

ULTRADOSER 2K

USER MANUAL



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Introduction

Thank you for your purchase of the Chart Inc. (Chart) UltraDoser 2K Liquid Nitrogen (LN₂) 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 2K 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 2K 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

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This manual is intended for use by Chart UltraDoser 2K operators. 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 RESPONSIBILITY 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 2K 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 2K potentially bursting the bottles (or containers). Proper calibration of the UltraDoser 2K ensures optimum nitrogen doses to avoid over pressurization. Be sure to remove any bottles (or containers) that receive more than its proper LN₂ doses before sealing.

⚠ WARNING!: If you are at all unsure of how to safely work on this system, **STOP** and contact Chart immediately at +1 408.371.4932.

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

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

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

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

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

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



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

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

Safety Bulletin

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

Oxygen Deficient Atmospheres

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

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

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

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

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

If oxygen deficient atmosphere is suspected or known to exist:

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

Nitrogen

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

Nitrogen vapors in air dilute the concentration of oxygen necessary to support or sustain life. Inhalation of high concentrations of this gas can cause anoxia, resulting in dizziness, nausea, vomiting, or unconsciousness and possibly death. Individuals should be prohibited from entering areas where the oxygen content is below 19% unless equipped with a self-contained breathing apparatus.

Unconsciousness and death may occur with virtually no warning if the oxygen concentration is below approximately 8%. Contact with cold nitrogen gas or liquid can cause cryogenic (extreme low temperature) burns and freeze body tissue.

Persons suffering from lack of oxygen should be immediately moved to areas with normal atmospheres. **SELF CONTAINED BREATHING APPARATUS MAY BE REQUIRED TO PREVENT ASPHYXIATION OF RESCUE WORKERS.** Assisted respiration and supplemental oxygen should be given if the victim is not breathing. If cryogenic liquid or cold boil-off gas contacts a worker's skin or eyes, the affected tissues should be promptly flooded or soaked with tepid water (105-115°F; 41-46°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 2K

The UltraDoser 2K is designed for variable speed filling lines up to 2000 bottles (or containers) per minute (under specific conditions). It will compensate for changes in line speed, ramp up, and ramp down conditions.

Unpacking the UltraDoser 2K

The UltraDoser 2K will arrive in a specially designed shipping crate. If the system is intended to be moved from one location to another, storing the crate for future use is ideal.

Upon arrival of the UltraDoser 2K, 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 2K.

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 2K 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: Standard Head: 2"W x 9.5"H (51mm x 241mm)
EP Head: 2"W x 11"H (51mm x 279mm)

Total Weight: UltraDoser: 32 lbs (14.5kg)
2K Controller: 22.5 lbs (10.2kg)

Dosing Range: 0.002 – 14 grams/dose

Dosing Accuracy: +/- 2% of dose weight

Timing Range: 5.5 - 1000 milliseconds in 0.1 millisecond intervals

Control Voltage: 24 VDC

Materials: Stainless steel construction. Built to food and beverage industry standards.

Crate Dimensions: 58"L x 58"W x 24"H (1473 x 1473 x 609mm)
300 lbs with stand (136 kg)
225 lbs without stand (102kg)

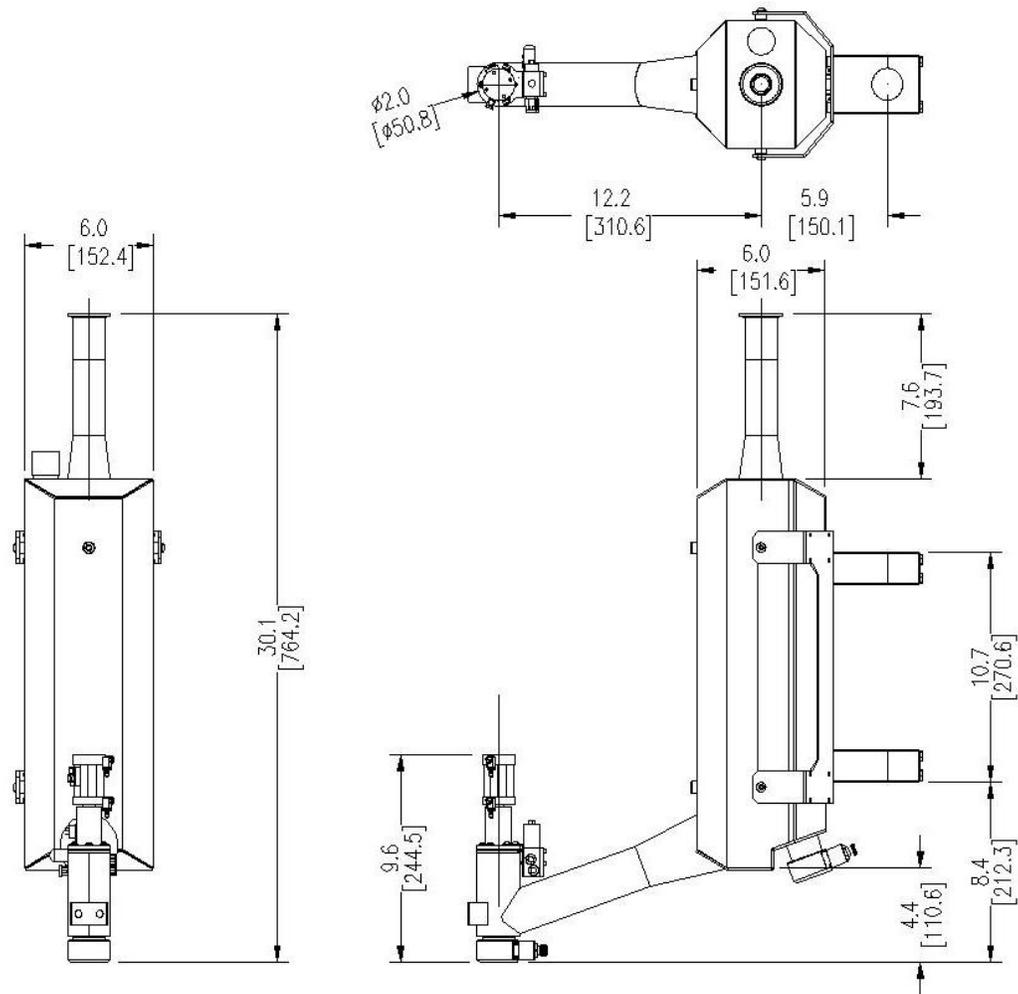
□ Utility Requirements

Electrical Supply: 100-240 VAC 50-60Hz 110 W

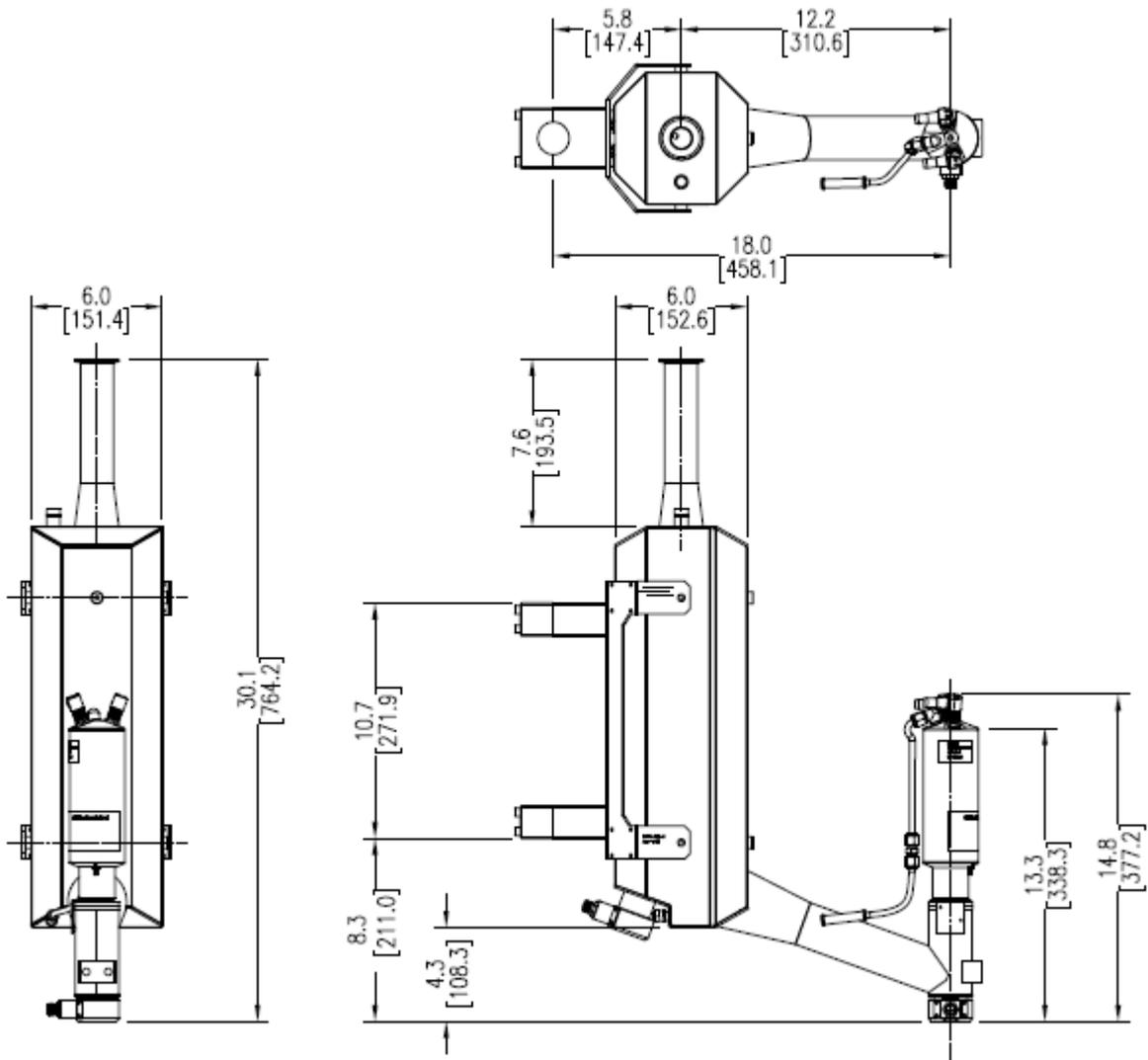
Liquid Nitrogen: Portable Dura-Cyl dewar – 22 psi (1.5 bar)
Bulk Tank (House Fed) System (with Chart Phase Separator)
– 100 psi (6.9 bar)
Maximum flow rate 15 gallons (56 liters) per hour

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



Shown with Standard Head



Shown with EP Head

UltraDoser 2K Components

□ Standard Components

UltraDoser Body

The stainless steel vacuum insulated reservoir provides a ready supply of LN₂ for dosing operations.

Distribution Block

Houses the electrical connectors and wiring interface between the operating parts of the UltraDoser unit and the 2K controller.

2K Controller

2K 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 inserted into the UltraDoser unit.

Bayonet Connection

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

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.

Dosing Head

The dosing head delivers the dose of LN₂.

Dosing Valve Assembly

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

Valve Confirm Assembly

The valves confirm assembly is attached to the pneumatic cylinder. The assembly consists of an electromagnetic sensor and related cabling. The sensor confirms that the valve stem was lifted thereby providing a dose of LN₂.

Dosing Head Heater

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

The dosing head heater has a built-in splash guard to minimize the dosing nozzle's exposure to splashed product or LN₂.

Dosing Nozzle(s)

The size of the dosing nozzle directly affects the amount of LN₂ dosed. 0.040", 0.050", and a 0.060" nozzles ship loose with the UltraDoser 2K system. Custom sizes may be ordered from Chart.

Drain Plug

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

Vent Heater

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

 Optional Components

C-Flex Hose

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

Electro-Pneumatic Actuator (EP Head)

The Electro-pneumatic actuator assembly contains the dosing stem, solenoid valve and Bimba-cylinder all within a self-contained water-tight housing. The main benefit is ease of use during Clean-In-Place (CIP) operations. The solenoid valve rests on the pneumatic cylinder. The cold GN₂ running through the valve has a cooling effect on the cylinder offsetting some of the heat generated by the opening and closing of the actuator.

Installation

□ Application Evaluation

The UltraDoser 2K can be used for both inerting and pressurization applications. The application must be evaluated to determine the ideal location of the dosing head on the filling line.

Inerting – Inerting is the process of removing oxygen (O_2) from a bottle (or container) by dosing a relatively large amount of LN_2 in the bottle (or container) to inert. The liquid dose quickly converts into gas displacing air and oxygen from the bottle (or container). The ideal location for the UltraDoser unit must allow for enough time between dosing and capping so that the liquid dose is converted into a gas.

Pressurization – Pressurization occurs by dosing a relatively small amount of LN_2 into a bottle (or container). The liquid dose quickly converts into gas and the bottle (or container) is then capped or sealed to capture the expanding gas. The UltraDoser unit should be installed as close to the capper as possible.

□ Support Stand Location

The UltraDoser unit is supplied with a mounting bracket assembly. The assembly consists of the bracket attaching to the UltraDoser body and two clamps designed to fit on 1½” stainless steel rod. Chart can supply a prefabricated stand to accommodate the mounting bracket assembly. This stand can be utilized in almost all installations. If the Chart stand cannot be used in your installation, fabricating one with 1½” diameter rod or round bar will make installation of the UltraDoser 2K simpler. The following instructions will assume installation of Chart’s prefabricated support stand (Figure 4).

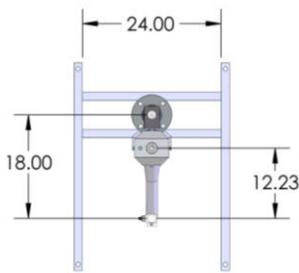


Figure 1

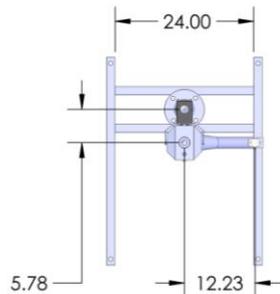


Figure 2

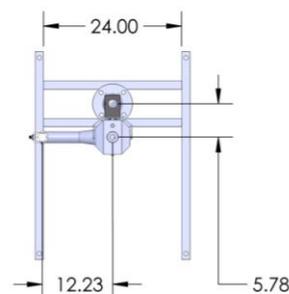


Figure 3

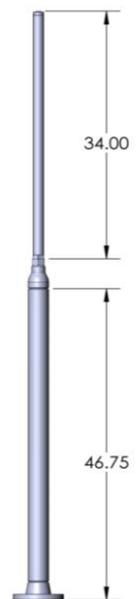
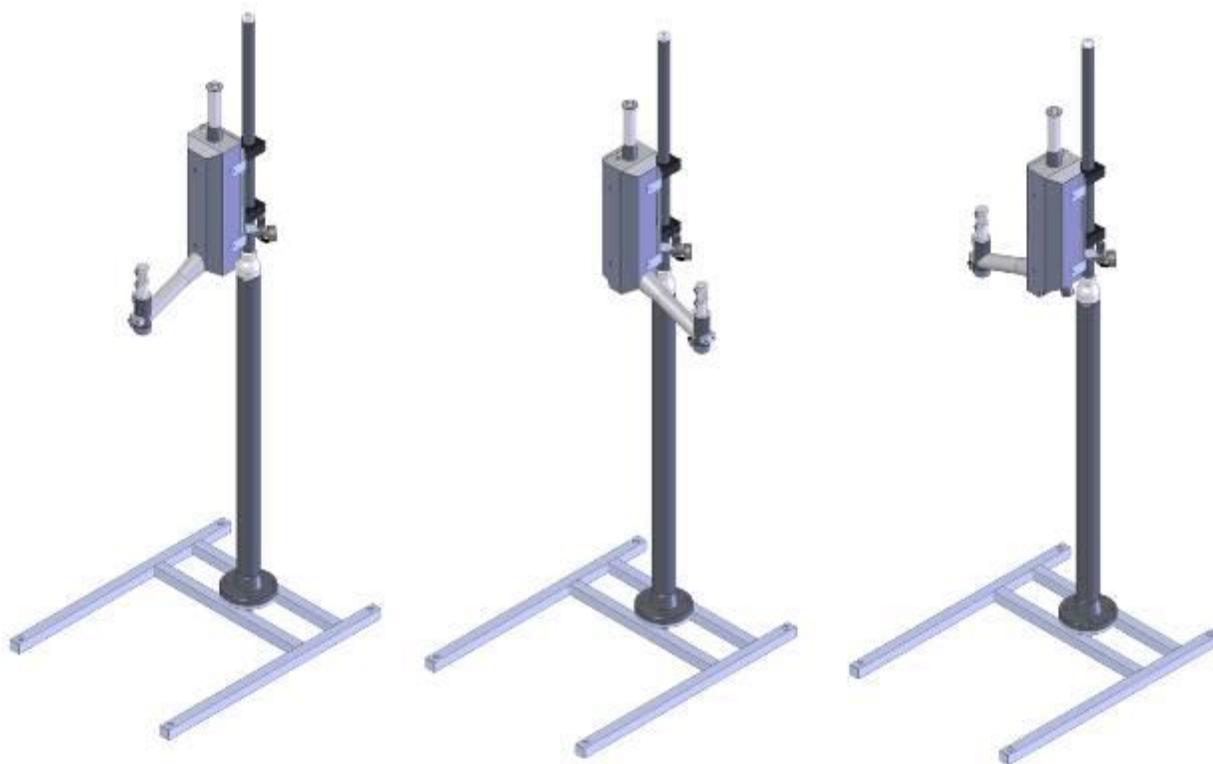


Figure 4

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.



□ Connecting the Distribution Block

The distribution block houses the electrical connectors and wiring interface between the operating parts of the UltraDoser unit and the 2K controller. There are five connections on the distribution block:



Vent Heater (D-1)

Provides +24VDC power to the vent heater. A green light on the cable connector indicates that power is being made available to the vent heater.

Nozzle Heater (D-2)

Provides +24VDC power to the dosing head heater. A green light on the cable connector indicates that power is being made available to the dosing head heater.

Timing/Container Sensor (D-3)

Provides +24VDC power to the timing/container sensor and indicates sensor activity. A green light on the cable connector indicates that power is being supplied to the sensor. A yellow light will flash when a container is detected.

Dose Solenoid (D-4)

Provides +24VDC power to the solenoid valve assembly located on the dosing head. A green light on the cable connector indicates that power is being supplied to the solenoid valve. A yellow light will appear when the solenoid valve has been activated.

Confirm Sensor (D-5)

Provides +24VDC power to the confirm sensor assembly located on the dosing head. A green light on the cable connector indicates that power is being supplied to the confirm sensor. A yellow light will appear when the pneumatic cylinder has lifted the valve stem. Simultaneously, a yellow indicator will illuminate on the confirm sensor body.

Aux (D-6)

Not used.

□ Installing the Nozzle

Three nozzles are supplied with the UltraDoser 2K – 0.040”, 0.050”, and 0.060”. Custom sizes may be ordered from Chart.

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



Image 1



Image 2

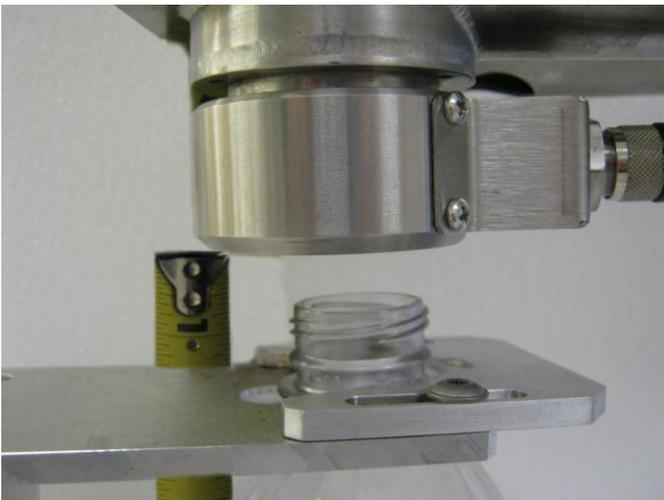


Image 3

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

□ Positioning the Dosing Head

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



□ Installing the Bottle Detect Sensor

The bottle detect sensor must be a PNP type sensor and is used to detect if containers are present on the line. Chart provides a PNP 18mm photoelectric sensor with the UltraDoser 2K system. Ideal sensor placement is about four (4) to six (6) pockets from the dosing head. If the sensor does not detect a container for the user defined number of seconds, the UltraDoser unit will stop dosing. See [Inputs/Outputs] → [Bottle Sensor] on page 41 for additional information.

See “Appendix A – Sensor Positioning” on page 63 for additional information.



□ Installing the Timing Sensor

The timing sensor is installed to detect filling line speed and must be installed for the UltraDoser 2K to operate properly. Chart provides a PNP 12mm inductive proximity sensor with the UltraDoser 2K system. Ideal sensor placement should provide a one-to-one signal and will vary for each filling line.

See “Appendix A – Sensor Positioning” on page 63 for additional information.



□ Installing the Encoder

The speed sensor is installed to detect filling line speed and must be installed for the UltraDoser 2K to operate properly. Chart provides a PNP 12mm inductive proximity sensor (Image 5) with the UltraDoser 2K system. Chart highly recommends a SICK encoder (Image 4) be installed in lieu of a PNP sensor to increase the resolution of the speed output for better performance of the UltraDoser 2K at higher line speeds. The SICK encoder provided by Chart comes from the factory preset to 500 pulses per container.

See “Appendix A – Sensor Positioning” on page 63 for additional information.



Image 4: SICK Encoder

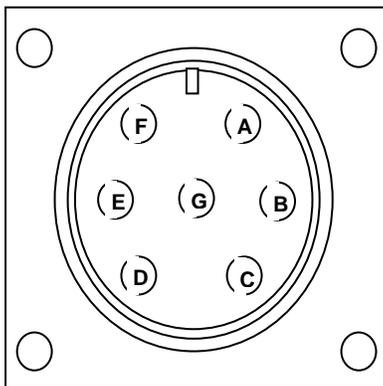


Image 5: 12mm Inductive Proximity Sensor

Encoder Installation

IMPORTANT: Only one channel is used to provide necessary pulse for the UltraDoser 2K system. For correct encoder functionality, shielded cabling must be used. The encoder should be grounded, either thru the mounting bracket or separate ground wire.

Encoder Cable Connections:



Encoder Pin No.	Function	Wire color*	Controller Pin No.
A	CH- A Output	Green or Blue	4
D	+ DC Output	Red	1
F	DC Return	Black	3
G	Case Ground	White	2

* Wire color refers to the conductors of the shielded communication cable.

□ Installing the 2K Controller

Locate the ideal location for the 2K controller. Brackets are supplied to mount the controller on the Chart prefabricated support stand or 1½” diameter rod or round bar. If Chart’s prefabricated brackets are not utilized, the controller’s mounting tabs can be utilized.



On/Off Switch – Main power switch for the 2K controller

Dose Disable Push Button – Manual dose disable push button to disable dosing

Light Tower Status:

The indicator light provides a visual display of the operating status of the UltraDoser 2K.

Green – Normal Operation

Amber (solid) – Warning Condition; see “Alarms” on page 44 for additional information.

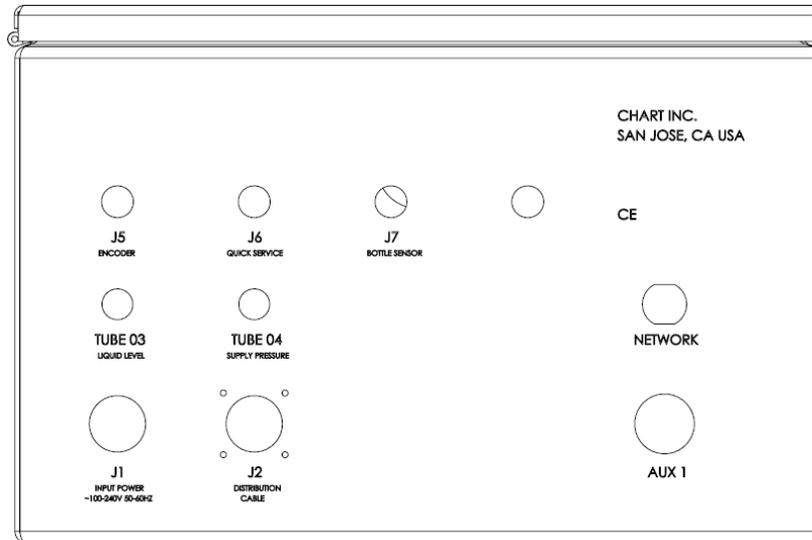
Amber (flashing) – Quick Service Mode

Red – Fault Condition; see “Alarms” on page 44 for additional information.

IMPORTANT: Upon manual dose enabling via the push button, a pop up confirm window will display on the Home screen (below). Push Yes/No to confirm.



The bottom of the 2K controller is the electrical “hub”.



Input Power (J1)

The 2K controller power cable (6ft) is connected to the 2K controller at port J1.

Distribution Cable (J2)

The 2K controller I/O (input/output) cable, a component of the distribution block, is connected to the 2K controller at port J2.

Tube 03

Tube 03 (UltraDoser Liquid Level) from the Gas Manifold Assembly is connected to the 2K controller at Tube 03.

Tube 04

Tube 04 (UltraDoser Supply Pressure) from the Gas Manifold Assembly is connected to the 2K controller at Tube 04.

Encoder (J5)

An encoder must be used to provide approximately 500 24v pulses per container. A PNP 12mm proximity speed sensor is provided as a back up to provide the 2K controller with minimal pulses that are used to calculate the line speed. The encoder (proximity sensor, if used) is connected to the 2K controller at J5.

Quick Service (J-6)

The quick service solenoid valve located on the gas manifold assembly is connected to the 2K controller at port J6.

Bottle Sensor (J-7)

A PNP bottle detect sensor connected to the 2K controller at port J7.

Network

An industrial Ethernet connection (8 pin M12) is provided to connect to the network for remote access to the HMI display.

2K Controller Adjustments

IMPORTANT: In general, the color of the field's backfill dictates the functionality. Black = Read only, Blue = PLC calculated value, Yellow = User entered value, Red/Green = Toggle feature.

□ Home Screen

The Home Screen displays pertinent information and actual parameters currently running. The Home Screen is a “read-only” screen; any changes need to be made on the respective screens. The only active buttons are located in the top left portion of the screen: the Chart logo and the country flag (see page 25 for additional information). From the “Home” Screen, the operator can navigate to other screens and functions using the navigation buttons on the bottom of the screen.



Home Screen overview and meanings:

- Dose Mode – This is the Dose Delay Mode, either ‘Fixed’ or ‘Auto’.
- Dose Delay (mS) – The Dose Delay should be a steady number proportionally between ‘Distance Delay Calibration’ Points High and Low.
- Dose Duration (mS) – The Dose Duration should be a steady number proportionally between ‘Dose Duration Calibration’ Points High and Low.
- Pulses (container to container) – This is the pulse count between timing sensors. A low number indicates a low resolution and a high number indicates the possibility of exceeding 20,000 pulses per second.
- Line Speed (CPM) – This number indicates the bottles per minute (or per hour) and should be steady.
- LN2 Level – This is the calculated liquid nitrogen level from the level sensor.
- Inlet Pressure – This is the calculated inlet pressure from the inlet pressure sensor.

□ About

On the [Home] screen, pressing the Chart logo will show the [About] screen. Chart's contact information as well as the 2K controller's PLC and HMI version and default IP address will be available on this screen.

CHART  **About** 11/11/13
12:51:55

Chart Industries
161 Baypointe Parkway
San Jose, CA 95134 USA
Telephone: +1 800-371-3303
Service : +1 408-371-4932
Website : www.chartdosers.com

	PLC:	HMI:
Version:	131107_2KS_V10	131107_2KS_V10
IP Address:	192.168.0.2	192.168.0.3
Subnet:	255.255.255.0	255.255.255.0

Home **Setup** **Recipes** **Maintenance** **Alarms**

□ Languages

On the [Home] screen, pressing the flag will show the [Languages] sub-screen. Select the desired language setting from this screen.



Flag	Language
USA	English
Mexico	Spanish
Brazil	Portuguese
UK	English
Spain	Spanish
Portugal	Portuguese
China	Simplified Chinese
Poland	Polish
Italy	Italian

IMPORTANT: Selecting a language automatically determines all settings including the date, pressure measurements, and distance measurements. All flag selections, except for USA, default to metric settings.

□ Setup

Selecting the [Setup] navigation button will prompt two sub-navigation buttons: [System Settings] and [Calibration]. Access to these screens will require log in with user ID and password. See 'Access and Passwords' on page 27 for additional information.

The screenshot displays the CHART Home interface. At the top left is the CHART logo and an American flag. The title "Home" is centered at the top, with the date and time "10/09/13 14:03:47" on the right. The main area is divided into several sections:

- Left Column:** A list of parameters with values: Dose Mode (blank), Dose Delay (mS) (0.0), Dose Duration (mS) (0.0), Line Speed (CPM) (0), and Pulses (Cont. to C) (0). A "Calibration" button is overlaid on the Line Speed row, and a "System Settings" button is overlaid on the Pulses row.
- Middle Column:** A "Recipe" section showing "--" and a "Dosing Valve" section showing "Disabled" in a red box. Below is the "Inlet Pressure" section showing "0.0 psi".
- Right Column:** An "LN2 Level" section showing "0 %".

At the bottom, there is a navigation bar with five buttons: "Home" (highlighted with a yellow underline), "Setup", "Recipes", "Maintenance", and "Alarms".

□ Access and Passwords

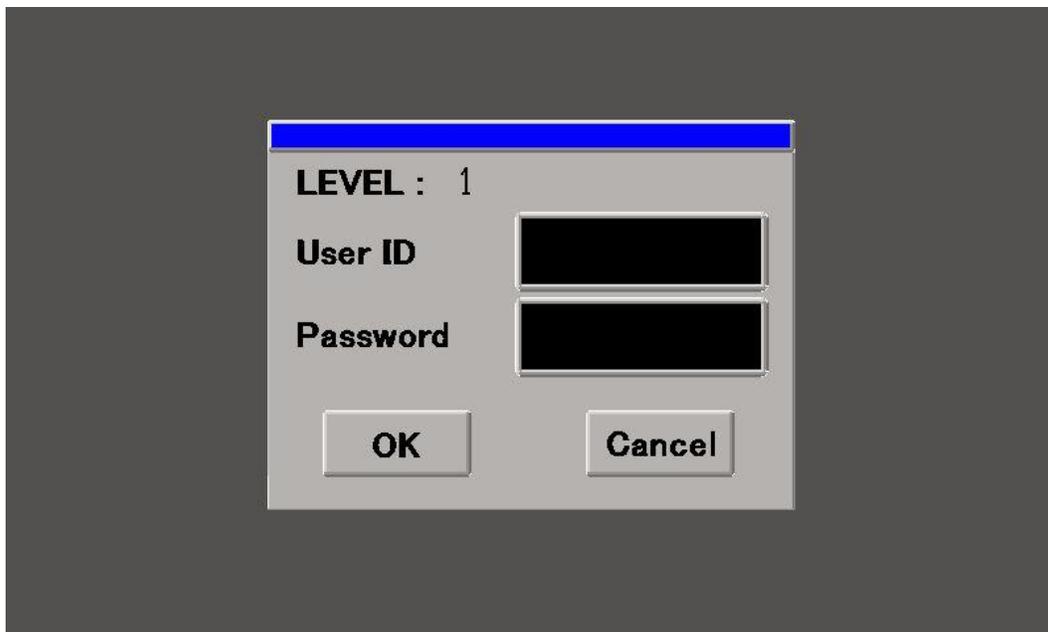
Changing any parameters on any screen requires a user ID and password. When accessing the changeable boxes a log-on dialog box will appear requesting a user ID and password. The 2K controller has been programmed to a default user and password as described below.

User: A

Password: A

IMPORTANT: Once logged in, any and all user information is changeable. Care must be taken when entering user and password information to prevent locking out personnel.

IMPORTANT: User may be prompted to re-enter user ID and password information if the 2K controller is idle for more than five (5) minutes.



□ System Settings

From [Setup], select [System Settings] to change system settings such as date/time, reset batch actuations, and hide/show the alarm banner.

Date/Time Set	
Date	MM/DD/YYYY
Current Date	10/31/13
Set Date	/ /
Time	hh:mm:ss
Current Time	9:22:29
Set Time	: :

Dosing Head Actuations	
Total Actuations	0
Batch Actuations	0
<input type="button" value="Reset"/>	

Alarm Banner	Security
<input type="button" value="Hidden"/>	<input type="button" value="Log out"/>

Home Setup Recipes Maintenance Alarms

System Settings overview and meanings:

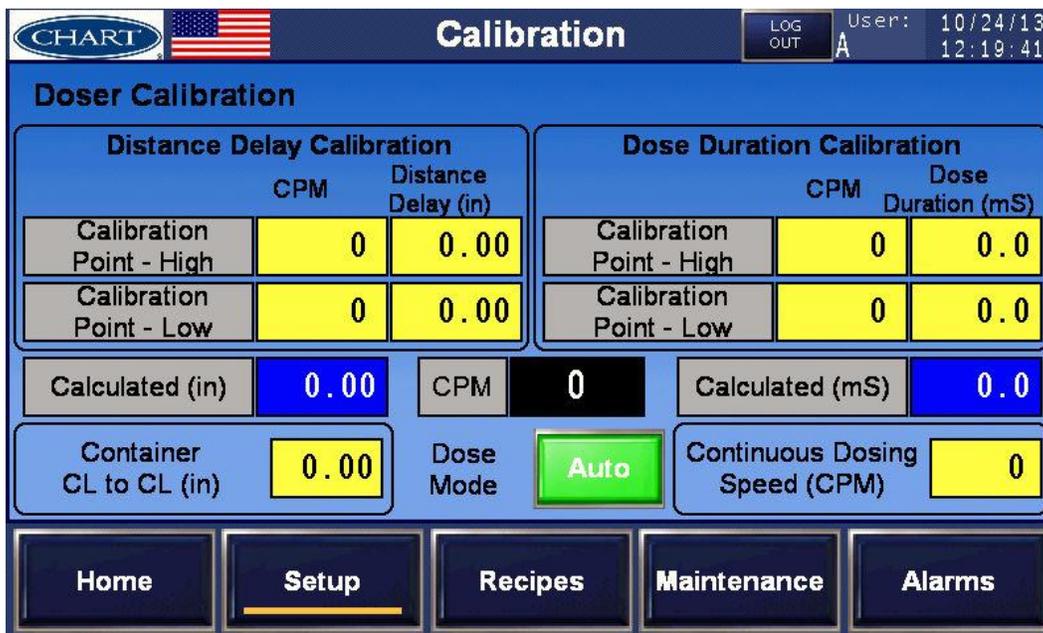
- Date/Time Set – The factory will program and set the current date and time. Any changes can be made at the ‘Set Date’ or ‘Set Time’ field.
- Dosing Head Actuations – Displays the total number of actuations and the batch number of actuations. Total will show the life of the system while batch can be reset.
- Banner Alarm – Hide or show alarm conditions on the [Home] Screen. If the banner is hidden, a small colored circle will display next to the flag on the [Home] Screen. If the alarm is shown, the alarm condition will display and cover the first 0.5” (12.7mm) of the top of each screen.
- Security – Another way to log in/out to change user settable parameters.

□ Calibration

From [Setup], select [Calibration] to set up the dosing parameters. Determine the desired Dose Mode: Auto or Fixed. Auto Dose Mode compensates for any changes in line speed by auto-adjusting the distance delay and dose duration. Fixed Dose Mode does not compensate for any changes in line speed. The distance delay and the dose duration will remain unchanged.

IMPORTANT: Proper set up of the [Calibration] screen is essential to the successful operation of the UltraDoser 2K system. If after reading this section you are still unsure, please contact Chart's service group at +1 408-371-9313.

Auto Dose Mode



The screenshot shows the 'Calibration' screen for the CHART UltraDoser 2K system. The screen is titled 'Calibration' and includes a 'LOG OUT' button and user information (User: 10/24/13, 12:19:41). The main section is 'Doser Calibration', which is divided into two columns: 'Distance Delay Calibration' and 'Dose Duration Calibration'. Each column has two rows for 'Calibration Point - High' and 'Calibration Point - Low'. The 'Distance Delay Calibration' table shows CPM values of 0 and Distance Delay (in) values of 0.00. The 'Dose Duration Calibration' table shows CPM values of 0 and Dose Duration (mS) values of 0.0. Below these tables are fields for 'Calculated (in)' (0.00), 'CPM' (0), 'Calculated (mS)' (0.0), 'Container CL to CL (in)' (0.00), 'Dose Mode' (Auto), and 'Continuous Dosing Speed (CPM)' (0). At the bottom, there are navigation buttons for Home, Setup, Recipes, Maintenance, and Alarms.

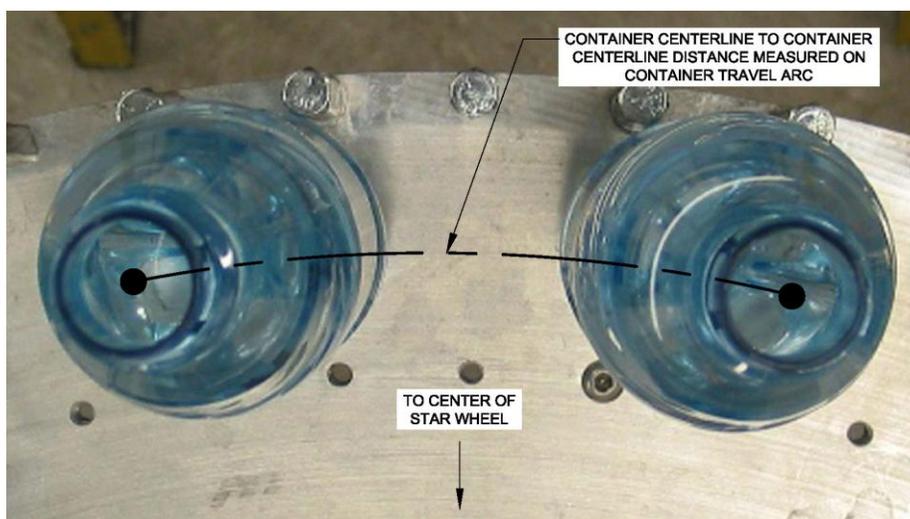
Distance Delay Calibration			Dose Duration Calibration		
	CPM	Distance Delay (in)		CPM	Dose Duration (mS)
Calibration Point - High	0	0.00	Calibration Point - High	0	0.0
Calibration Point - Low	0	0.00	Calibration Point - Low	0	0.0

Calculated (in): 0.00 CPM: 0 Calculated (mS): 0.0

Container CL to CL (in): 0.00 Dose Mode: Auto Continuous Dosing Speed (CPM): 0

Enter Setup Parameters for Auto Dose Mode:

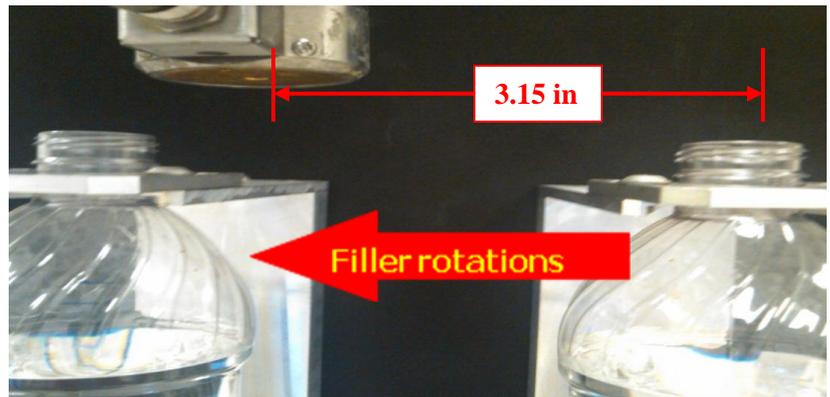
1. Measure and enter the distance between two containers, centerline to centerline in the 'Container CL to CL' field. See image below for additional information in determining this value.



2. Enter the 'Continuous Dosing Speed (CPM)'. This is the maximum speed at which the UltraDoser 2K will dose in discrete (pulse) mode. If the line speed exceeds this user entered value, the UltraDoser 2K will dose in continuous (stream) mode.
3. Distance Delay Calibration Point High CPM – Enter the CPM of the fastest operating line speed.
4. Distance Delay Calibration Point High Distance Delay (mm) – Enter 10% of the 'Container CL to CL' value as a starting point and verify with a high speed camera or similar. Adjust accordingly.

IMPORTANT: Measurement for Distance Delay Calibration Point High is impossible to measure. It will need to be verified by high speed camera. **Dose too early = increase delay, dose too late = decrease delay**

5. Distance Delay Calibration Point Low CPM – Enter the CPM of the slowest operating line speed.
6. Distance Delay Calibration Point Low Distance Delay (mm) – Jog the filler until timing sensor is activated (distribution block D-3 cable, yellow light). Measure the distance from the center of the dosing head to the leading edge of the bottle. See images below for additional information in determining this value. This value is ~75% of the "Container CL to CL" value. Verify with a high speed camera or similar. Adjust accordingly.



IMPORTANT: The system will automatically adjust for speed changes within the high/low calibration points. This system calculated value is shown in the 'Calculated' blue field.

7. Dose Duration Calibration Point High CPM – Enter the CPM of the fastest operating line speed.
8. Dose Duration Calibration Point High Dose Duration (mS) – Enter the distance delay for the fastest operating line speed.
9. Dose Duration Calibration Point Low CPM – Enter the CPM of the slowest operating line speed.
10. Dose Duration Calibration Point Low Dose Duration (mS) – Enter the distance delay for the slowest operating line speed.

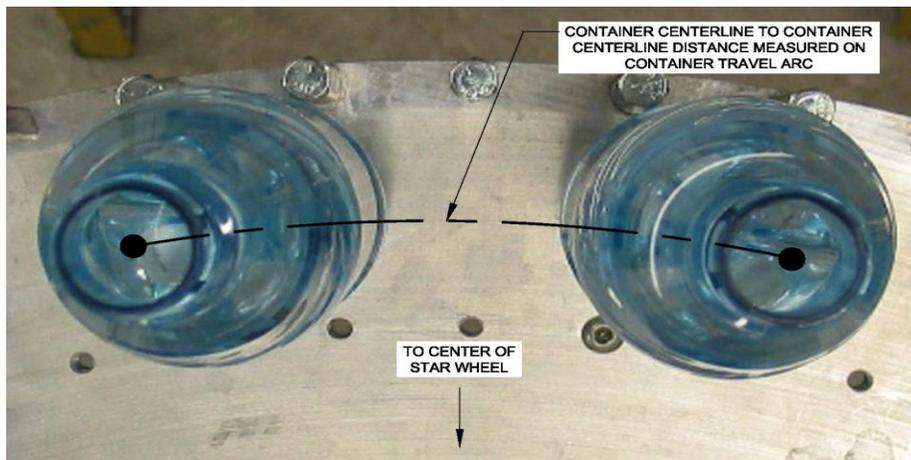
11. The calculated Dose Duration (mS) is displayed in the blue box under the Distance Delay Calibration setup.

Fixed Dose Mode



Enter Setup Parameters for Fixed Dose Mode:

1. Measure and enter the distance between two containers, centerline to centerline in the 'Container CL to CL' field. See image below for additional information in determining this value.



2. Enter the 'Continuous Dosing Speed (CPM)'. This is the maximum speed at which the UltraDoser 2K will dose in discrete (pulse) mode. If the line speed exceeds this user entered value, the UltraDoser 2K will dose in continuous (stream) mode.
3. Enter the 'Fixed Time Delay'. This is the amount of time the system will wait (in milliseconds) after the bottle detect sensor has been detected until the dose duration (in milliseconds) begins.

4. Enter the 'Dose Duration'. This is the amount of time the system will dispense liquid from the dosing head (in milliseconds).

□ Recipes

Creating a Recipe

1. From the [Recipes] screen, press [Transfer] → [Upload from PLC] to upload the dosing parameters from the [Calibration] screen. The "Recipe Parameters" should auto populate.



2. Press [Yes/No] to confirm the action.



3. Name the recipes in the “Recipe Name” value.

IMPORTANT: The “Recipe Name” value will be used to identify recipes on the [Home] screen.

The screenshot shows the CHART Recipes interface. At the top, there is a logo for CHART, an American flag, the title "Recipes", a "LOG OUT" button, and the user ID "A" and date/time "10/31/13 09:27:59". Below the title, there are two main sections: "Recipes" on the left and "Recipe Parameters" on the right. The "Recipes" section shows a list of recipes, with "Recipe in~1" selected. A keyboard overlay is visible in the foreground, with the text "Recipe in~1" entered in the input field. The "Recipe Parameters" section is a table with the following data:

Recipe Parameters	Value
Distance Cal High CPM	5000.0
Distance Cal High Distance(in)	0.0
Duration Cal High CPM	100.0
ion(mS)	3.0
ce(in)	0.0
on(mS)	100.0
(CPM)	100

An arrow points to the highlighted input field in the "Recipe Parameters" table, with the text "Enter Recipe Name Here".

4. Press [Save]. This name will appear on the [Home] screen when the recipe is [Download(ed) to the PLC] (as opposed to the name under “Recipe”).

Activating a Recipe

The screenshot shows the CHART software interface for managing recipes. The top bar includes the CHART logo, an American flag, the title "Recipes", and user information: "LOG OUT", "User: A", "10/24/13", and "12:20:00".

The main interface is divided into several sections:

- Recipes List:** A table with a header "Recipes" and a single row containing "Recipe in".
- Transfer Section:** Three buttons labeled "Transfer", "Edit", and "Save".
- Recipe Parameters Table:** A table with two columns: "Recipe Parameters" and "Value".

Recipe Parameters	Value
#1 Distance Ca1-CPM	5000.0
#1 Distance Ca1-Distance(in)	0.0
Ca1-CPM	100.0
Ca1-Duration(mS)	3.0
Ca1-CPM	100.0
Ca1-Distance(in)	0.0
Ca1-CPM	100.0
#2 Duration Ca1-Duration(mS)	3.0
Container CL to CL (in)	0.0
Continuous Dosing Speed (CPM)	100
Fixed Time Delay (mS)	3.0
Recipes Name	

At the bottom, there is a navigation bar with five buttons: "Home", "Setup", "Recipes" (which is highlighted with a yellow underline), "Maintenance", and "Alarms".

1. Select and highlight the recipe you would like to use.
2. Press [Transfer] → [Download to PLC] to activate the recipe.
3. Verify that the recipe has been activated. The “Recipes Name Value” should appear on the [Home] screen.

IMPORTANT: If any changes are made to the [Calibration] settings of an activated recipe, the recipe will become deactivated and the current settings will take precedence. Verification of this can be seen on the [Home] screen at the Recipe field; a – will appear instead of the recipe name.

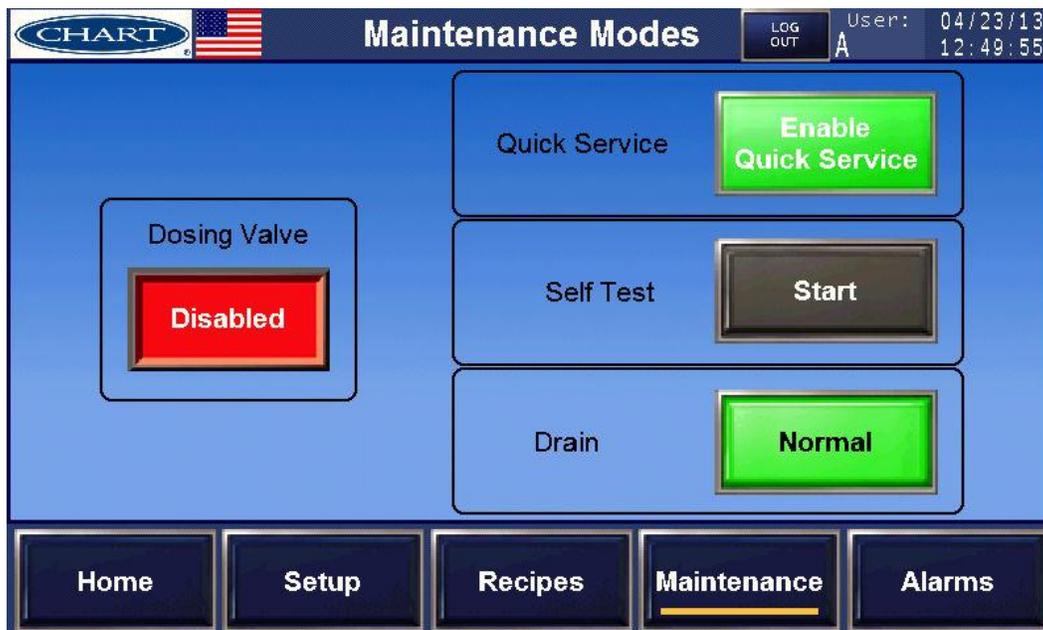
□ Maintenance

Selecting the [Maintenance] navigation button will prompt three sub-navigation buttons: [Maintenance Modes], [Graphs], and [Inputs/Outputs]. Access to these screens will require log in with user ID and password. See 'Access and Passwords' on page 27 for additional information.



□ Maintenance Modes

From [Maintenance], select [Maintenance Modes] to select and activate maintenance related features.



Dosing Valve Disabled

When the dosing valve is disabled, the maintenance modes become visible.

Quick Service – the quick service button engages a solenoid which routes gaseous nitrogen (GN₂) through the body to the dosing head. This is typically used to purging the system to ensure a clean pathway for liquid to flow. If a system has been left off for some time or exposed to air, moisture may have accumulated which could result in ice formation causing a blockage in the system. Purging by sending gaseous nitrogen will “dry out” the system.

IMPORTANT: Press and HOLD [Enable Quick Service] to activate.

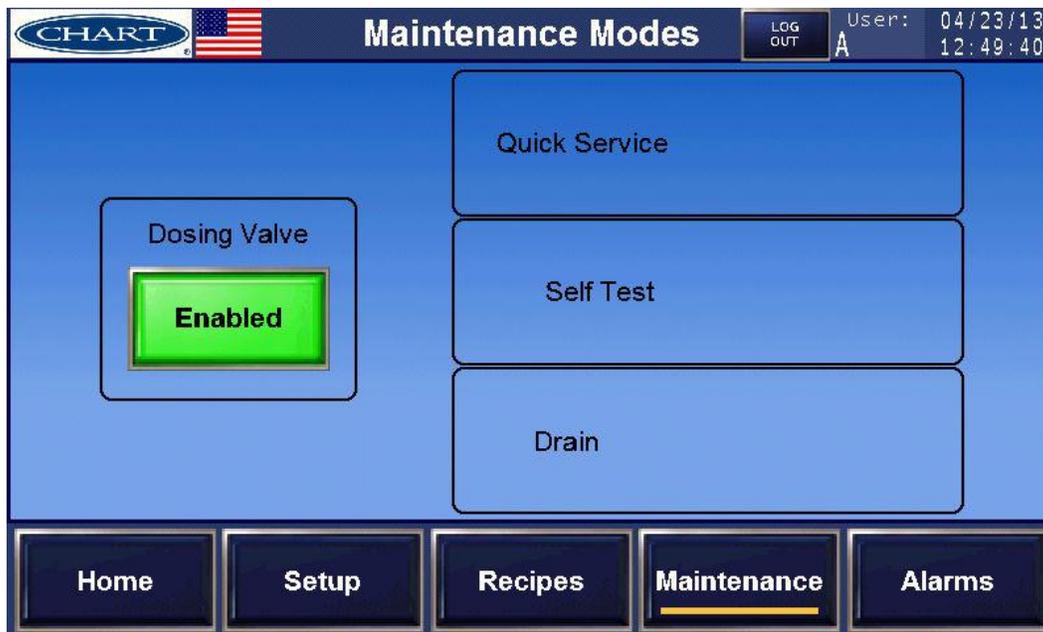
Self Test – used to test the firing of the dosing solenoid. Pressing self test activates the solenoid for 5 pulses.

Drain – used to drain liquid nitrogen from the body of the UltraDoser through the dosing head.

IMPORTANT: Press and HOLD [Normal] to activate.

Dosing Valve Enabled

When the dosing valve is enabled, the maintenance modes become invisible.

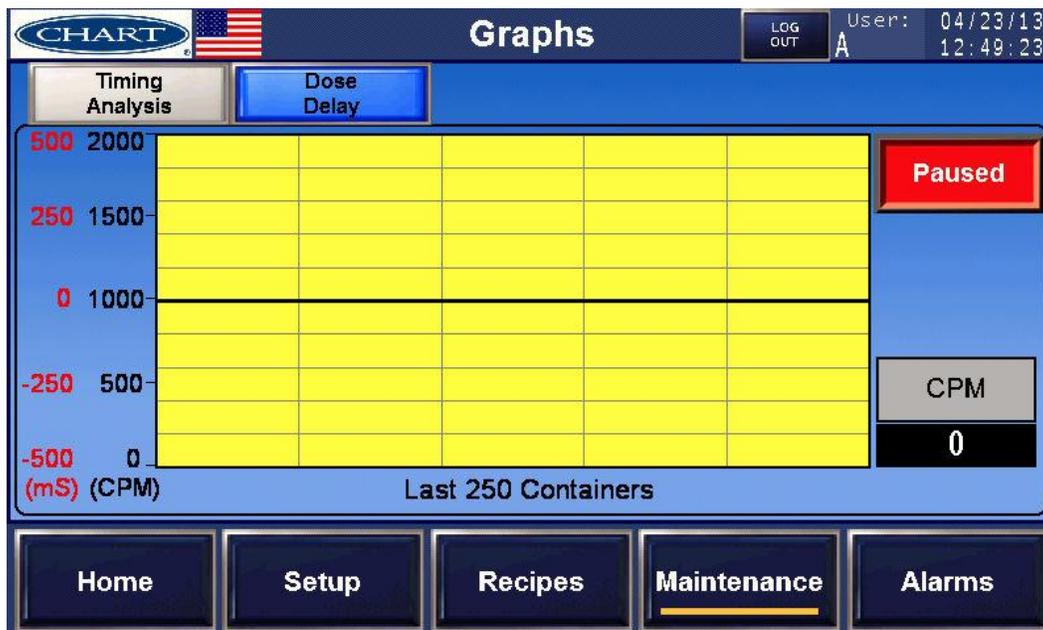


□ Graphs

From [Maintenance], select [Graphs] to view serves as the location for activation of the system once all the parameters have been set.

Timing Analysis Graph – This circular graph is updated left to right every few seconds with current CPM data. The graph shows the CPM timing of the last 250 containers. The important characteristic to watch is the consistency of the data. There should not be large spikes in data (inconsistent speed or spacing) or sine waves (line speed wobble).

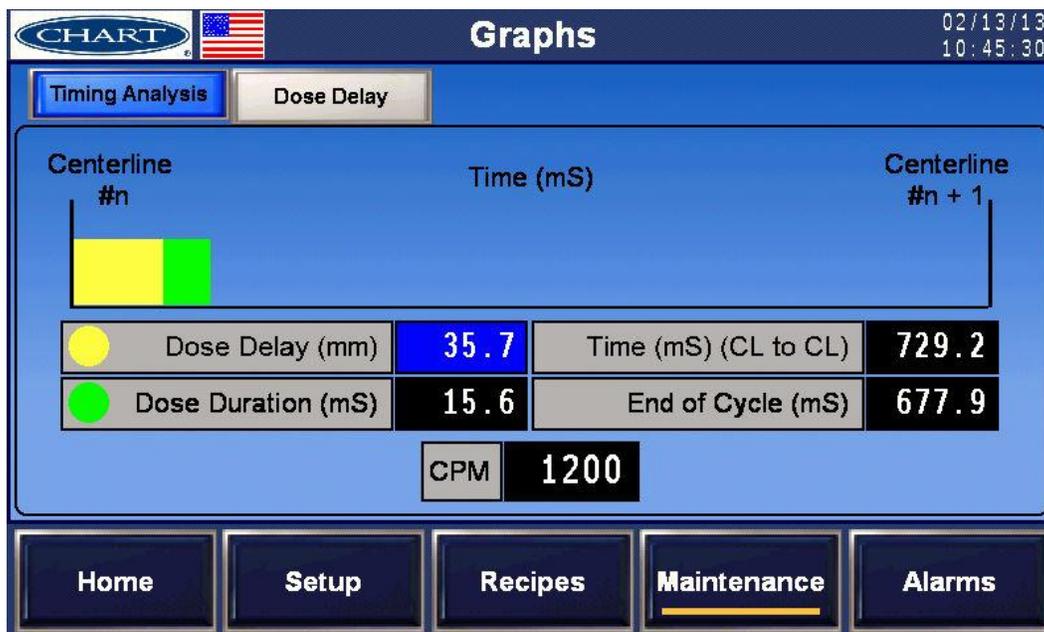
IMPORTANT: This graph shows the steadiness of the filler's line speed. Variation in the line speed will cause variation in the dosing.



Dose Delay Bar Graph – The graph starts at the left with the sensing of a container by the timing sensor and ends at the right with the sensing of the next timing sensor. This is the time between timing sensors and is the total time allocated for the Dosing Delay and the Dosing Duration.

- Dosing Delay (mS) – The yellow bar graph is the Dosing Delay time.
- Dosing Duration (mS) – The green bar graph is the Dosing Duration or the time the LN2 valve is actuated.
- Realtime – The graph updates in realtime showing continuous doses.
- End of Cycle (mS) – This is the time after the LN2 valve is turned off before the next timing sensor will arrive.

IMPORTANT: The graph should be consistent and not come close to the next timing sensor line or the Dose Delay may be too long, the Dose Duration may be too long, or the CPM may be too fast.



Inputs/Outputs

Tower Light – troubleshoot the tower lights



These are the three colored lights on top of the 2K controller.

- Green Light – press the 'Force On' toggle pushbutton to turn the green light on. Press the 'Force Off' toggle pushbutton to turn the green light off. The force action is enabled when the pushbutton is red. Disable both forces to return the green light to normal operation.
- Red Light – press the 'Force On' toggle pushbutton to turn the red light on. Press the 'Force Off' toggle pushbutton to turn the red light off. The force action is enabled when the pushbutton is red. Disable both forces to return the red light to normal operation.
- Yellow Light – press the 'Force On' toggle pushbutton to turn the yellow light on. Press the 'Force Off' toggle pushbutton to turn the yellow light off. The force action is enabled when the pushbutton is red. Disable both forces to return the yellow light to normal operation.

Liquid Level – calibrate and set alarm threshold for Liquid Level

The screenshot displays the 'Inputs/Outputs' screen for the 'Liquid Level' section. The interface includes a top navigation bar with 'CHART' logo, an American flag, and the title 'Inputs/Outputs'. On the right, there is a 'LOG OUT' button and user information: 'User: A', '04/23/13', and '12:48:46'. Below the navigation bar, there are five tabs: 'Distribution Block', 'Bottle Sensor', 'Inlet Pressure', 'Liquid Level' (selected), and 'Tower Light'. The main area is divided into two columns. The left column contains four level readings: 'Raw Level' (0.0), 'Offset Level' (0.0) with a '0% Calibrate' button, 'Forced Level (%)' (0.0) with a green 'Force' button, and 'Current Level (%)' (0.0) with a '100% Calibrate' button. The right column contains an 'Alarm Thresholds' table with three rows: 'Very Low', 'Low', and 'High'. Each row has two columns: 'Level (%)' and 'Time (sec)'. The 'Level (%)' and 'Time (sec)' values are 0.0 and 0.00 respectively for all three thresholds. At the bottom, there are five navigation buttons: 'Home', 'Setup', 'Recipes', 'Maintenance' (highlighted with a yellow underline), and 'Alarms'.

Alarm Thresholds		
	Level (%)	Time (sec)
Very Low	0.0	0.00
Low	0.0	0.00
High	0.0	0.00

- Raw Level – This is the raw reading from the PLC analog input.
- 0% Calibrate – Push this pushbutton when calibrating at the zero Liquid Level.
- Offset Level – After calibrating the liquid level at zero level by pushing the ‘0% Calibrate’ pushbutton the raw reading will become the Offset Level.
- 100% Calibrate – Push this pushbutton when calibrating at the 100% Liquid Level.
- Current Level % - The blue box indicates the current liquid level.
- Forced Level % - You can force a liquid level by typing a value in the yellow input box and pressing the ‘Force’ toggle.
- Alarm Thresholds – The thresholds low and high liquid level alarms can be set by typing an alarm threshold % value and associated time before the alarms occurs into the yellow input box.

Inlet Pressure – calibrate and set alarm threshold for Inlet Pressure

The screenshot shows the 'Inlets/Outputs' control panel for 'Inlet Pressure'. At the top, there is a 'LOG OUT' button and a user status indicator 'A' with the date '04/23/13' and time '12:48:42'. Below this are five tabs: 'Distribution Block', 'Bottle Sensor', 'Inlet Pressure' (selected), 'Liquid Level', and 'Tower Light'. The main area is divided into two columns. The left column contains four pressure-related fields: 'Raw (mbar)' with a black display showing '0', 'Offset (mbar)' with a black display showing '0' and a '0% Calibrate' button, 'Forced (mbar)' with a yellow display showing '0' and a green 'Force' button, and 'Final (mbar)' with a blue display showing '0'. The right column contains an 'Alarm Thresholds' table with columns for 'Pressure (mbar)' and 'Time (sec)'. The table has three rows: 'Very High' (yellow), 'High' (yellow), and 'Low' (yellow), all showing '0' for pressure and '0.00' for time. Below the table is an 'LN2 source' field with a green 'Phase Separator' button. At the bottom, there are five navigation buttons: 'Home', 'Setup', 'Recipes', 'Maintenance' (highlighted with a yellow underline), and 'Alarms'.

Alarm Thresholds	
Pressure (mbar)	Time (sec)
Very High	0.00
High	0.00
Low	0.00

- Raw Inlet Pressure – This is the raw reading from the PLC analog input.
- Offset Inlet Pressure – After calibrating the inlet pressure at zero level by pushing the ‘Offset’ pushbutton the raw reading will become the inlet pressure offset.
- Final Inlet Pressure % - The blue box indicates the current inlet pressure.
- Forced Inlet Pressure % - You can force an inlet pressure by typing a value in the yellow input box and pressing the ‘Force’ toggle.
- Alarm Thresholds – The thresholds low and high inlet pressure alarms can be set by typing an alarm threshold % value and associated time before the alarms occurs into the yellow input box.
- LN2 Source – Press the ‘LN2 Source’ toggle to choose the source of liquid nitrogen.

Bottle Sensor – set the functions of the bottle detect sensor



The Bottle Sensor is used to detect bottles moving under the dosing head.

- a) Result – This is the current status of the Bottle Sensor. When illuminated green, bottles are being sensed, either from the sensor or the 'Bypass Enabled/Disabled' pushbutton.
- b) Bypass Enabled/Disabled Pushbutton – Provides the ability to override the bottle detect sensor. Ideal if the bottle detect sensor goes bad, the doser will still run. When 'Enabled', if there is no bottle detection for the user defined seconds 'No Bottles (sec)', the system will stop dosing liquid nitrogen
- c) No Bottles (sec) – If 'Bypass Enabled', if there is no bottle detection for the user defined seconds entered in this field.

Distribution Block – troubleshoot the distribution block sensors/connections



These digital inputs and outputs replicate the lights on the Distribution Block.

- a) Speed Sensor (digital input) – Usually this is the status of the encoder pulses.
- b) Timing Sensor (digital input) – This is the status of the one per bottle sensor.
- c) Valve Confirm (digital input) – This is the status of the LN2 valve actuator sensor.
- d) Bottle Detect (digital input) – This is the status of the bottle sensor.
- e) Dose Disable (digital input) – This is the status of the Dose Disable.
- f) Quick Service (digital output) – This is the status of the Quick Service function.
- g) Dose Solenoid (digital output) – This is the status of the Dose Solenoid LN2 valve actuator.

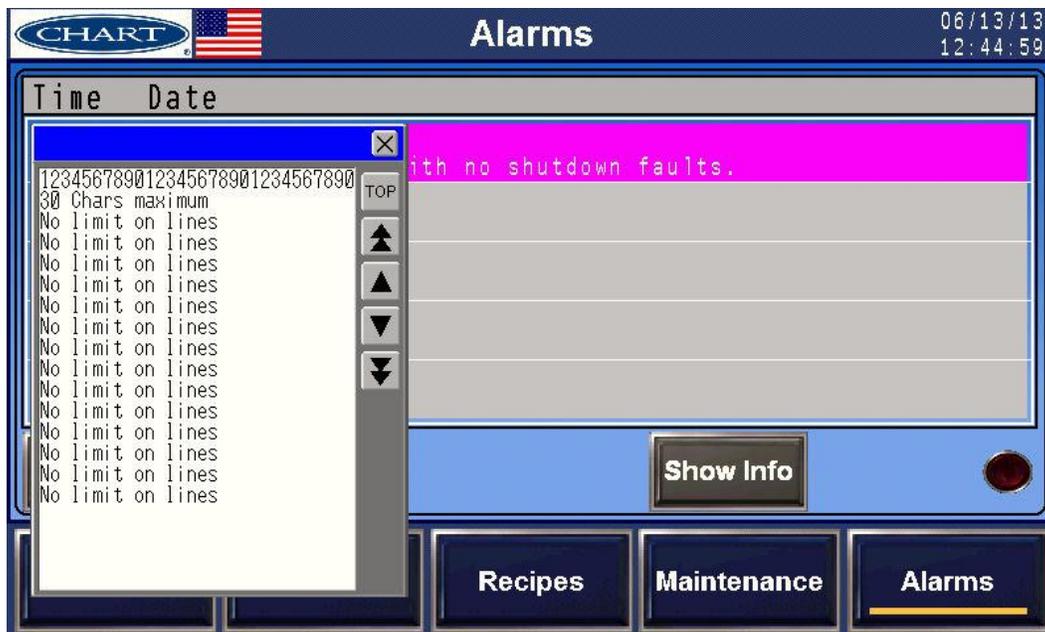
Alarms

Two alarm screens are provided: Alarms and Alarm History. Alarms are displayed on the 'Alarms' screen when they are currently active and are retentively displayed on the 'Alarm History' screen.

IMPORTANT: Alarm conditions do not stop liquid nitrogen dosing.



IMPORTANT: Alarm conditions are shown on the [Alarms] screen. Information to resolve the alarm can be found by highlighting the alarm condition and pressing [More Info].



Warning Level Alarms – These warning alarms are provided to assist in troubleshooting any lack of functionality. These warning alarms trigger a solid yellow light.

WARN #1 – Started Dosing with no shutdown faults. (green) – [gives a green starting reference on the alarm history screen.]
WARN #2 - Dosing is Disabled. – [Dosing has been manually disabled from the HMI.]
WARN #3 - Continuous Dosing CPM threshold exceeded. – [The actual CPM exceeds the ‘continuous dosing’ setpoint.]
WARN #4 - Liquid Level too low. – [Check the Liquid Level sensor or calibration.]
WARN #5 - Liquid Level too high. – [Check the Liquid Level sensor or calibration.]
WARN #6 - Inlet Pressure too low. – [Check the Inlet Pressure sensor or calibration.]
WARN #7 - Inlet Pressure too high. – [Check the Inlet Pressure sensor or calibration.]
WARN #8 - Dose Delay too long. – [Dose delay was longer than the timing sensor interval. Check the Dose Delay setpoint.]

Level 2 Alarms – These sensor alarms require checking sensors if persistent. These alarms trigger a solid red light.

FAULT #20 - Speed Sensor Pulses not seen on input #0. – [Check the wiring to input #0, 24VDC power, or the Speed Sensor.]
FAULT #21 - Speed Sensor Pulses not seen on input #4. – [Check the wiring to input #4, 24VDC power, or the Speed Sensor.]
FAULT #22 – Timing Sensor Pulses not seen on input #1. – [Check the wiring to input #1, 24VDC power, or the Pocket Sensor.]
FAULT #23 – Container Sensor not seen on input #12. – [Check the wiring to input #12, 24VDC power, or the Bottle Present Sensor.]
FAULT #24 - Valve Confirm Sensor Pulses not seen on input #3. – [Check the wiring to input #3, 24VDC power, or the Valve Confirm Sensor.]
FAULT #25 - Liquid Level very low. – [Check the Liquid Level sensor or calibration.]
FAULT #26 - Inlet Pressure very high. – [Check the Inlet Pressure sensor or calibration.]

Level 3 Alarms – These alarms are severe internal control wiring problems. These alarms trigger a solid red light.

FAULT #32 – Internal PLC error. PWM Pulses not seen on input #2. – [Check the wiring to input #2 or 24VDC power.]

FAULT #33 - Internal PLC error. PWM Pulses not seen on input #6. – [Check the wiring to input #6 or 24VDC power.]
FAULT #34 - Internal PLC error. PWM Pulses not seen on input #8. – [Check the wiring to input #8 or 24VDC power.]
FAULT #35 - Internal PLC error. PWM Pulses not seen on input #10. – [Check the wiring to input #10 or 24VDC power.]

Level 5 Alarms – These alarms disable dosing. These alarms trigger a solid red light.

FAULT #50 - Estop PB not seen on input #14. – [The red mushroom pushbutton on the front of the Doser control panel is pushed.]
FAULT #51 - Remote Disable on. – [The remote Doser disable is active.]
FAULT #53 - Bottle Sensor Pulses seen too fast. – [Check the encoder. Too many pulses were detected than are allocated between timing sensor signals.]

□ Alarm History

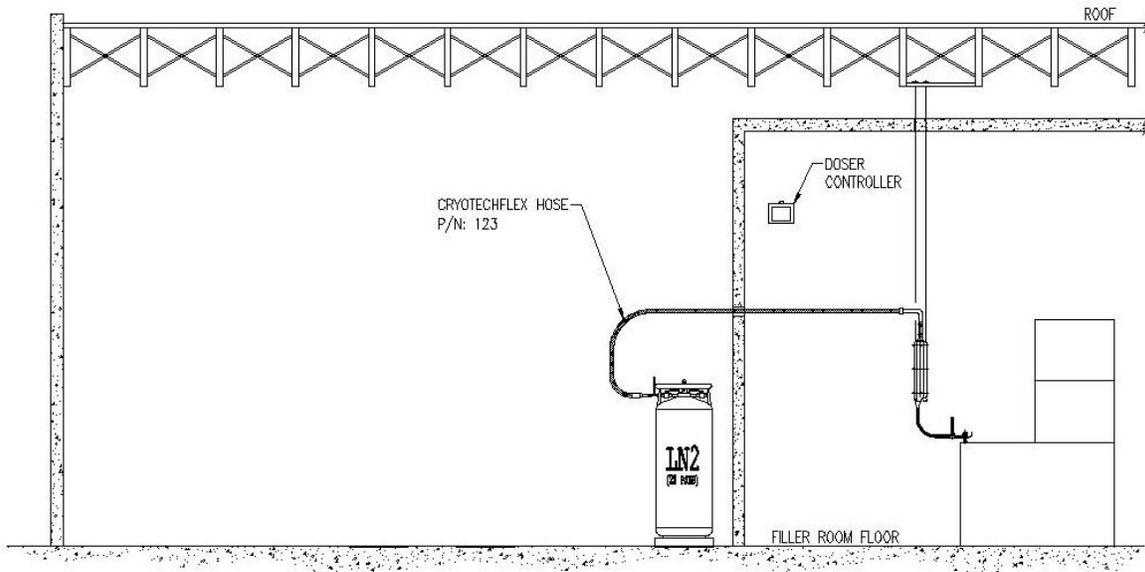
The alarm screen automatically clears itself of fault conditions once the fault itself has been cleared. The Alarm History screen is similar to the Alarm screen but keeps a total history of all fault conditions. The alarm log does not automatically clear the faults so these conditions are kept until manually cleared by the administrator.



Daily Operating Procedures

The UltraDoser 2K system can be fed by either a portable Dura-Cyl dewar or a bulk tank (house fed) liquid nitrogen system.

Dura-Cyl Dewar Fed System



IMPORTANT: LN₂ is -320°F (-196°C). Any water and/or moisture can cause ice which will affect the performance of the UltraDoser 2K system. Providing a positive pressure of GN₂ (also known as purging) to the UltraDoser unit before introducing LN₂ into the body will eliminate many performance interruptions.

Purging with Gaseous Nitrogen

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

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

IMPORTANT: The supply pressure reading on the 2K controller may read 12 ± PSI due to the added GN₂ pressure.

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

System Start Up

1. Place the On/Off switch on the 2K controller in the "On" position. Ensure the "Dosing Disable" push button is pushed in to disable dosing.
2. Insert the supplied 10 micron filter into the male bayonet on the supplied C-Flex hose using a 1/8" allen wrench.
3. Attach the C-Flex hose (male bayonet side) to the UltraDoser unit with the supplied bayonet clamp and gasket.
4. Attach the C-Flex hose (female flare fitting side) to the 22psi LN₂ 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. Adjust the dosing parameters. See "2K Controller Adjustments", page 24, for additional information.
8. Pull out the "Dosing Disable" push button to enable 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 On/Off switch on the 2K controller in the “Off” position.
2. Shut the liquid valve (clockwise direction) on the Dura-Cyl dewar.
3. If possible, purge with GN₂ until next use. See “Purging with Gaseous Nitrogen,” page 50, for additional information.

IMPORTANT: The supply pressure reading on the 2K controller may read $12 \pm$ PSI due to the added GN₂ pressure.

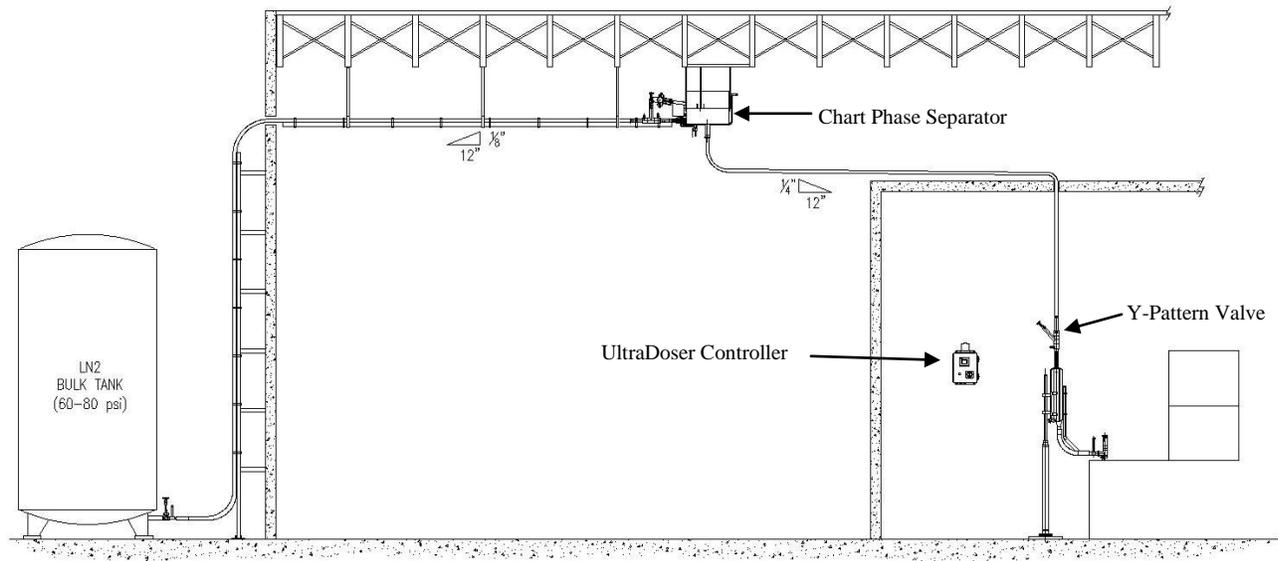
Dura-Cyl Dewar (22psi) Change Out Procedure

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-Cyl dewar.

1. Shut the liquid valve (clockwise direction) on the Dura-Cyl dewar.
2. Disconnect the C-Flex hose from the Dura-Cul dewar using a 7/8” open end wrench or adjustable crescent wrench.
3. Connect the C-Flex 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 2K 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.

□ Bulk Tank (House Fed) System



IMPORTANT: LN₂ is -320°F (-196°C). Any water and/or moisture can cause ice which will affect the performance of the UltraDoser 2K system. Providing a positive pressure of GN₂ (also known as purging) to the UltraDoser unit before introducing LN₂ into the body will eliminate many performance interruptions.

Purging with Gaseous Nitrogen

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

This section assumes a Y-Pattern valve and Purge Kit are installed upstream of the UltraDoser unit. Chart highly recommends each UltraDoser 2K be installed with a Y-Pattern valve and Purge Kit to isolate the UltraDoser unit from the LN₂ source and to purge the UltraDoser unit to eliminate performance interruptions.

A dedicated GN₂ source is required to purge the UltraDoser unit. Chart recommends a dedicated GN₂ source from the facility.



Image 6: Y-Pattern Valve with Purge Kit Assembly

1. Manually close (clockwise) the Y-Pattern valve (blue handle).
2. Manually open (clockwise) the ball valve (yellow handle) on the Purge Kit.
3. On the 2K controller, go to [Maintenance] [Maintenance Modes] screen (see page 30 for additional information). “Disable” the dosing valve.
4. Manually close (clockwise) the valve (silver nut) on the CryoDoser arm and power “Off” the 2K controller.

IMPORTANT: The supply pressure reading on the 2K controller may read $12 \pm$ PSI due to the added GN₂ pressure.

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 LN₂ temperatures (-320 °F; -196 °C). Once the UltraDoser unit is at or near ambient temperature, the “fog” will warm up.

System Start Up

This section assumes the Chart Phase Separator is full of liquid nitrogen. If this is not the case, ample time is needed to fill the Chart Phase Separator with liquid nitrogen before the UltraDoser 2K can start-up.

1. Manually close (counter-clockwise) the ball valve (yellow handle) on the Purge Kit.
2. Manually open (counter-clockwise) the Y-Pattern valve (blue handle) to start the flow of LN₂.
3. As the UltraDoser fills, remove the dosing head heater and nozzle. Clean and dry both before reinstalling. See “Nozzle Cleaning Procedure,” page 5, for additional information.
4. Wait until the UltraDoser unit is filled with liquid nitrogen, approximately 10 minutes, before 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 Y-Pattern valve and call Chart service at +1 408.371.4932.

System Shut Down

1. Manually close (clockwise) the Y-Pattern valve (blue handle).
2. Manually open (clockwise) the ball valve (yellow handle) on the Purge Kit.

IMPORTANT: The supply pressure reading on the 2K controller may read $12 \pm$ PSI due to the added GN₂ pressure.

3. On the 2K controller, go to [Maintenance] [Maintenance Modes] screen (see page 30 for additional information). “Disable” the dosing valve.
4. Manually close (clockwise) the valve (silver nut) on the CryoDoser arm and power “Off” the 2K controller.

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 LN₂ temperatures (-320 °F; -196 °C). Once the UltraDoser unit is at or near ambient temperature, the “fog” will warm up.

Service and Maintenance

□ Nozzle Change Out

1. Remove the dosing head heater.
2. Insert the nozzle tool into the nozzle area until the tool connects with the nozzle (Image 7).
3. Remove the nozzle with the driver in a counter-clockwise direction. Remove.
4. Once the nozzle is removed, place the new nozzle or cleaned nozzle into the nozzle tool and insert in a clockwise direction (Image 8).



Image 7



Image 8

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

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

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

□ Nozzle Cleaning

1. Remove the nozzle from the UltraDoser. See “Nozzle Change Out,” page 53.
2. Clean the nozzle opening with a very thin wire and blow dry nitrogen through it.
3. Thoroughly dry the nozzle with dry nitrogen gas before re-installing.

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

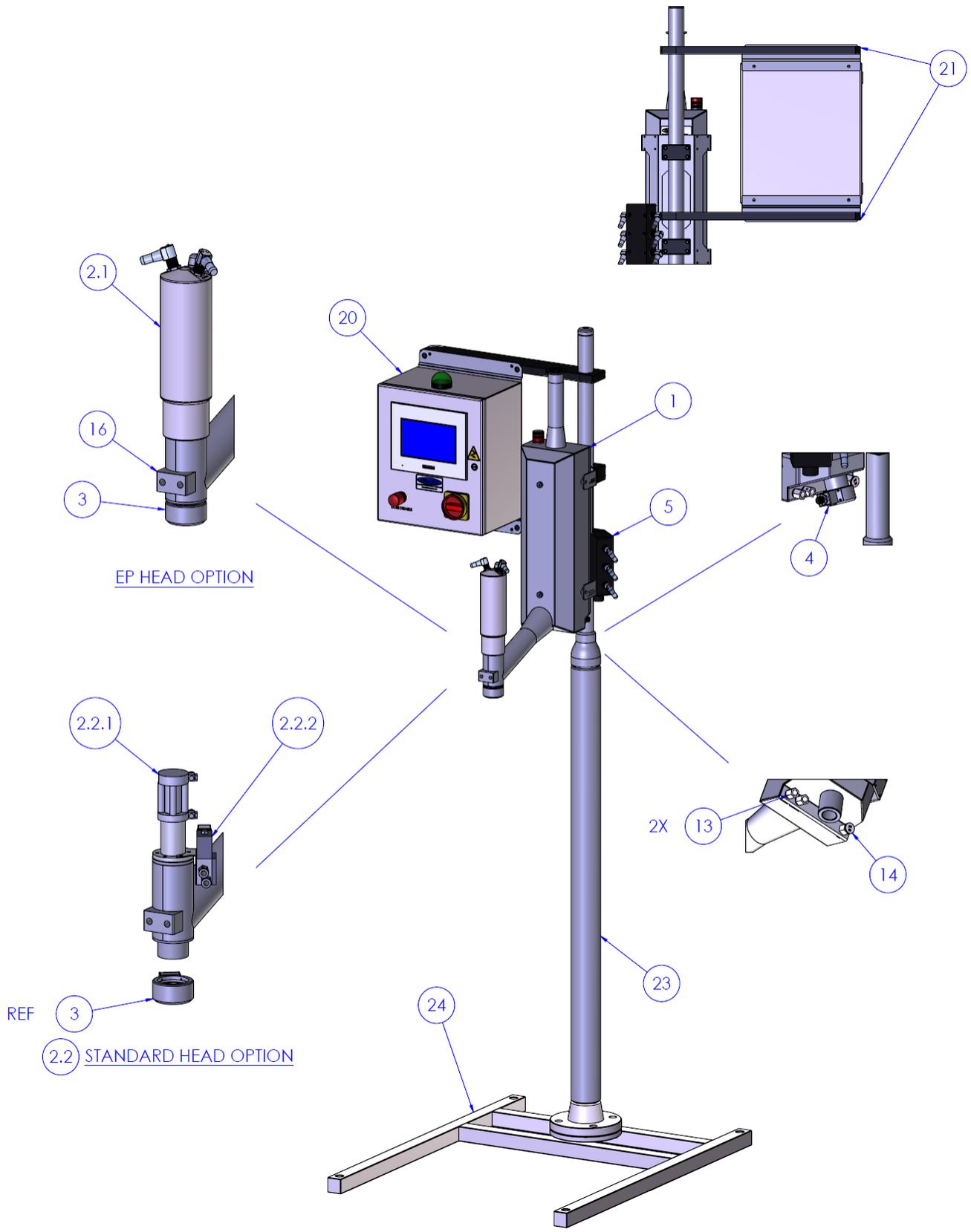
□ Purging with Gaseous Nitrogen

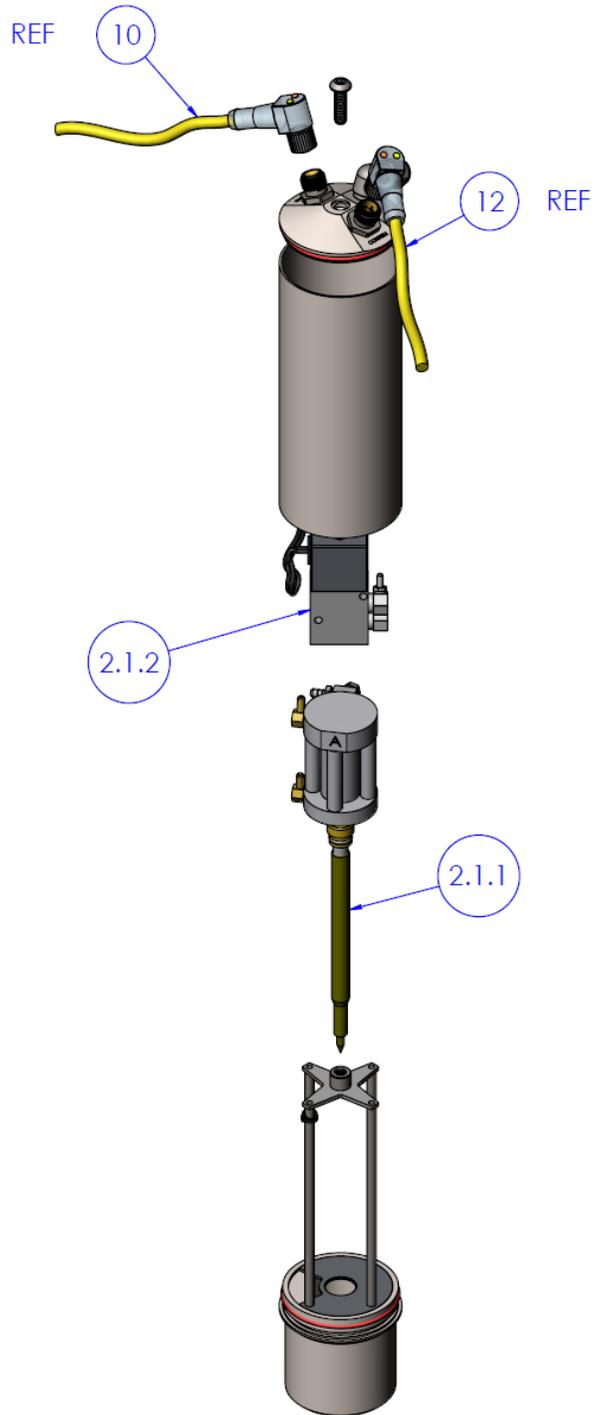
The UltraDoser unit must only be purged with gaseous nitrogen. Chart recommends the UltraDoser unit be purged when not in use. However, this may not be practical for all operators. At a minimum, the UltraDoser unit should be purged to eliminate any water that may be inside the unit after installation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

See page 47 for Dura-Cyl dewar fed systems or page 50 for bulk tank (house fed) systems for additional information.

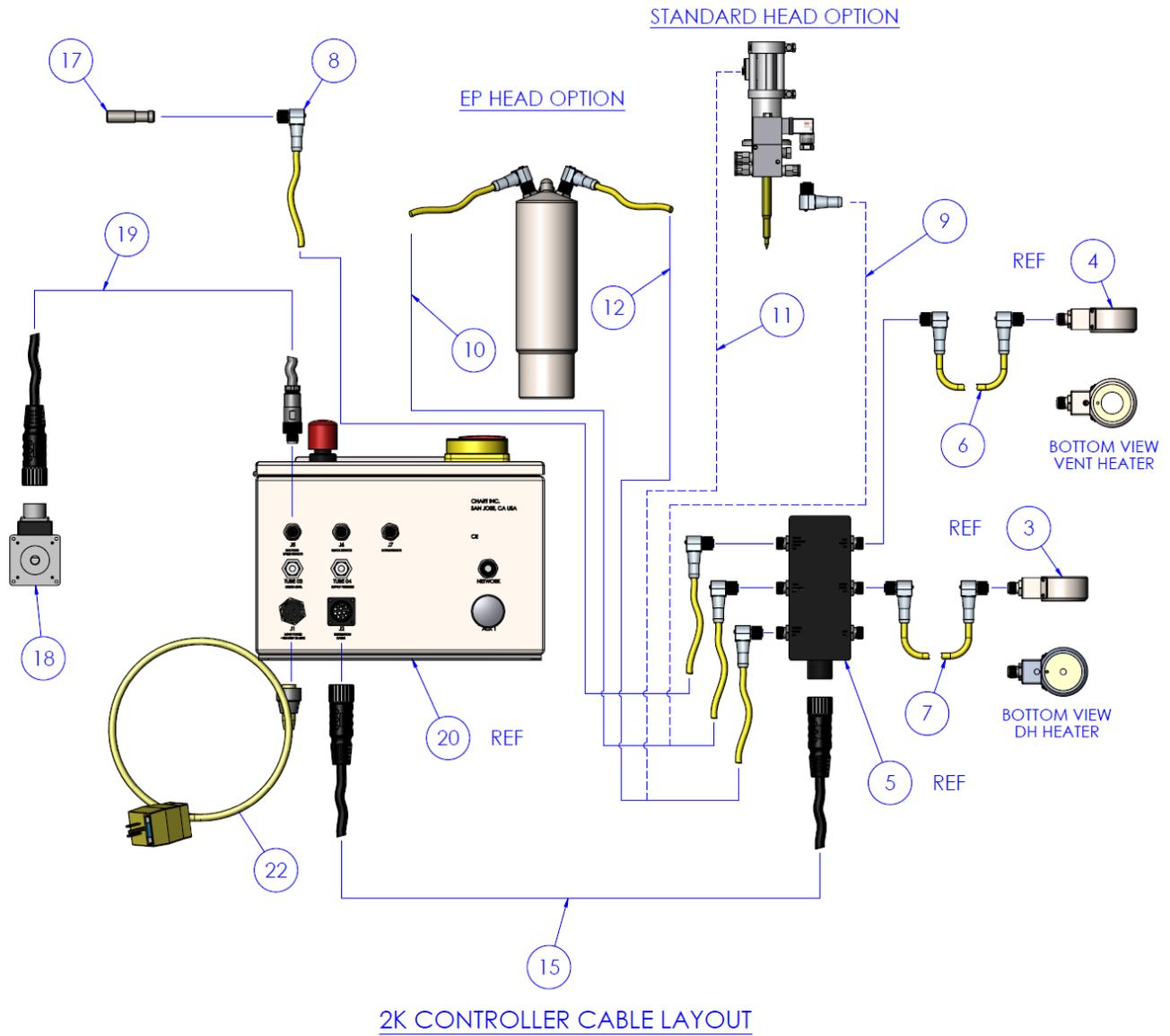
Common Replacement Parts

Item No.	Part Description	Part No.
	<i>ULTRADOSER PARTS</i>	
1	UltraDoser Body	15170
2	Head Assembly	
2.1	EP Head Assembly (Optional)	1005
2.1.1	Dosing Stem (Valve) Assembly	670.38
2.1.2	Solenoid Valve Spare Assembly	2450.16
2.2	Head Assembly (Standard)	
2.2.1	Dosing Stem (Valve) Assembly	141
2.2.2	Solenoid Valve Spare Assembly	535
3	Dosing Head Heater (no cable included)	106C
4	Vent Heater Assembly (no cable included)	105C
5	Distribution Block	571
6	Vent Heater Cable – 4mt (D-1)	105C.01
7	Nozzle (Dosing Head) Heater Cable – 1.2mt (D-2)	1411
8	Timing / Container Sensor Cable Assembly – 2mt (D-3)	2440.16
9	Dose Solenoid Cable – 1.5mt (D-4 for Std Head)	2045
10	Dose Solenoid Cable – 1.5mt (D-4 for EP Head)	323
11	Confirm Sensor Cable – 1.5mt (D-5 for Std Head)	1201
12	Confirm Sensor Cable – 1.5mt (D-5 for EP Head)	323
13	75 Micron, 1/8” M x F Snubber	160
14	SRV, 50 psi	211
15	Distribution Block Cable – 5mt	577
	<i>SENSORS</i>	
16	Complete Sensor Bracket Assembly (install at UltraDoser head)	1422
17	12mm Inductive Proximity Sensor (Speed & Timing Sensor)	2807
18	Encoder (3/8” shaft)	2870.08
19	Encoder Cable – 20ft	2870.22
NOT SHOWN	18mm Photoelectric Sensor (default Bottle Detect Sensor)	2870.10
NOT SHOWN	18mm Sensor Support Hardware (use with PN 1422)	694
	<i>2K CONTROLLER PARTS</i>	
20	Controller Assembly – 2KS (Siemens)	2880
20	Controller Assembly – 2KA (Allen Bradley)	2870
21	Controller Mounting Assembly	2384
22	Controller Power Cord Assembly – 4mt	410
	<i>MISC PARTS</i>	
23	Doser Stand	119
24	Stand Base	326A
NOT SHOWN	C-Flex Fill Hose – 10ft	123
NOT SHOWN	Y-Pattern Manual Globe Valve	S60MYCD
NOT SHOWN	Y-Pattern Purge Kit	C6454

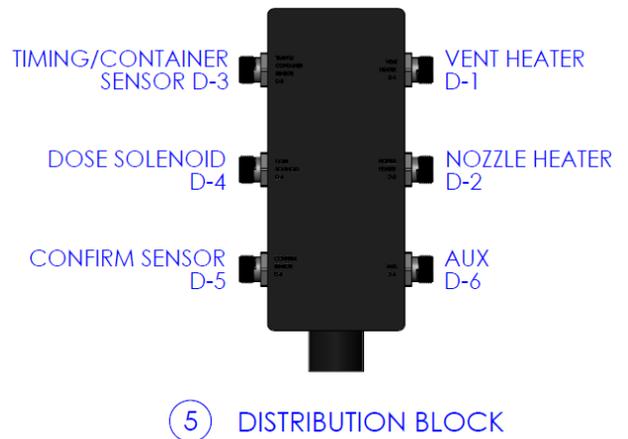


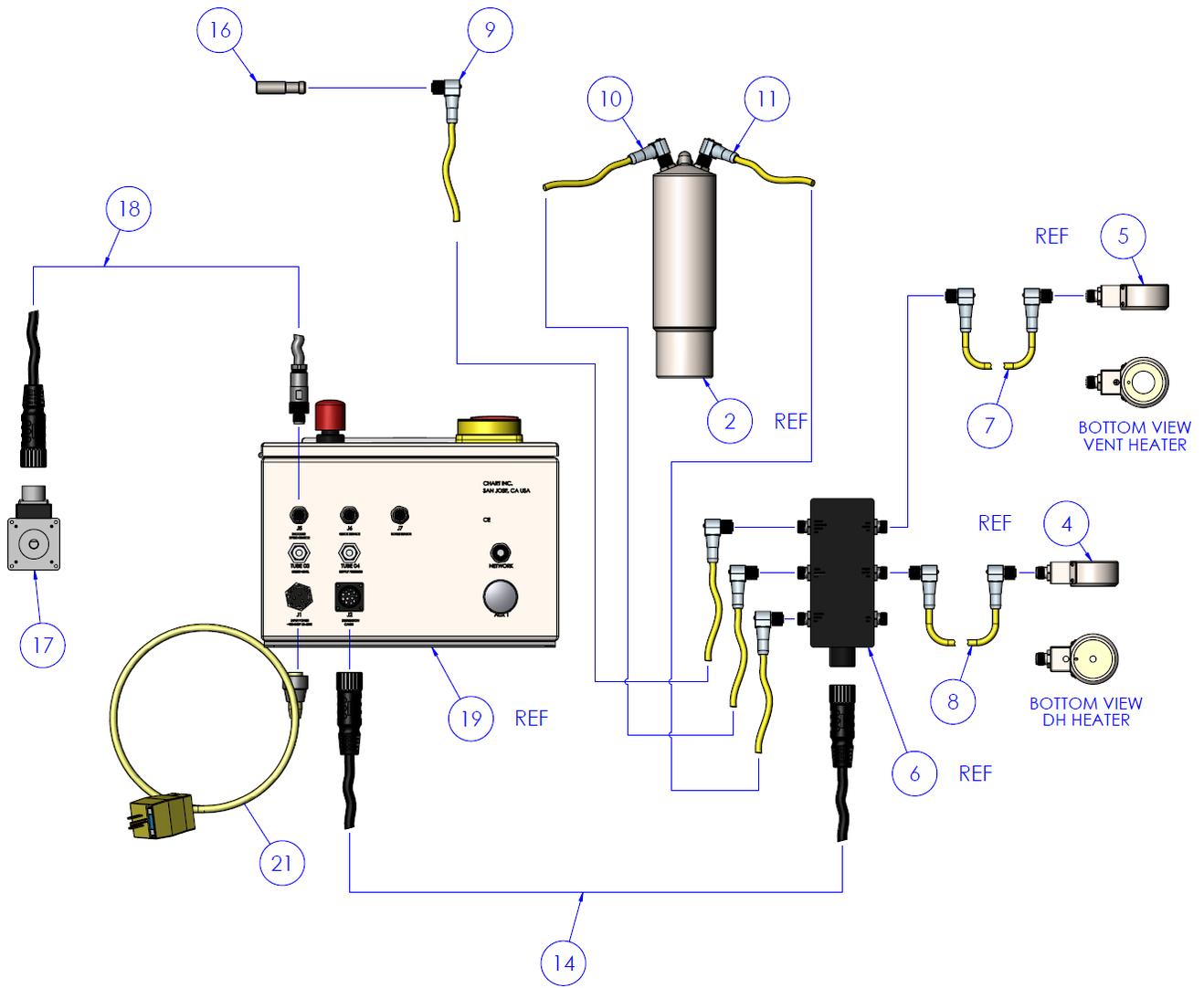


(2.1) EP HEAD ASSEMBLY



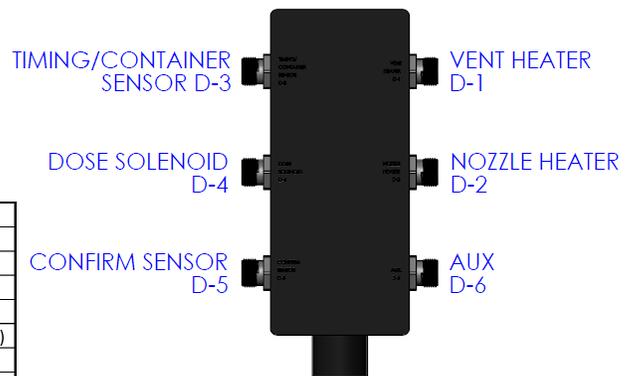
	SOURCE	CABLE ITEM NO.	DESTINATION
CONTROLLER (ITEM 20)	J1 - INPUT POWER	22	AC POWER
	J2 - DISTRIBUTION CABLE	15	DISTRIBUTION BLOCK (ITEM 5)
	J5 - ENCODER/SPEED SENSOR	19	ENCODER (ITEM 18)
DISTRIBUTION BLOCK (ITEM 5)	D1 - VENT HEATER	6	VENT HEATER (ITEM 4)
	D2 - NOZZLE HEATER	7	DOSING HEAD HEATER (ITEM 3)
	D3 - TIMING/CONTAINER SENSOR	8	TIMING SENSOR (ITEM 17)
	D4 - DOSE SOLENOID	10	EP HEAD - DOSE (ITEM 2.1)
	D5 - CONFIRM SENSOR	12	EP HEAD - CONFIRM (ITEM 2.1)
	D4 - DOSE SOLENOID	9	STD HEAD - DOSE (ITEM 2.2)
D5 - CONFIRM SENSOR	11	STD HEAD - CONFIRM (ITEM 2.2)	
	D6 - AUX		NOT USED





2K CONTROLLER CABLE LAYOUT

	SOURCE	CABLE ITEM NO.	DESTINATION
CONTROLLER (ITEM 19)	J1 - INPUT POWER	21	AC POWER
	J2 - DISTRUBTION CABLE	14	DISTRIBUTION BLOCK (ITEM 6)
	J5 - ENCODER/SPEED SENSOR	18	ENCODER (ITEM 17)
DISTRIBUTION BLOCK (ITEM 6)	D1 - VENT HEATER	7	VENT HEATER (ITEM 5)
	D2 - NOZZLE HEATER	8	DOSING HEAD HEATER (ITEM 4)
	D3 - TIMING/CONTAINER SENSOR	9	TIMING SENSOR (ITEM 16)
	D4 - DOSE SOLENOID	10	EP HEAD - DOSE (ITEM 2)
	D5 - CONFIRM SENSOR	11	EP HEAD - CONFIRM (ITEM 2)
	D6 - AUX		NOT USED



⑥ DISTRIBUTION BLOCK

General Trouble Shooting

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

Condition: The safety relief valve is venting.	
Possible Causes	Actions
<ul style="list-style-type: none"> The pressure of the LN₂ supply is greater than 50 psi (3.44 bar). 	<ul style="list-style-type: none"> Check the pressure of the LN₂ supply. If the supply pressure is greater than 50 psi (3.44 bar), reduce the supply pressure. <p>**Note: A dewar can be vented to reduce the pressure.</p>
<ul style="list-style-type: none"> The vent is obstructed. 	<ul style="list-style-type: none"> Check the UltraDoser unit vent. If the vent is obstructed, clear the obstruction. <p>If the vent is obstructed with ice, contact Chart's service team at +1 408.371.4932.</p>

Condition: Liquid is coming out of the vent.	
Possible Causes	Actions
<ul style="list-style-type: none"> The LN₂ supply pressure is too high. 	<ul style="list-style-type: none"> Lower LN₂ supply pressure to 22 psi (1.5 bar) or lower.
<ul style="list-style-type: none"> Ice has developed inside the unit, causing the internal float valve to malfunction. 	<ul style="list-style-type: none"> 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. <p>Contact Chart's service team at +1 408.371.4932 for a detailed procedure.</p>

Condition: Liquid is coming out of the dosing head even though the valve is shut close.	
Possible Causes	Actions
<ul style="list-style-type: none"> The LN₂ supply pressure is too high. 	<ul style="list-style-type: none"> Reduce the LN₂ supply pressure.
<ul style="list-style-type: none"> The valve seat is contaminated (ice or particles). 	<ul style="list-style-type: none"> The UltraDoser unit must be drained of LN₂. The dosing valve assembly must be removed and cleaned. <p>Contact Chart's service team at +1 408.371.4932 for a detailed procedure.</p>
<ul style="list-style-type: none"> Air supplied to the solenoid is reversed. 	<ul style="list-style-type: none"> Reverse the LN₂ lines that supply and vent to the solenoid.

Condition: No liquid from the dosing head.	
Possible Causes	Actions
<ul style="list-style-type: none"> There is insufficient liquid inside the UltraDoser unit. 	<ul style="list-style-type: none"> Check the level of LN₂. If the level is empty or low, open the supply valve.
<ul style="list-style-type: none"> The unit is disabled. 	<ul style="list-style-type: none"> Pull out the Dose Enable switch to enable mode (ensure switch is not lighted).
<ul style="list-style-type: none"> The nozzle is frozen shut. 	<ul style="list-style-type: none"> Run Quick Service to thaw nozzle. Remove, clean, and re-install the nozzle (see page 40).
<ul style="list-style-type: none"> The bottle detect sensor is not detecting a container. 	<ul style="list-style-type: none"> Check sensor connections. Ensure the sensor is correctly positioned to detect points (gear tooth or the like) If necessary, replace sensor.
<ul style="list-style-type: none"> The speed sensor/encoder is not functioning. 	<ul style="list-style-type: none"> Check the speed sensor/encoder is operating correctly and is sending a signal to the 2K controller.

Condition: The dosing valve fault error is displayed on the 2K Controller.	
Possible Causes	Actions
<ul style="list-style-type: none"> The dosing valve assembly is not moving. 	<ul style="list-style-type: none"> Check the pneumatic pressure. There must be approximately 60-70 psi (4.13-4.82 bar) for the dosing valve to function correctly.

Condition: The speed sensor fault error is displayed on the 2K Controller.	
Possible Causes	Actions
<ul style="list-style-type: none"> The speed sensor (or encoder) has been dislodged. 	<ul style="list-style-type: none"> Check speed sensor (or encoder) connections.
<ul style="list-style-type: none"> The speed sensor (or encoder) has malfunctioned. 	<ul style="list-style-type: none"> Replace speed sensor (or encoder).

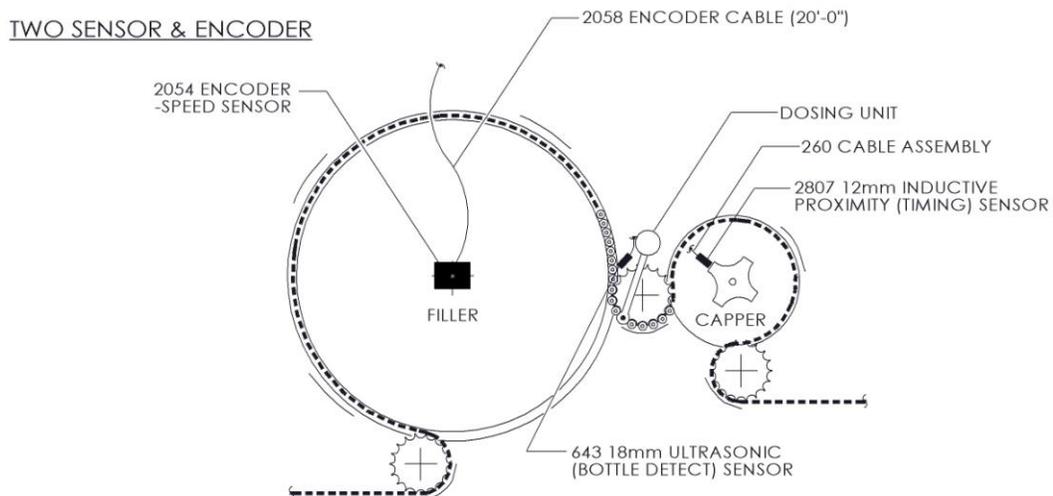
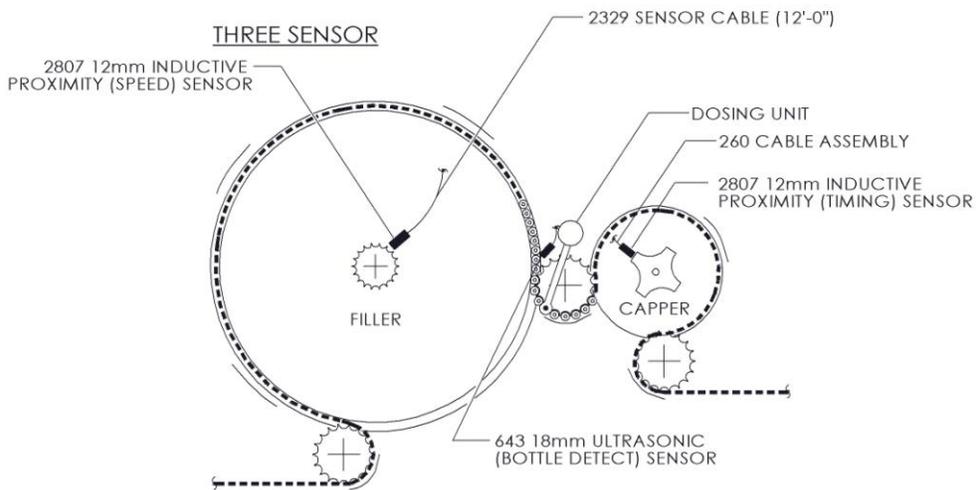
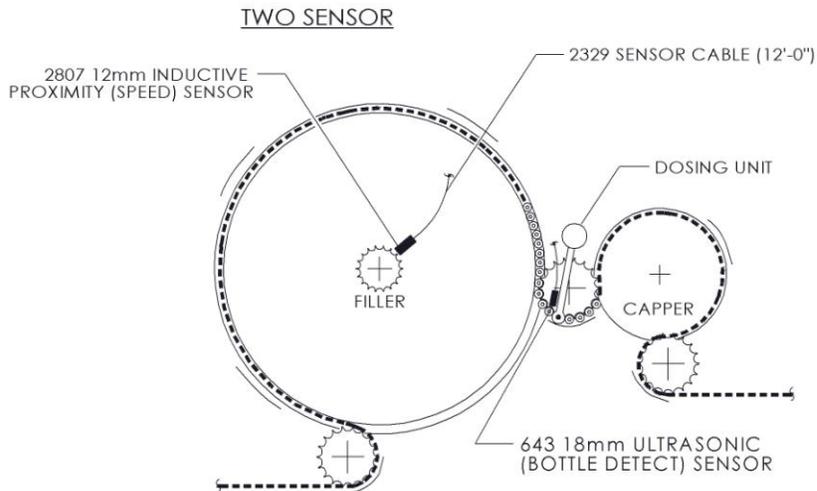
Warranty

All sales of Liquid Nitrogen Dosing Systems ("LN₂ Dosing Systems") from Chart Inc. ("Chart") to the purchaser are subject to all applicable Chart standard terms and conditions in effect at the time of sale, unless otherwise agreed in writing by an authorized representative of Chart. In addition to the warranty stated in Chart's Standard Terms and Conditions of Sale, Chart warrants to the original purchaser of Chart manufactured LN₂ Dosing Systems that for one (1) year after the date of shipment to the original purchaser said Chart manufactured LN₂ Dosing System will maintain all vacuum and performance standards for said LN₂ 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 LN₂ 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 LN₂ Dosing System. As a further pre-condition to any Chart warranty obligation hereunder, purchaser shall return said purportedly defective LN₂ Dosing System, freight prepaid, to the plant of the manufacturer within thirty (30) days after receipt of the LN₂ Dosing System. Chart shall inspect the returned LN₂ Dosing System, and, if said LN₂ Dosing System is found defective, shall, at Chart's option as purchaser's sole and exclusive remedy, either (i) repair or replace such LN₂ 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 LN₂ 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.

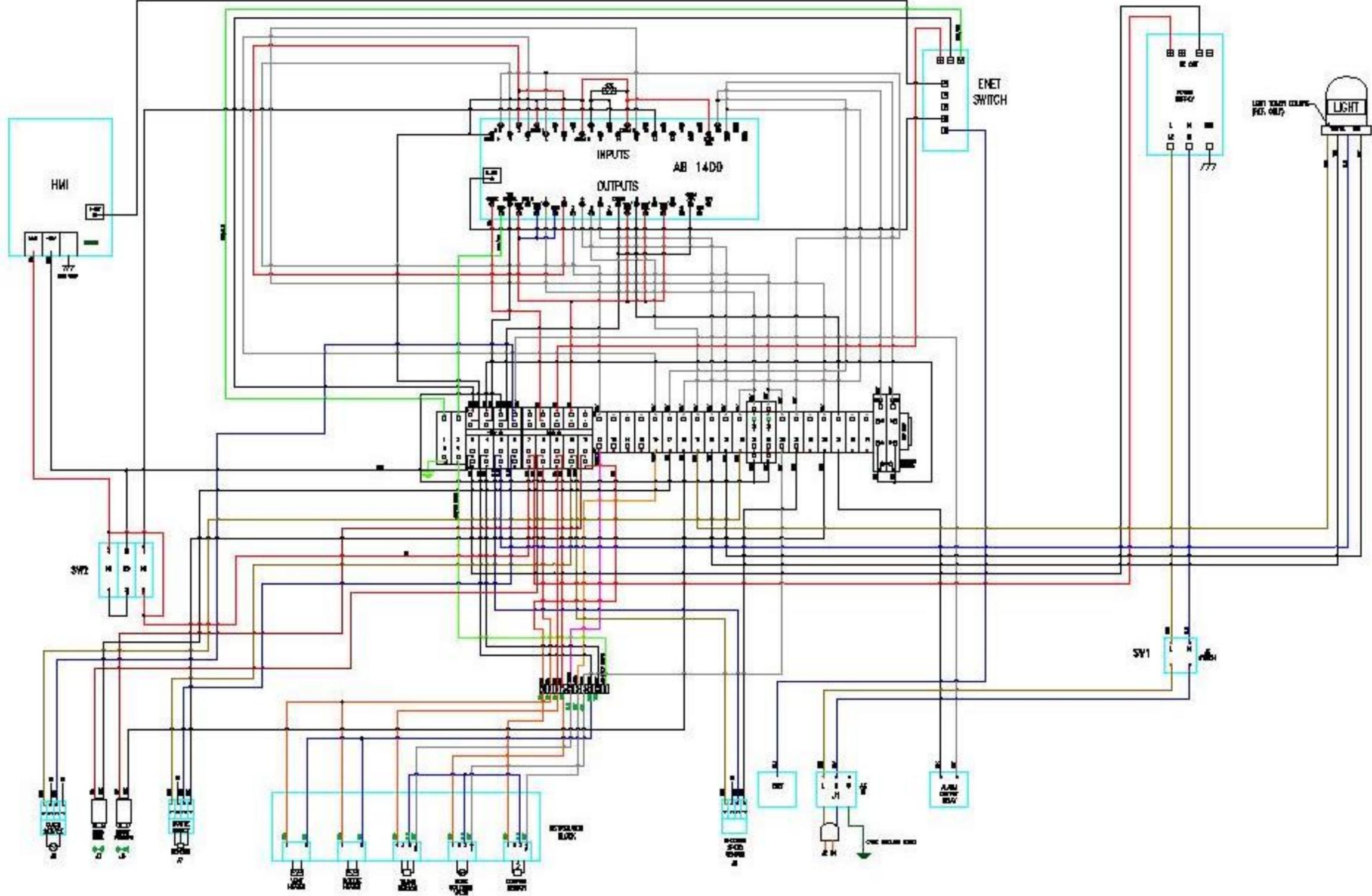
Chart's sole and exclusive liability under this Warranty is to the original purchaser and shall not exceed the lesser of the cost of repair, cost of replacement, or refund of the net purchase price paid of the LN₂ Dosing System by the original purchaser. Chart is not liable for any other losses, damages, 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 LN₂ Dosing System.

Appendix A – Sensor Positioning



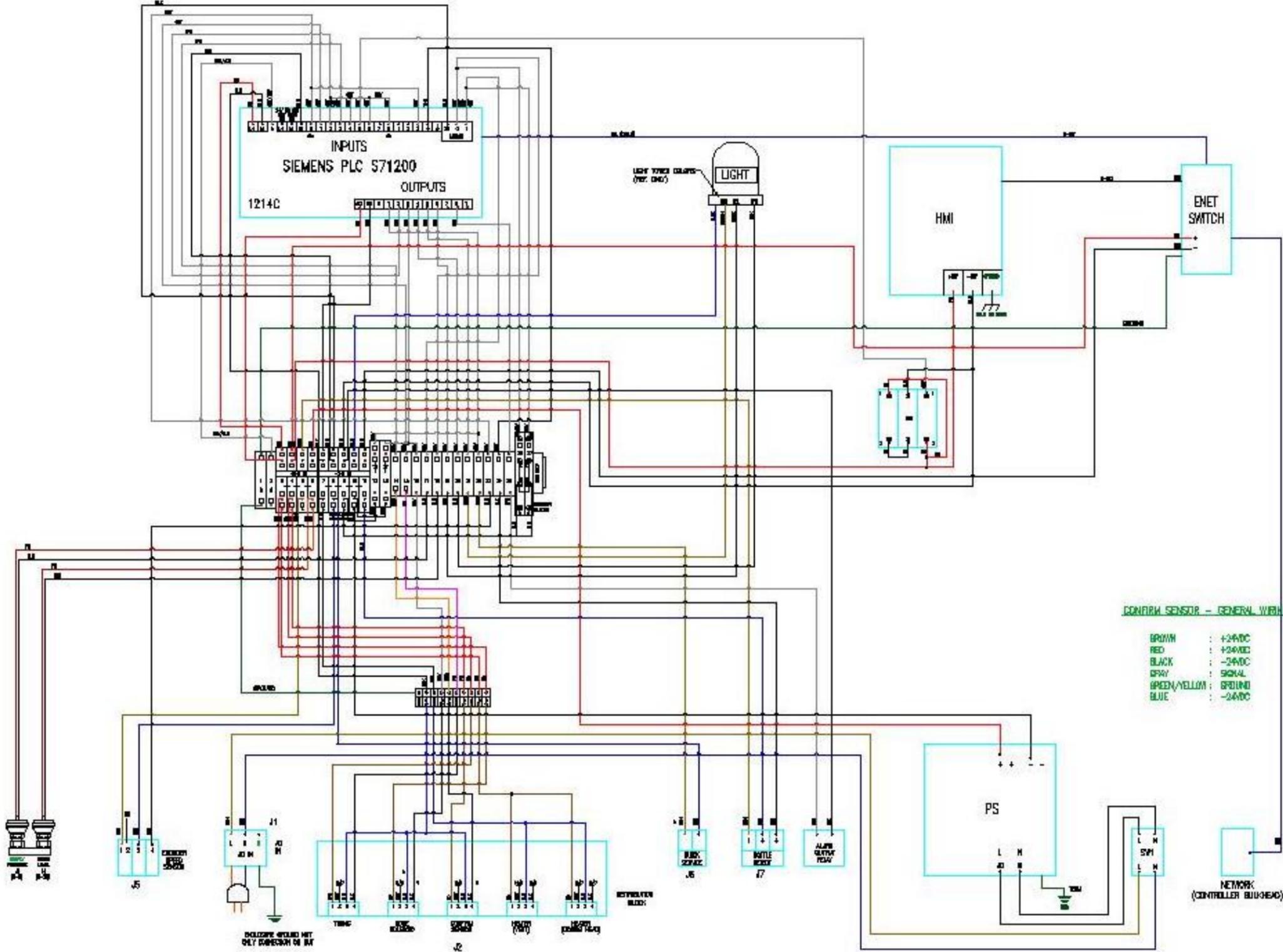
Appendix B – 2KA (Allen Bradley) Controller Wiring Diagram

I/O FUNCTIONS	
DIGITAL INPUT	ANALOG INPUT
1. I0 00 - I02 BOTTLE REJECT	I0 17 - I01 LIQUID LEVEL
2. I0 12 - I01 TANK POSITION	I0 18 - I01 SUPPLY PRESSURE
3. I0 01 - I02 CONFORM SENSOR	
4. I0 06 - I01 OVERSPEED / SPEED SENSOR	
OUTPUTS	
1. O0 02 - O01 CIRCUIT BREAKER	
2. O0 03 - O03 DISCHARGE VALVE	
3. O0 04 - O03 LIGHT TOWER RED	
4. O0 07 - O03 LIGHT TOWER YELLOW	
5. O0 31 - O04 LIGHT TOWER GREEN	
6. O0 30 - O03 ALARM BELL RELAY	



Appendix C – 2KS (Siemens) Controller Wiring Diagram

I/O FUNCTIONS	
DIGITAL INPUT	ANALOG INPUT
1. I0 24 - DI0.4 BOTTLE DEFECT	TI 16 - AI0 LIQUID LEVEL
2. I0 15 - DI0.1 TIMING SENSOR	TI 17 - AI1 SUPPLY PRESSURE
3. I0 14 - DI0.3 CONVEX SENSOR	
4. I0 05 - DI0.0 EXHAUST/SPREAD SENSOR	
OUTPUTS	
1. Q0 20 - DO0.1 QUICK SERVICE	
2. Q0 18 - DO0.3 DOORING VALVE	
3. Q0 21 - DO0.5 LIGHT NEVER RED	
4. Q0 19 - DO0.6 LIGHT NEVER YELLOW	
5. Q0 22 - DO0.4 LIGHT NEVER GREEN	
6. Q0 33 - DO0.0 ALARM OUTPUT RELAY	



CONFIRM SENSOR - GENERAL WIRING

- BROWN : +24VDC
- RED : +24VDC
- BLACK : -24VDC
- GRAY : SIGNAL
- GREEN/YELLOW : SIGNAL
- BLUE : -24VDC

NOTE:
ALL CABELING 22 GA. (UNLESS NOTED)