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Technical Guide

Envision One cDLM: Parallelism and Home Position

This technical guide will teach you the steps involved to complete the parallelism calibration and the home position calibration. These calibrations will need to be performed periodically on the Envision One cDLM printer. Please keep this guide near the printer.

Applicable Printers: Envision One cDLM series

Primary Supplies

Digital calipers
Scraper
Material
Post-processing materials
"Home Position Calibration Cubes" .stl file
RFID material tag
1.5 mm Allen wrench
3 mm Allen wrench

Getting Started

The printer will need to have its parallelism and home position looked over under the following situations:

A) Printed parts are not adhering to the build platform, especially in one corner or half of the build platform.
B) The current material tray is replaced with a new material tray.

What is parallelism? What is home position?
Parallelism and home position both refer to the relationship between the build platform and the material tray. Parallelism is achieved when the platform and material tray are aligned with each other, creating an equal distance across the buildable space. Home position is the lowest point the build platform should move in relation to the material tray.

Procedure

To check, modify, or fine-tune the printer's parallelism and home position, a calibration .stl file is printed. The model's height is measured and recorded. The printer may be modified based on the measurements. Reprint the calibration file, measure, adjust as needed. The printer must be powered on for the duration of the parallelism calibration, and the home position calibration.

1 Process the calibration print file
Download the .stl file to the computer where the Envision One RP software is installed. Open the software and select a buildstyle. Import the .stl file into the software.

Home Position Calibration Cubes.stl *is a file made of nine blocks, each block is five millimeters in height. This file is located on the USB drive that ships with every Envision One cDLM printer. The .stl file is also available to download by contacting EnvisionTEC support, or an authorized distributor.*

2 Print the calibration file
Check to make sure the printer and material are prepared before starting the print job. Print the ***Home Position Calibration Cubes.stl*** file. Once the print has completed, take a look at the build platform. Check to see if there are nine cubes on the platform.
If any of the cubes are missing, the first step is to find the missing cube(s) in the material tray. Use the **Expose a Layer** option on the printer's touch screen. This option is available at the end of every print job, and will to help to remove any cured particles that settled to the bottom of the material tray. The cubes that are missing will be the first clue as to where the printer needs to be adjusted.

3 Post-process
Gently remove the calibration blocks from the build platform using the scraper that came in the start-up kit with the printer purchase. Clean and cure the models using the same methods as the start guide suggests.

4 Take measurements
A) Prepare a sheet of paper for the measurements or print out this guide and use the worksheet on the third page. The worksheet is a view of how the calibration blocks correspond to the material tray, *Fig. 4*.

Orient your drawing this same way, and remember to note the front of the build platform.

B) Take a close look at each printed block. There is a small number printed on the side. The blocks must be measured and recorded in order.

Measure the Z (height) of each model
Record
Double-check

5 Parallel assessment
Examine the measurements taken from the calibration blocks.
What are we looking for?

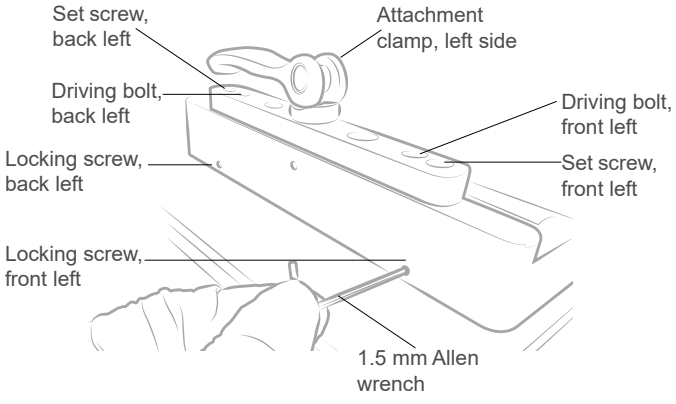
If all of the blocks are within **+/- 100 microns**, then the printer is parallel, and no further actions needs to be taken at this time.

If all the blocks are within **4.90 and 5.10 mm**, then the printer's home position is correct, and no further actions needs to be taken at this time.

If the home position is correct and the printer **is not parallel**, move on to ***Step 6***. If the printer is parallel and the **home position is not correct**, skip to ***Step 9***.

6 Prepare the printer for adjustments
In order to make adjustments to the parallelism, the locking mechanism for the material tray must be released. The material tray is held secure by four locking screws located on the sides of the material tray attachment assembly, *Fig. 1.* Using the 1.5 mm Allen wrench, unlock all four locking screws by turning them two full rotations to the left.

Fig. 1 ENVISION ONE PARALLEL SETTINGS



7 Adjust the printer
Adjustments to parallelism are made by turning the screws in front and behind the material tray attachment clamps, *Fig. 1*.

> **How it works -**
> The outer screws, or **Set Screws**, rest on top of the printer's counter top, preventing the material tray from dropping down, *Fig. 1*.
> The inner screws, or **Driving Bolts**, are threaded into the printer's countertop and move the material tray assembly up and down, *Fig. 1*.

Reference your drawing made in ***Step 4*** to determine which area will need adjustment. Most often, one corner will need to be either raised or lowered in order to even out the height measurments of the calibration blocks. Using the 3 mm Allen wrench, **apply adjustments cautiously and precisely** in the following manner -

> ***One half turn = 200 microns***
> ***One quarter turn = 100 microns***
>
> ***If the height measurement is too low -***
> **1** Turn the **Set Screw** counter-clockwise
> **2** Turn the **Driving Bolt** clockwise by the same amount
>
> ***If the height measurement is too high -***
> **1** Turn the **Driving Bolt** counter-clockwise by the same amount
> **2** Turn the **Set Screw** clockwise

8 Lock the set screws on the sides
To lock the adjustments in place, turn the **Locking Screws** two full rotations to the right. The locking screws are located on the sides of the material tray attachment assembly, *Fig. 1.* If the Home Position Calibration is not needed, skip ahead to **Step 13**.

Home Position Calibration

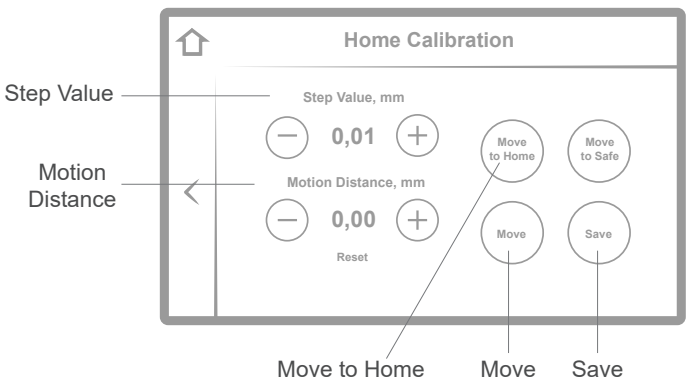
9 Accessing the calbration menu
The Home Calibration menu can be accessed from the printer's touch screen -

> *Settings > Move and Calibration > Home Calibration*

10 Prepare the printer
To avoid potential damage to your material tray, remove the build platform from the printer and place it aside on a clean work surface.

11 Adjust the printer
Once the build platform is removed, select the **Move to Home** button towards the center of the screen, *Fig. 2*. The build platform holder will begin moving down along the Z axis to its current home location.

Fig. 2 ENVISION ONE DLP CS HOME CALIBRATION



Towards the left of the Home Calibration screen are two groups of numbers, *Fig. 2* -

> **1** The bottom section is the **Motion Distance**. This is the total distance the platform will move.
> **2** The top section is the **Step Value**. This is the increment used for the **Motion Distance**. The Step Value increments can be set to 0.01, 0.10, 1.00, and 10.00.

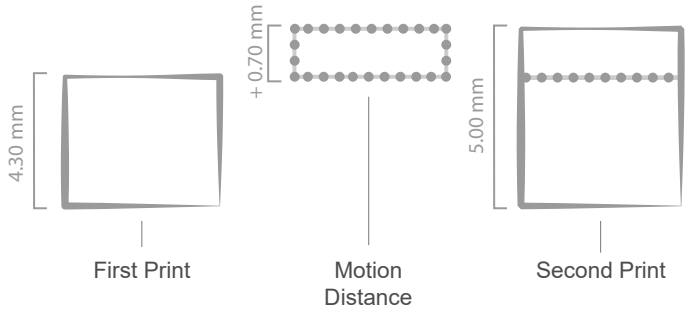
Reference the drawing made in ***Step 4*** to determine the new home position. The adjustment should be made from the average height of the calibration blocks, with the goal of adjusting all the blocks to be within the 4.90 -5.10 mm range.

> ***If the average height measurement is below 4.90 mm -***
> Adjust the Motion Distance using a **positive number**.
>
> ***If the average height measurement is above 5.10 mm -***
> Adjust using the Motion Distance using a **negative number**.

For example -

> If the average height of the calibration blocks was 4.30 mm, the **Motion Distance** should be set to +0.70 mm, *Fig. 2.* This will increase the height of the calibration blocks. When the calibration blocks are printed a second time the average height should now be between 4.90 mm - 5.10 mm after the adjustment, *Fig. 2*.

Fig. 2 ENVISION ONE HOME CALIBRATION - EXAMPLE



12 Saving adjustments
Once the **Motion Distance** is set select the **Move** button, *Fig. 2*. The build platform holder will move up or down by the amount designated in the **Motion Distance** section. Select the blue **Save** button to save the changes you made, *Fig. 2*.The build platform holder will automatically begin to move all the way up to the top of the Z axis tower and the new home position is set.

13 Confirmation
Once the calibration is done, print the ***Home Position Calibration Cubes.stl*** job file again. Following the instructions in **Step 4**, measure the Z-heights of the calibration blocks again.

> If all of the blocks are within **+/- 100 microns**, then the printer is parallel, and no further actions needs to be taken at this time.
>
> If all the blocks are within **4.90 and 5.10 mm**, then the printer's home position is correct, and no further actions needs to be taken at this time.
>
> If the blocks are still **out of tolerance**, refer back to **Step 6** for parallelism, or **Step 9** for home position. Repeat until all calibration blocks are within tolerance.

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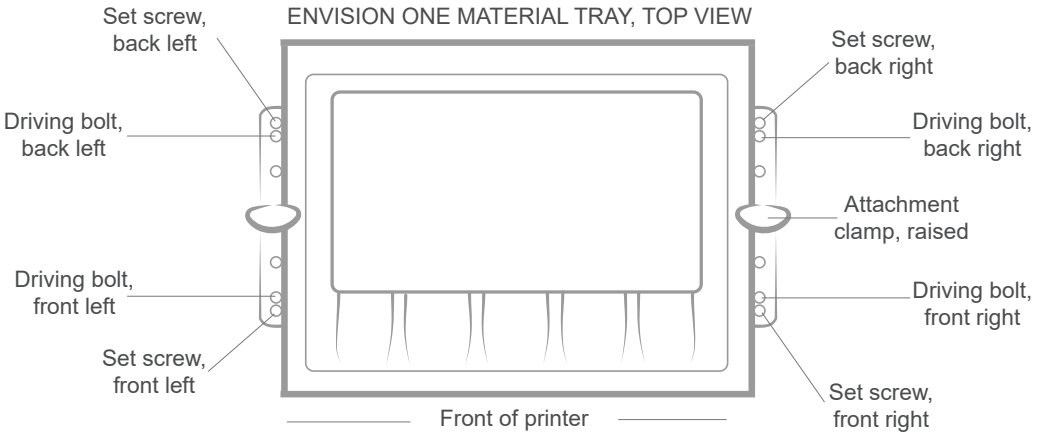
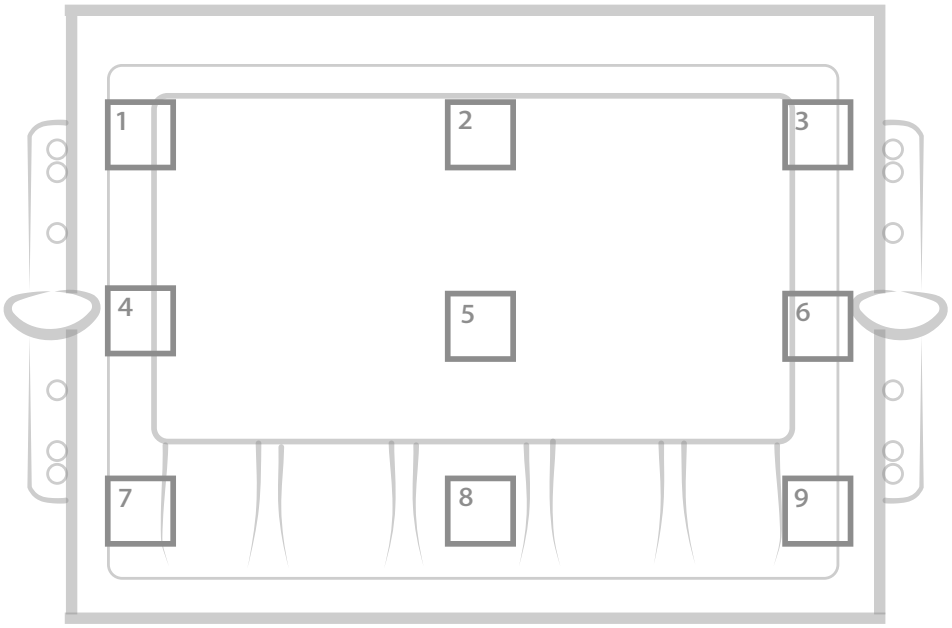
Worksheet

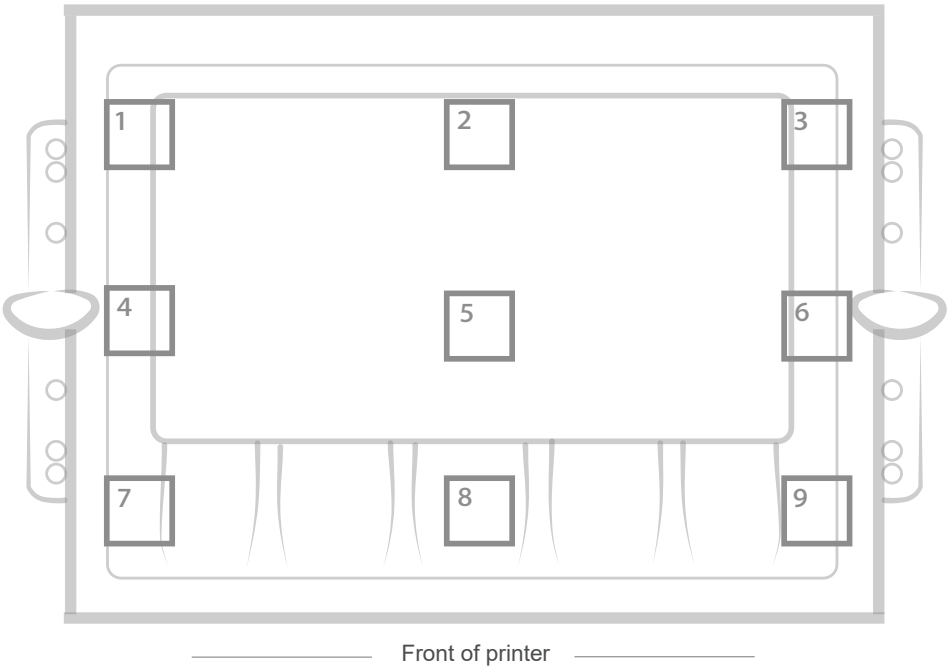
Below is a worksheet to assist with measuring the calibration blocks in **Step 4**.

The worksheet is a view of how the calibration blocks correspond to the material tray, *Fig.4*. For example, the height measurement of calibration block 1 corresponds to the back left corner of the material tray, and the height measurement of calibration block 9 corresponds to the front right corner.

Fig. 4







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