ULTRADOSER SC350c

USER MANUAL

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Introduction

Thank you for your purchase of the Chart Inc. (Chart) UltraDoser SC350c 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 SC350c 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 SC350c 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 SC350c 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 SC350c 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 SC350c potentially bursting the bottles (or containers). Proper calibration of the UltraDoser SC350c 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 IMPORTANTs 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 SC350c

The UltraDoser SC350c is designed for filling line speeds up to 350 bottles (or containers) per minute. It can compensate for changes in line speed up to 350 bottles (or containers) per minute. Line speeds greater than 350 bottles (or containers) per minute will prompt the UltraDoser SC350c to continuously dose (in lieu of discrete / pulse dosing) until the line speed returns to less than 350 bottles (or containers) per minute.

Unpacking the UltraDoser SC350c

The UltraDoser SC350c 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 SC350c, 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 SC350c.

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 SC350c 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

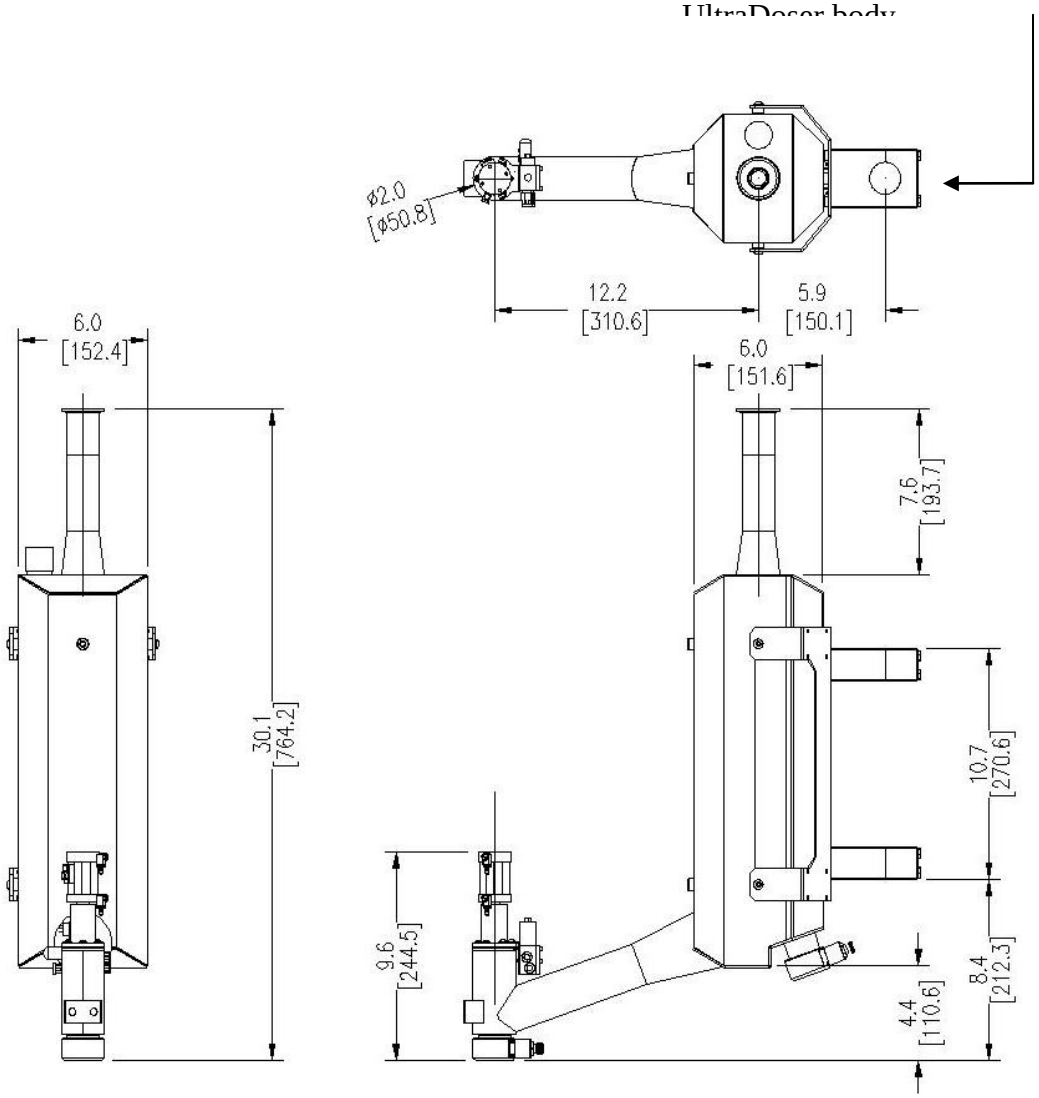
UltraDoser Body Dimensions:	Reservoir height: 18” (457mm) Hexagonal: 6” (197mm) Arm reach : 12” or 18” (305mm or 457mm) from stand dependent on mounting bracket location
UltraDoser Dosing Head:	2”W x 9.5”H (51mm x 241mm)
Total Weight (w/electronics):	UltraDoser: 32 lbs (14.5kg) SC350c Controller: 10.5 lbs (4.8kg)
Dosing Range:	0.01 – 14 grams/dose
Dosing Accuracy:	+/- 5% of dose value
Timing Range:	15 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

IMPORTANT: Mounting bracket can be mounted at 90° intervals around the central axis of the UltraDoser body



UltraDoser SC350c Components

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

Distribution Block
This electrical connection "block" houses the connections between the operating parts of the UltraDoser unit and the SC350c controller.

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

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

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.

ElectroPneumatic (EP) Actuated Valve (if ordered)
If ordered, the UltraDoser has an ElectroPneumatic actuated dosing valve. The valve is driven by a pneumatic cylinder. Gas pressure to the cylinder is controlled by a 24 volt solenoid valve.

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.

Valve Confirm Assembly
The valve confirm assembly is attached to the pneumatic cylinder. The sensor confirms that the valve stem was lifted and dosing occurred.

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 Nozzle
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.

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.

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.

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.

SC350c Controller
SC350c controller dictates the dosing operation of the system.

Dosing Head Pressure Gauge
The dosing head pressure gauge measures the head pressure of the liquid nitrogen in the reservoir and acts as a liquid level indicator. The pressure gauge should read between 0.4 – 0.5 psi when the reservoir is full.

Gas Regulator Pressure Gauge
The regulator controls the pressure of the gaseous nitrogen to the actuator. The regulator is preset to 60 psi. If necessary, on-site adjustments may be made. Only gaseous nitrogen should be used in this application. Air, even if it is dry compressed air, should NEVER be used as an alternative.

Source Pressure Gauge
This gauge measures the pressure of the liquid nitrogen source. This pressure reading should read between 3-22psi depending on the source of liquid nitrogen (house system or Dura-Cyl dewar fed).

Installation

Application Evaluation

The UltraDoser 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 container or package. To inert a container, a relatively large dose of LN_2 is introduced into the container. The liquid dose then converts into gas displacing air and oxygen from the container. A plastic cover may be placed over the dosed containers so that O_2 is not allowed to re-enter the container before capping. The ideal location must allow for enough time between dosing and capping so that the liquid dose is converted into a gas.

Pressurization – Pressurization occurs when LN2 is introduced into container or package. The container is then capped or sealed to capture the expanding gas. To pressurize a container, a relatively small dose of LN_2 is introduced into the container immediately before the container is capped or sealed.

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 SC350c simpler. The following instructions will assume installation of Chart's prefabricated support stand (Figure 4).

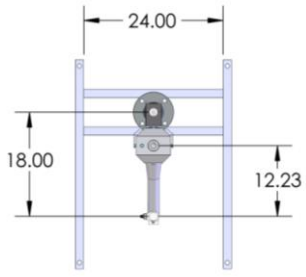


Figure 1

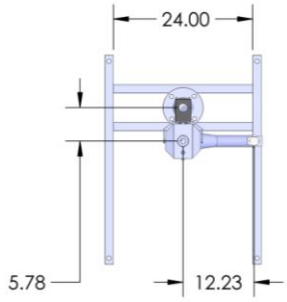


Figure 2

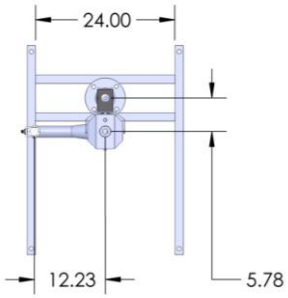


Figure 3

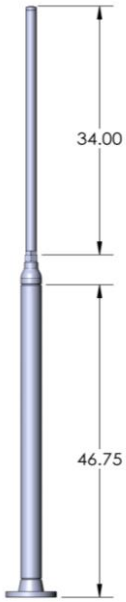


Figure 4

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 SC350c Controller

Mount the SC350c 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.

There are three connections on the bottom of the SC350c controller.

Input Power (J-1)

The SC350c controller power cable is connected to the SC350c controller at port J-1.

Interface Connection (J-2)

The interface cable, a component of the distribution block, is connected to the SC350c controller at port J2.

Speed Sensor (J-3)

The SC350c controller requires a speed sensor when operating in "Speed Compensated" mode. The PNP speed sensor should be connected to the SC350c controller at port J-3.

Connecting to the Distribution Block

The electrical connection "block" houses the connections between the operating parts of the UltraDoser unit to the SC350c controller.

Vent Heater (D-1)

This is the connector marked D-1 on the distribution block. A green light on the cable connector indicates that power is being supplied to the vent heater.

Nozzle Heater (D-2)

This is the connector marked D-2 on the distribution block. A green light on the cable connector indicates that power is being supplied to the nozzle/dosing head heater.

Timing/Container Sensor (D-3)

This is the connector marked D-3 on the distribution block. A green light on the cable connector indicates that power is being supplied to the sensor. A yellow light will appear whenever a container is detected.

Dose Solenoid (D-4)

This is the connector marked D-4 on the distribution block. A green light on the cable connector indicates that power is being supplied to the solenoid valve. A yellow light will appear whenever the solenoid valve has been activated.

Confirm Sensor (D-5)

This is the connector marked D-5 on the distribution block. A green light on the cable connector indicates that power is being supplied to the solenoid valve. A yellow light will appear whenever the pneumatic cylinder has lifted the valve stem.

Installing the Nozzle

Three nozzles are supplied with the UltraDoser SC350c – 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.
4. Thread the nozzle into the dosing head area in a clockwise direction. Do not over torque.
5. Re-apply the dosing head heater.

CAUTION: Never use an ice-pick, screwdriver, torch, or similar devices on the dosing head. 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 Container Sensor

The container sensor must be a PNP type sensor and must be installed for the UltraDoser SC350c to operate correctly. The optimal distance from the dosing head center to bottle (or container) detection is approximately 3/4 the distance between containers.

For example: If the centerline distance between two bottles (or containers) is 4.75 inches (120 mm), then mount the container sensor approximately 3.50 inches (89 mm) from the center of the dosing head.

Installing the Speed Sensor

The speed sensor must be a PNP type sensor and must be installed for the UltraDoser SC350c to operate in "Speed Compensated" mode and must provide a continuous stream of pulses. Visually or electronically check that the speed sensor is generating a steady stream of pulses. The speed sensor should be installed with twisted and shielded wire to prevent noise from corrupting the speed pulses.

Principles of 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 SC350c guarantees that a precise, accurate dose of LN_2 is delivered. The UltraDoser SC350c 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 SC350c controller's electronics. Dose duration is measured in milliseconds.

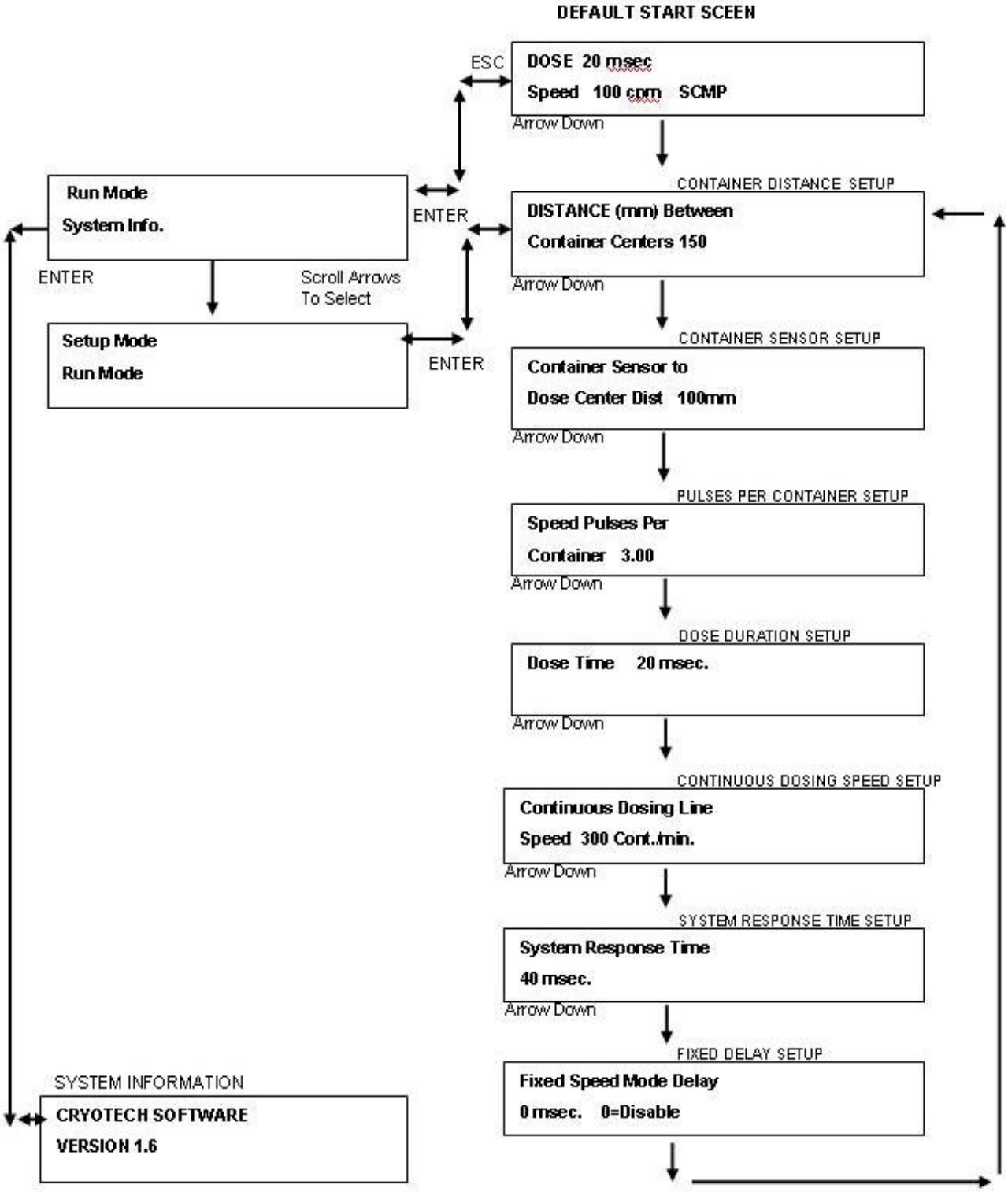
IMPORTANT: The following production conditions must be controlled to ensure consistent dosing results:

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.

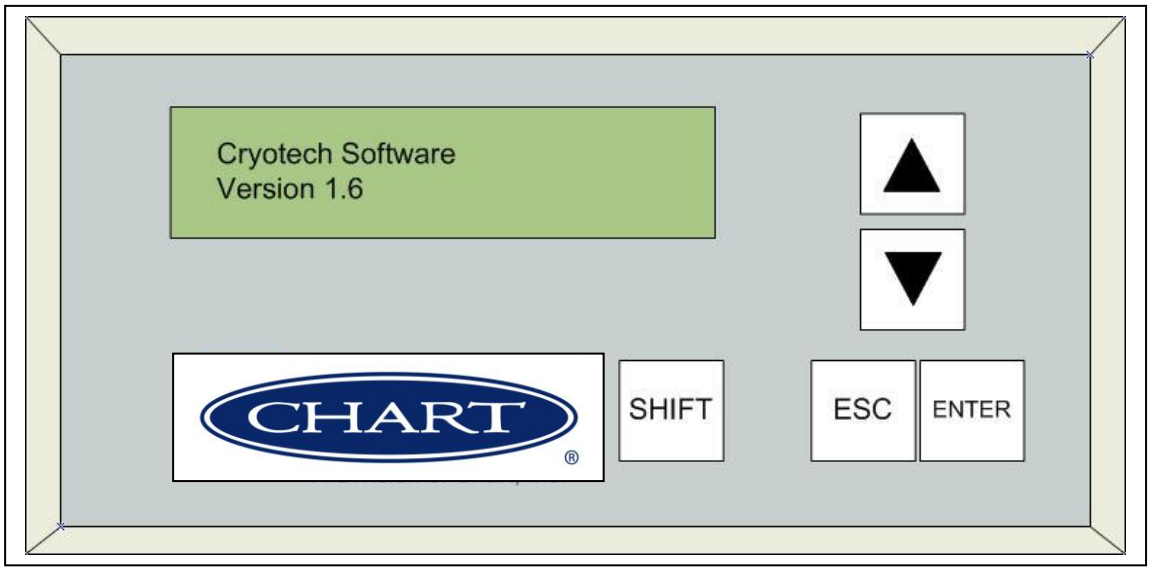
IMPORTANT: Enough time must be allowed for specific dosing operations. When using the UltraDoser SC350c for inerting purposes (removal of oxygen) time must be allowed between dosing and complete capping of the bottle (or container). See "Inerting", page 13, for additional information.

SC350c Controller Adjustments

Controller Configuration Flow Chart

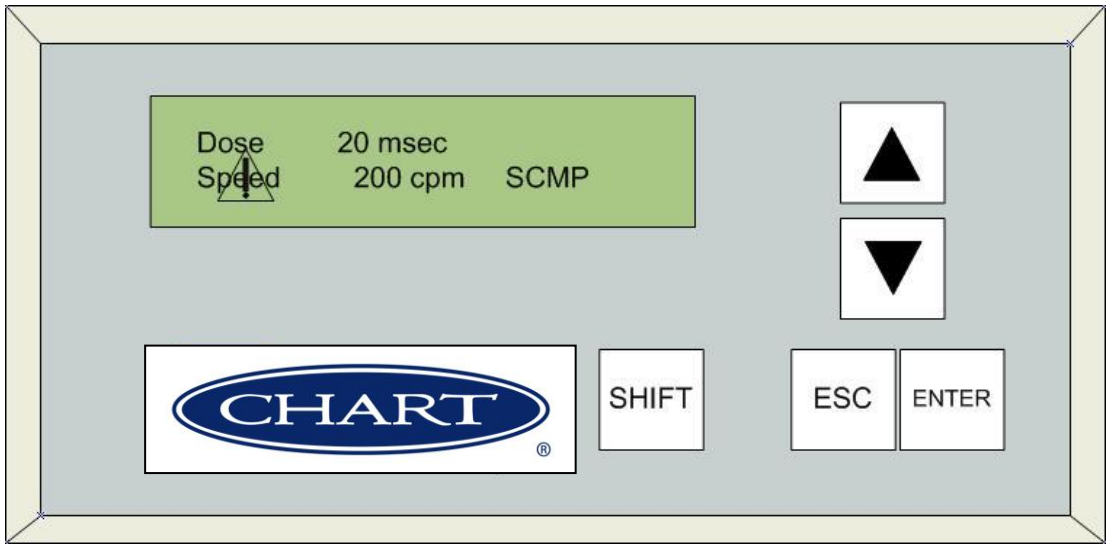


System Information Screen



This System Info sub menu is where the software version is shown. This would only be accessed for upgrade or troubleshooting purposes. This screen is used to view the software version number. It would only be viewed if the controller was being repaired or upgraded. The operator cannot change this screen. This screen does not affect system operation.

Alarm Screen



The software alerts the user for the following reasons:

1. If it detects speed sensor failure after a container has been detected;
2. The dosing valve has not been activated after a container has been detected; or
3. The controller DOSE ENABLE switch is in the disable mode, “0”.

The alert will appear as a flashing triangle in the Display Screen. The flashing triangle will disappear once the alarm condition has been resolved.

System Set Up

The software is programmed for the dosing head to be installed 3/4" or less above the container. The container sensor and the speed sensor must be installed for the unit to operate correctly. Verify installation and functionality of both sensors prior to continuing with the setup procedure.

Pull out the emergency off switch and verify the unit powers up. The EMO switch is located on the front of the controller. When pushed, the electric supply for the entire controller will be shut down.

Speed Compensated Mode

IMPORTANT: In Speed Compensated Mode, the UltraDoser unit relies on the PNP speed sensor to dispense liquid nitrogen. Parameters must be entered into the SC350c controller based on the sensor and bottle (or container) distances. Failure to enter the correct parameters may result in missed doses.

1. On the controller, turn the DOSE ENABLE switch to the disable mode, "0".

2. From DISPLAY (Image 1) press ESC to go to SETUP (Image 2).

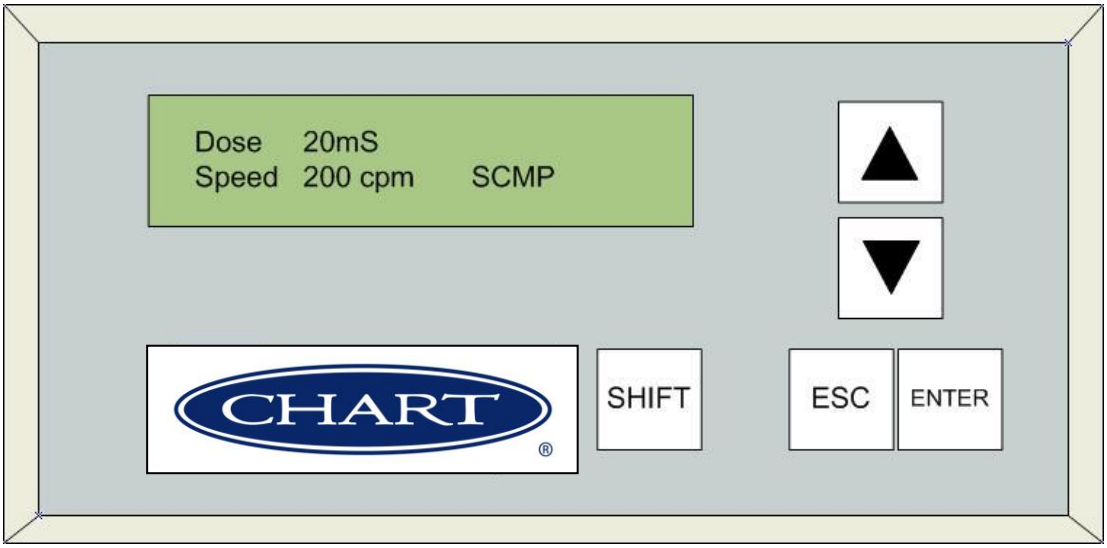


Image 1: Display Screen

IMPORTANT: Under normal operation, this screen will be displayed.

The system defaults to DISPLAY at power up. This screen shows the dose duration, the current speed of the line in containers per minute (cpm), and the current dosing mode: "SCMP" for Speed Compensated Mode or "FXDD" for Fixed Delay Mode.

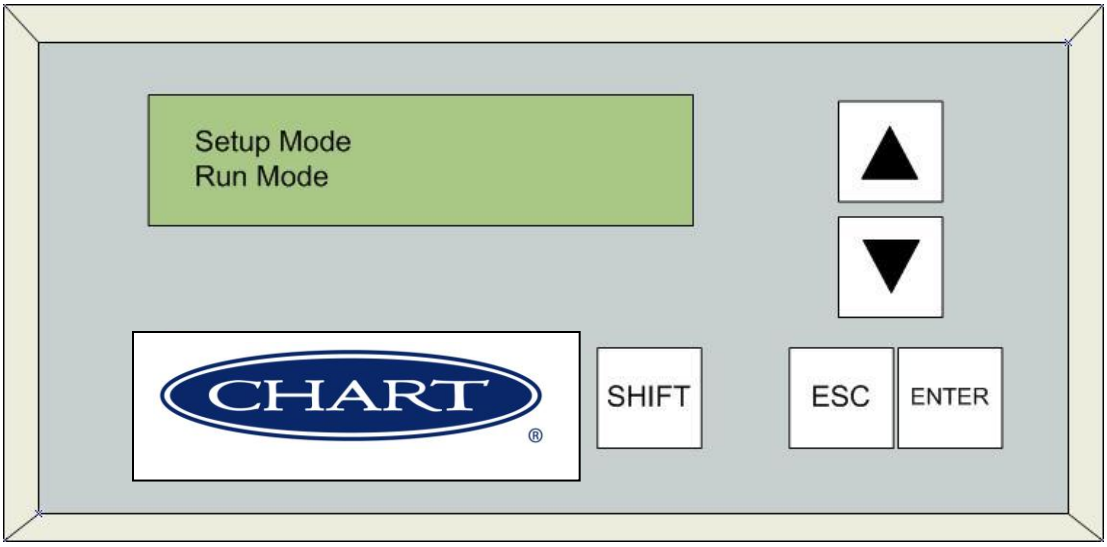


Image 2: Setup Screen

3. Use the arrow key ▲ or ▼ to highlight "Setup Mode". Press ENTER.

IMPORTANT: After 1 minute, the panel will return to DISPLAY.

4. Use the arrow key ▲ or ▼ to highlight OPERATOR INPUT. Press ENTER to activate CONTAINER DISTANCE SETUP (Image 3).

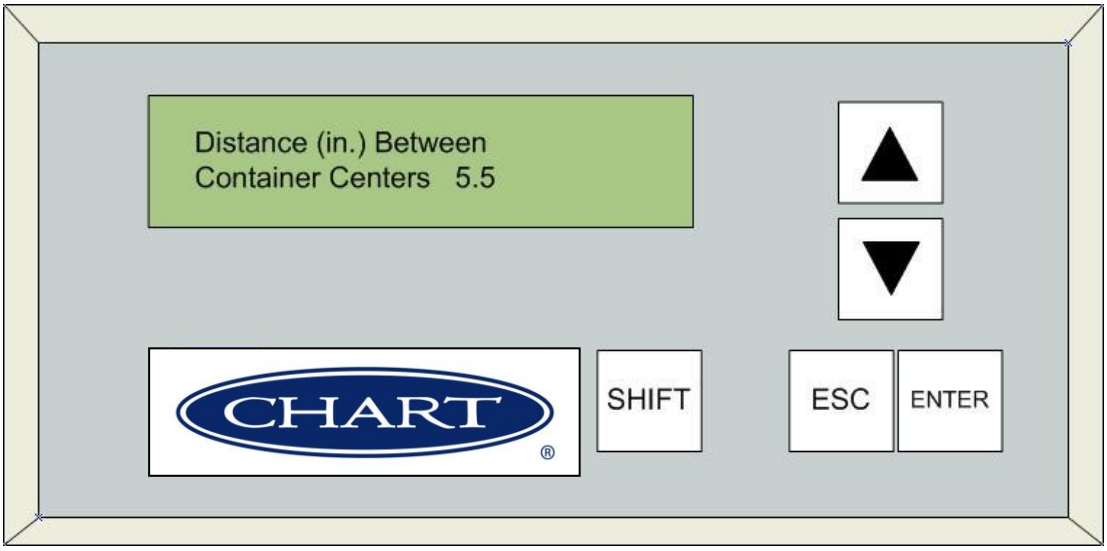


Image 3: Container Distance Setup Screen

Input the container to container distance using the arrow key ▲ or ▼ and then press ENTER.

Input Limits	Units	Maximum	Minimum
Distance Between Container Centers	Inches	20	2
Distance Between Container Centers	Millimeters	500	50

5. Press the arrow key ▼ to activate CONTAINER SENSOR SETUP (Image 4).

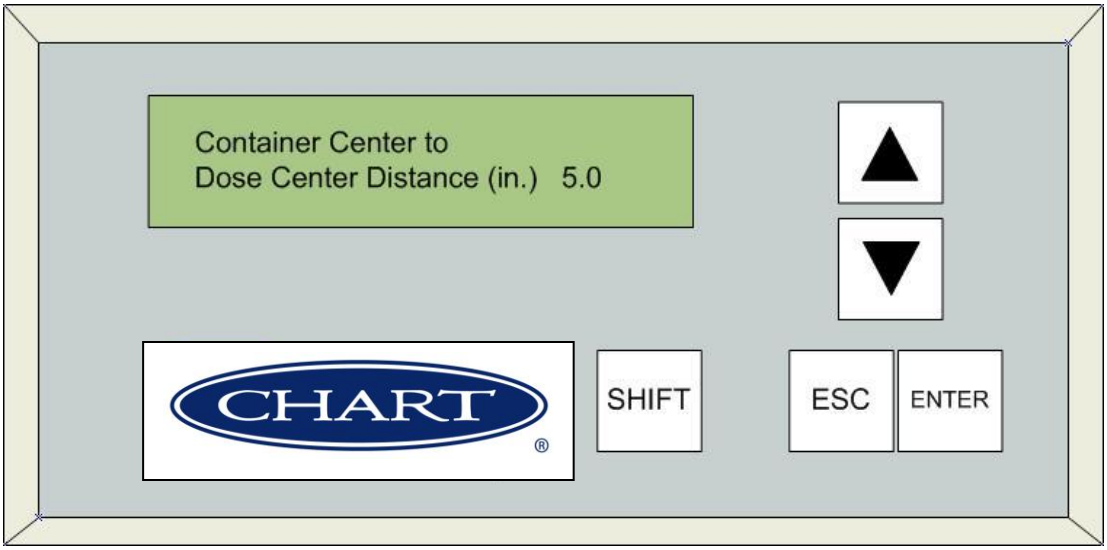


Image 4: Container Sensor Setup Screen

Input the Container Sensor to Dose center distance using the arrow key ▲ or ▼ and then press ENTER.

Function	Units	Maximum	Minimum
Container Sensor to Dose Center Distance	Inches	20	0
Container Sensor to Dose Center Distance	Millimeters	500	0

6. Press the arrow key ▼ to activate PULSES PER CONTAINER SETUP (Image 5).

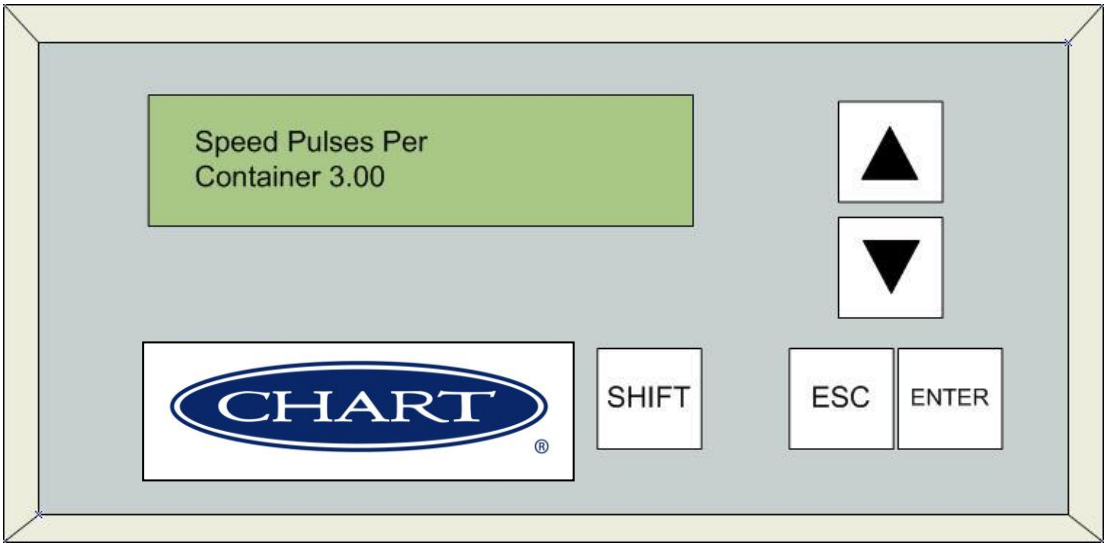


Image 5: Pulses Per Container Setup Screen

Input the Speed Pulses per Container using the arrow key ▲ or ▼ and then press ENTER.

IMPORTANT: The number of pulses does not have to be a whole number. This is a critical parameter of the system and care should be taken to input the correct value.

Determining Speed Pulses per Container

Speed pulses per container can be determined by observing the light pulses on both the container and speed sensors. If there are three speed light pulses per container pulse, the speed pulses per container would be 3. The unit will accept a decimal number (3.4) of speed pulses per container if the setup does not have an even number of speed pulses per container.

In cases where the lights on the container and speed sensors are not visible, the controller can be opened and light pulses on inputs IO.1 (Speed Sensor) and IO.2 (Container Sensor) can be counted. Only trained personnel should attempt this method as improper handling could void the warranty, or damage the product.

Function	Units	Maximum	Minimum
Speed Pulses Per Container	Count	12.00	1.00

7. Press the arrow key ▼to activate DOSE DURATION SETUP (Image 6).

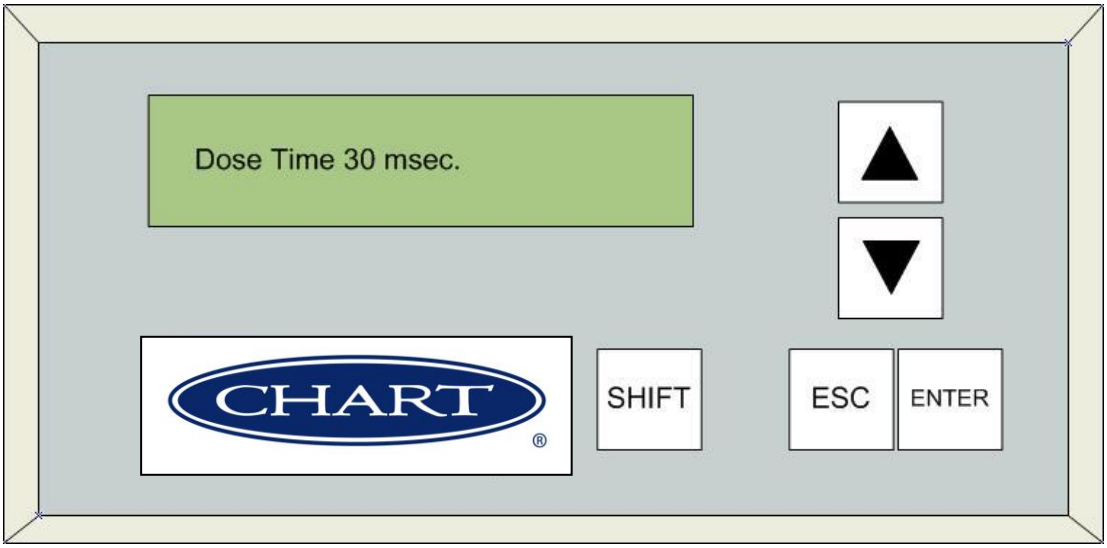


Image 6: Dose Duration Setup Screen

Input the Dose Duration using the arrow key ▲ or ▼ and then press ENTER.

Function	Units	Maximum	Minimum
Dose Time	Milliseconds	1000	15

8. Press the arrow key ▼to activate CONTINUOUS DOSING SPEED SETUP (Image 7).

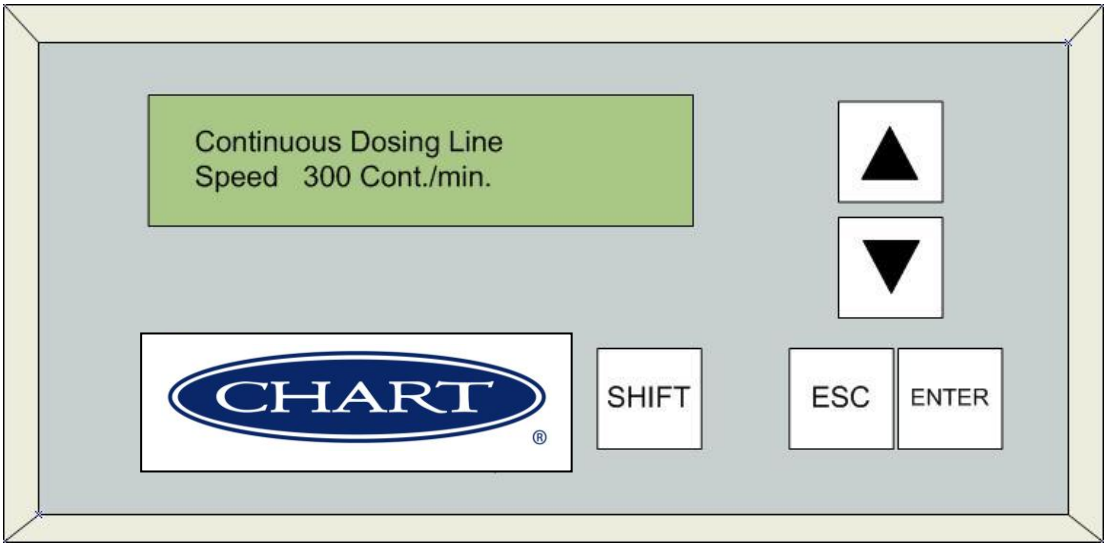


Image 7: Continuous Dosing Speed Setup Screen

Input the Continuous Dosing Line Speed using the arrow key ▲ or ▼ and then press ENTER.

Function	Units	Maximum	Minimum
Continuous Dosing Line Speed	Containers per Minute	350	100

IMPORTANT: When the line speed exceeds the "Continuous Dosing Line Speed" (factory set at 350 containers per minute), a continuous stream of liquid nitrogen will be dispensed if containers are present. Nitrogen that misses the bottle and hits either the floor or other machinery may form ice form in the area.

9. Press the arrow key ▼to activate SYSTEM RESPONSE TIME SETUP (Image 8).

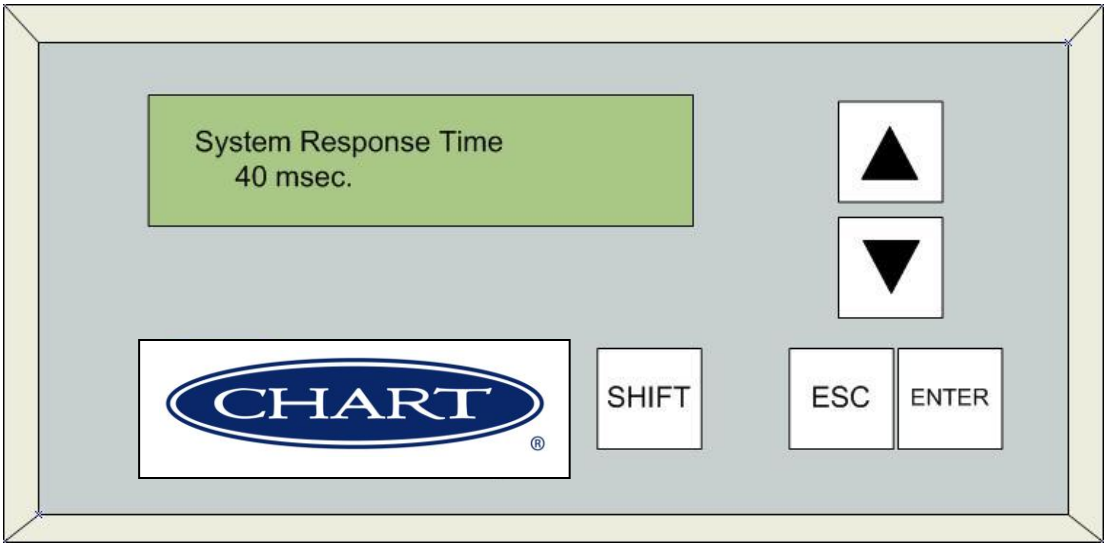


Image 8: System Response Time Setup Screen

Input the System Response Time the arrow key ▲ or ▼ and then press ENTER.

IMPORTANT: The System Response Time is an adjustment that is used to make small adjustments to valve timing. It may be required when the normal setup does not correctly dose containers. This feature is intended to compensate when the dosing head is greater than 3/4 inch from the container or the pneumatic pressure (GN_2) is near the operational limits of the system. The initial value is set at the factory and does not normally need to be adjusted.

Function	Units	Maximum	Minimum
System Response Time	Milliseconds	60	20

10. Press the arrow key ▼to activate FIXED DELAY SETUP (Image 9).

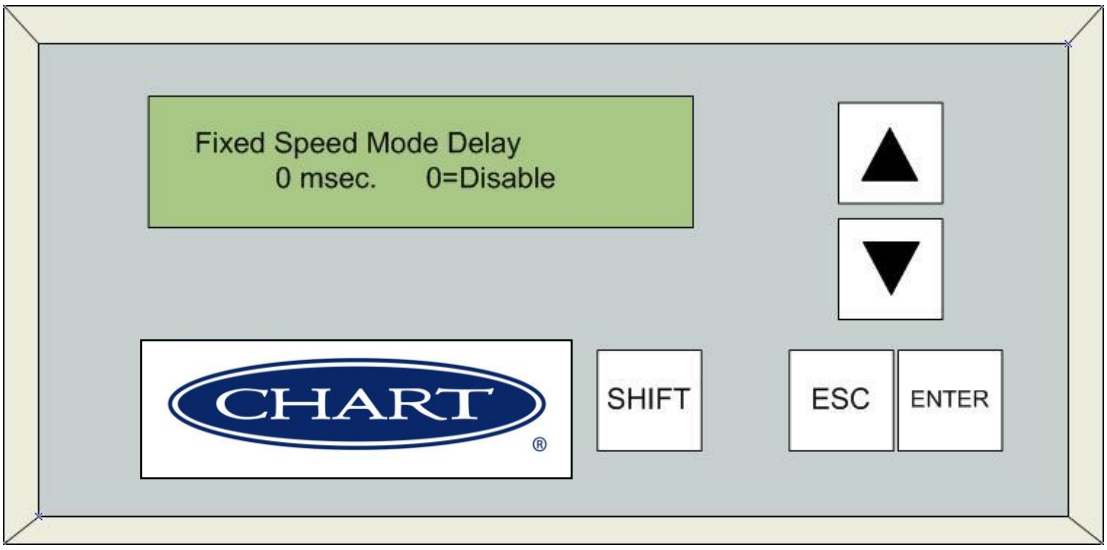


Image 9: Fixed Delay Setup Screen

Place the SC350c controller in speed compensated mode by entering a value of "0" in this screen.

IMPORTANT: This screen changes the mode of operation from Speed Compensated Mode to Fixed Delay Mode. When this screen indicates that the Fixed Speed Mode Delay is 0msec, the unit is in Speed Compensated Mode. When there is any other time value set in this screen, the unit is in Fixed Delay Mode.

In Fixed Delay Mode, the UltraDoser dispenses liquid nitrogen defined by the user defined milliseconds REGARDLESS of the line speed.

Function	Units	Maximum	Minimum
Fixed Speed Mode Delay	Milliseconds	5000	0

11. From FIXED DELAY SETUP, press ESC to return to DISPLAY.

12. Use the arrow key ▲ or ▼ to highlight SCREEN DISPLAY. Press ENTER to activate DISPLAY.

13. On the controller, place the DOSE ENABLE switch in the enable mode "1".

Fixed Delay Mode

IMPORTANT: Fixed Delay Mode is designed for steady speed filling lines. It does not compensate for changes in line speed. Therefore, you should initialize the system at the intended line speed. Any changes to the line speed may require changes to the dose settings: fixed delay and dose time.

1. On the controller, turn the DOSE ENABLE switch to the disable mode, "0".

2. From DISPLAY (Image 10) press ESC to go to SETUP (Image 11).

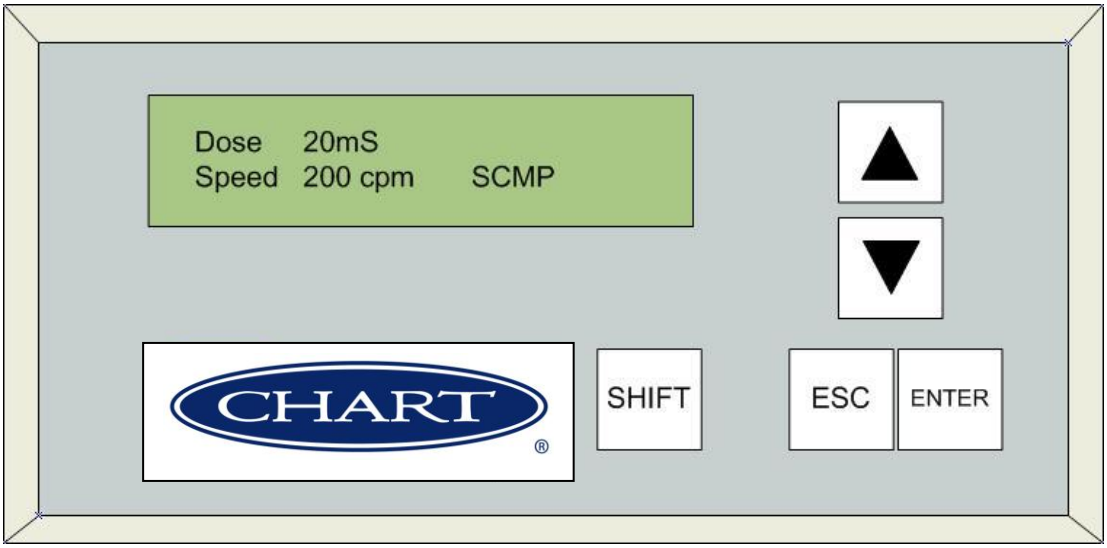


Image 10: Display Screen

IMPORTANT: Under normal operation, this screen will be displayed.

The system defaults to DISPLAY at power up. This screen shows the dose duration, the current speed of the line in containers per minute (cpm), and the current dosing mode: "SCMP" for Speed Compensated Mode or "FXDD" for Fixed Delay Mode.

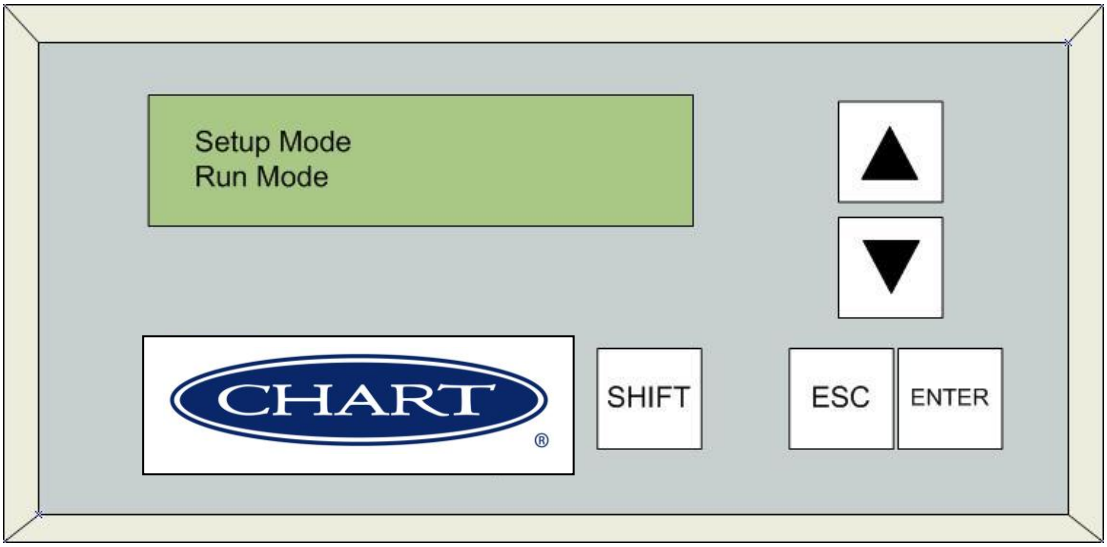


Image 11: Setup Screen

1. Use the arrow key ▲ or ▼ to highlight “Setup Mode”. Press ENTER.

IMPORTANT: After 1 minute, the panel will return to DISPLAY.

2. Use the arrow key ▲ or ▼ to highlight OPERATOR INPUT. Press the arrow key ▼until FIXED SPEED MODE DELAY is visible (Image 12).

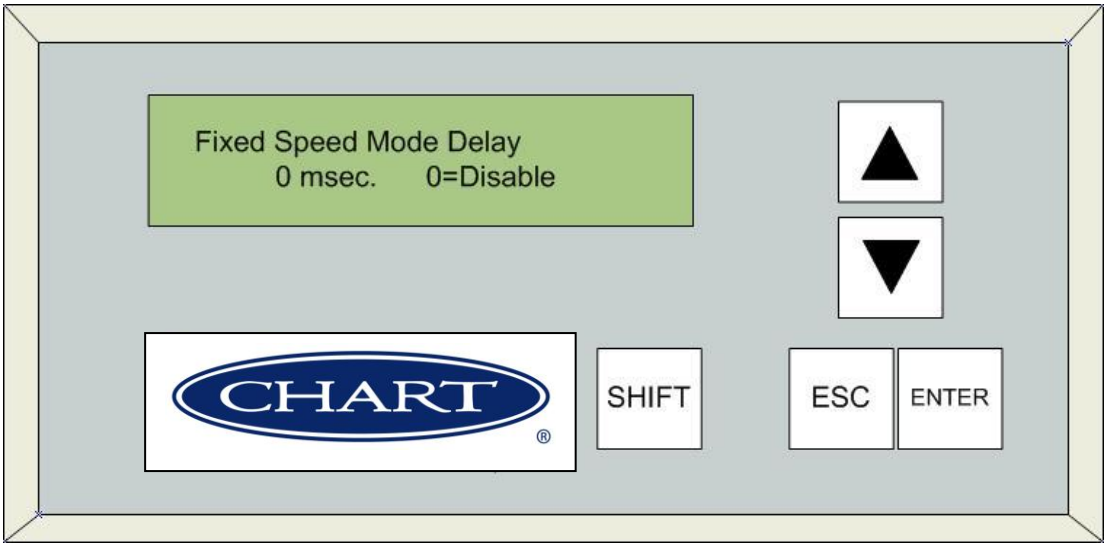


Image 12: Fixed Speed Mode Delay Screen

Place the unit in “Fixed Delay” mode by entering a value other than “0” in this screen. The entered value will be the delay the system uses to dose containers.

3. Use the arrow key ▲ or ▼to select the desired delay. Press ENTER to set the displayed value.

IMPORTANT: A delay of 40 will delay the dose for 40 milliseconds. This value is the delay between the time a bottle (or container) is detected and the dosing valve is opened. The closer the container sensor is to the dosing head, the shorter the time delay.

Function	Units	Maximum	Minimum
Fixed Speed Mode Delay	Milliseconds	5000	0

4. Use the arrow key ▲ or ▼until DOSE DURATION appears (Image 13).

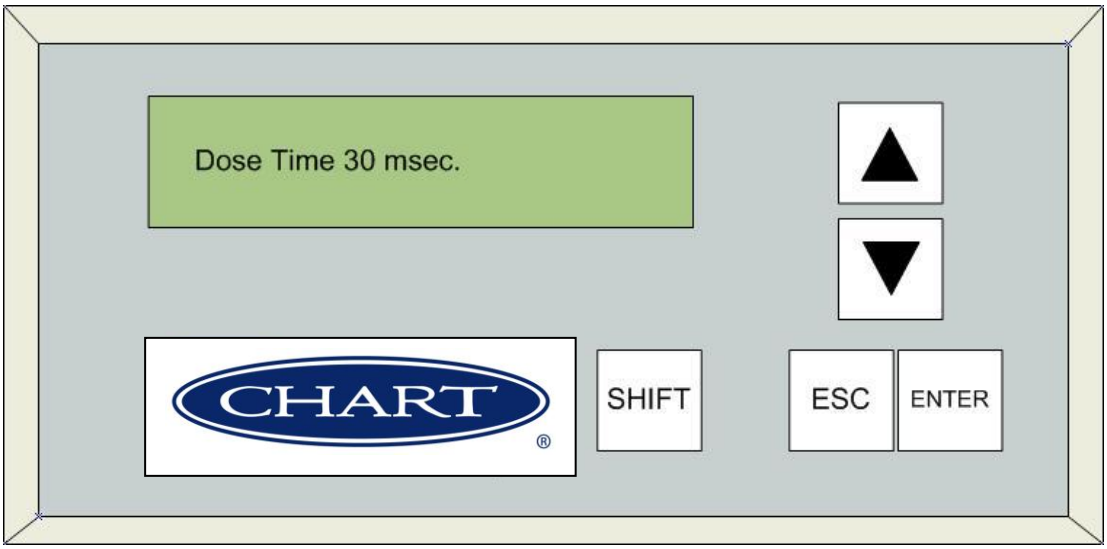


Image 13: Dose Time Screen

The dose time setting controls the amount of time (in milliseconds) that the dosing valve is open. The amount of LN2 that is trapped inside a 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 container contents, fill levels and head space. Therefore, the time setting for each filling operation must be evaluated.

Function	Units	Maximum	Minimum
Dose Time	Milliseconds	1000	15

5. On the controller, place the DOSE ENABLE switch in the enable mode, "1".

SC350c 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.

IMPORTANT: To verify that the dose is being dispensed into the container, fill the container with water and look for the tell-tale "fog" from the dose of LN2 on the water.

IMPORTANT: If the container sensor is far from the dosing head and the time delay is large, be sure to do a trial run at line speed. The electro-pneumatic solenoid valve does not record signals from the sensor while it is dosing or in a delay mode from the previous signal. During the initial set up, one should verify that all containers are receiving a dose.

Daily Operating Procedures (Dewar Fed System)

The UltraDoser SC350c unit can be fed by either a portable Dura-Cyl dewar or a house liquid nitrogen system. Most UltraDoser SC350c installations will utilize portable Dura-Cyl dewars.

IMPORTANT: LN_2 is -320ºF (-196ºC). Any water and/or moisture can cause ice which will affect the performance of the UltraDoser SC350c system. Providing a positive pressure of ambient 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 ambient 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. **IMPORTANT: this step will require additional fittings such as ½" male flare fitting and compression fittings.
2. Flow ambient 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.
7. Place the DOSE ENABLE switch on the controller to the "0" position. This will prevent the UltraDoser from dosing until the operator is ready.
8. Turn the controller "ON" by pulling the EMO button out. The front panel will show the DISPLAY screen if the controller is functioning correctly.
9. Adjust the dosing parameters. See "SC350c Controller Adjustments", page 21, for additional information.
10. Place the DOSE ENABLE switch on the controller to the "1" position. This will allow the unit to begin dosing.

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 DOSE ENABLE switch on the controller to the "0" position. This will stop the machine from dosing nitrogen.
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.

IMPORTANT: Rotate the Dose Enable switch to the "0" position if the system will not be used for a period of time; example an 8hr. shift. This will disable the dosing function but allow the system to continue to supply power to the dosing and vent heaters to prevent ice build-up.

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 SC350c 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.

Service and Maintenance

Nozzle Change Procedure

1. Remove the dosing head heater.
2. Insert the nozzle tool into the nozzle area until the tool connects with the nozzle.
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.

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 ambient 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. **IMPORTANT: this step will require additional fittings such as ½" male flare fitting and compression fittings.
2. Flow ambient 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.

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 UltraDoser 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. **IMPORTANT: 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 UltraDoser 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 UltraDoser 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 UltraDoser dosing head.	
Possible Causes	**Actions**
• There is insufficient liquid inside the UltraDoser unit.	• Check the level of LN_2. If the level is empty or low, open the supply valve on the Dura-Cyl dewar.
• The unit is disabled.	• Switch the Dose Enable switch on the controller to the "1" position.
• The nozzle is frozen shut.	• Remove, clean, and re-install the nozzle (see page 30).
• 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.
• The speed sensor is not functioning.	• Check the speed sensor is operating correctly and is sending a signal to the controller.

5. Condition: The dosing valve alarm is displayed on the SC350c controller.	
Possible Causes	**Actions**
• The dosing valve assembly is not moving.	• Check the pneumatic pressure There must be more than 60 psi (4.14 bar) to have the dosing valve function correctly. • Check the confirm sensor for correct placement.

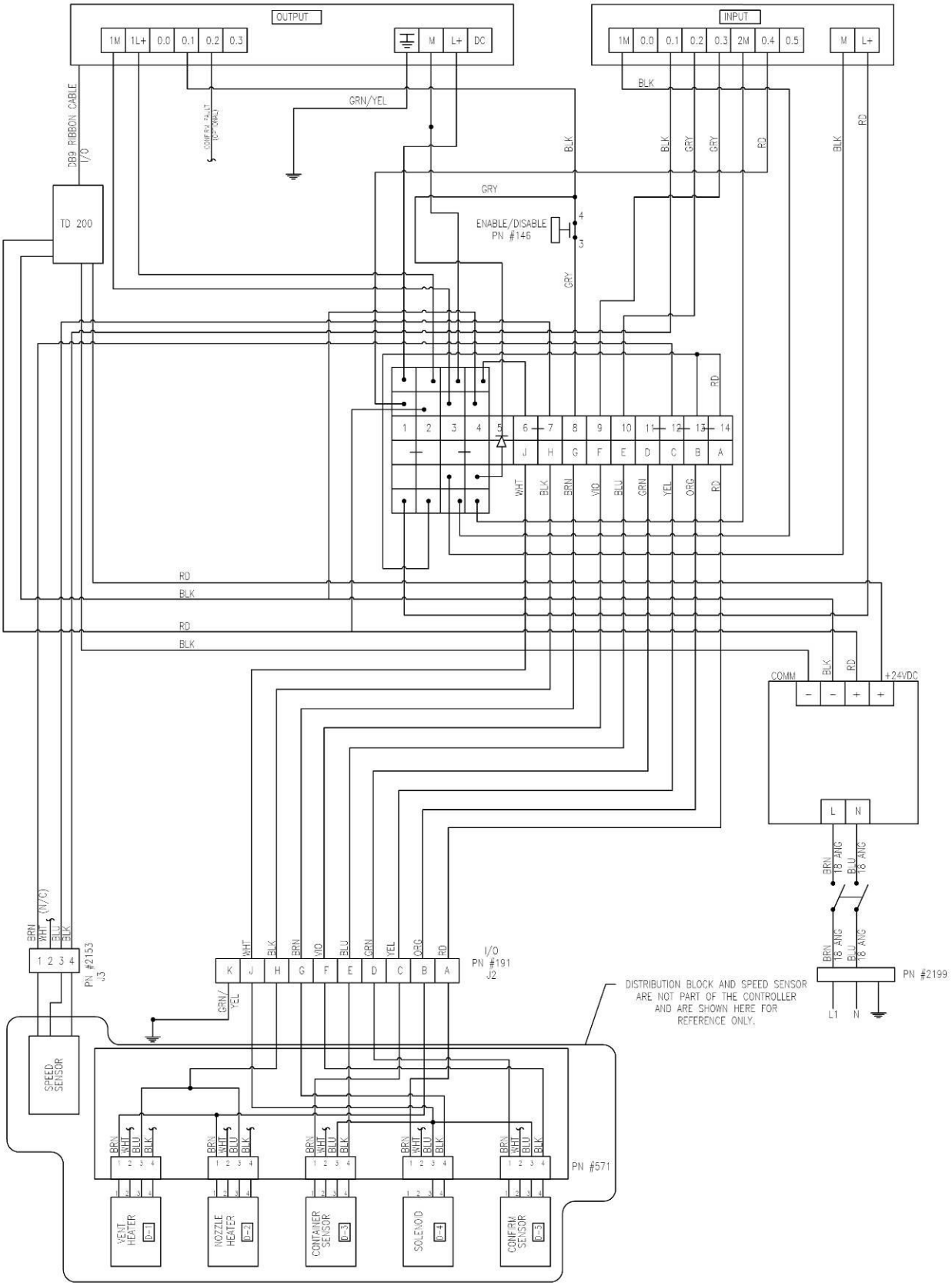
7. Condition: The SC350c controller is in speed compensated mode but is missing bottles (or containers).	
Possible Causes	**Actions**
• The container sensor is not detecting a container.	• Check sensor connections. If necessary, replace sensor.
• The speed sensor has been dislodged.	• Check speed sensor connections.
• The speed sensor has malfunctioned.	• Replace speed sensor.

*****IMPORTANT: The UltraDoser unit will continue to dose even if there is a speed sensor fault. The SC350c controller displays the last known speed and compensates per that speed.***

Replacement Parts

Part Description	Part Number
Injection Unit Spare Parts Kit Includes PNs: 102, 103, 104, 105C, 106C, 141, 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	1411
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
12mm Sensor Support Hardware: Mount (for PN 336)	584
Complete Sensor Bracket Assembly UltraDoser	1422
Bottle Detect Sensor (12mm Ultrasonic Sensor PNP)	336
Controller Mounting Assembly	2384
Controller Assembly – SC350c	2810A
Gauge Assembly	133
User Manual, UltraDoser SC350c	1903
UltraDoser Body	15171
Speed Sensor (12mm Inductive Proximity PNP)	2807
Speed Sensor support bracket (for PN 2807)	2779
EP (EletroPneumatic) Head Assembly	1005
Distribution Block	571
Distribution Block Cable	573
Confirm Sensor and Cable - UltraDoser	1201
Solenoid Valve and Cable Assembly PNP	1202
Liquid Gasket, 625	C6208
Distribution Block Cable, 12’ Extension	209
Timing/Container Sensor Cable	2440.16

SC350c 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.