MARK ROBERTS MOTION CONTROL

CINEBOT MINI

QUICK START GUIDE

QSG Product Code: MRMC-2272-00
Products covered: MRMC-2227-00, MRMC-2238-00

CRANES AND RIGS | BROADCAST | HEADS & DSLR | PRODUCT PHOTOGRAPHY | RENTALS

Cinebot Mini Quick Start Guide

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Chapter 1 **Quick Start**

Important safety instructions

To ensure the best from the product, please read this manual carefully. Keep it in a safe place for future reference.

To reduce the risk of electric shock, do not remove the cover from the unit. No user serviceable parts inside. Refer servicing to qualified personnel.

Power and connections

- This unit must be connected to a mains socket outlet with a protective earth connection.
- This unit is not disconnected from the AC power source as long as it is connected to the wall outlet.
- When not using the unit for a long period of time, ensure that the AC power cord is disconnected from the wall outlet.
- The AC wall outlet should be installed near to the unit and be easily accessible.
- Do not plug in or attempt to operate an obviously damaged unit.

General care

- Do not force switches or external connections.
- When moving the unit, disconnect the mains cable and then disconnect the long umbilical cable.
- Do not attempt to clean the unit with chemical solvents or aerosol cleaners, as this may damage the unit. Use a clean dry cloth.
- Do not use around flammable gas. All electrical equipment can generate sparks that can ignite flammable gas.
- Keep away from pets and children. The head has powerful motors that can pinch, so take care not to get your hands trapped in the head or cabling.

- Keep cables tidy. Use cable ties to keep them out of harm's way. If you have a head with slip rings then make use of them; avoid running any cables between the base and the rotating head or camera.

Location

Installation of this unit should be away from sources of excessive heat, vibration, and dust.

Keep the brakes on caster wheels on when using the Cinebot Mini on Pedestal.

Intellectual property

This product includes confidential and/or trade secret property. Therefore, you may not copy, modify, adapt, translate, distribute, reverse engineer, or decompile contents thereof.

Overview

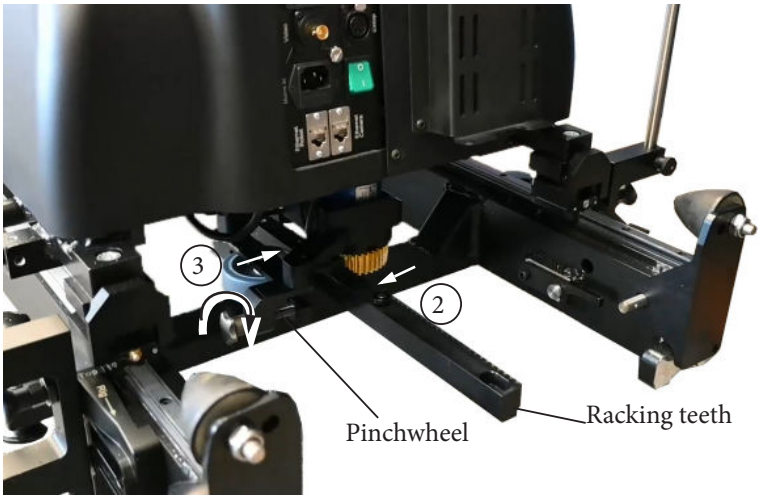
Thank you for using the Cinebot Mini from Mark Roberts Motion Control (MRMC). Cinebot Mini is designed for reliable day-in, day-out use in professional studio and Outside Broadcast environments. It is a low cost, lightweight Moco rig using the Universal Robots UR10e collaborative robot on a pedestal or track. It provides motion control at limited speeds and travel range compared to the existing Bolt range, but adequate for limited complexity and lower speed shoots. Cinebot comes with optional 500mm and 300mm risers that can be used to raise the height of the arm

Cinebot Mini on Pedestal has a lightweight but sturdy movable pedestal which can be held down with weights.

Cinebot Mini on Track has a base designed to move along precision track. It has removable trolley wheels for moving between sets, and can also be held down with weights at temporary locations.

Attaching the Pinchwheel Assembly to Cinebot Mini on Track

1. After removing the packaging and putting the Cinebot Mini on Track from the crate, remove the cable tie on the Cinebot Mini base underside that has been added to secure the pinch wheel assembly during transport.

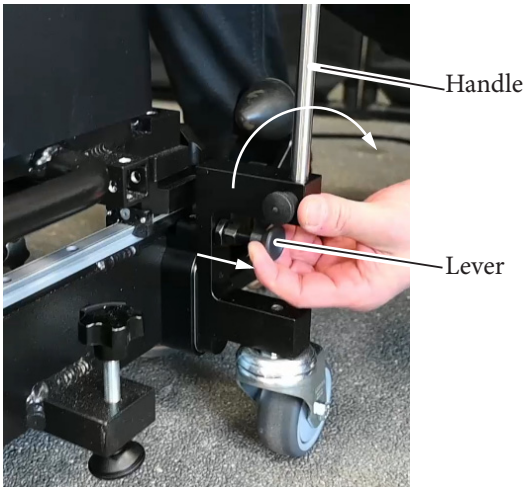


2. Push the track motor gear to the teeth of the racking so they are in mesh.
3. Slightly push the pinchwheel to the rear of the racking and use the star screw to finger tighten it.
4. Check that the base is now firm on the track and is not able to be pushed by hand.

Removing/Adding the Wheel Units on the Cinebot Mini on Track

Cinebot Mini on Track is transported over one length of track on 4 x wheel units. The 2 x smaller wheels are steering wheels to manoeuvre the rig and put it in the desired position. The 2 x larger wheels are fixed wheels. These units can be lowered or removed while the rig is in operation.

To lower the wheels, while pulling the lever on the wheel away from the rail and lower the handle down.



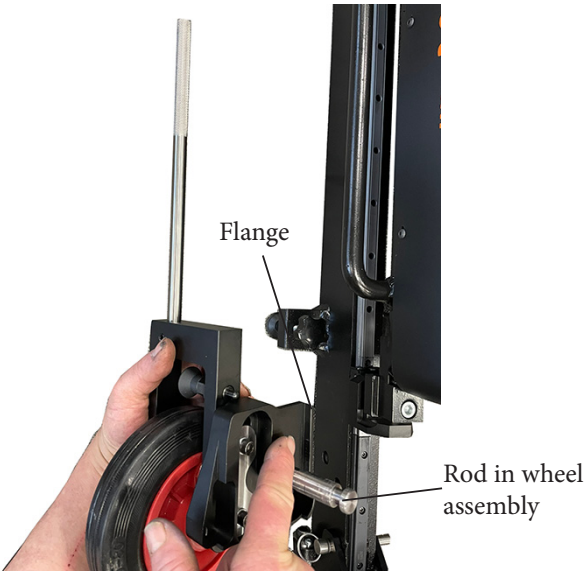
Similarly lower the other 3 x wheels.

To **remove the wheels**:

Remove the clip from the castor wheel bracket and detach the wheel assembly away from the rail.

To **add the wheels** to the rails:

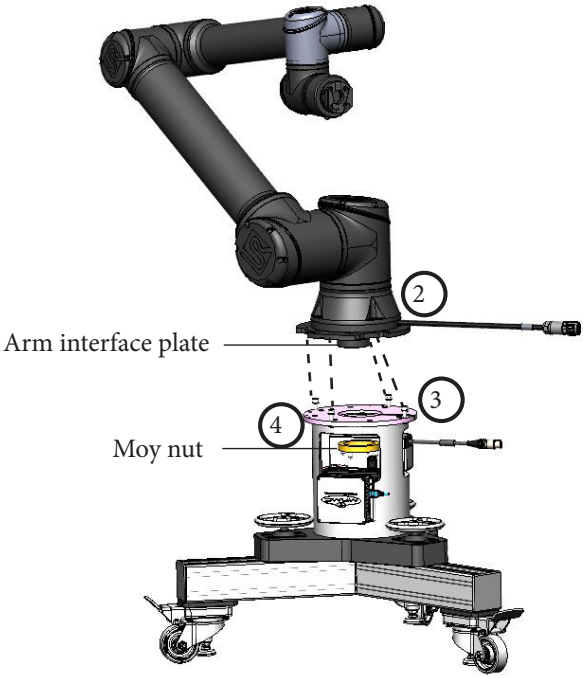
1. Each wheel assembly can be attached to the rail only to the specific location on the track. Ensure you find the correct wheel assembly matching the side of the rail using the label on each. Adjust the bracket on the wheel so that the handle is lowered and parallel to the rail and flange on the wheel bracket can go under the rail.



2. Insert the rod in the wheel assembly into the cavity in the rails and clip it to the rail.

Cinebot MINI

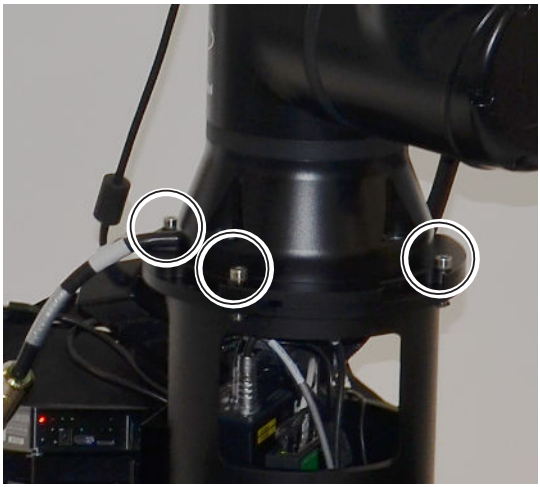
Mounting Cinebot Mini Arm on the Base



1. Ensure that the brakes on the castor wheels in the base are engaged for the pedestal version and pinchwheel is in mesh with the racking for the track version.
2. If not done already, remove the moy nut from the interface plate from the bottom of the arm. Lift the arm directly above the base.
3. While aligning the key on the interface plate on the arm and slot on the base, lower the arm on the base cavity so that the 4 x M8 insert into the slots on the interface plate. Lock the arm on the base by slightly turning the arm clockwise. Tighten the 4 xM8 screws.
4. Reach to the interface plate from within the cavities in the base, hand tighten the moy nut to the interface plate to secure the arm to the base. You can optionally source a Mitchell spanner or wrench locally to do the same.

Removing Cinebot Mini Arm from the Base

1. Ensure that the brakes on the castor wheels in the base are engaged.
2. Reach to the interface plate from within the cavities in the base, unscrew the moy nut from the interface plate. You can optionally source a Mitchell spanner or wrench locally to do the same.
3. Loosen the 4 x M8 captive screws that secure the arm to the base and turn the arm clockwise to release from the base.



Mounting Cinebot Mini Arm on the Columns

Mounting 300mm Column

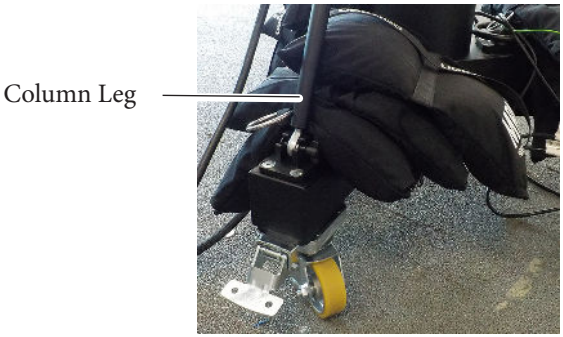
1. If the robot arm is mounted on the base, use the procedure in *Removing Cinebot Mini Arm from the Base* on page 9 to remove the arm.
2. Add the 300mm column to the base by aligning the key on the mounting plate on the column and slot on the base, lower the column on the base cavity so that the 4 x M8 screws insert into the slots on the mounting plate on the column. Turn the column clockwise so that it locks into the base. Tighten the 4 xM8 screws.
3. While aligning the key on the interface plate on the arm to the slot on the base, lower the arm on the base cavity so that the 4 x M8 screws in the column insert into the slots on the interface plate in the arm. Lock the arm on the base by slightly turning the arm clockwise. Tighten the 4 xM8 screws.
4. Reach to the interface plate from within the cavities in the base, hand tighten the moy nut to the interface plate to secure the arm to

the base. You can optionally source a Mitchell spanner or wrench locally to do the same.

Mounting 500mm Column

1. If the robot arm is mounted on the base, use the procedure in *Removing Cinebot Mini Arm from the Base* on page 9 to remove the arm.
2. Add the 500mm column to the base by aligning the key on the mounting plate on the column and slot on the base, lower the column on the base cavity so that the 4 x M8 screws insert into the slots on the mounting plate on the column. Turn the column clockwise so that it locks into the base. Tighten the 4 xM8 screws.

3. Secure the column legs to the base by tightening the 3 x wing nuts to the 3 x pivot brackets, respectively.



4. While aligning the key on the interface plate on the arm to the slot on the base, lower the arm on the base cavity so that the 4 x M8 screws in the column insert into the slots on the interface plate in the arm. Lock the arm on the base by slightly turning the arm clockwise. Tighten the 4 xM8 screws.

5. Reach to the interface plate from within the cavities in the base, hand tighten the moy nut to the interface plate to secure the arm to

the base. You can optionally source a Mitchell spanner or wrench locally to do the same.

Laying the Track for Cinebot Mini on Track

1. Lay the robot with the first track section on its feet.
2. Raise the two middle feet of the track section (1 on each rail) so they do not touch the ground, leaving the rail to rest on the four corner feet.

3. Level the track in both length and width directions using a spirit level, by adjusting the four corner feet of the track. Make sure all four corner feet are touching the ground (no wobble).

> Hint
>
> The four corner feet also determine the track height. If you are laying track on a level floor, try to use the middle of the height adjustment range so that subsequent sections have some leeway (in their feet) to cater for any unevenness in the floor.

4. Lower the two middle feet until they touch the ground (finger tight against the ground).

Laying subsequent track sections

1. Lay the next track section in line with the previously laid track section and as close to it as possible, making sure it is the right way around.
2. Raise the middle feet of the new track section so they do not touch the ground.
3. Adjust the height of the new track section to match that of the previous section by adjusting the two corner feet nearest to the joint (one on each rail).
4. Level the new track section with a spirit level by adjusting the two corner feet furthest from the joint (one on each rail).
5. Slide the new track section along the floor against the previous track to firmly engage the ends of the rails. (Slide the new section — not the previous section.) You might need to repeat steps 3 to 5 until you get good alignment of the rails at the joint.

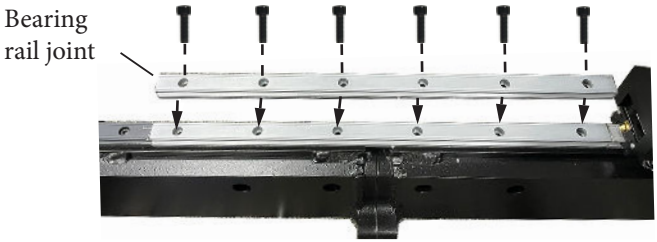
6. Make sure the rack joint has the correct spacing by clamping a rack matching block to it, teeth meshed, using a vice.

7. Firmly tighten the two large bolts that hold the track sections together at the joint (one on each rail). You can also use these to help pull the track sections together, once they are at the same height.

8. On the new section, lower the six middle feet until they touch the ground (finger tight against the ground).

Mounting bearing rail joints

1. At one of the track joints, slide a track bearing (included in the spares) over the end of the bearing rails.
2. Add one of the long bearing rail joints onto the track.
3. Align the bearing rail joint with the existing rail by sliding the track bearing over the joint at each end.
4. Insert the screws and tighten them.

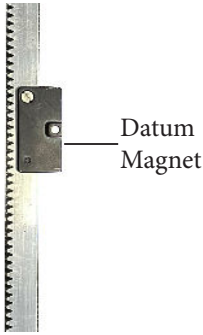


5. Slide the track bearings along the rail to the next joint and repeat steps 1 to 4 for all remaining joints. For the track ends you use the short bearing rail pieces (with only two holes) and one track bearing to help with alignment.

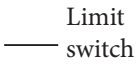
6. Remove the vice and rack matching block.

Datum Magnet

The track has a **Datum magnet** which can be detected by the Datum sensor under the pinchwheel in the track base. The Datum magnet defines a fixed reference point on the track for the electronics. The rig controller can then use this position as the home position or zero point, from which all positions, movements, and soft limits along the track are measured.



The **Limit Switch** consists of a magnetic sensor located on the track motor pinch wheel on the underside of the rig, and two magnets which you mount at each end of the rack. The position of the magnets along the rack defines the ultimate limits, along the track, for the rig electronics. You define the soft limits within the range of the Limit Switch magnets, so that if the soft limits fail for some reason and the rig reaches one of the Limit Switch magnets, the system electronics automatically shut down any further movement and apply the brakes.



Hint

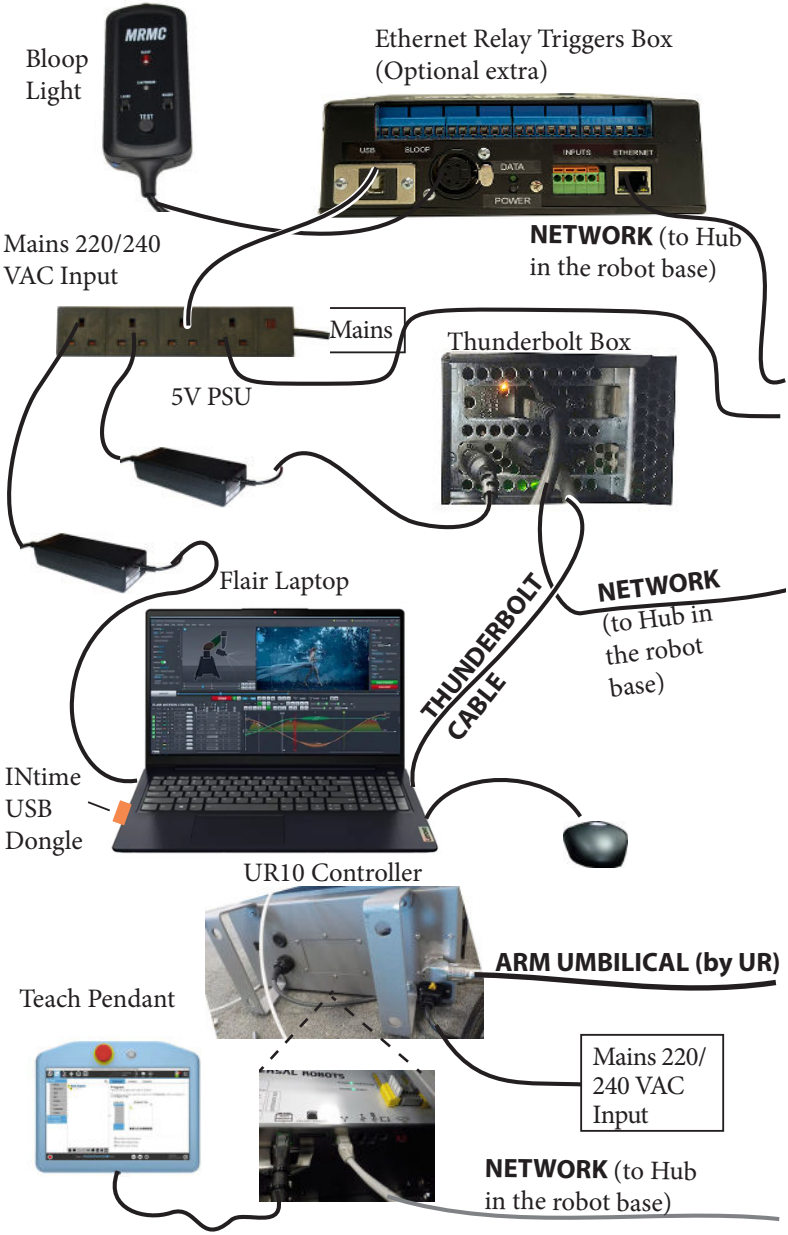
If you move the Datum magnet to a different position along the track, remember to change the soft limits in your controller or Flair computer to cater for the new Home position.

Note

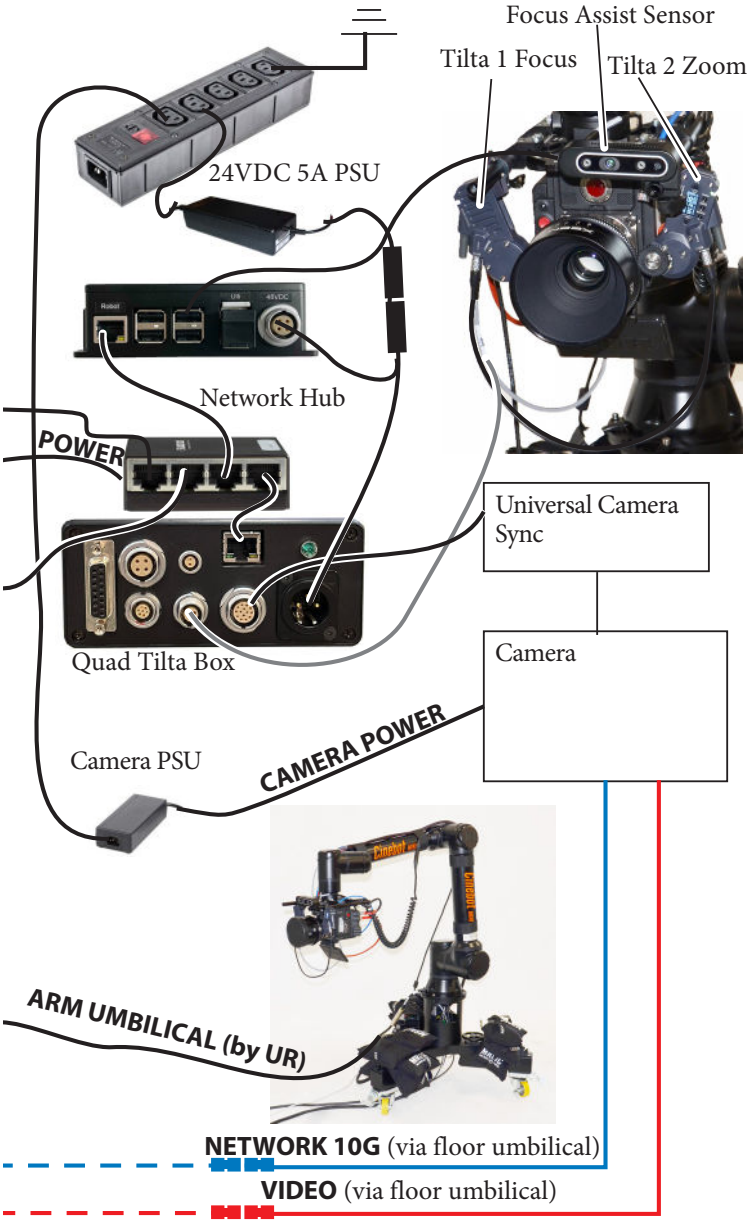
Ensure that the robot is not directly above the datum magnet when stopping it to put the pinchwheel out of mesh, for example for transport. Move the robot over along the track before putting the pinchwheel out of mesh.

Notes

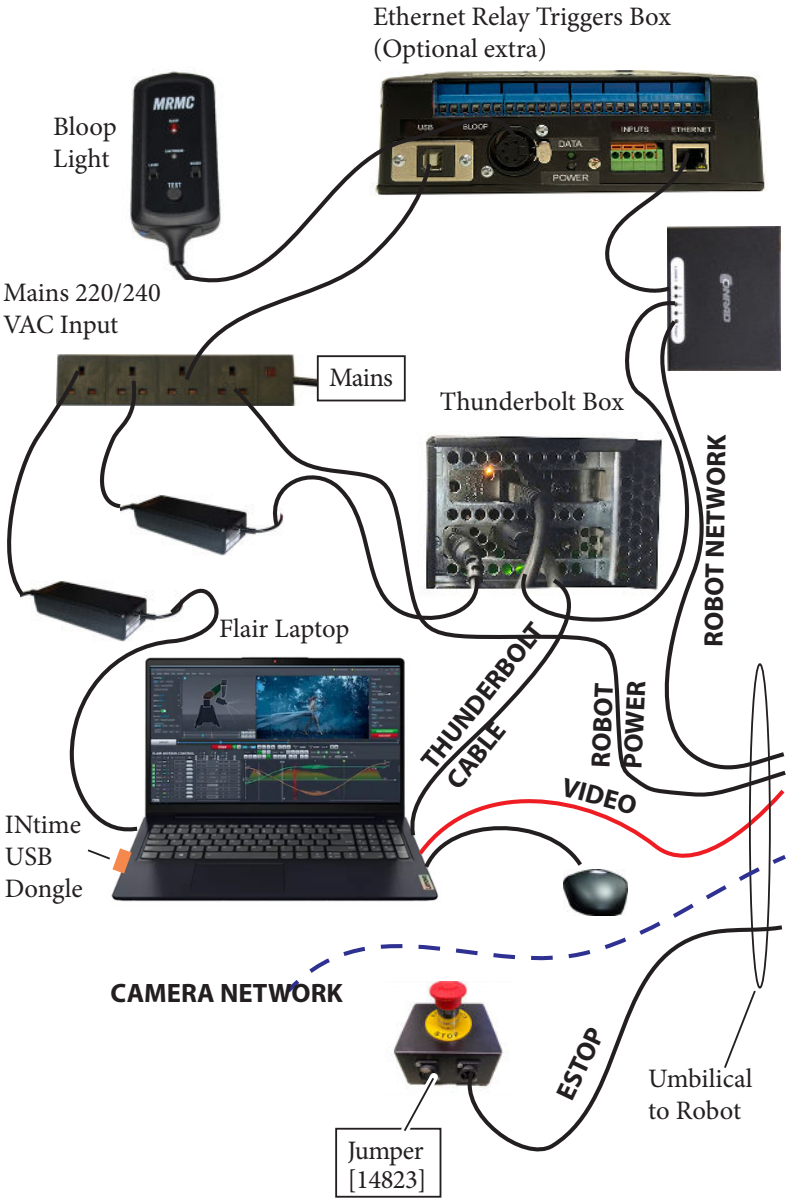
Connecting the cables (Cinebot Mini on Pedestal) - Operator's Position



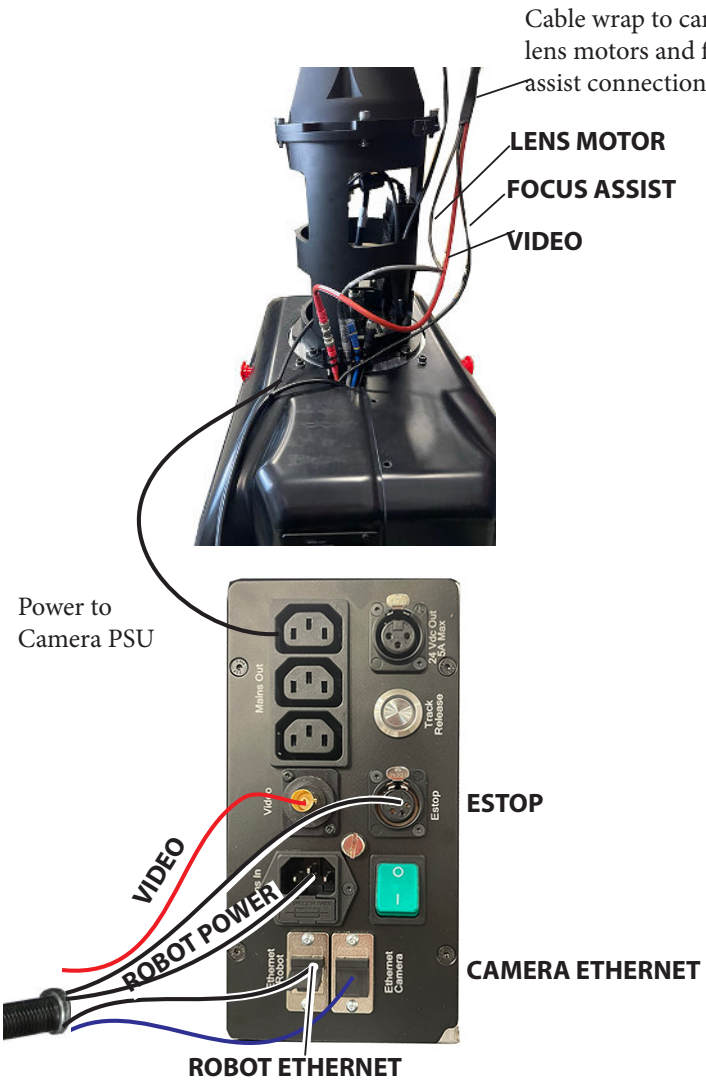
Connecting the cables (Cinebot Mini on Pedestal) – Robot Base - Robot Arm



Connecting the cables (Cinebot Mini on Track) - Operator's Position



Connecting the cables (Cinebot Mini on Track) – Robot Base - Robot Arm



Picture of base connections - Cinebot Mini on Track

Picture of Cinebot Mini on Track

Starting up the Cinebot Mini on Pedestal system

Once you have attached all the cables, you power up the rig by switching on the components in the order described below.

1. Mount the camera on the Cinebot mini arm on the camera plate. Note that the camera plate can only be used to top-mount the camera and is the minimised version of the Camera Platform for Bolt Family. For more information on mounting the camera and lens motors, see the *Camera Platform for Bolt Family Quick Start Guide*.

2. Make sure you have secured the area around Cinebot Mini on Pedestal. Put up guard rails around Cinebot Mini on Pedestal as necessary, and tell others on the set that you are now powering up the rig.

3. With everything powered off including the laptop, connect all cables as detailed in the diagram on page 18.
4. Power the switch on the IEC 5Way Extension and the power strip on the operator's desk. This will power up the robot, the camera, and the thunderbolt box.
5. On the Teach Pendant, press the power button and allow the system to start, displaying text on the PolyScope.
6. A popup appears on the touch screen indicating that the system is ready and that the robot must be initialized.
7. In the Payload field, in Active Payload, verify the payload mass.
8. Power up the Flair laptop.

9. On the Flair PC, start the Flair application by double-clicking on the Flair icon on the Desktop.

   Flair automatically loads the relevant firmware into all attached axis boards, including Any interface boxes or model movers that are attached to the computer stack such as Turntable.

10. Release the E-stop on the teach pendant, by turning the button clockwise until the red button pops up.

11. In Flair, click on the **Engage Robot** button.

12. Optionally, zero the axes as required in Flair. The Cinebot Mini on Pedestal arm itself does not require zeroing but you need to zero other axes, such as:

    - Any external Lens Control Motors (LCMs) that you are using. To zero these you first set the focus to infinity (∞), zoom to wide-angle (zoomed out all the way), iris/aperture to wide open and then use the relevant **Zero → Direct Zero Axis** menu option to set those lens positions as the zero points in Flair.

    - Any model mover axes like Turntable.

Cinebot Mini on Pedestal start-up summary

2. Secure the area
3. Switch on Cinebot Mini on Pedestal
3. Switch on the Flair PC
4. Check networking lights for robot in Ready state
5. Start Flair
6. Release the E-stop on the teach pendant

In Flair:

7. **Engage Robot**
8. Zero the lens control motors

The rig is now ready to use.

Shutting down the Cinebot Mini on Pedestal system

1. If you are going to transport Cinebot Mini to a new location, put the Cinebot Mini on Pedestal arm into its Transport position. You can do this by using Flair (although you might have to reset the soft limits to reach the Transport position).
2. In the Flair software, click on the **Disengage Robot** button.
3. Press down all E-stop buttons.
4. Close the Flair software.
5. Shut down Windows on the Flair PC.

Starting up the Cinebot Mini on Track system

Once you have attached all the cables, power up the rig by switching on the components in the order described below.

1. Mount the camera on the Cinebot mini arm on the camera plate. Note that the camera plate can only be used to top-mount the camera and is the minimised version of the Camera Platform for Bolt Family. For more information on mounting the camera and lens motors, see the *Camera Platform for Bolt Family Quick Start Guide*.

1. Make sure you have secured the area around Cinebot Mini on Pedestal. Put up guard rails around Cinebot Mini on Pedestal as necessary, and tell others on the set that you are now powering up the rig.

2. With everything powered off including the laptop, connect all cables as detailed in the diagram on page 18.
3. Power the switch on the IEC 5Way Extension and the power strip on the operator's desk. This will power up the robot, the camera, and the thunderbolt box.
4. Power up the Flair laptop.
5. On the Flair PC, start the Flair application by double-clicking on the Flair icon on the Desktop.

   Flair automatically loads the relevant firmware into all attached axis boards, including any interface boxes or model movers that are attached to the computer stack such as Turntable.

6. Release the E-stop on the robot base, by turning the button clockwise until the red button pops up and green LED lights up.
7. In Flair, click on the **Engage Robot** button.
8. Engage and then zero the Track axis. Zero the other axes as required in Flair. The Cinebot Mini on Track arm itself does not require zeroing but you need to zero other axes, such as
    - The Track: To do this you use the Zero > Ho me Axis > Track menu option. When zeroing the track axis is initiated, the rig will seek the datum limit sensor in the negative direction, so the rig must first be driven in a positive direction just past the datum magnet (sensors are on the pinch wheel assembly)
    - Any external Lens Control Motors (LCMs) that you are using. To zero these you first set the focus to infinity (∞), zoom to wide-angle (zoomed out all the way), iris/aperture to wide open and then use the relevant **Zero → Direct Zero Axis** menu option to set those lens positions as the zero points in Flair.
    - Any model movers

Cinebot Mini on Track start-up summary

2. Secure the area
3. Switch on Cinebot Mini on Track
3. Switch on the Flair PC
4. Check networking lights for robot in Ready state
5. Start Flair
6. Release the E-stop on the desk

In Flair:

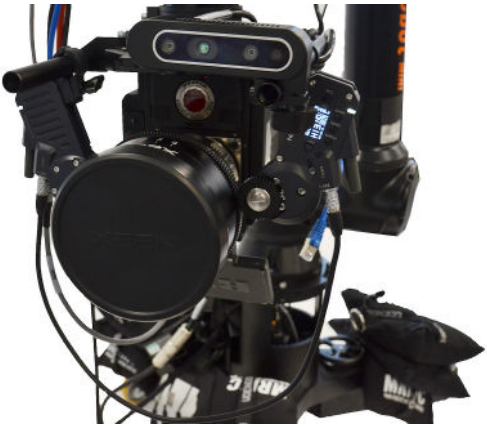
7. **Engage Robot**
8. Zero track and other axes

The rig is now ready to use.

Setting up a Lens in Flair Classic with Tilta motors

1. Mount the lens motors on the camera plate to control focus and zoom. Use the *Camera Platform for Bolt Family of Robots Quick Start Guide* for instructions on how to mount the camera platform on the robot arm and to add the motors on to the matte bars.

Picture of lens control motors on the camera platform



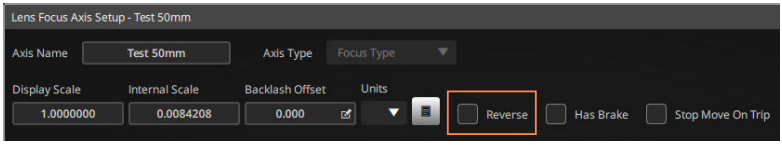
2. Plug the cables for motors. Note that the motors are daisy chained. They are powered up when the quad box in the robot base is powered up. Switch on the power to the robot.

3. They will each have a number on them, usually 2 or 3. These are the port numbers on the network node in Flair. They are run from a Quad Axis board that is a node on your normal Ethernet network.

4. On each motor, press the **Calibrate** button for 3 seconds and the motor will find both end stops and set the internal scale in Flair from 0-1 for the real travel between end-stops.

   Once the calibration is done,

   4.1 Drive the lens to ∞ and in Flair, check that Focus is at zero.
   Similarly, check that closed focus is at 1. If the values are interchanged or negative, disable the Focus axis and go to Focus axis setup and reverse the motor direction.



   4.2 Save the axis setup and exit.

   4.3 Ensuring that the hand controller is off, enable the Focus axis.

   4.4 Drive the focus axis to both ends until you notice a 'jump' in Flair. (This jump is because of the motor correcting its direction.)

5. In Flair, choose **Setups** → **Lens Setup** and choose any **Empty Lens**.

6. Specify a **Name** for the lens.

7. Add a **Focal Length** for your lens.

8. Check that the **Moves** option is checked.

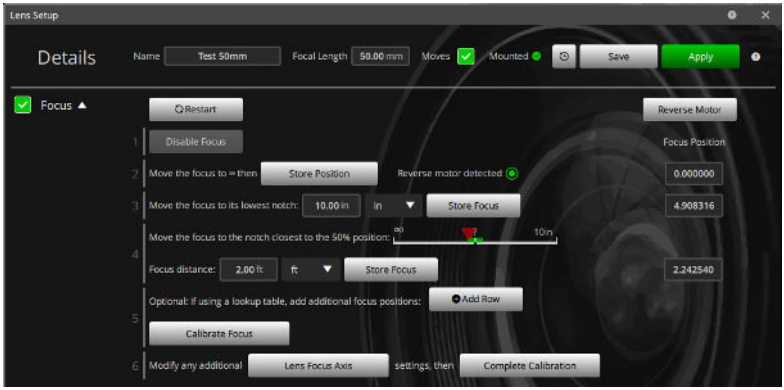
9. You will be guided through the on-screen steps for focus calibration. In step 1, click **Disable Focus**.

10. For step 2, using the Flair main screen, move the focus to ∞, and click **Store Position**.

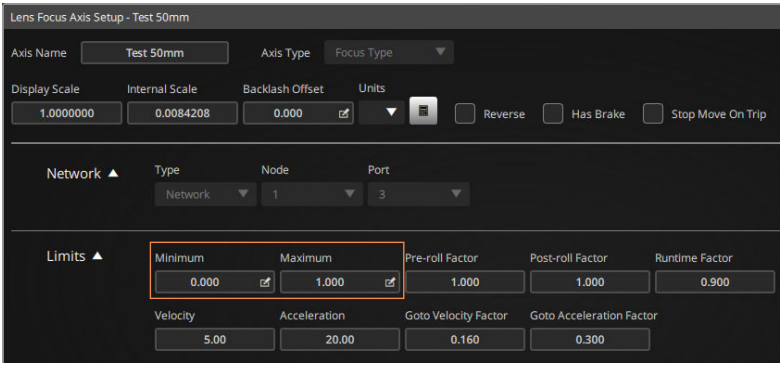
11. For step 3, move the focus on lowest notch and enter the reading on the lens in the box and select the units. Click **Store Focus**.

12. For step 4, move the lens to the mid-point mark in the lens travel and enter the reading on the lens in the **Focus distance** box and select the units. Click **Store Focus**.

13. For step 5, click **Calibrate Focus**.



14. For step 6, click **Lens Focus Axis** and in the Lens Focus Axis dialog box, **Minimum Limit** will be set to **0** and **Maximum Limit** to **1**. If not, type these in.



15. Click **Save** and Exit.

16. In the Lens Setup dialog box, click **Complete Calibration**.

17. Scroll down to Extras, measure the **X**, **Y** and **Z nodal offsets** according to the camera and lens positions and add these values in the respective boxes. Add the values for other offsets that apply. For more information on offsets, refer to the *Flair 7.3 Manual*.

18. Click **Save** and **Apply**. Close the Lens Setup dialog box.

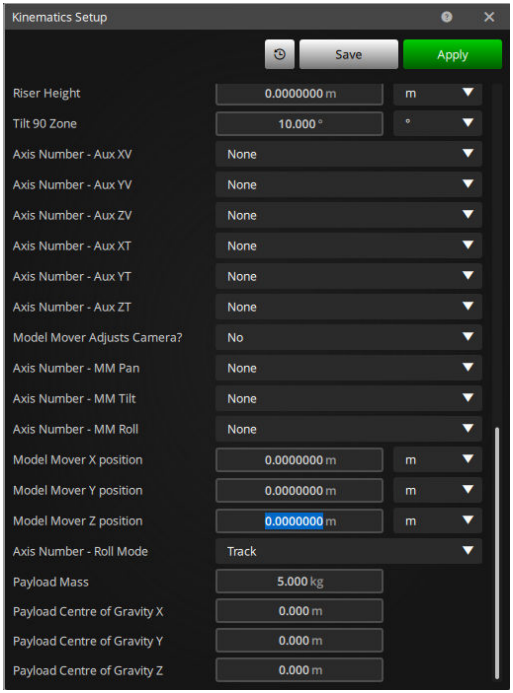
19. Whenever an already calibrated lens is used, the Nucleus-M Lens Motor must be placed where it was on the Focus and it must have the **Calibrate** button pressed on it to find end-stops of that lens. Then, when the lens setup is loaded and applied from Flair files, the Focus calibration will be correct.

Setting the Payload for Cinebot Mini

The robot allows the use of a special 'PushMoco' mode which allows the robot arm to be manually moved into desired positions and/or poses and to store waypoints either using Flair user interface or pressing a button on the Bluetooth Remote Control. When PushMoco is active, in order for the robot to function as desired and not drop unexpectedly, it is important that the payload and centre of gravity values are set up accurately. Once the value is set for a specific payload, you can toggle PushMoco on or off, as required.

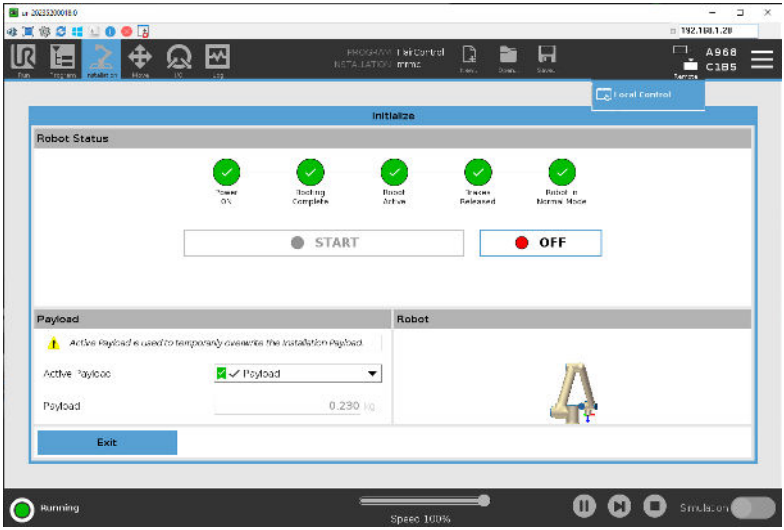
The correct payload value for the robot can be set using the wizard in the VNC Viewer program.

1. Ensure that the fields in the Kinematics setup in Flair are left blank, as shown:

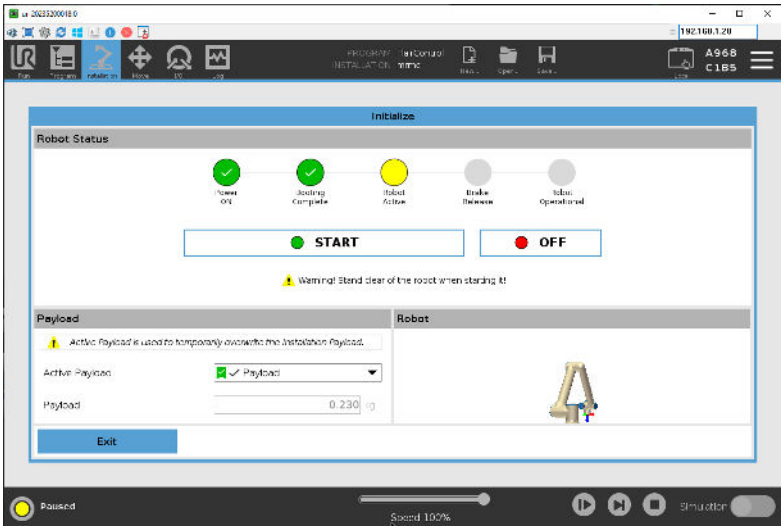


2. On the laptop, launch the VNC Viewer program – polyscope user interface.

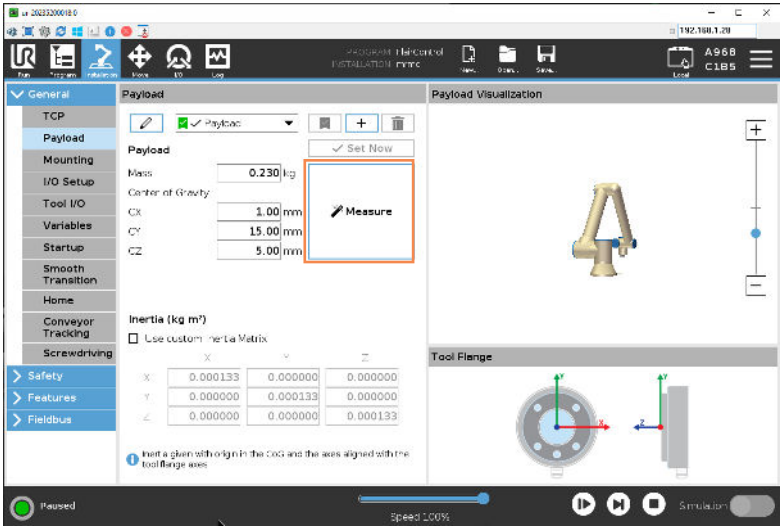
3. If you are already running Flair, in VNC viewer, pass the control to **Local**.



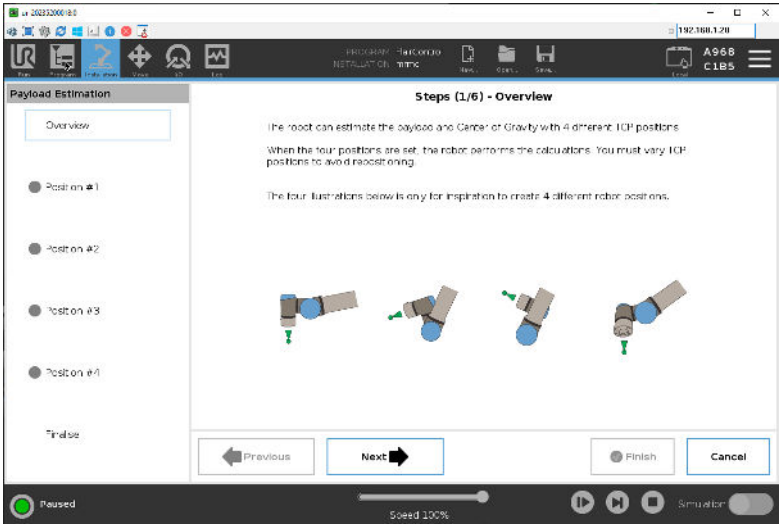
4. If you have just powered up the robot and are not connected to Flair, start the VNC Viewer on the laptop. After the robot has initialised, the screen will appear as follows



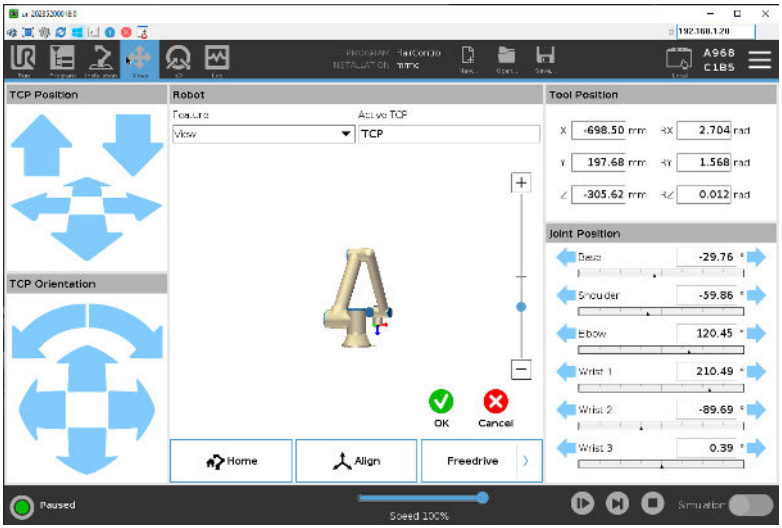
5. Click **START**. Select **Installation → General →Payload**. Click Measure to start the Payload Wizard.



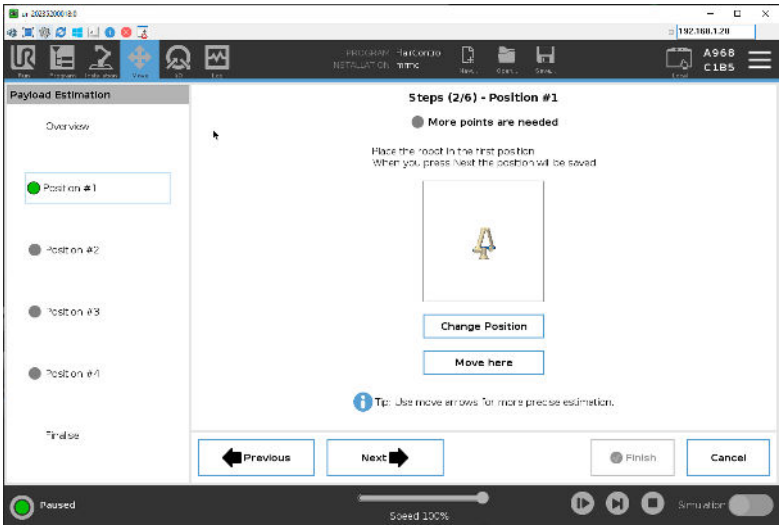
6. As stated on the screen, the robot can estimate the payload and centre of gravity with 4 different robot positions excluding any camera axes. Click **Next**.



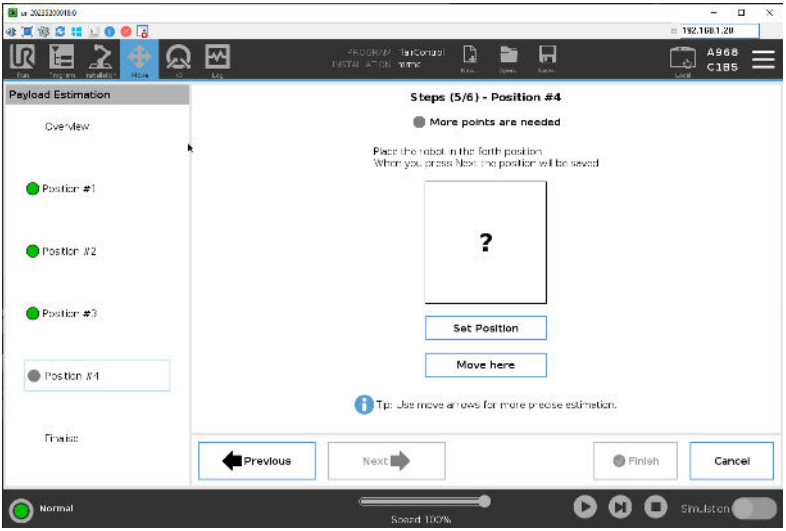
7. When you have put the robot into first position, click **OK**.



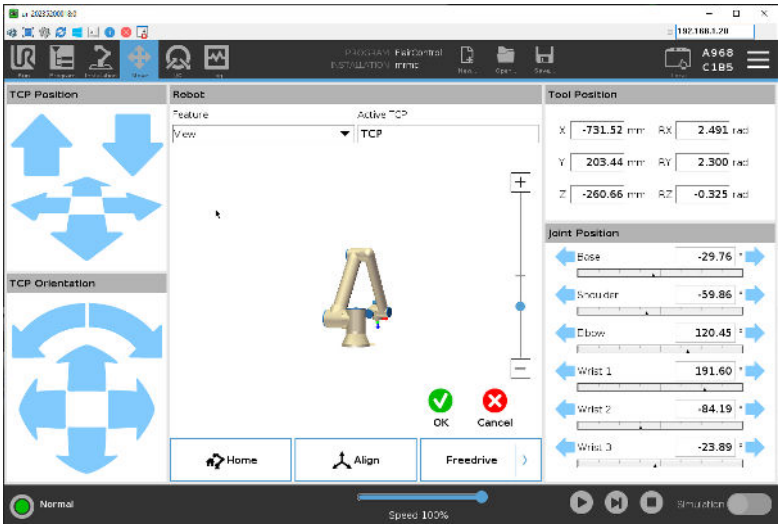
8. On the next screen, click **Next**.



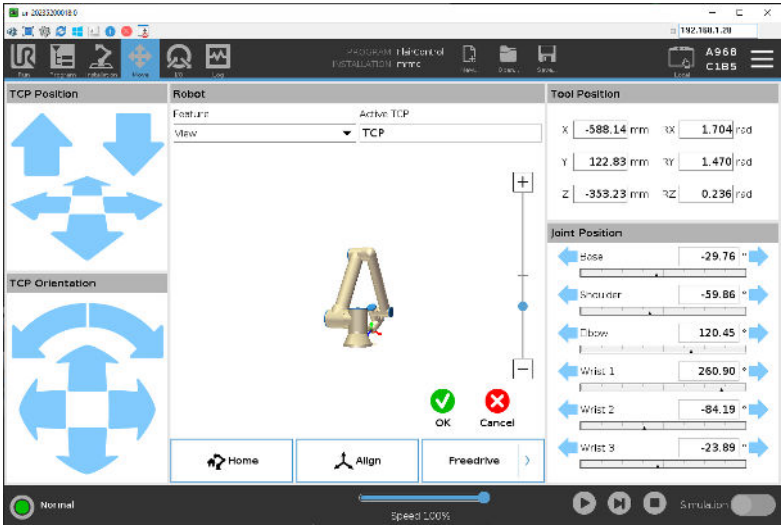
9. Click Set Position to start setting the second position.



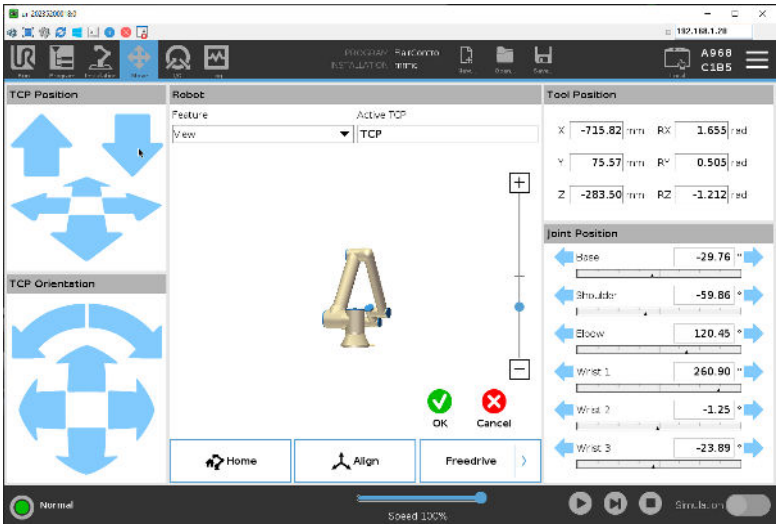
10. Put the robot in the second position and click OK.



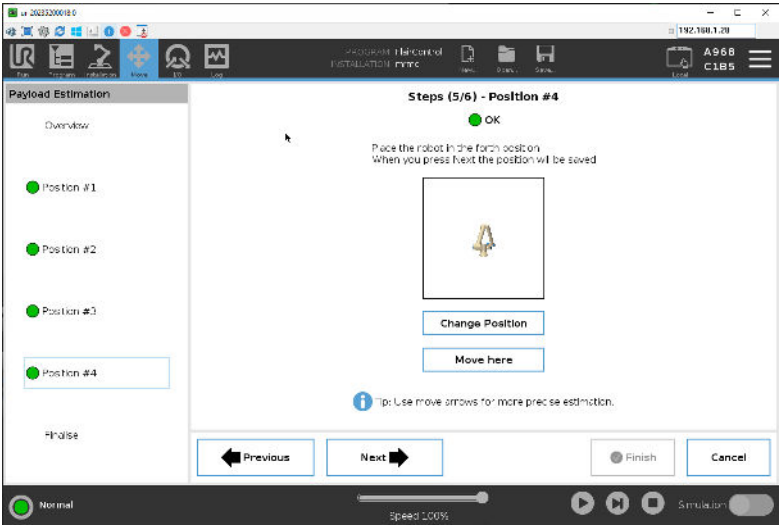
11. Repeat steps 9 and 10 to add the third position.



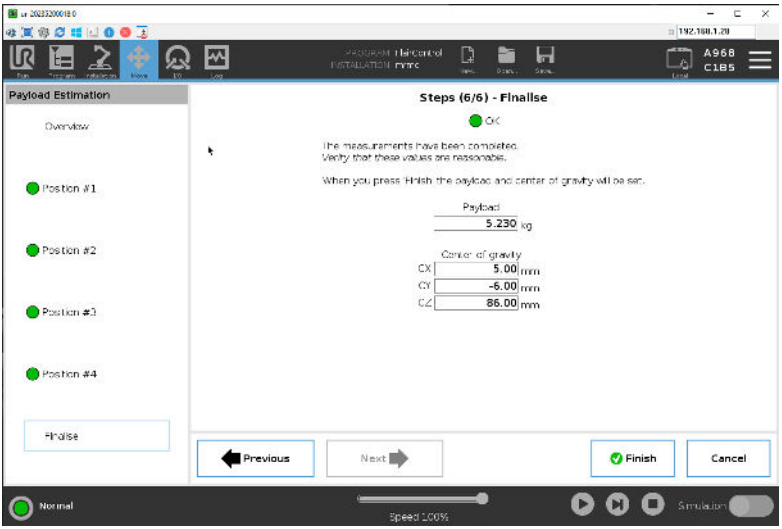
12. Similarly, add the fourth position and click **OK**.



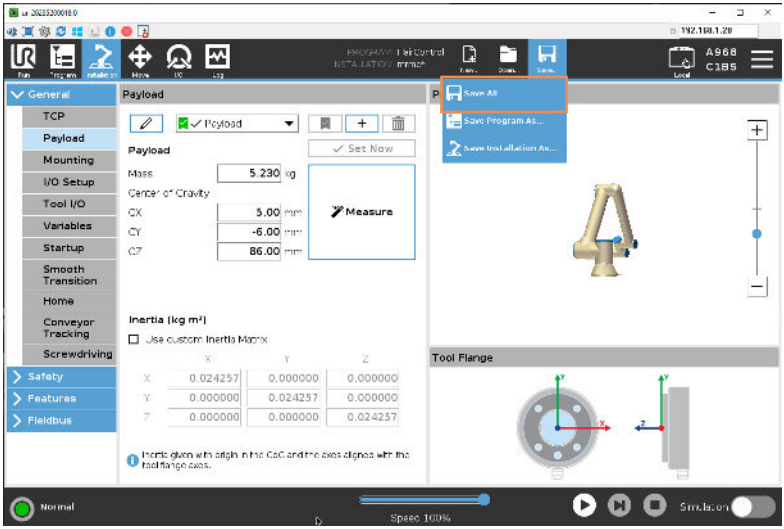
13. Click **Next**.



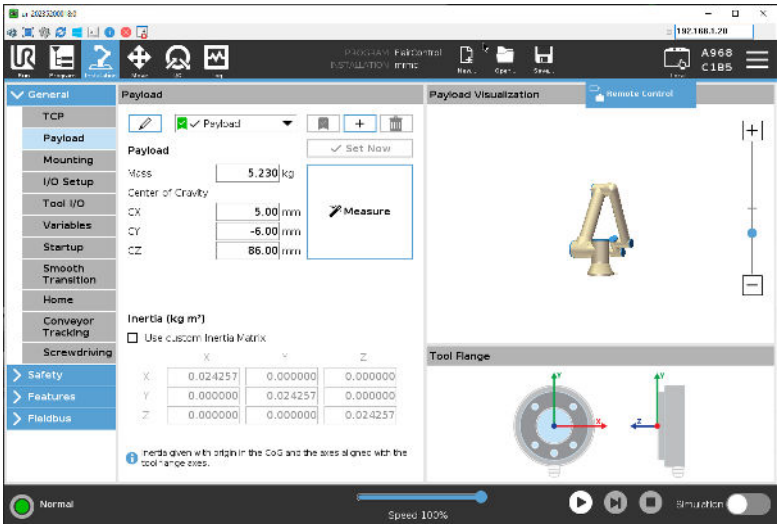
14. On the final screen of the wizard, the estimated payload and centre of gravity measurements are shown. Click **Finish**.



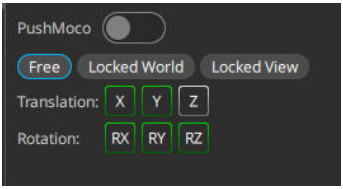
15. Select **Save** → **Save All**.



16. If Flair is launched, you can select **Local** → **Remote Control** to pass the control of the robot to Flair.



17. Toggle PushMoco on from main Flair screen. It turns green.

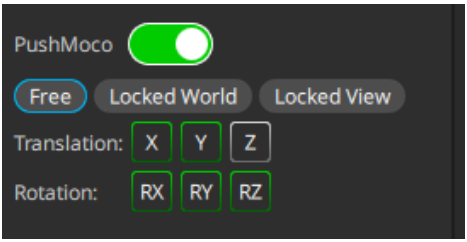


18. Manually move the robot arm to the desired position and use Flair or the Cinebot Mini remote interface mounted at the end of the arm to store waypoints in Flair.

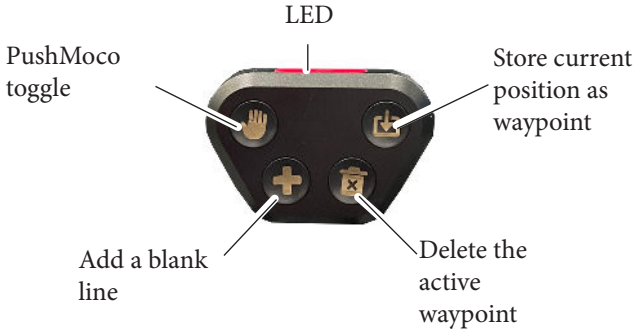
19. In Flair, after storing all desired positions, toggle PushMoco off.

Flair Constraints Feature

When storing a waypoint in PushMoco, you have an option of storing positions only for desired axes. By default all axes positions are recorded and are green. You can opt out of recording positions of axes by toggling them off so they turn grey. In the following example, the 'Z' translation axis position will not be recorded.



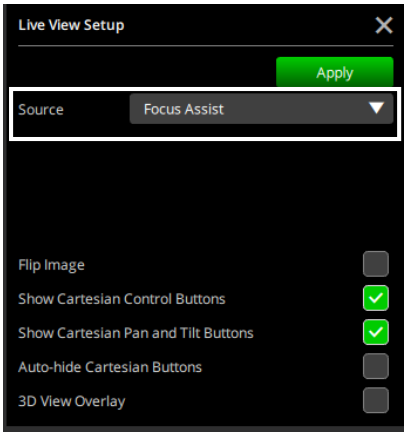
Cinebot Mini remote interface functions



LED colour	Description
Red	Robot is engaged
Green	PushMoco is active
Amber	Estop active

Using Focus Assist with Cinebot Mini

1. In the Flair LiveView window, click Setup icon to open the Live View Setup popup.
2. In the LiveView Setup dialog box, select **Focus Assist** from the Source drop-down list.



   The video from the Focus Assist will now appear in the LiveView area.

3. Click **Apply**.
4. Click **GOTO** in Live View. The GOTO button turns green. and moves the Focus Axis to do a Goto move when the Focus axis is in **Follow Target** or **Follow Object** (Focus Independent but calibrated).

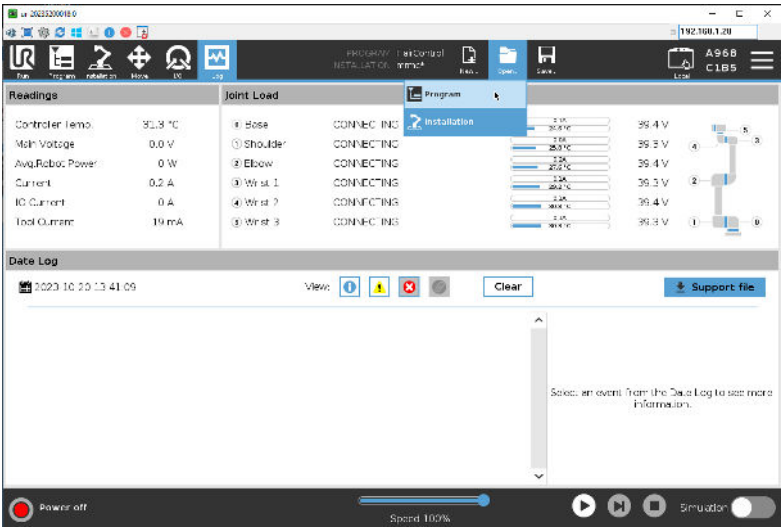
Notes

Appendix 1 **Troubleshooting and Maintenance**

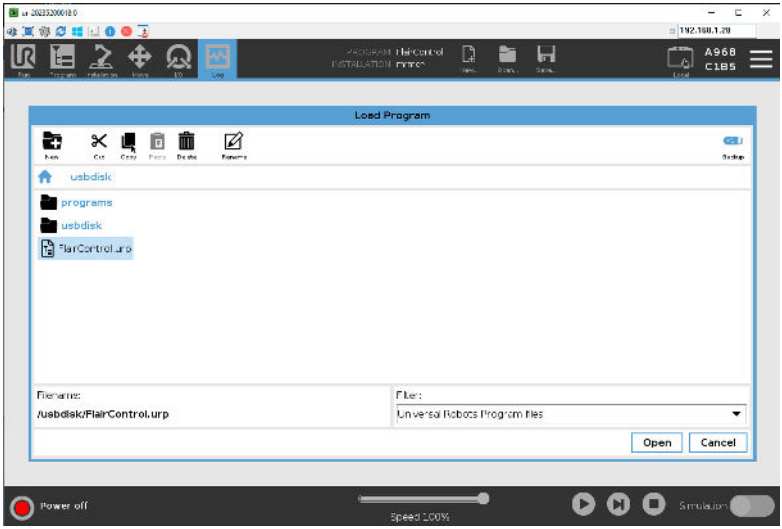
Loading the Flair Program on Cinebot Mini on Track

The Flair program is updated at the factory. However, if there's a software update, you might need to load it on the rig. It is important that this is done carefully and efficiently.

1. Launch the VNC Viewer program from the desktop icon.
2. Load the latest the **FlairControl.urp** file onto a USB flash drive. In VNC Viewer, select **Open** → **Program**.



3. Open usbdisk and copy FlairControl.urp. Click the home icon and paste the file to that directory. Open the copied FlairControl.urp program.



Appendix 2 **Specifications**

Physical and Mechanical

Temperature range: 0-40 °C
Humidity tolerance: 0% to 85% relative humidity, non-condensing

Total payload (camera and platform): 10kg

Degrees of freedom: 6

Repeatability: +/- 0.02mm

Mass (including riser columns): 66kg

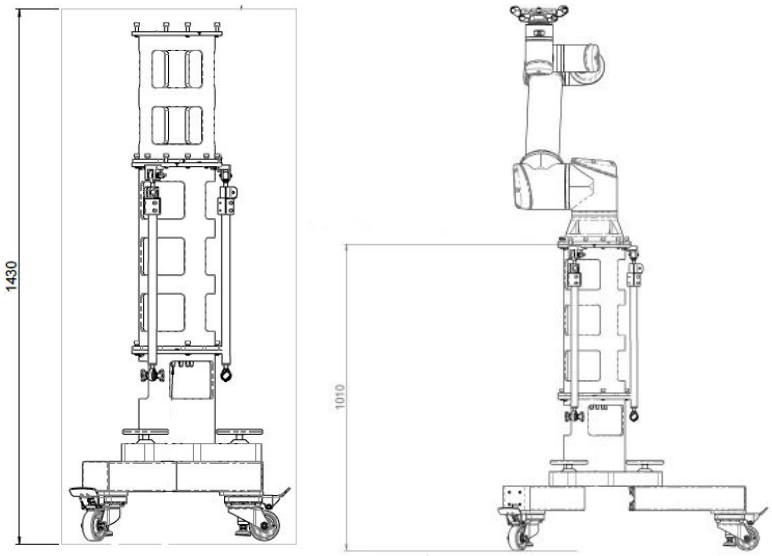
Mass (weight bags):

Mass (track section): 25kg

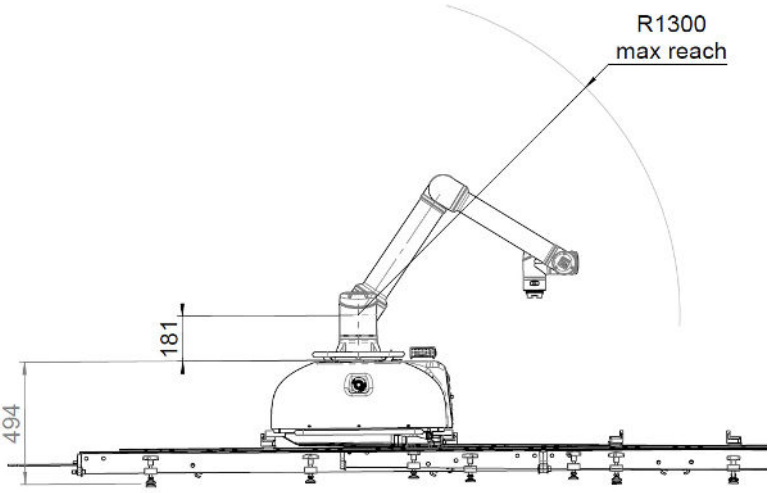
Max width (Cinebot Mini on Track): 800mm/18”

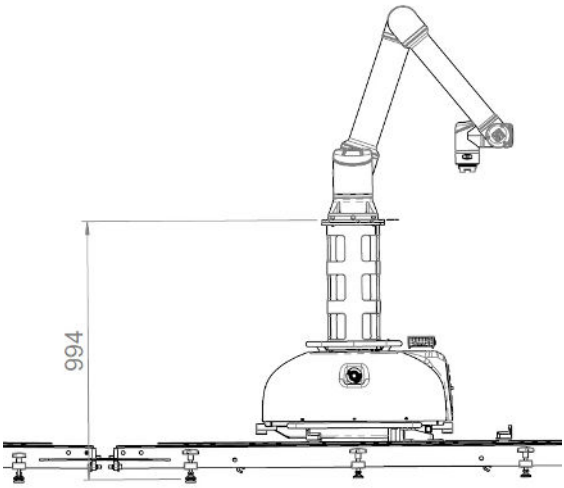
Power requirement: 240 VAC

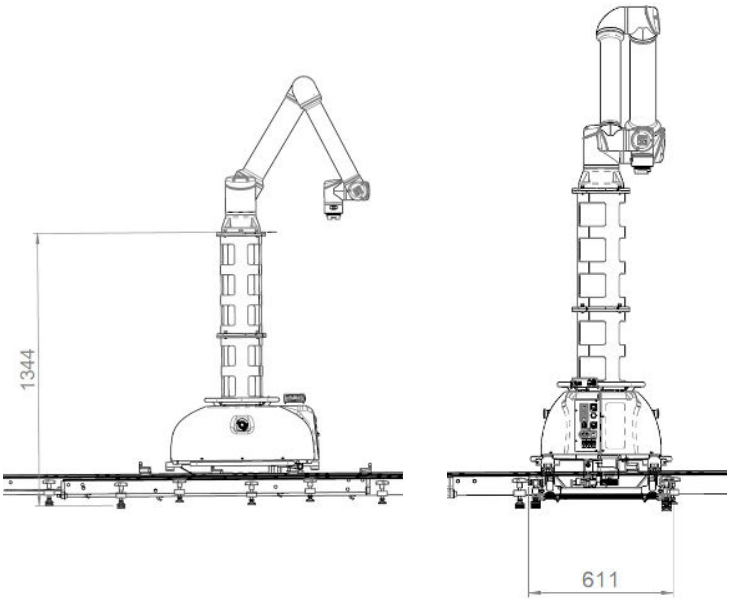
Cinebot Mini on Pedestal



Cinebot Mini on Track






1344
611

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