SWAY

BY RAFAEL LOZANO-HEMMER

Version : 2025-05-05

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GENERAL IMPORTANT INFORMATION

This short section must be read for proper operation.

SWAY (2016)

BY RAFAEL LOZANO-HEMMER

Technique

Rope, wood, steel, carbon fiber, LCD display, actuator, micro-controller.

Description

"Sway" is a kinetic sculpture that responds to data; it is a computer-controlled metronome that oscillates to the rhythm of a specific statistic. The rope was braided onto a thin vertical carbon fiber rod to make it stand upright and the floor rope acts as a free-standing base. The piece stands on a wooden plinth which contains a small motor and an electrical circuit that makes the noose sway and pendulate almost imperceptibly from time to time. The sway adds to the trompe l'oeil effect of the rope hanging upside-down. The collector or curator may choose the frequency with which the rope sways, with the default value being around once every 40 to 60 seconds, which represents the rate of homicides in the World. Other possible numbers include the rate of suicides, one every 30 to 50 seconds, the rate of drug-war related murders, one every 25 to 35 minutes, or the rate of journalists killed, one every couple of days.

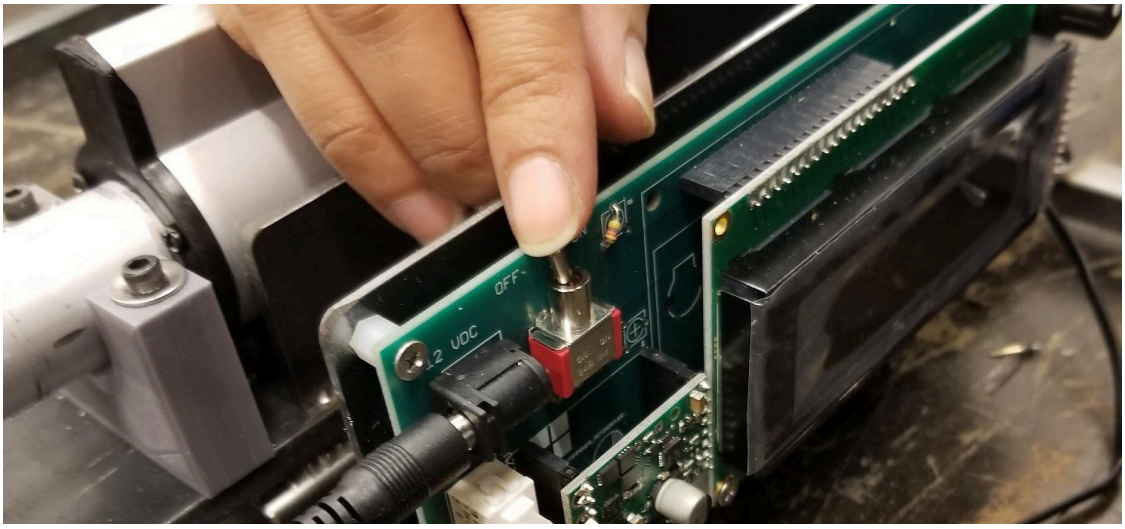
There are many artists who have worked with the noose throughout Art History, but there is one precedent to this work that is essential to reference: unbeknownst to Lozano-Hemmer, artist Fermín Ceballos made an upside-down noose for his exhibition "Perturbación" in the Centro Cultural de España in Santo Domingo, Dominican Republic, in 2012.

Operation

Please refer to Appendix I - Installation for detailed information and wiring diagram.

1. Connect the sculpture to electrical power using the power supplies and cables provided.

2. Turn on the sculpture using the power switch on the LCD display found at the base of the rope, beneath the plinth. The rope should begin oscillating or swaying after a few seconds. Consult the image on the next page to see where the switch is located



General Artwork Behaviors

The noose is activated by the actuator and moves by a few millimetres, then sways back and forth for a few seconds before stabilizing in its rest position. The pace at which the movement would happen will depend on the selected statistic.

Maintenance

To clean the ropes, use a clean toothbrush and softly brush the rope in one direction, only until the dust and/or the stain disappears.

If the stain does not come out, use ANC Pull Out 2 spray cleaner. When using this product, make sure to wear nitrile gloves, a mask with proper filters for particles, and a pair of safety glasses as you want to avoid any contact between the spray, your eyes, and your skin. Make sure you use the product in a **very well-ventilated area**.

Shake the ANC Pull Out 2 and spray lightly onto the affected area in a circular motion. Use compressed air if it is available; aim the air hose at the treated area and, from a distance of about two feet (60 cm), very gently spray the treated area until a white crusty powder appears. Wait a few seconds for full absorption (the stain should rise to the top of the powder), then, with a heavy force of air, blow off the remaining residue.

If compressed air is not available, spray the cleaner as described above. Wait until a crusty white powder appears (typically 5-10 minutes), then brush off the residue using a clean, dry toothbrush. The stain should disappear at this point. Repeat if necessary.

Use ANC Pull Out 2 cleaning product ONLY when necessary. Never use water or any liquid soap or any other cleaner that requires wetting the rope.

To clean the plinth, use a damp and clean cotton rag and gently rub the affected area until the stain or blemish disappears. If the stain persists, use a sponge and gently scrub the stain until it goes away, while being careful not to remove the paint. Dry the surface with a clean cotton rag.

Placement Instructions

Important Note: Please wear gloves at all times while handling the artwork. The rope and the plinth are very susceptible to marks and dirt.

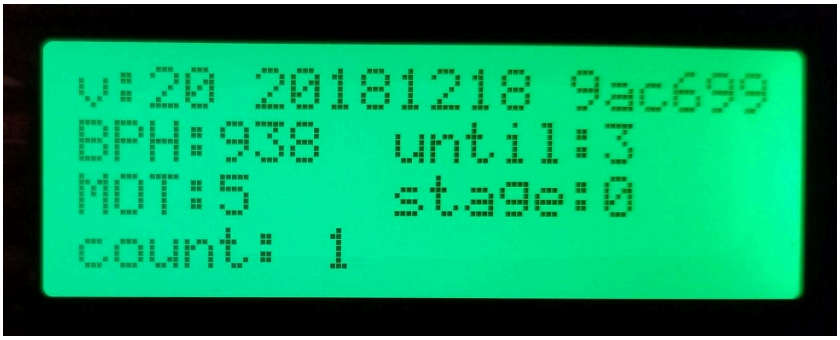
Make sure the floor the sculpture is sitting on is even with no significant slant. Consult the artist studio with regards to placement of the sculpture within a space.

The lighting of the artwork should be relatively even on the whole sculpture so visitors can appreciate the whole unit. This said, having brighter lighting around the noose part of the sculpture and its base is also an option. The sculpture could also cast a sharp shadow on a surrounding wall. Please see examples on our website.

DETAILED TECHNICAL INFORMATION

Normal Software Operation

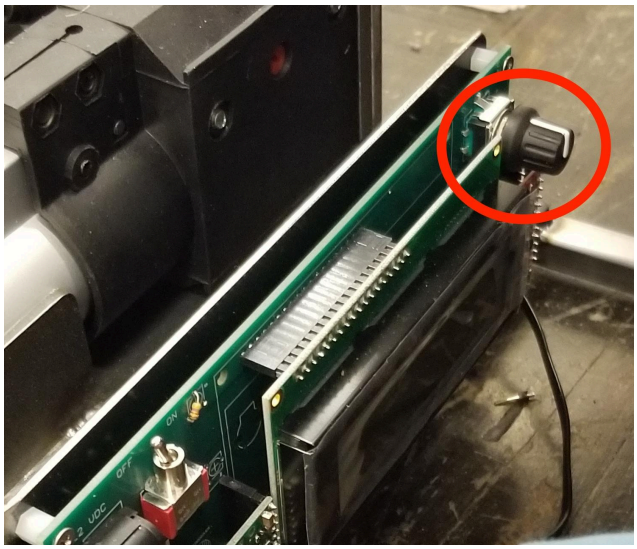
When the software starts up, the LCD display will light up and show the following message:



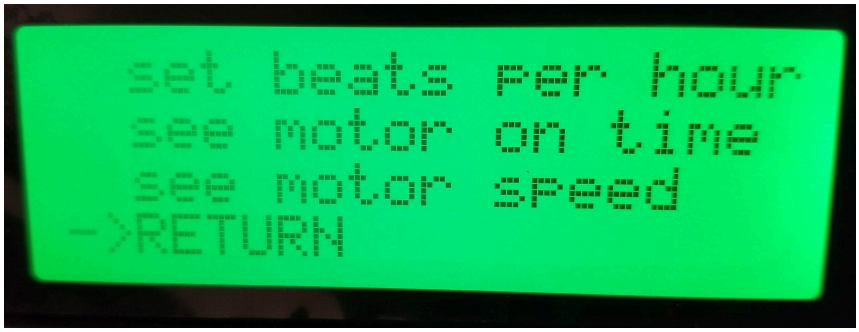
Once the software boots, the sculpture will go to its point of reference, which should be perfectly perpendicular to the floor. At this point, the display shows a countdown describing the duration (in seconds) of the actuators' movement; as the actuators move in-and-out, the rope will sway according to this predetermined rhythm.

Manual Software Calibration

In the event that some adjustments need to be made to the rhythm of the rope's movements, you will need to access the software. You can access the menu by pressing on the knob found on the right of the display, as shown below.



After pressing the knob, you'll have access to the software menu.



Here, you will see four options displayed: **set beats per hour**, **see motor on time**, **see motor speed** and **RETURN**. The only option available for adjustments is **set beats per hour**.

BPH/Beats per hour allows you to change the frequency of swaying of the rope. For example, if you want the rope to sway every 4 seconds, you would set the BPH to 900, by calculating the beats per hour (there are 3600 seconds in an hour, which, divided by 4, gives you 900.) This is the number you should set this parameter to.

Statistics

The specific statistics to use should be approved by the artist's studio and not adjusted once on site. The following table lists the most common statistical data used by the artist's studio to set up the frequency, or beats-per-hour, for the sculpture, based on 2019 statistical data.

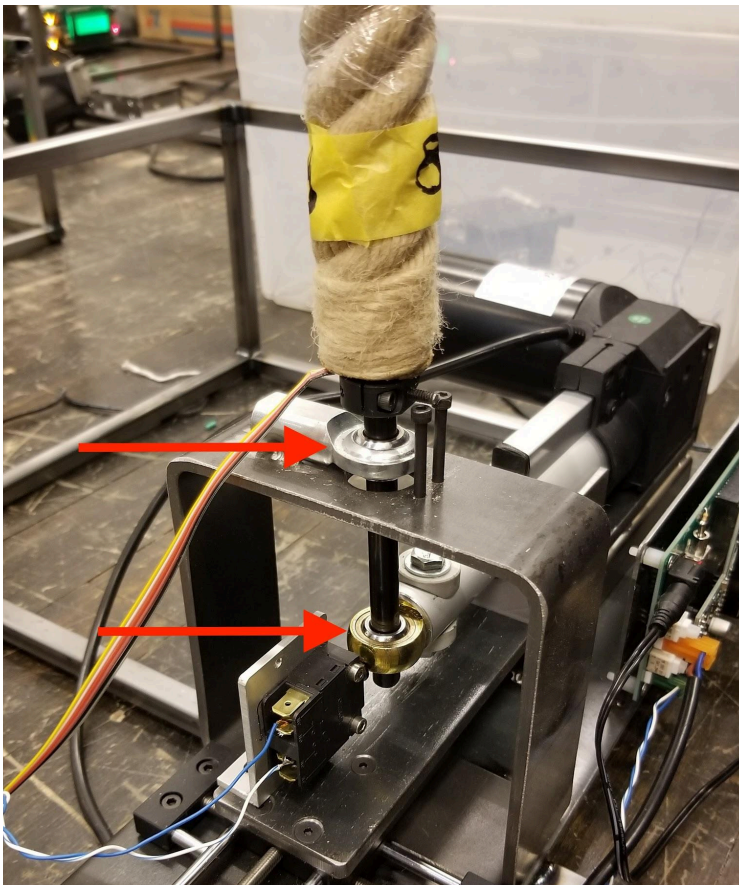
Statistic #1	Forced displacement	22.40 per minute	1344 pulses per hour	Every 2-3 seconds
Statistic #2	Murder	0.85 per minute	51 pulses per hour	Every 70-71 seconds
Statistic #3	Environmental crime	14.40 per minute	864 pulses per hour	Every 4 seconds
Statistic #4	Extermination due to poverty	57.07 per minute	3424 pulses per hour	Every 1 segundo
Statistic #5	Enslavement	18.53 per minute	1112 pulses per hour	Every 3 seconds
Statistic #6	Forced disappearance	0.0039 per minute	1 pulses per hour	Every 3600 seconds
Statistic #7	Sexual violence	17.12 per minute	1027 pulses per hour	Every 4 seconds
Statistic #8	Torture and cruel treatment	11.42 per minute	685 pulses per hour	Every 5 seconds

Preliminary Troubleshooting Steps

IMPORTANT NOTE: Each time the rope has to be taken out of the structure for troubleshooting, the entire rope surface needs to be covered in wrapping plastic. Please wear gloves at all times.

The rope is not swaying.

If the rope is not swaying, it could be caused by two things. First, check that the metal rod inside the rope is still properly inserted into the two circular metal bearings (see the photo below). Before making sure that the rod is securely in place, first turn the sculpture off by flicking the power switch.



If the rod is correctly in place, we might have an issue with the motor. The first thing to check is if the display shows a value of 0 for the “Until” section and if the small LED near the limit switch connector - bottom left of the board - is lit (consult the PCB section). In such a case, we could try to fine tune the motor by retracting it a bit. To do so, flick the main switch Off, disconnect the limit switch from the board, then flick the switch On, then press on the button located between

the motor connector and the limit switch connector: the motor should retract a bit towards the inside, in such case you shouldn't move it more than 1 centimetre, but enough to have a gap between the limit switch and the motor's eyelet. At that point, flick the switch Off, reconnect the limit switch to the board and flick the switch On again. The artwork should be back on track.

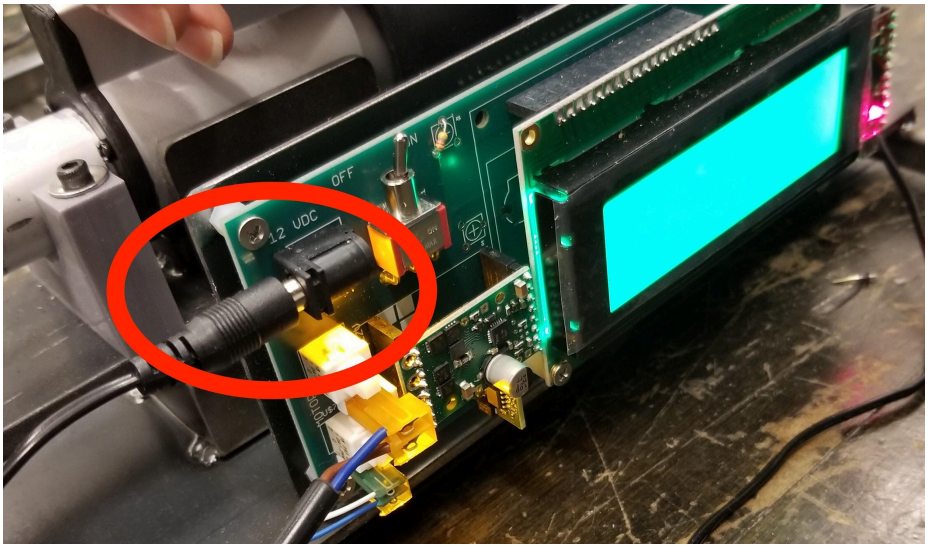
If the rod is correctly in place, and the rope is still not swaying, the motor might be dead. If the actuator does not move at all, then there is no power from the motor. First, make sure that the motor is still properly connected to the logic board (consult the Wiring Diagram). If the motor is properly connected and is still not working, then it needs to be replaced. Please follow the motor replacement procedure outlined in Appendix IV.

The rope is not straight.

As was the case for the rope not swaying, it may be that the rod is not properly inserted in between the two bearings found inside the base. Check that the rod is still properly in place, and, if the rope is still not straight, you might need to re-calibrate the XY axis. Refer to the Appendix I - Installation section describing how to calibrate the axis.

The display is not turning on.

Make sure the display is properly connected to the power supply. Refer to the wiring diagram.



The back cover panel of the plinth fell off.

The panel is held in place with magnets. Ensure that the magnets are all aligned properly when placing the panel onto the plinth.

The noose is crooked.

There are small metal rods inside the noose which help keep its circular shape. These nooses are very delicate, therefore please contact the studio before manipulating the nooses.

The braided rope is loose.

To reduce any gaps between the rope strands, hold the rope below the coiled neck of the noose and gently tighten it by moving downwards in the direction that the rope has been braided until reaching the base of the rope.

If some gaps persist, stitch the strands together using the stitching thread provided (Gütermann col #520) in an invisible stitch. See Invisible Stitch for stitching instructions. If glue is needed, only use Beacon FabricTac glue as it is a special glue for fibers which dries clear and stays clear overtime. Glue should be used only as a last resource.

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
4462 rue Saint-Denis
Montréal, Québec, Canada
H2J 2L1
Tel 1-514-597-0917
info@antimodular.com
www.antimodular.com

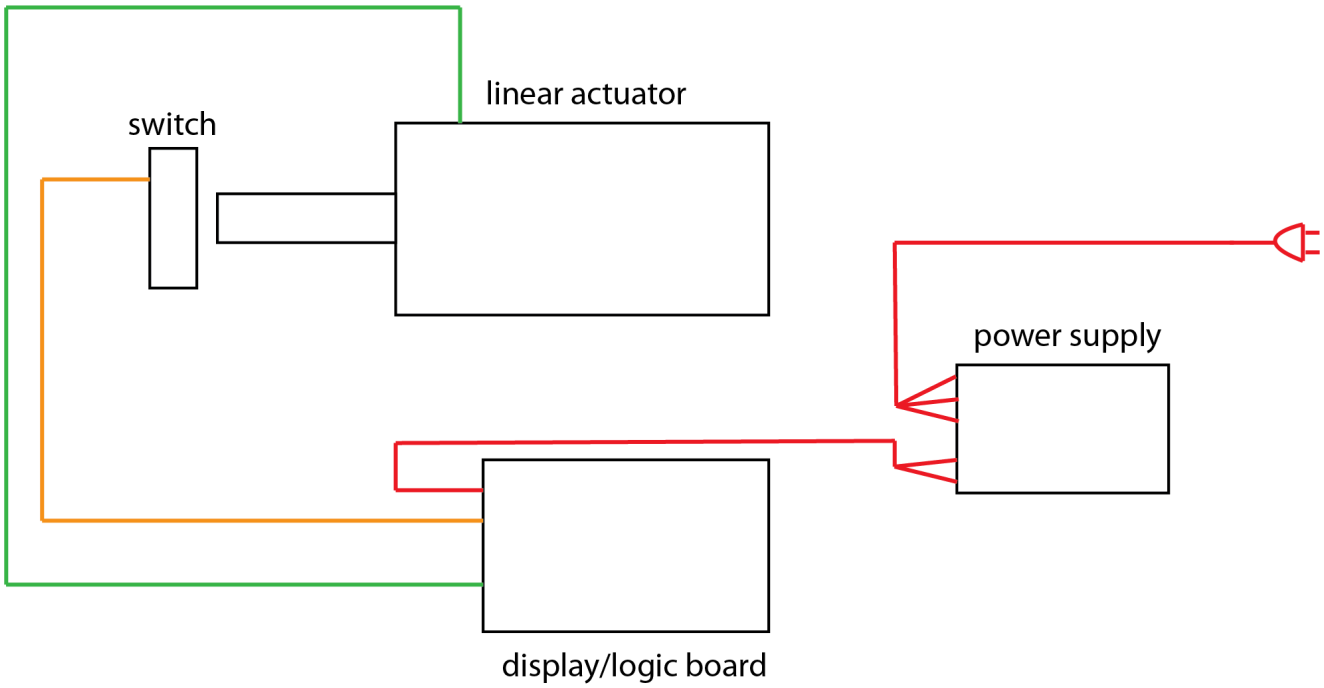
APPENDIX I - INSTALLATION

Description of Components

This artwork requires the following components:

Component	Description
Rope with carbon fibre rod	Four-strand twisted spun polypropylene rope. Wrapped around a carbon fibre rod to create the noose component of the sculpture. - (Specs in section Carbon Fiber Rod & Rope)
Collar clamp	Holding the Fiber rod at the right height, in the right orientation. - (McMaster 9746T12)
Internal skeleton metal frame	The steel frame hidden under the plinth, hosting the actuator, the PCB, the mechanism and the power supply. A balljoint (McMaster 60645K34) is welded on top to help aligning the rod. - (Specs in section Internal Skeleton Metal Frame Drawings & Foam Panels Drawings)
Plinth	The shell hiding the skeleton. Within the plinth, we retrieve foam blocks, supporting the internal metal frame. (Specs in Plinth)
Magnets	Four magnets hold the removable section of the plinth in place. - (Specs in Magnets)
PCB	Logic board, controlling the linear actuator and mechanism of the artwork. (Parts listed in PCB)
Linear actuator	Stroke electric linear actuator. Integrated into the base of the piece, beneath the plinth. As the actuators move in-and-out, the rope will sway according to a predetermined rhythm. - (Specs in Linear Actuator & Rod end)
Limit switch	Used to limit the movement of the rope - (Digikey SW980-ND)
XY stage	Allows a fine adjustment of the rope hosting point so the rope stands vertically. - (XY Axis Manual Stage Sliding Table Adjust Platform 40*40mm Travel 50*50mm/20*20mm /80*80mm)
Power supply	12VDC, 6 amps, open frame power supply. (Digikey 285-1825-ND)

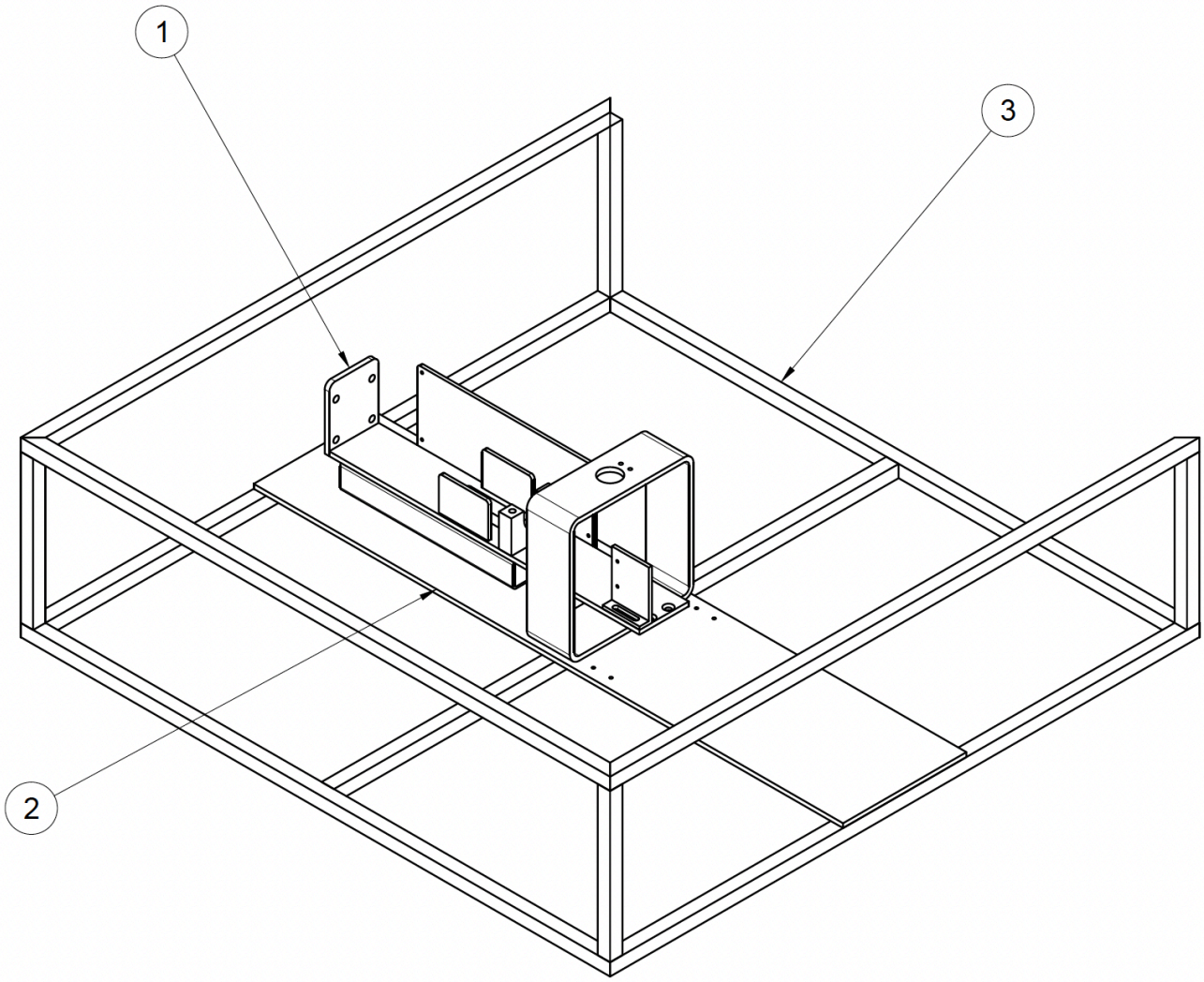
Wiring Diagrams and Connections

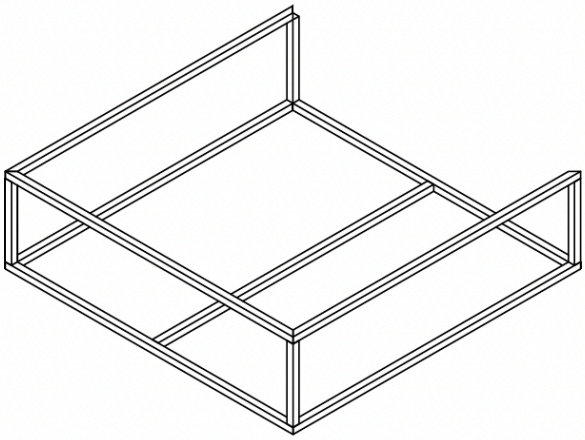


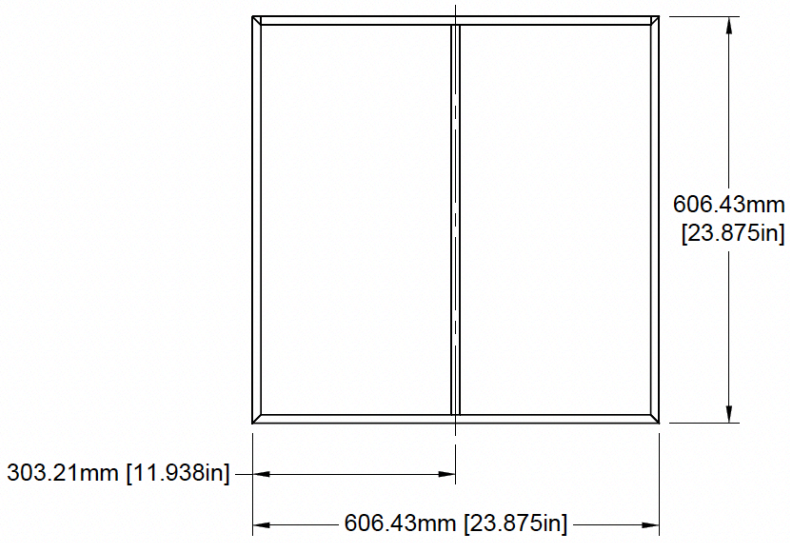
APPENDIX II - TECHNICAL DATA SHEETS

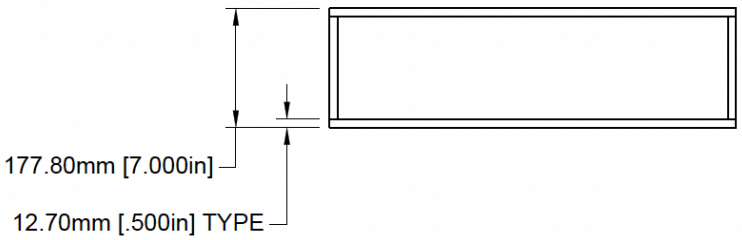
Internal Skeleton Metal Frame Drawings

PARTS LIST	
ITEM	PART NUMBER
1	SUBASSEMBLY 1
2	SUBASSEMBLY 2
3	FRAME



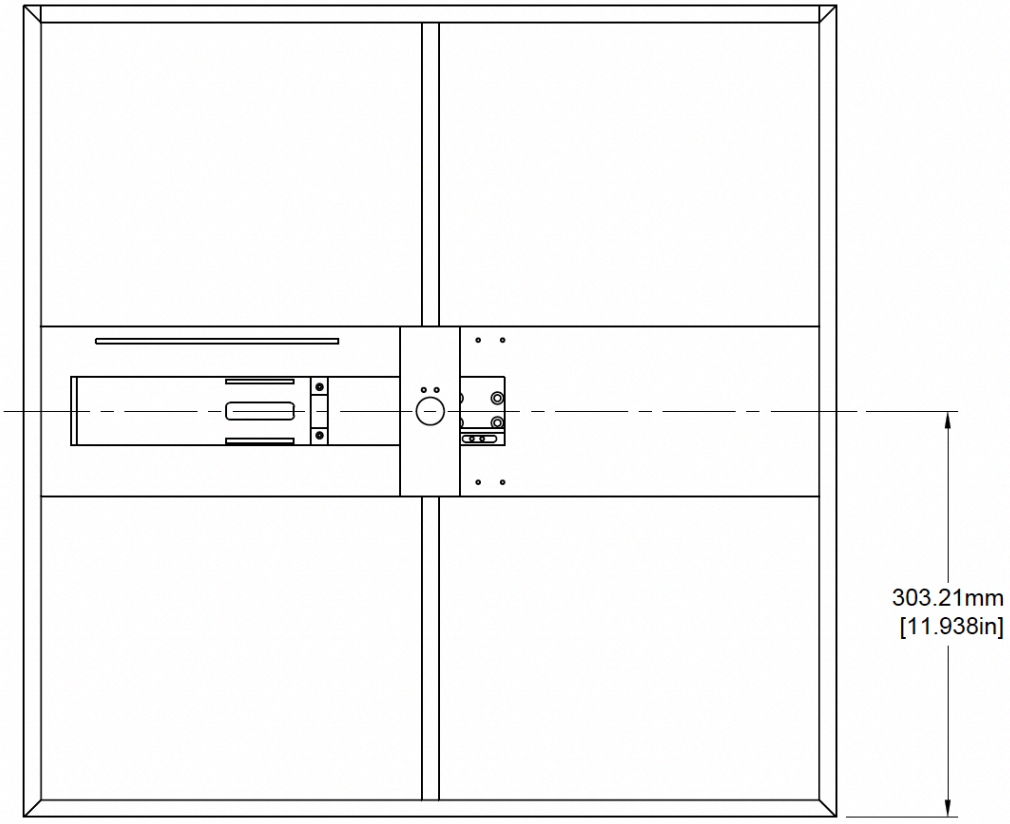






PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Frame	A			
DRAWN	William Sutton 2022-10-19	SCALE 1:10	MATERIAL Steel	SHEET 2/15	

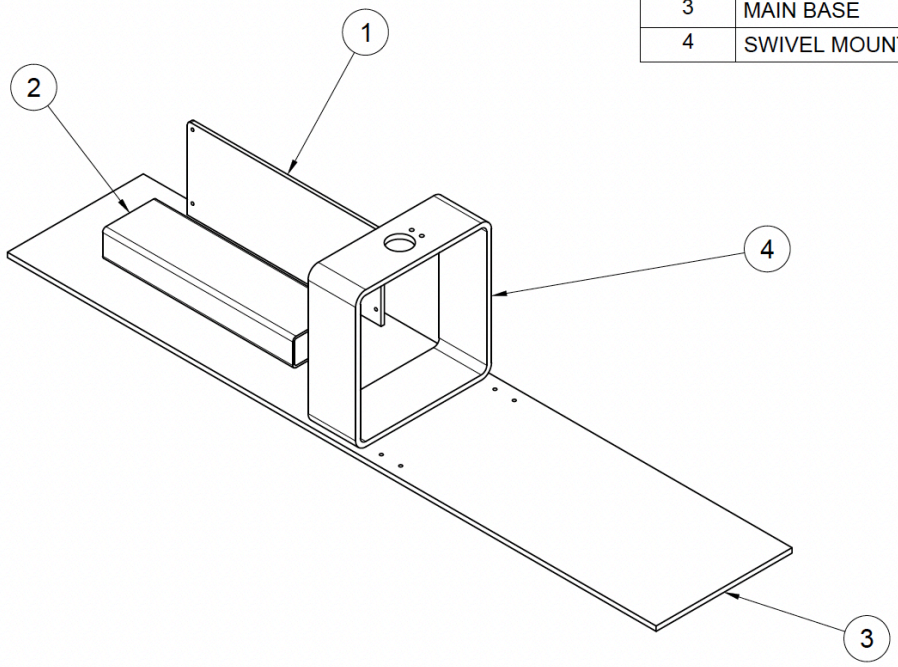
Assembly of the Main Base onto the Frame

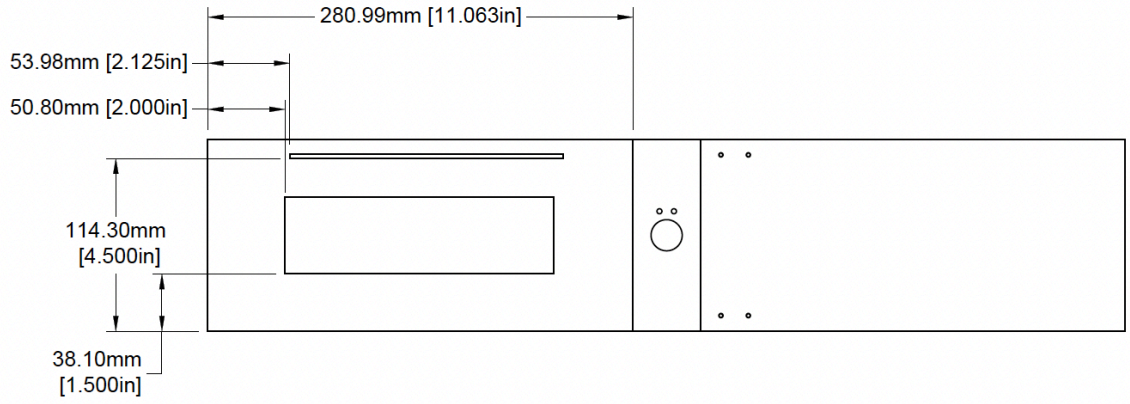


PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Metronomos	A			
DRAWN	William Sutton 2022-10-19	SCALE 1:5	MATERIAL Steel		SHEET 3/15

Assembly of the components onto the Main base (Subassembly 2

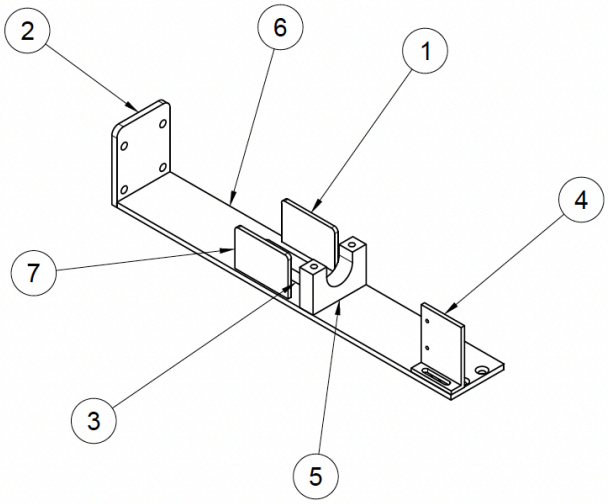
PARTS LIST	
ITEM	PART NUMBER
1	PCB MOUNT
2	PISTON REST PLATE
3	MAIN BASE
4	SWIVEL MOUNT



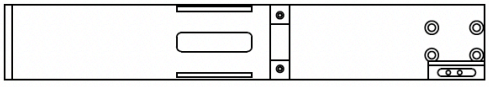


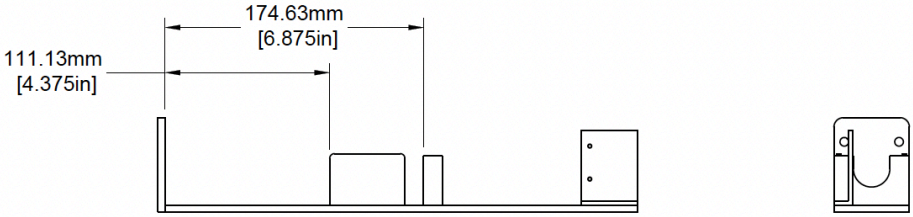
PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Subassembly 2	A			
DRAWN	William Sutton 2022-10-19	SCALE 1:8	MATERIAL Steel		SHEET 4/15

Assembly of the components onto the Subassembly 1



PARTS LIST	
ITEM	PART NUMBER
1	PISTON LEFT SIDE SUPPORT
2	PISTON MOUNT
3	PISTON UNDERSIDE SUPPORT
4	SENSOR MOUNT
5	PISTON SLIDE
6	PISTON BASE
7	PISTON RIGHT SIDE SUPPORT





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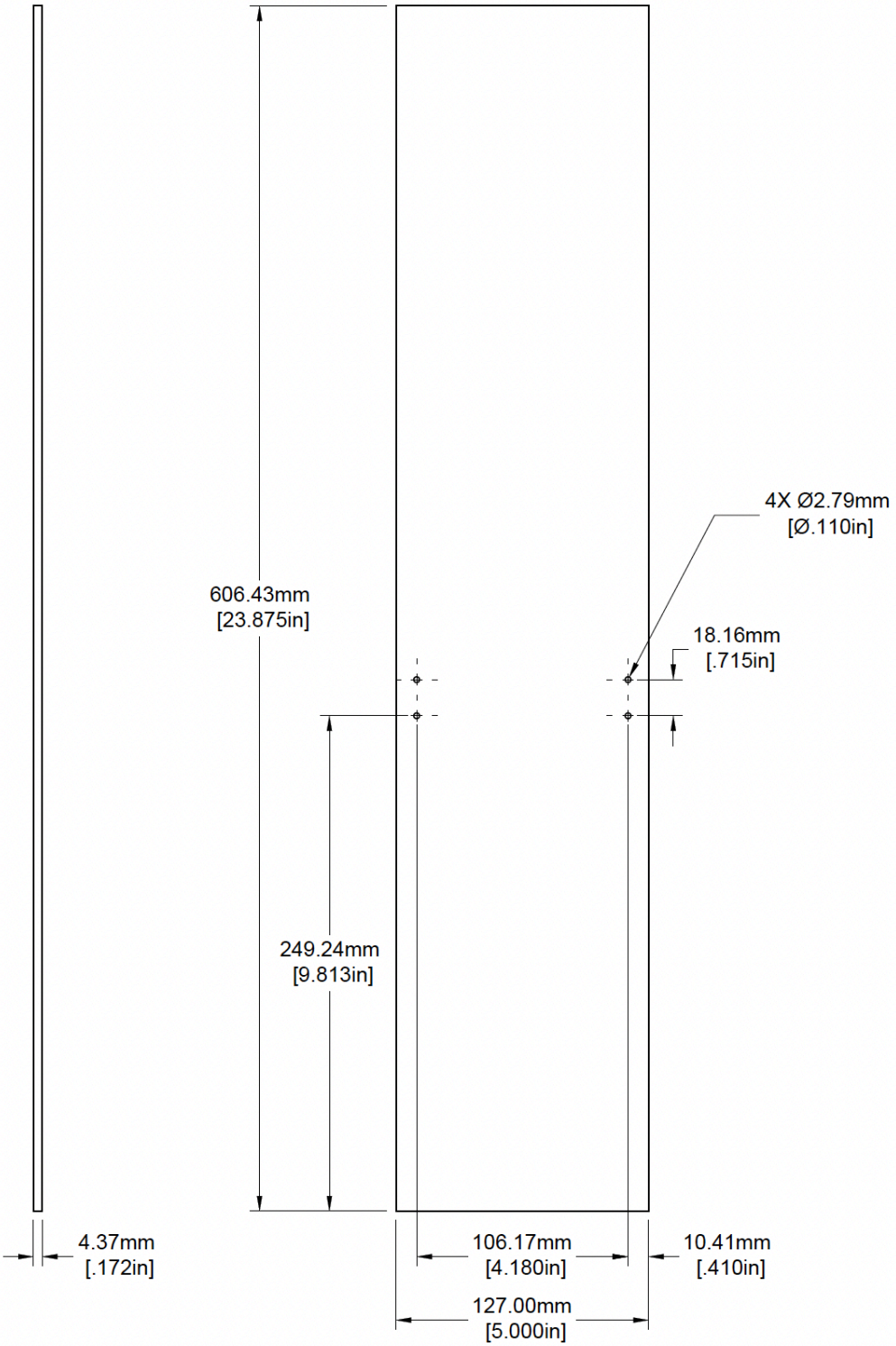
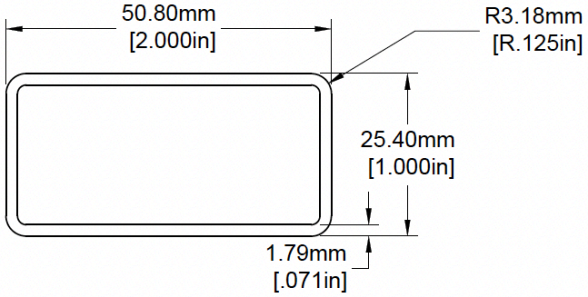
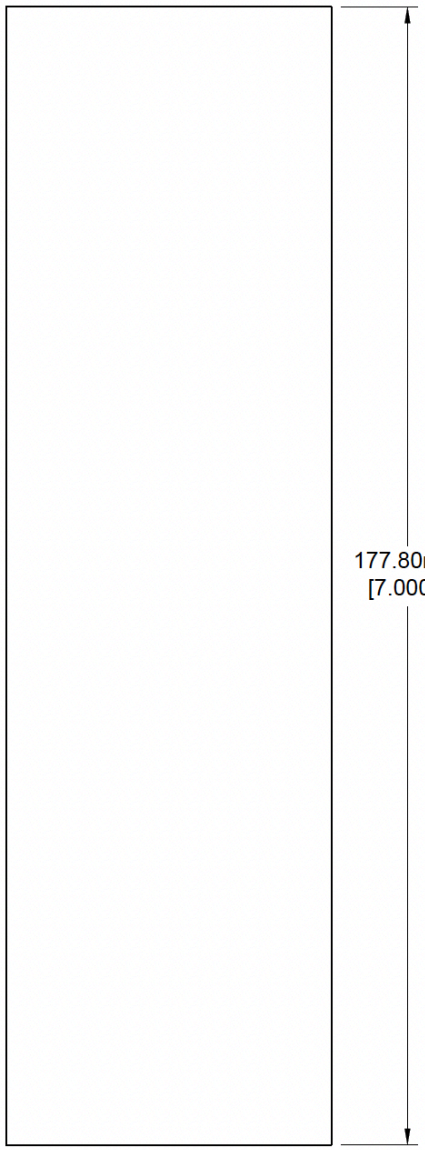
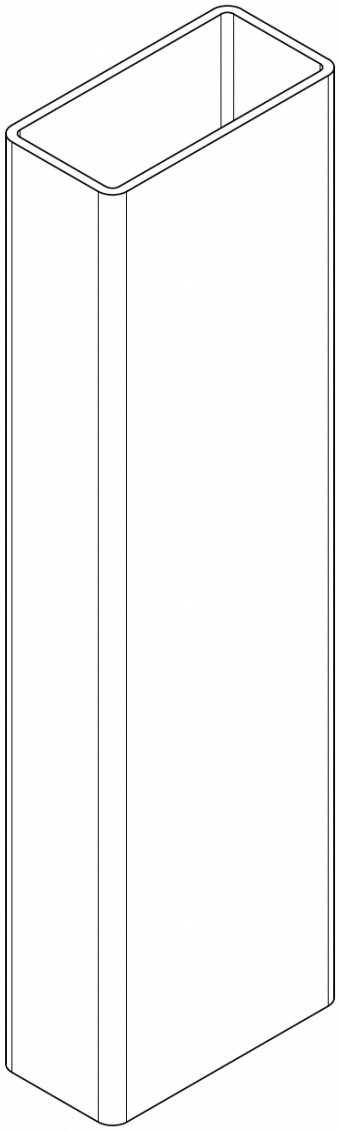
PART	Subassembly 1	A			
DRAWN	William Sutton 2022-10-19	SCALE 1:4	MATERIAL Steel		SHEET 5/15



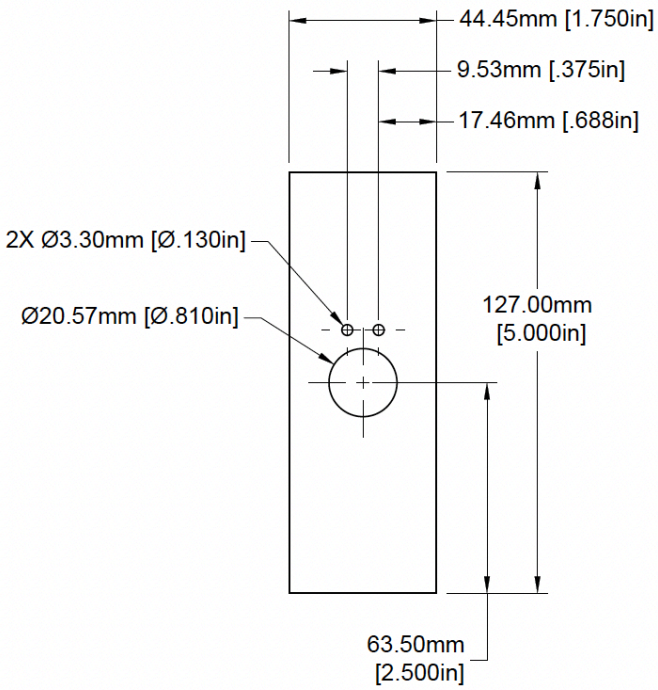
PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Main Base	A			
DRAWN	William Sutton 2022-10-19	SCALE 1:3	MATERIAL Steel		SHEET 6/15

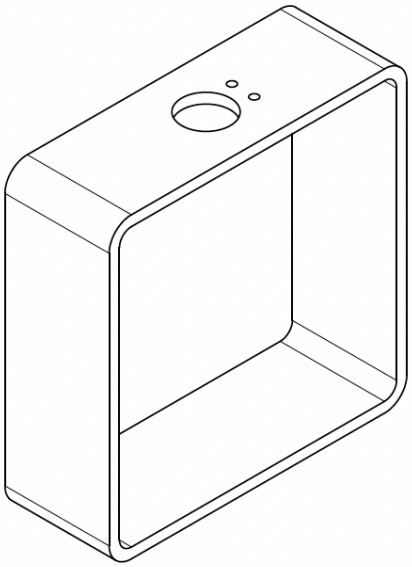


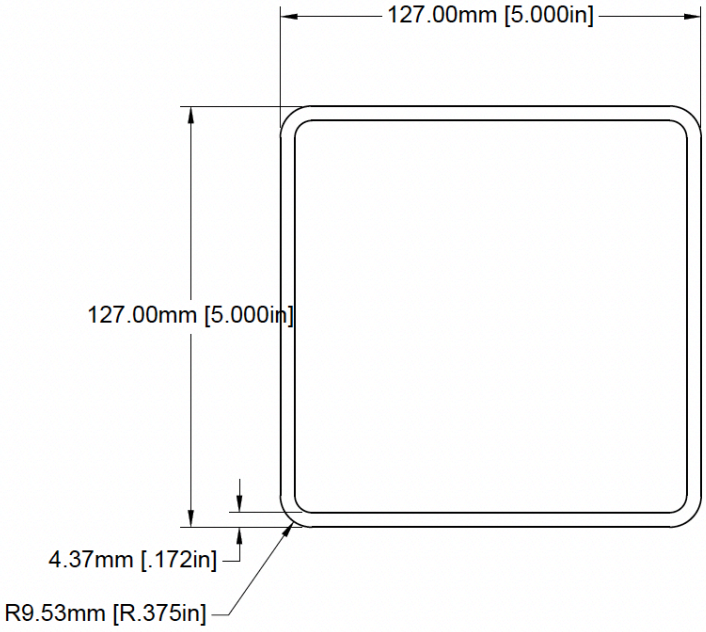




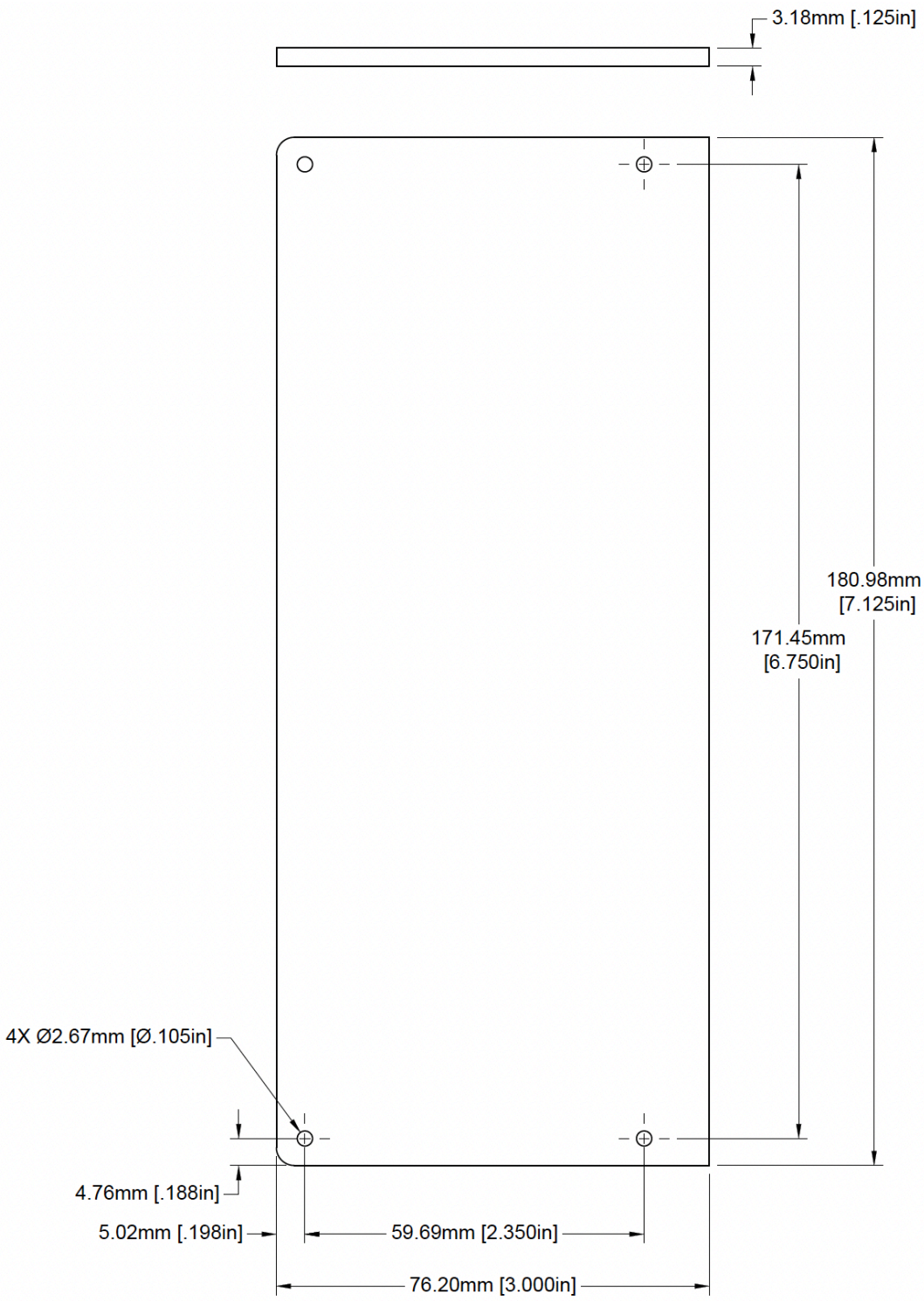
PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Piston Rest plate	A			
DRAWN	William Sutton 2022-10-19	SCALE 1:1	MATERIAL Steel		SHEET 7/15



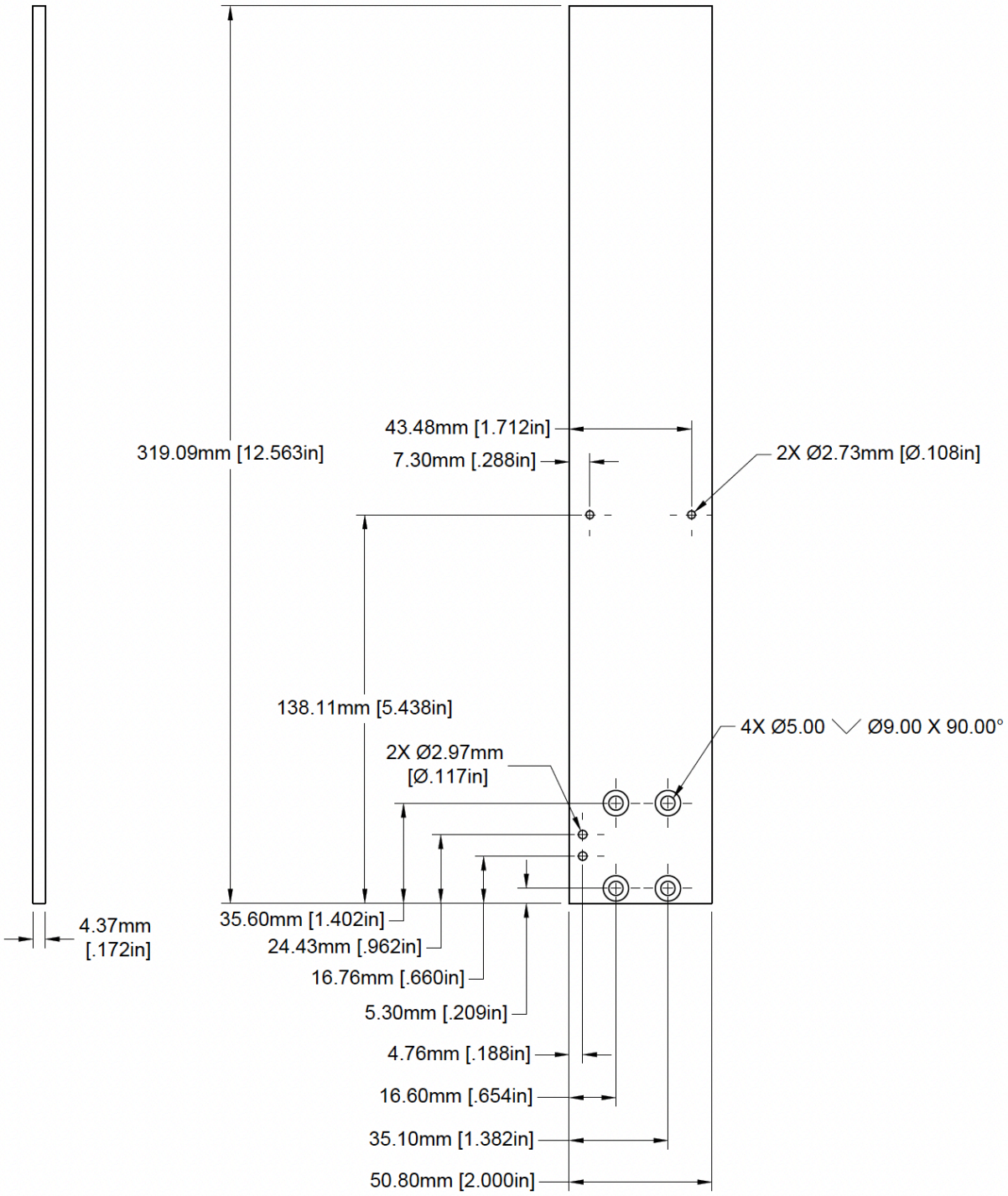




PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Swivel mount	A			
DRAWN	William Sutton 2022-10-19	SCALE 1:1	MATERIAL Steel		SHEET 8/15



PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	PCB mount	A			
DRAWN	William Sutton 2022-10-19	SCALE 1:1	MATERIAL Steel		SHEET 9/15



PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Piston Base	A			
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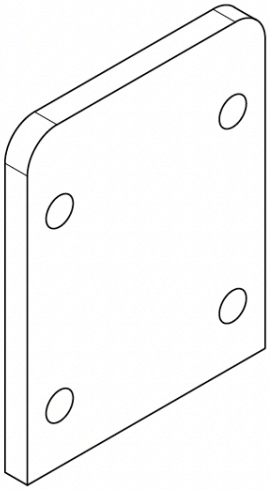
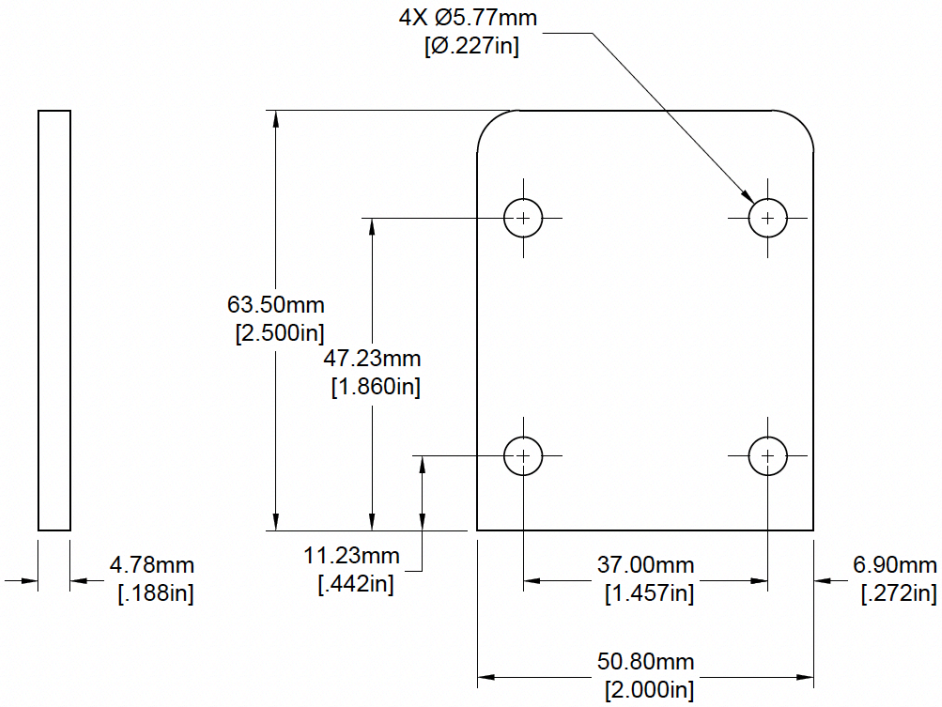
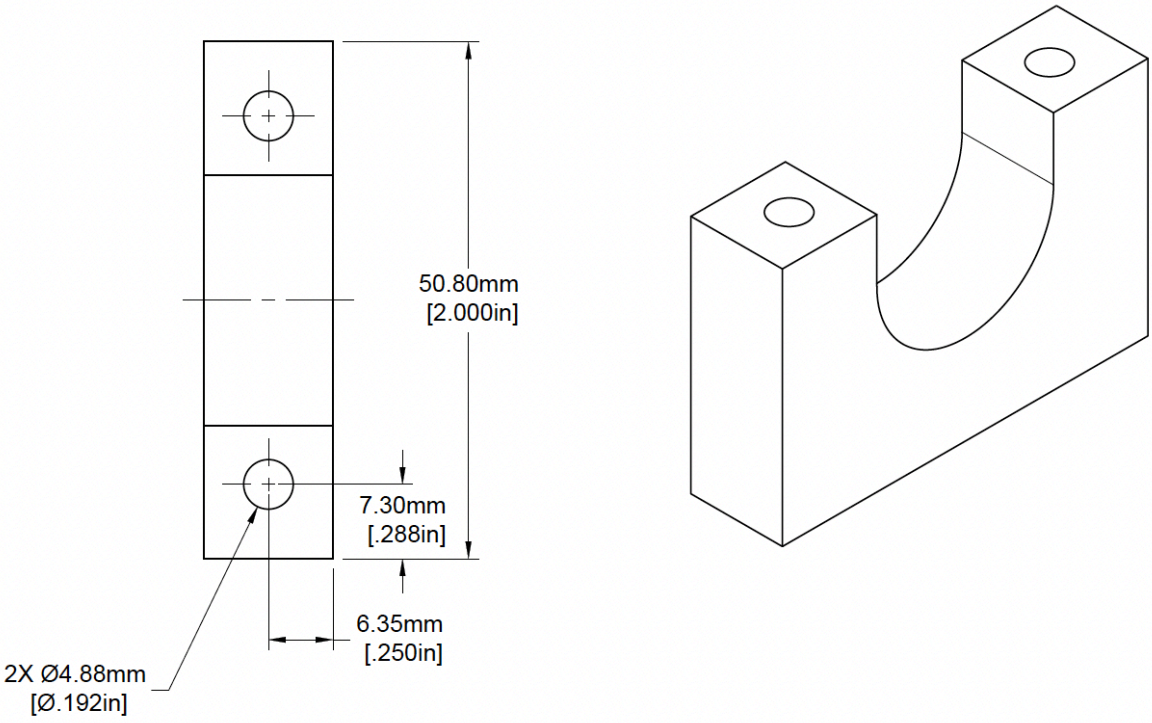
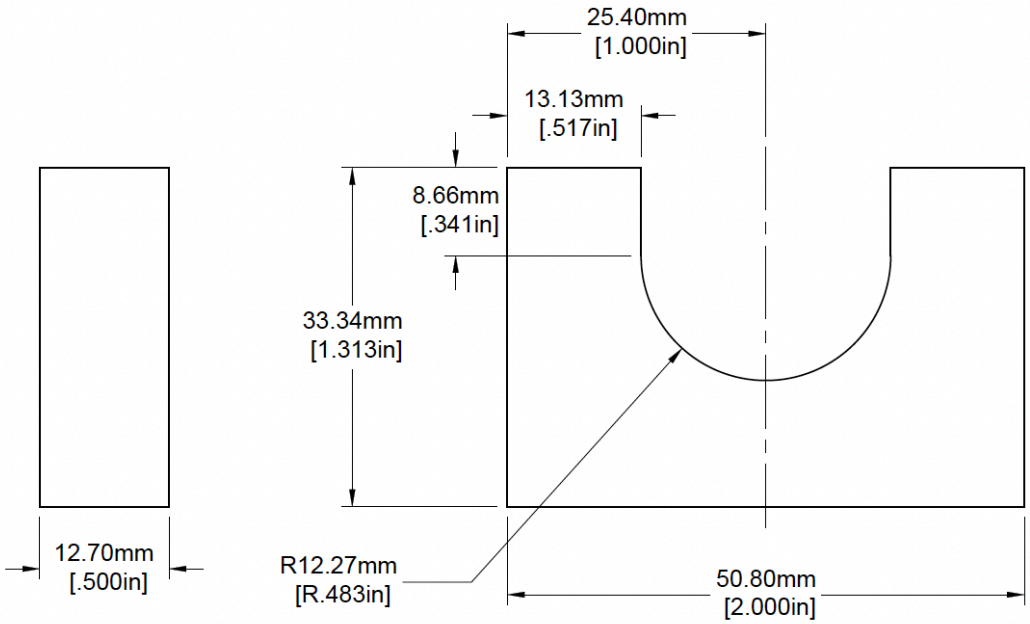




PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Piston mount	A			
DRAWN	William Sutton 2022-10-19	SCALE 1:1	MATERIAL Steel		SHEET 11/15





PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Piston Slide	A			
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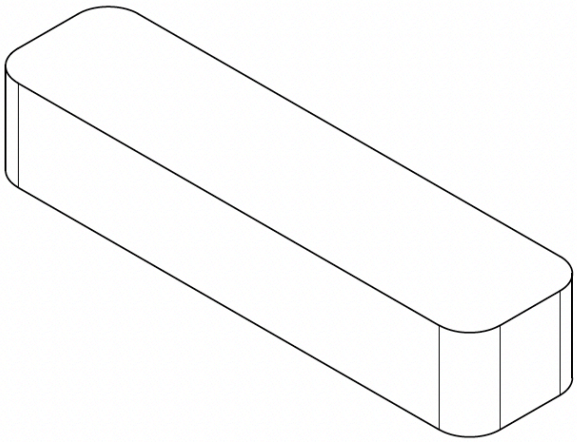
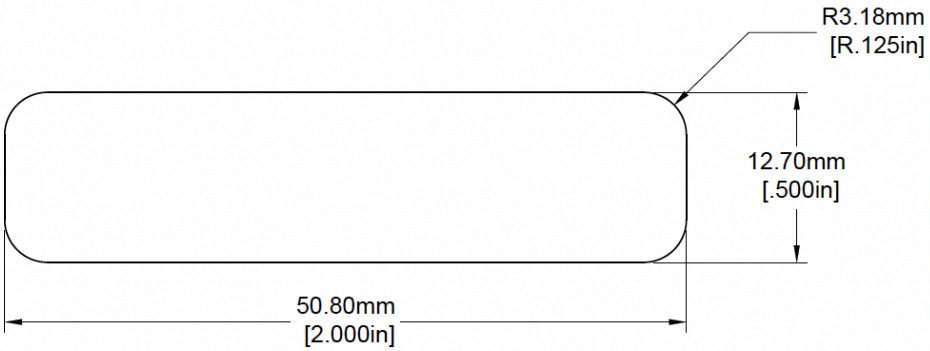
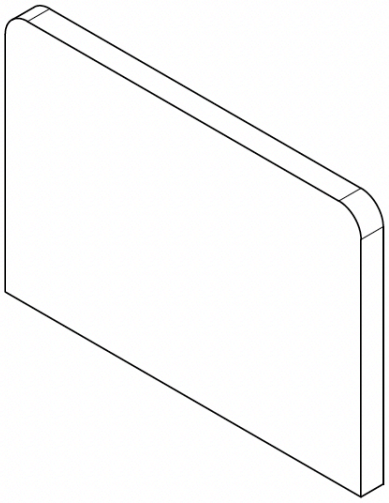
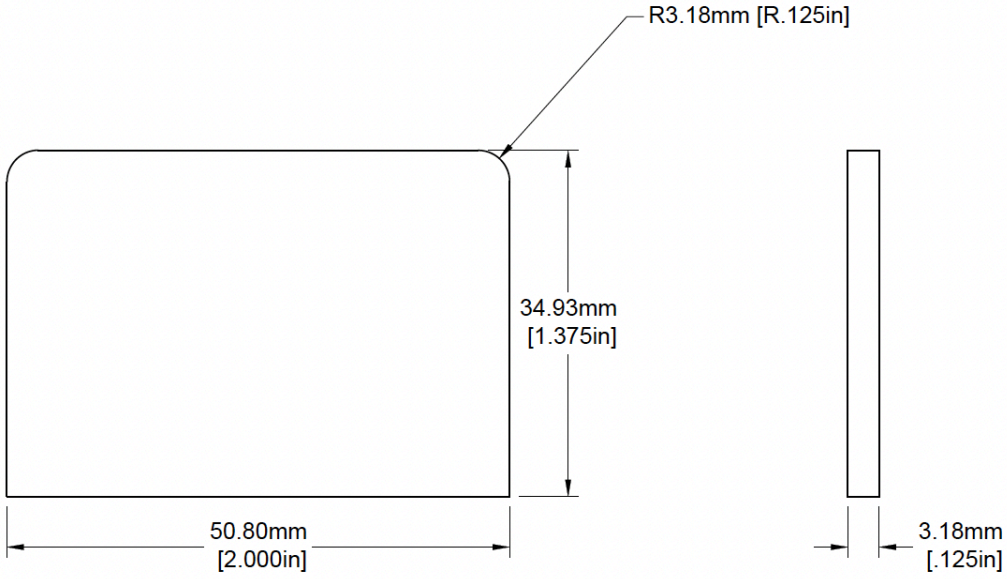


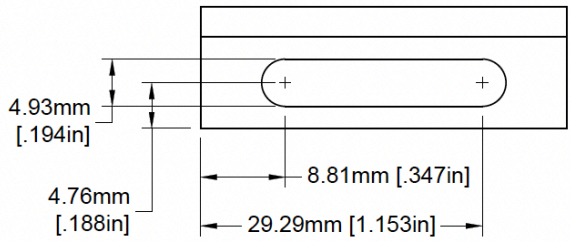


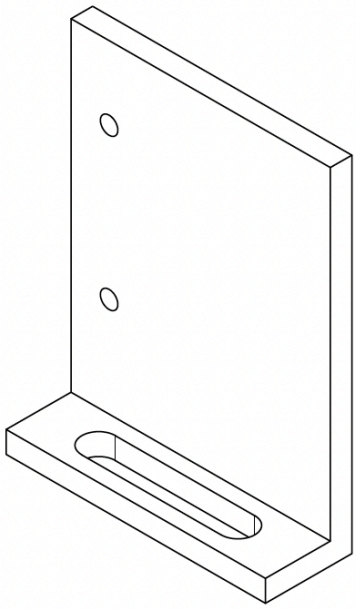
PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Piston Underside support	A			
DRAWN	William Sutton 2022-10-19	SCALE 2:1	MATERIAL Steel	SHEET 13/15	

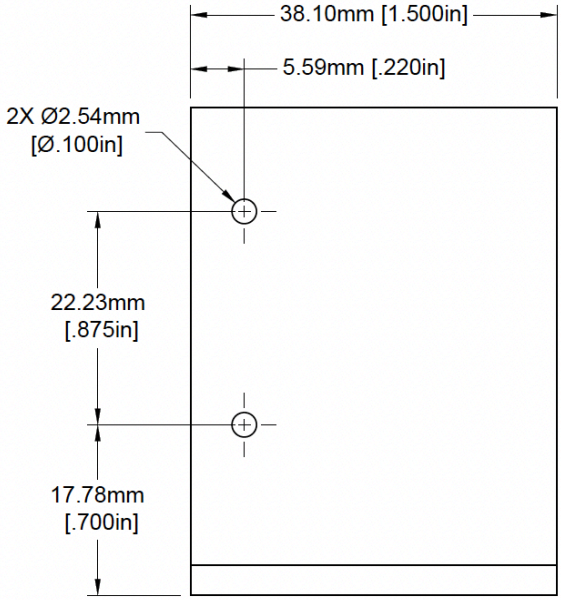


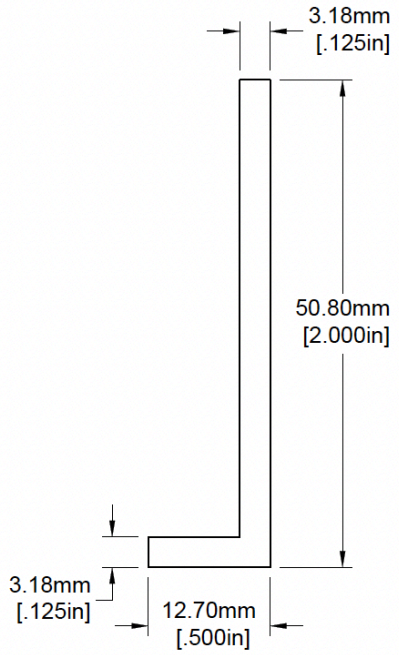


PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Piston Left/Right Side support	A			
DRAWN	William Sutton 2022-10-19	SCALE 1.5:1	MATERIAL Steel		SHEET 14/15





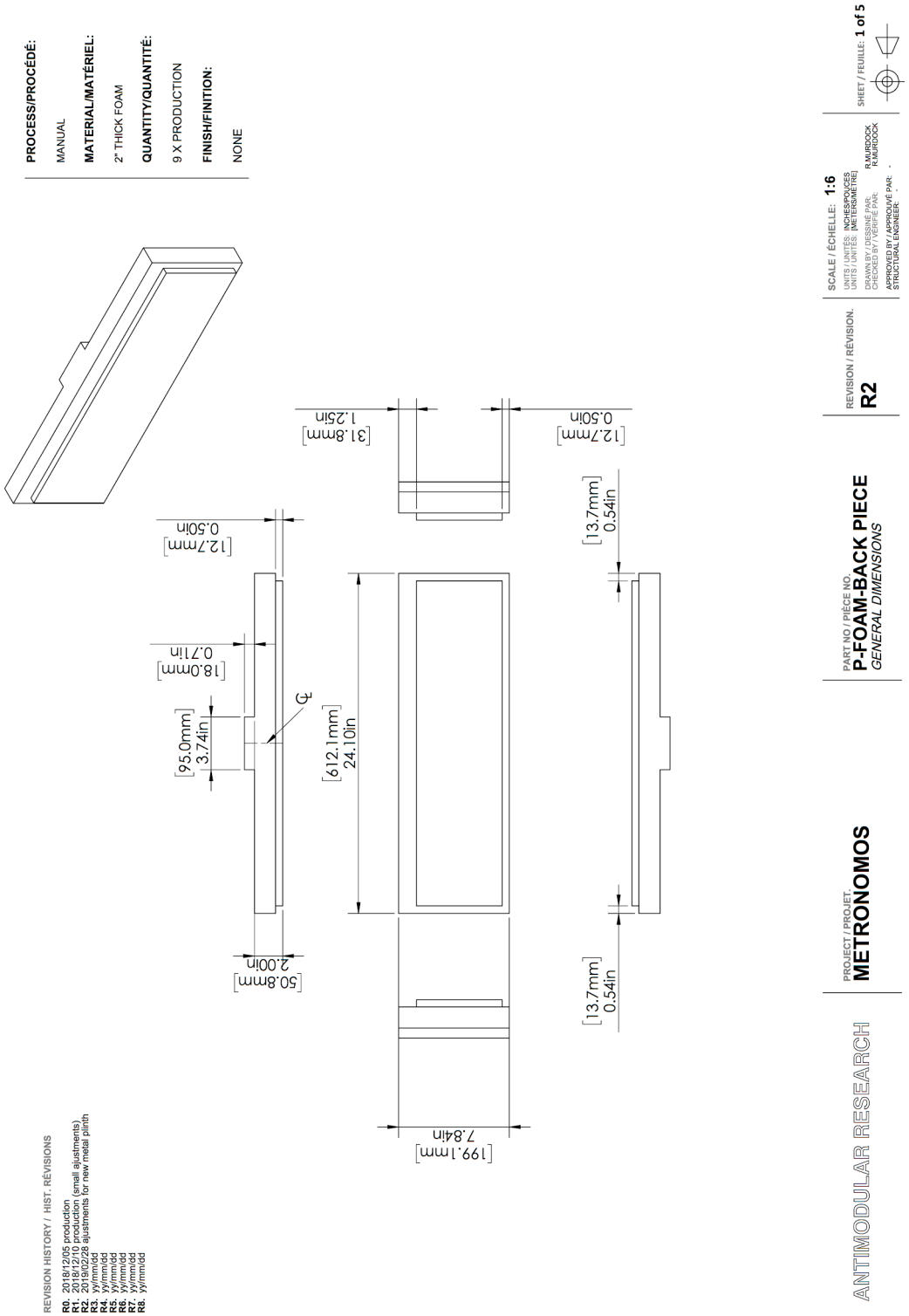




PROJECT	Metronomos	SIZE	CODE	DWG NO	REV
PART	Sensor mount	A			
DRAWN	William Sutton 2022-10-19	SCALE 1.5:1	MATERIAL Steel		SHEET 15/15

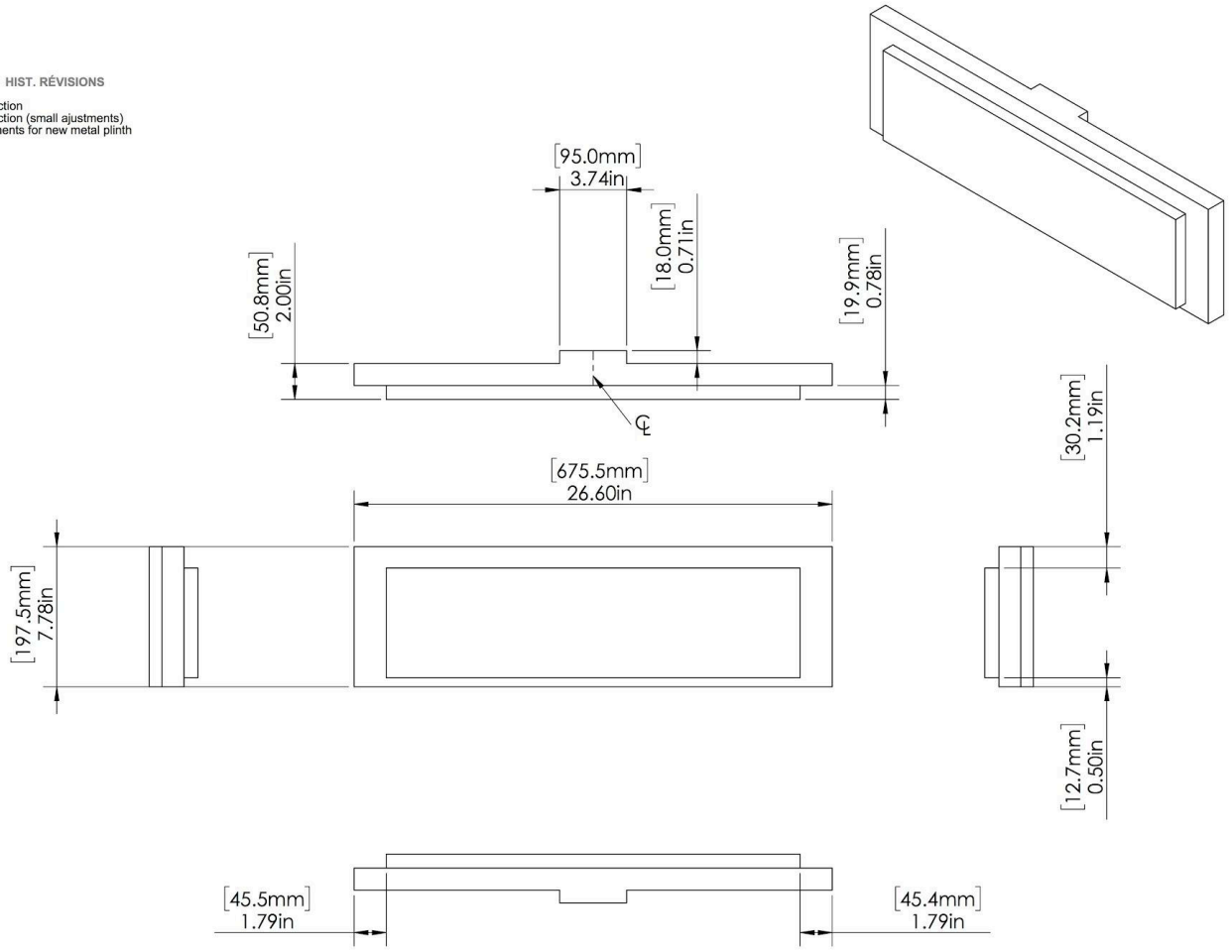
Foam Panels Drawings

These are used only if the wood plinth is in use: they secure the sculpture base within the plinth.



REVISION HISTORY / HIST. RÉVISIONS

R0. 2018/12/05 production
R1. 2018/12/10 production (small ajustments)
R2. 2019/02/28 ajustments for new metal plinth
R3. yy/mm/dd
R4. yy/mm/dd
R5. yy/mm/dd
R6. yy/mm/dd
R7. yy/mm/dd
R8. yy/mm/dd



PROCESS/PROCÉDÉ:

MANUAL

MATERIAL/MATÉRIEL:

2" THICK FOAM

QUANTITY/QUANTITÉ:

9 X PRODUCTION

FINISH/FINITION:

NONE

ANTIMODULAR RESEARCH

PROJECT / PROJET.
METRONOMOS

PART NO / PIÈCE NO.
P-FOAM-DOOR PIECE
GENERAL DIMENSIONS

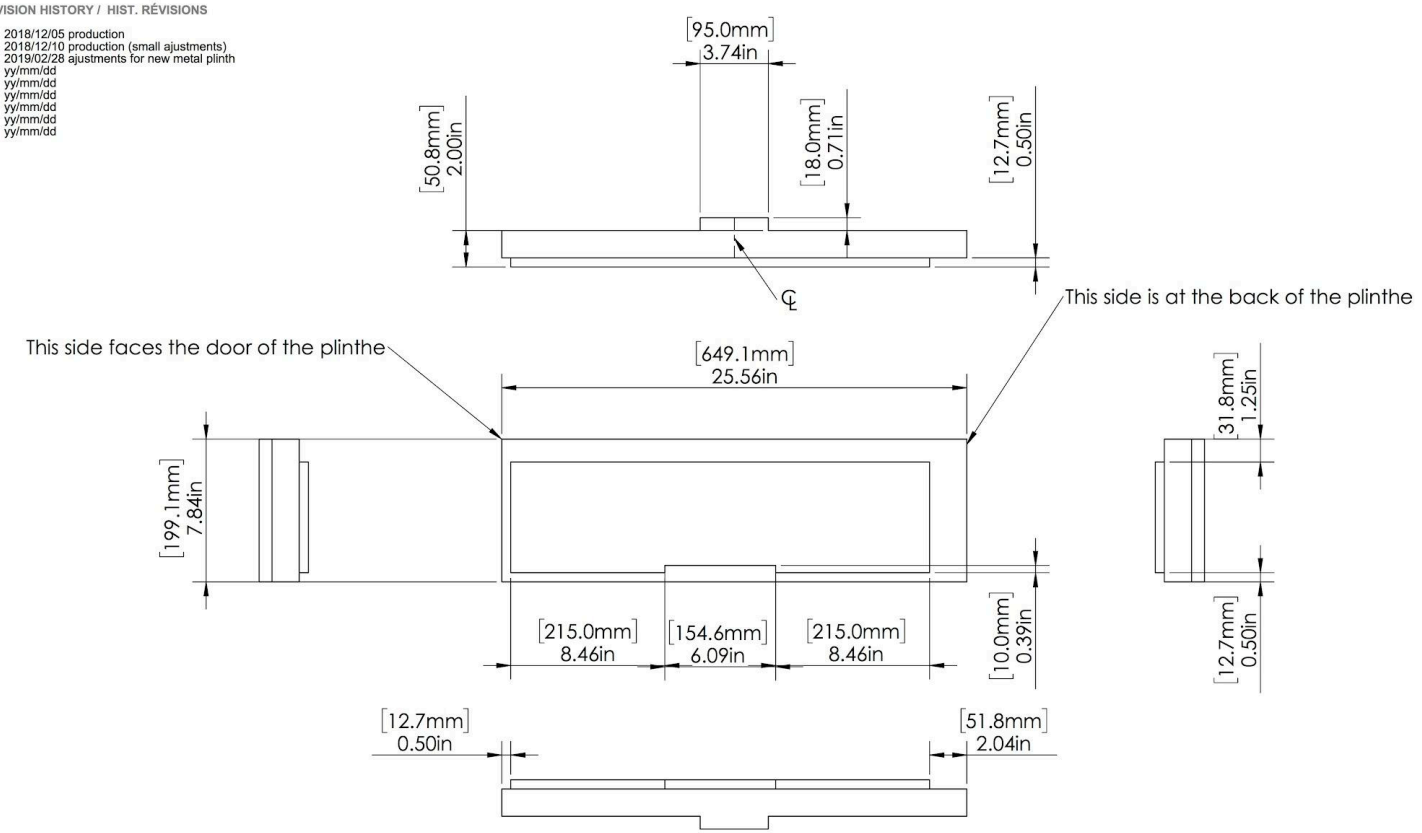
REVISION / RÉVISION.
R2

SCALE / ÉCHELLE: **1:6**
UNITS / UNITÉS: INCHES/POUCES
UNITS / UNITÉS: [METERS/MÈTRE]
DRAWN BY / DESSINÉ PAR: R.MURDOCK
CHECKED BY / VÉRIFIÉ PAR: R.MURDOCK
APPROVED BY / APPROUVÉ PAR: -
STRUCTURAL ENGINEER: -

SHEET / FEUILLE: **2 of 5**

REVISION HISTORY / HIST. RÉVISIONS

R0. 2018/12/05 production
R1. 2018/12/10 production (small ajustments)
R2. 2019/02/28 ajustments for new metal plinth
R3. yy/mm/dd
R4. yy/mm/dd
R5. yy/mm/dd
R6. yy/mm/dd
R7. yy/mm/dd
R8. yy/mm/dd



PROCESS/PROCÉDÉ:

MANUAL

MATERIAL/MATÉRIEL:

2" THICK FOAM

QUANTITY/QUANTITÉ:

9 X PRODUCTION

FINISH/FINITION:

NONE

ANTIMODULAR RESEARCH

PROJECT / PROJET.
METRONOMOS

PART NO / PIÈCE NO.
P-FOAM LEFT PIECE
GENERAL DIMENSIONS

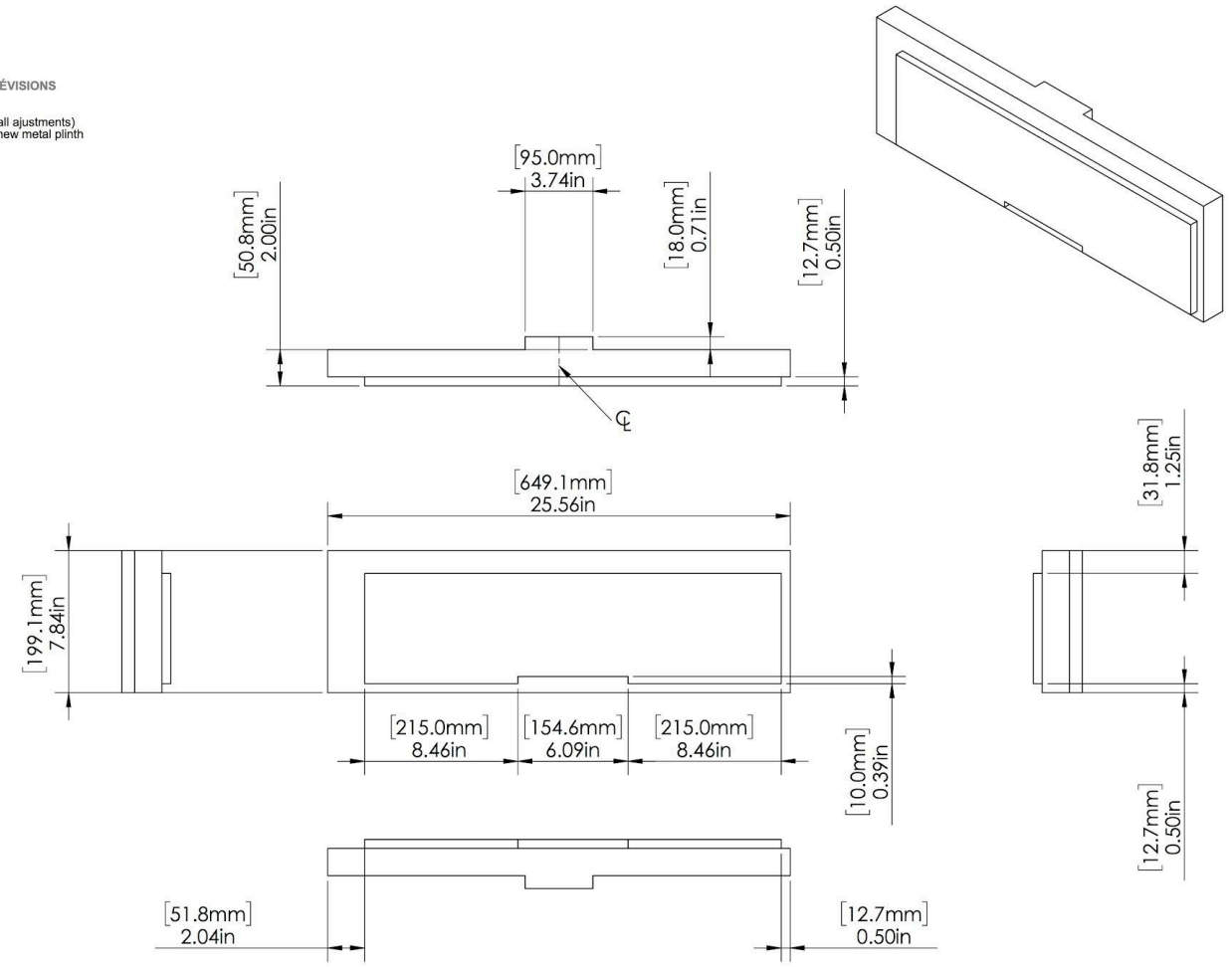
REVISION / RÉVISION.
R2

SCALE / ÉCHELLE: **1:6**
UNITS / UNITÉS: INCHES/POUCES
UNITS / UNITÉS: [METERS/MÈTRE]
DRAWN BY / DESSINÉ PAR: R.MURDOCK
CHECKED BY / VÉRIFIÉ PAR: R.MURDOCK
APPROVED BY / APPROUVÉ PAR: -
STRUCTURAL ENGINEER: -

SHEET / FEUILLE: **3 of 5**

REVISION HISTORY / HIST. RÉVISIONS

R0. 2018/12/05 production
R1. 2018/12/10 production (small ajustments)
R2. 2019/02/28 ajustments for new metal plinth
R3. yy/mm/dd
R4. yy/mm/dd
R5. yy/mm/dd
R6. yy/mm/dd
R7. yy/mm/dd
R8. yy/mm/dd



PROCESS/PROCÉDÉ:

MANUAL

MATERIAL/MATÉRIEL:

2" THICK FOAM

QUANTITY/QUANTITÉ:

9 X PRODUCTION

FINISH/FINITION:

NONE

ANTIMODULAR RESEARCH

PROJECT / PROJET.
METRONOMOS

PART NO / PIÈCE NO.
P-FOAM RIGHT PIECE
GENERAL DIMENSIONS

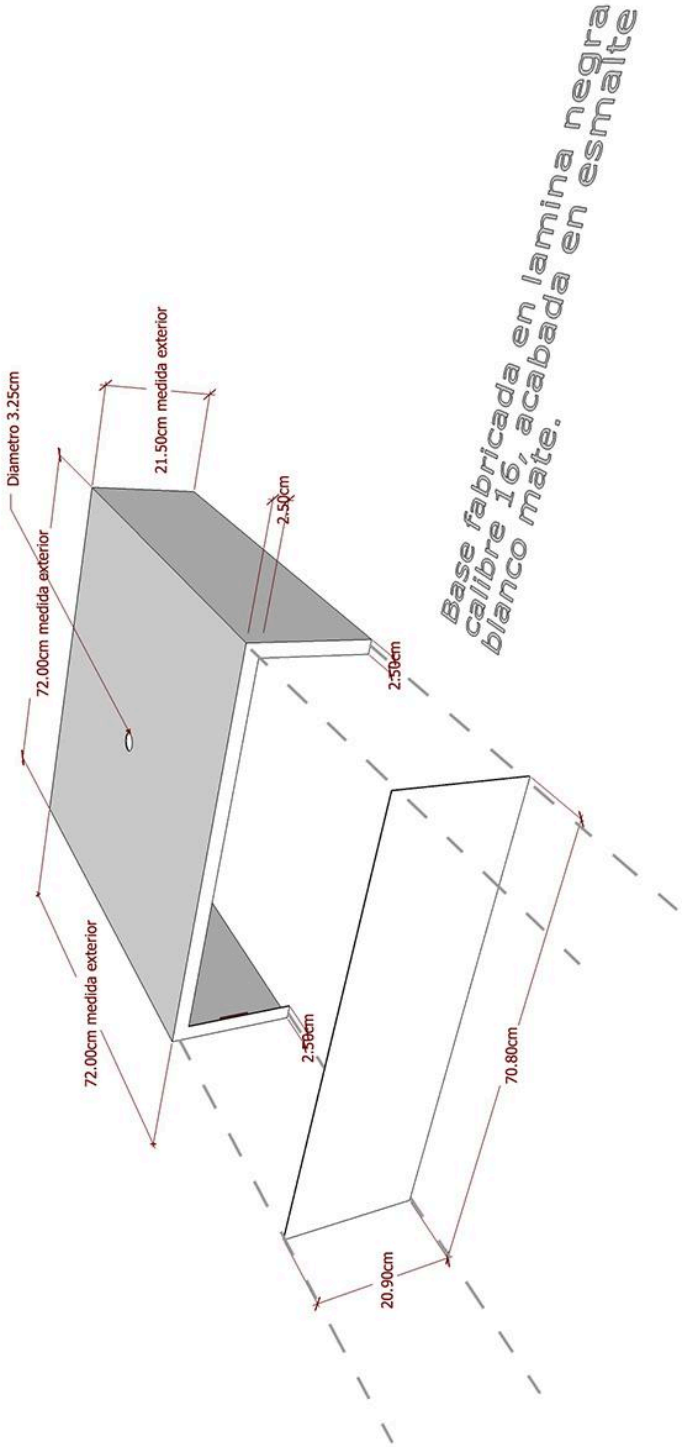
REVISION / RÉVISION.
R2

SCALE / ÉCHELLE: **1:6**
UNITS / UNITÉS: INCHES/POUCES
UNITS / UNITÉS: [METERS/MÈTRE]
DRAWN BY / DESSINÉ PAR: R.MURDOCK
CHECKED BY / VÉRIFIÉ PAR: R.MURDOCK
APPROVED BY / APPROUVÉ PAR: -
STRUCTURAL ENGINEER: -

SHEET / FEUILLE: **4 of 5**

Plinth

This is an optional element for the exhibition and their use is a curatorial decision. Here is a drawing of plinths that works well with the sculpture and foam panels described above.



Base fabricada en lamina negra
calibre 16, acabada en esmalte
blanco mate.
Diámetro 3.25cm
21.50cm medida exterior
2.50cm
72.00cm medida exterior
2.50cm
4 imanes de neodimio
50mm x 19mm x 4mm,
colocados en el interior de la base.
72.00cm medida exterior
2.50cm
70.80cm
20.90cm

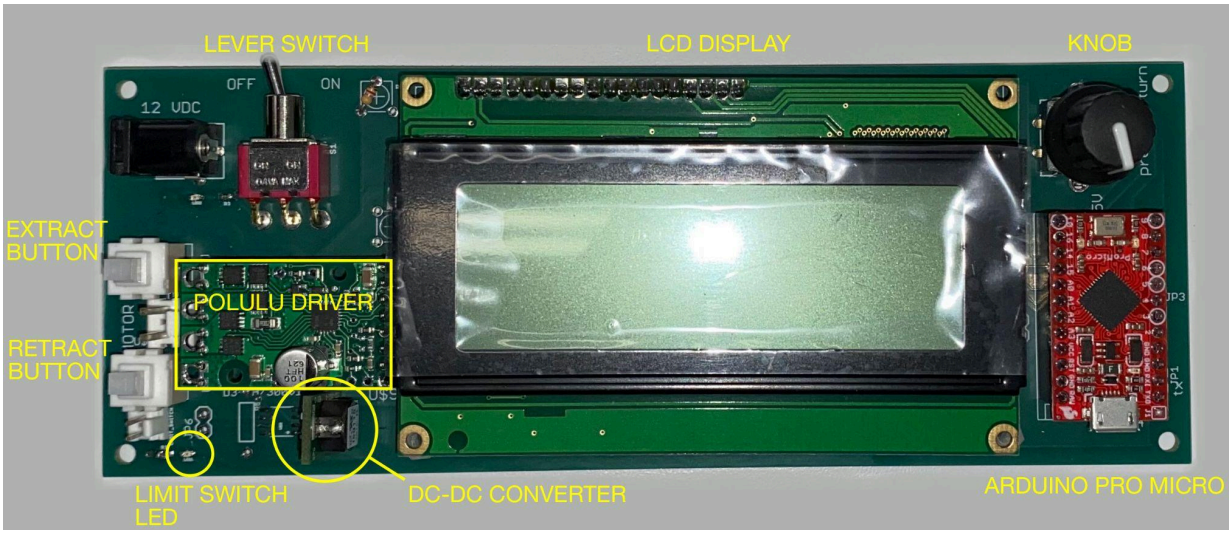
PCB

Here's a listing of the parts used in the PCB assembly:

Component	Model	Source	Amount in use
Hex standoffs M3 Nylon 6mm	CBMFTS210A	Digikey	4
SMD diode	S5DC-FDICT-ND	Digikey	1
PCB	Custom design	Antimodular	1
18 pins female header 8mm high		Digikey	2
18 pins male header long pins		Digikey	1
RGB backlight positive LCD 20x4 display	499	Adafruit	1
Hex standoffs M3 Nylon 10mm	36-25501-ND	Digikey	2
12 pins female header 8mm high		Digikey	2
12 pins male header long pins		Digikey	2
Arduino Pro Micro 5V	DEV-12640	Sparkfun	1
8 pins female header 8mm high		Digikey	2
Pololu G2 High-Power Motor Driver 24v13	2991	Abra	1
Circular Power Connector - female barrel on cord (2.1mm-5.5mm ID/OD)	CA-2185	Digikey	1
Circular Power Connector - male barrel on PCB (2.1mm-5.5mm ID/OD)	839-1516-ND	Digikey	1
Push Button	401-1139-ND	Digikey	2
2 pin tyco connectors 2.54 pitch	A121329-ND	Digikey	1
2 pin tyco connectors 3.96 pitch	A31296-ND	Digikey	1
2 pin tyco header 2.54 pitch	A1921-ND	Digikey	1

2 pin tyco header 3.96 pitch	A24164-ND	Digikey	1
SMD Resistor - 150 Ohms		Digikey	1
SMD Resistor - 560 Ohms		Digikey	1
SMD LEDs	160-1448-1-ND	Digikey	2
On/Off Toggle Leaver Switch	432-1164-ND	Digikey	1
DC DC 5V 1.5 amp converter	811-2196-5-ND	Digikey	1
Resistor - Thru hole - 4.7 KOhms		Digikey	1
Knob	377	Adafruit	1

And all this looks like while assembled:



LCD Display

Grifo QTP 4x6-C4 Display Technical Information

On board ressources	Full duplex RS 232, RS 422, RS 485 or current loop serial line. EEPROM for set up, messages and so on (2K Bytes max.).
LCD columns/rows	4 rows of 20 columns
CPU	89C4051 with 14.7456 MHz Crystal
Communication protocol	Baud rate: 1200, 2400, 4800, 9600, 19200, 38400. Stop bit: 1 or 2. Parity: none. Bits x chr: 8, 9. Default: 19200 Baud, 1 Stop, No parity, 8 Bits.
Com logic protocol	Selectable between normal and master slave. Default: normal.
Receive buffer dimension	30 characters
Size	98 x 61 x 30 mm (W x H x D)
Characters size	5 x 7 dots, 2.95 x 4.75 mm (W x H)
Weight	160g max.
Mounting	Through display mounting holes. Center spaces of holes are forming a rectangle with a 93x55mm footprint.
Keys autorepeat	After 500 ms and then every 100 ms.
Temperature range	From 0 to 50 °C.
Relative humidity	20% up to 90% (without condense).
Connectors	CN3: 8+8 pins AMP Mod II, 90°, Male. The female connector for CN3 can be directly ordered to Grifo with the code CKS.AMP16 (kit composed by a female AMP Mod II 8+8 pins plus 16 contact to crimp), or to AMP dealer by using P/N 280366 and P/N 182206-2.
Power voltage and consumption	Typically 5V, but these displays were modified to run on up to 12V current. Each display draws about 0.75W.

Consult the Grifo Use Manual (http://www.grifo.com/MANUAL/uk_QTP4X6.PDF), if needed.

Rope

Spun Polypropylene 4- strand PP2402

Barry

TECHNICAL DATA SHEET

 # PP

Spun Polypropylene 4-Strand Rope

This 4-strand twisted spun polypropylene rope imitates the color of natural hemp. This synthetic alternative to hemp has a higher breaking strength and lasts longer.

Features

- Natural look
- Mildew and rot resistant
- Soft touch
- Good UV resistance

Applications

- Climbing ropes
- Climbing nets
- Crowd control (with net)
- Outdoor decoration

SPECIFICATIONS

- Standard color: Light brown
- Other diameters available on request

Code	Diameter (mm)	Diameter (in)	Average Strength (kg)	Average Strength (lbs)
PP2002	20	3/4	3 983	8 781
PP2402	24	1	5 579	12 300
PP3202	32	1-1/4	9 240	20 371

Barry Cordage Ltd.
6110 boul. des Grandes Prairies
Montreal QC H1P 1A2 Canada
514.328.3888 514.328.1963
1.800.305.2673 (Canada / USA)

www.barry.ca

Document # ft-pp-en-rev1 (2016/09/14)

Carbon Fibre Rod

Pultruded Unidirectional - 0.375” x 96” from Rock West Composites. Sku: 47311-L96.

OD	0.375”
WT	0554 lb
Application	Bending/Tension
LG	96”
Materials	Standard modulus carbon
Pattern	Unidirectional
Shape	Round
Solid OD 1 (Flat to flat)	0.000” - 0.099”
Tensile Strength	320 ksi / 2.34 GPa
Compressive strength	270 ksi / 1.90 GPa
Fiber Volume	65%
Matrix material	Bisphenol Epoxy Vinyl Ester
Diameter tolerance	+/- 0.007"

Magnets

Type	Neodymium
Size	50 x 19 x 4 mm
Strength	5000 Gauss

Supplier:

UNIMAN
Antonio Solis 147
Col. Obrera C.P. 06800, México D.F.
http://unimanimanes.com.mx/neodimio.html

Linear Actuator

30mm/s 50 lbs 60 mm stroke electric linear actuator for food vending machine application

FOB **Reference** Price: Get Latest Price

US $18-25 / Pieces | 1 Piece/Pieces (Min. Order)

Contact Supplier | Start Order

Leave Messages

Seller Support: Trade Assurance – To protect your orders from payment to delivery

Payment: VISA TT e-Checking Pay Later More

Shipping: Alibaba.com Ocean Shipping Service from China to U.S

Get shipping quote

Quick Details

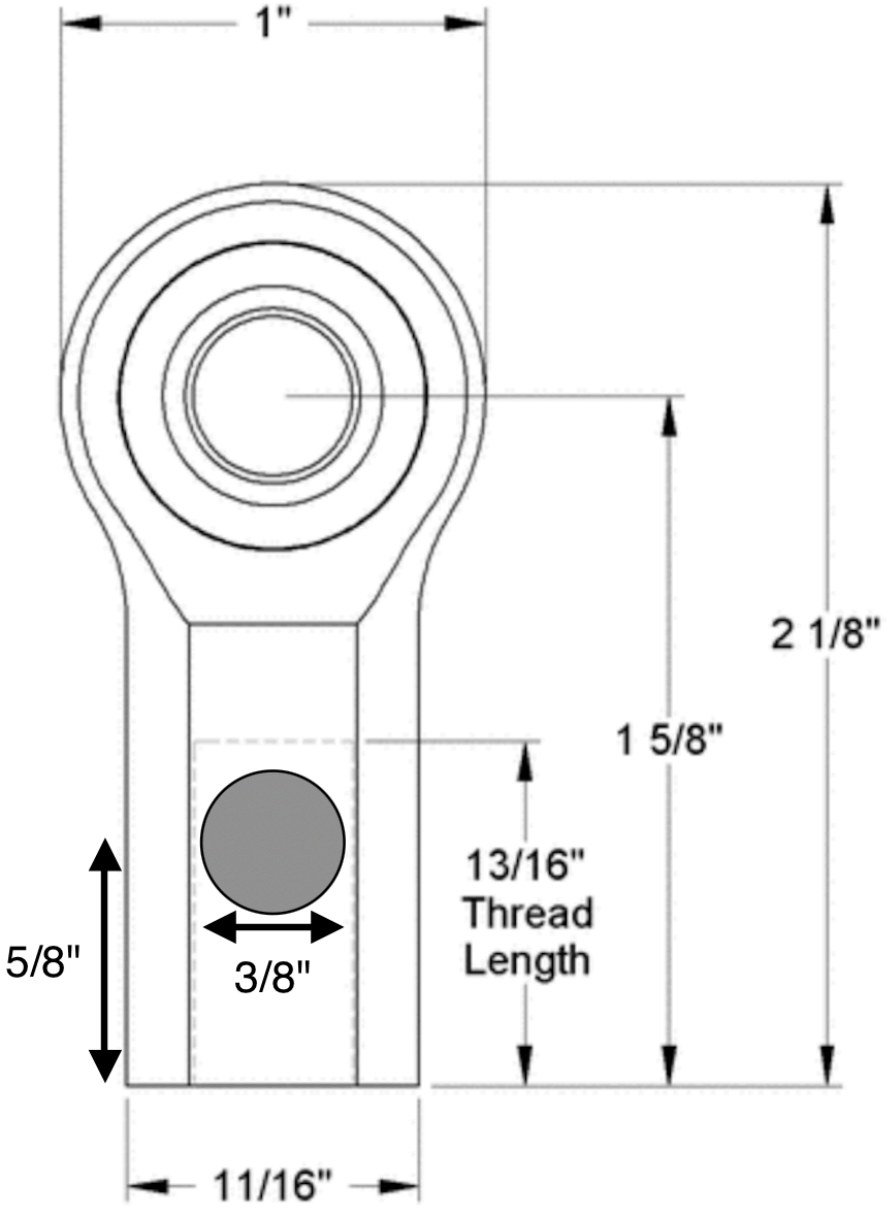
Place of Origin:	Jiangsu, China (Mainland)	Brand Name:	YONGNUO
Model Number:	YNT01	Voltage(V):	12V/24V
Output Power:	60w	Usage:	Boat, Car, Electric Bicycle, Fan, Home Appliance, Electric Tool
Certification:	CE, ROHS	Type:	Other, Linear Actuator
Construction:	Permanent Magnet	Commutation:	Brush
Protect Feature:	Other	Speed(RPM):	2600rmp
Continuous Current...	2.5A	Efficiency:	IE 2
Speed (RPM):	custom made	Material:	Aluminum
Port:	Ningbo/Shanghai	Warranty:	1 Year
Color:	Black/ Silver White		

LINER ACTUATOR YNT-01 TECHNICAL PARAMETER			
Product Name	YNT-01 Linear Actuator	Input voltage	12/24VDC
Load capacity	Max6000N(push)/6000(pull)	Stroke	50mm~600mm(Customized Stroke Available)
Free load speed	30mm/s(500N)	Operation temperature	-26°C~+65°C
Full load speed	4mm/s(6000N)	Protection class	IP54
Duty cycle	20%(2 minutes continuous use in 8minutes)	Limit switch	Built-in
Output Power	60w	Noise level	<=50dB
Pot	Shanghai/Ningbo	Control mode	wired or wireless
Certificate	**CE, RoHS**	Minimum installation distance	stroke+175mm

Available through Alibaba (https://www.alibaba.com/product-detail/30mm-s-50-lbs-60-mm_60752404410.html?spm=a2756.order-detail-ta-ta-b.0.0.584a2fc2nVMCKj)

Ball Joint Rod End

At the end of the linear actuator has been fitted an internally threaded oil-embedded ball joint rod end (McMaster 6072K174). This piece is modified to be held by the linear actuator's tip assembly: an hole with a diameter of ⅜" (9,5mm) has been drilled ⅝" (16mm) away from the flat end of the rod end.



Spray Cleaner

ANC Pull Out 2

SAFETY DATA SHEET

Version : 1.0

AME01009
Dec 31, 2014

SECTION 1) CHEMICAL PRODUCT AND SUPPLIER'S IDENTIFICATION

Product ID : AME01009
Product Name : ANC Pull Out 2
Revision Date : Dec 31, 2014
Supersedes Date : N.A.
Manufacturer's Name : American Niagara
Address : 6690 Jones Mill Court Bldg. A&B, Norcross, GA 30092
Emergency Phone : CHEMTREC : USA - 1-800-424-9300 **Date Printed :** Mar 09, 2015
Information Phone : 1-877-320-4747
Product/Recommended Uses: Spot Lifter

SECTION 2) HAZARDS IDENTIFICATION

Classification:

Aerosol - Category 1
Specific Target Organ Toxicity -Single Exposure (Respiratory Tract Irritation) - Category 3
Specific Target Organ Toxicity - Repeated Exposure - Category 2
Acute Toxicity (Oral) - Category 4
Skin Irritation - Category 2
Eye Irritation - Category 2A
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1B
Chronic-Environment-Category 3

Pictograms:

Signal Word:

Danger

Hazardous Statements - Physical:

H222 - Extremely flammable aerosol

Hazardous Statements - Health:

H302 - Harmful if swallowed
H335 - May cause respiratory irritation
H373 - May cause damage to organs (state all organs affected, if known) through prolonged or repeated exposure (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H340 - May cause genetic defects (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)
H350 - May cause cancer (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)

Hazardous Statements - Environmental:

H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements - General:

P101 - If medical advice is needed, have product container or label at hand.

P102 - Keep out of reach of children.

P103 - Read label before use.

Precautionary Statements - Prevention:

P261 - Avoid breathing dust/fume/gas/mist/vapors/spray.

P271 - Use only outdoors or in a well-ventilated area.

P233 - Keep container tightly closed.

P260 - Do not breathe dust/fume/gas/mist/vapors/spray.

P264 - Wash ? thoroughly after handling.

P280 - Wear protective gloves/protective clothing/eye protection/face protection.

P201 - Obtain special instructions before use.

P202 - Do not handle until all safety precautions have been read and understood.

P270 - Do not eat, drink or smoke when using this product.

P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

P211 - Do not spray on an open flame or other ignition source.

P251 - Do not pierce or burn, even after use.

P273 - Avoid release to the environment.

Precautionary Statements - Response:

P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P314 - Get Medical advice/attention if you feel unwell.

P302 + P352 - IF ON SKIN: Wash with plenty of water/?

P321 - Specific treatment (see ? on this label).

P332 + P313 - If skin irritation occurs: Get medical advice/attention.

P362 + P364 - Take off contaminated clothing. And wash it before reuse.

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337 + P313 - If eye irritation persists: Get medical advice/attention.

P308 + P313 - IF exposed or concerned: Get medical advice/attention.

P301 + P312 - IF SWALLOWED: Call a POISON CENTER/doctor/... if you feel unwell.

P330 - Rinse mouth.

Precautionary Statements - Storage:

P403 + P405 - Store in a well-ventilated place. Store locked up.

P410 - Protect from sunlight.

P412 - Do not expose to temperatures exceeding 50 °C/122 °F.

Precautionary Statements - Disposal:

P501 - Dispose of contents/container to disposal recycling center. Under RCRA it is the responsibility of the user of the product to determine at the time of disposal whether the product meets RCRA criteria for hazardous waste. Waste management should be in full compliance with federal, state and local laws.

SECTION 3) COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Chemical Name	% by Weight
0068476-86-8	Petroleum gases, liquefied, sweetened	28% - 46%
0000075-09-2	METHYLENE CHLORIDE	21% - 34%
0000127-18-4	TETRACHLOROETHYLENE	16% - 26%
0112926-00-8	SILICA - PRECIPITATED	2% - 5%

0000109-87-5	DIMETHOXYMETHANE	2% - 4%
0112945-52-5	SILICA, AMORPHOUS FUMED	0.0% - 0.4%
0000075-56-9	PROPYLENE OXIDE	0.0% - 0.3%
		Trace

SECTION 4) FIRST-AID MESURES

Inhalation:

Remove source of exposure or move person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.

If exposed/feel unwell/concerned: Call a POISON CENTER/doctor.

Eliminate all ignition sources if safe to do so.

Skin Contact:

Take off immediately all contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Gently blot or brush away excess product. Wash with plenty of lukewarm, gently flowing water for a duration of 15-20 minutes. Call a POISON CENTER/doctor if you feel unwell. Store contaminated clothing under water and wash before reuse or discard.

IF exposed or concerned: Get medical advice/attention.

Eye Contact:

Remove source of exposure or move person to fresh air. Rinse eyes cautiously with lukewarm, gently flowing water for several minutes, while holding the eyelids open. Remove contact lenses, if present and easy to do. Continue rinsing for a duration of 15-20 minutes. Take care not to rinse contaminated water into the unaffected eye or onto the face. If eye irritation persists: Get medical advice/attention.

Ingestion:

Ingestion is not an applicable route of exposure.

If ingestion occurs, rinse mouth with a small amount of water. Immediately call local poison control center or go to an emergency department. Never give anything by mouth to an unconscious or drowsy person.

SECTION 5) FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Dry chemical, foam, carbon dioxide water spray or fog is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Sand or earth may be used for small fires only.

Unsuitable Extinguishing Media:

Do not direct a solid stream of water or foam into hot, burning pools this may result in frothing and increase fire intensity.

Specific Hazards in Case of Fire:

Contents under pressure. Keep away from ignition sources and open flames. Exposure of containers to extreme heat and flames can cause them to rupture often with violent force.Product is highly flammable and forms explosive mixtures with air, oxygen, and all oxidizing agents. Gas leaks or liquid spills readily form flammable mixtures at temperatures below ambient. Vapors are heavier than air and may travel along surfaces to remote ignition sources and flash back.Material can accumulate static charges which may cause an incendiary electrical discharge.

Dangerous when exposed to heat or flame. This material can be ignited by flame or spark under normal atmospheric condition.

Sensitivity To Mechanical Impact: Container could potentially burst or be punctured upon mechanical impact, releasing flammable vapor.

Fire-Fighting Procedures:

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Water may be ineffective but can be used to cool containers exposed to heat or flame. Caution should be exercised when using water or foam as frothing may occur, especially if sprayed into containers of hot, burning liquid.

Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.

Special Protective Actions:

Wear protective pressure self-contained breathing apparatus (SCBA) and full turnout gear.

Cool fire exposed containers with water.

Protect against bursting cans.

SECTION 6) ACCIDENTAL RELEASE MEASURES

Emergency Procedure:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).

Do not touch or walk through spilled material.

Isolate hazard area and keep unnecessary people away. Remove all possible sources of ignition in the surrounding area. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur.

If spilled material is cleaned up using a regulated solvent, the resulting waste mixture may be regulated.

Recommended Equipment:

Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).

Personal Precautions:

Avoid breathing vapor. Avoid contact with skin, eye or clothing. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Use explosive proof equipment. Avoid inhalation of dust and contact with skin and eyes. Do not touch damaged containers or spilled materials unless wearing appropriate protective clothing.

Environmental Precautions:

Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems and natural waterways by using sand, earth, or other appropriate barriers.

Methods and Materials for Containment and Cleaning Up:

Contain and collect spilled material with an inert absorbent and place in a container for disposal.

After containment, it should be shoveled removed by a vacuum truck (if liquid) to chemical waste area.

SECTION 7) HANDLING AND STORAGE

General:

Wash hands after use.
Do not get in eyes, on skin or on clothing.
Do not breathe vapors or mists.
Use good personal hygiene practices.
Eating, drinking and smoking in work areas is prohibited.
Remove contaminated clothing and protective equipment before entering eating areas.

Eyewash stations and showers should be available in areas where this material is used and stored.

Refer to OSHA 1910.1052 for requirements for handling and use of methylene chloride.

Ventilation Requirements:

Use only with adequate ventilation to control air contaminants to their exposure limits. The use of local ventilation is recommended to control emissions near the source.

Storage Room Requirements:

Keep container(s) tightly closed and properly labeled. Store in cool, dry, well-ventilated areas away from heat, direct sunlight, strong oxidizers and any incompatibilities. Store in approved containers and protect against physical damage. Keep containers securely sealed when not in use. Indoor storage should meet OSHA standards and appropriate fire codes. Containers that have been opened must be carefully resealed to prevent leakage. Empty container retain residue and may be dangerous.
Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored.

Take measures to prevent the build up of electrostatic charge.

Do not store above 120°F (49°C).

Ground and bond containers and receiving equipment. Avoid static electricity by grounding.

Contents under pressure.

SECTION 8) EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection:

Wear eye protection with side shields or goggles. Wear indirect-vent, impact and splash resistant goggles when working with liquids. If additional protection is needed for entire face, use in combination with a face shield.

Skin Protection:

Use of gloves approved to relevant standards made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Use of an apron and over- boots of chemically impervious materials such as neoprene or nitrile rubber is recommended to avoid skin sensitization. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Launder soiled clothes or properly disposed of contaminated material, which cannot be decontaminated.

Respiratory Protection:

High airborne concentrations may necessitate the use of self-contained breathing apparatus (SCBA).

If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker, a respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed. Check with respiratory protective equipment suppliers.

Appropriate Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Chemical Name	OSHA TWA (ppm)	OSHA TWA (mg/m3)	OSHA STEL (ppm)	OSHA STEL (mg/m3)	OSHA-Tables-Z1,2,3	OSHA Carcinogen	OSHA Skin designation	NIOSH TWA (ppm)	NIOSH TWA (mg/m3)	NIOSH STEL (ppm)	NIOSH STEL (mg/m3)	NIOSH Carcinogen
										2b	12.6b	1
DIMETHOXYMETHANE	1000	3100			1			1000	3100			
METHYLENE CHLORIDE	25 (a)		125 /15 minutes		1,2	1		b				1
Petroleum gases, liquefied, sweetened	500	2000			1							
PROPYLENE OXIDE	100	240			1			a				1
SILICA - PRECIPITATED	20 (b)	80 mg/m3 percent SiO2+2			1,3				6			
TETRACHLOROETHYLENE	100 (a)/ 200 ceiling		300ppm /5 mins. in any 3 hrs. (a)		1,2			b				1

Chemical Name	ACGIH TWA (ppm)	ACGIH TWA (mg/m3)	ACGIH STEL (ppm)	ACGIH STEL (mg/m3)
DIMETHOXYMETHANE	1000	3110		
METHYLENE CHLORIDE	50	174		
Petroleum gases, liquefied, sweetened				
PROPYLENE OXIDE	2			
SILICA - PRECIPITATED				
TETRACHLOROETHYLENE	25	170	100	685

SECTION 9) PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical Properties

Density	5.77882 lb/gal
% Solids By Weight	4.28000%
Density VOC	2.51956 lb/gal
% VOC	43.60000%
VOC Actual	2.51956 lb/gal
VOC Actual	301.91936 g/l
Density VOC Less H2O and Exempts	0.00000 lb/gal

Appearance	Thick off white liquid
Upper Explosion Level	Concentrate: 23% by volume Propellant: 9.2 % by volume
Odor Threshold	N.A.
Odor Description	Characteristic
pH	N.A.
Flammability	N/A
Water Solubility	N.A.
Flash Point Symbol	N.A.
Flash Point	Concentrate: N/A Propellant:-132.32 °F
Viscosity	N.A.

Lower Explosion Level	Concentrate:12 % by volume Propellant: 1.8 % by volume
Vapor Pressure	N.A.
Vapor Density	N.A.
Freezing Point	N.A.
Melting Point	N.A.
Low Boiling Point	N.A.
High Boiling Point	N.A.
Auto Ignition Temp	N.A.
Evaporation Rate	N.A.
VOC Composite Partial Pressure	N.A.

SECTION 10) STABILITY AND REACTIVITY

Stability:

Material is stable at standard temperature and pressure.

Conditions to Avoid:

Avoid heat, flames and sparks, avoid high temperatures, direct sunlight and contact with incompatible materials.

Hazardous Reactions/Polymerization:

No data available.

Incompatible Materials:

Avoid contact with strong oxidizers, reducers, acids, and alkalis.

Hazardous Decomposition Products:

Smoke, carbon monoxide and carbon dioxide may form in the event of incomplete combustion.

SECTION 11) TOXICOLOGICAL INFORMATION

Skin Corrosion/Irritation:

Prolonged or repeated contact with this product may dry and/or defat the skin. This product may be harmful if it is absorbed through the skin.

Causes skin irritation.

Serious Eye Damage/Irritation:

Liquid or vapors may irritate the eyes.

Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Eye contact may lead to permanent damage if not treated promptly.

Respiratory/Skin Sensitization:

No data available.

Germ Cell Mutagenicity:

May cause genetic defects.

Carcinogenicity:

May cause cancer.

Reproductive Toxicity:

No data available.

Specific Target Organ Toxicity - Single Exposure:

No data available.

Specific Target Organ Toxicity - Repeated Exposure:

May cause damage to organs.

Prolonged exposure may cause central nervous system effects, liver and blood damage.

Aspiration Hazard:

No data available.

Acute Toxicity:

Ingestion: Ingestion can cause gastrointestinal irritation, nausea, and diarrhea.

Harmful if swallowed.

Inhalation: May cause upper respiratory irritation, drowsiness, mental depression or narcosis, difficulty in breathing, irregular heartbeats. Overexposure may cause cardiac sensitization and increased risk of cardiac arrest, blurred vision, adverse effects on the lungs, liver, kidney, nervous system, and other internal organs, coma or death.

0000075-09-2 METHYLENE CHLORIDE

LC50 (guinea pig): 11600 ppm (6-hour exposure) (7)
LC50 (rat): 57000 ppm (15-minute exposure) (8)
LC50 (mouse): 16186 ppm (8-hour exposure) (9)

LD50 (oral, rat): 2100 to 3000 mg/kg (1)

0000075-56-9 PROPYLENE OXIDE

LD50 (oral, rat): 1140 mg/kg (15,16)
LD50 (oral, rat): 947 mg/kg (cited as 1.14 mL/kg) (16)
LD50 (dermal, rabbit): 7175 mg/kg (cited as 8.64 mL/kg) (15)
LD50 (dermal, rabbit): 1246 mg/kg (cited as 1.50 mL/kg) (16)

0000127-18-4 TETRACHLOROETHYLENE

LC5O (rat): Approximately 3786 ppm (4-hour exposure) (22); approximately 4000 ppm (4-hour exposure) (23)
LC50 (mouse): 5200 ppm (4-hour exposure) (24)

LD5O (oral, rat): Approximately 2600 mg/kg (cited as 1.6 mL/kg) (20)
LD50 (oral, male rat): 3835 mg/kg (25)
LD50 (oral, female rat): 3005 mg/kg (25)
LD50 (dermal, rabbit): Greater than 3245 mg/kg (0/5 animals died) (2)

Acute Exposure

0000075-09-2 METHYLENE CHLORIDE

The substance is irritating to the eyes, skin and respiratory tract. It can cause effects on the CNS, blood, liver, heart and lungs. Exposure could cause carbon monoxide poisoning resulting in impaired functions. Exposure at high concentrations could cause lowering of consciousness and death. Methylene Chloride is a potent irritant of mucous membranes. If swallowed, the substance may cause vomiting and could result in aspiration pneumonitis.

Chronic Exposure

0000075-09-2 METHYLENE CHLORIDE

Inhalation exposure may result in neurological symptoms, including paraesthesiae, respiratory irritation and gastrointestinal disturbances. Long term exposure causes damage to the CNS and to the liver. Repeated or prolonged contact with skin may cause dermatitis.

Potential Health Effects - Miscellaneous

0000075-09-2 METHYLENE CHLORIDE

Is an IARC, NTP or OSHA Carcinogen. There is limited evidence that this substance causes spontaneous abortions. Contact can severely irritate and burn the skin and eyes with possible eye damage. Skin contact may cause inflammation and burns. Inhalation of high concentrations can have narcotic effects; Carbon monoxide produced as a metabolite in the body.

SECTION 12) ECOLOGICAL INFORMATION

Toxicity:

Harmful to aquatic life with long lasting effects.

Persistence and Degradability:

No data available.

Bio-accumulative Potential:

No data available.

Mobility in Soil:

No data available.

Other Adverse Effects:

No data available.

SECTION 13) DISPOSAL CONSIDERATIONS

Waste Disposal:

Under RCRA it is the responsibility of the user of the product to determine at the time of disposal whether the product meets RCRA criteria for hazardous waste. Waste management should be in full compliance with federal, state and local laws.

Empty Containers retain product residue which may exhibit hazards of material, therefore do not pressurize, cut, glaze, weld or use for any other purposes. Return drums to reclamation centers for proper cleaning and reuse.

SECTION 14) TRANSPORT INFORMATION

U.S. DOT Information:

Ground Transportation: (Continental United States, Canada & Mexico): Consumer Commodity ORM-D

IMDG Information:

Shipping Name: Aerosols, flammable
UN/NA #:1950
Hazard Class:2.1

Marine Pollutant: No data available

IATA Information:

We do NOT recommend this product to be shipped via air. It would need to be repacked by an authorized packing company and the DG would have to be completed by a licensed hazardous material shipping company.

SECTION 15) REGULATORY INFORMATION

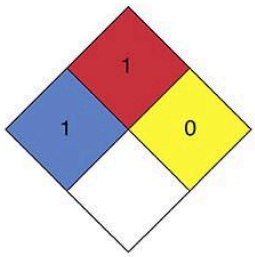
CAS	Chemical Name	% By Weight	Regulation List
	METHYLENE CHLORIDE		
0000075-09-2		21% - 34%	CERCLA,SARA312,SARA313,TSCA,RCRA,CA_Prop65 - California Proposition 65
0000075-56-9	PROPYLENE OXIDE	0.0% - 0.3%	CERCLA,SARA312,SARA313,VOC,TSCA,CA_Prop65 - California Proposition 65
0000109-87-5	DIMETHOXYMETHANE	2% - 4%	SARA312,VOC,TSCA
0000127-18-4	TETRACHLOROETHYLENE	16% - 26%	CERCLA,SARA312,SARA313,VOC,TSCA,RCRA,CA_Prop65 - California Proposition 65
0068476-86-8	Petroleum gases, liquefied, sweetened	28% - 46%	SARA312,TSCA
0112926-00-8	SILICA - PRECIPITATED	2% - 5%	SARA312
0112945-52-5	SILICA, AMORPHOUS FUMED	0.0% - 0.4%	SARA312

SECTION 16) OTHER INFORMATION

Glossary:

ACGIH- American Conference of Governmental Industrial Hygienists; ANSI- American National Standards Institute; Canadian TDG- Canadian Transportation of Dangerous Goods; CAS- Chemical Abstract Service; Chemtrec- Chemical Transportation Emergency Center (US); CHIP- Chemical Hazard Information and Packaging; DSL- Domestic Substances List; EC- Equivalent Concentration; EH40 (UK)- HSE Guidance Note EH40 Occupational Exposure Limits; EPCRA- Emergency Planning and Community Right-To-Know Act; ESL- Effects screening levels; HMIS- Hazardous Material Information Service; LC- Lethal Concentration; LD- Lethal Dose; NFPA- National Fire Protection Association; OEL- Occupational Exposure Limits; OSHA- Occupational Safety and Health Administration, US Department of Labor; PEL- Permissible Exposure Limit; SARA (Title III)- Superfund Amendments and Reauthorization Act; SARA 313- Superfund Amendments and Reauthorization Act, Section 313; SCBA- Self-Contained Breathing Apparatus; STEL- Short Term Exposure Limit; TCEQ- Texas Commission on Environmental Quality; TLV- Threshold Limit Value; TSCA- Toxic Substances Control Act Public Law 94-469; TWA- Time Weighted Value; US DOT- US Department of Transportation; WHMIS- Workplace Hazardous Materials Information System.

HMIS



Chronic : ☐

DISCLAIMER

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

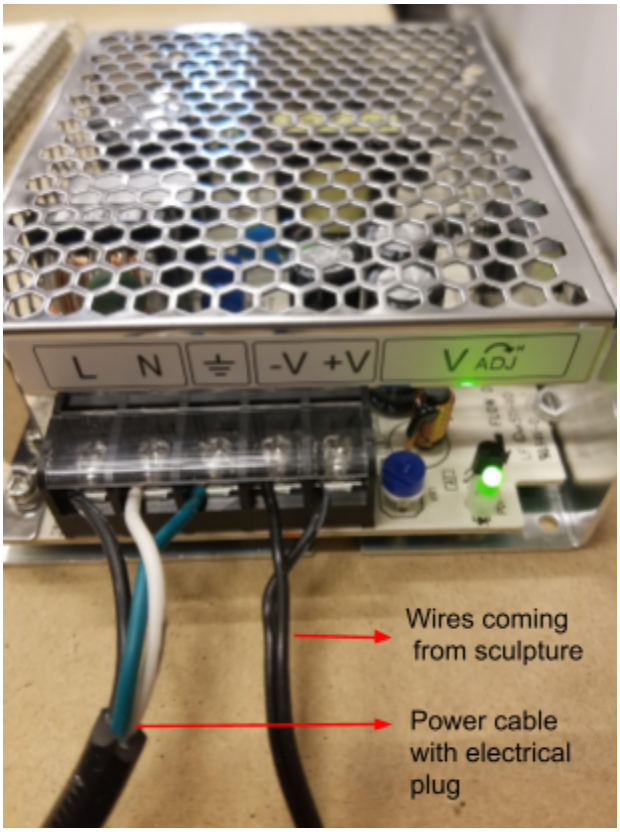
APPENDIX III - ASSEMBLY OF THE WORK

Installing the Rope

Important Note: Please wear gloves at all times while handling the artwork. The rope and the plinth are very susceptible to marks and dirt.

1. Start by marking the placement of the sculpture on the floor with painters tape. Carefully place the base on these marked locations.

2. Attach the power supply. First, attach the wires from the sculpture base to the power supplies using the screw terminals, as shown in the photo on the next page. Then, attach a power cable to the power supply, also shown in the photo on the next page.



3. If the plinth is a desired element in the exhibition, place the foam around the metal base before handling the rope (refer to the section about foam panels and covers.) The metal plinth needs to be installed at the same time as the rope.

4. If the plinth is a desired element in the exhibition, insert the rope into the sculpture's base. This step requires four people, and everyone should be wearing gloves at all times. Two people handle the rope while the two others keep the box above the

structure. Again, refer to the section about foam panels and covers for pictures and instructions. To insert the rope into the support bracket:

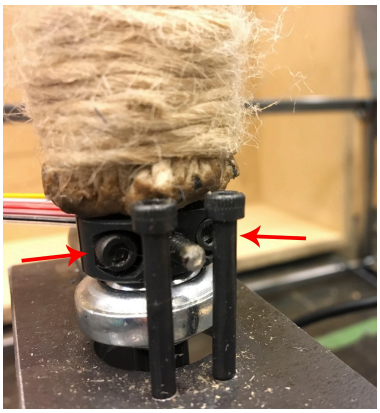
First, line up the carbon fibre rod (poking through the end of the rope) with the hole at the top of the base, then insert it carefully. The second person should kneel and guide the rod through the hole, into the actuator bracket underneath the plinth (as shown in the photo below).

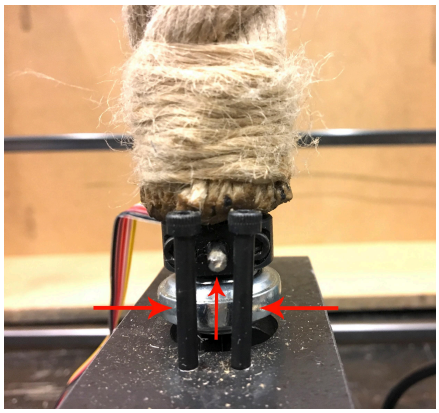
Throughout the process, make sure that both of the people holding the metal plinth keep it straight, without leaning on the rope.

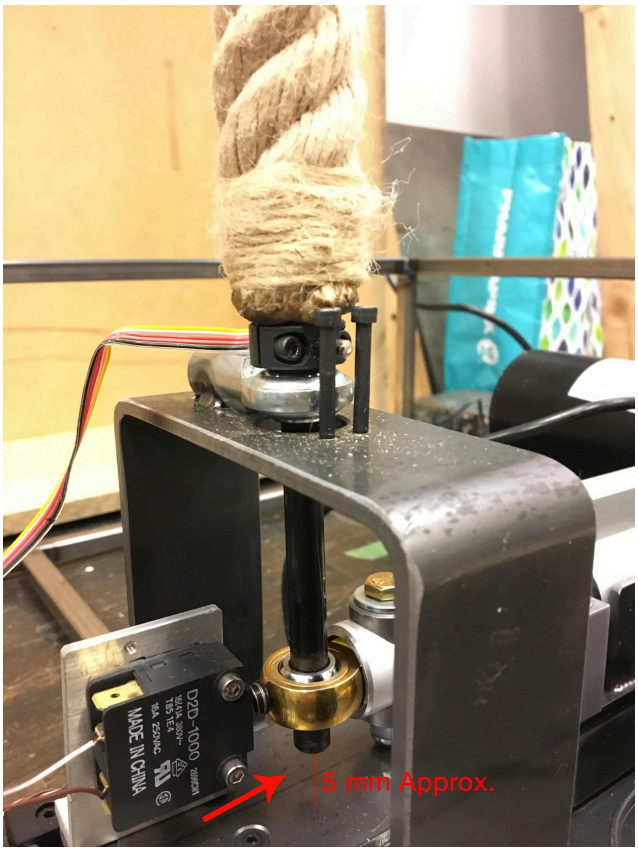
Once the rope is properly inserted in place, slowly lower the metal plinth atop of the frame. Make sure the foam is securely in place.

5. Once the rope is in place, adjust the height of the sculpture using a laser level. The height of each sculpture should be about 198 cm (from the top of the noose to the top of the plinth.)

   To adjust the height, simply unscrew the stop clamp ring, located at the end of the rope, then bring it to the correct height and screw the clamp back in place. Make sure the screw sticking out of the stop clamp is centred between the two stoppers coming out of the metal arch. Make sure that the carbon fibre rod is at least 5 mm away from touching the bottom of the metal base. Consult the following photos illustrating this.





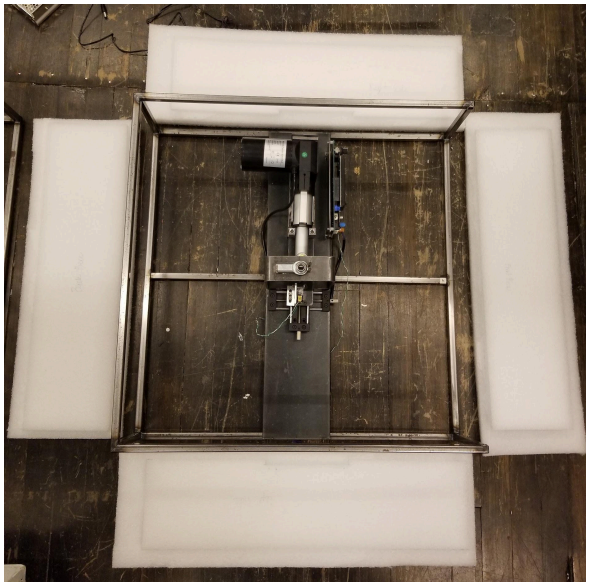
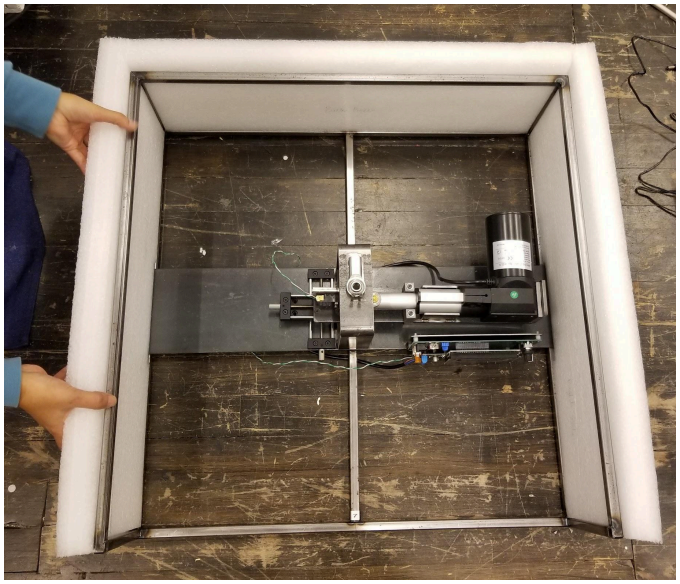


6. Plug the sculpture into a power source. Consult the wiring diagram if needed.

7. Verify that the sculpture is swaying according to the correct frequency, or beat-per-hour, close off the plinth. Place the foam into the gap, then place the removable cover onto the back of the plinth, align the magnets, and press gently into place. See the following photos for reference.

Foam Panels and Covers

1. If the plinth is a desired element in the exhibition, each sculpture requires four custom-cut foam panels to support the metal frame inside of the plinth. Place the back panel and both side panels in place, so that they are squeezed inside the metal frame. Keep the final foam panel close by, but do not install it yet.

2. Wrap the spine of the sculpture in plastic before installing it, as shown in the photo below.

3. Using the help of three people, bring the white cover over the metal frame. Insert the sculpture inside the base and once it is securely in place (inside the actuator), lower the base towards the floor slowly, trying not to crush the foam. Make sure the sides of the cover do not get stuck in the foam panels. Wear gloves at all times.

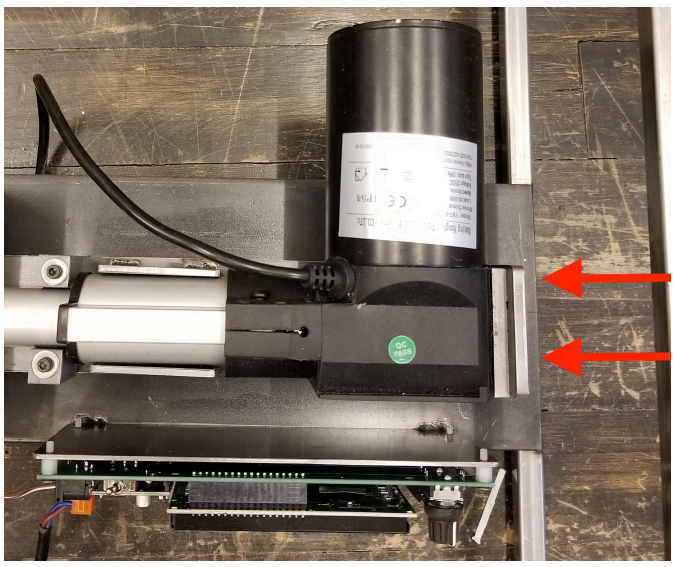
APPENDIX IV - REPAIRS AND OTHER MANIPULATIONS

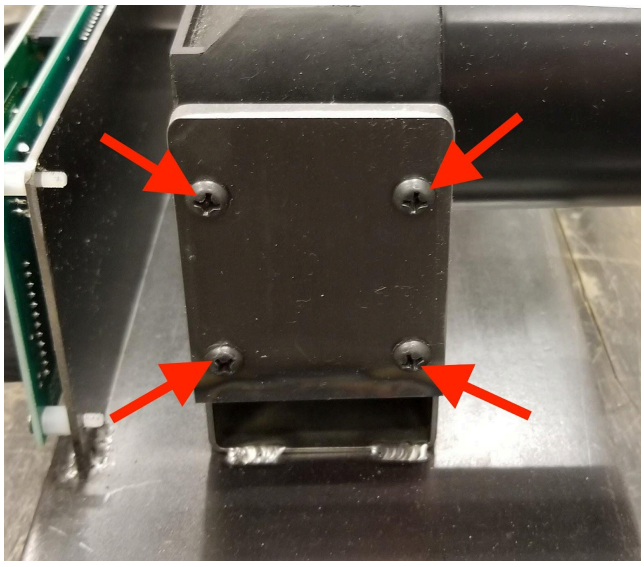
Replacing a Motor

Each time a sculpture needs to be fixed or replaced, please cover the spine of the sculpture in plastic before taking it off the base to not dirty or damage the rope surface. To do this, **first turn off the motor** and then proceed to wrap the sculpture. The plastic is necessary; it will protect the sculpture while you are handling it. Please refer to the foam panels and covers section for pictures and further instructions.

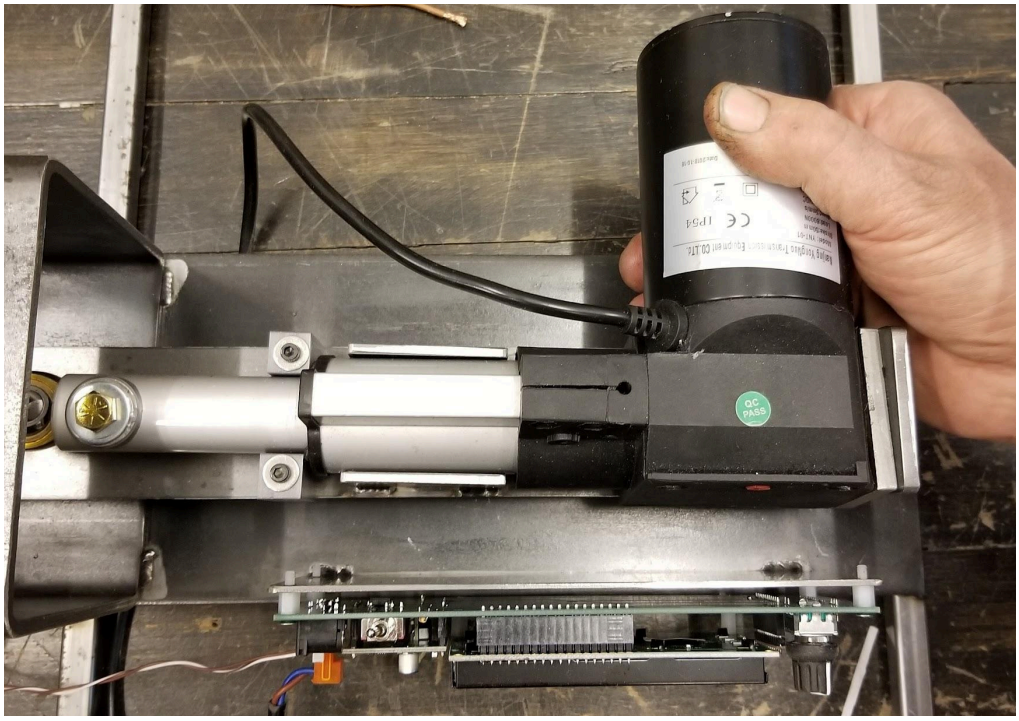
First, disconnect the motor from the board. Carefully unplug the yellow connector shown below.

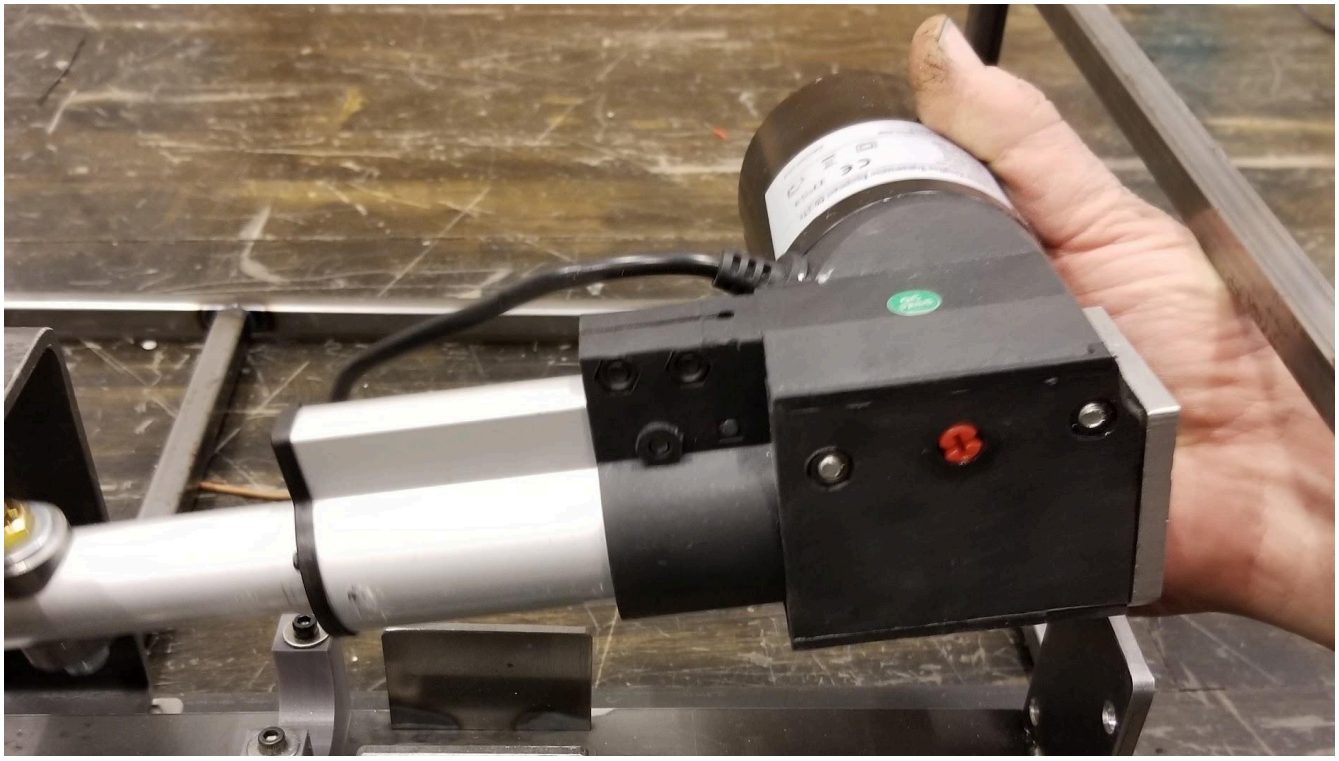
Using a screwdriver, remove the four screws holding the motor to the base. Make sure to hold the motor firmly while you unscrew the screws located on the sides, as shown below.



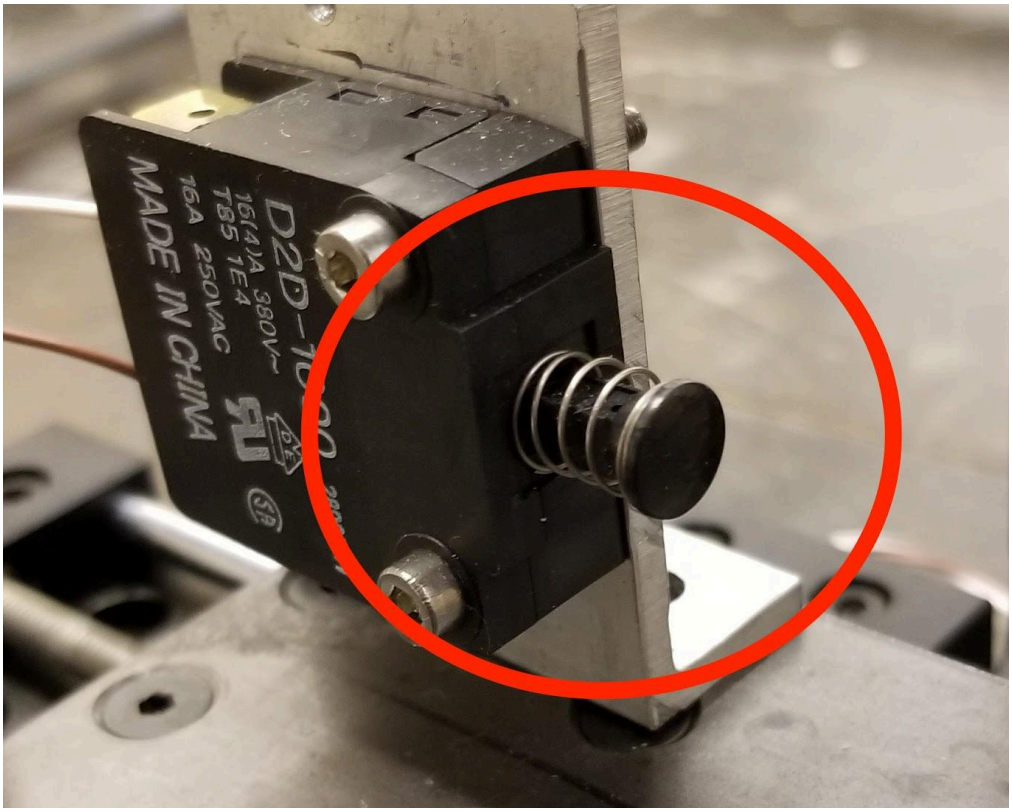


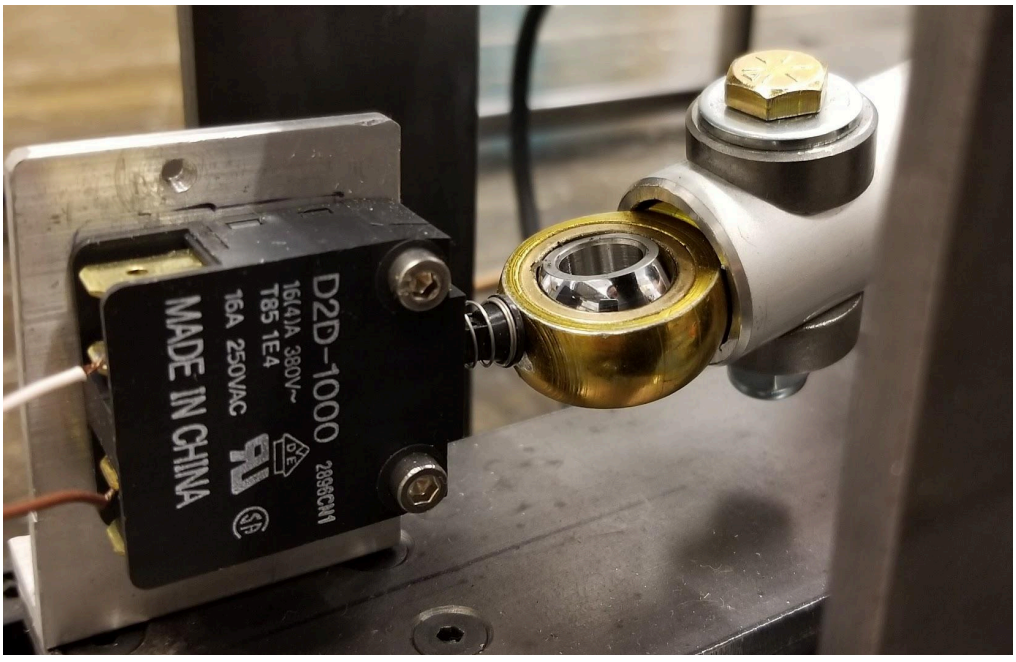
Remove the motor from the metal frame very carefully, and be mindful of the fragile parts surrounding the motor. The limit switch, located next to the end of the motor with the bearing, is especially delicate. Lift the motor upwards first, then slide it out.





The image below shows the limit switch and the very fragile coil circled in red. When the motor is in place, the protruding part retracts inside the black switch casing, as shown in the second photo below. If not careful, it can snap and break. Insert the new motor carefully and secure it in place with the four screws.

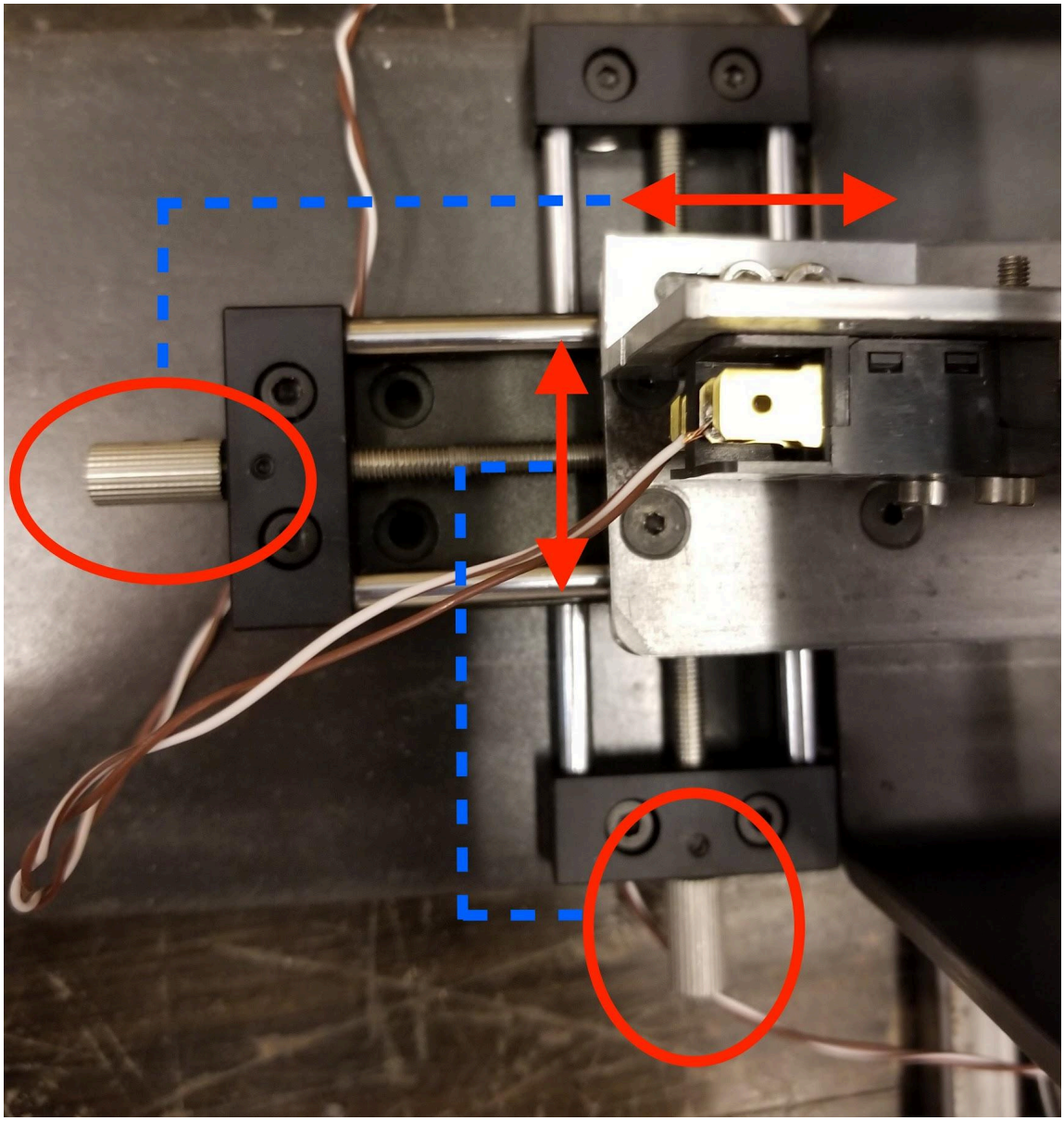




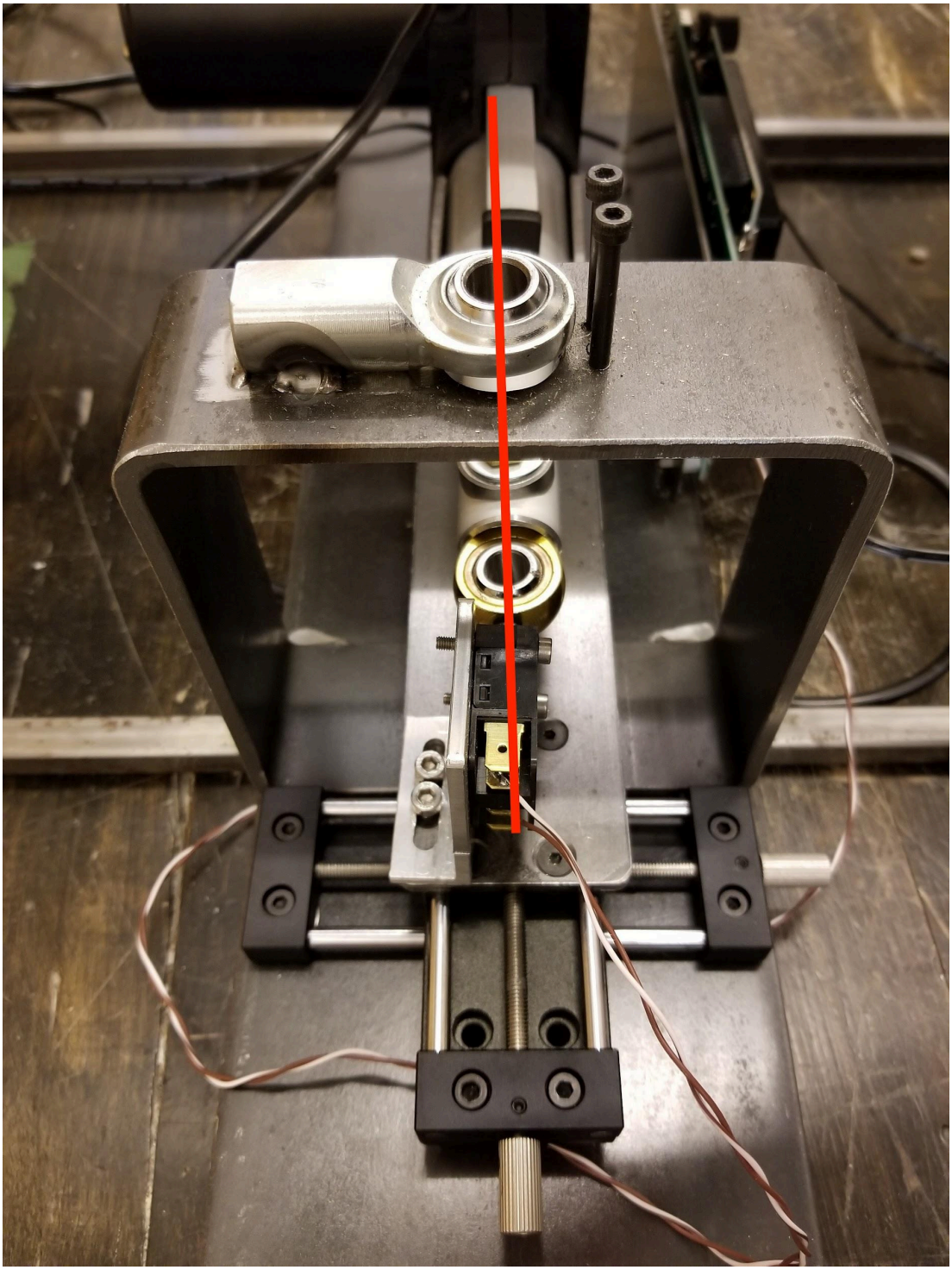
Calibrating the XY Axis

The XY axis is located at one end of the metal base. There are two knobs to adjust the axis, as shown in the diagram below.

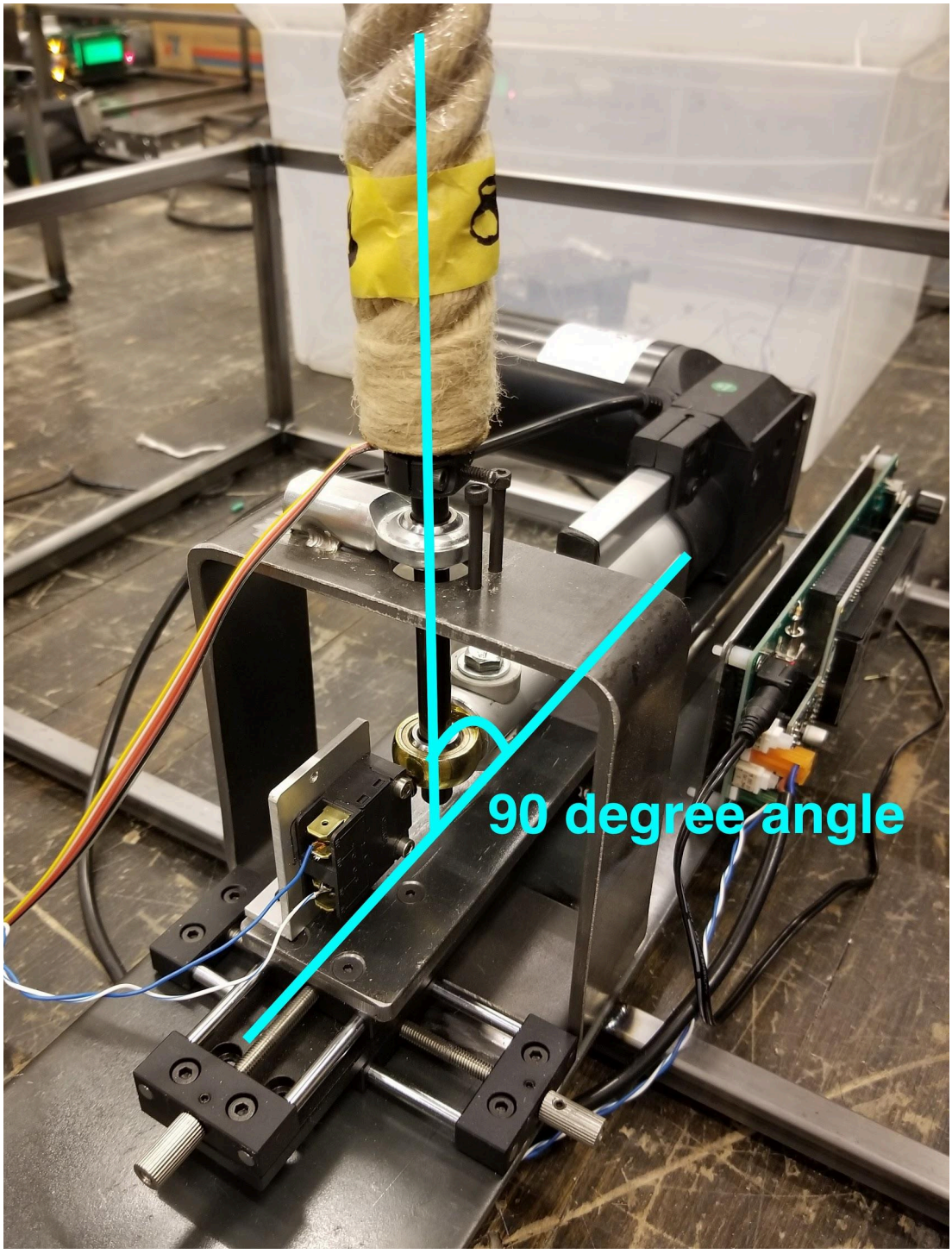
The knob on the left controls the back and forth motion of the actuator (illustrated here by a left-right arrow) and the knob at the bottom controls the side-to-side motion of the actuator (illustrated here by an up-down arrow). Turn the knobs clockwise and counterclockwise to move the actuator base into its desired position.



The goal is to align both bearings in a parallel position, so that the rod will be straight when inserted into the base, as illustrated below.



Using a level, adjust the XY axis until you get a 90° angle between the floor and the noose. It is important to base your calibration on the noose and not the length of rope itself, as we want the nooses to look centered and not all the sculptures are perfectly straight.

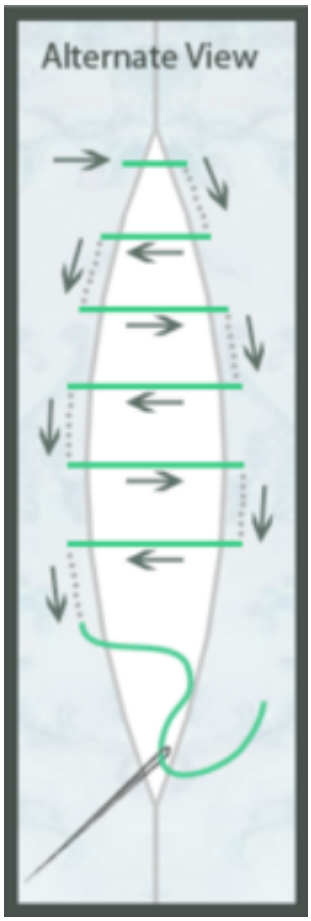


Invisible Switch

To reduce any gaps between the rope strands, hold the rope below the coiled neck of the noose and gently tighten it by moving downwards in the direction that the rope has been braided until reaching the base of the rope.

If some gaps persist, stitch the strands together using the stitching thread provided (Gütermann col #520) in an invisible stitch, as described below:

1. Tie a knot at the end of the thread.
2. Slip the threaded needle inside the rope to hide its knot.
3. Bring the needle out through the bottom edge of the rope strand.
4. Using the point of the needle, pick up just a few threads from the rope strand opposite where the thread is coming from. (This is the tiny stitch that is marked by a dotted line in the graphic below.)
5. Push the needle back into the opposite rope strand from where your thread is coming from.
6. The stitches should be 1/4" (5mm) in length on average.
7. Repeat this process for the entire length of the gap that is being fixed.



Programming a PCB (SPARKFUN ARDUINO ProMicro)

The following requires some basic knowledge about Arduinos: follow the steps at your own risk.

To (re)program a PCB, you will need the following: a computer with Arduino software installed, to install few Arduino libraries, the Sparkfun Board Manager set in Arduino and a USB A to USB Micro cable.

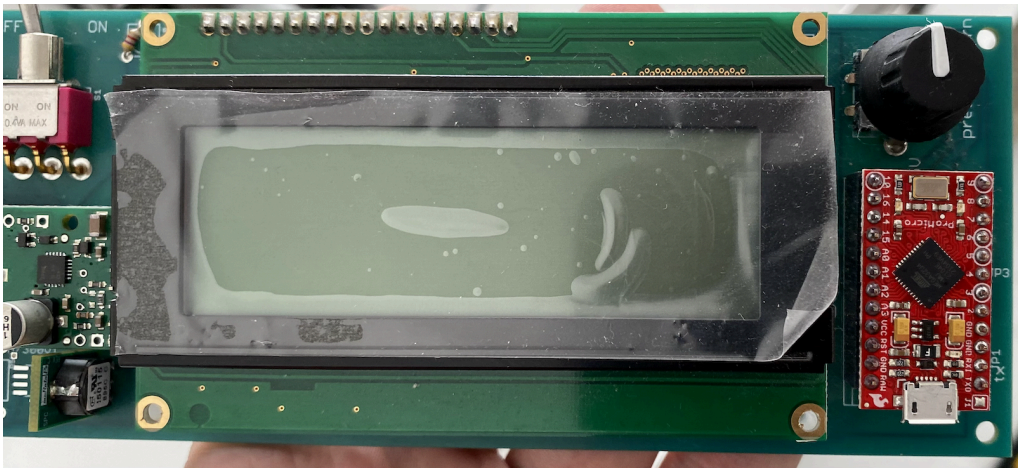
Ensure the following:

1. Download and install the Arduino version 1.8.16 or newer (newer version might introduce issues).
2. Within Arduino, go into Tools > Manage Libraries and install the following libraries: Bounce2 v 2.52.0, LiquidCrystal v1.0.7, RotaryEncoder v1.1.0. ****** See references below.***
3. Under Arduino > Preferences, locate the Additional Boards Manager URLs section and add the following link: ****** See references below.***
   https://raw.githubusercontent.com/sparkfun/Arduino_Boards/main/IDE_Board_Manager/package_sparkfun_index.json
4. **Detach the Sparkfun Arduino Pro Micro from the hosting PCB. Uploading a firmware version onto it while being attached to the PCB will probably break the Arduino.**
5. Connect the Arduino to the computer with the USB A to USB micro cable.
6. In Arduino, under Tools > Boards, go pick the Sparkfun Boards > Sparkfun ProMicro.
7. Under Tools > Processor, select the 5V version.
8. Under Tools > Port, select USB connection linking the Arduino to the computer. You might want to disconnect / reconnect the Arduino to notice the right port.
9. Under Tools > Programmer, select “Arduino as ISP (ATmega 32U4)”.
10. Open the metronomos_LCD.ino file provided to you. Once loaded in Arduino, it should show several tabs including metronomos_LCD, build_version, encoderKnob, fastPWM, lcd_display, motors, serial_receive, store_data.
11. First try to Verify the code, if it says at the bottom of the screen “Done compiling” with no error in the console.

Good compilation will result like this

Bad compilation will look like this(text may differ)

12. If previous step worked well, click on Upload and push the code to the Arduino.
13. Once it is uploaded, you can disconnect the Arduino from the computer, connect it back to the PCB, without any USB cable connected to it, USB port facing towards bottom of the board.



14. While all PCB connections are disconnected (actuator, switch), connect the PCB to the power connector and flick the switch on. If screens load up to the point where it displays metronomos vXX, speeds, stats and etc, you upload process is completed.
15. You can then proceed to use that PCB within a sculpture, connected to the power, the actuator, the limit switch.

References:

1. Library Bounce2 v 2.52.0 (Thomas O Fredericks): https://www.arduino.cc/reference/en/libraries/bounce2/
2. Library LiquidCrystal v1.0.7 (Arduino): https://www.arduinolibraries.info/libraries/liquid-crystal
3. Library RotaryEncoder v1.1.0 (Matthias Hertel): https://www.arduino.cc/reference/en/libraries/rotaryencoder/
4. If you can't find the Sparkfun ProMicro board, odds are the Step4 - Board Manager didn't work well. Look at instructions provided by Sparkfun here: https://learn.sparkfun.com/tutorials/qwiic-pro-micro-usb-c-atmega32u4-hookup-guide#mac_linux_boardaddon