



Knight Dairy Farm Products



Dairy-Chem Plus 2 & 3 Part Teat Dip Blending Instruction Manual

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CAUTION: Wear protective clothing and eyewear when dispensing chemicals or other materials. Observe safety handling instructions (MSDS) of chemical mfrs.



CAUTION: To avoid severe or fatal shock, always disconnect main power when servicing the unit.



CAUTION: When installing any equipment, ensure that all national and local safety, electrical, and plumbing codes are met.

INTRODUCTION

The KNIGHT Dairy Chem Plus teat dip blending system is designed to produce factory quality dairy farm hygiene chemistries in real time as they are consumed by the dairy farm. This simple yet sophisticated system relies on advanced patent pending flow metering and embedded control software technology to produce consistent high quality teat dips from concentrate.

The Dairy Chem Plus can produce a variety of dairy cow udder treatment solutions including Iodine, Chlorine Dioxide and Chlorhexidine. In addition to producing your quality teat dips on the farm Dairy Chem Plus logs all of the system

blending activity enabling you to help the dairy farmer control costs and improve overall udder hygiene.

DAIRY CHEM PLUS PROCESS – HOW IT WORKS

The Dairy Chem Plus teat dip blending system utilizes a sophisticated computer controlled process to blend concentrated chemicals with water into a factory quality finished teat dip solutions. To understand the basic operation of the system it's important to understand the process logic and —events— that govern how it operates. The Dairy Chem Plus blending process works as follows:

Batch Initiation:

- **Float:** When set to —float— operated the system monitors the state of the lower level float in the RTU tank. When the product level drops below the float, the blending sequence is initiated.
- **User:** When set to —user— operated the system monitors the state of the SCROLL key on the front panel. When the SCROLL key is pressed, the blending sequence is initiated

Status Check:

- **Temperature:** When enabled, the system will check the temperature of the concentrate. If the temperature is within the tolerance setting, the system will begin dispensing. If the temperature is outside of the tolerance setting, an alarm message will be displayed on the screen. If the Temperature Alarm setting is —ON—, an audible alarm will sound. The system will then begin dispensing unless the Temperature Hold setting is —ON—. If the Temp Hold setting is —ON— the system will not begin dispensing.

Dispensing:

- Depending on the formula settings, pumps 1,2 and 4 (pump 4 on a 3 pump system only) begin pumping concentrate and/or water through the flow meters. The flow meters register the volume of fluid as it passes through. When the target volume is achieved for each fluid in the formula, the pump shuts off. If multiple Blend Increments are required to achieve the total Blend Volume, the process repeats itself until the total Blend Volume has been batched up.
- During the blending sequence the system will show in real-time the volume of dispensed product in gallons on the main controller display.
- During the blending sequence, if the microcontroller fails to receive the proper amount of pulses from any of the flow meters during any single increment of batching, the system will halt the blending sequence and display an error message for the corresponding flow meter.

Data Logging:

- Upon completion of the blending sequence, the system will beep, indicating the data for that particular batch was recorded. The system records the date, time, formula, individual pump volumes, total dispensed product and any alarm conditions. These files can be accessed and viewed on your PC at a later date.

Understanding Flow Meter Operation and Flow Meter Alarms

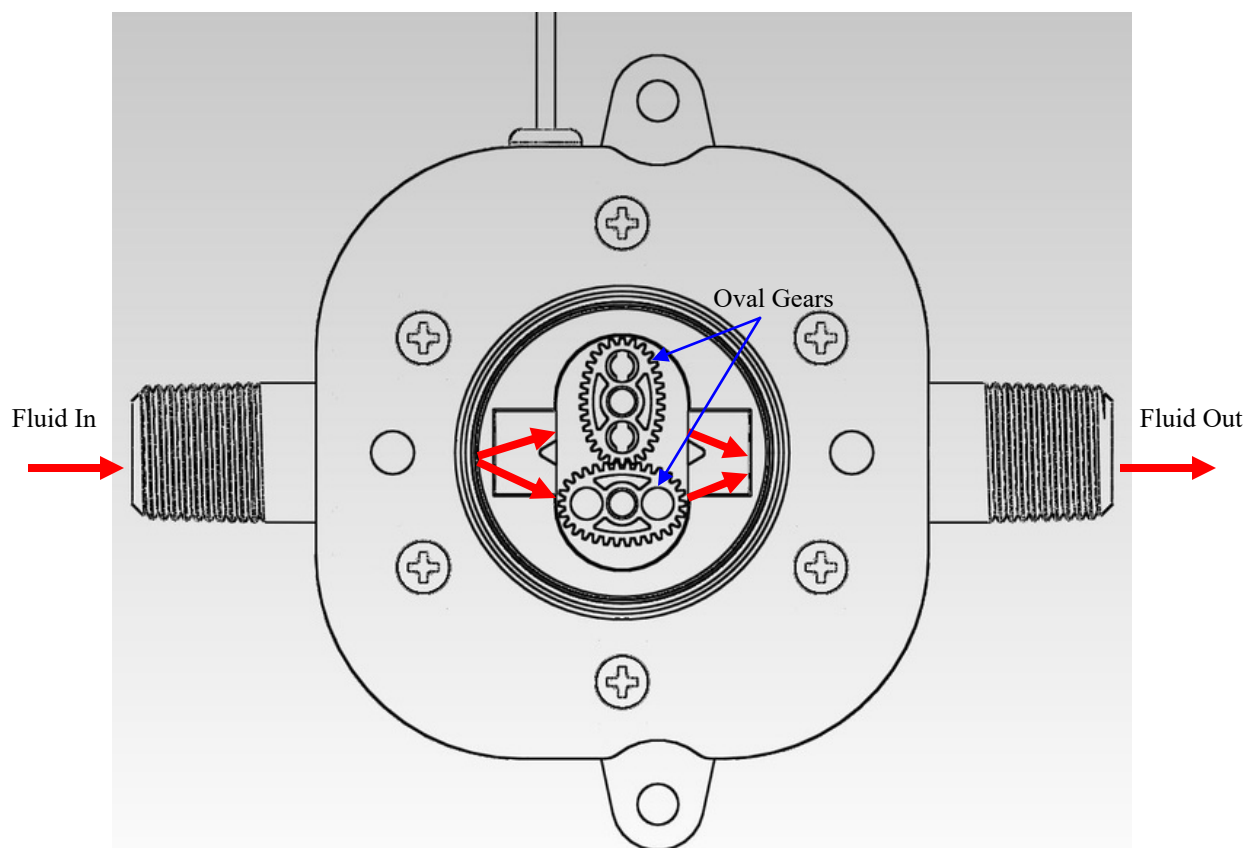
Dairy Chem Plus relies on a sophisticated fluid metering technology to achieve consistent and repeatable blending of your teat dip formulations. That's why calibration of the flow meters and internal monitoring of the flow metered fluid movement are essential if the system is to produce factory quality solutions on the farm.

The flow meters produce a digital signal that is communicated to the system controller any time the pumped fluid pressure causes the gears to turn. The rate at which these gears turn and the resultant signal is what we describe as flow meter counts/sec. Flow meter counts per second are used to quantify the flow error tolerance while flow meter counts per / ml (= .XXX) are used to measure the volume of all fluid ingredients in your formulation for a given —Batch Volumell.

Flow meter alarms are how the system communicates to the user that the concentrates or water are not flowing at the expected flow rate. Flow Error Tolerance is hardcoded to provide a maximum range of flow and time as detected by the flow meter and is managed as 100% percentage of the calibrated time plus 1 second. During calibration both the volume per pulse and total runtime are stored in internal memory. During a blending sequence, the system will run the pump until the desired volume is dispensed (this is a function of the volume/pulse number recorded during calibration). If the system does not receive all the pulses necessary to achieve the volume required within the time stored + the tolerance time (double + 1 second), you will receive an error. For example, if the iodine concentrate calibration time was 30 seconds, during a blending increment the system would allow a runtime for that pump of 61 seconds to complete the total pulses required for the volume. If all pulses are not received in less than 61 seconds, you get an alarm.

Typical flow meter alarms occur when the chemical supply runs out and air enters the pump suction line changing the speed of the gears and resultant —flow meter countsll. These alarms can also occur when the pump loses prime or breaks down entirely.

The Dairy Chem Plus Controller has a —Flow Meter Testll menu for viewing the current real-time pulse counts/sec vs. calibrated pulse counts/sec. You will use this tool to troubleshoot flow meter alarm issues. **See page ???** for instructions on using this tool. NOTE: These numbers do not need to be identical but should be within 10 pulse/sec to avoid errors. If the numbers vary by more than 10 pulses/sec, re-calibrate the pump.



SYSTEM PN'S AND DESCRIPTIONS

7667090

3 Part System: Two chemical concentrates + water teat dip blending system. Two .4GPM (1.5LPM) EDP chemical pumps, One 1.5GPM (5.7LPM) EDP water pump, PVDF flow meters, water tank w/float and filter, tank mounting shelf, controller, static mixer and mounting kit.

7667120

2 Part System: Two chemical concentrate teat dip blending system. Two 1.5GPM (5.7LPM) EDP pumps, PVDF flow meters, controller and mounting kit.

7667130

2 Part System: Two chemical concentrate teat dip blending system. One 1.5GPM (5.7LPM) EDP pump & One .4GPM (1.5LPM) EDP pump, PVDF flow meters, controller and mounting kit.

7667140

2 Part System: Two chemical concentrate teat dip blending system. Two .4GPM (1.5LPM) EDP pumps, PVDF flow meters, controller and mounting kit.

Optional Components

7667052—Air solenoid/regulator kit for 7667090

7667056—Air solenoid/regulator kit for 7667120, 7667130, 7667140

7667053—One Liter RTU tank w/dual floats, wall bracket and fittings

7667054—11 Gallon RTU tank w/dual floats, wall bracket and fittings

7667028—11 Gallon water tank w/float assembly, filter, wall bracket and fittings

7110198—Temperature probe (comes standard w/3 part system, PN 7667090)

7600781—Level switch kit w/50' cable for bulk tank, 1/2" NPT

7541100-01—CS-5000 Container shelf assembly

DAIRY CHEM PLUS COMPONENT DEFINITIONS

Elliptical Knight Flow Meters – measure precise volumes of concentrated Iodine, skin conditioner water and other chemical concentrates to form the highest quality dairy hygiene products. The DAIRY CHEM PLUS flow meters communicate via a digital signal to a sophisticated microcontroller that manages the entire formulation process and records all critical usage data.

The DAIRY CHEM PLUS Flow Meter performs the following functions:

Precise metering of chemical concentrates to an accuracy of +/- 2% per liter of finished product.

Detects loss of chemical flow due to empty chemical concentrate totes and drums or loss of prime to the pumps.

Provides a data —feedback loop allowing extremely accurate data logging of chemical concentrate consumptions.



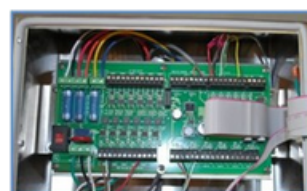
Main Controller– The DAIRY CHEM PLUS embedded microcontroller manages the entire concentrate to finished product blending process. Secure password protection prevents abuse and manipulation of programmed formulations and settings by non authorized users. Its very simple menu driven user interface keypad makes programming and calibration fast and efficient. Real time display messages alert operators to —out of range conditions that require attention by on site personnel or the DAIRY CHEM PLUS trained specialist.



The Memory Module links directly to the Main Controller and collects all of the chemical blending event data for managing quality of the chemistry produced, monitoring consumption and invoicing the customer according to the test dip produced. An integrated SD type (media card) reader provides a simple means of downloading report files and uploading settings to the system.



The Input-Output Board connects all the pumps, flow meters, floats, and temperature probe to the Main Controller. When the Main Controller issues a command to the Input-Output board to blend the test dip, the pumps and flow meters, sensors and probes work together to blend a superior quality test dip.



Electric Diaphragm Pumps (Chemical/Water) have been selected for this system for their outstanding reliability, compatibility with chemical concentrates and for their durable performance under pressure. The concentrate pumps dispense at .40 GPM/1.51 LPM open flow and are directly controlled by the Input/Output board at 115 VAC. These three valve pumps are fixed speed and utilize a —wobbler plate movement to attenuate three pistons that create a peristaltic motion on the valve chambers that create excellent suction and discharge pressure. A comparable 1.5 GPM/5.7 LPM pump for water pulls water for blending out of the water tank as required by the test dip formulation. This pump is intended for water ONLY and is not to be used for chemical even in an emergency! **NOTE: There are three different configurations of pumps use on the 2 part system.**



Self Contained Water Tank/Float system has been selected to supply consistent and reliable water pressure required for accurate formulation blending. An inline water filter protects the float seals from dirt, sand and other water source related impurities that could create leaks and premature wear. This comes with the 3 part system and is optional for the 2part systems.



Static Mixer is used for the purpose of creating agitation and mixing of the chemical concentrates and water components in the formulations. Used on the 3 part system only.



Calibration/Finished Product Valves direct flow of the chemical concentrates to your calibration vessel or to the finished product storage tank. Used on the 3 part system only.



Drum/Tote Mounted Float Sensors maintain a selected level of ready to use teat dip in the storage tank. The lower level float triggers the system blending and replenishment cycle while the upper level float acts as an emergency cut off in the event the lower float fails. The system will not blend product if the lower level switch indicates the storage tank is full. In the event the upper float is activated the system will display the message
—Upper Float On – Call for Service!



The Blended Teat Dip Storage Tank should be determined and should provide for at least three to five days of ready to use teat dip storage based on the typical use rate of the farm. This calculation should take into account the level within the tank at which the float will be mounted. Having a multiple day reserve of teat dip in your storage tank will provide the customer with sufficient product to keep milking cows should the system break down and give you time to get to the farm to resolve any problems.

Products that cannot be stored such as Chlorine Dioxide based dips should have a storage capacity equal to what will be used for each milking.

Temp Sensor is used to measure/monitor the current temperature of the Iodine concentrate and to trigger (and record) an alarm if the temperature changes to an —out of rangell temperature. The temperature sensing function is a —proactivell function to alert operators to out of range conditions that could lead to excessive Iodine flow meter alarm(s) that could prevent the system from refilling the storage tank. The system compares the current concentrate temperature against the —last calibratedll temperature (+/- XX F) to proactively alert the dairyman the concentrate that is on line cannot be used until the temperature is in range. The system will record temperature alarms in the batch report should they occur during a blending operation.

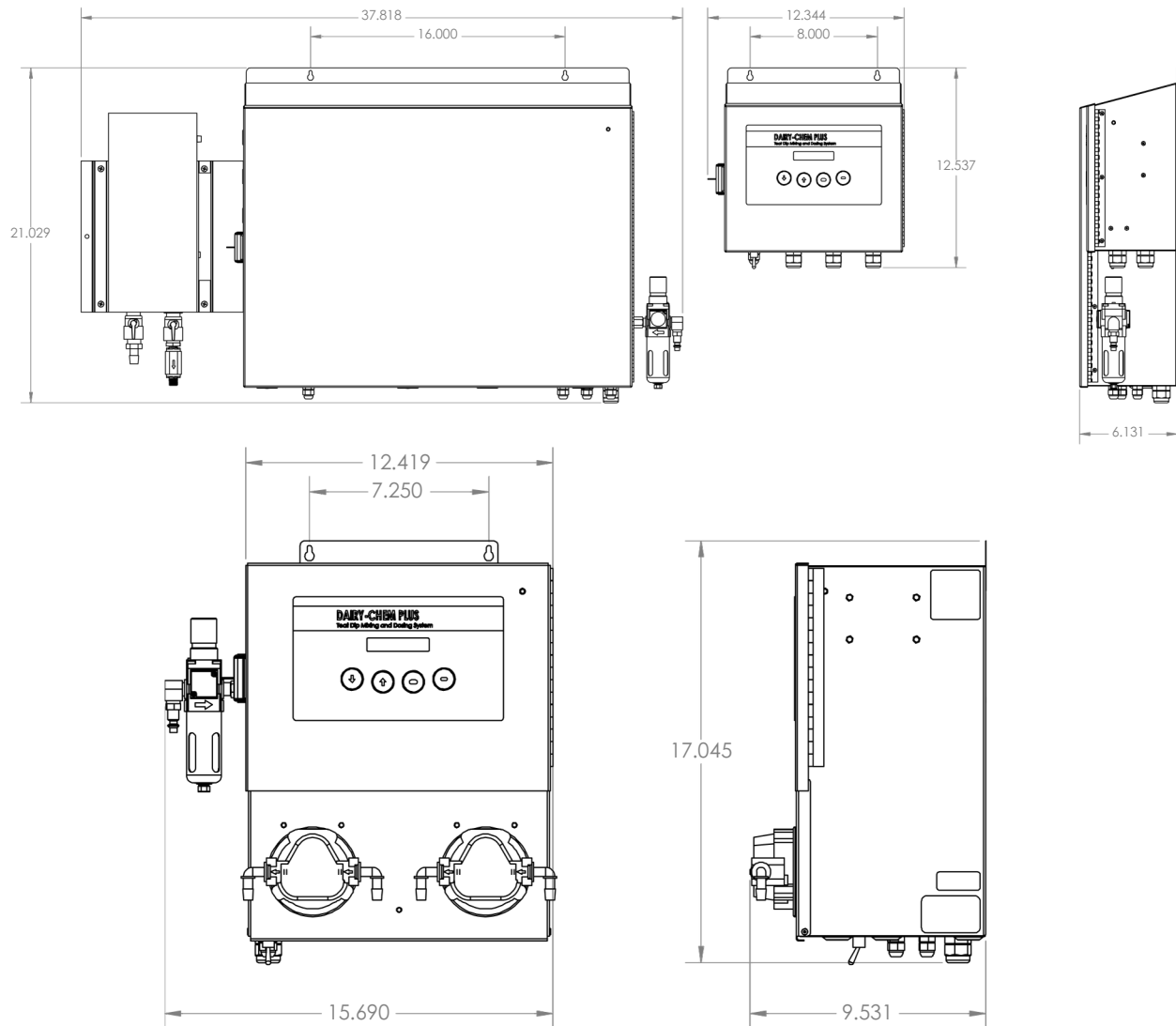


Air Regulator/Control Valve is an optional component for use when you do not want to transfer product during the batching sequence. Run your teat dip transfer pump air supply line from the output of the assembly to your pump. In the Program Setup file for the system, set —Teat Pump Is:ll to ON and the system will disable the airflow to your transfer pump during all batching sequences.

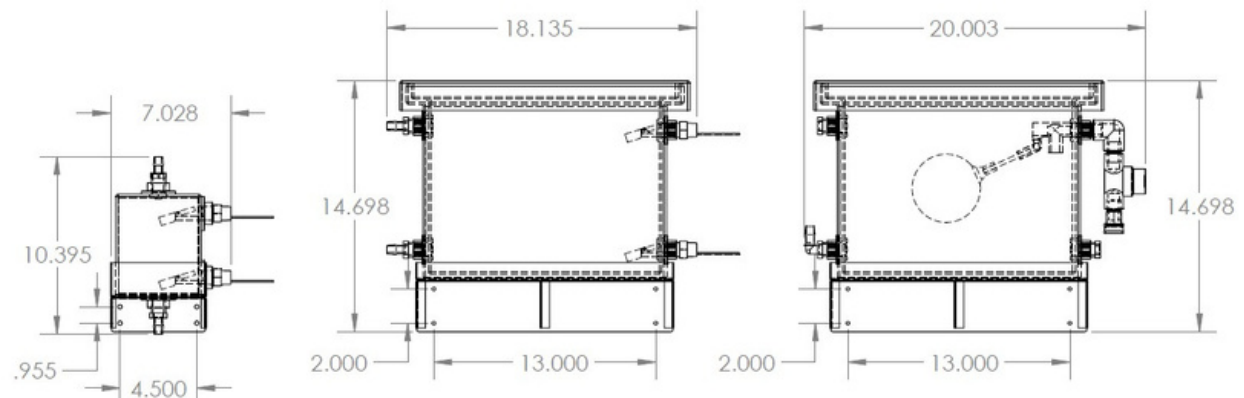


Installation Space: The DAIRY CHEM PLUS systems are designed for wall mounting. Make sure the wall surface is flat enough to allow flow meters to orientate at 90 degrees to the floor.

Systems Dimensions:



Optional Component Dimensions:



Power Requirements

Power: ☐ Duplex 115 VAC outlet for system. 20 Amp service.

Materials of Construction

- ☐ **#304 stainless steel** - pump/control cases, static mixer base/cover, water tank secondary mixer/finished product measuring vessel brackets, water tank bracket.
- ☐ **Schedule 80 PVC**- check valves, foot valves, hard plumbing, static mixer.
Polypropylene – Tank adaptors, electric diaphragm pump heads and fittings, chemical floats, water tank, water float, temp sensor cable shroud.
- ☐ **Flow Meter** – Body (PPS), Gears (PPS for chemical, PFDV for water), Fittings (Nylon)
Temp Sensor – Sensor body (ABS), Sensor Epoxy (Black Resin), Cable Insulation (PVC).

CUSTOMER SUPPLIED INSTALLATION MATERIALS

Material	Purpose	Estimated Qty Per System
☐ Graduated Cylinders a. 1000 ML for water b. 250 ML for concentrate c. 100 ML for concentrate	☐ Calibration of system	☐ One Set
☐ Hose/Cable Enclosures. Plastic "Panduit" or other cable/wire ducting and cover	☐ Secure all hose, cable, power cords in a protected, safe and professional housing	Depends on distance and routing. Can be used to enclose hose/cables directly beneath unit only or from units all the way to the teat dip storage tank depending on customer preference
$\frac{3}{4}$ " O.D. x $\frac{1}{2}$ " I.D. Nylon braided hose 1.9 cm O.D. x 1.27 cm I.D.	Concentrate suction hose Finished product delivery to storage tank	15 ft/4.6 M per concentrate pump Measure distance from top of static mixer to storage tank
$\frac{3}{4}$ " (1.9 cm) stainless steel hose clamps	Secure all hose connections	12 per system
$\frac{1}{2}$ " (1.27 cm) plastic hose barb fittings	Secure finished product hose to storage tank	One
High pressure hose, $\frac{3}{4}$ " FGHT x $\frac{3}{4}$ " MGHT. Appliance type or better recommended. Metric conversion sourced locally	Connect water source to water tank float valve	One
Wall anchors and screws. Type depends on wall surface material. Should be at least #10 x 1" (25.4 cm x 2.54 cm) sheet metal screw with plastic or lead anchors for main system. 2" plastic pipe and pipe hangers (unistrut or other)	☐ Mount system on wall	☐ Five per system
☐ 1" schedule 40 PVC pipe	☐ Convey $\frac{1}{2}$ " I.D. discharge hose and float cables from system to teat dip storage tank Stand pipe for concentrate suction or temp sensor submersion	☐ Depends on distance from system to storage tanks 50" for totes sized for 250 gallon totes 38" for 55 gallon drums
☐ Stainless steel hose clamps	☐ For securing hose connections and tank adaptor	24) $\frac{3}{4}$ " (1.9 cm) clamps 2) 3" (7.62 cm) clamps
☐ Lead anchors and lag bolts.	☐ Mount water or chemical storage tank on wall.	Depends on wall surface. Use four minimum.

System Location

(1) The DAIRY CHEM PLUS system must be installed inside the milking facility building directly above where chemical concentrates will be placed. **The pumps in the system have a suction limit of 10 ft linear feet (3.04 M) of hose.** Longer suction hose lengths will prevent the system from priming effectively and dispensing at the desired flow rate. **Note: the optimal distance from the top of the chemical concentrate drum/tote to the bottom of the pump cabinet is 18" with the total length of exposed suction hose no more than four feet.**

(2) Locate the system in the chemical or utility room as far from outside entry doors or windows or near doors or farm equipment that can radiate excess heat.

(3) Do not place system in close proximity to frequency drives and other equipment that can radiate high levels of electrical noise and interference.

(4) The DAIRY CHEM PLUS controller can be installed to the side or above the pump/flow meter unit but NEVER below it! **NOTE: The 2 pump systems have the controller built into the pump cabinet.**

3 Pump System Step By Step Installation Procedures

(1) Mount cabinet (s) on wall in specified proximity to concentrate tanks/drums, water and power source:

- a. Use a level to position control and pump cabinets correctly.
- b. Controller should be positioned at eye level for easy access for programming and retrieval of data and away from any moisture.

(2) Install plastic or stainless steel wire/hose ducting beneath the controller and pump cabinets to cover/secure tubing and cable and provide a safe and service friendly installation for your customer:

- a. Place the ducting below the level of the chemical concentrates tote (s) to allow the pump cabinet to be mounted as close to the tote as possible to minimize suction hose length.
- b. Cut holes or use slots to drop cable/hose into the ducting as required.

(3) Route finished product discharge hose to storage tank:

- a. Measure length of ½" (1.27 cm) I.D. braided discharge hose from the finished product discharge ball valve to storage tank and cut to length.
- b. Install a ½" (1.27 cm) barb x ½" NPT barb fitting to the storage tank to secure the finished product hose to the tank.
- c. Route discharge hose along wall/ceiling and secure to wall with PVC pipe or other enclosure.
- d. Connect discharge hose to ½" (1.27 cm) tank fitting using a service loop above fitting.

(4) Install water tank:

- a. Mount stainless steel bracket and tank assembly below the level of the pump/flow meter cabinet. Failure to do so will result in siphoning of water into the finished product tank.
- b. Use proper anchors to support weight of the water tank when full.
- c. Set the tank onto the bracket and position water inlet side of tank for easy access and service.
- d. Connect hose from cold water source to ¾" FGHT fitting and tighten.
- e. Connect water pump suction port to tank discharge fittings.
- f. Turn on water slowly and fill tank. Check for leaks.
- g. Adjust float to maintain 2/3 level tank capacity.
- h. Install tank cover.



CONTINUED ON PAGE 11

(5) Mount finished product level float sensor in teat dip storage tank: (if using level switch kit PN 7600871)

- a. Drill a 3/4"(1.91 cm) hole using hole saw into side of bulk tank or tote leaving sufficient finished product volume for three to five days of use under the float. Remember, when the product level drops below the float switch the system will replace the product consumed (Blend Volume) during the milking shift.

NOTE: When the tank is empty the floats should be in a "closed state". Verify with multi-meter.

(6) Route tank level float cable from main controller case to finished product storage tank:

- a. Attach cable to finished product delivery hose or install in separate PVC pipe along wall/ceiling.
- b. Secure cable safely to prevent equipment and operators from damaging it.
- c. Wire the floats per the wiring diagram on page 42. The low level float (triggering float) goes to LLS-1 (sig/gnd) and the upper level float (overflow) goes to LLS-2 (sig/gnd).

(7) Route chemical concentrate pump suction hose to chemical concentrate tanks:

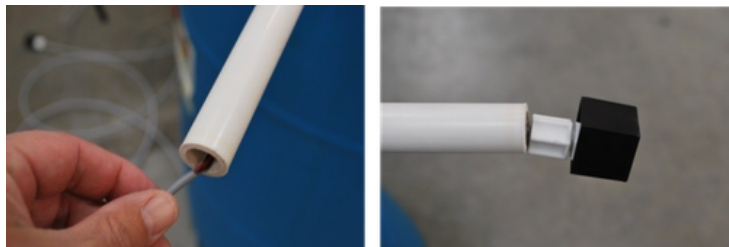
- a. Route 1/2"(1.27 cm) I.D. suction hose through grommets on pump case bottom and connect to suction side of chemical concentrate pump (s) right side.
- b. Secure in place with stainless steel gear clamps.
- c. Route tubing through a stand pipe. It is recommended that you use a foot valve and strainer on suction lines to the pumps to protect the flow meters from debris that could potentially jam the gears.
- d. Drop stand pipe into drum opening.



Note: Maximum suction hose length is 10 ft (3.04 M) between pump and bottom of chemical concentrate tank.

(8) Install the temperature sensor (if equipped):

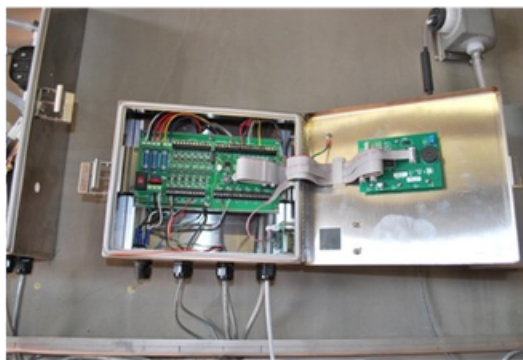
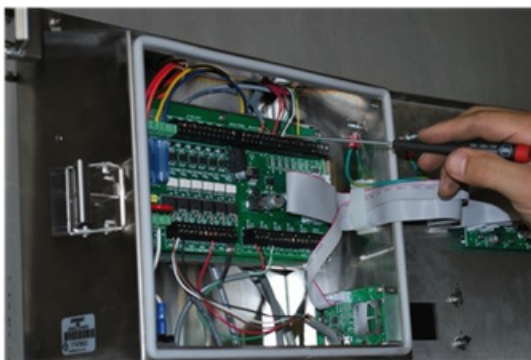
- a. Cut 1"(2.54 cm) PVC pipe to length for drum/tote height in use.
- b. Insert the temperature sensor cable through the bottom of PVC pipe.
- c. Pull temp sensor cable through PVC pipe until sensor element reaches bottom of PVC pipe.



- d. Drop temp sensor through drum opening and secure in place.
- e. Wire the temp sensor back to the terminal strip in the controller as it was received. See wiring diagram on page 42 for details.

CONTINUED ON PAGE 12

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- (10) Install flow meter cable (red, black, white, green and yellow leads) connection through strain relief on control case bottom. Follow wiring diagram on page 42.
- (11) Install EDP pump cable (brown, orange, red, blue, black, white, violet and yellow) from pump cabinet through strain relief on control case bottom and wire to I/O board. Follow wiring diagram on page 42.
- (12) If using the optional air regulator/solenoid valve to control transfer pump, connect yellow and violet leads from same cable to pump #5 DC output. This output controls the air flow to an external air pump used to dispense finished two part dips mixed in equal 50-50 parts to jugs, dip cups or storage tanks. Follow wiring diagram on page 42.
- (13) Move all chemical concentrate tanks into position and power up system.



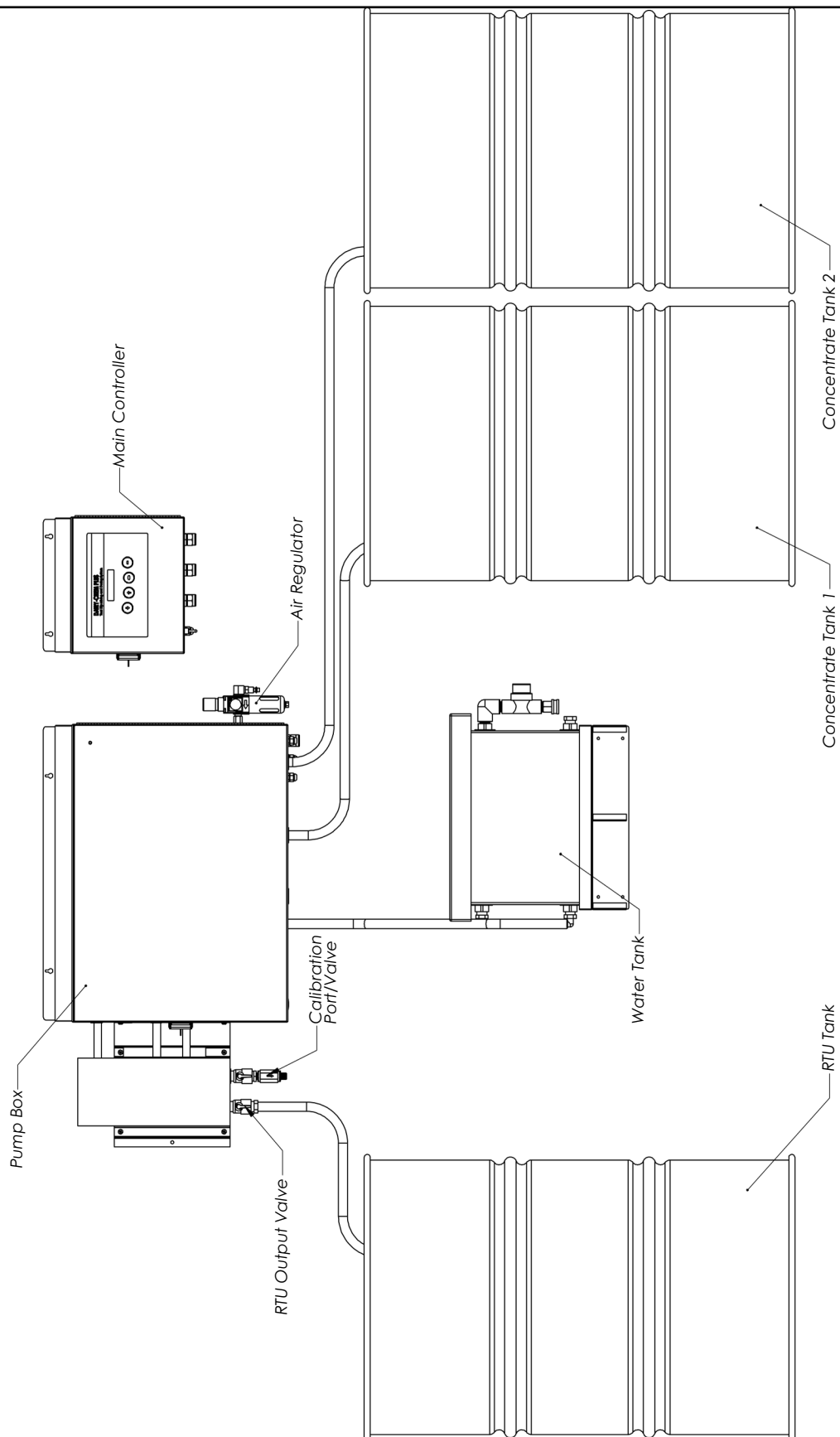
- (14) Priming Pumps:
- Open Calibration Valve and close RTU Output Valve. See page 12 for valve identification.
 - Press and hold OK button until 0000 appears. Press OK again until you see the Prime Yes/No screen.
 - Press scroll until you select the pump to be primed.
 - Put bucket or graduated cylinder under calibration valve output.
 - Press Up key to start / stop prime.
 - Repeat prime for each chemical concentrate pump and water.
 - Check all fluid connections for leaks.

Note: Electric diaphragm pumps out of the box will have —dryll seals that may not prime instantly. You may need to remove the suction fitting and dribble a small amount of water into the pump as it is priming to —wetll the seals before it will create enough suction to prime. You may also need to prime with water before concentrate the first time.

- (15) SystemProgramming—Go to page 17 for instructions on system programming

SEE PAGE 13 FOR SYSTEM DIAGRAM

3 Pump System Diagram (7667090)



2 Pump System Step By Step Procedures

(1) Mount cabinet on wall in specified proximity to concentrate tanks/drums, water (if applicable) and power source:

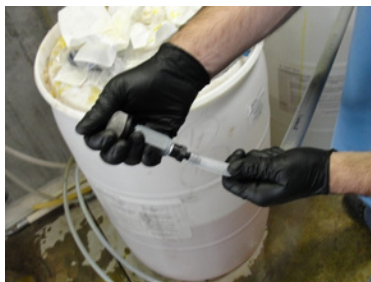
- a. Use a level to position control and pump cabinets correctly.
- b. Controllers should be positioned at eye level for easy access for programming and retrieval of data and away from any moisture.

(2) Install plastic or stainless steel wire/hose ducting beneath the controller and pump cabinets to cover/secure tubing and cable and provide a safe and service friendly installation for your customer:

- a. Place the ducting below the level of the chemical concentrates tote (s) to allow the pump cabinet to be mounted as close to the tote as possible to minimize suction hose length.
- b. Cut holes or use slots to drop cable/hose into the ducting as required.

(3) Connect chemical concentrate pump suction hose (3/8" ID braided tubing in accessory kit) to chemical concentrate tanks (drums)

- a. Route 3/8" I.D. suction hose from pump inputs (right side)
- b. Secure in place with stainless steel gear clamps
- c. Route suction hose through PVC stand pipe and attach foot-valve assembly. See pic below.
- d. Drop stand pipe into drum opening.



(4) Install temperature sensor if equipped. See instructions on page 121 Wire per the wiring diagram on page 43.

(5) Once the system is mounted and the pumps plumbed to the concentrate tanks, you are ready to prime.

(6) Priming Pumps:

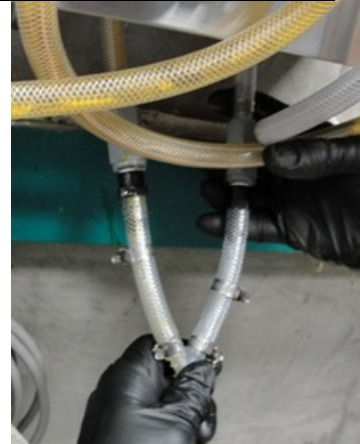
- a. Press and hold OK button until 0000 appears. Press OK again until you see the Prime Yes/No screen.
- b. Press scroll until you select the pump to be primed.
- c. Put bucket or graduated cylinder under calibration valve output.
- d. Press Up key to start / stop prime.
- e. Repeat prime for the second pump.
- f. Check all fluid connections for leaks.

Note: Electric diaphragm pumps out of the box will have —dryll seals that may not prime instantly. You may need to remove the suction fitting and dribble a small amount of water into the pump as it is priming to —wetll the seals before it will create enough suction to prime. You may also need to prime with water before concentrate the first time.



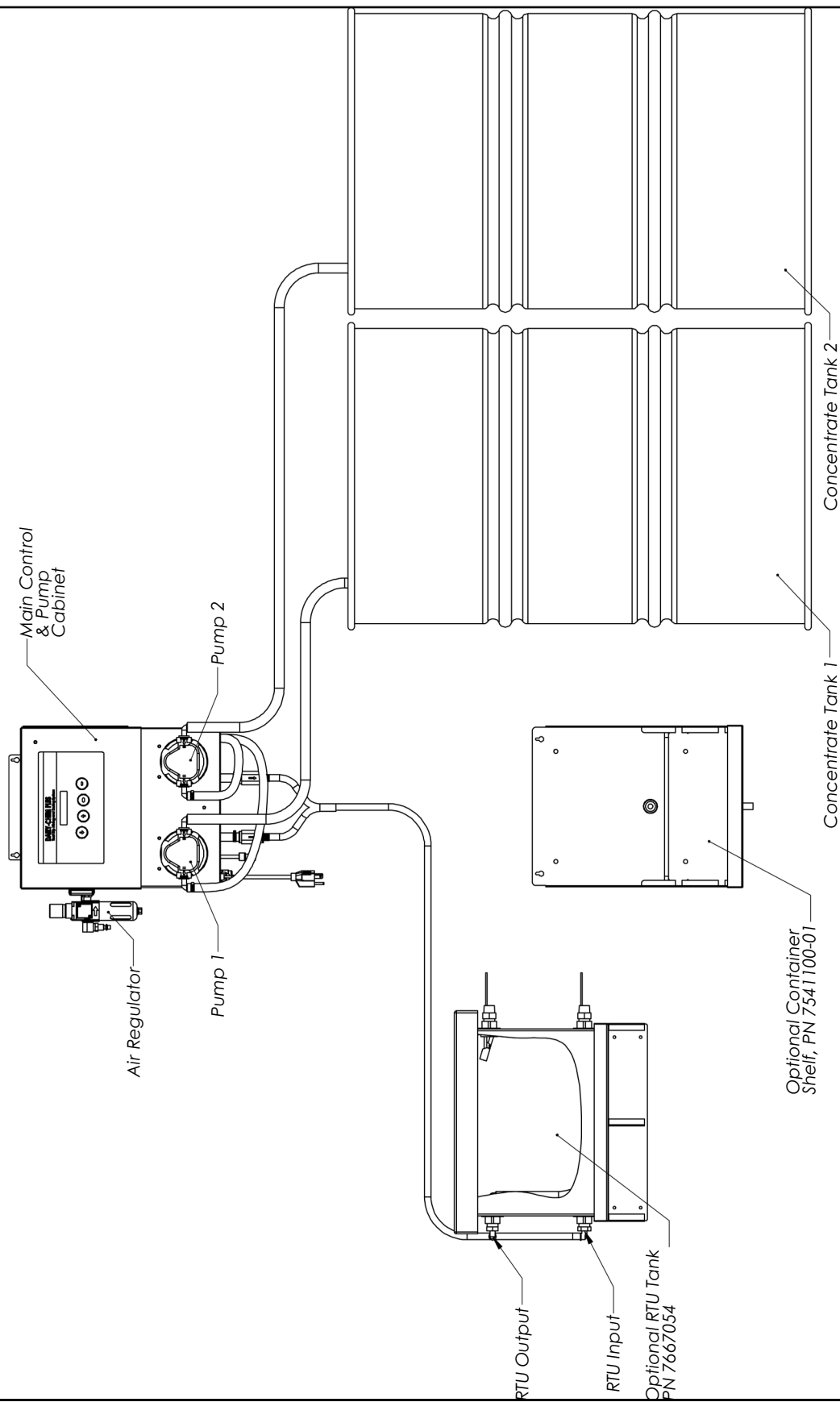
CONTINUED ON PAGE 15

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- (7) Connect 2-way adapter and route to RTU tank (if applicable) - See 2 Part System Diagram on page 15 for details.
- Connect 2-way adapter from the accessory kit as shown to the right.
 - Secure using supplied hose clamps.
 - Run 3/8" ID output tubing supplied to RTU tank or discharge point as necessary. See page 16 for tube routing details.
- (8) System Programming—Go to page 17 for instructions on system programming



SEE PAGE 16 FOR SYSTEM DIAGRAM

2 Pump System Diagram (7667120, 7667130, 7667140)



System Programming

The PC application can be downloaded at <http://knight.idexftp.com>

Use Login ID: DairyChem Plus

Password: Knight

NOTE: The login ID and password are case sensitive

Programming the DAIRY CHEM PLUS System from the PC application

The system can be programmed for the first time using the DAIRY CHEM PLUS User Interface panel or by programming a system setup file using the DAIRY CHEM PLUS PC software and uploading the settings to the system using an SD card. The preferred method is to use the pc software tool as it will save time and allow you to use previously programmed files saved on your computer.

DAIRY CHEM PLUS PC Software for Windows (XP, Vista, 7)

This simple PC application tool is designed to help you manage your DAIRY CHEM PLUS System business. It is essential for extracting teat dip usage reports and other critical quality and cost related data you will use to invoice your customers, manage consumption of teat dip or provide superior support to your dairy farm customers. A laptop computer with an SD Card slot or USB port with SD Card Reader must be used for programming units in the field and managing the data.

Installing the DAIRY CHEM PLUS PC Software:

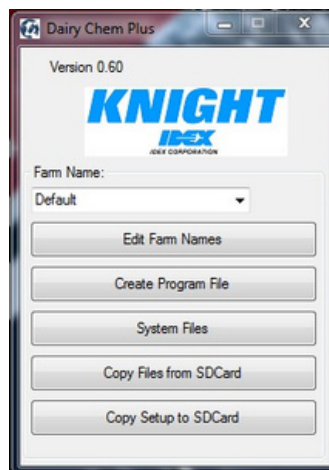
1. Before installing the installation disk you need to download drivers from the Microsoft Download website. Once on the site use the search function to find Microsoft .NET Framework 3.5 Service Pack 1. Download and install these system files as instructed.

2. After downloading the drivers from Microsoft insert the DAIRY CHEM PLUS PC Software CD and follow the installation prompts. The desktop icon will automatically be placed on your desktop at the end of the installation.

3. Double click the DAIRY CHEM PLUS icon to start the application.

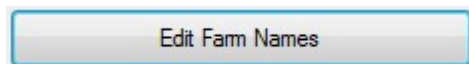
Programming DAIRY CHEM PLUS Setup Files

Programming DAIRY CHEM PLUS system setup files is quick and easy with this simple Windows based programming tool. To get started create a dairy farm location for the files to be saved and follow the steps below:

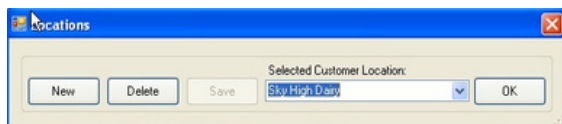


Creating a Farm Location and Setup File– All setup and report files are archived based on the location of each of the systems you install. If you have multiple units on one farm it's best to keep all of the report files under a single farm name location. For new installations create a new location by doing the following:

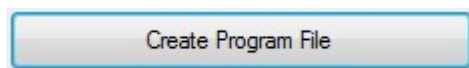
- a. Click on —Edit Farm Names button.



- b. Click on —New button and enter a name for the dairy. Click —Save when done. Click —Ok.



- c. Click on —Create Program File button.



- d. Programming a DAIRY CHEM PLUS setup (settings) file. The setup file you are about to program will be saved to this location. The program functions in the view below mimic the menus in the control panel.

 A screenshot of the "Program File - Dairy Chem Plus" setup window. The window contains various input fields and buttons, numbered 1 through 22.

16 Formula Name	Pump 1 Parts	Pump 2 Parts	Pump 3 Parts	Water Parts
Teat Treatment	1.0	0.5	0.0	3.0

18 Chemical Names	19 Price per GAL
1 Iodine 1	\$9.00
2 Glycerine	\$3.00
3 Not Used	\$0.00
4 Water	\$0.00

20 Shift Times:
1 06:00 AM
2 11:30 AM
3 05:00 PM
4 11:00 PM

Teat Pump is: ☒ Off ☐ On 12
 while Blending

Blend Volume: 0010.0 Liters 13

Blend Increment: 1/ 10 of Blend Vol. 14

RTU Refill: ☒ Float ☐ User 15

1 ID Number: 1234567
 4 Language: ENGLISH
 8 Temperature Alarm: ☐ Off ☒ On

2 Main Password: 0000
 5 Farm Name: Mile High Dairy
 9 +/- 15 °F

3 User Password: 0000
 6 Unit of Measure: ☒ Standard ☐ Metric
 10 Temperature Hold: ☐ Off ☒ On

7 Flow Meter Alarm: ☐ Off ☒ On
 11 Batch Count 00

21 Save and Exit Setup Exit Setup without Saving 22

PROGRAM FILE DEFINITIONS

(1) ***I.D. Number:*** – It is recommended that you track/control the productivity of this equipment by the serial number provided on each unit or by a numeric identifier of your own that is stored in the system memory and printed in the header of all reports. It's an effective way to manage preventative maintenance schedules for the systems you have installed and to measure your return on investment. You will enter this number into the serial number field in the PC software setup file.

(2) ***Main Password:*** – This is the password you will use to access all of the programming menu's on the DAIRY CHEM PLUS User Interface panel. It allows access to all programming functions. Each system is shipped from the factory with 0000 as the access code. Do not leave —0000 as the code as this will allow easy access to your settings and can disrupt normal operation of the system by unauthorized personnel.

(3) ***User Password:*** – This password allows the user access to the priming menu only. This is another password you don't want to leave at —0000.

(4) ***Language:*** - Select language to be displayed. ***NOTE: Currently English is the only language available.***

(5) ***Farm Name:*** – This name will appear in the report header to help you identify the origin of the reports and manage your DAIRY CHEM PLUS customer's data.

(6) ***Unit of Measure:*** – U.S. users will select Standard mode to see settings/report data in U.S. gallons. Use Metric for fluid measurements liters/milliliters.

(7) ***Flow Meter Alarm:*** – Select On mode to alert operators to out of range flow meter alarm display/audible tones.

(8) ***Temperature Alarm:*** - Use this button to select whether or not you want the system to display a RED temperature alarm screen when the concentration temperature is out of range.

(9) ***Temp Range: (if equipped)*** – This is the temperature range tolerance setting for the Iodine concentrate. The optional temperature sensor is installed in the concentrate tank to alert the customer to —out of range conditions that could prevent the system from producing more product the next time the float triggers a refill. In regions where ambient temperatures are widely variable temperature monitoring is a critical function as the viscosity of the concentrate will change and cause flow meter alarms when flow meter pulse counts are out of range. Iodine concentrate temperatures can vary with exposure to temperatures in transit or changes in farm weather patterns. Remember, a 50% change in pulse counts/second will induce a flow meter alarm. Select at least a 10 F range. If no temperature sensor is used program —00 for tolerance and select Temp —off.

(10) ***Temperature Hold:*** – In the event the iodine chemical concentrate temperature reaches a temperature outside of the temperature range this function when enabled will ignore the refill event and postpone blending until the temperature is within range. Select —off if no temperature sensor is used.

(11) ***Flow Error Delay:*** - In conditions where the temperature will have a known effect on concentrate viscosity that may induce flow meter errors, you can use this setting to ignore —xx number of cycles that may, under normal circumstances not create errors. This allows the system to continue running under the assumption that it is still pumping product but at a much slower rate than when initially calibrated. If the system continues to receive an error after the programmed delay number, it will then discontinue producing product.

(12) ***Teat Pump Is:*** - Use this button when using the system to control the transfer pump via the optional solenoid valve/regulator assembly. This gives you the option to halt transfer of product to the parlor while new product is blending. This ensures only completely made up and properly mixed product gets to the parlor.

(13) ***Blend Volume*** – This is the amount of finished teat dip the system will produce anytime the float or the user triggers the system to blend product. We recommend this volume be equal to the amount of finished product needed for each milking shift.

(14) ***Blend Increment*** - This function allows you to break the entire blend volume into multiple increments of water and chemical that enhances the mixing and suspension of the mixture. The more blend increments programmed the better mixing occurs. The number of blend increments depends on your concentrates and how well they mix in water and stay in solution. It is recommended that you calculate the blend increment volume to be between 1 and 2 liters for ease of calibration as well.

PROGRAM FILE DEFINITIONS Cont.

(15) **RTU Refill** – Select —floatll if the system will automatically refill the finished product storage tank by the float switch or —userll to allow the operator to select when the storage tank will be refilled with teat dip. When —userll is selected, the operator will use the SCROLL key to begin dispensing.

(16) **Formula Name** – Input a name for the teat dip formula name you would like to see on your reports. The maximum number of characters is 16.

(17) **Pump Parts** (%) Programming – input the correct chemical to water proportions in —partsl (3 to 1, 5 to 1) as specified by the manufacturer of the chemical concentrates. The system will blend from one to three chemicals and water and automatically calculate the refill batch size volumes for you.

(18) **Chemical Names** – Program the names of your concentrates in these locations. The will appear in the reports and in the system. The maximum number of characters is 16. Water cannot be changed and is hard-coded to operate on pump output #4.

(19) **Price per Gal** – Enter the retail price of the chemical concentrates in dollars/gallon or liter.

(20) **Shift Times** – these settings should be programmed for the approximate time of day that milking sessions will begin. Program from one to four shift times. Program 12:00 AM for any unused shift times.

Application Note: *When programming shift times be sure to program them in sequential order from the beginning of the day to the end.*

(21) **Save and Exit Setup:** - When done filling out all of the fields, use this button to save all the data and exit the programming screen.

(22) **Exit Setup without Saving:** - Use this button to exit the setup without saving any changes.

Saving Setup Files



- a. Once you have entered all of the settings into the setup screen view click on the —Save and Exit Setup button. This will take you back to the opening DAIRY CHEM PLUS PC Software screen. Use the —Exit Setup without Saving button for viewing previously programmed files.

You are now ready to upload the setup file to the DAIRY CHEM PLUS system.

Uploading Setup Files to the DAIRY CHEM PLUS System— before uploading setup files to the system you ***MUST*** clear usage data. See pg 23-24 In the programming menu.

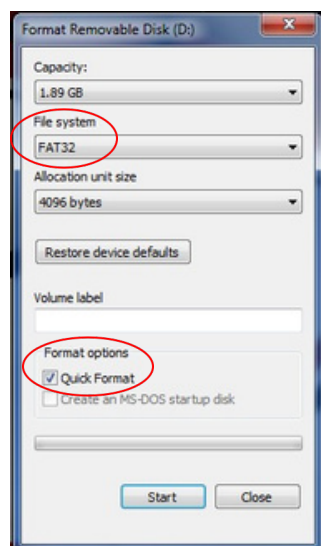
File/Report Types – The DAIRY CHEM PLUS System utilizes two different file formats to program dispensers and report logged data:

- a. ***1234567S.TXT*** is a Setup file. The first seven characters before —S are the serial numbers for the unit you are programming. If you left the serial number blank the file will appear as ***0000000S.TXT***.
- b. ***082010_0135PM_1747852R.RPT*** is a Logged Data Report File. The first 13 characters indicate the date and time the report was generated. The last 13 characters denote the dispenser serial number it came from.

Formatting Your SD Card – when you purchase SD cards from a store they must be properly formatted to work in the DAIRY CHEM PLUS system. To verify proper formatting load the SD card into your computer and open the My Computer view. The SD card should be shown. NOTE: A low density SD card must be used.



Next, right click on the SD card and select —Format... In the —File system drop down menu select FAT32. Under —Format options check the —Quick Format box. Press the —Start button. NOTE: You will receive a warning message that all data will be erased. Be sure there is no data on the SD card that you wish to keep prior to pressing the —OK button. When the format is complete, press the —OK button.

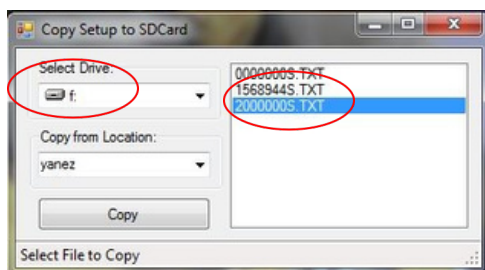


Transferring Setup Files to the SD Card:

- a. First place an SD card into your SD card slot or an equivalent USB media card reader.
- b. From the DAIRY CHEM PLUS Opening screen click on the —Copy Setup to SD Card button.



- c. From the —Select Drive dropdown menu be sure you have the SD card drive selected.



- d. Select/Highlight the Setup file you want then click the Copy button. The status bar on the bottom will tell you when the file is copied. Once it says —File Copied, Click on the X to close the view. You now have the file you need to program the system with on your SD card.

Uploading Setup Files to the system – After clearing logged data at the controller, insert the FAT 32 formatted SD card into the SD card slot in the system. See programming menus pg. 19 for uploading setup files.

Check uploaded settings to determine if file transferred properly. Scroll through system menus to verify all settings were transferred correctly.

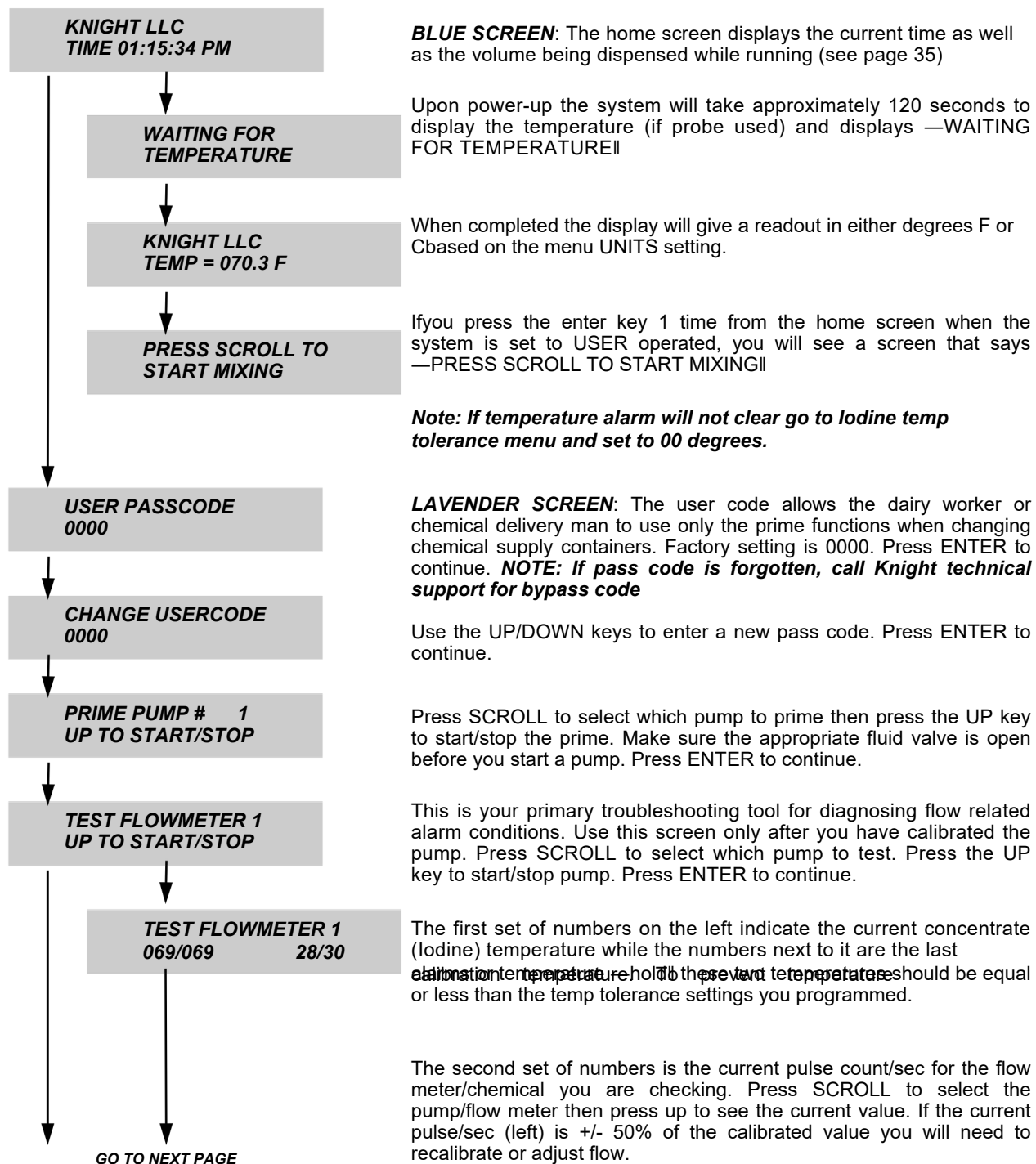
Note: Setup file name must match the serial number programmed in the system from the factory or your setup parameters will not load properly.

Downloading reports from the DAIRY CHEM PLUS system to the SD card. See programming menu page 23.

Opening Report Files from the SD Card – Once the reports are saved from the DAIRY CHEM PLUS system to the card you are ready to review and process the data as required. See pages 26-28 for further details.

Programming from Machine

- Hold down the Enter key to enter and exit programming menus.
- Use the Enter key to navigate through the menus. You can go forward but not back.
- Scroll is used to move the cursor and to select different settings.
- Settings are saved ONLY when you exit the programming menus and the screen color goes from lavender to blue.



MAIN PASSCODE
0000

This is your Main pass code that protects all system settings and access to your data. Use the UP/DOWN keys to enter your private code and press ENTER when done. It is easiest to do this once your are done programming so you don't have to enter the code every time you go in and out of the menus during programming. **NOTE: If pass code is forgotten, call Knight technical support for bypass code**

CHANGE PASSCODE
0000

Use the SCROLL/UP/DOWN keys to change the Main pass code

DATE 04-12-11
TIME 01:34:19 PM

SELECT LANGUAGE
ENGLISH

English is the only operational language at present. Press ENTER to continue.

SELECT UNITS
STANDARD

Press SCROLL to select Metric or Standard (U.S.) UOMs. Press ENTER to continue.

SELECT UNITS
METRIC

ENTER SYSTEM ID
0000000

Use the SCROLL,UP/DOWN, and ENTER keys to enter your system I.D. numbers.It'simportant to have unique system I.D. for each of your systemstotrackthe activity of your equipment. Press ENTER to continue.

TRANSFER SETUP
'UP' TO START

BeforeinsertingyourSD card to program the system make sure it wasformattedforFAT-32 and contains your setup file. Make sure the setupfileonyourSDcard has the same system I.D. as the unit you areabouttoprogramor the file will not load properly. programming oritwillnottransfercorrectly. Insert your SD card and press UP.

TRANSFER SETUP
COPYING DATA....

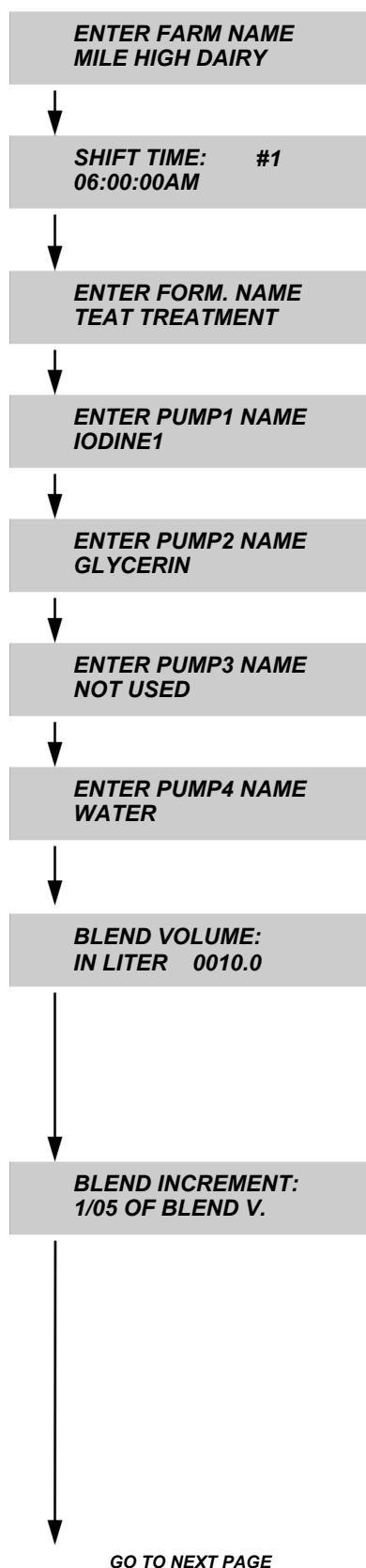
Ifthesetupfileisonyour SD card and the I.D.'s match this message will appearbriefly.

TRANSFER SETUP
COMPLETE

Attheendofasuccessful file transfer you see this message. Press ENTERto continue.

NOTE:Ifyougetanerror, see page 25.

GO TO NEXT PAGE



Use the SCROLL and UP/DOWN keys to input the name of the dairy. This name will appear in your reports. Press ENTER to continue.

Enter shift times here by pressing UP/DOWN key for shift # then SCROLL to set digits and AM/PM. Shift time should be programmed to coincide with the beginning of each milking. Press ENTER to continue.

Use the SCROLL and UP/DOWN keys to input the formula name or make changes. This name will appear in your reports. Press ENTER to continue.

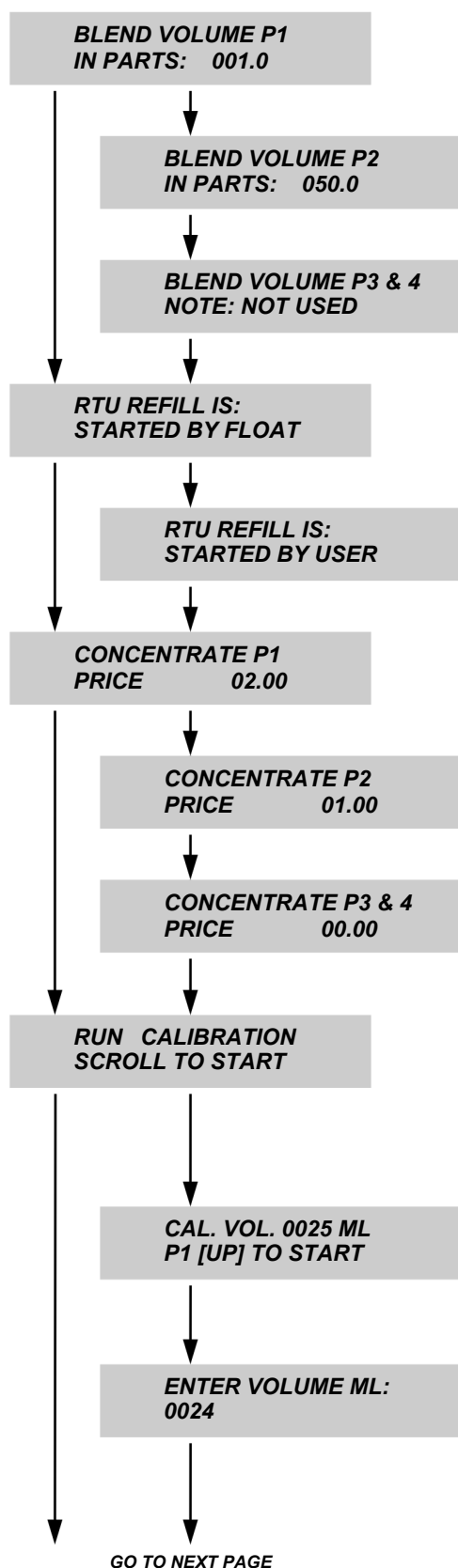
Use the scroll and UP/Down keys to input the chemical name or make changes. This name will appear in your reports. Press ENTER to continue.

NOTE: Depending on the system, some pumps may not be used.

This is the volume of finished teat dip solution the system will mix anytime the storage tank level switch provides a signal or the user starts the mixing process by pressing the SCROLL key. This blend volume should be set to the approximate volume of teat dip used during each milking session. This will assure that fresh product is produced for each milking. Range is 0-9999.9 liters. Use the SCROLL/UP/DOWN keys to enter volume. Press ENTER to continue.

To achieve the most effective and stable blending of all the ingredients the blending increment simply takes the total blend volume divides it into equal parts based on a range of 1 to 1 or 1 to 999. Depending on the —mixologyll of your concentrates and the need to suspend chemical solids in solution, pick the blending increment that works best for your concentrates. Use UP/DOWN keys to select increment. Press ENTER to continue.

NOTE: For ease of calibration, it is recommended to calculate your blend increment to be no more than 2 liters. Example: for a BLEND VOLUME of 10 liters you would have a BLEND INCREMENT of no more than 1/05 (10L / 5 = 2L).



Most manufacturer concentrate —ready to use formulation instructions are stated in —parts per fluid unit (gallons/liters). Use the UP/DOWN keys to select the pump to program and then press SCROLL to get to bottom line. Use the SCROLL/UP/DOWN keys to program the formulation in 000.0 to 999.9 parts. Press ENTER to continue. **Warning! You must recalibrate anytime you change the formula.**

NOTE: When broken down from the total BLEND VOLUME to a BLEND INCREMENT the lowest part volume can be no less than 25ml. Example: for a 50:1 formula you would calculate the BLEND INCREMENT minimums as follows—1 part = 25ml, 50 parts = 1250ml (25 * 50) = total minimum blend increment of 1275ml (1250 + 25).

Press SCROLL to select float or user blending start. Press ENTER to continue.

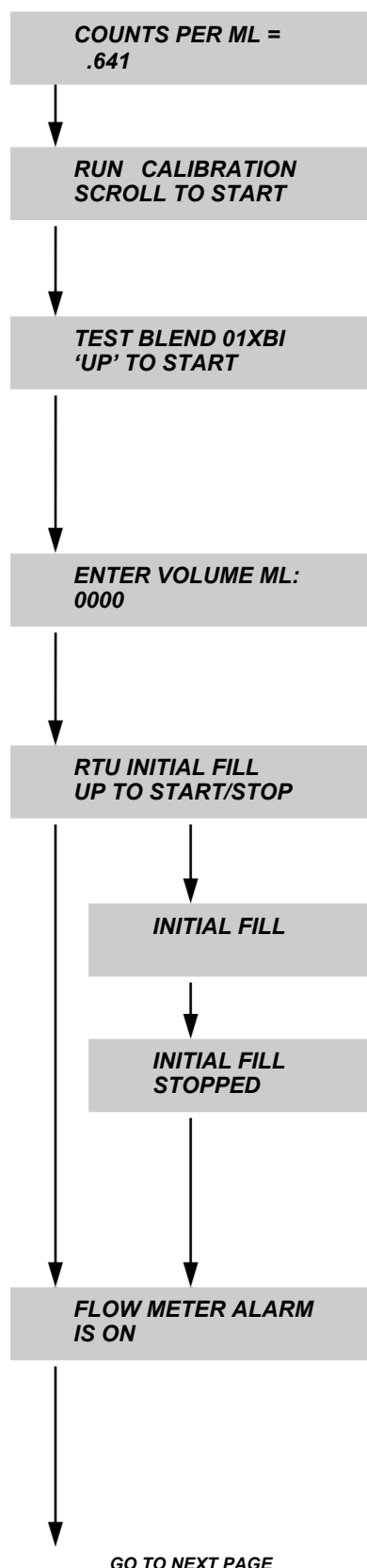
NOTE: When USER is selected, the operator uses the SCROLL key from the main screen to begin dispensing.

Press UP/DOWN key to select pump. Press SCROLL to move cursor to pricing. Use SCROLL/UP/DOWN keys to enter price/gal or liter. Repeat for each chemical concentrate. Press ENTER to continue,

YELLOW SCREEN: Prior to calibration make sure the product you are about to calibrate has been primed all the way to the calibration ball valve. Press SCROLL to enter the calibration sub menus. Note: It is important to wait for a valid temperature reading (< 2 min.) before calibrating, if using a temperature sensor in the Iodine concentrate.

The top line provides you the calibration target volume in ml. Use a graduated cylinder that is closest in range to capture the chemical and measure carefully. Make sure the calibration ball valve is open and the main dispensing ball valve is closed. Press the UP key to start. Let the pump run until it stops.

LAVENDER SCREEN: Use the SCROLL/UP/DOWN keys to enter the volume dispensed then press ENTER. It normally requires three attempts for each ingredient to achieve an acceptable calibration volume. Repeat the calibration procedure until you achieve the targeted volume (mls) +/- 2%.



Flow Meter pulse —Counts per mlll is fluid unit used by the system to measure the precise volume of concentrate or water into the finished product. Press ENTER to continue.

YELLOW SCREEN: Press the SCROLL key to repeat pump calibration for all pumps used. Press ENTER to continue.

NOTE: Depending on system configuration some pumps may not be used

Use this menu function to produce a test blend of finished product once you finished calibration. Use the UP/DOWN keys to select 01 to 99 batch volumes then press ENTER to start. The system will stop itself. Normally 01 is sufficient to test. Press ENTER to continue.

NOTE: This function should be used to test concentration accuracy. Make the test batch and titrate. Adjust formula parts as necessary.

If the test blend batch size equals the sum of all the ingredients (P1=__P2=__ P4=__) enter nothing here. If the test blend volume is off by more than 2% of the sum of all ingredients in your desired batch volume, use the SCROLL/UP/DOWN keys to enter the amount measured and the system will adjust calibrations to compensate for any variance. Press ENTER to continue.

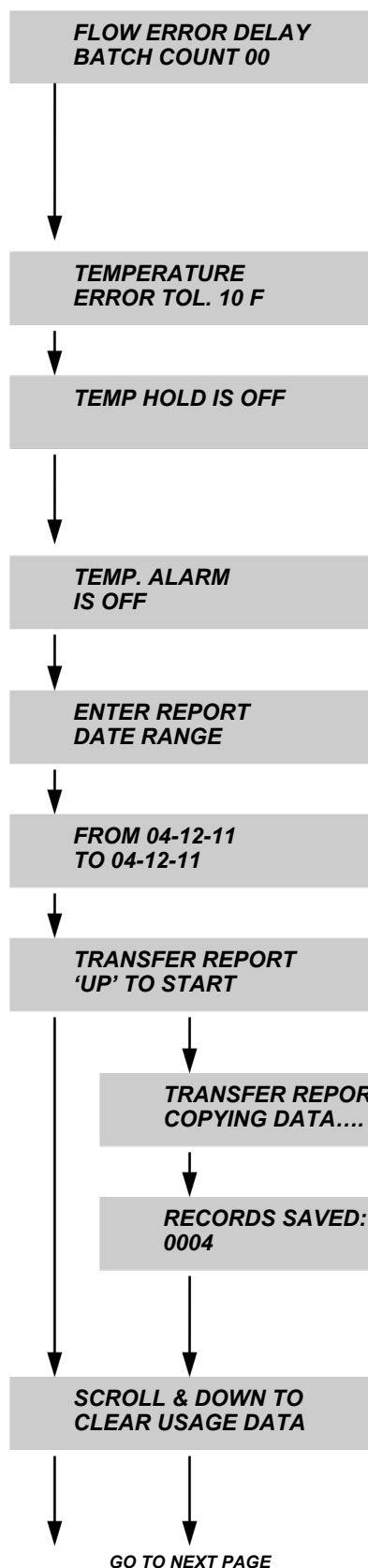
There are two ways in which to fill your teat dip storage tank for the first time. You can use the RTU Initial Fill function by pressing the UP key to start filling with the teat dip formulation you just calibrated. The system will make up full blend volumes until commanded to stop by pressing the UP key again. Press ENTER to continue.

When the UP key is initially pressed you will see the screen to the left. The system will begin blending product in blend increments to make up full blend volumes.

When the UP key is pressed again you will see the screen to the left. The system will complete the blend volume that it started and then stop.

NOTE: You can also start the fill by turning the system on so the storage tank float triggers the filling process. The system will make product in blend increments to full blend volume while the trigger float is low.

This is the audible alarm on-off function. Use the SCROLL key to toggle between ON/OFF. It is recommended that you leave the alarm on to notify operators when the system requires attention. Internally the system monitors the amount of time it takes to dispense each blend increment. If any particular pump takes 50% longer in time to achieve it's pulse count and dispense it's programmed volume, as compared to the calibration time, the system will alarm. Press ENTER to continue.



Some iodine concentrates are susceptible to variation in viscosity when they are exposed in the chemical suction hose during the Winter months usually over-night. To prevent frequent flowmeter alarms during the first batch of the day use this function to ignore one or more —initial all batchesto allow the lower temperature concentrate to pass through the suction hose and flowmeter. Leave at 00 unless you experience alarms under these conditions. Use the UP/DOWN keys to set. Press ENTER to continue.

Use the UP/DOWN keys to set the temperature sensor tolerance range if you are using a temperature sensor. Set to 00 if no sensor used. Press ENTER to continue.

Use the SCROLL key to toggle between ON/OFF. Select On to prevent the system from blending product when temperatures are out of range. This will prevent flowmeter alarms that prevent the system from blending product. If setting to On the system will blend once the proper temperature is achieved. Press ENTER to continue.

Use the SCROLL key to toggle between ON/OFF to enable/disable the audible alarm for temperature errors. Press ENTER to continue.

The screen at the left will appear for a few seconds prior to changing to the next screen to select your date range.

Use the SCROLL/UP/DOWN keys to select the date range for your report. Press ENTER when the correct date range displayed.

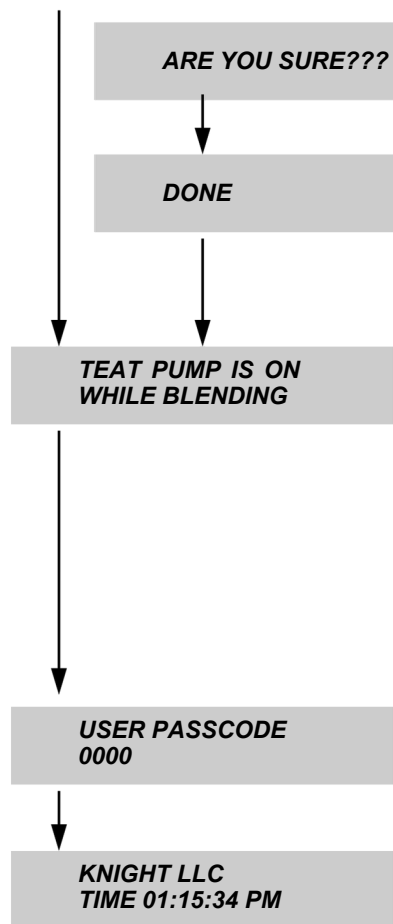
To download report data insert your SD card (formatted to FAT 32) then press the UP key. Wait until display shows Records Saved message. If no records saved change report date range and try again. Press ENTER to continue.

RED SCREEN: This screen appears while data is downloading.

Once all the records are finished downloading this screen will appear. It is now safe to remove the SD card. Press ENTER to continue.

NOTE: If you get an error, see page 35.

LAVENDER SCREEN: Use the Clear Usage Data command after the system has been programmed and calibrated. This is essential in order to report complete and accurate data. Press SCROLL/DOWN keys simultaneously to clear. Press ENTER to continue.



LAVENDER SCREEN: The teat pump is most commonly an the air operated pump used to pump finished teat dip from the storage tank to the milking parlor sprayers or a dispensing valve. Use this feature only if the system is equipped with the optional air solenoid valve that controls the air supply to the teat pump and only if the mixture in the storage tank is proportionally incorrect while blending is in process. Use the SCROLL key to toggle between ON/OFF. Press ENTER to continue

You are now back at the beginning of the menu. You can use the ENTER key to navigate through the menu items again or press and HOLD the ENTER key to exit out to the main run screen.

OTHER SCREENS:

**REFILL VOLUME
IN LITER 0007**

GREEN SCREEN: Blending events are displayed in green. The refill volume is an approximation of the total volume for reference only. Actual volumes are logged in the report or can be measured with a graduated cylinder.

**FLOW METER ERR 1
CHECK CONC/WTR**

RED SCREEN: There are multiple alarm conditions generated by the system as detailed in the programming section. Alarm condition will turn the screen RED and display the relevant information. If the system has stopped blending due to an alarm condition, press the ENTER key to restart. If the alarm condition persists, troubleshoot the system to determine the root cause. There is a troubleshooting section on pages 30-32 of this manual.

**TEMPERATURE OUT
TIME 01:56:16 PM**

**UPPER FLOAT ON
CALL FOR SERVICE**

FLOAT ENABLED

BLUE SCREEN: From the home screen you can enable and disable the floats by simultaneously pressing the UP/DOWN keys.

FLOAT DISABLED

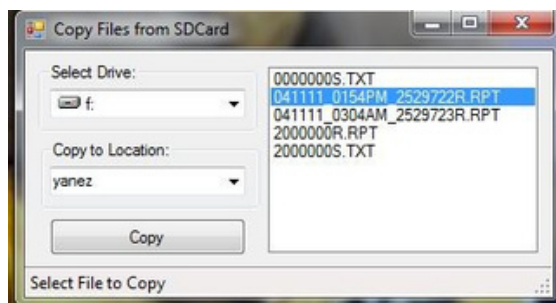
NOTE: Disable the floats anytime you are troubleshooting the system.

**TRANSFER SETUP
SD CARD TIME OUT**

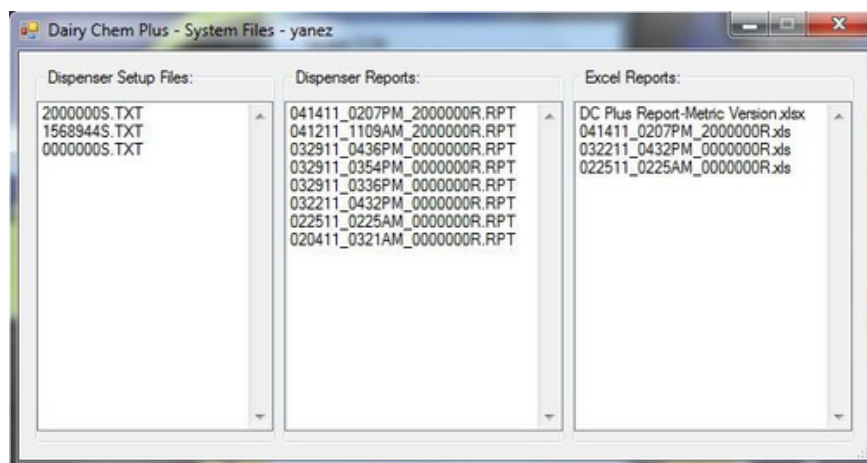
RED SCREEN: This message will appear if the I.D. numbers in your system and the SD card do not match or if no SD card was inserted when you pressed the UP key. Try again or turn power off/on and try again with SD card in place.

Opening Report Files from the SD Card - Once the reports are saved from the DAIRY CHEM PLUS system to the card you are ready to review and process the data as required.

- a. Insert SD card with saved report files from the system into your PC and open the DAIRY CHEM PLUS application. Click on the —Copy Files from SD Card button.



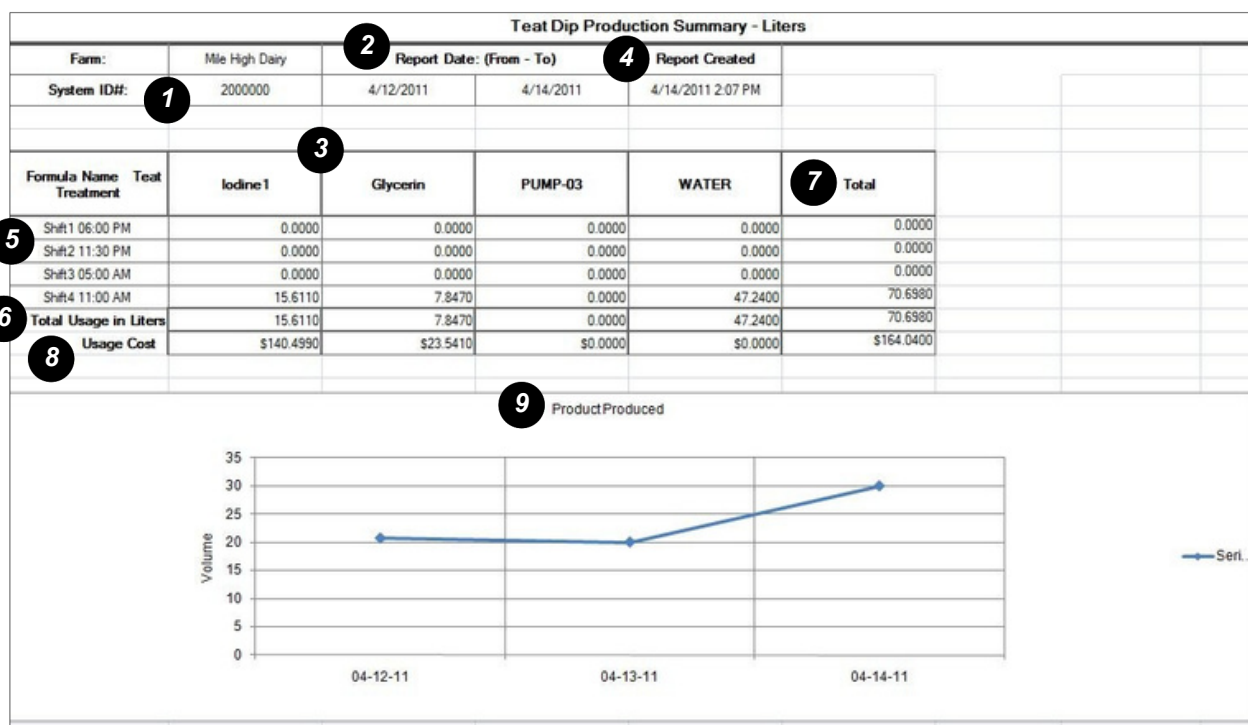
- b. Select/highlight the .RPT report file you want to copy from your SD card.
- c. Click the Copy button. The status bar on the bottom will tell you when the file is copied. Once it says —File Copied, Click on the X to close the view. You now have the data file you wish to view copied into your PC application.
- d. Double click the .RPT report from the —Dispenser Reports directory that you would like to view.



Understanding Report Data

Blending Activity Report								
Farm:	Mile High Dairy	Report Dates: (From - To)		Report Created				
System ID#:	2000000	4/12/2011	4/14/2011	4/14/2011 2:07 PM				
1	2	4	3 Volumes in Liters				5	6
Date	Time	Formula Name	Iodine1	Glycerin	PUMP-03	WATER	Total Finished Product Blended	Alarms
4/12/2011	12:17 PM	Test Treatment	0.0240	0.0260	0.0000	0.0330	0.0830	
4/12/2011	12:33 PM	Test Treatment	0.0100	0.0190	0.0000	0.5120	0.5410	
4/12/2011	12:34 PM	Test Treatment	0.0240	0.0260	0.0000	0.0330	0.0830	
4/12/2011	1:47 PM	Test Treatment	0.4440	0.2220	0.0000	1.3330	1.9990	Test Volume
4/12/2011	1:51 PM	Test Treatment	1.7770	0.8880	0.0000	5.3330	7.9980	Flow Meter Error Iodine1
4/12/2011	1:52 PM	Test Treatment	2.2220	1.1110	0.0000	6.6660	9.9990	
4/12/2011	1:56 PM	Test Treatment	0.0000	0.0000	0.0000	0.0000	0.0000	Temperature Hold Alarm
4/12/2011	1:56 PM	Test Treatment	0.0000	0.0000	0.0000	0.0000	0.0000	Temperature Hold Alarm
4/12/2011	1:56 PM	Test Treatment	0.0000	0.0000	0.0000	0.0000	0.0000	Temperature Hold Alarm
4/13/2011	2:00 PM	Test Treatment	2.2220	1.1110	0.0000	6.6660	9.9990	
4/13/2011	2:02 PM	Test Treatment	2.2220	1.1110	0.0000	6.6660	9.9990	
4/14/2011	2:03 PM	Test Treatment	2.2220	1.1110	0.0000	6.6660	9.9990	
4/14/2011	2:04 PM	Test Treatment	2.2220	1.1110	0.0000	6.6660	9.9990	
4/14/2011	2:05 PM	Test Treatment	2.2220	1.1110	0.0000	6.6660	9.9990	

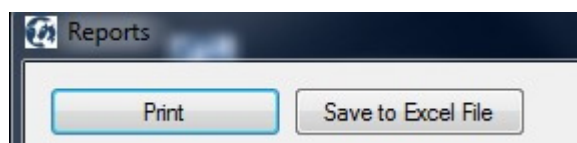
- [1] **Date– Month/Day/Year** - Refers to the actual date the system produced product. The on board real timeclock with five year lithium battery keeps time and dates accurately.
- **Time**– This is the actual time of day the system produced the teat dip formulations as triggered by the user or the storage tank level switch.
- **Product Name** – Indicates the volume of the individual concentrates that were batched on that date and time.
- **Formula Name** – Indicates the pre-programmed formula name of the finished product blended on that date and time.
- **Total Finished Product Blended** – Total volume in gallons/liters of teat dip produced (all ingredients).
- **Alarms** – in this column all system errors will be shown. Alarm types include:
- **Flow Meter 1,2,3,4**—These alarms occur because the flow rate of the fluid moving past the gears is out of range. During calibration, the time to deliver the required amount of fluid for a given concentrate is recorded and stored in internal memory. If the time to delivery the fluid during normal operation exceeds the calibration time by double + 1 second and alarm is generated.
 - **Chemical concentrate Temperature out of range**—This alarm occurs when the concentration temperature (if used) is outside of the pre-programmed temperature tolerance range.
 - **Temperature Hold**—This lets you know that the system attempted to produce product but was unable. This only occurs when you have the —Temperature HoldII function activated.
 - **Test Volume**—This lets you know that the batch run was only a test volume. It helps to account for ALL usage.
 - **Initial Fill**—This lets you know that the fill was not triggered during normal operation but manually for the initial fill upon installation or any time it's activated in the user programming menu.



- [1] **System I.D.#** - this identifies the system by the serial number or company identification number you programmed.
- [2] **Report Date** - this is the date range for the report as you requested it from the system. All activity that took place during that time is logged in the report.
- [3] **Product Name** – indicates which product was batched on that date and time.
- [4] **Report Created** – this is the date the report was downloaded from the system.
- [5] **Shift 1, 2, 3, 4** – Usage of each chemical and water by each shift.
- [6] **Total Usage in Liters/Gallons** – total gallons/liters produced during report period requested by each product and water.
- [7] **Total** – finished product produced by each shift and for the entire date range.
- [8] **Usage Cost** – total volume of chemistry and finished product used at the price per gallon programmed.
- [9] **Product Produced** – the line graph depicts actual volume of finished product produced for each day over the date range of the report.

Converting Reports to Excel Format

- a. Click on the —Save to Excel File button at the top of the report view screen. The report will be automatically saved in Excel format in the —Excel Reports directory.



These reports can now be opened in Excel and saved to a location on your computer.

Calibration Guidelines:

- (1) Do not attempt to calibrate without the proper measuring vessels. You will need a 100 ml, 250 ml, and 1000 ml graduated cylinder every time you calibrate. NOTE: the maximum calibration requirement is 2L.
- (2) Calibrate on initial installation.
- (3) Calibrate anytime concentrates of a different viscosity are to be used.
- (4) Calibrate anytime you change the blend volume.
- (5) Calibrate anytime you switch from one DAIRY CHEM PLUS formula to another.
- (6) Calibrate at least once each season as ambient temperatures change.
- (7) Calibrate anytime you replace a pump or pump seal.

DAIRY CHEM PLUS Preventative Maintenance

The following preventative maintenance schedule and replacement parts are recommended to assure consistent and reliable performance for the life of the system.

Every Six Months:

Procedure	Part #'s
Replace suction check valves and Gear clamps for all chemical concentrate pumps	7901249
Replace 3/8" braided hose on Iodine chemical concentrate lines including suction and discharge sides to static mixer manifold	0800338
Replace pump suction/discharge fittings on Iodine pump	1600810, 1600807
Replace static manifold check valves	7901239
Remove and clean water filter on water tank	
Remove and inspect storage tank float assembly. Replace if any evidence of damage or excessive wear	

Every Twelve Months:

Procedure	Part #'s
Replace Iodine chemical concentrate pump assembly	1600136-01
Replace 3/8" braided hose on Iodine chemical concentrate lines including suction and discharge to static mixer manifold	0800338
Remove and replace all suction/discharge fittings on all chemical concentrate pumps	1600810, 1600807

DAIRY CHEM PLUS TROUBLESHOOTING

Issue	Likely Cause/Solution
Flow Meter Errors - Chemical concentrates	Chemical concentrate drum empty Air trapped in suction hose. Prime pump Check iodine chemical concentrate temperature out of range Pump not properly calibrated Replace pump suction/discharge fitting O Rings Damaged flow meter or flow meter fitting Suction or discharge check valves plugged/inoperable Pump inoperable Flow meter not wired correctly to I/O board
Flow meter error water	Water source turned off Water supply pressure/flow rate varies too much Water filter needs cleaning Water pump in operable Pump not properly calibrated Replace pump suction/discharge fitting O Rings Water float inoperable Discharge check valves plugged/inoperable at static mixer
Iodine chemical concentrate pump wont prime	Suction hose too long Chemical concentrate too cold Suction or discharge check valve plugged Suction hose not properly sealed (vacuum loss) Replace pump suction/discharge fitting O Rings Calibration and Storage tank ball valves both closed Pump lower valve assembly worn or plugged with particulate
Temperature alarms won't clear	Increase "working" temperature range to what is sustainable. Cycle power to unit Temp sensor not in tank at correct depth Temp sensor damaged/faulty
Chemical concentrate pump(s) will not pump fast enough	Check for suction/discharge hose restrictions Chemical concentrate too cold Discharge check valves plugged/inoperable at static mixer or suction
Water tank will not refill	Water source turned off Water supply pressure/flow rate varies too much Water filter needs cleaning

DAIRY CHEM PLUS TROUBLESHOOTING (CONTINUED)

Issue	Likely Cause/Solution
Chemical concentrate pump suction hose will not hold prime	Suction check valve faulty/plugged or fallen off Replace pump suction/discharge fitting O Rings Hole in suction hose
No pulse counts in prime menu	Chemical concentrate too cold Pump inoperable Flow meter damaged Flow meter not wired correctly Flow meter leaking Check valve on static mixer manifold bad
Pump leaking at fittings	Bad O Rings
Pumps run anytime power is applied	Pump leads shorted to cabinet Defective I/O board
Display shows non-standard characters or incorrect information	Microprocessor failure System not "cleared" before installation
System will not accept main/user pass code	Pass code changed Call KNIGHT for assistance
System not responding to float	Bad I/O board input Float damaged
System will not accept Setup file	Float mis-wired
System will not download report file	File name of system does not match setup file SD card not formatted FAT 32 Non standard SD card (high density) Bad Memory Module
Wrong time/date in system	Corrupt data in system
Prime buttons do not operate	Reset date and time
Pumps will not start/run a batch on shift time	Microcontroller board not aligned/mounted correctly Switch damaged
System leaks at calibration check valve	Storage tank level is satisfied Float switch damaged or mis-wired

Water tank level above water pump inlet port

Report Content Issues	
No usage data logged	System made no product SD card not formatted for FAT 32 Date range incorrect System time/date invalid
Wrong Time/Date	Wrong time/date entered
Non standard characters in reports	System usage was no cleared on installation SD card not formatted FAT 32
Average per day in gallons incorrect	Check actual days system produced teat dip in batch report
Iodine "Active Levels" not correct	Water quality issue Increase/Decrease Iodine in formula
Missing shift batch	Storage tank full at shift time

DAIRY CHEM PLUS Do's and Don'ts

The Dairy Chem Plus is a fully integrated system that relies on the precision and proprietary performance of all components as a whole to produce quality teat dips and perform reliably. Using non-Knight components will degrade system performance or prevent the system from operating.

Never use a non-Knight pump in the system.

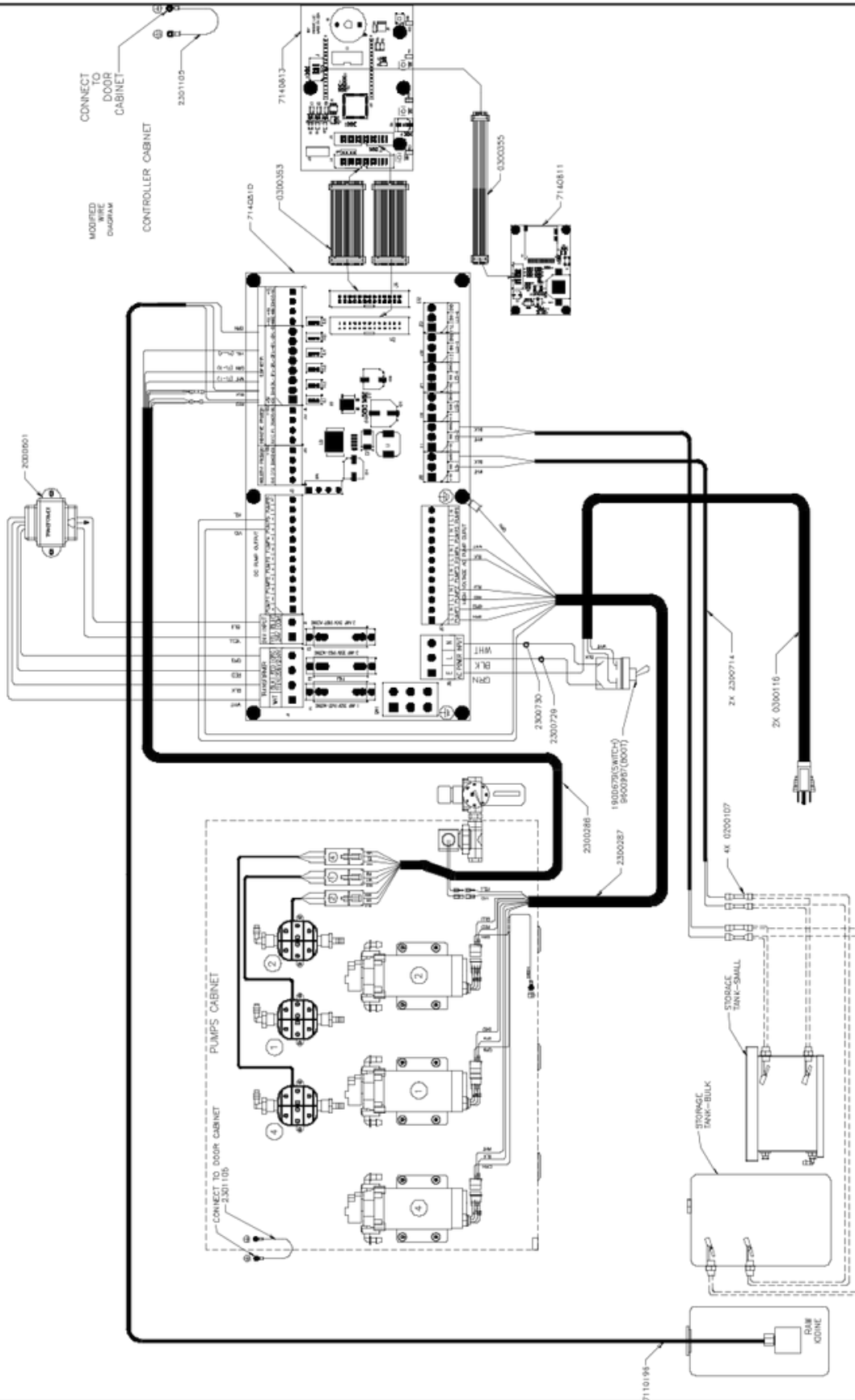
Never use a non Knight check valve in the system.

Always use EDP pumps with Viton seals for chemicals.

Always wear safety glasses when working with chemicals under pressure.

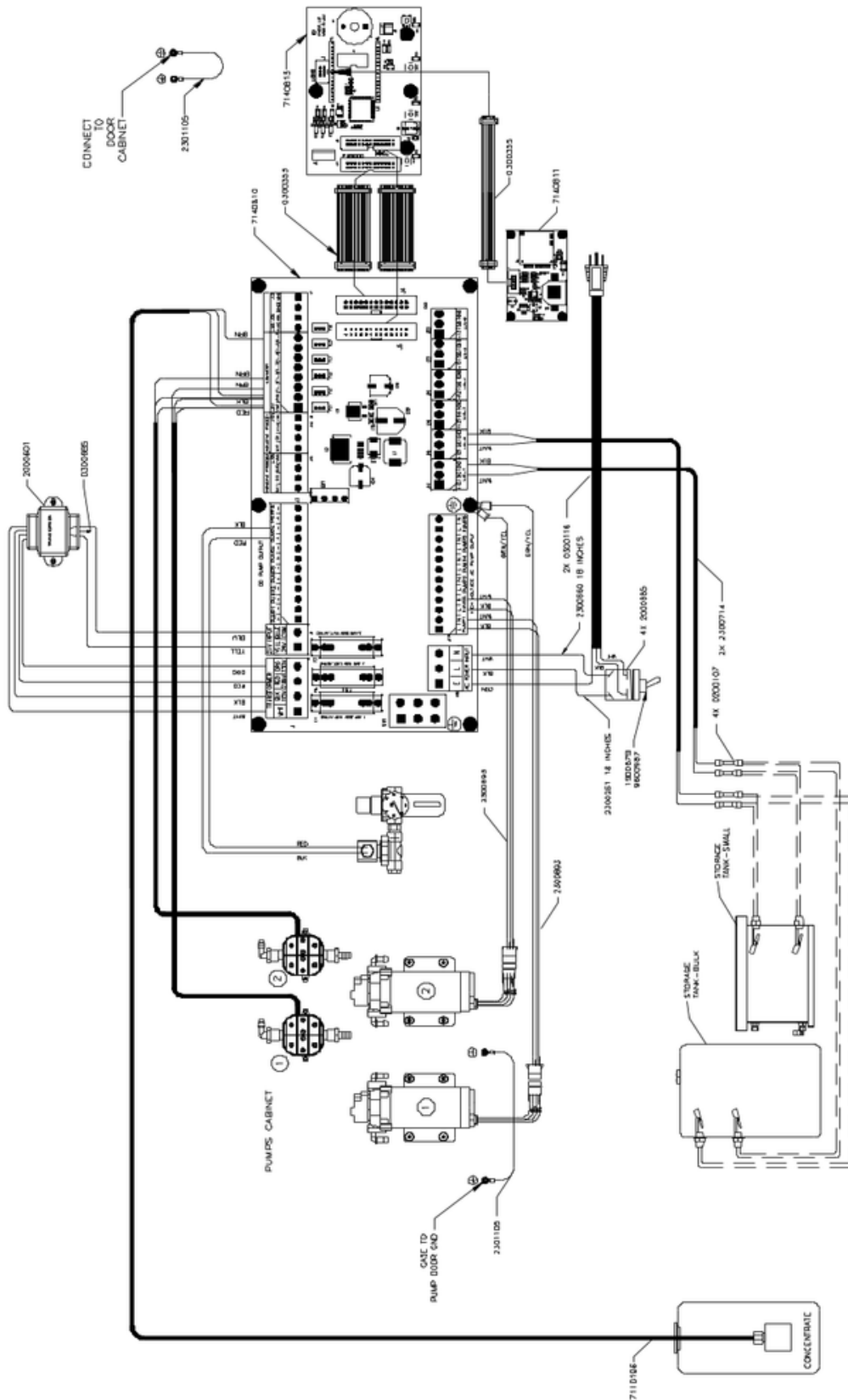
Only use Knight flow meters in the system.

DAIRY-CHEM PLUS 3 PUMP SYSTEM WIRING DIAGRAM (7667090)



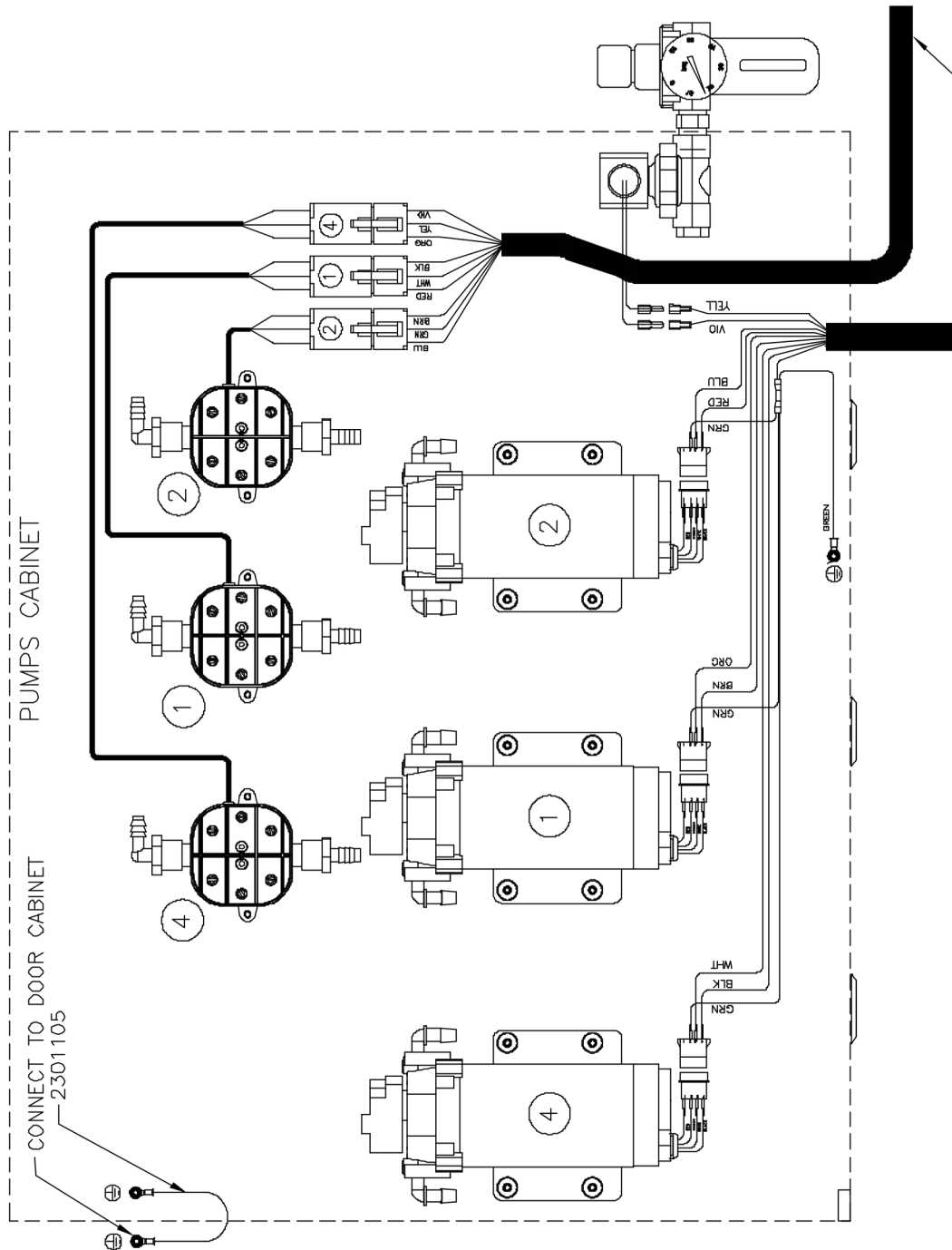
NOTE: When operated in **USER MODE**, you must connect a jumper across the **SIG** to **GND** terminals on **LLS-2**
NOTE: The above diagram is for the following system PN's: 7667090.

DAIRY-CHEM PLUS 2 PUMP SYSTEM WIRING DIAGRAM (7667120, 7667130, 7667140)

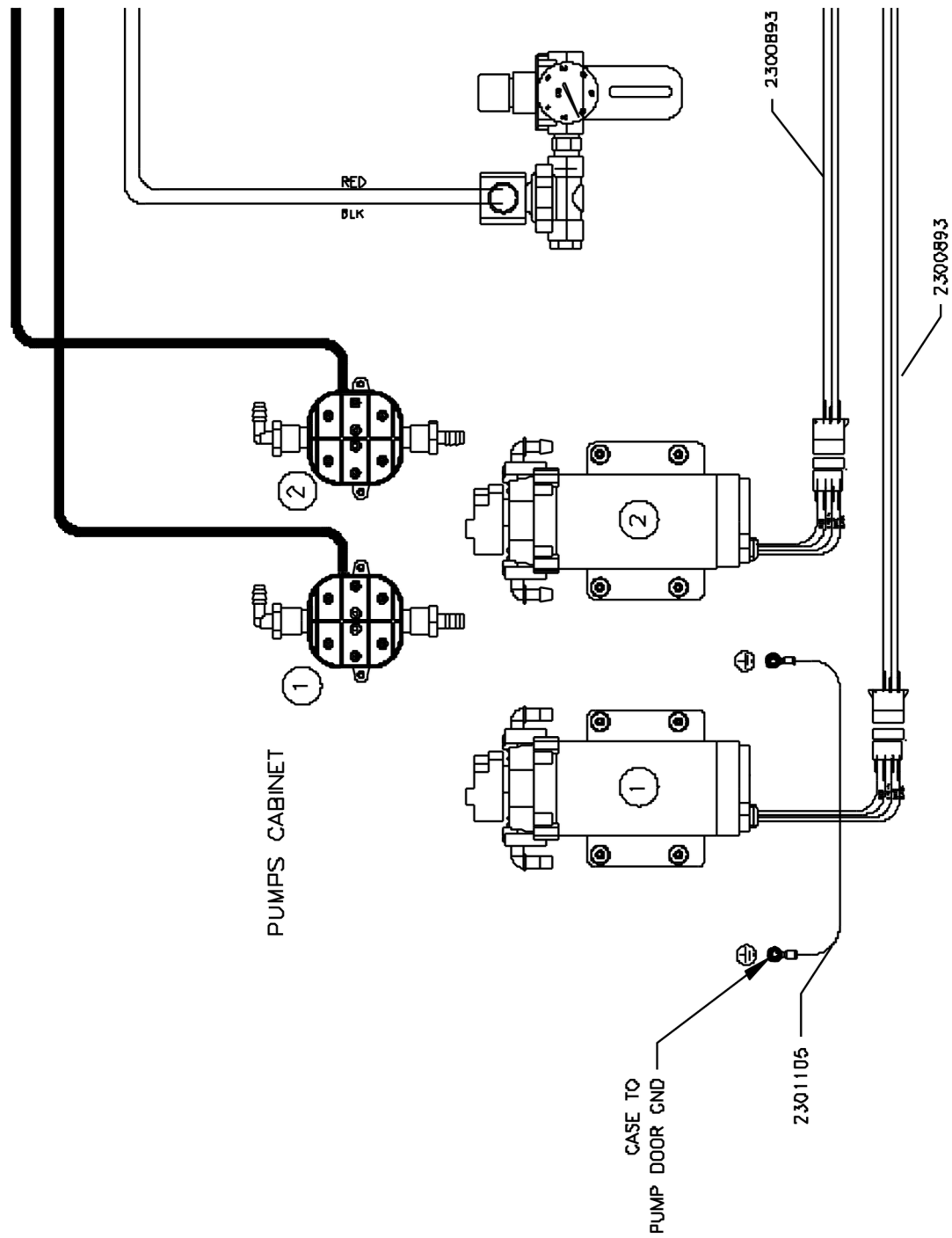


NOTE: When operated in USER MODE, you must connect a jumper across the SIG to GND terminals on LLS-2
 NOTE: The above diagram is for the following system PN's: 7667090

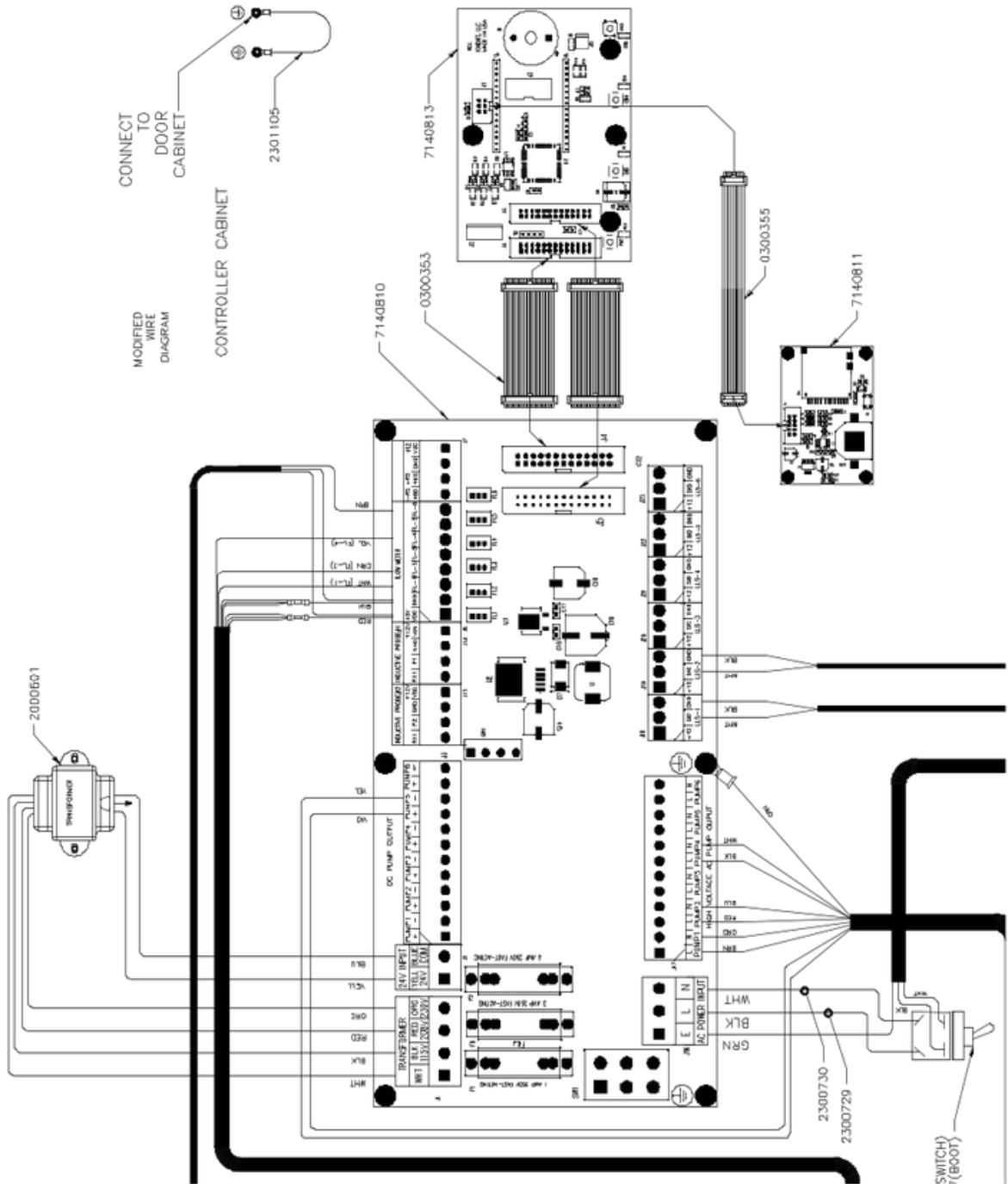
WIRING DIAGRAM—3 PUMP CABINET (7667090)



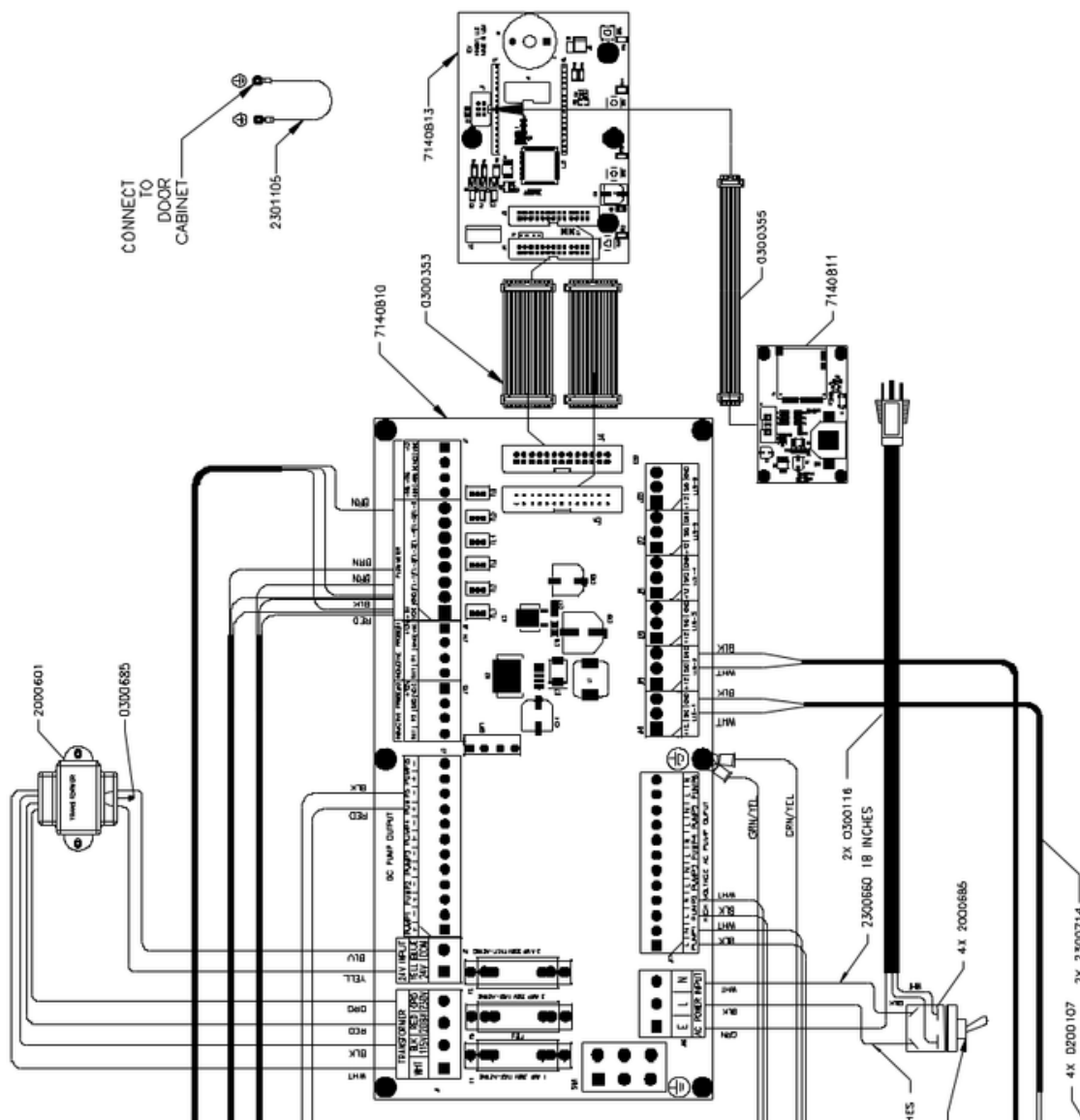
WIRING DIAGRAM—2 PUMP CABINET (7667120, 7667130, 7667140)



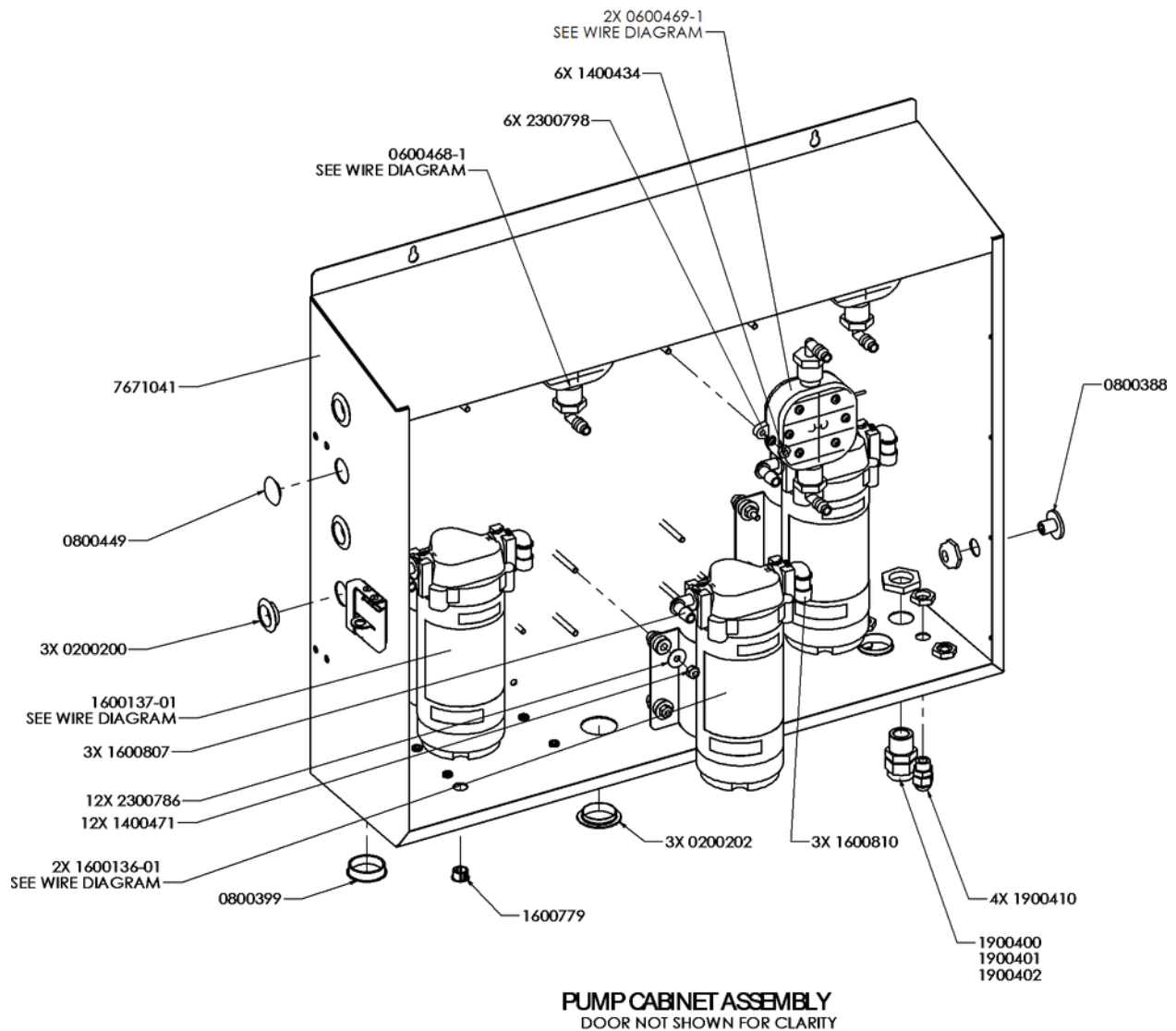
WIRING DIAGRAM—I/O BOARD & MAIN CONTROLLER FOR 3 PUMP SYSTEM (7667090)



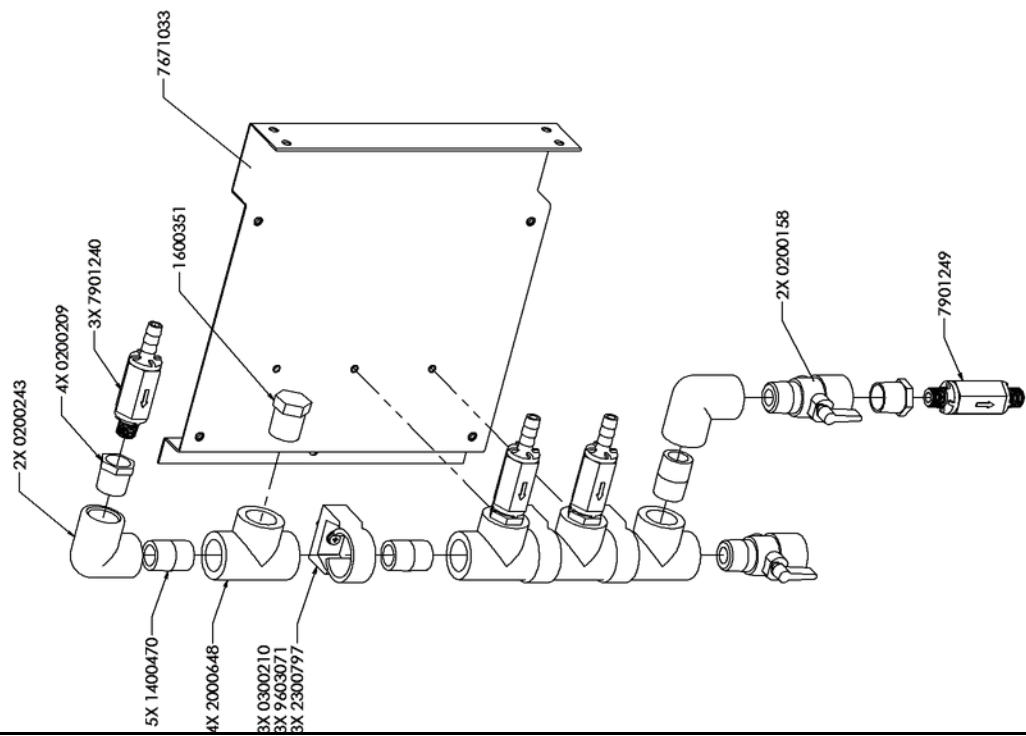
WIRING DIAGRAM—I/O BOARD & MAIN CONTROLLER FOR 2 PUMP SYSTEM (7667120, 7667130, 7667140)



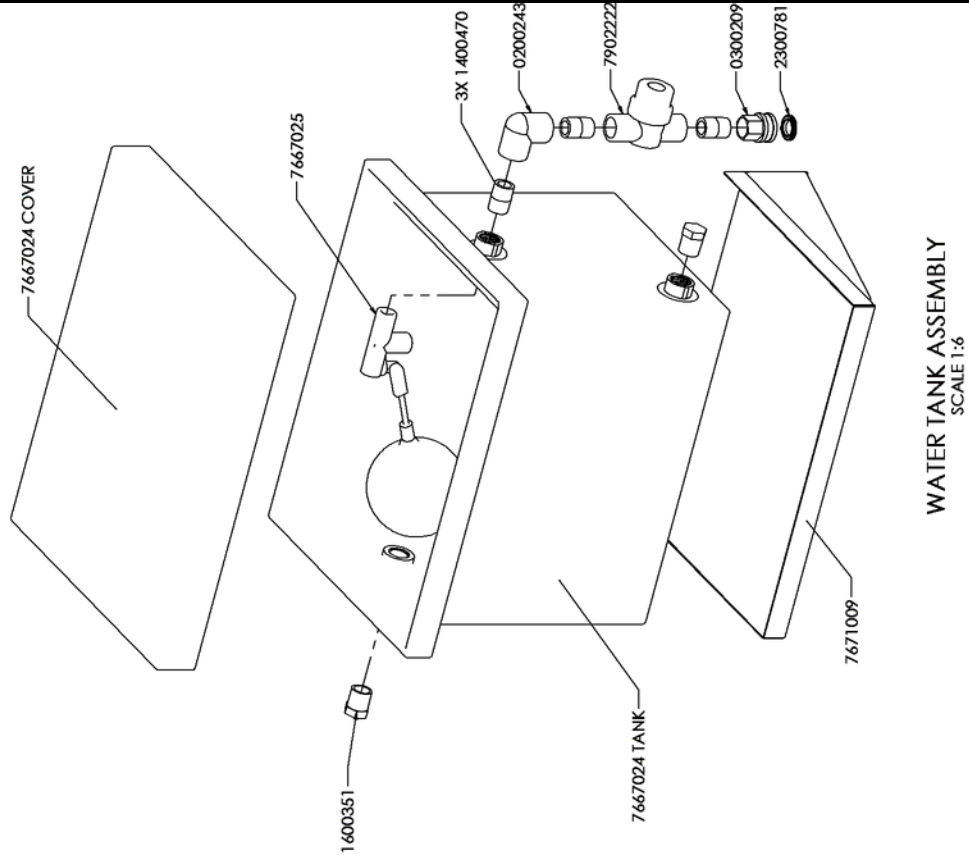
3 Part (7667090) Exploded View Diagrams with PN's



3 Part (7667090) Exploded View Diagrams with PN's continued

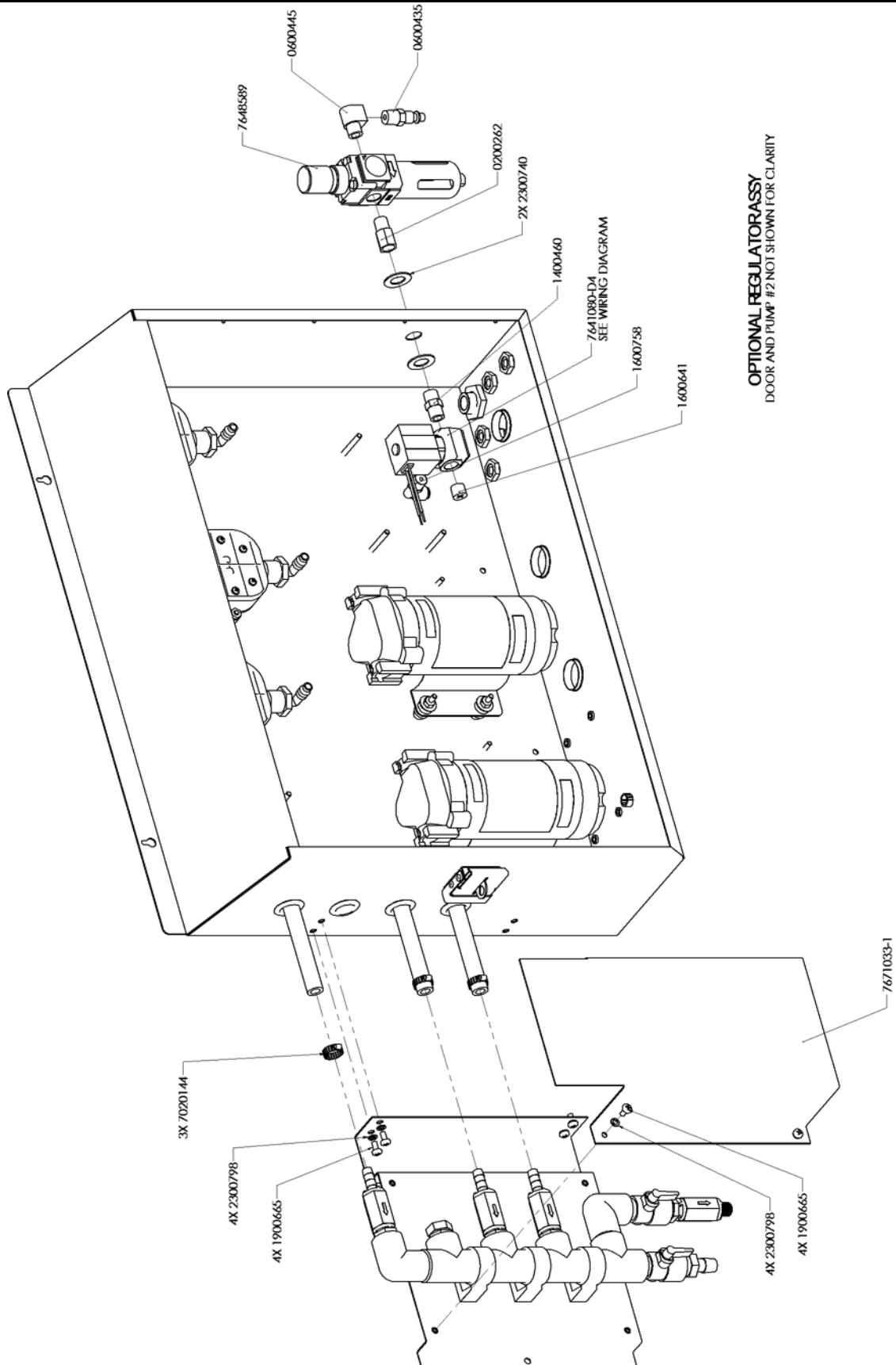


STATIC MIXER ASSEMBLY



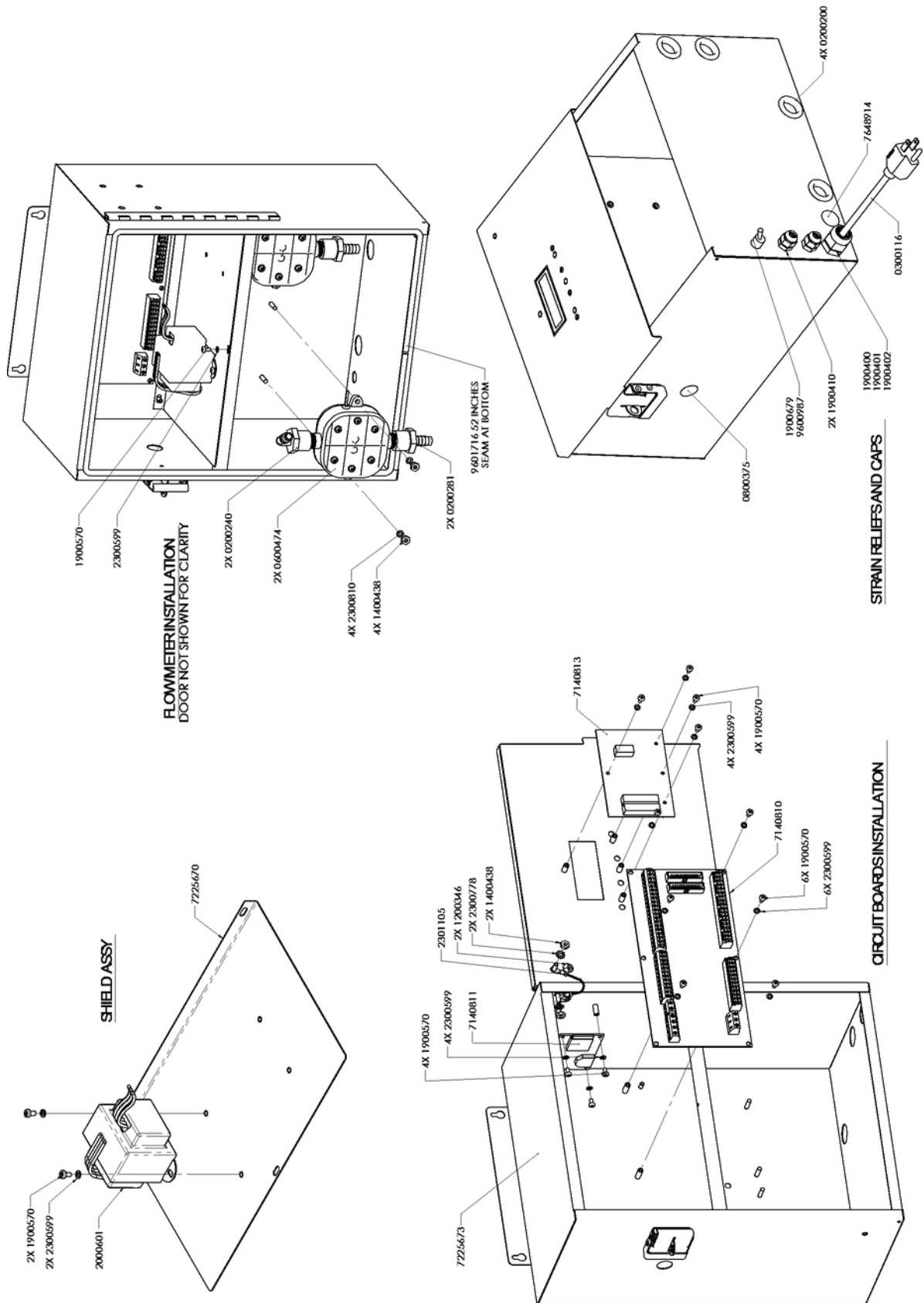
WATER TANK ASSEMBLY
SCALE 1:6

3 Part Exploded (7667090) View Diagrams with PN's continued

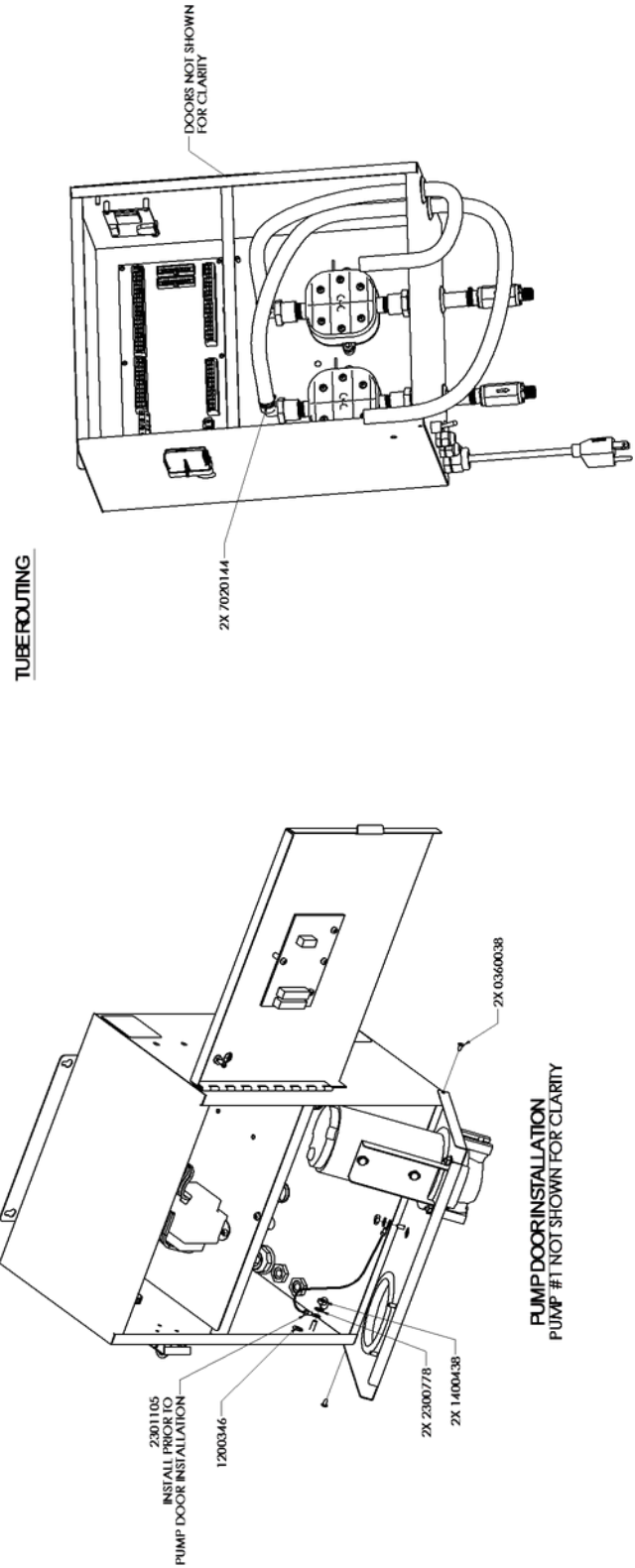
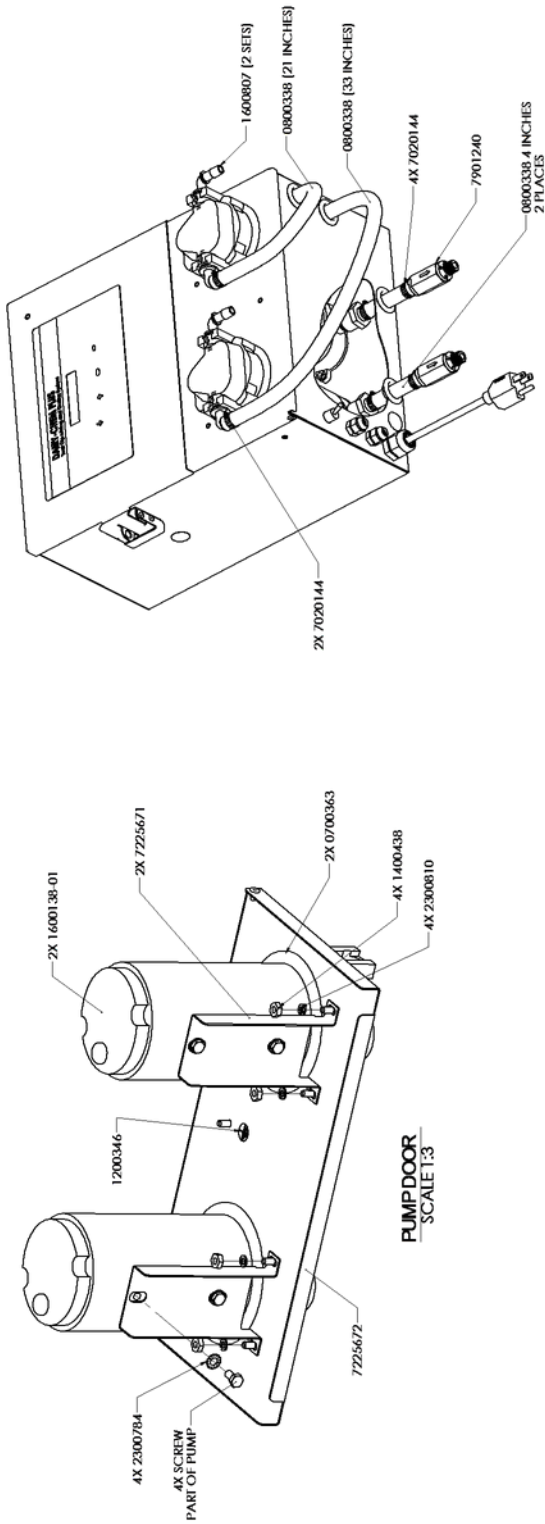


OPTIONAL REGULATOR ASSY
DOOR AND PUMP #2 NOT SHOWN FOR CLARITY

2 Part (7667120, 7667130, 7667140) Exploded View Diagram with PN's

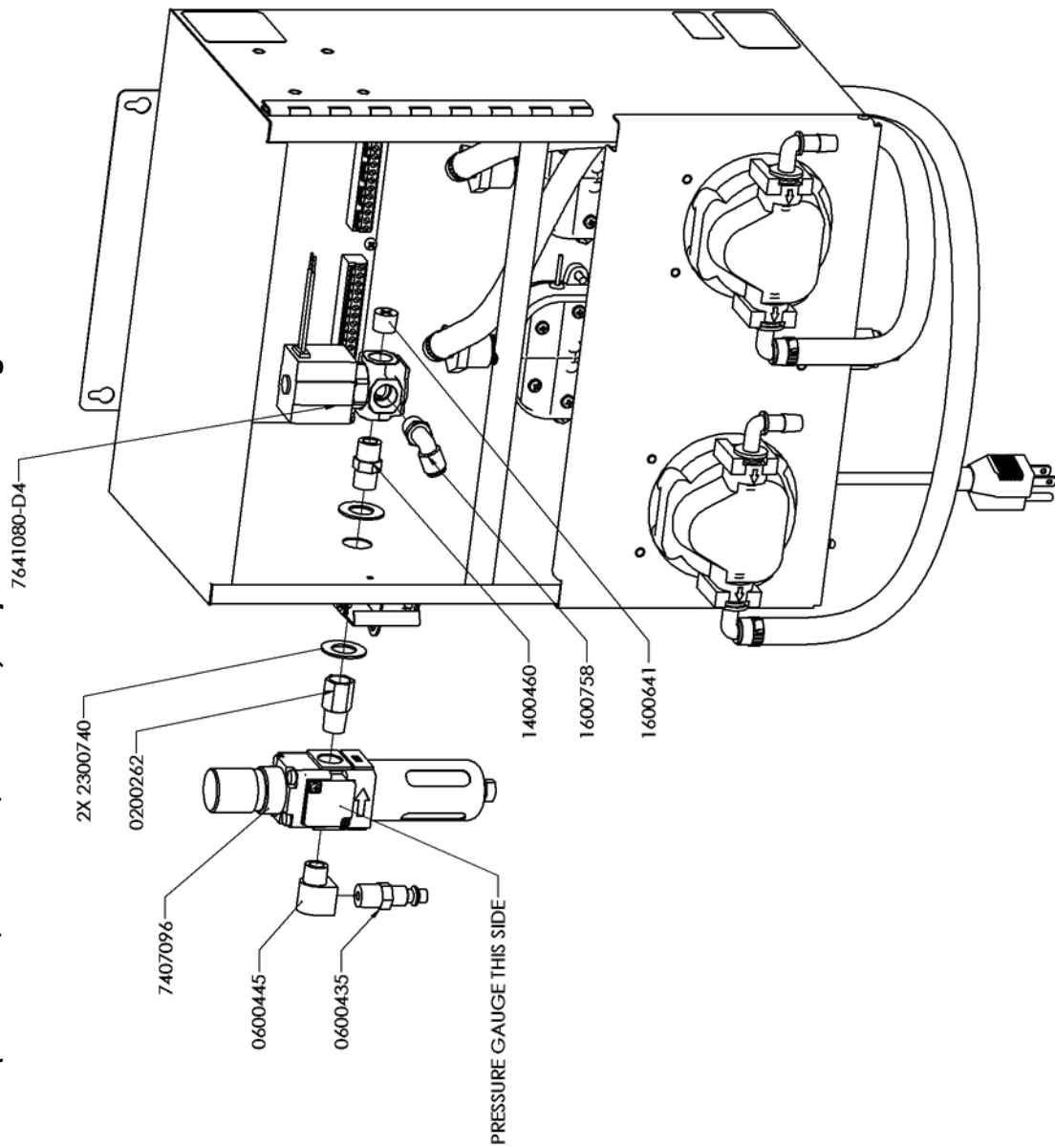


2 Part (7667120, 7667130, 7667140) Exploded View Diagrams with PN's continued



TUBEROUTING

2 Part (7667120, 7667130, 7667140) Exploded View Diagrams with PN's continued



DISCLAIMER

Knight LLC does not accept responsibility for the mishandling, misuse, or non-performance of the described items when used for purposes other than those specified in the instructions. For hazardous materials information consult label, MSDS, or Knight LLC. Knight products are not for use in potentially explosive environments. Any use of our equipment in such an environment is at the risk of the user, Knight does not accept any liability in such circumstances.

WARRANTY

All Knight controls and pump systems are warranted against defects in material and workmanship for a period of ONE year. All electronic control boards have a TWO year warranty. Warranty applies only to the replacement or repair of such parts when returned to factory with a Knight Return Authorization (KRA) number, freight prepaid, and found to be defective upon factory authorized inspection. Bearings and pump seals or rubber and synthetic rubber parts such as —Oil rings, diaphragms, squeeze tubing, and gaskets are considered expendable and are not covered under warranty. Warranty does not cover liability resulting from performance of this equipment nor the labor to replace this equipment. Product abuse or misuse voids warranty.

FOOTNOTE

The information and specifications included in this publication were in effect at the time of approval for printing. Knight LLC reserves the right, however, to discontinue or change specifications or design at any time without notice and without incurring any obligation whatsoever.

KNIGHT



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