Christie JumpStart Server

Operation Manual

020-101018-01

CHRISTIE®

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NOTICES

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REGULATORY

The product has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the product is operated in a commercial environment. The product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of the product in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at the user's own expense.

This Class A digital apparatus complies with Canadian ICES-3 (A) / NMB-3 (A).
Cet appareil numérique de la classe A est conforme à la norme ICES-3 (A) / NMB-3 (A) du Canada.

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GENERAL

Every effort has been made to ensure accuracy, however in some cases changes in the products or availability could occur which may not be reflected in this document. Christie reserves the right to make changes to specifications at any time without notice. Performance specifications are typical, but may vary depending on conditions beyond Christie's control such as maintenance of the product in proper working conditions. Performance specifications are based on information available at the time of printing. Christie makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of fitness for a particular purpose. Christie will not be liable for errors contained herein or for incidental or consequential damages in connection with the performance or use of this material.

The product is designed and manufactured with high-quality materials and components that can be recycled and reused. This symbol means that electrical and electronic equipment, at their end-of-life, should be disposed of separately from regular waste. Please dispose of the product appropriately and according to local regulations. In the European Union, there are separate collection systems for used electrical and electronic products. Please help us to conserve the environment we live in!

GENERAL WARRANTY STATEMENTS

For complete information about Christie's limited warranty, please contact your Christie dealer. In addition to the other limitations that may be specified in Christie's limited warranty, the warranty does not cover:

a. Damage occurring during shipment, in either direction.
b. Damage caused by misuse, improper power source, accident, fire, flood, lightning, earthquake or other natural disaster.
c. Damage caused by improper installation/alignment, or by product modification, if by other than a Christie authorized repair service provider.
d. Problems caused by combination of the equipment with non-Christie equipment, such as distribution systems, cameras, video tape recorders, etc., or use of the equipment with any non-Christie interface device.
e. Failure due to normal wear and tear.
f. Warranty does not cover image retention.

PREVENTATIVE MAINTENANCE

Preventative maintenance is an important part of the continued and proper operation of your product. Please see the Service Manual for specific maintenance items as they relate to your product. Failure to perform maintenance as required, and in accordance with the maintenance schedule specified by Christie, will void the warranty.

Table of Contents

Introduction

This manual provides information and procedures for operating, servicing, and repairing the JumpStart server. Only Christie accredited service technicians are authorized to service and repair the JumpStart server.

JumpStart software is designed to work with Christie MicroTiles, but it can also be used with Christie rear-projection and flat panel solutions.

JumpStart software manages tiled displays with up to four video inputs. You can display multiple media files, Microsoft Windows applications, and live video on a 5-10 megapixel digital canvas.

Safety Warnings and Guidelines

To make sure you remain safe, read and observe all warnings and precautions before you service the JumpStart server.

General Precautions

⚠ DANGER	• To prevent physical injury or equipment damage, it is important that you read *Specifications* on page 19 in its entirety before performing any service procedure covered in this manual. • Do not modify any circuit. • Disconnect ALL power to the JumpStart server before servicing. Failure to observe these warnings could result in death or serious injury.
⚠ WARNING	To reduce the risk of injury from a hot component, allow the surface to cool before touching.

Power Precautions

⚠ WARNING

- A power cord is included with your JumpStart server. Before operating the JumpStart server make sure that you are using a power cord, socket, and power plug rated for your location.
- Use only an AC power cord recommended by Christie. Do not attempt operation if the AC supply and cord are not within the specified voltage and power range.
- Do not allow anything to rest on the power cords. Locate the server where the cord cannot be damaged by persons walking on it or objects rolling over it.
- Never operate the server if a power cable appears damaged.
- Do not overload power outlets and extension cords as this can result in fire or shock hazards.
- Ensure the equipment is properly connected to the supply circuit and follow equipment ratings to avoid overloading the circuits.
- Reliable grounding of rack-mounted equipment should be maintained. Particular attention should be given to supply connections rather than direct connections to the branch circuit.

Failure to observe these warnings could result in death or serious injury.

Installation Considerations

NOTICE

- When installing the JumpStart server in a closed or multi-unit rack assembly, the ambient temperature cannot exceed 35°C (95°F). The maximum ambient temperature limit applies to installations at elevations of 1525m (5000 feet) or lower. For installations above 1525m (5000 feet), lower the temperature by 1°C (1.8°F) for every additional 305m (1000 feet) of elevation.
- To allow unrestricted airflow around the JumpStart server, maintain a distance of 15.24cm (6 inches) or greater between the server and walls or other obstructions.
- When installing the JumpStart server in a rack, avoid uneven mechanical loading to reduce the risk of personal injury or equipment damage.

JumpStart Server Symbols

These symbols can appear on the JumpStart server:

Symbol	Precaution
	Indicates the presence of hazardous energy circuits or electrical shock hazards.
	Indicates that the area contains no user or field serviceable parts and electrical shock hazards may be present.
	When present near an RJ-45 receptacle, indicates a network interface connection.
	Indicates the presence of a hot surface or hot component. Contact with the hot surface may cause personal injury.

Electrostatic Discharge Precautions

NOTICE

Electrostatic discharge (ESD) can damage electronic components, such as the system board, CPU and modules. ESD damage can shorten a component's life expectancy or render it useless.

Follow these precautions to reduce the risk of ESD damage to components:

- Ground yourself to the server chassis and ground the chassis to a proper ground point when working with a static-sensitive component or assembly.
- If possible, work on a grounded surface like a mat.
- Keep electrostatic-sensitive components in their static-safe packaging until you are ready to install.
- Always avoid touching pins, leads, or circuitry.

Technical Support

If you are unable to resolve your issue, contact Christie support:

- North and South America: +1-800-221-8025 or *tech-support@christiedigital.com*

- Europe, Middle East, and Africa: +44 (0) 1189 778111 or *techsupport-emea@christiedigital.com*

- Asia Pacific: *tech-asia@christiedigital.com*

Related Documents

For information about using the JumpStart client software, see the JumpStart User Manual (020-101155-xx). For information about using JumpStart with Christie MicroTiles, see the JumpStart Quick-Start Guide (020-100918-xx).

Install and Manage the JumpStart Server

This section provides information and procedures for installing and connecting your JumpStart server to a display wall.

A display wall with one ECU and a single row of MicroTiles cannot contain more than 15 MicroTiles.

The EDID resolution of a single MicroTile subarray might be set so that the incoming signal is larger than the native resolution of the MicroTile (720x540 pixels). This could result in cropped images and videos. To make sure the entire incoming signal is displayed, use the master ECU web interface to set the EDID values manually.

What's In the Box?

- JumpStart server
- Accessory Box:
    - Product registration card
    - Quick Setup Guide
    - JumpStart Software CD
    - JumpStart Operation Manual
    - Keyboard and mouse
    - Mini DisplayPort to DVI-D dongle
    - DVI to VGA adapter (2 per C02I-SL module)
    - DVI to Component adapters (2 per C02I-SL module)
    - DVI to HDMI adapters (2 per C02I-SL module)

Front Panel Components
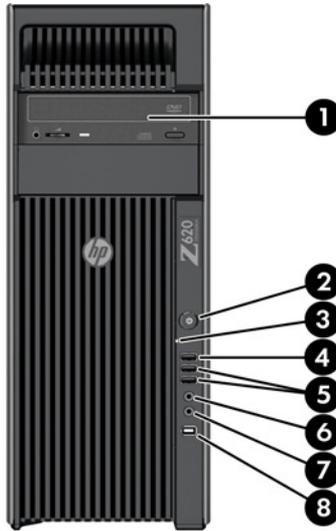
1	Optical drive	5	SS⟲ USB 3.0 (2, blue)
2	⏻ Power button	6	🎧 Headphone connector
3	Hard drive activity light	7	🎤 Microphone connector
4	USB 2.0 port (black)	8	IEEE–1394a FireWire connector

Rear Panel Components

1	Power cord connector	**8**	Audio line-out connector (green)
2	PS/2 mouse connector (green)	**9**	Microphone connector (pink)
3	USB 2.0 ports (4, black)	**10**	USB 3.0 ports (2, blue)
4	J-45 network connectors (orange) *Bottom connector is AMT enabled*	**11**	IEEE–1394a FireWire connector
5	Audio line-in connector (blue)	**12**	PS/2 keyboard connector (purple)
6	Graphics card connector	**13**	Rear Power button
7	Security slot	**14**	Power supply Built-In Self Test (BIST) LED

Before You Begin

Before you start your installation:

- Turn the display wall and master ECU on.

- Select a location for the JumpStart server that has access to power and can be connected to the display wall.

- Select a location for the server that has unrestricted airflow so that the maximum temperature of 35°C (95°F) is not exceeded.

- If mounting the server in a rack, avoid uneven mechanical loading. (Optional rail kit required: 128-100102-01)

- Make sure the MicroTiles installation includes 1 to 6 ECUs, and a single master ECU.

- Ensure that your network provides Internet access for the JumpStart server. The MicroTiles Web interface requires Adobe Flash, which is not pre-installed on the server because of license restrictions.

Unpack the JumpStart Server

1. Remove the accessories box from the JumpStart server box.

2. Pull the JumpStart server out of the box with the handles on the upper corners of the server.

3. Remove the keyboard and mouse from the accessories box.

Connect the JumpStart Server to a Display Wall

The JumpStart server includes an AMD FirePro W600 display module and 6 Mini DisplayPort to DVI adapters. With this configuration you can connect a maximum of 6 display devices to the JumpStart server.

DVI-D connection requires Extended Display Identification Data (EDID), which is detected at startup.

1. Turn the ECUs and display wall on.

2. Identify the master ECU. A flashing green LED light on the right side of the back panel identifies the master ECU.
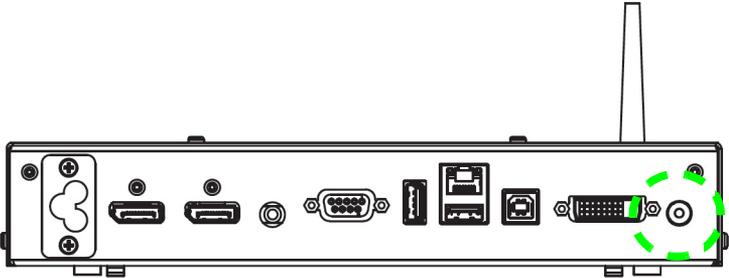
3. Connect the smaller end of each Mini DisplayPort to DVI adapter to the port on the back of the server. Be careful not to insert the adapters into the connectors the wrong way.

Port	Description
1	DVI
2	Mini DisplayPort

4. Connect the other end of each cable to a DVI extension cable (not supplied).

5. Connect the extension cable to a display device in any order.

6. Connect the keyboard and mouse to the USB ports on rear of the JumpStart server.

> If you are connecting the server directly to the master ECU with an Ethernet cable and you are not using a router, make sure the IP addresses on the server and master ECU are configured on the same network. To configure the IP address of the server, consult with your network administrator.

7. Connect one end of a CAT5 Ethernet cable (not provided) to the Ethernet port on the rear of the JumpStart server.

8. Connect the other end of the CAT5 Ethernet cable to an Ethernet port on the master ECU.

Connect Power

1. Connect the power cord (packaged separately) to the AC inlet on the rear of the JumpStart server.

2. Connect the three-pronged end of the power cord to a grounded AC outlet. The Input voltage must be capable of 100-240 VAC, 9.7A.

Turn the Server On

Press the power button on the front of the JumpStart server and wait until the Windows 7 operating system initialization completes.

If your JumpStart server is connected to Christie MicroTiles the MicroTiles Connection Wizard appears. See *Complete the MicroTiles Connection Wizard* on page 11.

Complete the MicroTiles Connection Wizard

1. If the MicroTiles Connection Wizard is not open, right-click the Christie MediaServer icon in the Windows task bar and select **MicroTiles Setup Wizard**.

    If you cannot see the MicroTiles Connection Wizard, disconnect one of outputs and connect it to a computer monitor. Complete steps 2 to 8 and then disconnect the computer monitor and reconnect the connector to the JumpStart server.

2. Click **Next**.
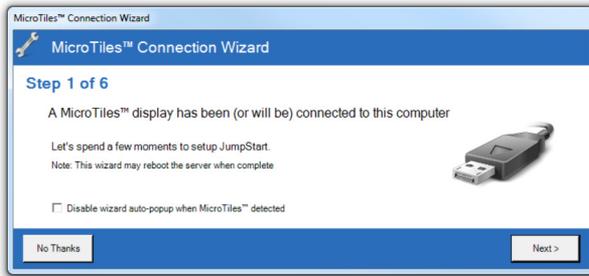
    If the display wall is already configured, you are prompted to confirm that you want to clear the current configuration. To continue, click **Yes**.

3. Select **Ethernet** or **Serial**. Click **Next**.

    If you selected Ethernet, move to step 4. If you selected serial, move to step 5.
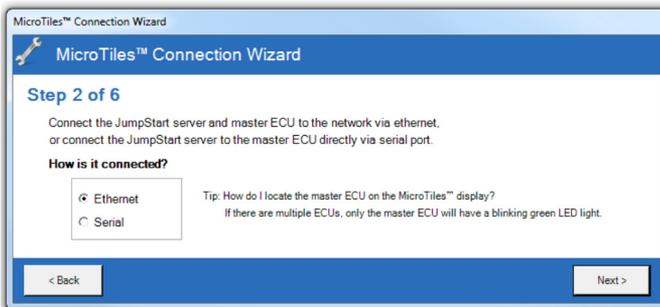
4. Complete these fields:

Field	Description
IP Address	The IP address of the master ECU.
Port	The master ECU port to which the JumpStart server is connected.
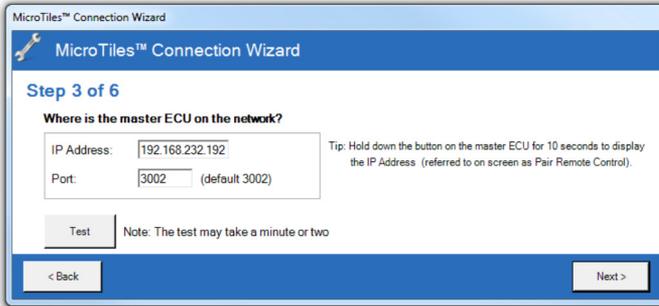
5. Complete these fields:

Field	Description
Serial Port	The master ECU serial port to which the JumpStart server is connected.
Baud Rate	The baud rate of the master ECU serial port.
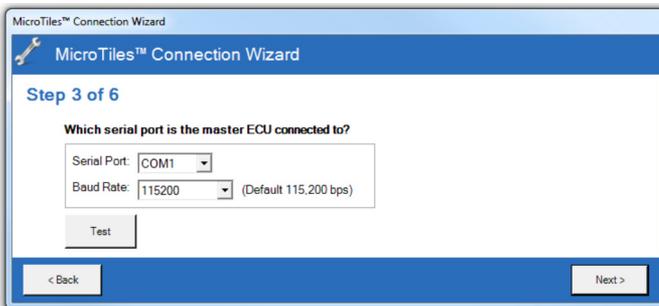
6. Click **Test**.

If an error message appears, make sure that your master ECU and display wall are on and that your JumpStart server is connected properly.

7. Click **Next**.

8. Select one of these options:

Option	Description
Automatically configure MicroTiles resolution (server will restart) - Recommended	The MicroTiles Connection Wizard sets the extended display identification data (EDID) values on each ECU to achieve the optimal canvas resolution supported by the server.
	If you have subarrays defined, they are reset. If automatic configuration fails, a link to access the MicroTiles Web interface appears so that you can complete the configuration manually.
Manually configure MicroTiles resolution	1. Click **Click here to access to the WebUI**
	2. Click **Canvas Management** > **Layout** > **Subarray Configuration**,
	3. Click **Auto Subarray**.
	4. Click **Source Management** > **Customize EDID**.
	5. Adjust the **Horizontal Size**, **Vertical Size**, and **Frame Rate** to match your display wall. When you adjust these settings, the Bandwidth required to achieve them is dynamically updated. We recommend that the bandwidth should not exceed 150 MHz. When you are finished.
	6. Click **Apply**.
	For more information, see the MicroTiles User Manual (020-100329-XX).

7. Click **Next** twice.

8. Adjust the Microsoft Windows desktop display settings. When your adjustment is complete, click **OK**.

    To detect your current setup, click **Detect**. To show the numbers corresponding to your displays on your display wall, click **Identify**.
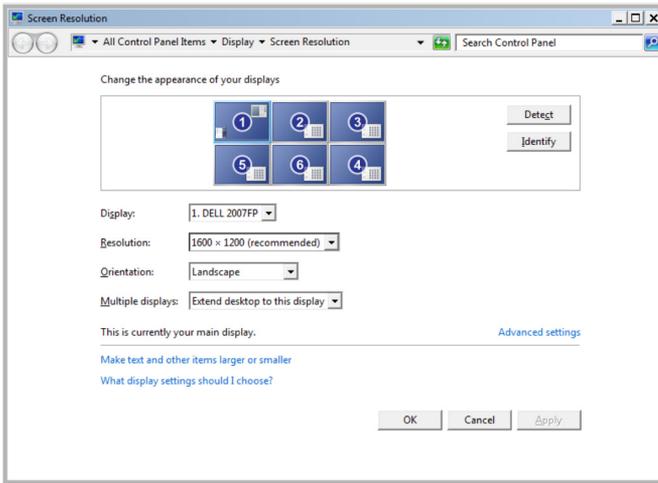
9. Click **Open the AMD Control Panel** if you are using multiple ECUs and want to show full-screen applications or use the Christie Interactivity Kit across the entire canvas. For more information, see the Catalyst Pro Control Center online help.
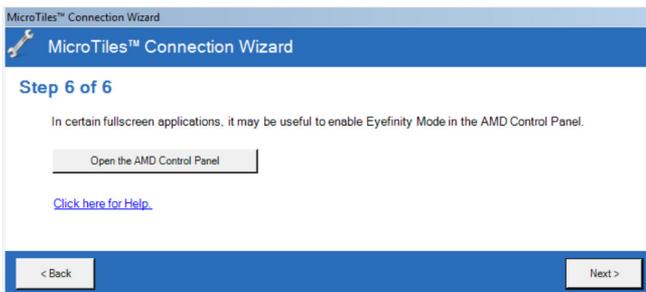
10. Click **Next**.

11. Click **Done**.

Change the Display Wall Settings

Right-click the Christie MediaServer icon in the Windows task bar and select **MicroTiles Setup Wizard**.

Update the Java Software

Do not upgrade the Java software with the web server running.

1. On the JumpStart server desktop, right-click **Computer** and then click **Manage**.

2. Double-click **Services and Applications** in the left pane.

3. Double-click **Services** in the right pane.

4. Right-click **Christie Web Server** and then click **Stop**.

5. Click > **Start** > **Control Panel** > **Java (32-bit)**.

6. Click the **Update** tab. Click **Update Now**.

7. Return to the Services list, right-click **Christie Web Server** and then click **Start**.

Update the ECU and MicroTiles Firmware

To work with JumpStart, your ECUs and MicroTiles need the latest version of firmware.

When you need to upgrade the firmware, the MicroTiles Connection Wizard displays a message and provides a link to the MicroTiles Web interface. Click the link and then click **Configuration** > **Firmware Upgrade** > **ECUs and MicroTiles**.

For more information, see the MicroTiles User Manual (020-100329-XX). at www.microtiles.com. Click **Downloads** > **User Manuals**.

Disable DHCP

To work with JumpStart, the ECU must be networked with DHCP disabled.

If you enable DHCP, the MicroTiles Connection Wizard displays a message and provides a link to the MicroTiles Web interface. Click the link and then click **Configuration** > **Ethernet**. In the **DHCP** list, select **Disabled**, and then click **Apply**.

For more information, see the MicroTiles User Manual (020-100329-XX). at www.microtiles.com. Click **Downloads** > **User Manuals**.

Input and Output Connections

You can use a DVI-I connection to connect the JumpStart server to other devices such as a computer. To use RGB, HDMI, or Component connections, a VGA, HDMI or Component to DVI-I adapter is required. The maximum resolution of a DVI-I connection can be WUXGA resolution (1920 x 1200 x 24-bit) digital or QXGA resolution (2048 x 1536 x 24-bit) analog. The DVI-I capture frame rates are determined by the number of simultaneous captures and the resolution.

Output Signals

The Mini DisplayPort connectors on the rear of JumpStart server are capable of displaying WUXGA resolution (1920 x 1200) at 60 Hz. For SXGA+ resolution, the refresh rates are 60-75 Hz. Mini DisplayPort to DVI-D adapters are included with the JumpStart server.

Connect display devices or ECUs to the 6 Mini DisplayPorts on the output module.
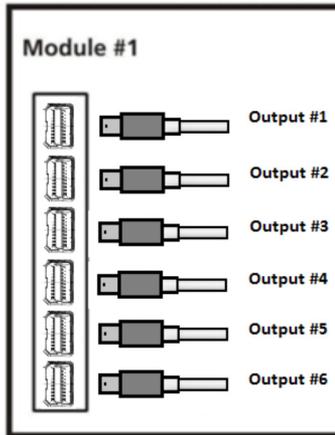
2-Port DVI-I Input Module

Each DVI-I input module has two DVI-I connectors. A source connected to the top connector is considered Input #1.
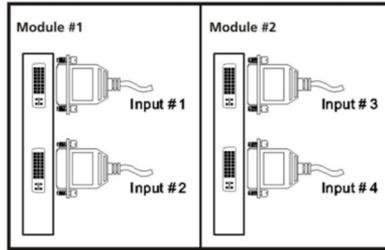
The DVI-I input module can accept these input signals: DVI-D, DVI-A, DVI-I, RGB/VGA (HD15 to DVI-I adapter), RGB 3/4/5 wire (proper adapter), HDMI (HDMI to DVI-I adapter), and Component (Component to DVI-I adapter). This table lists the specifications for the standard input VGA connectors:

Signal Description	RED	GREEN	BLUE	Hor/ Comp	Vert
RGB with H & V Sync (5 wire)1, 2, 3	Red	Green	Blue	H-Sync	V-Sync
RGB with composite sync (4 wire)1, 2, 3, 4, 5	Red	Green	Blue	Comp Sync	No signal
RGB with sync-on-green (3 wire) 4,5	Red	Green with sync	Blue	No signal	No signal

- Sync signals cannot be swapped between the Horizontal/Composite and Vertical connectors.
- Sync signal(s) can be negative or positive polarity.
- Sync present on any of the RGB signals will be ignored en separate or composite sync is input.
- Sync can be bi-level.
- 'No signal' means no signal should be applied to the input.

No DVI signal

If you do not see output on any of the display devices, it is possible there is a problem with the EDID.

1. Close all applications.
2. Select **Start > Shutdown**
3. Disconnect the JumpStart server from AC power.
4. Change the cables or re-seat the connectors.
5. Reconnect the JumpStart server to AC power
6. Turn the JumpStart server on and confirm the configuration is correct.

Recognizing Hard Drive Failures

Occasionally, a failed hard drive can resume operation after you restart the JumpStart server or after you remove and then reinstall the hard drive. If you continue to use a failing hard drive you could lose data. Replace all hard drives that show symptoms of failure.

When a hard drive begins to fail, a `POST` message with a list of failed hard drives appears when JumpStart server is restarted. The `POST` message continues to appear whenever the JumpStart server is restarted and a functional hard drive is detected.

Turn the Server Off

When you press the power/standby button, some power supply components and internal circuitry remain active until the JumpStart server is disconnected from AC power.

When you turn the JumpStart server off to perform maintenance, disconnect the power cord from the AC power supply. Failure to disconnect the power cord may increase the risk of personal injury, electric shock, or equipment damage.

1. Close all applications.
2. Select **Start > Shutdown**.

Specifications

Main Chassis

Drive Bays	3 x hot plug 3.5" SATA drive bays 2 x media drive bays
Expansion Slots	2x PCIe 3.0 x16 (x16 mechanical) 1x PCIe 3.0 x8 (x8 mechanical) 1x PCIe 2.0 x4 (x8 mechanical) 1x PCIe 2.0 x1 (x4 mechanical) 1x PCI 33MHz
Cooling	1 x 92mm CPU fan 2 x rear exhaust fan 1 x front intake fan 1 x 60mm (rear) memory fan 1 x 40mm (front) memory fan
Chipset	Intel® C602
Processor	Intel® Xeon™ E5-1620 3.6GHz 10M
Operating System	Windows 7 Professional 64-bit
Application Software	JumpStart Display Wall Control Software

Main Memory

Type	DDR3-1600 RDIMM ECC
Standard Capacity	16GB (4 x 4GB)
Memory Protection	Advanced ECC with online spare capabilities

I/O Interfaces

Mouse	1
Keyboard	1
USB 2.0 Ports	5 (1 front, 5 rear, 3 internal)
USB 3.0 Ports	4 (2 front, 2 rear)
IEEE 1394 (Firewire)	2 (1 front, 1 rear)
RJ-45 (LAN)	2

Storage

Capacity	1 TB
Interface	Serial ATA
Transfer Rate Synchronous (Max.)	6GB/s
Rotational Speed	7200 RPM
Cache Size	64MB

Power Requirements

Standard	800 Watt Custom PSU
Range Line Voltage	100-240V
Rated Input Voltage	100-240V
Rated Input Frequency	50/60Hz
Rated Input Current	3A

Peripheral Devices

Keyboard	Type	Generic
	Interface	PS/2 or USB
Mouse	Type	2-button optical with scroll wheel
	Interface	PS/2 or USB

Graphics Output (AMD FirePro W600)

Card Format	PCI Express Gen3 x16
Form Factor	Full Height, Half Length
Graphics Memory	2GB GDDR5
Number of Output Channels	6
Max. Digital Output Resolution per Channel	4096x2160 (4K), 30bpp @ 60Hz - DisplayPort 1.2 2560x1600 (WQXGA) - Dual Link DVI 1920x1200 (WUXGA) - Single Link DVI
Max. Resolution Bandwidth	165MHz
Min. Resolution Bandwidth	25MHz
Max. Cards per System	1 (6 display channels)
Connectors	6 mDP connectors (compatible with all other outputs with adapters)
Max. Power Consumption	75 Watts
Supported Display Modes	All available in 16bpp and 32bpp
DisplayPort Protocol	1.2

DVI Input (C02I-SL)

This table lists the frame rate for non-interlaced sources and the field rate for interlaced sources. Signals are displayed at a lower rate (frames are dropped).

The C02I-SL capture card might be able to display resolutions not listed in the table. However, the quality of the image cannot be assured.

Card Format	2.5GHz PCIe 1.0 x4 adapter
Format Factor	Full Height, Half Length
Video Capture Memory	64MB triple buffered
Number of Input Channels	2 (DVI-I connectors)
Max. Cards per System	2 (4 channels)
Supported Input Resolutions - Digital	640x480 (VGA), 800x600, 1024x768, 1280x1024, 1600x1200, 1920x1080, 1920x1200 (WUXGA)
Supported Input Resolutions - Analog	640x480 (VGA), 800x600, 1024x768, 1280x1024, 1600x1200, 1920x1080, 2048x1536 (QXGA)
Supported Input Resolutions - HD	480p, 576p, 720p, 1080p
HDCP	Not supported
Input Connector Type	DVI-I or HD15 VGA, HDMI, Component (with adapter)
Power Consumption	15 Watts (Max.)
Power Requirements	+3.3V @ 0.25A, +12V @ 2A
Horizontal frequency range	15 – 110kHz
Vertical frequency range1	25 – 200Hz
Scan format	Progressive
Dot (pixel) clock rate	Analog: 25 – 170MHz Digital: 25 – 165MHz
Active pixels per scan line	640 min., 2048 max. (analog), 1920 max. (digital)
Active lines per field/non-interlaced frame	480 min., 1536 max. (analog), 1200 max. (digital)

Sync types	Separate H and V
	Composite (bi-level)
	Sync-on-green (bi-level)
	DVI Single Link
Polarity	Positive or Negative (separate H and V sync, composite sync)
Input levels R,G,B – with sync: R,G,B - without sync:	1.0Vp-p ±2dB (0.79Vp-p – 1.26Vp-p) 0.7Vp-p ±2dB (0.56Vp-p – 0.88Vp-p)
Input offset	± 2V
Nominal impedance	75 ohms

Embedded PCI Express Gigabit NIC Server Adapter

Network Interface	10/100/1000-T
Compatibility	IEEE 802.3 10Base-T IEEE 802.3u 100Base-TX IEEE 802.3ab 1000Base-T
Data Transfer Method	PCI Express, four lanes (x4)
Connector	RJ-45
Network Transfer Rate: 10Base-T (Half-Duplex): 10Base-T (Full-Duplex): 100Base-TX (Half-Duplex): 100Base-TX (Full-Duplex): 1000BaseTX (Half and Full-Duplex):	10Mb/s 20Mb/s 100Mb/s 200Mb/s 2000Mb/s
Cable Support 10Base-T: 10/100/1000Base-TX:	Cat. 3, 4, 5 UTP; up to 100m (328ft) Cat. 5 UTP; up to 100m (328ft)

Safety

- CAN/CSA C22.2 No. 60950

- UL 60950-1

- EN/IEC 60950-1

Electromagnetic Compatibility

Emissions	FCC CFR47, Part 15, Subpart B, Class A – Unintentional Radiators
	CAN ICES-3 (A) / NMB-3 (A)
	CISPR 22 / EN55022, Class A - Information Technology Equipment
Immunity	CISPR 24 / EN55024 EMC Requirements - Information Technology Equipment
Marking	The controllers are designed to comply with the rules and regulations required for the product to be sold in various regional markets, including; USA/Canada, European Union, Australia/New Zealand, Kuwait, China, Korea, Japan, Mexico, Ukraine, Russia, South Africa, and Saudi Arabia.

Reliability and Serviceability

Reliability	MTBF of major components	50,000 hours
Serviceability	MTTR	15 minutes max.

Quality

- Manufactured at the Christie Canadian facility; certified for ISO 9001:2000 and ISO 14001:2004

Environment

Operating	Temperature	+5°C to +35°C (+40°F to +95°F) NOTE: Derate by 1 degree C (1.8 degrees F) for every 305m (1,000ft) altitude over 1,525m (5,000ft)		
	Relative Humidity	8% to 85% non-condensing		
	Altitude	0 to 3,048m (10,000ft) max.		
	Shock (Single event only	Half-sine: 40g, 2-3ms		
	Vibration (random, non-continu-ous)	0.5g (rms), 5-300Hz		
Non Operating	Storage	Temperature	-40°C to +60°C (-40°F to +140°F) NOTE: Derate by 1 degree C (1.8 degrees F) for every 305m (1,000ft) altitude over 1,525m (5,000ft)	
		Relative Humidity	8% to 90% non-condensing	
	Shipping	Shock (Single event only)	Half-sine: 160cm/s, 2-3ms (~100g) Square: 422cm/s, 20g	
		Altitude	0 to 9,144m (30,000 ft) max.	
		Vibration (random, non-continuous)	2.0g (rms), 10 to 500Hz	

Corporate offices

USA – Cypress
ph: 714-236-8610

Canada – Kitchener
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