Product Manual

CryoDoser FleX™ Pack Premier
Liquid Nitrogen Dosing System

Designed and Built by:

Chart Inc.

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Part Number 15968 Rev. B

Contents

Revision Log

Revision Level	Date	Description
A	09/24/2020	Original
B	02/24/2022	Replacement PN and Notice updates

Preface

General

The CryoDoser FleX™ LN2 Dosing System is the first doser with the ability to serve many dosing applications within one unit. Chart Inc. has designed a brand new dosing system that can be used from the slowest production lines to the fastest. Chart's modular design uses a body with exchangeable dosing arms. This unique approach provides flexibility of optimization and can be tailored to the specific customer application.

The CryoDoser FleX Pack Premier features a distinct controller with the capability of speeds in excess of 2000 containers per minute with superb accuracy.

With more standard functions than any other doser offered before, and a brand new all around design, the CryoDoser FleX system is ready to change the market.

Features

- Compact Size - enables installation in limited spaces
- Discrete Dosing - 2000+ cpm
- SoftDose™ Compatible - Chart's proven technology for hot fill, powder and granular applications.
- MicroDose™ Standard - the Pack Premier has a controller function that allows dosing pressure adjustments
- RemoteDose™ Standard* - monitor, troubleshoot and make adjustments while connected to your VPN**
- ExacTrack™ - Use the EP head system for supreme accuracy and make dose duration changes in increments of 0.1mS
- High-Pressure Liquid Capable - Deliver LN_2 into the CryoDoser Flex up to 100 PSI.
- Warranty - four (4) year vacuum warranty; highest in the industry; one (1) year controller warranty

**Results achieved at Chart laboratory conditions.*
***Access to the internal network is necessary for this function.*

Key Benefits

- Lightweight PET - reduce the weight of PET for cost and environmental savings
- Glass to PET Transition - eliminate glass safety hazards and weight of containers
- Container Rigidity - maintain container shape even with lighter weight containers
- Eliminate Paneling - increase the internal pressure to offset paneling issues
- Oxygen Reduction - create an inert environment to preserve product freshness
- Extend Shelf Life - minimize oxygen levels
- Ease of Labeling - consistent container rigidity creates an efficient labeling process
- Reduce Nitrogen Consumption - measurable and repeatable liquid doses
- Maximize Warehouse Storage Space - increasing product stackability utilizes less square footage
- Stabilize Organic Products - extend shelf life without preservatives

Product Manual

This manual is designed to be used in conjunction with the CryoDoser FleX Liquid Nitrogen Dosing System provided by Chart. Chart makes no warranties, express or implied, regarding the content in this manual. Chart assumes no responsibility for any outcomes as a result of using this manual. If after reading this manual you are not confident in carrying out any task, please contact Chart's service team at 1-408-271-4932.

The safety requirements for operating the CryoDoser FleX system and handling or transporting extremely cold liquid products are shown in the Safety section. Use this safety section as a "Safety Checklist" each time the equipment is being used.

In the Installation section there are illustrations for proper connections.

The Controller Adjustments and Daily Operations Section will give information on getting the system up and running smoothly.

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

Terms

Throughout this manual safety precautions will be designated as follows:

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

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

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

Acronyms / Abbreviations

The following acronyms / abbreviations are used throughout this manual:

BAR	Pressure (Metric)
CIP	Clean in Place
CPM	Containers Per Minute
GN_2	Gaseous Nitrogen
HMI	Human Machine Interface
Kg	Kilogram
LN_2	Liquid Nitrogen
mS	Milliseconds
O_2	Oxygen
PET	Polyethylene Terephthalate
PLC	Programmable Logic Controller
PN	Part Number
PNP	Positive-Negative-Positive
PSI	Pounds per Square Inch

Safety

General

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

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

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

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

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

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

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

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

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

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

Warning! ***Over pressurization of containers can occur while using Chart's CryoDoser FleX doser potentially bursting the containers. Proper calibration of the CryoDoser FleX system ensures optimum nitrogen doses to avoid over pressurization. Be sure to remove any containers that receive more than the proper LN_2 doses before sealing.***

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

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

Safety Bulletin

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

Oxygen Deficient Atmospheres

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

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

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

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

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

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

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

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

Nitrogen

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

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

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

Installation

General

In order to set up and run this liquid nitrogen dosing system, the following utilities are required.

- 120VAC – 240VAC Power – Used to provide power to the control box
- Liquid Nitrogen – Maximum tank pressure of 80psi. For pressures above this limit consideration should be given to using a Chart Phase Separator.
- Gaseous Nitrogen – 60 to 80psi of constant gas pressure is required for operation of the pneumatic inlet valve and for gas purging.

Set Up Steps

The following steps provide a general guideline for assembling the dosing unit. Steps do not necessarily need to be followed in the exact order.

- Assemble the stand and base
- Position the dosing body on the stand
- Mount the Control Box
  - If on the stand, affix the mounting arms.
  - If away from the stand mount using suitable hardware.

Note – If the doser will be subjected to wash-down ensure the Control Box is located away from any wet areas.

- Position the Interface box on the stand.
- Connect all cables and tubes as per instructions in this manual

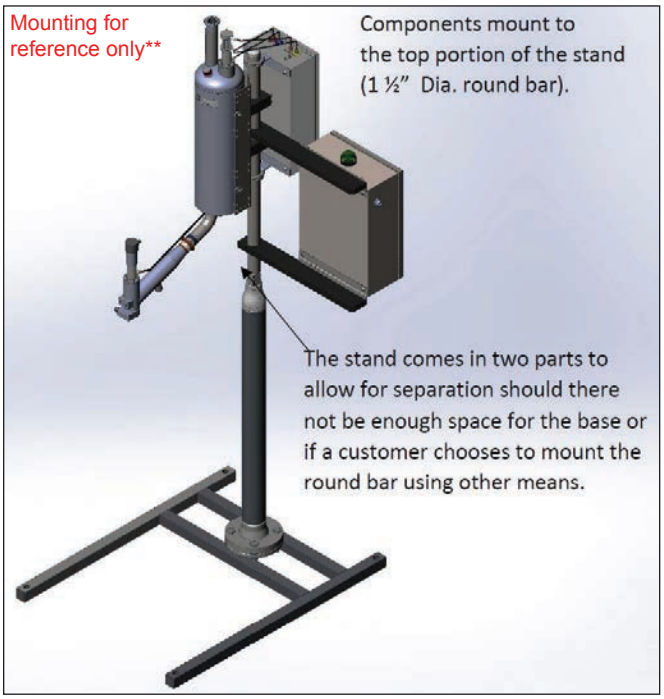
Caution – Ensure that the gas pressure is not turned on at this time

  - Position sensors. See the section on sensor location
- Connect the liquid nitrogen feed line to the inlet on top of the dosing body
- Turn on the Control Box and run through the First Time Set-Up Procedure
- Proceed to the Dosing Containers Section

Assembling the System

The Cryodoser FleX system is shown in the following illustrations. Some items such as cables or cable assemblies, and component parts may have been removed for clarity. A complete system is shown below on a moveable stand and base. This configuration may be moved into position on a filling line and removed as needed.

If mounting the dosing unit within a filling line the top half of the stand (1 ½" round bar) or similar attachment can be used to secure the dosing body/bracket to the filler enclosure. The control box as shown supported by two arms may be wall mounted separate from the body.

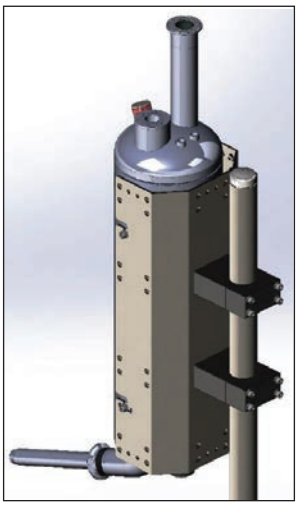


***** If subject to washdown or within a filling line where steam, cleaning solutions, and the like are to be used, the control boxes (control and interface) must be placed outside of the washdown area.***

Mounting the Dosing Body

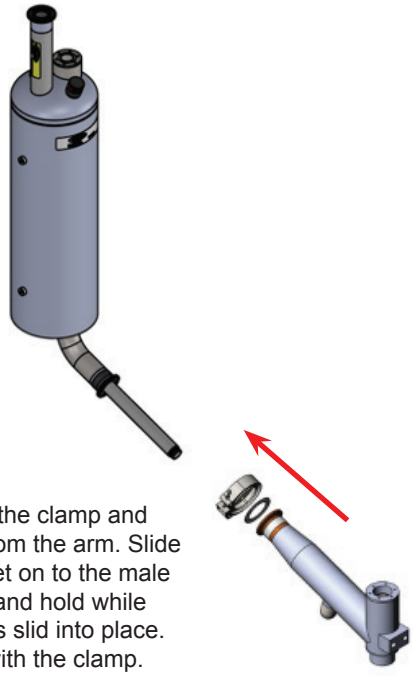
The following drawing shows the dosing body and support bracket. The dosing body is typically provided completely assembled on the bracket and will include an inlet pneumatic actuator, dosing arm, actuator and clamps with gaskets for the inlet and arm. Loosen the eight bolts on the support blocks enough to be able to slip the assembly over the 1 ½" round bar stand section. It is beneficial if two people perform this task.

Note: *Do not remove the bolts completely. Doing so could cause the bracket to separate from the clamps.*



Mounting the arm assembly

The arm assembly is typically attached to the dosing body during assembly. If so, this step may be skipped. If the arm is to be replaced follow the steps below.

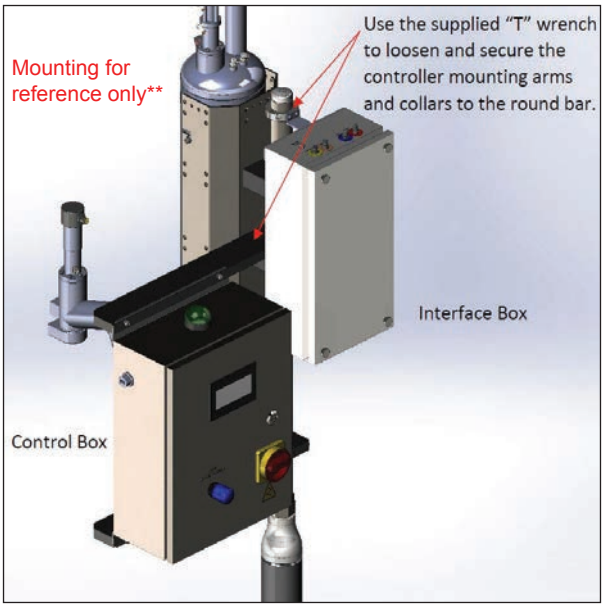


Remove the clamp and gasket from the arm. Slide the gasket on to the male bayonet and hold while the arm is slid into place. Secure with the clamp.

Mounting the Control and Interface Boxes

Secure the Control Box and the Interface Box on to the top section of the stand.

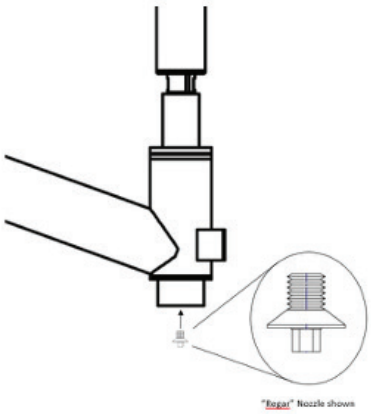
Note: *The Control box may be mounted as shown to the two Delrin "arms" or if washdown conditions exist, it may be mounted outside of the wet zone on a suitable surface using the mounting holes or flange located at the rear of the Control box. Loosen the clamps on each to allow for easier mounting.*



***** If subject to washdown or within a filling line where steam, cleaning solutions, and the like are to be used, the control boxes (control and interface) must be placed outside of the washdown area.***

Installing a nozzle

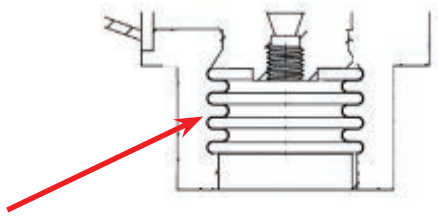
Nozzles are threaded inserts that are inserted into the dosing head. Each nozzle has a specific diameter opening or multiple openings of various geometries. A nozzle is one variable that determines the amount of LN2 that is deposited into a container.



Dosing units are typically provided with various nozzles. To insert a nozzle:

- Remove the dosing head heater
- Place the nozzle in the nozzle tool supplied with the dosing unit
- Thread nozzle into the dosing head, making sure not to cross-thread the nozzle

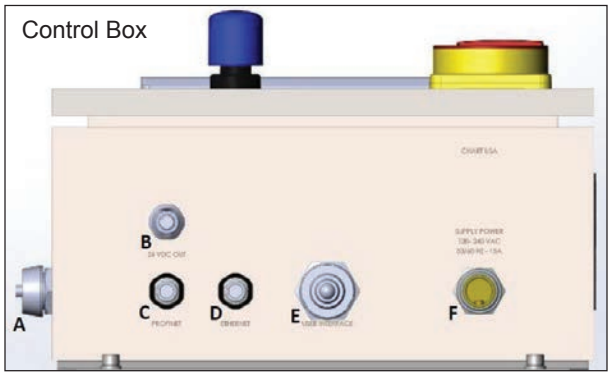
Caution: ***The area adjacent to the nozzle may become frozen during operation. Do not attempt to dislodge or pry out the nozzle with any sharp object such as an ice-pick, screw driver or similar tool.***



Also, do not apply direct heat to a frozen nozzle in an attempt to melt ice. The ribs of the internal bellows on the inside of the dosing head are extremely thin walled metal. A puncture or high heat will destroy the vacuum and internal insulation and VOID WARRANTY.

Control and Interface Box Connections

The bottom of the Control and Interface boxes have connections for fittings and cables used for communication, power and gaseous nitrogen.



A. **USB Port Connector** - Use this port with a USB memory stick to load any future software changes/ upgrades.

B. **24 VDC Out Connector** - DC power from the Control box to Interface box. Connect the DC power cable.

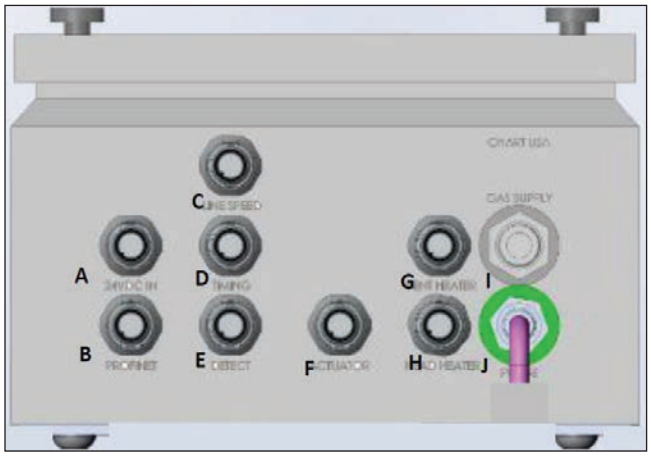
C. **Profinet Connector** - Industrial Ethernet. Connect the Green Ethernet cable to the Ethernet port of the Interface Box.

D. **Ethernet Connector** - Used only when external communication is to be used. (Not used with Craft Custom System).

E. **User Interface Connector** - High end applications when I/O signals will be exchanged between the dosing system and filling lines. (Not used with Craft Custom System).

F. **AC Power Connector** - Connect the AC power cord to a 110V - 240VAC Outlet.

Interface Box



A. **24VDC IN Connector** - Connect DC cable from the control box to this connector.

B. **Profinet Connector** - Connect the green Ethernet cable from the control box to this connector.

C. **Line Speed Connector** - For systems that will be using either an encoder or speed sensor, connect the encoder or speed sensor cable to this connector.

D. **Timing Connector** - This system uses the timing signal looking for 1 pulse per container. Connect the timing sensor to detect each container or container location.

E. **Container Detect Connector** - Connect the container detect cable to this connector.

F. **Actuator Connector** - Connect either the EP Head or EASE actuator cable to this connector.

G. **Vent Heater Connector** - The short heater cable connects to this connector.

H. **Head Heater Connector** - The longer heater cable connects to this connector.

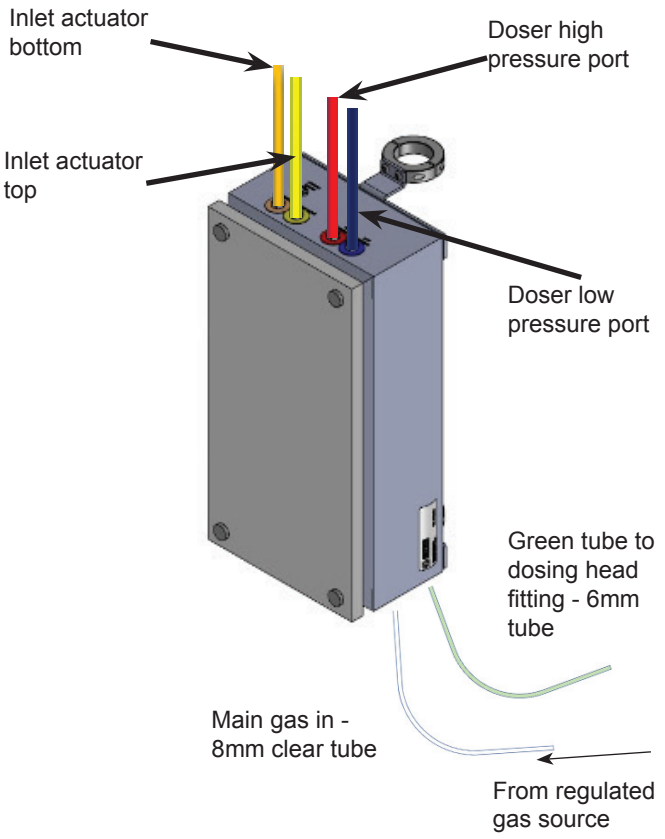
I. Gas Supply Fitting - Main gas inlet. Connect the 8mm clear tube to this fitting.

J. Purge Fitting - Connect the green 6mm polytube to the fitting on the actuator.

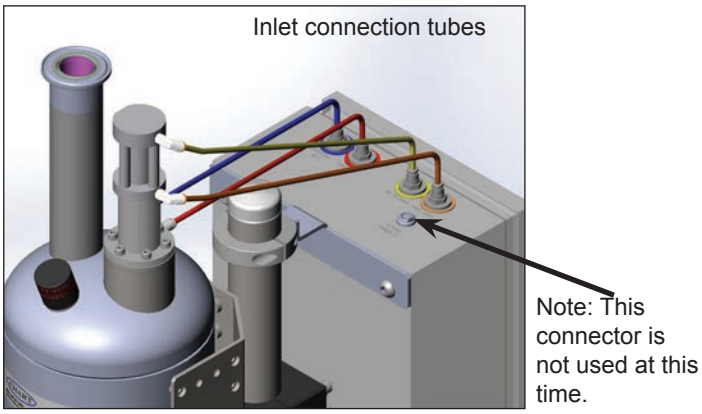
Tube Connections - Top and Bottom

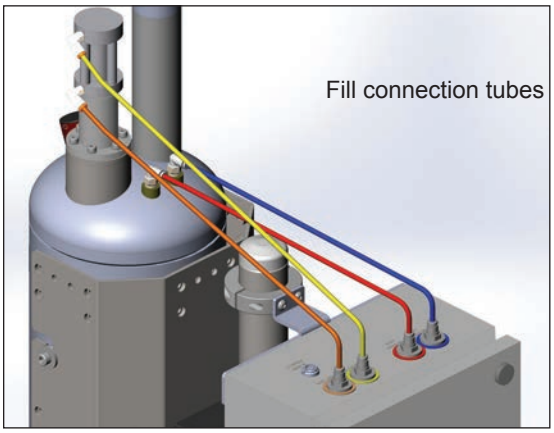
Clear tube — 8mm. Main nitrogen gas inlet. Connect to gas port at bottom of Interface box (I). Requires 60-80 psi.

Green tube — 6mm. Nitrogen gas purge to dosing head. Connect tube from interface box (J) to dosing head.



The inlet and pressure tubes are color coded for easy installation to the dosing body and pneumatic actuator. Push the end of each corresponding tube to the location marked or shown on the Interface box.





Cables

The following drawings identify the cables provided for connections of the CryoDoser FleX product.

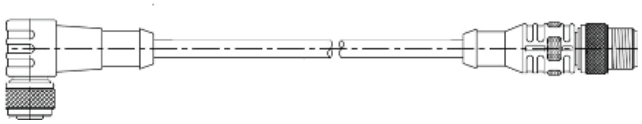
DC Power Cable (PN 2840.108) - Connect from control box (B) to Interface box (A).

Ethernet Interconnection Cable (PN 2840.122) - Connect from control box (C) to Interface box (B).

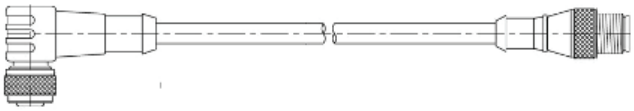
Note: No gender difference in cable ends. Either side may be connected to the boxes. Care must be taken when connecting this cable. Ensure each side is mated properly to the connector at each enclosure and that the pin tabs are correctly positioned.

AC Power Cable (PN 410) - Connect from control box (F) to 110VAC to 220VAC outlet.

Note: 120VAC plug shown here.



Sensor Cable (PN 2840.112.01) - Connect from Interface box (C, D or E) to sensors. Can be used for timing, container detect or speed.



Actuator Cable (PN 2840.902.01) - Connect from Interface box (F) to actuator EASE or Electro-pneumatic "EP" head.

Heater Cable (PN 2840.113.01 & 2840.113.02) - Connect from Interface box (G and H) to dosing head and vent heaters. Lengths determine which cable is connected to each heater.

Encoder Cable (PN 2840.903.01) - Connect from Interface box (C) to encoder.

Sensor Set-Up

Sensor set-up and placement is critical to the correct functioning of the Pack Premier Dosing System. Each sensor input is a +24VDC signal that may be provided from sensor(s) or a similar signal supplied from the filler.

Sensor Types:

- Inductive Proximity*
  - General metal sensing; Aluminum cans, aluminum bottles, etc.
  - Barrel Type: 12mm dia., 18mm dia., 30mm dia.
  - Used for timing when sensing gear, or metal containers – one pulse per container is needed when used in this application
  - Used for speed pulses when sensing on metal gears – multiple pulses per container needed when used in this application. More pulses provide better accuracy/ resolution.
  - Used for container detect when sensing metal containers
- Capacitive Proximity**
  - Specific metal sensing; must know material type
  - Same uses as Inductive
- Ultrasonic
  - General overall sensing. Not material specific
  - Barrel type; 12mm dia.
  - Various additional geometries can be available***
  - Used primarily for container detect applications
  - Not ideal for timing or speed sensing
- Photo-electric
  - Similar to Ultrasonic
  - Barrel Type: 18mm dia.
  - Used primarily for container detect applications
  - Not ideal for timing or speed sensing
- Encoder
  - Device for speed pulses
  - Programmable with use of programming module****
  - Shaft mounted to filling system; filler or seamer/ capper tracking line speed
  - Max pulses per shaft revolution 65,000 plus. (only 500 needed for dosing)

* When used for speed reference only – Either a sensor or an encoder are needed not both. Must be specified at time or order. Consult Chart if there are any questions.

** Chart does not carry this type of sensor though it may be ordered

*** Chart carries only a 13mm barrel type currently

**** Programming module can be obtained separately from Chart.

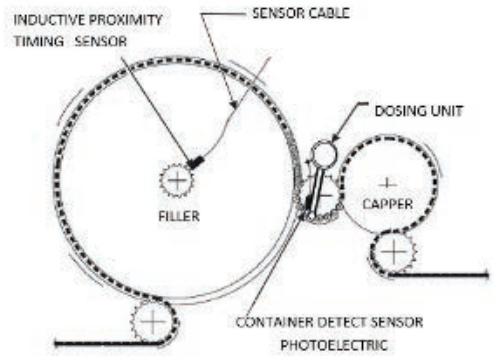
Sensor configurations

Shown below are the three different sensor configurations that can be set up for LN2 dosing.

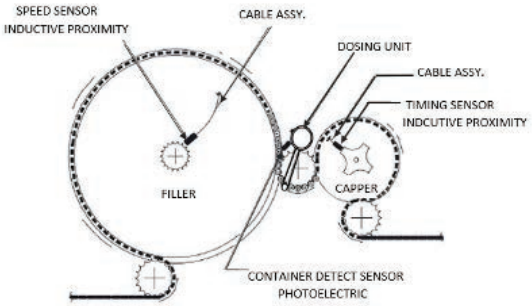
Note: Sensor locations shown below are examples and may not be the exact locations where they would be placed at a specific site. The timing sensor must provide a signal identifying each container. This sensor is typically located on a gear or filler/capping head providing one pulse per container.

Container detect sensor placed adjacent to dosing head or slightly upstream detecting containers a number of pockets ahead of container's arrival at the dosing head.

TWO-SENSOR SET UP



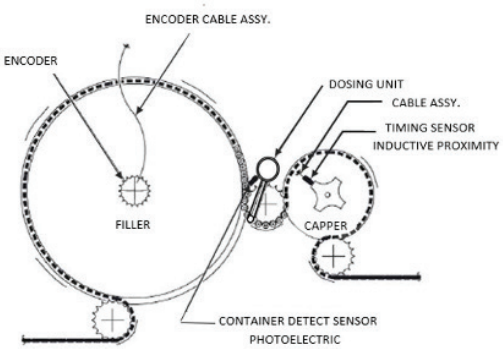
THREE-SENSOR SET UP



A three-sensor setup uses the inductive sensor on a multi-point per container gear to provide better timing resolution and compensate for changes in speed.

The timing sensor is again at point providing one pulse per container and the container detect is placed at front of the dosing head or slightly ahead to cool or chill the nozzle prior to containers reaching the head.

TWO SENSOR & ENCODER SET UP

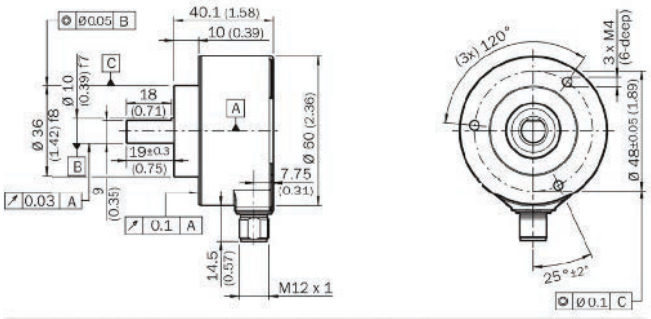


Two sensor and encoder is basically the same as the three-sensor setup but the speed sensor is replaced by the encoder to generate more pulses per container.

The timing sensor is again at point providing one pulse per container and the container detect is placed at front of the dosing head or slightly ahead to cool or chill the nozzle prior to containers reaching the head.

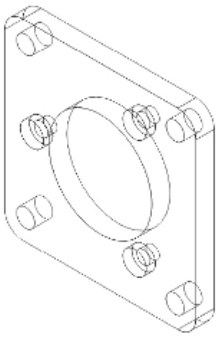
Caution! When using an encoder to provide a speed reference it will be necessary to provide a suitable mounting location and mechanism. Chart includes a mounting flange. However, a separate mounting bracket or bell housing may be required prior to installation of the encoder. Consult Chart for details.

The following encoder information is provided for the SICK device used with Chart dosers. Reference only.



Dimensional drawing Face mount flange, radial plug connection M12

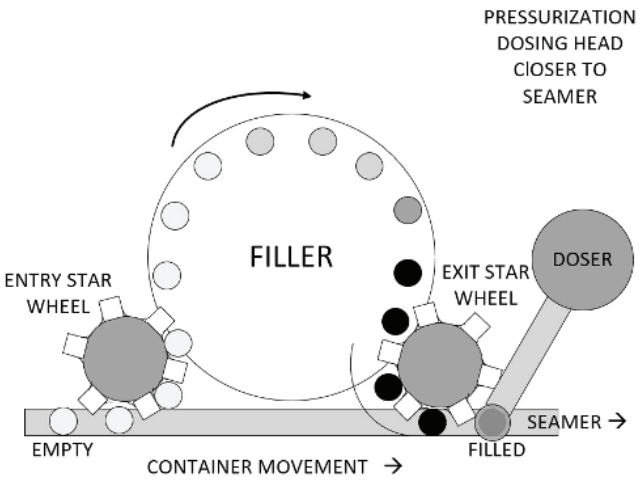
Dimensions in mm (inch)
General tolerances according to DIN ISO 2768 mK



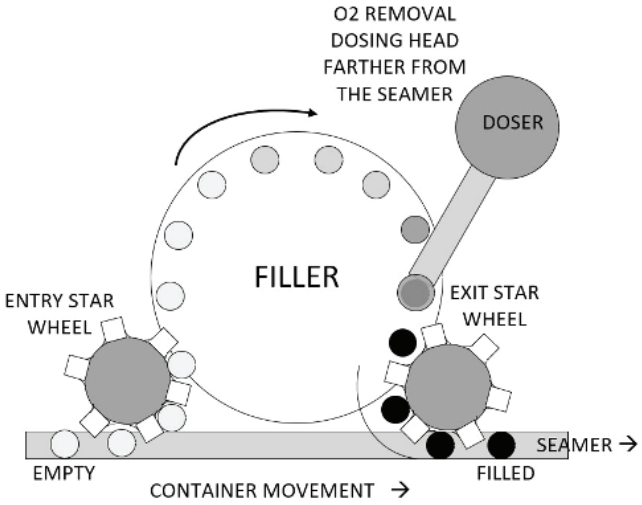
The encoder flange is provided on the encoder to assist with installation.

Doser Positioning

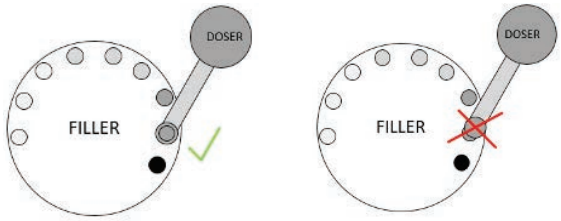
The position of the dosing unit or more specifically the dosing head is critical in obtaining good results. Maximum pressure within a container will depend on various factors but as a general rule, if pressure is the goal the doser should be placed closer to the seamer/capper as possible. Oxygen removal requires just the opposite.



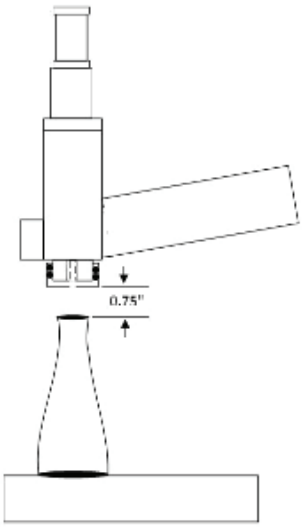
Maximum O2 removal within a container will also depend on various factors but as a general rule, to allow time for the liquid nitrogen to gas off, expand, and remove oxygen, the doser should be placed farther away from the seamer/capper.



The dosing head must be placed directly over the center of the container in order to achieve maximum dose volume across the entire opening of the container.



The height of the dosing head above the container must be positioned so that any splashing of product to be dosed will not negatively impact the dosing nozzle. In addition, external influences such as moving air or undercover gas should be minimized. Chart recommends approximately 3/4in. (19mm) above the opening of the container to minimize the dispersion of the nitrogen dose.

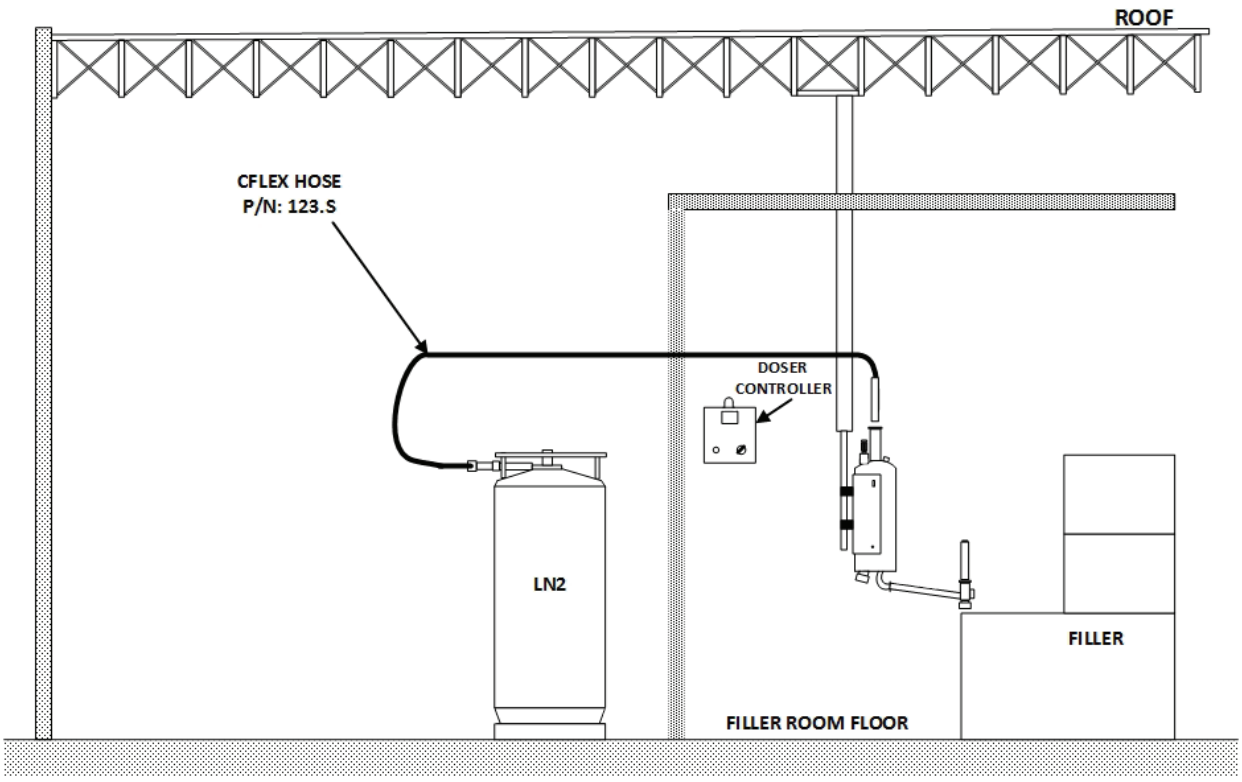


Operating Procedures

The CryoDoser FleX system can be fed by either a portable Dura-Cyl® Liquid Cylinder or a bulk tank (house fed) liquid nitrogen system.

Dura-Cyl® Liquid Cylinder Fed System

Note: *LN_2 is -320°F (-196°C). Any water and/or moisture can cause ice which will affect the performance of the CryoDoser FleX system. Providing a positive pressure of GN_2 (also known as purging) to the CryoDoser FleX unit before introducing LN_2 into the body will eliminate many performance interruptions.*



Dura-Cyl Cylinder Change Out Procedure

The Dura-Cyl cylinder will need to be changed out from time to time. The operator should visually check the gauges on the Dura-Cyl cylinder to monitor the internal liquid level. When the gauges read low levels, it must be exchanged with a full Dura-Cyl cylinder. Chart recommends a cylinder pressure between 60-80 psi.

1. Close the liquid valve (clockwise direction) on the Dura-Cyl cylinder.

Caution! ***Always assume there is pressure in a transfer hose prior to disconnecting. Use caution as the coupling nut is loosened.***

2. Slowly disconnect the C-Flex hose from the Dura-Cyl cylinder using a 7/8” open end wrench or adjustable wrench, waiting a few seconds for any accumulated gas to dissapate.

3. Connect the C-Flex hose to the liquid outlet on the full Dura-Cyl cylinder using a 7/8” open end wrench or adjustable wrench.

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

Bulk Tank (House Fed) System

Note: *LN_2 is -320°F (-196°C). Any water and/or moisture can cause ice which will affect the performance of the CryoDoser FleX system. Providing a positive pressure of GN_2 (also known as purging) to the CryoDoser FleX unit before introducing LN_2 into the body will eliminate many performance interruptions.*

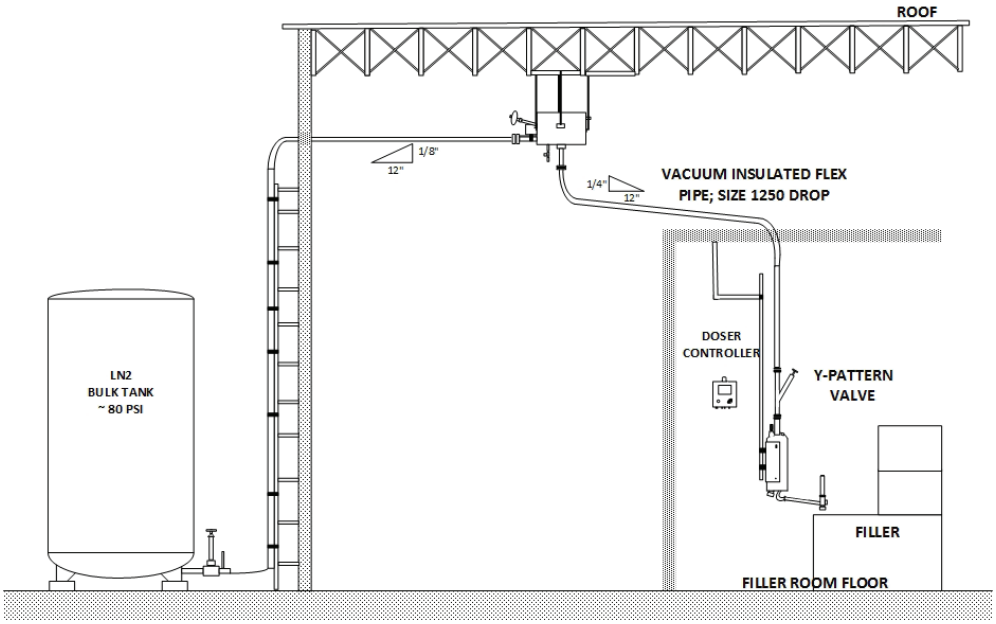


Image 23

Purging with Gaseous Nitrogen *(Also see Service and Maintenance)*

Purging is the process of introducing nitrogen gas into the CryoDoser FleX body to minimize and/or eliminate ice that may have formed within the system. Ice may form whenever there is an introduction of a liquid substance into the CryoDoser FleX body. This may be because of product splashing, steam from CIP, or just an intake of moisture from the environment.

Freeze-ups may result in delays - some extreme if the ice within the body has occurred deep inside the vessel.

With the CryoDoser FleX system, Chart has taken steps to ensure freeze-ups are minimized. Each system is provided with integral heated gas purging capabilities. Heating the gas accelerates the removal of ice so as to bring the downtime to a minimum.

Gaseous nitrogen can also be used to introduce positive pressure into the dosing system. Positive pressure keeps nitrogen gas flowing through the CryoDoser FleX body and minimizes the intrusion of air/moisture when the dosing system is idle.

For additional information about purging please refer to the Controller section.

Caution! ***When purging the CryoDoser FleX 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 CryoDoser FleX unit is still at or near LN_2 temperatures (-320°F; -196°C). Once the CryoDoser FleX unit is at or near ambient temperature, the "fog" will warm up.***

System Start Up

There are two primary methods for delivering liquid nitrogen to the CryoDoser FleX system; phase separator through a Y-pattern valve and Chart Dura-Cyl® Liquid Cylinder or similar dewar through a Chart flexible "123" hose.

If the CryoDoser FleX system is being fed liquid nitrogen via a phase separator, ensure the phase separator has been properly set up prior to set up of the CryoDoser FleX. Refer to the Phase Separator Product Manual for specific instructions.

If the CryoDoser FleX system is being fed liquid nitrogen from the Chart Dura-Cyl cylinder, ensure the connection hose to the CryoDoser FleX has been properly connected including the installation of a safety relief device as part of the hose installation, that the stainless steel filter has been installed in the end of the hose bayonet, and that the bayonet connection to the CryoDoser FleX has been properly installed and secured.

Manually open (counter clockwise) the blue handle valve on the Dura-Cyl liquid cylinder.

System Shut Down (For House-Fed System)

1. Manually close (clockwise) the Y-Pattern valve (blue handle).

2. Start purge process from the control screen. For details, refer to the controller section of this manual.

Also, refer to the phase separator product manual for instructions regarding shutting down of the phase separator if applicable.

1. If your CryoDoser FleX system is being fed off of a Chart Dura-Cyl liquid cylinder close (clockwise) the valve of the cylinder.

2. Start purge process from the control screen. For details, refer to the controller section of this manual.

Best Practices for Superb Operation

Minimize the entry of moisture into the dosing system

1. Moisture turns into ice when subjected to cryogenic temperatures. Ice causes blockages and can lead to tremendous down time. Moisture can inadvertently enter the dosing system in various ways including splashing product, system cleaning, or from the environment. It is extremely important to be aware of this and prevent moisture from entering or accumulating in the dosing system.

2. How can moisture be prevented from entering the dosing system?

    a. When not in use, or being cleaned, cap the vent and the dosing head area.

    b. If the system will not be used for a short period of time it is helpful to keep some liquid in the dosing body to provide positive pressure at the vent preventing moisture from creeping in.

Nozzle use

Standard nozzles are single opening devices with diameters ranging from 0.020” to 0.110” in 0.005” increments. In addition to these devices, Chart provides a range of specialty nozzles in our “Soft Dose” packages. These nozzles include: Ventilator, Regar, Diverging, Converging, Angle and Hot Chute.

- Where to use - There is no set standard that identifies a specific nozzle for a product. Each product, product line, and requirement will lead towards defining the type of nozzle(s) used. In general, standard single opening nozzles are used in the vast majority of liquids; such as water, teas, coffees and beers. They are also used with dry goods such as peanuts and almonds. The same nozzles can be used for both pressurization or inerting (oxygen reduction).

- Soft dose nozzles may also be used for pressurization or inerting. The use of these nozzles may provide added benefits such as less spray for products that can tend to be ejected from their container if a single hole nozzle is used. Powder or granulated products such as ground spices, ground coffee, teas, or even baby formula are examples of susceptible products.

- Soft dose nozzles such as the “Regar” nozzle have a shower head spray pattern that can be used to diffuse slightly to minimize product ejection. In addition, this particular nozzle has a wide spray pattern making it suitable for larger opening containers.

- The Hot Chute is a unique soft dose product. This device utilizes a standard nozzle but also incorporates a set of heating elements and nose extension allowing access to some locations where a standard dosing head may not be able to reach into a small space. The added heating elements diffuse the nitrogen stream causing it to become more of a mist which also minimizes product expulsion.

Sensors

The Chart dosing systems typically utilize three sensors for high speed operation. Lower speed lines or manual operated lines can operate on just one sensor.

1. Sensors provided for Chart dosing systems are as follows:

    Timing
    Container detect
    Speed
    Encoder

- Timing - typically an inductive proximity device. This sensor will provide a pulse identifying a start time where a container has been detected. This sensor is suitable for detecting on any metal object such as a gear tooth or shaft collar bolt. This sensor is typically a barrel type and comes in three different diameters: 13mm, 18mm and 30mm. Sensing distances are approximately as follows:

  13mm dia. = 2mm (0.08 in.)
  18mm dia. = 4mm (0.2 in.)
  30mm dia. = 7-8mm (0.3 in.)

- Container detect (Pack Premier Only) - Typically a photo-electric device. This sensor will provide a signal identifying an approaching container. It is capable of detecting virtually any type of object that is placed within its sensing distance, therefore good for cans, bottles, pouches of all shapes, sizes and colors. The sensing distance may vary based upon the manufacturer of the sensor but it typically has a range of approximately 4 inches (10cm).

  The sensor is typically a barrel type and is provided in an 18mm diameter.

  The sensor is typically placed at or near the dosing head. It also serves the purpose of nozzle cooling when placed at some short distance in front of the dosing head. This feature can be very important when the filler tends to sit idle with no containers passing for short periods of time.

  As the system sits without dosing, the dosing head heats up which results in the next dose (or couple of doses) being slightly warmer and therefore more gaseous. This will result in lower pressure in the first few containers.

- Speed Sensor - Typically an inductive proximity device, this sensor will provide pulses to the PLC to identify line speed. In addition, the number of pulses per container will determine the accuracy of the dosing unit.

Note: *A sensor can typically only provide a limited number of pulses. For greater accuracy, especially at high speeds, an encoder is to be used. See next bullet.*

- Encoder - this device provides an input to the interface box but unlike the other two sensing devices that provide only one pulse — or limited pulses — each time it is triggered, this device provides hundreds or even thousands of pulses. The device can be programmed to output up to the maximum capability of the device (65,000 pulses per shaft revolution). Considering the standard pulses necessary for high speed dosing is about 500 pulses per container, this encoder is capable of many more than needed to perform optimally.

How much LN_2 is needed?

Identifying the right amount of liquid can be challenging. Some trial and error is commonplace. However, there are a couple of ways to minimize the number of trial and error situations.

1. Use the largest nozzle and lower the dose duration. It is much easier to punch a button rather than removing a nozzle so the fewer number of times a nozzle is to be removed, the better. Start with a larger nozzle size than you think is necessary and run a shorter dose duration than what is probably needed. Test to see what the pressure or oxygen level is and increase the duration until a desirable result is achieved.

2. Use a continuous stream as a starting point. Targeting a small opening can also be challenging. However, if a continuous stream is used initially it can then be reasoned that the nozzle size is correct. The second half of this test is to then "shorten" the stream. In other words target the stream to start and stop within the opening.

3. Semi-continuous stream - a trick to use when targeting is more difficult due to erratic conveyor movement, environment issues, poor sensing or sensor susceptibility is to start and stop the stream before and after each container. Set the dose early (starting just before the container gets under the dosing head) and end it just after the container has passed.

4. How do you know if you're hitting the target? Two simple techniques:

   - Look for the "smoke" out of the container
   - Feel test

   Is the smoke good enough? Depending on your specification and/or requirement more or less nitrogen may be needed. Once smoke is seen, a measurement is taken (pressure or oxygen levels). That measurement can then be used to determine whether more or less nitrogen is needed. Increase the dose duration. If the pressure goes up, the initial target was fairly accurate. If it stays the same, then the initial target was a bit late and the added dose duration just placed nitrogen into the space after the container has passed. In this case move the targeting sensor so it triggers sooner.

   What about oxygen content? This will require an oxygen meter or tester. Oxygen measurements can be even trickier.

Dosing Containers

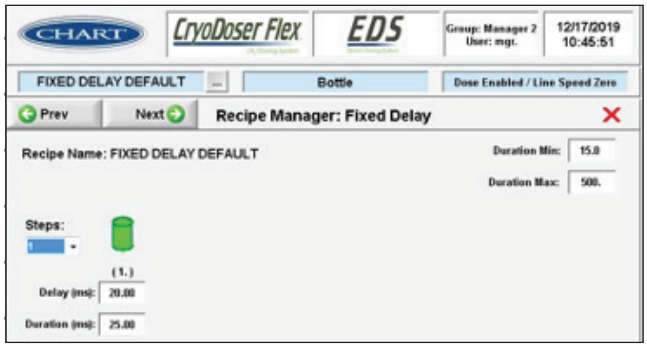
This section outlines the steps needed to dose a container. Fixed delay will be described first followed by ExacTrack. This section assumes the following:

- The doser has been properly positioned within the filler or on a suitable stand
- All sensors have been set in place
- The initial Set-Up has been properly conducted
- The dosing body has been purged
- The user has understood how to set up and load a recipe
- A nozzle has been placed in the dosing head
- The dosing body has been filled with LN_2

Fixed Delay Dose

Fixed Delay is a simple application and requires only one sensor. This recipe must assume a rotary filler, run at a constant speed. It is also assumed that by definition, a rotary filler will fill, and seal each container with no difference in wait time between filling and sealing each container.

- The recipe will only need one step (a step = one container)
- The filler is run at speed to identify that the timing sensor has sensed the next available container
- Ensure the dose enable button on the Controller front is pulled out (lighted blue)
- Run a set of containers and determine if the dose is before, after, or in each container
- Adjust the dose until it is seen that the dose is within the container

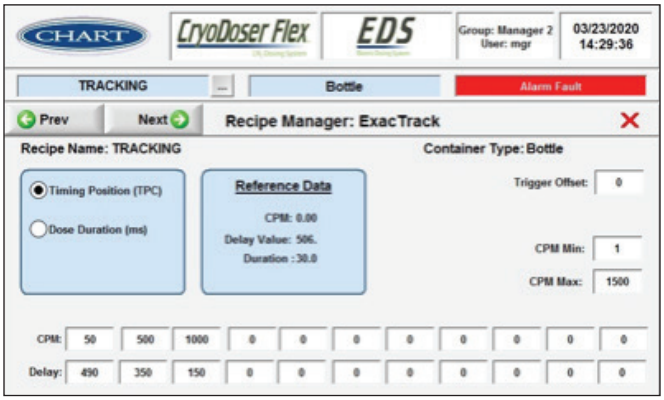


Note: *Once the dose timing has been achieved (dose is in the container) dose duration and nozzle must then be adjusted to arrive at a desirable pressure and/or oxygen level.*

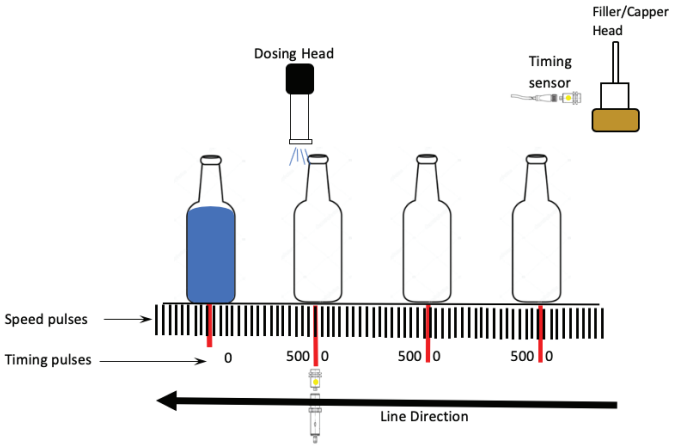
ExacTrack Dose

ExacTrack works based on having multiple pulses per container for accurate timing and dose resolution to compensate for line speed changes or ramping up/down. An ExacTrack recipe must therefore be set up with different delays based upon the filler speeds.

In the figure shown below the recipe includes three variables; speed (cpm), delay (timing position TPC), and duration. The speed is a relatively easy parameter to determine; there are typically speed ranges from zero to the maximum speed. These ranges include; jog, slow, intermediate, fast or max. speed and each may be included in the ten blocks or random speed increases may be included as shown in the recipe below. For additional information see the recipe section in this manual.



How do you arrive at the proper delay? As shown in the example above, the delays decrease and the speed increases. A delay from the time the timing sensor senses the next container will decrease as the speed increases.



To understand how ExacTrack functions we must define how the timing and speed pulses work together.

The timing pulse provides 1 pulse per container. Within each timing pulse the dosing system uses a series of delay pulses; the total number of pulses equals 500. (This setting

is for line speed only). When the timing pulse is set it also resets the Delay pulses so that there are always 500 between containers.

To provide maximum amount of time between containers the timing sensor should be positioned so it is activated just prior to the container reaching the dosing head. Since there are 500 pulses between containers and if the sensor is placed so that there is maximum distance to the next container a good supposition would be that the timing pulse is close to the 500 speed pulse location. That number may be 490 for example. This is the starting point at zero speed. As the speed increases the delay numbers will then decrease.

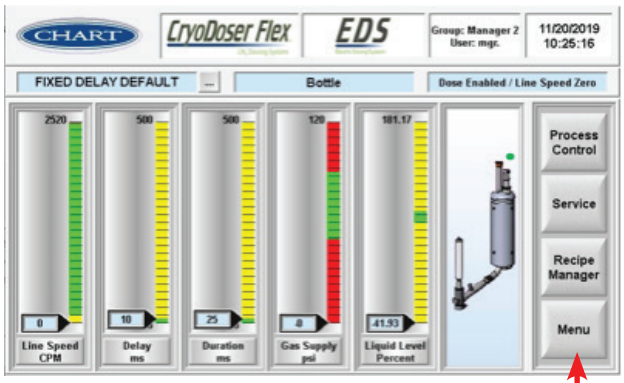
Notice that the delay numbers decrease as the speed increases. Once the slowest speed is set all other delay settings are determined by the operation of the filler, for example a filler with a blow molder attached it will only run a set speed and possibly a half speed to run out remaining containers. So, in this situation the next setting would be its full speed and the delay required to dose into the container. In between these two set points the controller will automatically adjust the delay according to the line speed.

However, if there are step changes or speed changes due to build back function in the filler speed this can mean inputting more delay settings into the controller going up from 0 to its max speed as in the screen shot previous. This will give you the ability to fine tune the dose at these set speeds to optimize the dosing process.

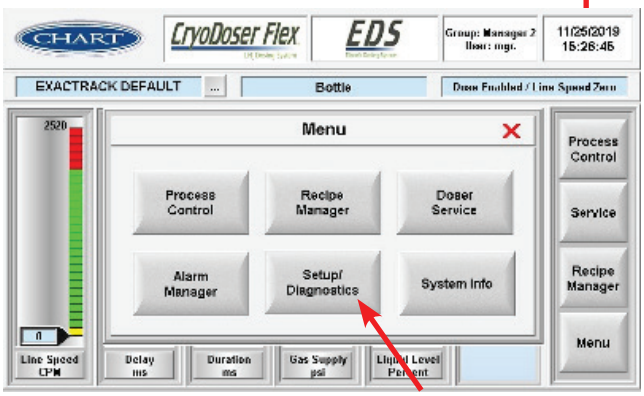
Controller Setup

Logging In

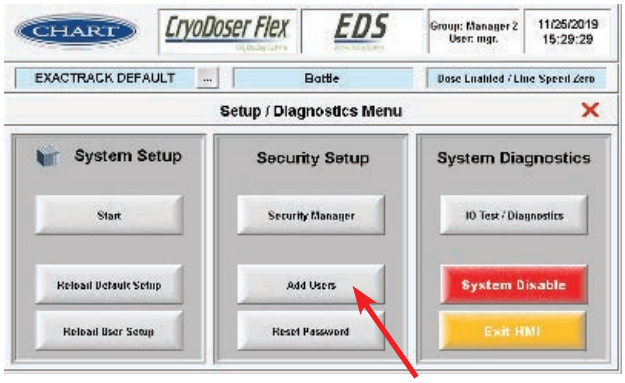
After logging in using the generic Group and User, a new password and levels can now be added.



Press Menu to bring up the Menu Screen.



Press setup/Diagnostics

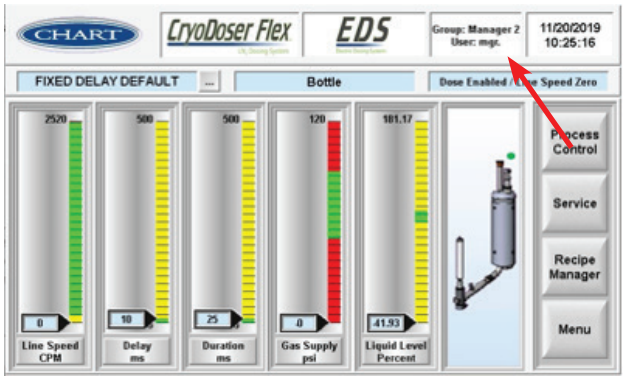


Press Add Users to add and allow a new person to access screen functions

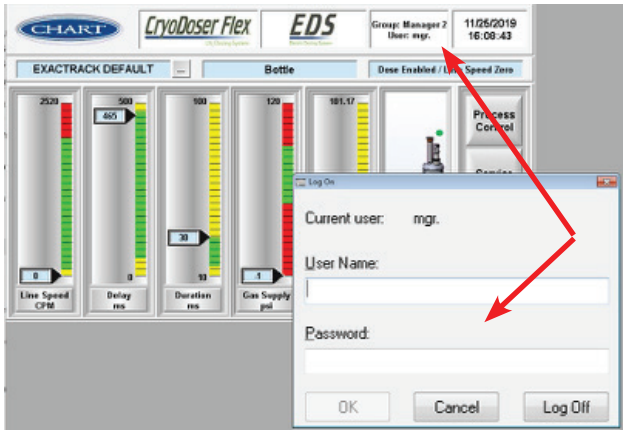
At the New User dialog box, determine the type of access the new user will be allowed to have.

This is done in the Group section. Options range from Guest to Manager 2. Many users can be placed in each group. For maximum access Manager 1 or Manager 2 can be chosen.

When complete, press Create User then Exit. Next, check to see if the new user appears as a valid user



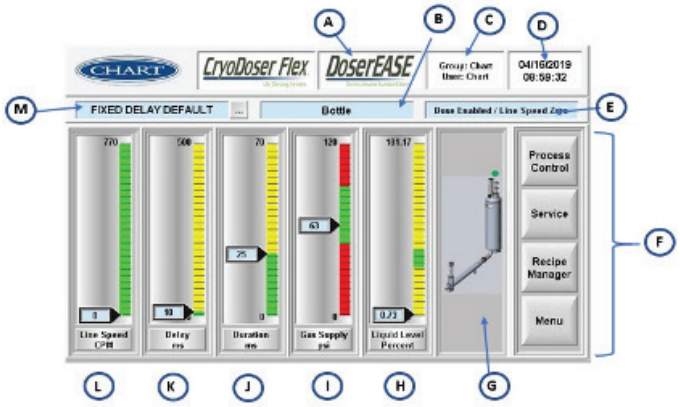
Press the Group/User field



Enter the new user and password that was previously created and check to see if they appear in the Group/User field.

Main Screen

The Main screen of the Pack Premier Controller provides general system information and at a glance status of the current application.



A – This field describes the type of actuator the system has been configured.

B – User defined container type is shown in this field. This information is entered as part of a recipe

C – Groups and User is the Pack Premier password system that is user defined in the log-in screen. This field identifies who is logged in and which level of access that person has been given.

D – General date and time information can be set as 12 or 24 hour clock

E – Field provides current status of the system and can also show alarm conditions

F – Button set to navigate to other screens

G – Model of doser provides a quick status as to readiness of the doser. Green equals ready

H – Bar graph shows liquid level within the dosing body

I - Bar graph shows the gas inlet pressure availability

J – Bar graph shows the dose duration of the current recipe

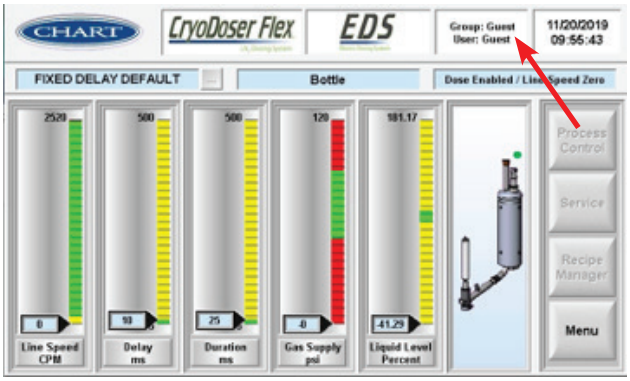
K – Bar graph shows the dose delay of the current recipe

L – Bar graph shows the current line speed of the filler

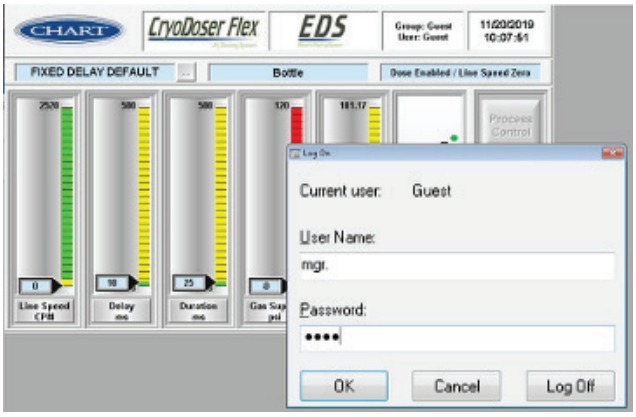
M – Field shows the current recipe being run

First Time Set Up

On power up a user must first log in to access any information. Guest log-in will not allow any further access to other screens.

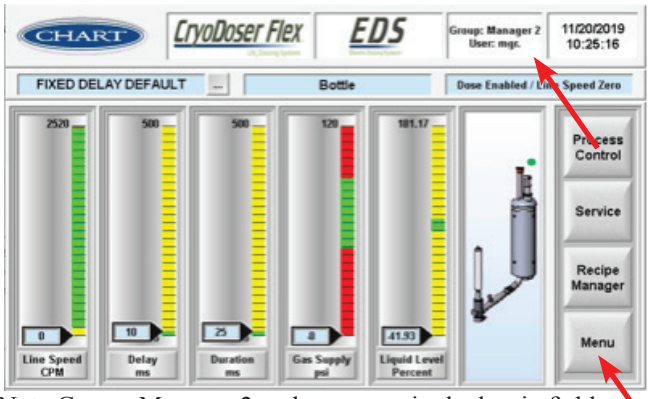


A generic log-in has been created to allow initial access including creating other users and groups. Click on the Groups/User field to log in.



When the log-in box appears, input the default username “mgr.” (Note the period at the end). The default password is “1234”. Enter, then click OK.

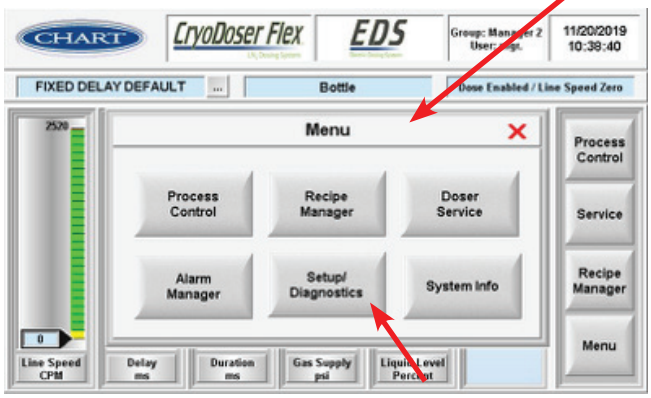
Note: *This user and password may be deleted once a different user and password have been created. For more information, see section on creating users, groups and log-in passwords.*



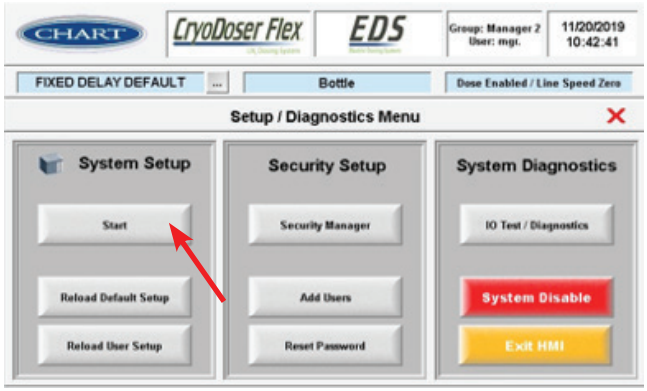
Note Group: Manager 2 and user mgr. in the log-in field. This level of user and group will allow for a new user(s) and group(S) to be set up.

Note: *See chapter on adding groups, users for additional instructions.*

Click the Menu button to bring up the Menu screen.

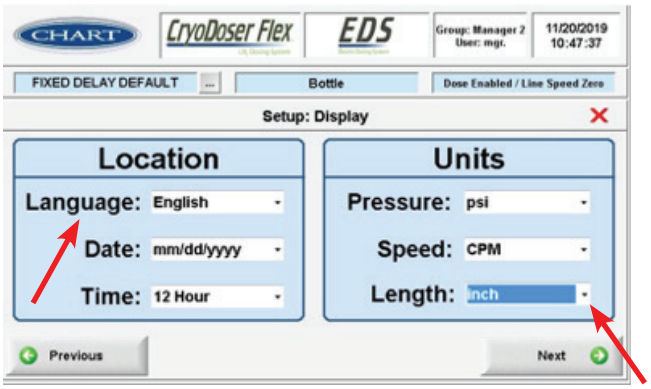


From here click the Setup/Diagnostics button.

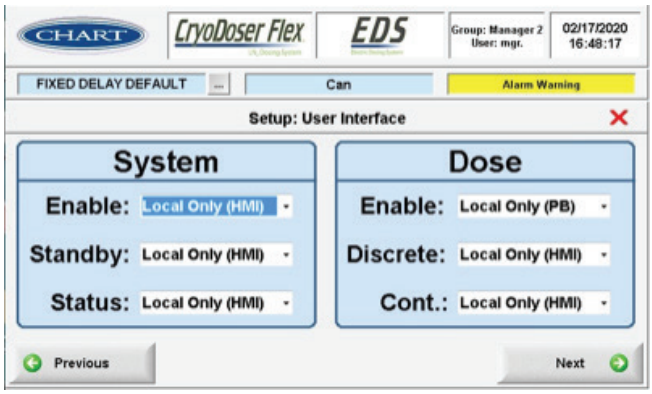


System setup is done first. Click the Start button to begin the setup.

This screen sets the parameters as shown (Date, Units, etc.) and can be set based on user preference. If there are no changes needed proceed to the next screen by pressing Next.



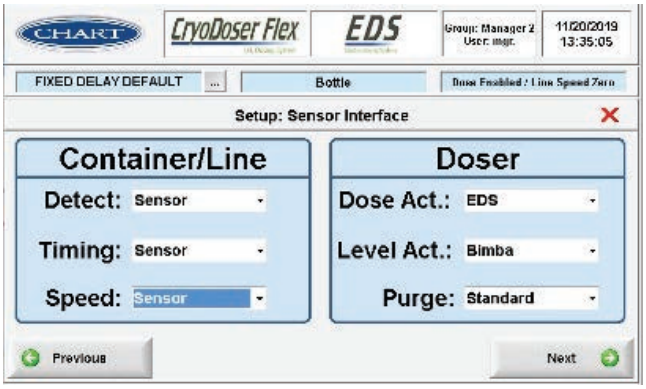
Additional languages are being added as the software translations take place. Units can be in metric or as shown here in Imperial (U.S.).



The User Interface Screen sets function controls.

Most systems will be controlled from the Chart controller and touch panel display. If so, these items are to be left as shown. Press Next when complete.

Note: *If an external control panel is to be used instead of the local panel each of the above must be individually set by selecting "User Input" from the pull down menu.*

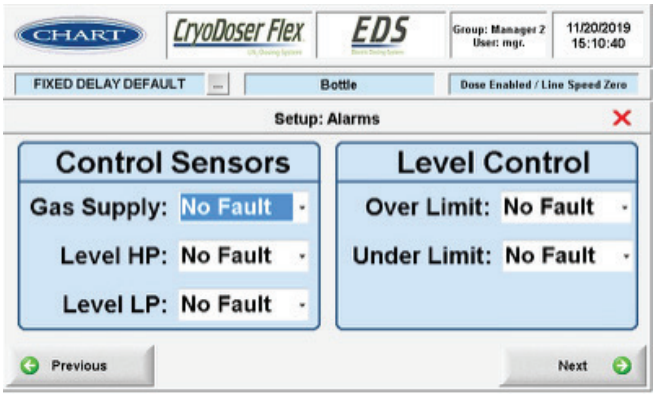


The Sensor Interface screen sets up sensors and other identified funcitons.

Most systems will receive signals from Chart supplied sensors and be controlled from the Chart touch panel display. If so, the items shown here may be left as is. If any of the signals for Container/Line will come from other than Chart sensors, click the pull-down arrow and select the "User Input".

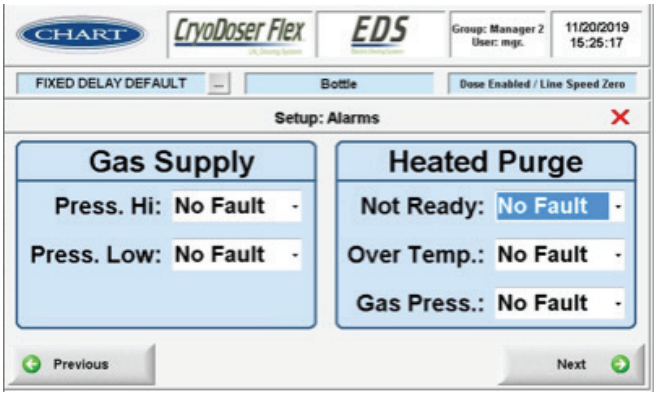
The actuators, and purge items will have already been configured when the system was built. No need to change unless any of these items were changed at the install facility.

Press Next when complete.

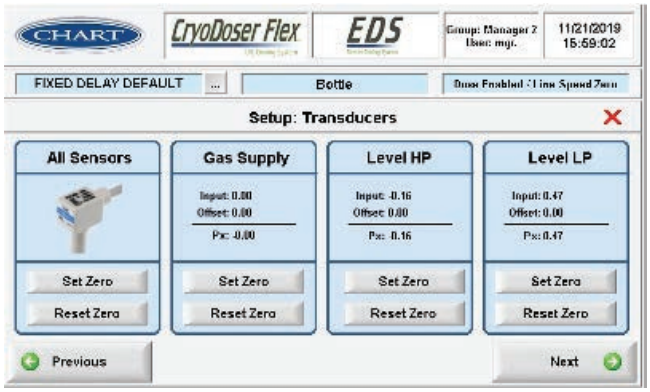


These screens set up alarms for the identified functions. Each function can be set as either No Fault, Warning, or Fault.

All items are default set to No Fault. No alarms will occur. An item set to No Fault will not show any alarm at all. Dome light will stay green. An item set to Warning will show a yellow light. An item set to Fault will show a red light.



Press Next when complete.



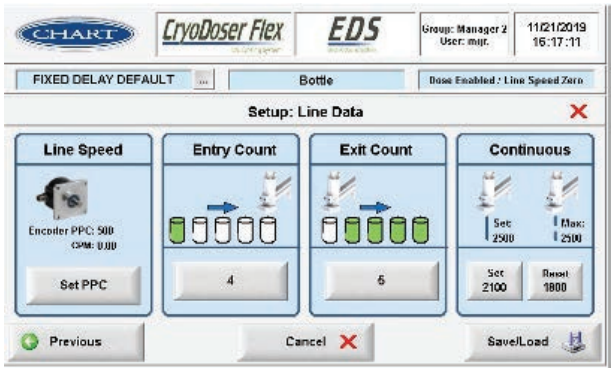
This screen sets up the transducers to read the liquid level in the doser body and the gas pressure for the inlet actuator.

Each transducer can be set individually though it is easiest to set them all at once. Press Set Zero to calibrate the sensors. See Caution below.

Click Next when complete.

Caution! ***It is critical that no pressure, gas or liquid be present when setting/calibrating these sensors. It is recommended that the user temporarily remove the clear plastic tube from the main gas inlet at the bottom of the Interface box. It may also be helpful to remove both the high-pressure tube (red) and low- pressure tube (blue) from the top of the Interface box to ensure no residual pressure is present within the dosing unit.***

Note: *Any residual liquid nitrogen in the dosing body will affect the sensor calibration. Should any sensor need re-calibration, the body must be completely dry prior to re-calibrating.*



The Line Data screen sets up various parameters as shown.

If an encoder is to be used, the PPC or Pulses per Container can be defined here. The default setting is 500 PPC. Adjust this PPC to match the filler speed.

Entry and exit count adjust how many pockets are sensed before the dose begins and how many doses at the end of a series of containers are dosed.

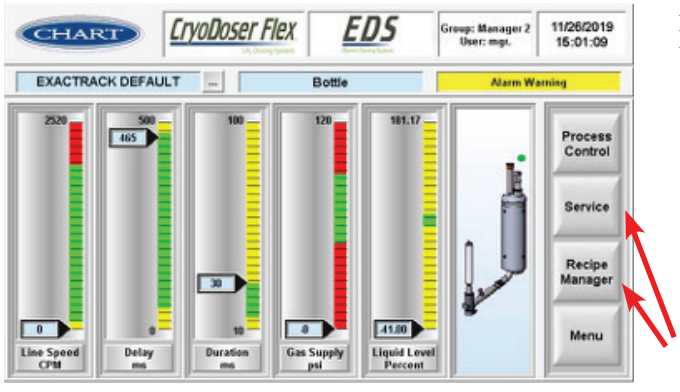
Set the continuous and discrete dosing values. Depending on container opening size and line speed it may be practical to set a speed at which the line switches from an individual container dose to a constant stream of liquid nitrogen. Default numbers may be set here and are dependent on the type of dosing head you have selected earlier in the setup screen.

When complete, press Save/Load and all screen items will be saved as previously selected.

Purging: Set-Up and How to

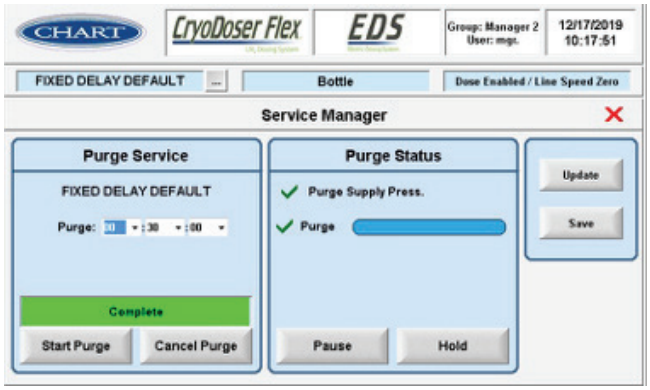
Moisture of any type will turn to ice if it comes in contact with liquid nitrogen. It is critical that a dosing body be free of any moisture prior to introducing liquid nitrogen into it. Purging is the process used to deliver nitrogen gas into the system to assist in drying and/or wicking out any residual moisture. The CD FleX product provides an automated and semi-automatic process to purge moisture from the dosing system.

The best strategy against a frozen system is to purge regularly; before beginning a fill, when idle, when changing nozzles, and prior to shut-down. A routine purging process must be established to ensure the dosing system remains as free of moisture as possible. If there is a question about a specific situation please contact Chart Service for instructions and/or direction: 408-371-4932.



Purging the system is located in the Service function or as part of a Recipe. (See Recipe section for details).

The simplest way to purge is through the Service Manager Screen. Press the Service Button to proceed to the Service Manager Screen.



The Service Manager is a semi-automatic operation requiring the specific purge time to be entered.

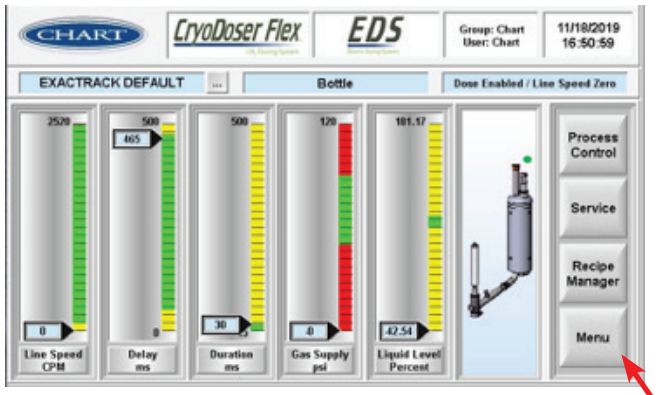
This purge time may be kept constant if it is working well otherwise, if a different purge time is needed, it must be entered each time and individually saved.

To activate, set the purge time in hours, minutes and even seconds if desired and press Start Purge. Press Update and Save to keep this purge time.

Recipes – Fixed Delay

The Cryodoser FleX system is recipe based. A system will not run without a recipe. A number of default recipes have been provided though they may not be optimum for a specific customer product and application so a new recipe should be created. This section describes how to create a recipe, load a recipe and what a recipe consists of. To run a recipe see "Dosing Containers" in the physical set up section of this manual.

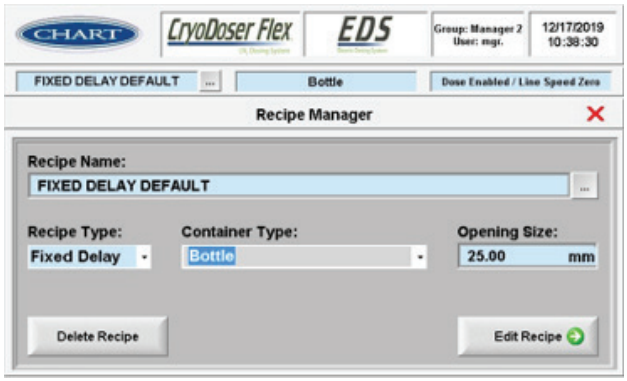
There are two types of dosing recipes; Fixed delay and "ExacTrack". Fixed delay is a simple version that provides for a delay time and an actuator duration. The duration time will determine how much LN2 is being delivered to the use point/container. ExacTrack allows for greater accuracy and provides speed compensation.



To begin, select the Recipe Manager Button from the main screen.

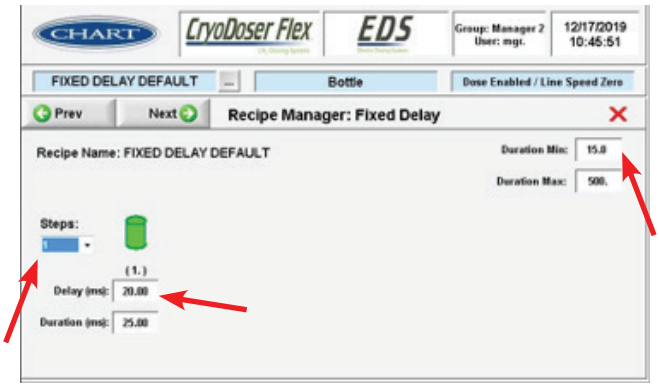
From the Recipe Manager screen, selecting the Recipe Name field will bring up a keyboard that will allow for a new recipe to be created. When the name is highlighted a new recipe can be entered.

Note: *The recipe name must be followed by ".DAT" for the system to recognize the name. The ".DAT" will not appear on the front of screen recipe name.*



The new recipe will show on the field. The recipe type will stay as a Fixed Delay. User can provide a container type for reference and a container opening size.

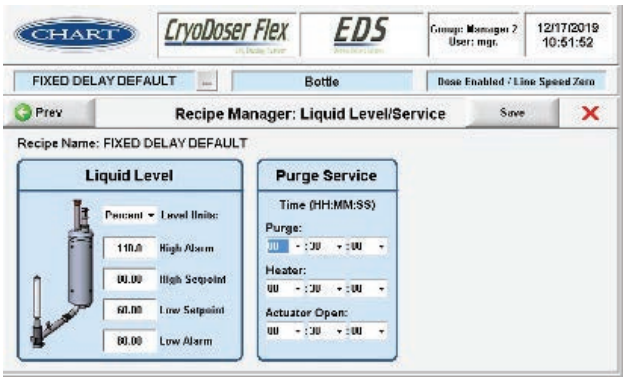
When complete press the Edit Recipe button to continue the recipe update.



The fixed delay recipe has the option of dosing between 1 and 10 containers (steps).

Each container (step) can have a different dose duration and/ or delay if needed. For rotary type fillers only one step is typically necessary.

A minimum and maximum duration time can be set as part of the recipe on this same page. When complete press the next button to continue the recipe update.

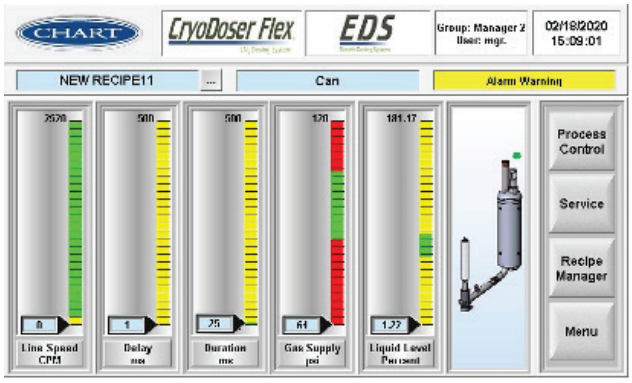


The last two steps finishing up a Fixed Delay recipe have to do with setting liquid level and recipe purge.

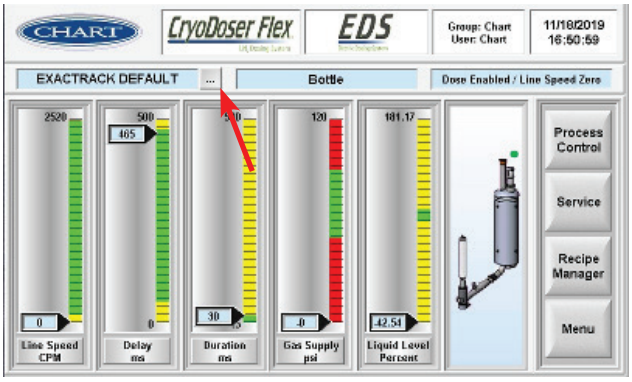
Set the level in percent (easiest) or choose a different set of units. The high setpoint is the maximum fill level of the doser. Low setpoint is the minimum fill level at which the inlet valve re-opens to top up the doser back to the high setpoint. Assign an alarm setpoint based upon your percentage filled or empty.

The high alarm is the point at which the system will go into alarm indicating "liquid level high". This will not prevent or stop the doser from working.

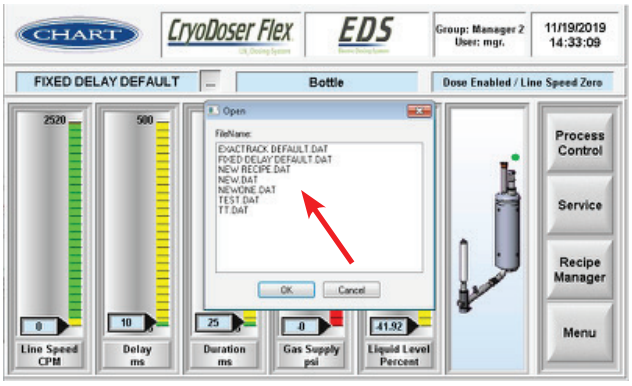
As a final feature, set the purge time including heated purge and should the actuator be open or closed.



Press Save to end this recipe then exit to the main screen.



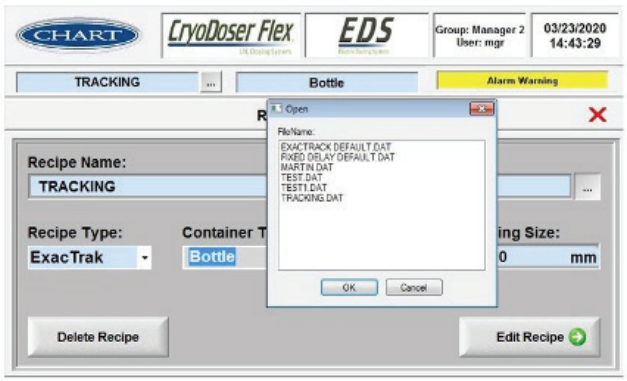
To recall the recipe from the main- screen select the square to the right of the recipe name. This opens a pop-up field with all current and previous recipes.



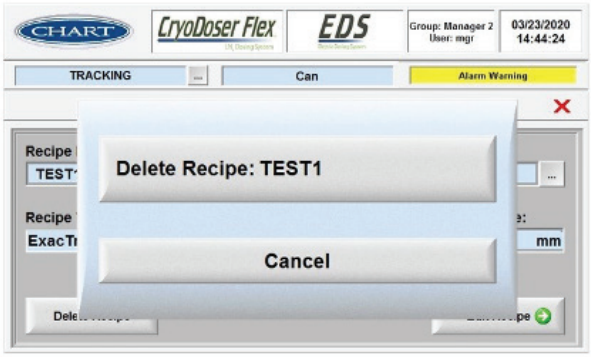
Select the desired recipe and click OK.

Note: *If a recipe was created and does not appear it is probable that the ".DAT" was not added after the recipe name. Repeat the recipe steps and ensure the ".DAT" has been added.*

Select the load recipe button and the recipe name will appear in the recipe field. All parameters that were entered previously are ready to be used.



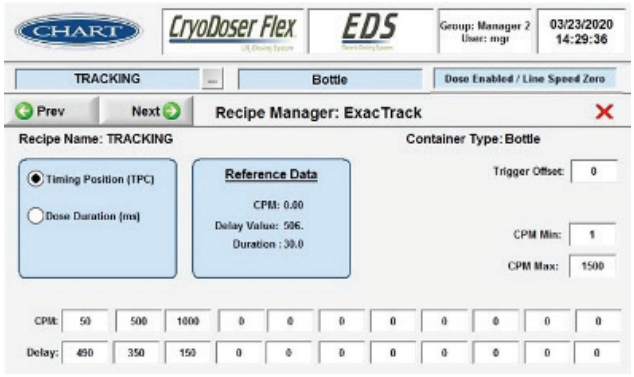
To delete a recipe from the menu, press the delete recipe button and the recipe dialog box will appear. Select recipe to be deleted.



Confirm the recipe and press the delete recipe button if correct.

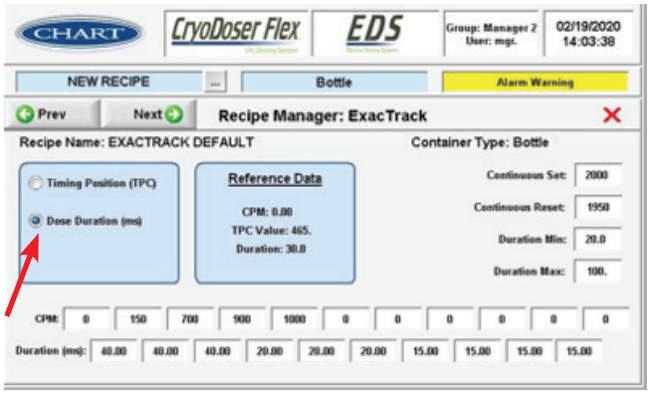
Recipes – Exactrack

The previous recipe section described a fixed delay recipe. Exactrack recipes start out in similar fashion but have additional information to complete the recipe. To set an ExacTrack recipe you must select "ExacTrack" in the recipe type drop-down box.



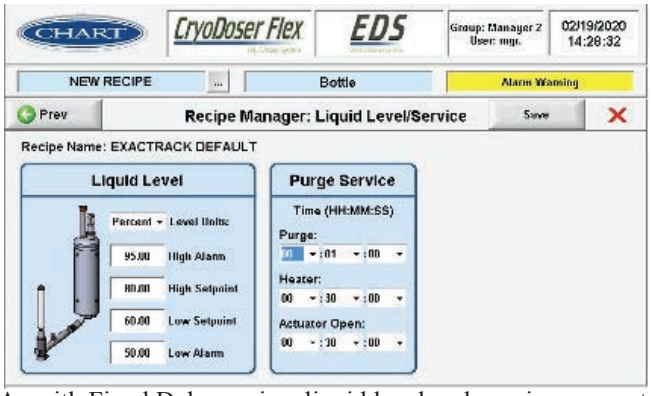
From Recipe Manager the Exactrack default recipe is selected bringing up the Exactrack recipe

User can select the minimum and maximum speeds, trigger offset, speed ranges (CPM – containers per minute) and delay.



Dose duration for each speed range can be set by pressing the dose duration button on the page.

As part of this recipe other parameters can be added including; dose duration per speed range, general duration minimum and maximum, and continuous stream set points.

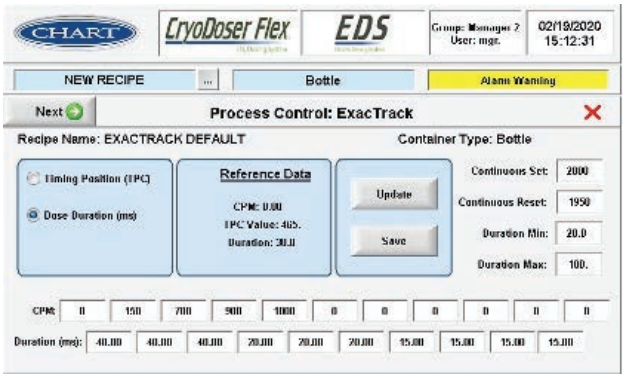


As with Fixed Delay recipe, liquid level and purging are part of Exactrack recipes.

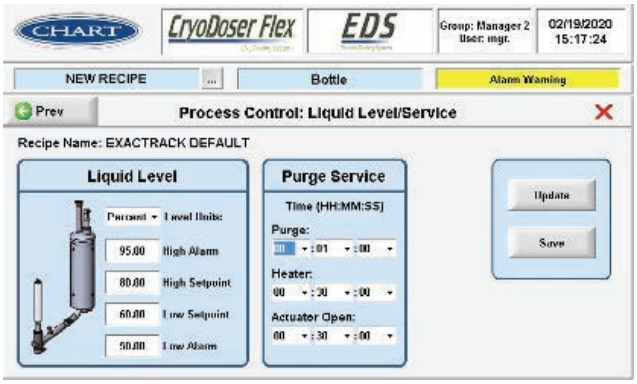
Press Save when complete.

Process Control

The Process Control Screens are very similar to the recipe screens. Process Control allows a user to modify parameters and settings without affecting a recipe. Process Control can be performed on any recipe Fixed Delay or Exactrack. Depending on the User group, these changes may or may not be able to be saved. To see which groupscan make changes please see the section for creating users.



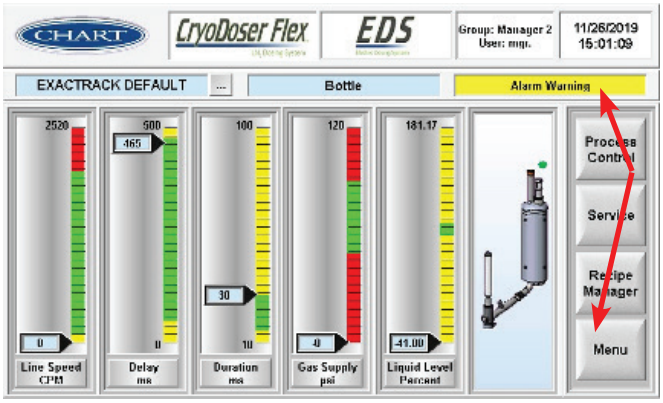
The process control screen acts very much like the recipe screens providing timing position, and dose duration information for each speed range. The “recipe” that is being evaluated can be modified in real-time by pressing the Update button. However, the recipe will not premanently change unless the user wishes to do so by pressing the Save button (user dependent).



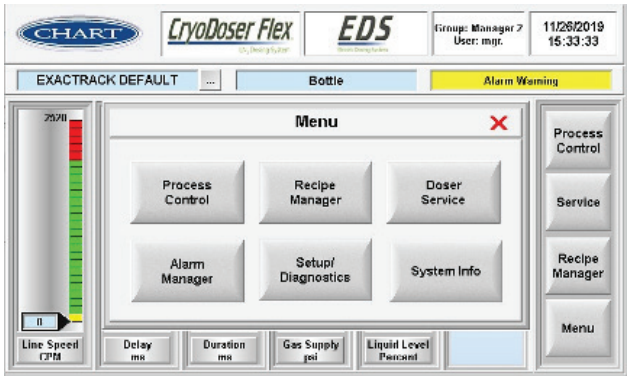
The same process is applicable to the liquid level and purge settings.

Press Update to modify the process in real-time or Save to save the updated process to the running recipe. (User dependent).

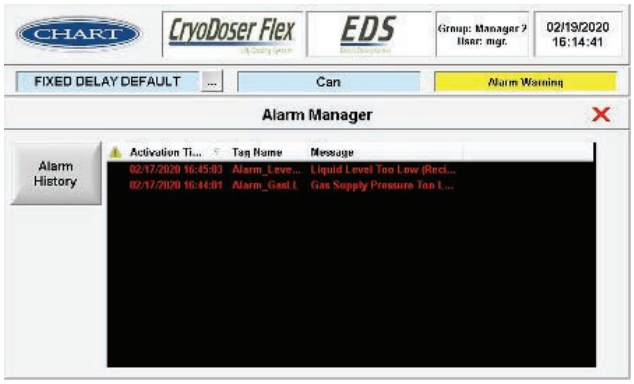
Alarm Manager



The Alarm Manager can be found from the main screen by first pressing the Menu button or the alarm banner.



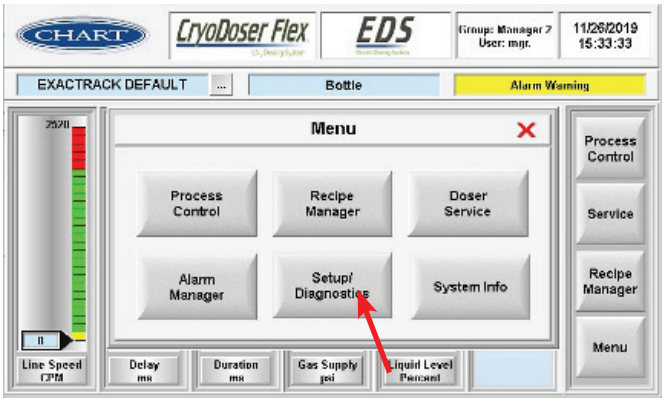
The Alarm Manager button then calls for the Alarm Manager.



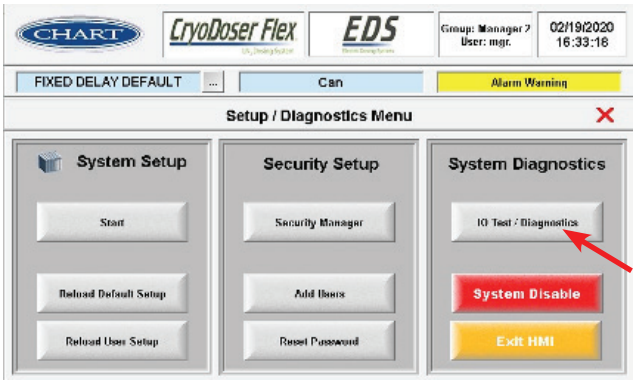
From the Alarm Manager screen the alarms are red based on the parameters chosen when setting alarms during initial set-up.

Alarms are kept in the Alarm manager screen until the alarm is reset or the condition is cleared. Alarm History keeps alarms for extended periods to allow a user to check if a condition can be seen as a problem.

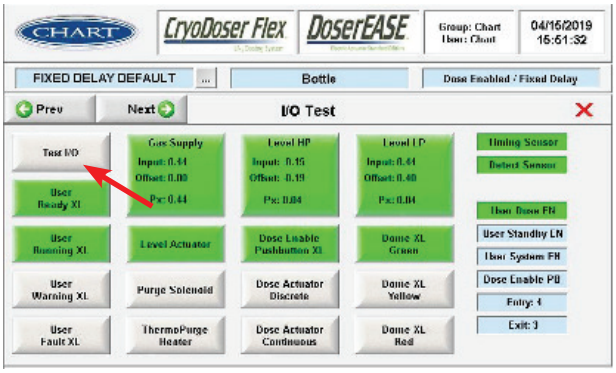
System Diagnostics



From the Menu screen select Setup/Diagnostic button.

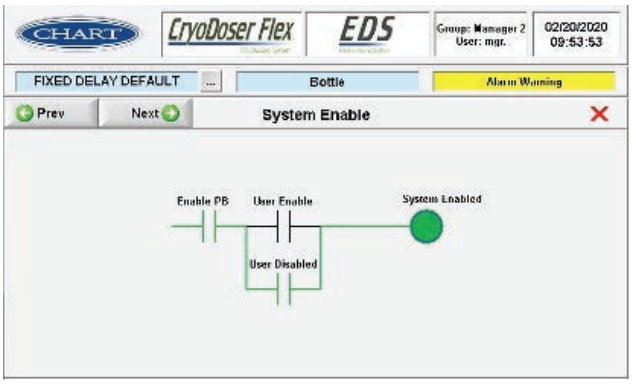


Select IO Test/Diagnostics.

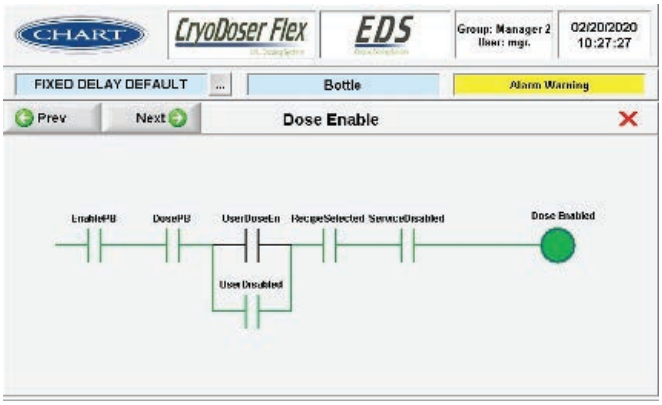


I/O Test allows for testing of all individual components of the system. Green status of the buttons show that the assigned function is active. Pressing Test I/O in the upper left starts the manual operation of the selected function.

Note: *Pressing Test I/O eliminates all automatic operations of the dosing system. Before exiting the Test I/O screen ensure the Test I/O button is not depressed so control of the dosing system can be returned to normal operation.*

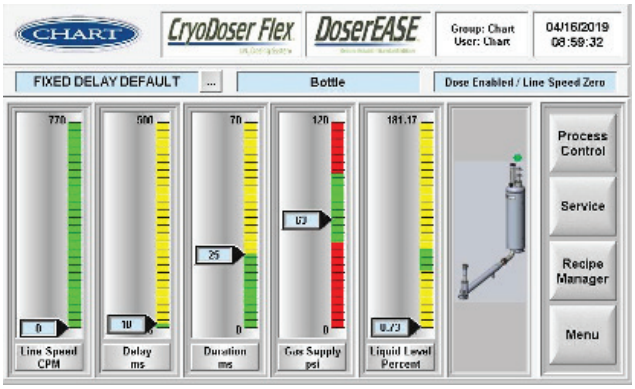


Pressing the Next button opens the System Enable Screen which provides a ladder logic representation of the system.

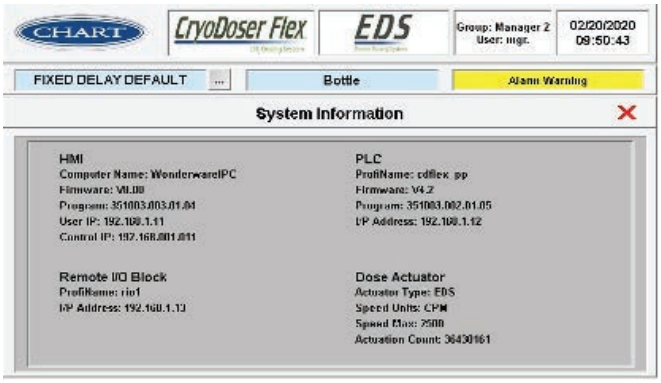


Pressing the Next button then opens the Dose Enable Screen also showing a ladder logic representation. Green ladder resulting in a Green Dose Enable identifies that the dosing is functioning normally.

System Info



System Info provides basic information about some of the hardward and software used in the Pack Premier Controller. Press the Menu button for the Menu Screen and then press System Info.



This information may be extremely critical should it be necessary to provide detail about the overall system for customer service or support.

FAQ's

1. When should I purge?
   a. Purging really depends on the situation and too many variables however, to keep the dosing system functioning properly it's recommended that routine purging is done and generally if the system has been off and not running a quick purge to see if there is any moisture in the dosing head will be sufficient.
2. How long do I purge?
   a. Start with a few minutes if no moisture is seen. If moisture is felt, keep purging until there is no more moisture. When in doubt keep going.
3. My heater is frosting up. How do I fix that?
   a. The heater itself may be working but there is enough cold running through it that it is not providing enough heat to keep the frost off. As long as the frost is not interfering with the dosing or the frost is enough to fall into product then continue to operate as normal. If the frost gets too great the system must be allowed to warm up and let the heater catch up.
4. Which nozzle should I use?
   a. Single opening nozzles (from 0.020" dia. To 0.100" dia.) should be used as large as possible as long as the result does not exceed customer requirement. The limitation is the maximum time over the container. The largest nozzle that will yield a good result should be used as it is easier to reduce dose duration time from the display (HMI) rather than change nozzles if more or less is needed.

5. When would I use a soft dose nozzle?

    a. Typically, the application will dictate the type of nozzle. “Soft Dose” nozzles do what the name implies, softens the dose. This is very much needed when the product being dosed requires much less pressure to ensure the product remains in the container and is not blown out when being dosed. Products such as powders, or ground coffee, or hot filled liquids tend to react better when being soft dosed.

6. Which Sensor should I use?

    a. This question depends on the application of the sensor. See section on sensors for specific sensor uses. In general, for container detect the 18mm Inductive proximity sensor or photo-electric may be considered. For timing; the 12mm inductive proximity should be considered.

7. How much dose should I put into each container?

    a. The amount of dose or volume of LN2 into each container depends of the nozzle size and the amount to time the actuator stays open. Both are controlled by the user. The actual amount to be used is then dependent on a customer defined solution for pressure or oxygen content and must involve experimenting with both variables.

System Components

No.	Part Number	Description	Comments
1	35000	CryoDoser FleX Body	Body only. No Fittings
2	35054	Mounting Bracket	Delrin Mounts and Screws
3	35055	Heater Assy. Dosing Head	With 10W heater cartridge, o-rings & cable
4	35055.03	Heater Cartridge, 10W	
5	2840.113.02	Cable, Dosing Heater, 1.5M	
6	35056	Heater Assy., Vent	With 15W heater cartridge, o-rings & cable
7	35055.04	Heater Cartridge, 15W	
8	2840.113.01	Cable, Vent Heater, 0.4M	
9	35066	Interface Box	With mounting clamps
10	35063	Control Box	With mounting flanges
11	9640	Actuator, EP Head	With cable
12	9641	Actuator, EP Head	No Cable
13	35058	Actuator, EASE Electric	Includes hardware, fittings, o-ring
14	9650.S	Actuator, EASE Electric	Actuator only
15	2840.902.01	Cable Actuator, 1.5M	For both EASE & EP head
16	35050	Short Arm	With clamp and gasket
17	35061	Long Arm	With clamp and gasket
18	35067.003	Sensor Kit, Photo-electric (18mm)	Includes mounting hardware and cable
19	2870.10	Sensor, 18mm Photo-electric	
20	581	Bracket, 18mm Sensor	
21	35067.006	Sensor Kit, Ind. Prox. (18mm)	Includes mounting hardware and cable
22	757	Sensor, 18mm Ind. Prox.	
23	694	Sensor Support, (18mm)	
24	35067.004	Sensor Kit, Ind. Prox. (12mm)	Includes mounting hardware and cable
25	2807	Sensor 12 mm Inductive Prox.	
26	2779	12mm Sensor Bracket	
27	584	12mm Sensor Support	
28	35067.005	Sensor Kit, Ind. Prox. (30mm)	Includes mounting hardware and cable
29	755	30mm Sensor	
30	2345	30mm Sensor Bracket	
31	2840.112.01	Cable, Sensor, 5M	
32	35067.002	Encoder Kit	Includes mounting flange and 5M cable
33	2870.08	Encoder	
34	2840.108	Cable DC Power 2M	Connection between Control and Interface Box
35	2840.122	Cable Ethernet, 2M	Connection between Control and Interface Box
36	410	Cable, AC Power Cord	With U.S. 110VAC plug
37	102, 103, 104	Nozzles; 0.060”, 0.040”, 0.050”	Dia. orifice openings
38	651P	Nozzles	Contact Chart for other nozzles sizes
39	C6208	626 Gasket	Arm or inlet feed
40	35098.105.02	SS Purge Fitting	Used on dosing head actuator
41	350010.0000.0001	SS Purge Fitting Check Valve	Used on dosing head actuator
42	123.S	Transfer Hose	10ft. Vacuum Jacketed hose
43	1008	Tube Fitting	1/4” to 8mm for gas connection
44	35068.101.01	Gas Tubing Kit	8mm clear, 6mm green, 4mm various colors
45	362	Nozzle Tool	Hex socket head for nozzle replacement
46	CR_108	Liquid Filter, SS	

Maintenance and Troubleshooting

General

The Cryodoser FleX system generally requires little maintenance. However following simple steps will keep the doser and components working effectivly for the life of the product.

1. Routine purging of the system to prevent or minimize moisture from entering the body or arm.

    a. Purging should be preformed prior to filling of the doser. A simple rule of thumb is to feel under the dosing head while pressing the purge button. If any liquid is felt the purge should be continued for an extended period of time. Typical purge times are 15min. if minimal moisture is felt up to an hour if there is considerable mositure.

    b. Purging should be performed if there is ice build-up in the dosing head

    c. Purging should be performed if there is ice build-up in the vent area

    d. Purging must be performed if there is so much frost in the dosing head that no liquid is coming out.

2. Servicing of the inlet filter. The stainless steel filter in the end of the fill hose or Y-Pattern valve should be removed and examined and flushed with nitrogen gas approximately once every year.

3. Servicing of the actuator(s)

    a. EP Actuator – This device will generally not require service. However, it does use a component that is subjected to movement and therefore wear and tear. If any difference in performance is noted Chart Service should be contacted before attempting any service function.

    b. EASE Actuator – This actuator uses an electric solenoid and a combination of springs and fittings to provide the dose function. Service of this component should only occur once a year and only a check of the dosing stem should be necessary. Contact Chart Service for instruction.

4. Pneumatic tubing – Loose fitting or worn tubing should be replaced anytime there is a reduced performance noted. Ensure tubing is not cut, or kinked, and reduced free flow of gas is being noticed.

Note: *Chart Service Hotline: +1-408-371-4932*

Troubleshooting

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

No.	Issue	Potential Solution	Solution !!	Misc.
1	LN2 leaking from head	Purge with gaseous nitrogen		
		Clean nozzle area	Potential debris in nozzle	Replace nozzle
2	LN2 leaking from vent	Check liquid feed pressure	Optimum inlet pressure 80psi	
		Check gas inlet valve tubes	See manual for correct configuration	
3	Doser will not fill	Check gas inlet valve tubes		
		Check Y-Pattern Valve	Ensure valve is open	
		Check inlet feed from liquid cylinder	Ensure valve is open	
		Check inlet gas source at Interface box	Ensure 60-80psi is available	
4	Heater(s) not working	Check connection	Ensure heater cartridge pins are not bent or broken	
		Remove heater from doser body and let sit connected	Determine if heater now heats	Heater may have been subjected to excessive cold. Replace.
5	Doser not dosing	Check the sensor inputs	System enabled?	
6	Nozzle is frosting	Run system purge		

Specifications

CryoDoser FleX TechSpecifications

Materials	Stainless Steel Series 316L
Weight	38 lbs (17 kg)
Body Dimensions	28.5”H x 6”W (724mm x 152 mm)
Dosing Head Dimensions	13.5”H x 2”W (338mm x 50.8mm)
Arm Reach Short - 20-1/2” Long - 27-1/2”	20-1/2” to 27-1/2” (521mm to 699mm)
Head Pressure	Variable
Nozzles	Ships with 0.040”, 0.050”, 0.060” 0.020” - 0.100” available (0.005” increments)
System Utilities	Liquid Nitrogen: 3-80 psi (0.2-8.3 bar) Gaseous Nitrogen: 60-80 psi (4.1-5.5 bar) Electricity: 110-240V AC; 50/60Hz, 110W
Steady State Consumption	0.04 gal (0.15 liter) / hour
Purge Feature	Yes
Vacuum Insulated	Yes
Arm	Yes
SoftDose™ Compatible	Yes

CryoDoser FleX Components

Standard Components

CryoDoser FleX Body

The stainless steel vacuum insulated reservoir provides a ready supply of LN_2 for dosing operations.

Controller

Controller dictates the dosing operation of the system.

Inlet Filter

A 10 micron stainless steel inlet filter is provided. The filter needs to be installed inside the male bayonet (of either the Y-Pattern valve or C-Flex hose) inserted into the CryoDoser FleX unit.

Bayonet Connection

The bayonet connection allows the C-Flex hose or vacuum insulated pipe to connect to the CryoDoser FleX unit. Bayonets are vacuum insulated and provide a warm, frost-free connection.

Mounting Bracket Assembly

The CryoDoser FleX unit is supplied with a mounting bracket assembly. The assembly consists of the bracket attaching to the CryoDoser FleX unit and two clamps. These clamps are designed to fit on Chart’s support stand or 1-1/2” stainless steel rod.

Dosing Head

The dosing head delivers the dose of LN_2.

Dosing Head Heater

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

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

Dosing Nozzle(s)

The size of the dosing nozzle directly affects the amount of LN_2 dosed. 0.040”, 0.050”, and 0.060” nozzles ship loose with the CryoDoser FleX system. Custom sizes may be ordered from Chart.

Vent Heater

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

Optional Components

C-Flex Hose

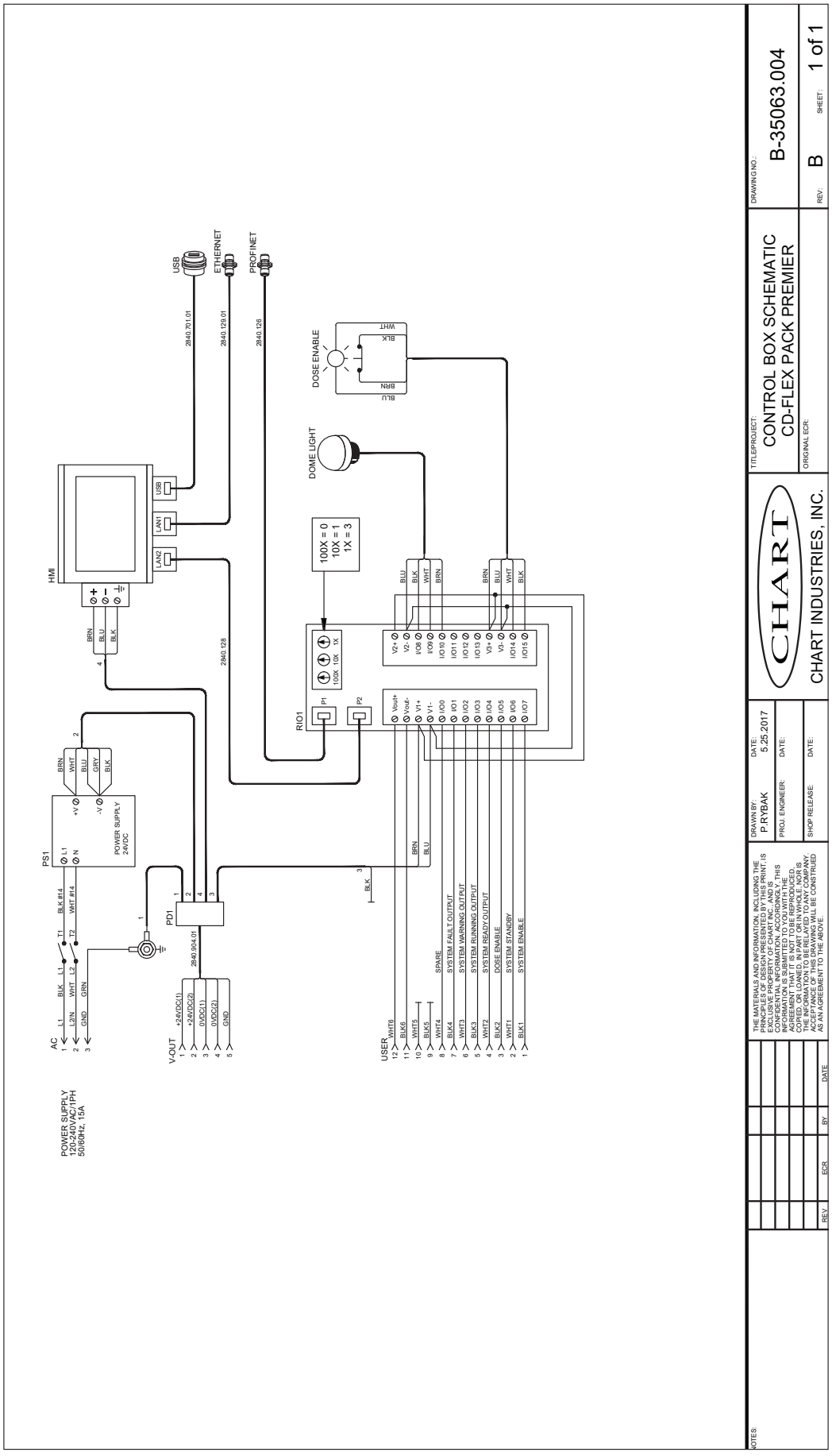
A vacuum insulated hose that provides a connection between the CryoDoser FleX unit and the LN_2 supply. The end of the bayonet has a 1/4” female pipe thread to accept the inlet filter.

Common Replacement Parts

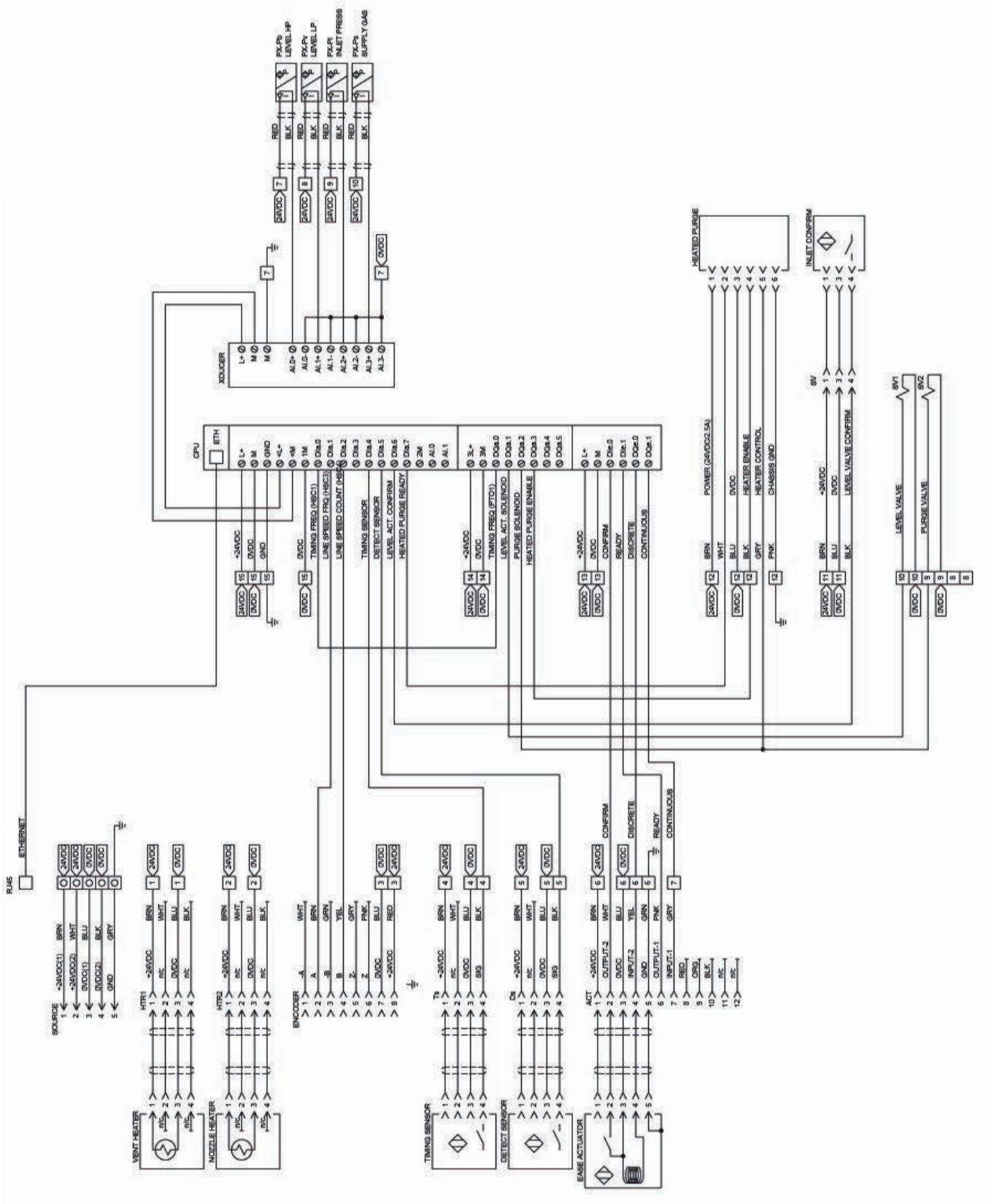
Item Number	Part Description	Part Number
1	CryoDoser FleX Body	35000
2	Short Arm	35050
3	Long Arm	35051 / 35061
5	EASE Electric Actuator	35058
6	Long Arm Support	35060
7	CryoDoser FleX Body Mounting Bracket	35054
8	Vent Heater Assy	35056
8a	10W Dosing Head Heater Cartridge	35055.03
9	Dosing Head Heater Assy	35055
10	Inlet Valve Assy	35057
11	Inductive Prox. Sensor Assy (Timing)	35067.004
12	Photoelectric Sensor Assy (Container)	35067.003
13	Encoder Assy	35067.002
14a	Control Box Assy PP	35063
15a	Interface Box Assy PP	35066
16	Doser Stand	119K
17	Doser Base	326A
18	Y-Pattern Valve	S6OMYCD
19	123 Fill Hose	123.S
20	10 Micron Inlet Filter	CR_108
21	AC Power Cord	410
22	Ethernet Cable	2840.122
23	DC Power Interconnect Cord	2840.108
24	Thermopurge Assy	35062
25	30mm Inductive Proximity Sensor Assy	35067.005
26	Sensor Cable(s)	2840.112.01
27	Encoder Cable	2840.903.01
28	Vent Heater Cable	2840.113.01
29	Dosing Head Heater Cable	2840.113.02
31	EASE Electric Actuator Cable	2840.902.01
32	Tubing Red, 4mm	35098.201.03
33	Tubing Blue, 4mm	35098.201.04
34	Tubing Yellow, 4mm	35098.201.05
35	Tubing Orange, 4mm	35098.201.08
36	Tubing Green, 6mm	35098.201.16
37	Tubing Clear, 8mm	35098.201.27
38	15W Vent Heater Cartridge	35055.04

Pack Premier Control Box Schematic

Pack Premier Interface Box



Schematic


PX-Pb LEVEL HP
PX-Pv LEVEL LP
PX-Pi INLET PRESS
PX-Ps SUPPLY GAS
XDUCER
CPU
ETH
HEATED PURGE
INLET CONFIRM
SV
SV1
SV2
LEVEL VALVE
PURGE VALVE
POWER (24VDC/2.5A)
HEATER ENABLE
HEATER CONTROL
CHASSIS GND
LEVEL VALVE CONFIRM
TIMING FREQ (HSC1)
LINE SPEED FRQ (HSC3)
LINE SPEED COUNT (HSC2)
TIMING SENSOR
DETECT SENSOR
LEVEL ACT. CONFIRM
HEATED PURGE READY
TIMING FREQ (PTO1)
LEVEL ACT. SOLENOID
PURGE SOLENOID
HEATED PURGE ENABLE
CONFIRM
READY
DISCRETE
CONTINUOUS
RJ45
ETHERNET
SOURCE
HTR1
HTR2
ENCODER
VENT HEATER
NOZZLE HEATER
TIMING SENSOR
DETECT SENSOR
EASE ACTUATOR

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 two (2) years after the date of shipment to the original purchaser said Chart manufactured LN_2 Dosing Systems will maintain all performance standards for said LN_2 Dosing Systems as published by Chart on the date of invoice. Warranty replacements due to vacuum loss will also follow the same warranty period and regulations.

Purchaser agrees that as a pre-condition to any Chart warranty obligation hereunder, purchaser shall fully inspect the LN_2 Dosing Systems immediately upon delivery to purchaser and shall give Chart written notice of any claim or purported defect within ten (10) days after receipt of the LN_2 Dosing Systems. As a further pre-condition to any Chart warranty obligation hereunder, purchaser shall return said purportedly defective LN_2 Dosing Systems, freight prepaid, to the plant of the manufacturer within thirty (30) days after receipt of the LN_2 Dosing Systems. Chart shall inspect the returned LN_2 Dosing Systems, and, if said LN_2 Dosing Systems is found defective, shall, at Chart's option as purchaser's sole and exclusive remedy, either (i) repair or replace such LN_2 Dosing Systems or any defective component or part thereof which proves to be defective, or (ii) refund the net purchase price paid by the original purchaser. Alterations or repairs by others or operation of such LN_2 Dosing Systems in a manner inconsistent with Chart accepted practices and all operating instructions, unless preauthorized in writing by Chart, shall void this warranty. This warranty does not extend to defects caused by the effects of normal wear and tear, erosion, corrosion, fire, or explosion.

Chart's sole and exclusive liability under this Warranty is to the original purchaser and shall not exceed the lesser of the cost of repair, cost of replacement, or refund of the net purchase price paid of the LN_2 Dosing Systems by the original purchaser. Chart is not liable for any other losses, damages, or costs of delays, including incidental or consequential damages. CHART SPECIFICALLY MAKES NO WARRANTIES OR GUARANTEES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, OTHER THAN OR WHICH EXTEND THOSE WARRANTIES EXPRESSED HEREIN. The original purchaser shall indemnify, defend and hold Chart harmless from any third party claims as a result of the use, sale, or lease of the LN_2 Dosing Systems.