ULTRADOSER FS150

USER MANUAL

CHART®

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Introduction

Thank you for your purchase of the Chart Inc. (Chart) UltraDoser FS150 Liquid Nitrogen (LN_2) Dosing System. Chart has designed and fabricated your system with attention to detail and utilizing the leading cryogenic technologies to ensure a high efficient and reliable system.

Please contact us with any questions or comments that you may have. If after reading this manual you are not confident in carrying out any task, please call Chart's service team at +1 408.371.4932.

Service

Chart's UltraDoser FS150 has been designed for years of safe and dependable operation. In the event service is required, please contact Chart at:

Chart Inc.
161 Baypointe Parkway
San Jose, CA 95134 USA
www.chartdosers.com
+1 408.371.4932

Manufacturer

The UltraDoser FS150 is designed and manufactured by:

Chart Inc.
161 Baypointe Parkway
San Jose, CA 95134 USA
www.chartdosers.com
+1 800.371.3303

Design Modification

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 of Chart.

Additional Copies

Additional copies of this manual are available by contacting Chart:

Chart Inc.
161 Baypointe Parkway
San Jose, CA 95134 USA
www.chartdosers.com
+1 800.371.3303

This manual is intended for use by Chart UltraDoser FS150 customers. It is important to read and understand the information in this manual before installing or operating the system. This manual is provided by Chart to its customers as a courtesy and, except as expressly provided in this manual, **CHART MAKES NO WARRANTIES, EXPRESS OR IMPLIED, REGARDING THE CONTENTS IN THIS MANUAL. CHART ASSUMES NO REPONSIBILITY FOR ANY OUTCOMES AS A RESULT OF USING THIS MANUAL.**

SAFETY FIRST!

Liquid nitrogen must be handled properly. Without proper handling, severe frost bite, cryogenic burning, oxygen deprivation, and bursting of sealed bottles (or containers) can result.

During this process, you may need:

- Safety glasses with side shields and/or protective face shield
- Insulated gloves for cryogenic service

Symbols and statements used throughout this text and their meaning are as follows:

⚠ Text following this symbol needs extra attention.

IMPORTANT: Text like this is extra information helpful to the situation

CAUTION: Text like this is information to help avoid personal injury and/or property damage.

⚠ **WARNING!: Text like this is information to help avoid serious personal injury or death and/or property damage.**

Safety

⚠ WARNING!: Your UltraDoser FS150 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.

⚠ 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 FS150 potentially bursting the bottles (or containers). Proper calibration of the UltraDoser FS150 ensures optimum nitrogen doses to avoid over pressurization. Be sure to remove any bottles (or containers) that receive more than its proper LN_2 doses before sealing.

⚠ 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.

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.

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

Exposure to such an oxygen deficient atmosphere can lead to unconsciousness and serious injury, including death.

CAUTION: Before removing parts or loosening fittings, empty the UltraDoser FS150 of liquid and release any vapor pressure in a safe manner.

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.

Safety Bulletin

Portions of the following information are extracted from Safety Bulletin SB-2 from the Compressed Gas Association, Inc. (CGA). For the full text of Safety Bulletin SB-2 and for more information about oxygen atmospheres, refer to Safety Bulletin SB-2 from the Compressed Gas Association, Inc. (CGA) at http://www.cganet.com. Additional information on nitrogen and liquid cylinders is available in CGA Pamphlet P-9. Write to the Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202 or visit their website at http://www.cganet.com.

Oxygen Deficient Atmospheres
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. 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 or 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. 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 helpless. This can occur if the condition is reached by 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 an unconscious partner unless equipped with a portable air supply. Best protection is obtainable by equipping all individuals with a portable supply of respiratory air. Lifelines are acceptable only if the area is essentially free of obstructions and individuals can assist one another without constraint.

If 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 asphyxiant. It will not support or sustain life and can produce immediate hazardous conditions through the displacement of oxygen. Under high pressure these gases may produce unconsciousness even though an adequate oxygen supply, sufficient for life, is detect.

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 a worker's skin or eyes, the affected tissues should be promptly flooded or soaked with tepid water (105-115^{o}F; 41-46^{o}C). DO NOT USE HOT WATER. Cryogenic burns, which result in blistering or deeper tissue freezing, should be examined promptly by a physician.

Receiving Your UltraDoser FS150

The UltraDoser FS150 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 FS150

The UltraDoser FS150 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 FS150, 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 the UltraDoser FS150.

While unpacking the crate, all contents should be carefully inspected. 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 Pack 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 UltraDoser 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.

Prior to installation, the UltraDoser FS150 should be stored in a location that will prevent dirt, water or other debris from getting inside the system. Similarly, it should be stored in a place that is generally out of the way of frequent traffic to reduce the risk of damage. Chart recommends storing the system in the crate when not in service.

Overview and Utilities

Product Specifications

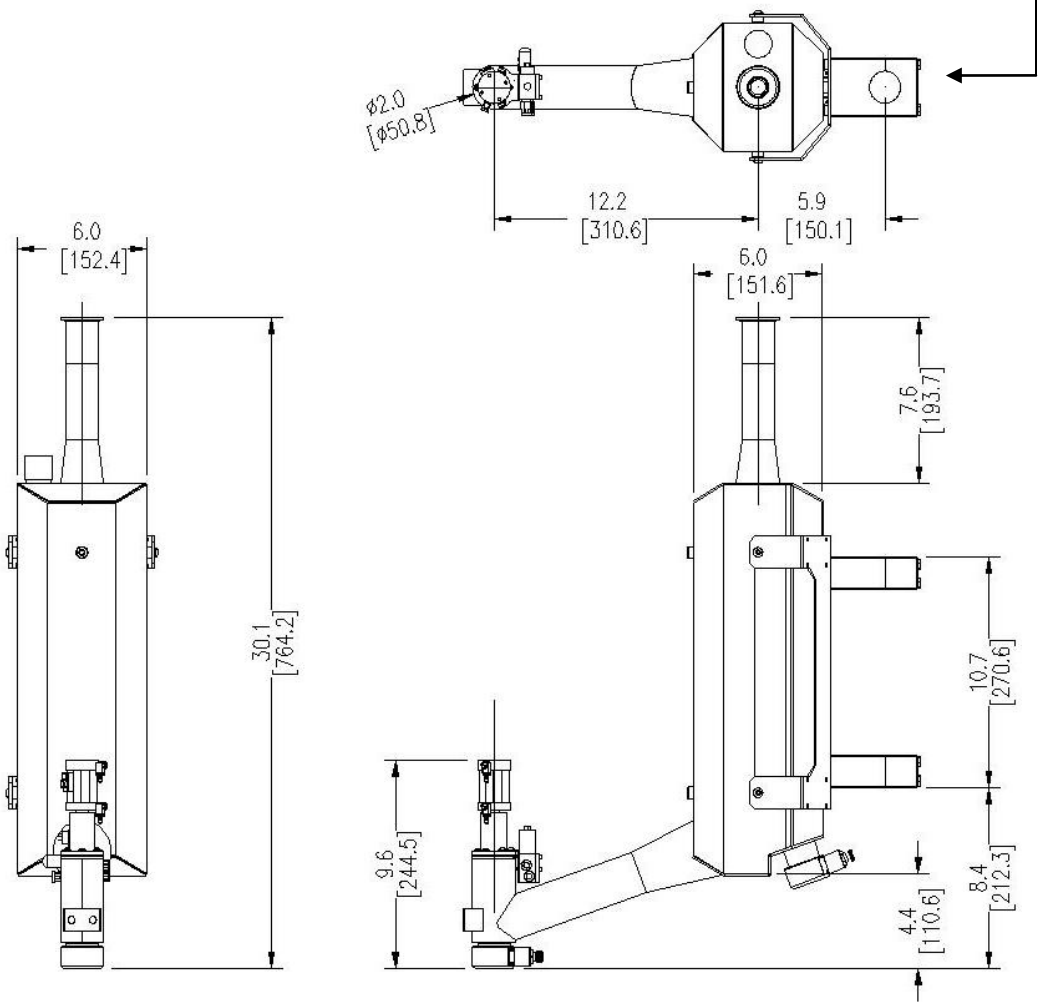
UltraDoser Body Dimensions:	Reservoir height: 18” (457mm) Hexagonal: 6” (197mm) Arm reach : 12” or 18” (305mm or 457mm) from stand dependent on mounting bracket location
UltraDoser Dosing Head:	2”W x 9.5”H (51mm x 241mm)
Total Weight (w/electronics):	UltraDoser: 32 lbs (14.5kg) FS150 Controller: 9.5 lbs (4.3kg)
Dosing Range:	0.01 – 7 grams/dose
Dosing Accuracy:	+/- 5% of dose value
Timing Range:	1 ms – 1000 ms (in 1 ms intervals)
Control Voltage:	24 VDC
Materials:	Stainless steel construction Built to food and beverage industry standards
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

Utility Requirements

Electrical Supply:	100-240 VAC 50-60Hz 110 W
Liquid Nitrogen:	Portable Dura-Cyl dewar – 22 psi (1.5 bar) House System (with Chart Phase Separator) – 100 psi (6.9 bar) Maximum flow rate 15 gallons (56 liters) per hour
Gaseous Nitrogen:	60 to 100 psi (4.1 to 6.9 bar) 10 SCFH gas per 100 bottles (or containers) per minute

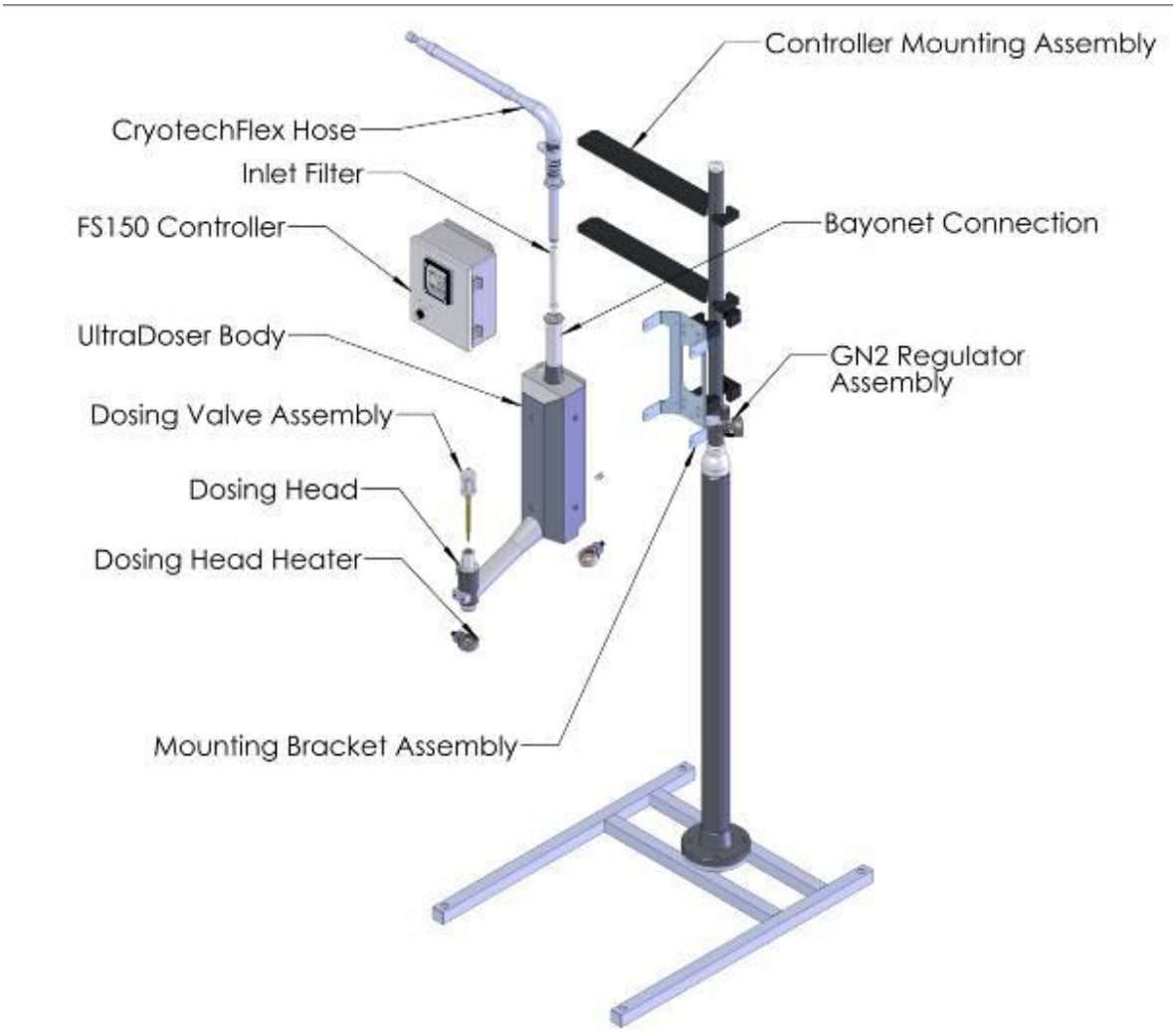
UltraDoser Body Dimensions

Note: Mounting bracket can be mounted at 90° intervals around the central axis of the UltraDoser body. See pages 16 and 17 for additional information.



UltraDoser FS150 Components

Front View



UltraDoser Body
The stainless steel vacuum insulated reservoir provides a working supply of LN_2 for dosing operations from your liquid nitrogen supply.

FS150 Controller
FS150 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 (milliseconds).

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

CryotechFlex Hose
A vacuum insulated hose that provides a connection between the UltraDoser unit and the LN_2 supply.

Controller Mounting Assembly
The FS150 controller is supplied with a mounting assembly. This assembly is designed to attach to the FS150 controller and fit on Chart's support stand or 1-1/2" stainless steel rod. See page 17 for additional information.

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

GN_2 Regulator Assembly
Controls the pressure of the house GN_2 (DO NOT use air, even if compressed dry air – CDA) to the dosing valve assembly. The regulator is preset to 60 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. See page 16 for additional information.

Dosing Head Heater
The UltraDoser unit has a self-regulating dosing head heater. The maximum temperature of the dosing head heater is 150ºF (65ºC) 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.

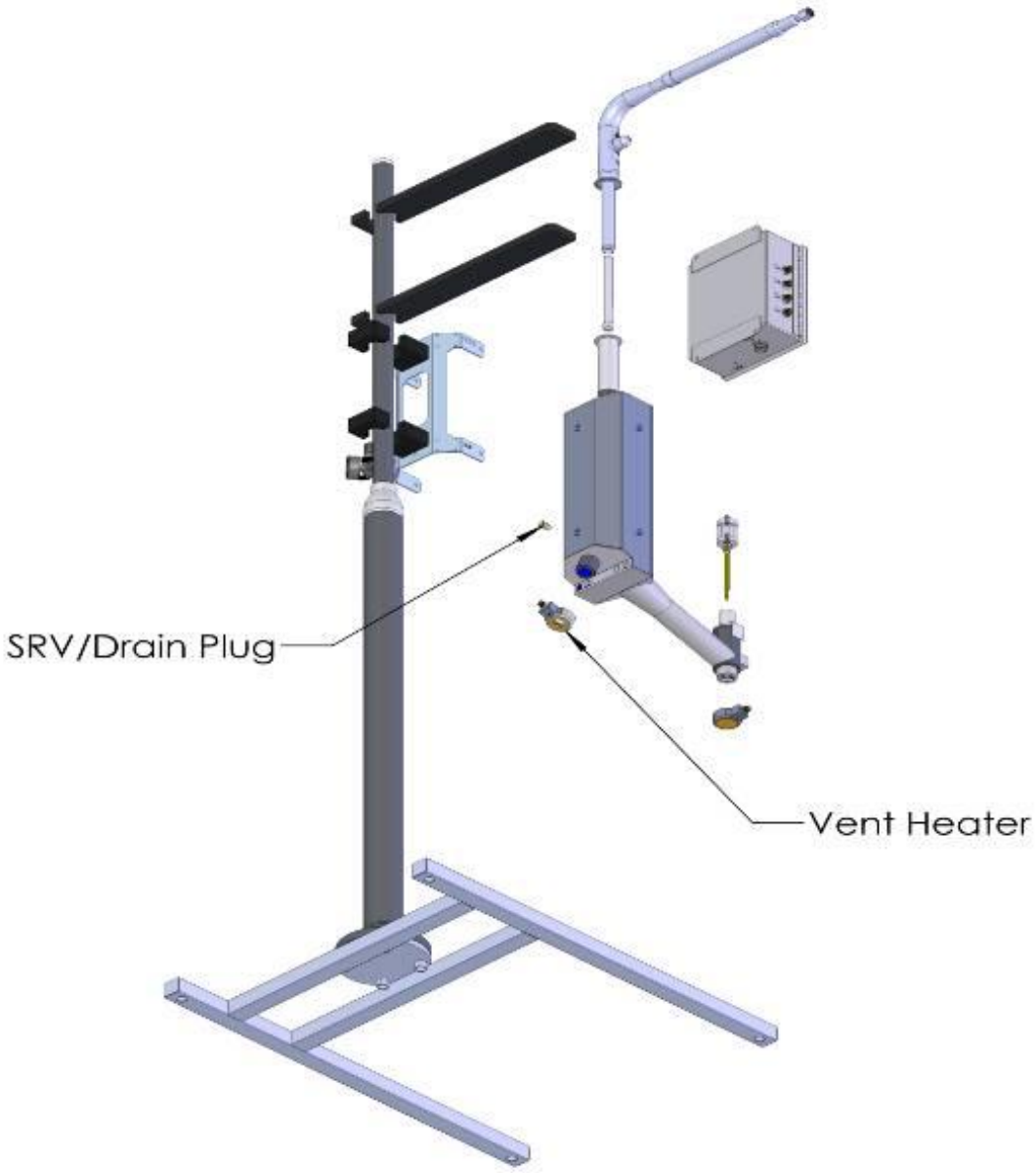
The dosing head heater has a built-in splash guard to minimize the dosing nozzle's exposure to splashed product or LN_2.

Dosing Head
The dosing head delivers the dose of LN_2.

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 LN_2 dosed. 0.040" ID, 0.050" ID, and a 0.060" ID nozzles ship loose with the LN_2 Dosing System. Custom sizes may be ordered from Chart.

Back View



SRV / Drain Plug
A 50psi SRV / drain plug are located on the back of the UltraDoser unit. When removed, this allows the LN_2 to drain from the UltraDoser body.

The 50psi 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 150ºF (65ºC) 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.

Installation

Application Evaluation

The UltraDoser FS150 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 (O_2) from a bottle (or container) by dosing a relatively large amount of LN_2 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 LN_2 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 FS150 simpler. The following instructions will assume installation of Chart's prefabricated support stand (Figure 4).

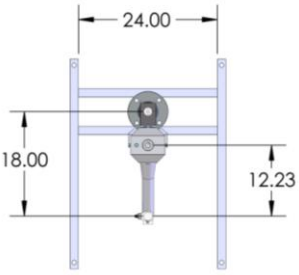


Figure 1

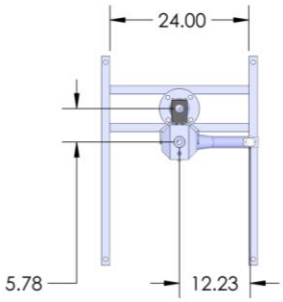


Figure 2

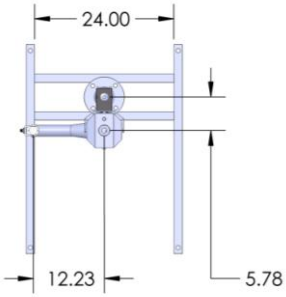


Figure 3

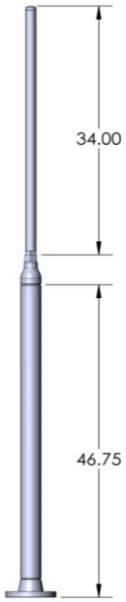


Figure 4

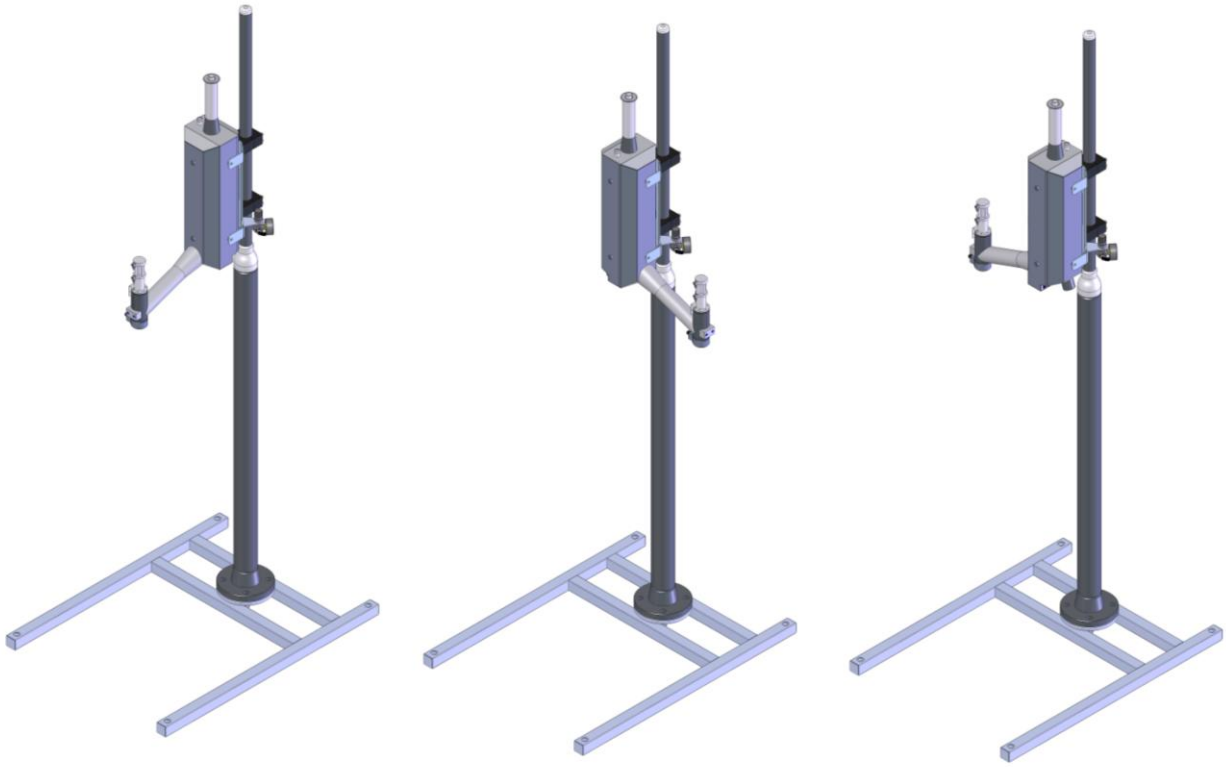
1. The UltraDoser unit can be installed on either side of a production line. Select the side that best suits the workplace. The mounting bracket assembly is installed straight back opposite to the arm from the factory. However, the UltraDoser body can be mounted in the mounting bracket such that the support stand is located on either side perpendicular to the arm (Figure 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 (4) 5/8" bolts included with the support stand in the proper locations.

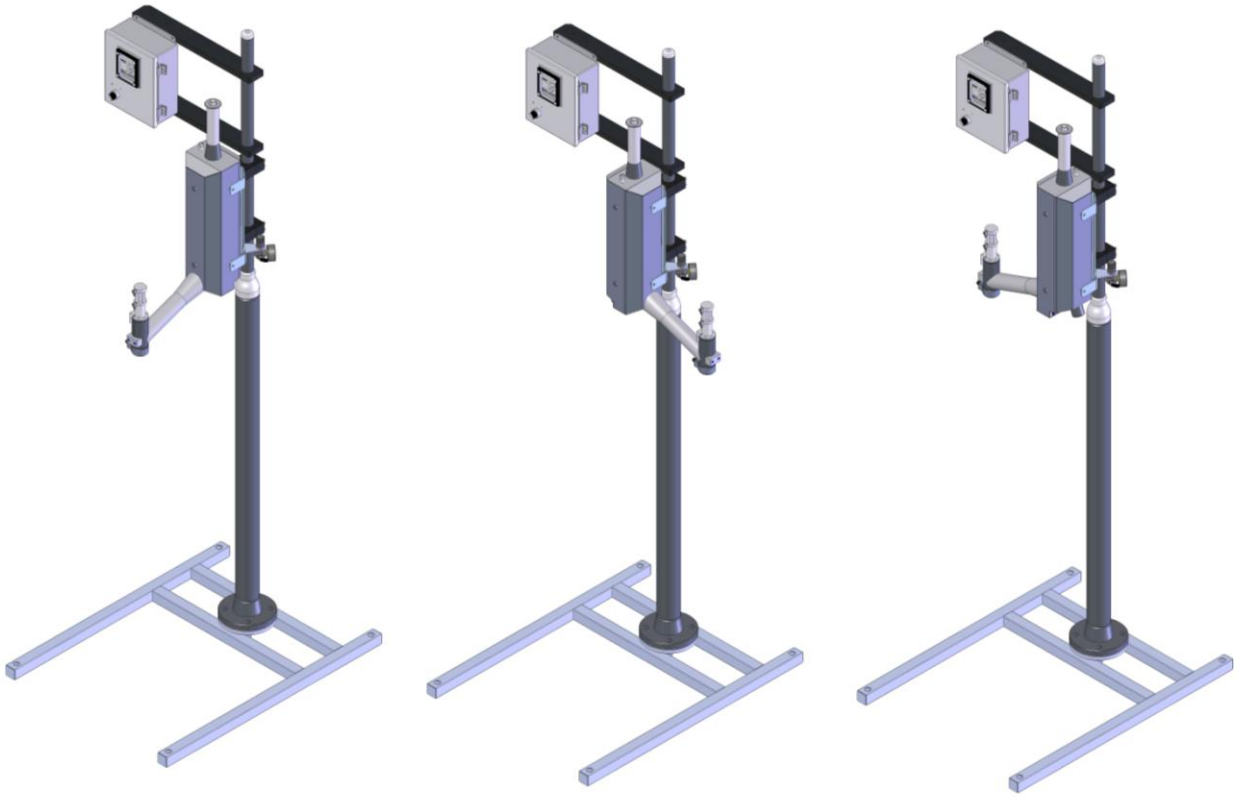
Mounting the UltraDoser Unit

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

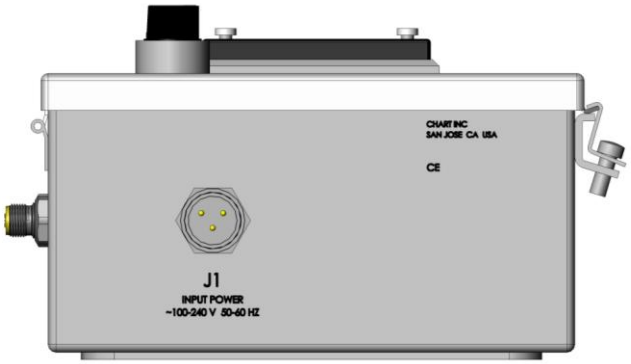


Installing the FS150 Controller

Mount the FS150 controller at a convenient location. Brackets are supplied to mount the controller on the Chart prefabricated support stand or 1½”diameter rod or round bar.

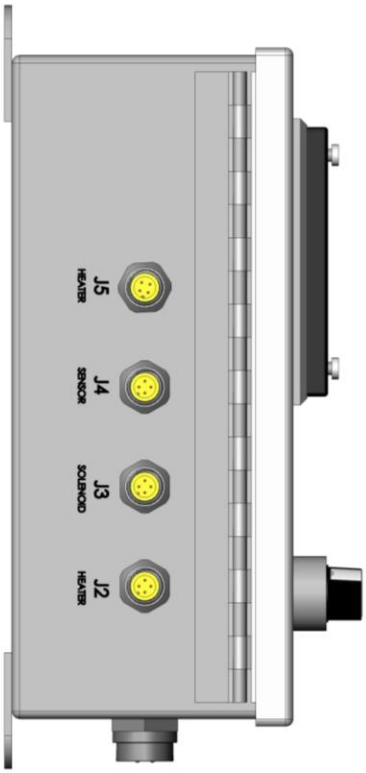


The bottom of the FS150 controller is the electrical plug connection. The left side of the FS150 controller is the electrical connection between the operating parts of the UltraDoser unit and the FS150 controller. There are five connections.



Input Power (J1)

The FS150 controller power cable (6ft) is connected to the FS150 controller at port J1.



Heater (J2)

This is the connector marked J2 on the FS150 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 FS150 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 FS150 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 FS150 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 FS150 – 0.040”, 0.050”, and 0.060”. Custom sizes may be ordered from Chart.

1. Remove the dosing head heater.
2. Select a nozzle.
3. Insert the nozzle into the nozzle tool, threads out (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.

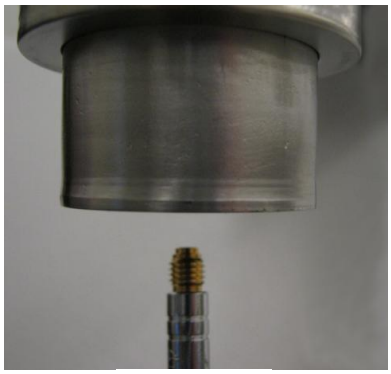


Image 1

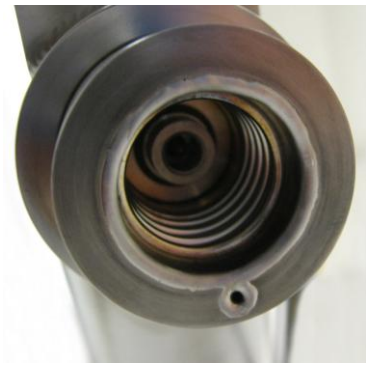


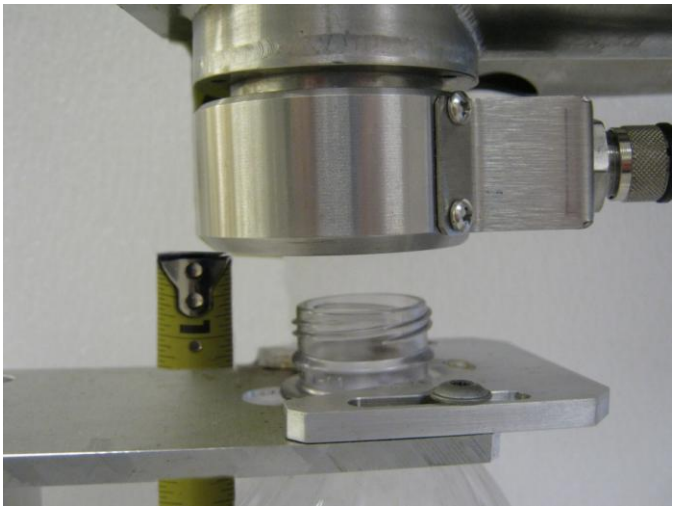
Image 2

Image 3

CAUTION: Never use an ice-pick, screwdriver, torch, or similar devices 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.

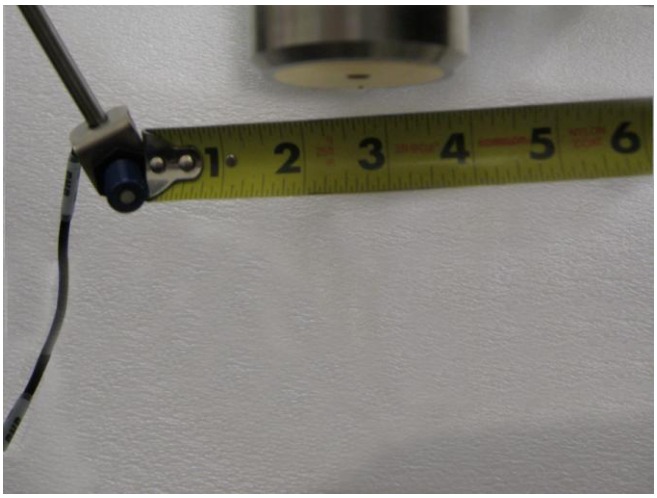
Positioning the Dosing Head

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 FS150 to operate correctly. The sensor must be mounted approximately 2 ½" from the UltraDoser dosing head.



Principles of Liquid Nitrogen (LN_2) 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 FS150 guarantees that a precise, accurate dose of LN_2 is delivered. The UltraDoser FS150 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 FS150 controller's electronics. Dose duration is measured in milliseconds.

IMPORTANT: 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.

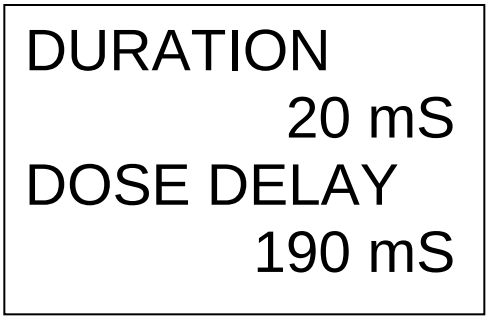
IMPORTANT: Enough time must be allowed for specific dosing operations. When using the UltraDoser FS150 for inerting purposes (removal of oxygen) time must be allowed between dosing and complete capping of the bottle (or container). See "Inerting", page 14, for additional information.

FS150 Controller Adjustments

The FS150 controller is designed to dose at a fixed speed only. The only adjustments are **Duration** (of Dose) and **Dose Delay**.

IMPORTANT: There are additional screens accessible on the FS150 controller but should not be modified. Modification to certain screens may void Chart warranty. See "Other Screens", page 24, for additional information.

IMPORTANT: The FS150 controller allows approximately 20 seconds to make adjustments to the Duration and Dose Delay features before returning to the "home" screen (image below).

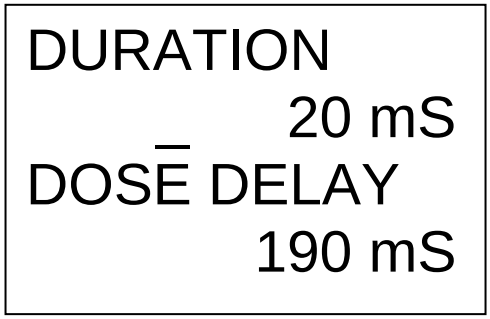


Duration (of Dose)

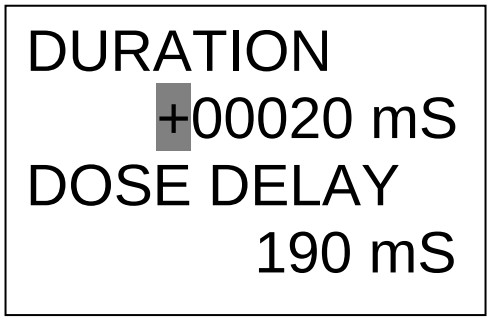
The Duration (of Dose) is the time in milliseconds (mS) that the UltraDoser dosing valve opens to dose.

The amount of LN_2 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.
2. Press and HOLD 'ESC' until cursor _ appears and blinks on the Duration mS value line (image below).



3. Press and HOLD ‘OK’. A plus sign + with appear highlighted and blink; five digits will also appear (image below).



4. Press the arrow key ► to highlight the desired digit.
5. Use the arrow key ▲ or ▼ to change the value.
6. Repeat steps 4 and 5 to change each desired digit value.
7. Press ‘OK’ to set value.
8. Press ‘ESC’ to return to the “home” page (image on page 21).

Feature	Unit	Maximum	Minimum
Duration	Milliseconds	1000	10

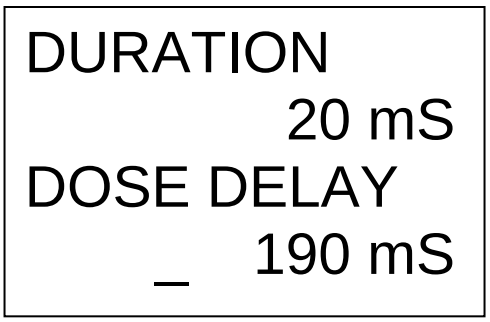
IMPORTANT: Duration setting may be set for more than 1000 mS on the display, but the maximum time the UltraDoser dosing valve opens to dose is 1000 mS (1 second).

□ Dose Delay

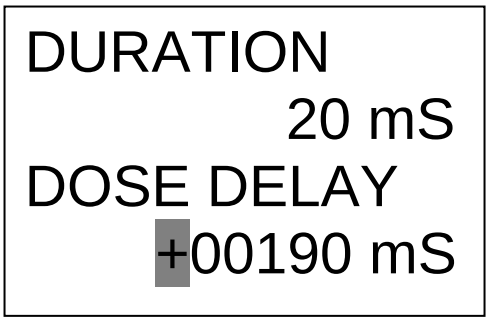
The Dose Delay is the time in milliseconds (mS) between the time the bottle detect sensor senses a bottle (or container) and the UltraDoser dosing valve opens to dose. The closer the bottle detect sensor to the dosing head, the shorter the delay time to dose.

IMPORTANT: The UltraDoser unit dispenses liquid nitrogen defined by the user defined milliseconds REGARDLESS of line speed.

1. Press and HOLD ‘ESC’ until the cursor _ appears and blinks on the Duration mS value line.
2. Press the arrow key ► to move the cursor _ to the Dose Delay mS value line (image below).



3. Press and HOLD ‘OK’. A plus sign + with be highlighted and blink; five digits will also appear (image below).



4. Press the arrow key ► to highlight the desired digit. Operator may be required to press the arrow key ◄ or ► multiple times to highlight the desired digit.
5. Use the arrow key ▲ or ▼ to change the value.
6. Repeat steps 4 and 5 to change each desired digit value.
7. Press ‘OK’ to set value.
8. Press ‘ESC’ to return to the “home” page (image on page 21).
9. Re-attach the display cover.

Feature	Unit	Maximum	Minimum
Dose Delay	Milliseconds	32699	190

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

FS150 Controller Set-up Verification

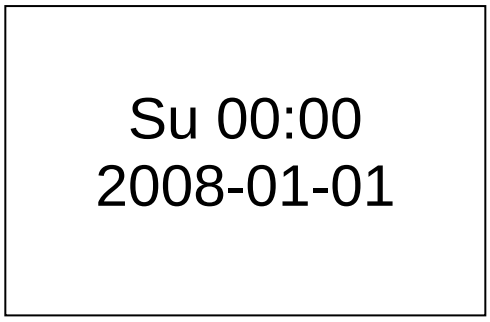
Send a bottle (or container) down the filling line. Note if the dose is dispensed before, in, or after the bottle (or container). If the dose is dispensed BEFORE the bottle (or container) reaches the dosing head, INCREASE the dose delay until the dose is dispensed into the bottle (or container). If the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

Other Screens

The FS150 controller has other screens that may be accessed but should not be modified. Modification could void Chart warranty.

If the operator should access any screens other than the "home" page (image on page 21):

1. Use the arrow key ◄ or ► to return to the "Date" screen (image below). Operator may be required to press the arrow key ◄ or ► multiple times.
2. Once at the "Date" screen, press the arrow key ▲ to return to the "home" page (image on page 21).



IMPORTANT: From the "date" screen, avoid using 'ESC' or 'OK'.

Daily Operating Procedures

The UltraDoser FS150 unit can be fed by either a portable Dura-Cyl dewar or a house liquid nitrogen system. Most UltraDoser FS150 installations will utilize portable Dura-Cyl dewars.

□ Dura-Cyl Dewar Fed System

Typical Dura-Cyl Dewar Installation Set-Up

IMPORTANT: LN_2 is -320ºF (-196ºC). Any water and/or moisture can cause ice which will affect the performance of the UltraDoser FS150 system. Providing a positive pressure of GN_2 (also known as purging) to the UltraDoser unit before introducing LN_2 into the body will eliminate many performance interruptions.

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 CryotechFlex hose (½" female flare side) to the house GN_2 system or portable GN_2 cylinder. **Note: this step will require additional fittings such as ½" male flare fitting and compression fittings.
2. Flow GN_2 (20 psi; 1.38 bar) through the UltraDoser body for approximately ten (10) minutes before system start up.

IMPORTANT: 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 LN_2 temperatures (-320 ºF; -196 ºC). Once the UltraDoser unit is at or near ambient temperature, the "fog" will warm up.

System Start Up

1. Remove the CryotechFlex hose from the GN_2 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 CryotechFlex hose using a 1/8" allen wrench.
3. Attach the CryotechFlex hose (male bayonet side) to the UltraDoser unit with the supplied bayonet clamp and gasket.
4. Attach the CryotechFlex hose (female flare fitting side) to the 22psi LN_2 Dura-Cyl dewar.
5. Open the liquid valve (counter-clockwise direction) on the Dura-Cyl dewar.
6. Wait until the UltraDoser unit is filled with liquid nitrogen, approximately 10 minutes.
6. Place the switch on the FS150 controller to the "1" position. This will turn the FS150 controller on.
7. Adjust the dosing parameters. See "FS150 Controller Adjustments", page 21, for additional information.

IMPORTANT: 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 dewar and call Chart service at +1 408.371.4932.

System Shut Down

1. Place the switch on the FS150 controller to the "0" position. This will turn the FS150 controller off.
2. Shut the liquid valve (clockwise direction) on the Dura-Cyl dewar.
3. If possible, purge with GN_2 until next use. See "Purging with Gaseous Nitrogen", page 25, for additional information.

Dura-Cyl Dewar (22psi) Change Out Procedure

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

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

IMPORTANT: The UltraDoser FS150 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 dewar without disrupting the production operation.

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. Remove.
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

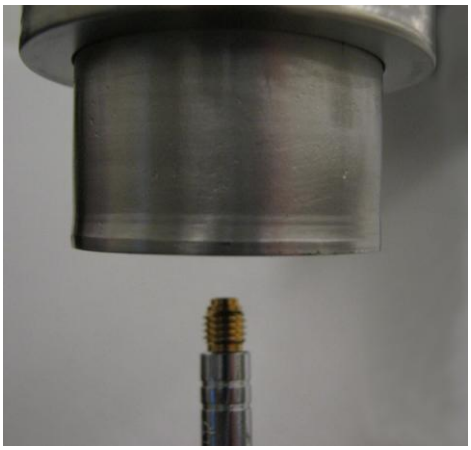


Image 2

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 150ºF (65ºC).

IMPORTANT: Always perform nozzle change out procedures before introducing LN_2 into the UltraDoser unit. Failure to do so may cause the nozzle to unthread and fall out.

IMPORTANT: 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. See "Nozzle Change Out Procedure" above.
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.

IMPORTANT: 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.

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 CryotechFlex hose (½" female flare side) to the house GN_2 system or portable GN_2 cylinder. **Note: this step will require additional fittings such as ½" male flare fitting and compression fittings.
2. Flow GN_2 (20 psi; 1.38 bar) through the UltraDoser body for approximately ten (10) minutes before system start up.

IMPORTANT: 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 LN_2 temperatures (-320 ºF; -196 ºC). Once the UltraDoser unit is at or near ambient temperature, the "fog" will warm up.

Replacement Parts

Refer to pages 12 and 14 for location of most replacement parts on the UltraDoser FS150.

Part Description	Part Number
Injection Unit Spare Parts Kit Includes PNs: 102, 103, 104, 105C, 106C, 362, and 535	567
0.040” Nozzle	102
0.050” Nozzle	103
0.060” Nozzle	104
Vent Heater Assembly (no cable included)	105C
Vent Heater Cable	105C.01
Dosing Head Heater (No cable included)	106C
Nozzle (Dosing Head) Heater Cable	106C.01
10 Micron Inlet Filter	108
10’ CryotechFlex 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
12mm Sensor Support Hardware: Mount	584
Complete Sensor Bracket Assembly UltraDoser	1422
12mm Ultrasonic Sensor (Bottle Detect)	336
Controller Mounting Assembly	2384
Controller Assembly – FS150	CR_2842
User Manual, UltraDoser FS150	20552241
UltraDoser Body	15171

General Trouble Shooting

Below are a few general trouble shooting guidelines. If after reading this section, the condition does not change or the condition is not covered in this section, please contact Chart's service team at +1 408.371.4932.

Condition: The safety relief valve is venting.	
Possible Causes	**Actions**
• The pressure of the LN_2 supply is greater than 50 psi (3.44 bar).	• 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 dewar can be vented to reduce the pressure.
• The vent is obstructed.	• 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 +1 408.371.4932.

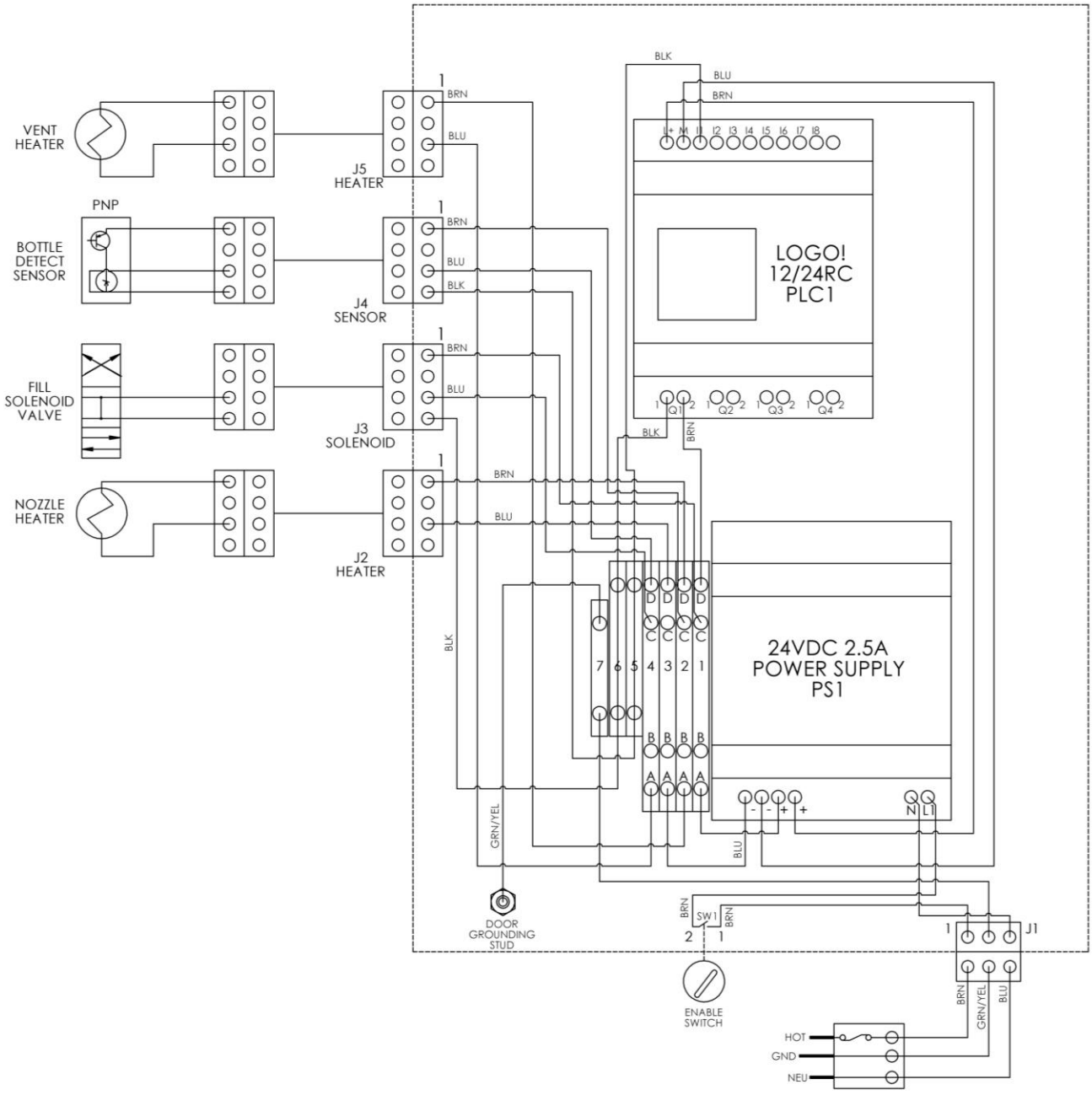
Condition: Liquid is coming out of the vent.	
Possible Causes	**Actions**
• The LN_2 supply pressure is too high.	• Lower LN_2 supply pressure to 22 psi (1.5 bar) or lower.
• Ice has developed inside the unit, causing the internal float valve to malfunction.	• The UltraDoser unit must be drained of liquid, allowed to warm up over a minimum of 24 hours with a continuous purge of warm nitrogen gas. Contact Chart's service team at +1 408.371.4932 for a detailed procedure.

Condition: Liquid is coming out of the dosing head even though the valve is shut close.	
Possible Causes	**Actions**
• The LN_2 supply pressure is too high.	• Reduce the LN_2 supply pressure.
• The valve seat is contaminated (ice or particles).	• The UltraDoser unit must be drained of LN_2, The dosing valve assembly must be removed and cleaned. Contact Chart's service team at +1 408.371.4932 for a detailed procedure.

Condition: No liquid from the dosing head.	
Possible Causes	**Actions**
• There is insufficient liquid inside the UltraDoser unit.	• Open the valve (counter-clockwise direction) on the Dura-Cyl dewar.
• The unit is disabled.	• The FS150 controller is off. Switch to the "1" position.
• The nozzle is frozen shut.	• Remove, clean, and re-install the nozzle (see page 22).
• There is insufficient GN2 to the dosing head valve.	• Check the level of GN_2 at the source. If the level is empty or low, replace.

Condition: The unit is dosing but missing bottles (or containers).	
Possible Causes	**Actions**
• UltraDoser dosing head is not over the bottle (or container).	• Position UltraDoser dosing head over the bottle (or container).
• Bottle detect sensor is not in the correct spot.	• Adjust position of the bottle detect sensor.
• Dose Delay time on FS150 controller is incorrect.	• Adjust Dose Delay time on FS150 controller.

FS150 Controller Wiring Diagram



Warranty

All sales of Liquid Nitrogen Dosing Systems ("LN_2 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 LN_2 Dosing Systems that for one (1) year after the date of shipment to the original purchaser said Chart manufactured LN_2 Dosing System will maintain all vacuum and performance standards for said LN_2 Dosing System as published by Chart on the date of invoice.

Purchaser agrees that as a pre-condition to any Chart warranty obligation hereunder, purchaser shall fully inspect the LN_2 Dosing System 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 LN_2 Dosing System. As a further pre-condition to any Chart warranty obligation hereunder, purchaser shall return said purportedly defective LN_2 Dosing System, freight prepaid, to the plant of the manufacturer within thirty (30) days after receipt of the LN_2 Dosing System. Chart shall inspect the returned LN_2 Dosing System, and, if said LN_2 Dosing System is found defective, shall, at Chart's option as purchaser's sole and exclusive remedy, either (i) repair or replace such LN_2 Dosing System 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 LN_2 Dosing System 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 LN_2 Dosing System 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 LN_2 Dosing System.