

RECURRENT ANAXIMANDER

BY RAFAEL LOZANO-HEMMER



TABLE OF CONTENTS

GENERAL IMPORTANT INFORMATION

Technique	3
Description	3
Operation	3
Maintenance	4
Placement Instructions	5

DETAILED TECHNICAL INFORMATION

Normal Software Operation	8
Manual Software Settings	8
Remote Access to Artwork's Computer	10
Preliminary Troubleshooting Steps	11
Troubleshooting Assistance	13
Support (Contact Us)	14

APPENDIX I - INSTALLATION

Description of Components	15
Wiring and Components	17
Power Dependencies	21
Replacing Components	22
Mounting Instructions and Photos	29
Packing Instructions and Photos	36

APPENDIX II - DATASHEETS

LED Panels	38
PCB Boards - MRV238	39

APPENDIX III - DESIGN DIAGRAMS

47

APPENDIX IV - CRATE SPECS

48

GENERAL IMPORTANT INFORMATION

This short section must be read for proper operation.

RECURRENT ANAXIMANDER (2020)

BY RAFAEL LOZANO-HEMMER

Technique

Computer, custom LED circular display (640 x 640). Glass diffuser, Powder-coated steel frame.

Description

Recurrent Anaximander is a generative animation running on a custom-made 400,000 pixel circular display. The piece features a solar simulation made with Reaction Diffusion, Navier Stokes, Voronoi and Perlin Noise algorithms, running on top of a Solar Dynamics Observatory (SDO) image that is updated daily by NASA. Small planets in orbit create infrequent eclipses that aid the trompe l'oeil render perspective. The project is named after Anaximander of Miletus (610-545 BCE), the pre-Socratic philosopher who first explained eclipses as a function of a cosmos that is all around us and whose concept of the World's origin from and collapse into the "apeiron" (the "indefinite") greatly influenced thinkers up to and including contemporary cosmogeny.

Operation

Please refer to [Appendix I - Installation](#) for detailed system information and wiring diagram.

1. Connect the piece to power.
2. Once you have turned the computer ON, the piece should start automatically after about three minutes.
3. To turn the piece OFF, press the same rubber button situated on the computer, and hold for one seconds.
4. Make sure to wait until the display and the computer have finished their shutdown routine, and have cooled down, before turning the piece on again. At minimum this should be 10 minutes.

Maintenance

Always handle the piece while wearing gloves.

Powder-Coated Aluminium Facade:

The metal outer casing can be cleaned with regular all-purpose cleaner. Do not use harsh cleaners or rough sponges. Remove dust using a feather duster, such as those produced by Swiffer.

Frosted Glass:

The glass is made of 10 mm-thick tempered glass. An industrial acid wash finish has been applied to its front in order to make the piece anti-reflective and give it a frosted effect.

It is important to remember that even though this surface is cleanable, please refrain from touching it with bare hands, for conservation purposes. Smudges and fingerprints show up very easily on this surface and could damage it long-term.

The recommended product to use while cleaning this surface is a sponge with dish soap and a small amount of water, dried with a paper towel. You may also use commercial cleaners such as Hertel or Windex. It is important to **AVOID citrus-based** cleaners. Use paper towels, such as Scott Towels, to avoid leaving behind any microfibers from terry cloth, towels or other fabric-like materials.

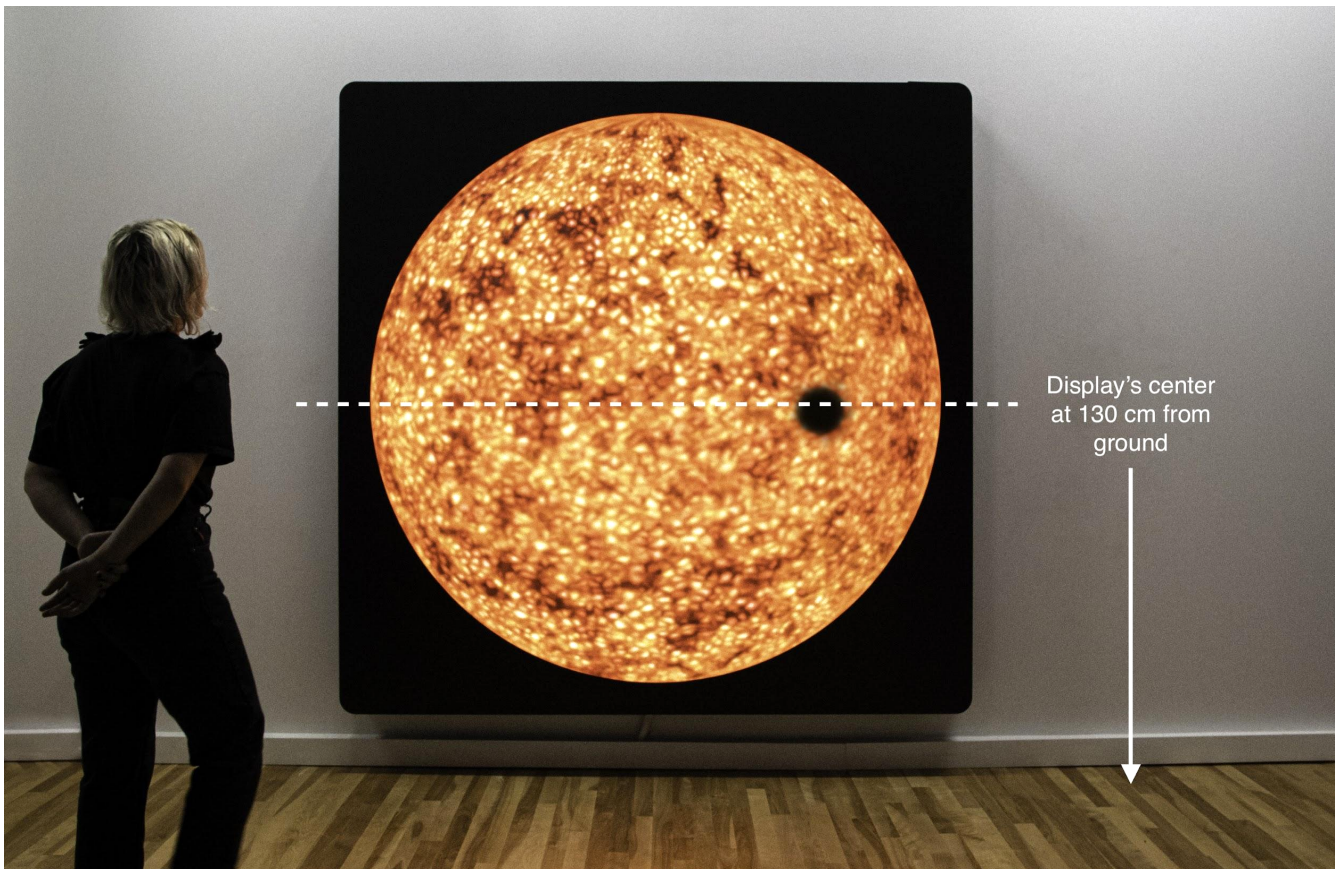
Important Notes: In the unlikely event that you need to remove the glass facade, **NEVER** use professional suction cups (typically used to move glass panels) on the acid wash side. Not only will the suction cups not adhere to the surface, but they also risk leaving a mark after removal.

Also, in the event that the glass facade has been removed, hold the facade in place during manipulation, rather than resting it on a wall or surface. The aluminum shape is affixed to the glass with silicone, and should be handled with extreme care to prevent the materials from detaching from one another or being damaged altogether.

Placement Instructions

Important Note: The piece weighs approximately 200 kg and can only be hung on a reinforced, load-bearing wall. Considering the piece's substantial weight, please ensure that you have enough assistance before moving the piece and thoroughly read through the [installation instructions](#) contained in this manual.

The screen's center should be positioned at 130 cm, which means that the bracket's holes should be anchored to the wall at 162.5 cm from the ground. Please note that the bracket comes in two parts and they are asymmetrical. Each bracket has one end with two holes in a vertical line, those ends should be aligned so they are next to one another.



Please note the reflective nature of the front of the display. Please do not position the piece next to a mural light source (such as a sconce) that could reduce the visibility of the artwork. Also, the piece should not sit in direct sunlight as it will make the display harder to see and will heat the piece's internal electronics to a higher-than-functional operating temperature.

The computer and video controller box are separate from the display hanging on the wall. An ethernet cable runs from the video controller box to the wall-mounted piece; keep this in mind when positioning the computer. Please note that the computer used in this piece runs especially warm. If the computer will live in a closed space such as a closet or cabinet, it will need at least 20 cm of free space around it and above it to keep its internal temperature cool. In very warm locations, it may be preferable to also install a fan that blows on the computer.

DETAILED TECHNICAL INFORMATION

Normal Software Operation

The custom software runs on Touchdesigner, which is automatically set to startup with the computer's daily power cycle. It is plug and play; it will auto-start displaying the artwork without any need to go through the computer's system or menus. The artwork's resolution is 640 x 640 which displays from the upper left corner of a normal HD 1920 x 1080 resolution desktop.

Manual Software Settings

Saturation and Brightness:

Using the wireless keyboard provided, one can adjust the brightness and saturation of the artwork using the **left** and **right arrow keys** for saturation control and the **up** and **down arrow keys** for brightness control. If you need to save these settings, press **CTRL + s keys**, so that the next time the artwork initiates, it remembers these settings.

Eclipse:

The piece will periodically feature planets that eclipse over the sun. You can initiate these eclipses outside their timed settings; the smallest of the planets can be triggered using the **e key**. Text will display on screen that says: "**Eclipse Started**", then it will take around 10 seconds for the planet to appear on the left side of the screen as it travels towards the right.

Calibration Overlay:

In the unlikely event that a re-calibration is required, perhaps after replacing an LED panel, then follow the following process:

The GUI can be accessed by pressing **alt + g** and closed with **alt + q**. There is a slider labeled **Calibration Overlay** that when slid to the right will change the artwork's image from the sun to a calibration grid, as pictured below. Make sure to slide this back to the left when you are finished with the calibration image in order to return the artwork to its normal output. Close the GUI with **alt + q**.



Correctly calibrated image, for consultation.

Remote Access to Artwork's Computer

There is a software installed on the computer running this artwork that allows the studio to connect remotely to the artwork. This feature is helpful when you require assistance from the studio, as we can remotely connect to it, do a quick inspection, and do a debugging session of your components, if needed. In order to enable this feature, the computer has to be connected to the internet at all times. Depending on the computer's operating system (Windows 7/8/10, OSX), the procedure to set the computer online will vary. Please look online for tutorials, if necessary.

Preliminary Troubleshooting Steps

After pressing the computer's power button, nothing seems to happen.

Power:

Do you hear any fan-like noise coming from the back of the display? If so, the computer is running and the display should show the piece shortly. Check if the computer feels hot, or if you can feel the fan running from the top of the computer, both of which indicate that the computer is running and receiving power. The computer has an orange light around the power button that appears when it is turned ON.

If the computer is turned ON but the screen is still not reacting, ensure that the power cable going from the back of the screen to the powersource is firmly in place.

If the display is turned ON but the computer is not, check that the power source is correctly giving power, or try restarting the computer by pressing the power button for a longer duration.

The piece does not react and the image is frozen.

Ensure that the computer and video control box are securely connected to the display through the ethernet cable. If the image is frozen, it might be because the connection has been disrupted. Restarting the piece, as described above, can be another solution. Check that the cables between the computer and the video box as well as the cable from the video box to the display are securely connected.

If the issue still persists after trying all of the above steps, then please [contact the Studio](#) for further assistance.

The piece is on but the screen is black.

The image may be offscreen for whatever reason. Restart the machine to see if the output window is in the correct space. Try moving the mouse to the top-left hand side to see if you can see the cursor.

An independent LED is strangely pixelated, or is not displaying the image.

In the unlikely chance that an area of the display is no longer responding or has become pixelated, independent from the rest of the display, this might indicate that an LED panel has become damaged and needs replacing. Contact the Studio with evidence of the issue. If you have access to the back of the display, take special note of the LED indicators on the PCB and on the power supplies. If a PCB does not have a red light, it means that it does not have power, and if it doesn't have a green light, it means it doesn't have data. This is helpful information to provide the Studio with, when they are assessing the issue.

Troubleshooting Assistance

Prior to contacting the Antimodular Studio with a problem about your artwork, please ensure that you went through the preliminary troubleshooting steps outlined in the previous section.

The troubleshooting process will vary depending on the problem. In order to make the process easier, it is recommended that you collect and send the following information to the studio:

- Date and time when the problem first happened;
- Description of the problem;
- Actions taken so far and conclusions;
- Detailed photographs (or videos) displaying the problem;
- Detailed photographs (or videos) of the suspected faulty component;
- Detailed photographs (or videos) of the whole artwork and its surroundings;
- Personnel involved.

Support (Contact Us)

If you would like support for the piece, please feel free to call Lozano-Hemmer's studio in Canada:

Antimodular Research
4060 St-Laurent, studio 107
Montréal, Québec, Canada
H2W 1Y9
Tel 1-514-597-0917
Fax 1-514-597-2092
www.lozano-hemmer.com

APPENDIX I - INSTALLATION

Description of Components

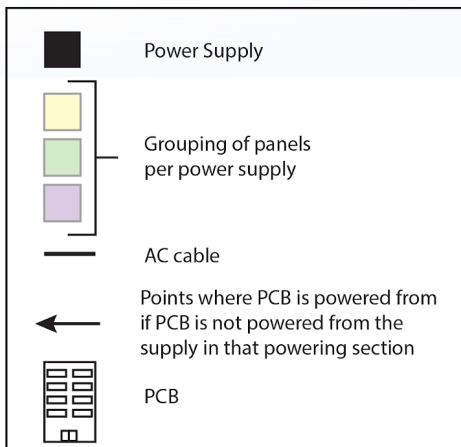
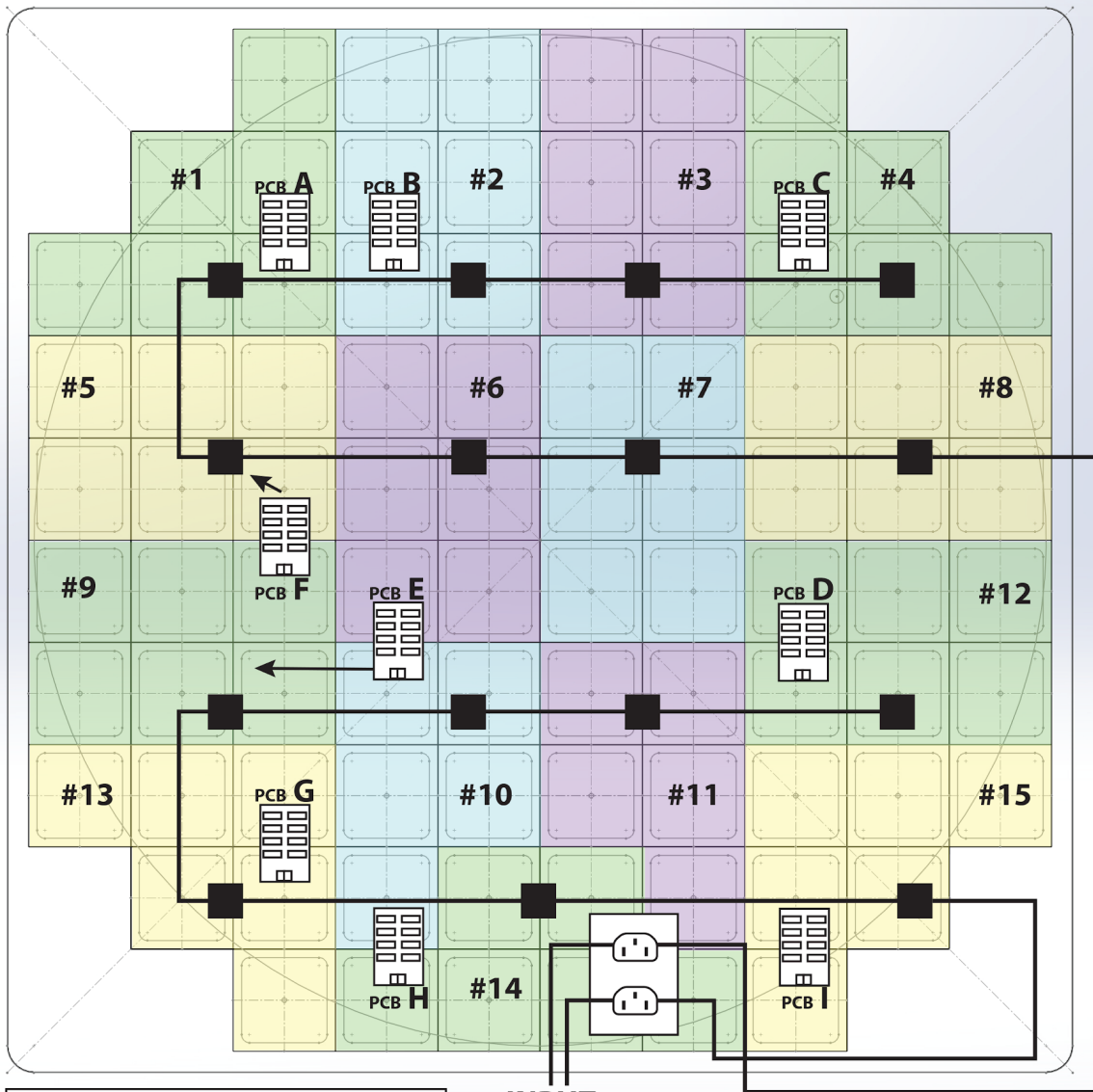
This artwork requires the following components:

Component	Description
1 Computer	2019 ZOTAC Magnus EC52070D (i5 CPU, RTX 2070 8GB, 16GB RAM)
1 Wireless Keyboard	While not required for normal use of the artwork, it allows you to troubleshoot the artwork.
1 custom display composed of 88 Custom LED Panels	The 88 Panels are linked together with a series of PCBs that receive a video signal from a programmed Video Controller Box. Total resolution of the custom screen is 640 x 640. This screen is taking a sample of a larger screen therefore on the computer the screen's resolution needs to be set to 1920 x 1080.
15 Power Supplies	LRS-350-5; OUTPUT 5V-60A; Red switch on side to convert between 115V or 230V.
9 Custom PCB Boards	MRV328 Novastar Receiving board panels; These send the video signal out to the individual daisy-chained LED panels.
1 Video Controller Box	Input: DVI. Supplied a HDMI to DVI cable to go from computer to Video Controller Box; Input: USB B (only used when programming PCB); Output: Ethernet. Ethernet port 1 goes to PCB A; Outputs: DVI to HDMI, USB A to USB B, Ethernet.



For consultation: Power Supplies, Custom PCB Boards,
Custom LED Panel, and respective cabling.

Wiring and Components



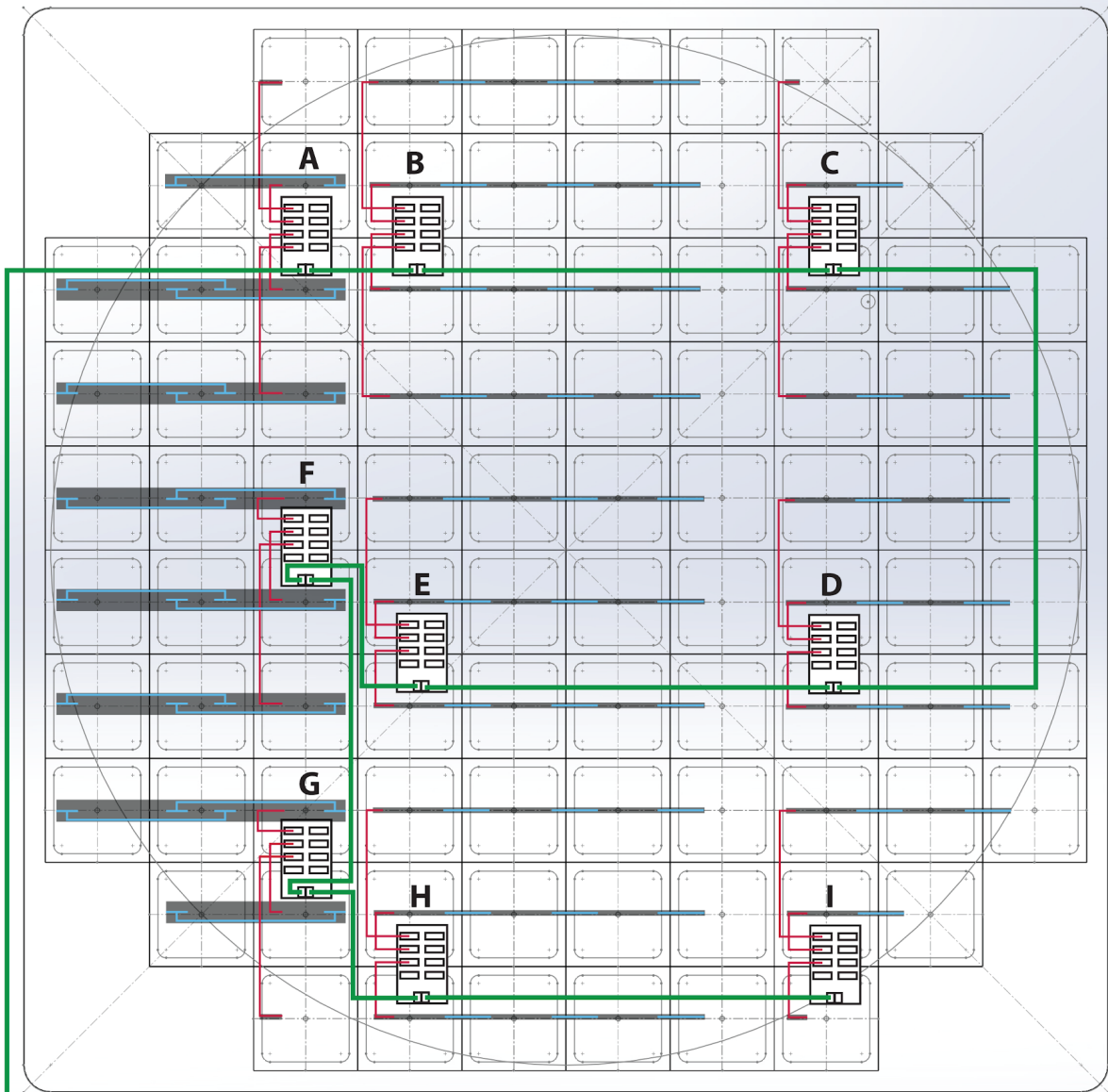
INPUT

Anaximander POWER WIRING

DIAGRAM IS FROM BACK OF DISPLAY

Each power supply is denoted by a section of colour. Arrows from PCB show which power supply it is being powered by.


Number labels are unique identifiers for power supplies
Letters are unique identifiers for Video Splitter PCBs




**Cat 5
INPUT**

**BLACK
VIDEO
BOX**

- Ethernet (Cat 5)
- Ribbon Wire. First one in PCB queue
- Ribbon Wire. Daisy chaining panels

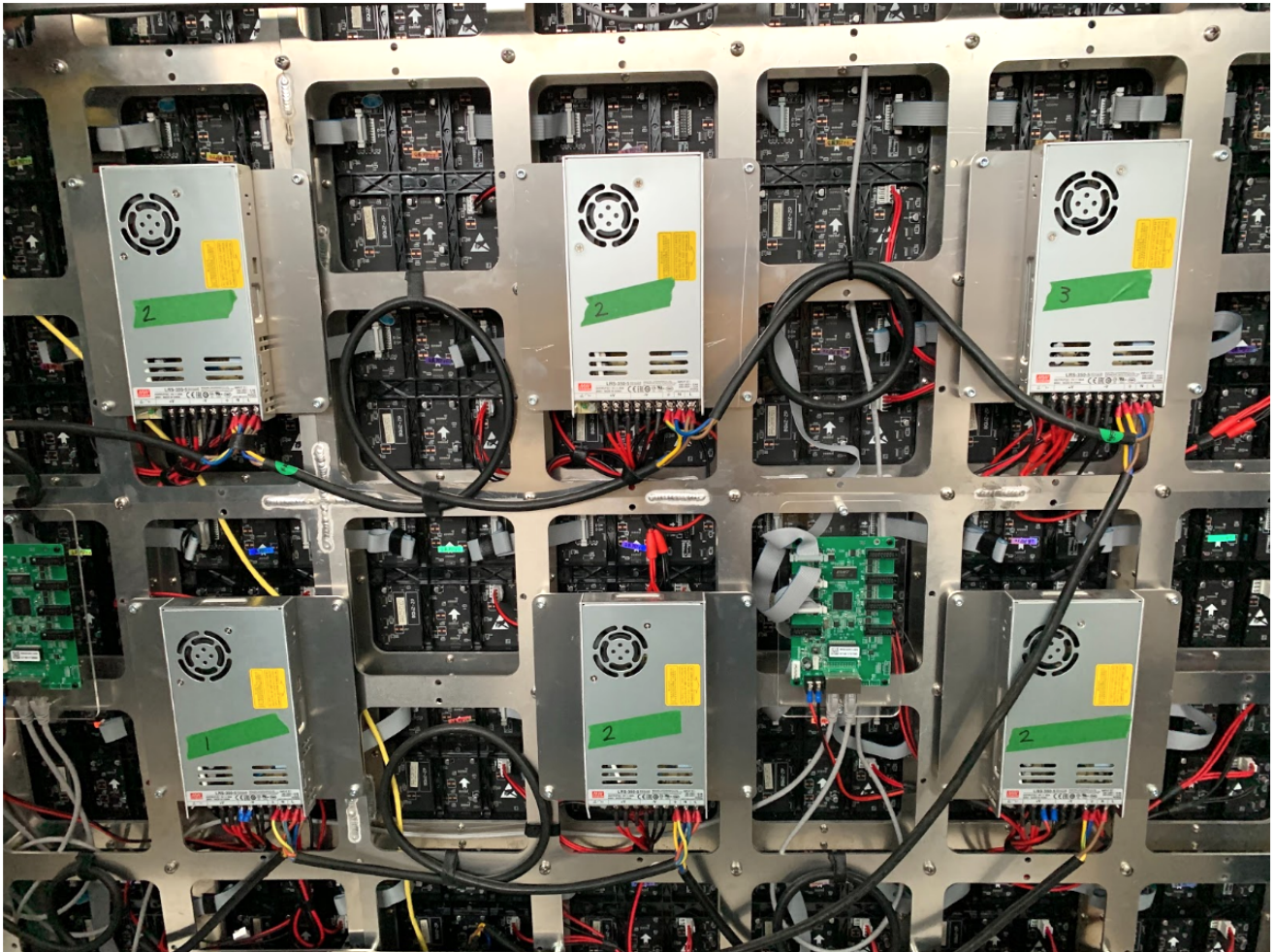
 PCBs to send signals out to panels

 *For Diagram ONLY. Visual display of how rows are linked to the PCB. Not used in wiring.

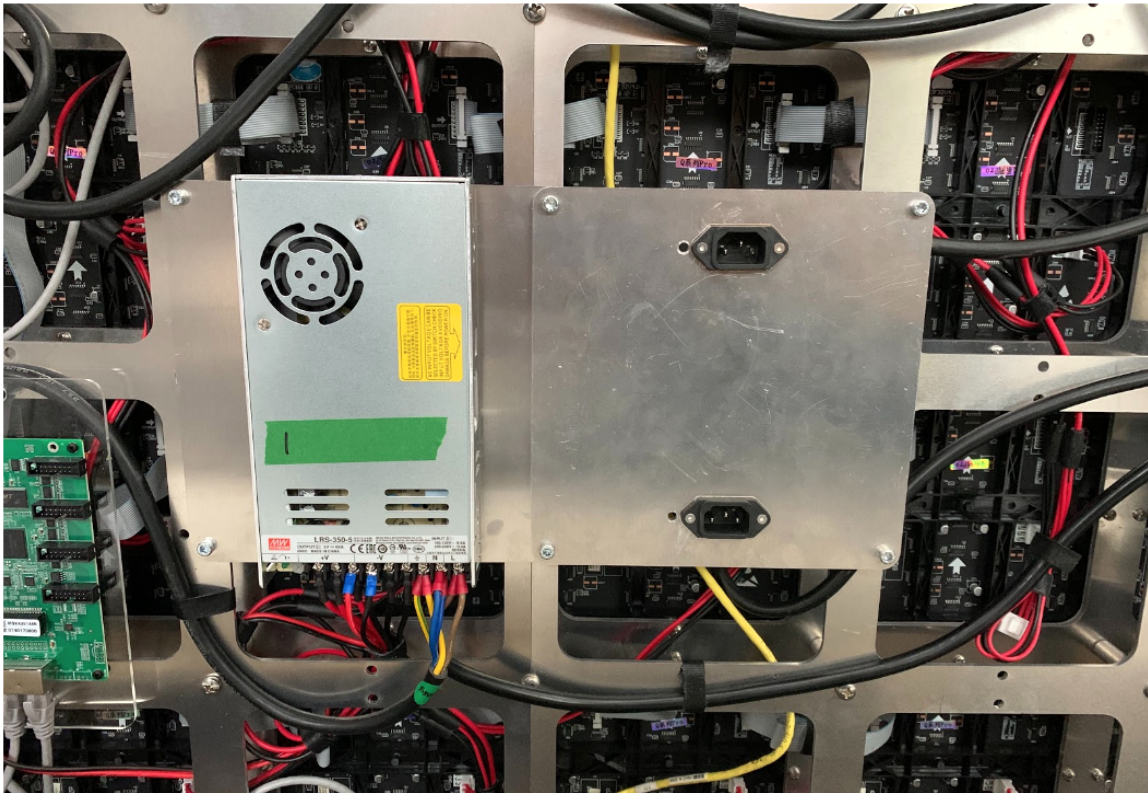
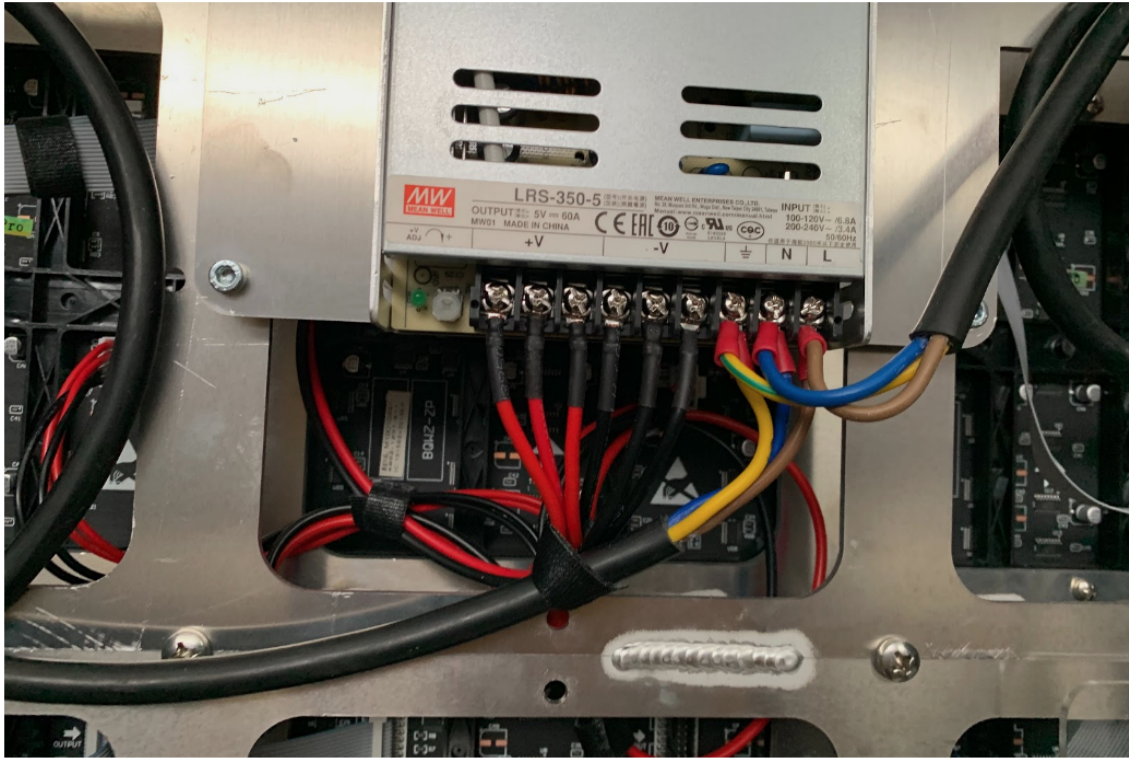
* colour difference of ribbon wires is for diagram simplicity.
 Besides length, there is no physical difference between these wires

Anaximander PCB WIRING

DIAGRAM IS FROM BACK OF DISPLAY



Close-up Photos of Wiring and Components, for consultation.



Above: Wired connections from Power Supplies;
Below: Power Supply and AC input power with IEC connectors

Power Dependencies

Important Note: There is a red switch located on the side of each of the fifteen power supplies that switches between **115V** and **230V**. This will need to be manually switched according to the power dependencies in question: in a North American setting, each power supply needs to be switched to 115V, and in a European setting, each power supply needs to be switched to 230V. This is very important, as an incorrect setting could damage the power supplies. Before installing, please inspect each power supply accordingly.



There are three C15 (computer power) cables to plug in for this piece: two for the display and one for the computer and video controller box. The display cables each require 1200 W, for a total of 2400 W. The computer and video box controller require 340 W.

Replacing Components

The following components should only be replaced after consulting with the Studio and require one or multiple skilled technicians. Please ensure all power is turned OFF before replacing any of the following components.

Replacing LED Panels:

Replacing an LED panel requires disassembling front glass and aluminum panel, as well as the side aluminum panels, to access the back grid on which the LED panels and electronics are fixed. This requires the assistance of at least six technicians, to stabilize the weight of the piece, and a chain and block system to raise the piece off the floor, in order to access both the front and back of the piece. Wear gloves throughout the entire process.

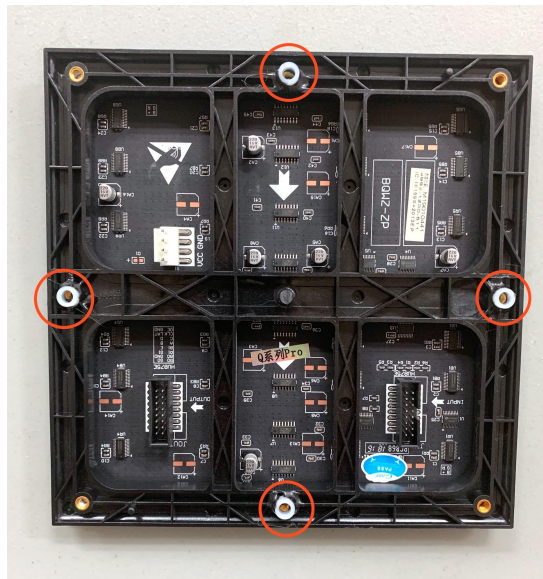


Assembly photos, including LED panel assembly, made possible by a ceiling-mounted chain block, which allows access to both sides of the piece.

1. First, unscrew and remove the four side panels. Next, carefully remove the glass and aluminum facade by unscrewing the bolts located on the four corners at the back of the frame. With the help of the assistants, holding the sides of the facade, slowly slide the glass panel off of the structure.

Hold the facade in place, off the structure, during the entire manipulation, rather than resting it on a wall or surface. The aluminum shape is affixed to the glass with silicone and should be handled with extreme care to prevent the materials from detaching from one another or from being damaged altogether.

2. The 88 LED panels are now visible. Locate the problematic LED panel and unplug the components and wires feeding into it. When unplugging the panel, take note of the orientation in which the panel was positioned and how the input and output wires were connected, as they will need to be reconnected in the exact same manner.
3. Unscrew the panel carefully from the back of the display. Manipulate the front of the LED panels very gently, as their pixels are easily damaged.
4. Replace the damaged LED panel with a spare. Each LED panel has been fitted with plastic standoffs to keep the panel mounted to the grid. Reattach the panel in the same orientation that it was removed. The LED panel should fit tightly into place, without any gaps between its neighbouring panels.



LED Panel with standoffs

5. Reconnect the power cable and the input and output ribbon wires. Please consult the [wiring diagram](#), if needed.
6. Plug in the piece to test that the new LED panel is functioning correctly with the others. If it is working well, unplug the piece, and prepare to re-attach the glass and metal facing.
7. With the help of the assistants, carefully reattach the glass facade by sliding the attached screws into the holes located in the four corners of the grid. Secure the facade securely in place with a bolt.

You will notice that the glass does not sit flush against the LED panels, as shown below; a stopper has been installed to both prevent the glass from touching the display surface and to provide optimum diffusion for the display image.



Side view of segments; gap between LED panels and glass and aluminum facing.

Replacing Power Supplies and Cables:



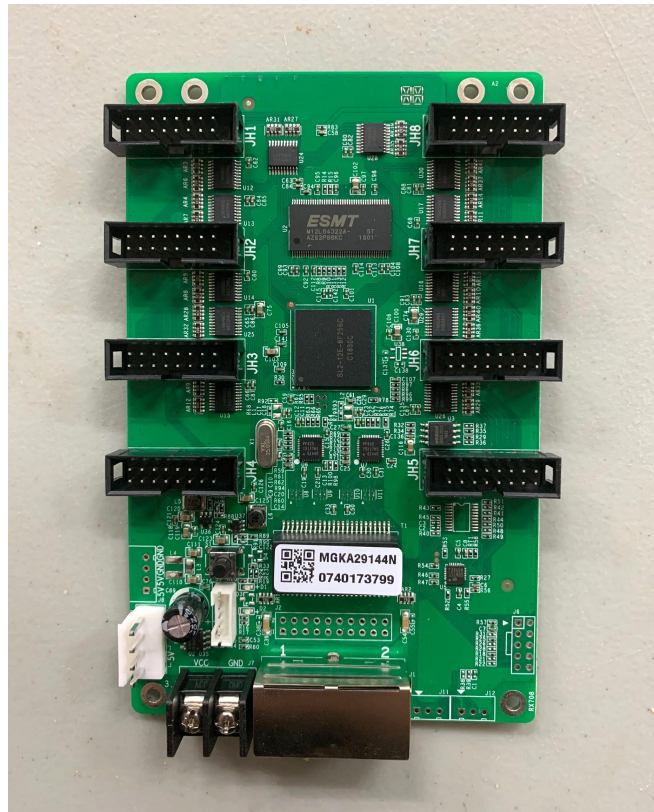
Each power supply is affixed to a metal plate, which sits atop and screws into the aluminum grid, for easy replacement. Please note that these particular power supplies have been altered; the internal fans are disabled to reduce noise. Do not replace these power supplies with any other type without consulting with the Studio beforehand.

1. Unscrew the wires from the power supply terminals.
2. Unscrew the metal plate holding the power supply in place.
3. Replace with a new power supply; screw in the wires. Be mindful of the polarity and the position of each cable.
4. Ensure that the power supply is switched to the correct voltage, as described in the above Power Dependency section.

Important Note: After replacing the power supply, in the unlikely chance that an issue persists, spare cables have been provided for potential replacement. Though, this should only be done by a skilled technician or electrician.

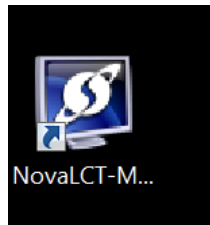
Replacing Custom Printed Circuit Boards (PCBs):

PCBs send the video signal to the individual daisy-chained LED panels. If an individual PCB does not have a red light, it means that it does not have power, and if it doesn't have a green light, it means it doesn't have data. These LED indicators are useful to note when troubleshooting.



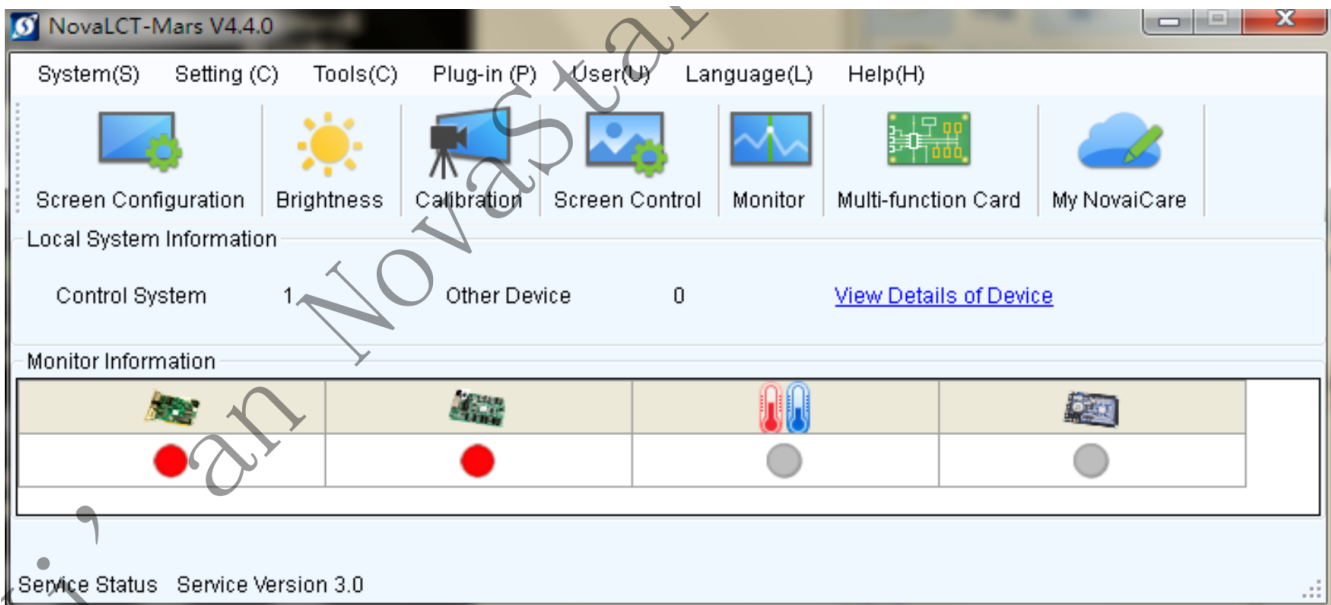
1. Please take note of each of the wire connections on the faulty PCB. After the PCB is replaced, these cables will need to be placed in the **exact** same position as before.
2. Each PCB is mounted onto a Plexi panel, which is then mounted to the grid. Unscrew the PCB from the Plexi panel, and unplug the ethernet cables, the ribbon cables, and the red cables
3. Screw on the new PCB and replug the cables.
4. Turn ON the display. At this stage, the new PCB will not be working, as it will need to be programmed first.
5. Connect the video controller box to the Recurrent Anaximander computer using both the HDMI to DVI cable and a USB A to USB B cable.

6. Navigate inside the computer's system and open the LED Controller software: NovaLCT.

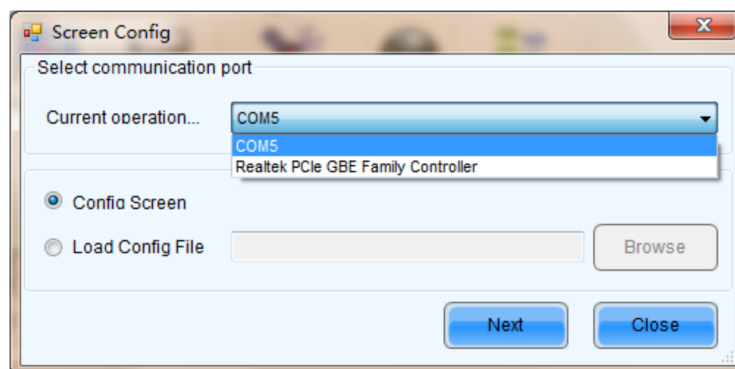


7. Sign-in to the display. Select User > Advanced Synchronous Login. Password is **admin**.

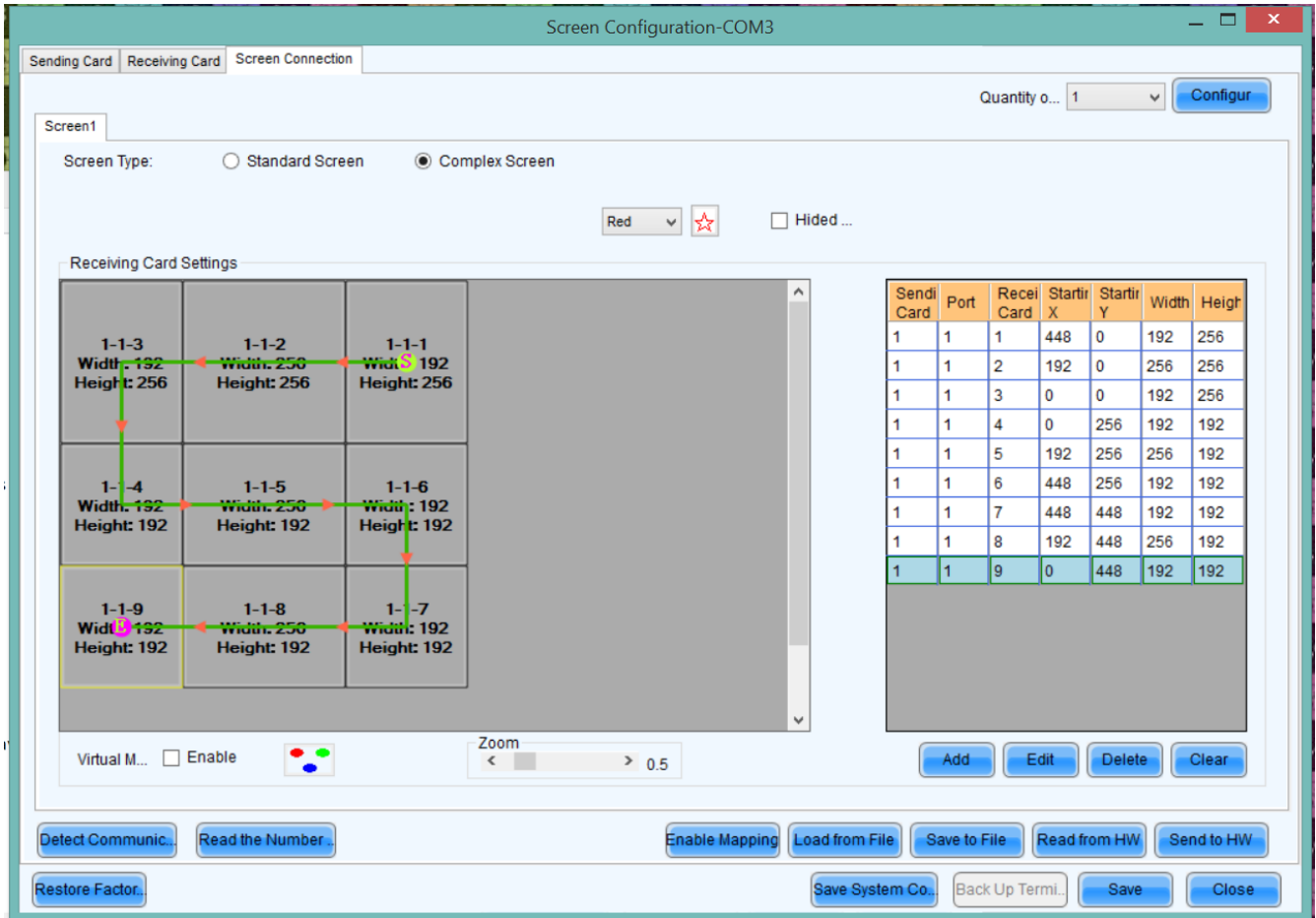
8. Select the **Screen Configuration** icon.



9. Select the **COM** port, then select **NEXT**.



10. On the bottom right, select the **Read From HW** button. This process takes about 20 seconds to read. Once finished, ensure that your screen configuration looks the same as the screenshot below. If it does not, the hardware has not been read correctly, so please contact the Studio for further assistance.



On the bottom right, select the **Send to HW** button. This process takes about 20 seconds to activate. After this, you should see a cohesive image on the display. If one of the rows of panels on the display does not look correct, double-check that the wiring to the PCB is correct, and consult the PCB Wiring Diagram. If after checking these, the image on the display is still not cohesive or not working at all, then please contact the Studio.

11. If the image on the display is readable and cohesive, save your settings by selecting **Save** on the bottom-right of the software application. The PCB is now programmed and the display is ready for normal use. Exit the software and stop screen monitoring when prompted.

Mounting Instructions and Photos

Important Note: The piece weighs approximately 200 kg and can only be hung on a reinforced, load-bearing wall. Considering the piece's substantial weight, please ensure that you have a minimum of six strong assistants to help lift the piece. Please wear gloves throughout the entire installation process.

1. Dismounting from crate: Remove the front panel of the crate, then the back/sides/top (attached together). The piece will remain upright and secure on the base of the crate, with the help of the brackets attached to the base.



2. Attach the arm brackets: Secure the arm brackets onto each side of the piece with the screws provided. These arm brackets are used only to lift and move the piece, but are absolutely necessary for mounting and dismantling the display.



3. Prepare to dismount and move the display; remove the screws securing the display to the brackets on the crate base, freeing the display to be moved. Have the assistants on hand, preventing the display from falling forwards or backwards. Use the provided custom rolling skates to temporarily move the piece closer to the installation area, if needed.





Bracket attached to the base of the crate, which keeps the display stabilized and upright.

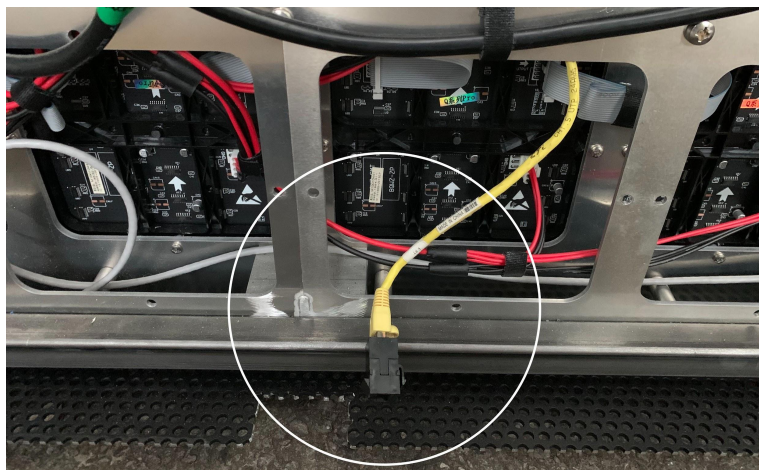
4. Attach the wall bracket to the wall, in preparation for hanging the piece. The bracket is in two pieces; hang them horizontally on the wall, as pictured below. The screen's center should be positioned at 130 cm, which means that the bracket's holes should be anchored to the wall at 162.5 cm from the ground.



*Left: Early prototype version of mounted wall bracket;
Right: Packing photo of final version of wall bracket, in two pieces.*

5. Before hanging the display on the wall, while you still have access to the electronics on the back of the piece, plug in the two power cables (into the AC input power with IEC connectors.) Let the cables hang from the piece, to be plugged in to the video control box and power outlet respectively once the display is securely hanging on the wall.

The ethernet cable can be plugged in (to the Female RJ45 Port pictured below) after the display is hung on the wall.



Female RJ45 Port for Ethernet Cable Connection

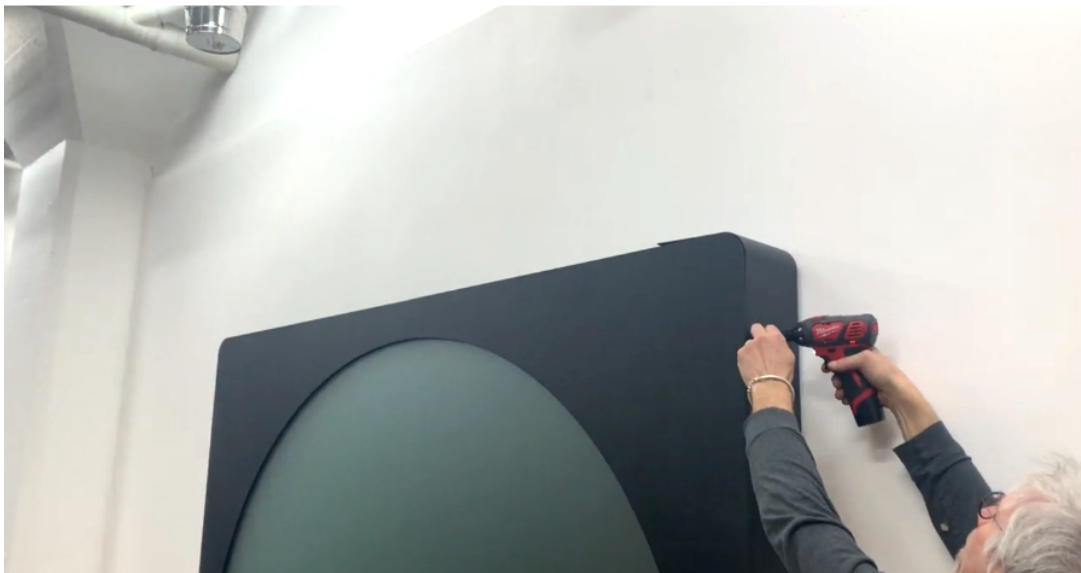
6. Prepare to pick up the display. With the help of six assistants (two on each arm bracket and two bracing the front of the glass, to prevent the piece from swinging forwards), pick up the piece using the arm brackets, and fit it atop the wall bracket. Raise the piece slightly above the wall bracket, then lower the metal bracket downwards, so that the back of the piece fits snugly into the wall bracket.



7. When the piece is securely fastened to the wall, unscrew the arm brackets. Keep on hand for future use.



8. Screw the four black side panels in place, contouring the display. Each is marked with a letter (**A-B-C-D**) indicating their position around the display. Start with **A**, on the top left corner of the display, followed by **B** on the top right corner, **C** on the bottom right corner, and **D** on the bottom left corner. Though they are similar, each panel is retrofitted to its exact location and are therefore not interchangeable.



9. Next, set up the computer and its components. Place the computer where you would like to store it during the operation of the piece. If installed within a wall or enclosure, make sure it has both 20 cm of space around each side (including the top) of the computer and a hole or

vent located somewhere in the enclosure, so the computer does not overheat. In very warm locations, it may be preferable to also install a fan that blows on the computer. If the antennas are not already installed on your computer, screw them into the computer, as illustrated below.



10. Plug the computer's power cable into a power source. Connect the HDMI cable into the HDMI port of the computer and the other end into the HDMI to DVI adapter which plugs into the video controller box. Connect the USB cable from the computer to the video controller box as well. Connect the Ethernet cable (the longest cable) running from the display into the video controller box. This is the only cable running between the display and the computer/video box set-up.
11. Plug in the two power cables hanging from the display into power outlets.
12. Turn the piece ON, as described in the Operation section.

Packing Instructions and Photos

Use anti-static plastic around the front and back of the piece to protect the electronics and the glass' surface during shipping.

The crate is dismantled in three parts: the front panel, the base, and the back/top/sides (attached together), which can be removed to pack and unpack the display safely. The piece will remain erect and secure on the base of the crate, with the help of the brackets attached to the base.



Brackets on base of crate keep the display securely in place during shipping and installing

The piece should fit snugly in the custom crate, as pictured below, to prevent damage from vibrations during shipping. The display alone travels in its crate alone, with all other components and assisting brackets in a secondary crate. The piece's four black side panels, for example, travel apart from the display, in a secondary crate, to allow the arm brackets to be mounted easily during installation.



Anti-Static Plastic used on front and back of display

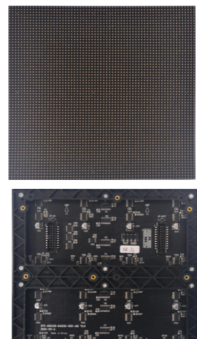
APPENDIX II - DATASHEETS

LED Panels

Ordered from Charming Co Ltd., CHINA
 Power: 5V, 20W
 Resolution: 64 x 64



Product Name	P3 LED Indoor Module		
Product type No.	54.08.004.007		
Module information		weight	0.31kg
Pixel Pitch(mm)	3 mm	Maintenance mode	Back maintenance
LED standard	2020SMD	Protection Level	IP42
Scan Mode	1/32	View Angle	140°
Module size	192mm*192mm	Working temperature	-20~50℃
Module Resolution(L×W)	64*64	Life Span	≥50,000 H
Power Consumption (W)	20W	Working Voltage	AC 110V
Refresh Rate (Hz)	3840	Control System brand	Novastar
Pixel Density(dot/m2)	111111Dot/m ²	Brightness(CD/m2)	≥600CD/m ²



2 Overview

The MRV328 is a new receiving card developed by NovaStar. A single MRV328 loads up to 256x256 pixels.

The MRV328 supports pixel level brightness and chroma calibration, which effectively removes color difference, greatly improves display consistency of LED images, and presents finer displays to users.

Software and hardware designs of the MRV328 have fully concerned users' deployment, operating and maintenance scenarios, enabling easier deployment, more stable operating and more efficient maintenance.

Hardware design:

- Integrates 8 standard HUB75 connectors, which makes the HUB board unnecessary.
- Adopts the Gigabit Ethernet port, which can connect to the PC.

Software design:

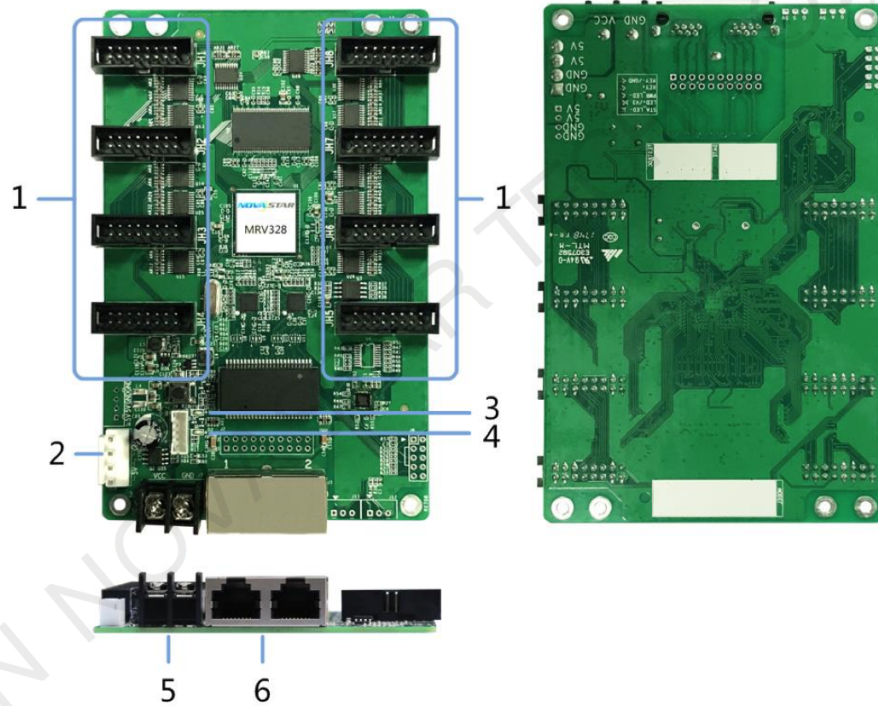
- Supports pixel level brightness and chroma calibration.
- Supports setting of images pre-stored in the receiving card.
- Supports status detection of temperature, voltage, Ethernet cable communication and video source signals.
- Supports the 5-pin LCD module.

3 Features

Features	Description
Supporting pixel level brightness and chroma calibration	Brightness and chroma calibration on NovaLCT for each pixel could remove color difference effectively, make the brightness and chroma of the whole screen highly consistent, and improve the display effect.
Supporting setting of images pre-stored in the receiving card	On NovaLCT, the specified images could be set as the screen startup image and images used when the Ethernet cable is disconnected or no video source signal is available.
Supporting status detection of temperature, voltage, Ethernet cable communication and video source signals	On NovaLCT, the status of receiving card's temperature, voltage, Ethernet cable communication and video source signals can be detected.
Supporting LCD module	Supports NovaStar's general 5-pin LCD module. The LCD module is connected to the HUB board to display temperature, voltage, single operating time and total operating time of the receiving card.
Supporting readback of configuration file	On NovaLCT, the configuration information stored in the receiving card can be read back.
Supporting readback of firmware version	On NovaLCT, the firmware versions of the receiving card can be read back.

4 Hardware Structure

4.1 Appearance



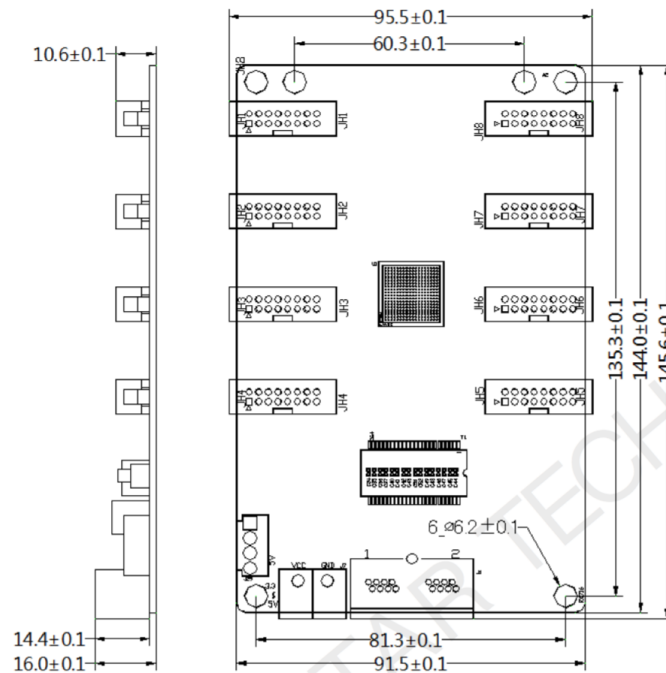
Product images provided in this file are for reference only, and the actual products shall prevail.

No.	Description
1	HUB75 connectors
2	Power socket
3	D1, status indicator
4	D2, power indicator
5	Power socket
6	Gigabit Ethernet ports

4.2 Dimensions

The board thickness is not greater than 2.0 mm, and the total thickness (board thickness + thickness of components on front and rear panels) is not greater than 17.0 mm.

The unit of dimension chart is “mm”. The location holes are connected to signal grounds (GND).

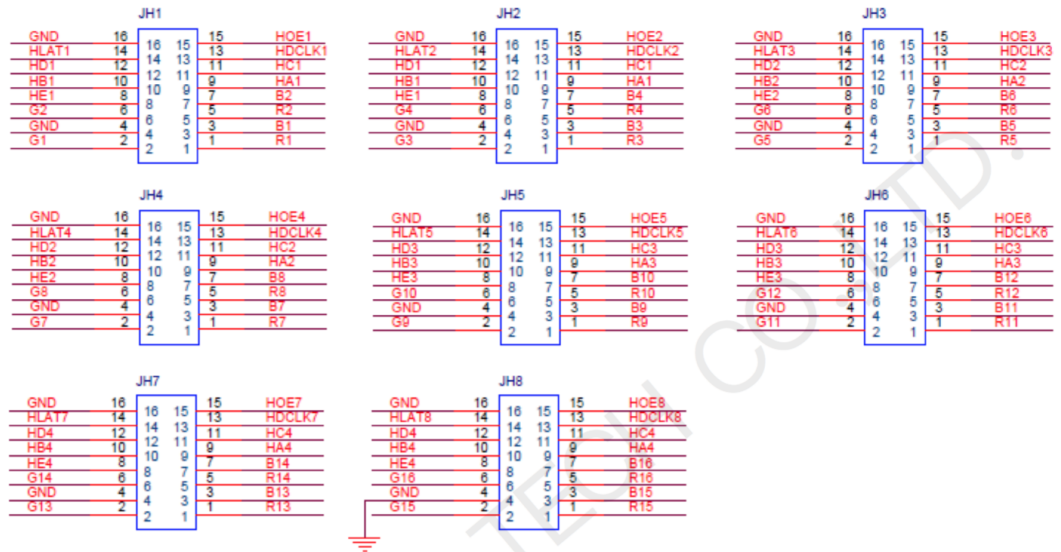


4.3 Indicators

Indicator	Status	Description
Status indicator (green)	Flashes every other 1s.	No sending card mode: The receiving card works normally with no sending card connected. Ethernet cable connection is normal, and video source input is available.
	Flashes every other 0.5s.	Sending card mode: Both the receiving card and the sending card work normally. Ethernet cable connection is normal, and video source input is available.
	Flashes every other 3s.	The receiving card works normally while the Ethernet cable connection is abnormal.
	Rapidly flashes for 3 times every other 3s.	The receiving card works normally and Ethernet cable connection is normal, while no video source input is available.
	Rapidly flashes every other 0.2s.	Program loading fails in normal operating and the device is coming to the backup operating state.

Power indicator (red)	Always on	The indicator will be always on after the power is on.
-----------------------	-----------	--

4.4 Definition of Data Interface



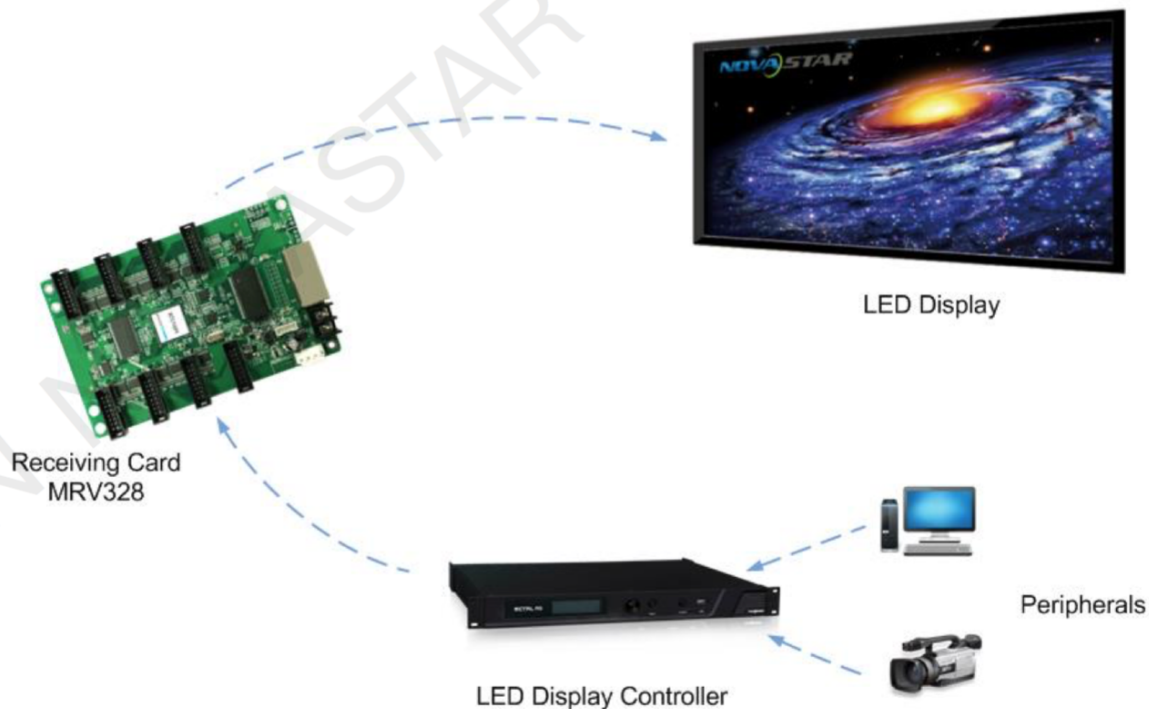
Definition of Data Interface			
GND	16	15	HOE
HLAT	14	13	HDCLK
HD	12	11	HC
HB	10	9	HA
HE	8	7	B
G	6	5	R
GND	4	3	B
G	2	1	R

6 Typical Networking

The MRV328 is applied to the LED display synchronous system which is generally composed of the LED display, receiving card, LED display controller (optional) and controller peripherals. The receiving card is connected to the LED display over HUB connectors.

The synchronous system requires connecting a computer to display the computer's images and texts on the LED display. The synchronous system's structure is shown in the following figure.

Figure 6-1 Sending card mode

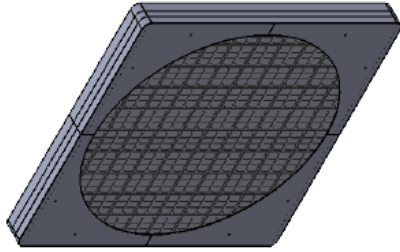


7

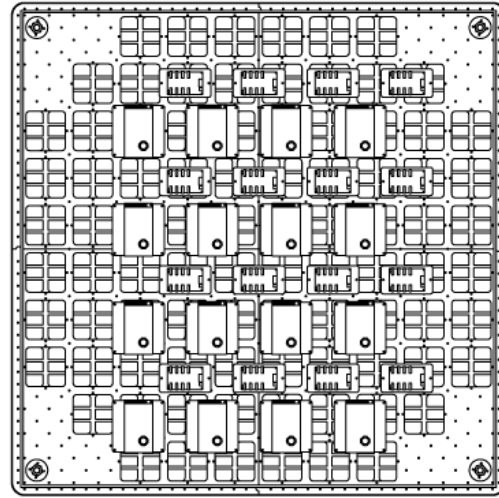
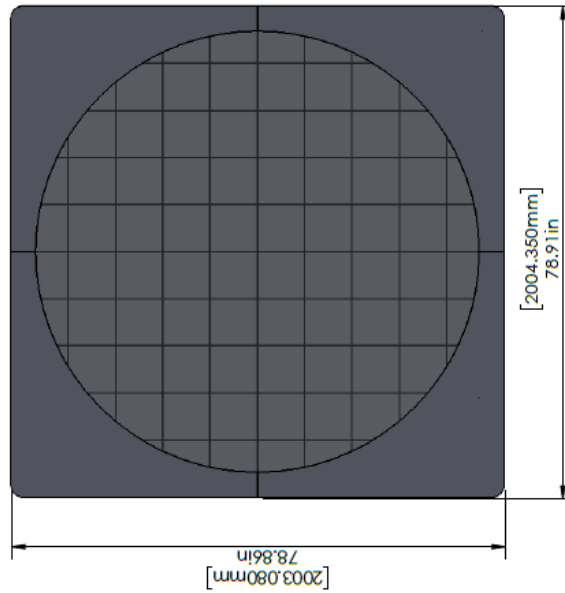
Specifications

Input voltage	DC 3.3 V–5.0 V
Rated current	0.5 A
Rated power consumption	2.5 W
Operating temperature	-20°C–70°C
Storage temperature	-25°C–125°C
Operating humidity	10% RH–90% RH
Dimensions	144.0 mm x 91.5 mm x 16.0 mm
Net weight	85.5 g
Certifications	RoHS
Packing	<p>An antistatic bag and anti-collision foam are prepared for each receiving card.</p> <p>Dimensions of the packing box: 650.0 mm x 500.0 mm x 200.0 mm, 100 receiving cards in each box.</p>

APPENDIX III - DESIGN DIAGRAMS



Weight: 420 LBS



REVISION HISTORY / HIST. REVISIONS
 R0. 20180300 GENERAL DIMENSIONS
 R1. 1/1/2018
 R2. 1/1/2018
 R3. 1/1/2018
 R4. 1/1/2018
 R5. 1/1/2018
 R6. 1/1/2018
 R7. 1/1/2018
 R8. 1/1/2018

PART NO / PIECE NO.
11-120919-FLATSUN-3
 GENERAL DIMENSIONS

REVISION / REVISION.
R0

SCALE / ECHELLE: **1:16**
 UNITS / UNITES: INCHES / POUCES
 UNITS / UNITES: METERS / METRE
 CHECKED / VERIFIE PAR: R.M. BOGGS
 APPROVED BY / APPROUVE PAR: [Signature]
 STRUCTURAL ENGINEER

SHEET / FEUILLE: **1 of 1**

PROJECT / PROJET
FLATSUN LIVE

ANTIMODULAR RESEARCH

APPENDIX IV - CRATE SPECS

Outer Dimensions: 224 (L) x 36 (W) x 226 (H) cm

Notes: Removable front, side, back, and top panels; Piece fixed to base with bracket.

Made by PacArt, Montreal, February 2020

