

Startup Instructions PDS2010

Machine preparation:

Locate the machine so you have access to 2 outlets if you have the separate chiller option. A 20A dual outlet or 2 separate and dedicated 15A outlets will do.

Items needed:

Rags or wipes

Scotchbrite pad

Metal scraper (2inch paint scraper or putty knife)

Spray bottle

Aluminum foil or stainless steel metal container for dimer

Micro-90 soap

Isopropanol or IPA

Silicone Hi-Vacuum grease

Flute baffle and tape

Fixture assembly

Fixture support plate.

Remove dust cover from cold trap opening.

Remove tape from chamber base plate ports.

Remove the side panels.

On the left side remove bubble wrap from furnace checking top and bottom of furnace for additional bubble wrap.

On the right side verify flow valve on vent solenoid is open.

Replace both side panels.

Open front access door and remove tape from vaporizer.

E-stop should be engaged. Verify by turning knob and if it pops out, E-stop was engaged.

Remove cold trap o-ring and clean groove.

Clean cold trap o-ring with a rag wet with IPA or isopropanol being very careful not to tear it.

Locate chiller module to right of machine, remove the padded sleeve and place the thimble into the cold trap housing. Allow the chiller hose to rest naturally. It might not sit flat, this is expected and normal with a new chiller.

If you have the manual fill cold trap instead of a mechanical chiller place it in the housing for now.

If you have auto LN2 thimble, place the thimble into the cold trap opening and connect the control cable from back of machine to control cap on thimble.

Attach power cords and connect the PDS2010 and chiller to power.

On the 2010, verify the main power light comes on when power is connected.

Verify the pump toggle is in the 'HOLD' position.

Verify Machine Operation and Functions:

Engage E-stop again and press the main power button. Power shouldn't come on.

Release E-stop and press the power button. The cooling fan should come on and the West 6100+ controllers should come on within 10 seconds.

Wait for the controllers to boot up and display values other than all 8's.

Toggle the furnace and gauge tube heaters on and verify the switch lights up. Leave on.

Toggle the vaporizer heater switch and verify the switch lights up and the feed thru turns. Turn off.

Verify pump has oil in it and level is between the lines on either side of the sight glass.

Prepare the baffle. Follow instructions in manual Section 4.8.7. and insert into furnace port making sure baffle fits slightly snug but not tight. You should be able to turn the baffle in place with little effort. If tight, unwrap some tape from below the screw stud. This will prevent the baffle from becoming stuck in furnace opening after multiple coating runs through buildup.

Press the green cycle start/stop button and verify it lights up. Furnace and gauge tube heaters will start heating up. Verify heaters are increasing in temperature. The gauge tube heats much faster than the furnace.

Prepare chamber for placement on the machine:

Use a rag wet with IPA or Isopropanol and wipe the lower step of the chamber base plate. This is the surface the chamber will sit on.

Wipe the gasket to ensure no debris will interfere with the seal. Apply a light coat of vacuum grease to the gasket.

If you have the removable lid chamber, remove the o-ring from the top of the chamber and wipe clean along with the o-ring groove. Apply vacuum grease to the o-ring and place back in the groove.

Lay the chamber on its side. If you have the removable lid lay it aside so the lid is resting on the handles or on a cloth, never place the flat sealing side of lid on any hard surface. This will prevent scoring the surface which may impact machine operation from improper sealing and long pump down times.

Prepare the Micro-90 in a 2% solution with water and with a rag apply to the inside of the chamber and sight glass, chamber base, chamber lid (if chamber is removable lid) cold trap thimble, fixture support plate and gauge tube port.

Assemble the fixture using the included drawing.

Attach the fixture support plate to the feed thru and place the fixture on the plate.

Set chamber on machine and lid if removable lid.

Note the value on the vacuum controller. If you have the mechanical chiller, hold the thimble flat to the cold trap housing and turn the pump switch from 'HOLD' to 'VACUUM'. The pump should turn on and the thimble should be felt being pulled onto the cold trap housing. The vacuum controller should display an actively decreasing value. Run for 30 seconds.

Verify the switch is lit then turn back to 'HOLD', then to 'VENT'. You should hear air rush in.

The vacuum controller will now show an actively increasing value. Once the display has returned to the noted value and you can remove the chamber or lid turn the switch back to hold.

Turn the chiller on and turn the pump on while holding the mechanical chiller thimble against the cold trap housing.

Let the system pump down to its lowest value (15 or less). It might take an hour at most. Usually you will see the lowest vacuum in less than 30 minutes. You should be able to get a vacuum reading below 10. This is your cold base. The vacuum may slow down around 75-100. This is normal. The mechanical chiller is two stage. After 5-10 minutes, the chiller will start cooling and you should see the vacuum controller value start to decrease again after a couple minutes.

Once your vacuum has reached a reading below 10, enable the furnace and gauge tube heaters then press the green button. The green button should light up and the heaters will start to heat. Let the furnace and gauge tube heat to setpoint which will take about an hour. Once the furnace has reached setpoint your vacuum should be below 15. Enable the vaporizer and let a dry cycle complete. It may take about 2 hours to complete. The green button will flash when the cycle is complete.

The cold trap thimble is critical to the operation of the machine by collecting all excess parylene vapor preventing it from building up in the pump and causing poor pump performance.

If you have the Auto fill LN2 thimble, it will not activate until the pump is turned on. Verify the LN2 source is connected to the cold trap and turned on.

If you have the manual fill thimble, fill it with LN2 now. You will have some boiling but it will slow down once the thimble is cold and under vacuum. Under vacuum the LN2 will last for some time (about 20 minutes) but a good habit is to check it every half hour and fill once it's half empty.

Alarm test:



PV - Present value

SP – Set point Value

Buttons (from left to right) –

Auto/manual (not used for alarm test)

Value increase

Value decrease

Function

Testing the alarm function for each heater controller is critical to machine safety. This test ensures the controllers detect a substantial temperature change (out of band condition) and disables the heaters along with an audible alarm. In order to operate correctly, the furnace and gauge tube heaters should be at temperature or at ambient. Changing the set point during heat up may not cause the alarm to trigger.

This test is completed during factory qualification. While not necessary to repeat the test, the procedure is detailed below for customer verification.

The Furnace and Gauge Tube heaters use a temperature band:

Furnace – 20, Allowable heater range 670-710C (690 Set point)

Gauge Tube – 10, Allowable heater range 125-145C (135 Set point)

Press the function key on the furnace controller. The controller display will change.



The top row should display the current set point, the bottom row will display the current parameter field (SP – Set Point).

At temperature set point, reduce by 25. Press the function key twice and the furnace alarm should trigger. The alarm will sound **3 times** every 10 seconds. The alarm light will blink when the alarm sounds. Press the alarm button to silence alarm and verify light still blinks **3 times** every 10 seconds. Press the cycle start/stop button to stop the alarm. The light should turn off.

Return furnace controller to default set point (690) then press cycle start/stop again to reset. The light should come back on.

Press the function key on the Gauge Tube controller.

Reduce Gauge Tube set point by 15 and press the function key twice. You should hear the alarm sound **twice** every 10 seconds. The alarm light will blink when alarm sounds. Press the alarm button to silence alarm and verify light still blinks **twice** every 10 seconds. Press the cycle start/stop button to turn off the alarm, light should go out.

Return Gauge Tube controller to default set point (135) and press the cycle start/stop once more to reset. Light should turn on.

The Vaporizer heater controller uses a different procedure to trigger an alarm condition. Adjusting the set point will not activate the alarm. The vaporizer procedure is detailed below.

The Vaporizer controller will require going into the setup options. Review operator's manual for instructions.

The vaporizer controller can be adjusted at ambient to trigger the alarm.

Adjust PhA2 to 0 and return to monitor display by holding the function key and pressing the raise key. Once the display changes, use the up arrow to cycle through the options and select the label "OPTR".

Press the function key.

The alarm should now sound once every 10 seconds. Press the alarm button to silence the alarm and verify the light blinks **once** every 10 seconds.

Press the cycle start/stop button to turn off the alarm. The light should turn off.

Return the PhA2 setting to default, exit to "OPTR" and press the cycle start/stop button again. The light should turn on.

If all heaters indicated their respective alarm signals, the test is complete.

Note:

The vaporizer will likely never alarm under normal use because the vaporizer temperature is controlled by the chamber pressure through the PLC programming. Typically the thermal fuse will open before a vaporizer alarm condition is detected.

If you'd like to test the auto shut off safety feature, let the alarm continue for over 5 minutes. Silence the alarm by pressing the red alarm button. The alarm silence doesn't disable the alarm condition, it just deactivates the alarm horn.

Coating Cycle Test:

Turn on the vaporizer.

Verify cold trap is below -75C if using mechanical chiller or if manual cold trap is used make sure it's more than half full.

If you have the Auto fill LN2, verify it's connected to the LN2 source and the source is turned on.

Once the vacuum is below 15 the vaporizer will begin to heat. The vaporizer will not begin to heat up until the furnace and gauge tube are at set point temperatures and the vacuum is below 15. This is programmed into the PLC and can't be modified or adjusted.

Once the vaporizer starts heating, let the machine run through its programming. The run should last about one hour with no dimer. The machine will indicate the cycle has ended by flashing the green cycle start/stop light.

Verify the heaters begin to cool down.

You can now start running the PDS2010 for coating runs once the vaporizer has reached a temperature below 50°C. The time the coating cycle will take is highly variable depending on the material to be coated, the amount of parts, dimer charge, humidity and other variables.

During normal operation the vacuum controller will automatically adjust the vaporizer temperature to maintain the vacuum set point. You may not see the vaporizer heater reach set point during a coating run until close to the end of the cycle. The vaporizer may reach its set point during ramp up to the vacuum set point and then cool off if vacuum set point exceeds the set point value. This is normal and is to be expected. The vaporizer will only get as hot as needed to maintain the vacuum set point. Control of the vaporizer temperature creates a consistent flow vapor to your parts resulting in a uniform smooth and clear coating.

Notes:

If you plan on running less than 5 grams of DPX-C you may see the vaporizer reach temperature set point and vacuum set point may not reach the default. You might see the parylene film appear hazy or cloudy with poor adhesion. This is a common issue with small dimer amounts and is solved by reducing the chamber base if possible, coating set point or changing the Pha2 setting no lower than 110°. You may need to complete a few cycles and monitor the vacuum reading to create a new set point.

Running DPX-N dimer:

DPX-N dimer runs in the 2010 are possible but require a few adjustments before proceeding.

Reduce furnace temperature to 650°C.

Adjust the vaporizer controller Pha2 from 174 to 160. Review the controller instructions in the operator's manual. Without this change, the cycle won't end automatically and will require a manual stop since Pha2 won't be met with the new reduced vaporizer temperature set point.

Reduce the temperature set point from 175°C to 160°C.

Increase the vacuum controller set point to at least 55. This number can vary. Finding the value that provides optimal coating performance and appearance in a timely manner will take experimentation.

On the chamber base plate, locate the vacuum port (opening to the right, closest to the cold trap housing) and use one of the included restrictor plates to reduce the vacuum port opening. This is necessary to prevent the DPX-N dimer from collecting on the thimble before having a chance to condense on the parts to be coated. DPX-N has a high energy content and needs to remain in the chamber longer to exhaust that energy before turning into a film.

Running DPX-C dimer after running DPX-N

If DPX-C dimer is to be used in the PDS2010 after DPX-N was used in the machine, there are a few requirements that must be addressed to prevent contamination of future C dimer runs.

Disconnect the 2010 from power, if heaters are hot, let machine cool to 100°C.

Make sure vaporizer door is closed and latched.

Remove the baffle.

Use the furnace pipe brush and scrub the entire length of the pipe of all residues.

Remove the T handle and attach rod to a drill and use the drill to scrub the length of the pipe in one direction then the reverse.

Open the vaporizer door and vacuum out all debris.

Verify furnace is below 50°C

Use rags soaked in IPA to wipe clean any remaining residue from the furnace pipe using each rag only once.

Start from the top of the furnace pipe and push the rags through into the vaporizer. Watch the color of the rag. They should lighten up from black to medium gray with no particulate. If particulate is still seen after 5 passes, continue until all particulate is gone.

Change the baffle, never reuse a baffle from DPX-N to run PDX-C.

Readjust controllers to default parameters including the vaporizer controller PhA2.

Run 2, 10g DPX-C runs in an empty chamber, with new baffle only. Do not open chamber.

Once the second run is complete, remove and clean chamber and base plate of film.

Machine is ready to run PDX-C.