
Brewer Science[®] Cee[®] 200X Precision Spin Coater



Operator/User Manual

New users: Read this manual in its entirety before operating the equipment.

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1. Products Covered in This Manual

This manual covers the Brewer Science® Cee® 200X series of spin coaters. This manual is to be used to install, operate, and troubleshoot this spin-coating equipment series. **New users should read this manual in its entirety before operating the equipment.**

2. Confidentiality Statement, Warranty, and Instructions for Returning Materials

2.1 Confidentiality Statement

Information supplied is only for use during 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 Brewer Science, Inc.**

2.2 Warranty

Brewer Science, Inc., warrants to the original purchaser (Buyer) that the equipment is free from defects in material and workmanship under normal use and service in accordance with Brewer Science instructions and specifications.

Buyer shall promptly notify Brewer Science of any claim against this warranty, and any item to be returned to Brewer Science shall be sent with transportation charges prepaid by Buyer, clearly marked with a Return Material Authorization (RMA) number obtained from Brewer Science Equipment Customer Support. (See section 2.3.)

Brewer Science's obligation under this warranty is limited to the repair or replacement, at Brewer Science's option, of any equipment, component, or part that is determined by Brewer Science to be defective in material or workmanship. This obligation shall expire one (1) year after the initial shipment of the equipment from Brewer Science.

This warranty shall be void if:

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



BREWER SCIENCE 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 Brewer Science be liable for consequential loss or damages, however caused. No person or representative of Brewer Science is authorized to assume for Brewer Science any liability in connection with Equipment nor to make any change to this warranty unless such change or modification is put in writing and signed by an authorized representative of Brewer Science.

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

2.3 Instructions for Returning Materials

Any materials, parts, or equipment returned to Brewer Science Equipment Customer Support must be clearly labeled with a Return Material Authorization (RMA) number.

To obtain an RMA number, contact:

Brewer Science Equipment Customer Support
Telephone: (573) 364-0300
Facsimile: (573) 364-9513
E-Mail: ceecustserv@brewerscience.com
Web Address: <http://www.brewerscience.com>

Shipping information for use in returns with an RMA number:

Brewer Science, Inc.
Attn: Equipment Customer Support
2401 Brewer Drive
Rolla, Missouri 65401
USA



3. Introduction to the Cee® 200X Precision Spin Coater

The Cee® 200X precision spin coater delivers track-quality performance, with revolutionary interface capabilities and the utmost in chemical compatibility, in an efficient, space-saving design.

Fully programmable and user-friendly, the Brewer Science® Cee® 200X precision spin coater features the accuracy and repeatability needed to eliminate processing variability from critical experiments. With its convenient, compact footprint, wide range of chemical compatibility, and durability, this easy-to-use benchtop system will provide years of high-performance operation, making the purchase of a Cee® 200X tool a smart and cost-effective decision.

3.1 Programmability

- PC-controlled
- PC-based touch screen interface and display
- Full-color alphanumeric-capable graphical user interface (GUI)
- 250,000 process recipe programs onboard
- A virtually unlimited number of user-defined recipe program steps
- 0.1-second resolution for step times (max. step time: 9,999.9 seconds)
- Spin speed: 0 to 6,000 rpm (0 to 12,000 rpm option at no charge; 0 to 16,000 rpm option available)
- Spin speed acceleration:
 - 0 to 30,000 rpm/s unloaded
 - 0 to 23,000 rpm/s with a 200-mm substrate
 - 0 to 3,000 rpm/s with a 6 in × 6 in × 0.250 in photomask recessed chuck
- Connectivity: USB/Ethernet port for communications for uploading/downloading process parameters with offline firmware standard (offline recipe number and steps unlimited)
- System capable of controlling third-party host software of high-end IDI-Cybor or Mykrolis positive displacement pumps
- Simultaneous dual automated dispense capability
- Bi-directional speed control/oscillating chuck
- Iteration software (recipe looping)
- Dispense or component outputs: 50
- Security: Password protection option available at no charge
- In-process/dynamic speed/acceleration control

3.2 Precision

- Spin speed repeatability: < 0.2 rpm
- Spin speed resolution: < 0.2 rpm
- Substrate sizes: < 1 cm to 200 mm round; 7 in × 7 in square



3.3 Reliability

- Indirect drive system protects the spin motor from contact with process chemicals and solvents
- Vacuum and lid interlock standard
- Industry-leading reliability and uptime
- 1-year full warranty on parts and labor
- Free remote technical support (phone, email, fax) for the life of the product
- Application process assistance for the life of the product

3.4 Bowl Design

- Teflon® spin bowl for material compatibility
- Integrated bowl ring to eliminate material migration
- Optional stainless steel bowl (for all-stainless-steel construction)
- Optional polyethylene bowl (educational package) available
- Optional polyethylene liners available
- Optional polyethylene/Teflon® splash ring
- Closed and optional open lid designs for process flexibility
- Drain and exhaust ports located in the bottom of bowl
- Optional nitrogen purge for an inert spin environment

3.5 Utilities

- Voltage ranges: 100, 110-125, 208-240 VAC, 50/60 Hz
- Power requirements: 655 watts
- Drain port: ¾ in OD
- Exhaust port: 1 in OD
- Vacuum: 25 in Hg
- Exhaust: 50 cfm at 0.2 in water
- Nitrogen or CDA (for automated dispenses): 70 psi

3.6 Dimensions

- 13.25 in (33.65 cm) W × 19 in (48.26 cm) D × 12 in (30.48 cm) H
- Machine weight: 40 lb (18.14 kg)
- Shipping weight: 100 lb (45.36 kg)



4. Spin Coater Overview

4.1 Model and Revisions

The model and serial number information for the Cee[®] 200X spin coater is located on the rear panel near the power inlet. Software version information can be found on the main software screen. See section 5, Software, for screen shots and a detailed explanation of the system software.

4.2 System Specifications

Maximum spin speed	6,000 or 12,000 or 16,000 rpm (depending on option purchased)
Maximum ramp	30,000 rpm/s
Speed accuracy	< 0.2 rpm
Maximum substrate size accommodated by bowl	200 mm
Recipe storage	Virtually unlimited
Power	100-120 or 220 volts AC, single phase
Weight	40 lb

4.3 Safety Hazards/Precautions



Read this manual in its entirety before operating the machine.

4.3.1 Overview of Equipment-Specific Hazards

The unit is very heavy and proper precautions should be taken when handling the machine to minimize risk of injury. Labels are placed on the machine to identify areas where caution is needed during operation.

4.3.2 Electrical



General Hazard



Pinch Point Warning



Notes:



High voltage is present in the machine. Disconnect the power before servicing.



Stored electrical energy is present in the machine. Before servicing, allow sufficient time for discharge. The servo amp has a charge light; do not service the machine until this light has gone out.

4.3.3 Mechanical



General Hazard



Pinch Point Warning



Notes:



This machine uses compressed gases that can provide motive force to components and can expand violently upon decompression. Disconnect N₂ or clean dry air (CDA) before removing any panels.



This machine has components capable of very-high-speed rotation. Ensure all lids and panels are in place before activating the rotational features.



Ensure that all panels are on and in their correct locations before powering up or operating the machine.



When opening the lid, be aware of the pinch point at the hinge cover. Open the lid only by using the handle on the lid.



The unit is very heavy, and proper precautions should be taken when handling or moving the machine to minimize risk of injury.



Always wear the proper personal protective equipment (PPE) for the job, including safety glasses, gloves, and other equipment as needed to protect from mechanical and chemical hazards.

4.3.4 Chemical



Notes:



Ensure all chemicals and materials being used in the tool are chemically compatible with the systems they will come in contact with during use. Consider all wetted parts of the storage, supply, dispense, and waste systems.



Ensure the chemical compatibility of all chemicals with each other. All dispensed materials are held in one common waste storage tank. Before use, check for the potential for reactions between chemicals.



Flammable chemicals. No open flames/sparks.



Relieve pressure before opening canisters, tanks, cartridges, or syringes to refill.



Relieve pressure and shut off chemical valves before removing spin lid or changing backside rinse (BSR) tubes, edge bead removal (EBR) tubes, or any other dispense nozzle or spray tip.





Flush tubing and valves with an appropriate solvent and drain system before servicing.



When draining the waste tank, use appropriate containers and connection methods.



Ensure proper ventilation/exhaust is used at all times.



Always wear the proper personal protective equipment (PPE) for the job, including safety glasses, gloves, and other equipment as needed to protect from mechanical and chemical hazards.

4.3.5 Lockout/Tagout Procedures and Information

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

4.3.6 Intended Use of Machine

The Cee® 200X spin coater is intended for use in semiconductor or optical materials applications. It is primarily intended for substrates up to the maximum stated size.

The Cee® 200X spin coater is not intended for use in food or medical applications or in hazardous locations.

The Cee® 200X spin coater is intended for use only by properly trained personnel wearing the proper PPE. **Anyone who is not trained in the proper use of this equipment and who has not fully read this manual should not operate this equipment.**

The Cee® 200X spin coater is intended for use in a clean room environment to provide the proper processing conditions for the substrates. If it is used outside of a clean room environment, substrate cleanliness may be compromised.

The Cee® 200X spin coater is not intended for use in a hazardous or explosive environment.

4.4 Installation

4.4.1 Facilities Requirements

The Cee® 200X spin coater requires the following utilities for operation:

- Voltage: Single-phase 100-120 VAC at 10 amps
- Vacuum supply: 20 in Hg
- Nitrogen supply: 45-55 psi (auto dispense)
- Exhaust port: 1 in OD
- Drain port: 3/4 in OD



4.4.2 Environment

The Cee® 200X spin coater should be operated in a clean, low-humidity environment.

4.4.3 Unpacking and Inspection

Thoroughly check the equipment for shipping damage. **If physical damage is seen, DO NOT APPLY POWER!** Contact Brewer Science Equipment Customer Support immediately.

The following items should be included with the shipment:

- One (1) Cee® 200X spin coater unit
- One (1) power cord with female power connector
- One (1) anodized aluminum stylus
- One (1) operator/user manual

The following optional items may be included:

- Spin chuck with screws
- Dispense controllers
- Dispense valves
- Dispense nozzles
- Dispense hubs

4.4.4 System Installation and Setup

1. Lift the unit out of the packing crate by grasping the bottom only. **Do not** lift the unit by any of the top covers or protrusions. **Do not** roll or turn the unit on its side or ends.
2. Remove plastic wrap and packing foam.
3. Place the Cee® 200X spin coater on a table of proper height and strength so that the controls and spin chuck are at the proper ergonomic height.
4. Level the machine using the feet so that the spin chuck is level from front to back and side to side.
5. Thoroughly clean the spin bowl and spin chuck.
6. Connect vacuum, N₂, drain, and exhaust lines.
7. Plug in the machine.
8. Once the unit is plugged in, only the cooling fan should be powered, not the display.
9. Switch the ON/OFF power switch to ON.
10. The display should momentarily show a boot screen and then show the main screen. Please be patient to allow the booting process to complete.

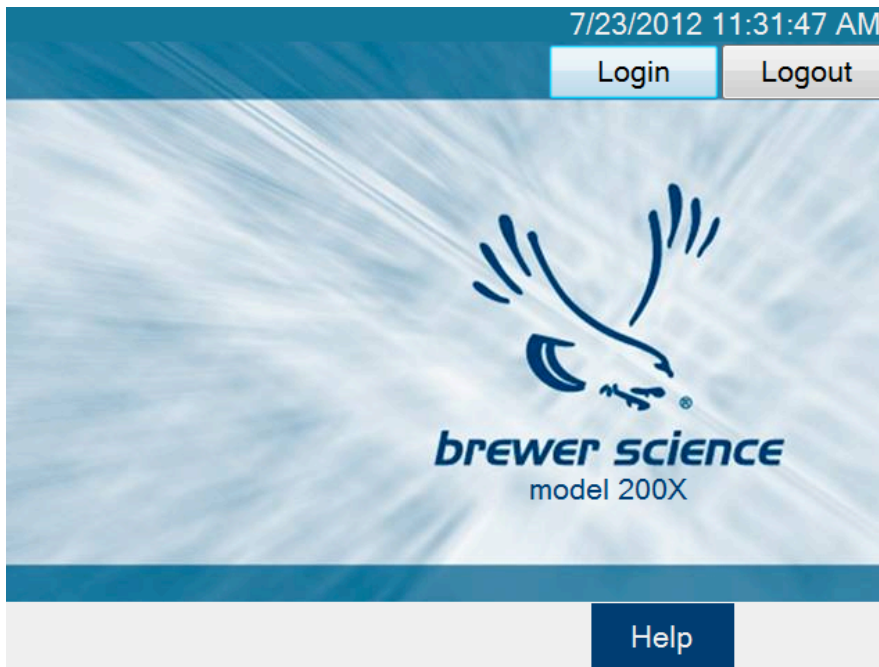


5. Software

5.1 Startup and Run Screen

5.1.1 Startup with Passwords Enabled

If the Cee® 200X unit has passwords enabled, the initial screen will be blank with login and logout buttons.



To log in, press the Login button, shown in the figure above, to view the touch screen keyboard, and then enter your password. By default, the passwords for a Cee® 200X tool are:

Super User Level: CEE

User Level: 200X

Maintenance: DIAG

5.1.2 Run Screen

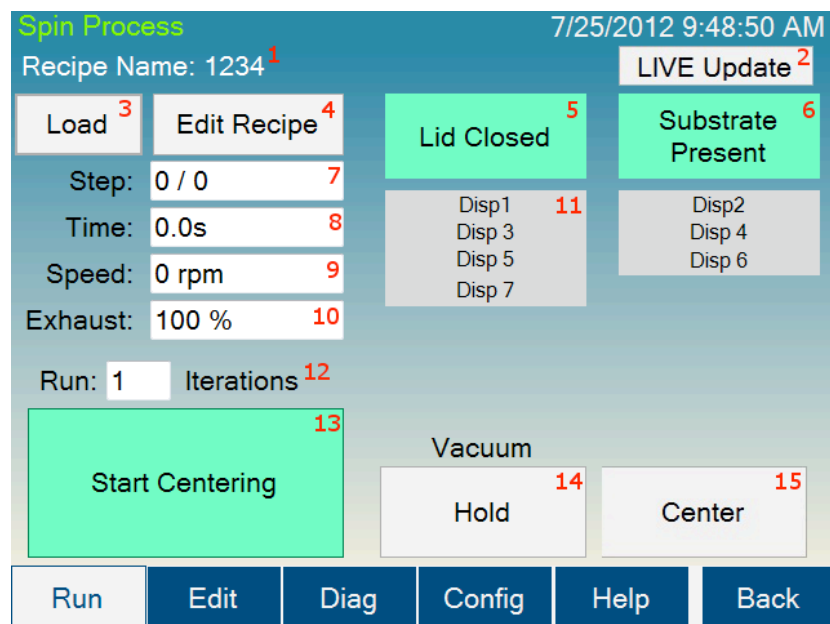
If login is successful, or if passwords are not enabled, the following Run screen should appear:



From this screen the user can go directly to the Spin Process screen by pressing the large button in the left-center of the screen. Navigating to other windows is also possible by using the navigation bar at the bottom of the screen.

5.2 Spin Process Screen

The Spin Process screen is used to run and monitor spin-coating processes using the Cee® 200X tool's software.



The controls and indicators found on the Spin Process screen are listed below:

1. **Recipe Name:** The name of the currently loaded recipe.
2. **LIVE Update button:** Allows the user to update the process that is currently running. This button is activated only during a running process. More information on LIVE Update is available in the LIVE Update section, section 5.7. LIVE Update is not available on all models.
3. **Load button:** Navigates to the recipe selection screen (section 5.2.1) to select the process settings.
4. **Edit Recipe button:** Navigates to the Spin Process editor if a recipe is loaded. If a recipe is not loaded, it will navigate to the recipe selection screen (section 5.2.1).
5. **Lid Closed indicator:** Shows the current state of the Lid Closed sensor.
6. **Substrate Present indicator:** Shows the state of the Spin Chuck Vacuum sensor.
7. **Step indicator:** Shows the current step of the process.
8. **Time indicator:** Shows the time remaining on the current process step.
9. **Speed indicator:** Shows the current speed of the spindle.

Spin Process 7/25/2012 9:48:50 AM

Recipe Name: 1234¹ LIVE Update²

Load ³	Edit Recipe ⁴	Lid Closed ⁵	Substrate Present ⁶
Step: 0 / 0 ⁷		Disp1 ¹¹	Disp2
Time: 0.0s ⁸		Disp 3	Disp 4
Speed: 0 rpm ⁹		Disp 5	Disp 6
Exhaust: 100 % ¹⁰		Disp 7	
Run: 1	Iterations ¹²		
Start Centering ¹³		Vacuum	
		Hold ¹⁴	Center ¹⁵

Run Edit Diag Config Help Back

10. **Exhaust indicator:** Shows the current setting of the programmable exhaust. (Programmable exhaust is not available on all models.)

11. **Dispense indicators:** Show which dispenses are currently activated.

12. **Iteration setting:** Allows the currently selected process to run consecutively for the entered number of times without stopping. (Iterative processing is not available on all models.)

13. **Process button:** The process button has four modes:

- Start Centering:** Starts the wafer spinning very slowly to check for centering on the spin chuck.
- Start Process:** Starts the selected process.
- Abort:** Aborts a currently running process.
- OK:** Turns off the Process Complete alarm.

14. **Vacuum Hold/Release button:** Allows the user to actuate the vacuum of the spin chuck as he/she centers the substrate.

15. **Center button:** This button will only appear if a non-zero time is set for the centering time on the Spin Configuration page. This button will re-run the centering process. This process can be run as many times as necessary until the Start Process (13) button (13) is pressed.

5.2.1 Running a Spin Process

Spin Process 7/25/2012 9:48:50 AM

Recipe Name: 1234 LIVE Update

Load

Edit Recipe

Step: 0 / 0

Time: 0.0s

Speed: 0 rpm

Exhaust: 100 %

Run: 1 Iterations

Start Centering

Lid Closed

Substrate Present

Disp1
Disp 3
Disp 5
Disp 7

Disp2
Disp 4
Disp 6

Vacuum

Hold

Center

Run

Edit

Diag

Config

Help

Back

To run a spin process with a substrate, a recipe must first be loaded. Pressing the Load button will bring up the recipe selection screen (see below). To select a recipe, double-press on the desired recipe or select the desired recipe and press Enter.

Filter: • Name • Date

folder1

folder2

production

1234

4321

ENTER

CANCEL

5.2.2 Centering a Substrate

The Cee® 200X tool has two methods of centering a substrate. The Centering Time parameter set on the User Spinner Configuration screen determines the method used.

User Spinner Configuration 7/25/2012 10:28:39 AM

Dispense Config			Config
Num	Name	Has Empty	
1	Disp1 ¹	None ²	Centering Speed: 60 ³ rpm
2	Disp2	None	Centering Time: 5 ⁴ sec
3	Disp 3	None	Idle Exhaust: 100 ⁵ %
4	Disp 4	None	<input checked="" type="checkbox"/> Enable Vacuum Chuck ⁶
5	Disp 5	None	<input checked="" type="checkbox"/> Enable Processing after Tank Empty Detected
6	Disp 6	None	<input checked="" type="checkbox"/> Enable Lid Open
7	Disp 7	None	

Revert ⁷ Save ⁸

Run Edit Diag Config Help Back

If the Centering Time (4) parameter is set to 0 seconds, pressing the Start Centering button will start the Spin Chuck spinning. The chuck will continue to spin as long as the lid is closed; if the lid is opened, the chuck will stop spinning. The lid can be lifted to adjust centering as many times as needed.

If the Centering Time (4) parameter is set to a non-zero value, pressing the Start Centering button will start the spin chuck spinning for the Centering Time value, regardless of the lid position (opened or closed). Once completed, pressing the Center button will restart the centering process.

5.2.3 Starting a Process

The screenshot shows the 'Spin Process' control interface. At the top, it displays 'Recipe Name: 1234' and a timestamp '7/25/2012 9:48:50 AM'. A 'LIVE Update' button is in the top right. Below the recipe name are two buttons: 'Load' and 'Edit Recipe'. The main control area includes a 'Step: 0 / 0' display, 'Time: 0.0s', 'Speed: 0 rpm', and 'Exhaust: 100 %'. A 'Run: 1 Iterations' field is present. A large green 'Start Process' button is prominent. To its right are 'Vacuum', 'Hold', and 'Center' buttons. Above the 'Start Process' button are two status indicators: 'Lid Closed' and 'Substrate Present'. Below these are two groups of display buttons: 'Disp1, Disp3, Disp5, Disp7' and 'Disp2, Disp4, Disp6'. At the bottom is a navigation bar with 'Run', 'Edit', 'Diag', 'Config', 'Help', and 'Back' buttons.

Once the substrate is on the spin chuck at a desired position, pressing the Start Process (Process) button will begin the process. For the duration of the process, the lid must remain closed.

5.2.4 Aborting a Process

This screenshot shows the same 'Spin Process' control interface as the previous one, but with the 'Start Process' button replaced by a red 'Abort' button. All other elements, including the recipe name, status indicators, and navigation bar, remain the same.

After a process has started, pressing the Abort button will abort the process. Aborting a process sets the substrate in a position that allows the user to safely recover the substrate.



5.2.5 Process Complete

The screenshot displays the 'Spin Process' control interface. At the top, it shows the date and time '7/25/2012 9:48:50 AM' and a 'LIVE Update' button. Below this, the 'Recipe Name: 1234' is displayed. The interface is divided into several sections: a left sidebar with 'Load' and 'Edit Recipe' buttons; a central area with 'Step: 0 / 0', 'Time: 0.0s', 'Speed: 0 rpm', and 'Exhaust: 100 %' fields; a 'Run: 1 Iterations' section; and a bottom navigation bar with 'Run', 'Edit', 'Diag', 'Config', 'Help', and 'Back' buttons. On the right side, there are two green status boxes labeled 'Lid Closed' and 'Substrate Present'. Below these are two grey boxes containing lists of display names: 'Disp1, Disp 3, Disp 5, Disp 7' and 'Disp2, Disp 4, Disp 6'. At the bottom right, there are three buttons: a large green 'OK' button, a 'Vacuum' button, and a 'Center' button.

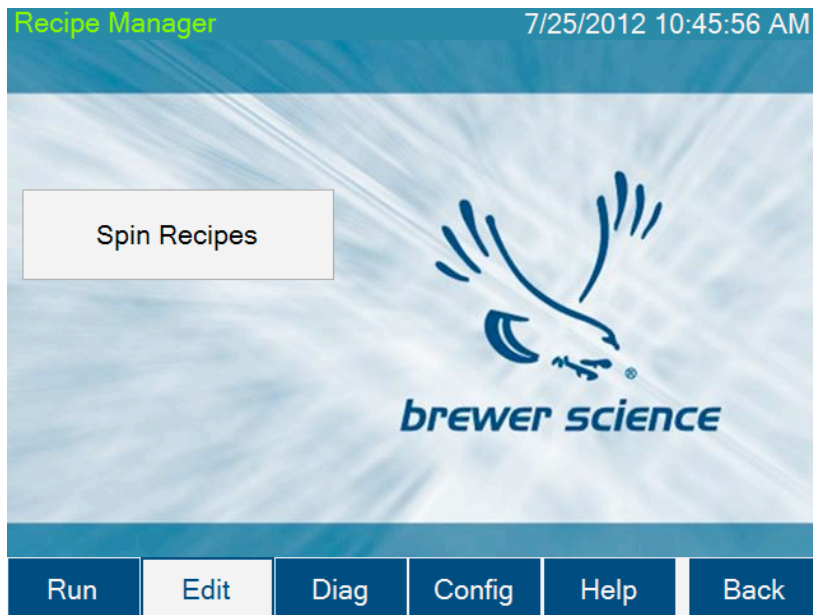
When a process is complete, the Cee® 200X tool will sound an alarm. Pressing the OK button will silence the alarm. The tool will then be ready to center another substrate.

5.2.6 Running Multiple Iterations

For models capable of iterative processing (iterative processing is not available on all models), it is possible to run a process multiple times consecutively. Entering a value greater than 1 in the Iterations field will cause the process to run the specified number of times. The tool will sound a slight alarm between runs, and the processes may be aborted in normal fashion.

5.3 Edit Screen

From the Edit screen below, the user can navigate to the Spin Recipe Edit screen by pressing the large button in the left-center of the screen.



5.3.1 Spin Recipe Edit Screen

The screen shown below allows spin recipes to be edited using the Cee[®] 200X tool's software.

Recipe Manager 7/25/2012 10:48:08 AM

Recipe Name: 1234

Step	Velocity (RPM)	Ramp (RPM/s)	Time (sec)	Dispenses	Exhaust (%)	Oscillation (sec)
1	1234	1000	30	none	100	0
2						
3						
4						
5						

Run Edit Diag Config Help Back

The controls and indicators found on the Spin Recipe Edit screen are listed below:



-
1. **Recipe Name:** The name of the currently loaded recipe.
 2. **Load button:** Opens the dialog to load a recipe into the editor.
 3. **Save button:** Opens the save dialog for saving the current recipe.
 4. **Delete button:** Opens the delete dialog for deleting recipes.
 5. **Velocity column:** Boxes where velocity (spin speed) values are entered (in rpm) for each step.
 6. **Ramp column:** Boxes where ramp acceleration values are entered (in rpm/s) for each step.
 7. **Time column:** Boxes where the length of each step is entered in seconds.
 8. **Dispenses column:** Boxes that allow the user to select which dispenses are active for each step.
 9. **Exhaust column:** Boxes where the exhaust setting (in a percentage) is selected for each step. (Programmable exhaust is not available on all models.)
 10. **Oscillation column:** Boxes where the time between oscillations (in seconds) is entered. (Oscillation mode is not available on all models.)
 11. **Insert button:** Inserts a blank step in front of the currently highlighted step.
 12. **Delete button:** Deletes the currently selected step.
 13. **Clear All button:** Clears all the data loaded in the editor.
 14. **Scroll Up button:** Steps the recipe up one step.
 15. **Scroll Down button:** Steps the recipe down one step.
 16. **Highlighted step:** The currently highlighted step is indicated with a darker gray color.



5.3.2 Writing a Spin Recipe

The Spin Recipe Edit screen, shown below, is where spin-coating recipes are entered.

Recipe Manager 7/25/2012 10:48:08 AM

RECIPE Recipe Name: 1234

Step	Velocity (RPM)	Ramp (RPM/s)	Time (sec)	Dispenses	Exhaust (%)	Oscillation (sec)
1	1234	1000	30	none	100	0
2						
3						
4						
5						

Buttons: Load..., Save..., Delete..., STEP, Insert, Delete, Clear All, Run, Edit, Diag, Config, Help, Back

5.3.3 Entering Data

By selecting the Velocity (5), Ramp (6), Time (7), Exhaust (9), or Oscillation (10) boxes, a numeric pad will appear.

Valid range: 0 to 12000

1234 X

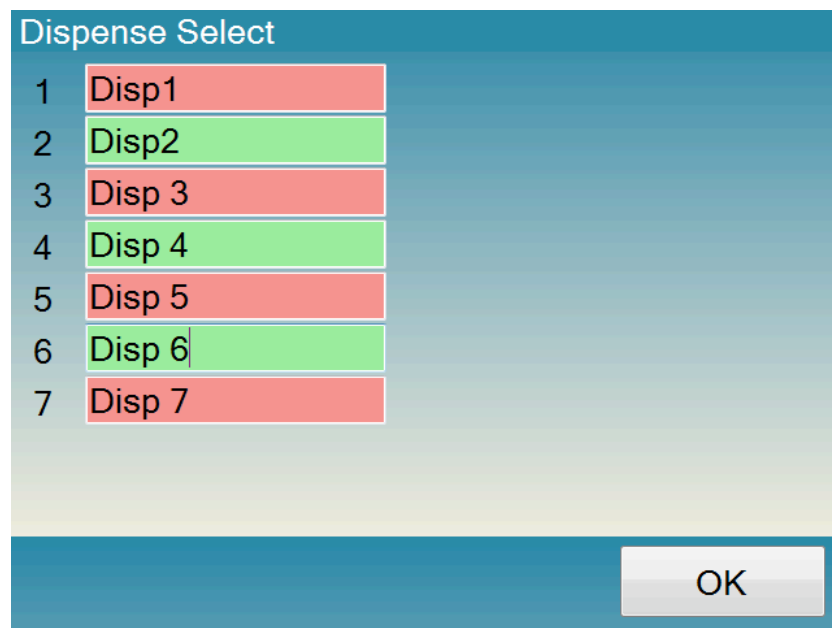
7	8	9	BACKSPACE
4	5	6	DELETE
1	2	3	ENTER
-	0	.	

Using the numeric pad, the user can now enter the parameter for the selected step. The number pad will indicate the valid range for the specific type of value at the top of the



window. Once the desired value is entered, pressing the ENTER key will close the numeric pad and return to the Spin Recipe Edit screen with the selected value updated.

By clicking on the Dispenses box (8, shown above), a Dispense Select screen will appear.

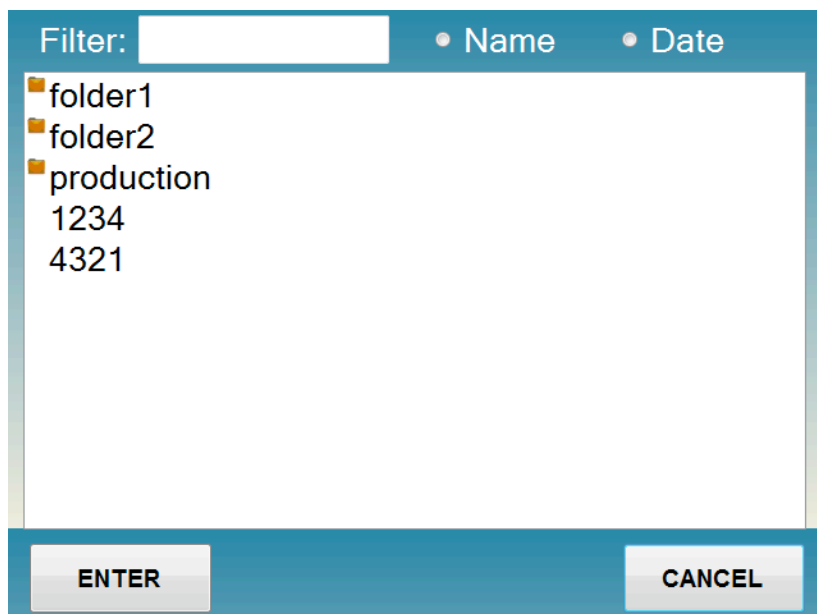


The Dispense Select screen will show all of the installed dispenses on the tool. The user selects which dispenses to turn on by pressing on the dispense name; pressing again will deselect the dispense. The dispense name can be configured on the User Spinner Configuration Screen. Dispenses that will be turned on during the step will be highlighted in green, and dispenses that will remain off will be highlighted in red. There is no limit to the number of dispenses enabled per step. Clicking OK will return to the Spin Recipe Edit screen, which will show the updated value in the Dispenses box.

Spin recipes have a limit of 100 steps. Steps that have values entered will be saved, and steps with no values will not be saved. If only part of the step data is entered, default values will be entered into the blank boxes. Recipes should be examined before running processes to ensure the default values are acceptable. If recipe data are entered in non-consecutive steps, values of all zeroes will be entered in steps between the steps containing data.

5.3.4 Recipe Management

Recipes are managed by the Load (2), Save (3), and Delete (3) buttons. To load a saved recipe, press the Load button, which will bring up the Recipe Select Screen.



The image shows a 'Recipe Select Screen' with a blue header. On the left, there is a 'Filter:' label followed by a white text input field. To the right of the input field are two radio buttons: 'Name' (which is selected) and 'Date'. Below the header is a white list box containing the following items: 'folder1', 'folder2', 'production', '1234', and '4321'. Each item is preceded by a small orange square icon. At the bottom of the screen are two buttons: 'ENTER' on the left and 'CANCEL' on the right.

The recipe can be loaded into the editor by pressing a recipe name and then pressing Enter, or by double-pressing a recipe name.

To delete a saved recipe, press the Delete button, which will also bring up the Spin Recipe screen. The recipe can be deleted by pressing a recipe name and then pressing enter, or by double-pressing a recipe name.

To save a recipe, press the Save button, which will bring up an on-screen keyboard (see below) for entering the recipe name. Enter the desired recipe name using the keyboard, and then press the Enter key, which will save the recipe with the desired name.



The image shows an on-screen keyboard interface. At the top is a text input field containing the text 'My Recipe'. To the right of the input field is a red square button with a white 'X'. Below the input field is a grid of keyboard keys. The first row contains keys for parentheses, ampersand, plus, minus, equals, comma, forward slash, left arrow, and right arrow. The second row contains keys for numbers 1 through 0, and a 'BACKSPACE' key. The third row contains keys for letters q through p, and a 'DELETE' key. The fourth row contains a 'CAPS' key, letters a through l, and a large green 'ENTER' key. The fifth row contains a 'SHIFT' key, letters z through m, a period/quote key, and a 'SPACE' key.

5.3.5 Recipe Backup

Recipes are saved in comma separated value (.csv) format. The Cee® 200X tool uses a Windows® operating system. The thermal recipes are saved in the **c:\Cee\Spin** folder in the Windows® file system. To back up recipes, copy recipe files to a storage device via the front USB port. Alternatively, files can be transferred via the Ethernet port on the back of the tool. By default the Cee® 200X tool is set up as IP address 192.168.1.1, and the spin recipe folder is shared as Spin as a network store.

5.3.6 Desktop Recipe Editing

Because the recipes are stored in .csv format, they are easily editable on a PC. Each step is stored as a line of data that looks like this:

Velocity,Ramp,Time,Dispenses,EX,Exhaust,Oscillation,EX,EX,EX,EX,EX

For example:

1000,3000,100,1.2.3,0,100,50,0,0,0,0

where

Velocity is 1000 rpm,

Ramp acceleration is 3000 rpm/s

Time is 10 seconds (tenths are stored in the last place)

Dispenses 1, 2, and 3 are enabled

[EXTRA value]

Exhaust is 100%

Oscillation Time is 5 seconds (tenths are stored in the last place)

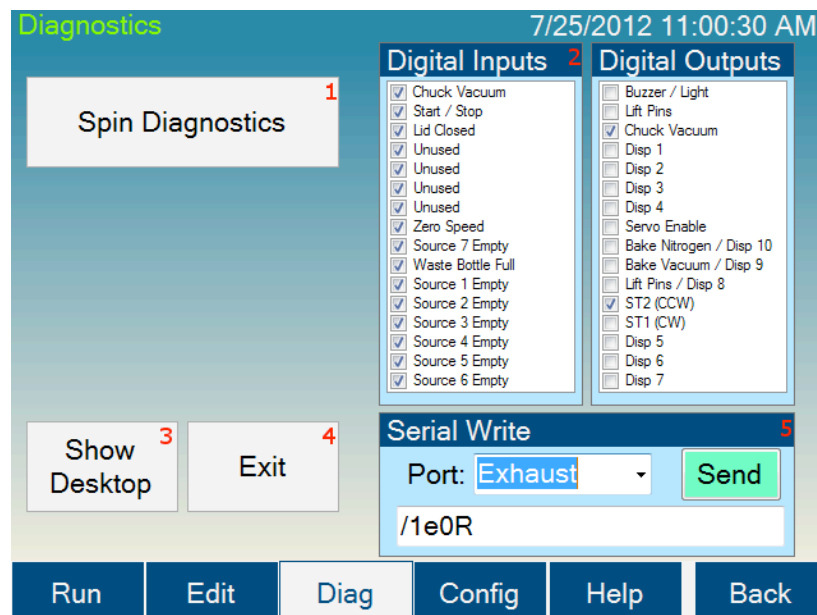
[5 EXTRA values].

The files will auto-load into Microsoft® Excel® or OpenOffice.org Calc.



5.4 Diagnostics Screen

The Diagnostics screen allows manual operation of most of the hardware on the Cee® 200X tool.

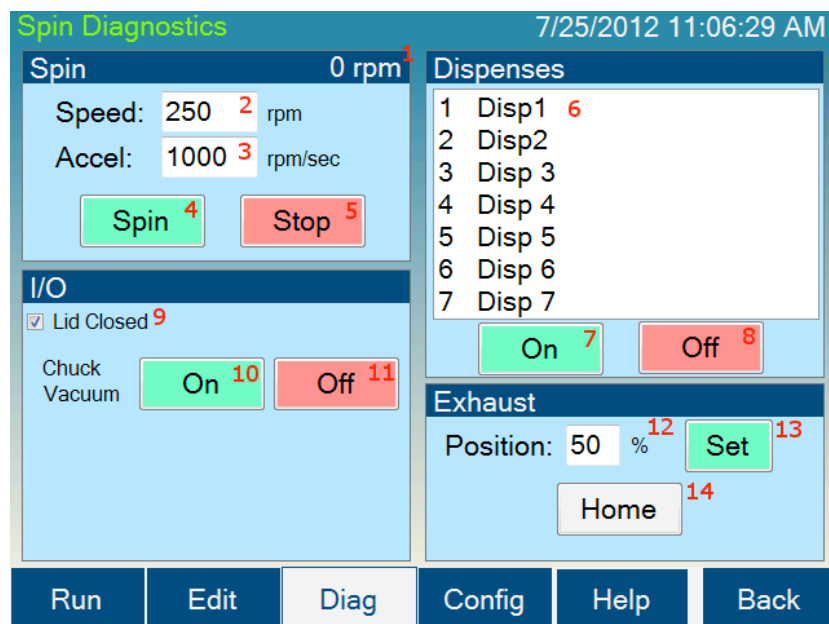


The controls and indicators found on the Diagnostics screen are listed below:

1. **Spin Diagnostics button:** Navigates to the Spin Diagnostics screen.
2. **Digital Inputs, Digital Outputs:** Panels showing the current state for all of the digital inputs/outputs (I/O) for the entire system.
3. **Show Desktop button:** Minimizes the Cee® 200X tool control software, which allows display of the Windows® desktop.
4. **Exit button:** Exits the Cee® 200X tool software.
5. **Serial Write section:** Allows for hardware writes to the serial ports of the Cee® 200X tool control system. **This box is intended for use by Brewer Science personnel only.**

5.4.1 Spin Diagnostics Screen

The Spin Diagnostics screen allows manual operation of most of the hardware on the Cee® 200X tool.



The controls and indicators found on the Spin Diagnostics screen are listed below:

1. **Spin speed (velocity) display:** Displays the current spin chuck speed (velocity).
2. **Speed box:** By pressing in this box, a numeric pad will appear to allow entry of the desired spin speed.
3. **Accel box:** By pressing in this box, a numeric pad will appear to allow entry of the desired ramp acceleration.
4. **Spin button:** Starts the spindle spinning using the entered velocity and acceleration.
5. **Stop button:** Stops the spindle.
6. **Dispense selector:** Pressing the desired dispense name will select and highlight it.
7. **Dispense On button:** Turns on the selected dispense.
8. **Dispense Off button:** Turns off the selected dispense.
9. **Lid Closed check box:** Displays the status of the lid closed sensor.
10. **Chuck Vacuum On button:** Turns on vacuum at the spin chuck.
11. **Chuck Vacuum Off button:** Turns off vacuum at the spin chuck.



Spin Diagnostics

7/25/2012 11:06:29 AM

Spin

0 rpm¹

Speed: 250² rpm

Accel: 1000³ rpm/sec

Spin⁴

Stop⁵

I/O

☒ Lid Closed⁹

Chuck Vacuum

On¹⁰

Off¹¹

Dispenses

1 Disp1⁶

2 Disp2

3 Disp 3

4 Disp 4

5 Disp 5

6 Disp 6

7 Disp 7

On⁷

Off⁸

Exhaust

Position: 50¹² %

Set¹³

Home¹⁴

Run

Edit

Diag

Config

Help

Back

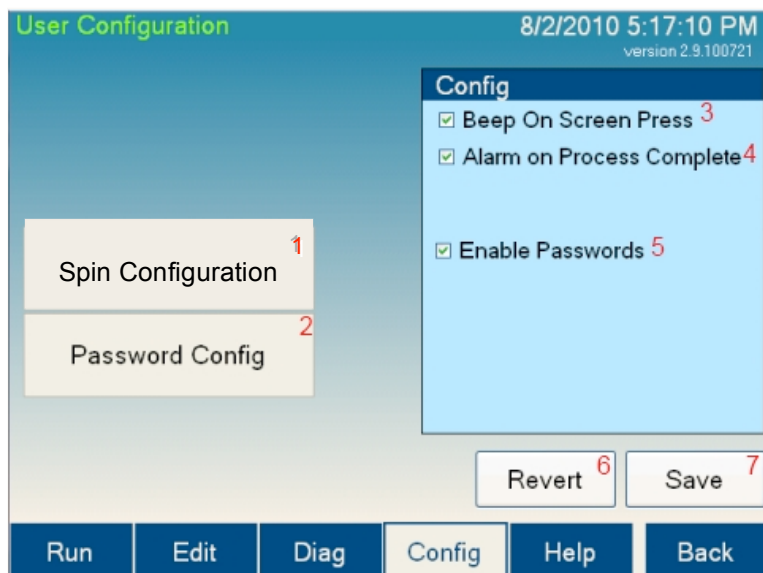
12. Exhaust Position: Pressing in this box brings up a numeric pad for entry of a desired exhaust position. (Exhaust is not available on all models.)

13. Exhaust Set button: Sets exhaust to the entered position. (Exhaust is not available on all models.)

14. Exhaust Home button: Causes the exhaust to re-initialize to its home sensor. (Exhaust is not available on all models.)

5.5 User Configuration Screen

The User Configuration screen allows the user to set parameters for the Cee® 200X tool operation. Not all parameters are available to all user levels.



The controls and indicators found on the User Configuration screen are listed below:

- 1. Spin Configuration button:** Navigates to the Spin Configuration Screen.
- 2. Password Configuration button:** Navigates to the Password Configuration Screen.
- 3. Beep On Screen Press:** If this setting is checked, the screen will sound a slight beep whenever a control is pressed. This feature is designed to give feedback while using the Cee® 200X tool.
- 4. Alarm on Process Complete:** If this setting is checked, the tool will sound an alarm when a process is completed.
- 5. Enable Passwords:** If this setting is checked, the tool will require a password to start. Using passwords also allows different users of different levels to access limited portions of the Cee® 200X tool's software. If passwords are not enabled, the Cee® 200X tool automatically logs in as a Super User. For information on logging in to the Cee® 200X tool's software, see the Run screen.
- 6. Revert button:** If changes made to the settings on this screen are not desired, pressing this button will revert back to saved settings.
- 7. Save button:** Saves all parameters on the screen.

5.5.1 User Spinner Configuration Screen

The User Spinner Configuration Screen allows the user to set parameters for the Cee® 200X tool's spin module operation. Not all parameters are available to all user levels.

Num	Name	Has Empty
1	Disp1	None
2	Disp2	None
3	Disp 3	None
4	Disp 4	None
5	Disp 5	None
6	Disp 6	None
7	Disp 7	None

Config

Centering Speed: 60 rpm

Centering Time: 5 sec

Idle Exhaust: 100%

☒ Enable Vacuum Chuck

☒ Enable Processing after Tank Empty Detected

☒ Enable Lid Open

Revert Save

Run Edit Diag Config Help Back

The controls and indicators found on the User Spinner Configuration screen are listed below:

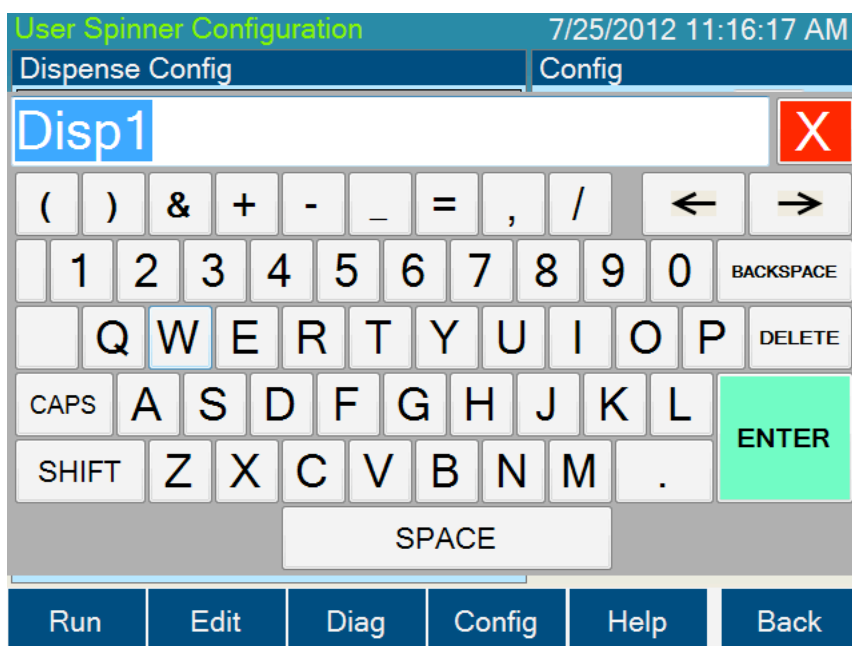
- Dispense Name column:** Allows the user to label each dispense with a unique name to identify the material dispensed.
- Has Empty column:** Allows the user to specify which empty sensor is connected to which dispense. Usually this feature is configured before the tool leaves the factory and needs no adjustment.
- Centering Speed:** Clicking in this box brings up a numeric pad to allow entry of the desired speed for centering.
- Centering Time:** Clicking in this box brings up a numeric pad to allow entry of the desired time for the the substrate to spin during the centering process. For more information on how this parameter affects operation, go to Centering a Substrate.
- Idle Exhaust:** Clicking in this box brings up a numeric pad to allow entry of the Idle Exhaust parameter, which is the position that the exhaust will go to after a spin process is complete. (Programmable exhaust is not available on all models.)
- Enable Vacuum Chuck:** If this setting is NOT checked, the Cee® 200X spin coater will run processes WITHOUT the vacuum sensor being activated.

7. Revert button: If changes made to the settings on this screen are not desired, pressing this button will revert back to saved settings.

8. Save button: Pressing this button will save all parameters on the screen.

5.5.2 Naming Dispenses on the User Spinner Configuration Screen

The dispenses may be named to reflect the material in each dispense. This name is then displayed on the Spin Diagnostics screen and the Dispense Select screen used while writing a recipe. To name a dispense, press the desired dispense in the dispense Name column.



Pressing the dispense step in the Name column will bring up an on-screen keyboard for name entry. Once the desired name is entered, press ENTER to close the keyboard and store the name in the dispense Name column. To save the new name, press the Save button (8). To undo the name change, press the Revert button (7).

5.5.3 Selecting Empty Sensors on the User Spinner Configuration Screen

A sensor may be used to indicate when dispense material has run out. The sensor number tied to each dispense is displayed on the Spin Configuration screen. These configurations are usually set at the factory and need no adjustment. However, if the material containers need to be switched or you no longer wish to use a sensor for a dispense, the empty sensors can be set here. Simply press the desired dispense location in the Has Empty column. A dropdown box will show the available sensors and a None setting. Select the new sensor that you want to use. To save the new empty sensor setting, press the Save button (8). To undo the change, press the Revert button (7).

User Spinner Configuration
7/25/2012 10:28:39 AM

Dispense Config			Config
Num	Name	Has Empty	Centering Speed: 60 ³ rpm
1	Disp1 ¹	None ²	Centering Time: 5 ⁴ sec
2	Disp2	None	Idle Exhaust: 100 ⁵ %
3	Disp 3	None	<input checked="" type="checkbox"/> Enable Vacuum Chuck ⁶
4	Disp 4	None	<input checked="" type="checkbox"/> Enable Processing after Tank Empty Detected
5	Disp 5	None	<input checked="" type="checkbox"/> Enable Lid Open
6	Disp 6	None	
7	Disp 7	None	
			<div style="display: flex; justify-content: space-around;"> Revert⁷ Save⁸ </div>

Run
Edit
Diag
Config
Help
Back

5.5.4 Password Configuration Screen

The Password Configuration screen allows the user to change passwords.

Password Configuration
7/25/2012 11:18:37 AM

User Level	New Password	Confirm New Password	
Super User	<input type="text"/>	<input type="text"/>	Update
Maintenance	<input type="text"/>	<input type="text"/>	Update
User / Recipe Editor	<input type="text"/>	<input type="text"/>	Update
User	<input type="text"/>	<input type="text"/>	Update

Run
Edit
Diag
Config
Help
Back

The default passwords for the Cee[®] 200X tool are:

Super User Level: CEE
User Level: 200X
Maintenance: DIAG

To change a password, press the New Password box for the desired user level, and an on-screen keyboard will appear which allows the user to enter a new password. The on-screen keyboard will not display the password. Retype the new password in the Confirm



New Password box. To save, press Update. If the entries in the New Password box and the Confirm New Password box match, the new password will be stored.

5.5.5 User Level Access

The level of access given to each different user level is:

Super User Level: Everything

User Level: Run screen

Maintenance: Run screen, Diagnostics screen, Configuration screen

By de-selecting the Enable Passwords option on the User Configuration screen, the Cee® 200X tool's software will automatically log in at the Super User level.



5.6 Navigation Bar

The navigation bar enables quick navigation of the Cee[®] 200X tool's software. The currently selected page is highlighted in white. The buttons on the navigation bar are listed below:



Run button: Navigates to the Run screen, which is where processes are run and monitored on the Cee[®] 200X tool.

Edit button: Navigates to the Edit screen, which is where processes are created, edited, and deleted on the Cee[®] 200X tool.

Diag button: Navigates to the Diagnostics screen. From here, the Cee[®] 200X tool can be operated manually, allowing maintenance and diagnostics to be performed.

Config button: Navigates to the Configuration screen. All the user-configurable settings for the Cee[®] 200X tool can be viewed or edited here.

Help button: Navigates to the Help page, which contains the User Manual.

Back button: Returns to the previous screen.

5.7 LIVE Update Feature

The LIVE Update feature of the X model software allows the user to update a recipe while it is running. The LIVE Update feature is not available on all models.

The screenshot shows the 'Spin Process' window with the title bar '7/25/2012 9:48:50 AM'. The 'Recipe Name' is '1234'. A red box highlights the 'LIVE Update' button in the top right corner. The interface includes several status indicators: 'Lid Closed' and 'Substrate Present' in green boxes, and 'Disp1', 'Disp3', 'Disp5', 'Disp7' in a grey box, and 'Disp2', 'Disp4', 'Disp6' in another grey box. The 'Run' button is highlighted in blue. The 'Edit Recipe' button is also visible. The 'Start Centering' button is in a green box. The 'Vacuum' section has 'Hold' and 'Center' buttons. The bottom navigation bar includes 'Run', 'Edit', 'Diag', 'Config', 'Help', and 'Back' buttons.

Spin Process 7/25/2012 9:48:50 AM

Recipe Name: 1234

LIVE Update

Load Edit Recipe

Step: 0 / 0

Time: 0.0s

Speed: 0 rpm

Exhaust: 100 %

Run: 1 Iterations

Start Centering

Vacuum

Hold Center

Run Edit Diag Config Help Back

The LIVE Update button appears once a process has started. Pressing the button will bring up a special Spin Recipe Editor page.

The screenshot shows the 'Spin Process - Running Step: 1' window with the title bar '2/25/2010 1:40:59 PM'. The 'Recipe Name' is 'My Recipe'. The interface includes a table with columns: Step, Velocity (RPM), Ramp (RPM/s), Time (sec), Dispenses, Exhaust (%), and Oscillation (sec). The table contains 5 steps. The 'Update' button is highlighted in blue. The 'Update and Save' button is also visible. The 'Save...' button is in a grey box. The 'STEP' section has 'Insert', 'Delete', and 'Clear All' buttons. The bottom navigation bar includes 'Run', 'Edit', 'Diag', 'Config', 'Help', and 'Back' buttons.

Spin Process - Running Step: 1 2/25/2010 1:40:59 PM

Recipe Name: My Recipe

Update

Update and Save

Save...

STEP

Insert

Delete

Clear All

Step	Velocity (RPM)	Ramp (RPM/s)	Time (sec)	Dispenses	Exhaust (%)	Oscillation (sec)
1	1000	3000	30	none	100	0
2	2000	3000	30	none	100	0
3	3000	3000	30	none	100	0
4	4000	3000	30	none	100	0
5	5000	3000	30	none	100	0

Run Edit Diag Config Help Back

The editor will load with the currently running recipe. This editor will function just as the normal process editor functions. The user can edit current steps, add steps, and delete steps.

Some buttons have different functions in LIVE Update mode:

Update button: This button loads the recipe currently in the editor into the spinner module **but does not** save it to the hard drive.

Update and Save button: This button loads the recipe currently in the editor to the spinner module **and** saves it to the hard drive.

Save button: This button saves the recipe currently loaded in the editor to the hard drive **but does not** affect the process currently running.

Cancel button: The X button in the upper right corner of the editor returns back the process page without making changes.

5.7.1 Limitations of LIVE Update

Changes made to the recipe will not be reflected in the process module until the next step starts on the process module.

Deleting a step that has already started will result in a step being skipped.

Inserting a step before the current step being processed will result in a step being repeated.

The Update and Save as well as Save functions do not give an option of saving to another name. LIVE Update is intended only for use on the recipe currently in process.

6. Service and Maintenance

6.1 Maintaining the Vacuum Liquid Trap

The Cee® 200X tool is relatively maintenance free. The only component that requires regular attention is the vacuum liquid trap. Its purpose is to trap any liquids that go down the spindle vacuum hole and prevent them from contaminating downstream components. To avoid getting any liquids down the spindle vacuum hole, **do not** spray any cleaners or solvents directly on the center of the spin chuck and **do not** dispense materials without a substrate on the spin chuck. However, because materials may inadvertently travel down the spindle vacuum hole, the trap must be emptied on occasion. Follow the steps below to empty the vacuum liquid trap:

1. Turn off the machine by pressing the ON/OFF power switch.
2. Disconnect the power by removing the plug from the rear of the machine. Use appropriate Lockout/Tagout procedures.
3. Shut off the vacuum supply at the facility supply port.
4. Remove the rear sheet metal cover from the machine; remove any dispense tubes or valves, as needed.
5. Inside the tool, mounted on the large aluminum block, is the vacuum liquid trap. It is a translucent white canister with a conical lid. Remove the vacuum liquid trap from the clips that attach it to the block.
6. Unscrew the canister from the lid, taking care not to spill any liquid into the machine.
7. Dispose of the liquid and any solids that have accumulated in the vacuum liquid trap. Follow all hazardous waste disposal procedures, as necessary.
8. Clean the canister and the metal wool inside it with an appropriate solvent. Again, dispose of the solvent by following all necessary hazardous waste disposal procedures.
9. Screw the canister back onto the lid. The tube protruding down from the lid should be pushed through the metal wool.
10. Snap the vacuum liquid trap back onto the clips. Ensure that no tubes are kinked.
11. Replace the rear sheet metal cover; in the process, replace any dispense tubes or valves that were removed.
12. Reconnect the power cord.
13. Turn on the machine by pressing the ON/OFF power switch.
14. The Cee® 200X tool is now ready to use.

6.2 Spin Chuck Replacement

The Cee® 200X tool is capable of processing many different sizes of substrates. Changing spin chucks may be necessary to run different sizes of substrates, depending on the spin chuck design. Follow the steps below to change a spin chuck:

1. Open the spin bowl lid and leave it open.
2. Turn off the machine by pressing the ON/OFF power switch.
3. Disconnect power by removing the plug from the rear of the machine. Use



appropriate Lockout/Tagout procedures.

4. Shut off the vacuum supply at the facility's supply port.
5. Hold the existing spin chuck in one hand and remove the #8 FHCS vented spin chuck screw in the center of the spin chuck using a $\frac{3}{32}$ hex wrench.
6. Pull the spin chuck straight up. It should lift directly off the spindle. If the chuck is stuck, wiggle it slightly to free it.
7. If the spin chuck was stuck, clean any residue that remains on the spindle or the bore of the spin chuck. Inspect the spindle and check for any damage.
8. Place the new spin chuck on the spindle. Note that the spin chuck has a notch in which the drive pin on the spindle fits. When placing the spin chuck on the spindle, align this notch with the drive pin, and push the spin chuck all the way down so that the pin is in the notch.
9. Replace the vented spin chuck screw, and tighten it using the hex wrench.

Spin the spin chuck by hand to verify that it does not wobble. If it does, loosen the screw and reposition the spin chuck. Retighten the screw and spin the chuck by hand to verify that it does not wobble.

6.3 Troubleshooting Chart

The following chart provides alarm messages that may appear on the touch screen and ways to resolve the indicated problems. The chart also provides other conditions that may cause problems as well as potential solutions.

Alarm or Indication	Potential Problem	Resolution
System dead, no display on touch screen	<ul style="list-style-type: none">• Blown fuses• Machine not plugged in/power not connected	<ul style="list-style-type: none">• Replace fuse• Plug in machine/connect power
Spin vacuum error	<ul style="list-style-type: none">• Vacuum lost during spin process• Spindle vacuum seal worn out	<ul style="list-style-type: none">• Check utility connections,• Verify incoming vacuum is more than 25 in Hg• Call Customer Support
Lid close error	<ul style="list-style-type: none">• Lid not closed fully• Lid opened during spin process	<ul style="list-style-type: none">• Close lid before spinning substrate
Process runs without speed change	<ul style="list-style-type: none">• Servo motion error	<ul style="list-style-type: none">• Cycle power on machine. If this error reoccurs, change speed or acceleration parameters and try again.• Call Customer Support
Grinding sound	<ul style="list-style-type: none">• Bearings going bad	<ul style="list-style-type: none">• Call Customer Support
Vibration	<ul style="list-style-type: none">• Loose belt or mechanical damage	<ul style="list-style-type: none">• Call Customer Support
Oscillation	<ul style="list-style-type: none">• Loose belt	<ul style="list-style-type: none">• Call Customer Support

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