EXTERNAL INTERIOR

BY RAFAEL LOZANO-HEMMER

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GENERAL IMPORTANT INFORMATION

This short section must be read for proper operation.

EXTERNAL INTERIOR (2015)

BY RAFAEL LOZANO-HEMMER

Technique

Acrylic sphere (measuring 61 cm in diameter), 1,600 one-way mirrors, LED light, metal, cantilevered beam and a 50W spotlight (used to illuminate the sphere from the outside.). Approximate weight is 125 kg.

Description

External Interior is an inside-out disco ball made with 1,600 one-way mirrors, like those found in police station interrogation rooms. The mirrors are mounted onto a transparent acrylic sphere that is suspended from pulleys and has a counterweight so that it can be raised and lowered easily. The sphere rotates freely and is illuminated with an external spotlight, and, like all disco spheres, it produces a projected array of lights. As a visitor places their head inside of the sphere, they see a *mise en abyme* reflection multiplied kaleidoscopically, creating both a spacious, yet isolated, self-centered experience. The effect is reminiscent of both Julio Le Parc's mirrored sculptures and the tessellated vision present in insects with compound eyes. Meanwhile, from the outside, the public can clearly see the person inside the sphere.

Their also exists a companion piece tited Internal Exterior, which is identical except that the one-way mirrors are flipped; when a participant is inside, he or she will be able to see everybody while the people outside will not be able to see him or her.

Operation

Please refer to Appendix I - Installation for detailed assembly information.

1. To turn the piece ON, plug the main power extension into the wall. and use a transformer if needed.

   IMPORTANT: This artwork runs on 110V. If local nominal voltage is more than this, you MUST use a step-down transformer to bring the voltage to 120V. A step-down transformer should handle at least 75W of consumption.

2. To turn OFF the piece, simply turn off the light dimmer (if being used) and unplug the power cord.

3. Alternatively, you can connect the artwork (or the step-down transformer) to an electrical timer in order to automatically turn the piece ON and OFF at desired times.

Maintenance

To clean the acrylic sphere, use the Novus #1 cleaner provided. Avoid using any other cleaning products as they might damage the acrylic, and NEVER use alcohol-based products for this purpose as they will crack the material. Make sure to wear clean nitrile or fabric gloves to avoid leaving fingerprints on the material.

Using a clean cotton rag and the Novus #1 cleaner, spray the product onto the rag, NEVER directly onto the acrylic. Proceed to clean the surface in a circular motion.

To clean the two-way acrylic mirrors inside the sphere, use a clean wet cotton rag with water only. Proceed to carefully and gently clean the surface in a circular motion.

Never use a compressed air or a duster to clean dust inside the sphere. This will destroy the mirror finish.

Clean the piece as often as necessary.

If you have any scratches, follow these steps:

Using sandpaper #200 and sand the scratch in a perpendicular motion. Clean the dust off.

Take a clean cotton rag and use Novus #3 cream to rub the sanded area. Use a very small amount and rub it in the same perpendicular motion that the sanding was done. Apply some pressure while doing this. Clean the residue off.

Take another clean cotton rag and use Novus #2 cream. Use a very small amount and rub the affected area in a circular motion. Apply enough pressure while doing this. Clean off the residue.

Use another clean cotton rag and spray the Novus #1 cleaner onto of the rag. Proceed to clean the acrylic in circular motion. By now, no marks or scratches should be visible; the surface should be completely smooth and polished.

If the scratches are still visible, repeat the steps above until all of the scratches have disappeared.

Placement Instructions

The piece is fixed to the ceiling using the ceiling installation bracket and one of the three optional aluminium pipes provided. Follow the instructions outlined in the installation instructions to place the artwork properly.

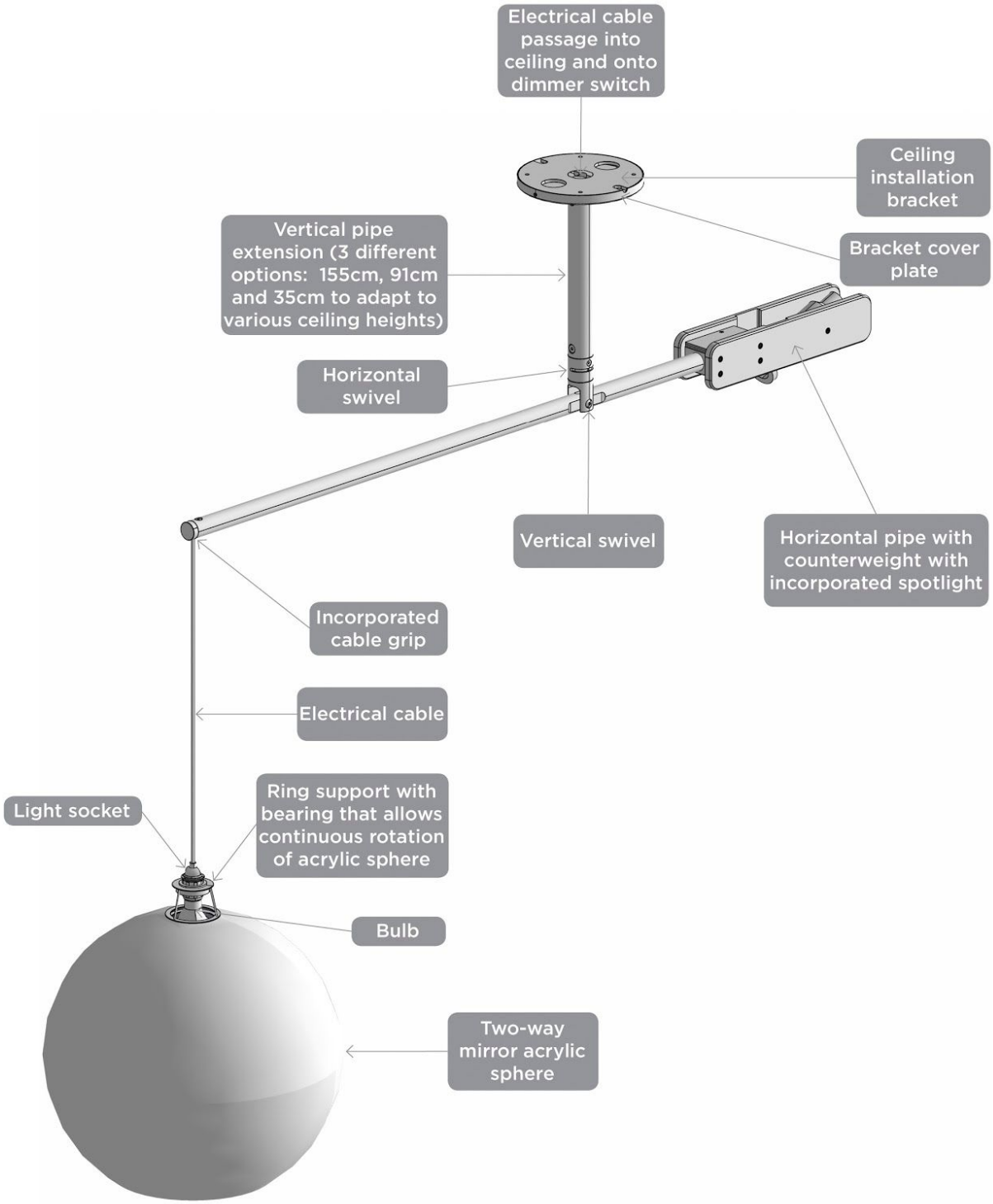
Please consult the diagram included in the general layout section indicating the required height and distance measurements of each component.

When the metal structure is parallel to the ground, the acrylic sphere should reach a height of 1.53 m, regardless of the ceiling height. Use a vertical pipe extension that best suits this. You can fine tune the piece's height by adjusting the cable height from the cable grip, but this should only be done when necessary. Ideally, this cable should never be moved.

DETAILED TECHNICAL INFORMATION

Hardware

Components



Preliminary Troubleshooting Steps

The LED light bulb in the sphere and the spotlight are not turning on.

Start by disconnecting the AC powerline cable from your power source. Ensure that the LED light bulb is well screwed into its socket, that the power source voltage is between 110 and 120V, and, finally, that the power source is live. Use a multimeter to check that the voltage is between 110 and 120V, or ask an electrician for assistance. After checking all the above steps, you can connect the AC power line to the power source.

If the problem persists after having followed all the instructions above, disconnect the AC power line and please contact the studio for further technical support. It is possible that the electrical connections within the metal structure could be loose.

The light in the sphere doesn't turn on, but the spotlight does.

If this happens, turn off the piece and make sure that the bulb is tightly screwed into its socket, then turn the piece back on.

If the problem persists, replace the bulb with one of the two new bulbs provided.

If this doesn't fix the problem, find a regular incandescent light bulb known to be working properly. Try to screw it into the sphere's light socket.

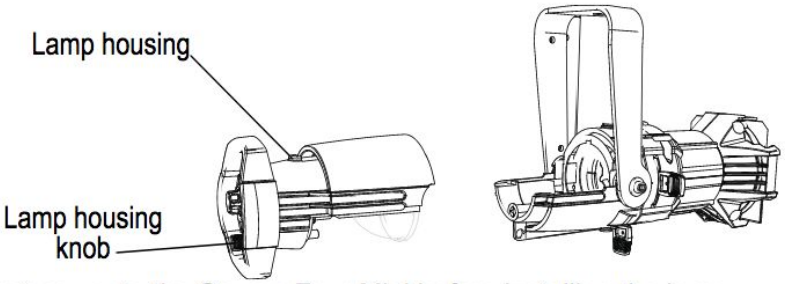
If it turns on, this indicates that the AC line's system is not faulty. In this case, use a multimeter to ensure that the voltage in the light socket is regulated between 110 and 120V. If the voltage is indeed between 110 and 120V, this might mean that the LED lamp is faulty and that another replacement unit is needed. Alternatively, if the voltage is closer to 240V, disconnect the AC power line and please ensure to use a step-down transformer to ensure the whole piece runs on 110-120V, as required. In extreme cases, where there is either no current or low current rated under 100V running to the light socket, disconnect the AC power line and please contact the studio for further technical support; there is probably an issue with the AC lines and a technician or an electrician will have to inspect the connections.

The spotlight doesn't turn on, but the sphere does.

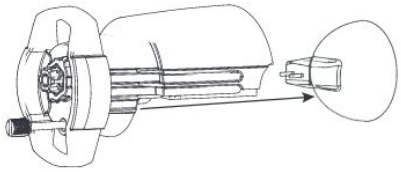
If this happens, during the first time the piece is turned on, disconnect the AC power line and ensure that your live current is rated in between 110 and 120V. If the current is closer to 240V, use a step-down transformer to power on the artwork.

If the current is rated between 110 and 120V, proceed to change the bulb of the spotlight using gloves. To do this, disconnect the AC power line and follow steps two through seven in the illustration below.

Replacing the Lamp



Step 1: Disconnect power to the Source Four Mini before installing the lamp.
Step 2: Loosen the brass lamp housing knob on the back of the lamp housing. The knob is not captured so it may come loose from the fixture.
Step 3: Pull the lamp housing away from the fixture body.
Step 4: Pull on the lamp carefully to remove it from the lamp housing.
Step 5: Gently push down on the replacement lamp until it is seated in place.
Step 6: Realign the housing into the grooves of the fixture.
Step 7: Align the knob with the hole, and tighten the lamp housing knob.



WARNING: ***RISK OF FIRE/INJURY TO PERSONS. Keep away from combustibles. Unplug to change bulb (lamp). Do not touch bulb (lamp), or the equivalent.***

CAUTION: *RISK OF FIRE - USE 50 WATT OR SMALLER, 12 VOLT, TYPE MR16 SHIELDED LAMP.*

If you encounter any further problems during this process or if the problem persists after replacing the lamp, please contact the studio for further technical support.

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
H2W 1Y9 Canada
Tel 1-514-597-0917
Fax 1-514-597-2092
info@antimodular.com
www.antimodular.com

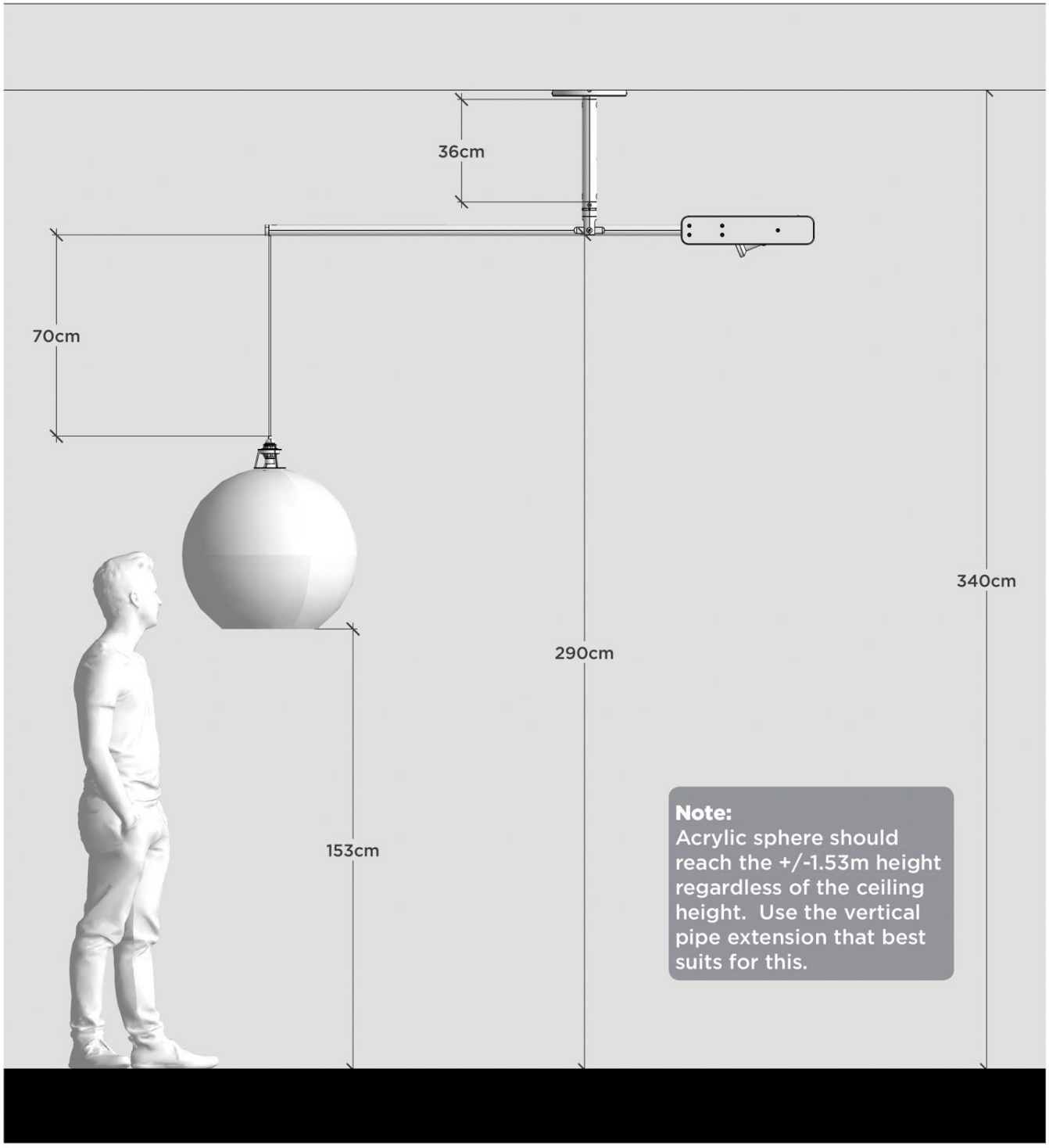
APPENDIX I - INSTALLATION

Description of Components

This artwork requires the following components:

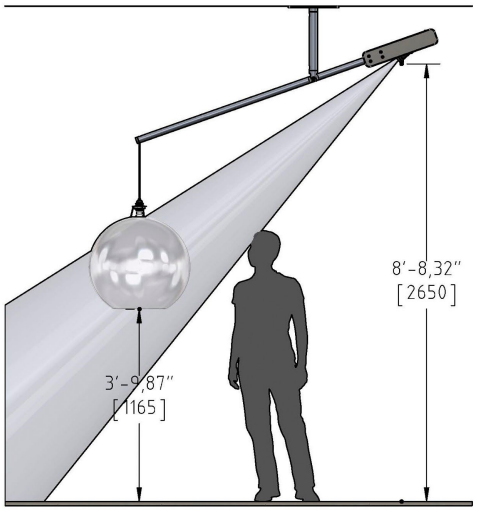
Component	Description
Acrylic sphere with two-way mirrored acrylic tiles	A custom sphere in which the viewer can place on their head.
Main aluminium horizontal pipe with swivel and spotlight housing/counterweight	Holds the sphere on one end and the mini spotlight and counterweight on the other.
3 aluminium vertical extension pipes	Used to set the piece at the correct height depending on the ceiling of the venue where the piece is being installed. The lengths of the pipes are: 155 cm, 91 cm, and 35 cm.
Aluminium ceiling installation bracket	Attaches the piece to the ceiling.
Aluminium ceiling bracket cover plate	Hides the hardware used to attach the ceiling installation bracket.
ETC source four mini spotlight	Lights the sphere.
Weight plates	Controls the amount of weight on the counterweight. Weights can be added or removed.
Swivel	Allows to rotate the main horizontal pipe to set the sphere in the desired position.
Cable grip	Prevents the textile electrical cable from sliding.
White textile electrical cord with light socket	Holds the sphere and houses the bulb inside the sphere.
Aluminium ring support with bearing	Attaches the sphere to the electrical lamp cord. The bearing allows the sphere to spin.
LED Bulb (inside sphere)	Lights the sphere from inside.

General Layout

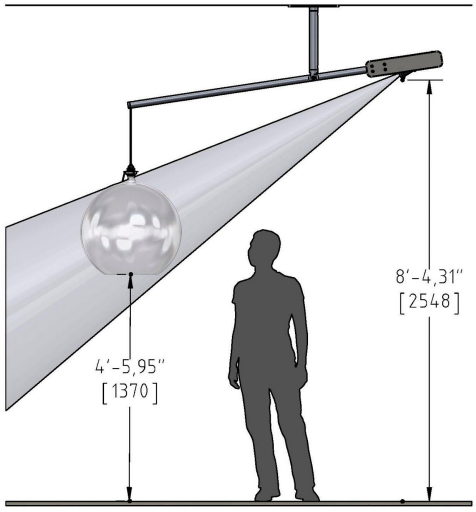


Lighting

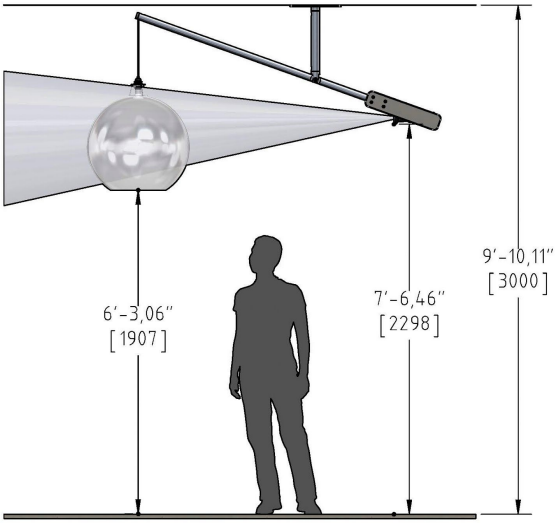
The piece can be raised and lowered easily according to the viewers' experience. The ETC Source four mini spotlight should be aligned in the counterweight in order to light the sphere as per the following diagrams in order to ensure the sphere being properly lit at all times. The following image illustrates the minimum, medium, and maximum height of the spotlight, in relation to the sphere.



MIN. HEIGHT



MED. HEIGHT



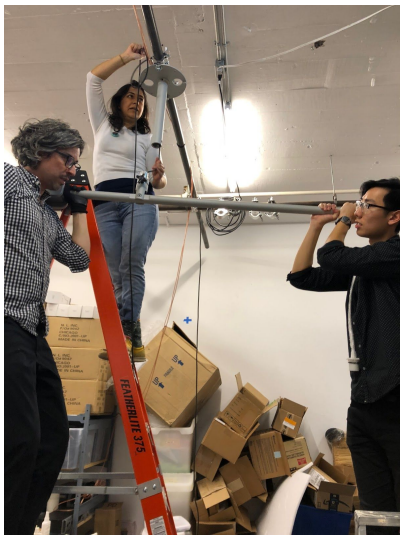
MAX. HEIGHT

Installation Instructions

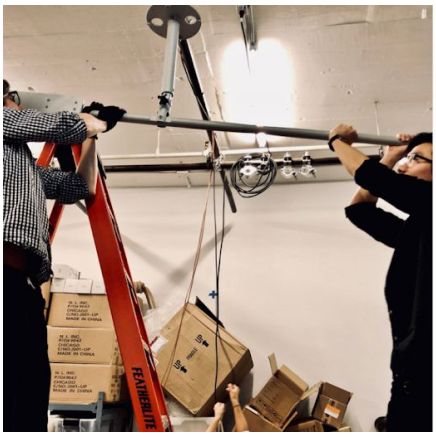
Please follow the instructions below for proper installation of the artwork. You will require at least three assistants and three ladders to install the piece.

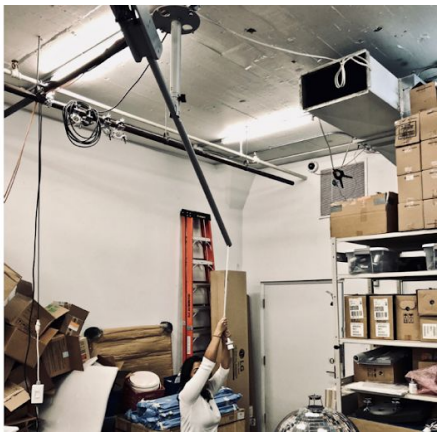
1. Using proper hex keys, attach and secure the ceiling bracket. Arrange the path of the electrical cables and the determine the location of the dimmers. Install the bracket plate.
2. Install the bracket cover plate (not shown in the below pictures).
3. Decide which vertical pipe you will use and attach it to the the ceiling bracket by screwing it in place.

If you are using the medium or the long pipe, make sure to run the electrical cable through it before attaching it to the ceiling bracket. You will need two people to do this, in order to support the main bracket mid-air at the same time that the vertical pipe is being attached to the ceiling bracket.

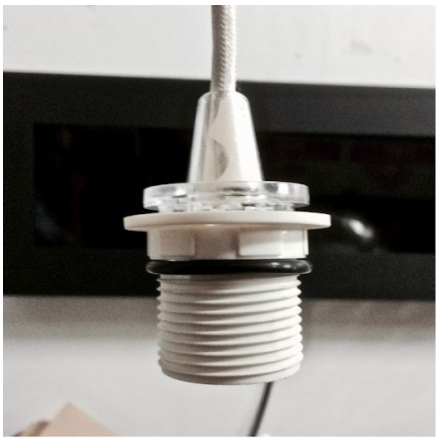
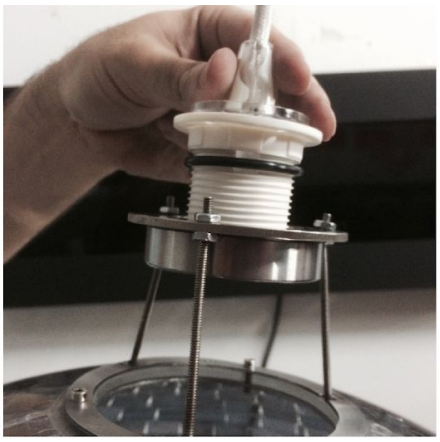


4. Raise the horizontal pipe, joining it to the vertical pipe. Screw it in place.
5. Decide the position that the sphere will be placed, turn the swivel as needed, and secure its position by tightening the knob on the horizontal swivel.
6. Once properly attached, keep holding the main horizontal pipe in place, as it will likely be out of balance. Use a temporary counterweight to keep it in place while preparing yourself for the next steps.
7. Carefully remove the temporary counterweight, and, when ready, the other person will pull the piece down from the light socket cable, as shown in the following photos. Please use clean gloves to avoid dirtying the white textile cable.



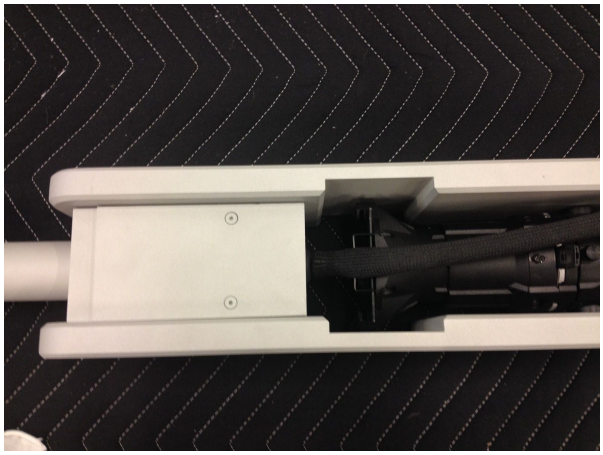


8. To attach the acrylic sphere, you will need two people. One person will hold the sphere and the second will pull the white cable down through the sphere's ring support.
9. On the light socket, prepare the first threaded ring with one rubber gasket underneath. Position the gaskets all the way to the top.
10. Carefully bring the sphere into place and insert the ring support into the threaded light socket.
11. Raise the support ring all the way to the top and insert a second rubber gasket underneath it.

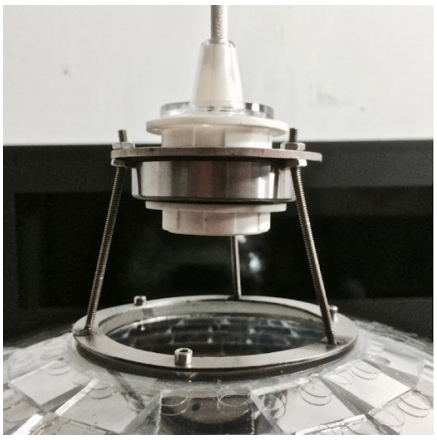

12. Screw in a second threaded ring and tighten it enough so that it holds the weight of the acrylic sphere. Slowly and carefully, allow the sphere to hang, balancing itself.
13. Let the piece hover and screw the lightbulb into the light socket. Check that the piece can rotate freely.
14. Check that the sphere can be raised and lowered easily, according to the viewer's height. Make sure that when the piece is not in use, the main horizontal pipe should

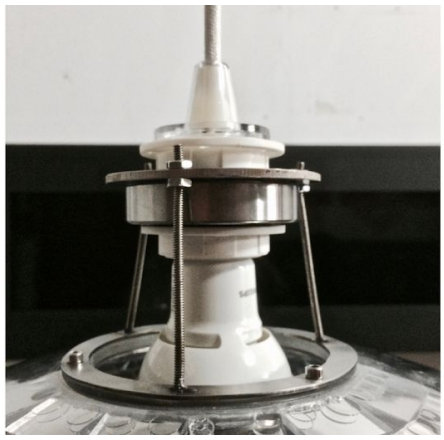
remain completely straight. If this doesn't happen, you need to adjust the weight on the counterweight. To do so, add or remove a weight plate on top of the counterweight until the piece can hold a perfect horizontal position.



IMPORTANT: Please note that the piece uses 50W of power and 110V. If local nominal voltage is more than 120V, you MUST use a step-down transformer to bring the voltage to 120V. A step-down transformer should handle at least 75W of consumption.

15. Turn on the piece by plugging the electric cord to the main wall electric socket or the transformer if needed. If the lightbulb inside the sphere is too bright and needs to be dimmed a bit, use the light dimmer provided. Simply connect one end of the dimmer to the main power cable coming from the aluminium pipe and the other end to the main wall socket. You can also add a light filter to the bulb; either #204, #205 or #206, depending on your needs.





16. Adjust the angle of the spotlight. Ensure that when the sphere is at its main position, that the spotlight emanates an even halo of light around it.

17. Clean the sphere as outlined in the maintenance section.
18. To try out the piece, simply use both hands to raise the sphere over your head, then lower it onto your head and spin it softly. The piece can also be lowered to accomodate a children's height.



Packing and Unpacking the Piece

The piece is shipped in two separate crates; one contains the acrylic sphere and the other contains the main aluminium horizontal bracket and the three aluminum vertical extension pipes.

Unpacking the Sphere:

Open the crate and remove the first layers of the protective bubble wrap.

Remove the light dimmer that has been attached with tape and proceed to take out the first foam layer.

On the next foam layer, carefully remove the two extra bulbs before removing the second foam layer to prevent them from falling. Remove the third layer of foam to completely clear the sphere.

Place back the two extra light bulbs onto the second foam layer when they are not in use, to protect them.

Gently grasp the sphere by its top ring support, lift it until it is completely out of the crate, and carefully place it on a clear table surface. Unwrap the sphere.

Unpacking the Main Horizontal Aluminium Bracket and Vertical Extension Pipes:

Open the crate and remove the first layers of bubble wrap. Carefully remove the various pieces of foam, each of which have been numbered.

Remove the two aluminium pipes from the crate and place them onto a cleared table.

Prior to removing the main bracket from the crate, carefully clear the white cable at the end of the pipe which has been tightly secured with the foam bracket support.

With the help of two people, lift the bracket out of the crate and place it on a cleared table. Proceed to remove the remaining components from the crate.

Please do not throw away any packing material as you will need it again when repacking the piece.

Packing the Sphere:

Wrap the sphere in bubble wrap, ensuring that you cover all the surfaces including the metal supporting ring on the top.

Carefully place the sphere inside the crate on top of the third bottom grey foam layer. Make sure that the sphere is placed straight.

Place the first, second, and third top foam layers on top of the sphere. Place the two extra bulbs in their respective compartments on the second layer, then attach the light dimmer with tape onto the top foam layer.

Add as many layers of bubble wrap as necessary to fully cover any remaining empty space. Close the crate.

Packing the Main Horizontal Aluminium Bracket and Vertical Extension Pipes:

Completely wrap the main horizontal aluminium bracket with bubble wrap.

To protect the spotlights, add a piece of white foam on each side and tape it on top of the bubble wrap.

Wrap up the electric cable coming from the bracket and attach it together with a tie wrap. With the help of two people, carefully place the bracket inside the crate, with the foam support securing it in place.

Place the electric cable and the ceiling installation bracket beneath the pipe, as well as the other tools. Fill any empty space with bubble wrap.

Place the extra screw plate and the medium and the long pipes against one of the corners of the crate and place the four foam pieces, in the order in which they are numbered.

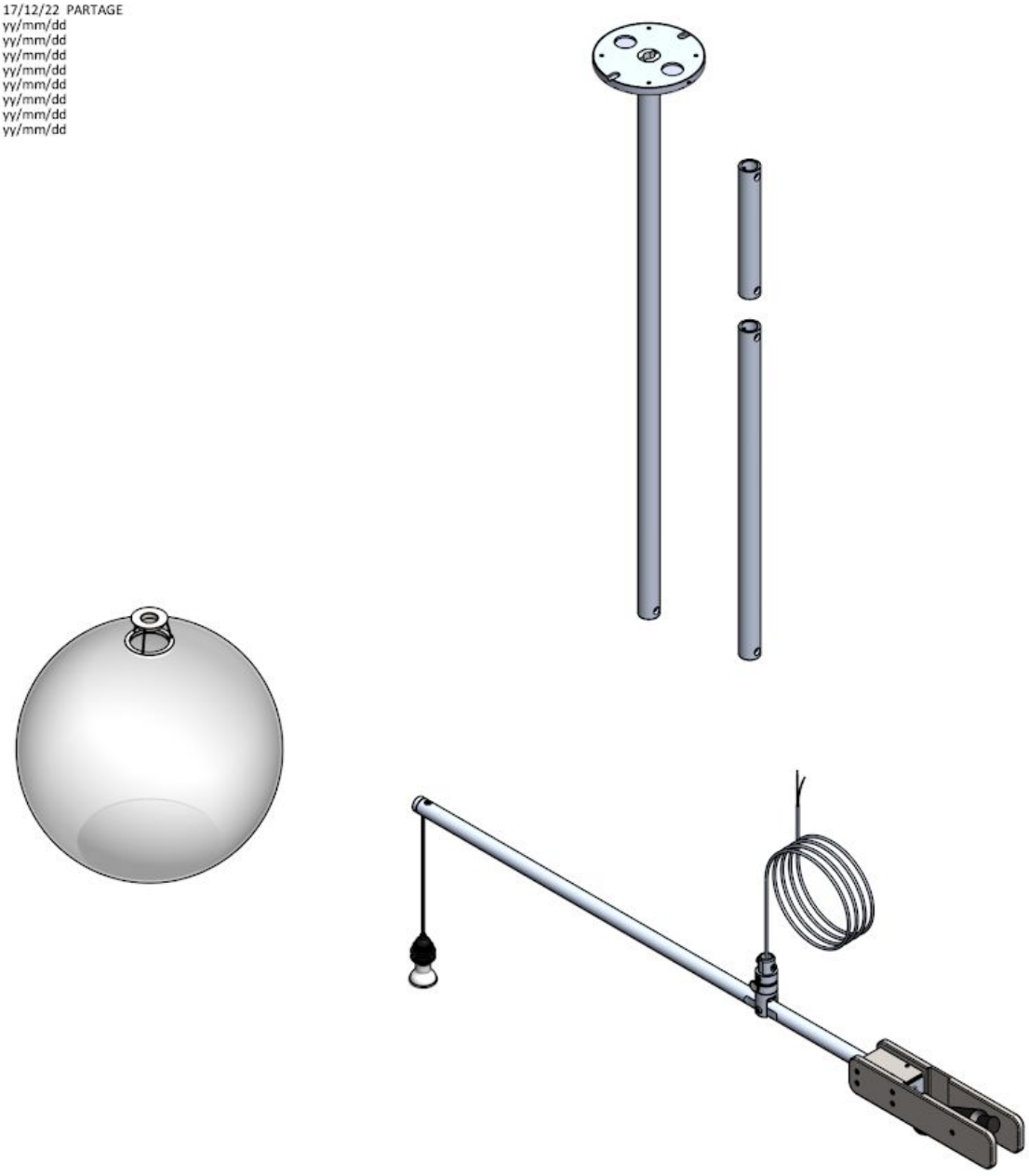
Add as many layers of bubble wrap as necessary to cover any remaining empty space. Close the crate.

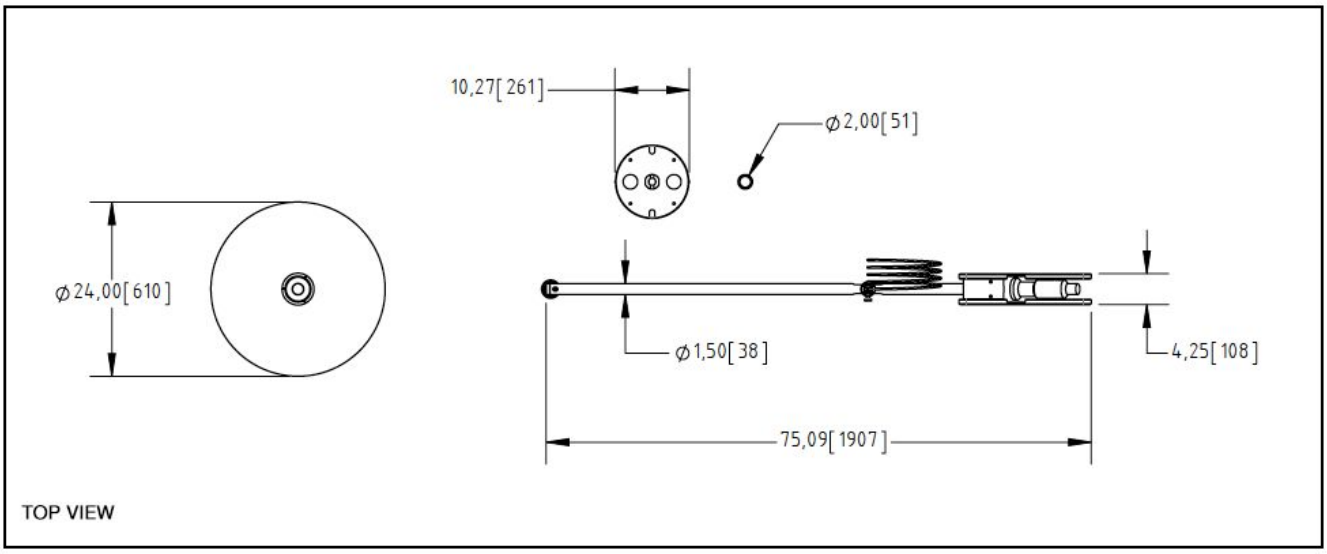
APPENDIX II - TECHNICAL DATA SHEETS

Swivelmount Structure

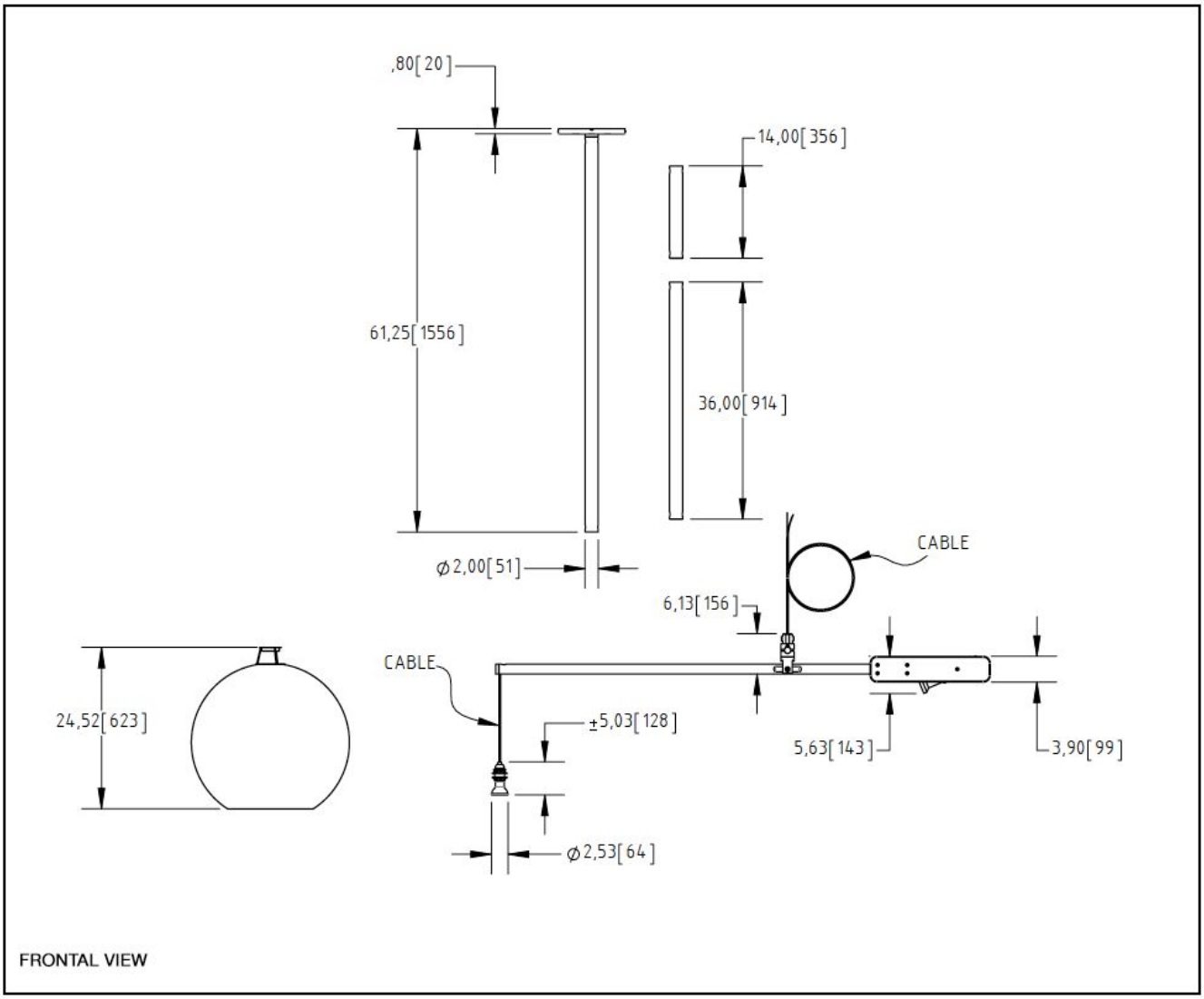
REVISION HISTORY / HIST. RÉVISIONS

R0. 17/12/22 PARTAGE
R1. yy/mm/dd
R2. yy/mm/dd
R3. yy/mm/dd
R4. yy/mm/dd
R5. yy/mm/dd
R6. yy/mm/dd
R7. yy/mm/dd
R8. yy/mm/dd





TOP VIEW



FRONTAL VIEW

Philips Dimmable LED Bulb

This bulb is used inside the acrylic sphere only.
The model used in this artwork is the 6PAR20/F25 3000 DIM with the following specifications:

Energy used	6 Watts
Incandescent/Halogen equivalent	50 Watts
Volts	120
Base	Medium (E26)
Bulb shape	PAR-20
Bulb color	Soft white
CRI	80
Color temperature (Kelvin)	3000 
Brightness (Lumens)	450
Center beam candlepower	1900
Bulb finish	Clear
Average rated life (hr)	25000
Beam angle	25°
Length	3.5 in
Diameter	2.5 in
Damp location	Yes
ENERGY STAR certified	Yes
Dimmable	Yes

ETC Source Four Mini Spotlight

The model used in this artwork is the 4M19 (7063A1000) with the following specifications:

Color	Black
Field angle	19 degrees
Beam angle	14.1 degrees
Diameter	Steel yoke 0.4" (10.3 mm)
Transformer	GE Lightech 230/12 V Class 2 potted electronic halogen transformer
Input current	0.28A
Field lumens	440 lm
Beam lumens	320 lm
Output voltage	11.7V
Lamp	Ushio 50 W Eurostar IR MR-16 lamp
Lamp life	5000-hour average lamp life
Color temperature	3000K
Operating temperature	32 to 104°F (0 to 40°C)
Dimensions (WxHxD)	5.2 x 7.1 x 9.6" (13.2 x 18.0 x 24.4 cm)
Weight	2.6lb (1.2kg)

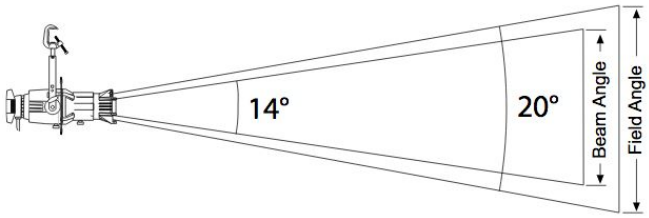
This unit has the following photometry specifications.

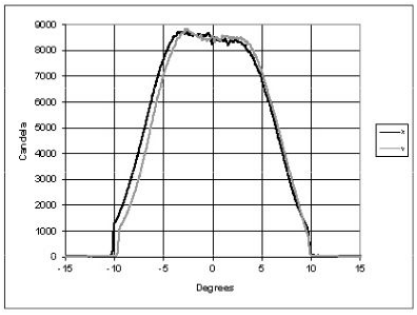
PHOTOMETRY

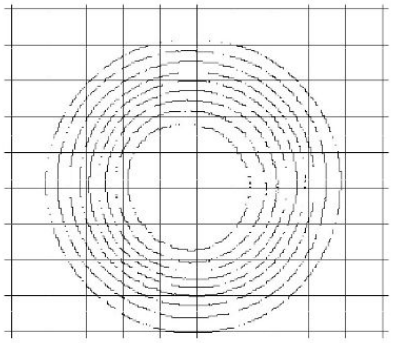
19 degree

FIELD LUMENS	BEAM LUMENS	BEAM ANGLE	FIELD ANGLE	CANDELA	LUMENS PER WATT
440	320	14.10°	19.54°	8,830	8.76

THROW DISTANCE	10ft 3.0m	15ft 4.6m	20ft 6.1m	30ft 9.1m
FIELD DIAMETER	3.4ft 1.0m	5.2ft 1.6m	6.9ft 2.1m	10.3ft 3.1m
ILLUMINANCE (FC)	88.3	39.2	22.1	9.8
ILLUMINANCE (LUX)	950	422	238	106







Here are the detailed physical dimensions of the unit.

ETC® **Source Four Mini™**

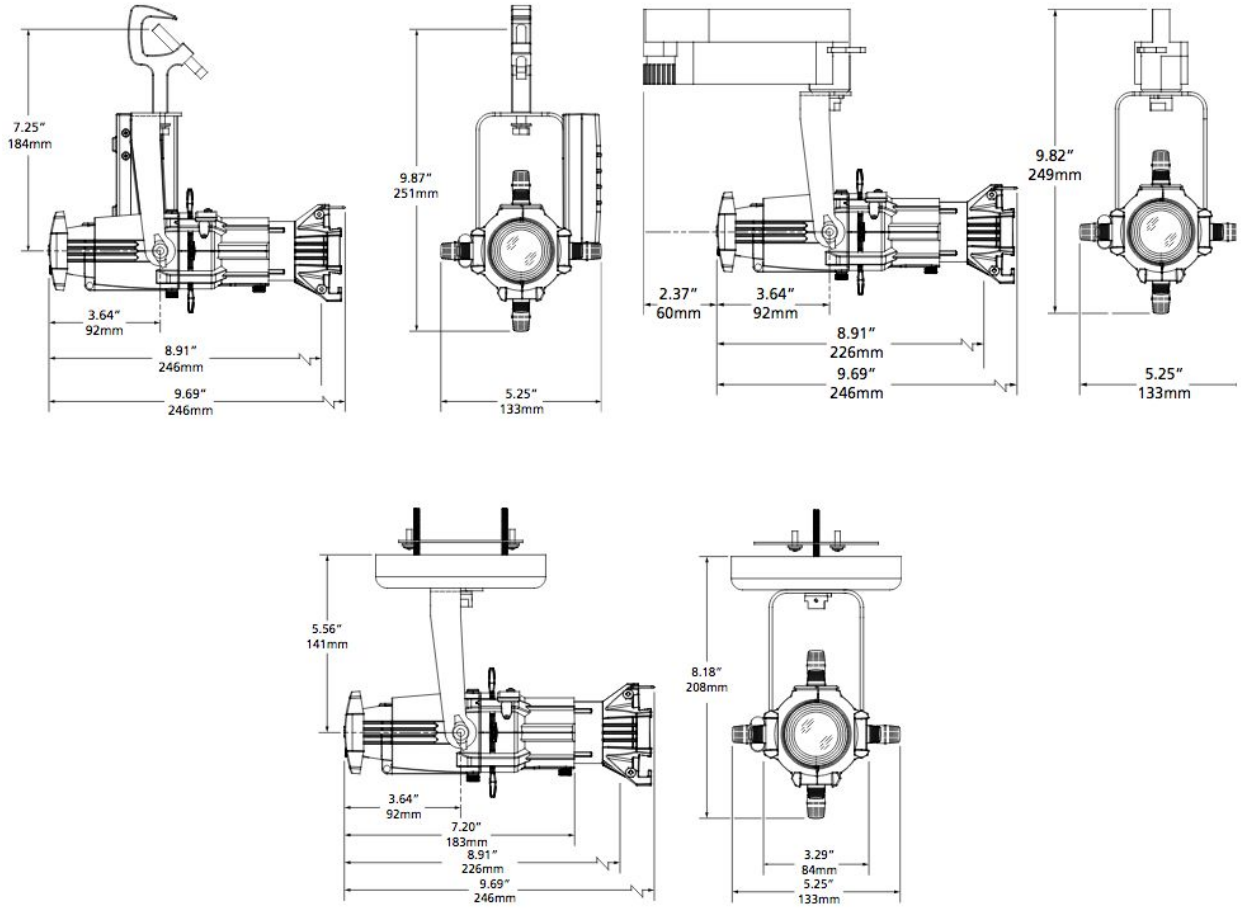
4M Series

PHYSICAL

Source Four Mini Weights and Dimensions

	WEIGHT		SHIPPING WEIGHT	
	lbs	kgs	lbs	kgs
Portable	2.7	1.2	3.8	1.7
Install Canopy	2.6	1.2	3.7	1.7
Track Mount	2.4	1.1	3.6	1.6

*Shipping Dimensions: 12.6" x 10.8" x 6"



Two-way Acrylic Mirrors

Mirror Properties

Physical	Test method	Units	FABBACK
Specific Gravity/Relative Density	ASTM D-792 / ISO 1183		1.19
Water Absorption	ASTM D-570 / ISO 62	% By wt	0.4

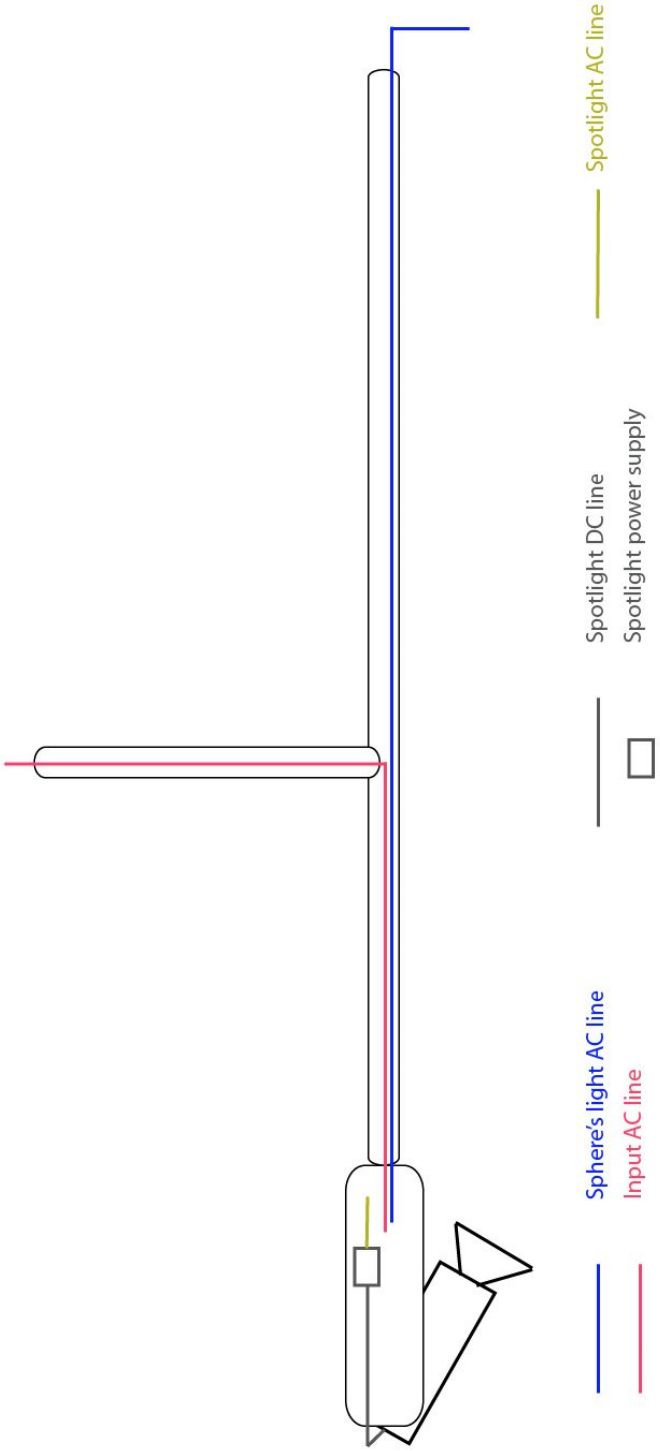
Mechanical	Test method	Units	FABBACK
Tensile Strength	ASTM D-638 / ISO 527	psi	**11,030
Tensile Modulus of Elasticity	--	psi	**490,000
Flexural Strength	ASTM D-790 / ISO 178	psi	**17,000
Izod Impact Strength – Molded Notch	ASTM D-256 / ISO 180	ft-lb/in Notch	**0.4
Rockwell Hardness	ASTM D-785 / ISO 2039-2		**M-95

Thermal	Test method	Units	FABBACK
Maximum Recommended Continuous Service Temperature		°F	160
Softening Temperature		°F	210-220
Melting Temperature		°F	300-315
Deflection Temperature @ 264 psi (1.8 MPa)	ASTM D-648 / ISO 75-2/A	°F	203
Deflection Temperature @ 66 psi (0.45 MPa)	ASTM D-648	°F	207
Coefficient of Thermal Expansion	ASTM D-696 / ISO 11359	in/(in-°F) x 10^{-5}	3.0
Flammability (Burning Rate)	ASTM D-635	In/minute	1.019
Smoke Density Rating	ASTM D-2843	%	3.4
Self-Ignition Temperature	ASTM D-1929	°F	833

**Applicable to the acrylic substrate

APPENDIX III - ELECTRICAL WIRING DIAGRAM

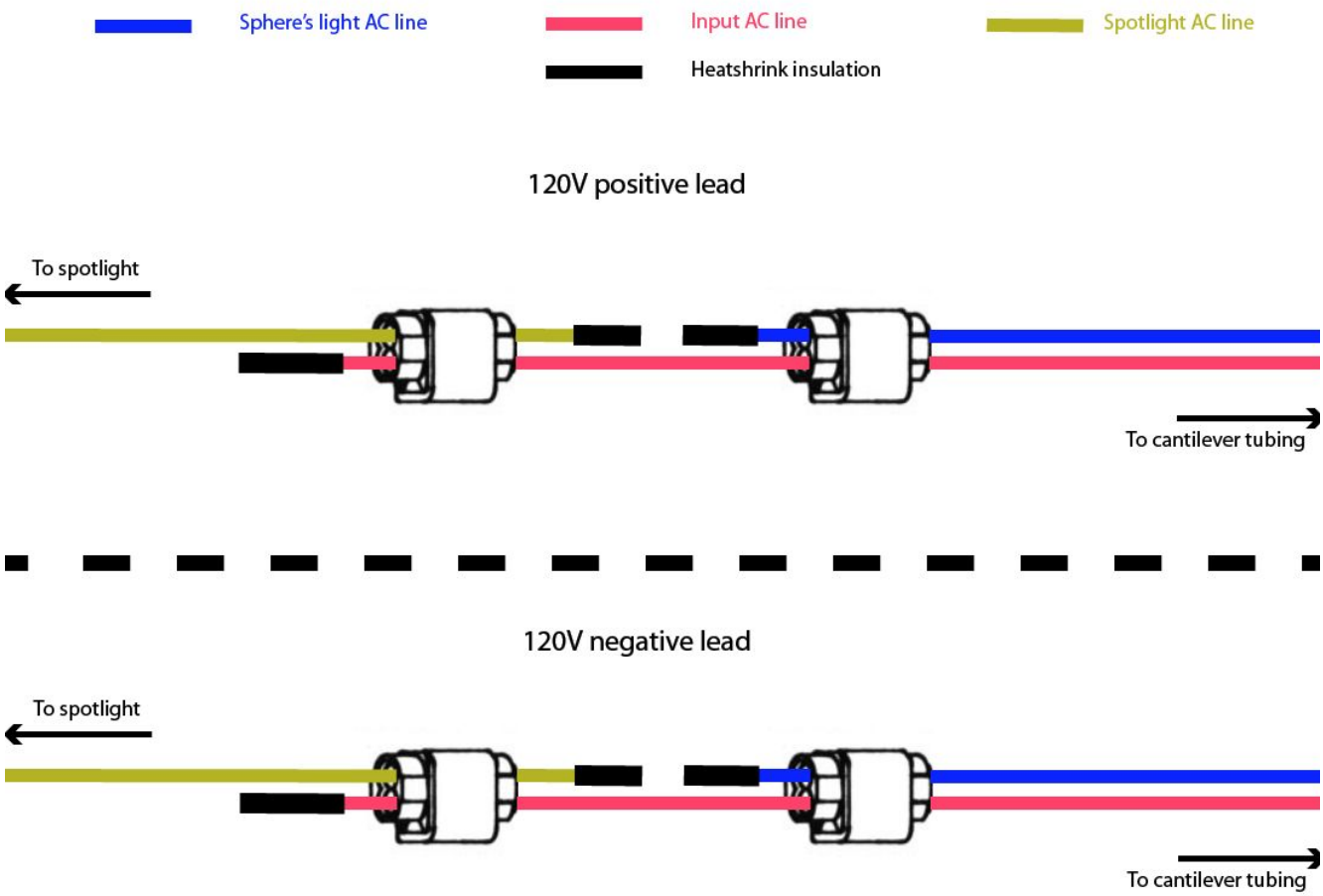
Cable Run (in the Structure)



Electrical Junctions

The electrical junctions are made up of three cables: the Input AC line, the sphere's LED light line, and the spotlight power supply. The following diagrams explain the connections. The white wires are the neutral/negative leads and the black wires are the positive leads. They are all connected in parallel, as shown below.

Electrical junctions could either be made up this way:



Alternatively, the electrical junctions could also be made up this way: