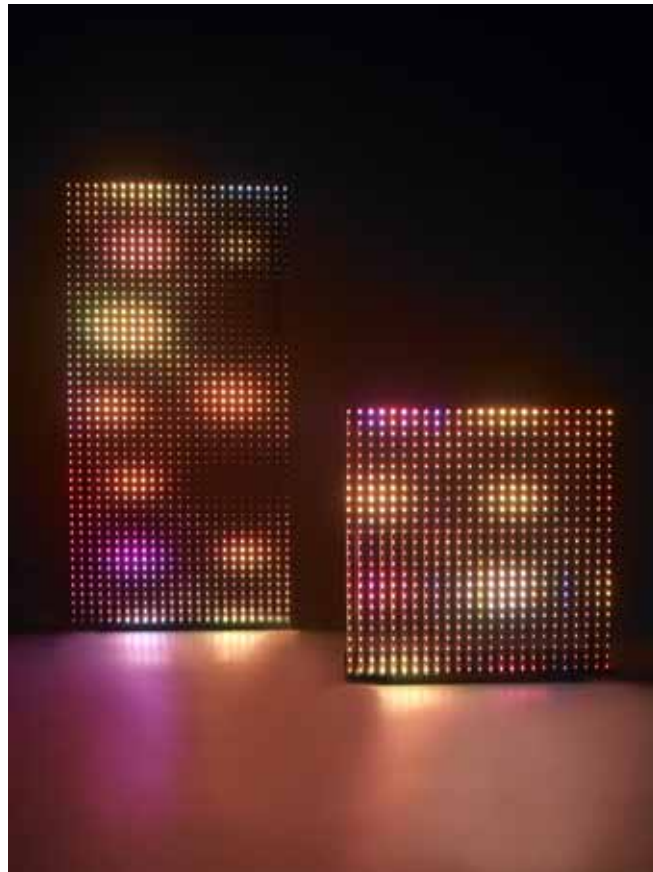


LC1140™ – LC2140™

LED Video Screen

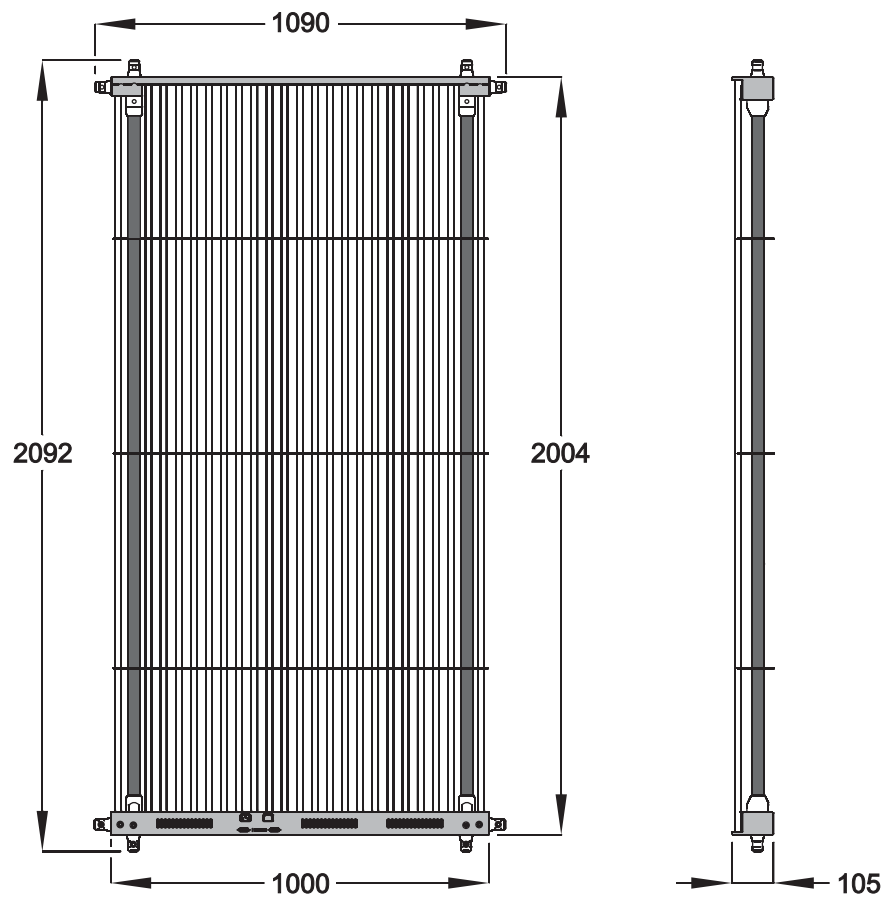
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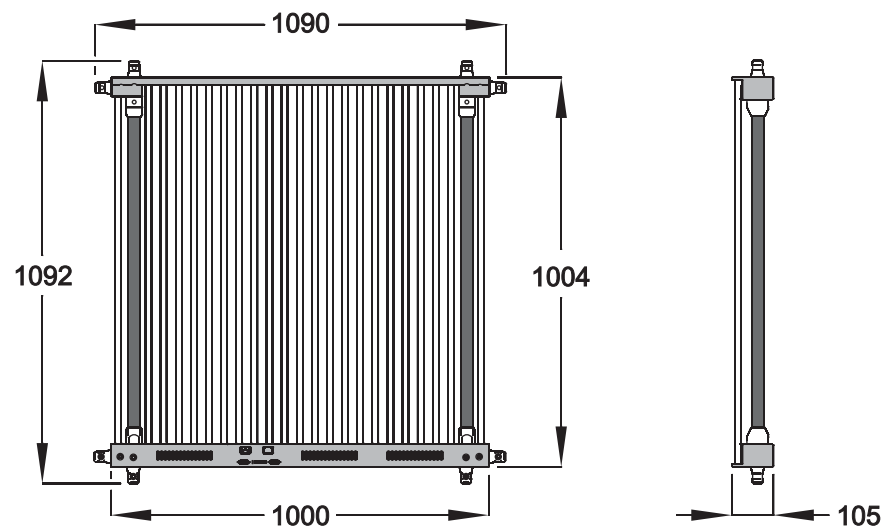
Dimensions

All dimensions are in millimeters

LC 2140



LC 1140



Safety Information



WARNING!
Read the safety precautions in this section before installing, powering, operating or servicing this product.

The following symbols are used to identify important safety information on the product and in this manual:



Warning!
Safety hazard.
Risk of severe injury or death.



Warning!
Refer to manual before installing, powering or servicing.



Warning!
Hazardous voltage. Risk of lethal or severe electric shock.



Warning!
Fire hazard.



Warning!
Emission hazardous to eyesight.



This product is for professional use only. It is not for household use.

This product presents risks of severe injury or death due to fire hazards, electric shock and falls.



Read this manual before installing, powering or servicing this product, follow the safety precautions listed below and observe all warnings in this manual and printed on the product. If you have questions about how to operate the product safely, please contact your Martin supplier or call the Martin 24-hour service hotline at +45 70 200 201.



PROTECTION FROM ELECTRIC SHOCK

- Shut down power to the entire installation at the building's main power distribution board and lock out power (by removing the fuse for example) before carrying out any installation or maintenance work.
- Disconnect the product from AC power before removing or installing any cover or part and when not in use.
- Always ground (earth) the product electrically.
- Use only a source of AC power that complies with local building and electrical codes and has both overload and ground-fault (earth-fault) protection.
- The outlet used to supply the product with power must be installed near the product and easily accessible so that the product can easily be disconnected from power.
- Connect this product to AC power using only a power cable that is listed, minimum 12 AWG or 3 x 2.5 mm², SJT or better. Suitable cable jacket types include ST, SJT, STW, SEO, SEOW and STO.
- Connect this product to AC power using only listed power connectors rated 20 A minimum.
- The total current draw of all devices connected in a chain via one product's power input socket, including that product, must not exceed 20 amps.
- Before using the product, check that all power distribution equipment and cables are in perfect condition and rated for the current requirements of all connected devices.
- Do not use the product if the power cable or power plugs are in any way damaged, defective or wet, or if they show signs of overheating.
- Do not expose the product to rain or moisture.
- Refer any service operation not described in this manual to a qualified technician.



PROTECTION FROM FIRE

- Do not attempt to bypass thermostatic switches or fuses. Replace defective fuses with ones of the specified type and rating only.
- Provide a minimum clearance of 0.1 m (4 in.) around fans and air vents.
- Do not stick filters, masks or other materials directly onto LED tubes.
- Do not modify the product in any way not described in this manual.
- Install only genuine Martin parts in or on the product unless an alternative is described in this manual.
- Do not operate the product if the ambient temperature (Ta) exceeds 40° C (104° F).



PROTECTION FROM INJURY



- Ensure that any structure used for support as well as all fastening and connecting hardware can hold at least 10 times the weight of all supported devices and equipment.
- Do not suspend the product from only one conical coupler.
- When stacking products on top of each other, fasten panels securely to prevent them from tipping or falling. Do not install more than:
 - Ten LC 1140 panels standing upright
 - Nine LC 1140 panels lying on their side
 - Eight LC 2140 panels standing upright, or
 - Six LC 2140 panels lying on their side
- When suspending in a curtain with panels hanging from each other, use two conical couplers to suspend each product. Do not install more than:
 - Nine LC 1140 panels hanging upright
 - Nine LC 1140 panels hanging sideways
 - Seven LC 2140 panels hanging upright, or
 - Seven LC 2140 panels hanging sideways
- When mixing LC 1140 and LC 2140 products in a stack or curtain, observe the maximum limit for LC 2140 panels stated above.
- Use a minimum of two approved secondary attachments (such as safety cables) to secure each product. Secondary attachments must be able to hold at least 10 times the weight of all the devices they secure and must be installed as described in this manual.
- Check that all external covers and rigging hardware are securely fastened.
- Block access below the work area and work from a stable platform whenever installing, servicing or moving the product.
- Do not look at lit LEDs from a distance of less than 40 cm (1 ft. 4 in.) without suitable protective eyewear. Do not view lit LEDs with optical instruments that may concentrate the light output.



Disposing of this product

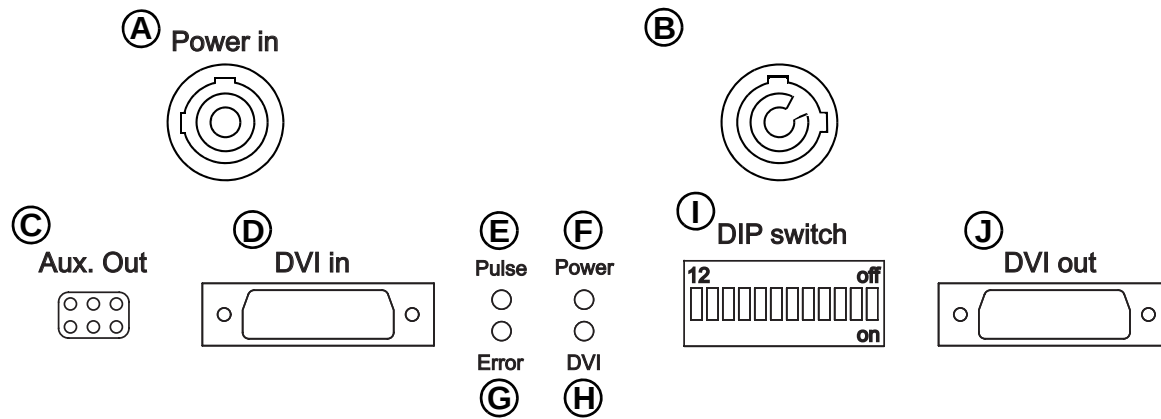
Martin™ products are supplied in compliance with Directive 2002/96/EC of the European Parliament and of the Council of the European Union on WEEE (Waste Electrical and Electronic Equipment), as amended by Directive 2003/108/EC, where applicable.

Help preserve the environment! Ensure that this product is recycled at the end of its life. Your supplier can give details of local arrangements for the disposal of Martin products.

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Connections panel overview



A - Power input socket

Insert a PowerCon input connector (blue, NAC3FCA) carrying 100-240 VAC nominal 50/60 Hz power. *Warning! Total current drawn via this socket must not exceed 20 amps maximum.*

B - Power output connector

Insert a PowerCon output connector (light grey, NAC3FCB) to relay power to the next panel.

C - Auxiliary out

Output for one extra LED tube (used when installing panels at an angle from each other)

D - DVI input connector

DVI-D single-link digital input from previous panel or video source.

E - Pulse indicator

Flashes when the system controller is running. Slow flashing indicates that there is no signal.

F - Power on indicator

Lights when power is applied.

G - Error/communication indicator

Should not light during normal operation. Flashes during communication with a PC. Lights constantly in case of error in video signal or panel.

H - DVI signal indicator

Lights when valid video signal is received.

I - DIP switch

Pins 1-6 set the panel's **x** axis coordinates in the video image.
Pins 7-12 set the panel's **y** axis coordinates.

J - DVI output connector

DVI-D single-link digital output to next panel.

Figure 1: Connections panel

Introduction

Thank you for selecting a product from the LC™ Series of modular LED-based video display panels from Martin™. This product features:

- Bright output 5 mm oval LEDs
- 1800 Cd/m² (1800 nits) effective light output at 25° C (77° F)
- Rich RGB color
- 25 x 50 pixels (LC 2140) or 25 x 25 pixels (LC 1140) per panel image resolution
- Color resolution of 14-bit per color
- 100° x 40° viewing angle
- Integrated video signal processor
- Video in/out via 'daisy-chainable' DVI connectors
- Genlock (using Martin DVI buffer box)
- Auto-sensing multi-voltage switch mode power supply
- Tough Neutrik PowerCon locking power connectors
- Prolyte CCS6 conical coupler system for fast installation

For the latest firmware updates, documentation, and other information about this and all Martin Professional™ products, please visit the Martin website at <http://www.martin.com>

Comments or suggestions regarding this document may be e-mailed to service@martin.dk or posted to:

Technical Documentation
Service Department
Martin Professional A/S
Olof Palmes Allé 18
DK-8200 Aarhus N
Denmark



Warning! Read "Safety Information" on page 3 before installing, powering, operating or servicing the LC 1140/LC 2140.

This is an ITE Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Unpacking

LC Series products are packaged either in sets of 4 panels in a 4-unit flightcase or as single panels in a cardboard box. The following items are included:

- In the 4-unit flightcase: 16 conical connectors and 24 threaded spigots, four flightcase castors (two with brakes) with mounting screws
- In the cardboard box: 4 conical connectors and 6 threaded spigots
- This user manual

Important! Do not throw away the protective shock-absorbing materials from the flightcase when you unpack the panels. The protective strips will be needed when panels are repacked in the flightcase (see "Packing panels in the flightcase" on page 9).

Using for the first time

Before applying power to the panel:

- Carefully review "Safety Information" on page 3.
- Check that the local AC power voltage is within the ranges listed on the serial number label and in "Power and main fuses" on page 13.
- To supply the panel with power, install a Neutrik PowerCon NAC3FCA connector on a listed, minimum 12 AWG or 2.5 mm² SJT (or better) power cable as described in "Power connection" on page 13.

Packing panels in the flightcase

Important! To ensure that LC 1140/LC 2140 panels can withstand the shocks that normally occur during transport, they must be packed in a Martin flightcase and transported in an upright position as described in this section. Damage caused to panels that are incorrectly packed or exposed to abnormal shocks is not covered by the product warranty.

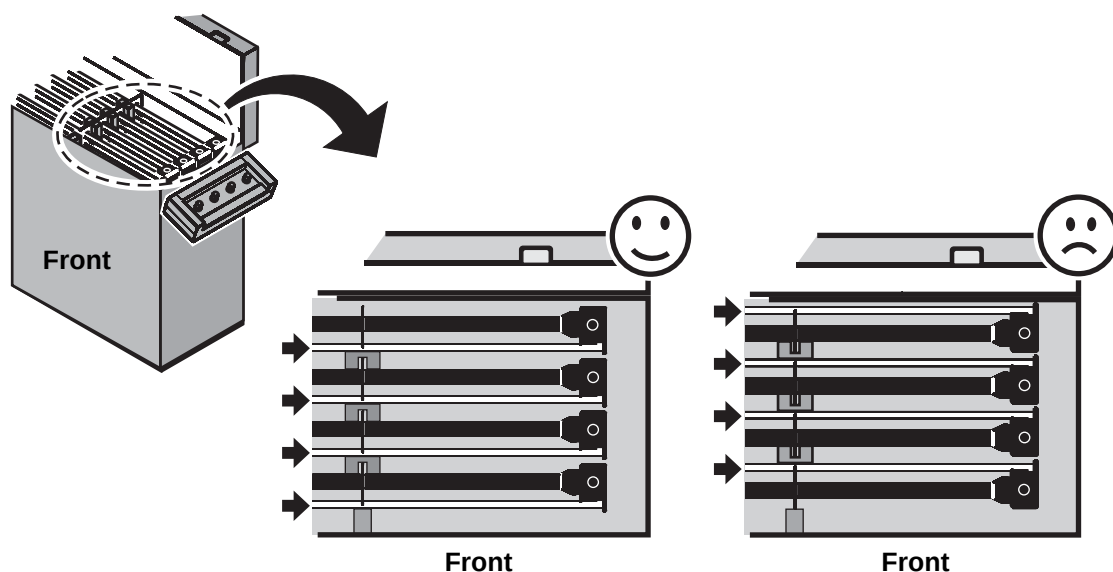


Figure 2: Panel orientation in flightcase

When removing panels from the flightcase, keep all protective material for use when repacking.

When repacking panels in the flightcase:

1. Insert panels with the clear LED tubes facing the front of the flightcase as shown in Figure 2, and
2. Insert the protective strips supplied with the flightcase so that the channel in each strip faces the front of the flightcase and slides over the clear plastic brackets as shown in Figure 3.

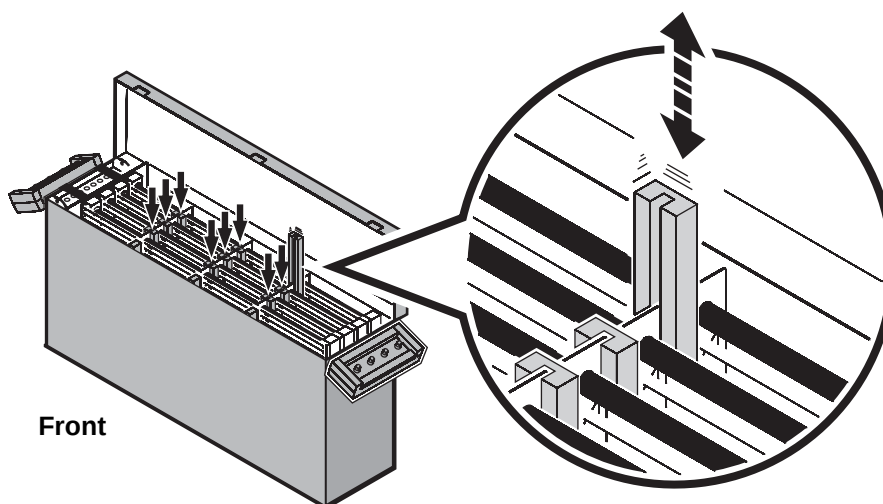


Figure 3: Protective strip orientation

Important! When transporting a flightcase that is not full, pack panels from the front without leaving gaps, so that any empty slots are at the back of the flightcase. Transport and store flightcases standing in an upright position only. Do not transport flightcases lying flat on their side.

Physical installation



Warning! Use two conical couplers to fasten a panel to a supporting structure or to another panel – never use only one conical coupler. Secure with two approved safety cables, looping one cable around each vertical side column. Do not use the LED tubes as secondary attachment points.

When stacking panels one on top of another or suspending panels one from another, do not exceed the limits given in Figure 4. If an installation needs to be taller than the limits given in Figure 4, additional support points must be provided to bear the weight of the additional panels.

The LC 1140/LC 2140 can be installed in a standing position alone or stacked, flown in a vertical curtain or suspended in any orientation from a truss or supporting structure.

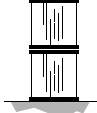
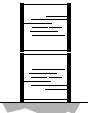
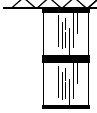
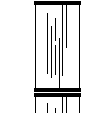
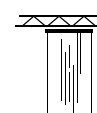
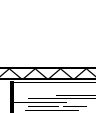
	Stacked upright	Stacked on side	Suspended upright	Suspended on side
LC 1140	 Max. 10	 Max. 9	 Max. 9	 Max. 9
LC 2140	 Max. 8	 Max. 6	 Max. 7	 Max. 7

Figure 4: Safety limits for stacking and suspending attached panels

Standing installation

Important! Do not place LC 1140/LC 2140 panels directly on a flat surface, as this will block the flow of air to the air vents in the base and cause overheating.

See Figure 4. One vertical stack with LC 1140 panels resting on each other may contain a maximum of 10 LC 1140 panels stacked upright or 9 LC 1140 panels stacked on their sides.

One vertical stack with LC 2140 panels resting on each other may contain a maximum of 8 LC 2140 panels stacked upright or 6 LC 2140 panels stacked on their sides.

An unlimited number of stacks of panels may be installed alongside each other.

If you install panels in a standing position:

1. Check that any structure or equipment used for support can bear at least 10 times the weight of all the panels, clamps, cables, auxiliary equipment, etc. that will be placed on it.
2. Make sure that there will be at least 0.1 m (4 in.) of free space and unrestricted airflow to and around the air vents in the base of the panels. One option is to install panels on stands or trusses placed on the surface.
3. Check that there are no combustible materials within 0.5 m (20 in.) of the panels when installed, and that there are no flammable materials nearby.
4. Fasten panels securely so that they cannot tip or fall.

Flying from a truss, bar or other structure

See Figure 4. One vertical curtain with LC 1140 panels suspended from each other may contain a maximum of 9 panels. One vertical curtain with LC 2140 panels suspended from each other may contain a maximum of 7 panels. These limits apply to panels both when suspended in an upright position and when suspended on their sides.

An unlimited number of curtains of panels may be installed alongside each other.

To fly panels from a rig or other structure:

1. Check that the structure can bear at least 10 times the weight of all the panels, clamps, cables, auxiliary equipment, etc. that it will have to support.
2. See Figure 5. Check that the structure will not flex under the weight of the panels. Hanging panels from a structure that is not straight will place a strain on panels. Damage caused to panels by mechanical stress is not covered by the product warranty.
3. Check that there are no combustible materials within 0.5 m (20 in.) of the panels when installed, and that there are no flammable materials nearby.
4. Install two conical couplers in the top of the first panel and install two rigging clamps or eyebolts on the couplers.
5. Block access under the work area. Working from a stable platform, hang the panel by fastening the rigging clamps or eyebolts to the truss or structure.
6. As soon as a panel is fastened in place, install two safety cables to secure it. Safety attachments must be able to bear at least 10 times the weight of all the panels they secure. Loop safety cables in a figure-of-eight around vertical side columns so that if a rigging clamp or conical connector fails, the weight of the panels will be held by the vertical columns and the blocks the columns are anchored in, and not by the panel bases or top rails.
7. See Figure 6. Continue hanging panels, attaching them with conical couplers (A) secured with threaded spigots (B) as illustrated. As soon as a panel is added to an array, secure it with two safety attachments.

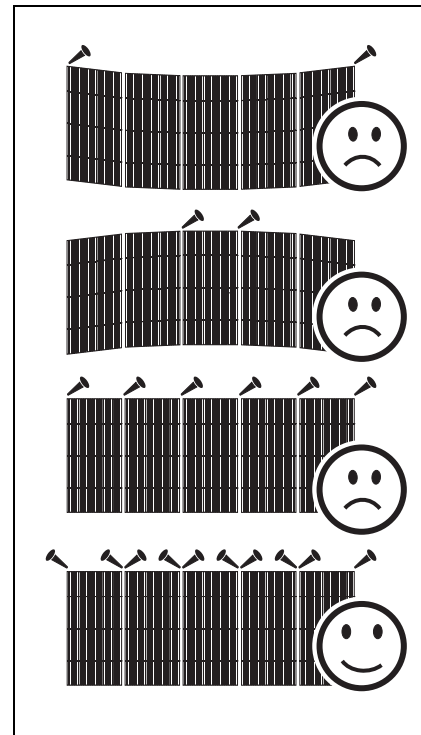


Figure 5: Avoiding stress on panels

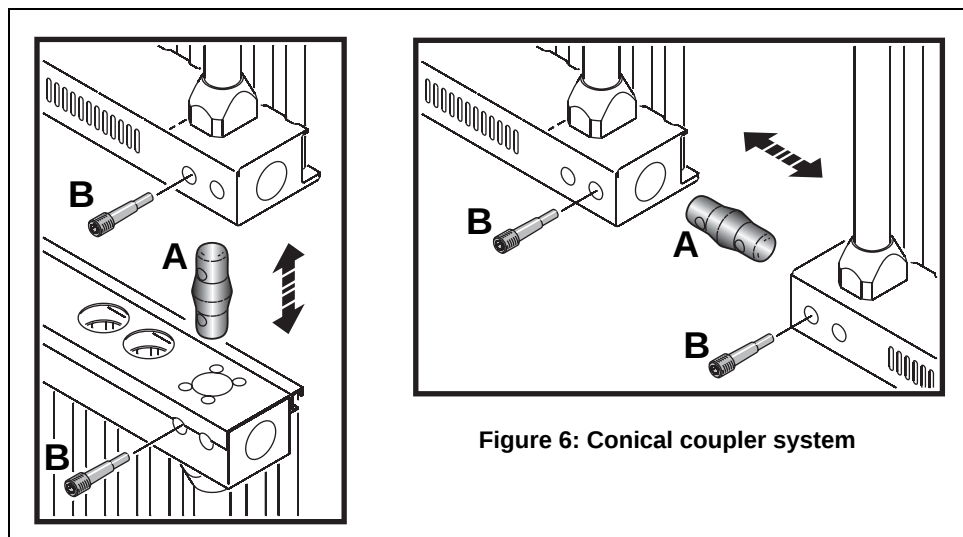


Figure 6: Conical coupler system

Diffuser

A diffuser may be fastened to the panel, respecting the diffuser manufacturer's safety precautions. Installing a diffuser gives a softer rendition of the video image, eliminating the 'hot-spot' effect.

Threaded holes for fastening a diffuser front are provided next to the holes for the conical coupler system. See Figure 7 for dimensions.

Single LED tubes

If you install panels angled away from each other, you will be left with a gap in the LED tubes at the apex of the angle. To fill this gap and give a solid wall of LEDs, it is possible to install a single LED tube between two panels. This tube must be connected to the **Aux. Out** connector on the connections panel.

If you are interested in this solution, contact your Martin supplier for details.

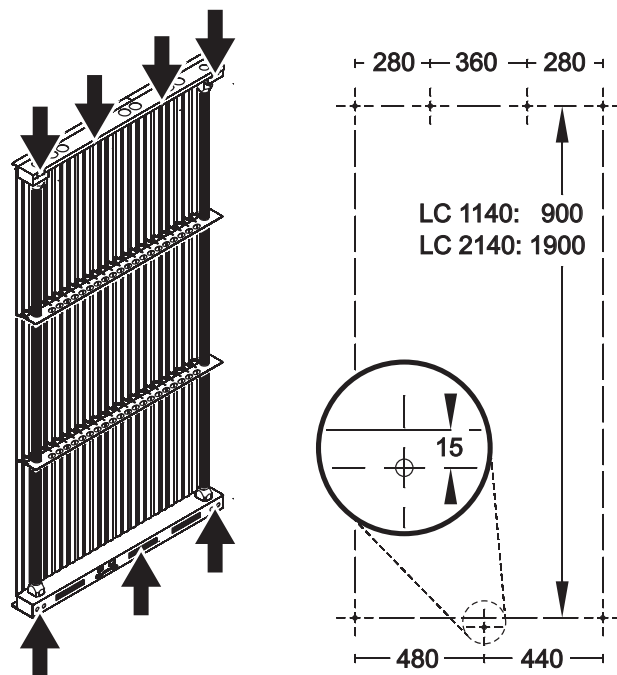


Figure 7: Diffuser front mounting holes

AC power



Warning! Read “Safety Information” on page 3 before connecting an LC 1140/LC 2140 panel to AC power. Lock out power to the entire distribution system before carrying out installation work.

Important! Do not supply the panel with power via an external dimming system, or you may cause damage to the panel that is not covered by the product warranty.

Power and main fuses

Warning! Replace fuses with ones of the same type and rating only.



The LC 1140/LC 2140 features an auto-sensing switch-mode power supply that automatically adapts to 100-120 V and 200-240 V nominal AC power at 50 or 60 Hz. Connect the panel to AC power that is within these voltage ranges only.



Power circuits in both LC1140 and LC 2140 screens are protected by three 5 amp slow-blow main fuses located on the three power PCBs in the base. See “Fuse replacement” on page 27 for details of accessing and changing a main fuse.

Current fluctuation

Power and current figures are given in “Typical power and current” on page 32. Current draw fluctuates slightly on a cycle of approximately one minute, especially at voltages over 200 V. Peak current draw is unlikely to occur at exactly the same time in multiple fixtures, but to avoid unintentional tripping of circuit-breakers, allow a safety margin of at least 20% when calculating the current requirements of an LC 1140/LC 2140 installation.

Power connection



Warning! For protection from electric shock, the panel must be grounded (earthed). Power distribution circuits must be fitted with a current overload fuse or circuit breaker and ground-fault (earth-fault) protection.



Warning! The total current draw of all devices connected via one power input socket, including the first panel connected, must not exceed 20 amps.

Warning! Use only a power cable that is listed, 12 AWG or 2.5 mm², SJT (or better) and power connectors that are listed, rated 20 A minimum.

Warning! The power socket/outlet must be installed near the LC 1140/LC 2140 and must be easily accessible so that the LC 1140/LC 2140 can easily be disconnected from power if necessary.

Power is supplied to the panel via the input socket. This socket accepts a blue Neutrik PowerCon NAC3FCA cable connector.

Power can be relayed to another device via the output socket. This socket accepts a light-grey PowerCon NAC3FCB cable connector. The total current drawn by devices that are interconnected by relaying power, including the first panel, must not exceed 20 amps. This means that, with a safety margin of 20%, a maximum of five LC 2140 panels or ten LC 1140 panels may be connected together at 230 V, for example. Current draw figures for LC 1140/LC 2140 panels are given in “Typical power and current” on page 32.

PowerCon connectors and suitable power cables with PowerCon connectors installed are available from your Martin supplier.

The Neutrik PowerCon NAC3FCA and NAC3FCB power cable connectors used with the LC 1140/LC 2140 accept power cable from 5 mm (0.20 in.) to 11 mm (0.43 in.) diameter when fitted with a white chuck, or from 9.5 mm (0.4 in.) to 15 mm (0.6 in.) diameter when fitted with a black chuck.

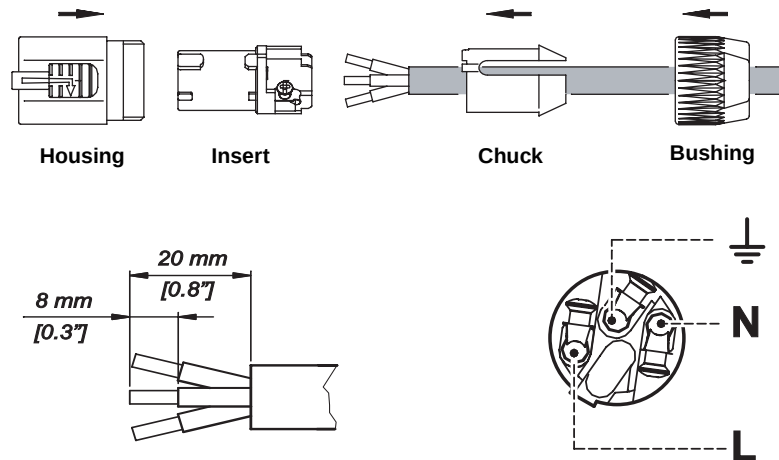


Figure 8: PowerCon cable connector assembly

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Figure 8 gives details of how to install a PowerCon connector on a power cable. Connect the live conductor to the terminal marked **L**, the neutral conductor to the terminal marked **N** and the ground (earth) conductor to the terminal marked .

You may need to fit your power cable with a power plug that is suitable for your AC power outlets. If so, install a grounding-type (earthed) plug that is rated 20 A minimum and follow the plug manufacturer's instructions.

Wire Color	Pin	Symbol	Screw (US)
brown	live	L	yellow or brass
blue	neutral	N	silver
yellow/green	ground (earth)		green

Table 1: Wire colors and pin identification

Table 1 shows common wire color codes and pin identification symbols. If pins are not clearly identified, or if you have any doubts about proper installation, consult a qualified electrician.

To plug a PowerCon connector in, line up the raised tab on the cable connector with the keyway in the chassis connector, push the cable connector in and twist clockwise to lock. To remove the connector, pull back the latch to release the lock, twist the connector counterclockwise and pull out.

There is no power on/off switch on LC panels. Apply and shut down power using an external switch at the power outlet or at the main switchboard. Make sure that the external switch is near the panels and easily accessible so that power to the panels can easily be shut down if necessary. Do not power panels on or off by inserting or removing live PowerCon connectors, as this will cause arcing at the connector contacts that will damage devices and connectors.

Important! *Shut down power to all panels and devices before connecting or disconnecting any element on the video link, or you may damage your graphics card or other video components.*

Shut down power to PowerCon connectors before inserting or removing them.

Apply power to the LC panels (and monitor, if used) before you apply power to the media server, or you may damage the panels' video circuitry.

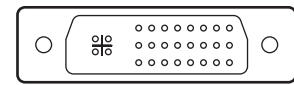
Video link

LC Series panels accept a 1024 x 768 XGA DVI-D single link (digital and DDC) signal and will display a 25x25 (LC 1140) or 25x50 (LC 2140) pixel image.

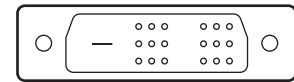
Each panel has two DVI connectors on its connections panel: one for video input and one for video output. See Figure 9. Although the video signal is DVI-D single link, the connectors are DVI-I dual link type. The advantage of this solution is that any DVI cable can be used, although only the pins that carry the DVI-D single link signal are actually used.

An output labelled **AUX** is also provided for one extra LED tube that can be added to fill the gap in a video curtain if panels are installed angled away from each other.

The LED labelled **DVI** on the connections panel lights when a valid video signal is being received.



DVI-I dual link connector



DVI-D single link pins

Figure 9: DVI connectors

Planning the video link

Figure 10 and Figure 11 show examples of video link layout. The following elements are involved:

Media server: We recommend the use of the Martin Maxedia™ for its advanced features and intuitive user interface.

Important! *The media server's graphics card must be set to send a video signal with a 50 or 60 Hz refresh rate, as LC 1140 and 2140 screens accept only these rates.*

DVI buffer box: You need a buffer box on the link if the following functions are required:

1. 1024 x 768 DVI monitor emulation. The Maxedia 'expects to see' a monitor on each of its outputs. The DVI buffer box emulates a 1024 x 768 DVI monitor, allowing a Maxedia to operate correctly, and relays the DVI signal to the rest of your installation.
2. Genlock synchronization of your installation via the buffer box's BNC connector. The Martin DVI Buffer Box also has a jumper that allows matching with a 50 or 60 Hz refresh rate.
3. Communication (reading installed software version, uploading new software, etc.) between the LC Series management application running on a PC and video panels via the buffer box's RS-232 connector. See "Advanced setup" on page 24 for the full list of functions.

DVI splitter: A splitter is required to send the video signal to more than one panel. It duplicates the video signal and sends it to two or more DVI devices. Splitters affect the quality of the DVI signal so there are limits to the number of devices that can be connected to successive generations (connecting a panel to a splitter as shown in Figure 10 gives a first generation signal, and connecting a splitter to a splitter as shown in Figure 11 creates a further generation).

Important! *If a DVI splitter is used, the DDCCLOCK and DDCDATA signals on pins 6 and 7 of the DVI input must be relayed to each of the splitter's DVI outputs if you want a PC to communicate with the panels connected to that output. Many DVI splitters relay the DDCCLOCK and DDCDATA signals to only one output (typically Output 1). The Martin DVI splitters listed under "Accessories" on page 32 relay these signals to all outputs, ensuring that a PC can communicate with all the panels on the video link.*

DVI monitor: A monitor is required to view the video image in parallel with the array of LC panels.

Important! *The monitor must accept a DVI-D signal with a 50/60 Hz refresh rate.*

Figure 10 is a schematic diagram showing how to route the DVI video signal through one splitter with four DVI outputs. Do not exceed a maximum DVI cable length of 5 m (16.5 feet) between the splitter and the first panel.

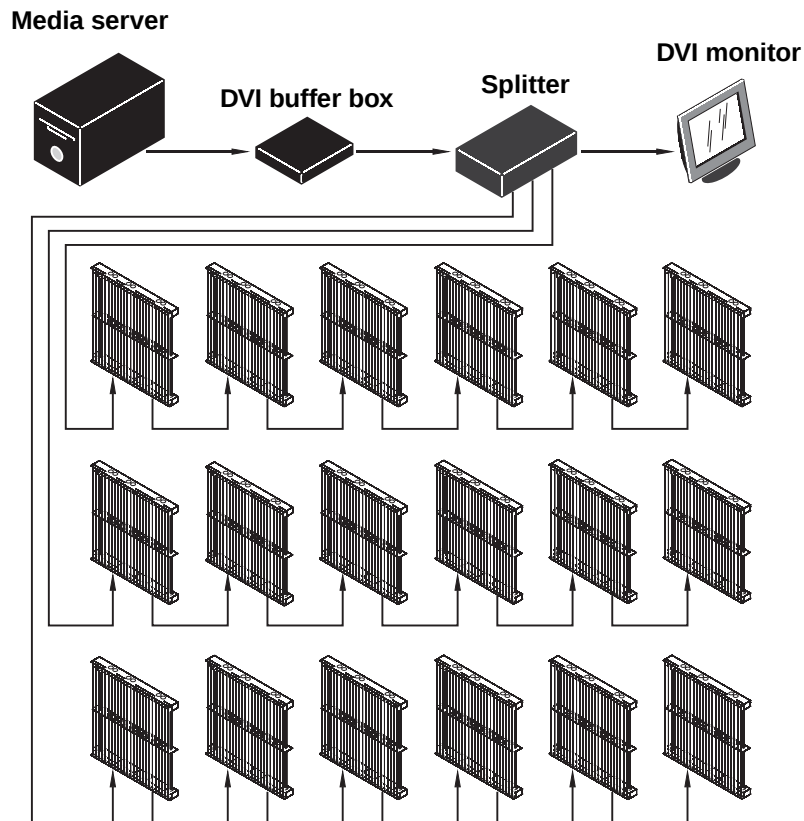


Figure 10: Schematic diagram of video connections

Sending the video signal through one splitter gives a first generation video signal. A maximum of 6 panels can be connected to a first generation signal. If you have one splitter with 4 outputs on your video link, you can therefore connect one monitor and 18 panels (or 12 panels with 2 monitors, 24 panels with no monitor, etc.).

See Figure 11. If you want to connect more panels, you must connect your monitor to the first output from the first splitter and then connect more splitters to the first splitter's other outputs. Sending a video signal through two splitters gives a second generation video signal. A maximum of 5 panels can be connected to a second generation signal. Sending a signal through a third splitter will give a third-generation signal, to which you can connect a maximum of 4 panels, and so on.

Figure 11 gives a schematic diagram of a link that contains a second level of splitters, giving a second generation signal that allows a total of 60 panels to be connected.

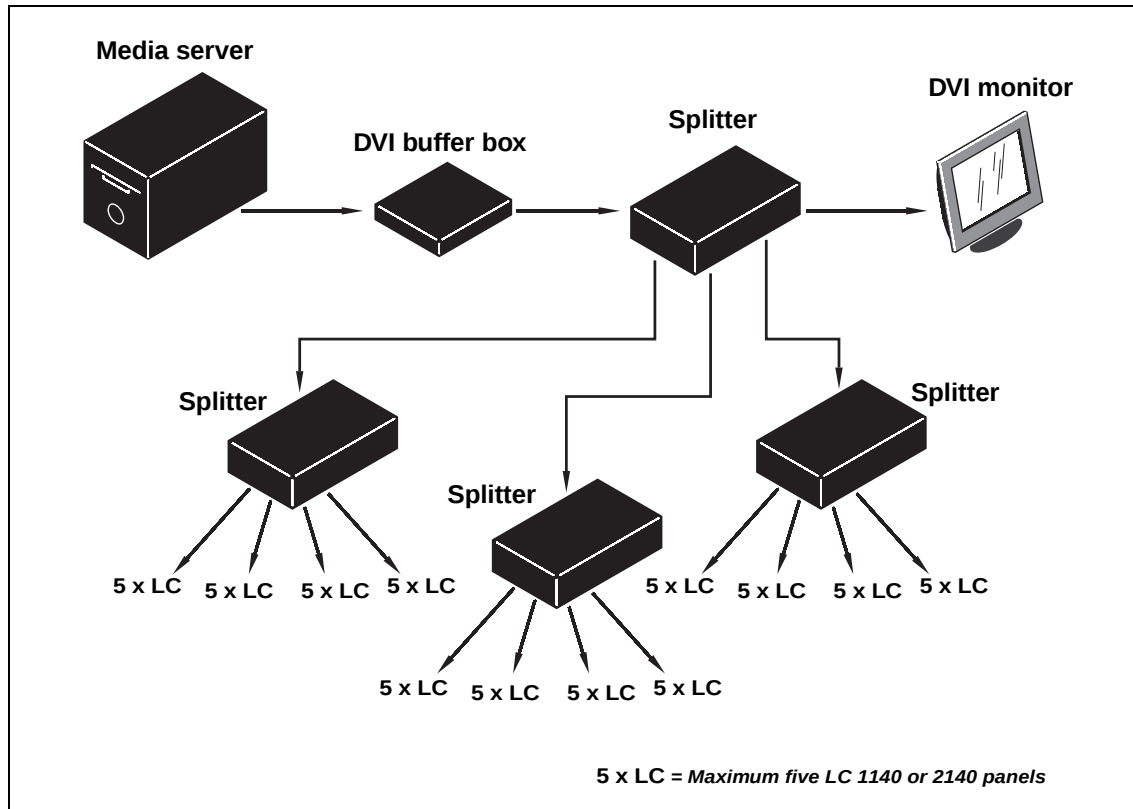


Figure 11: Second generation splitting

Connecting the video link

Important! *Media server graphics cards, LC panel video circuits and other components on the video link are sensitive and can easily be damaged by differences in potential. Observe the precautions listed below, or you may cause damage that is not covered by the product warranty:*

1. **Shut down power to all panels and devices before connecting or disconnecting any connector on the video link.**
2. **When inserting DVI connectors, ensure that the metal shields around the outside of male and female connectors make contact before the pins. This will provide a path to ground (earth) for any difference in potential between devices or components.**
3. **Apply power to the LC panels (and monitor, if used) before you apply power to the media server.**
4. **When you shut down the entire installation, power the media server off before you cut power to the LC panels and monitor.**

To maintain signal quality, the DVI cable between any splitter and the first panel connected to it must be maximum 5 m (16.5 feet) long.

To connect the video link:

1. Power all panels and devices off while making connections.
2. Connect the DVI output from the source (Martin Maxedia, for example) to a DVI buffer box.
3. Connect the DVI output from the DVI buffer box to the DVI input on a DVI splitter.
4. If you want to monitor the video image, connect the first DVI output from the splitter to your DVI monitor.
5. Connect the next DVI output from the splitter to either a second DVI splitter or the first panel's DVI input socket using a DVI cable max. 5 m (16.5 ft.) long.
6. Continue adding splitters or panels, connecting DVI output to DVI input and respecting the layout and guidelines explained earlier in this section.
7. When you have made all connections, set up the panels as described in the next section of this manual before applying power first to the panels (and DVI monitor, if used) and then to the other devices.

Panel setup

This section describes how to set panels to display a video image.

Video image resolution

Because LC 1140 panels can only display 25 x 25 pixels and LC 2140 panels can only display 25 x 50 pixels, to map every pixel in a 1024 x 768 pixel video image to a single pixel in a video curtain would require a very large installation with 41 panels horizontally and either 31 LC 1140 or 16 LC 2140 panels vertically. This arrangement would give full 1024 x 768 resolution with a few spare pixels at the edges.

Your installation probably has a smaller number of panels than this, so you can set up the output from your media server in two ways:

- You can display an area of the video image that has the same number of pixels as your installation at full pixel resolution (one pixel in the installation displays one pixel of the video image). The advantage of this is that you do not lose any detail from this area of the image, but the disadvantage is that you can only display part of the video image.
- You can display an area of the video image that has more pixels than your installation, but at reduced pixel resolution (one pixel in the installation displays an “average” of more than one pixel in the video image). The advantage of this is that you can display more of the video image than in the first method, but because you only have a limited number of pixels in your installation, you must accept loss of detail from the video image.

If you have a limited number of LC panels, you are thus faced with a trade-off between the amount of the video image you display and the amount of detail that is possible: the more of the video image you display, the less detail you can display. To take an extreme example of this, it is possible to display a full 1024 x 768 video image on one LC panel, but you have to accept a very significant reduction in video image resolution and loss of detail.

To reduce the resolution of a full 1024 x 768 video image, ‘shrink’ the image on your monitor screen until it contains the same number of pixels as your installation. For example, to display a full 1024 x 768 video image on an installation 200 pixels (8 panels) wide and 150 pixels (6 x LC 1140 panels or 3 x LC 2140 panels) high, you must ‘shrink’ the image to just under 20% of its original size, so that it fits in an area on your monitor screen 200 pixels wide and 150 pixels high.

Note that LC panels cannot ‘shrink’ a video image themselves – ‘shrinking’ must be carried out on the media server.

If your installation has the same aspect ratio as the video image (e.g. 1024 x 768, 800 x 600, 400 x 300, 200 x 150 pixels etc. for a 4:3 aspect ratio image), you can display the full video image using all the pixels in your installation. However, the smaller your installation is, the more you must ‘shrink’ the video image, reducing its resolution and thus the amount of detail you can display.

Tiles in the video image

The DVI signal on the video link contains the full video image information everywhere on the link, so each panel on the link receives the full video image. One panel can display only a small part of the full image, however, so each panel divides the video image into 25 x 25 pixel “tiles” as shown in Figure 12, and then displays one or two tiles:

- an LC 1140 panel displays one tile
- an LC 2140 panel displays two tiles – one tile plus the tile below it.

Setting panels to display tiles

To identify individual tiles, a panel gives each tile an x and a y coordinate according to the following principles:

- Coordinates are numbered starting at the top left-hand corner of the video image when facing the video image.
- The top left-hand tile is given the coordinates $x = 0, y = 0$.
- The next tile to the right is one tile further along the **x** axis, so it is given the coordinates $x = 1, y = 0$. After this tile, the next tile to the right is assigned the coordinates $x = 2, y = 0$, and so on.
- The tile below the top left-hand tile is one tile further down the **y** axis, so it is given the coordinates $x = 0, y = 1$. The next tile down is assigned the coordinates $x = 0, y = 2$, and so on.

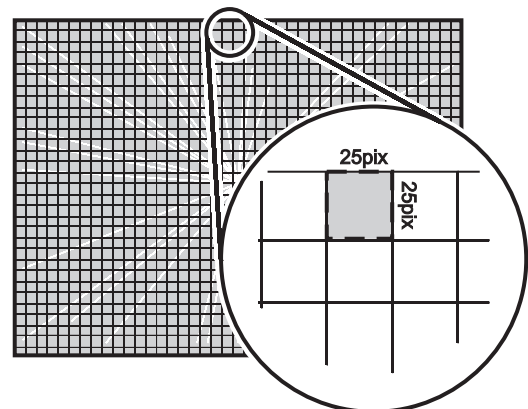


Figure 12: Tiles in the video image

To set a panel to display a specific part of the video image, you set the **x** and **y** coordinates of the tile you want it to display:

- An **LC 1140** panel will display that 25 x 25 pixel tile
- An **LC 2140** panel will display that 25 x 25 pixel tile plus the 25 x 25 pixel tile below it.

See Figure 13. Address setting is carried out on the panel's DIP switch. The DIP switch has 12 pins that are numbered from the right:

- Pins 1 to 6 are used to select the tile position on the **x** axis.
- Pins 7 to 12 are used to select the tile position on the **y** axis.

Numbers are set on DIP switches in binary form (1 = **000001**, 2 = **000010**, 3 = **000011**, 4 = **000100**, etc.). You set the binary number for the **x** coordinate on pins 1 - 6 and set the binary number for the **y** coordinate on pins 7 - 12.

For example, to set the **x** coordinate 17 and the **y** coordinate 14 on a DIP switch, you must first convert these coordinates to binary numbers (17 = **010001**, 14 = **001110**), then set the dip switch pins as shown in Figure 14.

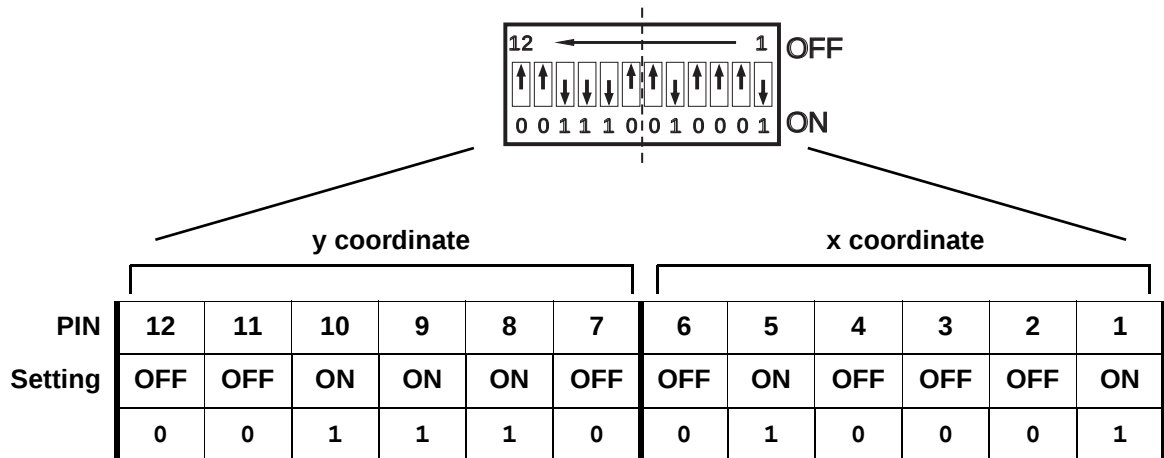
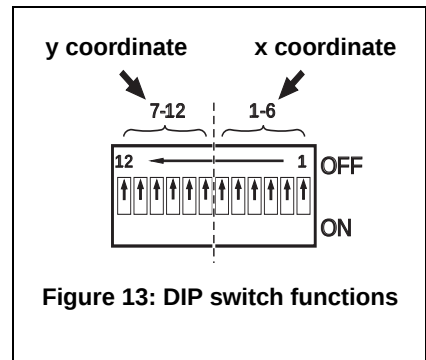


Figure 14: Example DIP switch settings

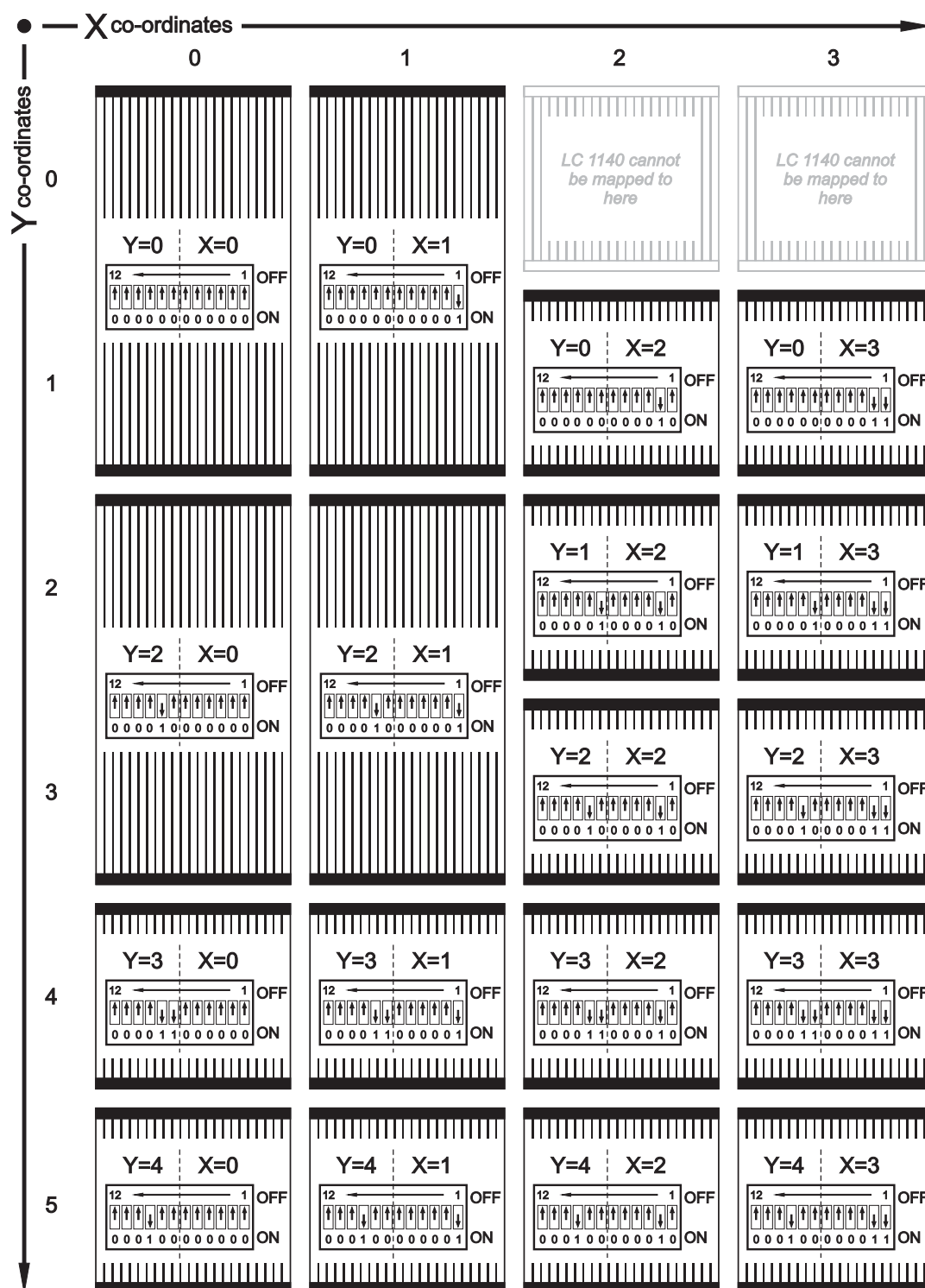


Figure 15: Mapping LC 2140 and 1140 panels from the top left corner of the image

See Figure 15. The addressing principle for the **y** axis is slightly different for LC 2140 and LC 1140 panels because they are different heights. Both types of panel are addressed starting with **y = 0**, but:

- setting the **y** coordinate to zero maps an **LC 2140** panel to the top row (if you set DIP switch pins 7 - 12 to **0**, the panel displays the rows with **y** coordinates **0** and **1**), and
- setting the **y** coordinate to zero maps an **LC 1140** panel to the second row (if you set DIP switch pins 7 - 12 to **0**, the panel displays the row with **y** coordinate **1**).

Note that an LC 1140 panel cannot be mapped to the top row of the video image.

If the principle behind mapping and addressing is confusing, just refer to the DIP switch settings shown in Figure 15, Figure 17 and Figure 18, and set the addresses in your installation following these examples.

Panel addressing – an example

Here is an example of how to set an array of panels so that each panel displays the correct tile in the video image. Let us say that:

- You have installed twenty-four LC 2140 panels in a curtain eight panels wide and three panels high, giving you 200 x 150 pixels in your installation.
- You have 'shrunk' the image you want to display to 200 x 150 pixels on your monitor screen.
- You have positioned this 200 x 150 pixel image approximately in the center of your monitor (positioning in the center of the monitor may not be absolutely necessary, but it usually gives more cropping and resizing options in your media software).

You now need to set the addresses of your panels so that they display a block of 25 x 25 pixel tiles that is $200/25 = 8$ tiles wide and $150/25 = 6$ tiles high, positioned approximately in the center of the 1024 x 768 video image.

See Figure 16. In the full video signal, the **x** axis is approximately 41 tiles wide and the **y** axis is approximately 32 tiles high. The tile with **x** coordinate 21 and **y** coordinate 16 is in the approximate center of the video image.

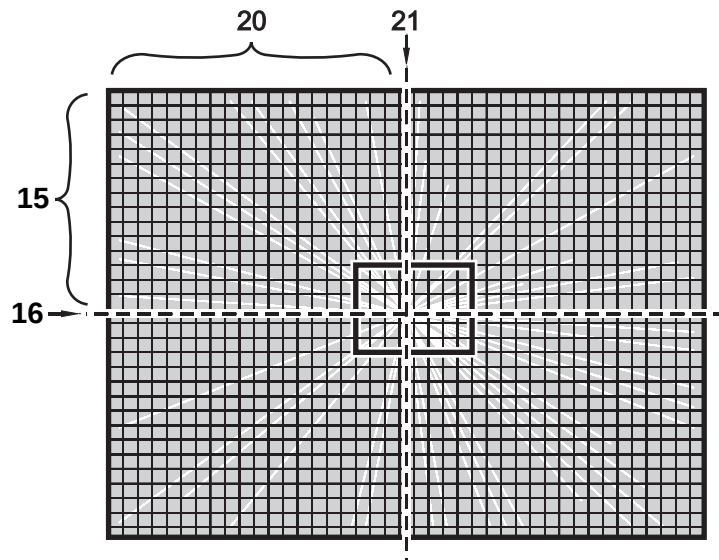


Figure 16: Finding the approximate center of the video display

See Figure 17. To address the LC 2140 panels in your installation so that they display the 200 x 150 pixel block in the center of your monitor, you must give them the **x** and **y** coordinates shown in the illustration.

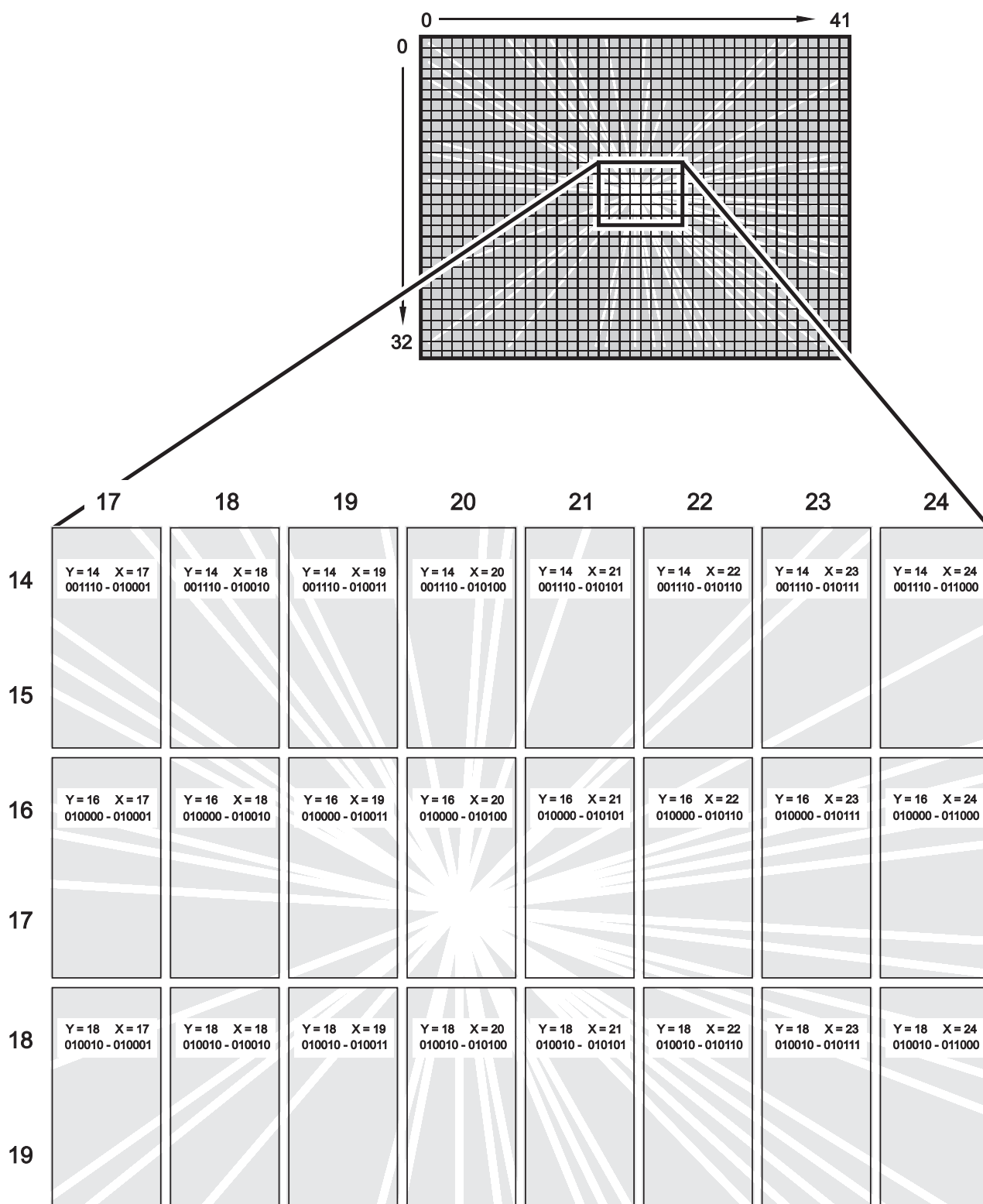


Figure 17: Displaying tiles in center of video image (LC 2140)

If LC 1140 panels are used to display the same pixels from the video image, they must be set as shown in Figure 18.

Note that with LC 1140 panels, you must set the **y** coordinate to the number of the row on the **y** axis *minus one* (i.e. to locate an LC 1140 panel on row **16** of the **y** axis, you must set its **y** coordinate to **15**).

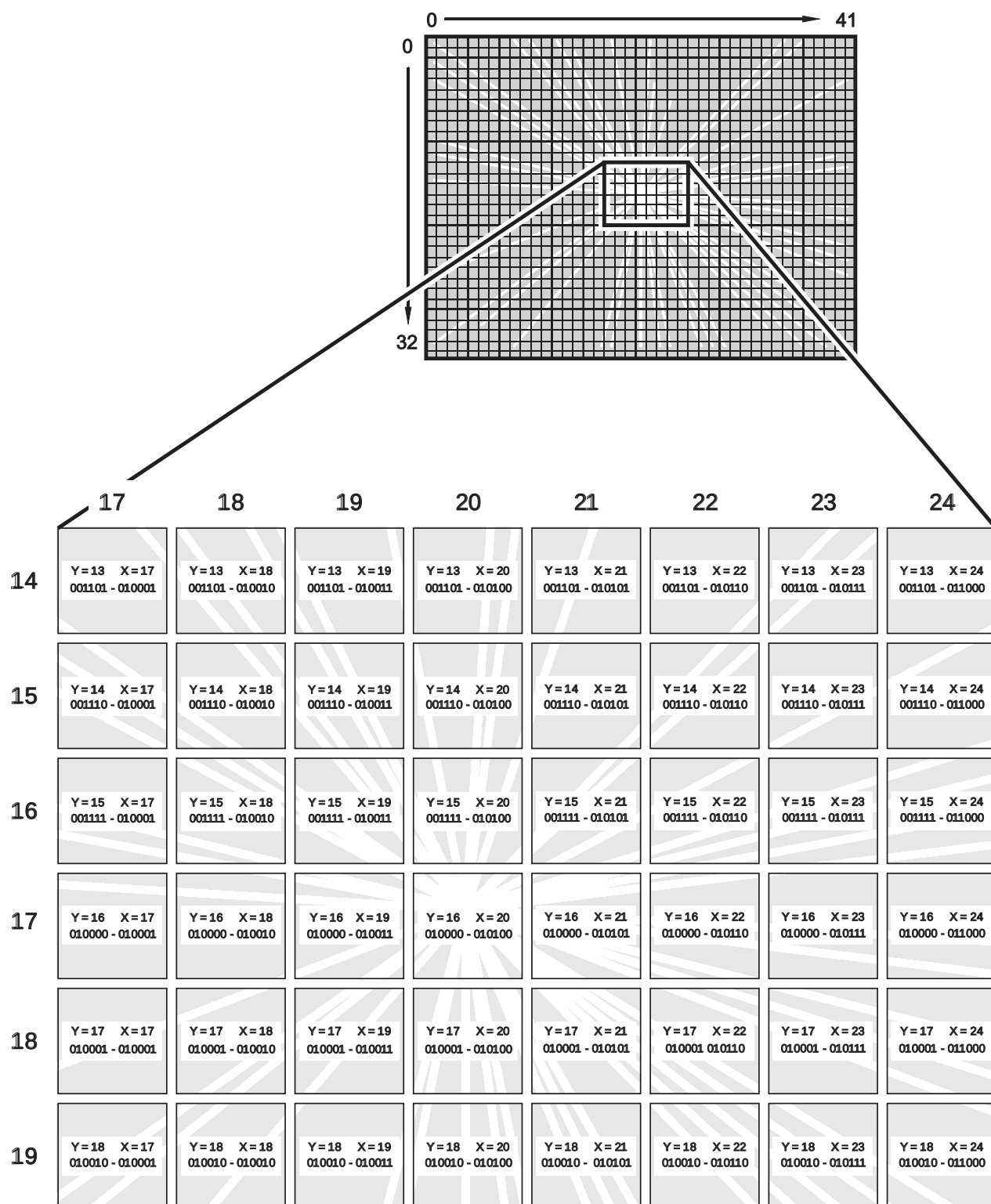


Figure 18: Displaying tiles from center of video image (LC 1140)

Tips for panel addressing

You may find the following tips helpful when setting addresses on panels:

- Remember that if you have LC 2140 panels in your installation, you must set **y** coordinate addresses to 14, 16 and 18 to obtain a correct video image.
- As mentioned earlier, when setting the **y** coordinate of an LC 1140 panel, remember that you must subtract 1 from the row on the **y** axis where you want to locate that panel (for example, set the **y** coordinate on an LC 1140 panel's DIP switch to **15** if you want that panel to display a tile on row **16** on the **y** axis).
- If you are mixing LC 2140 and LC 1140 panels in an installation, bear in mind that LC 1140 panels cannot be set to display the top row (row with **y** coordinate zero) in the video image – this row can only be displayed with LC 2140 panels.
- You can save time converting decimal to binary numbers by using one of the many free converters available on the Internet.
- After setting the addresses of the panels in an installation, you may need to do a little fine adjustment to the position of the pixel image on your monitor to align it precisely with your group of panels.

Advanced setup

Using the Martin LC Series DVI Buffer Box (P/N 91611269) and a PC with the LC Series management application (included with the buffer box), the following operations can be carried out via the video link:

- Viewing the software version currently installed in each panel in an installation.
- Uploading new software to panels in an installation.
- Genlock via the buffer box's BNC connector
- Brightness adjustment for an individual panel
- Global brightness adjustment for a complete installation
- Video image freeze-frame from the PC application

Full details and instructions covering these operations are included with the DVI buffer box.

Operation

If the system is correctly set up, operation is simply a question of displaying video from the media server or other DVI video source.

During operation, four LED indicators on the connections panel give information about the status of the panel and the video signal:

- The **Power** LED lights when power is applied to the panel.
- The **Pulse** LED flashes when the system controller is running. The flash rate is 1/16 of the signal frequency (at 50 Hz, 20 flashes take approx. 12 seconds). The LED flashes slowly when there is no signal.
- The **Error** LED should not light during normal operation. It lights constantly if there is a fault in the video signal or panel. The **Error** LED has a secondary function: it flashes when there is communication between a PC and the panel.
- The **DVI** LED lights when the panel is receiving a valid DVI signal.

When repacking panels in a Martin flightcase after operation, follow carefully the instructions in “Packing panels in the flightcase” on page 9.

Service and maintenance



Warning! Read “Safety Information” on page 3 before carrying out service or maintenance work on the LC 1140/LC 2140. Lock out power to the entire distribution system before servicing, cleaning or removing any cover. Refer any service operation not described here to a qualified service technician.

Important! Excessive dust, smoke fluid, and particle buildup degrades performance, causes overheating and will damage the panel. Damage caused by inadequate cleaning or maintenance is not covered by the product warranty.

As with electronic components in general, the LC 1140/LC 2140’s PCBs are sensitive to ESD (electrostatic discharge). Take precautions to avoid ESD damage during service.

It is Martin policy to use the best quality materials available to ensure optimum performance and the longest possible component lifetimes. However, optical components in all lighting fixtures are subject to wear and tear over the life of the fixture, resulting in gradual changes in color rendition, for example.

The extent of wear and tear depends heavily on operating conditions, maintenance and environment, so it is impossible to specify precise lifetimes for optical components. However, you will eventually need to replace the LEDs in the LC 1140/LC 2140 if their characteristics are affected by wear and tear after an extended period of use and if you require panels to perform within very precise optical and color parameters.

To maximize the life of the LC 1140/LC 2140 and protect the investment it represents, clean the panel regularly – especially the cooling fans and grilles – following the guidelines in this section.

Cleaning

Regular cleaning is essential for product life and performance. Buildup of dust, dirt, smoke particles, fog fluid residues, etc. degrades the panel’s light output and cooling ability.

Cleaning schedules for lighting fixtures vary greatly depending on the operating environment. It is therefore impossible to specify precise cleaning intervals for the LC 1140/LC 2140. Cooling fans suck in airborne dust and smoke particles, and in extreme cases panels may require cleaning after surprisingly few hours of operation. Environmental factors that may result in a need for frequent cleaning include:

- Use of smoke or fog machines.
- High airflow rates (near air conditioning vents, for example).
- Presence of cigarette smoke.
- Airborne dust (from stage effects, building structures and fittings or the natural environment at outdoor events, for example).

If one or more of these factors is present, inspect panels within their first 25 hours of operation to see whether cleaning is necessary. Check again at frequent intervals. This procedure will allow you to assess cleaning requirements in your particular situation. If in doubt, consult your Martin dealer about a suitable maintenance schedule.

Do not use abrasive, caustic or solvent-based products for cleaning, as they can damage plastic or painted surfaces.

To clean the panel:



1. Disconnect the panel from power and allow it to cool for at least 10 minutes.
2. Vacuum or gently blow away dust and loose particles from the fan blades and grilles in the base of the panel with compressed air.
3. Wipe the outside of the LED tubes with a soft, lint-free cloth dampened with a solution of water and detergent or auto shampoo. Apply gentle pressure only.

If the inside surfaces of the LED tubes require cleaning, remove the tubes, slide the LED circuit boards out of each tube as described in “Replacing LED tubes” on page 28, and blow through with compressed air. If necessary, flush each tube with a warm water/detergent solution. Dry thoroughly with compressed air before reassembling.

Fuse replacement



Warning! Disconnect from power before opening covers. Replace fuses with ones of the same type and rating only.



Important! The PCBs are sensitive to ESD (electrostatic discharge). Take precautions to avoid ESD damage. Avoid touching electronic components.

LC 1140 and LC 2140 panels are protected by three 5 amp slow-blow fuses on the three power supplies in the panel base.

To replace a fuse:

1. Disconnect the panel from power and allow to cool for 10 minutes.
2. See Figure 19. Remove four screws (arrowed) from a base cover and lift the cover up slightly for access to the fuse. Avoid pulling hard on covers, as this will strain the wiring.

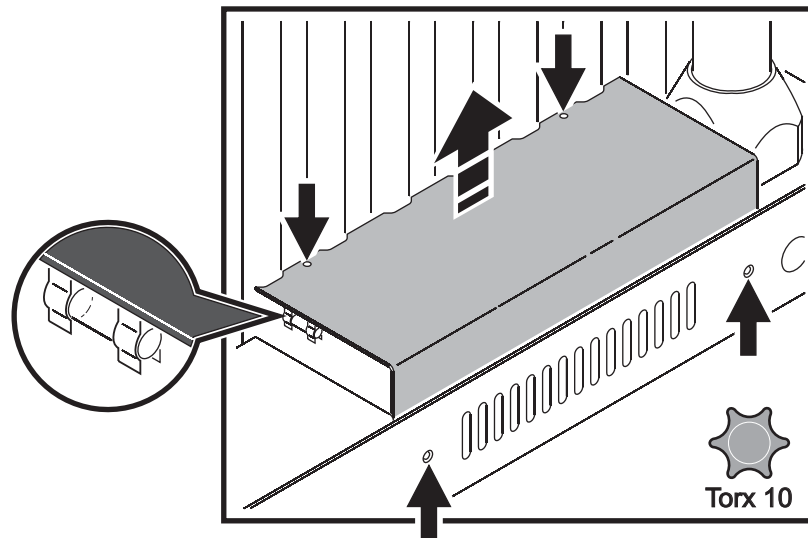


Figure 19: Fuse replacement

3. Replace the defective fuse with one of the same type and rating only. Replacement fuses are available from Martin suppliers.
4. Reinstall the cover before reapplying power.

Replacing LED tubes

To replace an LED tube:

1. Disconnect the panel from power and allow to cool for 10 minutes.
2. See Figure 20. Insert a broad flat-blade screwdriver into the slot in each of the clear plastic brackets immediately behind the tube you want to remove. Twist the screwdriver very slightly to release the tube in the slot so that it can be pulled forward out of the bracket.
3. See Figure 21. When the tube is released from all brackets, bend it outwards at the center (A and B) until the top of the tube is clear of the retaining bracket (C).
4. Pull the top of the tube forward (D) just enough for the tube to clear the retaining bracket. Do not pull the tube further forward than is necessary.
5. Lift the tube upwards (E), holding the PCB at the bottom of the tube so that it is unplugged from the base as the tube is lifted (F). Be careful not to damage the connector terminals on the PCBs while handling.
6. Slide the PCBs out of the tube for access to the LEDs.

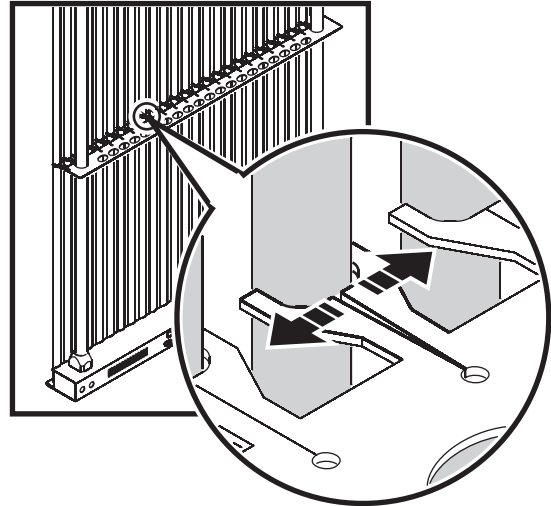


Figure 20: Releasing an LED tube

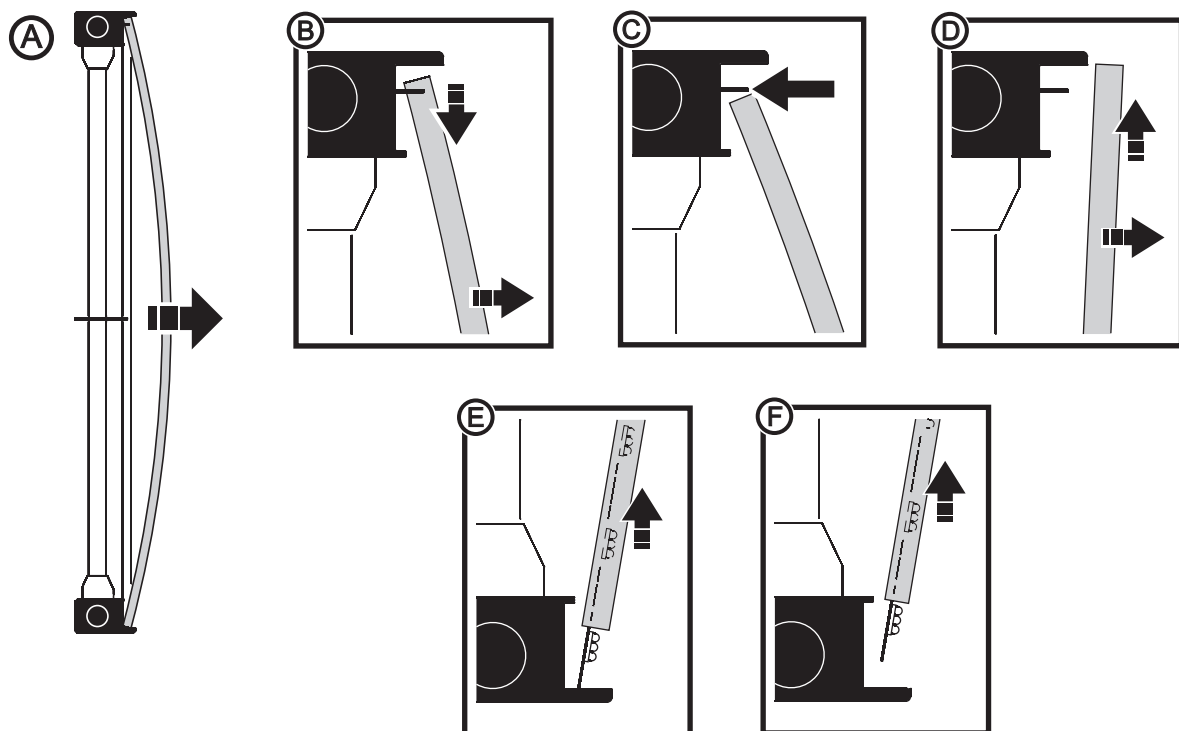


Figure 21: Removing an LED tube

To install an LED tube:

1. Hold the tube up against the panel. Plug the PCB at the bottom of the tube carefully into the panel base, avoiding any pressure that might damage the terminals.
2. Bend the center of each tube outwards as shown at (A) in Figure 21 until the top of the tube can pass under the retaining bracket (C). Slide the top of the tube under the retaining bracket.
3. Allow the tube to straighten so that the top of the tube engages in its cutout in the retaining bracket.
4. Clip the tube into the clear plastic brackets.
5. Do not reapply power until all tubes have been installed.

Installing new software

It may be necessary to upload new software to the LC 1140/LC 2140 if the product appears to have a software-related fault or if you want to update to a newer software version. Software updates are available from Martin and can be installed via the video link.

The following items are required in order to update software:

- The LC 1140/LC 2140 main CPU software update file, downloadable free of charge from the Support area of the Martin website at <http://www.martin.com>
- A Martin LC Series DVI Buffer Box (P/N 91611269) and PC with the LC management application that is included with the DVI buffer box.

Instructions for uploading new software are included with the DVI buffer box.

Troubleshooting

Problem	Probable cause(s)	Remedy
Panel is completely dead.	No power to panel.	Check power and connections.
	Fuse blown (located on PCBs behind connections panel).	Disconnect panel from power. Check fuses and replace.
One or more panels displays video incorrectly or does not display video at all.	Fault on video link.	Inspect connections and cables. Correct poor connections. Repair or replace damaged cables.
	Incorrect panel addressing.	Check addressing on panel.
	Panel defective.	Have faulty panel serviced by Martin service technician.
	Device on video link defective.	Have faulty panel tested and serviced by Martin service technician or supplier.
All LC panels and/or monitor screen display video incorrectly or do not display video at all.	Media server not sending at 50 or 60 Hz refresh rate.	Adjust media server/graphic card settings.
	Fault on video link.	Inspect connections and cables. Correct poor connections. Repair or replace damaged cables.
	Device on video link defective.	Have faulty panel tested and serviced by Martin service technician or supplier.
Display cuts out intermittently.	Panel is too hot.	Ensure free airflow around air vents. Clean fans and vents. Check that ambient temperature does not exceed max. permitted level. Contact Martin for service.
Error LED lights continuously.	Fault in video signal or panel.	Check all video connections, cables and equipment. Reset panel by disconnecting from power, then reconnecting. If Error LED continues to light, contact Martin for service.
Error LED flashes while a PC is connected.	No action is needed, this is normal.	

Table 2: Troubleshooting

Specifications

Physical

Length	1000 mm (39.4 in.)
Width	110 mm (4.3 in.)
Height, LC 1140	1004 mm (39.5 in.)
Height, LC 2140	2004 mm (78.9 in.)
Weight, LC 1140	14.3 kg (31.5 lbs.)
Weight, LC 2140	19.4 kg (42.8 lbs.)

Control and Programming

Setting and addressing	DIP switch
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Video Processing

Video signal processor	Integrated
Video signal	XGA 1024 x 768 DVI-D (digital single link), 25 x 25 (LC 1140) or 25 x 50 (LC 2140) pixels displayed
Video signal frequency	50 or 60 Hz
Genlock	Yes (via Martin DVI buffer box)

Photometric Data

Light source	5 mm (0.2 in.) oval LED
Total output (max.)	1800 Cd/m ² (1800 nits) measured outside LED tubes, Ta 25° C (77° F)
Pitch (pixel center-to-center)	40 mm (1.6 in.)
Pixels per m ²	625
Red dominant wavelength	627.5 nm ± 2.5 nm
Green dominant wavelength	522.5 nm ± 2.5 nm
Blue dominant wavelength	472.5 nm ± 2.5 nm
Color resolution	14 bits per color
Viewing angle	>100° horizontal, >40° vertical at 50% intensity

LC 1140

Resolution, one panel	25 x 25 pixels
Pixels per panel	625
LEDs per panel	1875

LC 2140

Resolution, LC 2140, one panel	25 x 50 pixels
Pixels per panel	1250
LEDs per panel	3750

Construction

Panel frames	Steel and aluminum
LED tubes	Acrylic
LED tubes per panel	25
Transparency through LED tubes (unmasked area)	> 60%
Color	Black panel frames
Protection rating	IP 20

Installation

Orientation	Any
Panel combination	Up to 7 hung vertically, no limit horizontally
Panel interlocking	Prolyte CCS6 conical coupler system

Connections

Power in/out	Neutrik PowerCon
Video in/out	DVI-D single link (DVI-I dual link connectors provided)

Electrical

AC power	100-120/200-240 V nominal, 50/60 Hz
Power supply unit	Integrated, auto-sensing multi-voltage
Main fuses	3 x 5 AT (LC 1140 and LC 2140)

Typical power and current

LC 1140

100 V, 50 Hz	310 W, 3.2 A, PF = 0.988
100 V, 60 Hz	309 W, 3.2 A, PF = 0.989
127 V, 50 Hz	305 W, 2.5 A, PF = 0.974
200 V, 50 Hz	299 W, 1.6 A, PF = 0.978
240 V, 50 Hz	291 W, 1.6 A, PF = 0.820

LC 2140

100 V, 50 Hz	627 W, 6.4 A, PF = 0.995
100 V, 60 Hz	627 W, 6.3 A, PF = 0.995
127 V, 50 Hz	612 W, 4.9 A, PF = 0.987
200 V, 50 Hz	590 W, 3.1 A, PF = 0.964
240 V, 50 Hz	584 W, 2.8 A, PF = 0.875

Figures apply with all LEDs at max. intensity. Figures are valid at nominal voltage and are typical averages, not maximum. Current draw may fluctuate at approx. 1 cycle per minute, especially at 200 V and above. Current fluctuation will not occur at the same cycle in all panels, but to avoid unintentional tripping of circuit breakers, add a 20% safety margin when calculating the current capacity of the power distribution system.

Thermal

Cooling	Forced air (temperature-regulated, low noise)
Maximum ambient temperature (T_a max.)	40° C (104° F)
Minimum ambient temperature (T_a min.)	0° C (32° F)
Total heat dissipation LC 1140 (calculated, 200 V, 50 Hz / 100 V, 60 Hz)	1020 / 1060 BTU/hr.
Total heat dissipation LC 2140 (calculated, 200 V, 50 Hz / 100 V, 60 Hz)	2020 / 2140 BTU/hr.

Acoustic

Noise level	< 45 dBA for one panel at 1 m (3.3 ft.), steady state, T_a 25° C (77° F)
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Approvals



EU safety	EN 60825-1, EN 60950
EU EMC	EN 55022, EN 55024, EN 61000-3-2, EN 61000-3-3
US safety	ANSI/UL 60950-1
Canadian safety	CAN/CSA 60950-1-03

Included Items

Prolyte CCS6 conical couplers and threaded spigots	
User manual	P/N 35000196

Accessories

3 m (9.8 ft.) power cable with Neutrik PowerCon NAC3FCA power input connector	P/N 11541503
Neutrik PowerCon NAC3FCA power input connector, cable mount, blue	P/N 05342804
Neutrik PowerCon NAC3FCB power output connector, cable mount, light grey	P/N 05342805
PowerCon daisy-chain power cable, 1.4 m (55 in.)	P/N 11850099
PowerCon daisy-chain power cable, 2.25 m (89 in.)	P/N 11850100
PowerCon daisy-chain power cable, 3.25 m (128 in.)	P/N 11850101
DVI-D cable, 1.5 m (59 in.)	P/N 91611265
DVI-D cable, 3.2 m (126 in.)	P/N 91611266
DVI-D cable, 5 m (197 in.)	P/N 91611267
Martin DVI buffer box, LC Series	P/N 91611269
Martin DVI splitter, 2-output	P/N 91611280
Martin DVI splitter, 4-output	P/N 91611290
Martin DVI splitter, 8-output	P/N 91611281
Prolyte CCS6 conical coupler	P/N 21021150
Threaded spigot for conical coupler	P/N 08330125
Half conical coupler (used as floor-mounting option)	P/N 26820300
Four-unit flightcase for 4 x LC 1140	P/N 91510110
Four-unit flightcase for 4 x LC 2140	P/N 91510040

Related Products

Martin Maxedia PRO™ System Media Server, EU	P/N 90732520
Martin Maxedia PRO™ System Media Server, US	P/N 90732530
Martin Maxedia Compact™ System Media Server, EU/US	P/N 90732540

Ordering Information

4 x Martin LC 2140™, 2 x 1 m, in 4-unit flightcase with 16 couplers and 24 spigots.	P/N 90354100
4 x Martin LC 1140™, 1 x 1 m, in 4-unit flightcase with 16 couplers and 24 spigots.	P/N 90354110
Martin LC 2140™, 2 x 1 m, in cardboard box with 4 couplers and 6 spigots.	P/N 90354120
Martin LC 1140™, 1 x 1 m, in cardboard box with 4 couplers and 6 spigots.	P/N 90354130

Specifications subject to change without notice

Notes

