DESIGNED & ASSEMBLED IN THE USA

BLUE ALPINE

Owners Manual

Medium - BA40MFD
Large - BA70LFD

Machine Versions 1 & 2

Updated Owners Manual & Recipes PDF

Document number A00106

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1 Thank You

Thank you for purchasing one of our freeze dryers! We hope you get many years of service and enjoyment from your machine. This manual provides important information about the initial setup, proper use, maintenance, repair, and troubleshooting of your freeze dryer.

Freeze drying is an incredible process that preserves food for up to 25+ years. The process starts by freezing the food to between -25°F (-31°C) to -40°F (-40°C). Freezing the food quickly will produce a higher quality end product. Once the food is thoroughly frozen, the vacuum pump is engaged and the pressure within the chamber is reduced to below the triple point of water. This "triple point" refers to the temperature and pressure at which water can exist as a solid, liquid, and vapor. Below this point, ice will sublimate into a vapor - that is, the ice will convert directly to water vapor without melting. This sublimation is how freeze drying works and it only occurs at a pressure below 611 Pa (4582 mTorr). As the vacuum pump runs, it reduces the pressure in the chamber. At these low pressures, the ice in the food sublimates, reducing the water content of the food until the food is dry. The water vapor is then deposited on the walls of the chamber to prevent it from entering the vacuum pump. The entire freeze drying process can take 18-36 hours and varies greatly depending on the material, thickness of the food, an volume of food being dried.

To make the freeze drying process quicker, the food is gently heated. **The key to making high quality freeze dried food is precise heating.** If the food is heated too high or too quickly, it will collapse and its texture will degrade. Fruits tend to be the most delicate materials requiring more gentle heating. Meats, candy, and liquids are more robust and can handle more aggressive heating profiles. As you run batches of different foods in your machine, you will learn the settings that work best for your application. The control software has pre-programmed settings for various foods to assist you in determining the optimal settings. However, keep in mind that freeze drying is sometimes trial-and-error. Not every batch will come out perfect in the beginning.

The freeze dryer is intelligently controlled by a robust algorithm. The system utilizes sensors to accurately regulate the temperature of the food and pressure of the chamber. Home freeze drying is all about reducing and simplifying a relatively scientific process down to where virtually anyone can do it. Here at Blue Alpine, we are excited to be part of your freeze drying journey.

Contents

Safety Labels

Warnings are added throughout the owners manual for your safety and convenience. Reference these warnings when setting up and operating your freeze dryer.

WARNING

- Incorrect operation could result in bodily injury or death.

CAUTION

- Incorrect operation could result in bodily injury or equipment damage or failure.

NOTICE

- Helpful suggestions and information to operate the machine most efficiently.

2 Safety Information

To reduce the risk of fire, electric shock, or other injury, follow all instructions and safety guidelines.

WARNING

- Keep ventilation openings, in the appliance enclosure or in the built-in structure, clear of obstruction.
- Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.
- Do not damage the refrigerant circuit.
- Do not use electrical appliances inside the food storage compartments of the appliance, unless they are of the type recommended by the manufacturer.
- Do not store explosive substances such as aerosol cans with a flammable propellant in this appliance.
- Do not freeze dry explosives, flammable liquids, or other unstable substances.
- Excessive oil mist from the pump can possibly hinder and or cause damage to some smoke detectors. If your freeze dryer will be operated in a space that has a smoke detector we recommend you purchase an upgraded oil mist filter from our website.
- Before performing any maintenance on the freeze dryer, ensure that the unit is turned off and unplugged.

General Safety

We are committed to the safety of our customers. Below is a QR code for a video showing some of the safety consideration for safely operating, maintenance, and servicing the freeze dryer and vacuum pump.

Customer Safety Video

- **Only** use the freeze dryer as described in this manual.
- When not in use, turn the freeze dryer off and disconnect from power by removing the plug from the outlet.
- **Do not** operate the freeze dryer above 90°F or below 32°F.
- Keep the freeze dryer out of reach from children.
- **Always** unplug your freeze dryer from the power outlet before cleaning your freeze dryer.
- **Do not** plug in or unplug the heating rack while the unit is turned on.
- **Always** make sure to place the freeze dryer upright on a flat, level surface before operation.
- **Do not** attempt to service or charge the pressurized refrigeration system.
- **Do not** place the freeze dryer near sources of heat, such as stovetops, ovens, or radiators.
- **Do not** place the freeze dryer directly on floors, carpets, or rugs.
- Place freeze dryer on a water resistant surface that can be easily cleaned, such as stainless steel, hard plastic, concrete, or stone.
- Pay attention to warning labels and symbols on the freeze dryer. These labels provide essential safety information.
- **Do not** place or immerse the freeze dryer, power cord, or plug in water.
- If the freeze dryer is damaged or not functioning correctly, stop using it and contact **Customer Support** immediately (see page 70).
- If you use any chemicals in the freeze-drying process, follow proper safety protocols for those chemicals and store the chemicals in a secure and well-ventilated area.
- This freeze dryer is not to be used by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Freeze dryers are not toys. Supervise children when they are near the freeze dryer at all times and **never** allow them to play with the freeze dryer

Food Safety

Except for a handful of fringe examples, freeze drying involves food. Food safety is naturally an important part of freeze drying. Freeze drying can easily preserve microbes that can be hazardous to human and animal health. It is important to keep your machine clean and dry. You can achieve a drier chamber after a load is complete if you do a second defrost cycle with the door open to help evaporate any water left on the tray rack or in the chamber. Bacteria and mold thrive in warm wet environments, which can be present in freeze dryers if not properly cared for.

From a food safety standpoint, a given food should be treated the same before, during, and after freeze drying. For example, raw chicken should be treated like raw chicken before freeze drying, while it is freeze drying, and after it has been dried and is being bagged. Freeze drying does not explicitly cook food. It only removes the water from the food.

Additionally, all food safety considerations relating to listeria, salmonella, trichinosis, E. coli, Clostridium botulinum, Norovirus, Hepatitis and all other food-borne illnesses should be accounted for when processing food in a freeze dryer.

Food safety is the sole responsibility of the freeze dryer operator. If there are any questions about a specific food or processing method, please consult the USDA, FDA, and other federal and state recommendations and regulations.

Freeze drying a scientific process that has only been simplified for home use in recent years. As such, any specific application of freeze drying may require the operator to perform some additional internal or external laboratory testing. Again, this is the responsibility of the freeze dryer operator.

3 About Your Freeze Dryer

3.1 Stay Up To Date

We are always making updates to our owners manual in order to provide a better experience for our customers. Stay up to date with the latest best practices and insights into your freeze dryer by using the online version of the manual. Follow the QR code below to get the latest owners manual.

Owners Manual & Recipes PDF

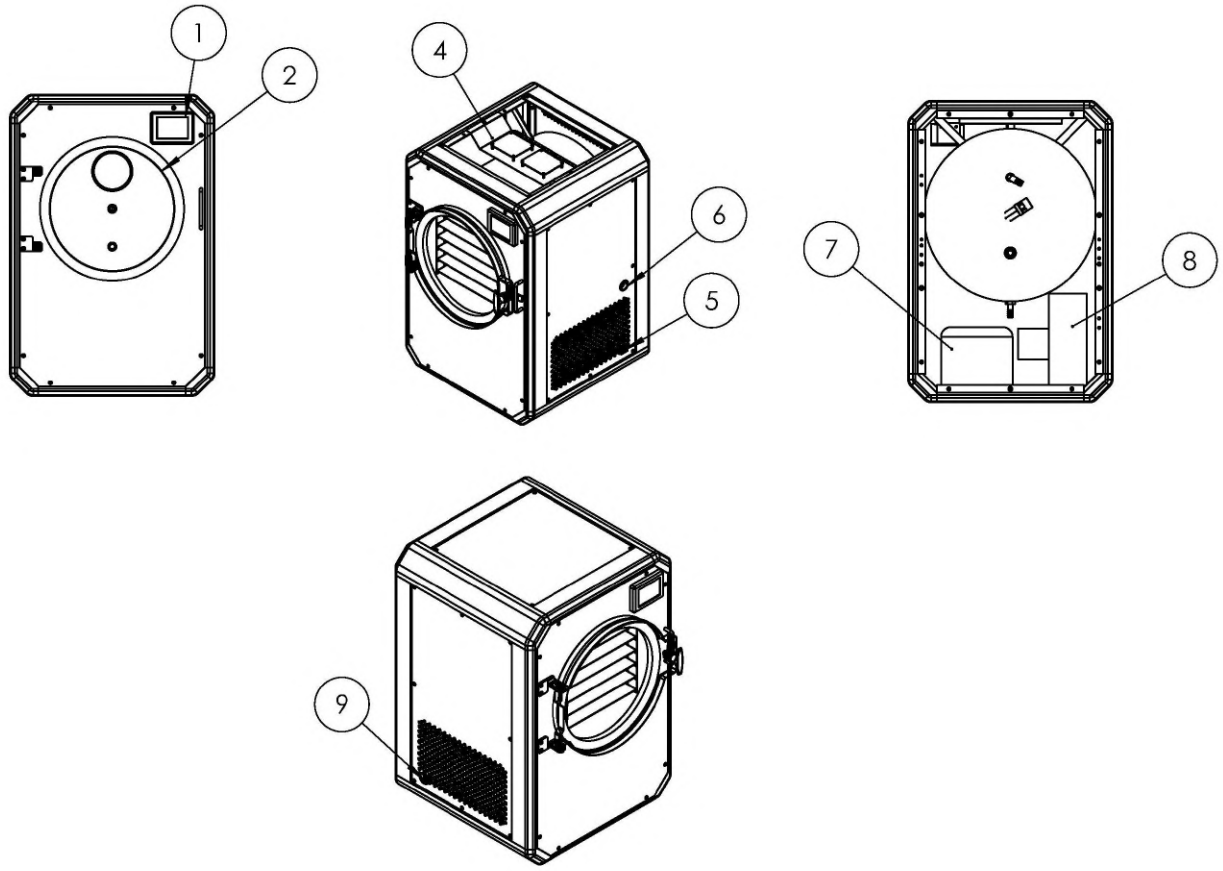
3.2 What's Included With Your Order

- 1x Freeze dryer
- 1x Power cord
- 1x Impulse sealer
- 1x Premium vacuum pump + oil
- 5x Stainless steel trays
- 5x Silicone mats
- 50x Mylar bags
- 50x Oxygen absorbers

3.3 Technical Specs

Specification	Medium	Large
Model	BA40MFD	BA70LFD
Dimensions (in)	20” x 21” x 30”	24” x 25.5” x 34”
Machine Weight	110lbs (50kg)	130lbs (59kg)
Shipping Weight	180lbs (82kg)	220lbs (100kg)
Chassis material	Aluminum	Aluminum
Door material	Polycarbonate	Polycarbonate
Chamber diameter	14in	15.7in
Max load capacity	15lbs (7kg)	25lbs (11kg)
Max liquid capacity	1.37gal (5.2L)	3.25gal (12.3L)
Max 24 hr period sublimated ice capacity	1.43gal (5.4L)	2.61gal (9.8L)
Max overall sublimated ice capacity	2.25gal (8.5L)	3.62gal (13.7L)
Max lbs/yr Food (Prefrozen & 90% uptime)	3,360lbs	6,132lbs
Standard Tray count	5	5
Tray size (in)	9.25” x 13”	13” x 18”
Tray size standard	1/4 cookie sheet	1/2 cookie sheet
Total Tray area	601in^2	1170in^2
Mat material	FDA Food Grade Silicone	FDA Food Grade Silicone
Voltage	120V 60Hz	120V 60Hz
Maximum power draw	13A (1560W)	17A (2040W)
Average power draw	9A (1080W)	12A (1440W)
Heating system power	590W	710W
Cooling capacity	520W	857W
Cooling capacity per tray area	.89 W/in^2	.73 W/in^2
Refrigerant	R1270, Propylene	R1270, Propylene
Charge mass	70.0g	150.0g
Refrigeration Compressor	1/3 HP Cubigel	1/2 HP Cubigel
Included vacuum pump	6-8 CFM, 1 HP	8 CFM, 1 HP
Vacuum pump oil change frequency	4-5 Batches	4-5 Batches
Lowest heat rack temp setting	1°F (-17°C)	1°F (-17°C)
Highest heat rack temp setting	165°F (73.8°C)	165°F (73.8°C)
Max ambient operating temp	90°F (32.2°C)	90°F (32.2°C)
Min ambient operating temp	32°F (0°C)	32°F (0°C)
Min ventilation space around unit	1ft (30.5cm)	1ft (30.5cm)
Min room area with 8ft ceiling	20 ft^2 (1.85m^2	20 ft^2 (1.85m^2
Operating noise level	64 - 78 dB	64 - 78 dB
Vertical spacing between trays - 5 tray	1.57in (40mm)	1.33in (34mm)
Vertical spacing between trays - 4 tray	2.04in (52mm)	1.73in (44mm)
Vertical spacing between trays - 2 tray	4.13in (105mm)	3.54in (90mm)
Vertical spacing between trays - 1 tray	8.26in (210mm)	7.16in (182mm)

3.4 General Components Overview



1 Control Panel
2 Chamber
3 Heat Rack
4 Electronics Bay
5 Vacuum Outlet
6 Vacuum Hose Location
7 Compressor
8 Condenser
9 Drain Hose Location

3.5 Service Parts List - Medium - BA40MFD - REV 2

Replacement parts are available on our website.

Component	Qty	UoM
[A00103-00] P100 Filter 3M 2097	1	Units
[A00104-00] Evaporator Panel Label	1	Units
[A00105-00] Blue Alpine Logo Sticker	1	Units
[A00106-00] Owners Manual	1	Units
[A00107-00] Impulse Sealer	1	Units
[A00108-00] 7 mil Mylar Bags	50	Units
[A00110-00] Torx T20 Screwdrivers	1	Units
[A00111-00] Oxygen Absorbers 300cc	50	Units
[A00112-00] 5mm Hex Key Loop T Handle Allen	1	Units
[A00117-00] Machine Serial Number Label - Medium	1	Units
[A00121-00] Danger Electric Shock Stickers - Small	2	Units
[A00124-00] 1/4 Sheet Silicone Tray	5	Units
[A00128-00] Medium Dust Cover	1	Units
[BA-6DVP-01] 6CFM Pump	1	Units
[E00102-00] Molex Cable	1	Units
[E00105-00] Ground Terminal	4	Units
[E00106-00] PT1000 RTD Thermometer Sensor	1	Units
[E00107-00] 3.5” Touch Screen	1	Units
[E00108-00] Digital PCB Board SAMD51	1	Units
[E00110-00] 6 Pin XH Cable - 50mm length	1	Units
[E00111-00] Power Entry Module	1	Units
[E00112-00] 20A Switch SPST	1	Units
[E00113-00] AC Socket Panel Mount	1	Units
[E00116-00] Thermal Switch 75°C 10A NC	1	Units
[E00117-00] 75x25x5mm heat sink anodized black	1	Units
[E00119-00] 120 x 25mm Cooling Fan + Wire Guard - Medium Unit	1	Units
[E00120-00] 15 amp Power Cable 14 AWG Cord	1	Units
[E00124-00] Deutsch Solid Contacts Stainless Steel - Male	6	Units
[E00125-00] Deutsch 6 Pin Connectors Black - Male	1	Units
[E00126-00] 6.3mm Female Crimp Spade Connector	8	Units
[E00127-00] 4.8mm Female Crimp Spade Connector (170325-1)	3	Units
[E00128-00] Medium 6 Wire Feedthrough Cable Assembly	1	Units
[E00130-00] Rev 2 Power PCB Board	1	Units
[E00131-00] Buffer PCB Board	1	Units
[E00136-00] Deutsch 6 Pin Connector Black - Female	1	Units
[E00153-00] 40 Pin FPC Cable - 300mm length	1	Units
[E00155-00] 9x9x5 mm Heat Sink With Adhesive	4	Units
[E90001-00] PVC4001 Vacuum Pressure Sensor Sub-Assembly	1	Units
[F00101-00] T-Handle	1	Units
[F00102-00] Stainless Handle	1	Units

Table 1 continued from previous page

Component	Qty	UoM
[F00104-00] M4 x 12mm Flat Head T20 Torx Stainless Bolt	4	Units
[F00106-00] M5 x 12mm Flat Head T20 Torx Stainless Bolt	4	Units
[F00107-00] M5-3 Self Clinching Nut	8	Units
[F00109-00] M2.5 Standoff 15mm M to F Nylon	4	Units
[F00110-00] M2.5 x 6mm Pan Head Philips Stainless Screw	18	Units
[F00112-00] Rivet - 2.4mm (3/32”)	48	Units
[F00113-00] M4 x 6mm Flat Head T20 Stainless Bolt	6	Units
[F00114-00] M3 x 5mm Flat Head T15 Torx Stainless Bolt	2	Units
[F00115-00] M3-1 Clinch Nut Stainless	2	Units
[F00116-00] M4 Spacer - 19mm Long Nylon	4	Units
[F00118-00] M4-3 Self Clinching Nut Stainless	44	Units
[F00119-00] M4-2 Self Clinching Nut Stainless	8	Units
[F00120-00] M4 x 50mm Pan Head Philips Stainless Bolt	4	Units
[F00121-00] M5 x 20mm Flat Head T20 Torx Stainless Bolt	4	Units
[F00123-00] M5 x15 Washer Stainless	4	Units
[F00124-00] Rivet - 4.8mm (3/16”) Grip Range 0.125” to 0.25”	32	Units
[F00125-00] #8 x 5/8” Stainless Self Tapping Screws	20	Units
[F00126-00] M5 x 10mm Countersunk T25 Torx Stainless Bolt	3	Units
[F00128-00] M4 x 10mm Flange Head T20 Torx Steel Bolt	38	Units
[F00129-00] 8mm Thrust Bearing & 2 Washers	4	Units
[F00132-00] M8 x 45mm Flange Socket Head Stainless Bolt	2	Units
[F00134-00] M2.5 Stainless Nut	4	Units
[F00136-00] M2.5 Standoff 15mm F to F Brass	4	Units
[F00139-00] M2.5 x OD4.2 x L5.0 Brass Hot Melt Inset Nut	2	Units
[H00101-00] Vacuum Hose 13mm ID x 21.3mm OD Black No Wire	2,500	mm
[H00104-00] 14mm Barb to 3/8” NPTF Male Elbow	1	Units
[H00107-00] 1/2” Female to 1/2” Male NPTF Elbow	1	Units
[H00108-00] Chamber Filter Fitting	1	Units
[H00109-00] 14mm Barb to 1/2” NPTF Male Straight Fitting	1	Units
[H00110-00] Compression Nut	1	Units
[H00111-00] Drain Valve	1	Units
[H00112-00] 14mm barb to 3/8 NPTF Male Fitting	2	Units
[H00115-00] 20.5mm Spring Clamp	2	Units
[H00117-00] 1/2 ZG (BSPT) Compression Pump Fitting - 21.3mm Hose	1	Units
[P00101-01] Door Medium Unit Polycarbonate 20mm	1	Units
[P00108-00] Plastic Corners	8	Units
[P00111-00] 1 Inch Black Silicone Gasket For p100 Filter	1	Units
[P00112-00] SB-8 Plastic Grommet	7	Units
[P00113-00] SB-11 Plastic Grommet	1	Units
[P00114-00] SB-19 Plastic Grommet	1	Units
[P00116-00] SB-30 Plastic Grommet	2	Units
[P00119-00] Silicone Rubber Door Seal Medium 382mm OD	1	Units

Table 1 continued from previous page

Component	Qty	UoM
[P00122-00] Leak Lock	10	mL
[P00134-00] Wire Management Clip	7	Units
[P00135-00] 3.5” Screen Bezel Mount Part 1	1	Units
[P00136-00] 3.5” Screen Bezel Mount Part 2	1	Units
[P00137-00] 3.5” Screen Bezel Mount Part 3	1	Units
[R00101-00] Compressor/Condenser - NUG90LR - Medium	1	Units
[R00106-00] .036 Capillary Tubing	1,677	mm
[R00108-00] 1” LLPT Foam Tape	1,125	mm
[R00113-00] Copper Tubing 50ft Roll	1	Roll 50ft
[S00107-00] 5 Tray Rack Side Bar Medium	2	Units
[S00108-02] 5 Tray Rack Back Medium	1	Units
[S00109-00] Tray Rack Wire Guard Medium	1	Units
[S00110-00] 1/4 Sheet Stainless Pans	5	Units
[S00111-00] Extruded Chamfer Frame V2 Medium	4	Units
[S00112-00] Extruded Corner Profile Long Medium	4	Units
[S00113-00] Extruded Corner Profile Short Medium	4	Units
[S00114-00] Side Panel 1 Right Medium	1	Units
[S00115-00] Side Panel 2 Left Medium	1	Units
[S00116-00] Back Panel Medium	1	Units
[S00117-00] Top Panel Medium	1	Units
[S00119-00] Medium Rear Mounting Brackets	2	Units
[S00120-00] Medium Mounting Tabs - Front Top of the Chamber	1	Units
[S00121-00-BLACK] Front Panel Black Medium 3.5” Screen	1	Units
[S00121-00-BLUE] Front Panel Blue Medium 3.5” Screen	1	Units
[S00122-00] Medium Mounting Tabs - Front Sides of the Chamber	2	Units
[S00124-00] Electronics Tray Medium	1	Units
[S00128-00] M8 Door Bottom Bracket	1	Units
[S00129-00] M8 Door Top Bracket	1	Units
[S00130-00] M8 Tab - 5mm Black	2	Units
[S90020-00] Medium 80W Sensor Vulcanized Heating Tray Sub-Assembly	1	Units
[S90021-00] Medium 80W Vulcanized Heating Tray Sub-Assembly	3	Units
[S90022-00] Medium 110W Vulcanized Heating Tray Sub-Assembly	1	Units
[S90023-00] Medium 160W Vulcanized Heating Tray Sub-Assembly	1	Units

3.6 Service Parts List - Large - BA70LFD - REV 2

Replacement parts are available on our website.

Component	Qty	UoM
[A00103-00] P100 Filter 3M 2097	1	Units
[A00104-00] Evaporator Panel Label	1	Units
[A00105-00] Blue Alpine Logo Sticker	1	Units
[A00106-00] Owners Manual	1	Units
[A00107-00] Impulse Sealer	1	Units
[A00108-00] 7 mil Mylar Bags	50	Units
[A00110-00] Torx T20 Screwdrivers	1	Units
[A00111-00] Oxygen Absorbers 300cc	50	Units
[A00112-00] 5mm Hex Key Loop T Handle Allen	1	Units
[A00113-00] Compressor Compartment Label 1	1	Units
[A00114-00] Compressor Compartment Label 2	1	Units
[A00115-00] Exterior Fire Label	1	Units
[A00116-00] Compressor Compartment Label 3	1	Units
[A00118-00] Machine Serial Number Label - Large	1	Units
[A00121-00] Danger Electric Shock Stickers - Small	2	Units
[A00126-00] 1/2 Sheet Silicone Tray	5	Units
[A00127-00] Large Dust Cover	1	Units
[BA-8DVP-01] 8CFM Pump	1	Units
[E90001-00] PVC4001 Vacuum Pressure Sensor Sub-Assembly	1	Units
[E00102-00] Molex Cable	1	Units
[E00105-00] Ground Terminal	4	Units
[E00106-00] PT1000 RTD Thermometer Sensor	1	Units
[E00107-00] 3.5” Touch Screen	1	Units
[E00108-00] Digital PCB Board SAMD51	1	Units
[E00110-00] 6 Pin XH Cable - 50mm length	1	Units
[E00111-00] Power Entry Module	1	Units
[E00112-00] 20A Switch SPST	1	Units
[E00113-00] AC Socket Panel Mount	1	Units
[E00116-00] Thermal Switch 75°C 10A NC	1	Units
[E00117-00] 75x25x5mm heat sink anodized black	1	Units
[E00124-00] Deutsch Solid Contacts Stainless Steel - Male	6	Units
[E00125-00] Deutsch 6 Pin Connectors Black - Male	1	Units
[E00130-00] Rev 2 Power PCB Board	1	Units
[E00131-00] Buffer PCB Board	1	Units
[E00136-00] Deutsch 6 Pin Connector Black - Female	1	Units
[E00141-00] 120 x 38mm Cooling Fan + Wire Guard - Large Unit	1	Units
[E00146-00] Large 6 Wire Feedthrough Cable Assembly	1	Units
[E00147-00] 20 amp Power Cable 12 AWG Cord	1	Units
[E00153-00] 40 Pin FPC Cable - 300mm length	1	Units
[E00155-00] 9x9x5 mm Heat Sink With Adhesive	4	Units

Table 2 continued from previous page

Component	Qty	UoM
[F00101-00] T-Handle	1	Units
[F00102-00] Stainless Handle	1	Units
[F00104-00] M4 x 12mm Flat Head T20 Torx Stainless Bolt	4	Units
[F00106-00] M5 x 12mm Flat Head T20 Torx Stainless Bolt	4	Units
[F00107-00] M5-3 Self Clinching Nut	8	Units
[F00109-00] M2.5 Standoff 15mm M to F Nylon	4	Units
[F00110-00] M2.5 x 6mm Pan Head Philips Stainless Screw	18	Units
[F00112-00] Rivet - 2.4mm (3/32”)	48	Units
[F00113-00] M4 x 6mm Flat Head T20 Stainless Bolt	6	Units
[F00114-00] M3 x 5mm Flat Head T15 Torx Stainless Bolt	2	Units
[F00115-00] M3-1 Clinch Nut Stainless	2	Units
[F00116-00] M4 Spacer - 19mm Long Nylon	4	Units
[F00118-00] M4-3 Self Clinching Nut Stainless	52	Units
[F00119-00] M4-2 Self Clinching Nut Stainless	8	Units
[F00121-00] M5 x 20mm Flat Head T20 Torx Stainless Bolt	4	Units
[F00122-00] M5 x 0.8 Hex Nut Stainless	4	Units
[F00123-00] M5 x15 Washer Stainless	4	Units
[F00124-00] Rivet - 4.8mm (3/16”) Grip Range 0.125” to 0.25”	32	Units
[F00125-00] #8 x 5/8” Stainless Self Tapping Screws	20	Units
[F00126-00] M5 x 10mm Countersunk T25 Torx Stainless Bolt	3	Units
[F00128-00] M4 x 10mm Flange Head T20 Torx Steel Bolt	46	Units
[F00129-00] 8mm Thrust Bearing & 2 Washers	4	Units
[F00131-00] M4 x 65mm Pan Head Phillips Stainless Bolt	4	Units
[F00132-00] M8 x 45mm Flange Socket Head Stainless Bolt	2	Units
[F00134-00] M2.5 Stainless Nut	4	Units
[F00136-00] M2.5 Standoff 15mm F to F Brass	4	Units
[F00139-00] M2.5 x OD4.2 x L5.0 Brass Hot Melt Inset Nut	2	Units
[H00101-00] Vacuum Hose 13mm ID x 21.3mm OD Black No Wire	2,500	mm
[H00105-00] 1/2” NPTF Female Coupler 50mm Length	3	Units
[H00108-00] Chamber Filter Fitting	1	Units
[H00109-00] 14mm Barb to 1/2” NPTF Male Straight Fitting	1	Units
[H00110-00] Compression Nut	1	Units
[H00111-00] Drain Valve	1	Units
[H00112-00] 14mm barb to 3/8 NPTF Male Fitting	3	Units
[H00114-00] 3/8” NPTF to 3/4-16” Adapter Fitting	1	Units
[H00115-00] 20.5mm Spring Clamp	2	Units
[H00117-00] 1/2 ZG (BSPT) Compression Pump Fitting - 21.3mm Hose	1	Units
[P00108-00] Plastic Corners	8	Units
[P00111-00] 1 Inch Black Silicone Gasket For p100 Filter	1	Units
[P00112-00] SB-8 Plastic Grommet	7	Units
[P00113-00] SB-11 Plastic Grommet	1	Units
[P00116-00] SB-30 Plastic Grommet	1	Units

Table 2 continued from previous page

Component	Qty	UoM
[P00117-00] ABS Handle Panel Mount	4	Units
[P00122-00] Leak Lock	1	mL
[P00128-00] Door Large Unit Polycarbonate 20mm	1	Units
[P00130-00] Silicone Rubber Door Seal Large 421mm OD	1	Units
[P00132-00] 6in x 40lb Zip Tie	4	Units
[P00135-00] 3.5” Screen Bezel Mount Part 1	1	Units
[P00136-00] 3.5” Screen Bezel Mount Part 2	1	Units
[P00137-00] 3.5” Screen Bezel Mount Part 3	1	Units
[P00139-00] SB-50 Plastic Grommet	1	Units
[R00107-00] Compressor/Condenser - NPT16LR - Large	1	Units
[R00112-00] Copper Tubing 77ft Roll (23.5m)	1	Roll 77ft
[R00114-00] .042 Capillary Tubing	1,956	mm
[S00126-00] 1/2 Sheet Stainless Pans	5	Units
[S00128-00] M8 Door Bottom Bracket	1	Units
[S00129-00] M8 Door Top Bracket	1	Units
[S00130-00] M8 Tab - 5mm Black	2	Units
[S00131-00] Large Rear Mounting Brackets	2	Units
[S00132-00] Large Mounting Tabs - Front Top of the Chamber	1	Units
[S00133-00] Large Mounting Tabs - Front Sides of the Chamber	2	Units
[S00134-00] Electronics Tray Large	1	Units
[S00135-00] Custom Stainless Pot Chamber Large	1	Units
[S00137-01] 5 Tray Rack Back Large	1	Units
[S00138-00] 5 Tray Rack Side Bar Large	2	Units
[S00139-00] Tray Rack Wire Guard Large	1	Units
[S00140-01] Extruded Chamfer Frame Large	4	Units
[S00141-00] Extruded Corner Profile Long Large	4	Units
[S00142-00] Extruded Corner Profile Short Large	4	Units
[S00143-00-BLACK] Front Panel Black Large 3.5” Screen	1	Units
[S00143-00-BLUE] Front Panel Blue Large 3.5” Screen	1	Units
[S00145-01] Side Panel 1 Right Large	1	Units
[S00146-00] Side Panel 2 Left Large	1	Units
[S00147-00] Back Panel Large	1	Units
[S00148-00] Top Panel Large	1	Units
[S90016-00] Large 95W Vulcanized Heating Tray Sub-Assembly	3	Units
[S90017-00] Large 95W Sensor Vulcanized Heating Tray Sub-Assembly	1	Units
[S90018-00] Large 135W Vulcanized Heating Tray Sub-Assembly	1	Units
[S90019-00] Large 195W Vulcanized Heating Tray Sub-Assembly	1	Units

4 Initial Setup

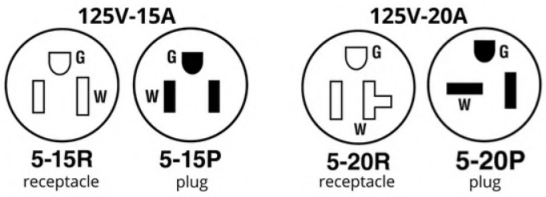
Initial Setup Video

4.1 Unpacking

1. Remove the impulse sealer, vacuum pump, and accessory box from the shipping pallet.
2. Cut along the edges of the freeze dryer's cardboard packaging. **Do not cut in the middle of the box**, or you may scratch or damage the freeze dryer.
3. Open the door and remove the black rubber seal. Cut and completely remove the shipping zip ties holding the tray rack in place.

4.2 Installation

1. Choose a suitable location for your freeze dryer.
    - Find a location that will allow you to plug the freeze dryer directly into a 110V wall outlet. **Never plug the freeze dryer into an extension cord. Never plug the freeze dryer into 220V power.** Doing so will void the warranty. Extension cords will cause the refrigeration compressor to burn up.
    - Make sure the freeze dryer is operated at an ambient temperature between 32°F and 90°F. Operating the freeze dryer above 90°F will shorten the life of the refrigeration compressor. Operating the freeze dryer below 32°F can cause liquid refrigerant to be sent back to the compressor which can also shorten the life of the refrigeration compressor.
    - Ensure that the freeze dryer is plugged into an outlet with a 15 amp breaker for the medium and 20 amp outlet for the large. **The outlet must have a ground.** Using an adapter that gets rid of the ground pin will void the warranty. Also ensure that the freeze dryer is the only device on the circuit. Powering other devices on the same circuit as the freeze dryer could cause the breaker to trip or the refrigeration compressor to be underpowered.



Medium Freeze Dryer **Large Freeze Dryer**

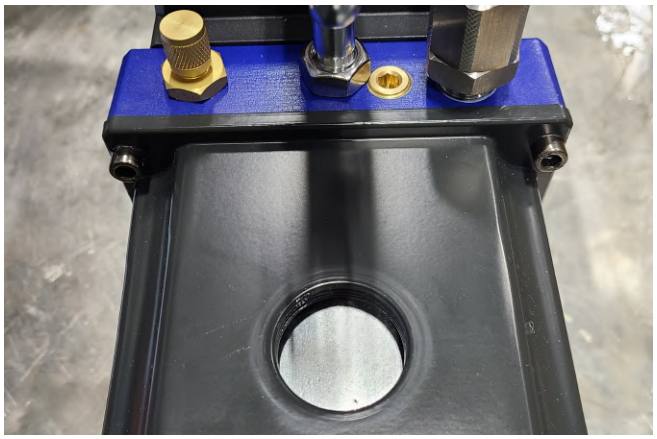
- If your specific installation requires a GFCI, please note that the GFCI should be as close to your electrical panel as possible. GFCI receptacles are prone to nuisance tripping the farther they are away from the electrical panel.
- When finding a suitable location for the freeze dryer, keep in mind that the machine creates a noticeable amount of noise (64 - 78 dB, or about the same as a clothes dryer). Also keep in mind that the machine creates heat, so the room in which it is operated will become warmer.
- Only run the freeze dryer on a level surface.
- It is typically best to place your freeze dryer on a surface that can be easily cleaned and is impervious to water such as a stainless steel counter top, table, or cart. The freeze dryer can have water condensate around some of the refrigeration lines and around the drum which can make its way onto whatever surface the freeze dryer is on while defrosting.

2. Make sure both the vacuum pump and freeze dryer's power switches are set to OFF (the power switch is located on the back of the machine). Note that the premium vacuum pump does not have a switch and will turn on as soon as it has power. The commercial vacuum pump does have a switch in the back.
3. Make sure the heat tray rack is connected to the plug at the back of the machine. To do this, open the door and remove the black rubber door seal. The heat tray rack may have rotated during shipping. Make sure the heat tray rack is inserted with the orange heat pads face down. The electronic connector plug should be stored above the heat tray rack when placing the tray rack back into the chamber.
4. When setting up the space it is important to have adequate air flow. The pumps produce a lot of heat if left in a closed space. The room or space the freeze dryer is in needs to have a minimum square footage of 20ft^2 with an 8ft ceiling. Additionally the machine needs to have at least 1ft of spacing on all sides for air flow. If the room does not have enough ventilation and starts to get hot, you can improve the freeze dryer performance by putting a fan on the condenser.

4.3 Vacuum Pump

1. The vacuum pump must be filled with oil and connected to your freeze dryer on the right hand side before operation. A small subset of machines are built with the vacuum pump on the left side. If your machine was built with the vacuum pump on the left side there will be stickers indicating that.

Dairyland Brand Vacuum Pump Oil (also branded as Clover Patch oil) is the best oil to use for freeze drying vacuum pumps. The vacuum pump oil should be changed every 4 to 5 loads. Its blue color is from detergents that help with sugar and water which is common in vacuum equipment in the dairy industry. The pump will require regular oil changes over time (see page 47). **All vacuum pumps are consumable items and will be the first component to fail**. Before running any batch, ensure that the vacuum pump has the correct amount of oil in it. **Running the vacuum pump without oil will ruin it.**



- Remove the large oil filter located behind the handle, and slowly fill the pump with vacuum oil through the opening until the oil level fills 1/3 to 1/2 of the sight glass. Oil filled above this level may decrease the ability of the pump to pull vacuum. The oil should be no less than the minimum marker. A funnel may help. Replace the oil filter.
- The brass nob on the top of the pump is called the gas ballast valve. It is also worth noting that opening the gas ballast valve one to four full turns after it is at vacuum can increase the life expectancy of your vacuum pump. Opening the gas ballast valve before the chamber is at vacuum can cause oil to come out of the valve. It is recommended to use the gas ballast valve, but it should be opened after the chamber is at vacuum to prevent dripping oil.
- Plug the vacuum pump power cord into the pump outlet on the side of the freeze dryer. If the vacuum pump has a switch, turn the pump switch to the on position. The pump will not turn on at this time. The machine will tell the vacuum pump to turn on and off. The pump will not turn on until the freeze cycle is finished. If you are worried that your pump is not functioning you can test it by plugging it directly into the wall outlet and verify that it is in the on position. Note that the premium vacuum pump does not have a switch and will turn on as soon as it has power. The commercial vacuum pump does have a switch in the back.

2. Power on the freeze dryer by plugging in the power cord to a 110V wall outlet and turning the switch to ON. The touchscreen should automatically turn on when the machine is switched on.
3. The setup of the **Commercial Vacuum Pump** is very similar to the standard vacuum pump, except that the commercial vacuum pump uses KF fittings instead of threaded fittings. Click the link to watch this video https://bluealpinefreezedryers.com/commercial_vacuum_pump_setup or scan the QR code.

4.4 First Load

All Blue Alpine freeze dryers are off gassed in the factory, and so there is no need to do a bread run in your new machine. Candy or meat are both great first loads to run because they are very forgiving. In general, the built in recipes will do well for you. Some fruits will need to be run on delicate, and some can be run on fruit. The more delicate fruits should be run on the delicate cycle. See our list of recipes for suggestions.

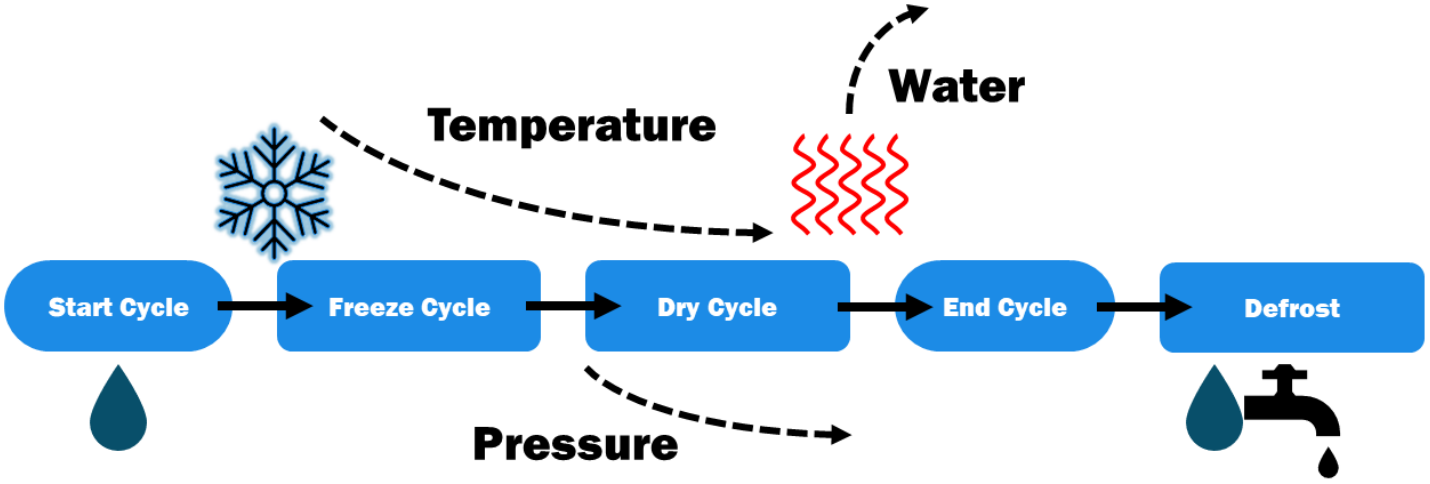
WARNING

- Never plug the power cord into an extension cord.
- Never plug the power cord into an outlet or power the machine with the side or top panels removed.

5 How Freeze Drying Works

5.1 Overview

After you have successfully installed and set up your freeze dryer, you're now ready to prepare your first batch of food. Good preparation is essential to successful freeze drying.

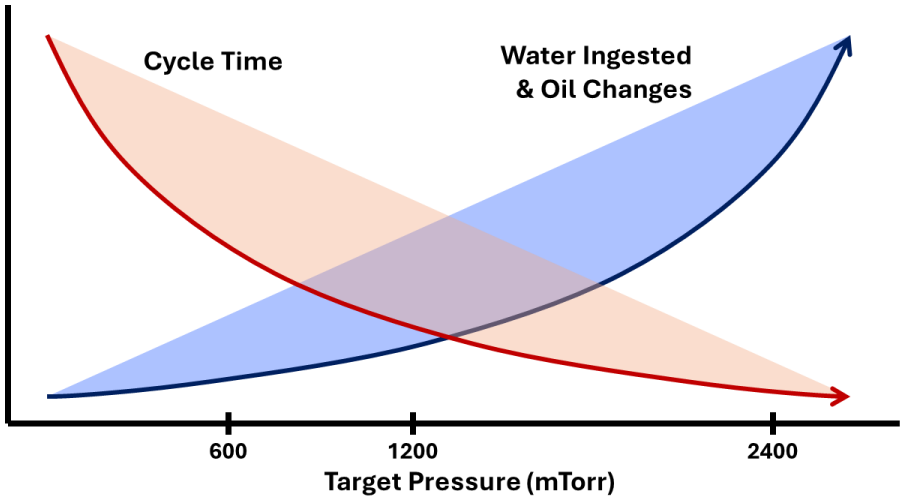


The cycle will begin with the **freeze cycle**. During this stage, your freeze dryer will get very cold, completely freezing the water inside your food. Once frozen, your freeze dryer will then begin the **dry cycle**. The pressure will begin to drop extremely fast, then slowly level off to a target pressure. Once the pressure drops low enough, the frozen water will begin to sublimate- transitioning from ice to water vapor. Think evaporation, but from a solid to gas, rather than a liquid to gas.

The heat racks will turn on to help control the sublimation rate. If water sublimates too fast, it may damage the food. The water vapor from the food then sticks, or condenses, onto the cold walls of the chamber and forms ice. All of that ice was water vapor from the air and from the food!

How low the pressure drops determines the length of the cycle time and the amount of water ingested by the pump. The more water ingested, the more frequent oil changes will need to be. This is a trade-off between longer cycle times and less water ingested, or shorter cycle times and more water ingested.

Running the system in the summer with higher temperatures in the room will result in longer cycles and more water being injected into the pump. These warmer temperatures will also result in the refrigeration system working harder. This could cause premature wear on the refrigeration system but may not be noticed until years later. Running the system in the winter with colder temperatures in the room will result in faster cycles and less water in the pump.



Every food is prepared differently, so we'll go through an example to give you an overall idea of how to prepare food for the drying process.

5.2 Thickness

The thickness of the food is extremely important to the quality of the end product. In general, fruits, vegetables, and meats need to be sliced before they are freeze dried. There is no minimum thickness, but there is a maximum thickness. For example, strawberries and bananas tend to freeze dry best when they are sliced to a thickness between 3/16" and 1/2". As a general rule of thumb, this thickness range (3/16" - 1/2" or 5mm - 13mm) is applicable to all food types.

Thicker slices will tend to leave pockets of water in the middle of the food and will significantly slow down the drying process. Trying to dry very thick pieces of food is not possible in a reasonable amount of time. It's better to limit the thickness to 1/2" or less to keep the drying time within a practical range.

Keep in mind that certain food types contain significantly more water than other foods. Foods with a higher water content will require a longer drying time. For example, drying a batch of candy is significantly faster than drying liquids or fruit.

5.3 Orientation

All food needs to be placed as flat as possible on the tray. Avoid stacking food or slices. Avoid overfilling the trays with food.

5.4 Loading Food into the Machine

After the food has been sliced and oriented on the silicone mats in the trays, you're now ready to place the trays in the tray rack. Load the food into the tray rack, close the door, and turn the handle. Make sure the vacuum pump is turned on and plugged into the outlet on the side of the machine.

CAUTION

- Do not plug or unplug the heating racks while the unit is turned on. Doing so may cause the plugs to arc and damage the unit. Always turn off the machine before plugging or unplugging the heat racks.

5.5 Quick Start

Turn the machine on and press the Quick Start button on the home screen.

Now, ensure that the drain valve is closed. This page is a reminder to always close the valve. If the valve is not fully closed, it will create a leak and cause a vacuum pressure error. Press Start to begin the cycle. You should hear the refrigeration system turn on. The vacuum pump should not turn on yet.

5.6 Freeze Cycle

The freeze cycle typically takes 8 hours (factory default setting). You can adjust the freeze time if you need a shorter or longer freeze cycle.

NOTICE

- Do not add cold food to a warm chamber. This may lead to a vacuum error.

Do not add cold food to a warm chamber. This will cause ice to melt in the food. This melting can lead to a vacuum error as well as excess water being ingested by the pump.

To prevent this from happening, simply start the cycle for 30 to 40 minutes prior to putting food in the chamber. This will ensure that cold food is placed into a cold chamber.

5.7 Dry Cycle

The freeze dryer works such that it will try to heat the trays until the unit reaches the set pressure for the recipe. If the unit only has to heat the food to 38°F to sublimate enough water out of the food to reach a set pressure of 1000mtorr, then that is all it is going to heat to. As the water sublimates out of the food and becomes a gas, the water acts as pressure withing the chamber. During the dry cycle, you can think of the mtorr reading as a measure of how many water molecules are coming off the food. Toward the beginning of the cycle the shelf temperature will be very low. The shelf temperature will not read the full temperature until the end of the cycle.

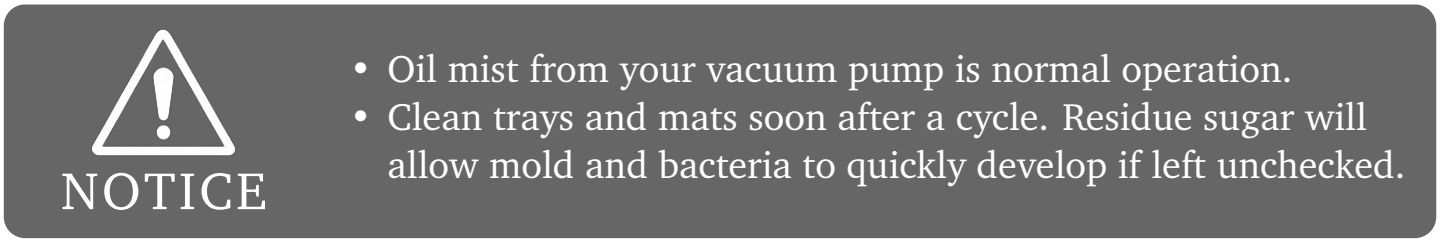
The three most important parameters for the dry cycle are the set pressure, the set temperature, and the dry time. The set pressure helps determine how aggressive or gentle a dry cycle is. The temperature is simply the final temperature of the heat trays. And the dry time can very greatly depending on how thick the food is, how much food is in the chamber, and what the ambient temperature is.

At the end of the dry cycle, you can check the doneness of your food. While the chamber is under vacuum, it is impossible to open the door. Slowly open the drain valve to bring the chamber back to atmospheric pressure. **The trays may be hot immediately following the dry cycle.**

Remove a sample of food from a tray and crack it in half. Most foods should have a crispy snap and a dry texture in the middle. Some foods may be more leathery than crispy. The middle should feel completely dry when you hold the food to your lips. If you do feel moisture or ice, the food needs more dry time. You can restart the drying cycle by going back to the home screen and choosing Quick Start if the cycle has completely ended. Then, skip the freeze cycle and go straight to the dry cycle. Adjust the dry time appropriately based on how moist the food sample was.

The food may be done before the dry cycle is completed. If the chamber pressure drops to or below 200 mTorr consistently for 1-2 hours, the food is likely done or close to being done. Pause the cycle and check the food before ending the cycle.

The heating racks sublimate water off from inside the food, and the resulting water vapor increases the chamber pressure. The freeze dryer applies enough heat to create the desired target pressure. When there is no more water inside the food, the chamber pressure will drop because there is little water to "boil" off and raise the pressure. The pressure sensors are very accurate, but have a lower limit of 200 mTorr and will not show lower pressures.



5.8 End of Dry Cycle

At the end of the dry cycle the freeze dryer will continue to freeze dry, but it will do it at a much more gentle rate. It will continue to cycle to pump on an off to keep the chamber under vacuum, but it turns the vacuum pump off for long periods of time in order to extend the life of the vacuum pump by.

The trays will continue to heat as well. As long as the recipe was set correctly initially, it is impossible to freeze dry food for too long. Therefore it is safe to allow the machine to sit in these end of cycle state until you are have time to package the food. However, it is best if you try and package the food within 24 hours to make sure you do not loose the batch to a power outage or anything else.

During this end of cycle state you will notice that the chamber ice will retreat away from the door. This is normal since the end of the chamber and the door are warmer than the refrigerant lines.

5.9 Defrost

After every batch, it is necessary to remove all of the ice that accumulates on the walls of the chamber. **Before defrosting the ice, remove the batch or else the food will rehydrate.** Place the drain hose in a bucket or container (1-5 gallons) and open the drain valve. Close the freeze dryer door. The defrost cycle uses the tray rack to heat the chamber and expedite the defrosting process. Allow all of the water to drain out of the freeze dryer, and then dry any remaining water in the chamber with a cloth.

It is a good practice that after the machine has been defrosted that the machine gets dried out with a towel or paper towel. There can be a significant amount of water left over after the defrost cycle that will need to be pushed to the drain or dried up manually. Once the machine is mostly dry inside the chamber, open the door and run the defrost cycle again. Make sure to leave the drain valve open as well. This will help prevent mold in the chamber and will lengthen the time between deeper cleanings.

- Not every batch will be successful, especially at first. There is a learning curve to freeze drying, so don't get discouraged if it does not work and a batch gets ruined.
- Every food is different. Some foods are significantly easier to freeze dry than others. That said, the machine's default settings should work on almost every type of food.
- Not all foods can be freeze dried. Chocolate, butter, oils, and excessively fatty items are examples of foods which can't be freeze dried.

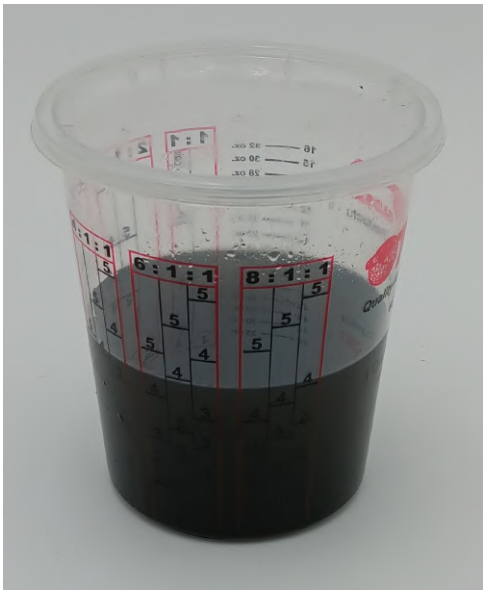
5.10 Storing Your Freeze Dried Food

There are two methods for storing your batch. The first is to use mason jars. While good showpieces, mason jars are heavy and prone to breaking. The second and recommended method is to use 7 mil Mylar bags. These can be easily sourced through the Blue Alpine website, or purchased from third-party vendors. Note that not all bags are the same. If purchasing from third-party vendors, be sure to use 7 mil bags with at least a 1.2 mil aluminum lining. To store your food:

1. Move your freeze dried food to the Mylar bag or mason jar.
2. Place one oxygen absorber packet in with your food. The O2 absorbers saturate after 30 minutes, so do not leave them out in open air for too long. They can be stored in an airtight container such as a mason jar or resealed in their plastic packaging with the impulse sealer.
3. Evacuate as much air as possible from the Mylar bags. If using a mason jar, shut the jar.
4. Zip the Mylar bag closed. Use the included impulse sealer to heat seal the end of the Mylar bag. We recommend sealing 2-3 rows for added measure to ensure there are no missed leaks.
5. To preserve food even longer, consider purchasing a chamber vacuum sealer. These machines work by helping remove all the air from a Mylar bag before it is sealed. At least one oxygen absorber should be used even if a chamber vacuum sealer is employed to seal the bags.

That's it! Your food is now preserved and will last for 20-30 years.

5.11 FAQ: Why does my vacuum pump oil look so dark after the first batch?



It can be very alarming to check your machine after running your very first freeze-drying cycle to find that the oil in your pump looks significantly darker. In an average cycle oil discoloration should be minimal, so what is happening on the first run?

This results from a combination of two main sources.

1. Extra particulates from the casting process.
2. Slight imperfections in metal parts within the vacuum pump that when first operated, get worn in.

Each pump has it's own break-in period based on very small differences in from one pump to the next. In general your oil can be filtered and reused. After oil has been used for 30 cycles your should consider getting new oil and recycling it.

6 Controls

This section is intended to help you navigate and optimize your freeze dryer's software efficiently. The software manages the vacuum pump, refrigeration system, and heating shelves.

This is the home page. The freeze dryer will default to this page every time it is turned on. From here, you can immediately begin a freeze drying cycle by pressing **QUICK START**.

For more precise control over the cycle, the **RECIPES** page will offer different food group presets to choose from. The **SETTINGS** page will be used for editing default settings and running hardware tests.

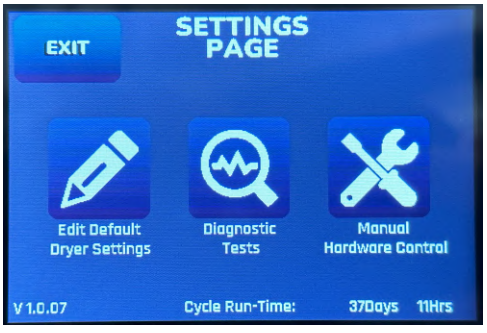
The **QUICK START** page makes it easy to quickly begin a freeze drying cycle. Pressing **START** will begin a cycle using the default settings.

If the freeze dryer is frozen over from a previous cycle, the **DEFROST** option will immediately begin thawing out the freeze dryer. If your food is already frozen, you can press **SKIP FREEZE CYCLE** to immediately begin the next part of the freeze drying cycle.

The **RECIPES** page offers preset freeze drying food groups including candy, greens, meat, fruit, liquid, and delicates. These presets are more optimized for the freeze drying performance of that particular food. Candy, for example, is better with a lower pressure than a lower temperature. The candy preset will account for this.

Each preset can also be modified with the **EDIT** button to change the default freeze time, dry time, dry temperature, and pressure.

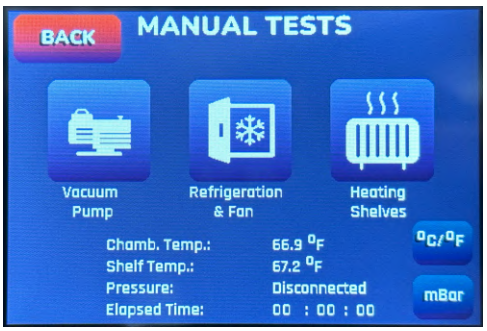
From the **SETTINGS** page, the default dryer settings can be modified by selecting **Edit: Default Dryer Settings**. These settings include the default freeze time, dry time, dry temperature, and pressure for the **QUICK START** setting. Measurement unit preferences, sound settings, and a factory reset are also found in this menu.



A thorough quality control test can also be run by pressing the blank upper right corner of this page.

The **MANUAL TESTS** page allows for individual components of the freeze dryer to be turned on or off. The vacuum pump, refrigeration and fan, and the heating shelves can all be toggled. Sensor measurements will also be shown.

This page can be helpful in diagnosing your freeze dryer. If any sensors are disconnected, this will be shown where the sensor measurements are displayed.



7 Customize Settings

After running several batches of food in your freeze dryer, you may want to start optimizing the settings to best suit your needs. For example, if you consistently dry the same food material in every batch, you might know the exact freeze time, dry time, or final temperature necessary for your application. Although these parameters can be changed while a cycle is running, it is sometimes helpful to save custom values as the default settings.

From the home screen, select the "SETTINGS" button and then select the "EDIT: DEFAULT DRYER SETTINGS" button. Within the Edit menu, you can navigate to various settings such as:

Default Freeze Cycle Time: Increase the freeze time for larger batches and decrease for smaller batches. Default freeze cycle time is 8 hours.

Dry Cycle Time: Increase the dry cycle time for batches with more water content. Default dry cycle time is 16 hours.

Final Shelf Temperature: This is the highest temperature that food reaches during the drying cycle. In general, the final temperature should be in the range of 80°F to 125°F depending on the hardiness of the food. Some delicate foods need to have a final shelf temp of 34°F in order not to shrivel. In freeze drying, every food has a melting point - the temperature at which the food begins to degrade, melt back, or shrivel. You can find the recommended shelf temperatures in the recipes section of this manual. A general rule of thumb is that if the food is turning our shriveled you can turn down the temperature and pressure, and if the food is not turning out shriveled you can turn up the pressure.

Each shelf on the tray rack will be heated to approximately the same temperature. There can be a 4°F to 10°F difference between the temperature of the shelves. This is normal and is not an issue for the vast majority of foods. If you are drying a variety of foods, use the final shelf temperature setting for the food with the lowest recommended temperature.

Generally, the factory settings will work for most applications, but some adjustment and forethought will inevitably be needed for each type of food. Adjusting the settings should only be done if you have sufficient experience with freeze drying. Also, the hardware and software that controls the freeze dryer is inherently intelligent. The system continuously monitors the process while precisely regulating the shelf temperature of the food and the chamber pressure.

8 Recipes

The recipes page can help users quickly find settings more optimized to the specific foods they will be drying. The preset temperatures and pressures are a good starting point, but you will need to test each food to optimize your recipe.

For example, pineapple is a relatively delicate food. Fresh pineapple will have a final shelf temperature a few degrees higher than frozen pineapple from the freezer section at the store. Canned pineapple will also be slightly different than the final shelf temperature than the other two. Whatever you are doing, you will need to make small fine tune adjustments to get the final product perfect.

If you are drying a variety of foods, use the final shelf temperature setting for the food with the lowest recommended temperature. If you get the food too hot it will destroy the proteins and cells of the food and cause it to collapse. This will usually result in a soft, flexible product similar to a wet fruit leather. If you see this happen, the food is no longer storable for long term storage and will need to be used quickly or thrown away. If this happens, simply try the samples again but about 10°F colder shelf temperature than what it was before.

The food will take longer to get done if the final shelf temperature is below 100°F, but sometimes it is necessary. Some food needs to start freeze drying at 34°F. This is a very gentle way to freeze dry (and it can certainly be done this way), but it will take a long time for the food to dry.

There are several characteristics outside of the recipe settings that can affect the freeze drying cycle. For example, all else being equal, if the food thickness increases the cycle will take longer. Additionally, more total food in the freeze dryer can make the load take longer as well. Similarly, if you double stack food it can take longer.

The outside temperature can also affect the cycle time. Freeze drying works faster/better when the temperature difference between the shelves and the chamber is greater. The higher the temperature outside the warmer the chamber temperature will be. You can improve your chamber temperature by putting a fan on the condenser side of the machine on hot days.

Lastly, the vacuum pump plays a huge part of how fast loads will get done. An older pump that cannot pull as deep of a vacuum will take longer and in some cases will not even freeze dry if the pump is not able to pull deep enough. A good way to test the health of the vacuum pump is to do an ultimate vacuum test. To do this, make sure the chamber is super dry, go to settings, then go to manual hardware control, and turn on the refrigeration and the vacuum together. Let it run for 1 hour and see what pressure it can get down to. Generally, any pressure under 500 mtorr is acceptable. If the value is over 500 mtorr but below 1100 mtorr you might consider bumping up the recipe pressures. If the ultimate vacuum pressure is over 1100 mtorr, you might consider getting a new vacuum pump.

8.1 Pineapple

Load Size:

Medium: 8-16 lbs

Large: 16-20 lbs

Toughness: Very delicate

Pressure: 500-700 mTorr

Shelf Temperature: 32-85°F

Drying Time: 24-48 hours

Freeze dried pineapple is deliciously sweet with tropical flavor locked in. Pineapple is vitamin rich, with plenty of Vitamin C to help boost your immune system. It makes a great snack between meals, on the trail outdoors, or as a unique addition to your yogurt or cereal.

Smaller bits of pineapple work better than larger bits. 3/4" chunks work well.

If the center of the pineapple bits start to look wet and fall in again, the shelves are too hot. In general pineapple should be treated as an ultra-delicate food.

Pineapple is a super delicate food and may need to be run at 32°F for 12 to 24 hours before manually turning up the temperature higher.

Sometime it can be a good idea to dry the food twice. To do this, dry the food for 24 to 48 hours. Then put the food in a freezer and defrost the chamber, then cool the chamber and start the cycle again. Run it for another 24 hours of dry cycle. This will help make sure all the water is out of the food. For the second drying, you can typically bump up the pressure and temperature without harming the shape or texture of the food. Drying wet foods twice can help because the cold chamber helps create a pressure gradient in the chamber which helps and facilitates sublimation. When to much ice builds up on the chamber walls with really wet foods, it can inhibit this gradient and therefore inhibit sublimation. By doing two dry cycles you can force the last little bit of water out of the food easier.

Like with most fruits, fresh pineapple will freeze dry better than those that are canned. Often times canned fruit will shrivel more readily. Additionally, canned fruits will get soft faster when exposed to moisture from the air or the oxygen absorber because of the extra sugar from the canning syrups.

8.2 Watermelon

Load Size:

Medium: 6-12 lbs

Large: 12-16 lbs

Toughness: Very delicate

Pressure: 600-800 mTorr

Shelf Temperature: 34-50°F

Drying Time: 48-72 hours

Watermelon is probably the most delicate of all the melons when it comes to freeze drying. Freeze dried watermelon is deliciously sweet treat that melts in your mouth. Like all melons, watermelon is an extremely delicate food and takes significantly longer to freeze dry compared to other fruits and vegetables. It is best to keep slices from 1/2 to 3/4 inch thick, and ideally make sure the cubes are flat and not wedge shaped. The melon should be placed in direct contact with the trays to allow as much heat transfer directly into the cubes. With watermelon it is easiest to cut large sheets of melon then place them on the tray to cut them. If you decide to cut the melon while on the silicone mat, make sure not to cut through the silicone mat.

If the melon turns out shriveled it is best to turn down the pressure and temperature. Freeze drying at 34°F may be counter intuitive, but it does work, it just takes longer. The lower, gentler temperatures will help make a much better end product. The biggest thing to watch for is to make sure the melon is dry all the way through. It can take a much longer amount of time to pull all the water out of the very center of the melon. The freeze dryer will read 200-400 mtorr and you might think the melon is done, but it is likely not done. The sublimation rate is so slow at those lower temperatures in can be deceiving.

It is best to start the cycle off at 34°F for the first 24 to 48 hours, then manually up the temperature to 40°F or 50°F later in the cycle.

Sometime it can be a good idea to dry the food twice. To do this, dry the food for 24 to 48 hours. Then put the food in a freezer and defrost the chamber, then cool the chamber and start the cycle again. Run it for another 24 hours of dry cycle. This will help make sure all the water is out of the food. For the second drying, you can typically bump up the pressure and temperature without harming the shape or texture of the food. Drying wet foods twice can help because the cold chamber helps create a pressure gradient in the chamber which helps and facilitates sublimation. When too much ice builds up on the chamber walls with really wet foods, it can inhibit this gradient and therefore inhibit sublimation. By doing two dry cycles you can force the last little bit of water out of the food easier.

8.3 Honeydew Melon

Load Size:

Medium: 6-12 lbs

Large: 12-16 lbs

Toughness: Very delicate

Pressure: 600-800 mTorr

Shelf Temperature: 34-50°F

Drying Time: 48-72 hours

Freeze dried honeydew is deliciously sweet treat that melts in your mouth. Like all melons, honeydew is an extremely delicate food and takes significantly longer to freeze dry compared to other fruits and vegetables. It is best to keep slices from 1/2 to 3/4 inch thick, and ideally make sure the cubes are flat and not wedge shaped. The melon should be placed in direct contact with the trays to allow as much heat transfer directly into the cubes. If you decide to cut the melon while on the silicone mat, make sure not to cut through the silicone mat.

If the melon turns out shriveled it is best to turn down the pressure and temperature. Freeze drying at 34°F may be counter intuitive, but it does work, it just takes longer. The lower, gentler temperatures will help make a much better end product. The biggest thing to watch for is to make sure the melon is dry all the way through. It can take a much longer amount of time to pull all the water out of the very center of the melon. The freeze dryer will read 200-400 mtorr and you might think the melon is done, but it is likely not done. The sublimation rate is so slow at those lower temperatures in can be deceiving.

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8.4 Tomatoes

Load Size:

Medium: 6-8 lbs

Large: 12-16 lbs

Toughness: Delicate

Pressure: 600-1,100 mTorr

Shelf Temperature: 105-120°F

Drying Time: 20-24 hours

Freeze dried tomatoes can be used in tomato paste, as a powder, or as a snack. A little bit of salt is delicious on freeze dried tomatoes.

If the center of the tomatoes start to look wet and fall in again, then the shelves are too hot.

Tomatoes also have a lot of water in them so loads with a lot of tomatoes may take longer.

They are also very delicate once they are dry because the cell structure is so dispersed.

Sometime it can be a good idea to dry the food twice. To do this, dry the food for 24 to 48 hours. Then put the food in a freezer and defrost the chamber, then cool the chamber and start the cycle again. Run it for another 24 hours of dry cycle. This will help make sure all the water is out of the food. For the second drying, you can typically bump up the pressure and temperature without harming the shape or texture of the food. Drying wet foods twice can help because the cold chamber helps create a pressure gradient in the chamber which helps and facilitates sublimation. When to much ice builds up on the chamber walls with really wet foods, it can inhibit this gradient and therefore inhibit sublimation. By doing two dry cycles you can force the last little bit of water out of the food easier.

8.5 Strawberry

Load Size:

Medium: 8-16 lbs

Large: 16-20 lbs

Toughness: Delicate

Pressure: 600-1,000 mTorr

Shelf Temperature: 100-110°F

Drying Time: 14-24 hours, or fruit/delicate recipe

Freeze dried strawberries are a popular fruit, and are easy to freeze dry. Ripe strawberries will offer the best flavor.

An optional acidic solution will help keep the strawberries from darkening while freeze drying. Soak the strawberries in equal parts lemon juice to water for 10-15 minutes and drain.

Slice the strawberries into smaller sections before freeze drying. This cuts back on the time to freeze dry and leaves brittle strawberry “chips”. If the center of the strawberries start to fall in and look wet again, the shelves are too hot.

Like with most fruits, fresh strawberries will freeze dry better than those that are prefrozen from the store. Prefrozen fruits and berries have a ”kill step” in their processing. This means that while they are being processed, there is a step in the processing designed to kill bacteria and such. This could include blanching, or other processes that can harm the integrity of the food and make it more susceptible to shriveling.

8.6 Grapes

Load Size:

Medium: 6-10 lbs

Large: 12-20 lbs

Toughness: Very delicate

Pressure: 600-800 mTorr

Shelf Temperature: 95-105°F

Drying Time: 20 hours, or delicate recipe

Freeze dried grapes taste similar to raisins, and are very sweet. Grapes need to be freeze dried for longer periods of time. Cut each grape in half before freeze drying. The grape skin makes it difficult for water to escape and dramatically increases the time to freeze dry.

During the process, sugar may bubble out. Laying the grapes face down seems to help prevent larger sugar residue bubbles from being left behind. You also might need to cool down the cycle a bit. Likewise, if the grapes start to turn out shriveled it is important to lower the set temperature and pressure.

8.7 Banana

Load Size:

Medium: 8-10 lbs

Large: 16-20 lbs

Toughness: Delicate

Pressure: 900-1,100 mTorr

Shelf Temperature: 105-110°F

Drying Time: 16 hours, or fruit recipe

Freeze dried bananas are inexpensive and easy to make. Freeze drying retains the bananas high concentrations of fiber and potassium.

Cut the bananas into slices no larger than 3/4".

If the banana bits start to bubble up, this is the sugar coming out of the banana. To fix this, you might need to cool down the cycle a bit.

8.8 Eggs

Load Size:

Medium: 64 small eggs

Large: 128 small eggs

Toughness: Hardy

Pressure: 800-1,200 mTorr

Shelf Temperature: 100-110°F

Drying Time: 16-20 hours, or liquid recipe

Eggs are best freeze dried as a puree. Fatty whites in the eggs will develop a strange rubbery texture when freeze dried, so it is recommended that you blend the eggs first. Even a whisk by hand will still leave clumps of whites floating around. The more homogeneous the mixture, the better the eggs will taste.

Scrambled eggs are okay, but raw eggs seem to turn out better in the end. Reconstituted eggs can be cooked like normal after.

Moving eggs around in trays usually results in spilling. Instead, it is usually easier to pour the egg puree into trays already in the freezer. Allow them to freeze, then move the tray to the freeze dryer. Alternatively, the trays can be loaded halfway in the freeze dryer heat rack and then filled with the egg puree.

8.9 Ice Cream

Load Size:

Medium: 3-5 lbs

Large: 6-10 lbs

Toughness: Delicate

Pressure: 800-1,200 mTorr

Shelf Temperature: 100-115°F

Drying Time: 16-20 hours

Ice cream is frozen, but you can't skip the freeze cycle. This is because there will often be a small amount of ice cream that melts on the trays. If you skip the freeze cycle, the vacuum pump may turn on while this tiny amount of ice cream is still liquid. If there is any liquid inside the chamber when the vacuum pump turns on, it will foam up and cause a mess.

Ice cream sandwiches should generally be cubed before freeze drying.

8.10 Puree

Load Size:

Medium: 6-8 lbs

Large: 12-16 lbs

Toughness: Hardy

Pressure: 600-1,100 mTorr

Shelf Temperature: 100-125°F

Drying Time: 18-24 hours

Many of the delicate foods can be done as a puree. Often this cuts down dry time but keeps the same nutritional value.

Berries, tomatoes, eggs and squashes are great to turn into a puree prior to drying.

8.11 Poultry

Load Size:

Medium: 8-12 lbs

Large: 16-24 lbs

Toughness: Hardy

Pressure: 900-1,500 mTorr

Shelf Temperature: 115-130°F

Drying Time: 16-20 hours, or meat recipe

Chicken, turkey, and mostly all poultry is very hardy and is pretty hard to mess up. Just cook the chicken or other poultry before drying.

The more moist the chicken or other poultry is before drying the better it will be to rehydrate.

For long term storage do not use any oils during cooking and try to cut out as much fat as possible. This will help to preserve the food. Try to get it into small chunks or strips. Shredded chicken is very easy to dry and rehydrates very well.

8.12 Pork

Load Size:

Medium: 8-12 lbs

Large: 16-24 lbs

Toughness: Hardy

Pressure: 900-1,500 mTorr

Shelf Temperature: 115-130°F

Drying Time: 16-20 hours, or meat recipe

Pork is very hardy and is pretty hard to mess up. Just cook the pork before drying.

The more moist the pork is before drying the better it will be to rehydrate.

For long term storage do not use any oils during cooking and try to cut out as much fat as possible. This will help to preserve the food. Try to get it into small chunks or strips. Shredded pork is very easy to dry and rehydrates very well.

8.13 Beef

Load Size:

Medium: 8-12 lbs

Large: 16-24 lbs

Toughness: Hardy

Pressure: 900-1,500 mTorr

Shelf Temperature: 115-130°F

Drying Time: 16-20 hours, or meat recipe

Beef is very hardy and is pretty hard to mess up. Just cook the beef before drying.

The more moist the beef is before drying the better it will be to rehydrate.

For long term storage do not use any oils during cooking and try to cut out as much fat as possible. If you need the seasoning to stick, use something like mustard or apple juice. This will help to preserve the food.

Try to get it into small chunks or strips. Smoked beef is absolutely amazing when it is rehydrated, and is pretty fun to take camping. Fatty cuts like brisket will probably not keep as long as leaner cuts, but should still last at least 10 years.

8.14 Gummy Candy

Load Size: As many as can fit

Toughness: Hardy

Pressure: 4,000-10,000 mTorr

Shelf Temperature: 130-150°F

Drying Time: 4-6 hours

Not all brands of gummies will work. If you are trying to do peach rings, for example, try multiple brands to see what works. Some brands will puff up nicely and others will be flat and hard. Leave ample space between gummies, otherwise they will clump together after freeze drying.

Freeze drying candy will usually take less time than most other types of food. This is because candy works better vacuum drying at higher pressures compared to freeze drying.

In general, if your candy is too puffy, then you need to bring the recipe temperature and pressure down. If the candy is not puffy enough, then you need to increase the temperature and pressure.

8.15 Hard Candy

Load Size: As many as can fit

Toughness: Hardy

Pressure: 4,000-10,000 mTorr

Shelf Temperature: 130-150°F

Drying Time: 4-8 hours

Jolly Ranchers will need to be cut in half. Otherwise, they will blow up and stick to the tray above. Leave ample space between the candies, otherwise they will clump together after freeze drying.

Jolly Ranchers should not need to be preheated. Some other candies like Lemon Heads may need to be preheated in an oven at 300 to 350°F. This will allow the sugar to get soft enough to puff up.

Freeze drying candy will usually take far less time than most other types of food. This is because candy works better vacuum drying at higher pressures compared to freeze drying.

The load size is dependent on how much the candy expands. Some candies will double in size, so leave enough room around each.

In general, if your candy is too puffy, then you need to bring the recipe temperature and pressure down. If the candy is not puffy enough, then you need to increase the temperature and pressure.

9 Advanced Settings

9.1 Candy Pre-warm

The Candy Pre-warm feature is intended to help certain candies that might require more heat to puff up and freeze dry. Enabling this option will turn on the heating shelves before vacuum drying the candy.

To access the Candy Pre-warm option, navigate to the candy recipes page. This feature enables you to customize your pre-warm time up to 10 hours and set your desired shelf temperature. Changing these settings will change both the pre-warm temperature and the dry cycle temperature. After the pre-warm is finished, the freeze dryer will proceed to the dry cycle and begin pulling vacuum while the candy is still hot. This process helps to expand and puff out the candy. If you choose not to use the Pre-warm option, your candy recipe will function like the other recipes on the machine.

Using this setting will cause the pump to ingest more water, and may require more frequent oil changes.

Note: The heating profile for the Candy Pre-warm mode is suggested, but may not provide the best results for a specific batch. It is recommended that you test various small loads of candy before attempting large loads to get the best results.

9.2 Maximum Shelf Temperature

This setting will drastically change the amount of time it takes to get the food dry. Generally you want to test a recipe by going lower on the maximum temperature and then testing batches with increasingly higher temperatures. **If the shelf temperature is too hot it will melt the ice in the food and the end product will be less than ideal**. This comes more into play with delicate foods like grapes and pineapple. Hardy foods like meat can often survive a higher temperature.

The shelf temperatures will not always operate at the maximum shelf temperature. These are controlled by an advanced algorithm that efficiently controls the chamber pressure by varying the shelf temperature. As the dry cycle continues and the water content of the food drops, the shelf temperature will approach the maximum shelf temperature.

9.3 Pressure Limit

The pressure limit is another great way to shorten or lengthen a cycle. Setting a lower pressure limit will heat the food more gently in the beginning of the cycle. Most of the water in the food is sublimated out in the beginning of the cycle. **Setting a lower pressure limit will increase the dry time, because the shelves will need to heat more slowly to avoid quickly increasing the pressure in the chamber**.

In contrast, setting a higher pressure limit will allow more heat to be put into the food quicker. This results in shorter dry times. The only drawback is that, as more water comes off the food, the pump

has a greater chance of ingesting water vapor. Setting the pressure limit too high will also decrease the quality of the food. Each food will be different, but a general rule of thumb is that anything above the triple point of water (4582 mTorr/ 611 Pascals) is not recommended. Anything above the triple point is more vacuum drying and not freeze drying, although this is preferred for some items like candy.

10 Cleaning

This section contains useful information on cleaning your freeze dryer. After each cycle, open the door and allow the inside of the freeze dryer to air dry. Any standing water can allow mold and bacteria to develop. An effective sanitation solution for surfaces exposed to food can be made at home with one tablespoon bleach to one gallon of water at 75°F.

WARNING

- Disconnect the power cord and ensure the machine has no power before cleaning or servicing.
- Never remove the tray rack while actively defrosting or heating.

CAUTION

- Do not clean a dirty compressor or frozen evaporator with a sharp object.

10.1 Cleaning the Tray Rack

Remove the door seal, take out the tray rack, and disconnect the wires. Clean the tray rack with water. **Do not place it in a dishwasher or submerse it in water.** A bristle brush will help clean the spaces between the trays.

Sanitize the tray surfaces with a second wash of soap and water or the bleach sanitation solution. Rinse the tray rack with water and allow it to air dry.

The rear fan can be cleaned with a bristle brush or canned air. The fan is also resistant to water and can be submerged for deep cleaning.

10.2 Cleaning the Chamber

Wipe down the inside of the chamber with a damp cloth, and sanitize the walls. Spray the drain hole on the bottom of the chamber with sanitizer along with pass-through hole (the hole with protruding wires). **Do not spray the electrical connector or the other hole in the machine.** The other hole houses the pressure sensor. Spraying a cleaning solution in the pressure sensor housing may cause damage to the pressure sensor. A sterilizing, non-oil wipe can clean the inside of the pressure sensor hole. Do not spray the electrical connector as this could corrode the terminals. Ensure the electrical connectors are free of moisture before reconnecting them.

You may also remove the P100 filter (see Section 11.3) and clean the vacuum hole, but this shouldn't need much cleaning. The filter removes any particles above 3 μm (microns) in size.

10.3 Cleaning the Door

The door is made of a polycarbonate glass. Do not use any solvents when cleaning the door, such as rubbing alcohol. Clean both sides first with water, then clean with a sanitization solution.

10.4 Cleaning Inside the Freeze Dryer

Once or twice a year, clean out inside the cabinet of the machine. Use compressed air to blow out any dust in the condenser. This keeps the refrigeration system running efficiently by allowing the refrigerant to be effectively condensed and cooled. Wipe down the inside panels and frames with a damp cloth. Use compressed air to clean the electronics and PCB's. Be extremely careful to avoid sharp corners when cleaning.

11 Maintenance

This section contains useful information about proper care and maintenance of your machine. Failing to perform proper maintenance on certain components of the machine, such as the vacuum pump, will void the warranty.

WARNING

- Disconnect the power cord and ensure the machine has no power before cleaning or servicing.

11.1 Changing the Vacuum Pump Oil

The vacuum pump tends to take the most abuse in a freeze drying system. Water, dust, and contaminants enter the pump and will eventually cause the pump to fail. However, proper maintenance coupled with consistent and frequent oil changes will keep the pump running for many years. Change the oil in your vacuum pump every 4-8 cycles. Loads with candy can be replaced every 20 cycles.

After each batch, check the quality of the oil in the pump through the sightglass. If the oil is milky, mirky, discolored, or there are visible contaminants, change the oil. Never let the vacuum pump sit for extended periods of time (more than 1-2 days) with contaminated oil. Used oil contains water and other contaminants that can corrode the pump. If you will not be using your freeze dryer, replace the oil in the vacuum pump with new oil to prevent corrosion. If water is left in the bottom of the casting for an extended amount of time between loads it can also cause the pump head casting to rust.

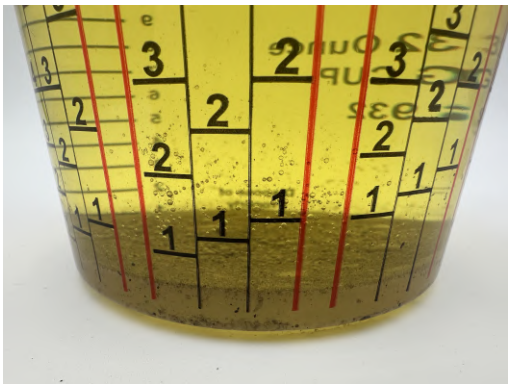
Dairyland Brand Vacuum Pump Oil is the best oil to run for freeze drying. Dairyland oil has detergents that help the vacuum pump handle water and sugars which are prevalent in the vacuum equipment used in the Dairy industry, and therefor is beneficial for the freeze drying industry.

Follow the steps below to change the oil in your vacuum pump:

1. Unplug the pump.
2. Have a funnel and storage container (minimum of 1 quart) placed under the drain valve of the pump to collect the used oil.
3. Use a 5mm Allen wrench to remove the drain plug on the bottom of the pump underneath the sightglass.
4. Drain the oil into the container. Tip the pump forwards to drain all of the oil. Removing the large oil filter at this stage can help the oil flow out the drain plug faster.
5. Reinstall the drain plug. The vacuum pump must also be level before filling with oil.

6. If not already removed, remove the oil mist filter located on top of the pump housing, and slowly fill the pump with vacuum oil through the opening until the oil level reaches the middle of the sight glass. The oil should be no less than the minimum marker. A funnel may help.
7. Reinstall the oil mist filter.
8. There are two options to filter the used vacuum pump oil so that it can be reused.

   Note: The oil will often have black particles in it. This is material from the casting of the pump and is normal. The pink P100 filter is intended to prevent food contamination from building up in the oil and will require the oil to be changed less often. It is highly recommended this filter is always used, but is not absolutely necessary.



   Option 1: Let the used oil sit in a clear container. Eventually, all the water will settle out and can be removed. The wetter the loads and the longer you go between oil changes the longer it takes for this water to settle out. Once the oil goes to an amber-clear color it is ready to pour back in the machine.

   Option 2: Brita-style water filter. This will help to clean the oil and is the fastest method. The downside to this is that the filters need to be replaced periodically and it can be a little messier.

Changing the oil is much like a car. The more often you change it the longer the pump will last. All vacuum pumps are consumable items, but with regular oil changes the pump should last about 4 to 6 years.

The brass nob on the top of the pump is called the gas ballast valve. It is also worth noting that opening the gas ballast valve one to four full turns after it is at vacuum can increase the life expectancy of your vacuum pump. Opening the gas ballast valve before the chamber is at vacuum can cause oil to come out of the valve. It is recommended to use the gas ballast valve, but it should be opened after the chamber is at vacuum to prevent dripping oil.

11.2 Changing the Vacuum Pump Oil Mist Filter

It is recommended to change the oil mist filter once a year. When the oil mist filter becomes clogged with oil, water, and or particulates it can cause the vacuum pump to work harder and draw more amps. Additionally, it is good practice to drain the water that has collected in the oil mist filter out between batches. This can be done by simply removing the oi mist filter and turning it upside down and shaking it around to get the water to shake out of it.

11.3 Changing the P100 Filter

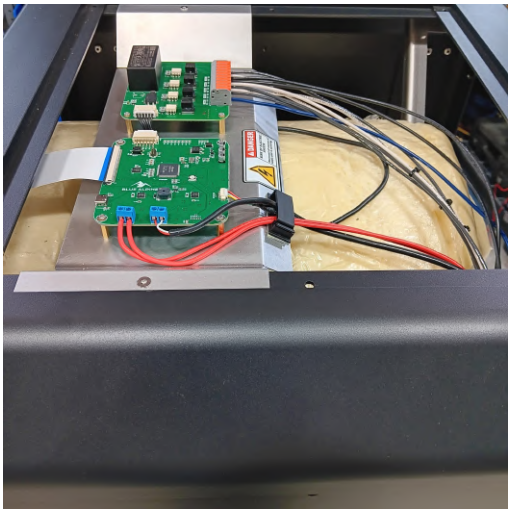
Changing the P100 filter in the chamber is easy. Simply rotate the filter counterclockwise until it pulls off, and replace the filter with another clean P100 3M™ Particulate Filter 2097. The filter should be changed about every 6 months.

11.4 Replacing PCB Components

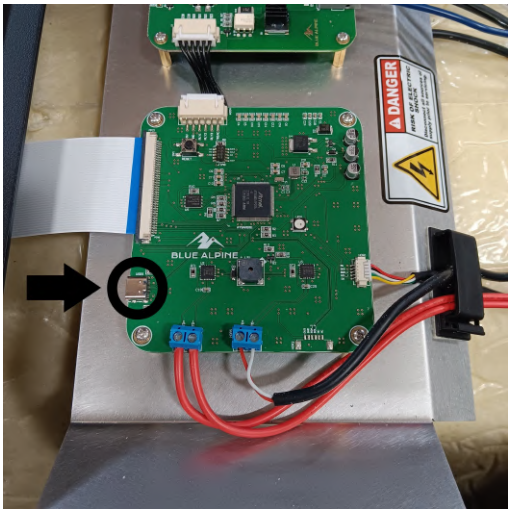
Ensure that the machine is turned off and unplugged before accessing the machine. Remove the top panel from the machine. The right PCB is the data PCB (the one closest to the screen). The left is the power PCB (the one furthest from the screen). Remove the four corner screws from the PCB that is needing to be replaced. Disconnect the attached wires one by one and install them into the new PCB. Once all the wires are swapped over, install the new PCB by screwing the four screws snugly back in place.

11.5 Updating Firmware

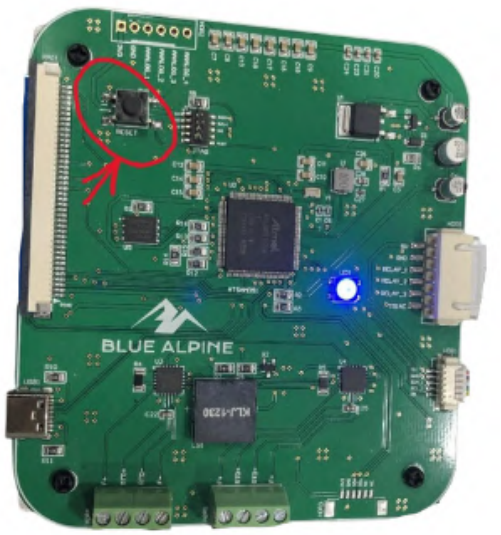
The latest firmware updates can be found on the Blue Alpine website. Navigate to the Downloads page and download the latest firmware for your model of freeze dryer.



1. Switch off and unplug your freeze dryer.
2. Open up the top panel of the freeze dryer using the screwdriver.

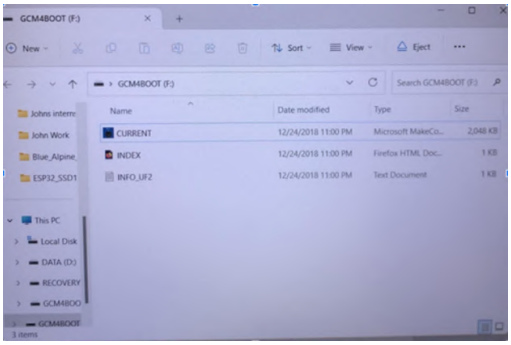


3. Find the USB-C port on the Blue Alpine data PCB (the green board on the right side of the machine) and plug in the USB-C connector.
4. Plug in the other end of the USB-C connector to your computer.



5. Press the reset button twice* to activate download mode. The GCM4BOOT drive window should pop up on your computer and will act like a USB drive; if not, check the connected USB devices on your computer and see if this drive is found.

   **The LED on the board lights green when in bootloader mode. If a red light is present, try pressing the reset button two more times. If the problem persists, contact support at (208)-607-1722.*



6. Drag and drop the new software (UF2 file) to the GCM4BOOT drive.

7. The new software will instantly upload and run on the board after this step.

   ***Note:** The screen backlight will not work until the machine is powered back on.*

8. Unplug the USB-C Cable from the machine, and place the metal panel back onto the machine.

   As of patch **14, multiple default values have changed. The machine is designed to not alter its default memory even with updates unless the user explicitly factory resets the machine. We recommend factory resetting the machine after the update. Please note that this will erase your personally saved settings.*

11.6 Performing a Factory Reset

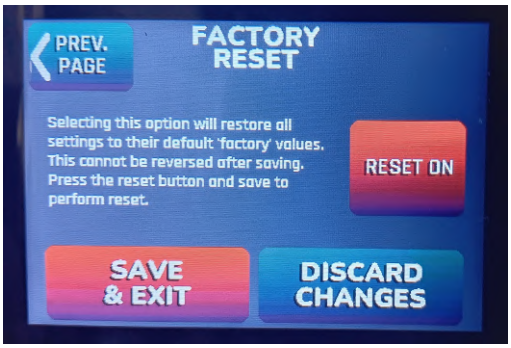
1. From the Home Screen, press the settings button.

2. Press the button entitled “Edit: Default Dryer Settings”

3. Press and hold the “Next Page” button until the Factory Reset page appears.

4. Press the button called “RESET OFF” and ensure that it reads “RESET ON”

5. Press the “SAVE & EXIT” button



11.7 Software Update Change Log

- V2.16.9 and V1.16.9
  - Added vacuum error on the manual test, dry cycle, and diagnostics pages. This error checks if the pump has been on for 2 minutes yet the pressure has not moved from ambient indicating an error with the valve being open or not a good enough seal being made. This can also indicate that the pressure sensor has fallen out of calibration.
  - Added Electronics Test to the diagnostics page. This test should be run every time a power or digital board is replaced. This test will test all 4 main hardware components to ensure they are wired correctly and are doing as they should. This test will also tell the user exactly which wires may be swapped physically. Checks for ground faults. Checks sensor accuracy.
  - Added 5 minutes delay whenever the fridge turns off. The compressor will not be able to turn on within 5 minutes of its last activation. The code will add this time to the freeze or dry time. This was done to allow pressure in the compressor to equalize before it turns back on in order to help with overloading.
  - Added ultimate vacuum test to the diagnostics page. Runs 2 hours with fridge to make sure vacuum is working correctly.
  - Added another settings page for the complete vacuum setting. This allows the user to choose if they would like their pump to stay on the entire time on the complete page or if they would like it stay at a certain threshold by turning off and on. If the user has a vacuum pump that does not have a solenoid valve they will need the pump to stay on.
  - Fixed bug with defrost fan. Fan used to always be on even when the settings said it should be off.
  - Corrected a bug that popped up when reducing the set pressure below the recommended set pressure.
  - Corrected an issue with the default temp not being able to be saved below 32°F.
  - Turn off heat when shelf is disconnected. Before, the heat would only turn off after the 3 minutes of disconnect prior to the error page being thrown. In those 3 minutes of disconnect prior to the error page, the heat would lock on. Now, it turns off during those 3 minutes.
  - Changed it so no hardware can turn on within 4 seconds of each other.
  - Vacuum Run time is now counted and tracked. On the settings page, it is shown and every 120 hrs of pump run time, a pop up reminder comes up to remind the user to change the oil.
  - Shelf Temp is now displayed on the defrost page.
  - Enhanced good pressure value checking. Will ensure a good vacuum is being pulled by checking that it goes below 350,000 mtorr in 6 minutes and 100,000 mtorr in 10 minutes.
- V2.16.8 and V1.16.8
  - Added software version to manual test page in the bottom left of the screen.

  - Reverted Complete Page vacuum logic to previous logic. Previously, the vacuum pump would turn off below a threshold and turn on above. Biggest complaint is that it would flicker on and off rapidly. Now, the vacuum pump turns off below a certain pressure then once it goes above the other threshold, it waits for a time then turns it back on.
  - Fixed Leak Rate test to display only what we need and not to check sensor accuracy.
  - Added const bool benchDevelopment so that errors don't pop up. This needs to be set to false when pushed.
  - Added a const bool testingErrorPage so that it could automatically send the error page to the screen to look at it. Added software version number to that page.
- V2.16.7 and V1.16.7
  - Removed the fault print on the Max chip. Error thrown by the max chip are not ignored if the value being read is still accurate. Allowing for fewer critical shelf temp errors.
  - Killed page 20 (diagnostics) because of redundancy. This was added back in 16.9.
  - Added the off gas function to the QC.
  - Adjusted times on QC tests.

12 Troubleshooting

Replacement parts are available on our website at
https://bluealpinefreezedryers.com/collections/replacement-parts.

We are committed to the safety of our customers. Below is a QR code for a video showing some of the safety consideration for safely operating, maintenance, and servicing the freeze dryer and vacuum pump.

Customer Safety Video

WARNING

- Disconnect the power cord and ensure the machine has no power before cleaning or servicing.

12.1 Freeze Dryer Won't Turn On

Check that the circuit breaker is not tripped. If so, check that the freeze dryer is not damaged in any way and reset the circuit breaker. Check that the power cord is plugged in, and that the mechanical power switch on the back of the unit is set to ON. If the machine is receiving power, a LED will glow on the power PCB board. Remove the top panel to check whether this is on. If not, contact **Customer Support** on page 70.

WARNING

- Do not touch any electrical components inside the machine while plugged in

12.2 Chamber Pressure Not Achieving Vacuum

To start, update the software to the latest version. The firmware download and the instructions for how to do it can be found at the link below. There are lots of changes we make to the software to handle errors better and communicate with sensors better. Simply updating the software may resolve the issue.
https://bluealpinefreezedryers.com/pages/software-update

Make sure your chamber is clean and dry, that there is no ice in it, and that the drain valve is closed. Make sure the pump is installed on the right side of the machine, and that the drain valve is on the left.

Check that no residual water is inside the chamber or drain hose. When attempting to pull vacuum, this water will evaporate and prevent the pressure from dropping.

Go to settings, then manual hardware control, and turn on the vacuum pump and the refrigeration together. This test will determine what ultimate vacuum pressure the unit can reach. After running for an hour, the unit should be able to reach below 500 mtorr.

Check that the door is sealing properly. The door seal should create a solid ring most of the way around the door seal about 1/8" thick without vacuum. While under vacuum the black seal should be 1/2" thick all the way around. You may need to clean the black seal as well. If there is any hair, fur, or any other contaminates in or on the seal it could be causing the vacuum error.

If the door seal has large gaps in the seal while not under vacuum, try turning on the vacuum and pushing on the door. If the door starts to seal only after pushing on the door, then the door needs to be adjusted so there are less gaps around the door. Sometimes the doors shift in transit and can cause this issue. You can also make sure that the door handle is completely closed. This will have a similar affect.

Cold food added to a warm chamber or warm tray will cause ice to melt in the food. This melting can lead to a vacuum error as well as excess water being ingested by the pump. To prevent this from happening, simply start the cycle for 30 minutes prior to putting food in the chamber. This will ensure that cold food is being placed into a cold chamber.

Check that the drain valve is closed. If air is escaping through any gaps between the hose and drain valve, then remove the drain valve from the hose, cut the hose back by 1in (25mm), and reinsert the hose. The drain valve itself might have a leak (sometimes a small puncture in the hose will also cause a leak). Drain valves can be purchased through our website. If a hose has a cut in it replacement hoses can also be ordered from our website.

Check that the vacuum pump oil is clean. Water and other contaminants will discolor the oil, and will cause the pump to not operate as efficiently as possible. Too much oil will also cause the pump to not draw vacuum as efficiently.

Another possible solution is to clean the reed valves on the vacuum pump. Almost all oiled vein vacuum pumps uses reed valves. When food particles, sugar deposits, or other contaminate get under the reed valves it can interrupt the vacuum seal of the valves. Click the link to watch this video https://youtu.be/0jXLwf-4kA8 or scan the QR code.

If the chamber is able to achieve pressure when testing using manual hardware control, but is not able to achieve pressure when running a recipe, make sure the food is fully frozen and that the recipe has plenty of time on the freeze cycle.

12.3 Vacuum Pressure Only Reading Atmosphere

To start, update the software to the latest version. The firmware download and the instructions for how to do it can be found at the link below. There are lots of changes we make to the software to handle

errors better and communicate with sensors better. Simply updating the software may resolve the issue. https://bluealpinefreezedryers.com/pages/software-update

If the vacuum pump is on and the the vacuum sensor is only reading atmosphere, or around 750,000 mtorr, first try to open the door. If you can open the door, then the vacuum pump is not connected correctly. If you cant open the door, make sure the seal has a large 1/2" black ring around the door.

If the problem persists, try turning the machine on and off again. Sometimes the pressure sensor can hang and just needs to be turned on and off again.

If that does not fix it, then it is likely that the pressure sensor or the buffer board needs replaced.

12.4 Door Not Sealing

Check that the door is sealing properly. The door seal should create a solid ring most of the way around the door seal about 1/8" thick without vacuum. While under vacuum the black seal should be 1/2" thick all the way around. You may need to clean the black seal as well. If there is any hair, fur, or any other contaminates in or on the seal it could be causing the vacuum error.

If the door seal has large gaps in the seal while not under vacuum, try turning on the vacuum and pushing on the door. If the door starts to seal only after pushing on the door, then the door needs to be adjusted so there are less gaps around the door. Sometimes the doors shift in transit and can cause this issue. You can also make sure that the door handle is completely closed. This will have a similar affect.

12.5 Mist Coming Out of Vacuum Pump

This is normal operation. Many people call this oil mist "smoke" that comes from your vacuum pump. It is a trait of every oil-based vacuum pump. During operation, if the freeze dryer unit is not completely sealed (door shut and drain valve closed), oil mist may also leave from these openings. If the oil mist from our standard oil mist filter is not acceptable for the room the freeze dryer is operating in, upgraded activated carbon oil mist filters are available for purchase on our website. Additionally, the oil mist can also be reduced by wrapping a microfiber towel tightly around the standard oil mist filter.

12.6 Excessive Water in the Pump

Defrost and drain your freeze dryer after every cycle. This is very important. Otherwise, the ice may become too thick and prevent the water vapor from being captured on the walls of the chamber. This could send excess water through the pump. This is not always the case for candy loads, but for regular food loads is a must.

Make sure to run the vacuum pump with the gas ballast valve open about one to four full turns. This will help cycle water vapor through the oil.

Make sure the pump is on the correct side of the machine. If it happens to get installed on the drain side the pump could ingest liquid water after the defrost cycle.

Check that there is no liquid water in the vacuum chamber during the cycle. This can boil off and the refrigeration will not keep up. If too much water vapor is created all at once, excess water vapor may be sent through the pump.

Make sure that the chamber and tray rack are cold if you are skipping the freeze cycle. Otherwise there may be some melting going on that can cause liquid water in the chamber.

Keep loads to about 8 pounds of food for a medium freeze dryer or about 16 pounds for a large freeze dryer when wet food is being dried. Larger quantities of wet food could cause excess water vapor and therefore excess water in the oil.

If excessive water in the pump continues to be a problem for your specific application, active oil water separator filters are available for purchase on our website.

12.7 Vacuum Pump Oil Discoloration

The oil in the vacuum pump can get discolored for several different reasons. There could be rust forming in the pump, the oil might be old, there may be too much acid or sugar in the food being freeze dried, or the gas ballast valve may need to be opened. For starters, Dairyland oil is the best oil to prevent rust and other discoloration in the pump. The blue color of Dairyland oil is caused by detergents in the oil that helps with water and sugars.

Another option to help with oil discoloration is to use the gas ballast valve. The difficulty with the gas ballast valve is that it should usually only be opened when the unit is already at vacuum. When the gas ballast valve is opened during pump down it can spit oil.

Some acidic foods like pickles and pickled foods can cause rust in the pump very quickly since some of the acid fumes will be ingested into the pump. If you suspect that there is rust in your pump you can take the cover off the pump to expose the pump head and use a brush to clean the rust off. Additionally you can use a product called Evapo-Rust ER012 to clean the pump. To do this, drain the oil, fill the pump with Evapo-Rust all the way full, let it sit for 24 hours, drain the Evapo-Rust, then flush once or twice with clean oil. Discard the flush oil, it should not be used in the pump. Not all rust removing products are safe for the pump. Evapo-Rust has been tested and works well with the Blue Alpine pumps.

12.8 Vacuum Pump Oil Draining Slowly

If the oil in the vacuum pump is draining slowly it is likely due to the oil mist filter being clogged either with oil or with particulates. If the oil is draining slowly simply remove the oil mist filter when changing the oil. Also consider getting a new oil mist filter or cleaning the fiberglass media in the current one.

12.9 Oil In Vacuum Chamber

The vacuum pumps that are sold by Blue Alpine have a solenoid in them to help prevent what is call back-streaming. At the end of the cycle the pump will usually turn on and off to maintain a vacuum. If the pump is not equipped with a solenoid, or if the solenoid is sticking, the pump can back-stream. This is where the vacuum of the chamber causes the pump to run in reverse and pull oil back up the intake of the pump. If you suspect the solenoid is sticking, you can plug your pump into a wall outlet and turn it on and off at 5 second intervals. This usually helps get the solenoid unstuck.

12.10 Excessive Noise

Noise is to be expected during operation. 64 - 78 dB (about the same as a clothes dryer) is typical. If the unit is excessively loud, check that there are no loose parts inside the machine. Check that the evaporator fan blades are in good condition. If not, contact **Customer Support** on page 70.

Often times, especially when re-pressurizing the unit, the ice that has collected on the chamber wall will crack. This can cause a very loud pop. This should not be a cause for concern.

12.11 Sensor Disconnect Error

To start, update the software to the latest version. The firmware download and the instructions for how to do it can be found at the link below. There are lots of changes we make to the software to handle errors better and communicate with sensors better. Simply updating the software may resolve the issue.
https://bluealpinefreezedryers.com/pages/software-update

If updating the software does not work, the unit will likely need a power board with updated grounding and or a new digital board. These are the two motherboards on the electronics tray on the top of the machine behind the screen.

12.12 Chamber Temperature Not Cooling

Check that the evaporator is clear of any dust or debris, and that there is sufficient airflow around the machine. It may also help to reduce the temperature of the room.

Check to make sure that the condenser fan is spinning. If you look through the holes on the right hand side of the machine you should be able to see the compressor fan. Go to settings, then manual hardware control, then turn on the refrigeration. The fan should turn on. If it does not a new fan motor is likely needed.

For medium units with serial number below 1034, check to make sure the protector and or protector wire is not damaged or burn up. Click the link to watch this video https://youtu.be/iYdMF3JN8V8 or scan the QR code.

Another possible cause of chamber refrigeration issues is if the condenser fan has burnt out or somehow obstructed. The condenser needs to have adequate air flow around it to be able to cool properly. When you look through the side of the lower portion of the machine you should see the condenser fan spinning when you turn the refrigeration on. If the condenser fan is not spinning, or if it has come loose, this could be the cause. If the condensor fan is the issue the symptom will present as follows: allow the machine to sit for 12 hours, turn the refrigeration on, if the chamber temperature goes down initially, and then goes up, it likely could be the condenser fan.

Check that there are no punctures or porosity in the refrigeration circuit inside the freeze dryer. If the test fails and the unit appears otherwise visibly undamaged, Contact Blue Alpine support on page 70.

12.13 Burning or Shriveled Food

If the unit is burning or severely shriveling the food first try to reduce the pressure and temperature for the recipe. For example, some melons may need to be reduced down to 800mtorr and 40 °F (4 °C) in order to freeze dry without shriveling.

If the unit is severely burning food every cycle regardless of changing the set temperature, clean the unit out and turn the unit off then back on. With the unit on the home screen wait 45 minutes and then feel the shelves. If the shelves are hot while they are not turned on and the unit is still on the home screen then the machine will need a new power board. This issue is caused when one of the triacs on the power board has failed. Specifically the triacs fail closed so they will continue to provide power to the heat rack even if not commanded to do so.

Fresh fruits and berries will freeze dry better than those that are prefrozen ones from the store. Prefrozen fruits and berries have a ”kill step” in their processing. This means that while they are being processed, there is a step in the processing designed to kill bacteria and such. This could include blanching, or other processes that can harm the integrity of the food and make it more susceptible to shriveling.

Similarly, fresh fruits will freeze dry better than those that are canned. Often times canned fruit will shrivel more readily. Additionally, canned fruits will get soft faster when exposed to moisture from the air or the oxygen absorber because of the extra sugar from the canning syrups.

12.14 Soggy or Chewy Food When Done

Sometimes food will be soggy or more chewy than normal. This is normal in some foods that are very sugary, but generally speaking the food should be crisp and fluffy. It is normal for food to become soggy as it is exposed to air and absorbs water from the air. If the food is soggy to any degree coming right out of the freeze dryer there are several possible causes. It is most likely that there was still water in the food. This can be solved by putting the food in for longer, or defrosting and running the food again.

The other possible cause is that there was to much sugar in the food and it was not able to dry properly. This can happen with canned fruits and juices.

Another possible cause is that the vacuum pressure was set too high. If you continue to have problems with a specific recipe try reducing the pressure, and possibly the temperature. It can also be a good idea to make the food chunks smaller and or thinner. If the food chunks are too big it can be hard for the water to escape from the inside of the food. Fruit and vegetable skins can also make it more difficult for the water to escape the fruit.

If the food is simply not done, you can try putting the food back in at a higher shelf temperature. It may be needed to refreeze the food before pulling vacuum again. Meaning you may need to put the food though a full second cycle, rather than skipping the freeze cycle.

Soggy food could also be a symptom of a bad vacuum pump or a vacuum leak. To determine this, run an ultimate vacuum test, or a leak rate test respectively.

12.15 Soggy or Chewy Food In Mylar Bag

Oxygen absorber have a small amount of water in them to help with the chemical reaction that absorbs the oxygen. This is true of all oxygen absorbers, both ferrous and non ferrous. For example, on average

a 300cc ferrous oxygen absorber has .77g of water in it. If a single oxygen absorber is placed in a bag with too little food then it can have the affect of making the food feel soggy. To counter this, it is best to have more food to help dilute the water. Additionally you can use a smaller oxygen absorber or fewer absorbers if your situation allows. Ambient air is only 21% oxygen by volume, so try using the fewest number of oxygen absorbers as possible. It can also be a good idea to use a few smaller oxygen absorbers and place them on opposite ends of the bag so that the water from the absorber is spread out over more food. You can also use a vacuum chamber sealer to pull more of the air out of the bag. This will not work for some foods that are soft as it will crush the food. The water from the absorbers is an acceptable amount of water as long as the quantity of food is enough to accept that water. For example , if you have 100g of food with 1% water content going into the bag, and you add a single oxygen absorber that has .77g of water in it, you will only be at 2% water content when the bag is sealed, which is acceptable. If you only have 10g of food going into the bag before you seal it, there might be a problem.

Also try not to shake the oxygen absorbers. They are the same material as hand warmers, and so if you shake them it will speed up the chemical reaction which can get hot and cause steam. If they don't get hot the oxygen absorbers will have a higher chance of keeping the water inside the packet.

Several other possible causes of soggy food could be a puncture in the mylar bag. It is also possible the of O2 absorber is already used or defective or has become more wet prior to being inserted into the bag. Another possibility is that the mylar bag is poor quality or has a plastic window in the bag and has allowed water to migrate into the bag.

Generally, if you are experiencing this sogginess issue, it can be a good idea to dry the food twice to verify that there was not extra water left in the very center of the food. To do this, dry the food for 24 to 48 hours. Then put the food in a freezer and defrost the chamber, then cool the chamber and start the food again. Run it for another 24 hours of dry cycle. This can be more true during the summer or in hot environments where the freeze dryer is not as able to get as cold. If you realize early that the food is soggy and the food has not spoiled yet, you can save the food by drying the food again. It is impossible to remove to much water from food by freeze drying.

Fresh fruits will freeze dry better than those that are canned. Often times canned fruit will shrivel more readily. Additionally, canned fruits will get soft faster when exposed to moisture from the air or the oxygen absorber because of the extra sugar from the canning syrups.

12.16 Heat Rack Not Heating During Dry Cycle

To start, update the software to the latest version. The firmware download and the instructions for how to do it can be found at the link below. There are lots of changes we make to the software to handle errors better and communicate with sensors better. Simply updating the software may resolve the issue.
https://bluealpinefreezedryers.com/pages/software-update

In general, the freeze dryer will heat the food slowly throughout the dry cycle. It will only reach full shelf temperature at the end of the dry cycle. This is normal operation.

If the heat racks never turn on at all during the dry cycle and the food is not done after an excessive amount of time, then it is possibly a vacuum leak, or the vacuum pump is worn and not able to pull enough vacuum any longer. The machine operates such that it will only heat the trays until it reaches the set pressure. As the trays heat they cause more water vapor to read as pressure in the chamber. If there is a vacuum leak, or if the pumps ultimate vacuum is no longer adequate, then the machine will

never turn the heat racks on because it is already at or above the set pressure. To test this, start by doing an ultimate vacuum test. Go to settings, then manual hardware control. Then turn on the vacuum pump and the refrigeration together. Let it run for 1 hour and then check the pressure reading. If the unit is able to get below 500 mtorr the the pump is fine and there is not a vacuum leak. If the unit is above 500 mtorr, but below 1400 mtorr, start by raising the pressure on the recipes by a few hundred mtorr. It is likely the pump is worn a little. By raising the mtorr on the recipes it will allow you to continue to freeze dry. If the ultimate vacuum is above 1400 mtorr it is likely the pump is worn and no longer able to pull a vacuum. It is possible there is a leak, but that is a much smaller possibility.

Click the link to watch this video https://youtu.be/dYm9iJ3h4Rc or scan the QR code.

12.17 Heat Tray Rack Won't Connect/Heat up

Check that the electrical connection between the heat rack and machine is secure.

The pins inside each Deutsch connector should be pulled out and all 6 should be at the same height. If any are pushed in, carefully pull the pins out with needle nose pliers until locked in place. If the heat rack still does not reach temperature when testing on the manual hardware control page, contact Blue Alpine support on page 70.

12.18 Excessively Long Batches

If the batches are taking longer than normal, or longer than desired, start by raising the set pressure and possibly the set temperature. This will help the machine pull more water off faster.

If that does not help then similar to the previous section it is possibly a vacuum leak, or the vacuum pump is worn and not able to pull enough vacuum any longer. The machine operates such that it will only heat the trays until it reaches the set pressure. As the trays heat they cause more water vapor to read as pressure in the chamber. If there is a vacuum leak, or if the pumps ultimate vacuum is no longer adequate, then the machine will never turn the heat racks on because it is already at or above the set pressure. To test this, start by doing an ultimate vacuum test. Go to settings, then manual hardware control. Then turn on the vacuum pump and the refrigeration together. Let it run for 1 hour and then check the pressure reading. If the unit is able to get below 500 mtorr the the pump is fine and there is not a vacuum leak. If the unit is above 500 mtorr, but below 1400 mtorr, start by raising the pressure on the recipes by a few hundred mtorr. It is likely the pump is worn a little. By raising the mtorr on the recipes it will allow you to continue to freeze dry. If the ultimate vacuum is above 1400 mtorr it is likely the pump is worn and no longer able to pull a vacuum. It is possible there is a leak, but that is a much smaller possibility.

12.19 Power Lost During Cycle

To start, update the software to the latest version. The firmware download and the instructions for how to do it can be found at the link below. There are lots of changes we make to the software to handle

errors better and communicate with sensors better. Simply updating the software may resolve the issue. https://bluealpinefreezedryers.com/pages/software-update

If the power to the freeze dryer is lost for any reason during a freeze or dry cycle, the freeze dryer will go into a limp mode and turn on the refrigeration only. While in this limp mode it will not heat the shelves or turn on the vacuum pump. This protection is there to help make sure the user evaluates the situation after the power has been restored to see if the food is salvageable and or what part of the cycle the machine should go to in order to restart.

12.20 Blueberries and Other Foods With Skins

In general, any food with a skin will have a harder time freeze drying. Blueberries are especially difficult to freeze dry. If possible, purée such foods and freeze dry the purée. If that is not possible cut the berries into halves or quarters. Additionally, using a tooth pick or other small sharp object to puncture holes in each of the berries can help. This technique can be used for blueberries, cherries, grapes, huckleberries, etc.

12.21 Juices

In general, juices do not freeze dry very well. They usually turn into a fruit leather of sorts regardless of settings. It is likely that the freeze dried juice will last for a very long time if vacuum packed correctly, however reconstituting it would likely take significant effort.

13 Return Policy

Money Back Guarantee

Customers may cancel their orders, prior to shipment, for a refund minus a 3% fee to cover the card charges incurred by Blue Alpine. The card companies still charge us regardless if we refund the money. We just don't want to lose money when someone changes their mind.

Once the freeze dryer(s) ships, if it is within 30 days of ship date, customers may return their freeze dryers for a refund less all shipping costs and less a restocking fee of 15%.

A return merchandise authorization (RMA) must be issued via email or other written form of communication before items can be shipped back to Blue Alpine LLC. Blue Alpine LLC reserves the right to not refund any items that did not have an RMA prior to being shipped back.

Restocking and return shipping fees for customers outside of the continental 48 states of the United States will vary and are calculated on a case by case basis.

Note: We have had customers that wanted to return the unit before it even arrived because the shipping company was a few days late. Although Amazon Prime delivery is great we are not that cool and can't afford to pay for impatience.

14 Warranty Information

14.1 One-Year Warranty

Full One-Year Warranty only includes the U.S. continental 48 states

Warranty Period: Blue Alpine LLC freeze dryers are warrantied for 12 months from the ship date if shipped directly from the factory or the date of purchase if purchased at a retail store. Proof of purchase is required for warranty. If the unit needs to be shipped back to our facility for maintenance, one additional month will be added to the warranty.

If the customer has the ability to use the machine but does not set it up or chooses not to use it, this time will still count toward the warranty time period.

Blue Alpine will be responsible for: Repair or, at our option, replacement of any part of this freeze dryer and/or vacuum pump which proves to be defective in workmanship or material. We are committed to making sure our machines are running and getting customers back into operation in a timely manner.

Consumer will be responsible for: There may be small things that can be replaced by the user. These could be things like a vacuum pump, computer board or software updates. The machines were designed to be simple to work on so if any part fails it is usually a very simple repair to get it working again. If you have any questions about how to do these replacements or updates we will be available to walk you through it and make it as easy as possible. The customer is explicitly and solely responsible of physically preparing the freeze dryer or other components for shipment back to Blue Alpine LLC. When asked, parts must be shipped back to Blue Alpine LLC before new parts can be sent. When returning shipping freight, photos of the shipment must be sent to Blue Alpine LLC before return shipping will be scheduled.

The customer will be responsible for any misuse or neglect of the freeze dryer, including but not limited to damage caused by plugging the unit into 240V, dropping the freeze dryer during installation, plugging the vacuum pump into the drain hose, and acts of god such as lightning strikes.

International Limited Warranty (Also Alaska & Hawaii)

All provisions of this limited warranty are the same as listed above except that service will be provided by the customer or a qualified local service provider that is approved by Blue Alpine but organized and paid for by the customer. The consumer will be responsible for the cost of transportation of the product to the repair shop or the travel cost of the technician to the consumer's location. In the event a consumer is required to ship the product directly to Blue Alpine for repair, the consumer is eligible for a shipping credit in an amount determined by Blue Alpine at the time of shipping.

Shipping for international orders is insured by Blue Alpine LLC according to the FAS – Free Alongside Ship incoterms. Any additional shipping insurance beyond FAS will be coordinated by the buyer with their freight forwarder.

14.2 Limited 3-Year Warranty

Warranty Period: Blue Alpine LLC will provide a limited warranty for a period of 36 months from the original ship date if shipped directly from the factory or the date of purchase if purchased at a retail

store. Proof of purchase is required for warranty. If the unit needs to be shipped back to our facility for maintenance, one additional month will be added to the warranty.

Blue Alpine will be responsible for: Repair or, at our option, replacement of any part of the sealed refrigeration system (compressor, condenser, evaporator, tubing, condenser fan) which fails because of defective workmanship or material.

Consumer will be responsible for: Diagnostic charges for determining defects, and any costs for transportation and delivery of the appliance required because of service. The customer is explicitly and solely responsible of physically preparing the freeze dryer or other components for shipment back to Blue Alpine LLC. When asked, parts must be shipped back to Blue Alpine LLC before new parts can be sent. When returning shipping freight, photos of the shipment must be sent to Blue Alpine LLC before return shipping will be scheduled.

The customer will be responsible for any misuse or neglect of the freeze dryer, including but not limited to damage caused by plugging the unit into 240V, dropping the freeze dryer, plugging the vacuum pump into the drain hose, and acts of god such as lightning strikes.

14.3 Normal Responsibilities of the Consumer

Note: This is a scientific process and an expensive machine. We ask that you learn everything you can about how the process works. It would be ridiculous to buy a car without knowing how to drive.

This warranty applies only to freeze dryers used in clean environments and when operated in accordance with Blue Alpine instructions. The consumer is responsible for the following items:

1. Proper use of the appliance in accordance with the instructions provided with the product.
2. Proper installation in accordance with the instructions provided with the appliance and in accordance with all local electrical codes.
3. Proper connection to a grounded power supply of sufficient voltage, replacement of blown fuses, repair of loose connections or defects in house wiring.
4. The appliance must be operated in a clean open area that has plenty of airflow and is not above 90°F (32.2°C) or below 32° F (0°C).
5. Damages to the appliance during or after installation. Do not lift the unit by holding onto the door.
6. Properly maintaining and operating the freeze dryer and vacuum pump. Changing the oil is important and the pump is much like a car engine. The more often you change the oil the longer it will last.
7. Ensuring freeze-dried food, or other freeze-dried material, are completely dry prior to packaging.
8. Ensuring proper, durable containers are used. Containers, once sealed, must not allow water or air to penetrate them.
9. Any new software updates will need to be performed but the user.
10. Ensuring sufficient/proper, fresh oxygen absorbers are included in the sealed container with the freeze dried material. They must not have expired or been exposed to the air prematurely for too long of a time.

11. PCB/motherboard replacement. The machines are built with the customer in mind and are easy to work on. Replacement of a board is not common but they are normally a 5 minute fix. If Blue Alpine LLC warranties a PCB/mother board it is the responsibility of the customer to replace it. Additionally if Blue Alpine LLC asks for the old PCB back for evaluation and provides a shipping label it is the responsibility of the customer to ship it back.

The quality of food processed in the machine can vary widely and change depending on even the smallest change in cycle parameters. Because of this, Blue Alpine accepts no responsibility for the quality of freeze-dried food or freeze-dried materials; nor does it accept responsibility for the packaging of the food or other freeze-dried material.

14.4 Exclusions

Damages caused by or through any of the items listed below are either excluded from the warranty or will void the warranty if not properly performed. The exclusions outlined herein are critical to ensure that the warranty applies only to manufacturing defects or failures directly related to the quality of materials and workmanship, as intended by Blue Alpine LLC.

1. Any modifications or add-on after-market accessories will void the warranty in its entirety.
2. Consequential or incidental damages such as, but not limited to, property damage and incidental expenses resulting from any breach of this written or any implied warranty.
3. The warranty does not cover flooding, fire, wind or other damage caused by natural events.
4. Damages caused by services performed by persons other than authorized by Blue Alpine.
5. Parts other than Blue Alpine repair parts or parts obtained from suppliers other than Blue Alpine personnel.
6. External causes such as abuse, misuse, inadequate power supply, or acts of God.
7. Products with original serial numbers that have been removed or altered and cannot be readily determined.
8. Damage cause by using an extension cord instead of direct line connection to available power supply.
9. Claims for personal injuries, incidental or consequential damages, or economic loss (profit or revenue), however caused.
10. If you are not the original owner of the freeze dryer, the warranty no longer applies.
11. Plugging the unit in to 220 voltage will void the warranty. Note: This has happened before that is why it is in here.
12. Plugging the unit into an outlet that has reversed polarity (the outlets hot and neutral are backwards) may also void the warranty and will be decided by Blue Alpine LLC on a case by case basis.
13. Failure to return components to Blue Alpine LLC when requested to return them may result in voided warranty.

14. No returns, service, or refunds will be provided for ”noisy” or ”loud” machines. Freeze dryers are inherently louder than an average home appliance.
15. Damages caused by any interruption, brown out, power surge, lightning strikes, power receptacle, or other power service anomalies are not warrantied. Blue Alpine LLC recommends plugging your freeze dryer into an appropriately sized surge protector.
16. Blue Alpine LLC does not cover the cost of any express or expedited shipping for any purchases, repair parts, warranty service, or replacement items. If expedited shipping or services are needed the customer can select what speed of service is wanted, then the customer will be sent a means to pay for the expedited shipping before the items are shipped.
17. Blue Alpine LLC reserves the right to void the warranty if the customer performs or arranges any repairs, modifications, or maintenance on the product without the prior written consent of the manufacturer via email or otherwise. The customer is required to contact the manufacturer before undertaking any such work.
18. Service calls which do not involve malfunction or defects in workmanship or material.
19. Any packaging materials, including the dust cover that comes with the machines. This is just packaging and may be damaged during shipping or unboxing.
20. Any damage caused by the customer to the vacuum pump, including but not limited to not changing the oil at correct intervals, hooking the pump up to the drain valve, using inappropriate cleaners in the pump, not putting oil in the pump, and improper reassembly of the pump. Any damages to vacuum pumps that exceed two replacement vacuum pumps will be assumed to be damages caused by the customer, likely related to how to customer is maintaining the vacuum pump.
21. Any food that is burnt and or stuck to the silicone mats, and or any damage to the silicone mats due to use, food preparation, cutting, cleaning, freeze drying, or otherwise is not included in this warranty. Additionally, any warping of the stainless steel sheet pans is not covered by this warranty.
22. All consumables such as the impulse sealer hot wire, impulse sealer PTFE parts, mylar bags, oxygen absorbers, vacuum pump oil, vacuum pump oil mist filter, vacuum pump carbon filter, and P100 chamber filter are explicitly excluded from the warranty.
23. The silicone mats can easily be cut if used as a cutting board and are therefore not covered under the full 1 year warranty. Instead, if there is a problem or manufacturing defect with the silicone tray mats the warranty is limited to 30 day from receipt of the freeze dryer.
24. Items categorized as ”Replacement Parts” and purchased from the Blue Alpine LLC website are sold on an as-is basis and are not covered under our standard product warranty. Due to the nature of these parts, we cannot accept returns, as we are unable to verify whether a returned item is the originally purchased part or one that has been used or replaced during a repair, or damaged during the repair process. By purchasing repair parts, the customer acknowledges and accepts that all sales are final. If you have any questions about this exclusion or need help selecting the correct part, please contact our support team before purchasing.

14.5 Service

Since it is the responsibility of the consumer to establish the warranty period by verifying the original purchase date, keep your delivery slip or purchase receipt or some other appropriate payment record. This written warranty gives you specific legal rights. You may have other rights that vary from state to state. Service under this warranty must be obtained by contacting Blue Alpine directly.

If you need service just call us. We are happy to help.

Blue Alpine 80 East Industrial Park Rd, Saint Anthony, ID, 83445, United States

208-607-1722

contact@bluealpinefreezedryers.com

14.6 Shipping

Note: Shipping times are just an estimate. Once the unit leaves or facility we have very little control over the freight company. Although delays in shipping are not common we ask for patience in dealing with the shipping company and any delays their company might cause.

Shipping Damage: If the machine is damaged during shipment we will work with the shipping company to make it right. Blue Alpine LLC reserves the right to decide to ship the customer parts such as panels that the customer will replace, or to ship the machine back to our facility to be repaired. This decision will be determined based on the extent of the damage.

14.7 Everything Else

1. **Non-Transferability of Warranty:** This warranty is extended only to the original purchaser of the product and is not transferable to subsequent owners. Any transfer of ownership voids the warranty.
2. **Purchase from a retailer:** If you have purchased from a 3rd party retailer you will need to provide a receipt or proof of purchase to initiate any warranty claim.
3. **Return of Parts or Items:** If a new part or item has been provided to the customer under warranty, Blue Alpine LLC reserves the right to request that old or damaged parts or items be sent back to Blue Alpine LLC for evaluation or repair. If Blue Alpine LLC provides return shipping labels for parts or items and the customer does not ship them back within 60 calendar days, Blue Alpine LLC reserves the right to void the warranty on the freeze dryer.

15 Legal Disclosures

Blue Alpine offers substantial support for our freeze dryers. Customers can contact our dedicated customer service team for assistance with maintenance, repairs, and technical inquiries. Blue Alpine remains committed to providing general support and assistance to our customers. If you have any questions or require further information, please don't hesitate to contact our customer service team.

Blue Alpine LLC does not assume responsibility for any damaged food or financial losses as a result of or associated with using the Blue Alpine freeze dryers. Blue Alpine will provide maintenance and repair parts covered by the warranty during the warranty period.

Blue Alpine LLC does not assume responsibility for any food safety related issues caused by the use of the freeze dryer, including but not limited to improper cleaning, improper maintenance, improper food preparation, machine malfunction leading to food safety issues, and the like. By purchasing a Blue Alpine Freeze dryer, the owner acknowledges that any operator of the freeze dryer has been properly trained on their specific application and the owner takes responsibility for the food safety relative to the freeze dryer regardless of performance or design of the feeze dryer.

By completing a purchase from Blue Alpine LLC, the customer expressly acknowledges and agrees to the terms and conditions outlined within the applicable warranty, as it is stated and without modification. Furthermore, the customer agrees and understands that any and all transactions, exchanges, or purchases involving Blue Alpine LLC shall be considered to have originated within the jurisdiction and authority of Fremont County, Idaho. In accordance with this stipulation, any and all disputes or proceedings arising in connection with, or as a result of, any purchase, transaction, or contractual engagement with Blue Alpine LLC shall be adjudicated, processed, and resolved exclusively within the legal system governing Fremont County, Idaho.

16 Disposal

If you wish to discard this product, please contact your local authorities for the correct method of disposal and for proper treatment, recovery and recycling. It is important to comply with local regulations and guidelines for the proper handling and disposal of your freeze dryer.

Here are some local authorities and resources you can contact for guidance on disposal:

Municipal or City Government Offices: Contact your local municipal or city government offices, particularly departments responsible for waste management, environmental protection, or sanitation. They can provide information on local regulations regarding electronic waste disposal and may offer guidance on disposal options or designated drop-off locations.

Waste Management Authorities: In many areas, there are specific waste management authorities or agencies tasked with overseeing waste disposal and recycling programs. These authorities can provide guidance on proper disposal methods for electronic equipment and may offer services for electronic waste collection or recycling.

Environmental Protection Agencies: State or regional environmental protection agencies often provide resources and information on electronic waste disposal and recycling initiatives. They may have guidelines or programs in place to promote responsible disposal practices and prevent environmental harm.

Recycling Centers or Facilities: Contact local recycling centers or facilities that accept electronic waste for recycling. They can provide information on accepted items, drop-off locations, and procedures for recycling electronic equipment such as freeze dryers.

Online Resources: Websites or online databases maintained by government agencies or environmental organizations may provide information on electronic waste disposal options and resources available in your area. These resources can help you locate designated drop-off locations, recycling events, or collection programs for electronic equipment.

17 Customer Support

If you have any questions or concerns about your product, please contact us.

Email: contact@bluealpinefreezedryers.com

Phone: 208-607-1722

Address: 80 East Industrial Park Rd Saint Anthony, ID, 83445

Support Hours

Mon-Fri, 8:30am-5:00pm MST

*Please have your order invoice and order ID ready before contacting Customer Support.