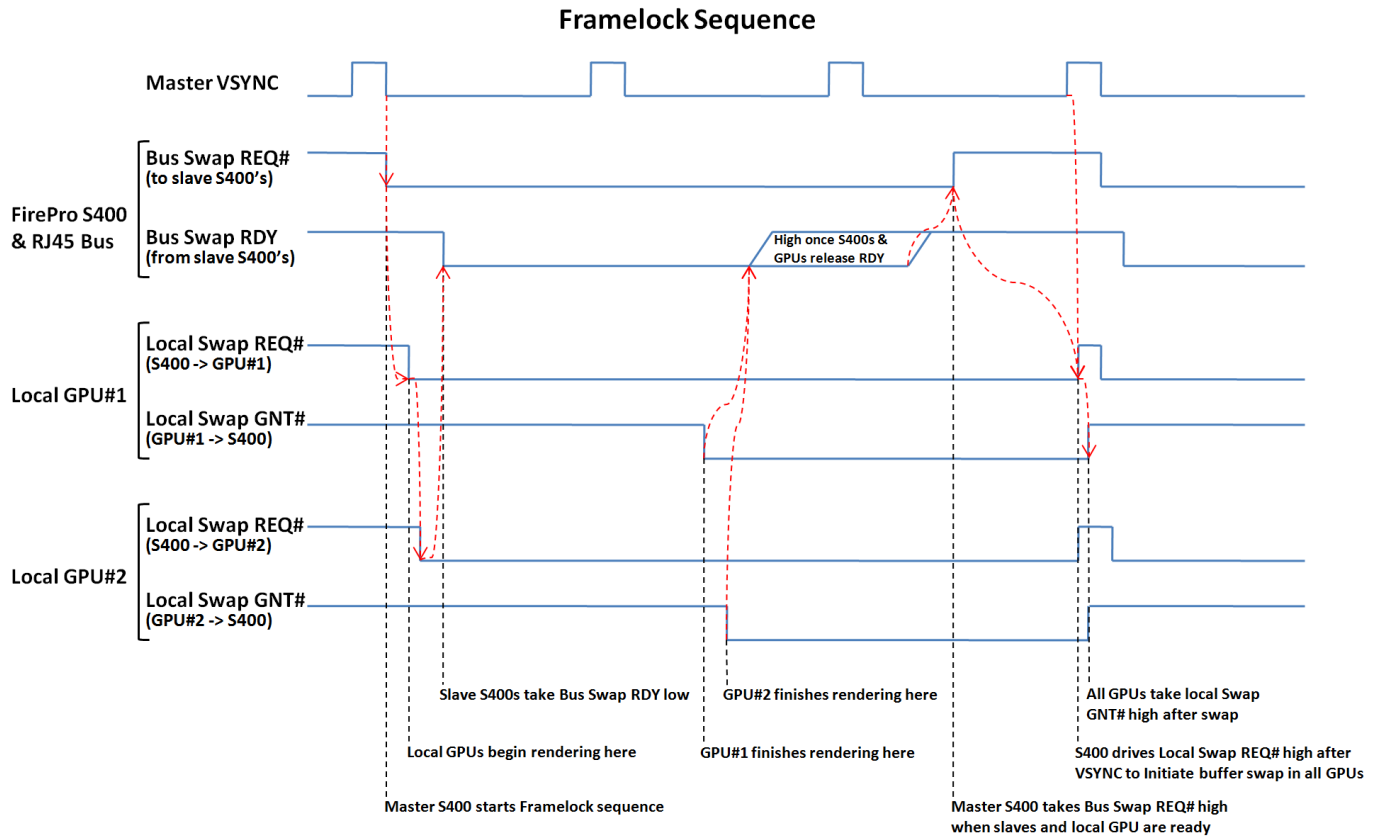
Framelock Signaling

Systems can be connected together to allow for a maximum of 16 computers to be connected in a chain from the timing server. Since the timing server can be configured such that both of its RJ-45 connectors are outputs, a total of 33 computers can be frame locked together.

Buffer swap support: Timing signals are provided enabling driver and application software to synchronize buffer swaps of multiple application windows across multiple systems.

Buffer Swap Mechanism

1. The server system takes Bus Swap Request# low when a buffer swap is required. Bus Swap Request# is a common broadcast signal to all clients.

2. The clients see Bus Swap Request# low, and each activates Bus Swap Ready low. Bus Swap Ready is a common wired-OR signal between all systems.

3. As each client becomes ready to swap, they release the Bus Swap Ready signal. This signal will not go active-high until ALL clients have released the signal.

4. The Timing Server sees Bus Swap Ready go active-high, then on the next frame sync boundary, the server takes Swap Request high.

5. The Timing Clients detect the rising edge on Bus Swap Request#, and use this to initiate the actual buffer swap.

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Framelock Sequence

Framelock Sequence timing diagram showing Master VSYNC, FirePro S400 & RJ45 Bus (Bus Swap REQ#, Bus Swap RDY), Local GPU#1 (Local Swap REQ#, Local Swap GNT#), and Local GPU#2 (Local Swap REQ#, Local Swap GNT#) signals.

Annotations in diagram:
- High once S400s & GPUs release RDY
- Slave S400s take Bus Swap RDY low
- Local GPUs begin rendering here
- Master S400 starts Framelock sequence
- GPU#2 finishes rendering here
- GPU#1 finishes rendering here
- Master S400 takes Bus Swap REQ# high when slaves and local GPU are ready
- All GPUs take local Swap GNT# high after swap
- S400 drives Local Swap REQ# high after VSYNC to initiate buffer swap in all GPUs

Framelock API

Applications requesting Framelock will use the OpenGL **WGL_NV_swap_group**, **GLX_NV_swap_group** or **SGIX_swap_group** and **GLX_SGIX_swap_barrier** extensions.

System setup example

Equipment Required:
- 3 PC workstations each equipped with S400 modules and correct GPUs
- 10m RJ45 cable

Setup Procedure:
1. Start up all three PC systems, and open the Catalyst Control Center application on each.
2. Connect the RJ45 cable as a daisy-chain between the three S400 modules.
3. On the first system, set the local display as Timing Server, configured in "Internal (Free Run)" mode. Also enable the RJ45 output ports, with the Timing Server as source.
4. On the other two systems, set the Timing Server as "None" and the Timing Client as RJ45 input.
5. Check the green and amber LEDs are colored as shown in *Figure 1*.
7. Run a suitable framelock-compatible graphics application on all three PC systems.

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