Lumicor®

Flexible LED Light Sheet

PRODUCT OVERVIEW INTRODUCTION

CUSTOMIZABLE

// Can be folded and shaped to suit project needs
// Its unique power distribution grid allows groups or single LEDs to be cut from the flexible sheet while maintaining a resilient circuit to all remaining LEDs
// Scalable while maintaining a Class 2 rating
// Multi-purpose design is suitable for indoor and outdoor use (IP65 rated)

BRIGHT & EVEN ILLUMINATION

// 5300K (Pure White) color temperature (custom color options available upon request)
// 330 LEDs per square foot (3559 LEDs per square meter)
// High LED density (420 LEDs per sheet)
// Each Light Sheet emits 1100 lumens
// Superior consistent light quality via precise ANSI bin control

LONG LIFESPAN

// Long LED lifespan (50,000+ hours)
// No heat sink required due to low operating temperature

WARRANTY

// Advanced 5-year warranty

24V IP65 DIMMABLE RoHS COMPLIANT c UL us LISTED

FLEXIBLE FIELD CUTTABLE BACKLIGHTING SOLUTION

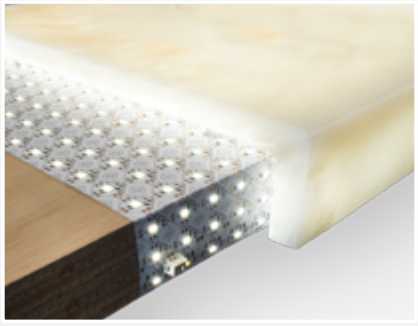
Light Sheets create a paradigm shift in backlighting design. With 330 LEDs per square foot, Light Sheets are specifically engineered to be a dimmable, field customizable solution for backlighting translucent materials with as little as 3/8" (11mm) of clearance. CutLEDs from any part of the sheet to avoid obstacles without interrupting power to the rest ofthe sheet, while maintaining UL Listing. Fold and shape over edges and around curvilinear shapes. Connect up to eight Light Sheets in any configuration needed, easily and quickly without soldering. Each sheet contains 420 LEDs, covers 1.27 square feet (1182 cm^2)and consumes only 12 watts per sheet (over 90 lumens per watt).

Cut

Our low voltage UL Listing allows for on-site customization which can eliminate custom order lead times. When discrepancies occur between drawing specs and field measurements or when changes need to be made, on-site customization avoids delays.

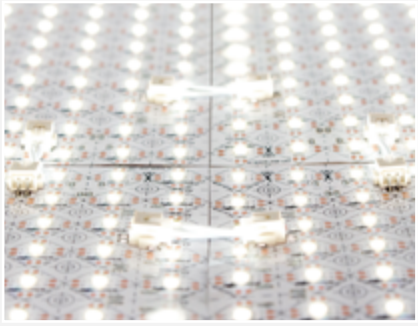
Fold

Fold and shape light sheets over edges and around curvilinear shapes. Add a seamless, uniform backlighting effect to translucent surfaces with multiple planes. The Flexible Circuit Board (FCB) can bend along both axes and diagonally.



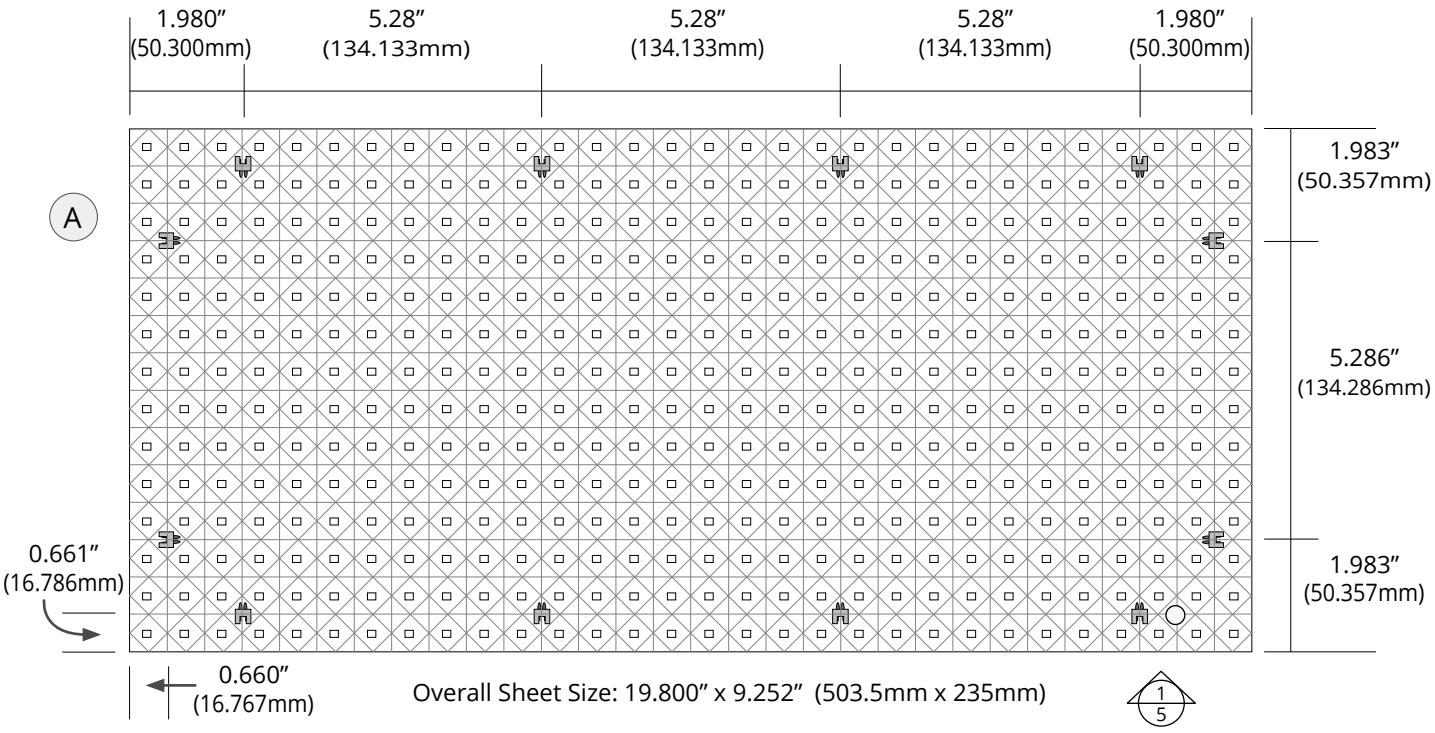
Connect

Sheets interconnect quickly andeasily with included sheet-to-sheet connectionwires. Connect up to eight sheets in any arrangement while maintaining a Class 2 rating. Integrated 2-pin connection blocks eliminate the need to solder and speed installation.



PACKAGE CONTENTS - EACH LIGHT SHEET INCLUDES AN ACCESSORY PACK

PART	DESCRIPTION	QUANTITY
A	Light Sheet with 3M adhesive backing and twelve integrated 2-pin connection blocks	1
PART	**ACCESSORY PACK CONTENTS**	**QUANTITY**
B	Sheet-to-sheet connection wires for aligned 2-pin connection blocks, 20AWG, 0.71" (1.8cm) length	4
C	Sheet-to-sheet connection wires for staggered 2-pin connection blocks, 20AWG, 3.75" (9.5cm) length	4
D	Cable management clips with silicone adhesive backing	4
E	Domed spacing bumpers with silicone adhesive backing (tested to support up to 440 lbs / 199kg ea.)	8
F	Wago® splicing connectors, shunted - use to connect wires with same polarity	2
G	Power lead with connector on one end and stripped on the other end, 20 AWG, 24" (61cm) length	1
H	Instruction Manual	1

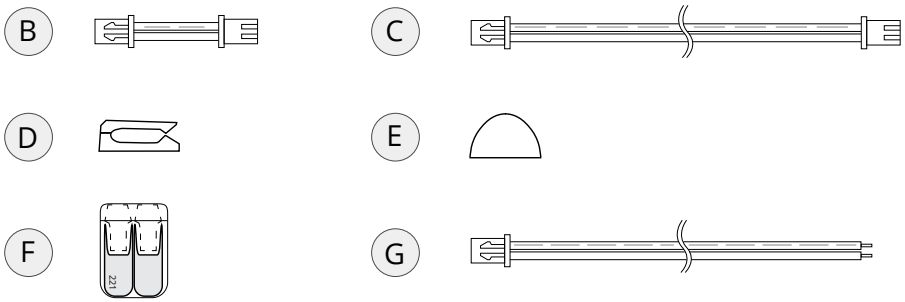


LEDs ARE FRAGILE!

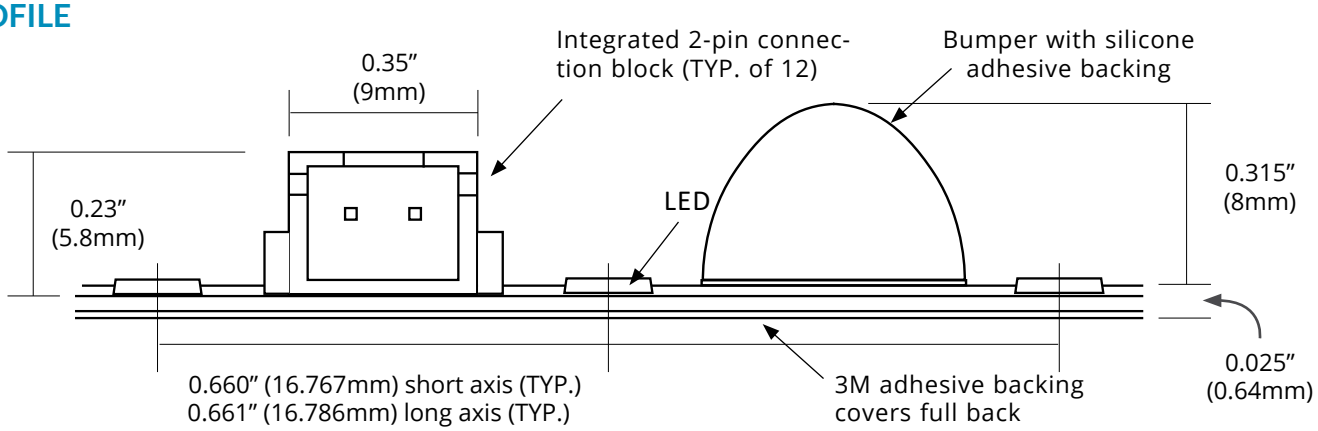
Do not set anything on top of Light Sheets (i.e. tools, mugs, etc.). Do not set Light Sheets on the floor where they could be stepped upon or where anything can be dragged over or set upon them. Light Sheets can be damaged unless properly handled.

TEST BEFORE INSTALLING!

Due to possible unforeseen issues with shipping and handling, we advise that all Light Sheets be inspected at time of delivery and dry-fit tested for proper illumination prior to mounting and again before the forward facing material is installed.



PROFILE



1 LIGHT SHEET ELEVATION

SPECIFICATIONS

ATTENTION! PLEASE REVIEW THE PRODUCT HANDLING, INSTALLATION & INTEGRATION ADVISORY ON PAGE 9			
ELECTRICAL			
Input Voltage	24 Volt DC - Constant Voltage		
Power Consumption	12 W / sheet - includes 10% headroom for power supply (9.45 W / ft^2, 101.7 W / m^2); 0.029 Watts / LED		
Wire Size	20 AWG 2 wire (Grey Stripe +, Solid White –)		
Wiring	Up to eight sheets can be powered by one UL Listed or UL Recognized Class 2 power supply. Use sheet-to-sheet connection wires (included, see Contents) to interconnect multiple sheets.		
Wire Length	One 24″ (61cm) 20AWG power lead is included with each sheet		
Connector	Twelve integrated 2-pin connection blocks		
Certification	UL Listed. Use with UL Listed or UL Recognized Class 2, LPS or LVLE Power Supply.		
PHYSICAL			
Color Temperature*	Pure White (PW) 5300K		
CRI	85+		
Mounting	Screws can be used within the concentric circles marked on the Light Sheet. Use mechanical fasteners when mounted vertically or suspended. 3M® adhesive backing on the Light Sheet is provided as a supplementary installation aid. Use the appropriate method or combination of methods depending on the type of mounting surface and its orientation.		
Operating Temperature	-22˚F ~ +122 °F (-30˚C ~ +50 °C)		
Environment	Wet location (IP65 rated). See also Product Advisory for wet location use.		
Thickness	See Profile drawing above		
Cut/Fold Line Spacing	0.660″ (16.767mm) short axis / 0.661″ (16.786mm) long axis		
Single Sheet Size	19.800″ x 9.252″ (503.5mm x 235mm)		
Packing Unit	Individual Light Sheet	Box of four Light Sheets	Carton of 40 Light Sheets
Area Covered	1.27 ft^2 (1182cm^2)	5.09 ft^2 (0.47m^2)	50.89 ft^2 (4.73m^2)
Weight	5.0 oz (141g)	2.0 lbs (0.8kg)	19.5 lbs (8.84kg)
Customization Options Available	Pre-cut, pre-mounted, specific color temperatures, IP20 rating, sheet sizes, LED pitch, and/or connector type and placement.		
POWER & CONTROLS			

* LED Kelvin temperatures listed herein have been derived from raw LED data. Actual Kelvin ratings can vary +/- 200K based upon environmental conditions including but not limited to the use of diffusion materials. A precise ANSI bin control system is utilized to help maintain LED conformity and to minimize variances.

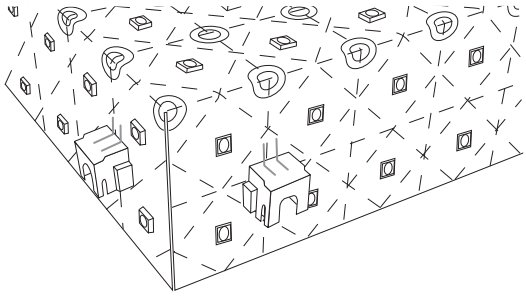
DRY FITTING, CUTTING* AND FOLDING

Dry fit the sheets and their connection wires before mounting the Light Sheets to the substrate. ***Always test function before installing the translucent (forward facing) material.***

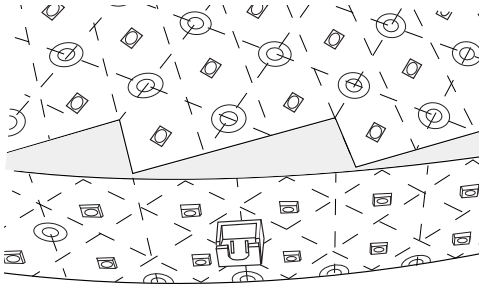
To make a fold in a Light Sheet, bend the sheet along one of the dotted lines marked on the sheet, then crease along this line, then relax the crease into a 90° (or other desired) angle. ***Be careful about folding where an LED is attached to the sheet since LEDs can break if forced over an edge. Do not repeatedly fold and unfold along the same line as this will weaken the flexible PCB. Do not fold a single Light Sheet and attach it to itself, however two*** separate ***Light Sheets may be attached back-to-back.***

To make a cut in a Light Sheet, use shears, scissors, utility knife and/or a precision/craft knife. Cut on horizontal, vertical and/or diagonal lines. Deviating from the lines could cut off power to one or more LEDs.

To fold or cut on a line where a 2-pin connection block exists, see Removing 2-Pin Connection Blocks below.



To form square corners, cut squares out of each corner of a dry fit arrangement, similar to Figure 10 on page 7, finding the nearest cut line that fits the design. Fold the Light Sheets over the base material so that the cut edges meet vertically as shown above. This will provide a uniform spacing for the translucent material.



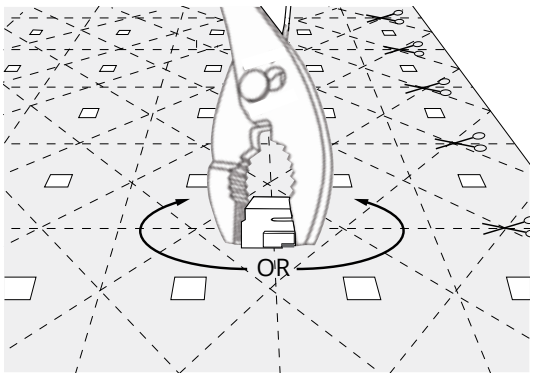
For curved shapes that meet a vertical surface, make a template of the horizontal plane, then place it over a dry fit arrangement and mark the shape onto the face of the Light Sheets, using a felt tip, roller ball pen or grease pencil. Note that the markings can easily be removed if desired. Then cut this shape out to the nearest cut lines. For the vertical surface, cut strips from other Light Sheets to follow the curve. It is strongly recommended to obtaining Light Sheets samples to mock up the design,especially when wrapping columns or combining planes with curves.

The strip can be powered from any integrated 2-pin connection block**, however if the distance around the curve exceeds 6.5 feet (2 meters), use multiple connection blocks or power inputs, no more than 6.5 feet (2 meters) apart to avoid voltage drop.

**When there are no connection blocks on the strip(s) of Light Sheets, solder strips together and solder power inputs as needed. See SolderingAdvisory on page 9.

REMOVING 2-PIN CONNECTION BLOCKS*

If one or more 2-pin connection blocks exist on a cut/fold line, it is best to remove the connection block to make a clean fold or cut. Using a pair of slip-joint pliers (see image at right), grasp the connection block firmly and rotate it either clockwise or counterclockwise while holding the Light Sheet in place. The connection block will unseat from the solder. Repeat for other connection blocks as needed and discard the removed block(s).



***NEVER CUT OR ALTER LIGHT SHEET(S) WHILE POWERED.**

USING ACCESSORIES

Short sheet-to-sheet connectors (B): When adjacent Light Sheets are mounted side-by-side with connection blocks aligned, the shorter sheet-to-sheet connection wires (B) should be used to interconnect multiple sheets. Their lengths are optimized so sheets align snugly. See Figure 1.

When connecting Light Sheets that are already mounted to a fixed surface, the short connection wires (B) will need to be shaped as shown in Figure 2 prior to pushing into connection blocks. Best practices include using two sheet-to-sheet connection wires for all adjacent Light Sheets in each Class 2 circuit to minimize voltage drop. Dry-fit test for proper illumination prior to mounting Light Sheets to the mounting surface and again before the forward facing material is installed.

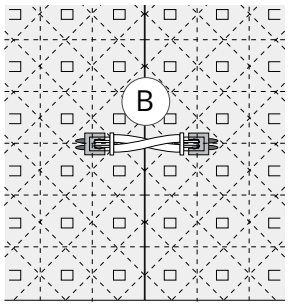


Figure 1

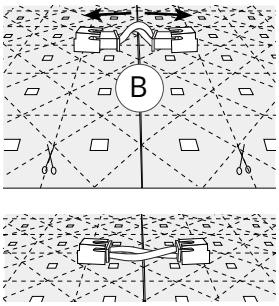


Figure 2

When connected, sheet-to-sheet connection wires have a twist (as shown in these illustrations) in order to maintain proper polarity.

Long sheet-to-sheet connectors (C): Use the longer sheet-to-sheet connection wires (C) to bridge gaps and/or connect offset sheets as shown in Figure 3.

Cable management clips (D): Route the connection wires so that the light from the LEDs is not blocked, then secure the wires in this position using the cable management clips with silicone adhesive backing (D) as shown in Figure 3.

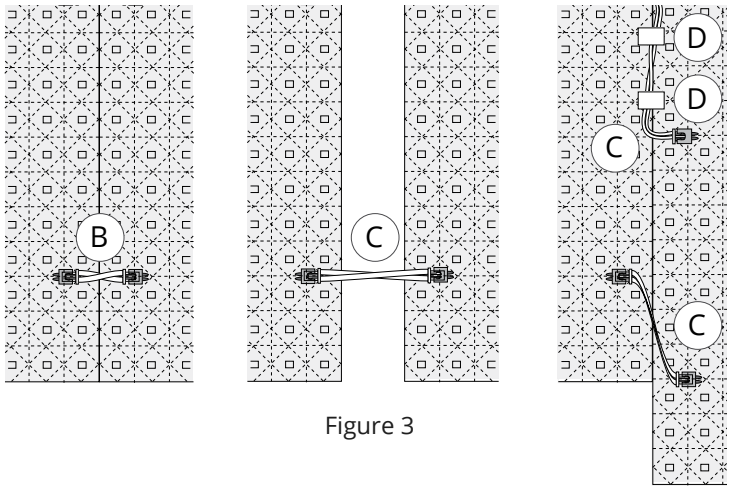


Figure 3

Domed spacing bumpers (E): The domed spacing bumpers (E) included with each Light Sheet have been engineered to bear the weight of translucent materials in horizontal applications and act as a safeguard in vertical applications so that the forward facing material does not harm the 2-pin connection blocks nor the LEDs. It is recommended to use eight bumpers per Light Sheet (approximately six per square foot), spacing them evenly to distribute the weight of the forward facing material (see Figure 4) and to add a level of protection in vertical applications when the forward facing material will be positioned near the Light Sheet (see Figure 5). When an application must bear more than 100 pounds per square foot (488 kg per square meter) of weight and/or bears live load.

The size of the bumper is not intended to provide the appropriate spacing between the Light Sheet and the forward facing material to achieve even illumination. Depending on the transmissive characteristics of the forward facing material, additional diffusion might be required.

Many variables of translucent materials affect transmissive characteristics and dictate the space required between the Light Sheet and the translucent material. Due to these variables, we encourage testing and mock-ups to ensure even illumination and that your vision is achieved.

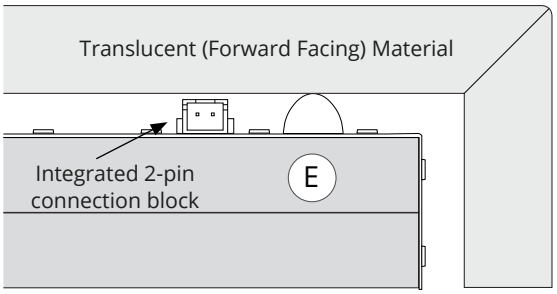


Figure 4

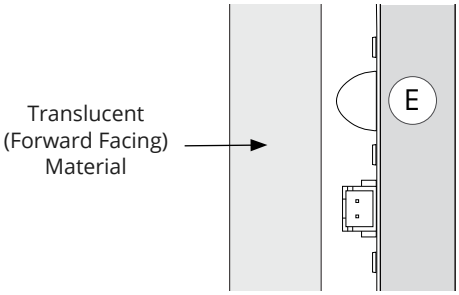


Figure 5

POWER INPUT

To avoid visible brightness variances due to voltage drop, the total distance should not exceed 6.5 feet (2 meters) from the power input to the Light Sheet to the farthest end of any interconnected sheet. Use only with UL Listed or UL Recognized Class 2 power units. Use a centrally located power supply to power interconnected sheets (see Figure 6) or split the length in two and power each with its own power supply as shown in Figure 7. Note that the two sections in Figure 7 are not connected electrically.

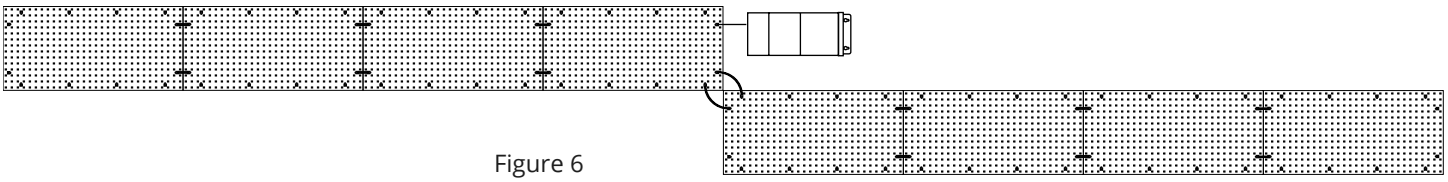


Figure 6

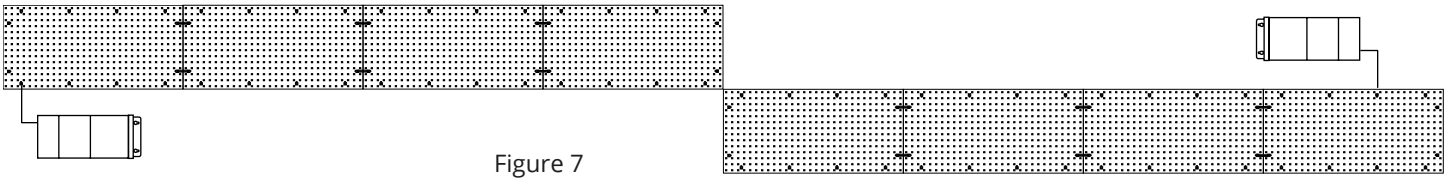


Figure 7

Power lead (G): Use the power lead (G) to route power from the power supply to a single sheet or a set of up to eight Light Sheets. See Figure 8.

Wago splicing connectors (F): The Wago® connectors (F) are provided for convenient power connection to the supply wires. They can be used in place of wire nuts, securing wires of the same polarity together. ***The grey striped wire of the power lead (G) is positive (+) and the solid white wire is negative (-). See Figure 8***.

The Light Sheet's 2-pin connection blocks each have a 4A capacity. Each Light Sheet consumes 12 watts (0.5 amps). Do not exceed the 4A maximum load capacity of a 2-pin connection block in any configuration nor interconnect more than eight sheets (96W total).

Barrel connectivity options/accessories are sold separately for use with barrel connected plug-in power supplies. See Additional Accessories on page 8 for more information.

Light Sheets are dimmable via 120V standard dimmers, 0-10V dimmers, and various Radio Frequency (RF) and wireless controls.

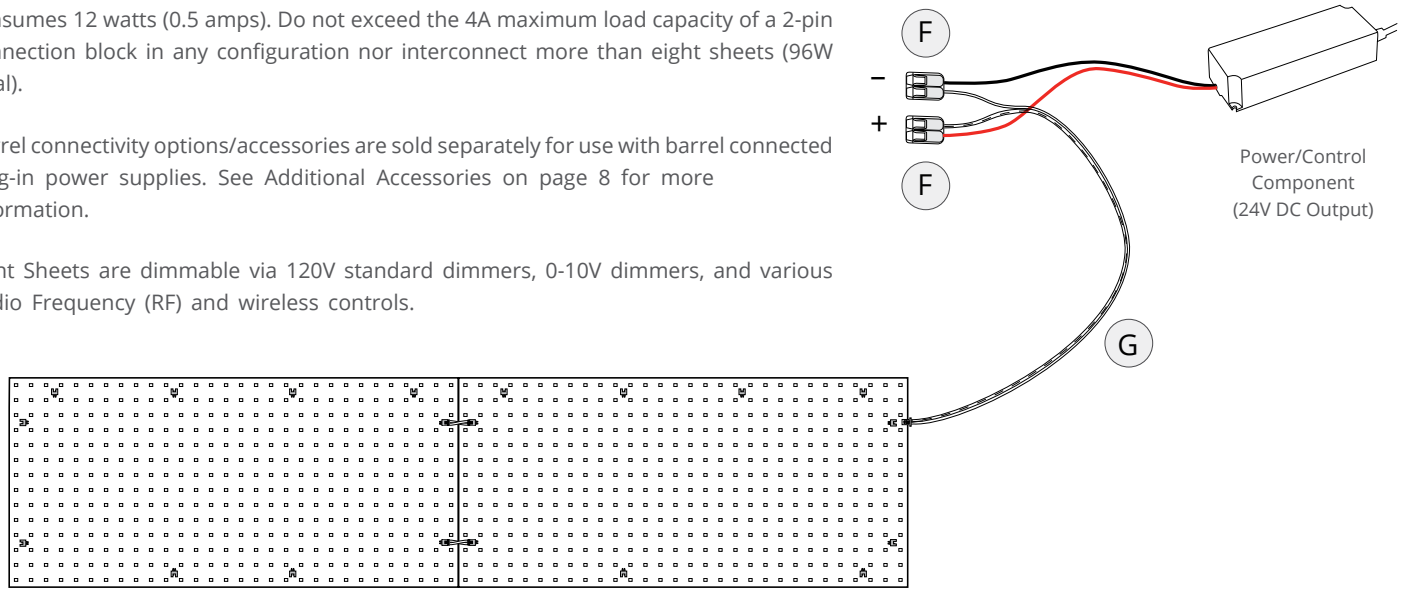


Figure 8

Soldering as Alternative Power Input Method

Soldering directly to the copper pads on the sheet provides another method of power input. Figure 9 shows the use of a longer sheet-to-sheet connection wire (C) with one connector cut off as a means to connect power from a connection block on one Light Sheet to another Light Sheet that has none available. ***Carefully solder the grey striped wire to a positive (+) copper pad and the solid white wire to a negative (-) copper pad.*** See also Soldering Advisory on page 9.

Note that the positive and negative copper pads used need not be adjacent to each other.

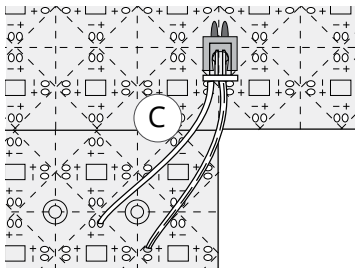


Figure 9

POWER DISTRIBUTION EXAMPLE

For larger scale applications, groups of up to eight sheets can be arranged next to each other, each powered by their own Class 2 power supply or with a multi-output Class 2 power supply as shown below. ***Note: The power consumption per Light Sheet is 12 watts, which includes 10% headroom for the power supply.***

LEDs may be cut from the Light Sheets in groups or singly. Figure 10 below illustrates an island with square corners, a sink cut-out and faucet drop. ***Note: The two sets of eight Light Sheets shown in light and dark grey below are*** **mounted adjacent** ***to each other, however they are*** **electrically isolated** ***from each other.***

The electrical load will decrease when LEDs are cut from a sheet or set of sheets. For example, if the sink cut out from the group in light grey below removes 700 LEDs from the set, the wattage of the LEDs removed is 20.3W (700 LEDs x 0.029 W/LED), so the wattage of that group is 75.7W (96W - 20.3W). The corner cuts remove 4 LEDs each, or 8 LEDs per group, the effect of which is negligible (8 LEDs x 0.029 W/LED = .23W).

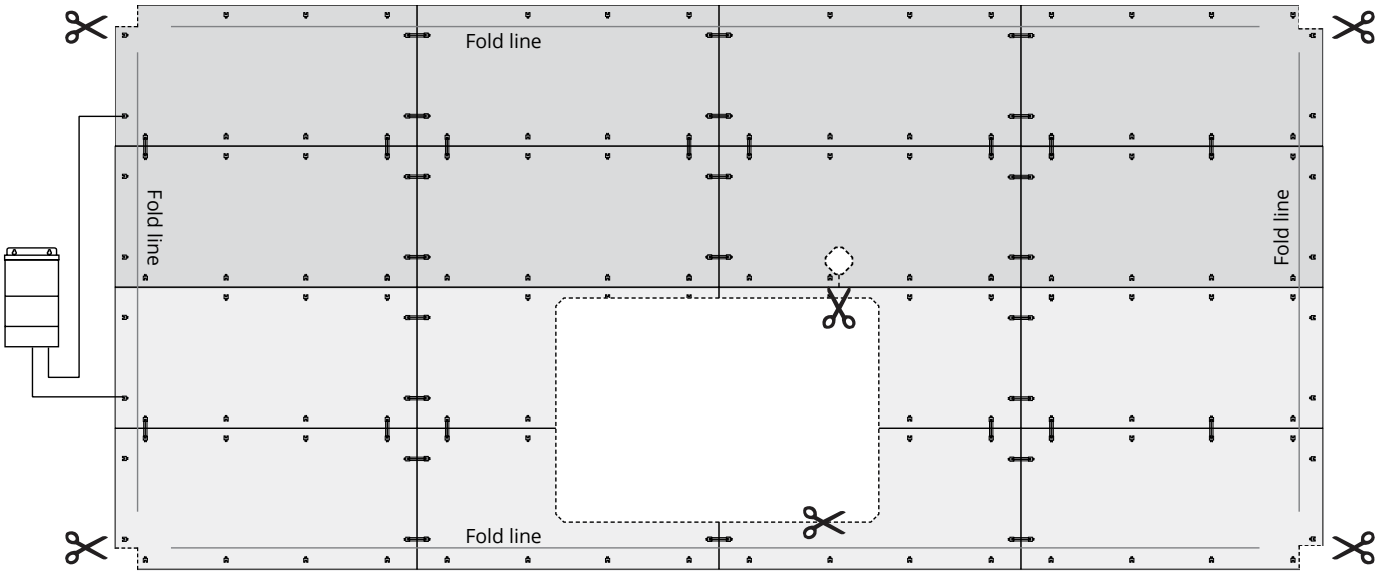


Figure 10

MOUNTING LIGHT SHEETS

Various mounting methods may be used to secure the Light Sheets to the mounting surface after the dry-fit and operation tests are complete. Use the appropriate method or combination of methods depending on the type of mounting surface and its orientation.

Mechanical Fasteners: Any penetrations through the Light Sheet must be made inside the concentric circles marked on the sheet. The smaller diameter circle on the Light Sheet indicates the maximum diameter of screw or other fastener that can be used without causing damage to the Light Sheet's power distribution grid. The larger diameter circle is the maximum diameter of the screw head that can be used without causing damage. See Figure 11. For suspended applications, use mechanical fasteners with an appropriate spacing to avoid sagging. Use pan head, domed, or round head screws, not tapered screws (like wood or drywall screws) and never screw the fastener so much that it deforms the Light Sheet. See Figure 12.

Re-test function before installing the translucent material.

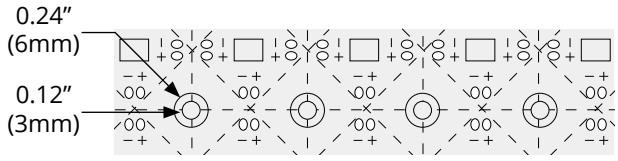


Figure 11

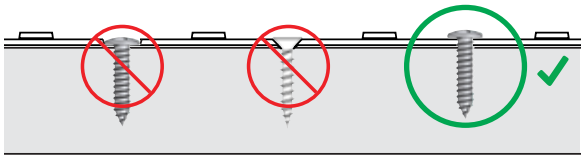


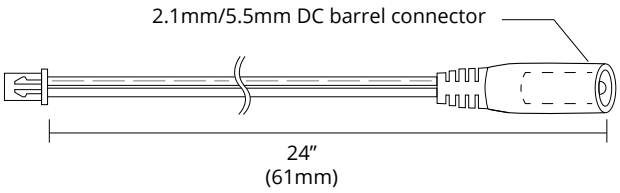
Figure 12

Application Specific Installation Guides are available upon request.

OPTIONAL ACCESSORIES

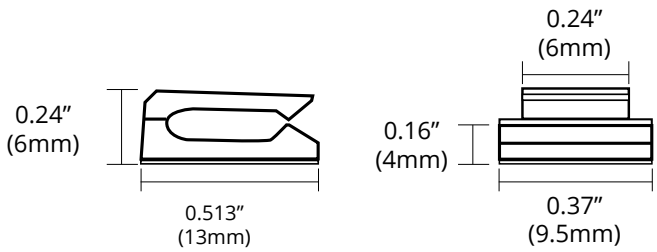
PLUG-IN ADAPTOR CABLE (AG-FDC-24)

This easy-to-use 24" (61cm) length adaptor cord has a female DC barrel connector on one end and a Light Sheet connector on theother end. Use with a plug-in power supply that has a male DC barrel connector.



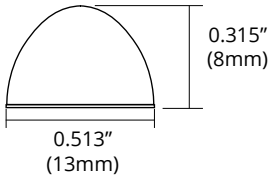
ADDITIONAL CABLE MANAGEMENT CLIP PACK (AG-CMC-P04, pack of 4)

Each has silicone adhesive backing to keep the clip in place on the Light Sheet, while holding long sheet-to-sheet connection wires in positions so they do not block any LED light from the sheet, possibly creating shadows on the translucent surface. They can also be used to hold power connection lead wires in place as necessary.



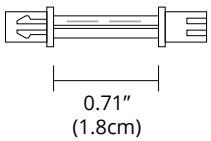
ADDITIONAL DOMED SPACING BUMPER PACK (AG-SB-P08, pack of 8)

Each has silicone adhesive backing to keep the bumper in place on the Light Sheet.

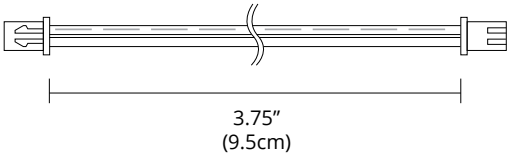


ADDITIONAL SHORT SHEET-TO-SHEET CONNECTION WIRES (AG-SSS-P04, pack of 4)

Replacement or additional sheet-to-sheet connection wires for interconnecting multiple Light Sheets.



ADDITIONAL LONG SHEET-TO-SHEET CONNECTION WIRES (AG-LSS-P04, pack of 4)



PRODUCT HANDLING, INSTALLATION & INTEGRATION ADVISORY

TEST BEFORE INSTALLING

Our production, packaging and shipping process is accompanied by a rigorous quality control procedure. All Light Sheets are subjected to a burn in period and are tested before packaging to ensureoperation of the highest quality. Due to possible unforeseen issues with shipping and handling, we advise that all Light Sheets be inspected at time of delivery and dry-fit tested for proper illumination prior to mounting and again before the forward facing material is installed.

DO NOT CONNECT TO AC POWER

ANY DIRECT CONNECTION OF LIGHT SHEETS TO AC CURRENT WILL DAMAGE THE LEDs.
Be sure to use a UL Listed or UL Recognized Class 2, LPS or LVLE low voltage power supply that conforms to the voltage requirements of the Light Sheet. This information can be found on the Light Sheet and its packaging, as well as the power supply labeling.

POWER, CONTROL & WIRING

For optimal power distribution and to minimize voltage drop, it is recommended that multi-strand, high strand count wiring be used for all low voltage DC connections. Wire gauge should be appropriate based upon system voltage and wire lengths to further minimize voltage drop. Power supplies, drivers and controls should be installed in well ventilated enclosures and/or per manufacturers recommendations. It is the customer's responsibility to ensure all components and installation practices meet or exceed local codes and requirements.

FRAGILE 2-PIN CONNECTION BLOCKS

DISCONNECT POWER AT THE SOURCE BEFORE REMOVING ANY 2-PIN CONNECTION BLOCKS. The integrated 2-pin connection blocks are made of plastic which can be damaged if made to bear weight. Use domed spacing bumpers (included) to bear the weight of any forward facing material in horizontal applications and to act as a safeguard to protect the Light Sheet in vertical applications.

CUTTING

DISCONNECT POWER AT THE SOURCE BEFORE ALTERING THE SHEET IN ANY WAY. NEVER CUT LIGHT SHEET WHILE POWERED. Field cutting of the Light Sheet does not void UL Listing. LEDscan lose input power if cut lines are not followed. Avoid cut edge contact with any conductive material(s), including other cut edges of Light Sheets. See also Wet Location Use below.

DRILLING

DISCONNECT POWER AT THE SOURCE BEFORE ALTERING THE SHEET IN ANY WAY. Light Sheets have specific areas where holes can be made in the sheet. The smaller diameter circles on the Light Sheet (0.12" / 3mm) indicate the maximum diameter of screw or other fastener's shaft that can be used without causing damage to the Light Sheet's power distribution grid. The larger diameter circle (0.24" / 6mm) is the maximum diameter of the screw head that can be used to without causing damage.

FASTENING

USE PAN HEAD, DOMED, OR ROUND HEAD FASTENERS, NOT TAPERED SCREWS. Never screw the fastener so much that it deforms the Light Sheet. Only penetrate the Light Sheet at the concentric circles marked on the sheet (see Drilling above for screw size limitations). For suspended applications, use mechanical fasteners with an appropriate spacing to avoid sagging.

WET LOCATION USE

Light Sheets are rated IP65. This rating is total protection against dust ingress as well as water projected by a nozzle against the enclosure from any direction for a limited time and may be used in wet locations, but not where standing water can accumulate. Cut edges of IP65 can optionally be sealed from moisture with an RTV Silicone Sealant or conformal coating.

INSTALLATION TEMPERATURE

Due to the characteristics of the 3M adhesive backing, installation environments and locations should be taken into consideration. Low temperatures can cause longer cure times for permanent adhesion.

FOLDING & MINIMUM RADIUS

There is no minimum bending radius for Light Sheets, however a single sheet may not be folded on itself because this could disrupt the flow of electricity through the folded sheet. Two separate IP65 sheets may be attached back-to-back since the 3M adhesive backing will act as non-conductive barrier. Light Sheets are not recommended for applications where a radius of less than 2" exists.

STORAGE

Store Light Sheets in a clean, dry area on a flat, horizontal surface. Do not open the anti-staticenvelope until ready to install. Ideal storage conditions: Temperature of 68° – 77°F, 50% humidity.

SOLDERING

DISCONNECT POWER AT THE SOURCE BEFORE ALTERING THE SHEET IN ANY WAY. Solder sheets or strips of Light Sheets together or solder power input(s) to Light Sheets. The Light Sheet's copper pads areengineered to handle 4A of load and polarity is noted by the + and - next to each copper pad. Use 20AWGstranded copper wire for up to 4A of load and follow ***electronics*** soldering best practices.