10L1BP MFE Operation Manual

INITIAL SETUP

1. Carefully remove the shipping crate protecting the Mechanical Extraction System (MFE)
2. Check for damage during transit
   - 2.1. Photograph the Tip-Indicators and Shock Indicators
     - 2.1.1. In the unlikely event of damage during shipment, pictures of the Tip-Indicators and Impact Indicators will be crucial documentation. Your assistance will help Infinity Supercritical expedite delivery of replacement equipment.
     - 2.1.2. Tip-Indicator Locations
       - 2.1.2.1. Outside of plywood crate
       - 2.1.2.2. Inside of plywood crate
     - 2.1.3. Shock Indicator Location
       - 2.1.3.1. Outside of plywood crate
       - 2.1.3.2. Inside of plywood crate
     - 2.1.4. After indicators have been photographed, they may be removed
   - 2.2. If you suspect that other damage has occurred during shipment, please photograph the damage and contact Infinity Supercritical
3. Unpack and check contents of all internal packages
   - 3.1. Please notify Infinity Supercritical of any missing equipment at time of delivery
4. Unpack and install the supplied CO_2 monitor near the desired extraction location
   - 4.1. Follow manufacturer's instructions regarding the proper setup and use of the CO_2 monitor
   - 4.2. The CO2 monitor should be placed at or below waist level. CO2 is more dense than air and will fill a space from the ground up. If placed near head level, the CO2 concentration may become dangerous before the monitor is able to sense it.
5. Roll the MFE into the desired operating location
6. Connect the Exhaust Manifold rear port to the outside atmosphere
   - 6.1. The rear port of the Exhaust Manifold is a Male -8JIC fitting also known as a Male 1/2" AN fitting
   - 6.2. The vent may be connected with either flexible hose or hard plumbed pipes
   - 6.3. One option is to have a hydraulic hose of the appropriate length custom made with a ½" Female AN fitting on one end. The other end should have the appropriate fitting to connect to hard plumbing that passes through the wall or ceiling.
     - 6.3.1. Whichever method is used, the materials need to be able to withstand 1,000 psi and extreme cold (-110 F).
     - 6.3.2. Do not vent the exhaust to an area where CO2 may accumulate
     - 6.3.3. Avoid running exhaust plumbing near any water pipes as exhaust may cause freezing
   - 6.4. ATTENTION: Location of Outside Exhaust port must be placed in a location that will

not endanger nearby personnel or property. Vented CO_2 presents an asphyxiation hazard as well as the potential to cause frostbite upon contact.

6.5. WARNING: Failure to properly plumb vent lines may cause damage to property, and/or injury, and/or death.

OPERATION

1. Electrical Setup
   1.1. Plug in the main system power cable
      1.1.1. Note: System requires 220v 30A Single Phase power supply
         1.1.1.1. Equipment ships with a male NEMA L14-30 plug on an approximately 5' cord
            1.1.1.1.1. The male plug is wired as follows:
               1.1.1.1.1.1. 10 Gauge Green Wire = Ground/Earth
               1.1.1.1.1.2. 10 Gauge White (W) Wire = Neutral
               1.1.1.1.1.3. 10 Gauge Black (X) Wire = Hot 110-120V
               1.1.1.1.1.4. 10 Gauge Red (Y) Wire = Hot 110-120V
         1.1.1.2. System should be on a dedicated circuit breaker
2. Heat Exchanger Setup
   2.1. Connect the (customer supplied) Water Chiller to the MFE Heat Exchanger
      2.1.1. Connect the Water Chiller outlet to the **[P1] (Bottom)** Port on the Heat Exchanger
      2.1.2. Connect the Water Chiller inlet to the **[P2] (Top)** Port on the Heat Exchanger
   2.2. Fill the Water Chiller with water (and anti-freeze if operating below 35F)
      2.2.1. Refer to (Customer Supplied) Water Chiller manufacturer's instructions for proper setup and operation
   2.3. Turn the Water Chiller on and set it to a maximum of 45° Fahrenheit if extracting below 1,500 psi, 55° Fahrenheit if below 1,750, 65° Fahrenheit if below 1,900 psi. Setting a target pressure above 1,900 is not recommend. This leaves a safety margin below the 2,000 psi maximum system pressure.
      2.3.1. As the Heat Exchanger is filled, additional water may need to be added to the Water Chiller
3. Loading the Extraction Vessel
   3.1. Remove the Extraction Vessel Lid using the included MFE Extraction Vessel Wrench
      3.1.1. ATTENTION: Use caution when removing the Extraction Vessel Lid. Dropping or mishandling the Lid may cause personal injury or damage to the MFE equipment
   3.2. Remove the Botanical Basket
   3.3. Fill the Botanical Basket with desired Botanical Matter
      3.3.1. Note: For best results Do Not fill with finely ground Botanical Matter
   3.4. Insert the Botanical Basket into the Extraction Vessel with the open end facing out. Be sure to guide the Flow Bar up through the grommet on the bottom of the Botanical

Basket. Make sure that the basket is sufficiently inside the extraction vessel, forcing the lid on may damage the basket. If the basket will not slide all the way down, check to see if there is a block of dry ice sitting in the bottom of the Extraction Vessel. If so, it will need to evaporate or be removed prior to loading the vessel.

3.5. It is also possible to load botanicals directly into the Extraction Vessel without use of the Basket. If operated in this manner, a shop vacuum will be required to remove the spent botanicals after each run.

3.6. Check that the mating surfaces of the Extraction Vessel and Extraction Vessel Lid are clean and that the Extraction Vessel O-Ring is in good condition

3.6.1. The wide portion of the lid plate must face down.

3.7. Check that there is sufficient Food Grade anti seize on the Lid threads, if not add more

3.8. Re-install the Extraction Vessel Lid using the Extraction Vessel Wrench

3.8.1. Once the Extraction Vessel Lid is fully tightened with the Wrench, use a rubber mallet to strike the end of the Wrench to further secure the Lid. A proper seal requires rotating the Lid Nut approximately $1/8^{th}$ turn past hand tight.

4. CO_2 Filling

4.1. CO2 Filling requires 3 steps which are repeated twice: Fill, Purge, and Equalize

4.2. Confirm that all valves, ports, and vents are closed: [**1] (Red), [2] (Red), [3] (Red), [4] (Red), [FP] (Yellow), [FV] (Yellow), [V1] (Blue), [V2] (Blue), & [RC] (Green)**

4.3. The Back Pressure Regulator **[BPR] (Green Knob)** should be open

4.4. Connect the (customer supplied) Liquid CO_2 cylinder to the **[FP] (Yellow)** Port on the MFE Pump using the included 6' -4JIC high pressure flex hose (The shipping kit will also include a CGA-320 Bottle Filling Sight Attachment) The CGA Fill Sight will attach to the bottle. The sight glass should be adjusted so that it rests in a horizontal position and the user is able to see into the sight to check for liquid flow. The flex hose will connect the CGA Fill Sight to the filling Port **[FP] (Yellow)**

4.4.1. Cylinder must contain Liquid CO2 and feature a Siphon Tube (a.k.a. Dip Tube, Eductor Tube, or Bottom Feed). Infinity Supercritical recommends using 100 lb bottles for the most efficient and economical use.

4.4.2. Dewer Tanks are not a viable method of filling due to their low bottle pressure

4.5. Slowly open the Liquid CO_2 Cylinder Valve **[Cylinder Valve]**

4.6. Open the CO_2 fill Port: **[FP] (Yellow)**

4.7. Open the Pump Suction Valve: **[4] (Red)**

4.7.1. At this point, Liquid CO2 will be flowing into and collecting in the Expansion Tank

4.7.2. Allow the flow to continue until pressure has equalized (hissing and other gas/liquid flow sounds will stop)

4.7.3. This completes the first "Fill" step in the first series of Fill-Purge-Equalize

4.8. With the bottle valve and the Fill Port **[FP] (Yellow)** open, slowly open the Fill Vent **[FV] (Yellow)** to release gaseous CO_2. Liquid from the bottle will displace gas in the reservoir. This will constitute the first "Purge" as the gaseous CO2 is purged from the

reservoir

4.8.1.1. Note: The **[FV] (Yellow)** vent only needs to be partially open (approximately 45 degrees) to allow for sufficient gas purging. Not opening the valve far enough will allow liquid CO2 to evaporate faster than it is replaced. If it is opened too far, it is possible for liquid CO2 to splash up and give a false positive fill reading.

4.8.2. While purging, watch the Fill Sight **[FS] (Black Manifold),** located on the Exhaust Manifold

4.8.3. Continue releasing gaseous CO_2 until liquid CO_2 is expelled

4.8.3.1. Note: Liquid CO_2 will appear as a white spray or "heavy snowstorm" in the Fill Sight and will be accompanied by a change in sound and vibration in the FV valve handle

4.9. Close the **[FV] (Yellow)** Vent

4.10. Confirm that Pressure Gauge **[C]** is indicating a pressure of 400-900 psi

4.10.1. Note: The exact pressure will depend on the ambient temperature of the extraction environment.

4.10.2. Look in the Reservoir Sight Glass and confirm that the Reservoir is full

4.11. Close the fill port **[FP] (Yellow)** valve

4.12. Slowly open valves **[1] (Red), [2] (Red), [3] (Red). [4] (Red) and [BPR] (Green Knob)** should already be open.

4.13. Pressure has now been equalized throughout the system and the reservoir needs to be topped off

4.13.1. This completes the first "Equalize" step, since the pressure has been equalized throughout the system

4.14. Close isolation valves **[3] (Red), [2] (Red), [1] (Red)**

4.15. It is now necessary to repeat the Fill-Purge-Equalize sequence a second time

4.16. Open the CO_2 fill Port: **[FP] (Yellow)**

4.16.1. At this point, Liquid CO2 will be flowing into and collecting in the Reservoir

4.16.2. Allow the flow to continue until pressure has equalized (hissing and other gas/liquid flow sounds will stop)

4.16.3. This completes the second "Fill" step in the first series of Fill-Purge-Equalize

4.17. With the bottle valve and Fill Port **[FP] (Yellow)** open, slowly open the Fill Vent **[FV] (Yellow)** to release gaseous CO_2. Liquid from the bottle will displace gas in the reservoir. This will constitute the second "Purge" as the gaseous CO2 is purged from the reservoir

4.17.1.1. Note: The **[FV] (Yellow)** vent only needs to be partially (approximately 45 degrees) open to allow for sufficient gas purging. Not opening the valve far enough will allow liquid CO2 to evaporate faster than it is replaced. If it is opened too far, it is possible for liquid CO2 to splash up and give a false positive fill reading.

4.17.2. While purging, watch the Fill Sight **[FS] (Black Manifold)** located on the Exhaust Manifold to determine when the Reservoir is full. Also, keep an eye on the CGA Fill Sight to confirm that liquid CO2 is still coming out of the supply cylinder. If flowing liquid is not visible in the CGA Fill Sight, the supply cylinder may be empty.

4.17.3. Continue releasing gaseous CO_2 until liquid CO_2 is expelled

4.17.3.1. Note: Liquid CO_2 will appear as a white spray or "heavy snowstorm" in the Fill Sight **[FS] (Black Manifold)** and will be accompanied by a change in sound and vibration in the FV valve handle

4.18. Close the **[FV] (Yellow)** Vent

4.19. Confirm that Pressure Gauge **[C]** is indicating a pressure of 400-900 psi

4.19.1. Note: The exact pressure will depend on the ambient temperature of the extraction environment.

4.19.2. Look in the Reservoir Sight Glass and confirm that the Reservoir is full

4.20. Close the fill port **[FP] (Yellow)** valve and the Cylinder Valve

4.20.1. The CO2 supply cylinder can be disconnected at this time and moved to safe location out of the way. Be aware that there is still liquid CO2 in the flex hose which will expand and create an area of extreme cold. When removing the hose from the fill port **[FP] (Yellow)** valve, unscrew the fitting only as far as necessary to release the pressure. Once the pressure has fully released, fully remove the flex hose.

4.21. Slowly open valves **[1] (Red), [2] (Red), [3] (Red). [4] (Red) and [BPR] (Green Knob)** should already be open.

4.22. Pressure has now been equalized throughout the system

4.22.1. This completes the second "Equalize" step, since the pressure has been equalized throughout the system and finishes the two part Fill-Purge-Equalize sequence

4.22.2. At this point the Reservoir should be approximately 70-80% full with liquid CO2.

5. Starting the Motor and Pump

5.1. Confirm that the system is plugged into power and that the main power switch is turned on.

5.2. If not already open, open all isolation valves **[1] (Red), [2] (Red), [3] (Red), [4] (Red)**

5.3. Open the Recirculation valve **[RC] (Green)**

5.4. Open the **[Back Pressure Regulator] (Big Green Knob)** all the way by turning it counter clockwise until it stops

5.4.1. Slowly turn the **[Back Pressure Regulator] (Big Green Knob)** clockwise to close until some resistance is felt. From this point, turn the knob an additional 2.5 complete revolutions clockwise to preset the regulator

5.5. Using the up and down arrows on the Digital Motor Controller select the desired extraction chamber pressure. The target pressure parameter needing to be set is call the "PID SET POINT"

5.5.1. On the VFD only, there is a decimal point in the pressure setting and read out that should be ignored. For example, 150.0 = 1,500

5.5.2. Pressure settings in increments of 10 psi are possible over the range of Reservoir Pressure up to 2,000 psi. We do not recommend selecting an extraction target over 1,900 as this will leave a cushion of pressure and time before the system could accidently be forced over it's 2,000 psi operating limit

5.5.3. The VFD Set Point should be set 50 psi higher than the target extraction pressure, this allows some pressure cushion before the motor and pump will begin slowing to prevent an over pressure event. For example, if planning to extract at 1,400 psi, the Set Point should be 1,450 psi

5.6. Look in the Reservoir Sight Glass and note the current liquid CO2 level

5.7. On the Digital Motor Controller, press the **[Run] (Green)** button

5.7.1. The MFE Pump will ramp up to its maximum speed and begin recirculating the Liquid CO_2 and bypassing the Collection Chambers

5.7.2. Allow the pump to recirculate for a minimum of 5 minutes

5.7.2.1. Note: This warm-up period allows the temperature of the system to equalize, the pump to achieve a consistent prime and to move liquid CO2 from the reservoir into the Extraction Vessel

6. Beginning Extraction

6.1. Confirm that the Back Pressure Regulator **[Back Pressure Regulator] (Big Green Knob)** is set to 2.5 clockwise turns past initial resistance, as explained in 5.4 and 5.4.1

6.2. Once the system has been recirculated for 5 minutes, look in the Reservoir Sight Glass and confirm that the liquid CO2 level has gone down. The Reservoir should now be approximately 40-60% full.

6.2.1. If the level is unchanged compared to your check performed in step 5.6, allow the recirculation to continue for an additional 5 minutes

6.2.1.1. If after the additional 5 minutes the level remains unchanged, stop the pump, close all isolation valves **[1] (Red), [2] (Red), 3 (Red),** and **[4] (Red)** and slowly open the Fill Port **[FP] (Yellow)** to depressurize the pump head. Remove the 6 pump valves, look for and remove any foreign debris, and confirm that all O-Rings are in good condition. Reassemble the pump head, close the Fill Port **[FP] (Yellow)** and open all isolation valves **[1] (Red), [2] (Red), 3 (Red),** and **[4] (Red).** Return to step 5.6 and continue.

6.2.2. If the level has visibly decreased, close the Recirculation Valve: [**RC] (Green)**

6.3. With the Recirculation Valve fully closed, begin monitoring the pressure in the Extraction Vessel, it should begin to rise slowly but steadily

6.3.1. From 600 psi it should take approximately 3-5 minutes to reach 1,000 psi. In rare occurrences, it may take up to 15 minutes. As long as the pressure is consistently climbing, the pump is working. Typically the rate of pressure rise will increase significantly after reaching 1,000 psi.

6.4. When the Extraction Vessel pressure reaches 1,000 psi the three heat circuits can be turned on as well as the chiller

6.4.1. We recommend the following Heat PID settings:
6.4.1.1. Extraction Vessel (Top Left PID) = 95F or 35C
6.4.1.2. Collection Chamber 1 (Top Middle PID) = 85F or 29.5C
6.4.1.3. Collection Chamber 2 (Top Right PID) = 80F or 26.5C
6.4.2. We recommend the following Chiller Temperature settings:
6.4.2.1. For extracting below 1,500 psi = 45F or 7C
6.4.2.2. For extracting between 1,500 psi and 1,750 psi = 55F or 13C
6.4.2.3. For extracting between 1,750 psi and 1,900 psi = 65F or 18.5C
6.4.3. After passing 1,000 psi the BPR should be used to maintain a pressure of 1,100 psi until the "waterfall" of returning liquid CO2 can clearly be seen in the reservoir sight glass
6.4.3.1. Increasing pressure too rapidly can move all liquid out of the reservoir and into the Extraction Vessel before the chiller is able to condense the return flow and replenish the reservoir. This will cause a stall.
6.4.4. Turn valve **[Back Pressure Regulator] (Big Green Knob)** clockwise to increase the extraction chamber pressure
6.4.5. Turn valve **[Back Pressure Regulator] (Big Green Knob)** counter-clockwise to decrease the extraction chamber pressure
6.4.5.1. Note: For best results, adjust the valve in a slow and steady manner
6.4.5.2. WARNING: If the pressure in the extraction chamber is accidentally increased beyond 2,000 psi, personal injury, equipment damage, and/or loss of product may result.
6.4.6. Once the return "waterfall" is clearly visible the Extraction Vessel pressure may be increased using the **[BPR] (Big Green Knob)**. This should be done in 100 psi steps so as not to draw down the liquid level in the reservoir too quickly
6.5. Once the desired operating pressure has been achieved, manual pressure adjustments may be required periodically until the desired extraction temperature is achieved
6.5.1. At this point the system's semi-automated design with work to maintain Extraction Vessel Temperature and Pressure until additional input is received. The operator should not leave the equipment unattended during this phase, but minimal input will be required.

7. Checking for a Stall and Stall Recovery

7.1. During the extraction phase it is a good idea to periodically check for a stall. During a stall, the system may appear to be functioning normally, but CO2 will not be flowing through the system. Stalls can be detrimental because although plant oils are still being dissolved by the CO2, the CO2 is no longer flowing through the system, which is required to deposit the oil in the Collection Chambers. Additionally, without CO2 flow, the Heat PID's are not accurately measuring the temperatures in their respective vessels which can lead to overheating. Overheating can burn product, burn botanicals, and/or damage the heat bands. Stalls can be caused by a number of different scenarios, but are

more common when extracting at higher pressures.

7.2. If closing the **[BPR] (Big Green Knob)** to increase Extraction Vessel pressure during the extraction phase does not result in a steady pressure climb, the system may be in a stall.

7.3. Checking for a stall. The three following tests can be performed to confirm a stall. All must be performed in a steady extraction state (while not attempting to increase or decrease pressure)

7.3.1. Quickly close and open the **[3] (RED)** valve. Keep your hand on the valve at all times, and do not allow it to remain closed for more than a few seconds. While the valve is closed, observe the CC PSI PID (Bottom Middle PID) and the RES PSI PID (Bottom Right PID). If experiencing a stall, little to no change will be observed in the process (RED) values. If the system still has good flow, the CC PSI process value (RED) should increase rapidly and the RES PSI process value (RED) should decrease.

7.3.2. Look into the Reservoir sight glass for the presence of a "waterfall." If little to no waterfall exists, the system may be in a stall. If a strong "waterfall" exists, a stall is unlikely.

7.3.3. Manually compare the temperature between the **[BPR] (Big Green Knob)** inlet flex hose and its hard-lined exit. The inlet should be significantly warmer than the exit if the system is flowing well. If a stall exists, it is likely that the inlet and outlet will feel roughly the same temperature to the touch.

7.4. If the presence of a stall is confirmed, the following should be attempted in the order presented to recover:

7.4.1. Open the **[BPR] (Big Green Knob)** to decrease the extraction vessel pressure by 100 psi. All the system to run at this new pressure for 2 minutes. Then slowly close the **[BPR] (Big Green Knob)** in an attempt to increase pressure. If it responds well, continue to rebuild pressure back to target in 100 psi steps. If it does not respond well, repeat 7.4.1 until you are unsuccessful at 1,200 psi, then proceed to 7.4.2.

7.4.2. If 7.4.1 has been unsuccessful at all pressures over 1,200, attempt to "Burp" the system using the recirculation **[RC] (GREEN)** valve. This will involve quickly opening and closing the valve 3-5 times. After "burping" allow the system to run for 2 minutes before attempting to build pressure by slightly closing the **[BPR] (Big Green Knob)**. If the extraction vessel pressure responds well, continue to build pressure in 100 psi steps back up to target pressure. If the pressure does not rise, move to the next method.

7.4.3. If 7.4.2 has been unsuccessful, turn off all three heat circuits and reduce pressure slowly until pressure is equal in all areas of the system. Once pressure is equal, open the recirculation **[RC] (GREEN)** valve and allow the system to recirculate for 5 minutes. Then proceed to start the system from step 6.1.

7.4.3.1. If 7.4.3 is not successful on the first attempt, try it a second time before

considering pump maintenance.

7.4.3.2. If a second attempt of 7.4.3 is not successful, turn off all heat, reduce pressure slowly until all areas are equalized, shut off motor, and turn off chiller. Then close **[1] (RED), [2] (RED), [3] (RED), [4] (RED)** and use the fill port **[FP] (Yellow)** to slowly depressurize the pump head. Once depressurized, open, check and clean all 6 valves. Then reassemble and begin next attempt from step 5.1.

7.4.3.3. If 7.4.3.2 is not successful, it may be time to clean or replace your high and low pressure pump seals. To do this, turn off all heat, reduce pressure slowly until all areas are equalized, shut off motor, and turn off chiller. Then close **[1] (RED), [2] (RED), [3] (RED), [4] (RED)** and use the fill port **[FP] (Yellow)** to slowly depressurize the pump head. Once depressurized: disconnect the ½" suction line using a 7/8" box wrench on the tube fitting; disconnect the safety pressure relief using a 9/16" box wrench on the tube fitting below the relief; disconnect the ¼" exit line between the pump head and check valve using a 9/16" box wrench on the tube fitting; then remove the two Allen bolts that secure the pump head the pump body using a 5/16" Allen wrench. This will give you access to the inside of the pump head to clean, look for damage, and/or replace the high and low pressure seals. After reassembling the pump and plumbing, begin again at step 5.1.

8. Adjusting Extraction Pressure

8.1. To increase the pressure in the Extraction Vessel

8.1.1. Use the Up arrow on the Digital Control Panel to increase the PID Set Point value to the desired pressure

8.1.2. Close the Extraction Vessel Pressure Valve **[Back Pressure Regulator] (Big Green Knob)** to set the desired extraction pressure

8.2. To decrease the pressure in the Extraction Vessel

8.2.1. Open the Extraction Vessel Pressure Valve **[Back Pressure Regulator] (Big Green Knob)** to set the desired extraction pressure

8.2.2. Use the Down arrow on the Digital Control Panel to decrease the PID Set Point value to the desired pressure

9. Heat

9.1. Extraction Vessel Heat

9.1.1. Extraction heat is provided by 2 heat bands and is controlled by PID #1 (Labeled EV located on the Top Left)

9.2. Collection Chamber Heat

9.2.1. CC1 heat is provided by 2 heat bands and is controlled by PID #2 (Labeled CC1 located in the Top Middle)

9.2.2. CC2 heat is provided by 1 heat band and is controlled by PID #3 (Labeled CC2 located on the Top Right)

9.2.2.1. WARNING: When in operation the heat bands can produce external temperatures of 400+ degrees Fahrenheit

9.3. Temperature PID Controllers

9.3.1. For complete PID Controller function please refer to the manufacturer supplied user's manual

9.3.2. Basic parameters have been preset during assembly.

9.3.3. To change the target temperature, use the "^" and "v" keys to set the value. When the desired temperature is shown, press the "Set" key. Press the grey "Cycle Button" [Circular Arrow], then "^" to select "run." The display will flash green, press "Set" to confirm and activate heat settings. Pressing "Set" again will return you to your temperature displays.

9.3.4. To turn the heat off, press grey "Cycle Button" [Circular Arrow] then the "v." "Stop" will be displayed in flashing green. Press "Set" to confirm. Pressing "Set" again will return you to your temperature displays.

9.3.5. With a temperature set, the PID will attempt to maintain the target temperature

9.3.6. When the heating systems are not in use, set the run parameter to "Stop" and adjust the target temperature to 0 degrees F to decrease the chance of heat turning on unexpectedly.

9.3.7. The top digital read out "PV" shows the current measured temperature (displayed in RED)

9.3.7.1. When the "Output 2" light is on, heat is actively being applied.

9.3.8. The bottom digital read out "SV" displays the target temperature (displayed in GREEN)

9.3.9. Note: With the application of heat, the Back Pressure Regulator **[Back Pressure Regulator] (Big Green Knob)** may have to be adjusted to maintain target pressure and motor speed until the temperature has reached its set point

9.4. Note: It may be possible to apply too much heat to the Extraction Vessel and/or Collection Chamber and "burn" your product. Experimentation will be required to determine the most effective temperature and heat application.

9.5. For accurate temperature feedback to function properly CO2 must be flowing through the system.

9.6. WARNING: Do not turn heat on unless the system is fully charged with CO2, the pump is running, and CO2 is flowing through the system. Heating the system without proper CO2 flow may cause damage to the equipment which is not covered by the warranty.

9.7. Pressure PID's

9.7.1. The top three Heat PID's are controlled by the bottom three Pressure PID's

9.7.1.1. The Heat PID's will not be turned on unless Process Value (RED) on the matching Pressure PID is greater than the Set Value (GREEN). These are factory set as follows:

9.7.1.1.1. EV Heat PID → ON when EV PSI Process Value (RED) is greater

than 500 psi (Green)

9.7.1.1.2. CC1 Heat PID → ON when CC PSI Process Value (RED) is greater than 200 psi (Green)

9.7.1.1.3. CC2 Heat PID → ON when RES PSI Process Value (RED) is greater than 200 psi (Green)

9.7.2. No user input is required for the bottom three pressure PID's. These are used for pressure readouts only and to prevent accidental application of heat without CO2 in the system.

9.7.2.1. Changing the Set Values (GREEN) on the Pressure PID's is not recommended

10. Finishing Extraction

10.1. To recapture as much CO2 as possible do the following

10.1.1. Turn off all heat

10.1.2. Keep the chiller turned on

10.1.3. Begin opening the **[Back Pressure Regulator] (Big Green Knob)** slowly reducing the EV pressure until the pressure readings on gauges A, B, and C equalize.

10.1.3.1. While decreasing pressure, monitor and prevent the pressure difference between the Collection Chambers and the Reservoir from becoming more than 20 psi.

10.1.3.2. Also, monitor and prevent the Reservoir pressure from climbing above 1,000 psi. If approaching 1,000 psi decrease the rate of your pressure decline so that the chiller has more time to condense the vapor and reduce the pressure in the reservoir.

10.2. On the Digital Control Panel press the **[Stop] (Red)** button

10.3. Once pressure has equalized, close the following valves: **[1] (Red), [2] (Red), [3] (Red), [4] (Red), [RC] (Green)**

10.4. Turn off the chiller

11. Opening and Refilling the Extraction Vessel

11.1. Confirm that Valves **[1] (Red), [2] (Red), [3] (Red), [4] (Red), and [RC] (Green)** are fully closed

11.2. Confirm that Vent 1 **[V1] (Blue)** is properly vented to the outside atmosphere

11.3. Open Vent 1 **[V1] (Blue)**

11.3.1. The slower the pressure is released from the Extraction Vessel through Vent 1 the less dry ice will be formed

11.4. When the Extraction Vessel Pressure Gauge **[A]** EV PSI PID (Bottom Left) both read 0 psi and there is no more sound of escaping gas you may open the extraction vessel lid, do so slowly so that any remaining pressure is noticeable before being fully opened.

11.4.1. WARNING: If the Extraction Vessel is opened with any internal pressure, even minimal gauge **[A]** pressure, personal injury and/or death and/or property damage may result.

11.5. Unload the spent organic material and replace it with new material

11.6. Reinsert the newly filled Botanicals Basket, confirm that the Extraction Vessel gasket is in good condition and all sealing surfaces are clean, apply food-grade anti seize on the threads if necessary, then re-install the Extraction Vessel Lid

11.7. To restart extraction begin at step 4.0

12. Opening the Collection Chambers / Collecting Oil

12.1. Confirm that Valves **[1] (Red), [2] (Red), [3] (Red), [4] (Red), & [RC] (Green)** are fully closed

12.2. Confirm that Vent 2 **[V2] (Blue)** is properly vented to the outside atmosphere

12.3. Open Vent 2 **[V2] (Blue)**

12.3.1. The slower the pressure is released from the Collection Chambers through Vent 2 the less dry ice will be formed

12.4. Allow the pressure in the Collection Chambers to bleed down to 0 psi on gauge **[B]** and CC PSI PID (Bottom Middle)

12.4.1. Do not attempt to unscrew the Collection Chambers with any pressure remaining in any of the Collection Chambers

12.4.2. WARNING: If any Collection Chamber is opened with any internal pressure, even minimal gauge **[B]** pressure, personal injury and/or death and/or property damage may result.

12.5. Unscrew the Collection Chambers and collect the extracted oil

12.6. If you are changing botanical variety with the next run, now would be a good time to perform additional cleaning to prevent cross contamination

12.7. If you are not changing variety, simply screw the recently emptied Collection Chambers back into their top housings

12.8. To restart extraction, begin at step 4.0.

13. Typical Maintenance Items

13.1. Pump Head Rebuild

13.1.1. If it becomes apparent that the pump is not functioning properly (it is difficult to increase the pressure in the Extraction Vessel above the bottle pressure, or pulsing in the high pressure lines has become erratic) it may be time to perform maintenance on the Pump Head

13.1.2. Accessing the Pump Head

13.1.2.1. Close the following Valves: **[FP] (Yellow), [1] (Red), [4] (Red)** and the CO2 Cylinder Valve

13.1.2.2. Slowly disconnect the filling hose from **[FP] (Yellow)**

13.1.2.2.1. Caution: There will be some pressure in the filling hose that needs to bleed off before completely disconnecting it

13.1.2.3. With the filling hose disconnected, slowly open the **[FP] (Yellow)** to release any remaining pressure in the Pump Head

13.1.3. As a first repair attempt always open, inspect, clean, and repair the 6 valves first. This can be done with the pump head still attached to the pump body. After this

inspection/repair has been completed, the system should be tested again. If operation has not improved, then proceed to removing the pump head.

13.1.4. To remove the pump head

13.1.4.1. Disconnect the discharge line between the pump head and check valve. Loosen the tube fitting end of the 3/8" NPT to ¼" Tube Elbow fitting. (When reinstalling, make sure that the check valve cap is properly orientated upwards and level.)

13.1.4.2. Disconnect the Pump Suction pipe that runs from the Valve **[4] (Red)** to the Pump Head

13.1.4.3. Disconnect the 1/2" Tube fitting on the Pump Head end using a 7/8" wrench

13.1.4.4. Remove the two Hex Socket Cap Head bolts that connect the Pump Head to the Pump Body using a 5/16" Hex wrench

13.1.4.5. Slide the pump head off the pump body

13.1.5. Replacing the High Pressure Seals

13.1.5.1. Refer to the instructional video: "Replacing the Pump Piston Seals and Cleaning the Pump Pistons"

13.1.6. Cleaning the Pump Valves

13.1.6.1. Refer to the instructional video: "Cleaning the Pump Head Valves

13.1.7. After reassembling the pump and plumbing, begin at step 4.0 if this is a new extraction. Begin at step 5.0 if this continuing an extraction that was interrupted.