



Product Manual
UltraDoser® 150S
Liquid Nitrogen Dosing System



Designed and Built by:

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Revision Log

Revision Level	Date	Description
B	08/24/2015	Reformat with new layout
C	06/09/2016	Update pages 12 and 19 for minimum dose amount of 20mS instead of 10mS. Update CryotechFlex hose to CFlex throughout. Update trademarks, update warranty section.
D	06/20/2016	Update warranty section to read 2 years
E	04/09/2019	Updated Replacement Part Numbers
F	02/07/2022	Update Replacement Part list
G	04/20/2023	Update Replacement Part list

Preface

General

The UltraDoser® 150S LN₂ Dosing System is a multi-purpose liquid nitrogen dosing system utilizing advanced cryogenic technology and PLC programming. LN₂ is supplied to the UltraDoser unit by a vacuum insulated hose and flows into the dosing head. A sensor detects the speed of the line (encoder compatible); a second sensor detects the presence of a container. When a container is detected, the dosing head opens and dispenses an exact amount of pure LN₂. A PLC (Programmable Logic Controller) is the brains behind integrating the sensors, controls and human interface.

Chart engineers designed an ultra-efficient system for low to medium production line speeds to dispense a precise dose of LN₂ into every container every time. The LN₂ gasifies and is either trapped in the container to add rigidity or escapes with oxygen to inert the headspace.

Features

- Compact Size - enables installation in limited spaces
- Precise Dosing - delivers consistent, accurate dosing
- Discrete Dosing - up to 2000* containers per minute
- Discrete or Continuous Dosing - change over defined by user
- SoftDose™ Compatible - Chart's proven technology for hot fill, powder, and granular applications
- RemoteDose™ Capable - monitor and troubleshoot the system remotely thereby minimizing or eliminating system downtime
- MicroDose™ Capable - designed specifically for tight pressure specifications
- IntelliDose™ Capable - automatic dose adjustments at any line speed between low/high points as defined by user

**Results obtained under specific conditions*

Key Benefits

- Lightweight PET - reduce the weight of PET for cost and environmental savings
- Glass to PET Transition - eliminate glass safety hazards and weight of containers
- Bottle Rigidity - maintain bottle shape even with lighter weight containers

- Eliminate Paneling - increase the internal pressure to offset paneling issues
- Oxygen Reduction - create an inert environment to preserve product freshness
- Extend Shelf Life - minimize oxygen levels
- Ease of Labeling - consistent bottle rigidity creates an efficient labeling process
- Reduce Nitrogen Consumption - Measurable and repeatable liquid doses
- Maximize Warehouse Storage Space - increasing product stackability utilizes less square footage
- Stabilize Organic Products - extend shelf life without preservatives

Product Manual

This manual is designed to be used in conjunction with the UltraDoser 150S Liquid Nitrogen Dosing System provided by Chart. Chart makes no warranties, express or implied, regarding the content in this manual. Chart assumes no responsibility for any outcomes as a result of using this manual. If after reading this manual you are not confident in carrying out any task, please contact Chart's service team at 1-408-371-4932.

Additional copies of this manual are available by contacting Chart at 1-800-371-3303.

The safety requirements for operating the UltraDoser 150S and handling or transporting extremely cold liquid products are shown in the Safety section. Use this safety section as a "Safety Checklist" each time the equipment is being used. In the Installation section there are illustrations for proper connections.

The Operations section contains set-up and operation information along with system features and service and maintenance.

The remaining sections provide information on Service, Troubleshooting, Specifications and the Warranty provided by Chart.

Terms

Throughout this manual safety precautions will be designated as follows:



Warning! *Description of a condition that can result in personal injury or death.*



Caution! *Description of a condition that can result in equipment or component damage.*



Note: *A statement that contains information that is important enough to emphasize or repeat.*

Acronyms / Abbreviations

The following acronyms / abbreviations are used throughout this manual:

BAR	Pressure (Metric)
GN ₂	Gaseous Nitrogen
ID	Inner Diameter
Kg	Kilogram
LN ₂	Liquid Nitrogen
MPT	Male Pipe Thread
mS	Milliseconds
PLC	Programmable Logic Controller
PN	Part Number
PSI	Pounds per Square Inch
SRV	Safety Relief Valve

Safety

General

Thank you for your purchase of Chart Inc.'s (Chart) UltraDoser 150S Liquid Nitrogen Dosing System. Chart has designed and fabricated your system with attention to detail and utilizing the leading cryogenic technologies to ensure a highly efficient and reliable system.

DO NOT use this product in a manner not consistent with the instruction outlined in this manual.

NEVER alter the design, or perform service that is not consistent with the instructions outlined in this manual without prior written approval from Chart.

Strict compliance with proper safety and handling practices is necessary when using a cryogenic system. We recommend that all our customers re-emphasize safety and safe handling practices to all their employees and customers. While every possible safety feature has been designed into the system and safe operations are anticipated, it is essential that the user of the cryogenic system carefully read to fully understand all WARNINGS and CAUTION notes listed in this safety summary and enumerated below. Also read the information provided in the Safety Bulletin for Inert Gases following this Safety Summary. Periodic review of the Safety Summary is recommended.



Warning! *Your UltraDoser 150S system may be fed by a vacuum insulated pipe system designed to contain pressurized, ultra-cold cryogenic liquids. These systems should only be worked on by trained personnel to avoid serious injuries such as freezing, oxygen deficient atmosphere and extremely high pressures.*

External valves and fittings can become extremely cold and may cause painful burns to personnel unless properly protected. Personnel must wear protective gloves and eye protection whenever removing parts or loosening fittings. Failure to do so may result in personal injury due to the extreme cold and pressure in the system.



Warning! *Accidental contact of liquid gases with skin or eyes may cause a freezing injury similar to a burn.*

Handle liquid so that it will not splash or spill. Protect your eyes and cover skin where the possibility of contact with liquid, cold pipes and equipment, or cold gas exists. Safety goggles or a face shield should be worn if liquid ejection or splashing may occur or cold gas may exit forcefully from equipment. Clean, insulated gloves that can be easily removed and long sleeves are recommended for arm and hand protection. Cuff less trousers should be worn over the shoes to shed spilled liquid.



Warning! *If you are at all unsure of how to safely work on this system, STOP and contact Chart immediately at 1-408-371-4932.*



Warning! *Any configuration which allows a trapped volume of cryogenic liquid or cold gas must be protected by a pressure relief valve. As the cold liquid/gas gains heat, the contents will expand and increase in pressure. A section not protected by an over-pressure relief valve will experience extremely high pressures and significant safety concerns.*



Warning! *Over pressurization of bottles (or containers) can occur while using Chart's UltraDoser 150S system potentially bursting the bottles (or containers). Proper calibration of the UltraDoser 150S system ensures optimum nitrogen doses to avoid over pressurization. Be sure to remove any bottles (or containers) that receive more than its proper LN₂ doses before sealing.*



Caution! *As with any cryogenic system, it should be observed that any non-insulated piping can get extremely cold and should not be touched by exposed skin. If the system requires maintenance, it should be shutdown and allowed to warm up.*



Caution! Before removing parts or loosening fittings, empty the UltraDoser 150S system of liquid and release any vapor pressure in a safe manner.

Safety Bulletin

Portions of the following information is extracted from Safety Bulletin SB-2 from the Compressed Gas Association, Inc. at www.cganet.com. Additional information on oxygen, nitrogen, and cryogenics is available in CGA Pamphlet P-9. Write to the Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202..

Oxygen Deficient Atmospheres



Warning! Nitrogen vapors in air may dilute the concentration of oxygen necessary to support or sustain life.

The normal oxygen content of air is approximately 21%. Depletion of oxygen content in air, either by combustion or by displacement with inert gas, is a potential hazard and users should exercise suitable precautions.

One aspect of this possible hazard is the response of humans when exposed to an atmosphere containing only 8 to 12% oxygen. In this environment, unconsciousness can be immediate with virtually no warning.

When the oxygen content of air is reduced to approximately 15 to 16%, the flame of ordinary combustible materials, including those commonly used as fuel for heat or light, may be extinguished. Somewhat below this concentration, an individual breathing the air is mentally incapable of diagnosing the situation because the onset of symptoms such as sleepiness, fatigue, lassitude, loss of coordination, errors in judgment and confusion can be masked by a state of "euphoria," leaving the victim with a false sense of security and well being.

Human exposure to atmosphere containing 12% or less oxygen leads to rapid unconsciousness. Unconsciousness can occur so rapidly that the user is rendered essentially helpless. This can occur if the condition is reached by an immediate change of environment, or through the gradual depletion of oxygen.

Most individuals working in or around oxygen deficient atmospheres rely on the "buddy system" for protection - obviously the "buddy" is equally susceptible to asphyxiation if he or she enters the area to assist the unconscious partner unless equipped with a portable air supply. Best protection is obtainable by equipping all individuals with a portable supply of respirable air. Life lines are acceptable only if the area is essentially free of obstructions and individuals can assist one another without constraint.

If an oxygen deficient atmosphere is suspected or known to exist:

1. Use the "buddy system." Use more than one "buddy" if necessary to move a fellow worker in an emergency.
2. Both the worker and "buddy" should be equipped with self-contained or airline breathing equipment.

Nitrogen

Nitrogen (an inert gas) is a simple asphyxiate. It will not support or sustain life and can produce immediate hazardous conditions through the displacement of oxygen. Under high pressure this gas may produce unconsciousness even though an adequate oxygen supply sufficient for life is present.

Nitrogen vapors in air dilute the concentration of oxygen necessary to support or sustain life. Inhalation of high concentrations of this gas can cause anoxia, resulting in dizziness, nausea, vomiting, or unconsciousness and possibly death. Individuals should be prohibited from entering areas where the oxygen content is below 19% unless equipped with a self-contained breathing apparatus. Unconsciousness and death may occur with virtually no warning if the oxygen concentration is below approximately 8%. Contact with cold nitrogen gas or liquid can cause cryogenic (extreme low temperature) burns and freeze body tissue.

Persons suffering from lack of oxygen should be immediately moved to areas with normal atmospheres. SELF-CONTAINED BREATHING APPARATUS MAY BE REQUIRED TO PREVENT ASPHYXIATION OF RESCUE WORKERS. Assisted respiration and supplemental oxygen should be given if the victim is not breathing. If cryogenic liquid or cold boil-off gas contacts worker's skin or eyes, the affected tissue should be flooded or soaked with tepid water (105-115°F or 41-46°C). DO NOT USE HOT WATER. Cryogenic burns that result in blistering or deeper tissue freezing should be examined promptly by a physician.

Receiving and Installation

Receiving

The UltraDoser 150S system is designed for steady speed filling lines up to 150 bottles (or containers) per minute. It does not compensate for changes in line speed. Any changes to the line speed may require changes to the dose settings.

Unpacking

The UltraDoser 150S system will arrive in a specially designed shipping crate. If the unit is intended to be moved from one location to another, storing the crate for future use is ideal.

Upon arrival of the UltraDoser 150S system, it is advised to immediately inspect for any signs of damage. If any damage occurred in shipping, claims must be filed with the shipping carrier immediately prior to unpacking.

All contents should be carefully inspected while unpacking the UltraDoser 150S system. Things to check for upon arrival include:

- Dents in the UltraDoser unit
- Male and female bayonets should be protected
- Proper number of bayonet clamps/flanges and o-rings (one set for every female bayonet)
- Any other components that were defined to ship loose

If there are any pieces listed on the packing slip and/or materials list not in the shipping crate, please contact Chart immediately at 1-800-371-3303.



Caution! *When removing the UltraDoser unit from the crate, gently set it on the ground. DO NOT drop the UltraDoser unit! When transporting the unit through the facility be sure to carry with care. Take care not to run into walls or drag the UltraDoser unit on the ground.*

If not installed immediately, the UltraDoser 150S system should be stored in a location that is out of the way of frequent traffic and will prevent dirt, water, or other debris from getting inside the system. Chart recommends storing the system in the crate when not in service.

Installation

Application Evaluation

The UltraDoser 150S system can be used for both inerting and pressurization applications. The application must be evaluated to determine the ideal location of the dosing head on the filling line.

- **Inerting** - Inerting is the process of removing oxygen (O₂) from a bottle (or container) by dosing a relatively large amount of LN₂ in the bottle (or container) to inert. The liquid dose quickly converts into gas displacing air and oxygen from the bottle (or container). The ideal location for the UltraDoser unit must allow for enough time between dosing and capping so that the liquid dose is converted into a gas.
- **Pressurization** - Pressurization occurs by dosing a relatively small amount of LN₂ into a bottle (or container). The liquid dose quickly converts into gas and the bottle (or container) is then capped or sealed to capture the expanding gas. The UltraDoser unit should be installed as close to the capper as possible.

Support Stand Location

The UltraDoser unit is supplied with a mounting bracket assembly. The assembly consists of the bracket attaching to the UltraDoser body and two clamps designed to fit on 1½” stainless steel rod. Chart can supply a prefabricated stand to accommodate the mounting bracket assembly. This stand can be utilized in almost all installations. If the Chart stand cannot be used in your installation, fabricating one with 1½” diameter rod or round bar will make installation of the UltraDoser 150S unit simpler. The instructions below will assume installation of Chart’s prefabricated support stand (Figure 4).

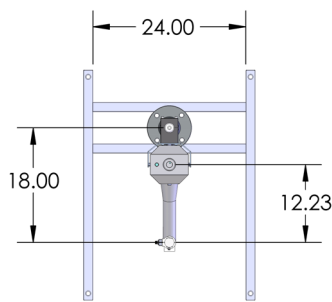


Figure 1

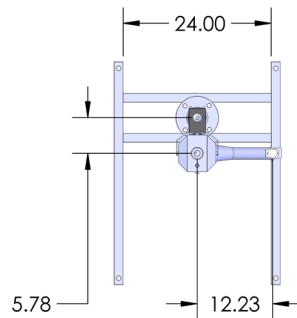


Figure 2

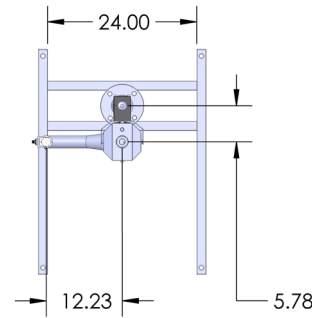


Figure 3

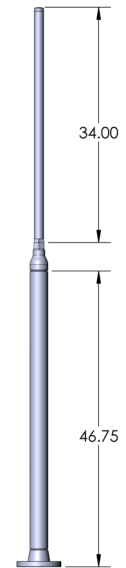
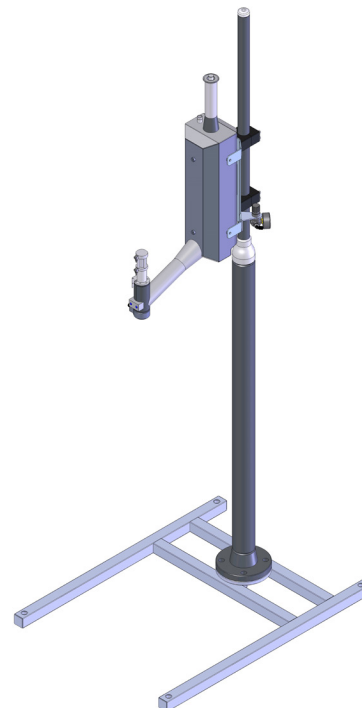


Figure 4

1. The UltraDoser unit can be installed on either side of a production line. Select the side that best suits the workplace. The mounting bracket assembly is installed straight back opposite to the arm from the factory. However, the UltraDoser body can be mounted in the mounting bracket such that the support stand is located on either side perpendicular to the arm (Figures 1 - 3).
2. Measure the appropriate distance depending on the UltraDoser configuration. This is the location for the installation of the support stand.
3. Mark the location of the stand and install the four 5/8” bolts included with the support stand in the proper location.

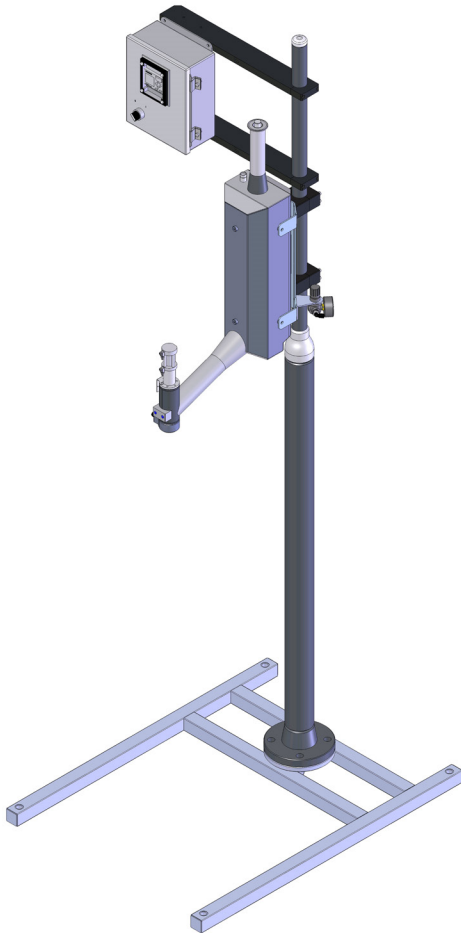
Mounting the UltraDoser Unit

Once the stand is installed, mount the UltraDoser unit on the stand using the supplied mounting bracket.



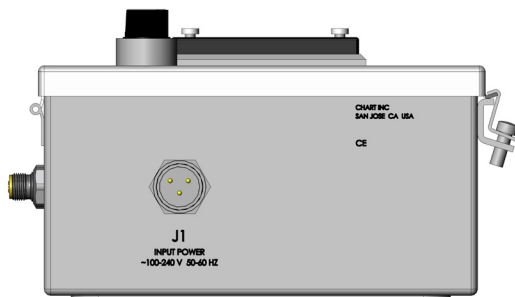
Installing the 150S Controller

Mount the 150S controller at a convenient location. Brackets are supplied to mount the controller on the Chart prefabricated support stand or 1 1/2" diameter rod or round bar.

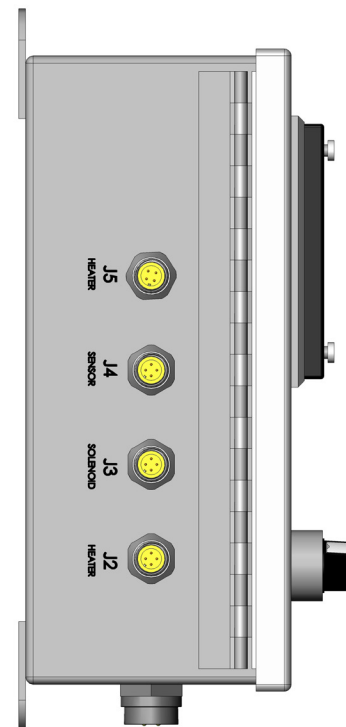


The bottom of the 150S controller is the electrical plug connection. The left side of the 150S controller is the electrical connection between the operating parts of the UltraDoser unit and the 150S controller. There are five connections.

- Input Power (J1) - The 150S controller power cable (6 ft.) is connected to the 150S controller at port J1.



- Heater (J2) - This is the connector marked J2 on the 150S controller. A green light on the cable connector indicates that power is being supplied to the heater (either dosing head or vent).
- Solenoid (J3) - This is the connector marked J3 on the 150S controller. A green light on the cable connector indicates that power is being supplied to the solenoid valve. A yellow light will appear when the solenoid valve is activated.
- Sensor (J4) - This is the connector marked J4 on the 150S controller. A green light on the cable connector indicates that power is being supplied to the bottle detect sensor. A yellow light will appear when the product bottle (or container) is detected.
- Heater (J5) - This is the connector marked J5 on the 150S controller. A green light on the cable connector indicates that power is being supplied to the heater (either dosing head or vent).



Installing the Nozzle

Three nozzles are supplied with the UltraDoser 150S system - 0.040 inch, 0.050 inch, and 0.060 inch. Custom sizes may be ordered from Chart.

1. Remove the dosing head heater.
2. Select a nozzle.
3. Insert the thread end of the nozzle into the nozzle tool (Image 1).
4. Thread the nozzle into the dosing head area in a clockwise direction (Image 2 & 3). Do not over torque.
5. Re-apply the dosing head heater.

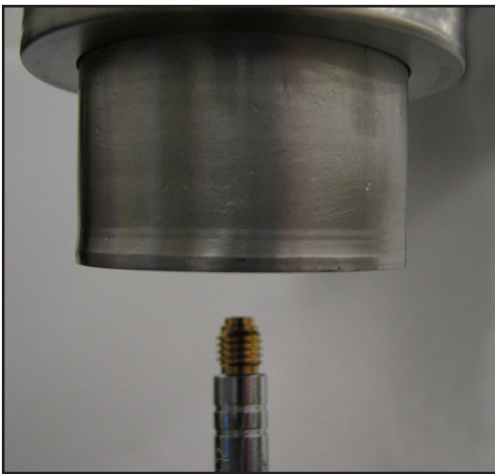


Image 1

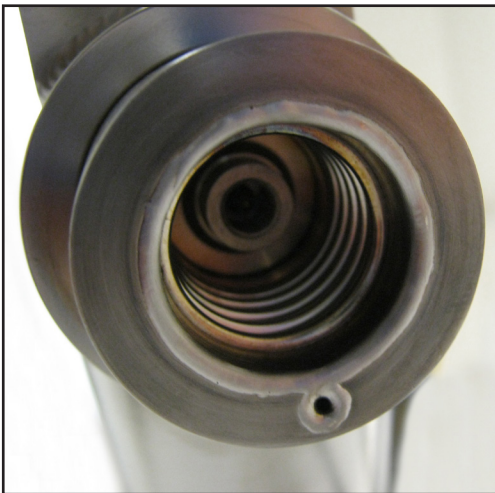


Image 2

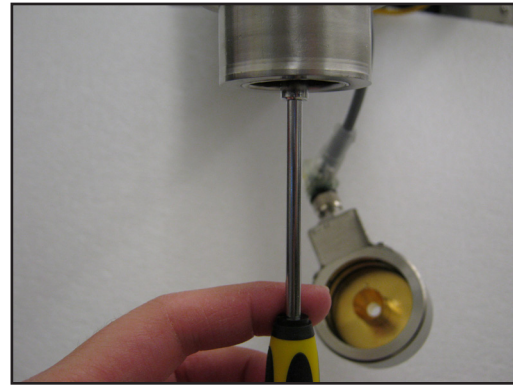


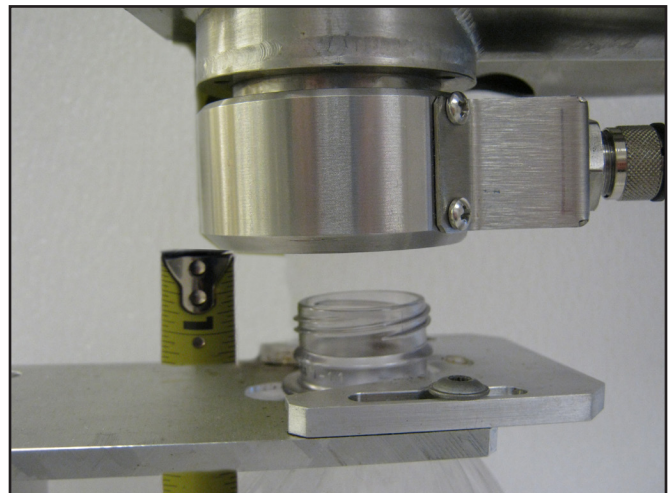
Image 3



Caution! Never use an ice-pick, screwdriver, torch or similar device on the dosing head (Image 2). The ribs of the internal bellows are a thin walled metal and the hole on the outer ring of the dosing head is a positive pressure port to help keep moisture out and ice from forming. High heat and puncture holes will destroy the vacuum insulation and VOID WARRANTY.

Positioning the Dosing Head

The dosing head should be directly over the bottle (or container) opening. The dosing head is typically installed 1/2" - 3/4" above the bottle (or container) opening. The UltraDoser unit must be manually adjusted to accommodate different sized bottles (or containers) running on the same production line.



Installing the Bottle Detect Sensor

The bottle detect sensor must be a PNP type sensor and must be installed for the UltraDoser 150S system to operate correctly. The sensor must be mounted approximately 2 ½" from the UltraDoser dosing head.



Operation

Principles of Liquid Nitrogen Dosing

To ensure consistent dosing results, an accurate dose must be delivered to each bottle (or container) AND each bottle (or container) must be processed in the same manner.

Chart's UltraDoser 150S system guarantees that a precise, accurate dose of LN₂ is delivered. The UltraDoser 150S system meets the following fundamental dosing conditions.

Pure Liquid at the Dosing Head

Pure liquid (i.e. liquid with no gas pockets) must be instantaneously available at the dosing head. Chart has a unique internal design that ensures the continual availability of pure liquid at the dosing head.

Constant Pressure

Constant pressure at the dosing head is a critical requirement for reproducible dose size. The unit utilizes a float valve that allows for a stable liquid level. This allows the pressure at the dosing head to remain constant during operation.

Dose Duration

The dose duration is tightly controlled by the 150S controller's electronics. Dose duration is measured in milliseconds.



Caution! *The following production conditions must be controlled to ensure consistent dosing results:*

1. Product bottle (or container) fill levels must be consistent.
2. Product bottle (or container) fill temperatures must be consistent.
3. Capping techniques must be consistent.
4. Product may not be spilled or splashed out of bottles (or containers) following dose.



Caution! *Enough time must be allowed for specific dosing operations. When using the UltraDoser 150S system for inerting purposes (removal of oxygen) time must be allowed between dosing and complete capping of the bottle (or container).*

Controller Adjustments

The 150S controller is designed to dose at a fixed speed only. The only adjustments are Duration (of dose) and Dose Delay.



Caution! *There are additional screens accessible on the 150S controller that should not be modified. Modification to certain screens may void Chart warranty. See 'Other Screens' section for additional information.*



Note: *The 150S controller allows approximately 20 seconds to make adjustments to the Duration and Dose Delay features before returning to the "home" screen (image below).*

<p>DURATION 20 mS DOSE DELAY 190 mS</p>

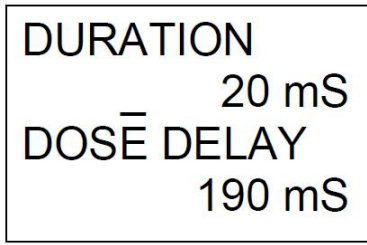
Duration (of Dose)

The Duration (of Dose) is the time in milliseconds (mS) that the UltraDoser dosing valve opens to dose.

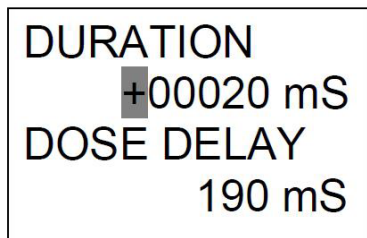
The amount of LN₂ that is trapped inside a bottle (or container) depends on many variables including the position of the dosing head, the position of the capper, the size of the dosing nozzle, the temperature of the bottle (or container) contents, fill levels, and head space. Therefore, the time setting for each filling operation must be evaluated.

1. Remove the display cover.

- Press and HOLD 'ESC' until cursor _ appears and blinks on the Duration mS value line (image below).



- Press an arrow key to move the cursor to the desired digit; the digit will appear highlighted and blink; five digits will also appear (image below).



- Press the right arrow key to highlight the desired digit.
- Use the up and down arrow keys to change the value.
- Repeat steps 4 and 5 to change each desired digit value.
- Press 'OK' to set value.
- Press 'ESC' to return to the "home" screen.

Feature	Unit	Max	Min
Duration	Milliseconds	1000	20



Note: Duration setting may be set for more than 1000 mS on the display, but the maximum time the UltraDoser dosing valve opens to dose is 1000 mS (1 second).

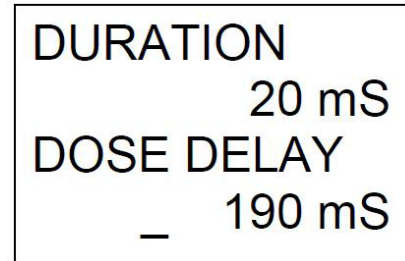
Dose Delay

The Dose Delay is the time in milliseconds (mS) between the time the bottle detect sensor senses a bottle (or container) and the UltraDoser dosing valve opens to dose. The closer the bottle detect sensor is to the dosing head, the shorter the delay time to dose.

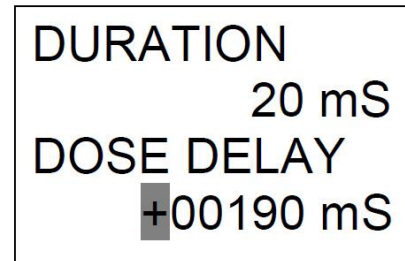


Note: The UltraDoser unit dispenses liquid nitrogen according to the user defined milliseconds regardless of line speed.

- Press and hold 'ESC' until the cursor appears and blinks on the Duration mS value line.
- Press the right arrow key to move the cursor to the Dose Delay mS value line (image below).



- Press and HOLD 'OK.' A plus sign + will be highlighted and blink; five digits will also appear (image below).



- Press the right arrow key to highlight the desired digit. Operator may be required to press the left or right arrow keys multiple times to highlight the desired digit.
- Use the up and down arrow keys to change the value.
- Repeat steps 4 and 5 to change each desired digit value.
- Press 'OK' to set value.
- Press 'ESC' to return to the "home" page.
- Re-attach the display cover.

Feature	Unit	Max	Min
Duration	Milliseconds	32699	0



Caution! Dose Delay setting must be ≥190 mS to dose discretely. Any setting <190 mS will result in a continuous dose.



Note: Dose Delay setting may be set for a maximum of 32699 mS (32 seconds) which may be impractical for most installations.

150S Controller Set-up Verification

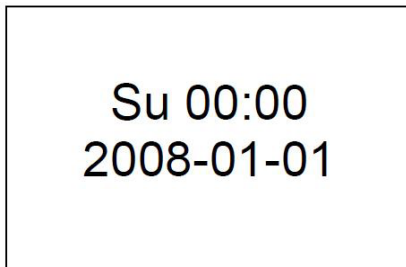
Send a bottle (or container) down the filling line. Note if the dose is dispensed before, in, or after the bottle (or container). If the dose is dispensed BEFORE the bottle (or container) reaches the dosing head, INCREASE the dose delay until the dose is dispensed into the bottle (or container). If the dose is dispensed AFTER the bottle (or container) reaches the dosing head, REDUCE the dose delay.

Other Screens

The 150S controller has other screens that may be accessed but should not be modified. Modification could void Chart warranty.

Follow the steps below if the operator should access any screens other than the “home” screen.

1. Use the ◀ or ▶ arrow keys to return to the “Date” screen (image below). Operator may be required to press the ◀ or ▶ arrow keys multiple times.
2. Once at the “Date” screen, press the ▲ arrow key to return to the “home” screen.



Caution! From the “date” screen avoid using ‘ESC’ or ‘OK.’

Daily Operating Procedures

The UltraDoser 150S unit can be fed by either a portable Dura-Cyl[®] Liquid Cylinder or a house liquid nitrogen system. Most UltraDoser 150S system installations will utilize portable Dura-Cyl cylinders.



Note: LN₂ is -320°F (-196°C). Any water and/or moisture can cause ice which will affect the performance of the UltraDoser 150S system. Providing a positive pressure of GN₂ (also known as purging) to the UltraDoser unit before introducing LN₂ into the body will eliminate many performance interruptions.



Typical Dura-Cyl Cylinder Installation Set-up

Purging with Gaseous Nitrogen

The UltraDoser unit must only be purged with gaseous nitrogen. Chart recommends the UltraDoser unit be purged when not in use. However, this may not be practical for all operators. At a minimum, the UltraDoser unit should be purged to eliminate any water that may be inside the unit after installation and prior to startup. The UltraDoser reservoir may also require purging when there is liquid nitrogen flowing out of the vent. The UltraDoser reservoir must also be purged when the nozzle becomes frozen shut.

1. Attach the CFlex hose (½” female flare side) to the house GN₂ system or portable GN₂ cylinder. Note: this step will require additional fittings such as ½” male flare fitting and compression fittings.
2. Flow GN₂ (20 psi; 1.38 bar) through the UltraDoser body for approximately ten (10) minutes before system start up.



Caution! When purging the UltraDoser unit, it will vent heavily and there will be a steady stream of “fog” from the vent. This “fog” will be cold to the touch if the internal temperature of the UltraDoser unit is still at or near LN₂ temperatures (-320 °F; -196 °C). Once the UltraDoser unit is at or near ambient temperature, the “fog” will warm up.

System Start Up

1. Remove the CFlex hose from the GN₂ outlet with a 7/8” open end wrench or adjustable crescent wrench.
2. Insert the supplied 10 micron filter into the male bayonet on the supplied 10 foot CFlex hose using a 1/8” allen wrench.
3. Attach the CFlex hose (male bayonet side) to the UltraDoser unit with the supplied bayonet clamp and gasket.
4. Attach the CFlex hose (female flare fitting side) to the 22 psi LN₂ Dura-Cyl® Liquid Cylinder.
5. Open the liquid valve (counter-clockwise direction) on the Dura-Cyl cylinder.
6. Wait until the UltraDoser unit is filled with liquid nitrogen, approximately 10 minutes.



Caution! When the UltraDoser unit is filling, it will vent heavily and there will be a steady stream of “fog” from the vent. Once the UltraDoser unit is filled, there will be a “wisp” of fog coming from the vent. If the UltraDoser unit overfills and liquid nitrogen starts dripping out the vent, close the liquid valve on the Dura-Cyl cylinder and call Chart service at 408.371.4932.

System Shut Down

1. Place the switch on the 150S controller on the “0” position. This will turn the 150S controller off.
2. Shut the liquid valve (clockwise direction) on the Dura-Cyl cylinder.
3. If possible, purge with GN₂ until next use.

Dura-Cyl® Liquid Cylinder (22 psi) Change Out Procedure

The Dura-Cyl cylinder will need to be changed out from time to time. The operator should visually check the gauges on the Dura-Cyl cylinder to monitor the internal liquid level. When the gauges read low levels, it must be swapped with a full Dura-Cyl cylinder.

1. Shut the liquid valve (counter-clockwise direction) on the Dura-Cyl cylinder.
2. Disconnect the CFlex hose from the Dura-Cyl cylinder using a 7/8” open end wrench or adjustable crescent wrench.
3. Connect the CFlex hose to the liquid outlet on the full Dura-Cyl cylinder using a 7/8” open end wrench or adjustable crescent wrench.



Note: The UltraDoser 150S system will continue to dose properly until the liquid level inside the UltraDoser unit runs low. This feature gives the operator a reasonable window in which to change out the Dura-Cyl cylinder without disrupting the production operation.

Service and Maintenance

Nozzle Change Out Procedure

1. Remove the dosing head heater.
2. Insert the nozzle tool into the nozzle area until the tool connects with the nozzle (image 1).
3. Remove the nozzle with the driver in a counter-clockwise direction.
4. Once the nozzle is removed, place the new nozzle or cleaned nozzle into the nozzle tool and insert in a clockwise direction (image 2).

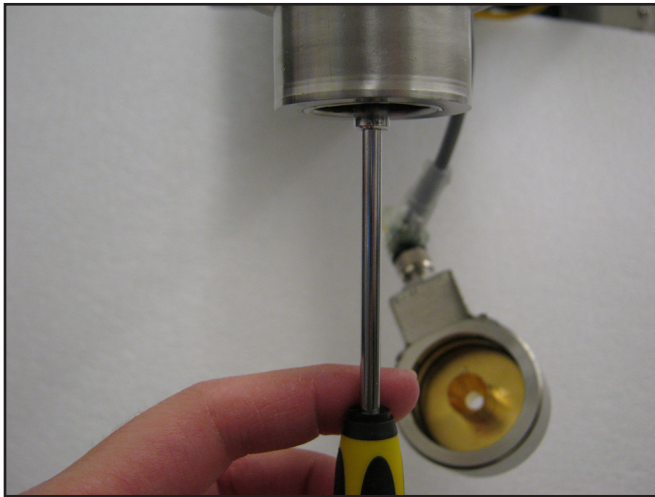


Image 1

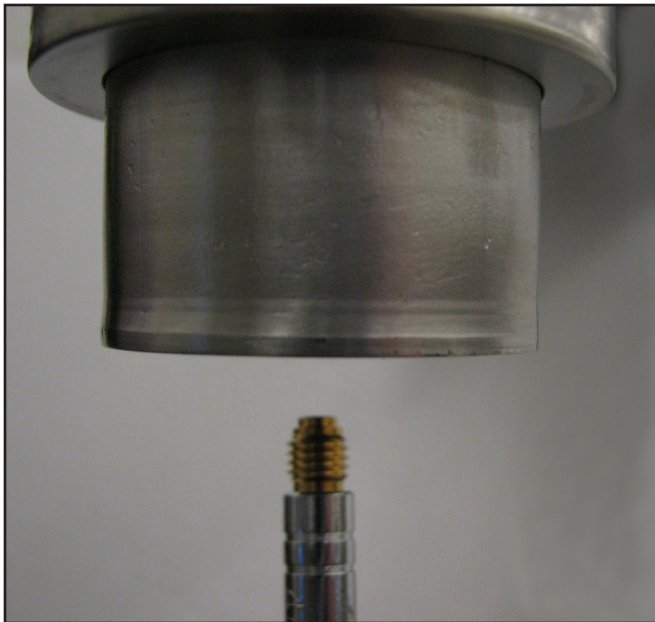


Image 2



Caution! The dosing head heater may still be in operation. Do not expose skin to prolonged contact with the dosing head heater. The maximum temperature of the dosing head heater is 150°F (65°C).



Caution! Always perform nozzle change out procedures before introducing LN₂ into the UltraDoser unit. Failure to do so may cause the nozzle to unthread and fall out.



Note: If the nozzle does not loosen easily, drain the UltraDoser unit through the SRV / drain plug and warm up nozzle with a low voltage heat gun.

Nozzle Cleaning Procedure

1. Remove the nozzle from the UltraDoser unit.
2. Clean the nozzle opening with a very thin wire and blow dry nitrogen through it.
3. Thoroughly dry the nozzle with dry nitrogen gas before re-installing.



Caution! Any moisture left on the nozzle will immediately freeze up when the nozzle is re-installed which may cause the nozzle to unthread and fall out.

Replacement Parts

Refer to the Specifications section of this manual for help in identifying the location of most replacement parts on the UltraDoser 150S system.

Part Description	Part Number	Length (meters)
Injection Unit Spare Parts Kit - Includes PNs: 3 Nozzles, customer choice, 35055.03, 141, 362 and 535	567	
0.040" Nozzle	102	
0.050" Nozzle	103	
0.060" Nozzle	104	
Vent Heater Assembly (no cable included)	35071	
Vent Heater Cable	2840.81	2.6
Dosing Head Heater (no cable included)	35070	
Nozzle (Dosing Head) Heater Cable	2840.82	3.6
10 Micron Inlet Filter	108	
10' CFlex Fill Hose	123	
Dosing Stem (Valve) Assembly	141	
Nozzle Tool - 4mm Hex Nut Driver	362	
Controller Power Cord Assembly	410	
Solenoid Valve Spare Assembly	535	
GN ₂ Regulator Assembly	566	
18mm Sensor Support Hardware Mount	694	
Complete Sensor Bracket Assembly UltraDoser	1422	
18mm Photoelectric Sensor (Bottle Detect)	2870.10	
Controller Mounting Assembly	2384	
Controller Assembly - 150S	CR_2842	
UltraDoser 150S Product Manual	20552241	
UltraDoser Body	15174	
Sensor Cable	2840.83	3.7
Solenoid Cable	2840.84	3.6
Heater Cartridge 10W	35055.03	
Heater Cartridge 15W	35055.04	
Cable-Solenoid with Connector	2840.90	8.6
Cable-Vent Heater	2840.91	7.6
Cable – Nozzle Heater,	2840.92	8.6
Cable - Sensor	2840.93	8.7
Cable – Solenoid with Connector	2840.95	13.6
Cable – Vent Heater	2840.96	12.6
Cable – Nozzle Heater	2840.97	13.6
Regulator Assembly, 2400	566	

Troubleshooting

Refer to the table below for troubleshooting procedures. The table is arranged in a Symptom/Possible Cause/Solution format. Note that possible causes for specific symptoms are listed in descending order of significance. That is, check out the first cause listed before proceeding to the next. If you need further assistance please contact Chart's service team at 1-408-371-4932.

Symptom	Possible Cause	Solution
The safety relief valve is venting.	The pressure of the LN ₂ supply is greater than 50 psi (3.44 bar). The vent is obstructed.	Check the pressure of the LN ₂ supply. If the supply pressure is greater than 50 psi (3.44 bar), reduce the supply pressure. **Note: A cylinder can be vented to reduce the pressure. Check the UltraDoser unit vent. If the vent is obstructed, clear the obstruction. If the vent is obstructed with ice, contact Chart's service team at 408-371-4932.
Symptom	Possible Cause	Solution
Liquid is coming out of the vent.	The LN ₂ supply pressure is too high. Ice has developed inside the unit, causing the internal float valve to malfunction.	Lower LN ₂ supply pressure to 22 psi (1.5 bar) or lower. The UltraDoser unit must be drained of liquid, allowed to warm up over a minimum of 24 hours with a continuous purge of warm nitrogen gas. Contact Chart's service team at 408-371-4932 for a detailed procedure.
Liquid is coming out of the dosing head even though the valve is shut closed.	The LN ₂ supply pressure is too high. The valve seat is contaminated (ice or particles).	Reduce the LN ₂ supply pressure. The UltraDoser unit must be drained of LN ₂ . The dosing valve assembly must be removed and cleaned. Contact Chart's service team at 408-371-4932 for a detailed procedure.
No liquid from the dosing head.	There is insufficient liquid inside the UltraDoser unit. The unit is disabled. The nozzle is frozen shut. There is insufficient GN ₂ to the dosing head valve. The duration (of dose) is set to a negative millisecond (mS) dose.	Open the valve (counter-clockwise) on the Dura-Cyl® Liquid Cylinder. The 150S controller is off. Switch to the "1" position. Remove, clean and re-install the nozzle. Check the level of GN ₂ at the source. If the level is empty or low, replace. Reset the duration (of dose) to a positive millisecond (mS) dose.
The unit is dosing but missing bottles (or containers).	UltraDoser dosing head is not over the bottle (or container). Bottle detect sensor is not in the correct spot. Dose Delay time on 150S controller is incorrect.	Position UltraDoser dosing head over the bottle (or container). Adjust position of the bottle detect sensor. Adjust Dose Delay time on 150S controller.
The unit is dosing in continuous mode but it should be discrete.	The dose delay setting on the 150S controller is set below 190 mS.	Reset the dose delay setting on the 150S controller to 190 mS or greater.

Specifications

UltraDoser Technical Specifications

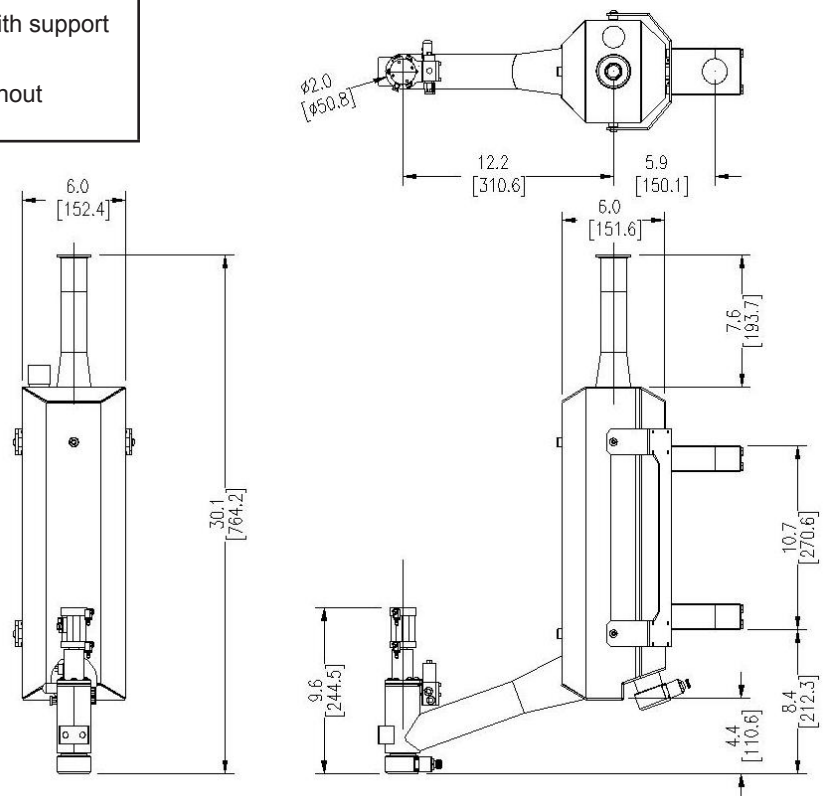
Materials	Stainless Steel Series 300*
Weight	32 lbs (14.5 kg)
Body Dimensions	18"H x 6"W (762mm x 152 mm)
Dosing Head Dimensions	9.5"H x 2"W (241mm x 50.8mm)
Arm Reach	12"-18" (304.8mm-457mm)
Head Pressure	0.45 psi (0.03 bar)
Nozzles	Ships with 0.040", 0.050", 0.060" 0.020" - 0.100" available (0.005" increments)
System Utilities	Liquid Nitrogen: 3-22 psi (0.2-1.5 bar) Gaseous Nitrogen: 60-100 psi (4.1-6.9 bar) Electricity: 110-240V AC; 50/60Hz, 110W
Steady State Consumption	0.04 gal (0.15 liter) / hour
EP Head Compatible	Yes
Vacuum Insulated	Yes
SoftDose™ Compatible	Yes
Crate Dimensions	59"L x 29"W x 21"H (1499mm x 737mm x 533mm) 225 lbs (102kg) with support stand 140 lbs (64kg) without support stand

*304 standard, 316L available upon request

Controller Technical Specifications

PLC Platform	Siemens
Display	Mono Keypad
Dose Duration	20 to 1000 mS (1 mS intervals)
Dose Volume	0.01 to 4 grams/dose
Max Discrete Dosing	150 cpm (9,000 cph)
Accuracy	± 5% of dose weight
Certifications	CE, NEMA, 4X
Weight	9.5 lbs (4.3 kg)

UltraDoser Body Dimensions



UltraDoser 150S Components

Refer to the drawing below for locations of the following components.

UltraDoser Body

The stainless steel vacuum insulated reservoir provides a working supply of LN₂ for dosing operations from your liquid nitrogen supply.

150S Controller

150S controller dictates the dosing operation of the system.

The operator inputs the “Duration” (of dose) and the “Dose Delay” settings. When the bottle detect sensor detects a bottle (or container), the UltraDoser unit will dose for the set duration (“Duration”) after the “Dose Delay” wait. The controller will automatically change to continuous dose if the “Dose Delay” is set less than 190 mS.

Inlet Filter

A 10 micron stainless steel inlet filter is provided. The filter needs to be installed inside the male bayonet on the CFlex hose.

CFlex Hose

A vacuum insulated hose that provides a connection between the UltraDoser unit and the LN₂ supply.

Controller Mounting Assembly

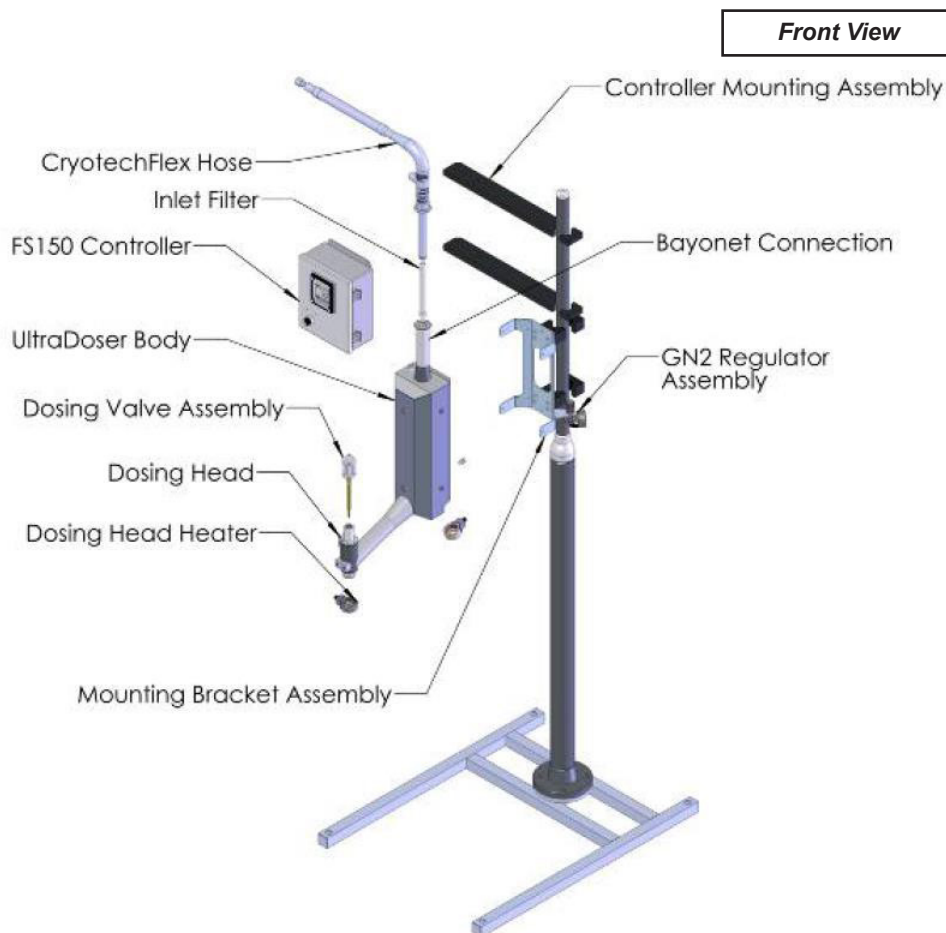
The 150S controller is supplied with a mounting assembly. This assembly is designed to attach to the 150S controller and fit on Chart’s support stand or 1 1/2” stainless steel rod.

Bayonet Connection

The bayonet connection allows a completely vacuum insulated, warm, and frost-free connection between the CFlex hose and the UltraDoser unit.

GN₂ Regulator Assembly

Controls the pressure of the house GN₂ (DO NOT use air, even if compressed dry air - CDA) to the dosing valve assembly. The regulator is preset to 6 psi (4 bar).



Mounting Bracket Assembly

The UltraDoser unit is supplied with a mounting bracket assembly. The assembly consists of the bracket attaching to the UltraDoser unit and two clamps. These clamps are designed to fit on Chart's support stand or 1 1/2" stainless steel rod. The bracket can be mounted in 3 positions.

Dosing Head Heater

The UltraDoser unit has a self-regulating dosing head heater. The maximum temperature of the dosing head heater is 150°F (65°C) and prevents frost or ice formation at the dosing head area. The heater is held in place by a set of o-rings. If needed, the dosing head heater can be removed by slipping it off of the dosing head. The dosing head heater has a built-in splash guard to minimize the dosing nozzle's exposure to splashed product or LN₂.

Dosing Head

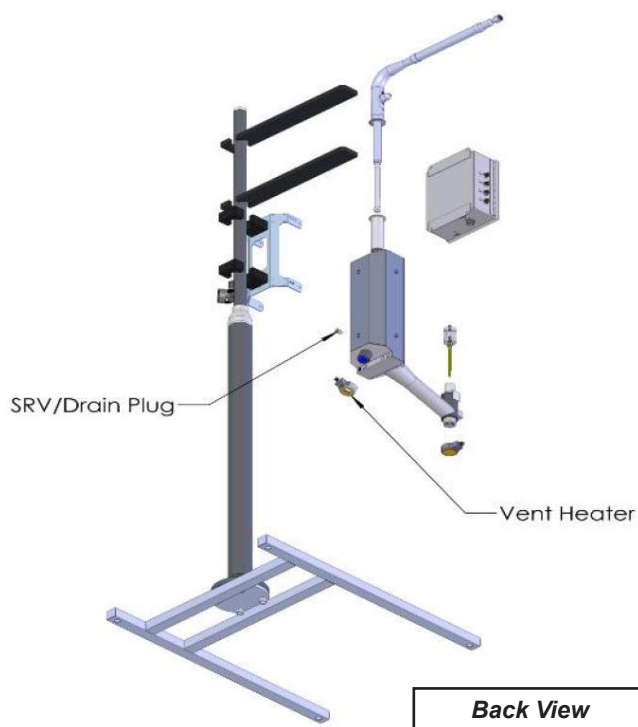
The dosing head delivers the dose of LN₂.

Dosing Valve Assembly

The dosing valve assembly contains the solenoid coil, the electromagnetic core with the valve stem, the return spring and the sealed valve housing.

Dosing Nozzle (not shown)

The size of the dosing nozzle directly affects the amount of LN₂ dosed. 0.040" ID, 0.050" ID, and 0.060" ID nozzles ship loose with the LN₂ Dosing System. Custom sizes may be ordered from Chart.



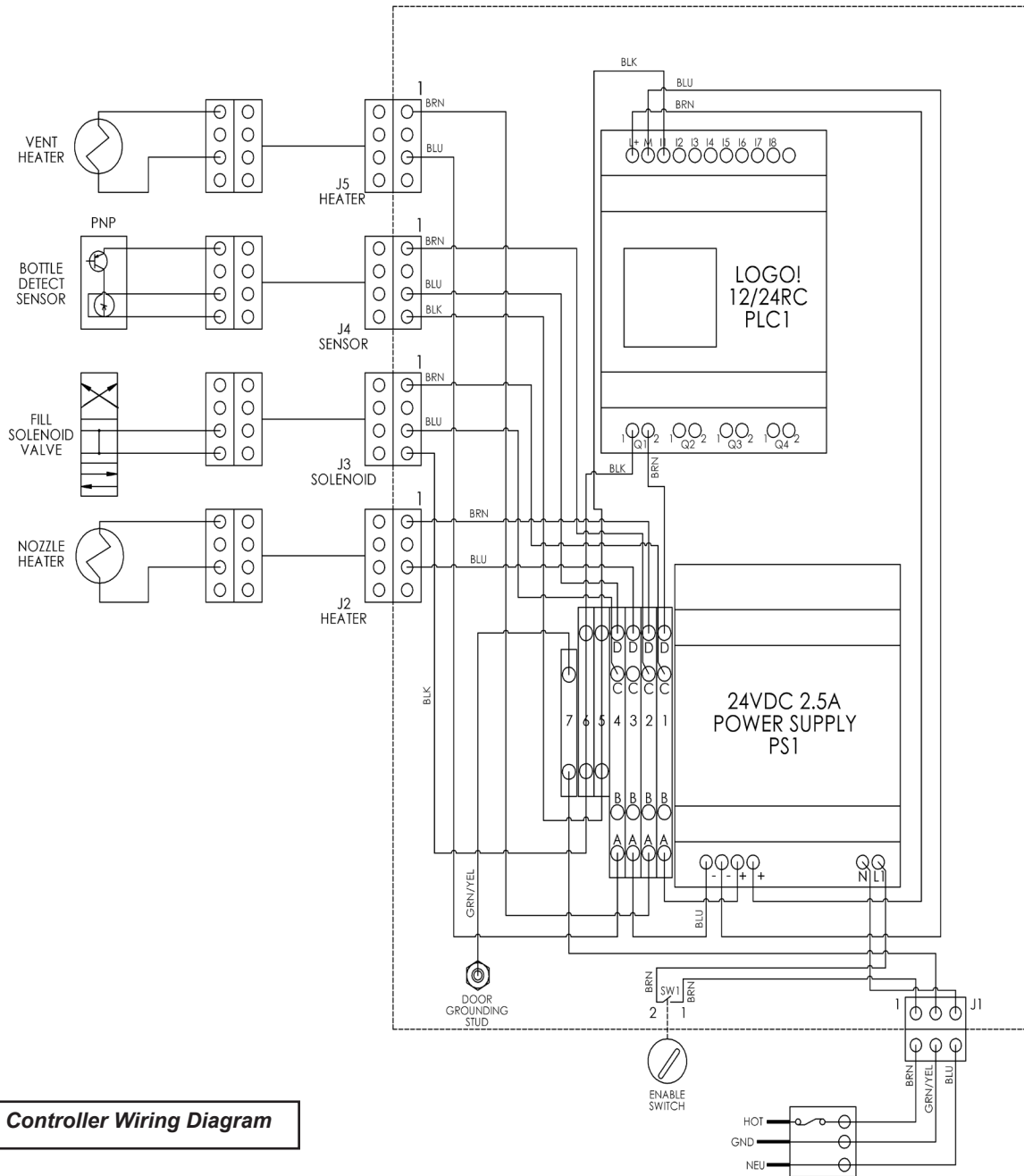
SRV / Drain Plug

A 50 psi SRV / drain plug is located on the back of the UltraDoser unit. When removed, this allows the LN₂ to drain from the UltraDoser body.

The 50 psi safety relief valve (SRV) is provided to protect the unit against over pressurization. If the pressure inside the unit reaches 50 psi or greater, the safety relief valve will vent excess pressure. Under normal operating conditions, the SRV should not vent.

Vent Heater

The UltraDoser unit has a self-regulating vent heater. The maximum temperature of the vent heater is 150°F (65°C) and prevents frost or ice formation at the vent area. The heater is held in place by a set of o-rings. If needed, the vent heater can be removed by slipping it off of the vent area.



150S Controller Wiring Diagram

Warranty

All sales of Liquid Nitrogen Dosing Systems (“LN₂ Dosing Systems”) from Chart Inc. (“Chart”) to the purchaser are subject to all applicable Chart standard terms and conditions in effect at the time of sale, unless otherwise agreed in writing by an authorized representative of Chart. In addition to the warranty stated in Chart’s Standard Terms and Conditions of Sale, Chart warrants to the original purchaser of Chart manufactured LN₂ Dosing Systems that for two (2) years after the date of shipment to the original purchaser said Chart manufactured LN₂ Dosing Systems will maintain all performance standards for said LN₂ Dosing Systems as published by Chart on the date of invoice. Warranty replacements due to vacuum loss will also follow the same warranty period and regulations.

Purchaser agrees that as a pre-condition to any Chart warranty obligation hereunder, purchaser shall fully inspect the LN₂ Dosing Systems immediately upon delivery to purchaser and shall give Chart written notice of any claim or purported defect within ten (10) days after receipt of the LN₂ Dosing Systems. As a further pre-condition to any Chart warranty obligation hereunder, purchaser shall return said purportedly defective LN₂ Dosing Systems, freight prepaid, to the plant of the manufacturer within thirty (30) days after receipt of the LN₂ Dosing Systems. Chart shall inspect the returned LN₂ Dosing Systems, and, if said LN₂ Dosing Systems is found defective, shall, at Chart’s option as purchaser’s sole and exclusive remedy, either (i) repair or replace such LN₂ Dosing Systems or any defective component or part thereof which proves to be defective, or (ii) refund the net purchase price paid by the original purchaser. Alterations or repairs by others or operation of such LN₂ Dosing Systems in a manner inconsistent with Chart accepted practices and all operating instructions, unless preauthorized in writing by Chart, shall void this warranty. This warranty does not extend to defects caused by the effects of normal wear and tear, erosion, corrosion, fire, or explosion.

Chart’s sole and exclusive liability under this Warranty is to the original purchaser and shall not exceed the lesser of the cost of repair, cost of replacement, or refund of the net purchase price paid of the LN₂ Dosing Systems by the original purchaser. Chart is not liable for any other losses, damages, or costs of delays, including incidental or consequential damages. CHART SPECIFICALLY MAKES NO WARRANTIES OR GUARANTEES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, OTHER THAN OR WHICH EXTEND THOSE WARRANTIES EXPRESSED HEREIN. The original purchaser shall indemnify, defend and hold Chart harmless from any third party claims as a result of the use, sale, or lease of the LN₂ Dosing Systems.

