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Operations Manual DataStream™ v6.10.1

Software



1.	IN	NTRODUCTION	4
	1.1	Confidentiality Statement	
	1.2	WARRANTY	
2.	D	DATASTREAM™ SOFTWARE INTERFACE OVERVIEW	5
	2.1	User Profiles & Permissions	5
	2.2	Logging In	
	2.2	Navigation Bar	
3.		DATASTREAM™ PROCESS PAGE	
		Process View Window – Table View	
	3.1		
	3.2	PROCESS VIEW WINDOW – RECIPE PROGRESS VIEW	
	3.3	Process View Window – Graph View Process View Window – Summary View	
	3.4		
4.	D	DATASTREAM™ RECIPES PAGE	
	4.1	RECIPE MANAGEMENT	
	4.2	LOAD THE RECIPE LIST	
	4.3	Creating New Recipes	
	4.4	BASIC RECIPE EDITOR	
	4.5	Advanced Recipe Editor	
	4.6	RECIPE STEP EDITOR	
	4.7	Preconditions	
	4.8	RUNTIME TOLERANCE EDITOR	
	4.9	PROCESS ALERT USER INTERFACE	
	4.10		
	4.11	DOWNLOAD RECIPE DATA	
	4.12	2 UPLOAD RECIPE DATA	
5.	D	DATASTREAM™ ABOUT PAGE	
	5.1	Tool Info	
	5.2	DATASTREAM [™] System Applications	
	5.3	Tool Usage	
	5.4	Client Info	
	5.5	Software Update Utility	
	5.6	Format USB for Tool Compatibility	
6.	D	DATASTREAM™ TOOLS	
	6.1	Manual Control Activity	
	6.2	Log Browser Activity	
	6.3	Settings	
	6.4	DIAGNOSTICS	
7.	D	DATASTREAM™ REMOTE ACCESS	
	7.1	Connecting to DataStream [™]	
	7.2	Remote Recipe Editing	
	7.3	LOCAL PRESENCE	
	7.4	Remote Preparation	
	7.5	REMOTELY RUNNING A RECIPE	
	7.6	CAPTURE LOCAL DISPLAY	
	7.7	Review Screenshot	
	7.8	Review Diagnostic Data	

7.9	DataStream™ API	
8. A	APOGEE [®] SPIN COATER DEVELOPER	
8.1	System Parameters	
8.2	Manual Controls – Apogee® Spin Coater	
8.3	RUNNING RECIPES	51
8.4	EDITING RECIPES	53
8.5	Editing Dispense Selection	54
8.6	TOOL SPECIFIC SETTINGS - APOGEE® SPIN COATER	54
8.7		
,	ystem Parameters	
N	Nanual Controls – Cee® AccuScan™ Dispense	
	canning Arm	
E	diting Recipes	57
9. A	APOGEE® BAKE PLATE	59
9.1	Safety Temperature Warning	
9.2	Timer Controls	
9.3	System Parameters	
9.4	Manual Controls – Apogee® Bake Plate	
9.5	PREPARATION	64
9.6	RUNNING RECIPES	
9.7	Editing Recipes	67
9.8	TOOL SPECIFIC SETTINGS – APOGEE [®] BAKE PLATE	68
10.	APOGEE® BONDER	
10.1	1 System Parameters	
10.2		
10.3	3 PREPARATION	
10.4	4 RUNNING RECIPES	75
10.5	5 Editing Recipes	
10.6	5 TOOL SPECIFIC SETTINGS – APOGEE [®] BONDER	77
11.	APOGEE® MECHANICAL DEBONDER	
11.1	1 System Parameters	
11.1	1 Manual Controls – Apogee® Mechanical Debonder	
11.2	2 RUNNING RECIPES	81
11.3	3 Editing Recipes	
11.4	4 TOOL SPECIFIC SETTINGS – APOGEE [®] MECHANICAL DEBONDER	
12.	TABLE OF REVISIONS	

1. Introduction

1.1 Confidentiality Statement

The 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® 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.

2. <u>DataStream™ Software Interface Overview</u>

2.1 User Profiles & Permissions

Apogee® equipment comes standard with four default user profiles:

<u>Username</u>	Password	Permissions
admin	admin2	 advanced recipe editing export log files manual tool control remote recipe preparation tool administrator user administrator
eng	eng0	 advanced recipe editing manual tool control tool administrator
tech	tech1	basic recipe editingmanual tool control
ор	op6	view recipemanual tool control

D		
Perm	ussions	

Description of Access

Shared Account	Restricts the ability to update profile information when logging in under a shared profile.
Basic Recipe Editing	Ability to create and edit basic recipes.
Advanced Recipe Editing	Basic recipe editing access + the ability to create and edit advanced recipes.
Export Log Files	Ability to export process and system log files.
Manual Tool Control	Access to execute manual tool operations.
Remote Recipe Preparation	Ability to preset temperature without local control.
Tool Administrator	Full access to tool configuration settings.
User Administrator	Ability to add, update, and delete users – including shared accounts.

*Controls for which a user does <u>not</u> have permissions will <u>not</u> be visible to the user.

2.2 Logging In

Upon powering up the machine, users will arrive at the login screen.

Cee® Apogee® Spin Coater

Username	
Password	Login
Password	

For initial set-up and orientation, the user should log-in with the *admin* profile credentials.

Demonstrations of processes outlined in the DataStream[™] Manual assume that the user has full administrator privileges.

2.3 Navigation Bar

Located along the top of the screen, the navigation bar provides easy access to Apogee® features and functions.

Apogee	Bake	Process	Recipes	About	Tools -	admin
	1	2	3	4	5	6
 Pro Re Ab Too 	cess cipes out ols			display create, system logs, d	vs process para , import, or expo n information an	nd equipment specifications ings, and manual overrides

3. <u>DataStream™ Process Page</u>

Select the *Process* tab from the navigation bar to run recipes and view real-time equipment operation from within the *Process* page. The user must be logged in and have local control to run recipes. See section 7.3 on Local Presence for more information.

Apogee	Bake	Process	Recipes	About	Tools -					adr	nin
A. †	3. ⊠	C.≣	D.🕏	2	2 Test_Recipe : Table View						
		Paramete	er			Actual		Set Point		Status	
	te Temper	ature	3		59.9 °C			4	In Range		
	L	ift Pin Heiរ្	ght			19.0 mm		19.0 mm		In Range	
	E	Bake Meth	od			Contact		Contact		In Range	
	Ambi	ent Tempe	erature			26.7 °C				In Range	
		Humidity	/			44.2 %				In Range	
100%	6		osed)0:00			5 START			aining 0:00		9
	1. pro	ocess vie	w quick li	nks		.provides e	asy select	tion of avail	able proc	ess views	

- A. Table View
- B. Graph View
- C. Recipe Progress
- D. Process Summary
- 2. process view dropdown......tap for an alternative means of accessing process views
- 3. recipe name.....at-a-glance verification of current recipe
- 4. process viewthe process view screen currently displayed
- 5. omni-buttondependent on the state of the equipment (e.g., start/abort recipe)
- 6. process progressgraphical display of process progress
- 7. system parameter state......displays status (critical high/low, warning high/low, in-range)

3.1 Process View Window – Table View

Visualize real-time system parameters in table form. Each parameter has an *Actual* value depicting current state. Most parameters have a *Set Point*, defined during recipe creation or via manual command. Some parameters, such as temperature controllers, can be manually disabled. When disabled, a *Set Point* of -- will be displayed as illustrated for *Plate Temperature* in the figure above.

All parameters have an associated *Status*; this column mirrors process alerts in warning level and associated color. *Status* ranges are pre-defined for all basic recipes and can be edited within the *Advanced* recipes menu covered in section 4.5.

*Please note, individual parameters vary between equipment types. Refer to your Apogee® Operations Manual for equipment specific details.

Apogee Bake	Process	Recipes	About	Tools -				admin	
^	:=	٢			Test_Resipe	Table View			
_	Parameter	r			Actual	Set Point	Status		
Pla	te Tempera	ture			59.4 °C	60.0 °C	In Range		
L	ift Pin Heigl	ht			19.0 mm	19.0 mm	In Range		
	Bake Metho	d			Contact	Contact	In Range		
Amb	ient Temper	rature			26.5 °C		In Range		
	Humidity				44.8 %		In Range		

100%	Elapsed 00:07:04	START	Remaining 00:00:00	
------	---------------------	-------	-----------------------	--

3.2 **Process View Window – Recipe Progress View**

Recipe Progress view displays steps of the active recipe in advanced recipe format.

Apogee	Bake	Process	Recipes	About	Tools -			admin			
A	M	≔	٢		Test_Recipe : Recipe Pro	ogress					
1	⊙			C							
2	Ħ			S							
3	Ħ		1	S							
4	Ħ		Set lift pins to 0 mm								
5	Ħ		Bake using Contact method								
6	Ŀ		2	0							
7	4		3	O							
					Step 6 of 7		4				
59%		-	osed)0:39		ABORT	Remaining 00:00:24		O			
1.	comp	leted			rendered in green with	a checkmark					

- 2. in process.....rendered in yellow awaiting checkmark
- 3. upcoming.....rendered in white awaiting checkmark
- 4. recipe progress.....graphical display of process progression

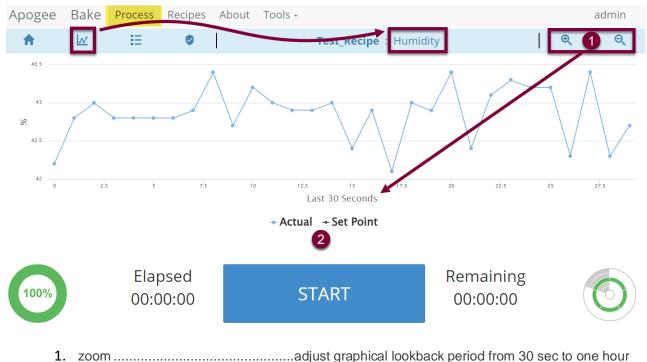
3.3 Process View Window – Graph View

For graphical representation of data for a given parameter, tap the parameter value in Table View.

Graph View will auto-scale based on the data presented and updates in real time to provide immediate feedback. View current and desired values simultaneously or independently using the **Actual** and **Set Point** controls. **Graph-View** features a default lookback period of 30 seconds; however, users can display up to one hour of graph data using **zoom** controls.

Apogee	Bake	Process	Recipes	About	Tools -					adm	nin
A	<u>~</u>	:=	0			Test_Recipe	Table V	iew			
	Parameter				Actual Set Point						
	Pla	te Temper	ature		59.9 °C 🦳						
	L	_ift Pin Hei	ght		19.0 mm 19.0 mm					In Range	
		Bake Meth	od		Contact Contact					In Range	
	Amb	ient Temp	erature		26.7 °C					In Range	
		Humidity	/		44.2 %					In Range	
100%		-	osed)0:00		S	TART		Remaini 00:00:0		C)

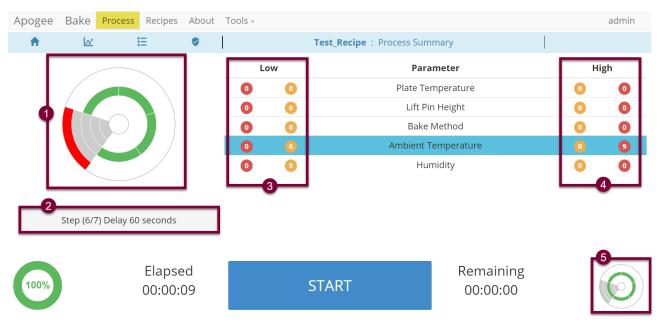
Alternatively, *Graph View* can be accessed by selecting the desired parameter in *Table View* and then tapping the *Graph View* quick link.



2. data selectiondisplay Actual values, Set Point values, or both

3.4 **Process View Window – Summary View**

Summarizes the most recent process, including active processes. The *Process View* window will also appear once an active process is completed.



- 1. Process alert UI depicts parameter status indicators achieved during a given process.
- 2. Process state message describing most recent action and/or process errors encountered.
- 3. Seconds spent in critically low and warning low status.
- 4. Seconds spent in critically high and warning high status.
- 5. Process alert UI depicts current parameter status indicators (may differ from item 1).

4. <u>DataStream[™] Recipes Page</u>

Easily view, edit, and create recipes locally via the DataStream[™] graphical user interface or use the DataStream[™] networking feature outlined in section 7 to upload and download recipes remotely.

4.1 Recipe Management

Access to *Recipe Management* is controlled at the user profile level. If a user does not have sufficient privileges for a specific activity, the button for that activity will not be displayed.

Apogee Bake	Process	Recipes	About	Tools -	admin
Recipe Controls					
Load					
New					
USB Upload					

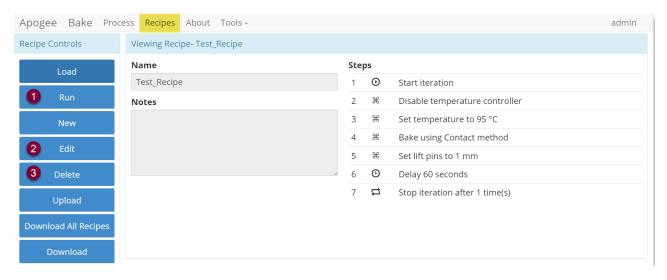
- 1. Load select an existing recipe to view, edit, or run
- 2. New initiates creation of a new recipe
- 3. USB Upload facilitates import of existing recipes

4.2 Load the Recipe List

Tap the *Load* button to access the recipe selection list which contains all available recipes by default. Use the *Search* field to refine the list then tap the name of the desired recipe to load it.

Apogee Ba	ake Process	Recipes	About Tools -	admin	
Recipe Control	S				
Canco	el	test			
Uploa		Test_Recip	e		

Once loaded, users can perform various actions on the recipe provided they have the necessary permissions and local control of the equipment. Note that recipes vary based on the type of equipment/recipe being loaded. For details on local control, review section 7.3 on Local Presence.



- 1. RunDirects user to the process page to begin the recipe.
- 2. Edit.....Allows for modification to existing recipes.
- 3. Delete.....Irreversible and requires action confirmation (see below).

4.3 Creating New Recipes

During manual recipe entry, the user with control of the machine will receive a system warning if a duplicate recipe name is entered. <u>This will not prevent overwrite</u>. Users should define and employ a unique nomenclature strategy to avoid potential for unintentional overwrite when duplicate names are entered.

Apogee Bake	Process	Recipes	About	Tools -		, ⁽⁴⁾ Warni	ng Re	ecipe blue already exists
Editor Controls	Editin	g Recipe-						
Save	Name	blue)	<u> </u>				Note	25
Cancel	Plate	Temperatu	re 180			°C		h
	Step	Time (seconds)		Process Metho	bd		Pin Height (mm)
Insert	1	60			Contact		~	

4.4 Basic Recipe Editor

All DataStream[™] equipped tools share the same core recipe-editing platform. Recipes are entered into the editor as a basic recipe, then converted to advanced recipes once executed.

tor Controls	Editing R	lecipe- Test_Recipe			
2 _{Save}	Name	Test_Recipe	0	Notes	
3 Cancel 🔋	Plate Ter	nperature 120		°C	
	Step	Time (seconds)	Process Method		Pin Height (mm)
4 Insert	1	60	Contact	~	
^	2	30	Contact	~	
~	3	30	Contact	~	
·	4	60	Proximity	~	
Delete					

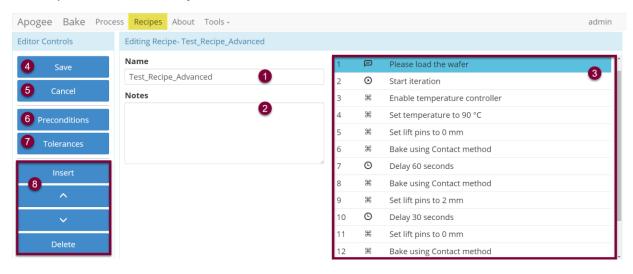
- 1. Recipe Editor UI.....parameters and controls vary between equipment types
- 2. Saveoverwrites existing recipe
- 3. Cancel.....discard changes to the recipe
- 4. Editor Controlsvary with recipe/equipment type/selections in Recipe Editor UI
 - Insert.....add a recipe step
 - Up/Downreorder recipe steps
 - Delete.....delete the selected recipe *irreversible
- 5. Advanced¹.....convert basic recipe to advanced recipe



6. Action ConfirmationPresents when data loss is possible and requires a secondary *confirmation* click within 3 seconds to proceed with the action.

4.5 Advanced Recipe Editor

Advanced Recipe Editor access is reserved for expert users and employed when more detailed control over a process is necessary.



- 1. Recipe Nameidentification of recipe via search and log files
- 2. Notesfield for additional process information, if desired
- 3. Stepsclick the desired row twice to open the Step Editor
- 4. Save².....overwrites existing recipe
- 5. Cancel.....discard changes to the recipe
- 6. Preconditionslaunches *Precondition Editor*
- 7. Tolerancesdisplays Runtime Tolerance Editor
 - Editor Controls.. Recipe Editor UI options vary between equipment
 - Insert.....add a recipe step
 - Up/Downreorder recipe steps
 - Delete......delete selected recipe *irreversible

¹ Access to the Advanced Recipe Editor is governed by user permissions. Recipe conversion cannot be reverted. Users without advanced editor access will be <u>unable</u> to interact with the recipe upon conversion. ² Users should define and employ a unique nomenclature strategy to avoid potential for accidental overwrite of recipes in the event that a duplicate name is entered.

4.6 Recipe Step Editor

Apoge	e Bake P	rocess <mark>Recipes</mark> About Tools -	admin
Editor (Controls	Editing Step - Please load the wafer	
1	Update	Control	Parameters 5
2		User Notifications 3	Title User Action Required
2	Cancel	Action	Body Please load the wafer
		Prompt User 4	· · · · · · · · · · · · · · · · · · ·
		Description	
		Please load the wafer 6	

- 1. Update save values of recipe step and return to Advanced Recipe Editor
- 2. Cancel..... discard changes to the recipe step and return to Advanced Recipe Editor
- 3. Control dropdown menu selection to define area of control
- 4. Actions..... specifies the action a control will perform
- 5. Parameters defines instruction for the control/action combination
- 6. Description compilation of step details for logs and display during recipe execution

Examples:

Control		Parameters
User Notifications	~	Title User Action Required
Action Prompt User	~	Body *enter prompts for the user here*
Description		
enter prompts for the user here		

<u>Control</u>: User Notification <u>Action</u>: Prompt User Parameters:

Title, Lleer Act

Title: User Action Required **Body:** *enter prompts for user here*

Description: *enter prompts for user here*

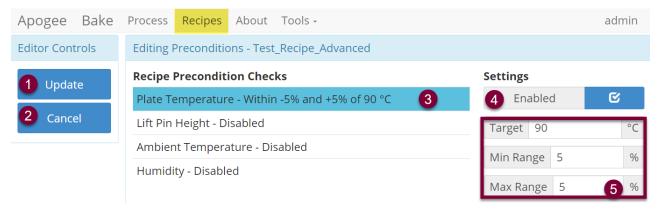
Control	Deveneteve
Control	Parameters
Plate Temperature ~	Value 90
Action	
Set 🗸	
Description	
Set temperature to 90 °C	
Control: Plate Temperature Action: Set	
Parameters:	
Valu	e: 90°C
Description: Set Temperature t	o 90°C

Control		Parameters							
Lift Pins	~	Step Size 2	mm						
Action Step	~	Direction Up	~						
Description									
Step lift pins Up 2 mm									
<u>Control</u> : Lift Pins <u>Action</u> : Step <u>Parameters</u>	<u>.</u> :								
	Step Size: 2mm								
	Direc	ction: Up							

Description: Step lift pins up 2mm

4.7 Preconditions

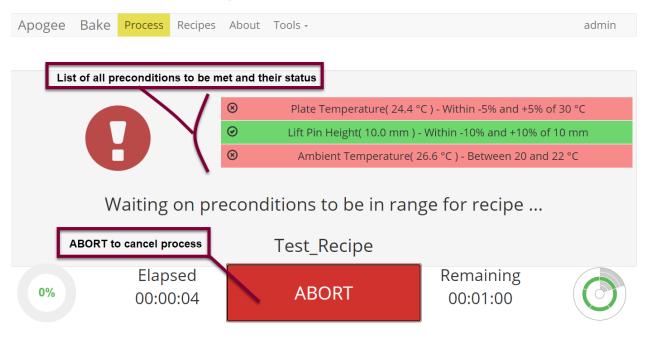
Preconditions are parameter/condition verifications that run prior to the start of a recipe. When preconditions are acceptable, the recipe will run normally. When preconditions are outside the specified range, the equipment will attempt to bring parameters inside the control range before beginning the process.



- 1. Update save <u>all</u> preconditions and return to the Advanced Recipe Editor
- 2. Cancel..... discard changes and return to the Advanced Recipe Editor
- 3. Precondition specified parameter and details of requirement
- 4. Enabled/Disabled³..... toggle switch dictates whether the condition is evaluated
- 5. Precondition Detail define acceptable range -fields vary by parameter

³ When disabled, the description will read *Disabled*.

Precondition Verification Example:



4.8 Runtime Tolerance Editor

Runtime Tolerances drive process alerts on the *Process* and *Manual Control* pages. These are parameter/condition verifications that run during recipe execution.

Apogee Bake	Process Recipes About Tools -	admin
Editor Controls	Editing Runtime Tolerances - Test_Recipe	
1 Update	Recipe Runtime Tolerances Abort on any Critical Tolerance 3	Settings 4 Enabled
2 Cancel	Plate Temperature - Between -5% and +5%	Critically High 10 %
	Lift Pin Height - Between -10% and +10%	Warning High 5 %
	Ambient Temperature - Between 20 and 22 °C	Warning Low 5 %
	Humidity - Between 35 and 45 %	Critically Low 10 5 %

- 1. Update save <u>all</u> recipe tolerances and return to the Advanced Recipe Editor
- 2. Cancel..... discard changes and return to the Advanced Recipe Editor
- 3. Tolerance..... the system parameter and details of requirements
- 4. Enabled/Disabled⁴...... toggle switch dictates whether the tolerance is evaluated
- 5. Tolerance Detail⁵...... define tolerance range fields vary between parameters

4.9 Process Alert User Interface

The **Process Alert Element** provides at-a-glance information regarding current system state(s) and leverages innate pattern recognition to facilitate quick identification of non-confirming data points. The

⁵ Run time parameters are considered relative to the current set point (when associated) other parameters are absolute values.

⁴ When disabled, the description will display *Disabled* and Process Alerts will show as *In Range*.

design employs both color and position variations ensuring that data is unambiguous to colorblind users.



Alert

Rendered if the system parameter is...

- 1. Critically Highabove the allowable upper limit
- 2. Warning Highabove target range but within allowable limits
- 3. In Rangewithin the target range
- 4. Warning Low.....below target range but within allowable limits
- 5. Critically Low.....below the allowable lower limit

A complete green circle is rendered when all parameters are within range.





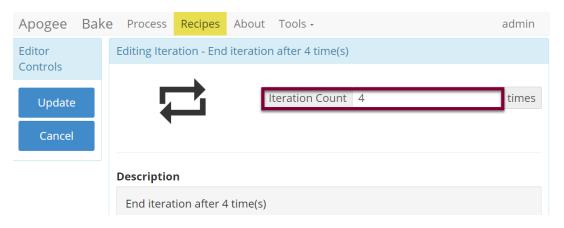
When a value from the parameter list is selected, the associated quadrant of the *Process Alert Element* is shaded in gray.

4.10 Iterations

Recipe iterations are controlled by selecting where the loop starts and how many times it should repeat. When more than one iteration is defined, the recipe will repeat all steps between the *Start Iteration* and *End Iteration* steps.

Editor Controls	Editing Recipe- Test_Recipe							
Save	Name			Steps				
	Test_Recipe		1	F	Load Wafer			
Cancel	Notes		2	Ħ	Enable temperature controller			
Preconditions			3	೫	Set temperature to 30 °C			
Preconditions			4	⊙	Start iteration			
Tolerances			5	€	Set lift pins to 4 mm			
		li	6	€	Bake using Contact method			
Insert			7	Ŀ	Delay 60 seconds			
^			8	₽	End iteration after 4 time(s)			
~			9	€	Set lift pins to 2 mm			
			10	ж	Set temperature to 130 °C			

The *Start Iteration* step can be moved or reordered within the recipe. The *End Iteration* step can be moved/reordered within the recipe and edited to define the number of desired iterations by double clicking the step.



The *Process Summary > Recipe Progress* page indicates how many iterations have been completed during a process.

Apogee	Bake Proce	ess Recipes Abou	t Tools -			admin		
A	LX.	∷≣ 🔮		Test_Recipe : Recipe Progress	[
6	ж			Bake using Contact method		c		
7	©			Delay 60 seconds	/	0		
8				End iteration after 4 time(s)		0		
9	æ			Set lift pins to 2 mm				
10	ж			Set temperature to 130 °C		Ο		
		Step 7 of 10			Iteration 1 of 4			
1%		Elapsed 00:00:08		ABORT	Remaining 00:04:55			

Only advanced recipes support iterations. Steps within an individual iteration cannot be added or deleted.

4.11 Download Recipe Data

DataStream[™] v6 enables operators with administrative privileges to download their Apogee® recipes for data preservation and for ease of transferring recipes to new Apogee® equipment. This can be accomplished in three ways: via USB, locally connected computer, or remote access.

<u>USB</u>

Useful for situations where the Apogee® equipment is not on the Local Area Network.

 To begin, access the root of an approved FAT32 formatted thumb drive, and create a folder titled DATASTREAM. Insert the thumb drive into the ⁶rear utility panel of your Apogee® Equipment.

*If the **USB Upload** button is not displayed, remove the USB drive and reinsert.

Do <u>NOT**</u> use the native internal Apogee® USB drive for recipe download – a secondary FAT32 formatted drive is required.**

2. Navigate to the **Recipes** page of your DataStream[™] screen and click **Load**.

Apogee Spin C	Coater	Process	Recipes	About	Tools -	а
Recipe Controls						
Load						
New						
USB Upload						

3. Select the recipe that you would like to download, then select **Save to USB**.

*Recipes are saved to the DATASTREAM folder in json format.							
Apogee Spin C	oater Process <mark>Recipes</mark> Abou	t Tools - a					
Recipe Controls	Recipe Selection						
Cancel	Search for a recipe	Q Search					
USB Upload	Hello						
Mask_Develop							
	TEST1						
	TEST2						

TEST3

⁶ For Cee® X-Pro II Workstation process modules, insert USB into the port located beneath the display/control panel on the face of the X-Pro II Workstation. For Cee® Flange Mount process modules, insert the USB into the port located on the backside of the user interface.

Apogee Spin C	loater	Process I	Recipes Ab	out Tools			а
Recipe Controls	Viewir	ng Recipe- Ti	EST1				
Load	Name	TEST1				Notes	
New		Enable (Chuck Vac		¢		ħ
Edit	Step	Velocity (rpm)	Ramp (rpm/s)	Time (seconds)	Exhaust (%)	Dispenses	
Delete	1	1000	20000	30	100	None	
USB Upload							
Save to USB							

4. Select Load to return to the recipe list and repeat these steps to save any additional recipes.

When saving to USB, you can only save one recipe at a time.

Local/Remote Computer

Establishing Connection

- 1. For <u>local connection</u>, connect your computer or laptop to the ethernet port on the ⁷rear utility panel of the Apogee® equipment, using an ethernet cable.
- 2. You'll need to establish a DHCP⁸ server (see below) on the computer to connect to your Apogee®. Once this is completed, skip to step 4.

Mac DHCP

- Open System Preferences
- Select Sharing Preference Pane
- > Enable Internet Sharing with the following settings:
 - To computers using Ethernet
 - Share your connection from Wi-Fi

Windows DHCP

Third-party DHCP server software will need to be installed in order to connect with the equipment.

3. For <u>remote connection</u>, review Section 7 DataStream[™] Remote Access.

If your Apogee® tool is already connected to your organization's network, proceed with the following instructions.

⁷ For Cee® X-Pro II Workstation process modules, connect to the ethernet port located at the rear of the X-Pro II Workstation. For Cee® Flange Mount process modules, connect to the ethernet port located on the backside of the user interface.

⁸ Please consult your Information Technology department for guidance on establishing a DHCP server.

Download Recipes

4. On the Apogee® Module, navigate to the About screen and make a note of the tool's IP address. The IP address will be unique for each Apogee® tool.

	e® Apogee® pin Coater		י ב
Tool Name	— Tool Info ——— Apogee Spin Coater	Cost Effective	Equipment
Serial Number Local Time	2241053 2024-03-26 20:17	© 2024 Cost Effective	e Equipment, LLC
System Time (UTC)	2024-03-26 20:17	———— Tool Us	age
External Address	10.0.1.74	Processes Run	0
MAC Address	00:19:b8:0d:5e:0d	Manual Operations	462
			0

5. Open your computer's browser and enter the IP address of the Apogee® into the URL bar.



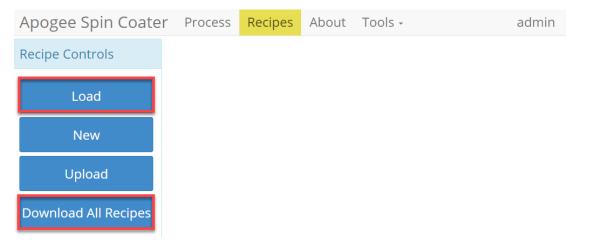
6. On your computer, enter administrator credentials and click Login.

Username	
admin	
Password	Login
© 2024 Cost Effective Equipment, LLC	

7. Navigate to the **Recipes** screen and select from the following options.

Load Access a list of recipes for selective download.

Download All..... Download a zip file of all recipes saved to this Apogee® device.



 For selective recipe downloads, select Load, click the recipe you wish to download, and then click Download. Note that you can still Download All Recipes from this screen if you wish to do so.

Apogee Spin Coater	Process	Recipes	About	Тос	o s ₊		admin		
Recipe Controls	Recipe	Recipe Selection							
Cancel	Searc	Search for a recipe Q Search							
Upload	Hello								
Download All Recipes		TEST1 TEST2							
	TEST3								
Apogee Spin Coater	Process	Recipes	About	T	ools -				
Recipe Controls	Viewi	ng Recipe	- TEST1						
Load	Name	e TEST1							
New			Enable	e Chi	uck Vac				
Edit	Step	Velo	city (rpm)	Ramp (rpm/s)	Tin	ne (seconds)		
	1	10	00		20000	30			
Delete									
Upload	/								
Download All Recipes									
Download									

Recipes will be found in your computer's **Downloads** directory by default.

4.12 Upload Recipe Data

DataStream[™] v6 enables operators with administrative privileges to upload their recipe data for ease of transfer to new Apogee® equipment. This can be accomplished in three ways: via USB, locally connected computer, or remote access.

Review section 4.11 Download Recipe Data before proceeding.

<u>USB</u>

- 1. Insert an approved FAT32 formatted thumb drive into the ⁹rear utility panel of your Apogee® module.
- 2. Navigate to the **Recipes** tab of the DataStream[™] screen and select **USB Upload**.

*If the **USB Upload** button is not displayed, remove the USB drive and reinsert.

Apogee Spin C	Coater	Process	Recipes	About	Tools -	а
Recipe Controls						
Load						
New						
USB Upload						

3. Select the recipe intended for upload and then select the **Upload** button.

Apogee Spin C	oater Process	Recipes	About	Tools -	а	
Recipe Controls	Recipe Upload From USB					
Cancel	TEST4.json					
Upload						

4. Repeat these steps to load additional recipes to your Apogee®. When finished, select **Cancel** to return to the previous screen.

Apogee Spin Co	oater Process	Recipes	About	Tools -	а	
Recipe Controls	Recipe Upload From USB					
Cancel Upload	TEST4.json					

5. Select Load to view the updated recipe list.

⁹ For Cee® X-Pro II Workstation process modules, insert USB into the port located beneath the display/control panel on the face of the X-Pro II Workstation. For Cee® Flange Mount process modules, insert the USB into the port located on the backside of the user interface.

Apogee Spin (Coater	Process	Recipes	About	Tools -	а
Recipe Controls						
Load						
New						
USB Upload						

Apogee Spin Co	oater Process	Recipes	About	Tools -	а			
Recipe Controls	Recipe Selection	Recipe Selection						
Cancel	Search for a re	cipe			Q Search			
USB Upload	Hello							
	Mask_Develop	Mask_Develop						
	TEST1	TEST1						
	TEST2							
	TEST3							
	TEST4							

Establishing Connection

- 1. For <u>local connection</u>, connect your computer or laptop to the ethernet port on the ¹⁰rear utility panel of the Apogee® equipment, using an ethernet cable.
- 2. Establish a DHCP server ¹¹ on the computer to connect to the tool then skip to step 4.

Mac DHCP

- Open System Preferences
- > Select Sharing Preference Pane
- > Enable Internet Sharing with the following settings:
 - To computers using **Ethernet**
 - Share your connection from Wi-Fi

Windows DHCP

Third-party DHCP server software will need to be installed in order to connect with the equipment.

3. For <u>remote connection</u>, review Section 7 DataStream[™] Remote Access.

If your Apogee® tool is already connected to your organization's network, proceed with the following instructions.

Download Recipes

4. On the <u>Apogee® Equipment</u>, navigate to the **About** screen and make a note of the tool's IP address. The IP address will be unique for each Apogee® tool.

	e® Apogee® pin Coater		\ ح	
Tool Name	— Tool Info ——— Apogee Spin Coater	Cost Effective	Equipment	
Serial Number Local Time	2241053 2024-03-26 20:17	© 2024 Cost Effective Equipment,		
System Time (UTC) External Address	2024-03-26 20:17 10.0.1.74		age0	
MAC Address	00:19:b8:0d:5e:0d	Manual Operations	462	

5. Open your computer's browser and enter the Apogee® IP address into the URL bar.

🗸 🧿 New Tab			× +	
\leftrightarrow \rightarrow	C	Ŵ	10.0.1.74	

6. On your computer, enter admin credentials and click Login.

¹⁰ For Cee® X-Pro II Workstation process modules, connect to the ethernet port located at the rear of the X-Pro II Workstation. For Cee® Flange Mount process modules, connect to the ethernet port located on the backside of the user interface.

¹¹ Please consult your Information Technology department for guidance on establishing a DHCP server.

Username	
admin	
Password	Login
© 2024 Cost Effective Equipment, LLC	

7. Navigate to the **Recipes** screen and select **Upload**.

Apogee Spin Coater	Process	Recipes	About	Tools -	admin
Recipe Controls					
Load					
New					
Upload					
Download All Recipes					

8. Navigate to the directory on your computer where recipes files are stored, select the first recipe for upload, and click **Open**.

*Only one recipe can be uploaded to DataStream[™] at a time.

**Zip files must be extracted before uploading to DataStream™.

\leftrightarrow \rightarrow \checkmark \uparrow	> boot (J:) > DATASTREAM	~ C	Search DATASTRE	م , MA
Organize 🔻 New folde	r		≣	
	Name	^ Date modified	Туре	Size
🛄 Desktop	🖌 🗍 🧊 TEST5.json	4/4/2024 12:40 PM	JSON File	1 KB
🚽 Downloads	TEST6.json	4/4/2024 11:04 AM	JSON File	1 KB
Documents	*			
File <u>n</u> a	me: TEST5.json		✓ All Files (*.*) <u>Open</u>	Cancel
Note the alert in t	the upper right corner	Recipe upload comp	olete	

9. Repeat these steps until all desired recipes have been uploaded to the Apogee®.

5. <u>DataStream™ About Page</u>

	Cee® Apoge Spin Coate			P			
Tool Name Serial Number	——— Tool Info — Apogee Sp 123456	in Coater	Cost Effective Equipment				
Local Time System Time (U External Addres			© 2024 Cost Effective Equipment, LLC Tool Usage Processes Run 113				
MAC Address	00:19:b8:00 aStream™ System Ap		Manual Operations User Aborts	Manual Operations 3555			
Firmware Web UI Diego	v6.10.1 v6.10.1 v6.8.0	24b1f0f 06cf06aa b6b6084	System Aborts Uptime Last Downtime	56 0.8 0	hrs hrs		
Manny Postal	v6.0.0 v6.0.0 Software Update	51e2e34 2ebb797	Clien Browser Name Browser Version Browser Size	t Info Chrome 130 1920 x 911			

5.1 Tool Info

Tool Name-----equipment identifier displayed in upper left corner, *configured in settings Serial Number------unique serial number assigned by Cee® during production Local Time------current time as defined by local time zone offset System Time-----current coordinated universal time based on the equipment's system clock External Address ----DHCP IP address assigned when connected to a network MAC Address-----hardware MAC Address for the external Ethernet port

5.2 DataStream[™] System Applications

A list of system applications is displayed alongside their respective version number(s). DataStream[™] v6 features an updated versioning nomenclature for simplified tracking of software compatibility.

Firmware-----facilitates real-time process controls and recipe execution

Web UI -----manages all user interactions

Diego ------displays the equipment's graphical user interface

Manny-----controls user management activities

Postal -----used to route emails to a configured SMTP server

5.3 Tool Usage

Processes Run -----total number of processes completed

Manual Operations --total number of manual operations run by users

User Aborts ------total number of processes/commands aborted by users

System Aborts ------total number of processes/commands aborted by the control system

Uptime -----runtime since the last reboot

Last Downtime-----duration of time the equipment was powered off prior to boot up

5.4 Client Info

Contains browser specific information useful for troubleshooting purposes.

5.5 Software Update Utility

The Software Update Utility is accessible to equipment administrators by clicking the *Software Update* button located at the bottom of the *About* page.

Patch files are supplied to Apogee® equipment via upload from a remote computer (requires network connection) or files can be transferred to the root of a *FAT32 formatted* USB flash drive and manually loaded through the USB port on the equipment's rear utility panel.

Visit us online or contact customer support for details and to download the latest version of DataStream[™].

Software Update Utility Insert USB or Upload Patch Files 1 Choose File Upload complete. 3 Apply Home 5 Please select a patch to apply

4

- 1. When updating from a remote computer, select *Choose File* to browse for patch files and select **Open**. (*If updating via local USB, skip this step.)
- 2. Patch files identified by the equipment will be displayed under Available Patch Files.
- 3. Tap to highlight the desired patch file and click *Apply*.
- 4. Installation status and a detailed output of the process is compiled at the bottom of the page.
- 5. Tap the *Home* button to exit the Software Update Utility and return to the main application.

*Once updates are applied, the equipment must be restarted for changes to take effect.

5.6 Format USB for Tool Compatibility

Please follow all organizational policies and procedures related to the use and preparation of portable drives for Apogee® equipment.

Apogee® equipment requires an 8GB (max) FAT32 Formatted USB Drive. Please consult with your Information Technology Department for assistance or contact Cee® Customer Support.

Once formatted, add a folder to the USB drive named *DATASTREAM* to complete the process. Your USB is now compatible for use with Apogee® equipment.

6. <u>DataStream™ Tools</u>

6.1 Manual Control Activity

Tools > Manual Control

The Manual Control page 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. If the user has sufficient privileges, the *Manual Control* selection is available under the *Tools* menu. See sections 8-11 for details on equipment specific controls.

If using the remote feature, the user must have confirmed their local presence to execute manual commands. See section 7.3 for more detail on Local Presence.

6.2 Log Browser Activity

Tools > Log Browser

The *Log Browser* activity is an advanced feature that allows users to download process logs formatted as .xlsx or. json. Logs can be loaded to a USB inserted into the rear utility panel of the Apogee® equipment or accessed via remote connection (see section 7 on DataStream[™] Remote Access for more detail.)

Search

Apoge	ee Ba	ke Pr	ocess	Recip	bes	About	Tools - admin
Log E	xporti	ng					1 2022-08-11 14:37
	e Run						Results
08/1	1/2022		gust 20	22		•	2022-08-11T11:23:55
Su 21	Mo	Tu	We	Th	Fr	Sa 6	2022-08-11T11:25:15
31 7	1 8	2 9	3 10	4 11 】	5 12	13	2022-08-11T11:27:22
14 21	15 22	16 23	17 24	18 25	19 26	20 27	4 2022-08-11T11:28:20
28 4	29 5	30 6	31 7	1 8	2 9	3 10	Screenshot 2022-08-11T11:32:49
<u> </u>	5	0	/	0	5	10	Data 2022-08-11T11:32:57
		(-	Search		_	3	2022-08-11T11:43:29
	D	elete A	ll Befo	re Date	9		Screenshot 2022-08-11T12:43:00
		Sav	ve to U	SB			Apogee Spin_20220811

- 1. Equipment local date & time serve as the reference point for all searches.
- 2. Manually key in the desired date or select one from the calendar widget.
- 3. Tap search to query the equipment for all records on the specified date.
- 4. Search results appear in a list format to the right of the screen.

Download

Users with sufficient permissions can export log files from the physical equipment to an appropriately formatted USB drive. Review section 5.6 for details on how to Format USB for Tool Compatibility.

Apogee	e Bal	ke Pr	ocess	Recip	pes	About	Tools -	admin	
Log Ex	porti	ng						2022-08-11 14:37	
Recipe Run Date 08/11/2022							Results		
<	2022	Aus	gust 20	22		>	2022-08-11T11:23:55		
Su 31	Mo 1	Tu 2	We	Th	Fr	Sa 6	2022-08-11T11:25:15	3	
7	8	2 9	10	11	12	13	2022-08-11T11:27:22		
14 21	15 22	16 23	17 24	18 25	19 26	20 27	2022-08-11T11:28:20		
28 4	29 5	30 6	31 7	1 8	2	3 10	Screenshot 2022-08-11T11:32:	49	
4	J	0	/			10	Data 2022-08-11T11:32:57		
		9	Search	-	2		2022-08-11T11:43:29		
	De	elete A	II Befo	re Dat	e		Screenshot 2022-08-11T12:43:00		
	-	Sav	ve to US	SB 🛛	1		Apogee Spin_20220811		
XLSX									
RAW									

- 1. Select a date from the calendar widget.
- 2. Click Search to query for logs on the desired date.
- 3. Select the data log(s) from the list of results.
- 4. Select Save to USB and select the desired file format.
- 5. Remove USB & manually load files onto an approved local computer for review.

6.3 Settings

User Profile Settings

Users with individual (non-shared) access can edit their personal profiles.

Apogee	Bake	Process	Recipes	About	Tools -	Jane
1			User Profil	e : admir	٦	
	°,		New Pass	word		
	\times				2	
			Email			
	201		user@ma	ilserver.t	tld 3	
	()		User Note	s		
			Administ	rators m	iay enter <mark>r</mark>	otes from the User Management activity.
						4
						Update 5

- 1. Profile Settingsnavigate to Tools > Settings then select the profile icon
- 2. New Password¹².....enter password and satisfy validation prompt
- 3. Email.....used throughout the system to send user defined notifications
- 4. User Notesdefined by user administrators (covered in the next section)
- 5. Updatesaves *all* profile settings defined within the activity

*Changes are effective upon the user's next login.

Tool Settings

Apogee Spin	Process	Recipes	About	Tools -				admin		
	•	Tool Set	tings							
.		Tool Na								
\times			e Spin							
101		0	_	3						
S		SSL Encryption (https) Disabled								
		Ambier	it Tempe	erature C	Offset (°C)					
			5 e Humid	ity Offse	et (%)					
		0 6								
		Buzzer	Setting	-7				*		
		Contin	iuous Bee							
		One B No Be					8			
						Update				

- 1. Tools Settings.....navigate to *Tools > Settings* then select the gears icon
- 2. Tool Name¹³.....identifier displayed in the upper left corner of the screen
- 3. Local Time Zone Offsetused to set the local time on the equipment according to UTC¹⁴
- 4. SSL Encryption¹⁵ (https)controls network access to the equipment.
- 5. Ambient Temp Offset.....ambient temperature calibration of ±50°C
- 6. Relative Humidity Offsetrelative humidity calibration of ±50%
- 7. Buzzer Setting.....disable/enable end of process alarm (single vs continuous beep)
- 8. Updatesaves all equipment settings defined within the activity

*Once updates are applied, the equipment must be restarted for changes to take effect.

¹² Leave the password field blank while updating other settings to ensure the password is <u>not</u> changed

¹³ If a name is not provided the tool will default to Apogee

¹⁴ Find your <u>UTC (Universal Coordinated Time)</u> offset

¹⁵ When enabled, the equipment can be accessed from both https and http.

Mail Settings

Apogee	Bake	Process	Recipes	About	Tools -			admin
		Postal SN	ITP Setting	S				
ي 1 کم		Host mailhost Port 465	3					
0		Usernam usernam Password	ne@mailhc	ost.tld	4			
						Upda	te 6	

- 1. Mail Settings.....navigate to Tools > Settings then select the mail icon
- 2. Hostthe SMTP server that mail is sent from
- 3. Portserver defined defaults for SMTP are 587 and 465 for SSL
- 4. Username.....defined by the mail server's administrator
- 5. Passwordsent to the server during mail submission
- 6. Updatesaves all mail settings defined within the activity

*Once updates are applied, the equipment must be restarted for changes to take effect.

*Cost Effective Equipment, LLC does not provide an SMTP server or access to a server for individual equipment.

User Management

The User Management activity is a limited access permission that allows for administrative control over all individual and shared user accounts on the equipment.

Apogee Bake Proces	ss Recipes About <mark>Tools -</mark>		admin
L	User Management		
<mark>،</mark>	Active Users	3 User Profile	
	Jane	Password	
	a admin	Email user@mailserver.tld *Enter notes relevant to the user or profile.	
0	2 eng f	Permissions	
	op .	Shared Account 🕑 4	0
	New 5	Basic Recipe Editing 🕢	0
	Save 6	Advanced Recipe Editing 😡	C
	Delete 7	Export Log Files 😧	C C
		Manual Tool Control 😧	R R
		Remote Recipe Preparation 🚱 Tool Administrator 🚱	0
		User Administrator 🚱	© O

- 1. User Settings.....navigate to Tools > Settings then select the users icon
- 2. Active Usersall system users select the user profile you wish to edit
- 3. User Profileadmin access to edit user information
- 4. User Permissionsdefine the activities a user will be able to access and perform
- 5. New.....create a new user
- 6. Save.....saves all user settings defined within the activity
- 7. Delete.....remove users who no longer require access to the equipment

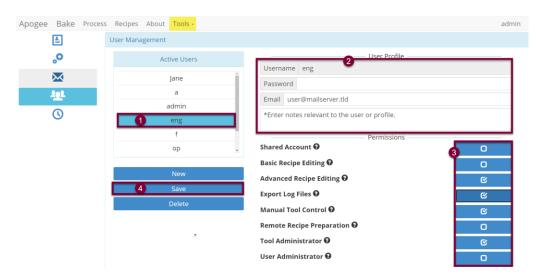
*Changes are effective upon the user's next login.

Add New User

Apogee	Bake Proc	ess Recipes About <mark>Tools -</mark>		adm		
		User Management				
	°	Active Users	User Profile			
	\sim	Jane	Username new_user_name 2 Password ·······			
	202	a	Confirm Password 3			
	()	admin	Please ensure the passwords match			
	0	eng	Email 4			
		f op	User notes 5			
		οp	Permissions	Permissions		
		New 1	Shared Account 😧	- 6		
		New 1 Save 7	Shared Account Θ Basic Recipe Editing Θ	• 6 •		
				-		
		Save 7	Basic Recipe Editing 🛛 Advanced Recipe Editing 🚭 Export Log Files 🚱	0		
		Save 7	Basic Recipe Editing Advanced Recipe Editing Export Log Files 🕢 Manual Tool Control	0		
		Save 7	Basic Recipe Editing Advanced Recipe Editing Export Log Files Manual Tool Control Remote Recipe Preparation			
		Save 7	Basic Recipe Editing Advanced Recipe Editing Export Log Files 🕢 Manual Tool Control			

- 1. In the User Management activity, tap New.
- 2. Enter a unique username (must be at least one character and contain no spaces).
- 3. Create the user's password & follow prompt to re-enter for verification purposes.
- 4. Enter the user's email address (if-applicable).
- 5. Enter relevant user notes (visible to the user within the user profile activity.)
- 6. Assign permissions by checking the box for each access need.
- 7. Click Save to move the user profile into production, facilitating access to the equipment.

Edit User Permissions



- 1. Select a user from the Active Users list.
- 2. Edit User Profile Data as needed.
 - Usernames cannot be modified.
 - Leave password field blank to prevent modification to current password.
- 3. Enable or disable permissions as needed.
- 4. Click **Save** to move changes into production.

*Changes are effective upon the user's next login.

Delete a User

When deleting users, it's important to note that this change is irreversible. Users are unable to delete their own account. Before deleting an administrator's account, the administrator permissions must be removed.

Apogee	Bake	Process	Recipes	About	Tools -					admin		
	1		User Mana	gement								
	°			Ac	tive Users		User Profile					
\mathbf{X}				_	lane	-	Username Jane					
							Password					
	<u> 202</u>				a		Email					
	(admin		Administrat	ors may enter notes from the User Manageme	ent activity			
	0				eng		, anni se ac	oro may enter notes norm the oser manageme	ine accivity.			
		f					Permissions					
					ор		Shared Account 😡					
							Basic Recipe Editing 😧 🎯					
					New		Advanced Recipe Editing 🕄 🛛					
					Save		Export Log Files 🚱					
				[Delete 😲				_			
			Confir	m perma	anent deletio	n of user	Manual Too	I Control 🥹	C			
					Jane		Remote Rec	ipe Preparation 😧	O			
							Tool Admini	strator 🛛	C			
							User Admini	istrator 🕄	0			

- 1. Select a user from the Active Users list.
- 2. Click Delete.
 - Action Confirmation is required.

Change System Time

UTC timestamp is automatically established when the Apogee® tool is connected to a network. When network connection is not possible, the **Change System Time** activity provides a simple and straightforward method for accomplishing this task.

Apogee	Bake	Process	Recipes	About	Tools -	а	dmin
	L		Change System Time				
	°		Enter new UTC time in format: YYYY-MM-DD HH:MM:SS				
	$\mathbf{\times}$					2	
			Change Time 3				
1.	Time S	ettings			na	vigate to Tools > Settings then select the time icon	

- 2. UTC Field.....enter the local time in the format defined
- 3. Change Time......updates system time and moves entry into production

6.4 Diagnostics

Apogee® equipment features a read-only diagnostic interface to aid equipment administrators in troubleshooting potential equipment malfunctions. To access diagnostics, navigate to **Tools > Diagnostics.**

The data output within the Diagnostic Interface varies by equipment and it is normal for some fields to indicate *null* or *undefined*. Please contact *Cee*® *Customer Support* with questions or for specific guidance in interpreting this data.

7. DataStream[™] Remote Access

A key feature of the DataStream[™] system is the ability to remotely view and control the equipment. Remotely connected users can view real-time parameters, create & edit recipes, view equipment information, and download log files. Every function available from the local user console is available via remote network connection. Additionally, there are some functions only available by remote connection.

7.1 Connecting to DataStream[™]

In this section, *host* refers to the Apogee® Equipment and *client* refers to the remote workstation.

Setting up a DataStream[™] network connection is a relatively straightforward process, however those inexperienced with configuring network assets or lacking necessary privileges, should contact their local system administrator for assistance.

To utilize the DataStream[™] network feature, the host must be connected to an active network via the Ethernet port on the rear of the equipment. The host and client must be on the same subnet. If the network has a firewall, a port must be opened to allow the host and client to communicate.

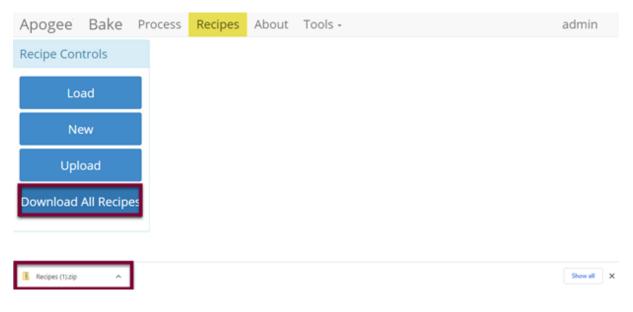
Equipment is configured as DHCP by default meaning the network will assign the host an IP address once connected. The IP address can be found under the **About** tab on the DataStream[™] GUI. Once connected to the network, the DataStream[™] network can be accessed by opening a browser window and entering the host IP address. The user will be required to enter their login credentials to access host functions.

7.2 Remote Recipe Editing

Remote users retain their local recipe editing capabilities. In addition, they are able to download recipes from the host equipment to their local client and upload recipes from their local client to the host machine. This provides an effective method of ensuring recipes are available and consistent across all equipment's.

Download Recipes

From the Recipes tab select *Download All Recipes* to extract a zip file of all recipes on the equipment or select **Load** to select individual recipes for download.



Upload Recipes

ecipe Controls	Open ← → × ↑ → This PC → Deskto	op > recipes > thermal	ٽ ~		×
	Organize 🔻 New Yolder			8==	- 🔳 🔞
Load	💻 This PC	^ Name	Date modified	Туре	Size
		a ua.json	8/1/2022 4:04 PM	JSON File	1 KB
	Desktop	/ bue.json	8/1/2022 4:04 PM	JSON File	1 KB
New	Desktop	i stren.json	8/1/2022 4:04 PM	JSON File	1 KB
		orange.json	8/1/2022 4:04 PM	JSON File	1 KB
		purple_new.json	8/1/2022 4:04 PM	JSON File	1 KB
Upload 🖌		red.json	8/1/2022 4:04 PM	JSON File	1 KB
		Test_Red_Recipe.json	8/1/2022 4:04 PM	JSON File	1 KB
		Test_Recipe.json	8/1/2022 4:04 PM	JSON File	3 KB
ownload All Recipes		(Test_Recipe_Advanced.json	8/1/2022 4:04 PM	JSON File	1 KB
ownoad All Recipes		test_test_json	8/1/2022 4:04 PM	JSON File	1 KB
		🦾 yellow.json	8/1/2022 4:04 PM	JSON File	1 KB
	File name: purple_n	ew json	~	All Files (*,*)	Cancel >

- 1. Navigate to the Recipes Tab.
- 2. Select upload and navigate to the desired folder or files.
- 3. Select the recipes to upload and click Open.

Upon successful import, the *Basic Recipe Editor* activity for the imported recipe will open and a *Recipe upload complete!* message is displayed.

Apogee Bake	Process Re	<mark>cipes</mark> About Tools -			Recipe upload complete
Recipe Controls	Viewing	Recipe- purple_new			
Load	Name	purple_new		Notes	
Prepare	Plate Te	mperature 180		°C	li li
New	Step	Time (seconds)	Process Method		Pin Height (mm)
New	1	60	Contact	*	
Edit					
Delete					
Upload					
Download All Recipes					
Download					

If the imported recipe already exists on the equipment, the import will fail, and the following message will display:



7.3 Local Presence

For safety reasons, users must verify their presence locally before running recipes or executing manual commands. Only one user can have control of the equipment at a given time.

When using the equipment without a verified local presence, the omni-button will be locked. All actions that impact equipment conditions are disabled. Blocked actions include running recipes, aborting recipes, and executing manual commands.

Local Presence Unverified – the orange *locked* omni-button indicates that the user does not have control of the machine



<u>Verifying Local Presence</u> – Click the omni-button to initiate the request for control of the equipment. The red *unlocked* omni indicates that a request is in process and triggers the blue local presence button on the Apogee® machine to flash. Press the flashing Local Presence button to finalize the control request.

When multiple users are seeking simultaneous local control of a single device, the user who most recently requested control will receive access when the local presence button is pressed.



7.4 Remote Preparation

Users with sufficient privileges can remotely prepare equipment to run a recipe. This feature is useful for preconditions and parameters that take a significant amount of time such as hot plate 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*.

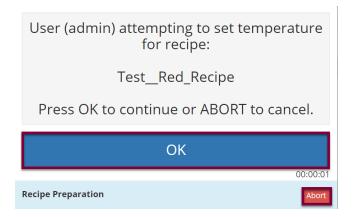
Apogee Bake P	rocess <mark>Recipes</mark> About Tools -		admin
Recipe Controls	Viewing Recipe- Test_Red_Recipe		
Load	Name Test_Red_Recipe		Notes
Prepare	Plate Temperature 180	°C	
Run	Step Time (seconds) 1 60	Process Method Contact	Pin Height (mm)
New			

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

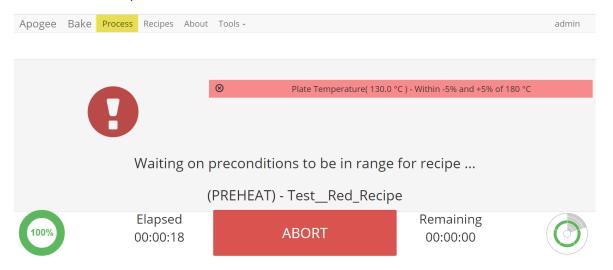
Doc Rev 3.7-20241101

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 active 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.



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



<u>**Preparation Complete**</u> – 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.

TestRed_Re	ecipe
Ready to ru	ın!
ОК	
	00:00:02
Recipe Preparation	

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

7.5 Remotely Running a Recipe

For safety reasons, users must verify their presence locally before running recipes or executing manual commands. Only one user can have control of the equipment at a given time. Please review section 7.3 on Local Presence to familiarize with the local presence feature.

Following completion of recipe preparation, the user will be directed to the *Process* page to initiate the recipe by clicking *Start*.

Apogee	Bake	Process	Recipes	About	Tools -	admin				
A	<u>Iv</u>	≣	0		Test_Red_Recipe : Recipe Progress					
1	\odot		Start iteration							
2	æ		Enable temperature controller							
3	Ħ	Set temperature to 180 °C								
4	Ħ		<u>ج</u>							
5	æ		S ا							
6	G		<u>ج</u>							
7	₽		S ا							
					Step 1 of 7					
100%		Elapsed Remaining 00:01:16 START 00:00:00								

When recipe preparation is unnecessary, the user will navigate to the Recipes tab, click *Load* to access the recipe list, select the desired recipe, and click *Run*. From here, they are directed to the *Process* page pictured above to initiate the recipe by clicking *Start*.

*When a recipe is initiated Prepare and Run commands are disabled to prevent interruption to the process.

7.6 Capture Local Display

With remote connection to the Apogee® equipment, click the user's name in the upper right corner and select *Capture Local Display* to view a capture of the physical machine's display.

This will not capture your view, but the view of a user who is physically present at the machine and can be useful for troubleshooting issues and/or providing guidance to users when your presence in the cleanroom isn't possible.

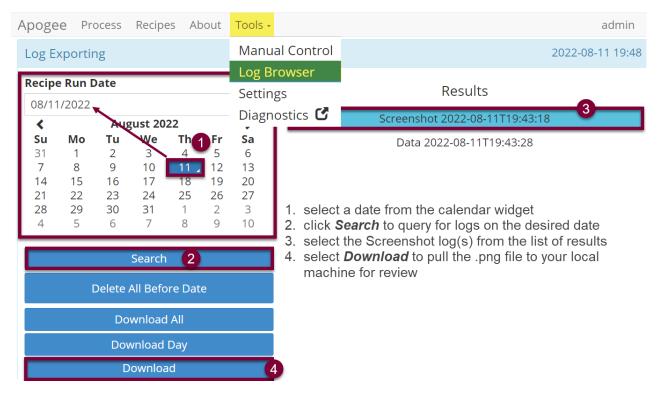


7.7 Review Screenshot

From the physical Apogee® Equipment, a local user can capture a view of their current display by tapping the user's name in the upper right corner and selecting **Take Screenshot**. This screenshot is then compiled into the log list in the **Log Browser** activity for export to USB or download of a .png file for review via remote connection.

For remote review of screen capture:

Tools > Log Browser

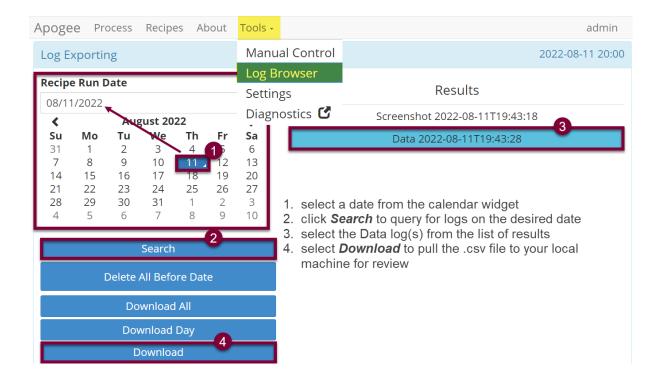


7.8 Review Diagnostic Data

From the physical Apogee® Equipment, a local user can capture a real-time snapshot of diagnostic data by tapping the user's name in the upper right corner and selecting *Export Diag Page*. This capture is then compiled into the log list in the *Log Browser* activity for export to USB or download of a .csv file for review via remote connection.

For remote review of diagnostic capture:

Tools > Log Browser



7.9 DataStream[™] API

Introducing the DataStream[™] API, the comprehensive solution for seamless integration, automation, and remote management in your operations. Our flexible and customizable API allows you to tailor your integration to suit your specific requirements.

Improve productivity, increase efficiency, and streamline operations with actions like barcode scanning, robotic handler integration, and remote user profile interaction. The possibilities are limited only by your imagination.

All Cee® Apogee® tools come equipped with DataStream[™] Technology, which offers HTTP endpoints for remote management of the tool.

Visit the Cee® GitHub here: <u>http://github.com/CostEffectiveEquipment/DataStream-API/wiki</u> for a repository providing detailed documentation of DataStream[™] Software endpoints and examples to help you get started. For questions, contact our <u>API support team</u>.

To ensure access to the full set of commands, we recommend updating to the latest version of DataStream[™].

8. Apogee® Spin Coater | Developer

System Parameters 8.1

Parameter	Actual	Set Point
Spin Speed	0 rpm	0 rpm
Spin Acceleration	500 rpm/s	500 rpm/s
Percent Exhaust	100 %	100 %
Exhaust Airflow	-1.2 CFM	-1.0 CFM
Active Dispenses	None	None
Dispense Source Empty	None	
Chuck Vac	99.1 kPa	101.3 kPa
Waste Bottle Full	False	
Ambient Temperature	25.9 °C	
Humidity	44.1 %	
Vibration	4	

Spin Speed	measured rotational speed of the spin chuck in revolutions per minute (rpm)
Spin Acceleration ¹⁶	dictates how fast the spin chuck will accelerate in revolutions per minute per second (rpm/s)
Percent Exhaust	displays the valve opening percentage of the optionally equipped programmable exhaust module
Exhaust Airflow ¹⁷	displays current exhaust pressures and, if set, controls exhaust pressures
Active Dispenses	indicates which dispenses are enabled
Dispense Source Empty	indicates when dispense sources are low or empty
Chuck Vac	measurement of the vacuum pressure holding the substrate against the spin chuck in kPa
Waste Bottle Full	indicates whether the sensors detect a full waste bottle
Ambient Temperature	the air temperature of the environment where the equipment is housed
Humidity ¹⁸	the ambient relative humidity in the environment where the equipment is housed

¹⁶ Spin Acceleration settings are dependent on the presence of a Spin Speed set point.
¹⁷ Displays a set point of -1 when automated control is disabled.
¹⁸ 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.

8.2 Manual Controls – Apogee® Spin Coater

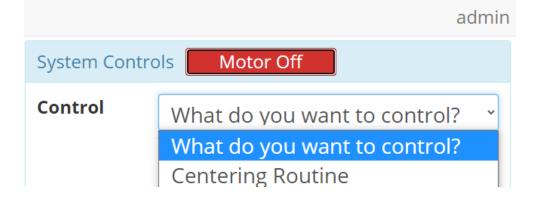
The Manual Control activity is an advanced feature that allows users to run most operating processes outside of a recipe. This mode is useful for tasks such as prototyping processes, verifying equipment operation, and recovering from aborted processes. To access the activity, navigate to **Tools > Manual 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. See section 7.3 for more detail on Local Presence.

Apogee Process Recipe	es About T	ools -	admin
System Values			System Controls Motor Off
Parameter	Actual	Set Point	Control What do you want to control? *
Spin Speed	0 rpm	0 rpm	What do you want to control?
Spin Acceleration	500 rpm/s	500 rpm/s	Centering Routine Spin Speed
Active Dispenses	None	None	Please check Dispense
Dispense Source Empty	None		change. Chuck Vac
Chuck Vac	98.8 kPa	99.0 kPa	
Waste Bottle Full	False		APPLY
Ambient Temperature	29.1 °C		
Humidity	37.8 %		
Vibration	3		

Motor Off Functionality

DataStream[™] v6 introduced the Motor Off functionality for one-click, instant motor shutdown within the Manual Controls menu. Please note that this will <u>not</u> act as a brake for the spin chuck but when pressed, will disengage the motor allowing the spin chuck to coast down. Motor-off functionality is especially useful for applications involving large substrates with significant momentum.



Centering Routine

Apogee	Process	Recipes	About	Tools -		admin
System Value	S				System Controls Motor Off	
Par	ameter	A	ctual	Set Point	Control Centering Ro	vutine ·
Spin Speed		0	rpm	0 rpm	A stilling	
Spin Accelera	ation	500	rpm/s	500 rpm/s	Action Center Wafe	r v
Active Disper	nses	Ν	lone	None	Title Press OK to continue	~
Dispense Sou	urce Empty	Ν	lone			r
Chuck Vac		98	.9 kPa	101.3 kPa	Body Please center the wafe	· ·
Waste Bottle	Full	F	alse		Please center the wafer	
Ambient Terr	nperature	-1	.1 °C			
Humidity		-1	1.1 %		APP	I Y
Vibration			-1			

Select a **Control** of Centering Routine and the **Action** will default to Center Wafer.

Select an option from the **<u>Title</u>** dropdown menu.

Select an option from the **Body** dropdown menu.

Click APPLY

Allows users to test and view configuration of the Centering Routine Display window outside of the Advanced Recipe Editor Activity.

Spin Speed:

Apogee Process Recip	es About <mark>To</mark>	ols -	admi
System Values			System Controls Motor Off
Parameter	Actual	Set Point	Control Spin Speed
Spin Speed	2000 rpm	2000 rpm	Action
Spin Acceleration	10000 rpm/s	10000 rpm/s	Set ~
Active Dispenses	None	None	Speed 2000 rpm
Dispense Source Empty	None		Accel 10000 rpm/s
Chuck Vac	98.8 kPa	64.0 kPa	
Waste Bottle Full	False		Osc 0 \$\$ seconds
Ambient Temperature	29.1 °C		Set Spin Speed to 2000 rpm (0 sec oscillation)
Humidity	38.3 %		
Vibration	80		APPLY

Select a <u>Control</u> of Spin Speed. The <u>Action</u> will default to Set. Close the spinner lid and enter desired values for spin speed, acceleration, and oscillation within the supported range for each setting:

Speed	1-12,000 rpm (standard spinner) 1-6,000 rpm (450 spinner)
Acceleration	1-30,000 rpm/s
Oscillation ¹⁹	0-99 seconds

Click APPLY

Note that the actual and set point values have populated on the system values list.

Programmable Exhaust:

Apogee Spin Coater Process	Recipes About Tool	5 -			adm
System Values			System Controls	Motor Off	
Parameter	Actual	Set Point	Control	Programmable Exhaust	
Spin Speed	0 rpm	0 rpm	8 - 41		
Spin Acceleration	500 rpm/s	500 rpm/s	Action	Set	
Percent Exhaust	60 %	60 %	Percent 0	Set Hold Airflow	
Exhaust Airflow	15.0 CMH	-1.0 CMH		Go Home	
Active Dispenses	None	None	Set exhaust to 0 %		
Dispense Source Empty	None			Step	
Chuck Vac	-1.1 kPa	101.3 kPa		APPLY	
Waste Bottle Full	False				
Ambient Temperature	-1.1 °C				
Humidity	-1.1 %				
Vibration	-1				

Select a <u>Control</u> of *Programmable Exhaust* Select an <u>Action</u> of *Set*, *Go Home*, *Hold Airflow*, or *Step Click APPLY*

Programmable Exhaust - Set:

ogee Spin Coater	Process F	Recipes	About	Tools -	
vstem Values					
Parameter			Actual		Set Point
Spin Speed			0 rpm		0 rpm
Spin Acceleration		5	500 rpm/	/s	500 rpm/s
Percent Exhaust			60 %		60 %
Exhaust Airflow	_	•	15.0 CM	н	-1.0 CMH
Active Dispenses			None		None
Dispense Source Empty			None		
Chuck Vac			-1.1 kPa	3	101.3 kPa
Waste Bottle Full			False		
Ambient Temperature			-1.1 °C		
Humidity			-1.1 %		
Vibration			-1		

¹⁹ reverses spin direction for the period specified

Select a <u>Control</u> of *Programmable Exhaust* Select an <u>Action</u> of *Set* Enter the target exhaust *percentage*.

Click APPLY

Opens or closes the programmable exhaust valve to the desired position.

Refer to the Exhaust Airflow parameter to determine the rate (CMH) that air is exhausted from the spin bowl.

*Must Stop 'Holding Airflow', if set, before setting programmable exhaust. (See below.)

Programmable Exhaust - Go Home:

Apogee Spin Coater	Process	Recipes	About	Tools -			admi	
System Values						System Contro	Motor Off	
Paramet	er		Actual		Set Point	Control	Programmable Exhaust	
Spin Speed			200 rpn	n	200 rpm			
Spin Acceleration			500 rpm	/s	500 rpm/s	Action	Go Home *	
Percent Exhaust			61%		60 %			
Exhaust Airflow			15.0 CM	н	15.0 CMH	Have the exhaust re-home itself		
Active Dispenses			None		None			
Dispense Source Empty	/		None				APPLY	
Chuck Vac			98.4 kPa	а	101.3 kPa			
Waste Bottle Full			False					
Ambient Temperature			-1.1 °C					
Humidity			-1.1 %					
Vibration			-1					

Select a <u>Control</u> of *Programmable Exhaust* Select an <u>Action</u> of *Go Home Click APPLY*

Used to recalibrate programmable exhaust positioning.

Programmable Exhaust – Hold Airflow:

Apogee Spin Coater Process	Recipes About Tool	s •		
System Values			System Controls Motor Off	
Parameter	Actual	Set Point	Control Programmable Ext	haust
Spin Speed	200 rpm	200 rpm	Action	
Spin Acceleration	500 rpm/s	500 rpm/s	Action Hold Airflow	
Percent Exhaust	61%	60 %	Target Airflow 15	
Exhaust Airflow	15.0 CMH	15.0 CMH		
Active Dispenses	None	None	Hold Exhaust at 15 CMH 🛩	
Dispense Source Empty	None			
Chuck Vac	98.4 kPa	101.3 kPa	APPL	Y
Waste Bottle Full	False			
Ambient Temperature	-1.1 °C			
Humidity	-1.1 %			
Vibration	-1			

Select a <u>Control</u> of *Programmable Exhaust* Select an <u>Action</u> of *Hold Airflow* Enter the target airflow *CMH Click APPLY*

Automates programable exhaust to reach and maintain a desired airflow.

Programmable Exhaust – Stop Holding:

Apogee Spin Coater Process	Recipes About Tool	s -		admin
System Values			System Controls Motor Off	
Parameter	Actual	Set Point	Control Programmable	e Exhaust 🔹 👻
Spin Speed	0 rpm	0 rpm	Action	
Spin Acceleration	500 rpm/s	500 rpm/s	Action Stop Holding	Ŭ
Percent Exhaust	60 %	60 %		
Exhaust Airflow	14.9 CMH	-1.0 CMH	Stops automatic control of exhaust	
Active Dispenses	None	None		
Dispense Source Empty	None		AP	PLY
Chuck Vac	-1.1 kPa	101.3 kPa		
Waste Bottle Full	False			
Ambient Temperature	-1.1 °C			
Humidity	-1.1 %			
Vibration	-1			

Select a <u>Control</u> of *Programmable Exhaust* Select an <u>Action</u> of *Stop Holding Click APPLY*

Stops automated control of exhaust air flow. *Must Stop 'Holding Airflow', before setting programmable exhaust. (See above.)

Programmable Exhaust – Step

pogee Spin Coater Process	Recipes About <mark>Tool</mark>	s -		admi
System Values			System Controls Motor Off	
Parameter	Actual	Set Point	Control Programmable Exhaust	
Spin Speed	0 rpm	0 rpm	Action	
Spin Acceleration	500 rpm/s	500 rpm/s	Action Step	~
Percent Exhaust	60 %	60 %	Step Size 5	%
Exhaust Airflow	14.9 CMH	-1.0 CMH		
Active Dispenses	None	None	Direction	Ŷ
Dispense Source Empty	None		Step exhaust Up 5 %	
Chuck Vac	-1.1 kPa	101.3 kPa		
Waste Bottle Full	False		APPLY	
Ambient Temperature	-1.1 °C			
Humidity	-1.1 %			
Vibration	1			

Select a <u>Control</u> of *Programmable Exhaust* Select an <u>Action</u> of *Step* Enter *the* <u>Step Size</u> *percentage* Enter a step <u>Direction</u> of *Up* or *Down Click APPLY*

Increments or decrements the exhaust position by a given percentage. *Must Stop 'Holding Airflow', before using this control.

Dispense (*if equipped)

Apogee Process Recip	oes About T	ools +		adı
System Values			System Controls Motor Off	
Parameter	Actual	Set Point	Control Dispense	~
Spin Speed	0 rpm	0 rpm	Action Enable Dignamore	
Spin Acceleration	16000 rpm/s	16000 rpm/s	Action Enable Dispenses	
Active Dispenses	1	1	Value	
Dispense Source Empty	None		1 Disponso 1	R
Chuck Vac	98.8 kPa	64.0 kPa	1 Dispense 1 2 Dispense 2	0
Waste Bottle Full	False		3 Dispense 3	0
Ambient Temperature	29.2 °C		4 Dispense 4	0
Humidity	37.8 %		Dispenses ON: 1	
Vibration	4		APPLY	

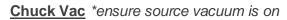
Select a Control of Dispense

The Action will default to Enable Dispenses.

Check the box for the desired dispenses - selections are rendered in green

Click APPLY

Note that the actual and set point values for enabled dispenses have populated on the system values list.



Apogee Process Reci	pes About <mark>T</mark>	ools -		admir
System Values			System Controls Motor Off	
Parameter	Actual	Set Point	Control Chuck Vac	~
Spin Speed	0 rpm	0 rpm	Action	
Spin Acceleration	16000 rpm/s	16000 rpm/s	Set	~
Active Dispenses	None	None	Vacuum On	~
Dispense Source Empty	None		Threshold 64	kPA
Chuck Vac	33.9 kPa	64.0 kPa		
Waste Bottle Full	False		Chuck Vac On (64 kPA)	
Ambient Temperature	29.0 °C			
Humidity	38.6 %		APPLY	
Vibration	3			

Select a Control of Chuck Vac.

The Action will default to Set.

Set Vacuum to On or Off.

Set **<u>Threshold</u>** to the desired value in kPa.

Click APPLY

Note that the actual and set point values have populated on the system values list.

8.3 Running Recipes

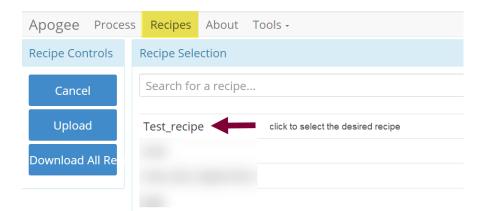
1. Navigate to the Recipes page.

Apogee Process Recipes About Tools -

2. Click Load to access the recipes list.

Apogee	Process	Recipes	About	Tools -
Recipe Con	itrols			
	Load			

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



4. Click Run.

Apogee Proces	s Reci	pes About	Tools -						
Recipe Controls	Viewin	g Recipe- Test <u></u>	_recipe						
Load	Name	Name Test_recipe							
Run		Enable Chu	ick Vac	C					
New	Step	Velocity (rpm)	Ramp (rpm/s)	Time (seconds)	Dispen	ses			
Edit	1	1000	20000	30		None			
Edit	2	1000	20000	20		Mana			

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

Аро	gee	Process	Recipes	Ab	oout	Tools -					admin
A		M	: =	0			Test_recipe :	Recipe P	rogress	[
1	g	Æ				Ρ	lease center the	e wafer			e î
2	(Ð					Start iteratio	on			C
3	g	Æ			Set	Spin Spe	ed to 1000 rpm	(0 sec osc	illation)		C
4	g	Æ					Dispenses ON:	None			C
E	0	n G					Dolov 20 coco	nde			6 2 *
							Step 1 of 18				
10	00%		Elapse 00:00:0				START		Remaining 00:00:00	(Ø

6. Use the centering activity to center the substrate.

Please center the wafer	1 Center 2 Vac ON 3 Vac OFF
ОК	4
	00:00:07
Press OK to continue	Abort

- 1. Spin chuck rotates slowly with vacuum on for a prescribed amount of time then stops rotation & vents vacuum.
- 2. Toggle chuck vacuum on.
- 3. Toggle chuck vacuum off.
- 4. Resume recipe.
- 7. Recipe execution.



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

8.4 Editing Recipes

Spin coater recipes may enlist an unlimited number of steps, each capable of defining spin speed, acceleration, spin time, percent exhaust opening, and dispense triggers. Users can easily insert new steps, reorder existing steps, and/or delete a selected step via the *Step Context Menu*.

Apogee Process	Recipes	ecipes About Tools -										
Editor Controls	Editing	Editing Recipe-										
Save	Name	Name Test_Recipe Notes										
Cancel		Enable Chuc	k Vac	S								
	Step	Velocity (rpm)	Ramp (rpm/s)	Time (seconds)	Dispenses							
Insert	1	1000	20000	30		1						
^	2	2000	10000	15		None						
~	3	1000	20000	30		2						
	4	100	500	60		None						
Delete	5	1000	20000	30		3						

Name	recorded in log files and used as criteria when searching for recipes
Enable Chuck Vac ²⁰	used when the substrate requires vacuum to remain on the spin chuck; the user must center the substrate prior to spinning
Step Velocity ²¹	speed in rpms the spin chuck will achieve on a given step
Step Ramp	rate in rpm/s the spin chuck will ramp on a given step
Step Time	the duration in seconds for a given step
Exhaust ²²	percent of exhaust opening
Dispense	the dispense triggered during a given step

Editing Dispense Selection 8.5

Enabled dispenses are rendered in green and display a checkmark. Multiple dispenses may be selected within the same step.

Apogee Process	Recipes About Tools -	admin
Editor Controls	Select Active Dispenses	
Back	1 Dispense 1	R R
	2 Dispense 2	0
	3 Dispense 3	0
	4 Dispense 4	0

Tool Specific Settings - Apogee® Spin Coater 8.6

Vac Threshold (kPa)	minimum vacuum threshold that must be reached before spinning a substrate
Centering Speed (rpm)	how fast the substrate spins during a centering routine
Centering Time (milliseconds)	how long the substrate spins during a centering routine
Idle Exhaust (%) ²³	default exhaust position when not running a process
Chuck Home ²⁴	facilitates loading/removal of substrates from a single position (0 to disable, 1 to enable)
Exhaust Sensor Offset	Sensor calibration setting to offset ambient pressures detected within the Apogee® cabinet.

²⁰ Only available to users with advanced recipe editor permissions.
²¹ preconditions default to ± 5% of the target speed
²² field is only present on tools equipped with optional programmable exhaust
²³ Idle Exhaust does not apply to tools not equipped with Programmable Exhaust

²⁴ When enabled, position is static.

AccuScan®²⁵ for Apogee® Spin Coater | Developer 8.7

System Parameters

Apogee Spin Coater	Process	Recipes	About	Tools -
System Values				
Parameter		A	ctual	Set Point
Spin Speed		C	rpm	0 rpm
Spin Acceleration		2000	0 rpm/s	20000 rpm/s
Scan Arm		130	0.0 mm	130.0 mm
Dispense Nozzle			1	1
Exhaust Airflow		0.	5 CMH	-1.0 CMH
Active Dispenses		1	Vone	None
Dispense Source Empty		1	lone	
Chuck Vac		98	8.9 kPa	64.0 kPa
Waste Bottle Full		I	alse	
Ambient Temperature		2	5.8 °C	
Humidity		3	7.4 %	
Vibration			3	

Scan Arm	Shows the current [Actual] and desired [Set Point] position of the arm (mm).
Dispense Nozzle	Reflects the dispense nozzle selected for the current process step.

²⁵ AccuScan[™] moving dispense arm is an optional accessory for Apogee® Spin Coaters & Developers. Page **55** of **85**

Manual Controls – Cee® AccuScan™ Dispense

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 <u>DataStream™ Manual</u> for guidance on the Local Presence feature.

Scanning Arm

Parameter Actual Set Point Spin Speed 0 rpm 0 rpm Spin Acceleration 500 rpm/s 500 rpm/s Scan Arm 130.0 mm 130.0 mm Dispense Nozzle 1 1 Exhaust Airflow 0.4 CMH -1.0 CMH Active Dispenses None None Dispense Source Empty None Time 2 Chuck Vac 98.5 kPa 101.3 kPa Waste Bottle Full False Ambient Temperature 24.2 °C Humidity 38.6 % Vibration 3 eelect a Control of Scan Arm and the Action will default to Set. nter a value for the Set Point to define the desired position of the Scanning Disperser. rm. eelect the desired nozzle from the Dispense Tip dropdown menu.	Apogee Spin Coater	rocess necip			admi
Spin Speed 0 rpm 0 rpm Spin Acceleration 500 rpm/s 500 rpm/s Scan Arm 130.0 mm 130.0 mm Dispense Nozzle 1 1 Exhaust Airflow 0.4 CMH -1.0 CMH Active Dispenses None None Dispense Source Empty None None Chuck Vac 98.5 kPa 101.3 kPa Waste Bottle Full False APPLY Humidity 38.6 % APPLY Vibration 3 Set Point to define the desired position of the Scanning Dispense Tip area value for the Set Point to define the desired position of the Scanning Disperser.	System Values			System Controls Motor Off	
Spin Acceleration 500 rpm/s 500 rpm/s Scan Arm 130.0 mm 130.0 mm Dispense Nozzle 1 1 Exhaust Airflow 0.4 CMH -1.0 CMH Active Dispenses None None Dispense Source Empty None Time 2 Chuck Vac 98.5 kPa 101.3 kPa Waste Bottle Full False APPLY Ambient Temperature 24.2 °C Humidity 38.6 % Vibration 3 Pelect a Control of Scan Arm and the Action will default to Set. Inter a value for the Set Point to define the desired position of the Scanning Dispurs. relect the desired nozzle from the Dispense Tip dropdown menu.	Parameter	Actual	Set Point	Control Scan Arm	~
Spin Acceleration 500 rpm/s 500 rpm/s 500 rpm/s Scan Arm 130.0 mm 130.0 mm 130.0 mm Dispense Nozzle 1 1 1 Exhaust Airflow 0.4 CMH -1.0 CMH 10 cmm Active Dispenses None None 10 cmm Dispense Source Empty None 10 cmm 10 cmm Chuck Vac 98.5 kPa 101.3 kPa Set Scanning Arm to 130 mm for Nozzle 1 Ambient Temperature 24.2 °C APPLY APPLY Humidity 38.6 % Vibration 3 elect a Control of Scan Arm and the Action will default to Set. Set Point to define the desired position of the Scanning Disp rm. elect the desired nozzle from the Dispense Tip dropdown menu. Set Point and the Dispense Tip dropdown menu.	Spin Speed	0 rpm	0 rpm	Action	
Dispense Nozzle 1 1 1 Exhaust Airflow 0.4 CMH -1.0 CMH Active Dispenses None None Dispense Source Empty None Chuck Vac 98.5 kPa 101.3 kPa Waste Bottle Full False Ambient Temperature 24.2 °C Humidity 38.6 % Vibration 3 elect a <u>Control</u> of Scan Arm and the <u>Action</u> will default to <u>Set</u> . Inter a value for the <u>Set Point</u> to define the desired position of the Scanning Disp rm. elect the desired nozzle from the <u>Dispense Tip</u> dropdown menu.	Spin Acceleration	500 rpm/s	500 rpm/s	Set	~
Dispense Nozzle 1 1 Exhaust Airflow 0.4 CMH -1.0 CMH Active Dispenses None None Dispense Source Empty None Time 2 Chuck Vac 98.5 kPa 101.3 kPa Waste Bottle Full False Ambient Temperature 24.2 °C Humidity 38.6 % Apply Vibration 3 Attion the Action will default to Set. elect a Control of Scan Arm and the Action will default to Set. neter a value for the Set Point to define the desired position of the Scanning Disponser. elect the desired nozzle from the Dispense Tip dropdown menu.	Scan Arm	130.0 mm	130.0 mm	Set Point 130	mm
Exhaust Airflow 0.4 CMH -1.0 CMH Active Dispenses None None Dispense Source Empty None Set Scanning Arm to 130 mm for Nozzle 1 Chuck Vac 98.5 kPa 101.3 kPa Waste Bottle Full False APPLY Ambient Temperature 24.2 °C APPLY Humidity 38.6 % APPLY Vibration 3 Set Scanning Will default to Set. elect a Control of Scan Arm and the Action will default to Set. Are a value for the Set Point to define the desired position of the Scanning Disp m. elect the desired nozzle from the Dispense Tip dropdown menu. Dispense Tip dropdown menu.	Dispense Nozzle	1	1		
Active Dispenses None Dispense Source Empty None Chuck Vac 98.5 kPa 101.3 kPa Waste Bottle Full False Ambient Temperature 24.2 °C Humidity 38.6 % Vibration 3 elect a Control of Scan Arm and the Action will default to Set. nter a value for the Set Point to define the desired position of the Scanning Disp m. elect the desired nozzle from the Dispense Tip dropdown menu.	Exhaust Airflow	0.4 CMH	-1.0 CMH	Dispense Tip Nozzie 1	~
Chuck Vac 98.5 kPa 101.3 kPa Waste Bottle Full False Apply Ambient Temperature 24.2 °C Apply Humidity 38.6 % Apply Vibration 3 Apply elect a Control of Scan Arm and the Action will default to Set. Set Scanning Arm to 130 mm for Nozzle 1 Image: Apply Apply Apply Image: Apply Apply Apply	Active Dispenses	None	None	Time 2	S
Chuck Vac 98.5 kPa 101.3 kPa Waste Bottle Full False Apply Ambient Temperature 24.2 °C Apply Humidity 38.6 % Apply Vibration 3 Apply elect a Control of Scan Arm and the Action will default to Set. And the Set Point to define the desired position of the Scanning Disponent. elect the desired nozzle from the Dispense Tip dropdown menu. Between the desired nozzle from the Dispense Tip dropdown menu.	Dispense Source Empty	None		Set Scanning Arm to 130 mm f	or Nozzle 1
Ambient Temperature 24.2 °C Humidity 38.6 % Vibration 3 elect a Control of Scan Arm and the Action will default to Set. Inter a value for the Set Point to define the desired position of the Scanning Disp rm. elect the desired nozzle from the Dispense Tip dropdown menu.	Chuck Vac	98.5 kPa	101.3 kPa		
Ambient Temperature 24.2 °C Humidity 38.6 % Vibration 3 elect a Control of Scan Arm and the Action will default to Set. nter a value for the Set Point to define the desired position of the Scanning Disp rm. elect the desired nozzle from the Dispense Tip dropdown menu.	Waste Bottle Full	False			,
Vibration 3 elect a <u>Control</u> of Scan Arm and the <u>Action</u> will default to Set. Inter a value for the <u>Set Point</u> to define the desired position of the Scanning Disp rm. elect the desired nozzle from the <u>Dispense Tip</u> dropdown menu.	Ambient Temperature	24.2 °C		APPLY	
elect a <u>Control</u> of Scan Arm and the <u>Action</u> will default to <i>Set.</i> nter a value for the <u>Set Point</u> to define the desired position of the Scanning Disp rm. elect the desired nozzle from the <u>Dispense Tip</u> dropdown menu.	Humidity	38.6 %			
nter a value for the <u>Set Point</u> to define the desired position of the Scanning Disp rm. elect the desired nozzle from the <u>Dispense Tip</u> dropdown menu.	Vibration	3			
elect the desired nozzle from the <u>Dispense Tip</u> dropdown menu.	Vibration Select a <u>Control</u> of S Enter a value for the	3 Scan Arm a			e Scanning Disp
nter a value for the Time to define the duration required to move to the target po	elect the desired n	ozzle from	the <u>Dispe</u>	e <u>nse Tip</u> dropdown menu.	
	inter a value for the	e <u>Time</u> to c	lefine the	duration required to move	to the target po
	Click APPL	V			

Editing Recipes

Begin by defining the desired Velocity (rpm) and Ramp (rpm/s) for a given step. Positions can be configured for each recipe step. Define the nozzle and then enter the desired position (in millimeters) from substrate center. Time will determine the total step time and the speed of the arm's movement. If a dispense is triggered, the specified nozzle will dispense for the duration of the step.

Example: assumes a 150mm wafer

Step 1 Dispense nozzle 1 moves to the center of the wafer over a period of 2 seconds.

Wafer spins at 1000rpm as Dispense 1 is triggered. Nozzle 1

- **Step 2** dispenses from the wafer's center, moving outward 65mm over the course of 5 seconds.
- **Step 3** Dispense Nozzle 2 is positioned at the wafer's edge.
- **Step 4** Wafer spins at 500rpm while Nozzle 2 dispenses a 1mm edge bead removal over the course of 5 seconds.

*The AccuScan[™] Dispense will return home at the end of the process.

**The AccuScan™ Dispense will not return home when operated via manual controls. See section 0 for details.

Apogee Spin Coa	ater Pr	ocess Re	<mark>cipes</mark> About	Tools -				admin
Recipe Controls	Viewing	g Recipe- E>	kample					
Load	Name	Example				No	otes	
New		Enable	Chuck Vac		¢			,
Edit	Step	Velocity (rpm)	Ramp (rpm/s)	Time (seconds)	Nozzle	Position (mm)	Dispenses	
Delete	1	0	20000	2	1	0	None	
	2	1000	20000	5	1	65	1	
Upload	3	0	20000	3	1	74	None	
Download All Recip	4	500	20000	5	2	74	2	

Velocity	substrate rpm
Ramp	substrate rpm/s
Time	defines the time in which the arm will reach its target position
Nozzle	the nozzle that the position is based from

Position ²⁶	adjusts the arm to the specified location
Dispenses	triggers the dispense of material for each nozzle

²⁶ A 0mm setting aligns the nozzle center with the substrate center. For fan spray, a positive adjustment may be necessary to accommodate spray width.

9. Apogee® Bake Plate

9.1 Safety Temperature Warning

The safety temperature warning feature is intended as a safeguard against operator injury. When the bake surface exceeds the temperature threshold specified by the equipment administrator, a Hot (~°C) watermark is displayed on all screens. When bake surface temperatures cool to temperatures less than the threshold specified by the equipment administrator, the watermark is cleared.

See Section 9.8 - Tool Specific Settings – Apogee® Bake Plate for details on how to enable and configure this setting.



9.2 Timer Controls

Located under the Tools menu, the timer controls feature provides convenient access to and tracking of manual process controls. Individual timers can be initiated concurrently, and users can toggle between count up and count down functions by tapping the button. On tapping *Start*, the *Count Up* timer will initiate. The *Count Down* timer allows for a user specified starting value (default is 10 seconds.) When the countdown hits zero the tool will elicit an audible alarm, the timer will continue to countdown into the negative, and the timer will turn red to further indicate that time has expired.

From the Timer Controls screen, users can raise/lower lift pins and select the desired bake method. Green indicates the current mode. Lift pins will lower to zero and raise to the lift pin idle position configured in system settings. (See Section 9.8 - Tool Specific Settings – Apogee® Bake Plate for details on how to configure the lift pin idle position.)

Apogee Bake Process	s Recipes About	Tools -	admin
Timer Controls			
10	‡ Second	ds -00:00:02.89	
Start Stop Cou	Int Down	Start Stop Count	Down
00:00:00.00		00:00:01.63	
Start Stop Co	ount Up	Start Stop Coun	t Up
Lift Pins	Bake Method	つ	
Raise Pins	Vac	Plate Temp	erature
Lower Pins	Prox	36.59	°C
	Contact		

9.3 System Parameters

Parameter	Actual	Set Point	Status
Plate Temperature	59.4 °C	60.0 °C	In Range
Lift Pin Height	19.0 mm	19.0 mm	In Range
Bake Method	Contact	Contact	In Range
Ambient Temperature	26.5 °C		In Range
Humidity	44.8 %		In Range

Plate Temperature ²⁷	current temperature of the hot chuck displayed against target set point in degrees Celsius
Lift Pin Height	height of exposed lift pins in relation to chuck in millimeters; precision control settings range from 0.0-19.0
Bake Method	dictates manner in which substrate is heated; vacuum, contact, proximity, lift pins; refer to Apogee® Bake Plate Operations Manual for more information
Ambient Temperature	air temperature of environment where equipment is housed
Humidity ²⁸	ambient relative humidity of environment where equipment is housed

9.4 Manual Controls – Apogee® Bake Plate

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. Available controls will be selected from the dropdown menu on the right.

If using remote feature, the user must have confirmed their local presence to execute manual commands. See section 7.3 for more detail on Local Presence.

stem Values			System Controls
Parameter	Actual	Set Point	Control What do you want to control?
Plate Temperature	24.5 °C		What do you want to control?
Lift Pin Height	19.0 mm	19.0 mm	Plate Temperature Lift Pins
Bake Method	Contact	Contact	Please check Bake Method
Ambient Temperature	26.7 °C		change.
Humidity	41.4 %		
			APPLY

Plate Temperature

 ²⁷ 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.
 ²⁸ 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.

System Values				
Parameter	Actual	Set Point		
Plate Temperature	41.5 °C			
Lift Pin Height	-1.0 mm	5.0 mm		
Bake Method	Contact	Contact		
Ambient Temperature	25.1 °C			
Humidity	45.5 %			

Select a <u>Control</u> of *Plate Temperature.* Select an <u>Action</u> of *Set.* Enter the desired value in °C.

System Contr	rols	
Control	Plate Temperature	~
Action	Set	~
Value 45		≎ °C
Please che change.	ck your values before applying the	

Click APPLY

The Temperature Controller <u>must</u> be enabled to initiate the heating process. See next step.

System Values			System Controls	
Parameter	Actual	Set Point	Control Plate Temperature	~
Plate Temperature	41.9 °C	45.0 °C	Action	
Lift Pin Height	-1.0 mm	5.0 mm	Enable	*
Bake Method	Contact	Contact	Value Enable	,
Ambient Temperature	25.0 °C			
Humidity	44.4 %		Enable temperature controller	

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.

System Controls		
Control	Plate Temperature	~
Action	AutoTune	~

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.

System Controls		
Control	Plate Temperature	~
Action	Ramp	~
Target 30		°C
Rate 2	°C / M	inute

Select an <u>Action</u> of *Ramp.* Enter the <u>Target</u> temperature. Enter the desired ramp <u>Rate²⁹</u> (between 1-6°C per minute).

Click APPLY

<u>Lift Pins</u>

System Values			System Controls	
Parameter	Actual	Set Point	Control Lift Pins	
Plate Temperature	42.9 °C	45.0 °C	Action	
Lift Pin Height	10.0 mm	10.0 mm	Set	
Bake Method	Contact	Contact	Height 10	mm
Ambient Temperature	25.0 °C			
Humidity	44.7 %		Set lift pins to 10 mm	

Select a <u>Control</u> of *Lift Pins.* Select an <u>Action</u> 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.

System Controls		
Control	Lift Pins	~
Action	Go Home	~

Select an Action of Go Home.

²⁹ Cee® does not offer active cooling on bake plates however, the ramp feature can be used to reduce the rate of cooling beyond what ambient conditions allow.

Click APPLY

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

System Controls		
Control	Lift Pins	~
Action	Step	~
Step Size 19		mm
Direction Up		~

Select an <u>Action</u> of *Step.* Enter the desired <u>Step Size</u> (between 0-19mm). Select the preferred <u>Direction.</u>

Click APPLY

System Controls		
Control	Lift Pins *	
Action	Raise Pins ~	

Select an Action of Raise Lift Pins.

Click APPLY

Set pins to the Lift Pin Idle Position specified in. Review the Apogee® Bake Plate Operations Manual for more information.

System Controls	
Control	Lift Pins ~
Action	Lower Pins ~

Select an Action of Lower Lift Pins

Click APPLY

Lift pins recede just beneath the surface of the hot plate to facilitate contact with the substrate.

System Controls			
Control	Lift Pins		~
Action	Ramp		~
Target 15			mm
Rate 25		mm	n/min

Select an <u>Action</u> of *Ramp* Enter the <u>Target</u> (between 0-19mm) Select the preferred ramp <u>Rate</u> (between 0-200mm/min)

Click APPLY

Bake Method

9.5 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*.

Apogee Bake F	Process Red	<mark>tipes</mark> About Tools -			admin	
Recipe Controls	Viewing F	Recipe- TestRed_Recipe				
Load	Name T	Name Test_Red_Recipe Notes				
Prepare	Plate Ten	nperature 180		°C	,	
	Step	Time (seconds)	Process Method		Pin Height (mm)	
Run	1	60	Contact		~	
New						

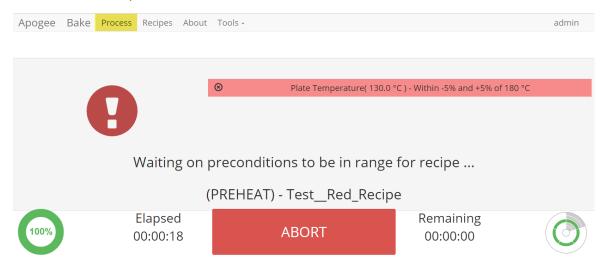
*Preparation processes cannot be initiated when the equipment is already in use.

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.

User (admin) attempting to set temperature for recipe:				
TestRed_Recipe				
Press OK to continue or ABORT to cancel.				
ОК				
00:00:01				
Recipe Preparation Abort				

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



<u>**Preparation Complete**</u> – 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.

TestRed_Recipe Ready to run!	
ОК	00:00:02
Recipe Preparation	00.00.02

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

9.6 Running Recipes

2.

1. Select Recipe Page

Apogee™ Bake	Process	Recipes	About	Tools -
Load Recipe				
Apogee™ Bake	Process	Recipes	About	Tools -
Recipe Controls				
Load				
New				

3. Search For, Identify, & Select Recipe

Apogee™ Bake Proces	s Recipes	About	Tools -
Recipe Controls	Recipe Selection		
Cancel	Search fo	r a recipe	
Upload	Test_Reci	pe 🔶	click to select the desired recipe
Download All Recipes			

4. Run Recipe

Apogee™ Bake P	rocess	Recipes	About	Tools -
Recipe Controls		Viewing Recipe- Test_Recipe		
Load		Name		
		Test_Recipe		
Run		Notes		

5. Start Recipe

Apogee	M Bake	Process	Recipes	About	Tools -		admin
A	<u>I</u>	≣	۲		Test_Recipe : Recipe Pro	ogress	
1	F				Load Wafer		
2	Ħ				Enable temperature controller		S
3	Ħ		Set temperature to 35 °C			c	
4	\odot		Start iteration			c	
5	æ				Set lift pins to 4 mm		
		Ste	ep 1 of 10			Iteration 1 of 4	
100%			apsed :00:00		START	Remaining 00:00:00	

6. Recipe Progression

	Step 7 of 10		Iteration 1 of 4	~
0%	Elapsed 00:00:05	ABORT	Remaining 00:05:00	

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

9.7 Editing Recipes

Apogee™ Bake Pr	rocess Recipe	s About Tools -		admi		
Editor Controls	Editing R	ecipe- Test_Recipe				
Save	Name T	Name Test_Recipe Notes				
Cancel	Plate Ten	nperature 120		°C		
	Step	Time (seconds)	Process Method	Pin Height (mm)		
Insert	1	60	Contact	~		
^	2	30	Contact	~		
~	3	30	Contact	~		
	4	60	Proximity	~		
Delete						
Advanced						

9.8 Tool Specific Settings – Apogee® Bake Plate

Temperature Offset Calibration (°C)	offset used by temperature controller to calibrate reported chuck temperature
Lift Pin Idle Position	specify default position of lift pins between processes
Lift Pin Offset	offset used for calibration of lift pin positioning
Safety Temp(°C) ³⁰	when hot plate temperature exceeds this value, HOT(°C) watermark is displayed on all screens
Idle Temp(°C) ³¹	specify temperature equipment will reduce to during periods of inactivity ³²
Time Before Idle(minutes) ³³	length of time (minutes) between processes before the thermal controller reverts to idle temperature specified

³⁰ A value of 0 will disable the safety temperature watermark.

³¹ A value of 0 will disable the thermal controller (temperature off) after specified *Time Before Idle(minutes)* – *specified* idle temperature settings will only facilitate *reduction* in temperature.

³² Inactivity is defined as time since last manual or recipe-controlled process – screen interactions will <u>not</u> delay idle temperature.

³³ A value of 0 in the Time Before Idle(minutes) field will disable the idle temperature feature and the bake surface will remain at the most recently specified temperature indefinitely or until a new temperature is specified.

10. <u>Apogee® Bonder</u>

10.1 System Parameters

Parameter	Actual	Set Point	Status
Lower Platen Temp	25.0 °C	25.0 °C	In Range
Upper Platen Temp	25.0 °C	25.0 °C	In Range
Chamber Pressure	97.5 kPA	97.5 kPA	In Range
Bond Force	0.0 N	0.0 N	In Range
Position	Load Top	Load Top	In Range
Ambient Temperature	32.7 °C		In Range
Humidity	73.9 %		In Range

Lower Platen Temperature	current temperature of lower platen displayed against target set point in degrees Celsius
Upper Platen Temperature	current temperature of upper platen displayed against target set point in degrees Celsius
Chamber Pressure	absolute pressure measured inside bond chamber in kPa
Bond Force ³⁴	calculated force between upper and lower platens measured in newtons
Position	refers to physical location and state of lower platen assembly; see Apogee® Bonder Operations Manual for further detail
Ambient Temperature	air temperature of environment where equipment is housed
Humidity ³⁵	ambient relative humidity of environment where equipment is housed

10.2 Manual Controls – Apogee® Bonder

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. Available controls will be selected from the dropdown menu on the right.

If using remote feature, the user must have confirmed their local presence to execute manual commands. See section 7.3 for more detail on Local Presence.

³⁴ Does not take substrate size into account.

³⁵ 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.

Apogee Bond	Process	Recipes	About	Tools -
-------------	---------	---------	-------	---------

System Values		
Parameter	Actual	Set Point
Lower Platen Temp	3277.1 °C	
Upper Platen Temp	3277.1 °C	
Chamber Pressure	120.0 kPA	-1.0 kPA
Bond Force	0 N	0 N
Position	Unload	Unload
Ambient Temperature	-1.1 °C	
Humidity	-1.1 %	

System Controls			
Control	What do you want to control?		
	What do you want to control?		
	Lower Platen Temp		
	Upper Platen Temp		
Please chec	Chamber Pressure		
change.	Vacuum Transfer		
	Bond Force		
	Position		
	APPLY		

Platen Temperature

System Values			System Controls
Parameter	Actual	Set Point	Control Lower Platen Temp
Lower Platen Temp	3277.1 °C	180.0 °C	Action
Upper Platen Temp	3277.1 °C		Enable
Chamber Pressure	120.0 kPA	-1.0 kPA	Value Enable
Bond Force	0 N	0 N	
Position	Unload	Unload	Enable lower temperature controller
Ambient Temperature	-1.1 °C		
Humidity	-1.1 %		APPLY

Select a <u>Control</u> of *Upper* or *Lower Platen Temp.* Select an <u>Action</u> of *Enable.*

Select a <u>Value</u> of *Enable* or *Disable* to activate or deactivate the temperature controller.

Click APPLY

System Values			System Controls
Parameter	Actual	Set Point	Control Lower Platen Temp
Lower Platen Temp	20.0 °C	30.0 °C	Action
Upper Platen Temp	20.0 °C		Set
Chamber Pressure	120.0 kPA	-1.0 kPA	Value 30
Bond Force	0 N	0 N	
Position	Unload	Unload	Set lower temperature to 30 °C
Ambient Temperature	-1.1 °C		
Humidity	-1.1 %		APPLY

Select a <u>Control</u> of *Upper* or *Lower Platen Temp.* Select an <u>Action</u> of *Set.* Enter the desired <u>Value</u> in °C. admin

Click APPLY

Note that the heating process has been initiated and a platen 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.

Chamber Pressure

System Values			System Controls
Parameter	Actual	Set Point	Control Chamber Pressure
Lower Platen Temp	20.0 °C	30.0 °C	Action
Upper Platen Temp	20.0 °C		Evacuate to
Chamber Pressure	120.0 kPA	60.0 kPA	Value 60
Bond Force	0 N	0 N	
Position	Unload	Unload	Wait for Chamber Pressure to reach 60 kPA
Ambient Temperature	-1.1 °C		
Humidity	-1.1 %		APPLY

Select a <u>Control</u> of *Chamber Pressure*. Select an <u>Action</u> of *Evacuate To*. Enter the desired threshold <u>Value</u> in KPa.

Click APPLY

Note that the evacuation process has been initiated and a Chamber Pressure set point has populated on the system values list.

Vacuum Transfer

System Values			System Controls
Parameter	Actual	Set Point	Control Vacuum Transfer
Lower Platen Temp	20.0 °C	30.0 °C	Action
Upper Platen Temp	20.0 °C	;	Action Detect transfer
Chamber Pressure	120.0 kPA	60.0 kPA	Title Title is displayed here
Bond Force	0 N	0 N	Body Body is displayed here
Position	Unload	Unload	Body Body is displayed here
Ambient Temperature	-1.1 °C		Use vacuum wand to transfer substrate
Humidity	-1.1 %		
			APPLY

Select a **Control** of Vacuum Transfer and the **Action** will default to Detect Transfer.

Enter the desired value in the **<u>Title</u>** field.

Enter the desired value in the **<u>Body</u>** field.

Click APPLY

Body is displayed here	
ОК	
	00:00:01
Title is displayed here	Abort

Allows users to test and view configuration of the Vacuum Transfer Display window outside of the Advanced Recipe Editor activity.

ystem Values		
Parameter	Actual	Set Point
Lower Platen Temp	20.0 °C	30.0 °C
Upper Platen Temp	20.0 °C	
Chamber Pressure	120.0 kPA	60.0 kPA
Bond Force	2720 N	4000 N
Position	Unload	Unload
Ambient Temperature	-1.1 °C	
Humidity	-1.1 %	

Bond Force

Select a <u>Control</u> of *Bond Force.* Select an <u>Action</u> of *Set.* Enter the desired <u>Value</u> between 1-12,000 N.

Click APPLY

Note that the process has initiated, and a Bond Force set point has populated on the system values list.

System Values			System Controls
Parameter	Actual	Set Point	Control Bond Force
Lower Platen Temp	20.0 °C	30.0 °C	Action
Upper Platen Temp	20.0 °C		Ramp
Chamber Pressure	120.0 kPA	60.0 kPA	Target 4000
Bond Force	2720 N	4000 N	Rate 500 N / Secon
Position	Unload	Unload	
Ambient Temperature	-1.1 °C		Ramp Bond Force to 4000 @ 500 N / Second
Humidity	-1.1 %		
			APPLY

Select an <u>Action</u> of *Ramp.* Enter the desired <u>Target</u> value in N. Enter the desired <u>Rate</u> value between 1-1000N/second.

Click APPLY

Position

System Values		
Parameter	Actual	Set Point
Lower Platen Temp	20.0 °C	30.0 °C
Upper Platen Temp	20.0 °C	
Chamber Pressure	120.0 kPA	60.0 kPA
Bond Force	2720 N	4000 N
Position	Load Top	Load Top
Ambient Temperature	-1.1 °C	
Humidity	-1.1 %	

Select a **Control** of Position.

Select an Action of Move To.

Select the desired <u>Value</u> from the dropdown menu (Load Top, Load Bottom, Process, or Unload).

Click APPLY

Note that the **position process** has initiated, and the desired position set point is reflected on the system values list.

10.3 Preparation

Users with sufficient privileges can remotely prepare equipment to run a recipe. This feature is useful for preconditions and parameters that take a significant amount of time such as bake plate 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*.

Apogee Bond	Process Recipes About Tools -		admin		
Recipe Controls	Viewing Recipe- Test_Red_Recipe				
Load	Name Test_Red_Recipe	Name Test_Red_Recipe Notes			
Prepare	Plate Temperature 180	°C			
Due	Step Time (seconds)	Process Method	Pin Height (mm)		
Run	1 60	Contact	~		
New					

*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 active 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.

User (admin) attempting to set temperature for recipe:		
TestRed_Recipe		
Press OK to continue or ABORT to cancel.		
ОК		
00:00:01 Recipe Preparation Abort		

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

Apogee Bond	Process Recipe	es About	Tools -		admin
			Plate Temperature(130.0	°C) - Within -5% and +5% of 180 °C	
	B				
	Waiti	ng on p	preconditions to be in range	for recipe	
		(PREHEAT) - TestRed_Recip	e	
100%	Elaps 00:00:		ABORT	Remaining 00:00:00	\bigcirc

<u>**Preparation Complete**</u> – 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.

	_Red_Recipe ady to run!
	OK 00:00:02
Recipe Preparation	

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

10.4 Running Recipes

1. Select Recipes Page.

Apogee Bond Process Recipes About Tools -

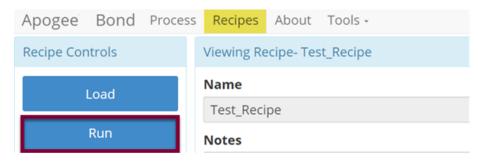
2. Load Recipe.

Apogee	Bond	Process	Recipes	About	Tools -
Recipe Con	trols				
	Load				
	Run				

3. Search For, Identify, & Select Recipe.

Apogee Bond Proces	s Recipes About Tools -		
Recipe Controls	Recipe Selection		
Cancel	Search for a recipe		
Upload	Test_Recipe		
Download All Recipes			

4. Run Recipe.



5. Start Recipe.

ŀ	Apogee	Bond	Process	Recipes	About	Tools -		admin
	•	<u>Iv</u>	≣	٢		Test_Recipe : Recipe Pr	rogress	
	1	F				Load Wafer		ر ا
	2	Ħ				Enable temperature controlle	r	R
	3	Ħ		Set temperature to 35 °C				R
	4	\odot		Start iteration G				区
	5	Ħ		Set lift pins to 4 mm				R Î
			Ste	ep 1 of 10			Iteration 1 of 4	
	100%			apsed :00:00		START	Remaining 00:00:00	

6. Recipe Progression.

	Step 7 of 10		Iteration 1 of 4	*
0%	Elapsed 00:00:05	ABORT	Remaining 00:05:00	

10.5 Editing Recipes

Bonder recipes may enlist an unlimited number of steps, each capable of defining a bake time and method. Users can easily insert new steps, reorder existing steps, and/or delete a selected step.

Apogee Bond	Process Recipes Ab	out Tools -		admin
Editor Controls	Editing Recipe- hello	Editing Recipe- hello3		
Save	Name hello3			Notes
Cancel	Use Sepa	rator Flags	D	
	Temperature 25			°C
Advanced	Force 1200			Ν
	Time 30		Secon	ds
	Evacuate Chamber T	0.5	k	PA
	Pre-bond Delay 15		Secon	ds
Name		recorded in log file recipes	es and used as	criteria when searching for
Use Separator Flags		enable to prevent contact between substrates pending evacuation of the chamber		
Temperature		target temperature or set point of platens for a given process		
Force		target force betwe	en upper and l	ower platens measured in

Time	time for which bond force should be applied in seconds with precision to one tenth of a second
Evacuate Chamber To	defines minimum chamber pressure required before a bond process can continue
Pre-Bond Delay	duration of delay following placement of bottom substrate

10.6 Tool Specific Settings – Apogee® Bonder

•	offset used by temperature controller to calibrate reported chuck temperature of lower platen
Upper Platen Temperature Calibration Offset (°C)	offset used by temperature controller to calibrate reported chuck temperature of upper platen

11. <u>Apogee® Mechanical Debonder</u>

11.1 System Parameters

Parameter	Actual	Set Point	Status
Position	Idle	Idle	In Range
Peel Force	12.0 N	12.0 N	In Range
Carrier Size	Unknown		Critically High
Film Frame Size	200 mm		In Range
Ambient Temperature	30.6 °C		In Range
Humidity	-1.1 %		In Range
Chuck Vac	95.8 kPa		In Range

Position	operational position of debond process
Peel Force	force in newtons imparted on substrate by way of gripper
Carrier Size	detected gripper size
Film Frame Size	detected vacuum chuck size
Ambient Temperature	air temperature of environment where equipment is housed
Humidity ³⁶	ambient relative humidity of environment where equipment is housed
Chuck Vac	measurement of vacuum pressure securing film frame against vacuum chuck in kPa

11.1 Manual Controls – Apogee® Mechanical 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. Available controls will be selected from the dropdown menu on the right.

If using remote feature, the user must have confirmed their local presence to execute manual commands. See section 7.3 for more detail on Local Presence.

³⁶ 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.

Peel Mechanism

System Values						
Parameter	Actual	Set Point				
Position						
Peel Force	-1.1 N	100.0 N				
Carrier Size	Unknown					
Film Frame Size	200 mm					
Ambient Temperature	29.4 °C					
Humidity	-1.1 %					
Chuck Vac	95.4 kPa					

System Controls						
Control	Peel Mechanism	~				
Action	Peel	~				
Force 10	0	Ν				
Separate wafers at 100 N						
APPLY						

Select a <u>Control</u> of *Peel Mechanism* Select an <u>Action</u> of *Peel* Enter the desired <u>Force</u> between *1-150N Click APPLY*

Note that the actual and set point values have populated on the system values list.

Position

System Values		
Parameter	Actual	Set Point
Position	Moving	Load Stack
Peel Force	12.0 N	12.0 N
Carrier Size	Unknown	
Film Frame Size	200 mm	
Ambient Temperature	29.4 °C	
Humidity	-1.1 %	
Chuck Vac	95.3 kPa	

Select a <u>Control</u> of *Position* Select an <u>Action</u> of *Move To*

Select the desired <u>Value</u> from the dropdown menu (Load Stack, Centering, Process, Unload Carrier, Unload Device)

Click APPLY

Note that the position process has initiated, and the desired position set point is reflected on the system values list.

Chuck Vac

System Values						
Actual	Set Point					
Moving	Load Stack					
12.0 N	12.0 N					
Unknown						
200 mm						
29.4 °C						
-1.1 %						
95.3 kPa						
	Moving 12.0 N Unknown 200 mm 29.4 °C -1.1 %					

System Con	trols						
Control	Chuck Vac	~					
Action	Set	~					
Vacuum	On v						
Chuck Vac							
	APPLY						

Select a <u>Control</u> of *Chuck Vac* The <u>Action</u> will default to *Set*. Set <u>Vacuum</u> to *On* or *Off. Click APPLY*

Note that the Mechanical Debonder's vacuum threshold is hard coded at <12 kPa and cannot be altered.

Gripper

System Values			System Con	trols		
Parameter	Actual	Set Point	Control	Gripper	~	
Position	Moving	Load Stack	Action			
Peel Force	12.0 N	12.0 N	Action	Set	~	
Carrier Size	Unknown		Grip Ope	n	~	
Film Frame Size	200 mm					
Ambient Temperature	29.7 °C		Gripper			
Humidity	-1.1 %					
Chuck Vac	95.3 kPa			APPLY		
Select a <u>Control</u> of	Gripper					
Select Action of Set.						
Set <u>Grip</u> to <i>Open</i> or	Closed.					
Click APPL	Y					

System Values		
Parameter	Actual	Set Point
Position		
Peel Force	0.0 N	100.0 N
Carrier Size	300 mm	
Film Frame Size		
Ambient Temperature	-1.1 °C	
Humidity	-1.1 %	
Chuck Vac	96.4 kPa	
Select a <u>Control</u> of (Prinnor	
Select <u>Action</u> of Pos		
Set <u>Position</u> to <i>Up</i> o	r Down	
Click APPLY	,	

11.2 Running Recipes

1. Select Recipes Page.

2. Load Recipe.

Debonder	Process	Recipes	About	Tools -
Recipe Control	ls			
Load				
New				

3. Search For, Identify, & Select Recipe.

Debonder Proce	ess <mark>Reci</mark> p	bes About	Tools -		
Recipe Controls	Recipe Selection				
Cancel	test				
Upload	test <	clic	k to select the desired recipe		

4. Run Recipe.

Debonder Proce	ess <mark>Recipes</mark> About Tools -		
Recipe Controls	/iewing Recipe- test		
Load	Name test		
Run	Force 15		
New	Film Frame Size 150 mm		
Edit	Carrier Size 100 mm		

5. Start Recipe.

Debond	ler Proce	ess Recipes Abou	t Tools -		[©] Recipe loaded!	
A	<u>₩</u>	₩ 🔍	test : Recipe Progre	SS	[
1	\odot		Start iteration		ک	
2	æ		Move to position Load Stack			
3	F		Please load the bonded pair.			
4	æ		Ś			
5	æ		Ś			
6	æ		Ś			
7	æ	Move to position Unload Carrier			<u>ج</u>	
8	F	Please unload the carrier wafer.			R.	
			Step 2 of 11			
100%		Elapsed 00:00:23	START	Remaining 00:00:00	Ø	

*Press the two flashing buttons on the front of the Apogee® Mechanical Debonder and follow the prompts on the screen during recipe execution.

6. Recipe Progression.



11.3 Editing Recipes

Debonder Proc	ess Recipes	About Tools -	admin
Editor Controls	Editing Recip	e- test	
Save	Name test	:	Notes
Cancel	Force 15	N	l
Advanced	Film Frame Carrier Size	Size 150 mm ~ 100 mm ~	

Name	recorded in log files and used as search criteria when searching for recipes
Force	maximum force in newtons allowed on substrate by way of gripper
Film Frame Size	specify diameter of film frame
Carrier Size	specify diameter of carrier substrate

11.4 Tool Specific Settings – Apogee® Mechanical Debonder

Wafer Sensor Enabled------- sensor can be disabled or enabled to detect presence of carrier substrate in gripper and verification of debond

12. <u>Table of Revisions</u>

Doc Rev #	Author	Description of Change(s)	Reviewed/Approv ed By	Date
3.7	J. Adams	 Updated Section 5 DataStream[™] About Page Added Section 8.7 AccuScan® for Apogee® Spin Coater Developer 	B. Waterworth	11/01/2024
3.6	J. Adams	 Updated Section 4.11 Download Recipe Data Updated Section 5 DataStream[™] About Page Updated Section 8.2 Manual Controls – Apogee® Spin Coater 	D. Tanksley B. Waterworth	7/09/2024
3.5	J. Adams	 Updated Section 5 DataStream[™] About Page Added Section 4.11 Download Recipe DataDownload Recipe Data Added Section 4.12 Upload Recipe Data Revised Section 8.2 Manual Controls – Apogee® Spin Coater with Motor Off details. 	B Waterworth	4/04/2024
3.4	J. Adams	 Updated Section 5 DataStream[™] About Page Updated Section 8.1 System Parameters Updated Section 8.2 Manual Controls – Apogee® Spin Coater Updated Section 8.3 Running Recipes Updated Section 11.1 System Parameters 	B Waterworth	12/28/2023

				1
3.3	J. Adams	 Updated Section 5 DataStream[™] About Page with versioning information Update Apogee to reflect registered trademark. 	B Waterworth	8/02/2023
3.2	J. Adams	 Update Section 5 DataStream[™] About Page with versioning information Added Section 7.9 DataStream[™] API 	B. Waterworth D. Tanksley	4/3/2023
3.1	J. Adams	 Update copyright detail Section 2.2 Logging In Added Section 9.1 Safety Temperature Warning Added Section 9.2 Timer Controls Safety Temp, Idle Temp, Time before Idle settings added to Section 9.8 Tool Specific Settings – Apogee® Bake Plate 	B. Waterworth D. Tanksley	1/16/2023
3.0	J. Adams	 Add Section 4.3 Creating New Recipes Add Section 7.6 - 7.8 summarizing Local Capture features update 8.2 Manual Controls – Apogee® Spin Coater with deservo details U*pdates to section 12 Table of Revisions 	B. Waterworth J. Strothmann	9/22/2022
2.0	J. Adams	 Update format Section 3 details updated Process View and Graph View features Add Section 5.6 Format USB for Tool Compatibility add sections 8.2, 9.4, and 10.2 outlining tool specific manual controls Add Section 11 Apogee® Mechanical Debonder Add Section 12 Table of Revisions 	B. Waterworth J. Strothmann	8/18/2022