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Owner's Manual

Cee® Apogee Dispenses



Cee
Cost Effective Equipment

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1. **Cee® Dispenses Introduction**

1.1. **Confidentiality Statement**

Information supplied is for the 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:

- (a) Any failure is due to the misuse, neglect, 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 Cee. Representatives of Buyer will be authorized to make repairs to the equipment without voiding warranty, on completion of the Cee training program.
- (c) Replacement parts are used other than those made or recommended by Cee.

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

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

1.3. **Returned Materials**

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

To obtain a RMA number, contact:

Cee Customer Support
Telephone: (573) 466-4300
E-Mail: support@costeffectiveequipment.com

Web Address: <http://www.costeffectiveequipment.com>


1.4. Safety Hazards/Precautions


 Read this manual in its entirety before operating the machine.


1.5. Overview of Equipment-Specific Hazards


The unit may be 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.


1.6. Mechanical

 This machine uses compressed gasses, which can provide motive force for components and can expand violently upon decompression. Disconnect N2 or CDA before removing any panels.


 When opening the lid be aware of any pinch points. Open the lid only by using the handle on the lid.


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

 Do not shake the vessel or and keep vessel upright at all times.

 Do not apply excessive heat to any pressure vessels.


1.7. Chemical


 Ensure chemical compatibility of all chemicals and materials being used inside the machine. This includes all wetted parts of the storage, supply, dispense, and waste systems.


 Ensure chemical compatibility of all chemicals with each other. All dispensed materials are held in one common waste storage tank. Check for reactions between chemicals before use.

 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 servicing supply lines, dispense valves or other components.

 Relieve pressure and shut off chemical valves before removing spin lid or changing BSR tubes, 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 waste tank, use appropriate containers and connection methods.

 Ensure proper ventilation/exhaust is used at all times.



Always wear the proper Personal Protective Equipment for the job. This includes safety glasses, gloves and other equipment as needed to protect from mechanical and chemical hazards.

1.8. 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.

1.9. Intended Use of Machine

The Cee® Dispenses are intended for use as a Semiconductor/Optical application spin coating machine.

The Cee® Dispenses are not intended for use in food or medical applications or for use in hazardous locations.

The Cee® Dispense are intended for use only by properly trained personnel wearing the proper personal protective equipment. Anyone not trained in the proper use of the Cee® Dispenses and have not fully read this manual should not operate the equipment.

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

The Cee® Dispenses are not intended for use in a hazardous or explosive environment.

2. Equipment Description

Automated dispense options, which are available on all Cee® Spin Coater and Developer tools, are a powerful and affordable way to bring a level of dispense control and automation to your benchtop process usually reserved for a production track or other high-volume production equipment.

Our automated dispense systems are exceptionally versatile and highly customizable with a wide range of configurable elements such as source vessels, level sensors, tubing diameters, tips and other accessories. For ease of use, these systems are fully integrated with the control software running on Cee® tools including Datastream™, which is standard on all Apogee™ spin coaters and developers.

Whether you need wide-angle spraying coverage for a cleaning or developing process, pinpoint material placement with industry-leading shot-to-shot dispense uniformity, or anything in between, an automated dispense system from Cee® can be designed and configured to meet your needs.

Additionally, when it comes to consumable and replacement parts, look no farther than Cee® for all your replacement and support part needs. We maintain a fully stocked warehouse of consumables such as high purity Teflon tubing and fittings guaranteed to keep your automated dispense system clean, particle-free, and working at peak performance.

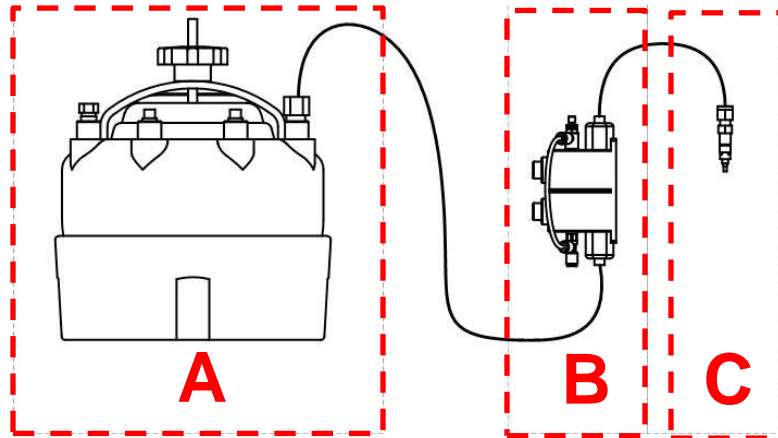
2.1. Utilities

- Nitrogen or CDA to Dispense Control Box (for automated dispense): 70 psi
- Regulated pressures from Dispense Control Box): <29 psi unless otherwise noted
- Dispense triggers (from spin coater or developer): 24 Volts
- House source material (optional): < 30 psi fluid pressure

2.2. Dispensing Operation

Cee® Automated Dispenses work in conjunction with Cee® Spin Coater and Developer software. You can find how to trigger dispenses from the equipment in the software portion of the equipment manual.

The Automated Dispense setup typically includes three basic components: a pressure vessel, a valve, and a dispense tip as shown in the figure below.



A: The pressure vessel holds the dispense material as well as pressurizes the fluid. The fluid pressure is controlled by the Dispense Control Box, which is covered in the next section.

B: The valve controls the flow of the pressurized fluid. When the valve is triggered, the diaphragm opens allowing the material to flow. Once the trigger is turned off, the valve closes and shuts the material flow off.

C: The dispense tip deposits the fluid onto the substrate. Cee® offers a variety of different dispense tips including backside rinse nozzles (BSR), edge bead removal nozzles (EBR), straight tips for puddle dispenses, and spray tips.

2.3. Dispensing Optimization

When setting up automated pressurized dispense systems such as cartridges, BSR (Backside Rinse), EBR (Edge-Bead Removal), and spray systems, it's important to understand what variables are used to determine overall dispense volume, rate, and suck back control. There are three main variables that affect the dispense volume. The first is the pressure regulated from the dispense control box to the chemical reservoir. The second is the amount of time you program in software for the dispense step. Finally, the third is the tubing diameter and tip size that is used on the dispense nozzle output. The first parameter is set at the control box for any given dispense. You can choose from 1-150 psi **(the pressure must be < 30 psi for standard material and valves)**. Typically for low viscosity solutions users will adjust their pressure between 5-10 psi. If using high viscosity materials, your pressure may need to be more than 20 psi. The critical part of the pressure is you want a constant stream of material with no splattering or surging out of the dispense tip.

The next parameter to be decided is the tip size, each dispense system is sent with a dispense tip kit with several sizes and materials to use. First, pick a tip material that is compatible with your desired chemical and then determine output diameter. Again, for thinner materials a smaller diameter, (18-22ga) should be used and for thicker materials larger tips (14-18ga) should be utilized. Critical areas of this selection, are good suck back after a dispense step and steady stream as mentioned earlier.

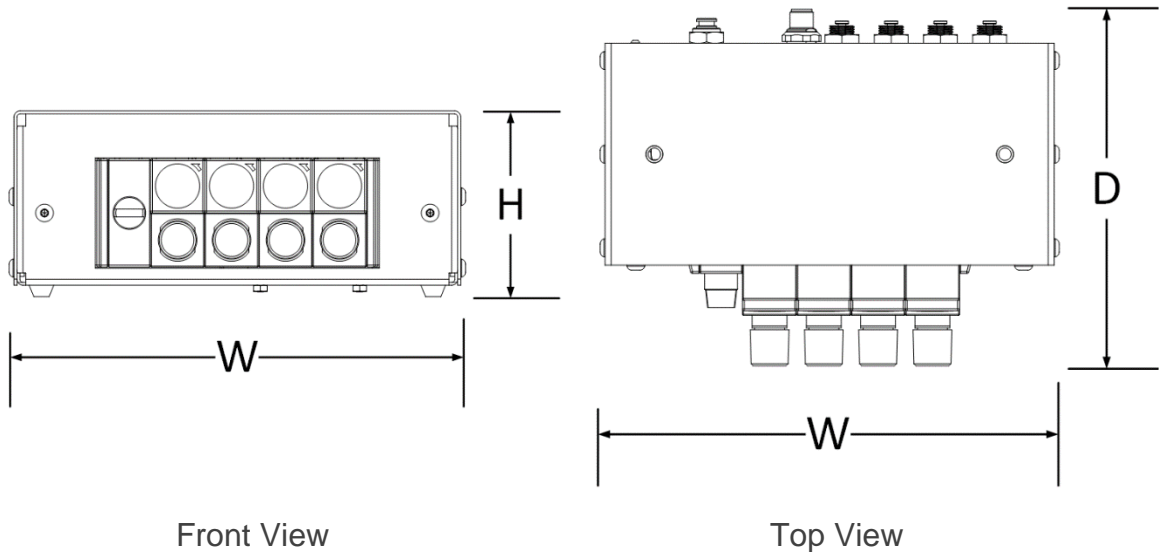
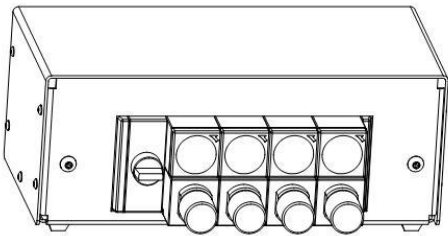
The final variable in this equation is the dispense time. This is set-up in software, at the beginning of each spin dispense step. The first selection in each step is Dispense #, if you want to dispense for that particular step, pick the correlating nozzle of your preferred dispense option. The corresponding time inserted for this recipe step will control the duration of the material flow. If wanting to perform a static dispense step, set the speed at "0 rpm" for the duration of the dispense step. Inversely if you prefer a dynamic dispense, the speed will normally be control to 50-200 rpm's. The Manual Control menu can be used to optimize the dispense pressure and time to achieve the targeted dispense volume to be deposited on the wafer. If the dispense volume is not sufficient, increase the dispense step time and if there is excess, simply decrease the time.



*Cee Pressure can dispense with multi-dispense control box

3. Dispense Control Box

The dispense control box is used to regulate the fluid pressure in a pressurized material vessel and to convert the electrical dispense signal from the Cee® equipment to a pneumatic trigger for the dispense valve. The dispense control box is required for any pressurized dispense on Cee® equipment and each dispense control box can support up to 4 dispenses. On the rear of the box, there are connections for the optional source empty sensors as well as optional waste bottle sensors.



Height (H)	Depth (D)	Width (W)
4 in (10.2 cm)	7.75 in (19.7 cm)*	9.5 in (24.1 cm)

*Add at least 6 in (15.24 cm) to the depth for tubing and connectors

Unpacking and Assembly

The dispense unit requires minimal assembly before operation. See the dispense setup diagrams for your tool and dispenses located on the USB provided with the tool. The following items should be included with the shipment for each pressure canister shipment.

- (1) Dispense control box
- (1) 6ft, 12-Pin dispense cable
- (1) 6 ft of green 1/8” urethane tubing w/ sleeve valve

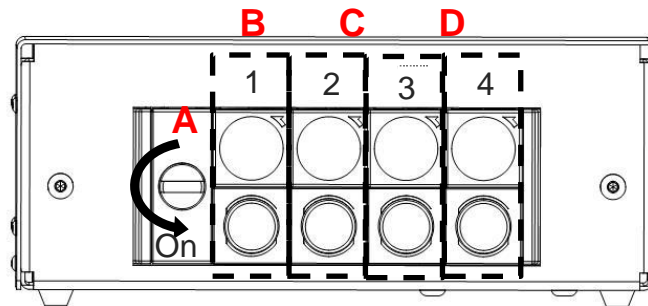
Additional items for dispenses were covered previously in Dispense Types

3.1. Dispense Control Box Installation and Setup

For technical drawings, please refer to the Dispense Setup Diagram located on the USB provided with the tool.

1. Locate the control box and the cable assembly from the packing crate. Attach one end of the cable assembly to the dispense control box and the other end to the corresponding dispense connector on the back of the machine. This connection is shown in the Dispense Setup Diagram.
2. Locate the 1/4" clear urethane tube attached to the control box. Attach the 1/4" clear urethane tube to the facility's nitrogen supply. This nitrogen supply should be **regulated to 70 psi**.

3.2. Dispense Control Box Use



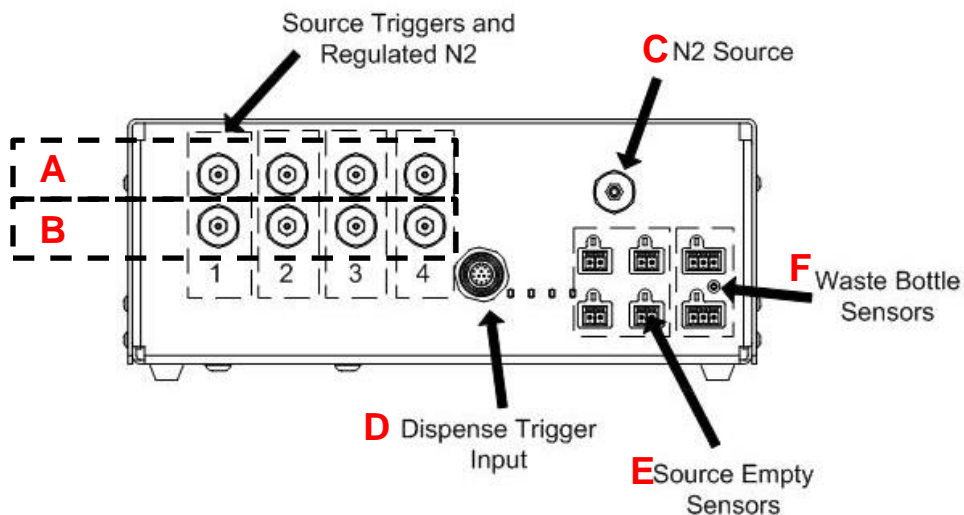
A – On/Off for Inlet Pressure: To turn pressure on, rotate the knob for inlet pressure counter clockwise until it is vertical. To turn pressure off, turn the knob clockwise until it is horizontal.

B –Fluid Pressure for Dispense 1: The dial shows fluid pressure and the associated knob set the pressure. Pull knob out from lock position and then turn knob clock-wise rotation to increase air pressure. **The pressure should not exceed 29 psi with the standard valve or unless otherwise noted.**

C –Fluid Pressure for Dispense 2: The dial shows fluid pressure and the associated knob set the pressure. Pull knob out from lock position and then turn knob clock-wise rotation to increase air pressure. **The pressure should not exceed 29 psi with the standard valve or unless otherwise noted.**

D –Fluid Pressure for Dispense 3: The dial shows fluid pressure and the associated knob set the pressure. Pull knob out from lock position and then turn knob clock-wise rotation to increase air pressure. **The pressure should not exceed 29 psi with the standard valve or unless otherwise noted.**

E –Fluid Pressure for Dispense 4: The dial shows fluid pressure and the associated knob set the pressure. Pull knob out from lock position and then turn knob clock-wise rotation to increase air pressure. **The pressure should not exceed 29 psi with the standard valve or unless otherwise noted.**



A –Unregulated Valve Trigger: These ports are triggered by the Cee® spin coater / developer software. They supply unregulated N₂ / CDA to the dispense valve to trigger a dispense. The numbers indicate the dispense number from the software.

B –Regulated Reservoir Supply: These ports supply regulated N₂ / CDA to the pressure vessels. This is the acting force on the fluid to dispense materials.

C –Inlet Pressure (N₂ / CDA): This is the main port for incoming N₂ / CDA. The connection is a 1/4" push to connect. Pressure supplied to this box should be set to 70 psi.

D –Dispense Electrical Signal: The round 12-pin cable plugs into here from the dispense port on the spin coater / developer.

E –Source Empty Sensor: There is an optional accessory for pressure canisters. If equipped, the sensors plug into the port associated with the dispense.

F –Waste Bottle Sensor: If the spin coater / developer is equipped with a Cee® Waste Carboy, the bottle is equipped with a full sensor. This sensor is an interlock for the software so that when the waste bottle is full, the spin coater / developer will not begin a new process. The sensor plugs into these ports.

4. Pressure Vessels

Cee® offers 3 different pressure vessels for dispenses; pressure canisters, cartridges, and syringes. Syringe dispense are covered in their own manual and not included in this one. It should be noted here that only vessels designed and rated for pressurized air service should be used with this dispense system and that manufacturer recommendations for maximum vessel pressure ratings should always be observed. All pressure vessels and tubing should be inspected regularly for leaks and other signs that their integrity may be compromised and replaced whenever a defect is discovered.

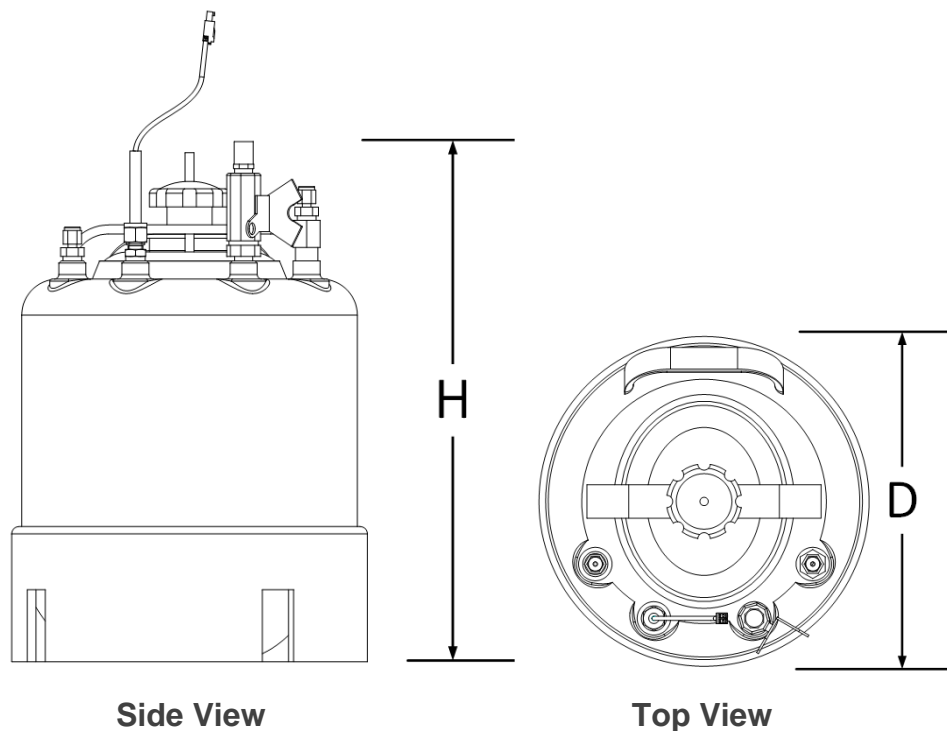
4.1. Pressure Canister

The standard pressure canisters are used to hold and pressurize material for dispensing on substrates used with Cee® spin coaters and developers. When the Cee® equipment triggers a pneumatic valve, material will flow from the pressure canister onto the surface of the substrate.

However, pressure cans are available in larger volumes ranging from 1-10 gallons, depending on the user requirement. This option is also very popular for dispensing adhesion promoters (HMDS), EBR/BSR, and/ or prewetting solvents.

Specifications All Standard Pressure Canisters Feature:

- Chemistry contact surfaces are either 304L or 316L Stainless Steel
- Four ¼" female NPT Fittings
- EPDM closure o-rings
- Fully passivated
- 3/8" MNPT x 1/4" FNPT dip tube
- Sizes range from 1 gallon to 10 gallons.
- Comes with 6ft (2m) of tubing



Size	Height (H)	Diameter (D)
1 Gallon	11.5 in (29.2 cm)*	10 in (25.4 cm)
2 Gallon	14.5 in (36.8 cm)*	10 in (25.4 cm)
3 Gallon	18 in (45.7 cm)*	10 in (25.4 cm)
5 Gallon	25 in (63.5 cm)*	10 in (25.4 cm)
10 Gallon	28 in (71.1 cm)*	13 in (33.0 cm)

*Add at least 12 in (30.5 cm) to the height to access the lid and top components

4.1.1. Unpacking and Assembly

The dispense unit requires minimal assembly before operation. See Dispense Setup Diagram for your tool and dispenses located on the USB provided with the tool.

The following items should be included with the shipment for each pressure canister shipment.

- (1) Pressure canister
- (1) 6 ft of PTFE dispense tubing (1/8" or 1/4" depending on configuration)
- (1) 6 ft of green 1/8" urethane tubing w/ sleeve valve

Additional items for dispense were covered previously in Dispense Types

4.1.2. Pressure Canister Installation and Setup

For technical drawings, please refer to the Dispense Setup Diagram located on the USB provided with the tool.

1. Locate the pressure can and the control box. Attach the 1/8" green urethane tube from the control box to the pressure vessel.
2. Open the pressure canister lid by loosening the black nut on the top of the pressure canister. The black nut does not need to be fully removed but loosened until the lid can be dropped, rotated, tilted and removed from the pressure canister.
3. Thoroughly clean the inside of the pressure canister before use.

4.1.3. Pressure Canister Use

To prepare the pressure canister for use follow the instruction below.

1. Release pressure on the pressure canister by shutting off the flow of N₂ / CDA via slide valve (slide away from pressure canister as shown to the right) and venting the pressure canister by opening the vent valve (also shown to the right). There is a hole in the vent valve handle that can be used for service lock out.
2. Open the pressure canister lid by loosening the black nut on the top of the pressure canister. The black nut does not need to be fully removed but loosened until the lid can be dropped, rotated, tilted and removed from the pressure canister.
3. Fill the pressure canister with material. The max volume of material should not exceed 75% of the pressure canister volume.
4. Replace the lid in reverse order of removal. The black nut for the lid should only be tightened by hand. Allow 30 seconds to 1 minute for the pressure canister to fully pressurize.

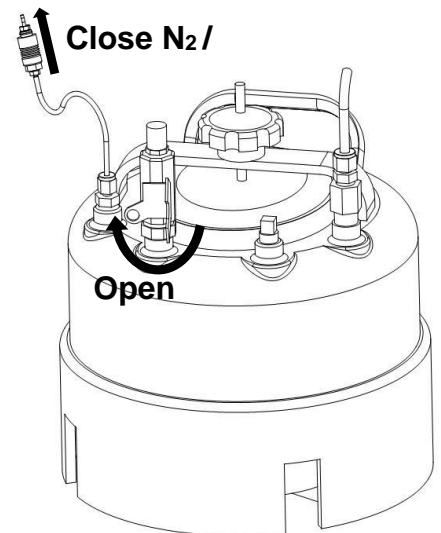


Figure: Preparing the pressure can for use

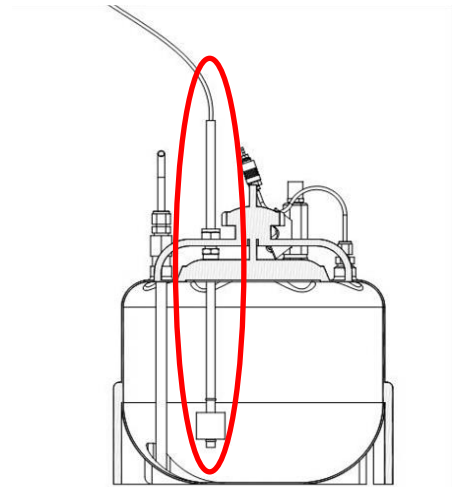
4.1.4. Empty Sensor (Optional)

The empty sensor is an option for the pressure canister. It can be purchased with the pressure can or added on later.

The float is set so that it is 1 inch off the bottom of the canister so that air will never be purged into the system. When the level of material falls below, the float will trigger the recipe that the canister is empty. If this happens during a process, it will alert but continue the process. If the pressure canister is empty at the start of a process, the machine will not let the user proceed until the canister is filled.

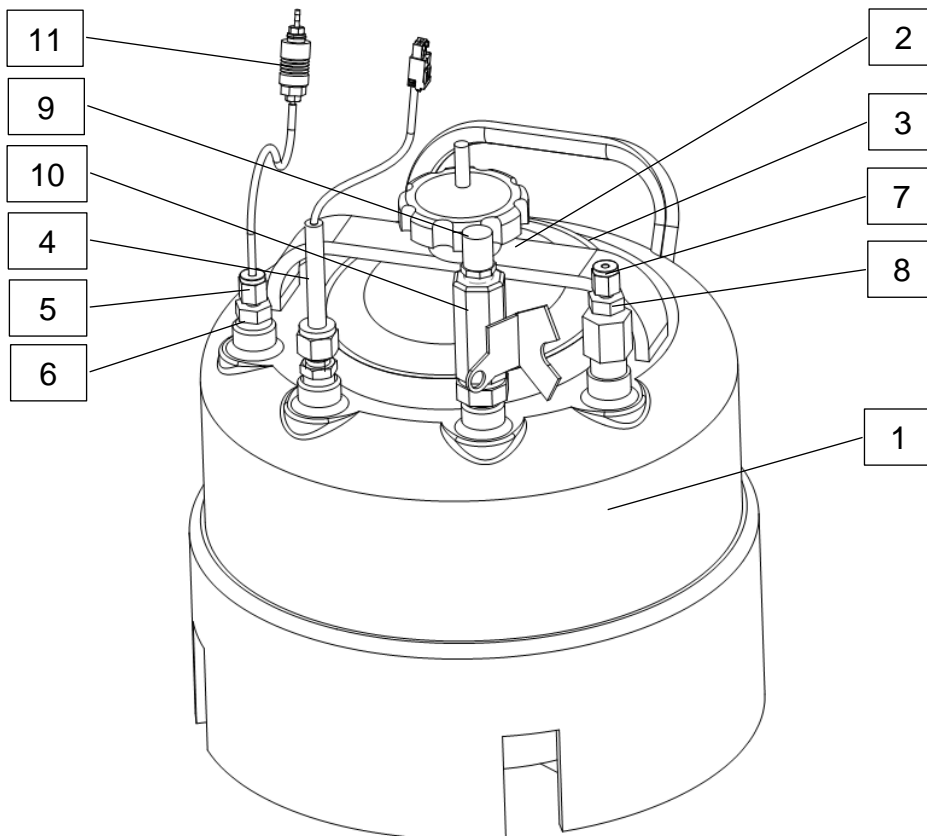
To setup the empty sensor, follow the instructions below.

Plug the empty sensor into the Source Empty Sensors connectors on the back of the dispense control box. The connectors are labeled 1-4 to indicate which dispense the sensor is for. Plug the sensor into the connector associated with the dispense number (i.e. Dispense 1 empty sensor would be plugged into dispense 1 source empty sensor location). Each control box can support 4 empty sensors and 4 dispenses.



Cross-section of pressure can with optional empty sensor shown

4.1.5. Pressure Canister Parts List



#	Cee Part #	Description
1	Pressure Canister w/ Dip Tube, Lid, and O-Ring*	
	609218	1 Gallon
	613401	2 Gallon
	607669	3 Gallon
	604533	5 Gallon
	609000	10 Gallon
2	614778	Pressure Canister Lid w/ O-ring
3	612674	O-Ring
4	Optional Empty Sensor w/ Swagelok	
	902695	1 Gallon
	903622	2 Gallon
	902989	3 Gallon
	903623	5 Gallon
	903624	10 Gallon
5	600401	1/8" Ferules for N ₂ Inlet

6	601340	1/8" Swagelok for N ₂ Inlet
7	Ferrules for Fluid Outlet	
	600401	1/8" Ferrules for 1/8" Tubing Fluid Outlet
	600404	1/4" Ferrules for 1/4" Tubing Fluid Outlet
8	Swagelok for Fluid Outlet	
	601340	1/8" Swagelok for 1/8" Tubing Fluid Outlet
	600605	1/4" Swagelok for 1/4" Tubing Fluid Outlet
9	609488	Exhaust Muffler
10	609489	Ball Valve
11	601242	Slide Valve

*Contact Cee Customer Support for part numbers for custom gravity fed or PTFE coated pressure cans

4.2. Cartridge Dispense

The standard cartridges are used to hold and pressurize material for dispensing on substrates used with Cee® spin coaters and developers. When the Cee® equipment triggers a pneumatic valve, material will flow from the cartridge onto the surface of the substrate.

Various sizes of pressurized EFD cartridge reservoirs are available for CEE® equipment. The cartridges normally hold 6 ounces (180 ml), 12 ounces (360 ml), or 20 ounces (750 ml) of material. Additionally, changing the disposable polypropylene liner in the transparent cartridge housing can be done very quickly, allowing the user to switch materials in a matter of seconds without risk of detrimental cross-contamination. The entire wetted liner assembly can be cleaned/reused or disposed of and replaced for the next chemical application.

Specifications All Cartridges Feature:

- Chemistry contact surfaces are polypropylene, PFA, and Teflon
- Disposable polypropylene liners
- Sizes range from 6 ounces to 20 ounces.

4.2.1. Unpacking and Assembly

The dispense unit requires minimal assembly before operation. See Dispense Setup Diagram for your tool and dispenses located on the USB provided with the tool.

The following items should be included with the shipment for each pressure canister shipment.

- (1) Cartridge assembly w/ stand
- (1) 6 ft of PTFE dispense tubing (1/8" or 1/4" depending on configuration)
- (1) 6 ft of green 1/8" urethane tubing w/ sleeve valve
- (Optional) Additional disposable liners and pistons for cartridge

Additional items for dispense were covered previously in Dispense Types

4.2.2. Cartridge Installation and Setup

For technical drawings, please refer to the Dispense Setup Diagram located on the USB provided with the tool.

1. Locate the cartridge assembly and the control box. Attach the 1/8" green urethane tube from the control box to the cap of the cartridge.

4.2.3. Cartridge Dispense Use

To prepare the cartridge dispense for use follow the instruction below.

1. Shutting off the flow of N₂ / CDA via slide valve (slide away from the cartridge as shown to the right). This also vents the cartridge.
2. Open the cartridge cap by rotating counter clockwise until the cap stops and then lift off on the cartridge.
3. Fill the cartridge with material. The max volume of material should not exceed 75% of the cartridge volume. A piston can be placed into the cartridge after filling with material. Some material will easily allow nitrogen to infuse into it causing bubbles at the point of dispense. The piston is not necessary but will help keep nitrogen from infusing into the material if needed.
4. Replace the lid in reverse order of removal. Allow 30 seconds for the cartridge to fully pressurize.

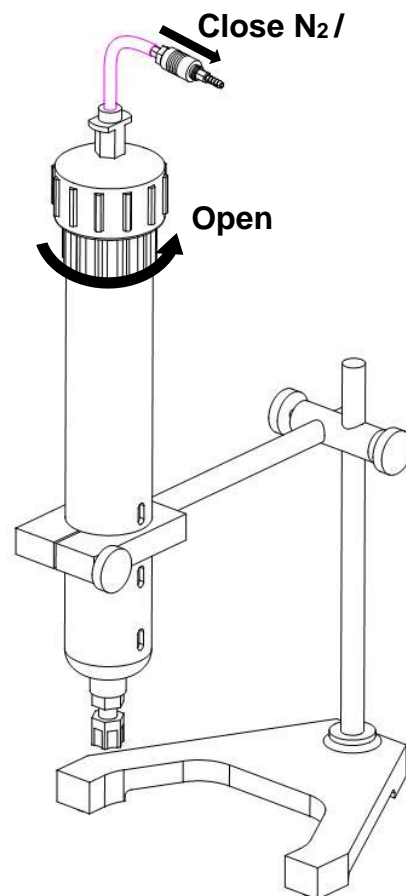


Figure: Preparing the cartridge for use

5. Dispense Types

5.1. Backside Rinse (BSR) Setup and Use

5.1.1. Unpacking and Assembly

The dispense unit requires minimal assembly before operation. See Dispense Setup Diagram for your tool and dispenses located on the USB provided with the tool. The following items should be included with the shipment.

- (1) BSR nozzle (fixed in the bowl of the spin coater or developer)
- (1) 1/8" dispense valve w/o suckback and tubing
- (1) Pressure vessel w/ tubing (refer to Dispense Setup Diagram for vessel type)
- (1) Dispense control box w/ tubing

5.1.2. BSR Installation and Setup

For technical drawings, please refer to the Dispense Setup Diagram located on the USB provided with the tool.

1. Locate the 1/8" Teflon tube and attach one end from the fluid out of the pressure can to the Backside Rinse Valve.
2. Locate the 1/8" clear urethane tube from the BSR valve and attach the other end to the control box (the port is shown in Dispense Setup Diagram).
3. Connect the 1/8" Teflon tube from the valve output to the BSR fitting on the utility bracket.

5.1.3. BSR Use

The BSR system provides an adjustable nozzle, for delivering cleaning solution to the back of the substrate. This material clears any residual coating residues and prevents subsequent migration to downstream process modules. This also prevents substrates from sticking to the hot plate by transferring material from the back of the substrate, to the surface of the hot plate. The user can specifically orientate the nozzle position, to clear the amount of exclusion area.



The BSR nozzle should be adjusted 0.5-0.75" below and away from the outside radius of any given spin chuck diameter. Furthermore, the nozzle should be slightly angled away >95° from the spin chuck surface. Typical BSR dispense recipe steps will be performed at 100-200RPM's for 10-30 seconds and the dispense control box should be regulated to approximately 5.5-8 psi of N2 pressure.

5.2. Edge Bead Removal (EBR) Setup and Use

5.2.1. Unpacking and Assembly

The dispense unit requires minimal assembly before operation. See Dispense Setup Diagram for your tool and dispenses located on the USB provided with the tool. The following items should be included with the shipment.

- (1) EBR nozzle (fixed in the lid of the spin coater or developer)
- (1) 1/8" dispense valve w suckback and tubing
- (1) Pressure vessel w/ tubing (refer to Dispense Setup Diagram for vessel type)
- (1) Dispense control box w/ tubing

5.2.2. EBR Installation and Setup

For technical drawings, please refer to the Dispense Setup Diagram located on the USB provided with the tool.

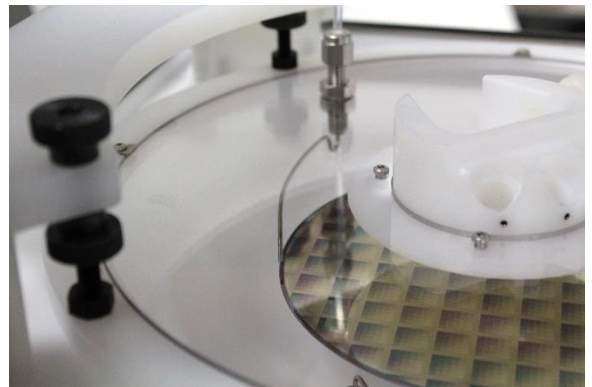
1. Locate the 1/8" Teflon tube and attach one end from the fluid out of the pressure can to the Edge Dead Removal Valve.
2. Locate the 1/8" clear urethane tube from the EBR valve and attach the other end to the control box (the port is shown in Dispense Setup Diagram).
3. Connect the 1/8" Teflon tube from the valve output to the EBR fitting on the spin coater lid.

5.2.3. EBR Use

The adjustment of the EBR position is manual, however it can be set very precisely and locked at specific heights and widths (1-10mm), from the edge radius. By manual manipulation the amount of edge cleaned is determined by the Operator.

This method of dispense is normally used in conjunction with a pressurized reservoir (1-Gal. Included) Dispense and small-orifice SMC valve (1/8" connections) (w/ suckback control). The EBR nozzle is completely adjustable in both height (Z-axis) and width (T-axis). Therefore, it can easily be

setup for different thicknesses and exclusions. We achieve optimal EBR results with the nozzle range of 1-2mm above the surface of the coated film. Therefore, the nozzle can be fixed at 2mm above the bare sample and this height should be universal regardless of the number of layers coated. The Cee EBR option is features a cutting accuracy +/-1mm



5.3. Luer Stream Dispense Setup and Use

5.3.1. Unpacking and Assembly

The dispense unit requires minimal assembly before operation. See Dispense Setup Diagram for your tool and dispenses located on the USB provided with the tool.

The following items should be included with the shipment.

- (1) Luer dispense nozzle
- (1) Box of assorted luer tips
- (1) 1/8" or 1/4" Dispense valve w suckback and tubing
- (1) Pressure vessel w/ tubing (refer to Dispense Setup Diagram for vessel type)
- (1) Dispense control box w/ tubing

5.3.2. Luer Dispense Installation and Setup

For technical drawings, please refer to the Dispense Setup Diagram located on the USB provided with the tool.

1. Locate the 1/8" Teflon tube and attach one end from the fluid out of the pressure can to the Edge Dead Removal Valve.
2. Locate the 1/8" clear urethane tube from the EBR valve and attach the other end to the control box (the port is shown is Dispense Setup Diagram).
3. Connect the 1/8"/1/4" Teflon tube from the valve output to the Luer fitting in the dispense hub located on the spin coater / developer lid.

5.3.3. Luer Dispense Use

The next parameter that has to be decided is the tip size, each dispense system is sent with a dispense tip kit with several sizes and materials to use. First, pick a tip material that is compatible with your desired chemical and then determine output diameter. Again, for thinner materials a smaller diameter, (18-22ga) should be used and for thicker materials larger tips (14-18ga) should be utilized. Critical areas of this selection, are good suck back after a dispense step and steady stream as mentioned earlier.

5.4. Spray Dispense Setup and Use (Developer/Cleaner)

5.4.1. Unpacking and Assembly

The dispense unit requires minimal assembly before operation. See Dispense Setup Diagram for your tool and dispenses located on the USB provided with the tool.

The following items should be included with the shipment.

- (1) EBR Nozzle (fixed in the lid of the Spin Coater or Developer)
- (1) 1/8" or 1/4" Dispense valve w suckback and tubing
- (1) Pressure Vessel w/ tubing (refer to Dispense Setup Diagram for vessel type)
- (1) Dispense Control Box w/ tubing

5.4.2. Spray Dispense Installation and Setup

For technical drawings, please refer to the Dispense Setup Diagram located on the USB provided with the tool.

1. Locate the 1/8" Teflon tube and attach one end from the fluid out of the pressure can to the Edge Dead Removal Valve.
2. Locate the 1/8" clear urethane tube from the EBR valve and attach the other end to the control box (the port is shown in Dispense Setup Diagram).
3. Connect the 1/8"/1/4" Teflon tube from the valve output to the spray fitting in the dispense brackets located on the developer lid.

5.4.3. Spray Dispense Use

It is critical to start the spin process several seconds prior to dispensing developer solution. This will help prevent material from wicking to the wafer backside. It is also critical to have the developer spray fan (spray nozzle positioned) so that the fan starts at the center of the wafer and extends to the wafer edge, the rotation of the wafer spinning will equally develop the exposed resist. Do not have the spray fan covering the entire wafer, this will also contribute to material wicking under the substrate.

Once developing and rinse is complete, increase spin speed to dry.

6. Dispense Valve

The dispense valve shown to the right shows the standard valve used for dispenses. Please note that BSR valves will not have suckback function or the suckback fitting at the top of the valve.

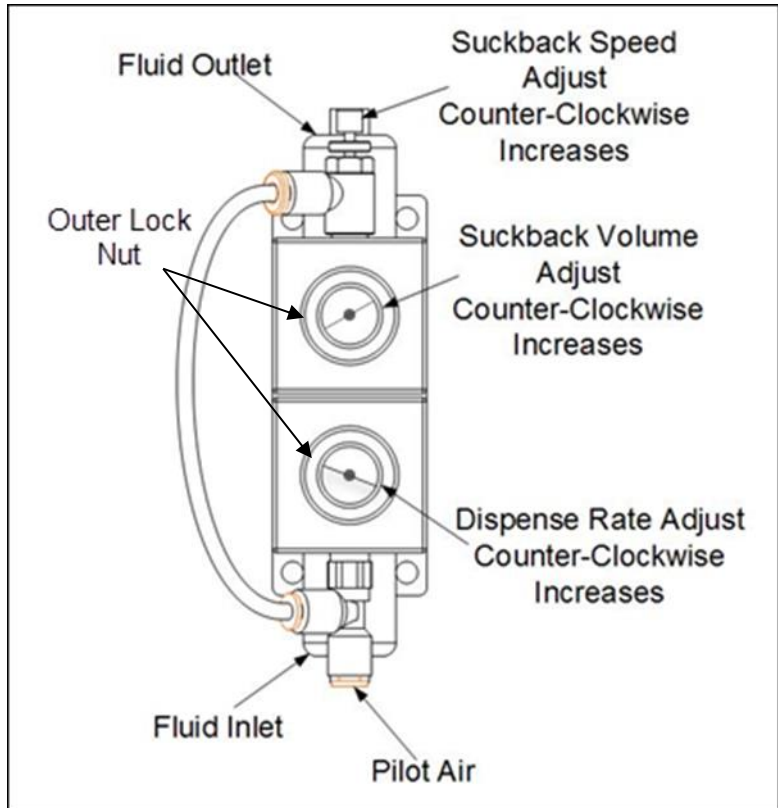
The fluid pressure to this valve, set by the Dispense Control Box, should never exceed 29 psi.

Fluid Inlet: The fluid enters the valve at this point from a pressure vessel.

Fluid Outlet: The fluid leaves the valve at this point and travels to the dispense tip.

Pilot Air: This is the unregulated valve trigger from the Dispense Control Box. This actuates the valve.

Dispense Rate Adjust: This can be used to control the fluid flow rate. Regulated pressure set by the control box can also be used to control the dispense flow rate. The best procedure is to set an adequate flow rate with the regulated pressure from the control box and then use this to make fine adjustments.



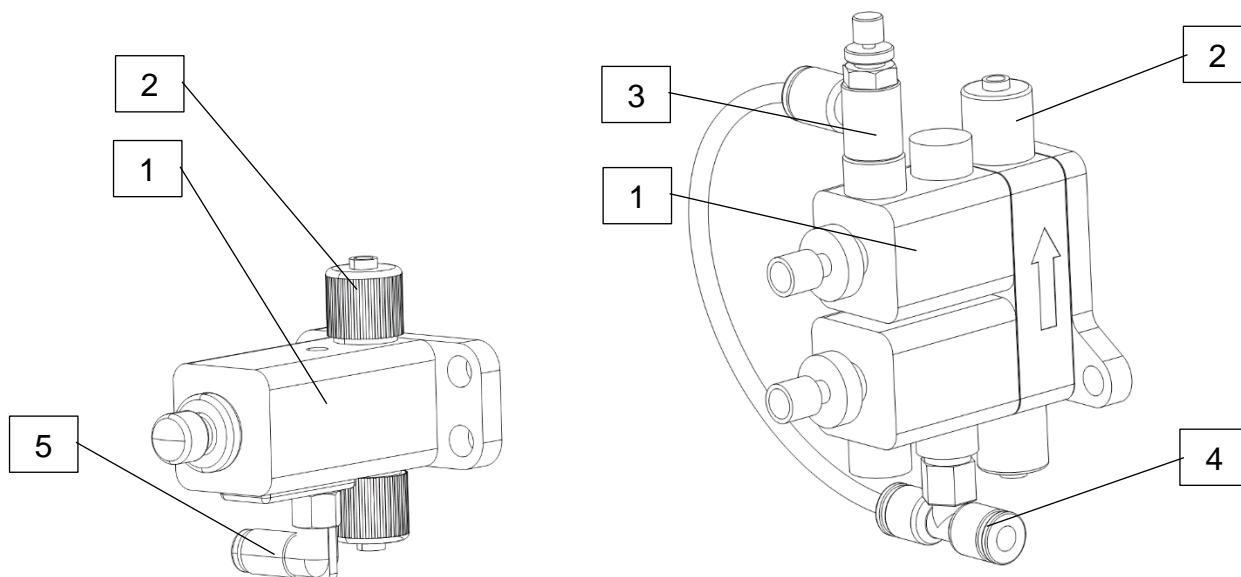
**Loosen the outer lock nut, adjust the inner dispense rate valve as needed, and then retighten the outer lock nut to secure your changes.*

Suckback Volume Adjust: This can be used to control the amount of suckback. Suckback is the movement of material backwards (opposite of the direction of dispense). This action will draw material back into the tip to prevent dripping. This adjustment changes the amount of suck back. Typically, we recommend ~1/8" of suckback from the tip. Refer to the Cee® YouTube Channel for a [video demonstration](#) of suckback adjustment procedures.

**Loosen the outer lock nut, adjust the inner suckback volume valve as needed, and then retighten the outer lock nut to secure your changes.*

Suckback Speed Adjust: This adjust how fast the suckback occurs. If the suckback is happening too quickly, air bubbles may be seen moving backwards in the dispense line after the dispense. This most commonly happens in low viscosity material. The appropriate rate is ~ 0.5 -1 second for the entire suckback action.

6.1. Dispense Valve Parts List



Dispense Valve w/o Suckback
(N₂ Blowoff / BSR)

Dispense Valve w/ Suckback

#	Cee Part #	Description
1		Dispense Valve w/ Caps and Inserts*
	613793	1/8" Dispense Valve w/o Suckback (BSR / N ₂ Blowoff)
	608444	1/8" Dispense Valve w/ Suckback
	606119	1/4" Dispense Valve w/ Suckback
2		Replacement Caps and Inserts*
	607041	1/8" Caps and Inserts for Body Size 1 (x2)
	607863	1/4" Caps and Inserts for Body Size 2 (x2)
	607873	1/8" Caps and Inserts for Body Size 2 (x1)
3	607644	Meter-out Flow Control
4	604237	Tee Fitting
5	604263	Elbow Fitting

*Inserts require special tool Part # 614202 to press in

7. Troubleshooting

7.1. Dispense Flow Rate Too High / Too Low

- If the flow rate is too low, make sure that the tubing from the pressure vessel to the dispense tip is not kinked.
- The flow rate can be adjusted 2 different ways:
 - Raising / lowering the fluid pressure on the dispense control box.
 - Adjusting the dispense rate on the dispense valve.

7.2. Dispense is Not Dispensing

- Make sure that the tubing from the pressure vessel to the dispense tip is not kinked or blocked.
- Ensure that there is 70 psi pressure to the control box.
- Ensure that the control box is on.
- Ensure that the dispense pressure is set and reading above 0 psi on the control box.
- Ensure that the communication cable from the spin coater / developer is plugged into the control box.
- Ensure that the dispense is being turned on from the spin coater / developer. When the dispense is actuated, a soft click should be heard from the control box.
- Ensure that if the pressure vessel is sealed and if equipped the vent closed.
- Ensure that the sleeve valve on the pressure vessel is on to allow input pressure to the pressure vessel.
- Ensure that the dispense rate on the dispense valve is not turned fully clockwise. Turn counter clock-wise for more flow.

7.3. Pressure Vessel is Not Pressurizing

- Ensure that there is 70 psi pressure to the control box.
- Ensure that the control box is on.
- Ensure that the dispense pressure is set and reading above 0 psi on the control box.
- Ensure that if the pressure vessel is sealed and if equipped the vent closed.
- Ensure that the sleeve valve on the pressure vessel is on to allow input pressure to the pressure vessel.

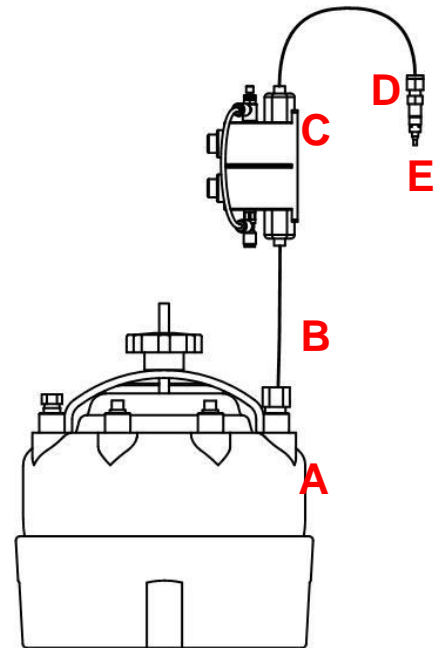
7.4. Dispense Tip is Dripping

- Ensure that 70 psi is being supplied to the control box. More than 70 psi will cause the valve to not fully close.
- Ensure that the regulated fluid pressure is set below the maximum threshold. For the standard valve the maximum regulated fluid pressure is 29 psi.
- Ensure that all fittings from the valve to the dispense tip is tight with no leaks.
- Ensure that the suck back volume and suckback speed is not set too low. To increase suckback volume, turn the suckback volume adjustment knob on the dispense valve counter-clockwise. To increase the suckback speed, turn the suckback speed adjustment knob on the dispense valve counter-clockwise.

7.5. Bubbles in the Dispense

Only Bubbles Between Valve and Tip (C & E)

- Check that both connections, C and D are tight. Air can be pulled into the fluid path through loose fittings.
- If experiencing bubbles during suckback, check that connection D is tight. Air can be pulled in during suckback of the valve.
- Dispense tip (E) may be too large for material surface tension. This may allow air to be pulled up into the dispense line and may also allow dripping during idle state.
- Nitrogen may have infused into the material inside pressure vessel. The bubbles would not appear until the material reaches atmospheric pressure, much like a soda bottle.
 - Depressurize pressure vessel when idle
 - Lower nitrogen pressure
 - Pressurize with different gas than nitrogen (such as argon)
- Trigger pressure is above 70 psi. The trigger pressure can push past the valve diaphragm and introduce nitrogen into the fluid.



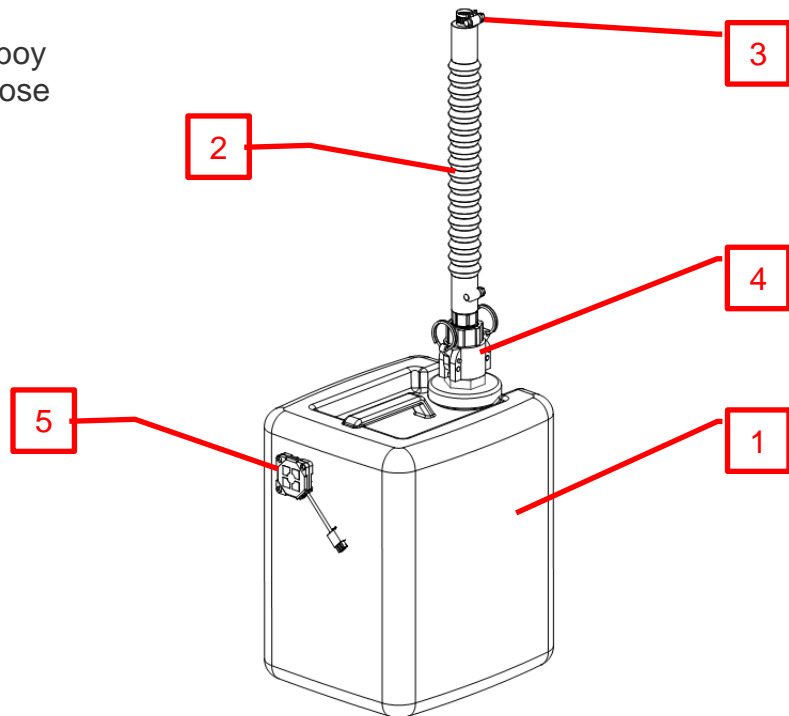
Bubbles Between Pressure Vessel and Dispense Tip (A & E)

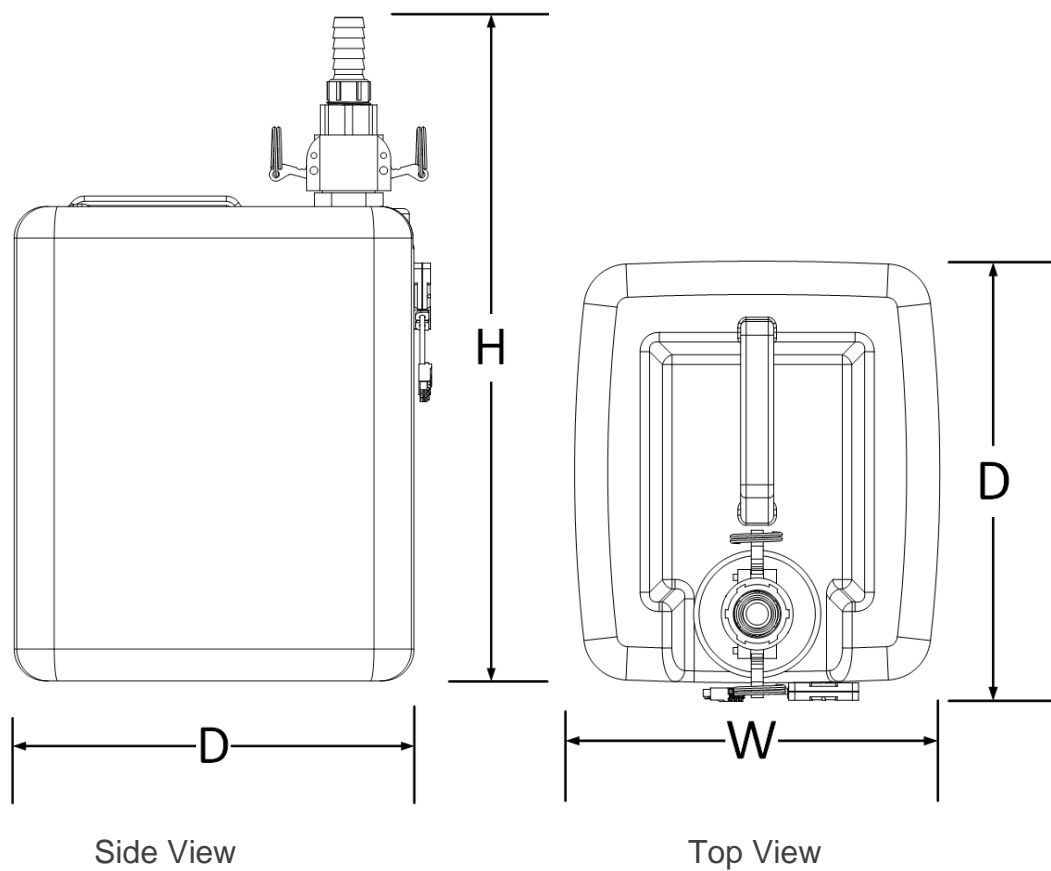
- Check that connection A is tight. A loose fitting at pressure vessel can pull air into the fluid path.
- Ensure that the fitting at connection A is not over tightened. PTFE ferrules are used in this setup and should only be tightened by hand and then ¼ turn by wrench.

8. Waste Carboy

Cee® equipment offers a complete waste carboy assembly kit (with carboy full sensor) for capturing spin coating and developer waste (aqueous/solvent). This waste carboy assembly is available in 2.5 or 5 gallons and easily connects directly to a Cee® spin coater. The capacitive sensor will alert when the carboy is full and allow the current recipe to conclude; however, it will not allow additional recipes to be initiated until the carboy is drained. This option ships with all necessary connecting hardware including:

1. 2.5 or 5-gallon Waste Carboy
2. 6 Feet of Flexible PTFE Hose
3. Two 1-inch Hose Clamps
4. Waste Carboy Coupler
5. Capacitive Sensor



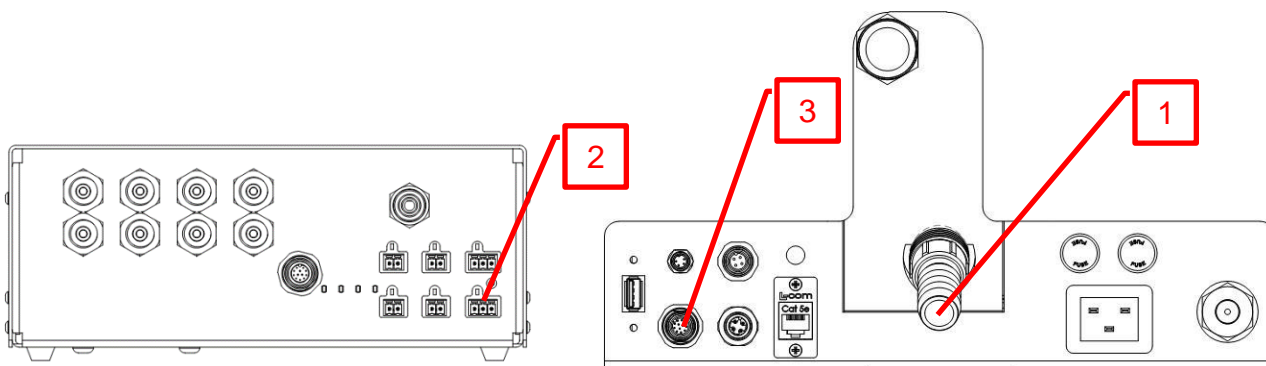


Size	Height (H)	Depth (D)	Width (W)
2.5 Gallon	17 in (43.2 cm)*	10 in (25.4 cm)	8.5 in (22.6 cm)
5 Gallon	20 in (50.8 cm)*	11 in (27.9 cm)	10 in (25.4 cm)

*Add at least 6 in (15.2 cm) to the height to access the lid and top components

8.1. Water Carboy Installation

The waste carboy gets connected to the drain port of the equipment (1). Slip the hose clamp onto the hose and press the hose onto the output of the equipment drain. Place the hose clamp over the output and tighten.

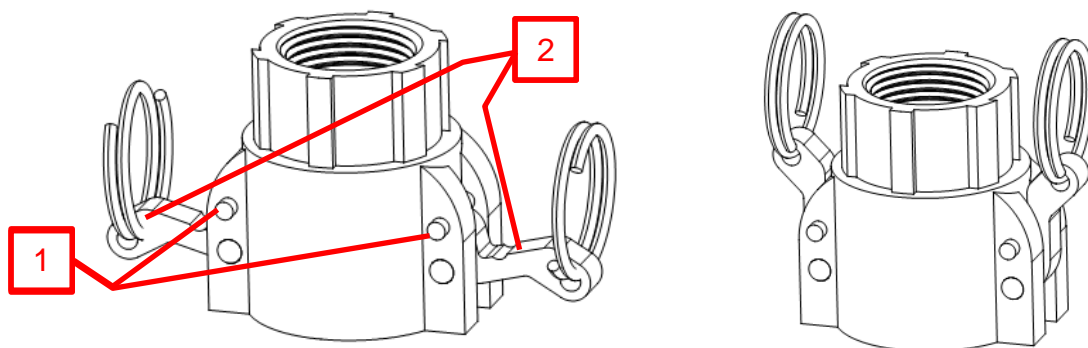


If the spin coater has automated dispenses (or a dispense control box) the waste carboy sensor gets connected to the back of the control box (2). If no automated dispense are being used the waste carboy gets connected to the 12-pin connector (3). The correct connector will be configured and supplied at the time of purchase.

Place the waste carboy in a location below the drain of the equipment. Ensure that the waste line is not kinked and has as little of a droop as possible.

8.2. Emptying Waste

1. Ensure the waste hose is free of material. If material is in the hose, lift and let drain into the carboy.
2. Release the hose from the carboy by pressing the buttons on both sides and flipping the arms down of the waste carboy coupler.

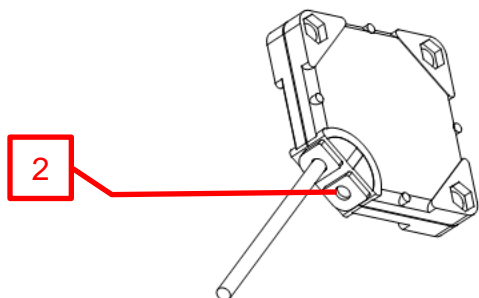


3. Lift up to remove the fitting from the waste carboy. Please note that the waste hose is open without the carboy.
4. Disconnect the sensor using the connector in line.
5. Transport to waste disposal area. When ready, remove the cap and pour waste out. Observe all waste management protocol of the facility.
6. Connect the sensor back to the connector (only one way to fit). Place the waste carboy coupler back onto the carboy. Press down and pull arms up and lock into place (can be done one at a time). Ensure that the hose is secured onto the carboy.

8.3. Sensor Setup

If the sensor is not reading full or you are getting a waste carboy full error when it is empty the sensor needs to be adjusted. Please read below for adjustment.

1. Locate the hole on the sensor next to the wire (shown below as 1). There is an adjustment screw inside.



2. Ensure that the waste carboy connected, and the equipment on.
3. If there is a light on the sensor, rotate the screw clockwise until the light turns off. Go back slowly until the light comes back on and turn an additional $\frac{1}{4}$ of a turn counterclockwise.
4. If there is no light on the sensor, rotate the screw counterclockwise until the light turns on. Rotate clockwise until the light goes out. Go back slowly until the light comes back on and turn an additional $\frac{1}{4}$ of a turn counterclockwise.