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Operations Manual

Apogee® Thermal Slide Debonder

Cost Effective Equipment

1 Introduction

1.1 Confidentiality Statement

Information supplied is for use in the operation and/or maintenance of Cee® equipment. Neither this document nor the information it contains shall be disclosed to others for manufacturing or any other purpose without written authorization from Cost Effective Equipment, LLC.

1.2 Warranty

Cost Effective Equipment, LLC warrants to the original purchaser (Buyer) that equipment is free from defects in material and workmanship under normal use and service in accordance with Cee® instructions and specifications. Buyer shall promptly notify Cee® of any claim against this warranty, and any item to be returned to Cee® shall be sent with transportation charges prepaid by Buyer, clearly marked with a Return Authorization (RMA) number obtained from Cee® Customer Support. Cee's obligation under this warranty is limited to the repair or replacement, at Cee's option, of any equipment, component or part which is determined by Cee® to be defective in material or workmanship. This obligation shall expire one (1) year after the initial shipment of the equipment from Cee®. This warranty shall be void if:

- Any failure is due to the misuse, neglect, improper installation of, or accident to the equipment.
- Any major repairs or alterations are made to equipment by anyone other than a duly authorized representative of Cee®. Representatives of Buyer will be authorized to make repairs to the equipment without voiding warranty, on completion of the Cee® training program.
- Replacement parts are used other than those made or recommended by Cee®.

CEE® MAKES NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, WITH RESPECT TO EQUIPMENT. NO WARRANTY IS MADE AS TO THE MERCHANTABILITY OF THE EQUIPMENT NOR ITS FITNESS FOR ANY PARTICULAR PURPOSE. In no event shall Cee® be liable for consequential loss or damages, however caused. No person or representative of Cee® is authorized to assume for Cee® any liability in connection with equipment nor to make any change to this warranty unless such change or modification is put in writing and approved by an authorized representative of Cee® in writing.

This warranty shall be governed by the laws of the state of Missouri, U.S.A.

1.3 Returned Materials

Any materials, parts, or equipment returned to Cost Effective Equipment, LLC must be clearly labeled with a Return Material Authorization (RMA) number.

To obtain an RMA number, contact:

Cost Effective Equipment, LLC Customer Support
Telephone ..... +1-573-466-4300
Email..... *support@costeffectiveequipment.com*
Web Address..... *www.costeffectiveequipment.com*
Physical Address..... 6 Industrial Drive; St. James, Missouri 65559

1.4 Model and Revisions

The model and serial number information for the Cee® Apogee® Thermal Slide Debonder are located on the rear panel. Software version information can be found on the *About* screen. Refer to the *DataStream™ Manual* for screen shots and a detailed explanation of the system software.

1.5 Environmental Considerations

	Cee® fosters sustainability through innovation in the durability and reliability of our precision tools and equipment. Individual component modules are engineered for serviceability ensuring long lasting performance. Processes are designed to minimize use & consumption of chemical compounds ensuring accurate, replicable, industry-leading results every time.	Cee® favorise la durabilité grâce à l'innovation dans la durabilité et la fiabilité de nos outils et équipements de précision. Les modules de composants individuels sont conçus pour une facilité d'entretien garantissant des performances durables. Les processus sont conçus pour minimiser l'utilisation et la consommation de composés chimiques, garantissant à chaque fois des résultats précis, reproductibles et à la pointe de l'industrie.
	Cee® diligently screens suppliers to ensure conflict-free sourcing of minerals and product components are constructed of recycled materials wherever possible.	Cee® sélectionne avec diligence les fournisseurs pour garantir que l'approvisionnement en minéraux est sans conflit et que les composants des produits sont fabriqués à partir de matériaux recyclés dans la mesure du possible.
	Cee® tools and equipment operate without the use of ozone depleting substances (ODSs) including chlorofluorocarbons (CFCs), methyl chloroform, hydrochlorofluorocarbons (HCFCs), carbon tetrachloride, perfluoro compounds (PFCs), or other volatile compounds/organic solvents.	Les outils et équipements Cee® fonctionnent sans utilisation de substances appauvrissant la couche d'ozone (SACO), notamment les chlorofluorocarbures (CFC), le méthyle chloroforme, les hydrochlorofluorocarbures (HCFC), le tétrachlorure de carbone, les composés perfluorés (PFC) ou d'autres composés volatils/solvants organiques.

1.6 General Safety Hazards / Precautions

	Read this manual in its entirety before operating or servicing the machine.	Lisez ce manuel dans son intégralité avant d'utiliser ou d'entretenir la machine.
	The unit is very heavy and proper precautions should be taken when handling the machine to minimize the risk of injury. Labels are placed on the machine to identify areas where caution is needed during operation.	L'unité est très lourde et des précautions appropriées doivent être prises lors de la manipulation de la machine pour minimiser le risque de blessure. Des étiquettes sont placées sur la machine pour identifier les zones où des précautions sont nécessaires pendant le fonctionnement.
	Sound pressure measurements greater than 80dB(A) are considered hazardous. The following sound pressure measurements were obtained from the Cee® Apogee® Thermal Slide Debonder at a distance of 3 ft (0.9 m) from the system: Stand-by Mode: 40dB(A) Normal Operations: 40dB(A)	Les mesures de pression acoustique supérieures à 80 dB(A) sont considérées comme dangereuses. Les mesures de pression acoustique suivantes ont été obtenues à partir de la plaque de cuisson Cee® Apogee® Thermal Slide Debonder à une distance de 3 pieds (0,9 m) du système: Mode veille: 40 dB(A) Fonctionnement normal: 40 dB(A)

1.7 Electrical

	High voltage is present in the machine. Disconnect power before servicing.	Une haute tension est présente dans la machine. Débranchez l'alimentation avant l'entretien.
	Stored electrical energy is present in the machine. Before servicing allow sufficient time for discharge.	L'énergie électrique stockée est présente dans la machine. Avant l'entretien, prévoyez suffisamment de temps pour la décharge.
	This unit must be connected to an outlet with proper grounding.	Cet appareil doit être connecté à une prise avec une mise à la terre appropriée.

1.8 Mechanical

	This machine may contain compressed gases which can provide motive force for components and can expand violently upon decompression. Disconnect N2 or CDA before removing any panels.	Cette machine peut contenir des gaz comprimés qui peuvent fournir une force motrice aux composants et peuvent se dilater violemment lors de la décompression. Débranchez le N2 ou le CDA avant de retirer les panneaux.
	Ensure that all panels are on and in their correct locations before powering up or operating.	Assurez-vous que tous les panneaux sont allumés et à leur emplacement correct avant la mise sous tension ou l'utilisation.
	When opening lids be aware of the pinch point at the hinge cover. Open lids only by using the handles on the lids.	Lorsque vous ouvrez les couvercles, faites attention au point de pincement au niveau du cache de la charnière. Ouvrez les couvercles uniquement en utilisant les poignées des couvercles.
	When operating lid, be aware of the risk of the lid falling and crushing/closing down on fingers/hands.	Lorsque vous utilisez le couvercle, soyez conscient du risque de chute et d'écrasement/fermeture du couvercle avec les doigts/mains.

1.9 Thermal

	Platens can reach temperatures sufficient to cause severe burns and may remain hot for a long-time following operation. Do not service the machine until all surfaces have cooled to a safe thermal condition (e.g., room temperature).	Les plateaux de cuisson peuvent atteindre des températures suffisantes pour provoquer de graves brûlures et peuvent rester chaudes longtemps après l'opération. N'entretenez pas la machine tant que toutes les surfaces n'ont pas refroidi à un état thermique sûr (par exemple, température ambiante).

1.10 Chemical

Cee® does not supply or dictate chemicals to be used in conjunction with the Cee® Apogee® Thermal Slide Debonder. Material data will be reviewed during equipment design and configuration to ensure compatibility with the customer's proprietary process. Prior to introducing new chemicals, refer to your chemical supplier's factory specifications and MSDS. Material Safety Data Sheets (MSDS) contain crucial information regarding chemical safety, including details about hazardous components, physical properties, spill and leak procedures, waste disposal guidelines, and personal protective equipment requirements for handling.		Cee® ne fournit ni n'impose aucun produit chimique à utiliser avec la plaque de cuisson Cee® Apogee® Thermal Slide Debonder. Les données matérielles seront examinées lors de la conception et de la configuration de l'équipement pour garantir la compatibilité avec le processus exclusif du client. Avant d'introduire de nouveaux produits chimiques, reportez-vous aux spécifications d'usine et à la fiche signalétique de votre fournisseur de produits chimiques. Les fiches signalétiques (MSDS) contiennent des informations cruciales concernant la sécurité chimique, notamment des détails sur les composants dangereux, les propriétés physiques, les procédures en cas de déversement et de fuite, les directives d'élimination des déchets et les exigences en matière d'équipement de protection individuelle pour la manipulation.
	Ensure chemical compatibility of all chemicals and materials being used inside the machine. This includes all wetted parts of the storage, supply, dispense, and waste systems.	Assurer la compatibilité chimique de tous les produits chimiques et matériaux utilisés à l'intérieur de la machine. Cela inclut toutes les parties mouillées des systèmes de stockage, d'alimentation, de distribution et de déchets.
	Potential for flammable Chemicals. No open flames/sparks.	Potentiel de produits chimiques inflammables. Pas de flammes nues/étincelles.
	Relieve pressure and shut off chemical valves before servicing supply lines, dispense valves or other components.	Relâchez la pression et fermez les vannes chimiques avant d'entretenir les conduites d'alimentation, les vannes de distribution ou d'autres composants.
	Ensure proper ventilation/exhaust is always used.	Assurez-vous qu'une ventilation/évacuation adéquate est toujours utilisée.
	Always wear appropriate Personal Protective Equipment. This includes safety glasses, gloves, and other equipment, as needed, to protect from mechanical and chemical hazards.	Portez toujours un équipement de protection individuelle approprié. Cela comprend des lunettes de sécurité, des gants et tout autre équipement, si nécessaire, pour se protéger des risques mécaniques et chimiques.
Exhaust and fume management is important to prevent the release of hazardous materials and ensure a safe working environment. Users should assume that all fumes are hazardous and take appropriate precautions to ensure system exhaust is functional per the guidelines outlined in section **Error! Reference source not found.** of this manual.		La gestion des gaz d'échappement et des fumées est importante pour empêcher le rejet de matières dangereuses et garantir un environnement de travail sûr. Les utilisateurs doivent supposer que toutes les fumées sont dangereuses et prendre les précautions appropriées pour garantir que l'échappement du système est fonctionnel conformément aux directives décrites dans la section 6 de ce manuel.

1.11 Lockout/Tagout Procedures and Information

Before servicing, turn off the machine and remove the power inlet cord by disconnecting the plug where it enters the machine.

Note: There are no LOTO (Lock Out/Tag Out) facilities supplied with the Cee® Apogee® Thermal Slide Debonder. It is the responsibility of the customer/installer/end-user to ensure that the suitable LOTO devices are provided on utilities being supplied to the Cee® Apogee® Thermal Slide Debonder in accordance with applicable laws, regulations, and/or company policies.

For more information, please contact *Cee® Customer Support*.

1.12 Intended Use of Machine

The Cee® Apogee® Thermal Slide Debonder is intended for use as a semiconductor/optical application machine.

The Cee® Apogee® Thermal Slide Debonder is not intended for use in food or medical applications or for use in hazardous locations.

The Cee® Apogee® Thermal Slide Debonder is intended for use only by trained personnel wearing the proper personal protective equipment. Anyone not trained in the proper use of the Cee® Apogee® Thermal Slide Debonder and having not fully read this manual, should not operate the equipment.

The Cee® Apogee® Thermal Slide Debonder is intended for use in a cleanroom environment to provide the proper processing conditions for substrates. If it is used outside of a cleanroom environment, substrate cleanliness may be compromised.

The Cee® Apogee® Thermal Slide Debonder is not intended for use in a hazardous or explosive environment.

Normal Operating Conditions

The Cee® Apogee® Thermal Slide Debonder is designed for indoor use only.

Ambient Temperature ..... 10°C - 30°C

Relative Humidity ..... ≤80%

Altitude ..... up to 3000 m

Pollution Degree 2

Overvoltage Category II

Permissible Voltage Fluctuations ..... 208-230VAC ±10%

	If the Cee® Apogee® Thermal Slide Debonder is used in a manner not specified by Cee® or with accessories not provided by Cee® the protection provided by the equipment may be impaired.	Si la plaque de cuisson Cee® Apogee® Thermal Slide Debonder est utilisée d'une manière non spécifiée par Cee® ou avec des accessoires non fournis par Cee®, la protection fournie par l'équipement peut être altérée.

2 Equipment Description

Streamline separation with a high-performance debonder designed for both production and R&D. The Cee® Apogee® Thermal Slide Debonder delivers consistent, clean wafer separation using controlled thermal and slide-off methods. Optimized for waxes and thermoplastic adhesives, it enables safe debonding of thin or sensitive substrates without chemical baths or manual handling. With semi-automated operation, dual heated platens, and programmable control of slide force and speed, this compact system delivers track-quality results without the complexity, footprint, or cost.

2.1 User Controls

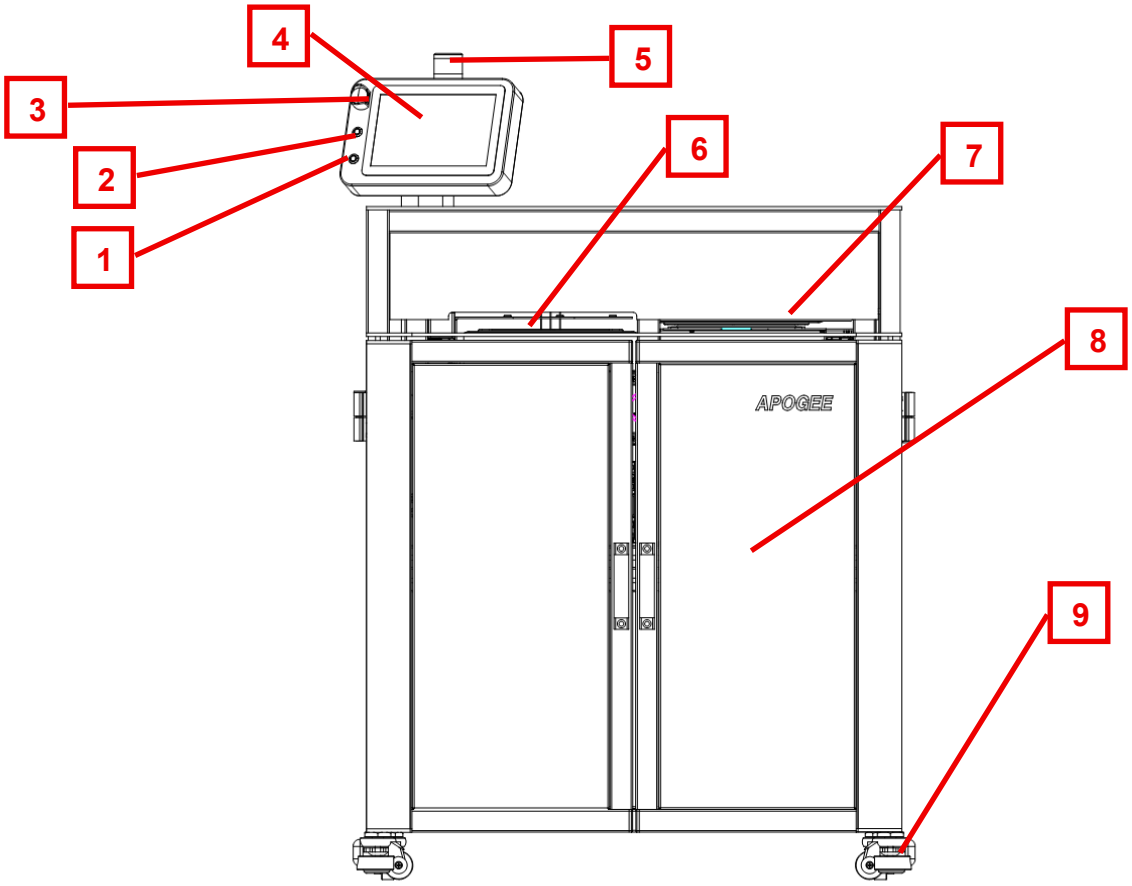


Figure 1 Apogee® Thermal Slide Debonder User Controls

1. local presence button[1] .... used for remote access
2. power button ..... used to turn the tool off and on
3. EMO[2] ..... immediately shuts down all process functions
4. touchscreen interface ..... graphical display for equipment operation and feedback
5. light tree ..... visual indicator for equipment state and alerts
6. load tray ..... used to load bonded wafers and unload the carrier
7. unload tray ..... used to unload the device wafer
8. door ..... open for access to electrical, platens, and storage
9. leveling feet ..... used to move the equipment and fix it into place

[1] Refer to the DataStream™ Manual for more detailed information.
[2] Emergency Machine Off (EMO)

2.2 System Components and Layout

Baseplate

The Apogee® Thermal Slide Debonder baseplate assembly is depicted in Figure 10 (below). The assembly / construction is divided up into the main areas identified in the image.

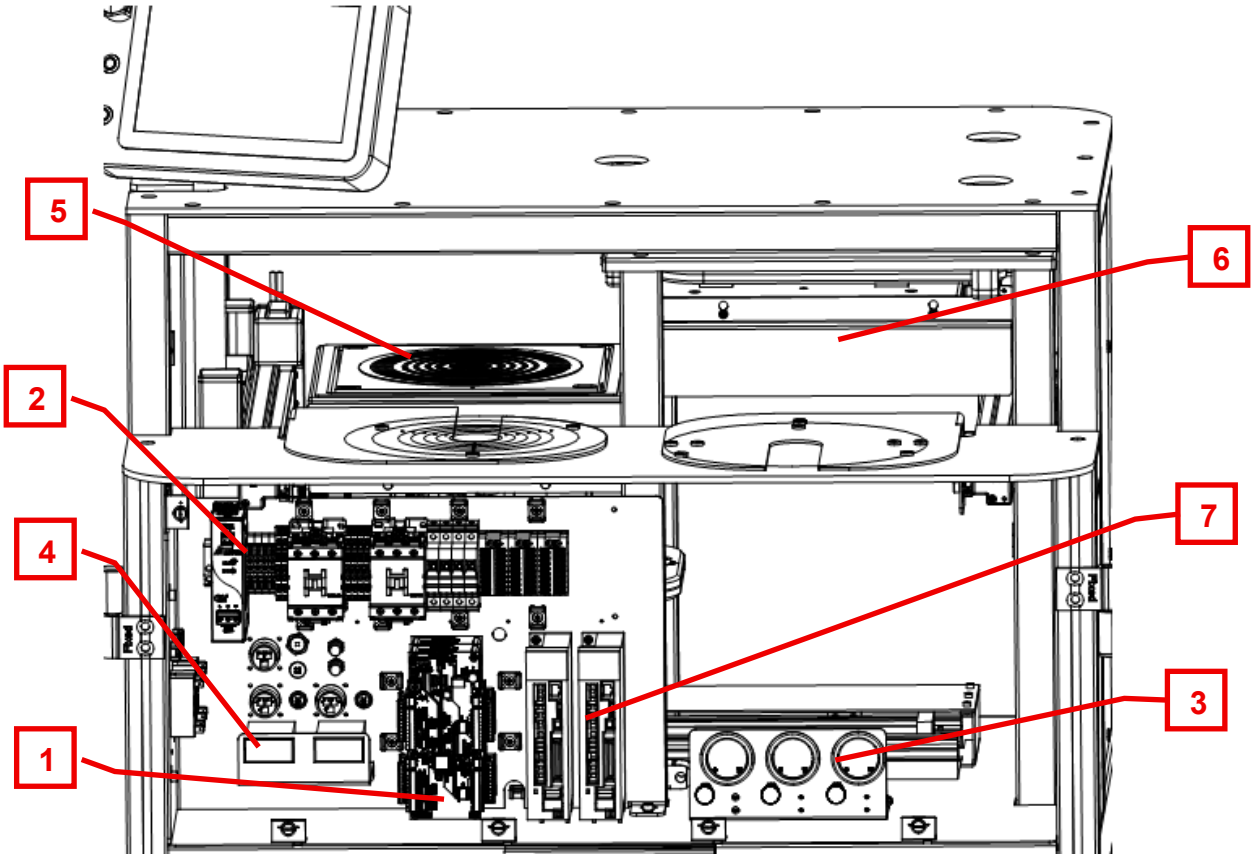


Figure 2 Apogee® Thermal Slider Debonder Baseplate

1. I/O control ..... digital inputs and outputs
2. electrical distribution bus ..... distributes AC and 24VDC power
3. pneumatic control ..... used for leveling process
4. temperature control ..... process and over temperature controllers and relays
5. lower platen ..... the platen in which the device and carrier wafer are loaded
6. upper platen ..... the platen in which the carrier is pressed into
7. servo controls ..... amplifiers for x-axis and z-axis servos

Lower Platen

The Apogee® Thermal Slide Debonder lower platen is where the bonded wafer pair is loaded in advance of being debonded. The platen surface is heated to the process temperature programmed in the debonding recipe. The lift pins assist with loading/unloading as well as gradually warming the bonded wafer pair up to temperature. Size-specific vacuum zones keep both carrier and device wafer held during the bonding stage.

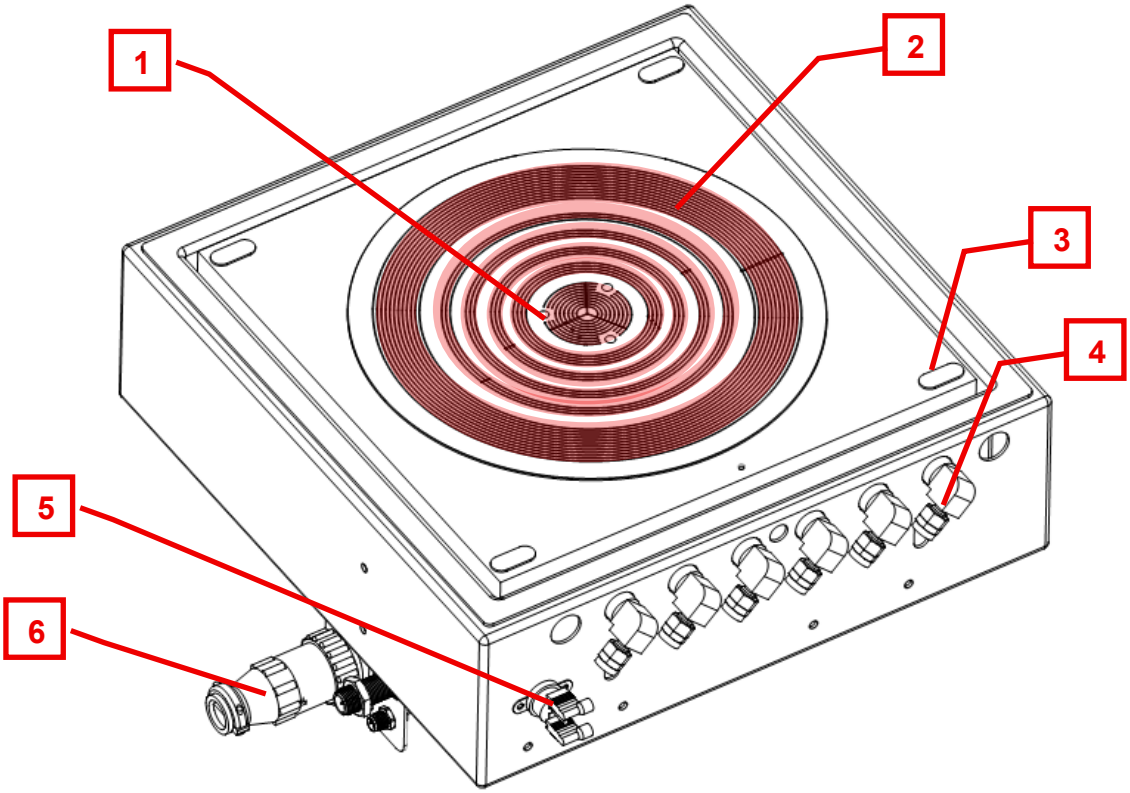


Figure 3 Apogee® Thermal Slide Debonder Lower Platen

1. lift pins.....3 points that raise and lower the wafer onto the platen
2. working area/vacuum zones.....surface that holds the wafer and zones for wafer sizes
3. leveling measurement points.....inlet for platen power and thermocouples
4. pneumatic ports.....connections for vacuum and N2 for each zone
5. thermal switch .....overlimit that trips the EMO on a temperature run away
6. electrical and communications .....connection for heater element, lift pins, and temp switch

Upper Platen

The Apogee® Thermal Slide Debonder upper platen is where the bonded wafer pair is debonded. The platen surface is heated to the process temperature programmed in the debonding recipe. Size-specific vacuum zones keep both carrier and device wafer held during the bonding stage. There are also deep grooves at the edge of each wafer size. These large grooves give a vacuum break to prevent adhesive from being transferred onto the back side of the device wafer. Once the debonding is complete, the device wafer is left on the upper platen and released onto the unloading tray.

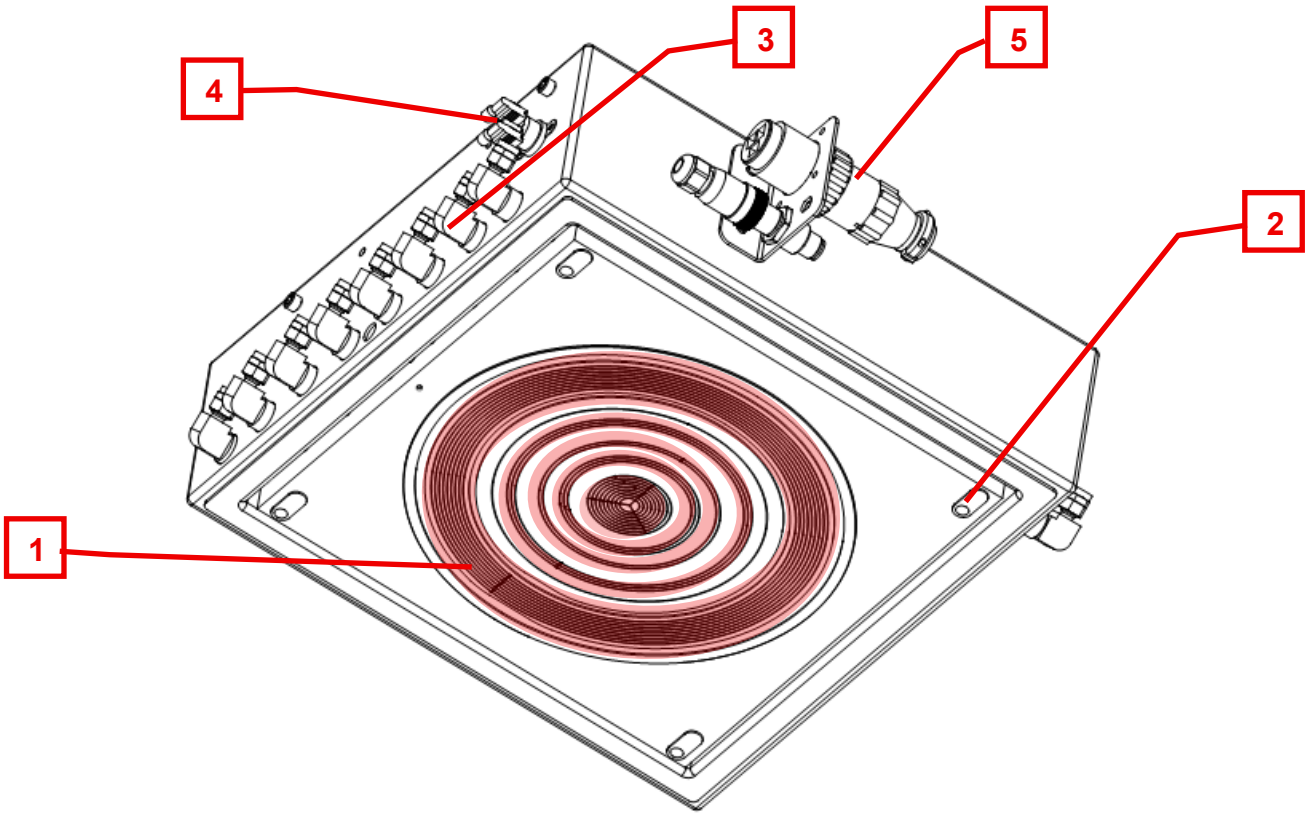
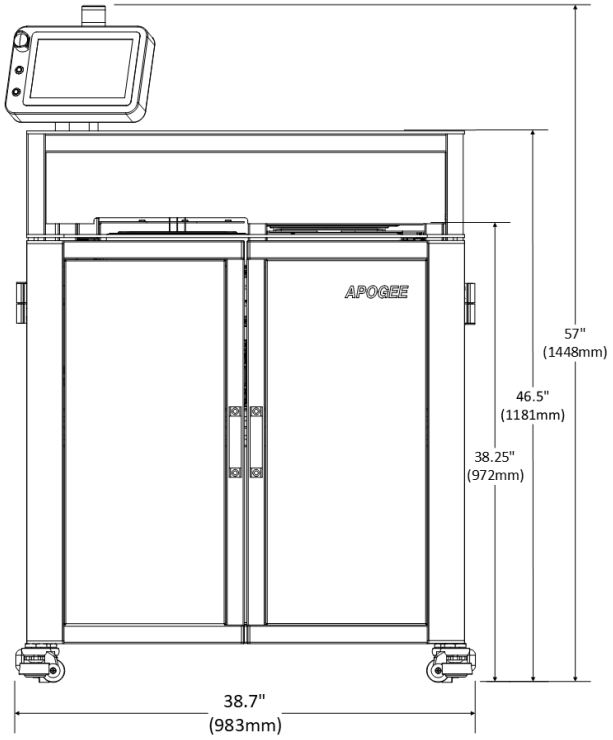


Figure 4 Apogee® Thermal Slide Debonder Upper Platen

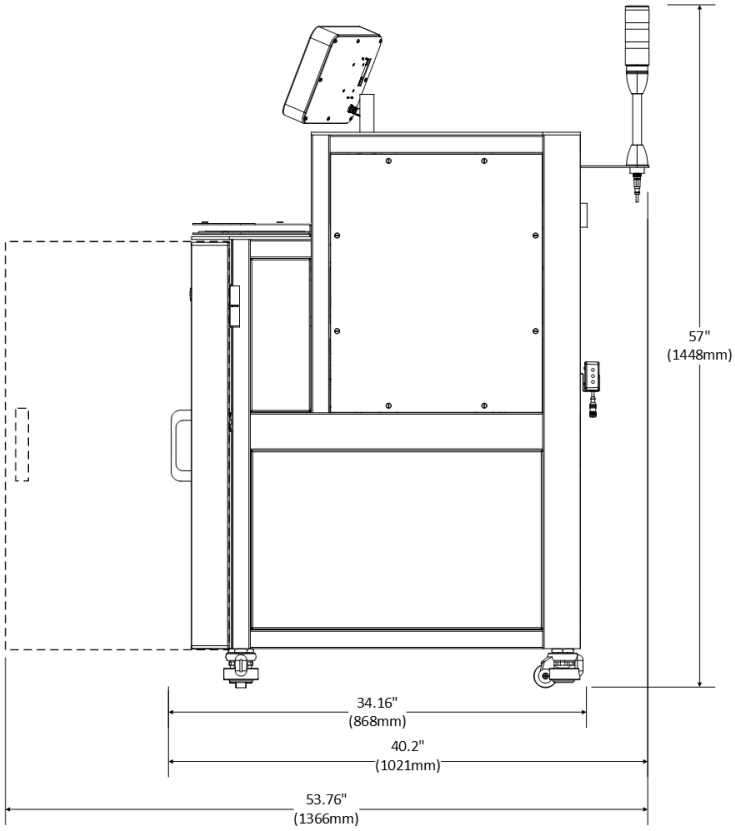
1. working area/vacuum zones.....surface that holds the wafer and zones for wafer sizes
2. leveling measurement points.....inlet for platen power and thermocouples
3. pneumatic ports.....connections for vacuum and N2 for each zone
4. thermal switch .....overlimit that trips the EMO on a temperature run away
5. electrical and communications .....connection for heater element, lift pins, and temp switch

2.3 Dimensions

38.7” (983mm) W x 40.2” (1022mm) D x 57” (1448mm) H
Machine Weight 560lbs (208.7kg)



Front View with Dimensions



Side View with Dimensions

2.4 Features & Programmability

- full-color touchscreen graphical user interface (GUI)
- supports unlimited user-defined program steps for each recipe
- 0.1 second step time resolution (9,999.9 seconds maximum step time)
- view process status and/or download for offline analysis
- process traceability for every wafer
- graphical process charts and logs for force and cycle time
- upload/download process parameters with DataStream™ technology
- low stress to device wafer
- excess force sensing: failsafe error recovery

2.5 Utilities

voltage ranges	208-230 VAC 50/60 hz
power requirements	15.3A max, 3519 Watts
fuse protector	MDA-20-R, Slow-Blow 250V, 20A *(qty 2)*
vacuum	20" HG(33kPa), 1/4" PTC OR 1/4" FNPT
nitrogen/CDA	70 psi(483kPa),1/4" PTC OR 1/4" FNPT

3 Installation

3.1 Clearance Requirements

The Cee® Apogee® Thermal Slide Debonder is a floor-standing unit requiring a sturdy and level floor for location. The recommended freestanding space requirements are: 3" (76.2mm) back to front and 3" (76.2mm) side to side.

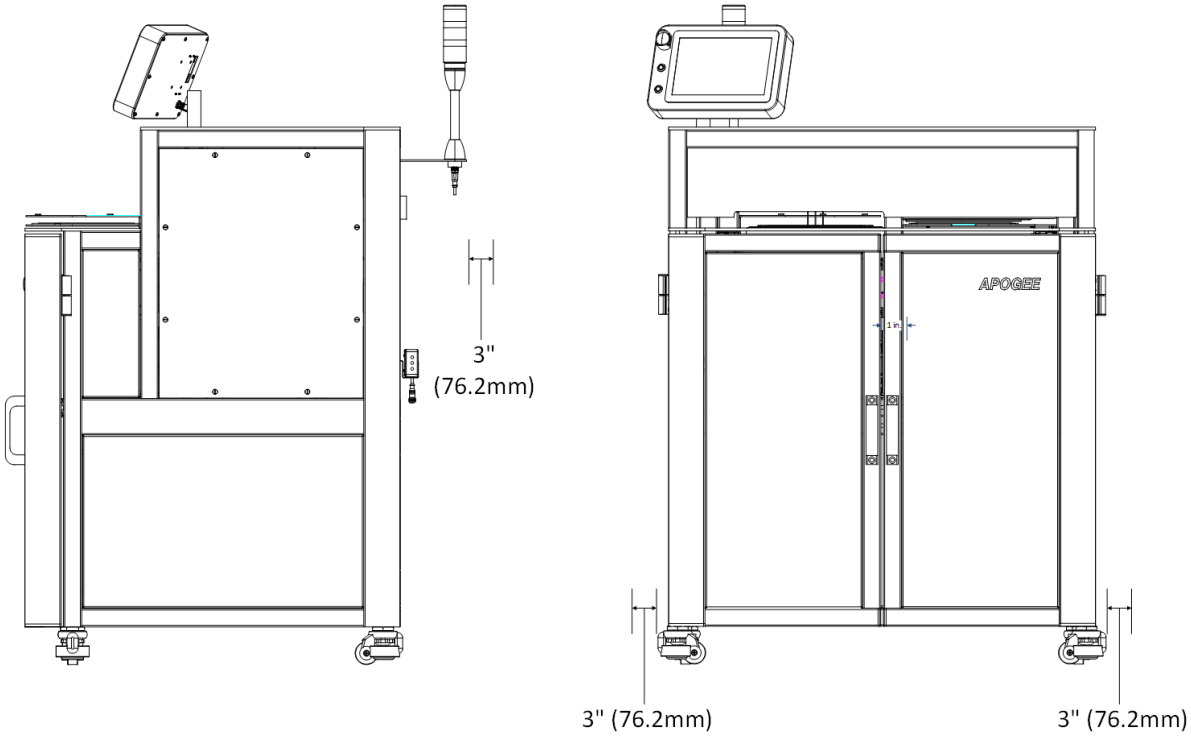


Figure 5 Apogee® Thermal Slide Debonder Clearance

3.2 Facilities Requirements

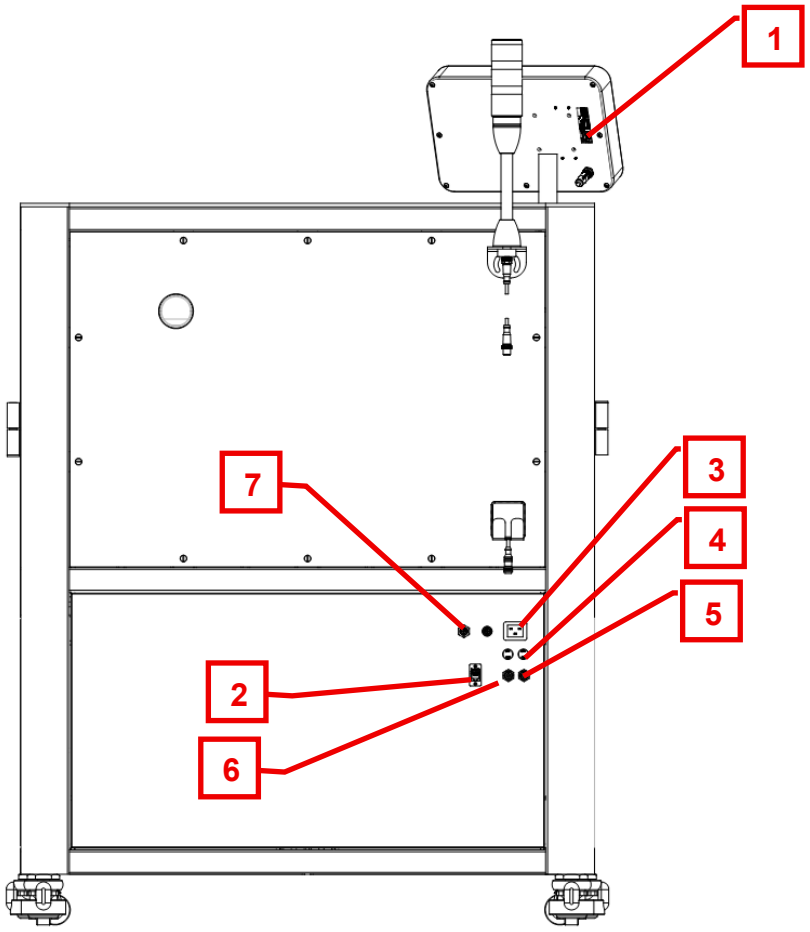


Figure 6 Apogee® Thermal Slide Debonder Utilities

1. USB Port[3] ..... facilitates data transfer
2. ethernet ..... facilitates remote recipe writing & remote device control
3. electrical power inlet ..... 20A | region specific | power cord supplied
4. fuses ..... system protection fuses
5. vacuum ..... ¼" PTC or NPT system vacuum
6. N2 (CDA)[4] ..... ¼" PTC or NPT system N2/CDA
7. accessory connections[5] ..... enables communication with optional accessories

[3] see DataStream™ Manual for more information
[4] Tools through July 2022 include ¼" barb connect as standard/ post-July 2022 tools are supplied with a ¼" push connect fitting as standard. Connection fittings may vary based on customer request.
[5] M12 circular metric connectors facilities external comm

3.3 Environment

The Cee® Apogee® Thermal Slide Debonder should be operated in a clean, climate-controlled environment.

3.4 Unpackaging & Inspection

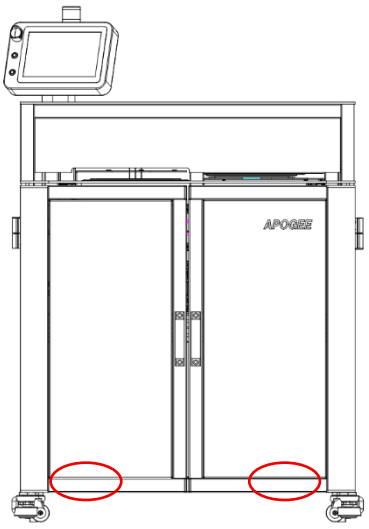


Figure 7 Fork Points

1. Carefully remove the sides from the crate. Lifting the unit from the crate base by forking at the points shown in Figure 7, Do not lift by any of the top covers or protrusions. Do not roll or turn the unit on its sides.
2. Remove packing foam and plastic wrap.
3. Open the front doors to find all accessories, power cord, light tree, temperature/humidity sensors packed inside the equipment.
4. Place the Cee® Apogee® Thermal Slide Debonder on a level floor of sufficient strength so that the controls are at the proper ergonomic height.
5. Thoroughly check machine for shipping damage. If physical damage is seen, **DO NOT APPLY POWER!** Contact Cee® Customer Support immediately.

3.5 System Installation & Setup

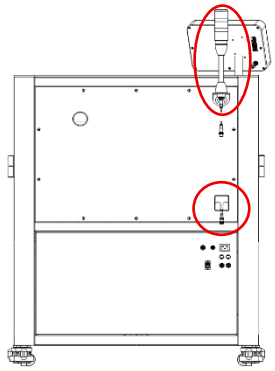


Figure 8 Light Tree and Temp/Humidity Sensor

1. Thoroughly clean the exterior of the Cee® Apogee® Thermal Slide Debonder. See section 7.5 for more information regarding proper cleaning procedures.
2. Install the light tree and temperature humidity sensor bracket onto the back of the machine (Figure 8) and plug both connectors in. The ports are labeled and only mate with the correct component.
3. Open the front doors of the equipment and locate the clear panel on the right side that allows you to access the platens. See Figure 9.
4. Using a flat head screwdriver, turn the three fasteners (shown in red circles in Figure 9) that hold the window on 90º, and then pull to remove the panel.
5. Locate the locking bracket (shown in blue circle in Figure 9) for the lower debonder platen, remove the 4 bolts using a 2.5mm allen key, and discard.
6. Using a flat head screwdriver, turn the three fasteners that hold the window back 90º (to their original position), align the panel up to the mounts, and push to snap the panel back into place.
7. Connect utilities per reference diagram in section 2.5.
    - connect the vacuum supply to the vacuum fitting
    - connect exhaust to the exhaust port.
    - connect nitrogen/CDA to the N_2 fitting
    - connect system power inlet, plug in the machine
    - optional- connect ethernet

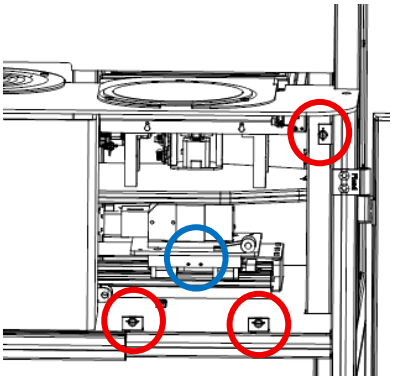


Figure 9 Platen Access

3.6 Start Up

1. Rotate the EMO button clockwise until it returns to the released position.
2. Turn the machine on by pressing the lighted power switch. The display will cycle through a series of boot screens before arriving at the main login screen.
3. Enter the default administrative login credentials:

   Username: ..... admin
   Password: admin2

**Your Cee® Customer Support representative will conduct initial system checks and calibration procedures following installation.*

4 DataStream™ Technology

This section covers information specific to Apogee® Thermal Slide Debonders and is intended as a companion to the DataStream™ Technology Software Manual. Please review the DataStream™ Operations Manual for detailed guidance on software usage.

4.1 System Parameters

Parameter	Actual	Set Point	Status
Lower Platen Temp	180.2 °C	180.0 °C	In Range
Upper Platen Temp	180.2 °C	180.0 °C	In Range
Lift Pin Height	0.0 mm	0.0 mm	In Range
Load Slide	0.0 mm	0.0 mm	In Range
Unload Slide	0.0 mm	0.0 mm	In Range
X Servo Position	0.2 mm	0.2 mm	In Range
X Axis Force	0.0 Newtons		In Range
Z Servo Position	-3 um	-3 um	In Range
Z Axis Force	0 %		In Range
Lower Vac	97.7 KPa		In Range
Upper Vac	97.7 KPa		In Range
Ambient Temperature	34.6 °C		In Range
Humidity	19.3 %		In Range

Lower Platen Temp---------- the current temperature of the lower platen displayed against the target set point in degrees Celsius[6]

Upper Platen Temp---------- the current temperature of the upper platen displayed against the target set point in degrees Celsius[7]

Lift Pin Height---------- the height of exposed lift pins in relation to the chuck in millimeters; precision control settings range from 0.0-19.0

Load Slide---------- the distance in that the load tray had moved from the home (out) position in millimeters

Unload Slide---------- the distance in that the unload tray had moved from the home (out) position in millimeters

[6] A process will not wait to achieve desired temperatures before moving onto the next step. Utilize preconditions or manual controls to ensure platen temperatures are in range before a process is initiated.
[7] A process will not wait to achieve desired temperatures before moving onto the next step. Utilize preconditions or manual controls to ensure platen temperatures are in range before a process is initiated.

X Servo Position----------	the distance in that the lower platen has moved (right to left) from the 0 position (directly under the upper platen) in millimeters
X Axis Force ----------	the force that the lower platen is moving[8] with (left to right), in Newtons
Z Servo Position----------	the distance in the lower platen has moved up from the 0 position (fully down) in microns
Lower Vac----------	measurement of the vacuum pressure holding the substrate against the lower chuck in kPa
Upper Vac----------	measurement of the vacuum pressure holding the substrate against the upper chuck in kPa
Z Axis Force----------	indicates whether the sensors detect a full waste bottle
Ambient Temperature------	the air temperature of the environment where the equipment is housed
Humidity[9]----------	the ambient relative humidity in the environment where the equipment is housed

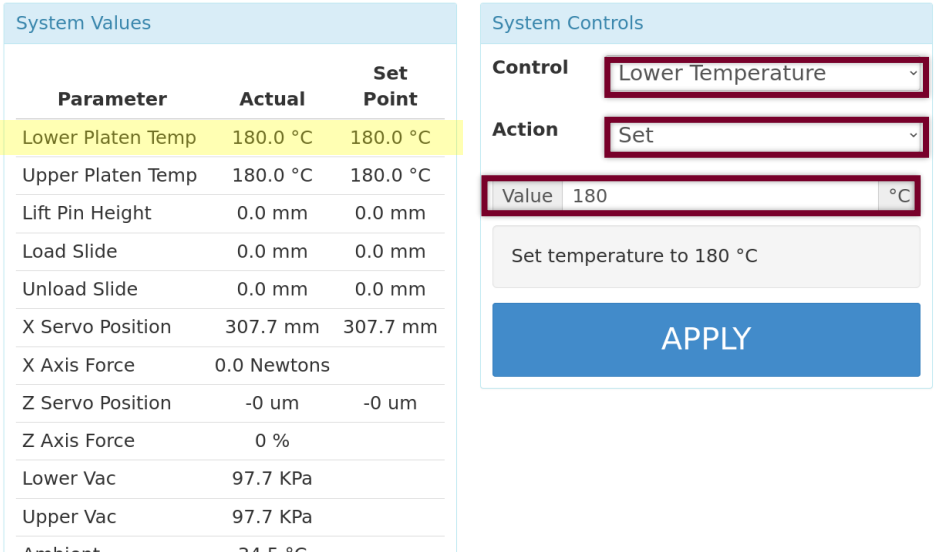
4.2 Manual Controls – Apogee® Thermal Slide Debonder

The Manual Control activity is an advanced feature that allows users to run most operating processes outside of a recipe. This mode is useful for tasks such as prototyping processes, verifying equipment operation, and recovering from aborted processes. To access the activity, navigate to ***Tools > Manual Control***. Actual and set point parameter values are displayed on the left. A drop-down menu of available controls is located on the right.

If using remote feature, the user must confirm local presence to execute manual commands. Refer to the DataStream™ Manual *for guidance on the Local Presence feature.*

[8] The X-axis movement of the lower platen is limited by both force and speed. For example, if the set X-axis force is reached, the platen may not reach the set point speed and vice versa.
[9] Both Ambient Temperature and Humidity are measured via a custom sensor board mounted next to a ventilation inlet inside the tool. If sensor is disconnected, default of -1.1 is displayed.

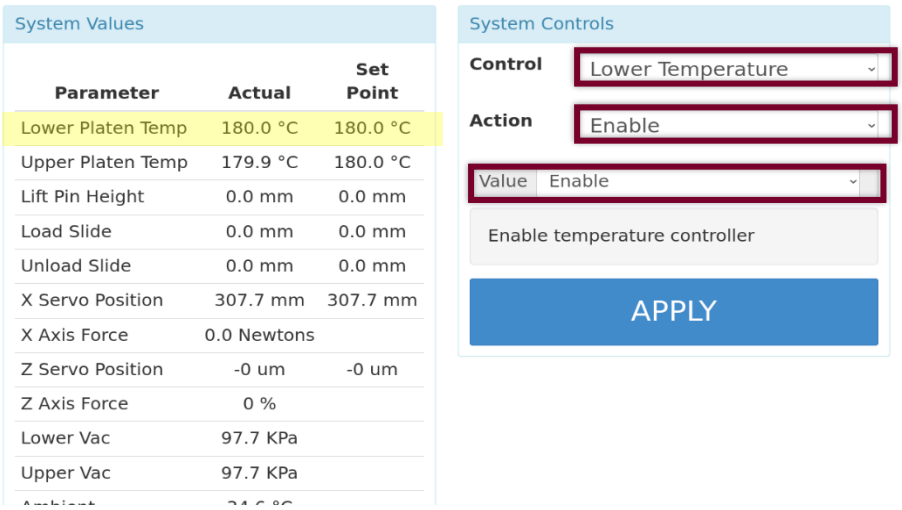
Lower Platen Temperature



Select a Control of Lower Platen Temperature
Select an Action of Set
Enter the desired value in °C

Click APPLY

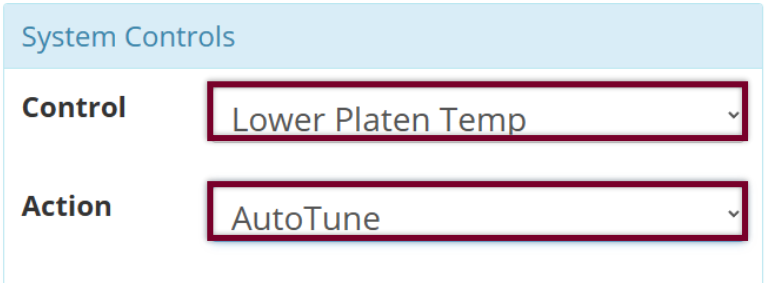
The Temperature Controller must be enabled to initiate the heating process. See next step.



Select an Action of Enable
Select a Value of Enable or Disable to activate or deactivate the temperature controller

Click APPLY

Note that the heating process has been initiated and a plate temperature set point has populated on the system values list. When a value of Disabled is selected, a Set Point of - - is displayed and the heating process is terminated.



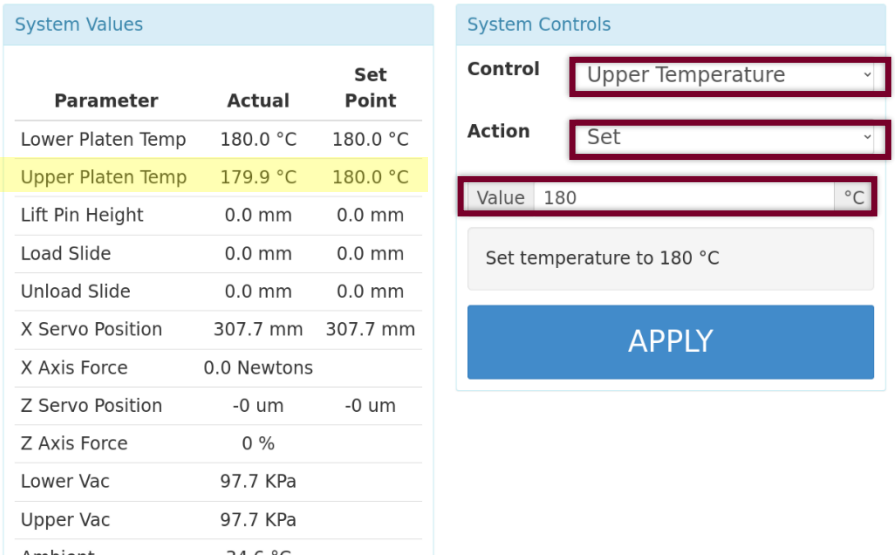
Select an Action of AutoTune

Click APPLY

User must first define the set point and enable temperature controller.

Useful for refining the temperature control for a given setting – note that this may take a significant amount of time.

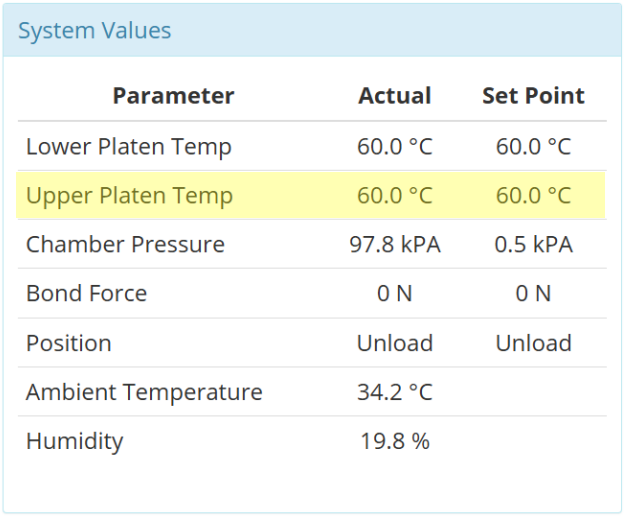
Upper Platen Temperature

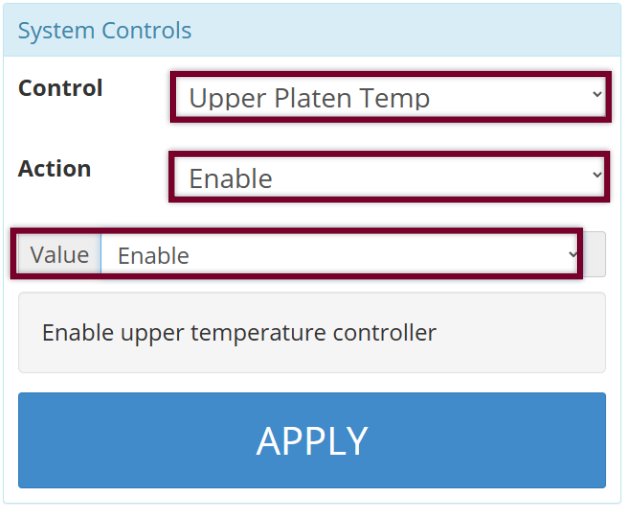


Select a Control of Upper Platen Temperature
Select an Action of Set
Enter the desired value in °C

Click APPLY

The Temperature Controller must be enabled to initiate the heating process. See next step.

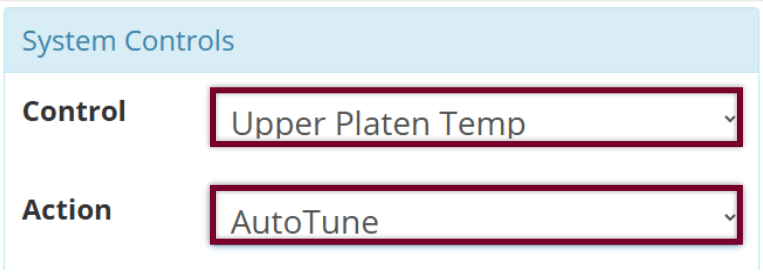




Select an Action of Enable
Select a Value of Enable or Disable to activate or deactivate the temperature controller

Click APPLY

Note that the heating process has been initiated and a plate temperature set point has populated on the system values list. When a value of Disabled is selected, a Set Point of - - is displayed and the heating process is terminated.



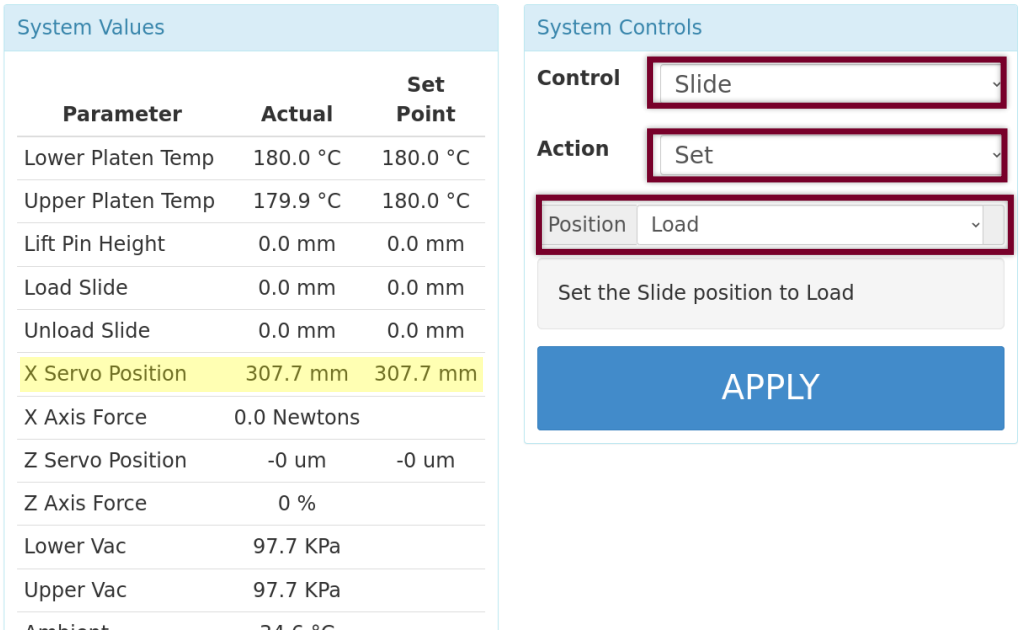
Select an Action of AutoTune

Click APPLY

User must first define the set point and enable temperature controller.

Useful for refining the temperature control for a given setting – note that this may take a significant amount of time.

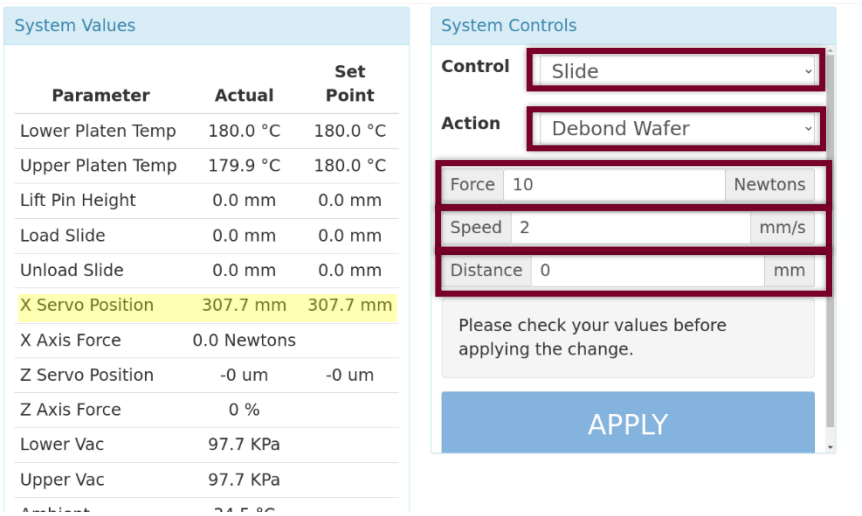
Slide



Select a Control of Slide and the Action will default to Set.

Select an Position of Load or Process to move the lower platen to the desired position.

Click APPLY



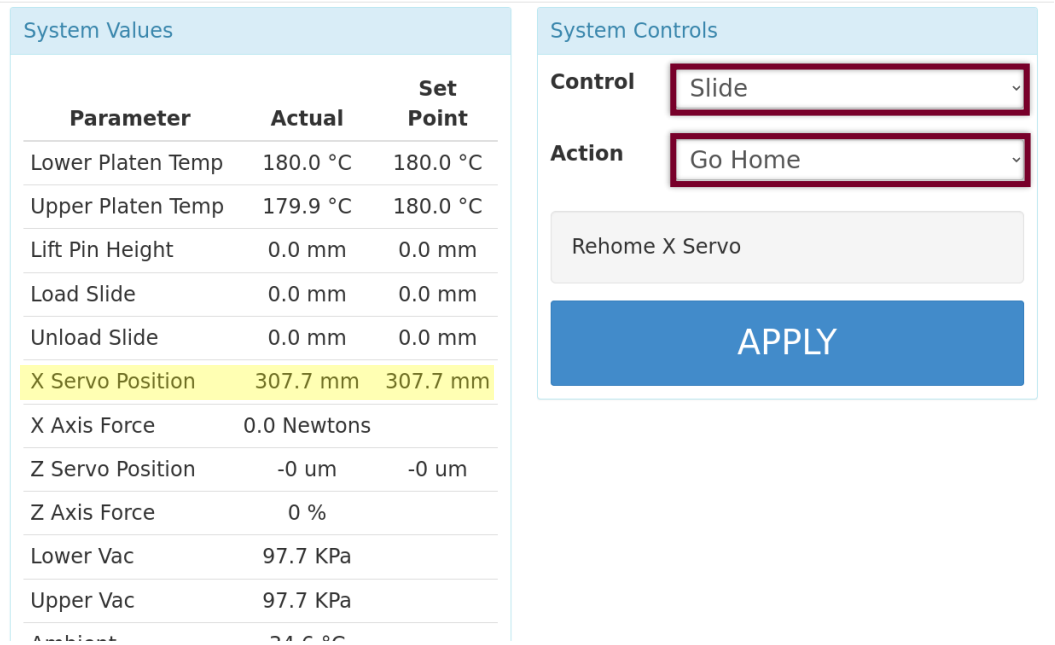
Select Debond Wafer from the Action dropdown menu.

Enter desired values for force, speed, and distance within the supported range for each setting:

Force	1-100 N
Speed	1-20 mm/s
Distance	0-400 mm

Click APPLY

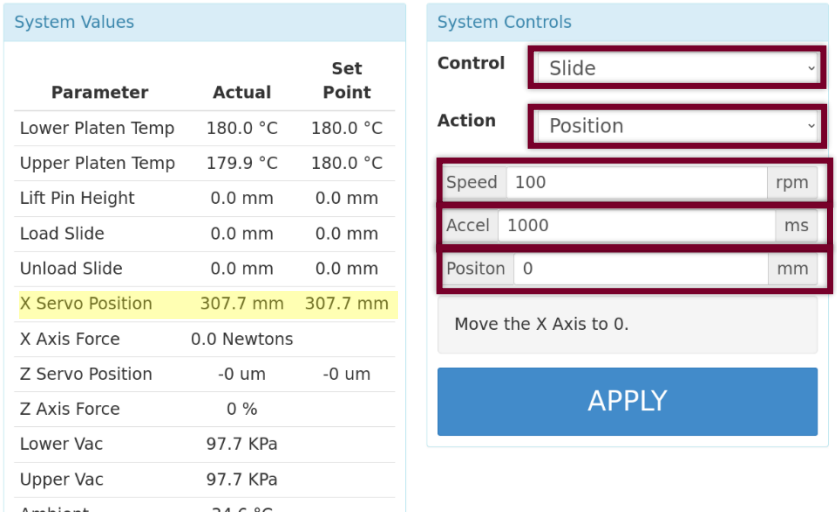
Note that the actual and set point values have populated on the system values list. The lower platen will move left at the speed, force, and distance entered. Please note that speed and force are dependent on each other. If the actual force is at the set value, the speed may not reach it value and vice versa.



Select an Action of Go Home.

Click APPLY

This will home the lower stage position.



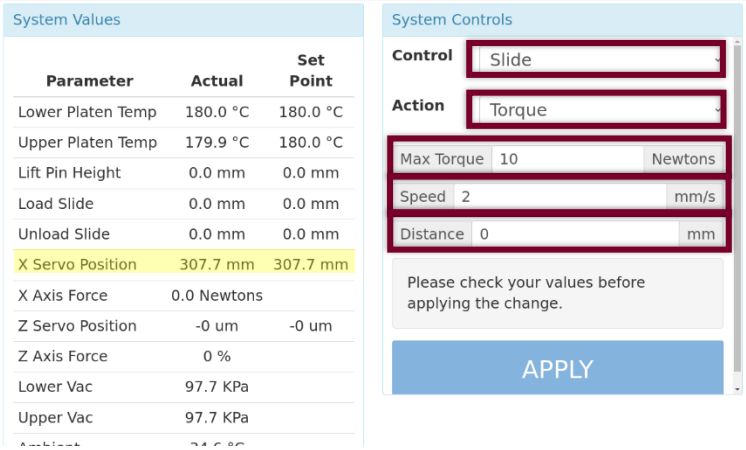
Select Position from the Action dropdown menu.

Enter values for speed, acceleration and distance within the supported range for each setting:

Speed	1-20 mm/s
Accel	1-10000 ms
Position	0-400 mm

Click APPLY

Note that the actual and set point values have populated on the system values list. The lower platen will move to the determined position at the speed, and acceleration entered.



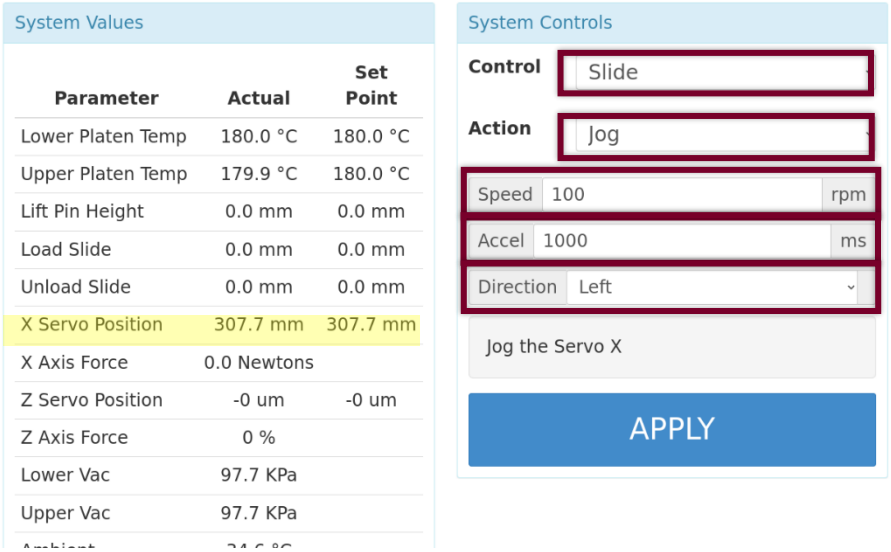
Select Torque from the Action dropdown menu.

Enter values for max torque, speed, and distance within the supported range for each setting:

Max Torque	1-100 N
Speed	1-20 mm/s
Distance	0-400 mm

Click APPLY

Note that the actual and set point values have populated on the system values list. The lower platen will move left at the max torque, speed, and distance entered. Please note that torque and are dependent on each other. If the actual torque is at the set value, the speed may not reach it value and vice versa.



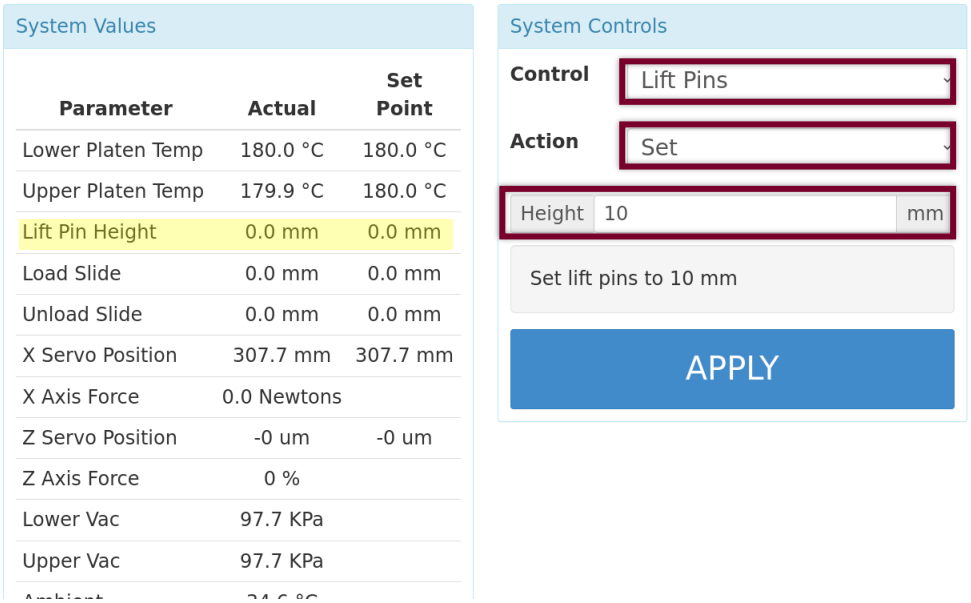
Select Jog from the Action dropdown menu.

Enter values for speed, acceleration, and distance within the supported range for each setting:

Speed	1-20 mm/s
Speed	1-10000 ms
Direction	Left / Right

Click APPLY

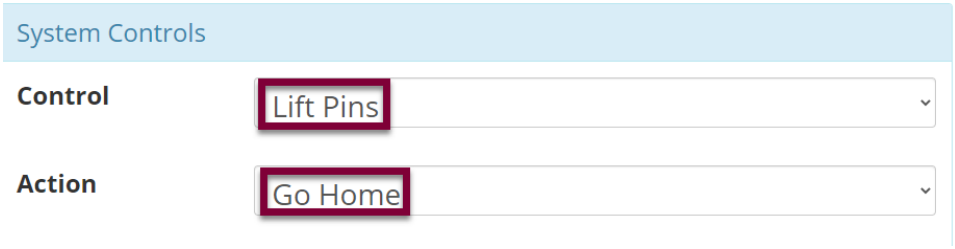
Lift Pins



Select a Control of Lift Pins
Select an Action of Set
Enter the target height (between 0-19mm)

Click APPLY

Note that the lift pin height set point has populated on the system values list.

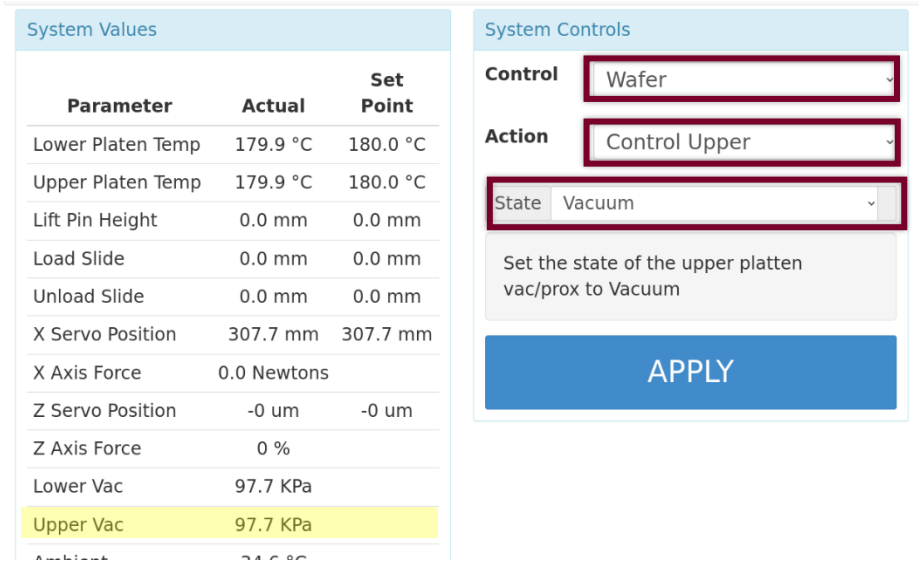


Select an Action of Go Home

Click APPLY

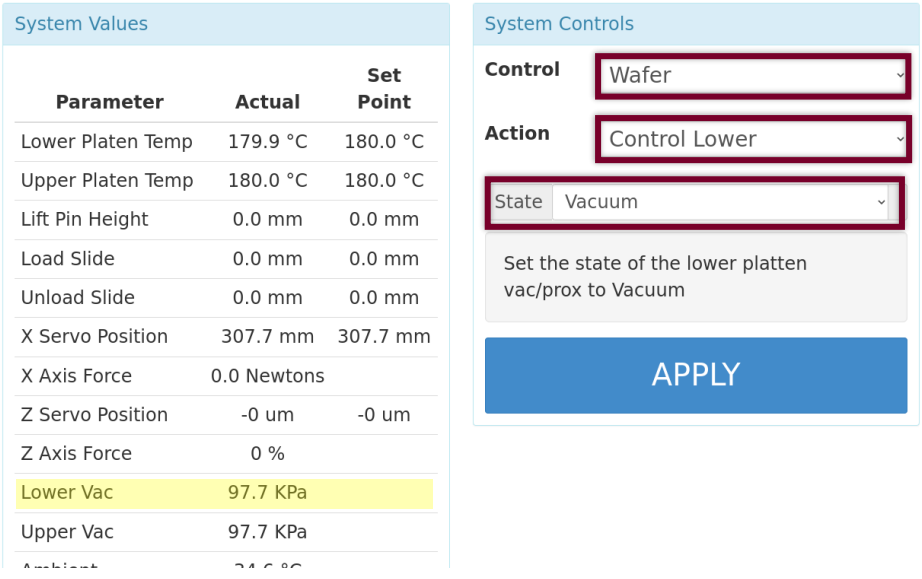
Lift pins recede beneath the surface of the hot plate until they contact the homing flag for recalibration of position.

Wafer



Select a Control of Wafer
Select Control Upper from the Action dropdown menu.
Select the desired function of vacuum, proximity, or off from the State dropdown to either turn vacuum on, purge nitrogen, or turn off flow to the ports of the upper platen.

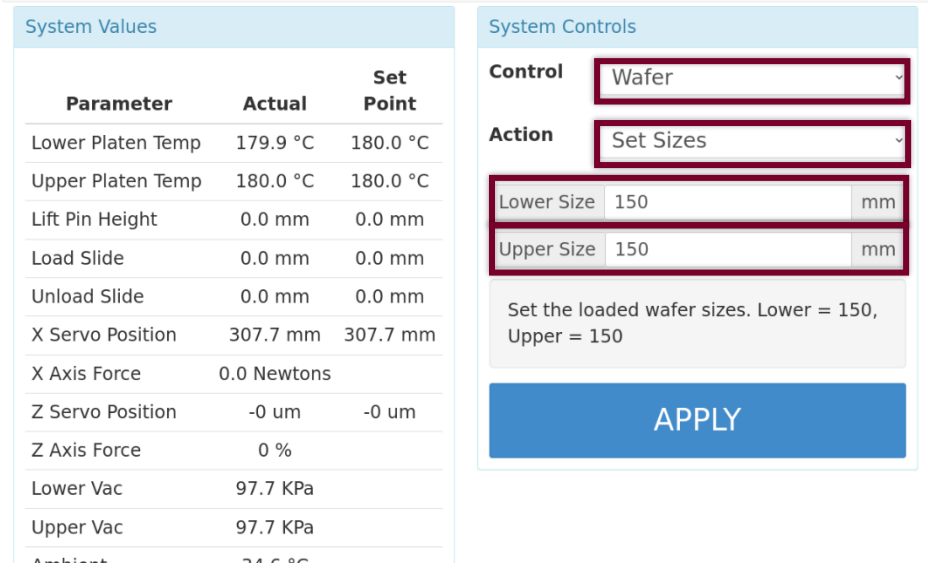
Click APPLY



Select Control Lower from the Action dropdown menu.

Select the desired function of vacuum, proximity, or off from the State dropdown to either turn vacuum on, purge nitrogen, or turn off flow to the ports of the lower platen.

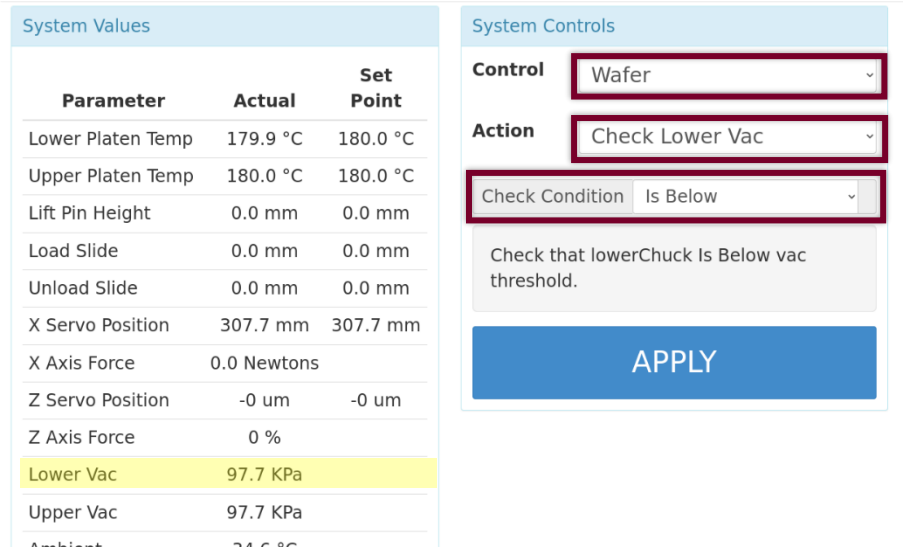
Click APPLY



Select Set Sizes from the Action dropdown menu.

Enter the lower and upper wafer sizes. These sizes determine the platen vacuum zones and pull length during debond.

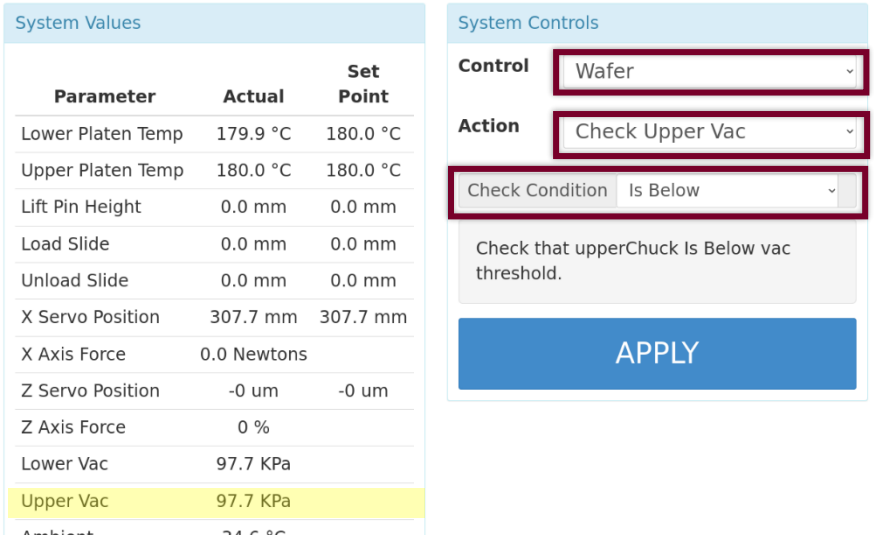
Click APPLY



Select Check Lower Vac from the Action dropdown menu.

Select from the Check Condition dropdown Is Below or Is Above. This will wait until vacuum is either achieve below the global threshold or that it has vented above.

Click APPLY

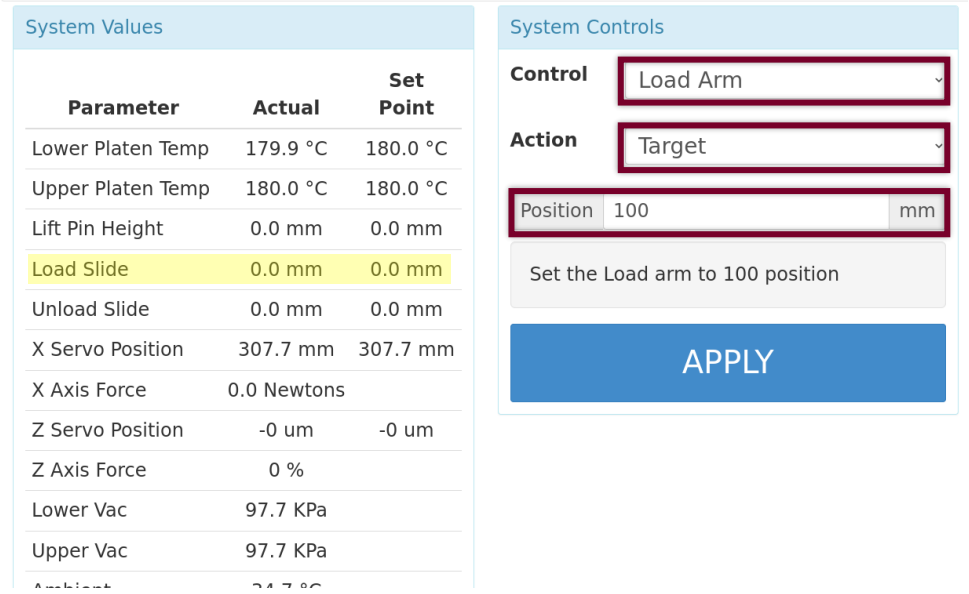


Select Check Upper Vac from the Action dropdown menu.

Select from the Check Condition dropdown Is Below or Is Above. This will wait until vacuum is either achieve below the global threshold or that it has vented above.

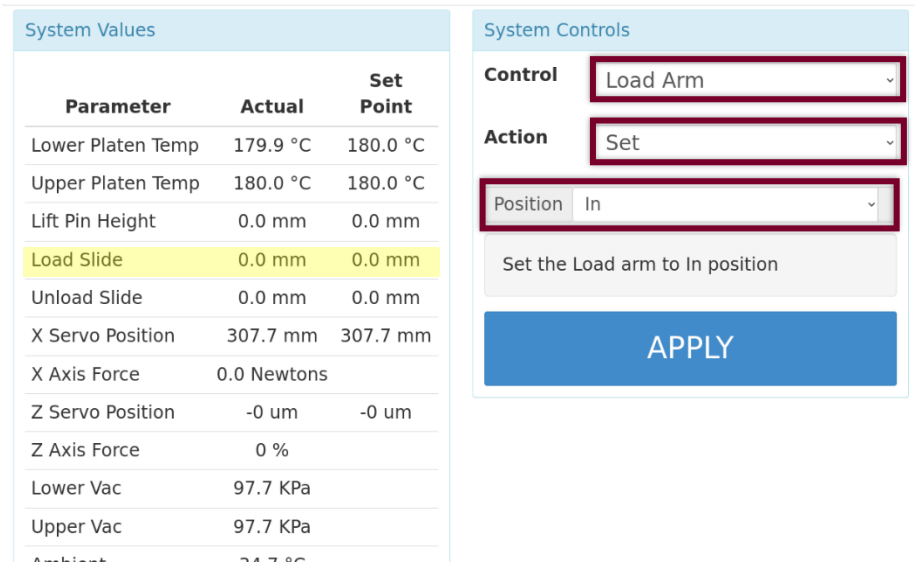
Click APPLY

Load Arm



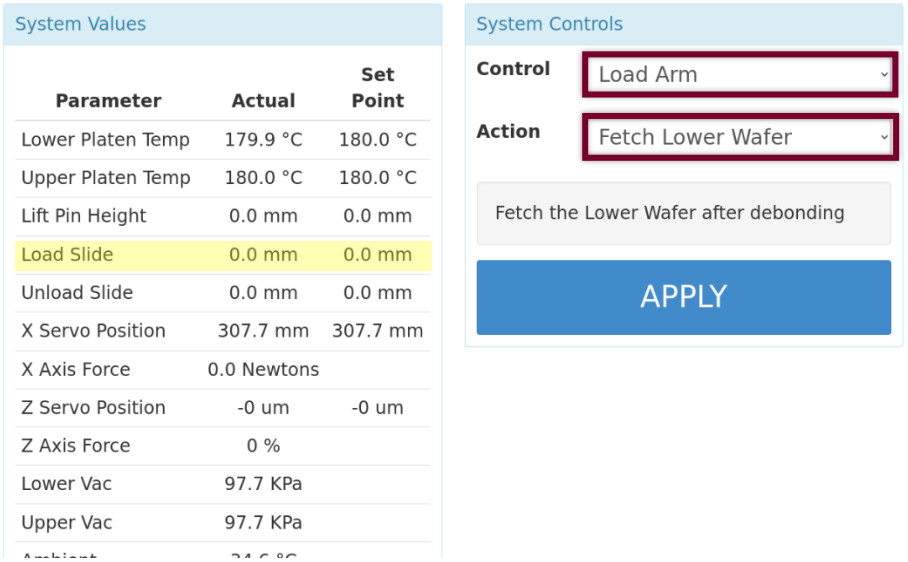
Select a Control of Load Arm
Select Target from the Action dropdown menu.
Enter the desired Position of the Load Arm, 0 mm being all the way out.

Click APPLY



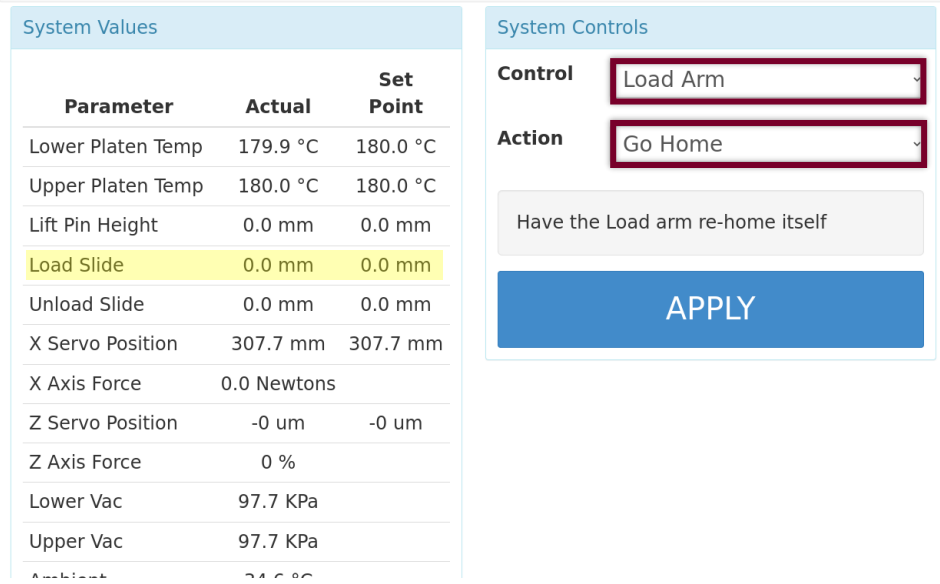
Select Set from the Action dropdown menu.
Select the desired Position of the load arm, In is positioned above the lower platen and Out is in the loading position.

Click APPLY



Select Fetch Lower Wafer from the Action dropdown menu.
The equipment will go through the process of removing a wafer from the system including releasing vacuum, raising lift pins, moving arm in, lowering lift pins, and moving the load arm back out.

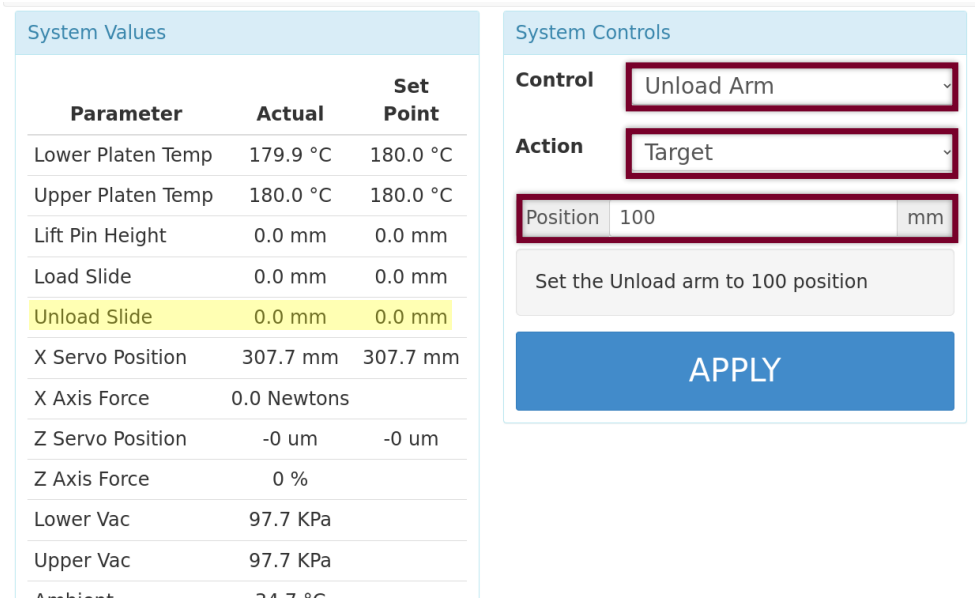
Click APPLY



Select Go Home from the Action dropdown menu.
The Load Arm moves all the way out to its end of travel to home its position.

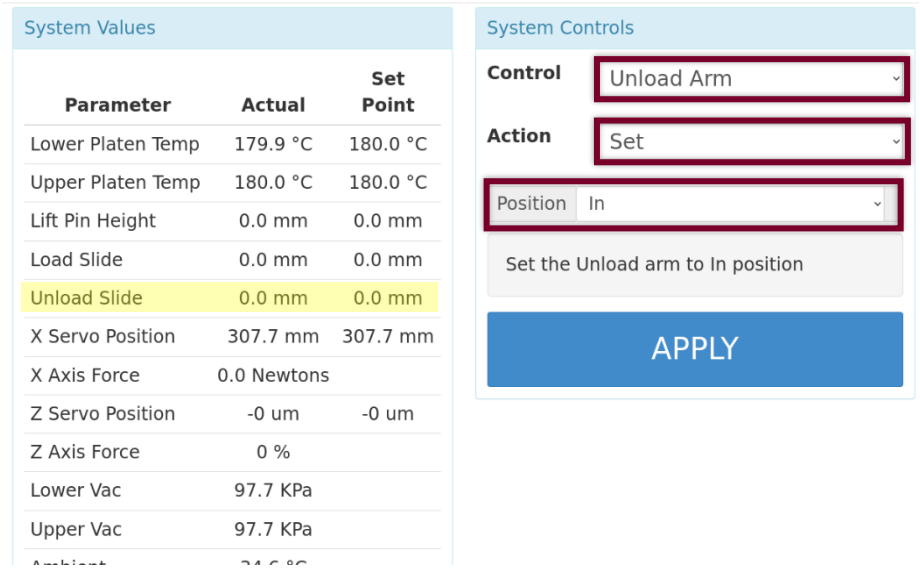
Click APPLY

Unload Arm



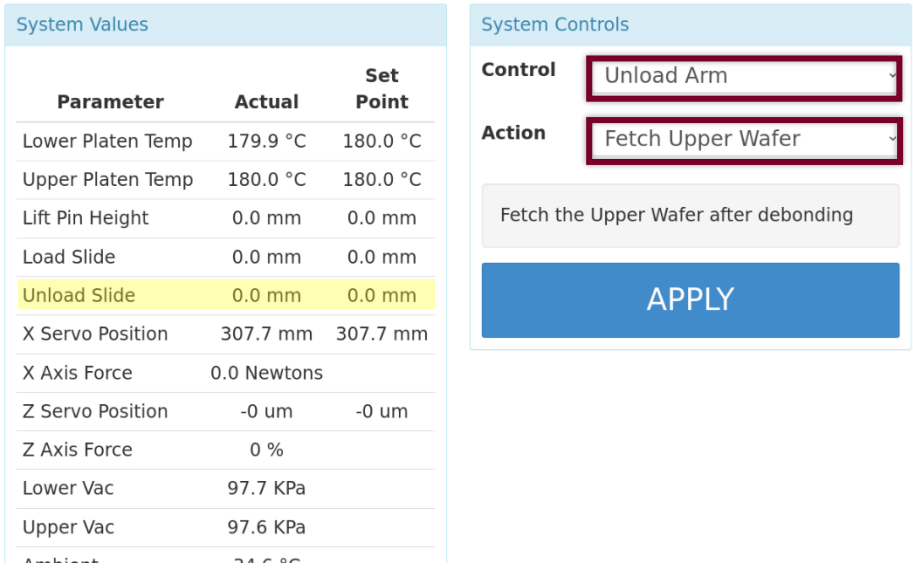
Select a Control of Unload Arm
Select Target from the Action dropdown menu.
Enter the desired Position of the Unload Arm, 0 mm being all the way out.

Click APPLY



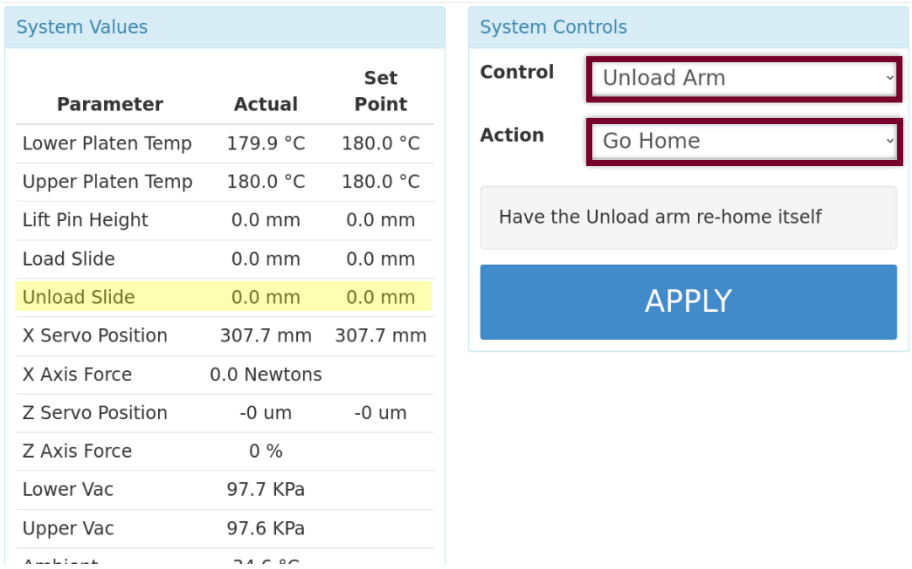
Select Set from the Action dropdown menu.
Select the desired Position of the unload arm, In is positioned below the upper platen and Out is in the unloading position.

Click APPLY



Select Fetch Upper Wafer from the Action dropdown menu.
The equipment will go through the process of removing a wafer from the system including moving arm in releasing vacuum, and moving the unload arm back out.

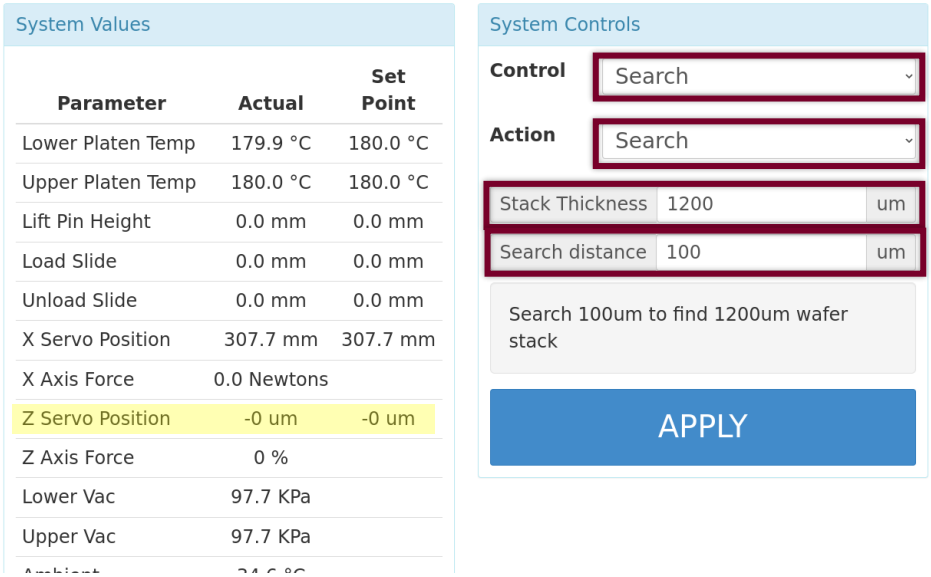
Click APPLY



Select Go Home from the Action dropdown menu.
The Unload Arm moves all the way out to its end of travel to home its position.

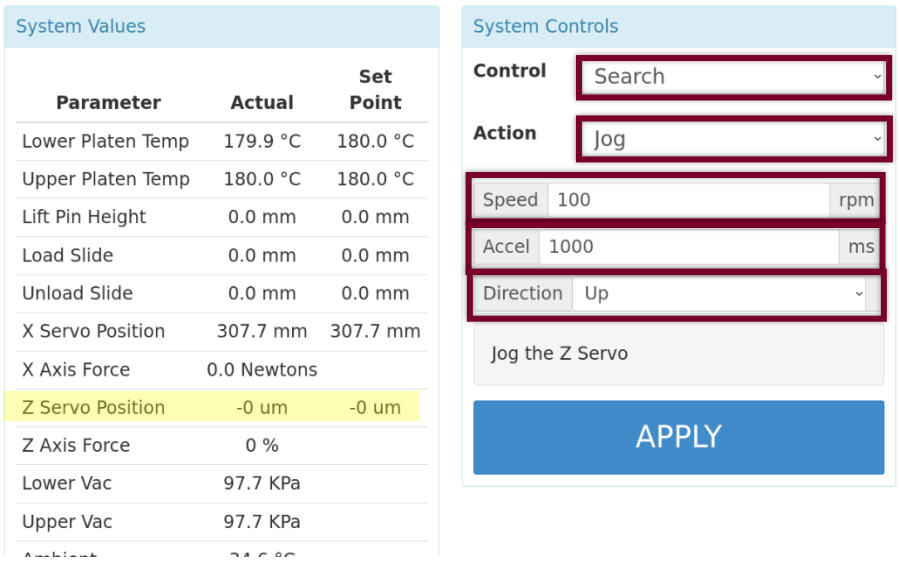
Click APPLY

Search



Select a Control of Search
Select Search from the Action dropdown menu.
Enter the bonded wafer pairs thickness in Stack Thickness and Search Distance. This will move the lower platen up to a position that the search distance away from the upper platen, then turn on upper vacuum and take small steps until upper vacuum is found.

Click APPLY



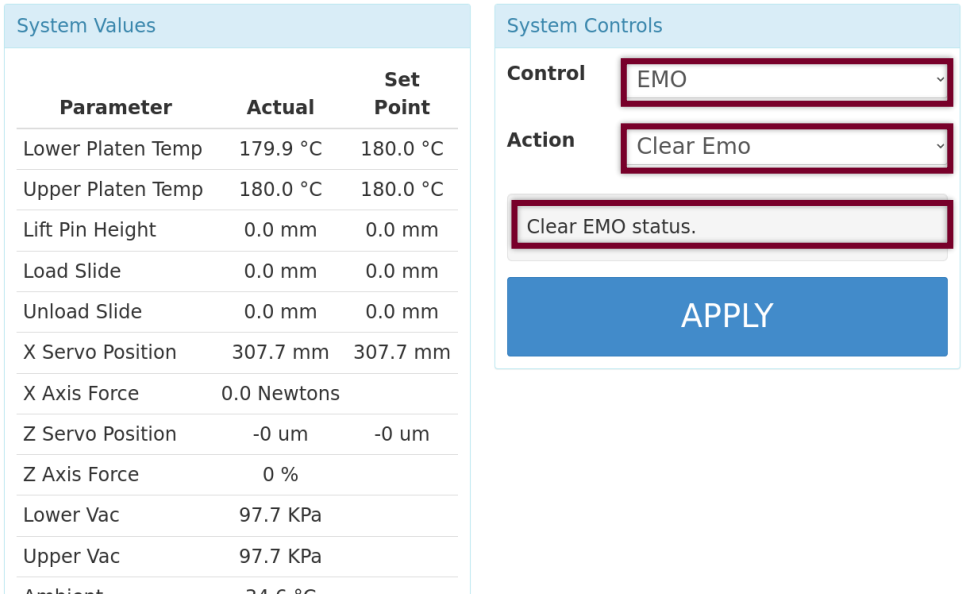
Select Jog from the Action dropdown menu.

Enter values for speed, acceleration, and distance within the supported range for each setting to jog 10 microns:

Speed	1-20 mm/s
Acceleration	1-10000 ms
Direction	Up / Down

Click APPLY

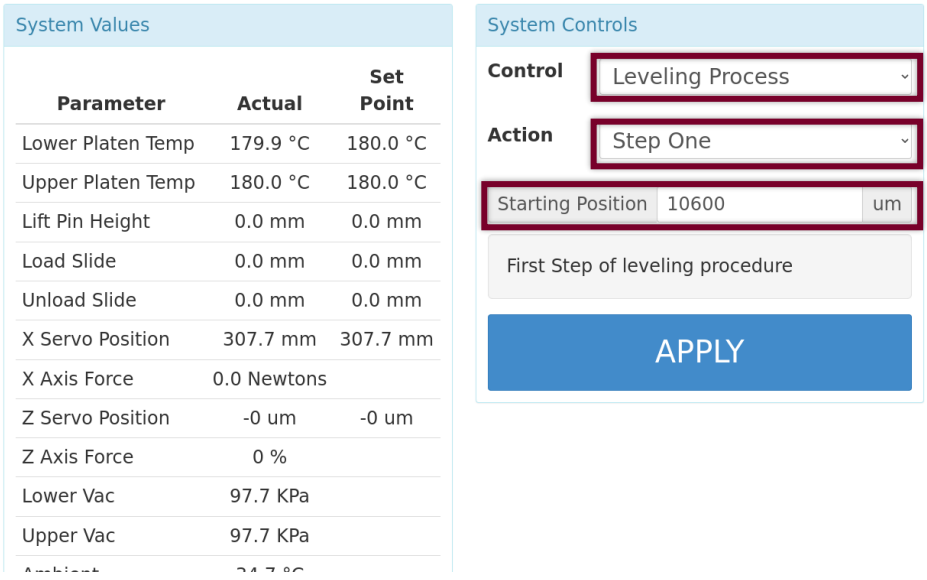
EMO



Select a Control of EMO
Select Clear Emo from the Action dropdown menu.
In the event of an Emergency Stop from either pressing the Estop button or overtemperature fault, the EMO will be reset.

Click APPLY

Leveling Process

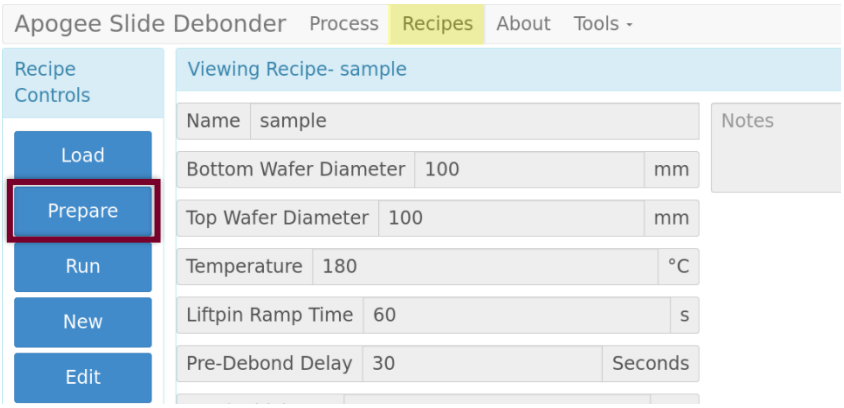


Select a Control of Leveling Process
Select Desired Step from the Action dropdown menu.
Enter the Starting Position. This process is explained in more detail in Section 5.4.

Click APPLY

4.3 Preparation

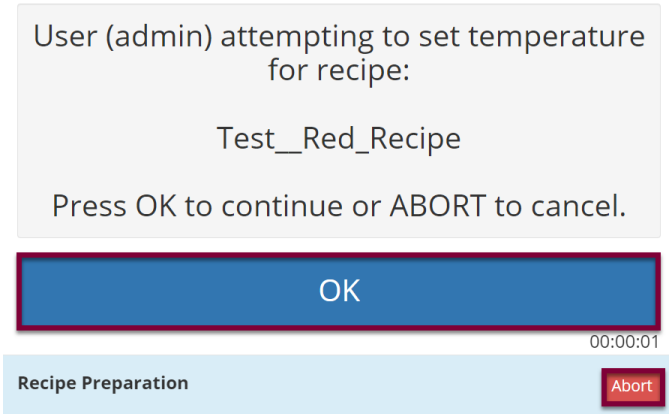
Users with sufficient privileges can ***Prepare*** equipment to run a recipe. This feature is useful for preconditions and parameters that take a significant amount of time such as hot chuck and platen temperatures. To initiate this feature, navigate to the ***Recipes*** tab, click ***Load*** to access the recipes list and select the desired recipe, then click ***Prepare***.



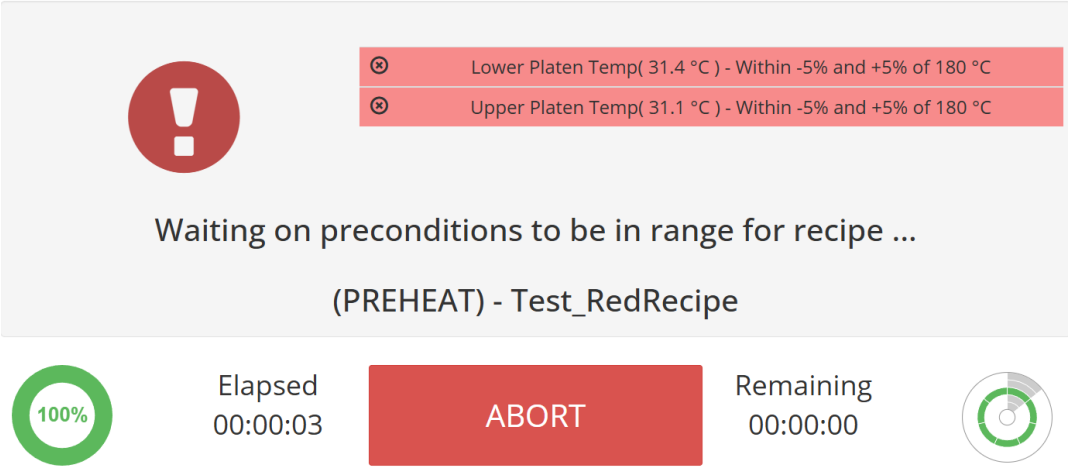
****Preparation processes cannot be initiated when the equipment is already in use.***

Local Display – When a ***Prepare*** command is entered, the user or device with active control of the machine receives an alert. This prompt includes the user and recipe to be prepared. The user with control of the machine can refuse the request by selecting ***Abort*** or accept the request by tapping ***OK***.

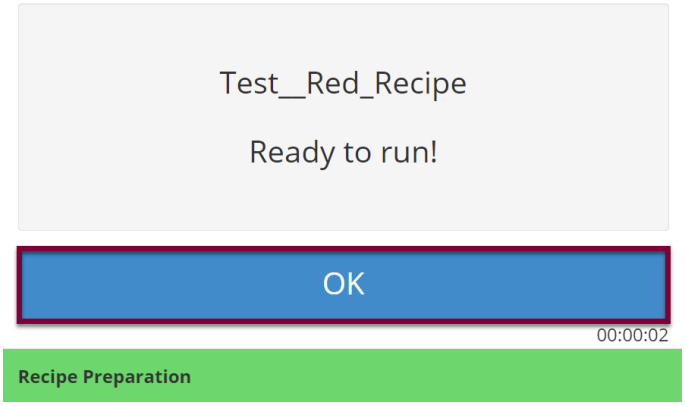
In the absence of a response, the request is auto accepted after two minutes.



Preparation In Process – progress toward the specified precondition(s) is displayed to the user with verified local presence.



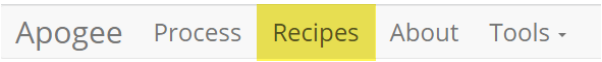
Preparation Complete – indicates that the equipment has reached all specified preconditions and the recipe can be initiated. Upon clicking ***OK*** the user is directed to the *Process* screen to begin the recipe.



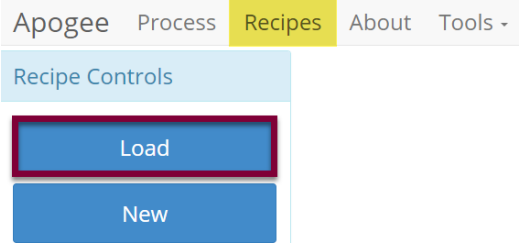
During recipe preparation the Prepare and Run commands are disabled to ensure no interruption to precondition processes.

4.4 Running Recipes

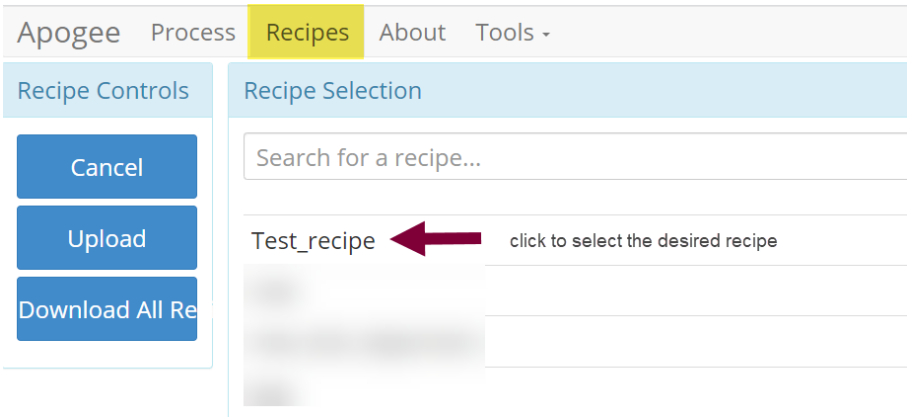
1. Navigate to the *Recipes* page.



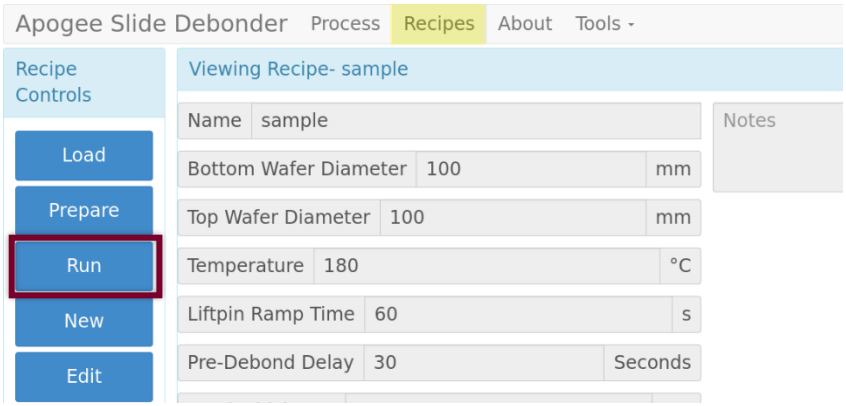
2. Click ***Load*** to access the recipes list.



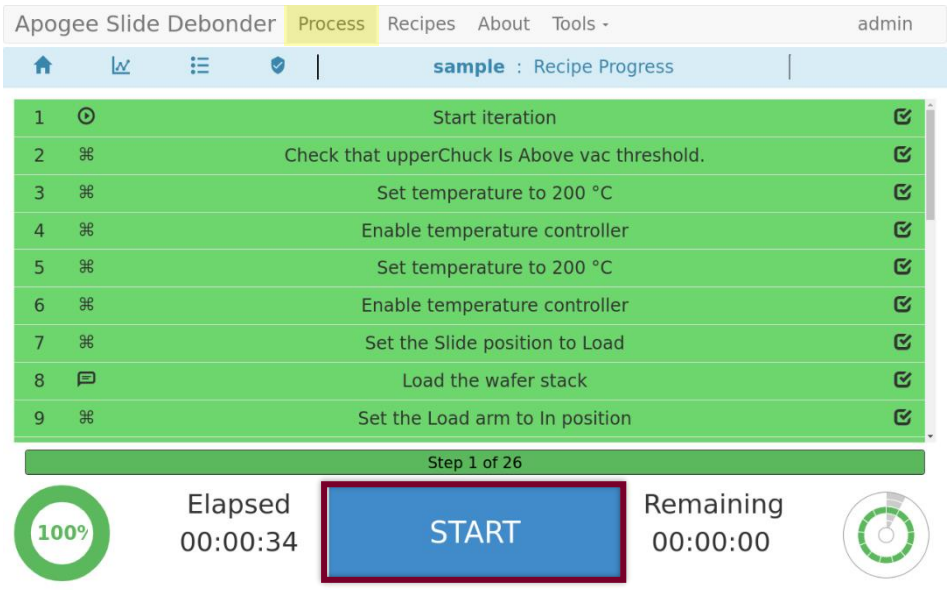
3. Search for, identify, & select the preferred recipe.



4. Click ***Run***.



5. Click ***Start*** to initiate the recipe process.

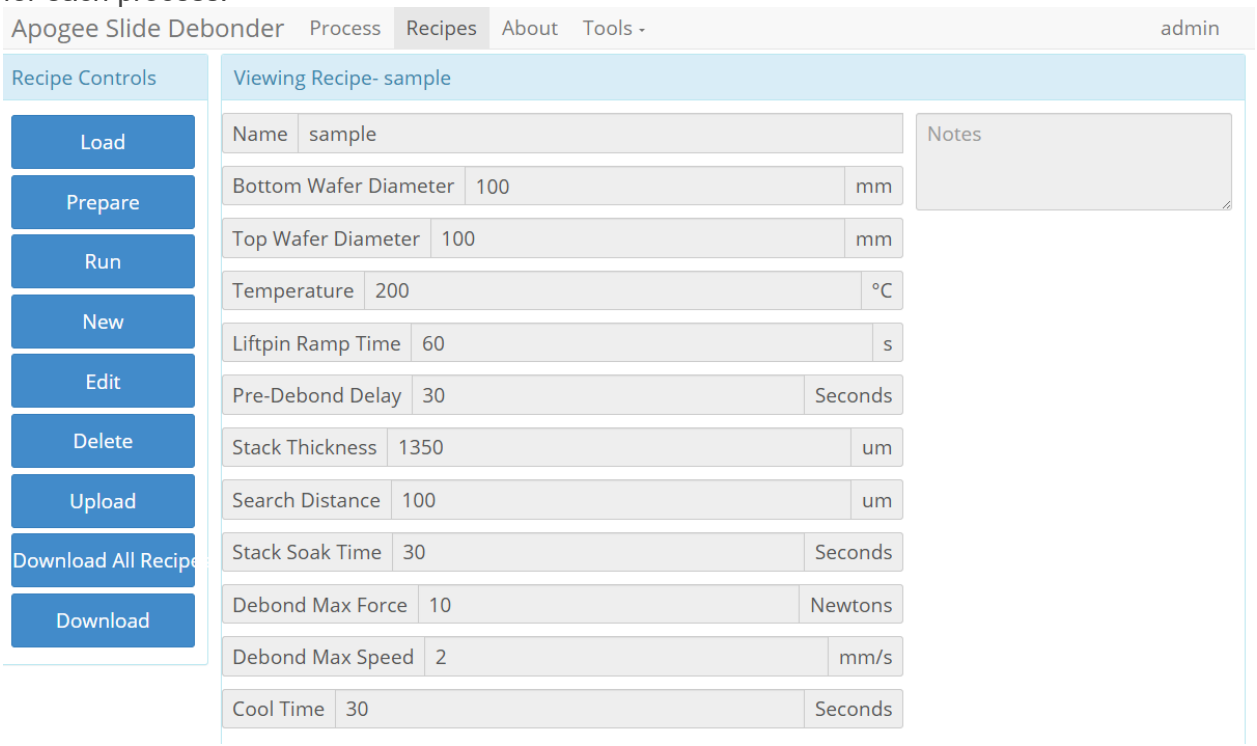


6. Recipe execution.

*Users may be required to follow prompts on the screen during recipe execution.

4.5 Editing Recipes

Basic thermal slide debonder recipes use a predefined process with parameters that can be optimized for each process.



Name---------- recorded in log files and used as criteria when searching for recipes

Bottom Wafer Diameter---- diameter of the carrier wafer to determine vacuum ports and debond length

Top Wafer Diameter--------- diameter of the device wafer to determine vacuum ports and debond length

Temperature[10]---------- sets the temperature of the upper and lower platens

Lift Pin Ramp Time---------- duration of the lift pins going from 19mm to 0mm after loading

Pre-Debond Delay---------- delay after wafer touches the lower platen before verifying vacuum

Stack Thickness---------- thickness of the bonded pair

Search Distance---------- distance desired for upper vacuum search

Stack Soak Time---------- delay after verifying vacuum on the upper platen

[10] preconditions default to ± 5% of the target temperature, independent platen temperatures can be set in advanced mode

Debond Max Force---------- the maximum sheer force during debond

Debond Max Speed--------- the maximum speed during debond

Cool Time---------- delay after wafers are unloaded to ensure wafers are safe to handle

4.6 Tool Specific Settings – Apogee® Thermal Slide Debonder

Lower Platen Temperature Offset Calibration (°C)-- Offset used by the temperature controller to calibrate the reported lower platen temperature

Upper Platen Temperature Offset Calibration (°C)-- Offset used by the temperature controller to calibrate the reported upper platen temperature

5 Thermal Slide Debonder Use & Operation

5.1 Process Flow

1. The equipment verifies that there are no substrates on the platens by attempting to pull vacuum.
2. Upper and lower platen temperatures are set and verified.
3. The load tray and unload tray move out.
4. X-Axis Slide, z-axis lift, and lift pins move to the start position.
5. The user is prompted to load the bonded wafers, carrier down / device up.
6. The user presses OK and the load arm moves in.
7. Lift pins move up to lift the bonded wafers of the load tray.
8. The load tray moves out.
9. Lower platen vacuum is turned on. The zones are specified by the carrier wafer size in the recipe.
10. The lift pins move down at a rate that is specified by the recipe.
11. A delay occurs based on lower stabilization time in the recipe.
12. The lower platen vacuum is verified.
13. The x-axis slide moves to the 0 position, locating the lower platen under the upper platen.
14. The z-axis moves the lower platen up to a starting position determined by the bonded pair thickness and search distance specified in the recipe.
15. Upper platen vacuum is turn on. The zones are specified by the device wafer size in the recipe.
16. The z-axis then takes a 2 micron step and checks to see if the vacuum threshold is met. If not it will repeat until vacuum is found or the max force is reached in which it will then abort.
17. Once vacuum is found on the upper platen, A delay occurs based on upper stabilization time in the recipe.
18. The x-axis then starts to move at a max force and speed determined by the recipe. Vacuum is monitored and a drop below the tolerances will abort the recipe. The x-axis will move a length determined by the carrier and device size in the recipe.
19. Once the x-axis reaches the stop position, the z-axis will move the lower platen down and the x-axis will move back to the starting position.
20. The lower platen vacuum will be turned off, N2 purged, and lift pins will move up to raise the carrier wafer.
21. The load tray will move in and the lift pins will lower leaving the carrier on the load tray.
22. The load tray will move out and the carrier wafer can be removed.
23. If not placed already, the GUI will prompt the user to load a Gel Pak onto the unload tray.
24. Once a Gel Pak is detected, the unload tray will move in.
25. Upper platen vacuum will turn off and upper platen N2 will turn on, transferring the device wafer from the upper platen to the lower platen.
26. The process wait, turn on upper vacuum to verify there is no wafer present, and then move the unload tray out.
27. The Gel Pak with the device wafer can then be removed.
28. There is a delay for cool down.
29. A prompt appears that process is complete.

5.2 Loading Wafers

Load bonded wafer pair into the load tray by setting the wafer between the eccentric load points show in Figure 10 in red. Ensure the wafer is setting flat on the load tray. The load points can be adjusted to accommodate a varying wafer diameter (i.e. 200, 201, and 202mm wafer diameter) and for centering by loosening the screw and turning the load point.

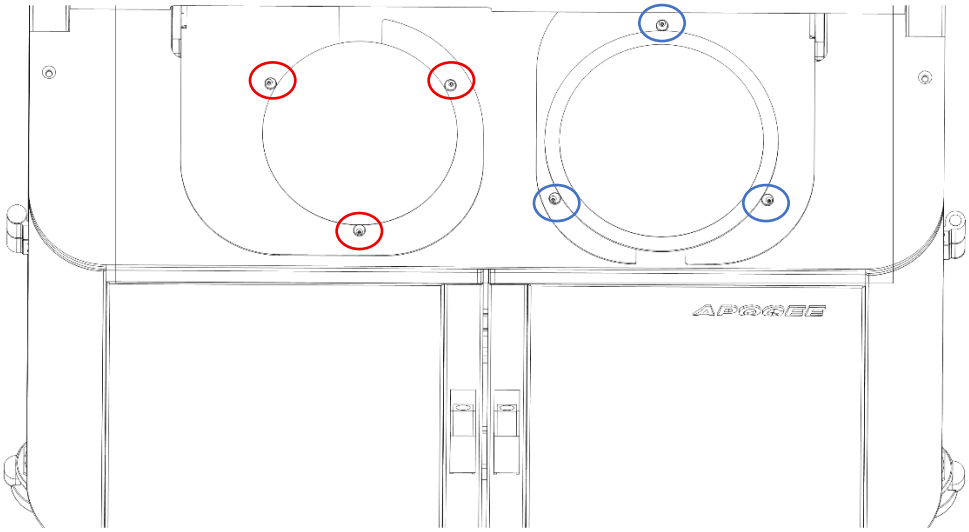


Figure 10 Load and Unloading Station

5.3 Unloading Wafers

Load Gel Pak into the load tray by setting it between the eccentric load points show in Figure 10 in blue. Ensure the Gel Pak is setting flat on the load tray. The load points can be adjusted to accommodate a varying Gel Pak by loosening the screw and turning the load point.

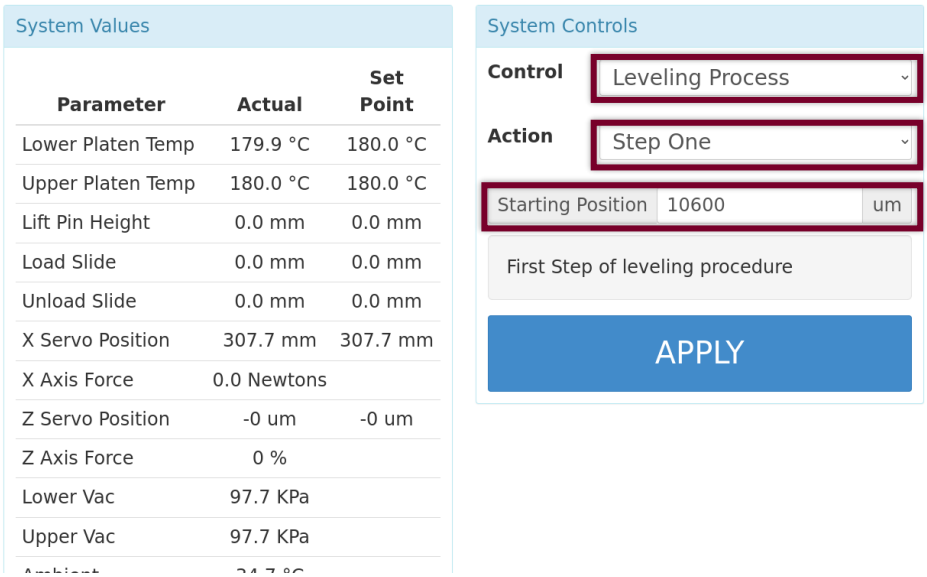
To unload the Gel Pak and device wafer, simply lift the Gel Pak off the unload tray by hand. The device wafer will be held on to the surface of the Gel Pak. Applying vacuum to the port on backside of the Gel Pak with a vacuum wand will release the device from the Gel Pak..

To unload the carrier wafer, lift the carrier wafer off the load station using tweezers, vacuum wand, or by hand.

5.4 Leveling Procedure

Ensuring that the platen surfaces are parallel to each other and to the plane of travel is critical for the operation of the slide debonder Poor setup can lead to partially debonded or chipped wafers.

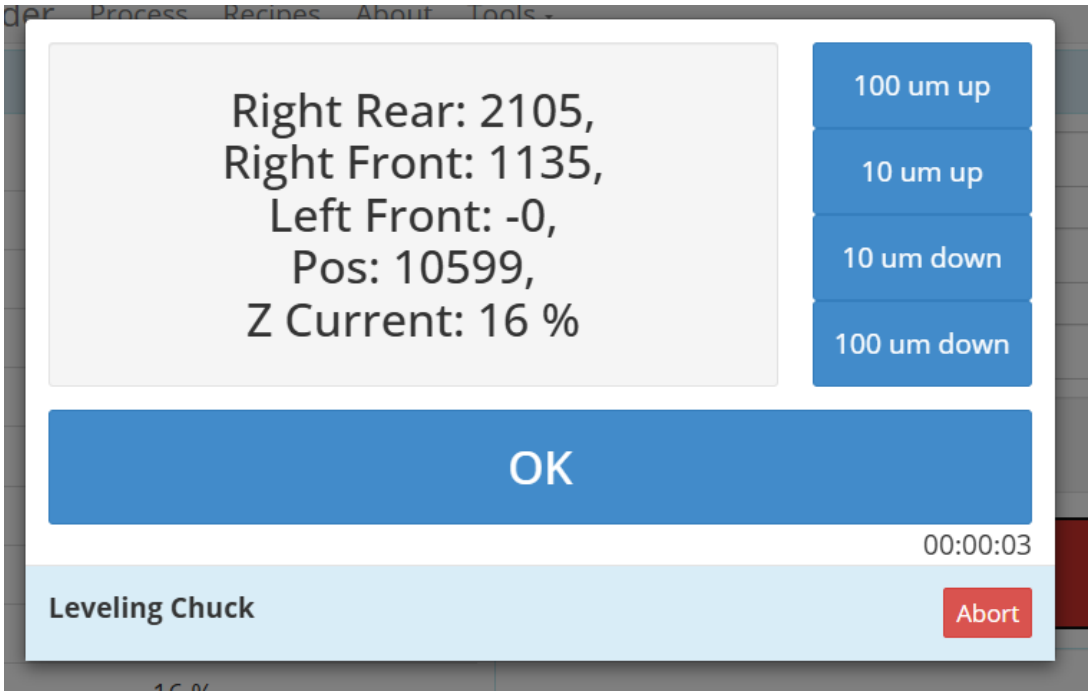
The Apogee® Thermal Slide Debonder has a procedure built in to help facilitate the leveling procedure. It uses ports in the platens to sample various positions to access the parallelism. During the procedure steps, there will be specific adjustments to make. To access, navigate to Tools-Manual Controls. Select Leveling Process from the Controls List.



Step One

Step One will adjust the parallelism of the upper platen to the lower platen. Select the Action drop down list and select Step One. Running the steps in sequence will reduce setup time and give the best results. There is a Starting Position field. This value should be the height at which the lower platen is very close to the upper platen but not touching. If the wrong number is entered here, it is not a concern. The height can be adjusted during the process. This is there just to speed it up.

Press Apply. The lower platen will move to the process position and move up to the starting point. A dialog box will appear.



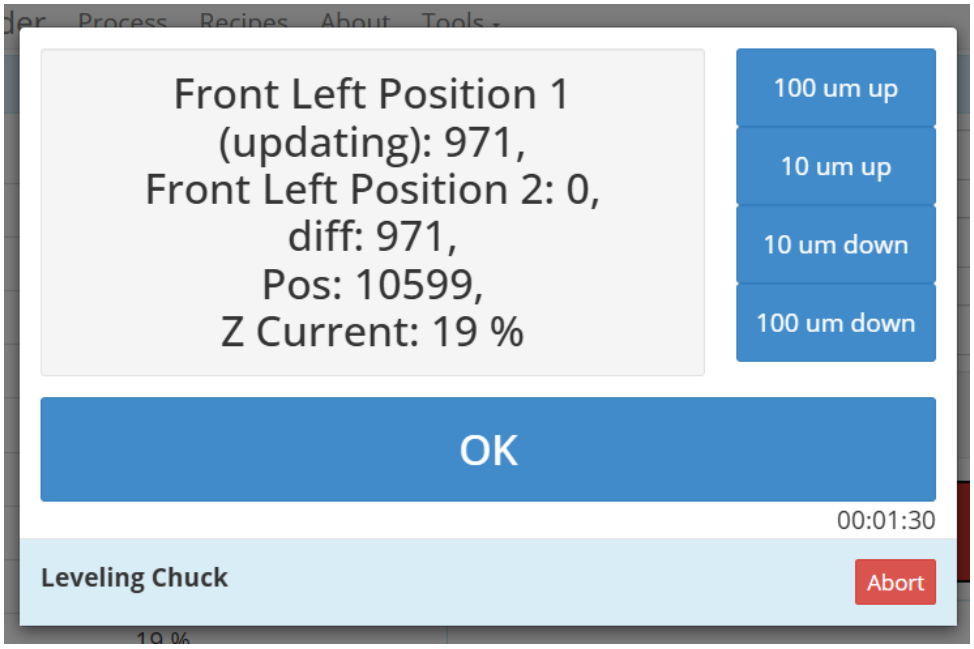
This box shows the live reading from all 3 measurement points as well as the current height and force (z current) being applied to lift the platen. Below is how to take measurements and adjust:

1. If the Z current is >10%, the platens are touching and a reliable reading can not be made. Select 10um Down or 100um down until the current stays below 10%.
2. When the Z current is <10%, check the 3 readings. There should be at least one that measures 500-3000 range.
    a. If none of the readings are in the 500-3000 range, move the platen up until that reading is seen on at least one of the points.
    b. If one or both Right Rear and Right Front are measuring 500-3000 range adjust the Upper Right Front until the Right Rear and Right Front values are within 100 of each other.
    c. If Left Front is in the 500-3000 range but Right Rear and Right Front are not, adjust the Upper Left until a reading of 500-3000 can be read on the Left Front and one/both of the Right Rear and Right Front.
3. Make the necessary adjustment, and then repeat 1-2 until all 3 measurements are within 100 of each other and the Z current is <10%.
4. Make a note of the Position (Pos) for the next section and press OK.

Step Two

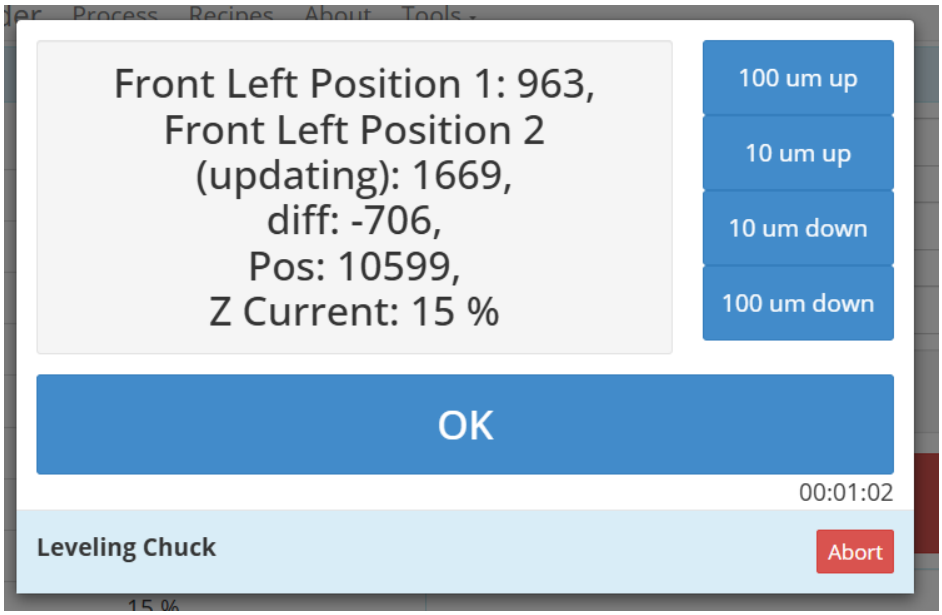
Step Two will adjust the parallelism of the upper platen to the travel of the lower platen. Select the Action drop down list and select Step Two. Running the steps in sequence will reduce setup time and give the best results. There is a Starting Position field. This value should be the Position noted at the end of Step One. Again, this vaule should move the lower platen is very close to the upper platen but not touching. If the wrong number is entered here, it is not a concern. The height can be adjusted during the process. This is there just to speed it up.

Press Apply. The lower platen will move to the process position and move up to the starting point. A dialog box will appear.



This box shows the live reading from the Front Left measurement point as well as the current height and force (z current) being applied to lift the platen. Below is how to take measurements and adjust:

1. If the Z current is >10%, the platens are touching and a reliable reading can not be made. Select 10um Down or 100um down until the current stays below 10%.
2. When the Z current is <10%, check the Front Left Position 1 (Updating) reading.
    a. If Front Left Position 1 (Updating) < 500, move the platen up until a reading >500 is shown.
3. Press OK.
4. The lower platen will now move down and over to take a second reading. It will move up to the same positon before OK was pressed. Note that Front Left Positon 1 is now a recorded value and Front Left Position 2 is now updating.

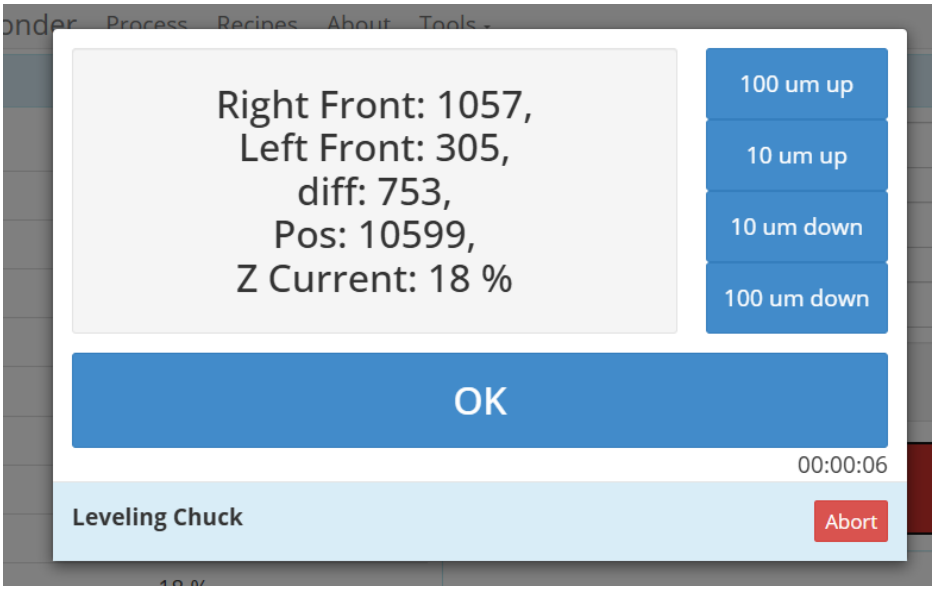


5. If the Z current is >10%, the platens are touching. Adjust the Lower Right Adjustment clockwise until the Z current reads <10% and the updated reading is with +/-100 of the recorded Front Left Position 1 reading.
6. Press Ok.
7. The lower platen will now move down and back to the first postion reading. It will move up to the same positon before OK was pressed in step 6. Note that Front Left Positon 2 is now a recorded value and Front Left Position 1 is now updating.
8. Repeat Steps 1-7 until no more adjustments have to be made.
9. To exit Step Two, note the final Position (Pos) and Press the Abort Button.

Step Three

Step Three will adjust the parallelism of the upper platen to the lower platen. Select the Action drop down list and select Step Three. Running the steps in sequence will reduce setup time and give the best results. There is a Starting Position field. This value should be the Position noted at the end of Step Two. Again, this vaule should move the lower platen is very close to the upper platen but not touching. If the wrong number is entered here, it is not a concern. The height can be adjusted during the process. This is there just to speed it up.

Press Apply. The lower platen will move to the process position and move up to the starting point. A dialog box will appear.



This box shows the live reading from the Right Front and Left Front measurement points as well as the current height and force (z current) being applied to lift the platen. Below is how to take measurements and adjust:

1. If the Z current is >10%, the platens are touching and a reliable reading can not be made. Select 10um Down or 100um down until the current stays below 10%.
2. When the Z current is <10%, check the 2 readings. There should be at least one that measures 500-3000 range.
    a. If none of the readings are in the 500-3000 range, move the platen up until that reading is seen on at least one of the points.
    b. If one or both Right Rear and Right Front are measuring 500-3000 range adjust the Upper Left until the Right Front and Left Front values are within 100 of each other.

3. Make the necessary adjustment, and then repeat 1-2 until both measurements are within 100 of each other and the Z current is <10%.
4. This is the last step of the leveling procedure. Press OK to Exit.

6 Troubleshooting & Diagnostics

6.1 System Performance Failures

Failure Mode	Recommendation
Load Tray Will Not Open/Close	• Check for physical obstruction to tray motion • Check for disconnected cables to motor
Unload Tray Will Not Open/Close	• Gel Pak not inserted into tray • Check for physical obstruction to drawer motion • Check for disconnected cables to motor
Tool is Unresponsive	• Check Emergency Stop switch is not depressed • Check thermal overlimit switches • Check electrical (utility) supply to tool • Check fuses
Chuck Vacuum Cannot be achieved	• Check vacuum (utility) supply to tool • Check for debris on the platens • Check for pinched airline or possible vacuum leak • Check for clogged vacuum lines

6.2 Wafer Alignment Failures

Failure Mode	Recommendation
Wafer Slips On Chuck	• Check centering of wafer on load arm • Check wafer loading is centering correctly on the lower platen • Check for debris on the platens • Check level of lift pins

6.3 Wafer Debonding Failures

Failure Mode	Recommendation
Broken Wafer - Debonding	• Ensure platen is clean and free of foreign material • Ensure wafer is free from damage prior to debonding • Verify leveling of platens
Vacuum Loss During Debonding	• Verify leveling of platens • Check for pinched airline or possible vacuum leak

7 Preventative Maintenance

This section provides personnel with procedures and guidelines for maintaining a Cee® Apogee® Thermal Slide Debonder.

7.1 Service and Repairs

Safety Notice: Important Repair Information for Cee® Equipment

⚠	In order to maintain safety and performance standards, only authorized representatives of Cee® are permitted to conduct repairs or alterations on Cee® equipment.	Afin de maintenir les normes de sécurité et de performance, seuls les représentants autorisés de Cee® sont autorisés à effectuer des réparations ou des modifications sur les équipements Cee®.
⚠	When servicing the machine, use only replacement parts made or recommended by Cee®.	Lors de l'entretien de la machine, utilisez uniquement des pièces de rechange fabriquées ou recommandées par Cee®.
⚠	Use only Cee® supplied shielded cables with this machine.	Utilisez uniquement les câbles blindés fournis par Cee® avec cette machine.
⚠	Unauthorized repairs may lead to serious risks such as equipment malfunction, damage, personal injury, or even death.	Les réparations non autorisées peuvent entraîner des risques graves tels qu'un dysfonctionnement de l'équipement, des dommages, des blessures corporelles ou même la mort.

7.2 Fault Condition

In the event of a fault condition, power cycle the tool to restore function.

7.3 Safety Checks

Inspect the Apogee® Thermal Slide Debonder for the following defects each day prior to use:

- Loose assemblies
- Improper closure

7.4 Mechanical/Utilities Checklist

Evaluate	Frequency	Detail
EMO Function	Quarterly	Periodically check the Emergency Stop function to ensure proper operation. With machine powered up and running, press the Emergency Stop button on the user interface console. Machine should shut down. If the machine does not shut down, employ lock out tag procedures, and contact Cee Customer Support for assistance.
Vacuum	Quarterly	If low vacuum is present, check system supply. If supply is in spec and problems persist, contact Cee Customer Support for more information.
Connections	Bi-Annually	Inspect all connections for proper installation.
Pressure Range	Bi-Annually	Check all pressures for ranges specified in tool manual.
Power	Bi-Annually	Verify that AC power is connected and of the proper voltage.

7.5 Cleaning

Observe Lockout / Tagout Procedures

Wear safety glasses

Do Not Eat or Drink While Performing this Procedure

Wear Protective Gloves

User Interface Assembly

Recommendation: Promptly clean up any spills on the touch-screen surface.

Procedure: Using a clean, absorbent material wipe any spills from the user interface touch screen surface. Do not apply solvents of any kind to the touch screen.

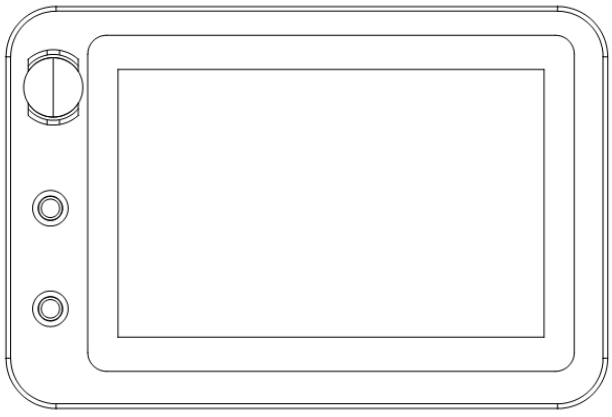


Figure 11 Apogee® Thermal Slide Debonder User Interface Assembly

Clean Platen

Recommendation: The upper and lower platen of the Apogee® Thermal Slide Debonder will need to be checked for cleanliness before every use and cleaned when necessary. Any foreign material on the chuck can cause wafer breakage.

Procedure: When cleaning the platen surface, it is good practice to use the mildest solvent possible such as acetone or isopropyl alcohol. ***Do not use caustic acids or bases.*** For major build-up of material, utilize a glass slide held at a 45° angle to gently scrape the material away then wipe clean with isopropyl alcohol or acetone. Please visit the Cee® YouTube Channel for a demonstration. If these methods are unsuccessful contact *Cee® Customer Support* for additional guidance.

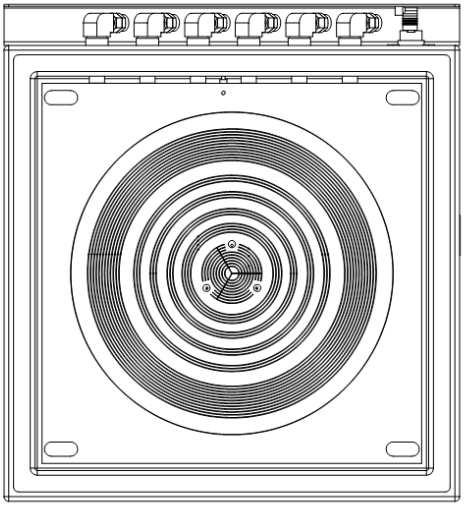


Figure 12 Apogee® Thermal Slide Debonder Platen Assembly

7.6 Vacuum Line Replacement

User Interface Assembly

Recommendation: Promptly clean up any spills on the touch-screen surface.

Procedure: Using a clean, absorbent material wipe any spills from the user interface touch screen surface. Do not apply solvents of any kind to the touch screen.