CHRISTIE®

MICROTILES™

Specification and Application Guide

CHRISTIE®

NOTICES

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Products are warranted under Christie's standard limited warranty, the complete details of which are available by contacting your Christie dealer or Christie. In addition to the other limitations that may be specified in Christie's standard limited warranty and, to the extent relevant or applicable to your product, the warranty does not cover:

a. Problems or damage occurring during shipment, in either direction.
b. Projector lamps (See Christie's separate lamp program policy).
c. Problems or damage caused by use of a projector lamp beyond the recommended lamp life, or use of a lamp other than a Christie lamp supplied by Christie or an authorized distributor of Christie lamps.
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e. Problems or damage caused by the use of any lamp, replacement part or component purchased or obtained from an unauthorized distributor of Christie lamps, replacement parts or components including, without limitation, any distributor offering Christie lamps, replacement parts or components through the internet (confirmation of authorized distributors may be obtained from Christie).
f. Problems or damage caused by misuse, improper power source, accident, fire, flood, lightening, earthquake or other natural disaster.
g. Problems or damage caused by improper installation/alignment, or by equipment modification, if by other than Christie service personnel or a Christie authorized repair service provider.
h. Problems or damage caused by use of a product on a motion platform or other movable device where such product has not been designed, modified or approved by Christie for such use.
i. Problems or damage caused by use of a projector in the presence of an oil-based fog machine or laser-based lighting that is unrelated to the projector.
j. For LCD projectors, the warranty period specified in the warranty applies only where the LCD projector is in "normal use" which means the LCD projector is not used more than 8 hours a day, 5 days a week.
k. Except where the product is designed for outdoor use, problems or damage caused by use of the product outdoors unless such product is protected from precipitation or other adverse weather or environmental conditions and the ambient temperature is within the recommended ambient temperature set forth in the specifications for such product.
l. Image retention on LCD flat panels.
m.Defects caused by normal wear and tear or otherwise due to normal aging of a product.

The warranty does not apply to any product where the serial number has been removed or obliterated. The warranty also does not apply to any product sold by a reseller to an end user outside of the country where the reseller is located unless (i) Christie has an office in the country where the end user is located or (ii) the required international warranty fee has been paid.

The warranty does not obligate Christie to provide any on site warranty service at the product site location.

PREVENTATIVE MAINTENANCE

Preventative maintenance is an important part of the continued and proper operation of your product. Please see the Maintenance section 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.

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.
CAN ICES-3 (A) / NMB-3 (A)
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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!

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Content

Installation Considerations

This document provides information and procedures for planning and constructing a MicroTiles canvas and recommendations for integrating MicroTiles into your unique environments. Consult your Christie dealer for more information.

Location requirements

Notice. Failure to comply with the following may result in property damage.

- The physical dimensions provided by MicroTiles Designer™ software include only the screen area. Please make sure enough room is provided to accommodate the feet and mounting brackets, and to secure the final row to the array. Refer to the product line drawing, available at www.microtiles.com for these dimensions.

Use the online calculator at www.microtiles.com or download the Christie MicroTiles Designer software to determine the number of tiles required for your array.

An array can contain a maximum of 200 tiles. If you require a larger display, a separate group of ECUs is required for every group of 200 tiles.

The base structure for your MicroTiles display must be capable of supporting the weight of the array with a maximum acceptable deflection of 0.6 mm (0.025″), typically up to five tiles high. When the base structure is only used for alignment of the first row (every single tile above being suspended by the wall mounting bracket), it must be capable of supporting two rows of tiles with the same maximum deflection. For dimensions and tolerances, see *3 x 3 array* on page 30.

MicroTiles can be serviced from the front or back. Rear service is limited to the fans and the power supply. All other components are only serviceable from the front. For details, see the Christie MicroTiles Service Manual (P/N: 020-100332-xx).

A sufficiently sized unobstructed space must be left at the back of all Christie MicroTiles arrays to allow for air flow and cooling, to make sure that the intake air of each tile is within the operating range of 5-40°C (41-104°F) for the display unit.

If the array is installed in an enclosed area, additional cooling may be required to make sure the maximum inlet temperature does not exceed 40°C (104°F). Consult an architect or mechanical engineer to calculate the required space, and to plan an adequate ventilation plan. See *Ventilation Examples* on page 38.

The fans on each tile have a maximum inlet air flow of 70 CFM (33 L/s). Maximum cooling load is 110W (375 BTUs/hr) per tile, when operating with all LEDs manually driven to the maximum levels; for example, without color matching. The inlet air temperature cannot exceed the maximum operating temperature.

Screen spacing

In a MicroTiles array, the physical size of the space between two adjacent screens is affected by temperature and humidity. Improper installation of the tiles also affects both the size and consistency of screen spacing. When the MicroTiles are installed correctly, the average physical distance between screens is typically 1.3 mm at 25°C (77°F) ambient and 50% non-condensing relative humidity, with a variance of ± 0.3mm. Use a feeler gauge to measure screen spacing accurately.

Support structures

Arrays that are five rows or higher must have a rear support. For details, see *Installations greater than five tiles* on page 34. This table lists the materials that you can use for the base structure:

Material	Description
Strut channels	Provide good support, are easily fabricated, have modular assembling capabilities, and shipping advantages.
Hollow structural tubing	Use of hollow structural tubing provides good support; however, this type of structural material requires elaborate fabrication activities and is less adaptable to modifications.
Aluminum extrusions	Provides less support than strut channels.
Wooden materials	Use of plywood and wood blocks are acceptable choices for temporary bases. However, rigidity and flatness needs to be maintained on a permanent base

Back structures are the support structure to which a MicroTiles array is anchored. To attach the mounting bracket to metal or wood studs, use an interface plate suitable for metal or wood studs. The interface plate mounting holes should align with the display unit mounting holes. Use shims and spacers to compensate for an uneven surface.

Mounting and anchor requirements

Mounting hardware is not provided. When installing MicroTiles follow your local standards and safety regulations

Use the four M6 female threaded bosses on the back of each display unit for wall and ceiling installations. For wall mounting, a minimum thread engagement of 12 mm (0.4″) and a maximum

thread engagement of 15 mm (0.6") are recommended. For ceiling mounting, use M6 bolts (property class 12.9 - plain finish) applied with 14 Nm of torque.

Installation Type	Recommendation
Floor mount - facing up	When floor mounting MicroTiles, only the tiles on the outside perimeter of the array can be serviced. Rigging or scaffolding is required to service the tiles on the inside perimeter. **Floor installations for viewing only** This type of floor installation has no protective barrier and cannot be walked on without damaging the product. Attach the tiles to a support structure using the mounting brackets. Each display unit in the array requires a mounting bracket to properly support the array and evenly distribute the weight. Power, cabling and source control remain the same as if the MicroTiles array was upright on a wall. **Floor installations with foot traffic** With this type of installation, you must install a transparent barrier above the tiles. The transparent barrier must be a minimum distance of a 20 mm (0.78") above the MicroTiles array at its lowest point. Make sure the barrier can be easily removed for servicing and the MicroTiles array has adequate cooling.
Walls with an Incline >20° Off Vertical	Use a wall mount bracket (P/N: 123-107109-xx) when the outer edges of the array are greater than 20°. For these types of installations, use overhead safety equipment such as hooks and rigging equipment to ensure safety and provide ease of installation. Ceiling or angle mounting are supported and included in product certification for North America. However, the mounting support system and the mounting surface must be evaluated and accepted by local authorities and adhere to local standards and safety regulations.
Suspended or Fly from Rigging	Mount a bracket to each tile.
Portrait Orientation	Make sure the air channel of the tile is up. Always rotate in a clockwise rotation to position the air intake above the heat sink, allowing the hot air to travel up and out of the tiles. The mechanical assembly, alignment features, the screen, and the optional mounting bracket, are optimized for landscape orientation. The horizontal viewing angle for the S300 screen is wider in landscape orientation than in portrait
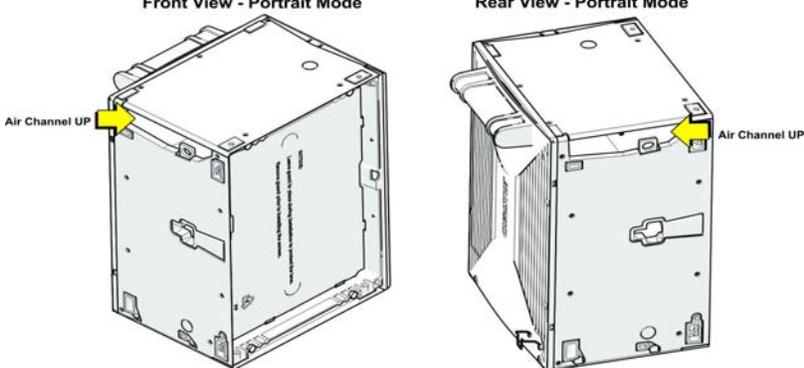
Installation Type	Recommendation
Curved Displays	• Tiles curved in a portrait orientation have a narrower horizontal viewing angle. • If screen gaps need to be maintained, then only a concave shape is possible (curving inwards), not convex. • A single wall may only be curved in one direction. • When mounting adjacent tiles at an angle – in landscape orientation – the center foot cannot be used on the bottom row. Instead, use two end feet and a rear mounting structure to maintain positioning of each column for consistent screen gaps. • If the angle of the curve between two tiles exceeds 5°, the infrared (IR) transmitter and receiver in neighboring tiles will not detect each other. Affected tiles will need to be manually mapped during initial setup, so that the system is aware of their physical location in the overall canvas. This is a simple, one-time process, but may be time-consuming on a large display. All other functionality of the tiles, including color and brightness matching, occurs through the display port cabling and is independent of the IR neighbor detection scheme.

The mounting surface is the surface to which the back face of the mounting bracket is secured. The mounting surface must be a minimum of 50 mm x 34 mm (2″ x 1-3/8″) and be capable of holding the MicroTiles array with a maximum allowable deflection of 0.6mm (0.025″). The maximum allowable deflection is measured at the bottom edge of the screen, when the current tile is anchored and the tile above it is resting on it.

The M8 threaded holes must be positioned relative to the edges of the anchor, as illustrated in *3 x 3 array* on page 30. The maximum allowable deflection measured at the bottom edge of the screen should not exceed 0.6 mm (0.025″).

Anchors refer to the M8 threaded mounting holes or M8 studs to which the mounting brackets are mounted. It is important that the nominal distance between anchors is maintained. For dimensions and tolerances, see *3 x 3 array* on page 30.

For clearance purposes around the array, positioning of the entire array (in XY plane) must take into consideration the relative position of the outer edges of the array to the mounting holes, in order to assure clearances between the outer edges of the array, and any surfaces adjacent to them (if applicable).

The wall mounting bracket should only be used on vertical structures/walls with an acceptable incline of ±20° vertical (towards/away from mounting surface). For details, see *3 x 3 array* on page 30.

Leveling feet

⚠️ **Danger!** Failure to comply with the following results in death or serious injury.

• TIP LOAD! If the array is two rows or higher additional hardware for tip resistance must be used. Either use the rear tie points on the array or bolt the leveling feet into the ground.
If the array is mounted to the leveling feet, it is mandatory that they are fastened anytime the array is two rows or higher to prevent tipping and provide stability. The leveling feet come equipped with machined points for bolting the array down, but the hardware is not supplied. Use M6 or 1/4″ hardware and follow all local standards and safety regulations when bolting the array.

Typically, the optional leveling feet are used when constructing an array two rows or higher to prevent tipping and to level and tilt small arrays. The leveling feet come equipped with machined points that allow the array to be secured to a solid surface. The fastening hardware is not supplied. Christie recommends M6 or 1/4″ hardware. Follow all local area standards and safety regulations when securing the array. For details, see the Christie MicroTiles User Manual (P/N: 020-100329-xx).

For a safe installation, follow these recommendations:

• Make sure the surface underneath the array is flat.

- Connect the cables row by row when an array is setup near a wall. When setting up an array where the back is exposed, first setup the entire array and then connect the wires.

- Grilles are provided with both the End and Center Foot kits for installation on the front of your array.

Ventilation requirements

⚠️ **Caution!** Failure to comply with the following could result in minor or moderate injury.

- A sufficiently sized unobstructed space must be left at the back of all Christie MicroTiles arrays to allow for air flow and cooling, to make sure that the intake air of each tile is within the operating range of 5-40°C (41-104°F) for the display unit.

- If the array is installed in an enclosed area, additional cooling may be required to make sure the maximum inlet temperature does not exceed 40°C (104°F). Consult an architect or mechanical engineer to calculate the required space, and to plan an adequate ventilation plan. See *Ventilation Examples* on page 38.

- The fans on each tile have a maximum inlet air flow of 70 CFM (33 L/s). Maximum cooling load is 110W (375 BTUs/hr) per tile, when operating with all LEDs manually driven to the maximum levels; for example, without color matching. The inlet air temperature cannot exceed the maximum operating temperature.

🛈 **Notice.** Failure to comply with the following may result in property damage.

- Temperature and humidity changes make the screen expand and contract. At the maximum temperature limit of 40°C (104°F) for S300 screens and 35°C (95°F) for S310 screens, the standard 1mm gap between screens is decreased and the screens may come into contact with adjacent screens or structures.

Each tile within an operating array generates heat, and the heat from the tiles at the bottom of the array rises, increasing the temperature of the air around the tiles higher up in the array. The MicroTiles array must be designed with an empty space behind the tiles to allow for the appropriate amount of ventilation. When designing the array, consult an architect or mechanical engineer to calculate and plan the space required for adequate ventilation. For examples of successful ventilation methods, see *Ventilation Examples* on page 38.

The airflow, temperature, and power requirements for each MicroTiles display unit are:

- **Mass:** 9.2kg (20.3lbs)

- **Intake Air Temperature:** 40°C (104°F) max for S300 screens and 35°C (95°F) for S310 screens.

- **Exhaust Requirements:** 70 CFM @ 40°C (104°F)

- **Power Requirements:** Single Phase 100-240V, 12 AMP Breaker

- **Power Consumption:** 110W maximum

- **Cooling Load:** 375 BTU/HR maximum

Christie recommends that you maintain a clean operating environment for your MicroTiles array. One of the two air channels in each tile contains a heat sink, which cools the LEDs. The dirtier the air flowing through the heat sink, the more likely some of that dirt will accumulate on the heat sink, reducing its ability to cool the LEDs. Over time, it may be necessary to clean the heat sinks or replace the light engine.

You can monitor the temperatures of your MicroTiles array with the WebUI, and receive warning messages by email or SNMP traps. For instructions on monitoring the MicroTiles array, refer to the *MicroTiles User Manual (P/N: 020-100329-13)*.

Power and brightness levels

For a typical Christie MicroTiles array with color and brightness matching enabled, power consumption ranges from 45 to 70 watts per tile. You can reduce power consumption by lowering the display brightness. A maximum calibrated brightness of approximately 600 nits (S300 screen), 800 nits (S100 screen), and 400 nits (S200 screen) is achievable at 70 watts per tile. Although you can disable brightness and color matching to achieve higher brightness and power levels, it is not recommended. Tile uniformity settings affect measured brightness (nits). When tile uniformity is enabled, the brightness at the center of the tile is adjusted electronically, reducing overall brightness by approximately 20%. Tile uniformity is necessary with flat fields of color and whites using the high-gain S100 screen.

This table lists minimum and maximum power consumption for the different models of MicroTiles:

	Power (W)	Brightness (nits)		
		S100 Screen Discontinued	S200 Screen Discontinued	S300 Screen
Minimum Calibrated Power	46	540	270	405
Maximum Calibrated Power	70	800	400	600

This table lists the color temperature and brightness levels of the different models of MicroTiles:

Color Temp (°K)	Percentage	Max Calibrated Brightness		
		S100 (nits) Discontinued	S200 (nits) Discontinued	S300 (nits)
3200	71%	572	286	429
4000	82%	654	327	491
5500	95%	761	381	571
6500	100%	800	400	600
8500	80%	641	320	481
9000	77%	618	309	463

Maximum design limits

Maximum power (110W) is the maximum power of a tile with all LEDs manually driven to the maximum levels.

Operating Condition	Item	Specification
Typical: At maximum brightness with color and brightness matched.	Power Consumption per Tile	70W
	Heat Load per Tile	239 BTUs/hr
	Sound Pressure per Tile	35dB at 25°C (77°F) ambient

Operating Condition	Item	Specification
Maximum: At maximum brightness, with every LED at maximum drive level, sacrificing color and brightness matching between tiles.*	Power Consumption per Tile	110W
	Heat Load per Tile	375 BTUs/hr
	Sound Pressure per Tile	45dB at 25°C (77°F) ambient

*A canvas is designed to achieve color and brightness matching between tiles by adjusting the drive levels of each LED in the canvas. Through this continuous process, the maximum brightness and color space of a complete canvas is lower than that of an individual tile. **Operating a MicroTiles canvas without color and brightness matching enabled is not recommended**.

Maximum power rating

The maximum power rating of a tile is 130W. Do not use this value for system power or thermal load calculations. These are the inrush current values when the tiles are turned on:

- 35A @132V
- 50A @ 262V
- Duration 0.6 m/sec

Power connections

This section describes the different methodologies available for connecting a MicroTiles array to AC power.

Power an array with Y-cables

A maximum of nine tiles can be connected together with Y-power cords. This limitation is defined by the safety rating of the tiles, which specifies a maximum current of 1.3 amps at 100 volts and the rating of the Y-power cords, which is 15 amps.
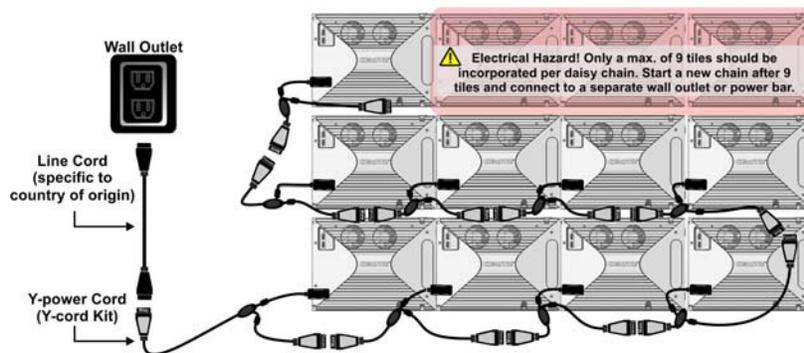
Power an array with a power bar

When using a power bar to power your MicroTiles array, make sure the number of tiles on a circuit does not exceed the recommended safety specifications, ratings, and local electrical codes.

Before you connect your MicroTiles array to a power bar, confirm the mains voltage for your region. For example, Japan is 100V, UK/Europe/Korea/China is 220V, and Australia is 230V.

This table provides responses to common questions about powering a MicroTiles array with a power bar:

Question	Response
How many MicroTiles can I connect to a power bar?	Each socket must be able to supply enough current to a tile without exceeding power bar power rating. Use this formula to verify that all of the sockets on a power bar can be used: $$\left(\frac{CR \times MV \times DF}{110W}\right) = \text{\# of tiles supported on power bar, where:}$$ Circuit current rating = CR Mains voltage = MV Derating Factor (DF) = 0.8 Max continuous tile power = 110W For example, in the UK the mains voltage (MV) is 220V. The power bar is a 16-socket device with a current rating (CR) of 10A and certified for use in the UK. Here is the formula: $$\left(\frac{10A \times 220V \times 0.8}{110W}\right) = 16 \text{ tiles supported}$$ Do not use a power bar with more sockets than the number of MicroTiles. Do not exceed the maximum current draw for any socket on the power bar. Do not connect one power bar to another.
Should the power bar have special features?	Surge protection, EMI filters, and fuses are not required.
What certification is needed for the power bar?	Use a power bar that is certified for use in the country where the MicroTiles are installed. If required, contact a relevant government authority for clarification.
What cable should I use to connect the tile to the power bar?	Connect a tile to a power bar with a region-specific power connector or a C13 connector. The power bar should have a minimum rating of 1.3A.
What are the recommended power bar manufactures?	Christie does not recommend or warrant a specific third-party provider of power bars.

This illustration shows a C14 plug connecting to a C13 receptacle Power Distribution Unit (PDU) from Eaton Power.

Eaton Power Distribution Unit with C14 Input and 16xC13 Output

Description: DB000 3M C14 SWN 16 WAY C13
Cordset: 3M PVC with IEC320 C14 10A Plug
Receptacles: 16 x IEC320 C13 (each 4 way block 10A rated)
Control: Double pole unit input switch with neon
Input Rating: 10A/230V AC
**Certification: CE marked to EN60950-1**
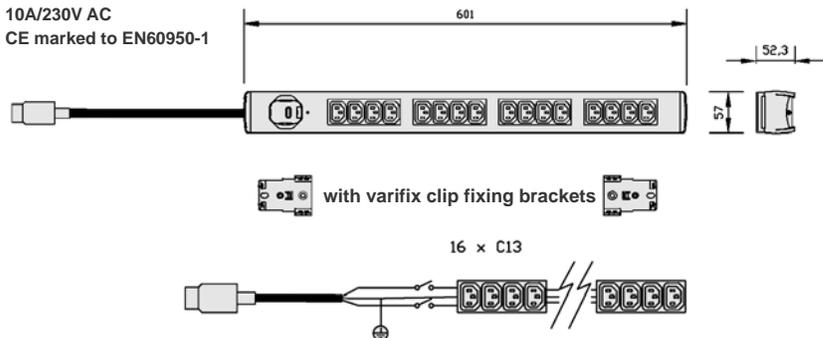
The PDU should have local safety/regulatory approvals and adequate electrical current capabilities.

Connection Example 1: 120V/15A circuit

This calculation determines the maximum number of tiles that you can connect to a 120V/15A circuit:

$$\left(\frac{15A \times 120V \times 0.8}{110W}\right) = 13 \text{ tiles can be connected to the circuit}$$

The configuration for this example could include one circuit of seven tiles and one circuit of six tiles. This example shows two circuits of six tiles.
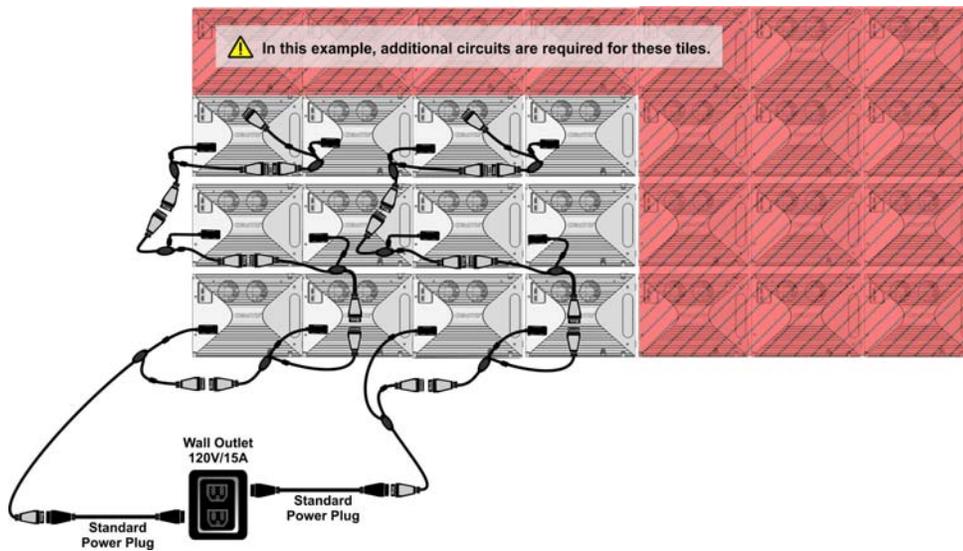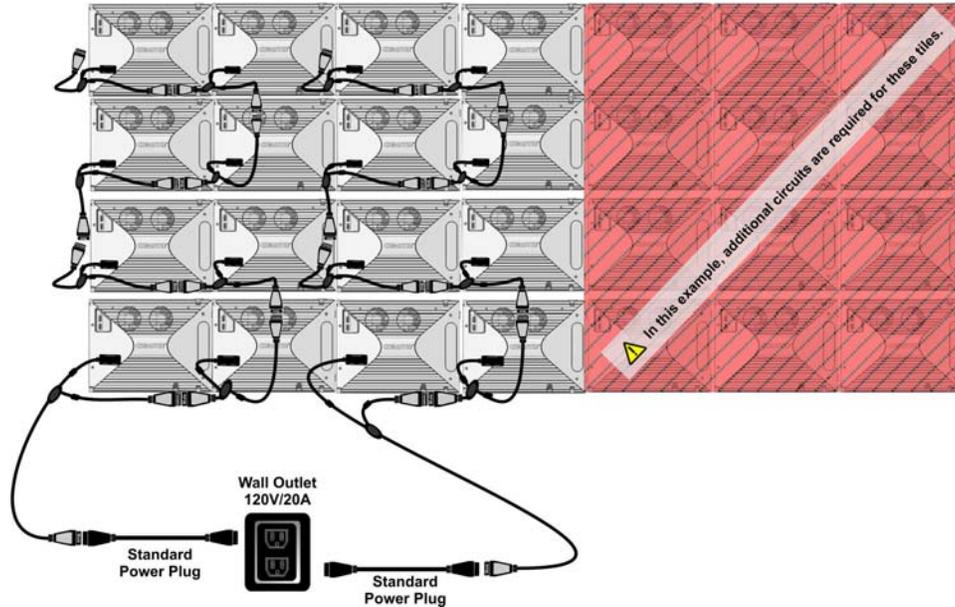

Connection Example 2: 120V/20A circuit

This calculation determines the maximum number of tiles that you can connect to a 120V/20A circuit:

$$\left(\frac{20A \times 240V \times 0.8}{110W}\right) = 17 \text{ tiles can be connected to the circuit}$$

The configuration for this example could include one circuit of nine tiles and one circuit of eight tiles. This example shows two loops of eight tiles:

Connection Example 3: 240V/16A circuit

This calculation determines the maximum number of tiles that you can connect to a 240V/16A circuit:

$\left(\dfrac{16A \times 240V \times 0.8}{110W} \right)$ = 27 files can be connected to the circuit

The configuration for this example could include three circuits of nine tiles. Site requirements and the layout of power outlets, may result in a different layout. This example shows three loops of eight tiles.
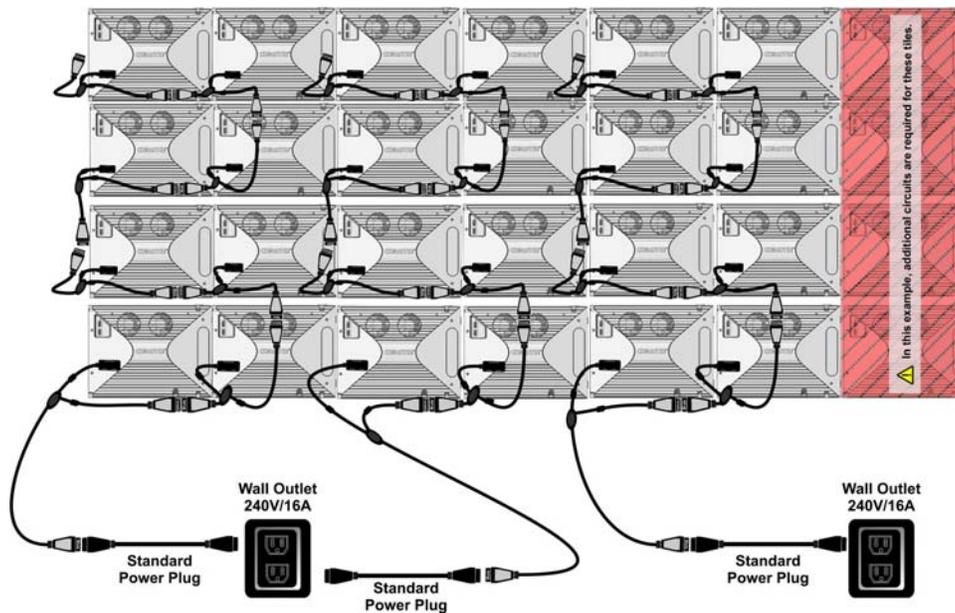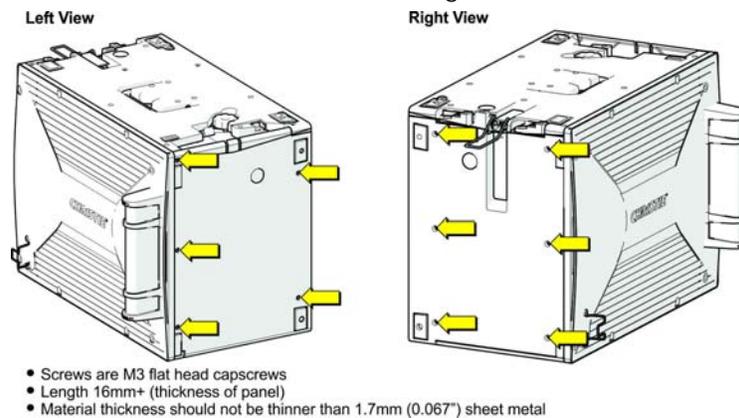
Noise considerations

When designing your MicroTiles array:

- Measured sound pressure levels are approximately 20% higher at the rear of an array. Minimizing sound reflections from the surface directly behind the tiles may be required to maintain low noise levels.

- Sound diminishes with distance and an individual viewer may only stand in proximity to a small portion of a display wall at once.

The size of the MicroTiles canvas, system settings, and operating conditions all contribute to the operating sound pressure level of a Christie MicroTiles array. The noise level per tile at full brightness is 35dB at 25°C (77°F) for a typical MicroTiles canvas operating at a calibrated brightness of approximately 700-800 nits.

Finishing trim

This illustration shows the location of the trim mounting screws.

- Screws are M3 flat head capscrews
- Length 16mm+ (thickness of panel)
- Material thickness should not be thinner than 1.7mm (0.067") sheet metal

The existing M3 screws on the left and right sides of the tiles can be removed and used to mount the trim. Leave at least two of the M3 screws on each tile to keep the side skins secure. Christie recommends using the top two screws to attach the trim to the top tile of an array. For the bottom tile Christie recommends using the bottom two screws to attach the trim. For the tiles in the middle of the array leave an M3 screw at the front and rear of the tiles. Do not remove any screws that are not being used for attaching trim. Additional M3 screws may be required for custom trim attachment.

Service access

Each individual tile within an array can be serviced without disassembling the entire array. You can service all components from the front, and the fans and the power supply can be serviced from the rear.

Additional resources

- *Christie MicroTiles User Manual* (P/N: 020-100329-xx)

- *Christie MicroTiles Serial Command Reference Guide* (P/N: 020-101547-xx)

- *Christie MicroTiles Service Manual* (P/N: 020-100332-xx)

- *Christie MicroTiles Quick Setup Guide* (P/N: 020-100331-xx)

- *Christie MicroTiles Designer* (to download visit www.microtiles.com)

- *Content Creation Guide* (to download visit www.microtiles.com)

- *Technical FAQ* (to download visit www.microtiles.com)

Design Your Array

This section provides information and procedures for designing and implementing a MicroTiles display.

MicroTiles Designer

MicroTiles Designer is a free software application that helps you plan, visualize, and implement a MicroTiles display. Download the software at www.microtiles.com.
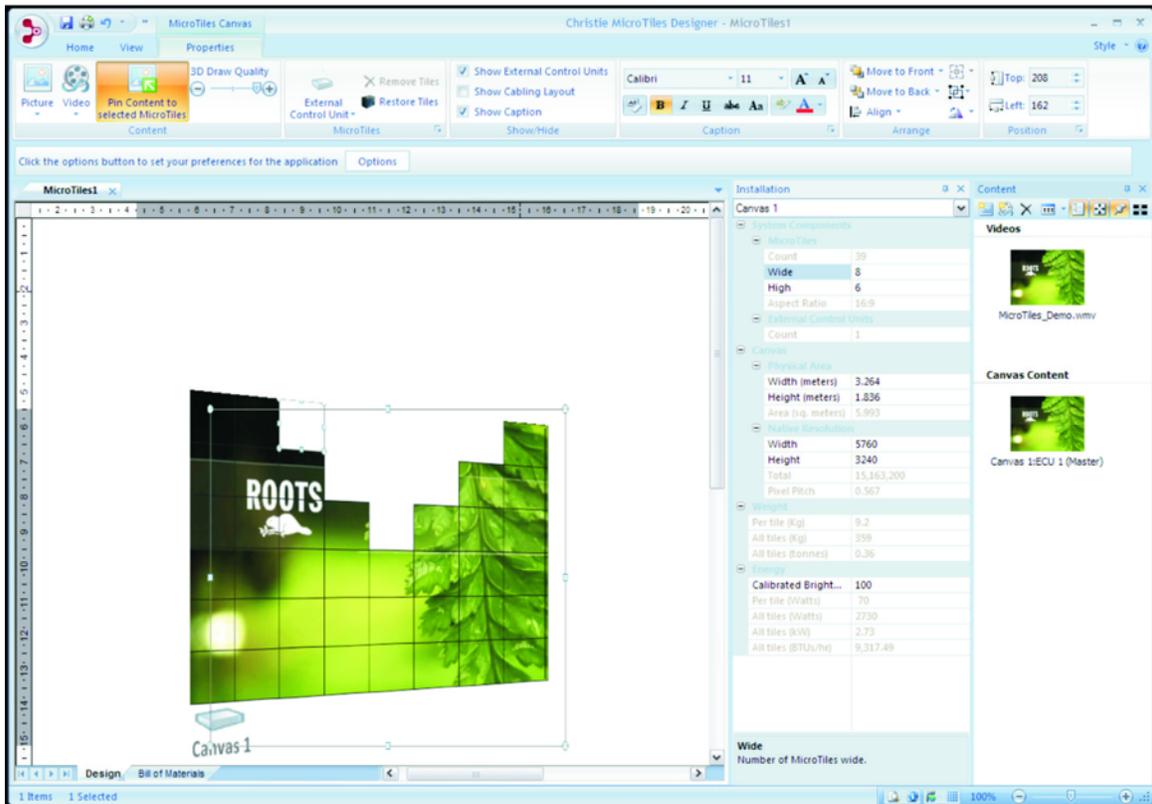
Cabling and electronic control unit layout

Before you construct your MicroTiles display, Christie recommends that you plan the canvas design and layout first to identify the locations of the electronic control units (ECU) and cabling requirements.

The maximum distance that an ECU can be installed from a tile is 3m (9.8 ft). This is the length of the display port cable.

If you create a larger array with multiple ECUs, place the ECUs along, near, or at the base of the display.

If longer display port cables are required, use a display port cable with a 10.8 Gb/s bandwidth specification. Longer display port cables may not operate with MicroTiles and electromagnetic interference may degrade signal integrity.

Christie does not recommend or warrant a specific third-party provider of longer display port cables. However, these cables have been successfully tested with MicroTiles:

- **Extron:** 7.6 m (25 ft)

- **DVI-Gear:** 10 m (33 ft) and 12.5 m (41 ft). This cable includes a built-in lock.

If you are using longer display port cables not supplied by Christie, secure the cable to the structure or the tile frame with a 12 inch (minimum) service loop. This prevents strain on the connector caused by the weight of the cable.

MicroTiles use a proprietary signal protocol, so you cannot use third-party display port extenders. To locate the media server or video processor remotely from the display, extend the DVI input signal to the ECU.

To generate an overview of the cabling for your array, click the **Properties** tab and select **Show Cabling Layout**. This image illustrates the cabling for a 6 x 7 tile array with four ECUs:
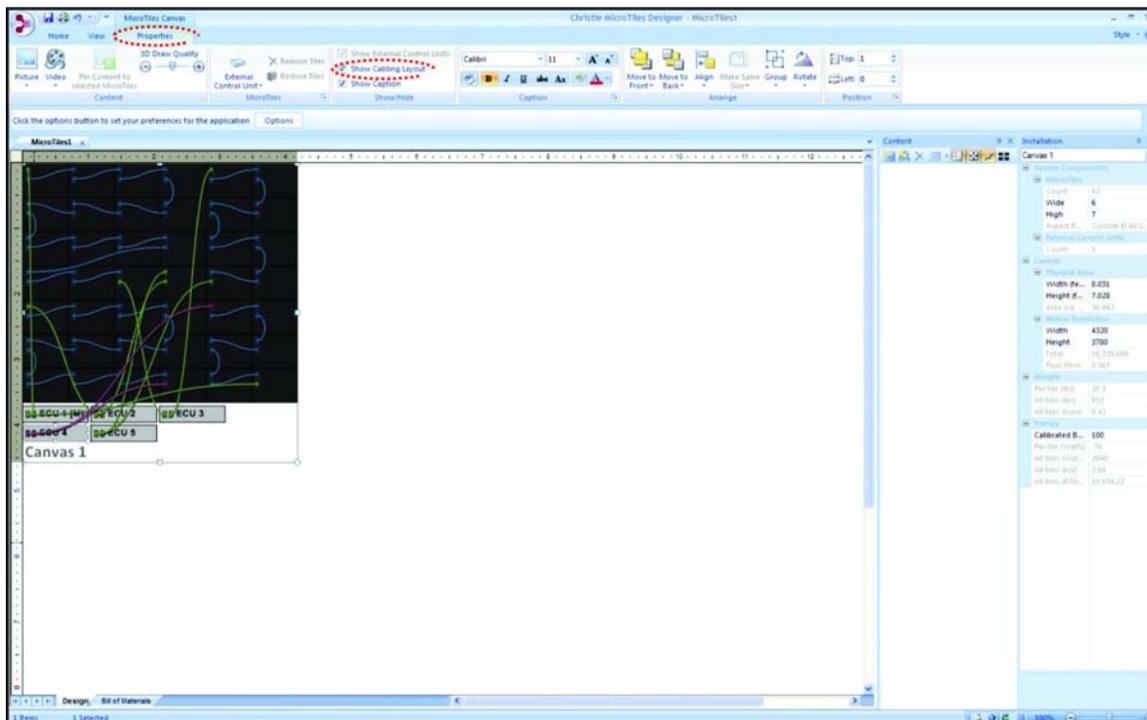
Digital Visual Interface Extenders

For some MicroTiles installations, a Digital Visual Interface (DVI) extender is required to transmit a video signal from the media source to the ECU. Not all DVI extenders work properly with MicroTiles arrays and many do not support non-standard resolutions.

Christie does not recommend or warrant a specific third-party DVI extenders. However, these extenders have been tested successfully with MicroTiles:
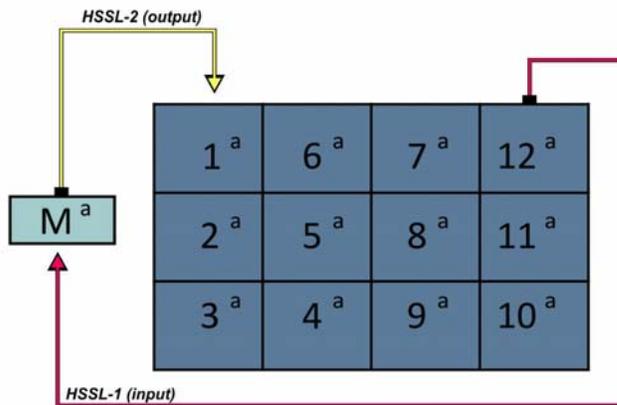
- Extron DVI 104

- Avenview F0-DVI-1000m-EMIX

Sample design configurations

This section provides examples of typical MicroTiles installations.

1 ECU + (4x3) + 1 Media Source

With this configuration, there is a single master electronic control unit (ECU). The media source connected to the master ECU is scaled to the entire array. You must configure subarray(s) if you need to crop or repeat the media source. For information about managing subarrays, see the Christie MicroTiles User Manual (P/N: 020-100329-xx). This image illustrates a canvas with one ECU and a closed display port loop:

In this example, the remaining tiles continue to display the media source if a tile fails. This redundancy is only possible when there is one active media source in the canvas, and when the display port loop is closed. The direction of the red and yellow arrows in the diagram indicate the direction of the local media source, however, in a closed loop layout the media source connected to the master ECU is also transmitted in the opposite direction (and consequently is referred to as the global media source).

ECU placement (Master/Slave)

The first diagram in this image illustrates a set of five tiles connected to a master ECU, and a set of four tiles connected to a slave ECU. The second diagram illustrates a single tile connected to a slave ECU, with an additional master ECU located directly in front of the slave ECU.
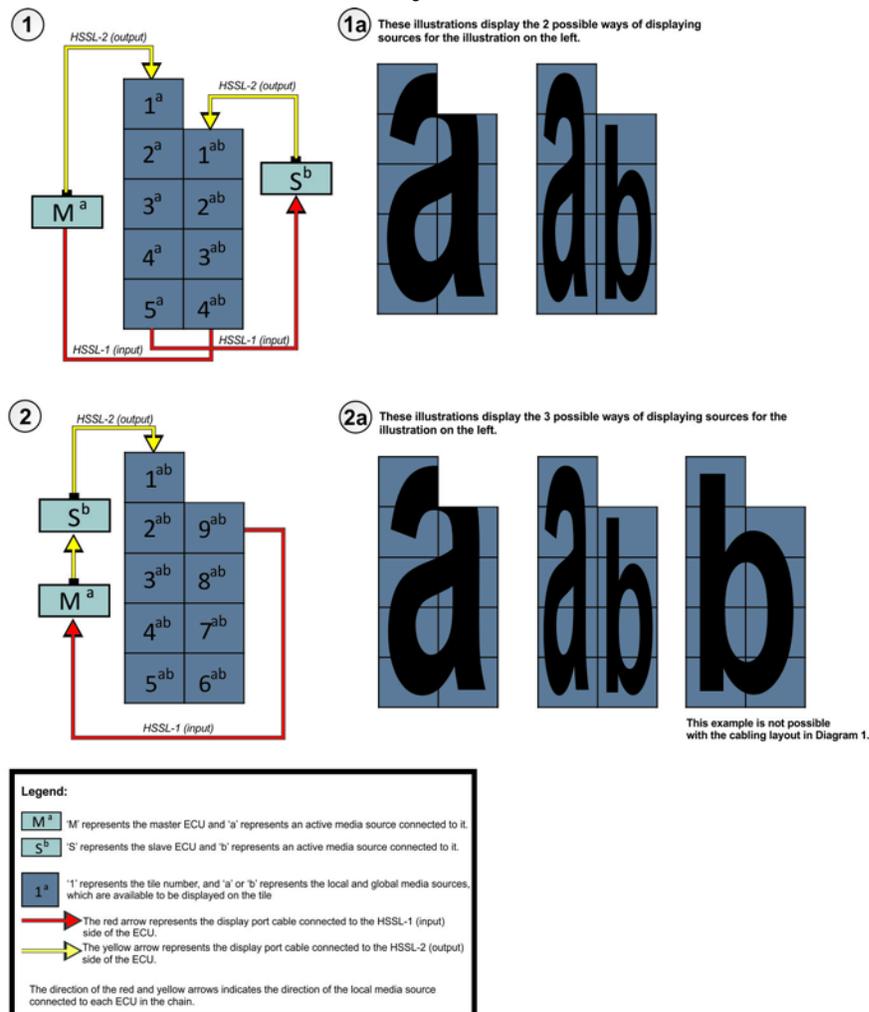
In both examples, the master ECU has an active media source "a", and the slave ECU has an active media source "b". Due to the different cabling methodology, every tile in Diagram 2 can display either source "a" or "b". In Diagram 1, source "b" can only be displayed on four tiles. The media source transmitted on the HSSL-2 (output) side of each ECU is replaced by the next active media source in the chain, whereas the media source on the master ECU is transmitted in the opposite direction around the closed loop and is therefore available to every tile.

In this example, there is more than one active media source. With this configuration, a disruption of the media source being displayed on the remaining tiles can occur if a tile fails. If the first tile on

the output side of the slave ECU fails, then source "b" will not be available to the remaining tiles in the local set because the local media source on a slave ECU only travels in one direction around the loop (on the HSSL-2 output side).

Four ECUs + (4x6) + four media sources

This image illustrates a setup with four local sets of tiles and four active media sources in a closed loop.
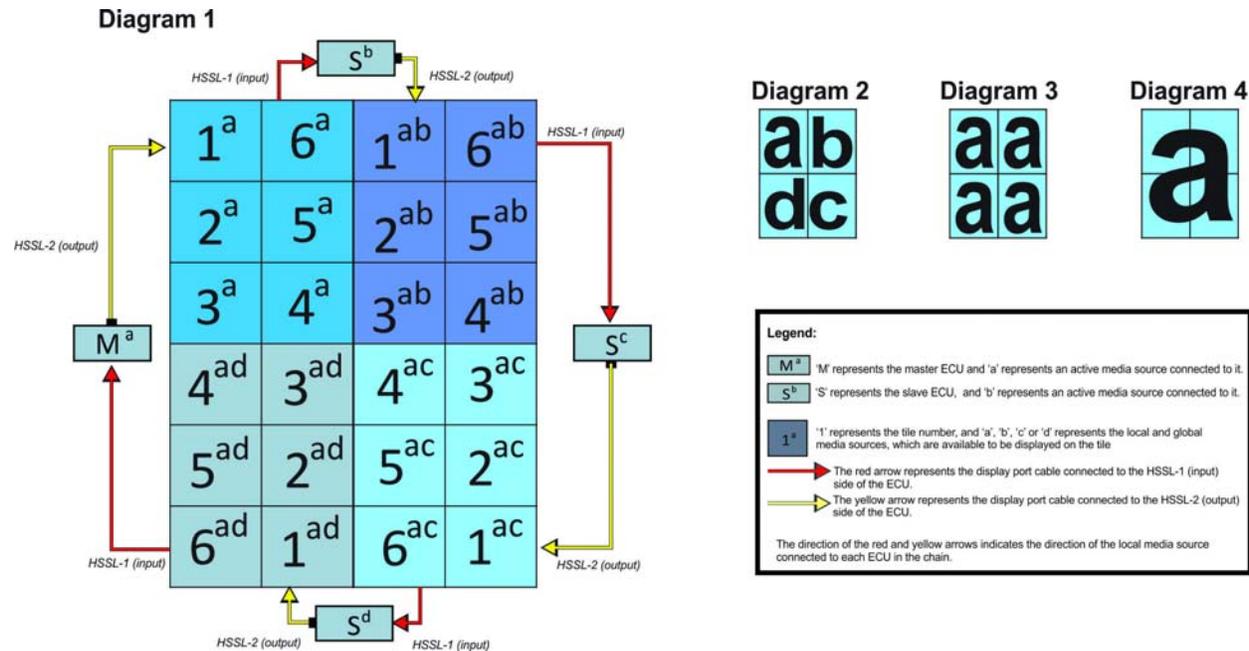
By default, the media source connected to the master ECU is scaled over the entire array.

In diagram 2, a subarray is created for each local set of tiles and the local media source is displayed. In diagram 3, a subarray is created for each local set of tiles and the global media source is displayed. For more information about managing subarrays, see the Christie MicroTiles User Manual (P/N: 020-100329-xx).

For a description of the limitations of multiple active media sources, see *ECU placement (Master/Slave)* on page 21.

Display resolution

To achieve a different resolution, adjust the number of ECUs connected to the tiles. The more ECUs in the system, the greater your displayed resolution. The maximum native resolution is 720 x 540 pixels per tile. A single ECU can drive up to six tiles at a native resolution of 60Hz. Although a single ECU can drive several hundred tiles, Christie recommends that you do not exceed 30 tiles per ECU.

Make sure the graphics card or video processor connected to a MicroTiles display can support the resolution of the displayed content. Most graphics cards require a horizontal resolution that is divisible by four or eight. Although extended display identification data (EDID) values are limited to 4095 pixels, this may exceed the capabilities of the graphics card. If the video processor can ignore the EDID values of the connected display it can generate resolutions in excess of 4095 pixels, and the MicroTiles to display horizontal and vertical resolutions up to 8192 pixels.

A single ECU can support a 1 mm pixel pitch on 20 tiles at 60Hz. To automatically calculate how many ECUs are required for your display, use the calculator on the MicroTiles web site (www.microtiles.com).

This table shows the maximum resolution that can be achieved with typical displays:

Example	Displays	81 tiles (9 wide x 9 high) 10.1 sq. m. (108.9 sq. ft) 4:3 aspect ratio			48 tiles (8 wide x 6 high) 6.0 sq. m. (64.5 sq. ft.) 16:9 aspect ratio		
ECUS	Mpixels at 60 Hz	Maximum Resolution	Pixel Pitch (mm)	Tiles per ECU	Maximum Resolution	Pixel Pitch (mm)	Tiles per ECU
1	2.62	1868 x 1401	1.97	81.0	2157 x 1213	1.51	48.0
2	5.23	2642 x 1981	1.39	40.5	3051 x 1716	1.07	24.0
3	7.85	3236 x 2427	1.13	27.0	3727 x 2102	0.87	16.0
4	10.47	3737 x 2802	0.98	20.3	4315 x 2427	0.76	12.0
5	13.09	4178 x 3133	0.88	16.2	4824 x 2713	0.68	9.6
6	15.71	4577 x 3432	0.80	13.5	5285 x 2972	0.62	8.0
7	18.33	4944 x 3708	0.74	11.6	5708 x 3210	0.57	6.9
8	20.94	5285 x 3963	0.69	10.1	5760 x 3240	0.57	6.0
9	23.57	5606 x 4204	0.66	9.0			
10	26.18	5909 x 4431	0.62	8.1			
11	28.80	6197 x 4647	0.59	7.4			
12	31.42	6473 x 4854	0.57	6.8			
13	31.49	6480 x 4860	0.57	6.2			

![Christie]

Display Hardware

This section provides an overview of the hardware options available for displaying content on your MicroTiles array.

Video processors

You can use video processors with subarrays to add special effects to your array. This illustration shows how to connect a video processor to an array and four ECUs:
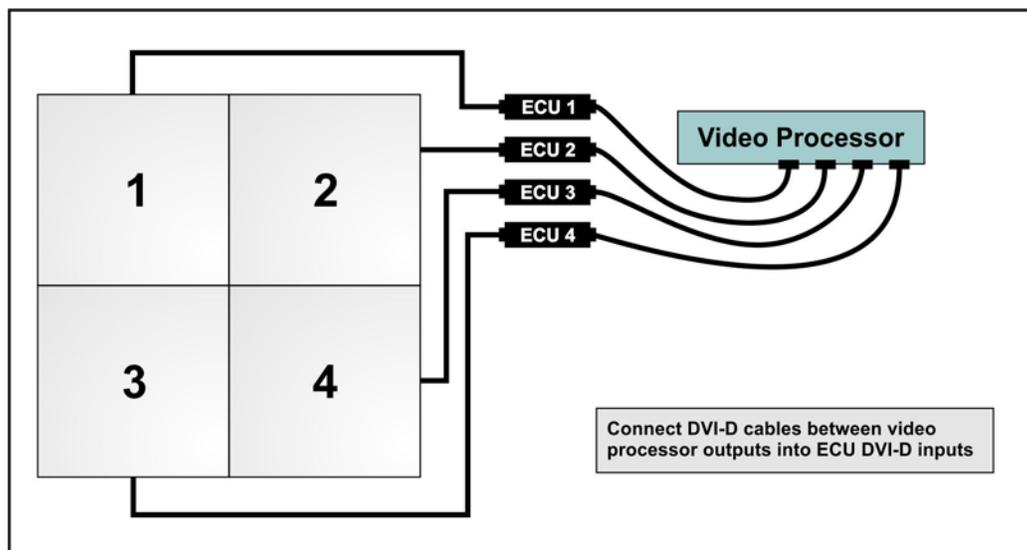
When adding a video processor, connect the Ethernet connection to the master ECU. Multiple video processors might be required if multiple connections are required. For example, a Vista Spyder has eight connections; an additional video processor is required if you are using more than eight ECUs.

Christie does not recommend or warrant a specific third-party provider of video processors. However, these products have been used successfully with MicroTiles:

- Vista Spyder

- Christie TVC Controller

- Dataton Watchout

- Jupiter Fusion 960

- RGB Spectrum MediaWall 4500 display wall processor

Media servers and graphics cards

Large walls of tiles with demands for high resolutions require powerful CPUs and graphic cards. Graphic cards take over much of the video playback from a computer's CPU and are recommended for many MicroTiles projects. Driver support for uncommon resolutions can be challenging, and you may have to incorporate third-party software to achieve the resolutions needed for your display.

Playback software

There are many applications that can organize, schedule, and distribute high-quality signals to the MicroTiles. Make sure the software supports your content type. For additional information, see *Content Considerations* on page 26.

Content Considerations

When designing content to display on the MicroTiles, keep the following information in mind.

Color choices

Deep saturated reds, greens and many blues look particularly vibrant on MicroTiles, as do blends of these colors. Mid-toned colors look better than they will on other display technologies, but do not have the stopping power of truly saturated colors. Whites and weak colors produce less than optimal results. Blacks output a rich, deep level rarely obtained with other types of displays. It is strongly recommended to integrate black areas in your design to create visual depth and optimize saturated color contrast impact.

Content resolution

The native resolution of a MicroTiles display is calculated by adding up the combined horizontal and vertical pixels of each tile to arrive at an aggregate number. For example, a digital column of 1 x 5 tiles has a native resolution of 720 x 2700. Content should be created to suit that resolution and aspect ratio. Mastering at a very high resolution allows for adjustment to different shapes and arrangements and retains the integrity of fonts. For a detailed overview on supported resolutions and system limitations, see *Display resolution* on page 22.

Source material

If the source material provided is poor quality, the finished content will also be poor. Whenever possible, creative work should be done using the original source material to make sure the finished product retains a very high quality.

Custom installations

MicroTiles provide venue designers with a compelling opportunity to work beyond the dimensions of a standard display and integrate them into real-world environments. MicroTiles can frame shop entry areas or straddle support beams. They can be the digital elements of large-format print installations for marketers, creating an element of surprise and visually activating, something that is otherwise static.

MicroTiles and interactivity

MicroTiles are ideal for interactive applications because the visuals respond well to the movements of viewers.

Compression technology considerations

Many options are available for file compression. Preliminary tests have led to the recommendation of outputting files in *.mov* format, using h.264 compression. Comparison testing made it clear that h.264 provided the optimal solution for high-quality video files, flexibility in resolution and completed sizes that were manageable for playback, transfer and storage.

Managing gradients and posterization

Managing gradients is a challenge, as encoding techniques that make file sizes manageable also create some visual havoc. Compression can lead to posterization (or color banding). It is possible to limit posterization by introducing noise (dither), as well as increasing the number of bits per color channel.

Up-scaling

Up-scaling reduces file size and possibly the burden on the playback hardware and software, and can produce some very good results. For projects in which the majority of viewers will view tiles no closer than 2-3 m (6-9 ft) away, up-scaling by as much as 50% will still produce very pleasing results. See *Content resolution* on page 26 and *Viewing distance* on page 27 for more information.

Re-using source material

By mastering source material in the highest practical resolution, files can be re-used and easily compressed to different sizes for different projects. Starting with lower resolutions and then up-scaling instantly introduces compromises that may be entirely acceptable in some projects, but a problem in others.

Viewing distance

In general, it is desirable to avoid pixilation, where viewers can see individual pixels in the image and angled lines appear jagged. The optimal resolution for a MicroTiles display is therefore a function of the ability of the viewer to resolve individual pixels, which is affected by a person's distance to the screen and visual acuity. For example, a person with 20/20 vision standing 8 m (26ft) away from a display cannot resolve individual pixels smaller than 1 mm. In addition, the resolution of the original source material should not show individual pixels in the content to a person viewing the display up close. To help with this design decision, MicroTiles Designer™ includes a convenient viewing distance calculator under the **Subarrays** tab in the Configuration Wizard.

The table below provides a general guideline for the number of tiles per ECU that would ensure either minimal or no visible pixilation of the displayed image at various viewing distances.

These calculations assume that the content meets the maximum resolution of 60Hz for a single-link DVI (i.e., approximately WUXGA at 60Hz). Higher resolutions are supported at lower refresh rates, in which case the number of tiles per ECU may be increased to achieve the desired pixel pitch. However, refresh rates are also an important design factor and must be balanced with resolution for the given design context. These guidelines are provided for general reference only and it is the responsibility of the customer to select an appropriate number of ECU inputs for a specific application of MicroTiles.

Viewing Distance		No Visible Pixelation		Minimal Visible Pixelation (33% increase)		Pixelation
Feet	Meter	Displayed pixel pitch (mm)	Number of tiles per ECU	Displayed pixel pitch (mm)	Number of tiles per ECU	What a person with 20/20 vision can perceive
<4	<1.2	0.567	6	0.690	10	0.502
5	1.5	0.618	8	0.873	16	0.627
6	1.8	0.750	12	0.980	22	0.752
7	1.2	0.873	16	1.160	28	0.878
7-10	1.2-3	0.873-1.196	16-30	1.160-1.620	28-50	0.878-1.254
10-15	3-4.5	1.196-1.81	30-72	1.620-2.48	50-180	1.881
>15	>4.5	>1.81	>72	>2.48	>180	>1.881

Pixel pitch values are for reference only.

Viewing angle

Screen Type	Description	Unit	Nom
S300	Horizontal 1/2-gain viewing angle	Degrees	33±10%
	Vertical 1/2-gain viewing angle	Degrees	29±10%
	Horizontal 1/3-gain viewing angle	Degrees	41±10%
	Vertical 1/3-gain viewing angle	Degrees	37±10%
S100 *Discontinued*	Horizontal 1/2-gain viewing angle	Degrees	35 +3/-5
	Vertical 1/2-gain viewing angle	Degrees	27±10%
	Horizontal 1/5-gain viewing angle	Degrees	45±10%
	Vertical 1/5-gain viewing angle	Degrees	41±10%
S200 *Discontinued*	Horizontal 1/2-gain viewing angle	Degrees	35±5%
	Vertical 1/2-gain viewing angle	Degrees	35±5%
	Horizontal 1/5-gain viewing angle	Degrees	60±5%
	Vertical 1/5-gain viewing angle	Degrees	60±5%

Installation Examples

This section provides examples of typical MicroTiles installations. The tile specifications for all examples are:

- Tile weight: 9.2 kg (20.3 lbs)
- Tile foot center: 0.85 kg (1.9 lbs)
- Tile foot ends: 0.35 kg (0.8 lbs)

The illustrations are not to scale.

3 x 3 array

The base structure for this array must be capable of supporting the weight of the first two rows of MicroTiles with a maximum acceptable deflection of 0.6 mm (0.025″). The approximate weight of a single tile is 11 kg.

The surface the array is anchored to requires a series of mounting holes for the M8 mounting bolts. The nominal distance between these holes must be 408 mm (16.063″) horizontally, and 306 mm (12.047″) vertically. Use a Grade8 M8 bolt to fasten the wall mounting bracket to the mating surfaces. Every M8 bolt in the array must be capable of withstanding a minimum 40Kgf in shear force and 20Kgf in tensile force. The recommended torque for the M8 bolt is 27ft-lbs.

The anchor for the M8 threaded hole must be 50.8 mm x 50.8 mm (2″ x 2″). When a second tile is resting on the top of an anchored tile, the maximum allowable deflection at the bottom edge of the second screen is 0.6 mm (0.025″).
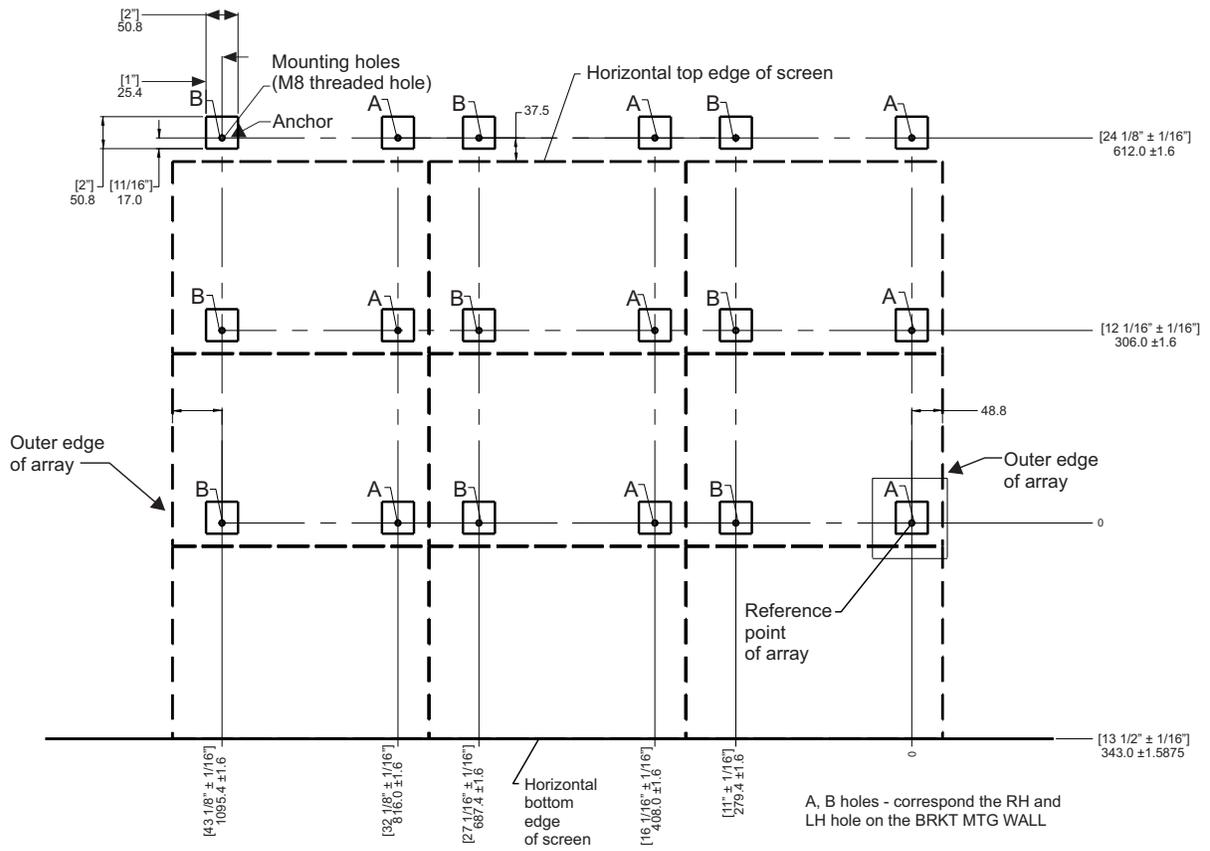
When installing the anchors, the mating surfaces must be:

- Perpendicular
- Flat to the mounting surface
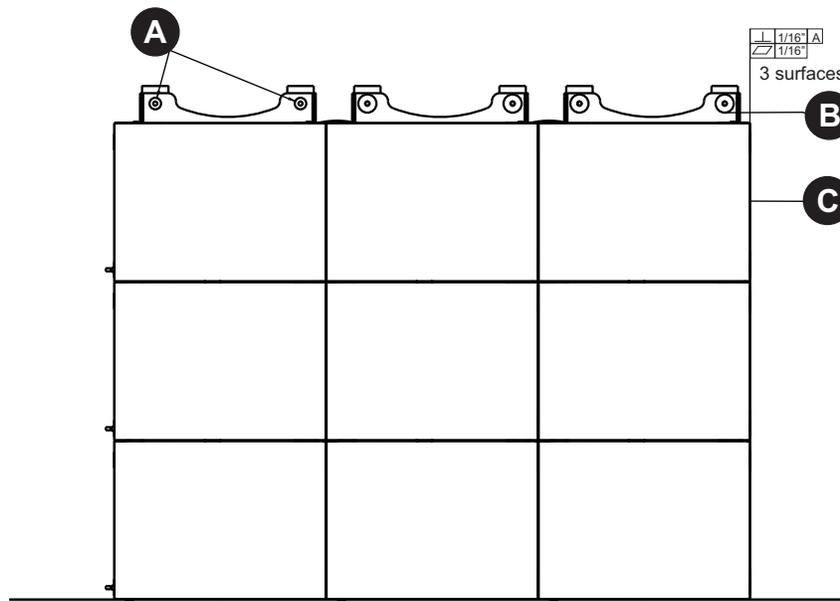- Within the specified tolerances of the proposed tile array.

When positioning the entire array in the XY plane, make sure there is adequate clearance between the outer edges of the array and adjacent surfaces.

> **i**
> - The mounting brackets should only be used on vertical structures and walls with an acceptable inclination of ±10° vertically (towards/away from mounting surface).
> - The array front and side view show expected alignment tolerances due to variations in the MicroTiles and the brackets.
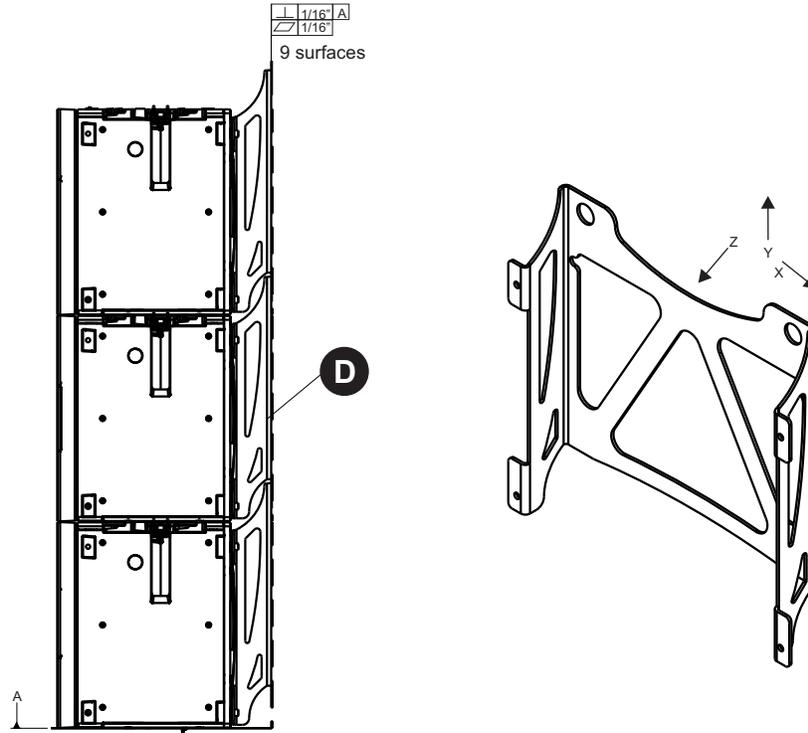
[2"] 50.8
[1"] 25.4
Mounting holes (M8 threaded hole)
Horizontal top edge of screen
B   A   B   37.5   A   B   A
Anchor
[2"] 50.8   [11/16"] 17.0
[24 1/8" ± 1/16"] 612.0 ±1.6

B   A   B   A   B   A
[12 1/16" ± 1/16"] 306.0 ±1.6

48.8
Outer edge of array
B   A   B   A   B   A
Outer edge of array
0
Reference point of array

[13 1/2" ± 1/16"] 343.0 ±1.5875

[43 1/8" ± 1/16"] 1095.4 ±1.6
[32 1/8" ± 1/16"] 816.0 ±1.6
[27 1/16" ± 1/16"] 687.4 ±1.6
Horizontal bottom edge of screen
[16 1/16" ± 1/16"] 408.0 ±1.6
[11" ± 1/16"] 279.4 ±1.6
0
A, B holes - correspond the RH and LH hole on the BRKT MTG WALL

Front view

A

⊥ 1/16" A
1/16"
3 surfaces

B

C

A	Ø22.2 Bracket Mounting Holes
B	Washer
C	Edge of screen

Side view

1/16" A
1/16"
9 surfaces

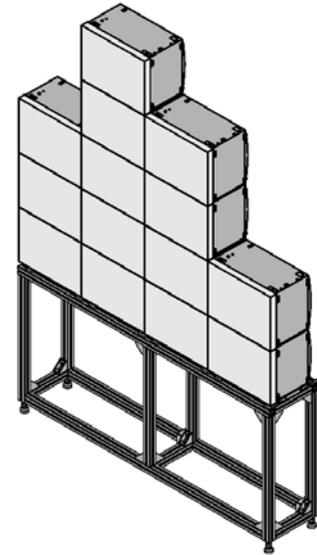| D	Mounting bracket
	The Bracket Mtg Wall (P/N: 011-103328-xx) is used in the array as an assembly, ASSY BRKT MTG Wall (P/N: 000-101635-xx) and it is available as a saleable item, MicroTiles Mount Bracket two pack (P/N: 000-101635-xx), including: 2x Bracket MTG Wall, 8x M6x1x16mm large socket head capscrews, and 4x M8 washers

Installations up to five tiles

Local building and safety regulations must be considered when designing and installing an array that is five tiles high. Follow these recommendations to prevent a tipping hazard:
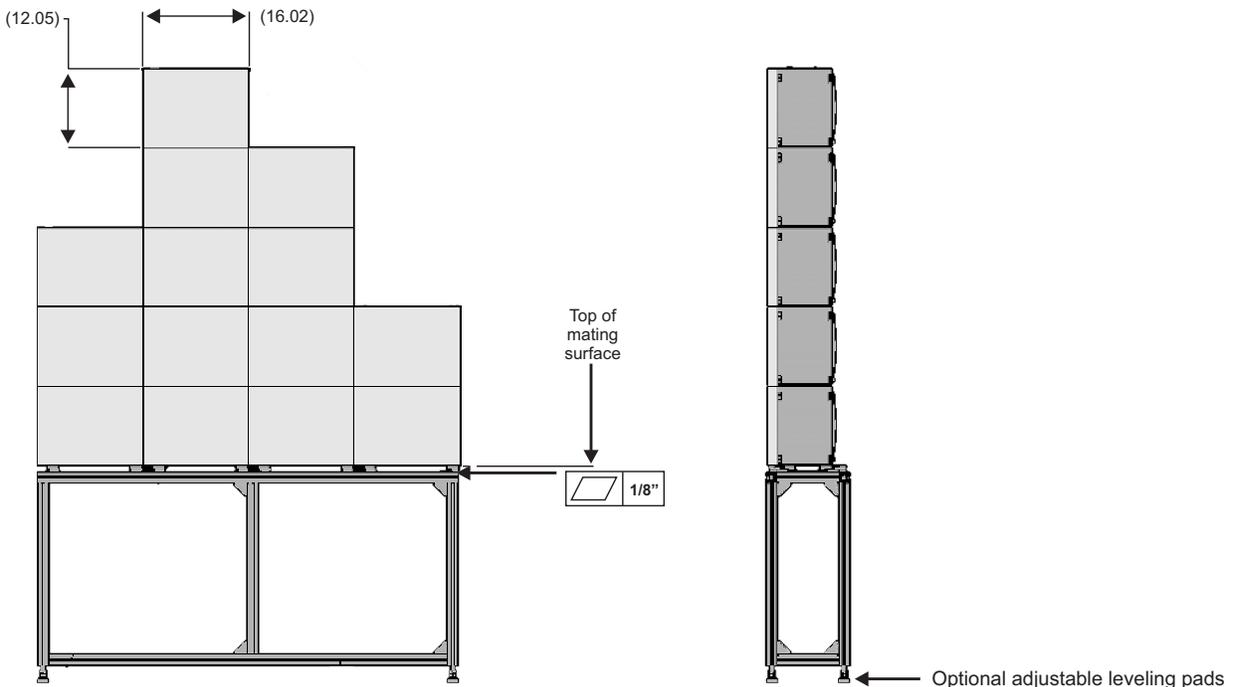
- Add ballast to the base, bolt the base to the floor, attach the array to a standalone support structure, building structure, walls or ceiling.

- Design the base like an A-frame, or use large floor plates if you need to hide the base underneath carpet or other flooring material.

The base must be designed to withstand the weight of the MicroTiles array and adhere to local building and safety regulations. The base structure for MicroTiles arrays can be made out of aluminum extrusion, welded hollow structural tubing, unistrut, or wood. Vertically align the display unit leveling feet so all of the mating surfaces are within the specified tolerance.
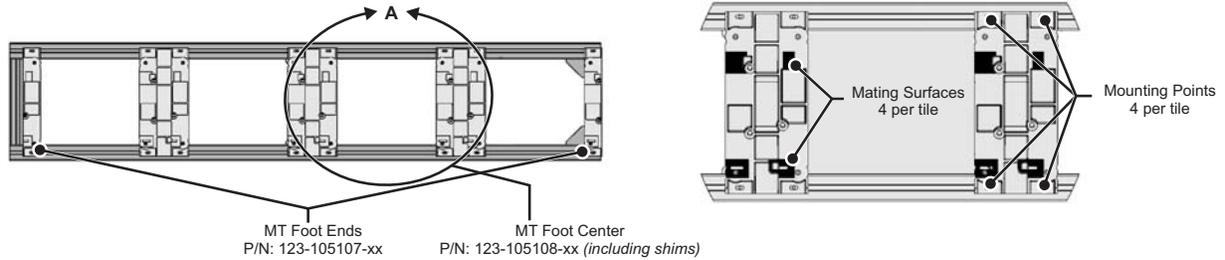
If rear access is required, the installation must provide room to remove the rear cover and remove the fans and the power supply.

Front and side views

Top of mating surface

1/8"

Optional adjustable leveling pads

Bottom views

MT Foot Ends
P/N: 123-105107-xx

MT Foot Center
P/N: 123-105108-xx *(including shims)*

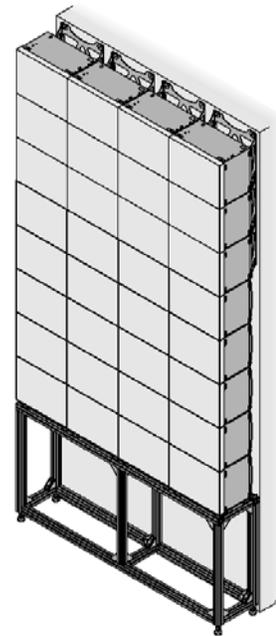Mating Surfaces
4 per tile

Mounting Points
4 per tile

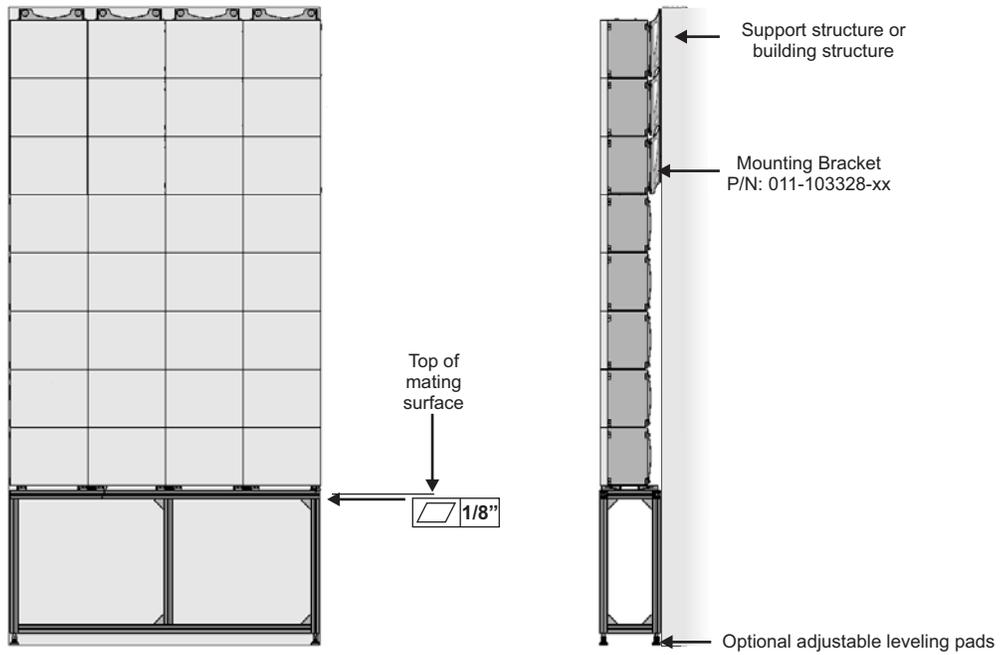# Installations greater than five tiles

Local building and safety regulations must be considered when designing and installing an array that is greater than five tiles in height. An independent evaluation by an engineer might be required to make sure the installation adheres to local building and safety regulations. Every MicroTile in the array must be secured to a support structure or the building.

The base must be designed to withstand the weight of the MicroTiles array and adhere to local building and safety regulations. The base structure for MicroTiles arrays can be made out of aluminum extrusion, welded hollow structural tubing, unistrut, or wood. Vertically align the display unit leveling feet so all of the mating surfaces are within the specified tolerance.
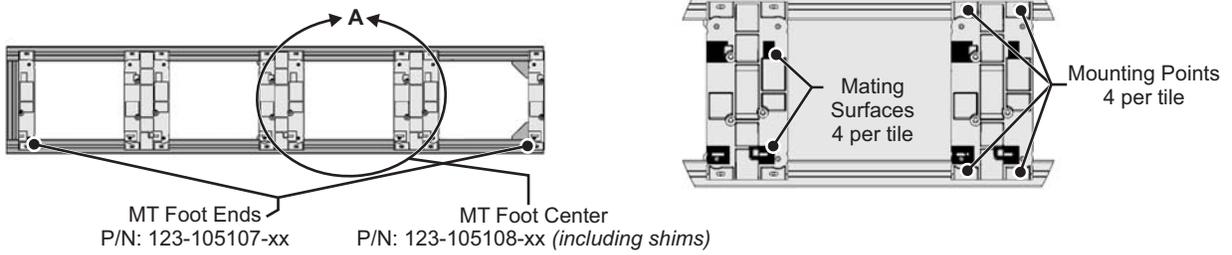
If rear access is required, the installation must provide room to remove the rear cover and remove the fans and the power supply.

Front and side views

Top of
mating
surface

1/8"

Support structure or
building structure

Mounting Bracket
P/N: 011-103328-xx

Optional adjustable leveling pads

Bottom views

A

MT Foot Ends
P/N: 123-105107-xx

MT Foot Center
P/N: 123-105108-xx *(including shims)*

Mating
Surfaces
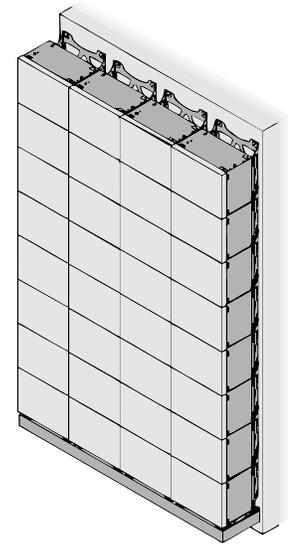4 per tile

Mounting Points
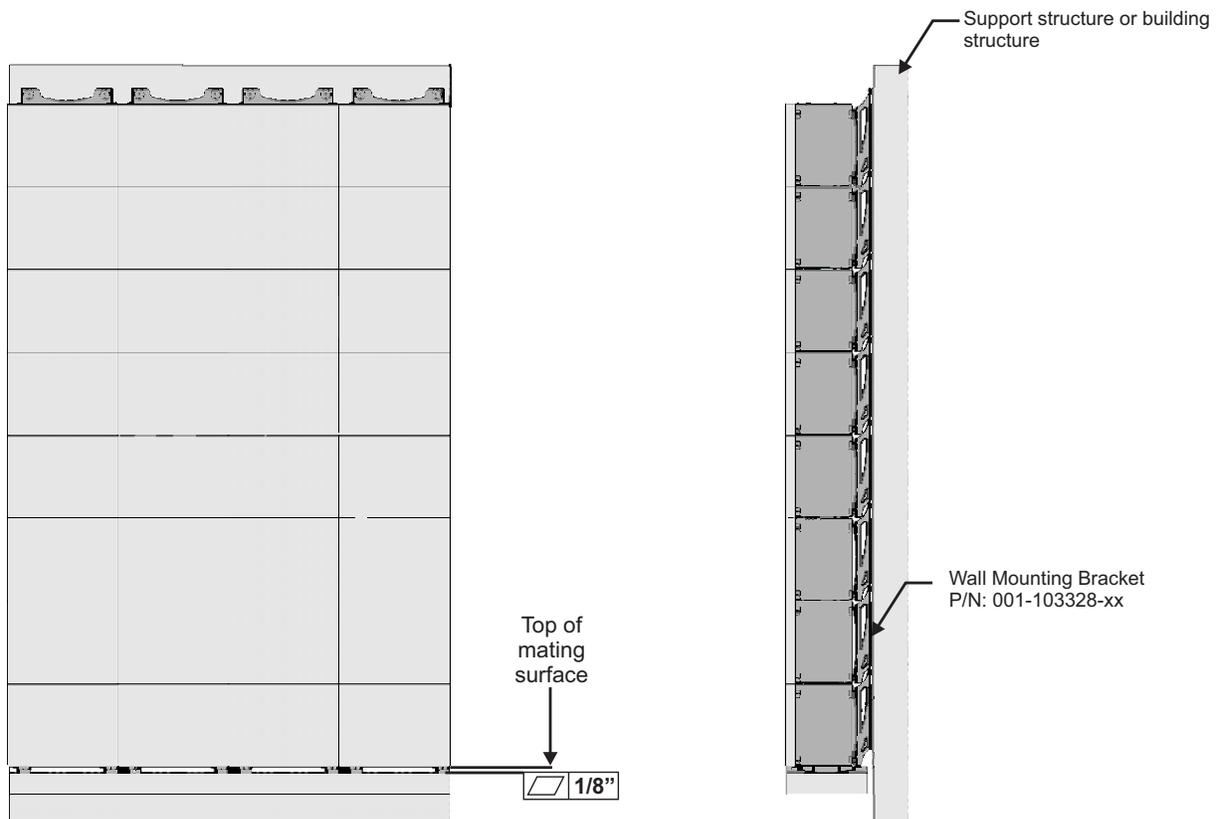4 per tile

Wall mounted array

Local building and safety regulations must be considered when designing and installing an array that is greater than five tiles in height. An independent evaluation by an engineer might be required to make sure the installation adheres to local building and safety regulations. Every tile in the array must be secured to a support structure or the building.

The base must be designed to withstand the weight of the MicroTiles array and adhere to local building and safety regulations. The base structure for MicroTiles arrays can be made out of aluminum extrusion, welded hollow structural tubing, unistrut, or wood. Vertically align the display unit leveling feet so all of the mating surfaces are within the specified tolerance. A wall mounted array must be capable of supporting two full rows of tiles.
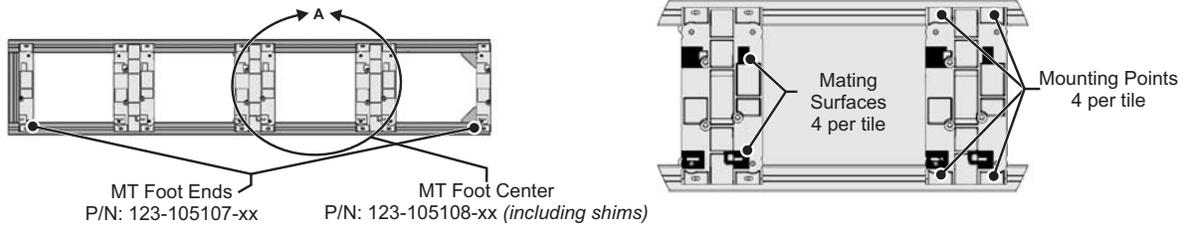
If rear access is required, the installation must provide room to remove the rear cover and remove the fans and the power supply.

Front and side views

Support structure or building structure

Top of mating surface

1/8"

Wall Mounting Bracket P/N: 001-103328-xx

Bottom view

MT Foot Ends
P/N: 123-105107-xx

MT Foot Center
P/N: 123-105108-xx *(including shims)*

Mating
Surfaces
4 per tile

Mounting Points
4 per tile

Ventilation Examples

⚠ **Caution!** Failure to comply with the following could result in minor or moderate injury.

- A sufficiently sized unobstructed space must be left at the back of all Christie MicroTiles arrays to allow for air flow and cooling, to make sure that the intake air of each tile is within the operating range of 5-40°C (41-104°F) for the display unit.

- If the array is installed in an enclosed area, additional cooling may be required to make sure the maximum inlet temperature does not exceed 40°C (104°F). Consult an architect or mechanical engineer to calculate the required space, and to plan an adequate ventilation plan. *See Ventilation Examples* on page 38.

- The fans on each tile have a maximum inlet air flow of 70 CFM (33 L/s). Maximum cooling load is 110W (375 BTUs/hr) per tile, when operating with all LEDs manually driven to the maximum levels; for example, without color matching. The inlet air temperature cannot exceed the maximum operating temperature.

🛇 **Notice.** Failure to comply with the following may result in property damage.

- Temperature and humidity changes make the screen expand and contract. At the maximum temperature limit of 40°C (104°F) for S300 screens and 35°C (95°F) for S310 screens, the standard 1mm gap between screens is decreased and the screens may come into contact with adjacent screens or structures.

To maximize the lifetime of a MicroTiles system, it is imperative that every display unit is adequately cooled. For more detailed specifications related to cooling, see *Ventilation requirements* on page 10.

It is the customer's responsibility to design and install a suitable ventilation system that provides adequate cooling. The following ventilation examples are provided for illustrative purposes only, and Christie does not recommend or warrant any system in particular. When designing the array, consult an architect or mechanical engineer to calculate and plan the space required for adequate ventilation. Example ventilation configurations include:

Convection cooling

To cool small MicroTiles arrays with convection cooling, install make-up air grilles beneath the tiles, allowing cooler air to be drawn into an unobstructed ventilation cavity behind the tiles. The make-up air is naturally pulled upwards as the hot air rises in the cavity.
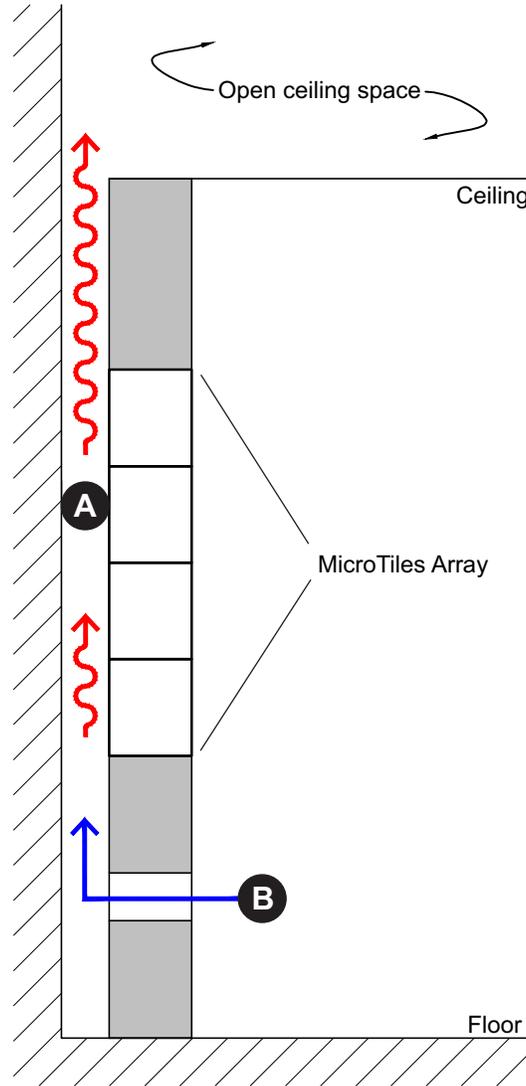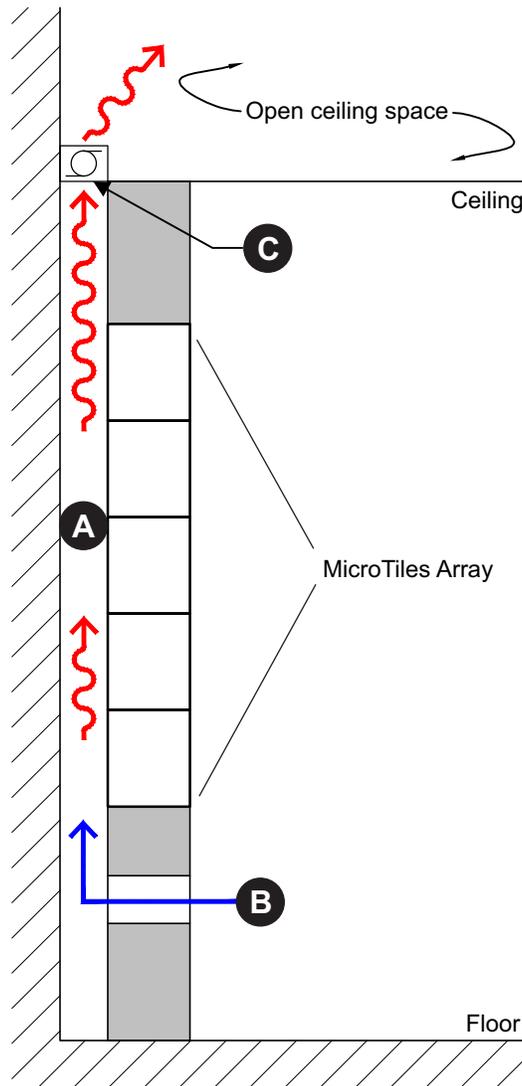

A	Unobstructed ventilation cavity
B	Make-up air grilles

Exhaust fan assisted cooling

Install fresh air grilles beneath the tiles and an exhaust fan at the top of the unobstructed ventilation cavity behind the tiles. The grilles allow make-up air to be drawn into the cavity behind the tiles as the hot air is pulled out of the cavity by the exhaust fan.

A contractor must determine the heat load of the array, and provide a suitably sized exhaust fan.

A	Unobstructed ventilation cavity
B	Make-up air grilles
C	Exhaust fan

Mechanically ventilated maintenance room or closet

The MicroTiles array is installed with a maintenance room that provides access to the back of the array. The room has an exhaust fan at the top of the area behind the tiles, and has wall or door grilles to provide a continuous supply of make-up air.

A contractor must determine the heat load of the array, and provide a suitably sized exhaust fan. Rooms or closets with open ceiling space may not require an exhaust fan.
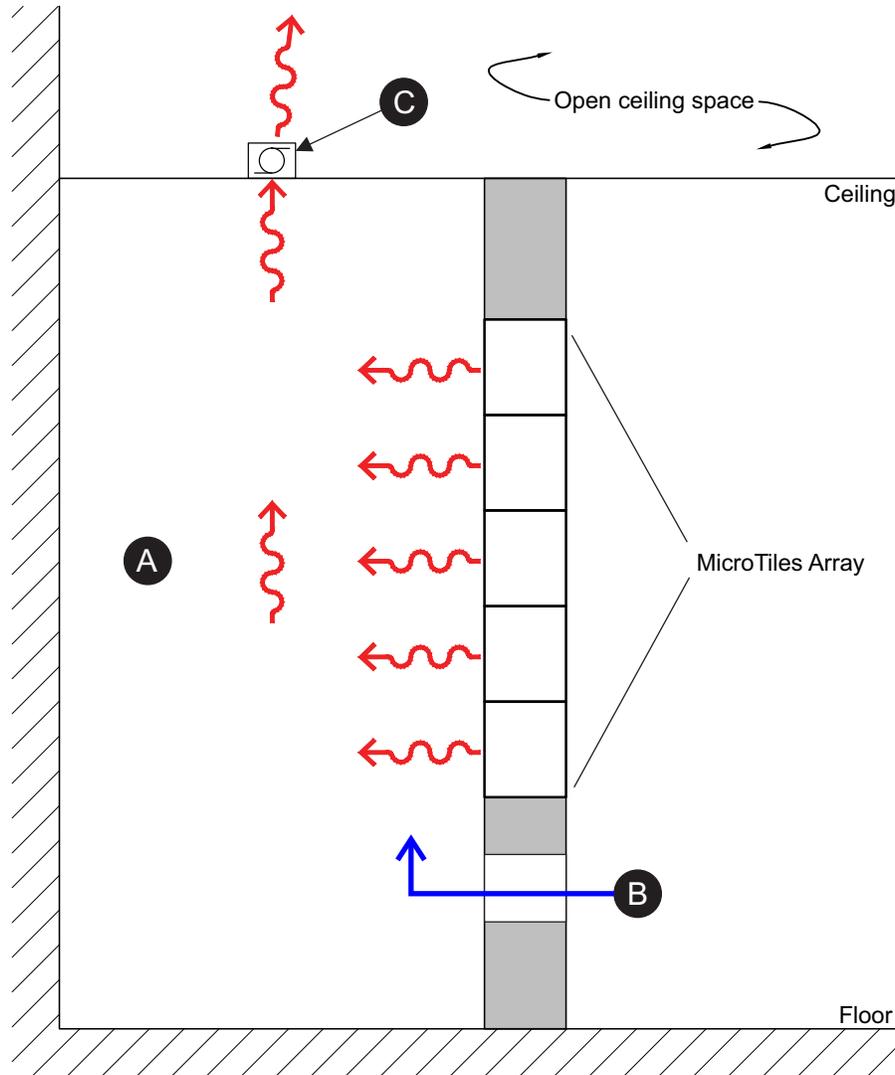
| A	Maintenance room or closet
B	Wall or door make-up air grilles
C	Exhaust fan

Mechanically engineered ventilated cavity

For large array installations, the architect's design must be reviewed and inspected by a licensed professional mechanical engineer to ensure adequate ventilation is in place for the MicroTiles array.

The following items must be considered when designing the ventilated cavity:

- The existing building conditions, including all heat loads in conjunction with the existing air handling equipment, must be examined to determine the most appropriate engineered solution. Should the existing mechanical equipment be unable to satisfy the necessary heat extraction from the ventilated cavity, new mechanical equipment may be necessary.

- The configuration and the total heat load of the MicroTiles array must be evaluated by the mechanical engineer to determine the most appropriate method of heat extraction.

- The ventilated cavity may be designed with or without duct work, as long as the maximum temperature within the ventilated cavity allows the MicroTiles array to maintain an operating temperature within the necessary range. Branch ducts may be required to ensure uniform heat extraction.

- If sufficient make-up air cannot be achieved through the design of the cavity, a hard ducted air supply may be required to ensure any trapped heat or hot pockets are ventilated.

- The mechanically ventilated cavity must offer unobstructed ventilation, and be sized for the support structure and duct work.

Side view

A	Make-up air or ducted supply air	
B	Branch ducts	
C	Engineered ducted supply air	
D	Engineered ducted return air	
E	Ventilation equipment	
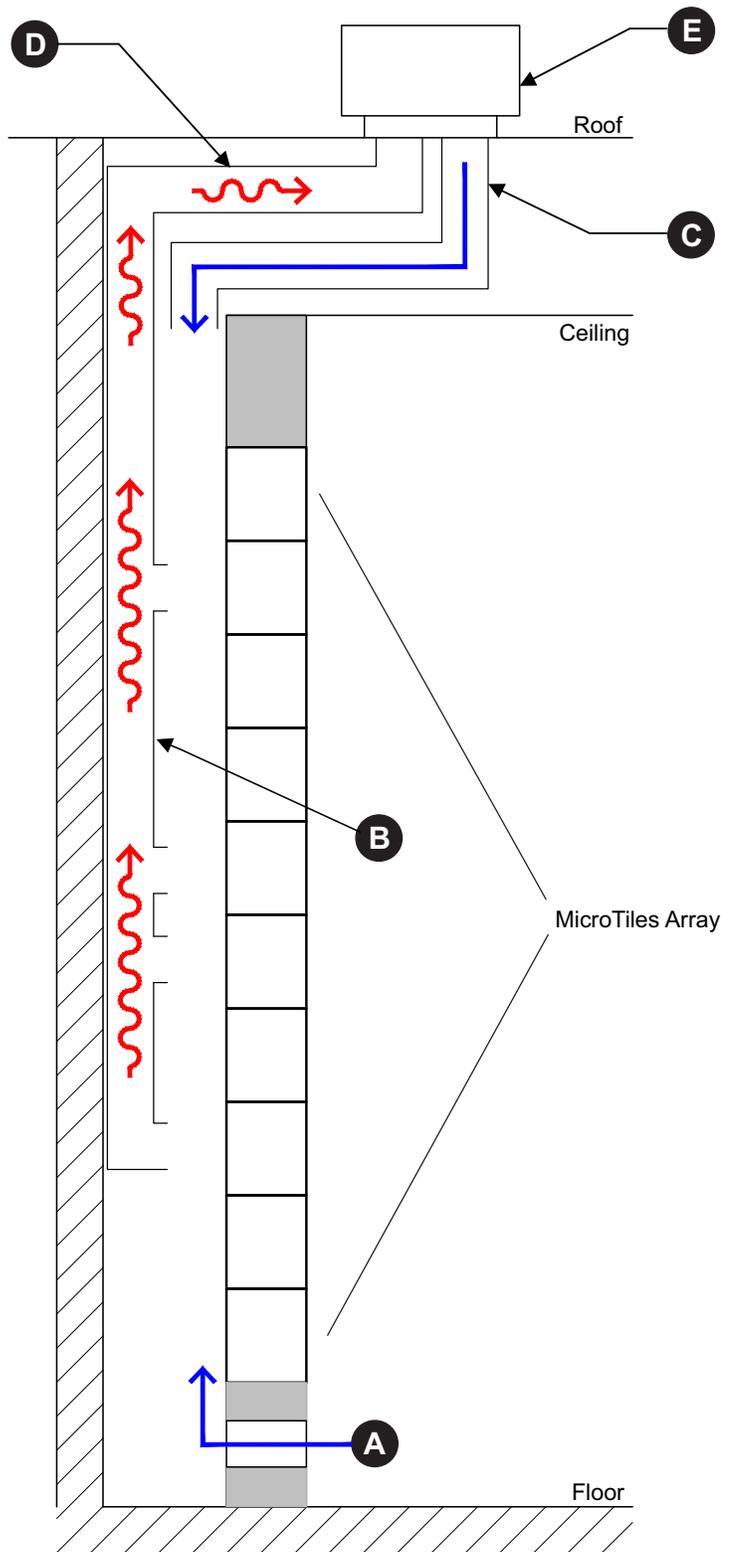
Front view
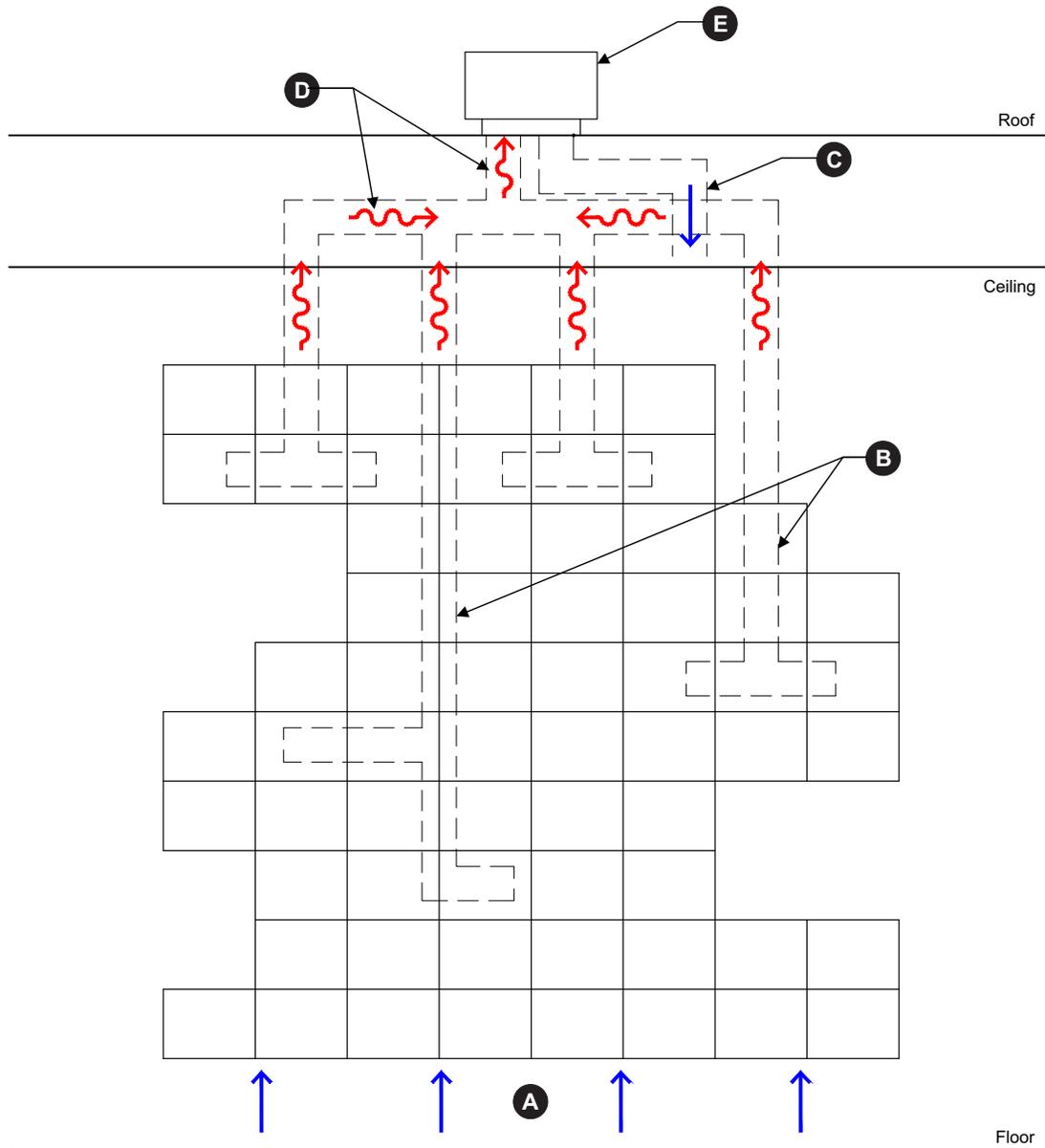
A	Make-up air or ducted supply air
B	Branch ducts
C	Engineered ducted supply air
D	Engineered ducted return air
E	Ventilation equipment

Product and Vendor List

This section provides a list of supported products and vendors who can help with your MicroTiles installation. Christie does not recommend or warrant any of the listed items or firms. For a current list of vendors and case studies, visit www.microtiles.com.
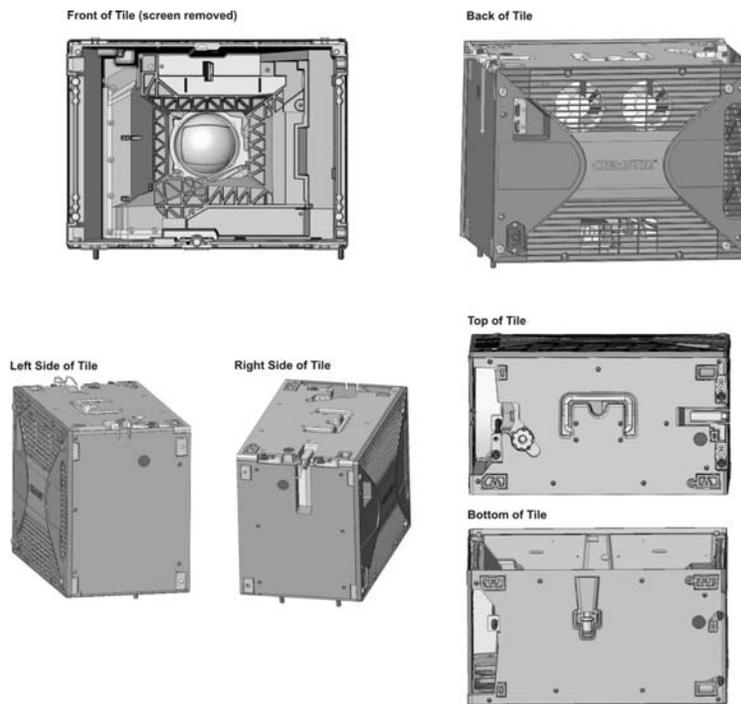
Item	Description
Processors, servers, and software	• Christie JumpStart, a content delivery solution bundled and server hardware to drive up to four ECUs • Mac Mini, Mac Book and Mac Book Pro with a VLC media player, QuickTime, or iTunes • Windows-based signage software: Watchout, C-nario, Omnivex, Remote Media, Scala, Harris, Nexus, and CoolSign • Linux-based signage software: WireSpring • Video processors: TVC-500, Vista Spyder, and Matrox Mura
Interactive solutions	• Gesture interactivity: Float4 Interactive and Vertigo Systems • Touch interactivity: Christie Interactivity Kit, U-Touch, and Float4 Interactive • Mobile interactivity: Txtstation, never.no
Mounting structures and integrated solutions	• Christie Global Services • Custom Display Solutions (CDS), Inc. • RP Visuals • Taylor Group • OHM Industrial Designers • Mode-Al and 10 Squared (United Kingdom)
Content production	• Christie Global Services • Show+ Tell • Avatar Studios • Amigo Digital (Europe) • Dagobert (Europe)

![Christie logo]

Bid Specification Information

This section provides information that you can use to prepare formal bid documents for the purchase of Christie MicroTiles display systems.

Overview

A MicroTiles array is a group of tiles arranged together and interconnected with 1 or more ECUs to form a unified, digital canvas. Video and data is transmitted internally by way of a proprietary bi-directional HSSL network capable of 5 Gbps. By connecting an active media source to an ECU, this source displays on the local set of tiles connected to the HSSL output of that ECU (HSSL-2). In addition, the media source connected to the master ECU functions as a global source, and can be displayed on any tiles connected on that ECUs HSSL input side (HSSL-1). In a system with multiple ECUs, the master ECU performs all global control functions. It is selected manually or by an automated election process.

Front of Tile (screen removed)   Back of Tile

Left Side of Tile   Right Side of Tile   Top of Tile

Bottom of Tile

Each tile must is capable of displaying a maximum resolution of 720 x 540, which is its native resolution. At a width of 408 mm (16.06″) and a height of 306 mm (12.05″), this provides sufficient pixel density (equivalent to a pixel pitch of 0.57 mm) for almost any practical application or viewing distance. Media sources are either displayed at the native resolution of the tiles, or upscaled as required to fit the physical arrangement of tiles. For example, at 60Hz, six tiles can display source content at a native pixel pitch of 0.57 mm, whereas the same content upscaled over 20 tiles would result in a displayed pixel pitch of 0.98 mm. Each ECU input must conform to the DVI specification and yield a maximum bandwidth of 165Mhz, with 5% of this bandwidth needed for blanking. At 60Hz, this is equivalent to the native resolution of six tiles.

When tiles are assembled adjacent to each other within a 5° angle, the master ECU uses the infrared neighbor detection capabilities of each tile to create a map of the entire array. In such installations, every tile automatically displays the correct portion of the input source and scales it accordingly.

Each tile contains sensors that continuously monitor the light output and temperature of each LED, enabling the master ECU to match the brightness and color of each individual tile in the canvas automatically. Under normal operation with color and brightness matching enabled, all tiles in the system are matched to the lowest performing tile in the canvas. The geometric alignment of the image on each tile is factory calibrated. In the event that fine tuning of color, brightness or geometric alignment is required, this capability is provided through the WebUI. For details, see the Christie® MicroTiles™ User Manual (P/N: 020-100329-xx).

Reliability and serviceability

- Mean Time Between Failures (MTBF) >50,000 hours for all major modules

- Mean Time to Repair (MTTR) < 15 minutes for any major serviceable component

- DLP® display technology is utilized for long-term performance: >100,000 hours expected life

- Solid state LED illumination technology is utilized for long-term performance: >65,000 hours rated life

- The projection system includes all solid state electrical components with the exception of cooling fans

- The projection system does not contain arc lamps, motorized color wheels, or motorized apertures

- All cooling fans employed in the system are monitored so that in the event of a single fan failure, the system will remain operational and the user is alerted. If a certain maximum LED temperature is attained the tile will shut down automatically

Optical and display performance capabilities

- DLP® technology with a resolution of SVGA 800 x 600 from a single 0.55" DMD utilizing three LEDs. Displayed resolution is 720 x 540

- Provides a maximum calibrated brightness of 600 nits (cd/sq.m) based on pure red, green and blue sources

- Provides a minimum contrast ratio of 1050 full field

- Includes a high-performance zero-offset, 0.46:1 wide angle projection lens

Color and brightness performance capabilities

- 115% CIE 1931

- Provides extensive color management control for accurate and adjustable color-space reproduction with an onscreen interface

- Includes an internal color and brightness management system that monitors all tiles in the system and automatically maintains uniformity across the entire canvas on a continuous basis

Brightness and uniformity

- White Uniformity: Minimum ±25% (measured as per IEC 61947-1:2002, with no electronics correction applied)

- Black Uniformity: Minimum 80% center-to-corner uniformity is calculated as follows: Divide the luminance of the dimmest of the four corner points of the center nine ANSI points by the average luminance over the nine points and multiply by 100

- 13-bit color processing

Consumable components

MicroTiles are long-lasting and reliable, with no color wheel, lamp or other consumable components.

Inputs

- The single-link DVI-D (digital) input is standard on the External Control Unit (ECU)

- Input bandwidth capability: up to 165Mhz per ECU

- Horizontal frequency range: 1-619KHz

- Vertical frequency range: 1-75Hz

Control

- Onscreen Display (OSD) via remote keypad control (RF)

- Serial control via RS-232 to master ECU

- Web User Interface (WebUI) via Ethernet to master ECU. To display the IP address on a tile press and hold the **Power** button on the ECU for five seconds or the **Pair** button on the remote.

Manufacturing

Manufactured in an ISO 9001 and ISO 14001 registered facility

On screen display and WebUI features

This section outlines the control functions available through the OSD and WebUI.

Source management

- Image Settings (brightness, contrast, gamma)
- Size and Position (input source properties, display window)
- Customize EDID (customize, restore)

Canvas management

- Display Mode (video, OSD)
- Layout (physical mapping, subarray configuration, ECU priority, configuration)
- Canvas Settings (color and luminance, image settings, image alignment)
- Diagnostics and Calibration (test pattern, wire map, HSSL info)

Configuration

- Power
- Date and Time
- Ethernet (MAC address, IP address, subnet mask, default gateway, DHCP)
- Firmware Upgrade (tiles, ECU)
- Remote Control (pair, unpair)
- Save & Restore Factory Defaults
- SNMP (system information, communication setup, notification configuration)

Status

- System Information
- System Alerts
- Temperature logs

Help

- Tool Tips
- About MicroTiles WebUI

Diagnostic monitoring

Continuous diagnostic monitoring via Ethernet and RS232.

Regulatory requirements

- Directives (EC) 2002/95/EC (RoHS), 2002/96/EC (WEEE), Regulation (EC) No. 1907/2006 (REACH)

- CAN/CSA C22.2 No. 60950-1-03 2nd Edition, UL 60950-1 2nd Edition, IEC 60950-1:2001 2nd Edition

- FCC, Part 15, Subpart B, Class A, EN55022/CISPR22 Class A, EN55024 / CISPR24, CE (EU)

- GoST-R (Russia), KC/KCC (Korea), PSE (Japan), C-Tick (Australia & New Zealand), Singapore, Dubai

Environmental requirements

- Operating temperature with S300 screen: 5°C to 40°C (50°F to 122°F)

- Relative humidity with S300 screen: 35-85% non-condensing

- 50 mm (2″) minimum clearance for ventilation

- Altitude: 0 ft (0 m) to 10,000 ft (3048 m)

- Vibration/motion limit: 0.5G

- Sound pressure per tile: 35dB at 25°C (77°F) ambient typical

- MicroTiles conform to RoHS environmental standards

Heat dissipation and power requirements

- In a typical canvas operating at maximum brightness with color and brightness matching enabled, each tile dissipates approximately 239 BTUs/hr and consumes 70W

- If every LED is set to its maximum drive level, maximum heat dissipation and power consumption per tile is 375 BTUs/hr and 110W

- A minimum 2″ (50 mm) space must be left at the back of all Christie MicroTiles arrays to allow for air flow and cooling. Larger displays may require a 4-6″ (101 mm - 152 mm) space to make sure that the air behind each tile is within the operating range of 5-40°C (41-104°F) for S300 screens and 5-35°C (41-95°F) for S310 screens. If the array is installed in an enclosed area, additional cooling may be required to make sure the maximum inlet temperature does not exceed 40°C (104°F) for S300 screens and 35°C (95°F) for S310 screens.

- A maximum of nine tiles can be connected together with Y-power cords.

Warranty

The projection system carries a 3-year parts and labor limited warranty for all components, including illumination.

Parts and Accessories

Standard components

The items listed in this table will be ordered with every system.

Item	Part Number	Part Description	Details
Display Unit	123-001102-xx	MicroTiles Display Unit D100	Each display unit includes a one meter display port cable, three vertical screws, one power connection security clip (comes installed), light seal trim and two horizontal adjustment screws for fine optimization of screen gaps.
Screen	123-124108-xx or 123-128102-xx	MicroTiles Screen S300 MicroTiles Screen S310	Ordered separately from display unit.
External Control Unit	123-101103-xx	MicroTiles ECU E100	Includes a three meter display port cable.
User Kit	123-103105-xx	MicroTiles User Kit	Includes: R100 Remote Control, screen removal tool, cleaning cloth, screen tape for sealing the corners of the array, *Christie MicroTiles Quick Setup Guide* and *User Manual* (with CD containing additional technical documentation).
Y-cord Kit	123-122106-xx	MicroTiles Y-cord Kit	One kit supports up to nine MicroTiles. This kit includes nine Y-cords with retention clips. This kit does not include regional line cords for connecting a group of tiles to a power outlet. Some regions do not accept Y-cords, see Regional Acceptance for Y-cords section of the *Christie® MicroTiles™ User Manual (P/N: 020-100329-xx)*. Regional line cords will be shipped separately. See Line Cords for D100 and E100 section of the *Christie® MicroTiles™ User Manual (P/N: 020-100329-xx)*.

Notice. Failure to comply with the following may result in property damage.

- Local or national regulations may not allow the use of Y-cords and may require an alternative method of power distribution, such as standard individual line cords for each tile, or power bars. This may include Japan, China, and Korea.
  For details about power bars, see *Power an array with a power bar* on page 12 and the Power Distribution section of the *Christie® MicroTiles™ User Manual (P/N: 020-100329-xx)*.

Optional accessories

The items listed in this table are optional, but in many cases may be required or recommended. To order additional kits and hardware, go to www.microtiles.com.

Item	Part Number	Part Description	Details
End Foot Kit	123-105107-xx	MicroTiles Foot/Ends (includes left/right end feet and one grille)	Leveling feet are recommended to help level the bottom row when building on a supporting structure. Order one end foot kit per array.
Center Feet	123-106108-xx	MicroTiles Foot/Center (three-pack includes three grilles)	Order one center foot to place between each column.
Mounting Bracket	123-107109-xx	MicroTiles Mounting Bracket (two-pack)	One required for every tile that is added to rows six and above in an array.

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For the most current technical documentation, please visit www.christiedigital.com

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