SOLUTION DELIVERY SYSTEM REMOTE (SDSR)

Installation, Operation, and Maintenance Manual

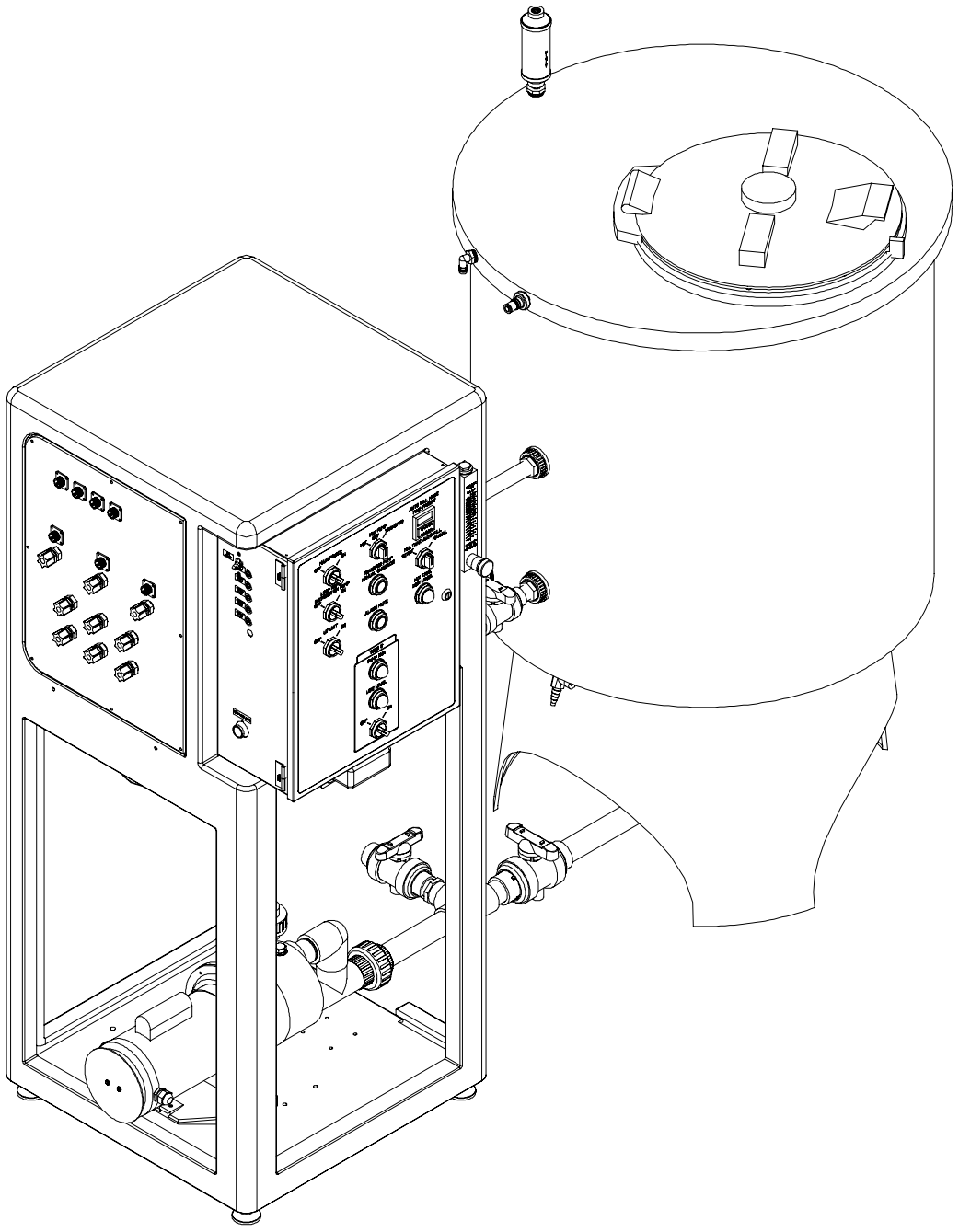

Table of Contents

Solution Delivery System
(SDS)

CHAPTER ONE:
GENERAL INFORMATION

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1.0 GENERAL INFOMATION

1.1. The Manual

This manual has been prepared to provide the operator with information and instructions regarding the installation, use, maintenance, and troubleshooting of the Mar Cor Solution Distribution System (SDS).

> **CAUTION:**
> When used as a medical device, Federal law restricts this device to sale by or on the order of a physician. Per CFR 801.109 (b)(1).

The manual has been written in narrative form supplemented with schematics and drawings for clarification. The operator can perform most procedures mentioned in this manual. Any exceptions will be clearly identified by a qualifying statement.

1.2. Safety Summary

Words in **BOLD CAPITAL** letters are used to identify labels on the device and key safety or qualifying statements. A list of all symbols and abbreviations is located at the end of this chapter. See Technote 120 in Appendix A for a glossary of relevant terms.

This safety summary does not contain all of the safety statements in the manual. Other safety statements are included within the manual text and are enhanced and defined as follows:

> **NOTE:**
> Statements that provide further clarification.
>
> **CAUTION:**
> Statements identifying conditions or practices that could result in equipment or other property damage.
>
> **WARNING:**
> Statements identifying conditions or practices that could result in personal injury or loss of life.

READ THIS MANUAL:
Prior to operating or servicing this device, this manual must be read and understood. Keep this and other associated manuals for future reference and for new operators or qualified service personnel. A note sheet is provided at the end of each chapter for operators to make notations that may be valuable to other users.

USE PROPER POWER CONNECTIONS:
Use proper wiring and connection methods to satisfy local and national electrical codes.

DO NOT REMOVE COVERS OR PANELS:
To avoid electrical shock hazard, do not remove covers or panels when power is supplied to the device. Do not operate the device when covers or panels are removed.

SHOCK HAZARD:
Connect this device to a proper ground connection in accordance with the National Electrical Code. DO NOT under any circumstances remove the ground wire or ground prong from any power plug. DO NOT use an extension cord with this equipment.

DEVICE LABELING:
Do not under any circumstances remove any Caution, Warning or any other descriptive labels from the devices until the conditions warranting the label are eliminated.

DO NOT OPERATE IN A FLAMMABLE ATMOSPHERE:
To avoid fire or explosion, do not operate this device in an explosive environment or near flammable anesthetics.

1.3. Applications

The Solution Distribution System (SDS) is intended to be used for mixing and distributing sodium bicarbonate (bicarb) as well as acid concentrates to remote points of use.

Bicarb and acid concentrates are used with purified water at the point of use to create the dialysate solutions used for hemodialysis.

NOTE:
The SDS is not a proportioning device. It is only a fluid delivery system.

WARNING:
The SDS is not equipped with monitoring devices for conductivity, pH or other parameters. The operator must follow the testing recommendations of the solution, chemical or product manufacturer. The operator is responsible for the correct application of these procedures.

1.4. Contraindications

The Solution Distribution System is not designed, sold, or intended for use outside of the device's stated applications, specifications, or limitations.

1.5. Environmental Considerations

Prior to the installation of your SDS, it will be necessary to provide utilities and create an environment suitable for the trouble-free operation of the SDS and its accessories.

POWER:

The SDS operates on 115V single-phase power. Histories of power failure, power surges, and low line voltages should be noted and reported to the manufacturer or their agent, as they may create adverse conditions for the operation of equipment.

WATER:

The SDS requires water that meets AAMI or local hemodialysis water quality standards. Additionally, it is necessary to have adequate flow rates and pressures. The minimum flow rate required for operation of the SDS is 1/2 gallon per minute.

> **NOTE:**
> Three to five gallons per minute flow rate is recommended. Lower flow rates will prolong the filling of the mix tank.

DRAIN:

The SDS requires a drain outlet. The drain must have a minimum capacity of twenty gallons per minute of continuous flow. The maximum height for the drain is six inches.

TEMPERATURE:

The equipment should be located in an environment that will protect the equipment from freezing or excessive heat. Refer to the bicarb manufacturer's recommendations for the preferred water temperature.

> **NOTE:**
> Low water temperature may cause difficulty in mixing and/or will result in extended mixing times.

NOISE:

It is advisable to locate the system away from the patient area. Hard walls will reflect noise and may make the unit seem louder.

1.6. Theory of Operation

The SDS provides semi-automatic mixing of bicarb concentrate and the distribution of bicarb and acid concentrates from storage to the patient stations. The mixed bicarb solution is automatically transferred to an elevated reservoir (head tank). The SDS, depending on the model purchased, can automatically transfer up to three different acid concentrates to elevated head tanks from 55-gallon drums or larger bulk acid storage tanks. Bicarb and acid then flow, via gravity, from the head tanks to the dispensing stations.

1.7. Fluid Components

Inlet Water Filter:

The 0.2-micron (nominal) filter prevents entry of particulate larger than 0.2 microns into the mixing system. The filter housing is opaque to inhibit algae growth.

Inlet Water Solenoid Valve:

The solenoid valve serves to shut off/turn on the water supply to the bicarb mix tank, permitting automatic or manual filling.

Flow Meter:

The flow meter, with integral needle valve, allows for visual indication and adjustments of fill rate.

Mix Tank:

The mix tank is a sealed tank with a conical shaped bottom. It is made of high purity polyethylene. The mix tank has volume marks molded into its side. The 70-gallon tank has 5-gallon and 10-liter gradations. The 100-gallon tank has 5-gallon gradations. The mix tank is made up of the following components:

- The low-level control switch prevents the mix pump from operating when the mix tank has insufficient volume for safe pump operation.
- The tank is equipped with a spray head for rinsing all internal surfaces.
- A sampling port is located at the bottom of the tank for testing/sampling purposes.
- A hinged cover with O-ring seal is provided for access into the tank.
- An eductor (mix nozzle) is located in the mix tank to aid in the mixing of powdered bicarb.
- A cartridge vent filter inhibits dust or other debris from entering the tank.

Drain:

A drain valve is provided to allow discharge of unused solution or rinse water.

Mix Pump:

The mix pump provides recirculation to mix the bicarb powder into solution. The mix pump is controlled with a timer that will shut down the pump after 10 minutes of operation to minimize the potential of over mixing. If more than 10 minutes of mixing is required, the hand switch will need to be turned OFF and back to MIX to resume mixing.

Flow Switch:

The flow switch is located on the output side of the mix pump to prevent damage to the pump. The flow switch will automatically turn the mix pump off during insufficient flow situations.

Transfer Pump(s):

Transfer pump(s) provide automatic refilling of the head tank(s). An individual transfer pump is provided for each solution.

Dip Tube:

Acid is drawn from a 55-gallon drum using a Dip Tube with an integrated level switch. An audible alarm sounds and the transfer pumps are disabled when the tank is empty. When bulk acid storage is used, a level switch with connections to the tank provides the same function as the dip tube.

Bicarb Head Tank:

The tank is a conical bottom, elevated head tank that stores bicarb solution for distribution to the patient stations via gravity. The tank is equipped with two level control switches. The high-level switch stops the filling of the tank when it is full. The low-level switch initiates the filling of the tank. In the event that the low-level switch is not satisfied within 2 minutes, an audible alarm sounds. The tank contains a spray-head assembly that facilitates rinsing of the internal surfaces of the head tank. The tank is equipped with an air vent that prevents pressure build-up in the system and provides overflow protection in the event that the upper level control switch should fail.

Acid Head Tank:

The tank is a conical bottom, elevated head tank that stores acid solution for distribution to the patient stations. The tank is equipped with two level control switches. The high-level switch stops the filling of the tank when it is full. The low-level switch initiates the filling of the tank. In the event that the low-level switch is not satisfied within 2 minutes, an audible alarm sounds. The tank is equipped with an air vent that prevents pressure build-up in the system and provides overflow protection in the event that the upper level control switch should fail.

UV Unit:

The Ultraviolet Unit is located in the bicarb solution flow path to the patients, assisting in the reduction of bacteria.

LRDP:

The Loop Rapid Distribution Pump on the bicarb loop purges air and primes the distribution piping from the distribution system.

1.8. Monitors and Controls

Control Panel:

Main Power Switch:

The Main Power Switch turns power **ON** and **OFF**. The switch must be **ON** for any function to take place.

Mix Pump Switch:

The Mix Pump Switch is a three-position switch (**MIX**, **OFF**, **TRANSFER**) that controls the power to the mix pump and transfer pump.

Auto Fill Mode Timer:

The fill timer is used to fill the mix tank for a predetermined amount of time. The user sets the mode on the auto fill timer to **E** and the time base to **m** (minutes) and adjusts the timer for the desired time.

LRDP Switch:

The LRDP Switch powers the bicarb loop distribution pump (after a 1 minute delay). The LRDP on the bicarb loop purges air from the distribution system and primes distribution piping.

Transfer Pump Manual Override Switch:

The Transfer Pump Manual Override Switch allows the user to transfer residual bicarb to the head tank manually. Once initiated, the transfer pump will operate for 5 minutes or until the head tank is full.

Mix Tank Auto Fill Switch:

The Mix Tank Auto Fill Switch (a momentary switch) initiates automatic or manual filling of the mix tank. When the **AUTO** position is selected, the fill timer and solenoid are activated, filling the mix tank. When manual filling is required, the switch must be held in the **MANUAL** position until the required water level in the mix tank is achieved.

UV Unit Switch:

The UV Unit Switch signals the UV unit to illuminate when the bicarb head tank is adequately filled.

Alarm Mute Switch:

The Alarm Mute Switch silences any audible alarm and changes any flashing alarm light to solid. The mute switch will silence the audible alarm for 5 minutes before the alarm sounds again, unless the alarm situation has been corrected.

Mix Tank Low-Level Indicator:

The Mix Tank Low-Level Indicator red light flashes and an audible alarm sounds when the bicarb solution is below the mix tank low-level switch. The light will turn solid when the alarm mute switch is activated.

Auto Fill Flow Meter with Needle Valve:

The flow meter, with integral needle valve, allows for visual indication and adjustments of fill rate. The flow meter can be read in gallons per minute (gpm) and liters per minute (lpm).

Acid Tank Switch:

The Acid Tank Switch energizes the transfer pump system controlling the automatic refill of the acid head tank(s). SDS units with acid pumps may have up to three Acid Tank Switches.

Pump Run Indicator:

A green pump run indicator will illuminate whenever the acid transfer pump is operating.

Low Level Indicator:

A red low-level indicator will illuminate, accompanied by an audible alarm when a low-level condition in the acid tank (55 gallon drum or bulk acid tank) occurs.

Dip Tube:

A dip tube with an integrated level switch sounds an audible alarm and disables the transfer pumps when the tank is empty. When bulk acid storage is used, a level switch and connections in the tank provide the same functionality as the dip tube.

Flow Switch:

The flow switch is located on the output side of the mix pump to prevent damage to the pump. The flow switch will automatically stop the mix pump during insufficient flow situations.

Mix Tank Low Level Switch:

The low-level float switch, located in the mix tank, prevents the mix pump from operating when the mix tank has insufficient volume for safe pump operation.

Audible Alarm:

An audible alarm will sound when any alarm condition is activated. The sound may be muted using the mute switch on the control panel.

PLC:

The PLC, or Programmable Logic Controller, is the input/output logic device which controls almost all functions of the SDS machine. It accepts various input signals from the hand switches on the control box, as well as signals from the various switches located in the mix tank, head tank(s), and drums (acid bulk storage). It then processes these inputs and, if the correct input signals are received (and certain other conditions are met), it will send an output signal to the appropriate component (acid transfer pump, bicarb mix pump, etc.) to activate that component. It also monitors the status of the various systems and triggers an audible and/or visual alarm when necessary. The operating program is factory installed and needs no user adjustment.

1.9. Options

Number of Acids:

The various models of the SDS are capable of delivering up to three different acid concentrates.

Acid Loop Auxiliary Pump:

Mounted in the unit or separately, the Acid Loop Auxiliary Pump purges air from the acid distribution system and primes the distribution piping.

SDS Remote Status Monitor:

A Remote Status Monitor is available as an option. It is used to alert dialysis station personnel when a problem with the Solution Delivery System exists and that appropriate steps should be taken to ensure patient safety. The SDS remote status monitor is a status indicator only and does not include any controls that allow remote operation or adjustment of the SDS system.

Wall Stations:

Wall-mounted solution dispensers are capable of delivering up to four different concentrates and water as well as drain access. Process connections are configured to be compatible with dialysis manufacturer's equipment.

Ozone:

The O_3Z ozone system is available as an alternate disinfectant for the bicarb mixing and delivery pathway. The ozone system attaches easily to the SDS unit.

> **WARNING:**
> The ozone system is intended for equipment disinfection only. It is not intended for solution disinfection.

Bulk Acid Storage:

Larger tanks (165–1000 gallon) are available for onsite bulk storage of acid. When the tanks are located away from the dialysis stations an auxiliary transfer pump unit may be required.

Head Tank Mounting:

Head tank mounting units are available in ceiling or wall mounting configuration.

Heat Disinfection (RO Water Loop):

Heat disinfection only applies to the RO water inlet piping loop that feeds the SDS unit. The SDS system cannot be heat disinfected.

If the SDS unit is equipped with PVC loop flow piping, it is **NOT** heat disinfect compatible. The SDS unit must be equipped with PVDF loop flow piping in order to have this option. When performing RO loop piping heat disinfection, close the RO supply water shut-off valve to the SDS unit.

> **WARNING:**
> The piping components, internal to the unit, are not heat tolerant and cannot be heat disinfected. To disinfect the SDS system, refer to Section 3.9, Bicarb System Disinfection/De-Calcifying Procedure.

1.10. Specifications

1.10.1. Input Water Requirements

	Minimum	Maximum
Input flow Rate (AAMI quality water)	0.5 GPM	5.0 GPM
Temperature (water)*	10°C (50°F)	30°C (86°F)
pH (water)	3.0	11.0
Inlet Pressure	20 PSI	100 PSI
Drain Capacity	20 GPM	N/A
Drain Height m)	N/A	6 in. (0.15

** Refer to the bicarbonate powder manufacturer's recommendation for water temperature.*

1.10.2. Electrical Specifications

Voltage	115 V~
Hertz	60
Amps	16
Phase	Single

1.10.3. Environmental Requirements

	Minimum	Maximum
Ambient Temperature	4°C (39°F)	32°C (90°F)
Storage Temperature	2°C (36°F)	32°C (90°F)
Altitude	N/A	10,000 feet
Relative Humidity	10% to 70% RH	
Pollution Degree	2	

NOTE:
The user/operator should recognize that moisture can be caused by condensation and is not necessarily an equipment leak. This equipment will function in the presence of condensation.

1.10.4. Dimensions

Mixing Tank:	70 or 100 gallon
Head Tank:	10, 15, or 30 gallons
SDS with 70 gallon Mix Tank*	58″H x 62″W x 36″D
SDS with 100 gallon Mix Tank*	58″H x 72″W x 36″D

*****Additional space is required for operator access and acid drums/bulk storage tank. Dimensions listed are for equipment only.

1.11. Disposal

Disposal of this product or parts must be carried out according with local disposal codes.

1.12. Electromagnetic Interference

This equipment can generate, uses, and can radiate radio frequency energy and, if not installed and used in accordance with these instructions, may cause harmful interference to other devices in the vicinity. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference with other devices, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving device.
- Increase the separation between the equipment.
- Connect the equipment into an outlet on a circuit different from that to which the other device(s) is connected.
- Consult the field service technician or manufacturer for help.

1.13. Service Assistance

If service assistance is required, please take the following steps:

1. Consult the "Troubleshooting" section of this manual (Chapter Five). If the problem cannot be identified and corrected by any of the procedures found in that section, then;
2. Contact your Facility Equipment Technician. If the technician is unable to help, then;
3. Call Technical Support Department at (800) 633-3080. Technicians are available for all calls between 7:00 a.m. and 7:00 p.m. CST, Monday through Friday. Technicians are also available at other times for **emergency calls only**. Product consultants will be on hand to discuss the problem with you and endeavor to rectify it over the phone. If the problem appears to be of a more serious nature, you will be given instructions regarding the action to be taken. Prior to making the phone call, you must be prepared to answer two questions:
    1. What model do you have; i.e., Bicarb and Number of Acids?

        UNIT MODEL: _____
    2. What is the serial number of your SDS (located on left side of controller)?

        UNIT SERIAL NUMBER: _____
4. In addition, for **Non-Emergency** issues, you may e-mail technicalsupport.marcor@xylem.com and a Technician will respond generally within one working day.

1.14. Return Goods Authorization (RGA) Procedure

If you wish to return goods for warranty evaluation and/or credit, please have your original sales order, invoice, and device serial number available when you call. Call us at (800) 633-3080 and request Technical Support. A Technical Support representative will provide instructions and a return goods authorization number, **which needs to be clearly written on the outside of the box used to ship your materials**. All equipment must be shipped to us with the freight prepaid by the customer. Call our Customer Service Center with any questions or issues concerning freight claims and a representative will discuss your situation.

All materials to be returned must be rendered into a non-hazardous condition prior to shipping.

1.15. Symbols and Abbreviations

~	Volts Alternating Current
24N	Neutral or ‘common’ connection of the 24-volt AC power supply
AAMI	Association for the Advancement of Medical Instrumentation
C	Celsius
C1	Contactor (Motor Starter Relay – Mix Pump)
CB	Circuit breaker (‘CB-1’)
CSA	Canadian Standards Association
cc	Cubic Centimeters
C/D	Cleaning/Disinfection
cfu/ml	Colony Forming Units per milliliter
cm	Centimeters
CO_2	Carbon dioxide
COM	‘Common’; refers to the 24 volt NEGATIVE direct current (‘-24VDC’) power supply
CR	Control Relay; ‘CR1, CR2, … (Example ‘CR2-13 refers to the number 13 terminal on the number 2 relay
EU	Endotoxin Units
F	Fahrenheit
FDA	Food and Drug Administration
Ft.	Foot (feet)
FU	Fuse FU1, FU2…
GPM	Gallons Per Minute
H	Hot (or line voltage) connection to the 115-volt power supply
Lbs.	Pounds
LPM	Liters Per Minute
LRDP	Loop Rapid Distribution Pump
m	Meter
mm	Millimeter
mEq	Milliequivalents
mg/L	Milligrams Per Liter
ml	Milliliters
MNPT	Male National Pipe Thread
N	Neutral (or common) connection of the 115-volt power supply

N/A	Not Applicable
ng/ml	Nanograms Per Milliliter
NPT	National Pipe Thread
NSF	National Sanitation Foundation
OTT	Ozone Throttle Tube
OZ	Ozone
PLC	Programmable Logic Controller
PLC-XM	Programmable Logic Controller – ‘Expansion Module’
P/N	Part Number
PPM	Parts Per Million
PSI	Pounds Per Square Inch
PVC	Polyvinyl Chloride
QD	Quick Disconnect
RO	Reverse Osmosis
SDS	Solution Distribution System
SDSR	Solution Distribution System Remote
TB	Terminal Barrier Strip (Main): ‘TB1’ (Example: ‘TB1-9’ refers to the terminal marked number 9 on the Main Terminal Barrier Strip)
UV	Ultraviolet Lamp
VAC	Volts Alternating Current

NOTES:

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Solution Delivery System

(SDS)

CHAPTER 2:
INSTALLATION GUIDELINES AND INSTRUCTIONS

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2.0 INSTALLATION GUIDELINES AND INSTRUCTIONS

2.1. Installation Guidelines

Refer to the Drawings Chapter for Clarification

The following are basic guidelines for the installation of the SDS system. Each application/installation will have particular characteristics that require attention when planning the installation.

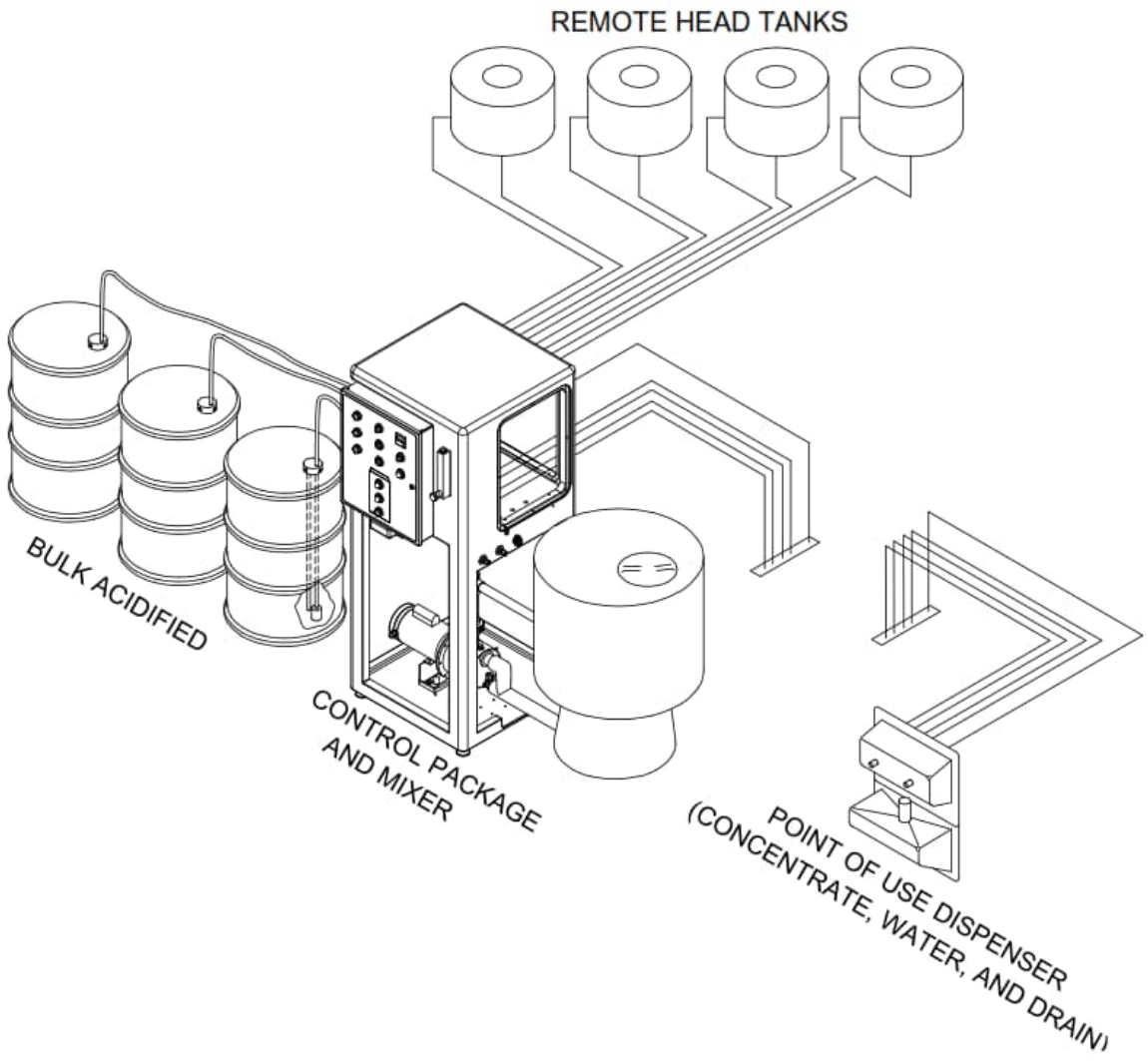


Figure 2.1: SDS System Diagram

2.2. SDS Unit Installation Requirements

The Solution Distribution Unit and the Bicarbonate Mix Tank should be located as close to the patient care area as possible.

The Remote Solution Distribution Unit and the Bicarbonate Mix Tank footprint requirement:

With a 70 gal. Solution Mix Tank:	55″ depth by 92″ width
Weight:	810 lbs
With a 100 gal. Solution Mix Tank:	60″ depth by 102″ width
Weight:	1050 lbs

An additional 48″ depth for operating space in front of the equipment is recommended.

2.2.1. Electrical Requirements

115 VAC, 20 AMP, 1 Phase Straight Blade Plug.

115 VAC, 20 AMP, 1 Phase duplex electrical outlet. Required for O_3Z use only.

2.2.2. RO Water Supply

For cold water, chemical disinfection, the unit includes two, 1 inch threaded female NPT ports for inlet and outlet RO water connections. For hot water, heat disinfection, the unit includes two ¾ inch threaded female NPT ports.

Inlet and outlet connections are interchangeable at the unit. The inlet SDS port is field connected from the loop supply feed. The outlet SDS port is field connected to the loop return line.

2.2.3. Drain (Floor Sink)

Floor sink capacity, minimum: 20 gpm

The area should be sloped to a floor drain in addition to the required floor sink.

2.3. Head Tank Installation Requirements

> **NOTE:**
> Our organization does not install head tanks. A qualified contractor under the supervision of the facility's architect must install them, adhering to local codes and seismic requirements.

The head tank(s) for the Remote Solution Distribution Unit must be ceiling or wall mounted and must conform to local codes.

The head tank(s) must be mounted directly above the Remote Solution Distribution Unit and no more than 10 feet away horizontally.

The head tank(s) must be mounted so that the bottom fitting on the tank is a minimum of 2 inches above the highest point of the distribution loop tubing.

Installation of the head tank(s) at a height greater than 7 feet above the point-of-use wall dispensers may require a pressure reduction device (P/N W3T578116). The pressure reduction device choice depends upon the type of dialysis machine used and its incoming pressure requirements for acid and bicarbonate solution. One pressure reduction device is required for each individual tubing run.

Suspend the head tanks and bracket assemblies from a structural member using threaded rod and a 'Unistrut' arrangement capable of holding each filled head tank. For an illustration of the head tank and the mounting hardware provided, please refer to Illustrations 6.35 through 6.38 in Chapter 6.

The installation hardware provided with the head tanks may not be adequate for installations where seismic requirements must be met, or if the facility architect requests that the head tanks be installed in a manner different than that outlined by us for structural reasons.

Head tank full operating weight

a. 10-gallon head tank: 105 lbs +/- 2 lbs
b. 15-gallon head tank: 150 lbs +/- 2 lbs
c. 30-gallon head tank: 300lbs +/- 2 lbs

2.4. Patient Loop Installation Requirements

Distribution loop tubing:

- Material: Polyethylene
- Size: 1/2 inch (outside diameter)
- Color: Blue (bicarb), Red (acid #1), Orange (acid #2), Yellow (acid #3)

The maximum number of patient stations per loop should not exceed 20 stations.

If the number of patient stations on a distribution loop is greater than 20 stations, the distribution loop should be split into two separate loops, each feeding 20 patient stations or less.

The maximum distribution length per loop should not exceed 700 feet.

If the distribution loop is longer than 700 feet, the distribution loop should be split into two separate loops, each less than 700 feet in length.

Each solution requires a separate loop of a different color: Blue (bicarb), Red (acid #1), Orange (acid #2) and Yellow (acid #3).

Distribution loop tubing runs start at the Solution Distribution Unit, are routed to the patient stations, and return to the Solution Distribution Unit.

The distribution loops may be routed in the ceiling (or raceway) dropping down to the patient stations or under the floor, rising to the patient stations.

If the distribution loop is to pass under the floor (concrete slab) to the wall chase and between wall chases, the tubing must be run in 4-inch diameter pipe with ‘sweep’ type elbows for routing the tubing and the ends of pipe must extend 6 inches (minimum) above the floor. Pipe must be watertight and must be installed with a ‘pull string’. If the distribution loop(s) is to pass through an unheated space, they should be insulated to prevent freezing.

Distribution loop tubing must be continuous (no in-line couplings in walls or ceiling). Breaks or splices in tubing runs should occur with tee fittings only at a patient station dispenser.

Distribution loop tubing must be installed with no kinks, pinched sections, scratches, marks (paint or plaster), or blemishes.

Distribution loop tubing must be installed straight (level) with appropriate restraints to prevent excessive sagging and must have a minimum bend radius of 2-1/2 inches.

2.5. Patient Station Instructions

1. At each patient station location, supply extra tubing as shown in the "SDS Loop Installation Guideline" in Chapter 6, "Drawings."
2. Label the ends of the distribution loop(s) tubing at the Solution Distribution Unit area **BICARB TO LOOP** and **RETURN**. If more than one bicarb distribution loop is required, label the tubing supply lines **BICARB LOOP 1** and **BICARB LOOP 2** and label the return lines **RETURN 1** and **RETURN 2**. Use the same method if more than one distribution loop exists for each acid.
3. Each end of the supply loop should be long enough to be routed to the appropriate head tank and have an additional 10 feet of tubing.
4. Each end of the return loop should be long enough to be routed to the SDS frame and have an additional 10 feet of tubing.

NOTE:
For best results and assistance with installation and warranty coverage, our organization should install the SDS system.

2.6. Installation Instructions

1. Locate the SDS frame and mix tank in a level location. The location must include a floor drain, good ventilation, a 20 amp 115 VAC outlet, a 20 amp 115 VAC duplex outlet (for ozone systems) and be within 10 horizontal feet from the head tank(s). A water supply valve should be in reasonable proximity.
2. Clean any shipping debris from inside the bicarb mix tank.
3. Ensure the bicarb mix tank is sitting properly on its stand and connect the SDS frame to the mix tank at two matching unions. Make certain that the union O-rings are in place. Tighten all other union connections.
4. Connect the mix tank low float switch wires from the mix tank to the low float switch wires on the frame.
5. Assemble the drain manifold; refer to Illustration 6.43 in Chapter 6. Mount the drain manifold in a manner appropriate for the location of the SDS frame, head tanks and floor drain.
6. Connect the SDS drain to the drain manifold with 1-inch flexible braided hose. See the drain manifold drawing for connection point.
7. Using 1/2″ blue tube from the installation kit, connect to the 1/2″ union located on the right side of the SDS unit and route to drain.
8. Install the UV quartz sleeve (P/N W2T501811) and lamp (P/N W2T180210) into the UV unit. For specific instructions, see Chapter 4, "Routine Maintenance."
9. Install the water filter (P/N W2T915718) into the filter bowl.
10. Remove and discard the shipping plug from the tank vent filter connection point.

11. Tighten all electrical screws in the control box to 9 inch-pounds except for the panel switches/indicators, PLC and terminal barrier strip. The panel switches/indicator screws should be tightened to 10-14 inch-pounds, the PLC terminal screws should be tightened to 5-inch pounds and terminal barrier strip to 7 inch-pounds.

CAUTION:
Vibrations during shipping/operation may cause connections to loosen. Loose connections may not allow the SDS Unit to operate correctly.

12. Connect the flexible hose from the port labeled **TANK** on the right side of the SDS frame to the QD fitting on valve V-3.
13. Prepare flexible hose assemblies for RO water supply and return. Remove shipping plugs from port connections at the back of the SDS unit. Connect hose assembly using appropriate 1 inch male NPT fittings (not provided) to the SDS port connections.
14. Route the power cord to the electrical receptacle.

2.7. Head Tank Tubing

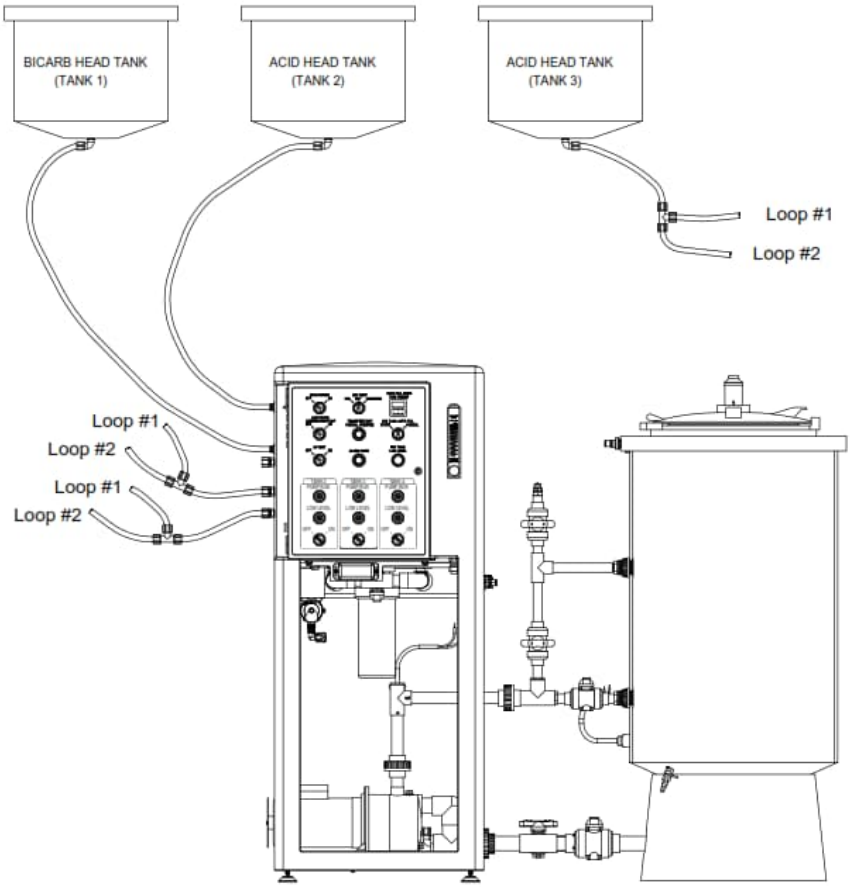


Figure 2.2: SDS Head Tank Tubing Installation

NOTE:
It is important to plan the tubing runs between the head tank(s) and the SDS frame before running any tubing. A good plan will ensure that the tubing runs will slope downward, and the bends will have a large radius. The tubing runs will have the best appearance if they are run straight, perpendicular and parallel.

NOTE:
Use FDA/NSF approved silicone sealant on all threaded connections.

1. Mark the locations for the clamps along the planned path. Space the clamps every 4 to 5 feet along the path. One clamp will hold the tubes and wires for two head tanks; if additional tanks are required, more clamps will be necessary.
2. For the planned tubing run, determine the most appropriate 1/2″ fittings (elbow or straight) to be installed into the inlet and outlet ports of the bicarb head tank. Install using Teflon tape and silicone caulk.
3. Install the float switches (P/N W2T188750) into the head tank (float switch arrow pointed down) using Teflon tape and silicone caulk.
4. Install a 1/2″ elbow barb (P/N W2T913794) fitting into the over-flow port of the head tank using Teflon tape and silicone caulk.

5. Place tank into the mounting bracket and rotate so the overflow port aligns with the head tank mounting bracket cutout.
6. Connect a 1/2″ blue tube to the head tank (side) fill port. Connect the other end of the tube to the port labeled HD TANK 1 SUPPLY on the left side of frame.
7. Connect a 1/2″ blue tube to the head tank (bottom) outlet port. Connect the other end of the tube to the port labeled HD TANK 1 RETURN on the left side of frame.

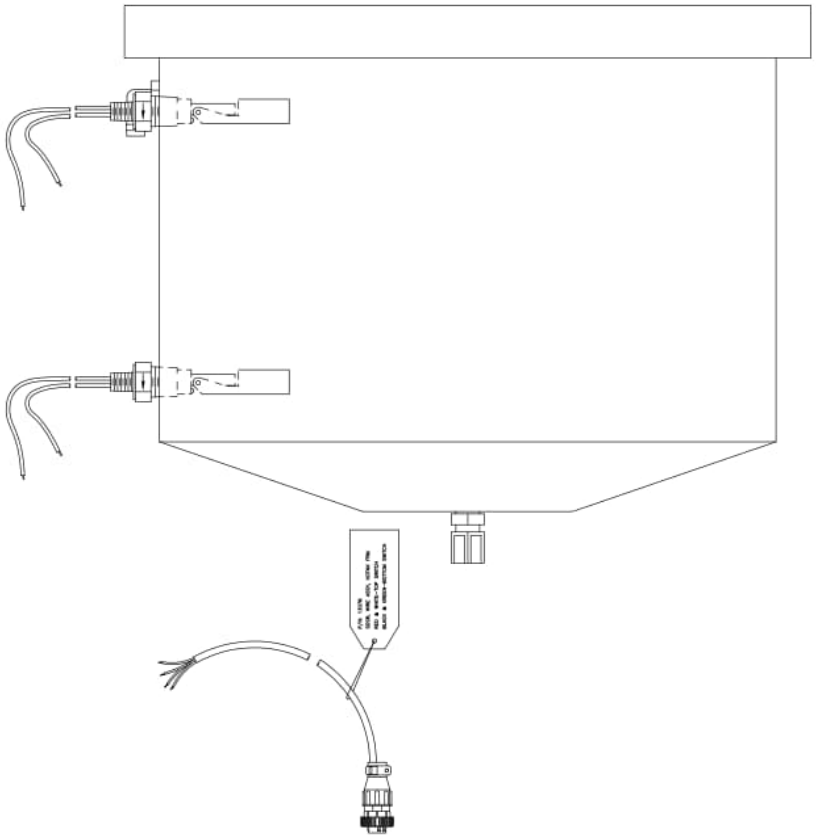


Figure 2.3: Head Tank Electrical Connections

8. Connect a clear 1/2″ ID vinyl tube to the head tank over-flow.
9. Attach the head tank cable's (P/N W3T578361) red and white wires to the top float switch and the black and green wires to the bottom float switch with wire connectors.

NOTE:
Fold the extra wire from the top switch and use tie-wraps to secure it, removing any strain from the wire connection. Repeat on the lower float switch.

10. Label the tubing from the outlet port bottom of the bicarb head tank as **HEAD TANK 1 RETURN**.

Perform the following steps for each acid head tank:

1. For the planned tubing run, determine the most appropriate 1/2″ fittings (elbow or straight) to be installed into the tank outlet and inlet ports. Install using Teflon tape and silicone caulk.
2. Install the float switches (P/N W2T188750) into the head tank (float switch arrow pointed down) using Teflon tape and silicone caulk.
3. Install a 1/2″ elbow barb fitting (P/N W2T913794) into the over-flow port of the head tank using Teflon tape and silicone caulk.
4. Place the tank into the mounting bracket and rotate so that the overflow port aligns with the head tank mounting bracket cutout.
5. Install the tubing and wires into the acid head tanks. For head tank 2 (acid #1) use red tubing, for head tank 3 (acid #2) use orange tubing, for head tank 4 (acid #3) use yellow tubing.
6. Connect 1/2″ tube, of the appropriate color, to the head tank (side) fill port.
    a. For acid #1 (red tube), connect to port labeled HD TANK 2 SUPPLY.
    b. For acid #2 (orange tube), connect to port labeled HD TANK 3 SUPPLY.
    c. For acid #3 (yellow tube), connect to port labeled HD TANK 4 SUPPLY.
7. Connect 1/2″ tube, of the appropriate color, to the head tank (bottom) outlet port.
    a. For acid #1 (red tube), connect to port labeled TANK 2.
    b. For acid #2 (orange tube), connect to port labeled TANK 3.
    c. For acid #3 (yellow tube), connect to port labeled TANK 4.
8. Connect clear 1/2″ ID vinyl tube to the head tank over-flow.
9. Attach the head tank cable (P/N W3T578361) red and white wires to the top float switch and the black and green wires to the bottom float switch with wire connectors.

NOTE:
Fold the extra wire from the top switch and use tie-wraps to secure it, removing any strain from the wire connection. Repeat this on the lower float switch.

10. Label the tubing from the outlet ports and the fill ports of the acid head tanks.
11. Route all tubes and wires down the wall, keeping them straight, avoiding overlapping. Use tie-wraps to keep the bundle orderly. The clamps may require tie-wraps to keep them closed.
12. Route the head tank overflow tubes to the drain manifold.

NOTE:
The overflow tubes must be routed in a manner such that the tubes are self-draining, i.e., no sags.
CAUTION:
If sags are present in the overflow tubing, the sag can fill with fluid, restricting the head tank from draining properly.
NOTE:
Fittings are provided on the acid dip tube and the bicarb mix tank for alternate overflow connections. If the bicarb mix tank fitting is not used, replace the fitting with a plug.

2.8. Bicarb Connections to the SDS Frame and Bicarb Distribution Loop.

To make bicarb connections to the SDS frame:

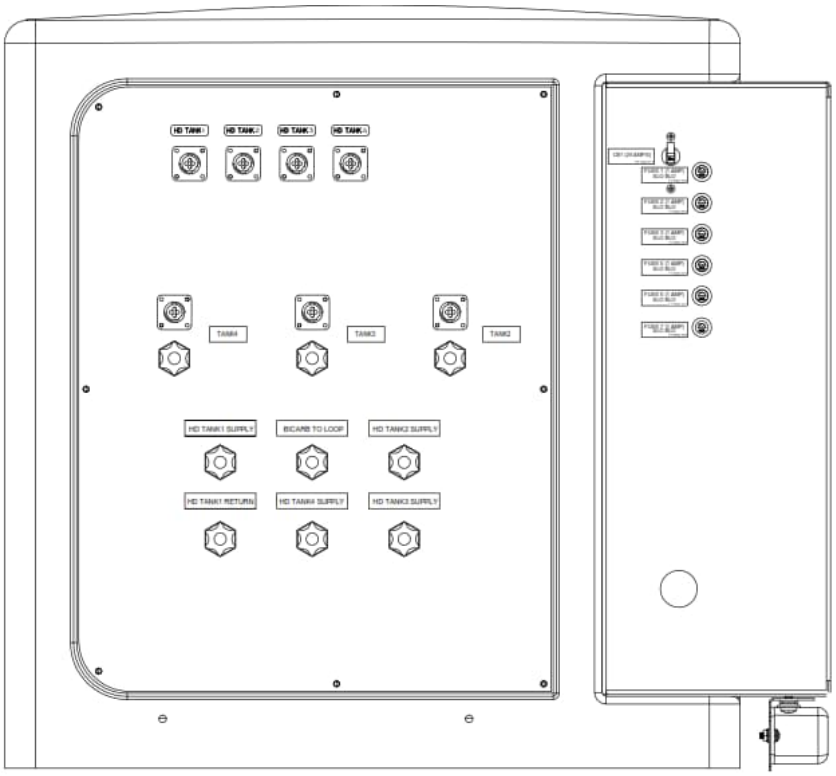


Figure 2.4: SDS Mix Frame Tube Connections (Three Acid)

1. Connect the 1/2″ blue tube marked **HEAD TANK 1 RETURN** (from bottom fitting of head tank) to the **HEAD TANK 1 RETURN** port on the SDS frame side panel. The tubing should be routed to the frame with large sweep bends to prevent kinks or excessive strain on fitting connections.
2. Install a 1/2" x 3/8” compression tee/valve (P/N W2T915516) at lowest point in the Head Tank #1 Return line. Using 3/8” tube, install a 4-inch piece into the end of valve V-6. Install a 1/2" x 3/8” reducing union (P/N W2T911983) on outlet end of valve. Use 1/2” blue tubing route to drain manifold.
3. Connect the 1/2" blue tube marked **BICARB TO LOOP** to the **BICARB TO LOOP** port on the SDS frame side panel. Route the tubing to the frame with large sweep bends to avoid kinks and excessive strain of the fitting connections in the tubes.
4. Connect the cable from the bicarb head tank to the **HEAD TANK 1** electrical connection on the SDS frame back panel. Route the wires with the bicarb tubes. Coil the excess wire and tie-wrap the coil to the bicarb tubing.
5. Tie-wrap the tubing and wires as required for support.

2.8.1. Bicarb Distribution Loop Supply Connection

NOTE:
If a second bicarb distribution loop is required, follow Steps 1-3 (below) for connecting to distribution loop supplies.

1. In the 1/2″ blue tube connected to the **BICARB TO LOOP** port on the SDS frame, cut the tube 24 inches from the port (ensure a clean perpendicular cut) and install a 1/2″ tubing tee (P/N W2T879804).
2. Connect the second bicarb distribution loop supply tube to the branch of the tee.
3. Tie-wrap the tubes as required for support.

2.8.2. Bicarb Distribution Loop Return Connection (Bicarb Wand) and Sample Valve

1. Create a Bicarb Wand Assembly:
   - Cut a 4 inch piece of 1/2" blue tubing provided in the installation kit.
   - On one end of the piece connect the female 1/2" compression quick-disconnect fitting (P/N W2T914760). This fitting is located in the installation kit.
   - On the other end of the 1/2” tube, connect a 1/2" x 3/8” compression tee/valve (P/N W2T915516). Insert a 2 inch piece of 3/8” tube provided in the installation kit into the 3/8” compression tee/valve.

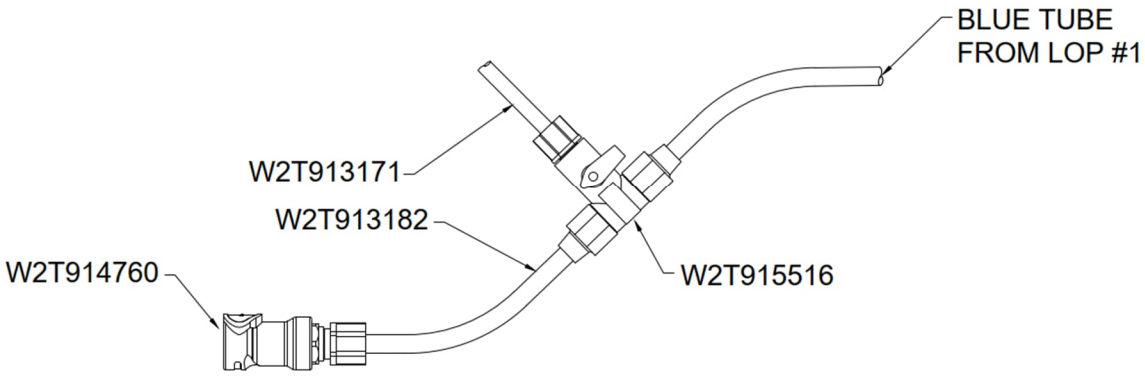


Figure 2.5: Single Loop Bicarb Wand

2. Route the bicarb distribution loop return tube to the right side of the SDS frame. Support the tubing with clamps and tie-wraps as required. Allow enough extra tube that when the loop return end is connected to the Bicarb Wand Assembly, the wand can be moved to easily connect to the **OPERATE**, **DRAIN** and **TANK** ports. The **TANK** port is located on the mix tank.
3. Cut the bicarb distribution loop return tubing and connect it to the Bicarb Wand Assembly.
4. Place the Bicarb Wand into the **DRAIN** port on the SDS unit.

2.8.3. Systems with Two Bicarb Distribution Loops

1. Route both Bicarb Distribution Loops to back of SDS frame on the right side. Connect to the SDS frame as specified in the previous instructions.
2. Assemble two 'Bicarb Isolation Valve' assemblies:
   - Gather two 1/4" NPT ball valves (P/N W2T913140), four 1/2" x 1/4" compression fitting (P/N W2T926359). Install the four 1/2" x 1/4" fittings into each valve using Teflon tape and silicone caulk.
   - Cut two 6 inch pieces of 1/2" blue tube and insert into one end of the Bicarb Isolation Valve assemblies.

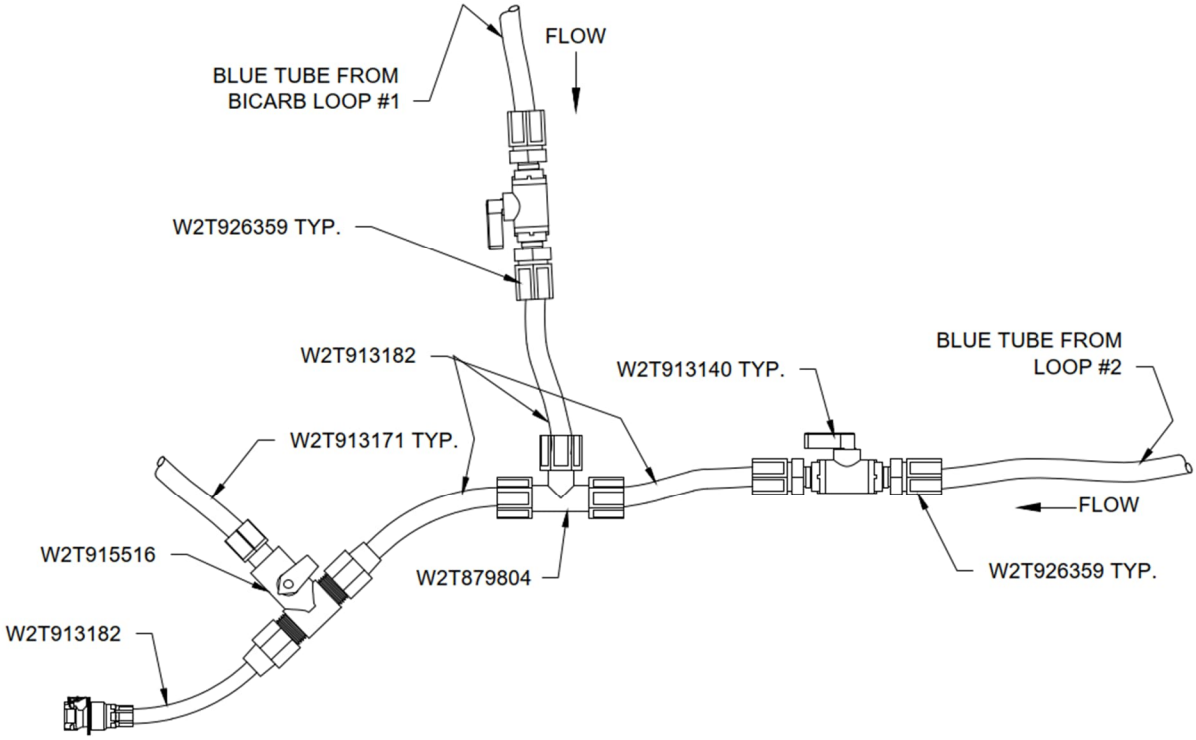


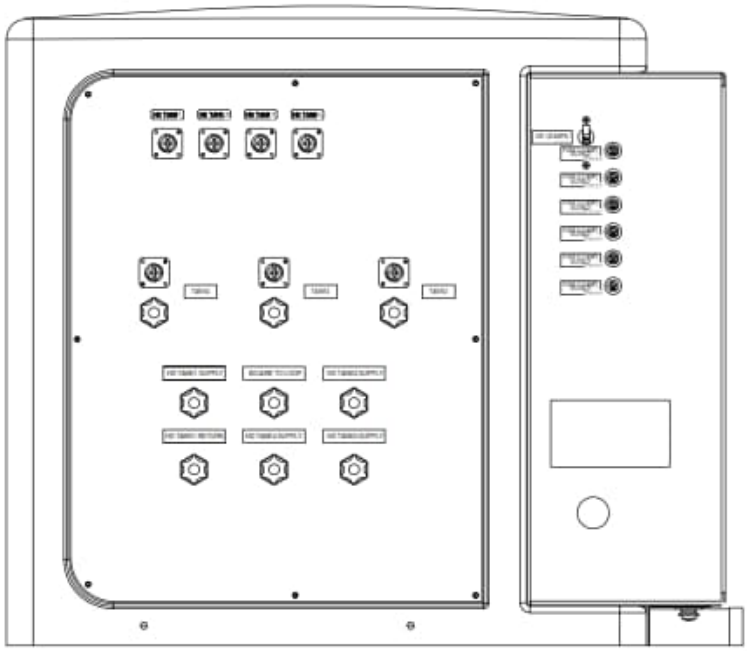
Figure 2.6: Dual Loop Bicarb Wand

3. Cut the bicarb distribution loop tube connected to the Bicarb Wand Assembly 6 inches from the 1/2” x 3/8” compression tee/valve.
4. Install the 1/2" tubing tee (P/N W2T879804) on to the 1/2" tube end that is attached to the Bicarb Wand Assembly.
5. Install the Bicarb Isolation Valve assemblies into the tubing tee.
6. Reconnect the bicarb distribution loop tubes to the Bicarb Isolation Valve assemblies.
7. Route the bicarb distribution loop return tubes from the distribution loop to the right side (facing the front) of the SDS frame. Support the tubing with clamps and tie-wraps as required.

2.9. Acid Connections to the SDS Frame and Acid Distribution Loop(s)

NOTE:
This section does not apply to 'Bicarb Only' systems.

"THREE ACID ASSEMBLY"
(LEFT SIDE VIEW)



"SINGLE-ACID" W/
AUX. ACID LOOP
PUMP PUSH
BUTTON SWITCH
(LEFT SIDE VIEW)

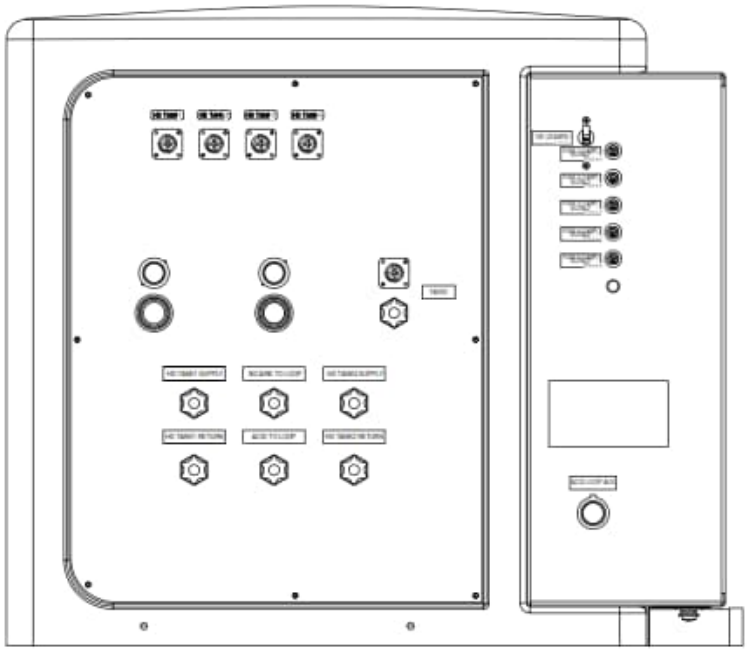


Figure 2.7: Mix Frame Acid Connections

Acid connections to the SDS frame:

> **NOTE:**
> The overflow tubes must be routed in a manner such that the tubes are self-draining, i.e., no sags.
>
> **CAUTION:**
> If sags are present in the overflow tubing, the sag can fill with fluid restricting the head tank from draining (by gravity) properly.
> **NOTE:**
> Fold the extra wire from the top switch and use tie wraps to secure it, removing any strain from the wire connection. Repeat on the lower float switch.

Head Tank #2 (Acid head tank #1)

1. Connect the 1/2″ red tube from the acid head tank fill port (side) to the **HEAD TANK 2 SUPPLY** port on the left side (facing the front) of the SDS frame. The tubing should be routed to the frame with large sweep-type bends.
2. Route the clear 1/2″ ID vinyl tube from head tank over-flow to the drain manifold or back to the bulk tank.
3. Connect the cable wires from the acid head tank to the appropriate head tank electrical connection point on the SDS frame back panel. Route the wires with the acid tube. Coil the excess wire and tie-wrap the coil to the tubing.
4. Tie-wrap the tubing and wires as needed for support.

For systems with the optional auxiliary acid loop pump:

1. Connect the 1/2″ red tube marked **HEAD TANK 2 RETURN** to the **HEAD TANK 2 RETURN** port on the left side panel of the SDS frame. The tubing should be routed to the frame with large sweep-type bends.
2. Tie-wrap the tubing and wires as needed for support.

Head Tank #3 (Acid head tank #2)

1. Connect the 1/2″ orange tube from the acid head tank fill port (side) to the **HEAD TANK 3 SUPPLY** port on the left side of the SDS frame. The tubing should be routed to the frame with large sweep-type bends.
2. Route the clear 1/2″ vinyl tube from the head tank overflow to the drain manifold or back to the bulk tank.
3. Connect the cable from the acid head tank to the appropriate head tank electrical connection on the SDS frame back panel. Route the wires with the acid tube. Coil the excess wire and tie-wrap the coil to the tubing.
4. Tie-wrap the tubing and wires as required for support.

Head Tank #4 (Acid head tank #3)

1. Connect the 1/2″ yellow tube from the acid head tank fill port (side) to the **HEAD TANK 4 SUPPLY** port on the left side of the SDS frame. Route the tubing to the frame with large sweep-type bends.
2. Route the clear 1/2″ vinyl tube from the head tank overflow to the drain manifold or back to bulk tank.
3. Connect the cable from the acid head tank to the appropriate head tank electrical connection on the SDS frame back panel. Route the wires with the acid tube. Coil the excess wire and tie-wrap the coil to the tubing.
4. Tie wrap the tubing and wires as required for support.

2.9.1 Acid Distribution Loop Supply Connections

Head Tank #2 (Acid head tank #1)

1. Route the red tube neatly from the bottom fitting of the head tank to the distribution loop supply tube of the same color.
2. Connect the tubing runs with a 1/2″ tubing union (P/N W2T879805).
3. Tie-wrap the tubing and wires as required for support.

For systems with the optional internal acid loop pump:

1. Connect the 1/2″ red distribution loop supply tube to the port labeled **ACID TO LOOP** on the SDS frame left side panel. Route the tubing to the frame with large sweep-type bends.
2. Tie-wrap the tubing and wires as required for support.

Head Tank #3 (Acid head tank #2)

1. Route the orange tube neatly from the bottom fitting of the head tank to the distribution loop supply tube of the same color.
2. Connect the tubing runs with a 1/2″ tubing union (P/N W2T879805).
3. Tie-wrap the tubing and wires as required for support.

Head Tank #4 (Acid head tank #3)

1. Route the yellow tube neatly from the bottom fitting of the head tank to the distribution loop supply of the same color.
2. Connect the tubing runs with a 1/2″ tubing union (P/N W2T879805).
3. Tie-wrap the tubing and wires as required for support.

2.9.2 Acid Distribution Loop Return Connections

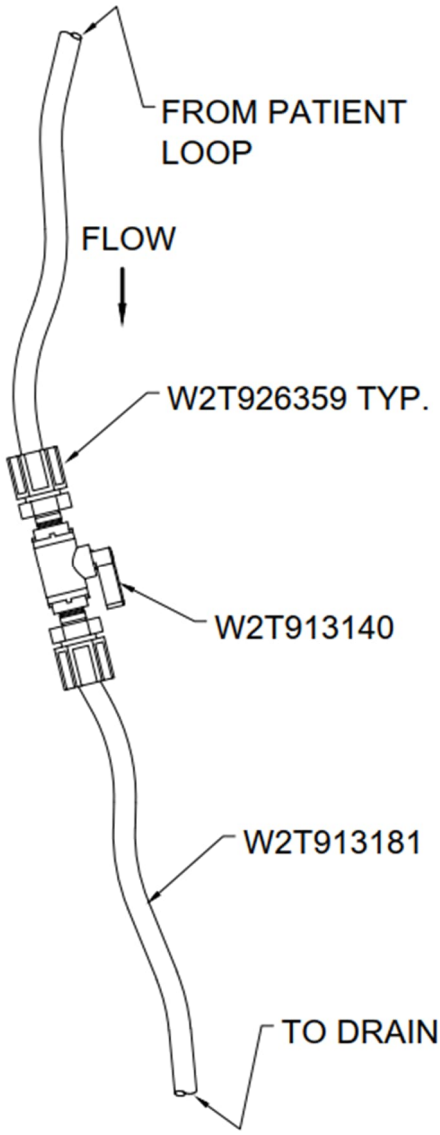


Figure 2.8: Acid Loop Return Assembly

For acid loop return lines that return to the SDS unit:

Acid #1 (red tubing), Acid #2 (orange tubing) and Acid #3 (yellow tubing)

1. Route the returning acid line to the drain manifold.
2. Assemble an Acid Isolation Valve:
   - Gather a 1/4″ NPT ball valve (P/N W2T913140) and two 1/2" x 1/4” compression reducing fittings (P/N W2T926359).
   - Install the two fittings into the valve using Teflon tape and silicone caulk.
   - Install the end of the tubing onto the free end of each valve.
3. Install the Acid Isolation Valve assembly onto the acid distribution return line near the drain manifold in a convenient location.
4. Connect the acid line to the drain manifold.

Acid loop return lines that end at the last station *(optional):*

NOTE:
Identify the location of the valves so they can be found in the future.

Acid #1 (red tubing), Acid #2 (orange tubing) and Acid #3 (yellow tubing):

1. Route the respective acid line to a drain.
2. Assemble an Acid Isolation Valve:
   - Gather a 1/4″ NPT ball valve (P/N W2T913140) and two 1/2" x 1/4" compression reducing fittings (P/N W2T926359).
   - Install the two fittings into each valve using Teflon tape and silicone caulk.
   - Install the end of the tubing onto the free end of each valve.
3. Install the Acid Isolation Valve assembly into the acid distribution return line near a drain in a convenient location.

2.10. Bulk Acid Supply Connections to the SDS Frame (User Supplied)

2.10.1. 55 Gallon Acid Drums

1. Determine where the 55-gallon drums are going to be located.

> **NOTE:**
> If the tubing that connects the 55 gallon drum to the SDS frame rise more than 7 feet or is longer than 15 feet, a remote transfer pump will be required (P/N W3T577992).

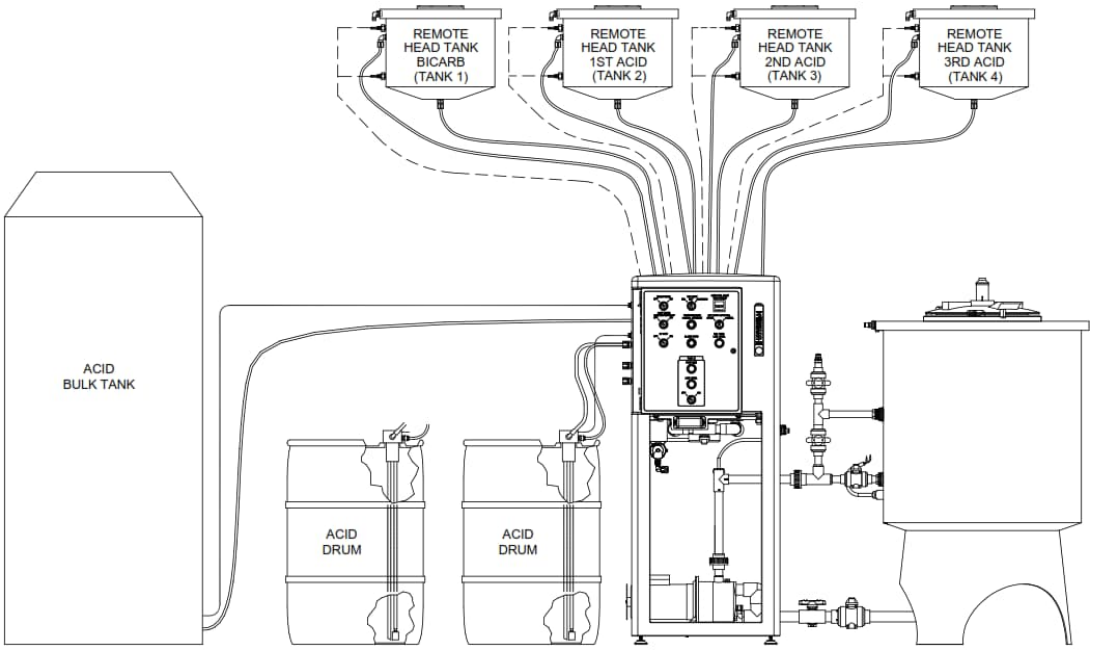


Figure 2.9: SDS Remote System

2. Place the dip tube assembly into the 55-gallon drum.
3. Connect 1/2″ tube to the compression fitting on the dip tube. For acid tank #1 use red tubing, acid tank #2 use orange, and acid tank #3 use yellow tubing.
4. Connect the two wires on the dip tube to the wire assembly provided.
5. Leaving a generous amount of tube and wire (enough to allow the dip tube to be removed and put into another drum or replacement drum), route the tube and wires to the left side of the SDS frame. Support the tube and wires with clamps and tie-wraps as required.
6. Connect 1/2″ tubing from the drum to the **TANK 2** port (red tube, acid #1), the **TANK 3** port (orange tube, acid #2), or the **TANK 4** port (yellow tube, acid #3) on the SDS frame.
7. Connect the electrical pin connector on the wire assembly to the corresponding electrical pin connector receptacle above the tank ports on the side of the SDS frame.
8. Coil the extra wire and tie-wrap it to the tubing.

2.10.2. Bulk Acid Storage Tanks

NOTE:
Use silicone sealant on all threaded fittings.

1. Determine where the storage tanks are going to be located.

NOTE:
If the tubing that connects the bulk acid storage tank(s) to the SDS frame rise more than 7 feet or is longer than 15 feet, a remote transfer pump will be required, P/N W3T577992.

2. Connect 1/2″ tube to the fitting on the output valve of the storage tank. For acid tank #1 use red tubing, acid tank #2 use orange, and acid tank #3 use yellow tubing.
3. Install the float switch, in the side of the storage tank in a location with easy access. Refer to Illustration 6.44 in Chapter 6.

NOTE:
The float switch is normally located at the 75 to 100 gallon level. This should be discussed with the facility's Chief Technician or a representative to determine the gallon level to install the float switch. Some facilities will adjust the switch level for delivery availability based on geographical considerations.

4. Connect the two wires on the float switch to the wire assembly provided.
5. Leaving a generous amount of tube and wire, route the tubing and wires to the left side of the SDS frame. Support the tubing and wires with clamps and tie-wrap as required.
6. Connect the 1/2″ tubing from the storage tanks to the **TANK 2** port (red tube, acid #1), the **TANK 3** port (orange tube, acid #2) or the **TANK 4** port (yellow tube acid #4) on the SDS frame.
7. Connect the electrical pin connector on the wire assembly to the corresponding electrical pin connector receptacle above the tank ports on the side of the SDS frame.
8. Coil the extra wire and tie-wrap it to the tubing.

FUNCTIONAL TEST

NOTE:
The system should be checked for correct operation and component leaks. Refer to Chapter 4, "Routine Maintenance."

Solution Delivery System

(SDS)

CHAPTER THREE:
SYSTEM OPERATION

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3.0 SYSTEM OPERATION

3.1. Daily Start-Up

1. Check the acid supply (bulk acid storage or drum), ensure that there is sufficient quantity to begin treatment, and there is enough acid for the entire treatment day.
2. Verify that the following switches are in the **OFF** position on the control panel.
   - Main Power Switch
   - Loop Rapid Distribution Pump
   - UV Sterilizer
   - Mix Pump
   - Acid Transfer Switch(es)
3. If the optional O3Z Ozone Disinfection System is installed, ensure that the OZ valves and OTT Line connections are properly configured for bicarb mixing. Refer to the Ozone System Manual for the correct settings.
4. Ensure the RO Distribution Loop is connected to the SDS unit.
5. Ensure that the SDS unit is plugged into power.
6. Turn the SDS system Main Power Switch **ON**.
7. Prior to mixing bicarb solution, confirm the absence of residual disinfectant.

WARNING:
Due to the possibility of disinfectant rebound, perform a residual disinfectant test before initiating the Bicarb Mixing Procedure.

3.2. Acid Solution Start-Up Procedure

1. Turn the Acid Transfer Switch(es), as required for the treatment day, to the **ON** position. The respective transfer pump run indicator should illuminate (if the head tank is not full).
2. Verify that the head tanks fill.

NOTE:
Acid will transfer automatically until the acid level in the drum or tank is too low for transfer. This condition will activate an alarm.

NOTE:
If air is present in the loop, the purge procedure will have to be performed. Refer to Chapter 3, “System Operation.”

3.3. Bicarb Solution Mix/Start-Up Procedure

Please read and follow all manufacturer's instructions and labels regarding the preparation of bicarbonate solution before continuing with this procedure.

WARNING:
Thoroughly follow all recommendations for mixing and testing the solution that the manufacturer suggests.

WARNING:
Perform the following procedure only after the recommended disinfection and rinse procedures have been completed and a NEGATIVE residual disinfectant test is attained. Due to the possibility of disinfectant rebound, perform a residual disinfectant test before initiating the bicarb mixing procedure.

NOTE:
The Mix Pump will operate for a maximum of 10 minutes if additional mixing is required, cycle the hand switch from MIX to OFF to restart pump.

Valve Schedule:

V-1 (Mix Pump Discharge Valve)	V-5 (Mix Tank Drain Valve)
V-2 (Spray Head Supply Valve)	V-6 (Bicarb Head Tank Drain Valve)
V-3 (Inlet Water Valve)	V-7 (Mix Tank Sample Valve)
V-4 (Mix Pump Suction Valve)	V-8 (Flow Meter Needle Valve)
Bicarb Wand	V-9 (Drain Line Sample Port Valve)

1. OPEN the following valves:
   - V-1 (Mix Pump Discharge Valve)
   - V-2 (Spray Head Supply Valve)
   - V-3 (Inlet Water Valve)
   - V-4 (Mix Pump Suction Valve)
2. Connect the Bicarb Wand to the **DRAIN** Port on the SDS unit.
3. Determine the amount of bicarb solution to be made.
   - How much bicarb will be required?
   - How much water (gallons) will be required?
4. Turn the Main Power Switch to the **ON** position.
5. Turn the Mix Tank Auto Fill Switch to the **MANUAL** position.
   - Set the Flow Meter Needle Valve (V-8) for a mix tank fill rate between 0.5-5 GPM (2-20 LPM) and release switch.

6. CLOSE the following valves:
   - V-5 (Mix Tank Drain Valve)
   - V-6 (Bicarb Head Tank Drain Valve)
   - V-9 (Drain Line Sample Port Valve)
7. The Auto Fill Mode Timer has a letter followed by three numbers followed by another letter:
   - The first letter should be set to 'E'.
   - The next three numbers indicate how may minutes the mix tank will fill.
   - The last letter should be set to '**m'** for minutes.
8. Set the Auto Fill Mode Time Preset for the time required to fill the mix tank with the appropriate amount of water based on the mix tank fill rate determined in Step 5 above. Example: 3 GPM x 20 min = 60 gallons.
9. Turn the Mix Tank Auto Fill switch to the **START** position.

> **NOTE:**
> As the timer counts down, the display will count down from a full black bar to a dash-lined white bar. It will say OFF OUTPUT when finished.

10. Check the fluid level in the mix tank. If additional water is required to bring the mix tank to the required level of water, either:
    - Turn and hold the Mix Tank Auto Fill Switch in the **MANUAL** position for as long as necessary to bring the amount of water to the correct level.

    OR:

    - Reset the Auto Fill Mode Time Preset for the time duration to bring the mix tank water level to the correct amount of water. Refer to the Auto Fill Mode Time Setting instructions in this section.
11. If the water level is too high, OPEN the Mix Tank Drain Valve (V-5) and drain the water until the level is correct.

12. After the mix tank water level has been verified as correct, close the following valves:
    - V-2 (Spray Head Supply Valve)
    - V-3 (Inlet Water Valve)

> **WARNING:**
> The Inlet Water Valve (V-3) should be **CLOSED AT ALL TIMES** except when the mix tank is being filled with water. If this valve is left open during treatments and the inlet solenoid valve fails, the bicarb solution will be diluted, causing interruption of treatment.

13. Open the mix tank lid.
14. Turn the Mix Pump Switch to the **MIX** position.
15. Add the appropriate amount of bicarb powder to the mix tank.
16. Close the mix tank lid.
17. Completely mix the bicarb solution.
18. Verify that the bicarb solution is fully mixed by testing the sample to the manufacturer's specifications.
    - A sample can be taken from the Mix Tank Sample Valve (V-7).
19. Once the bicarb solution mix has been verified, turn the Mix Pump Switch to the **TRANSFER** position.

> **NOTE:**
> An audible alarm will sound if the bicarb head tank low-level switch is not activated within two (2) minutes of the initiation of the transfer pump. Subsequent alarms indicate that bicarb transfer is not occurring, or the transfer is too slow. During initial fill of the bicarb head tank, this is a normal condition, pressing the alarm mute will silence the alarm.
>
> **CAUTION:**
> All dialysis machine bicarb concentrate lines must be disconnected from the wall dispenser concentrate access ports prior to operating the loop rapid distribution pump.

20. Turn the Loop Rapid Distribution Pump and the UV Unit Hand Switch to the **ON** position.

NOTE:
The loop rapid distribution pump will start following a one-minute delay, after the bicarb head tank low-level switch is activated.

21. Confirm that the head tank is filling. If not, see Chapter 5, "Troubleshooting."

DUAL LOOP INSTRUCTIONS:
Systems that have more than one bicarb distribution loop will require that each loop be independently purged.

Each loop is supplied with an isolation valve. To purge a loop, close one of the isolation valves and perform Steps 22 through 24 for each loop. Once the purge procedure has been completed on the first loop, return the bicarb wand to the **DRAIN** port prior to purging the second loop.

22. Verify that bicarb solution is flowing to drain by momentarily opening V-9 (Drain Line Sample Valve).
    - Verify the bicarb solution is present at the Drain Sample Valve (V-9) by using the manufacturer's recommended test methods.
    - For dual loop systems, each loop must be purged and tested independently.
23. Disconnect the Bicarb Wand from the **DRAIN** port and connect it to the **TANK** port on the SDS mix tank.
24. Purge air from the bicarb distribution loop(s) by running the Loop Rapid Distribution Pump for a minimum of five (5) minutes per every ten (10) patient stations.

NOTE:
Purge air from the patient stations.

NOTE:
If the level in the head tank falls below the low-level switch, the rapid loop distribution pump will shut down, and then restart following a one-minute delay after the bicarb head tank lower-level switch is activated.

25. After all air is purged from the loop, disconnect the Bicarb Wand from the **TANK** port, and connect it to the **OPERATE** port.
26. Turn the Loop Rapid Distribution Pump Switch to the **OFF** position.

27. Verify the following switch and valve positions:

SWITCH/VALVE	POSITION
Power Switch	ON
Mix Pump Switch	TRANSFER
UV Unit Switch	ON
LRDP Switch	OFF
Mix Pump Discharge Valve (V-1)	OPEN
Spray Head Supply Valve (V-2)	CLOSED
Inlet Water Valve (V-3)	CLOSED
Mix Pump Suction Valve (V-4)	OPEN
Mix Pump Drain Valve (V-5)	CLOSED
Bicarb Head Tank Drain (V-6)	CLOSED
Mix Tank Sample Valve (V-7)	CLOSED
Flow Meter Valve (V-8)	THROTTLED
Drain Line Sample Port (V-9)	CLOSED
Bicarb Wand	OPERATE PORT
Bicarb Loop Isolation Valve(s)	OPEN

NOTE:
The bicarb solution transfers automatically until a low-level alarm condition is reached in the mix tank.

28. The system is ready for normal operation.

3.4. Second Batch Bicarb Mix Procedure

This procedure is intended for making a batch of bicarb during the patient treatment day.

WARNING:
During the second bicarb mix procedure, the bicarb head tank automatic refill function will be cancelled. Operator must monitor the head tank levels and manually transfer bicarb as necessary to ensure the head tank does not completely empty.

NOTE:
The bicarb mix tank level switch will initiate an audible and visual alarm when the mix tank reaches the low level. The mix tank will have approximately 10 gallons of bicarb solution remaining.

1. Push the **Alarm Mute** button to silence the audible and cancel the low-level alarm.

NOTE:
The transfer process must be continuously monitored, as the bicarb head tank high-level float switch will disengage the transfer pump in this mode.

2. Turn the Mix Pump Switch to the OFF position.
3. PUSH the **Transfer Pump** Manual Override Push Button (only if the solution in the head tank is below the high-level float switch). This will transfer the solution from the mix tank to the head tank for five minutes or until the bicarb head tank high-level switch is activated as necessary. Depress the button as necessary to transfer the remaining bicarb solution to the head tank.

WARNING:
Do not begin the tank fill procedure until all the bicarb has been transferred to the head tank and the mix tank has been drained of all residual solution.

4. Open the Mix Tank Drain Valve (V-5) and drain the remaining bicarb solution.
5. Close the Mix Tank Drain Valve (V-5).
6. Determine the amount of bicarb solution to be made:
   - How much bicarb will be required?
   - How much water (gallons) will be required?

NOTE:
If the batch size is not the same size as the first batch, the Auto Fill Mode Time Preset must be adjusted to provide the correct amount of water.

7. Open the following valves:
   - V-2 (Spray Head Supply Valve)
   - V-3 (Inlet Water Valve)

WARNING:
Do not initiate the Auto Fill function of the SDS until bicarb head tank transfer pump has stopped. The transfer pump will operate for five minutes after the Manual Override push button has been pressed or the bicarb head tank level reaches the high-level switch.

8. Turn the Mix Tank Auto Fill Switch to the **START** position.
9. Check the fluid level in the mix tank. If an additional amount of water is required to bring the mix tank to the required amount of water, either:
   - Turn and hold the Mix Tank Auto Fill Switch in the **MANUAL** position for as long as required to bring the amount of water to the correct level.

   OR:

   - Reset the Auto Fill Mode Time Preset for the time needed to bring the mix tank water level to the correct amount of water. Refer to the Auto Fill Mode Time Setting instructions in this section.
10. If water level is too high, OPEN the Mix Tank Drain Valve (V-5) and drain the water until the level is correct.
11. After the mix tank water level has been verified, close the following valves:
    - V-2 (Spray Head Supply Valve)
    - V-3 (Inlet Water Valve)

WARNING:
The Inlet Water Valve (V-3) should be **CLOSED AT ALL TIMES** except when the mix tank is being filled with water. If this valve is left open during treatments and the inlet solenoid valve fails, the bicarb solution will be diluted, causing interruption of treatment.

12. Open the mix tank lid.
13. Turn the Mix Pump Switch to the **MIX** position.
14. Add the appropriate amount of bicarb powder to the mix tank.
15. Close the mix tank lid.
16. Completely mix the bicarb solution.

17. Verify that the bicarb solution is fully mixed by testing the sample per the manufacturer's specifications.
    - A sample can be taken from the Mix Tank Sample Valve (V-7).
18. Once the bicarb solution mix has been verified, turn the Mix Pump Switch to the **TRANSFER** position.

NOTE:
An audible alarm will sound if the bicarb head tank low-level switch is not activated within two minutes of the initiation of the transfer pump, indicating that insufficient fluid transfer has occurred.

NOTE:
If the bicarb head tank empties (completely) during this procedure, the bicarb loop must be purged.

3.5. Bicarb Distribution Loop Purge Procedure

WARNING:
All dialysis machine concentrate lines must be disconnected from the wall dispenser concentrate access ports prior to initiating the Loop Purge (Rapid Loop) Procedure.

WARNING:
This procedure is to be used to re-prime the bicarb distribution loop ONLY. During initial startup, ensure that all fluid is purged to drain until the proper concentration of bicarb solution has been verified at the Drain Line Sample Port Valve (V-9).

1. Place the end of the Bicarb Wand in the **TANK** port.
2. Turn the Loop Rapid Distribution Pump Switch to the **ON** position.

NOTE:
The loop rapid distribution pump will start following a one-minute delay after the bicarb head tank low-level switch is activated.

DUAL LOOP INSTRUCTIONS:
Systems that have more than one bicarb distribution loop will require that each loop be independently purged.

- Each loop is supplied with an isolation valve. To purge a loop, CLOSE one of the isolation valves and perform steps 3 and 4 for each loop.
- Once the purge procedure has been completed on the first loop, return the Bicarb Wand to the **TANK** port prior to purging the second loop.

3. Purge air from the bicarb distribution loop(s). Allow the Loop Rapid Distribution Pump to run for a minimum of five (5) minutes per ten (10) patient stations.

NOTE:
If the level in the head tank falls below the low-level switch, the rapid loop distribution pump will shut down and then restart following a one-minute delay after the bicarb head tank lower-level switch is activated.

4. Turn the Loop Rapid Distribution Pump Switch to the **OFF** position.
5. Disconnect the Bicarb Wand from the **TANK** port and connect it to the **OPERATE** port.
6. If system contains dual loops, ensure the Distribution Loop Isolation Valves are **OPEN**.

3.6. Acid Distribution Loop Purge Procedure (Internal Pump)

('Internal' Pump only; not applicable to all machines.)

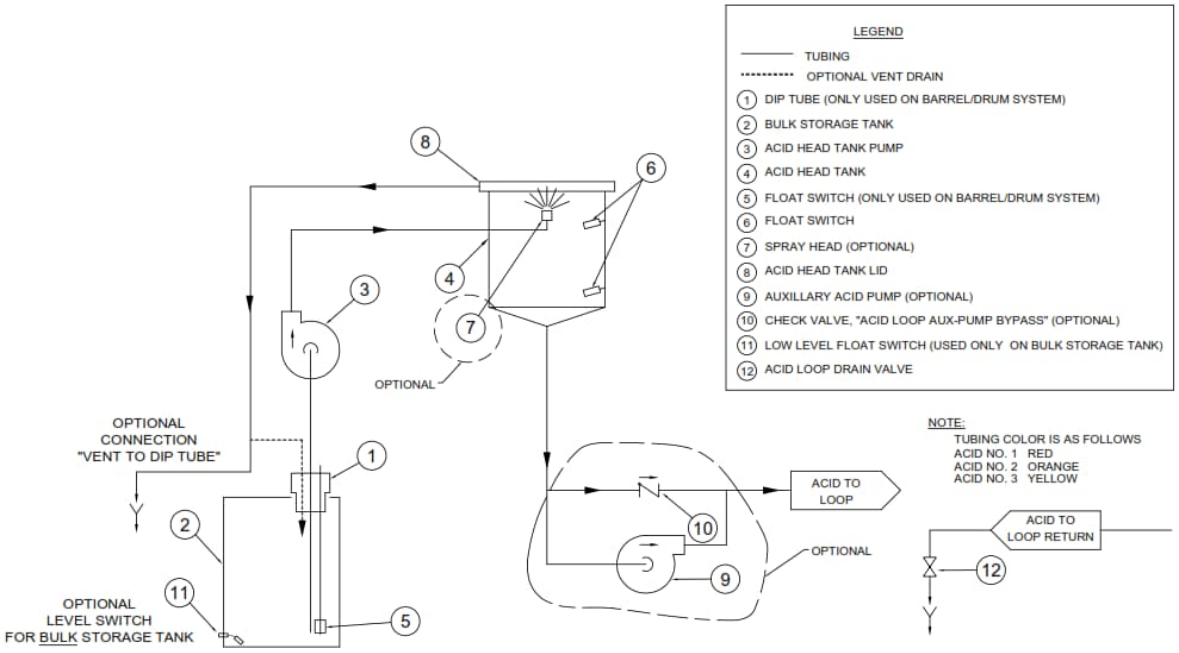

Figure 3.1: SDS Acid Process Diagram

WARNING:
All dialysis machine concentrate lines must be disconnected from the wall dispenser concentrate access ports prior to initiating the loop purge (rapid loop) procedure.

1. Ensure the following conditions of the SDS unit:
   - Main Power Switch is **ON**.
   - Acid Tank Switch is **ON**.
   - Acid Head Tank level above the low-level float switch.
   - Bulk acid supply is available.
2. Ensure that the outlet end of the Acid Loop Drain Valve is connected to drain and OPEN the Acid Loop Isolation Valve.

DUAL LOOP INSTRUCTIONS:
Systems that have more than one acid distribution loop will require that each loop be independently purged.
- Each loop is supplied with an isolation valve. To purge a loop, CLOSE one of the isolation valves and perform Steps 3 and 4 for each loop.

3. Depress the Auxiliary Acid Loop Pump Switch button (located on the left side of unit) and hold in the **ON** position.
4. Purge any air from the acid distribution loop(s). Allow the Loop Rapid Distribution Pump to run for a minimum of five (5) minutes per ten (10) patient stations.
5. RELEASE Auxiliary Acid Loop Pump Push Button Switch.
6. CLOSE the Acid Loop Drain Valve.

3.7. Acid Distribution Loop Purge Procedure (External Pump)

(Optional 'External' Pump)

WARNING:
All dialysis machine concentrate lines must be disconnected from the wall dispenser concentrate access ports prior to initiating an acid loop purge.

WARNING:
Wear gloves, eye protection, and protective clothing as required by your facility. Refer to the chemical manufacturer's recommendations.

1. Ensure the following conditions of the SDS unit:
   - Main Power Switch is **ON**.
   - Acid Tank Switch is **ON**.
   - Acid Head Tank Level above the low-level float switch.
   - Bulk Acid Supply is available.
2. Disconnect the end of the acid line to be purged from the drain connection.
3. Connect the end of the acid line to the inlet of the external purge pump.
4. Route the outlet of the purge pump to a drain using 1/2″ tubing.

DUAL LOOP INSTRUCTIONS:
Systems that have more than one acid distribution loop will require that each loop be independently purged.

- Each loop is supplied with an Acid Loop Drain Valve. To purge a loop, CLOSE one of the isolation valves and perform Steps 5 through 8 for each loop.

5. OPEN the Acid Loop Drain Valve.
6. Plug the purge pump cord into an electrical receptacle to activate the pump.

7. Purge any air from the acid distribution loop. Allow the pump to run a minimum of five (5) minutes per ten (10) patient stations.

NOTE:
If no fluid is pumped to drain within 1 minute, stop the pump. The pump will need to be installed at one of the first patient stations at the beginning of the loop. Reattempt purge procedure.

8. CLOSE the Acid Loop Drain Valve and unplug the purge pump power cord.
9. Momentarily OPEN the Acid Loop Drain Valve to relieve pressure and disconnect the acid line from the pump inlet and restore it to the original configuration.

NOTE:
The External Purge Pump should be rinsed with clean water prior to storage.

3.8. Bicarb System Rinse Procedure

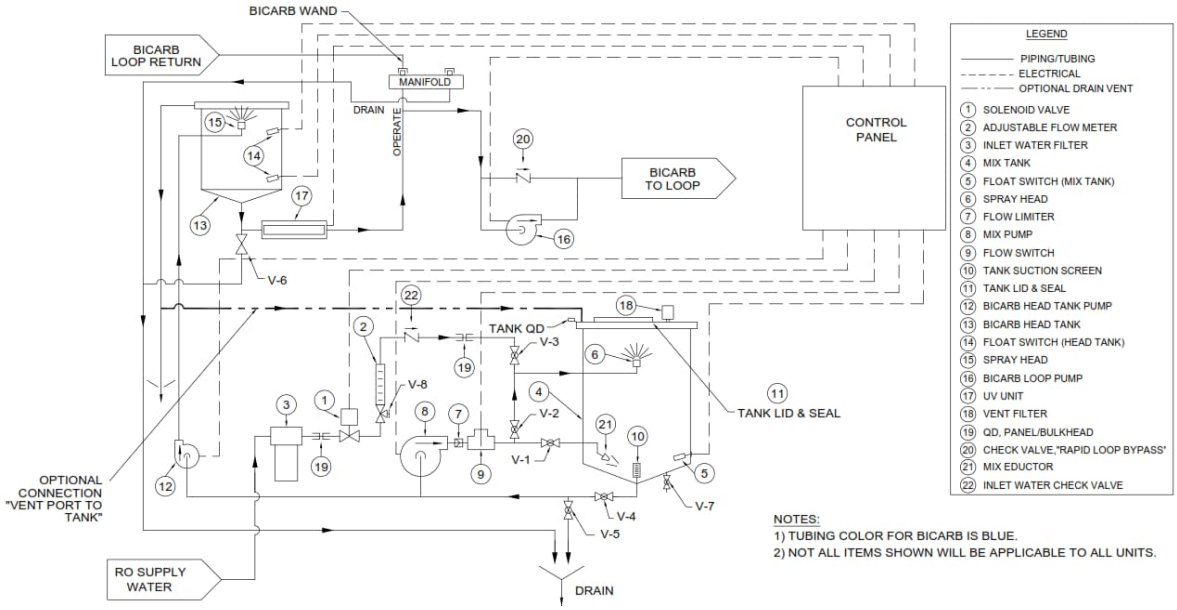

Figure 3.2: SDS Bicarb Process Diagram

WARNING:
Dialysis Equipment must not be connected to the SDS system during de-calcifying and/or disinfection. VERIFY THAT ALL DISTRIBUTION POINTS OF USE ARE DISCONNECTED.

1. Place the end of the Bicarb Wand (bicarb loop return) in the **DRAIN** port located on the right side of the SDS unit.
2. CLOSE the following valves:
   - V-1 (Mix Pump Discharge Valve)
3. OPEN the following valves:
   - V-2 (Spray Head Supply Valve)
   - V-3 (Inlet Water Valve)
   - V-5 (Mix Tank Drain Valve)
   - V-6 (Bicarb Head Tank Drain Valve)
4. Verify that the mix tank and bicarb head tank are empty by ensuring that no flow is coming from the drain line. If flow is present, wait until the flow has ceased before proceeding.
5. Ensure that the mix tank lid is on tight.
6. Turn the SDS Main Power Switch to the ON position.

7. Calculate the number of minutes required to fill the Mix Tank to 120 liters using the measured flow rate. Set the timer to calculated number of minutes for use in future operations. Turn the Mix Tank Auto Fill switch momentarily to the START position. This will open the Inlet Water Solenoid Valve.

    a. Open the Flow Meter Adjust Valve (V-8) to obtain a flow rate no greater than twenty (20) LPM.

8. Visually confirm water is flowing through the flow meter. After a few seconds, water should flow from the mix tank drain valve (V-5) to drain.

9. After five (5) minutes, turn the Mix Tank Auto Fill Switch to the **START** position to close the inlet water solenoid valve and allow the tank to drain.

10. Verify that the mix tank is empty by checking that no flow is coming from the drain line. If flow is present from the drain line, wait until the flow has ceased before proceeding.

11. Close Valves:

    a) V-5 (Mix Tank Drain Valve)

    b) V-2 (Spray Head Supply Valve)

12. Open Valve V-1 (Mix Pump Discharge Valve)

13. Set fill timer to fill tank with 120L of water. Turn the Mix Tank Auto Fill switch momentarily to the START position. This will open the inlet Water Solenoid Valve. Allow the mix tank to fill with 120L of water.

14. When fill is complete, turn the mix pump switch to MIX. After 1 minute, confirm the absence of bicarb, de-calcifier or disinfectant from the Mix Tank with the sample drawn from V-7, using a manufacturer's approved test method. Consult appropriate manufacturer. If the test is positive, turn off Mix Pump, open V-5 (Mix Tank Drain Valve) and V-2 (Spray Head Supply Valve), drain all water from the tank then repeat steps 7 and 14 unit negative residual is achieved. When negative residual is confirmed, draining of the Mix Tank is not required.

15. Turn off Mix Pump.

16. Set timer to fill the Bicarb Mix Tank with a minimum of 120 liters (or larger amount if needed for your facility) of water. Turn the Mix Tank Auto Fill switch momentarily to the START position to open the Inlet Water Solenoid Valve and begin filling the Bicarb Mix Tank. Visually confirm the Mix Tank water level at the end of the time period. Adjust level as required.

17. Turn the Mix Pump Switch to the **TRANSFER** position.

18. Allow head tank to fill until water is observed flowing from the Bicarb Head Tank Drain Valve (V-6) into the drain manifold. If the Bicarb Head Tank does not flow freely, STOP the procedure and reroute tubing to allow the tank to freely flow. Do not proceed until this is completed. Allow the head tank to rinse for a minimum of five (5) minutes. If a longer rinse is desired, it may be necessary to add water to the Mix Tank. If additional water is required, turn the Mix Pump switch to the off position, repeat steps 15 and 16. After 5 minutes of flowing to drain, close V-6 (Bicarb Head Tank Drain Valve) to start filling the head tank.
19. Turn the Loop Rapid Distribution Pump Switch to the **ON** position. (The Loop Rapid Distribution Pump will not turn on until the fluid level in the head tank reaches the low-level switch and the one minute delay has been satisfied.)

DUAL BICARB LOOPS:

If the SDS System includes two (2) bicarb loops, the loops must be rinsed separately. Close one of the Loop Isolation valves to force the water through the OPEN loop. Reverse the Isolation Valve positions, then repeat for the second loop. When complete, verify that the loop isolation valves are open.

20. Once the Loop Rapid Distribution Pump is activated, pump water to drain for ten (10) minutes, and then begin testing to confirm absence of bicarb, disinfectant or de-calcifier from the Loop Drain Sample Valve (V-9). If a positive residual exists, continue to rinse the bicarb distribution loop until a negative residual is achieved. If more water is required, add water to the tank by repeating steps 15 and 16.
21. Purge all distribution loop points of use for 15 seconds. Confirm the absence of bicarb, de-calcifier or disinfectant.
22. Turn the Mix Pump Switch from the TRANSFER position to the **OFF** position.
23. Turn the Loop Rapid Distribution Pump Switch to the **OFF** position. Open V-6 (Bicarb Head Tank Drain Valve) to drain the head tank and V-5 to drain the main tank.
24. Turn the Main Power switch to the **OFF** position.

NOTE:
The SDS Bicarb System has been rinsed. If water is still in the mix tank, it does not need to be drained if proceeding with mixing of bicarb, de-calcifier or disinfectant.

3.9. Bicarb System Disinfection/De-Calcifying Procedure

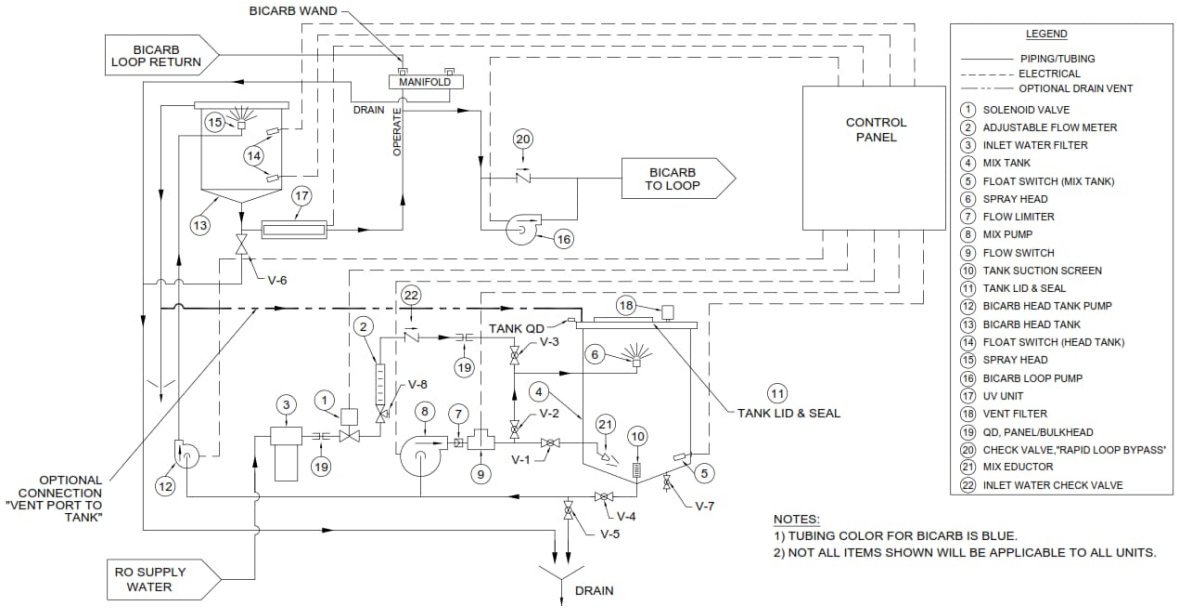

Figure 3.3: SDS Bicarb Process Diagram

WARNING:
We recommend that the disinfection procedure be performed every day that the bicarb system is used.

WARNING:
Label all the wall dispenser stations and the SDS with appropriate warning signs, such as **"DO NOT USE, CONTAINS DISINFECTANT."**

WARNING:
Dialysis equipment must not be connected to the SDS system during de-calcifying and disinfection. VERIFY THAT ALL DISTRIBUTION POINTS OF USE ARE DISCONNECTED.

CAUTION:
Prior to disinfection/de-calcifying, the system must be rinsed. Refer to Section 3.8, "Bicarb System Rinse Procedure."

1. OPEN V-2 (Spray Head Supply Valve)
2. CLOSE V-1 (Mix Pump Discharge Valve).
3. Connect the end of the Bicarb Wand to the **DRAIN** port on the SDS unit.

4. Set the timer to fill the Mix Tank with 120L of water. There may be water left in the Mix Tank if all was not used to rinse the distribution head tank and loop.
   a. Turn the Momentary Mix Tank Auto Fill switch once or twice as needed to START position to reset and open the Inlet Water Solenoid Valve and begin filling the Bicarb Mix Tank.
   b. Visually confirm the Mix Tank water level. Adjust as necessary.
5. After sufficient water volume is achieved, close V-3 (Water Inlet Valve).

WARNING:
The Inlet Water Valve (V-3) should be CLOSED **AT ALL TIMES** except when the mix tank is being filled with water. If this valve is left open during treatments, and the inlet solenoid valve fails, the bicarb solution will be diluted causing interruption of treatment.

6. Remove the mix tank lid.
7. Select any one chemical for disinfection or decalcifying.

WARNING:
DO NOT MIX CHEMICALS TOGETHER.

DISINFECTANT	QTY	%	DECALCIFIER	QTY	RATIO
Bleach (Household)	1200 mL	1%	Vinegar 5%	5.6 LTR	1:20
Peracetic Acid (Minncare HD®	2.0 LTR	2%			
37% Formaldehyde	2.0 LTR	2%			

NOTE:
Biosan® is not recommended for use in SDS systems due to foaming.
NOTE:
Add quantities listed to 120 Liters of treated water.

8. Gradually add the disinfectant or de-calcifier to the mix tank.

WARNING:
Wear gloves, eye protection, and protective clothing as required by your facility. Refer to the chemical manufacturer's safety recommendations.

WARNING:
Place a label prominently on the mix tank stating, **"WARNING! DE-CALCIFIER OR DISINFECTANT IN USE."**

9. Replace the mix tank lid.
10. Turn the Mix Pump Switch to the **MIX** position.
11. Mix the disinfectant or de-calcifier for 1 minute. Read the disinfectant or de-calcifier manufacturer's recommendations and adjust the mix time as required.
12. Allow the solution to mix for an additional 1 minute.

13. OPEN the following valve(s):
    - V-1 (Mix Pump Discharge Valve)
14. Turn the mix pump switch to the **TRANSFER** position.

> **NOTE:**
> Under certain conditions an air lock may develop in the head tank. It may be necessary to momentarily operate the loop Rapid Distribution Pump to overcome the air lock to initiate flow to drain. Valve V-6 (Bicarb Head Tank Drain Valve) must be closed prior to running the Loop Rapid Distribution Pump. Reopen valve V-6 after flow has initiated.

15. Transfer the disinfectant or de-calcifier to the bicarb head tank until solution is flowing to drain from the Bicarb Head Tank Drain Valve (V-6).
16. Once the presence of the disinfectant or de-calcifier is confirmed, CLOSE the Head Tank Drain Valve (V-6).
17. Turn the Loop Rapid Distribution Pump Switch to the **ON** position. Purge air from the bicarb distribution loop(s). Verify the presence of disinfectant or de-calcifier from the Drain Line Sample Valve (V-9).

> **DUAL BICARB LOOPS:**
>
> If the SDS System includes two (2) bicarb loops, the loops must be rinsed separately. Close one of the Loop Isolation valves to force the water through the OPEN loop. Reverse the Isolation Valve positions, then repeat for the second loop. When complete, verify that the loop isolation valves are open.

18. Move the Bicarb Wand from the **DRAIN** port on the SDS to the **TANK** port.
19. Turn **OFF** the Loop Rapid Distribution Pump.

20. Allow the disinfectant/de-calcifier to circulate for the appropriate contact time for the disinfectant or de-calcifier. Verify the presence of the disinfectant/de-calcifier at all the bicarb distribution loop points of use. Use appropriate test methods for disinfectants.

Disinfectant/ De-Calcifier	Circulation Time
(1%) Bleach	1/2 hour minimum
(2%) Peracetic Acid (Minncare HD®)	2 hours minimum
(2%) Formaldehyde	2 hours minimum
(1:20) Vinegar	1/2 hour minimum

CAUTION:
During recirculation confirm the presence of the disinfectant/de-calcifier at all the bicarb distribution loop points of use. Use appropriate test methods for disinfectants.

21. After the circulation time is complete, place the Bicarb Wand in the **DRAIN** port on the SDS unit.
22. Turn Mix Pump Switch to the **OFF** position.
23. CLOSE the following valves:
    - V-2 (Spray Head Supply Valve)
24. OPEN the following valves:
    - V-5 (Mix Tank Drain Valve)
    - V-6 (Bicarb Head Tank Drain Valve)

25 Verify that the mix tank and head tank are empty by checking the drain to see that no flow is present from the drain lines. If flow is still present, wait until flow has ceased before proceeding.

26. The system is now disinfected or cleaned.

WARNING:
The system must be rinsed and confirmed to be free of disinfectant/de-calcifier before patient use. Refer to section 3.8 Bicarb System Rinse Procedure.

3.10. SDS Shut Down Procedure

1. Place the appropriate acid transfer switch(es) in the **OFF** position.
2. Turn the UV Unit Switch to the **OFF** position.
3. Turn the Mix Pump Switch to the **OFF** position.
4. Turn the Main Power Switch to the **OFF** position.
5. Open valves V-5 (Mix Tank Drain Valve) and V-6 (Bicarb Head Tank Drain Valve) and place the Bicarb Wand in the **DRAIN** port.

Solution Delivery System
(SDS)

CHAPTER FOUR:
ROUTINE MAINTENANCE

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4.0 ROUTINE MAINTENANCE

4.1. Routine Maintenance of Solution Delivery Systems

The SDS systems have been designed to operate with a minimum of operator attention. Like all mechanical systems, they will operate longer with less trouble when operator maintenance is performed regularly. (A Maintenance Log Sheet has been included in Appendix A.) The maintenance procedures have been categorized by their frequency of action and are as follows:

NOTE:
The first part of this section provides the timelines and simple instructions for maintenance of your SDS System. The specific instructions and procedures for the more complex maintenance items are provided in the second part of this section.

WARNING:
Prior to performing any electrical maintenance unplug the SDS power cord from the wall receptacle.

4.1.1. Daily Maintenance

We recommend daily disinfection of the bicarb mixing and delivery portion of the SDS be done (or per your facility's protocol) with an appropriate disinfectant. Refer to Section 3.9, "Bicarb System Disinfection/De-Calcifying Procedure," in Chapter 3.

WARNING:
The bicarb mixing and delivery portion of the SDS must be rinsed free of the disinfectant, and a negative residual disinfectant test result confirmed before a batch of bicarb is made.

4.1.2. Weekly Maintenance

We recommend bacterial monitoring of the bicarb mixing and delivery portion of the SDS weekly for at least a month upon installation (or modification) of a SDS unit. The bacterial monitoring may be decreased to once a month if the weekly test results are within acceptable limits.

4.1.3. Monthly Maintenance

Perform bacterial monitoring of the bicarb mixing and delivery portion of the SDS on a routine basis. To ensure that solutions delivered to patients are always within the AAMI–specified limits for bacteria, we recommend taking monthly cultures as a minimum requirement. Samples should be taken both before and after the systems have been disinfected.

NOTE:
Check the acid and bicarb distribution loops and patient station connections for leaks. Repair any leaks as required.

1. When checking the wall box and loop fittings for leaks, ensure that no liquid or crystal formations are present at any connection.
2. If there are crystal formations, a damp cloth will re-hydrate the crystals, allowing the tubing to be removed from the fitting.

3. Cut approximately ¾″ off the end of the tubing and reinsert it into the fitting. In most cases, this will correct the problem. If the leak persists, replace the fitting.
4. Completely remove the threaded connectors and apply a small layer of food-grade silicone caulk (FDA approved) to the threads of the fitting. Reinsert the fitting into the port. This will help prevent the leak from reoccurring.

On the SDS unit, check the following items for leaks:

1. Check the bicarb mix pump for leaks at these locations:
   - Check the threaded connections into the large stainless steel casing of the pump. Treat leaking threaded connections with silicone adhesive and reinstall.
   - Check the seam between the motor and pump casing. If this leaks, first tighten the pump casing bolts. If the leak persists, replace the O-ring under the clamp (O-ring, P/N W2T914563).
   - Check the mechanical seal. Any leaking from the backside of the stainless pump head is likely to be a mechanical seal leak. Replace the mechanical seal in a timely manner or further damage to the motor and pump will occur (Kit, Shaft Seal, P/N W2T914211).

Acid and bicarb delivery pumps:

1. Check the acid and bicarb delivery pumps for leaks. Check the fitting and tubing connections for any sign of leakage. Attend to any leaks to prevent damage to other components.
2. Check the entire pump/motor unit for any signs of leaks.

Tubing connections:

1. Inspect all the connections and fittings in the SDS base unit for any leaks. Attend to any leaks to prevent damage to other components.
2. Check the acid and bicarb head tanks (including connections) for leaks. Repair any leaks noted.
3. Check the head tanks for leaks at the threaded connections into the tanks and the tubing connections into the fittings. Correct any leaks.

Check the Bicarb Mix Tank Vent filter for the presence of moisture.

1. Remove the filter and shake it with a downward motion, causing any water in to be expelled. Replace this filter if any water is expelled.

Clean the SDS unit frame with water to remove any acid and/or bicarb residue.

4.1.4. Quarterly Maintenance

1. The bicarb mixing and delivery portion of the SDS should be decalcified quarterly. Refer to Section 3.9, “Bicarb System Disinfection/De-Calcifying Procedure,” in Chapter 3.

> **NOTE:**
> This de-calcification may need to be performed more frequently, depending on the rate of precipitate formation.

2. Check the acid and bicarb overflow lines for fluid or obstructions.
   - It is very important to check both the acid and bicarb overflow lines for fluid or obstructions. Fluid in either line will cause excessive backpressure and will not allow the gravity feed system to work properly.
   - Inspection of the overflow fittings on the head tanks is important because the bicarb or acid solution can form crystals and block the vent opening. Simply remove the fitting and clean away any build-up.
3. Check the bicarb mix tank lid seal for degradation.
   - Any cracks or malformations of the O-ring should be evaluated to determine if replacement is necessary.
4. Check the SDS inlet water filter.
   - Remove the filter bowl and inspect the filter for obvious signs of biofilm fouling. Any discoloration of the filter is suspect.
5. Check the SDS Remote Monitor functions (if applicable).
   - See the remote monitor manual for correct operation.
6. Verify proper operation of the SDS check valve by following the procedure in Technote 297.

4.1.5. Semi-Annual Maintenance

1. Change the SDS filter regardless of visual condition.
2. Check all the indicator lights and alarms on the control panel:
   - Check the indicator lights and alarms by lifting the bicarb dip tube out of the acid barrel, causing a low-level alarm condition to occur at the acid tank indicator. Bulk tank systems may check the alarm by allowing the level in the tank to drop below the level switch to initiate the alarm before re-filling.
   - Turn the Main Power Switch **ON** and place the Mix Pump Switch in **TRANSFER** mode with the mix tank empty. This will cause the mix tank low-level indicator to light as well as an audible alarm to sound.
   - To verify the mute switch, push the mute button during an alarm. This will cause the audible alarm to cease, but the visual should still stay on.
   - Turn the Main Power Switch **OFF** when the testing is complete.
   - The green Acid Pump Run indicator may be checked at any time during normal operations when the acid transfer pump is running.
3. Replace the Bicarb Wand Assembly quick disconnect fitting. Refer to Section 4.2.8, “Bicarb Wand Assembly Quick Disconnect Fitting Replacement,” in this chapter.
4. Verify the proper operation of the solenoid valve. Refer to Section 5.14 in Chapter 5, “Troubleshooting.”

4.1.6. Annual Maintenance

1. Change the UV Lamp. Refer to the procedure at the end of this section.
2. Tighten all the wire connection terminals in the control panel. Refer to Illustration 6.49, “Annual Maintenance Requirements,” in Chapter 6 for proper torque requirements.
3. Perform Head Tank Float Switch Function Test. Refer to the procedure in this chapter.
4. Replace the mechanical seals and O-rings on the Bicarb Mix Pump.

4.2. Specific Maintenance Procedures and Instructions

4.2.1. Bicarb System Disinfection or De-Calcification Procedure

Refer to Section 3.9, “Bicarb System Disinfection/De-Calcifying Procedure,” in Chapter 3.

4.2.2. Recommended Bacterial Monitoring Procedure

Bacteria culture tests should be performed at least once per month, or more often as necessary to assure that the microbial count of the mixed bicarbonate solution complies with AAMI standards. Consult with the testing method or laboratory for required materials.

Sampling technique recommendations:
It is best to wear gloves, long sleeves, and a mask to prevent contamination of the sample with skin and respiratory bacteria. Always draw the sample at the ‘worst case scenario,’ at the end of the day just before disinfection of the system. Drawing the test sample after disinfection proves efficacy of the procedure but does not give the operator an idea if the frequency of disinfection is adequate.

Laboratory test method:
Consult with your lab to find out what type of sterile container to use and how much mixed bicarbonate solution is required to perform the test. Make certain that your laboratory is informed of the correct procedure for performing a concentrate solution culture, e.g., a spread plate method, not a calibrated loop technique; culture media should be tryptone glucose extract agar (TGEA) Reasoners 2A (R2A), or other media that can be demonstrated to provide equivalent results. Blood agar and chocolate agar shall not be used. If tested incorrectly, the results may be inaccurate. The sample should be assayed within 4 hours, or it must be immediately refrigerated and assayed within 24-hours of collection on a regular schedule.

Procedure:

1. Using aseptic technique, open the sampling port and allow approximately 100 cc or more of mixed bicarb concentrate to flow before taking the sample.
2. Allowing the solution to flow, hold the sterile sample container under the stream.

> **NOTE**:
> Closing the sampling port before removing the container from the stream will expose the test solution to ‘un-rinsed’ sides of the sampling valve and may cause an erroneous culture result.

3. Fill the container with the appropriate amount of solution and remove it from the solution stream.
4. Close the sampling port.
5. Cap the specimen container immediately.

6. Label the specimen appropriately with:
   - Test to be performed - culture.
   - Sample source - bicarb solution, machine number or sample port area.
   - Time and date sample obtained.
   - Person who obtained specimen.
   - Any other pertinent information or procedures required by laboratory.

4.2.3. Leak Repair

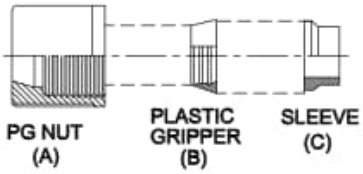
General information: Any leak from any part of the system should be corrected as soon as possible. Left unattended, leaks can cause secondary damage, necessitating expensive repairs. For instance, bicarb solution leaking out of the mix pump head can enter the motor, causing damage to the motor with a subsequent expense of replacement, including parts, labor and system down-time.

> **NOTE**:
> Use FDA/NSF approved silicone sealant on all threaded connections.

Threaded connections:

1. Prior to performing maintenance on any threaded fitting, relieve pressure in the piping/tubing system, i.e., turn off the pump, open a drain port, etc.
2. Remove the connecting tube or disconnect the piping at the nearest union joint.
3. Tape the pipe threads with 2 or 3 wraps of Teflon tape.
4. Insert the threaded fitting into the opening and hand tighten. Be careful to avoid cross threading. Tighten using a wrench only, if necessary, about one-half turn.
5. Re-connect piping, pressurize, and inspect for leaks.
6. If the leak was not corrected, de-pressurize system and tighten an additional quarter turn. Excessive tightening can crack threaded fittings. Pressurize the system and inspect for leaks.
7. If the leak continues, it may be necessary to replace the threaded fitting.

Tubing connections:



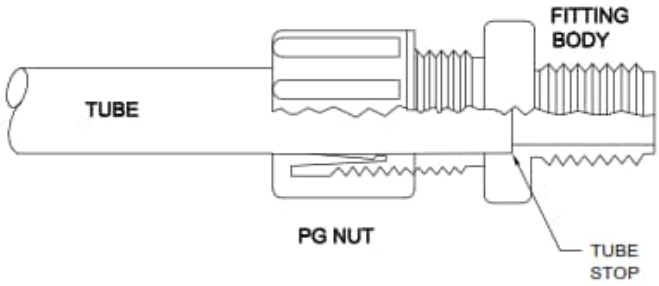
PG NUT ASSEMBLY

AS SHOWN ABOVE, INSERT GRIPPER (B) INTO NUT (A).
PUSH SLEEVE (C) INTO NUT ASSEMBLY.

INSTALLATION INSTRUCTIONS

1. CUT THE TUBING END SQUARELY AND REMOVE THE INTERNAL AND EXTERNAL BURRS
2. INSERT THE TUBING THROUGH THE BACK OF THE NUT ALL THE WAY THROUGH THE NUT ASSEMBLY TO THE TUBE STOP IN THE FITTING BODY (SEE ILLUSTRATION). IF THE TUBING DOES NOT ENTER THE NUT EASILY, LOOSEN THE NUT ONE TURN AND THEN INSERT THE TUBING ALL THE WAY TO THE TUBE STOP IN THE FITTING BODY.
3. TURN THE NUT HAND TIGHT.
4. WRENCH TIGHTEN THE NUT 1-1/2 TO 2 TURNS.
5. ALL NUTS MUST BE RETIGHTENED WHEN THE SYSTEM REACHES PROJECTED OPERATING TEMPERATURE.

NOTE: SQUEAKING SOUND WHEN TIGHTENING NUT IS NORMAL. FOR PIPE THREADED CONNECTIONS, TEFLON TAPE MUST BE USED. DO NOT PUT TEFLON TAPE ON TUBING NUT THREADS, ONLY PIPE THREADS.



NOTE: IT IS NOT NECESSARY TO DISASSEMBLE THIS FITTING FOR APPLICATION. MERELY INSERT TUBING TO STOP AND TIGHTEN NUT.

Figure 4.1: Push-in Fitting Instruction

4.2.4. Bicarb Mix Pump Maintenance (EBARA) (Mechanical Seal)

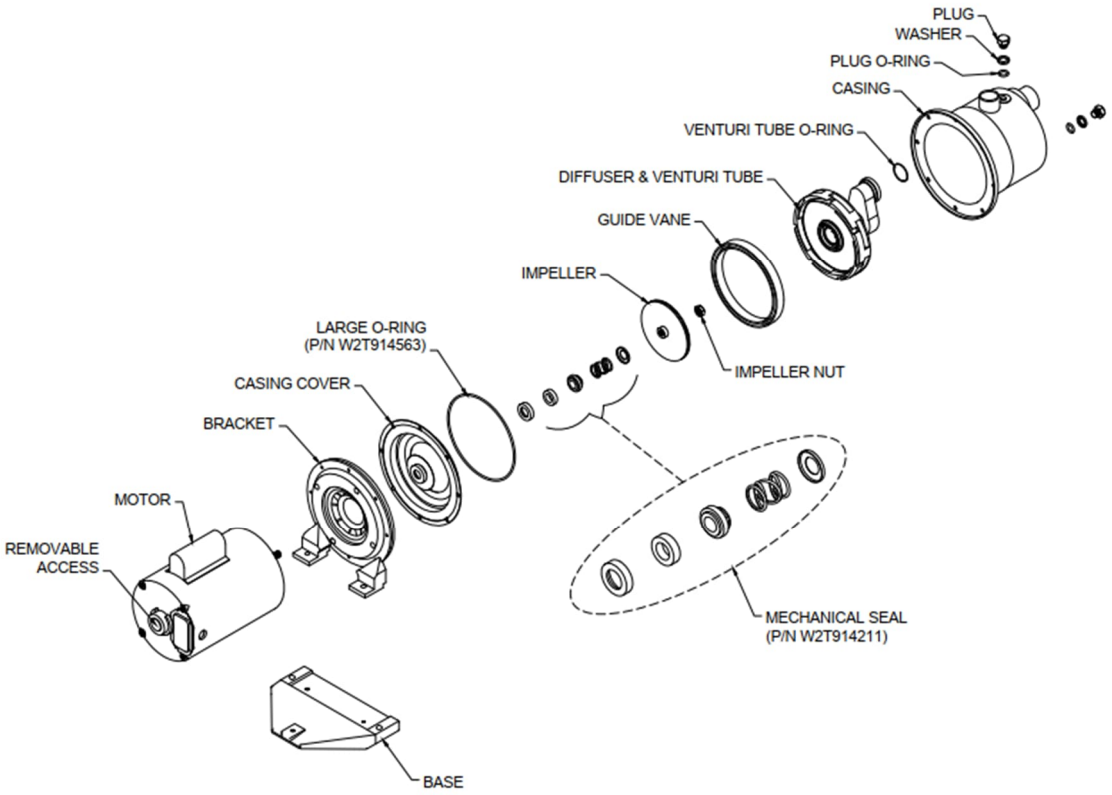


Figure 4.2: EBARA Pump Exploded View

NOTE:
Yearly replacement is recommended due the abrasive nature of bicarbonate powder.

WARNING:
Prior to performing any electrical maintenance unplug the SDS power cord from the wall receptacle.

1. Disconnect the union on the outlet and inlet piping on the pump.
2. Loosen the bolts that connect the pump casing and the motor.

WARNING:
When performing maintenance do not touch any exposed electrical connections.

3. Carefully separate the pump casing from the motor.
4. Remove the 17 mm nut holding the impeller in place. It may be necessary to grip the impeller with large channel lock pliers or a strap wrench. Use extreme caution to avoid damage to the impeller. The impeller is made of stainless steel and will tolerate 'gripping', but do not 'bite' into the metal with the pliers. If the impeller is damaged during removal, it must be replaced.

5. Remove the access cover from the rear of the motor. Use a large screwdriver to hold the shaft while removing the impeller. Unscrew the impeller from the motor shaft (counterclockwise).
6. After the impeller is removed, the shaft seal assembly will be exposed. Using two screwdrivers, pry off the rotating part of the shaft seal from the motor shaft and discard. Do not score or scratch shaft.
7. Remove and discard the stationary part of the shaft seal. It can be removed with a small screwdriver.

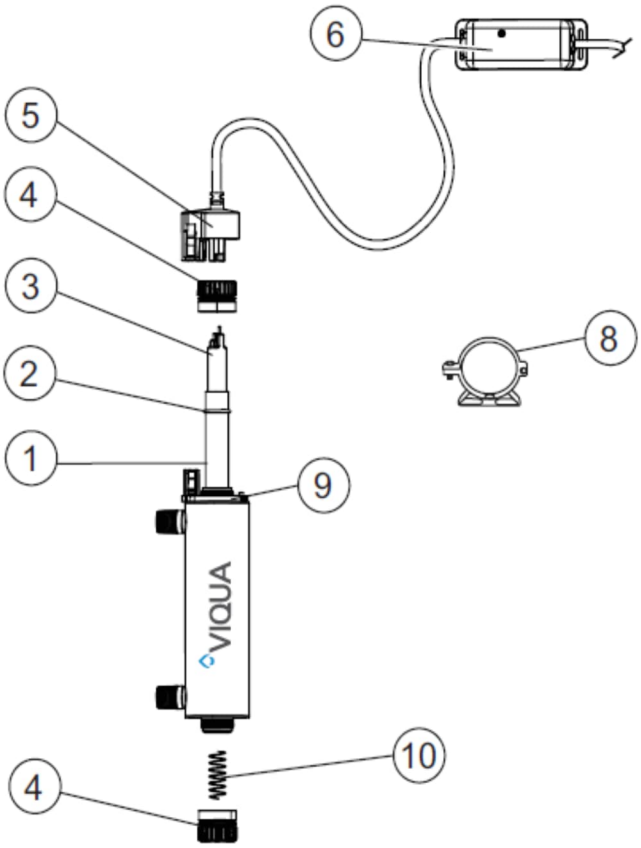
CAUTION:
The new seal may be damaged by the presence of body oil or lubricants on the sealing surfaces. Don't touch, mar, or scratch the polished surface of either the stationary seal or the rotating seal with spring. It is advisable to handle these parts with rinsed, powder-free latex gloves. Do not allow any lubricants to come in contact with the sealing surfaces.

8. Be sure the stationary seal recess and cover plate is clean. Apply a thin coat of non-toxic silicone lube/soapy water in the surface of the central recess of the cover plate.
9. Gently push the stationary seal assembly into the recess of the cover plate. Be careful not to scratch or mar the face of the seal. Make sure the seal assembly is fully seated into the recess.
10. Clean the motor shaft to remove any debris.
11. Place the rotating assembly of the shaft seal on the motor shaft.
12. Push the assembly along the motor shaft until the 2 shaft seal faces come into contact.
13. Spin the impeller on (clockwise) until the shaft starts to turn. Place the large screwdriver in the motor access and give a quick twist clockwise to finish spinning impeller on. Ensure the impeller is securely on the shaft.
14. Secure the impeller with a strap wrench or large channel lock type pliers and install the 17 mm nut to secure the impeller in place.
15. Remove all plugs and jetted ports containing O-rings. Replace with the appropriate O-ring from the O-ring kit and reinstall into the pump housing plugs, ports, and venturi ports.
16. Install the pump casing (large) O-ring onto the casing cover.
17. Replace pump casing cover. Ensure not to pinch or crush O-ring. Reinstall the eight 10 mm hex head bolts. Tighten until snug.
18. Reconnect the unions on the inlet and outlet of the pump.
19. The pump is now ready to test and verify leak free operation.

4.2.5. SDS water filter inspection and replacement instructions

1. Turn off the water supply from the RO water loop to the SDS machine and relieve any pressure in the line.
   - Turn the Main Power Switch **ON** and turn the Mix Tank Auto Fill Switch to the **MANUAL** position. When the pressure has been relieved, turn the Main Power Switch on the SDS **OFF**.
2. Remove the filter bowl by rotating clockwise. Remove the filter from the filter bowl and discard.
3. With a clean towel, wipe the inside of the filter bowl and filter bowl head to remove any biofilm.
4. Install a new submicron filter (P/N W2T915718) into the filter bowl and reattach the filter bowl to the head using a counterclockwise rotation. Secure hand tight.
5. Ensure that the V-1, V-2, V-3, V-4, and V-5 valves are all in the OPEN position.
6. Turn the RO water valve to the SDS unit on. Turn the Main Power Switch to the **ON** position. Set the auto-fill mode timer to 10 minutes. Turn the Mix Tank Auto Fill Switch to the START position and adjust the auto-fill flow rate to 1-2 gallons.
7. When the timer has timed out and the filter is rinsed, place the Main Power Switch in the **OFF** position.

4.2.6. UV lamp and Quartz Sleeve replacement instructions



ITEM	DESCRIPTION	P/N
1	Quartz Sleeve	W2T501811
2	O-ring	--
3	Lamp	W2T180210
4	Retaining nut	--
5	Lamp connector	--
6	Controller	W2T906930
7	N/A	--
8	Mounting bracket	W2T924137
9	Lamp connector base	--
10	Spring	--

Figure 4.3: UV Lamp Exploded View

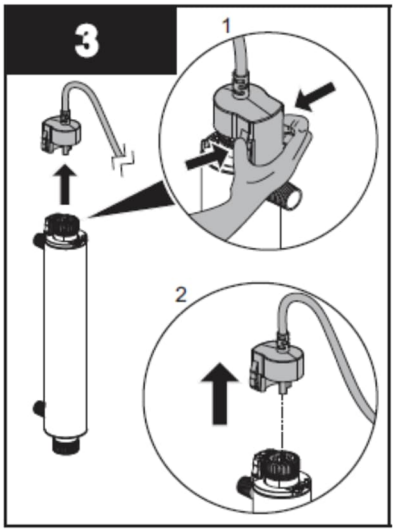
NOTE:
Prior to quartz sleeve replacement, drain the bicarb delivery system.

WARNING:
Prior to performing any electrical maintenance, unplug the SDS power cord from the wall receptacle.

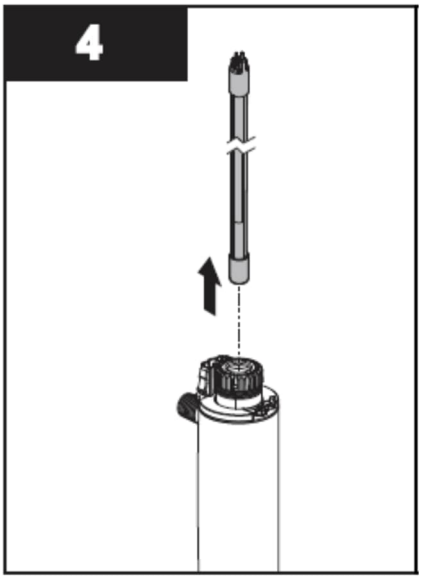
NOTE:
The UV lamp must be replaced after 9000 hours of continuous operation (approximately one year) in order to ensure adequate disinfection.

LAMP REPLACEMENT

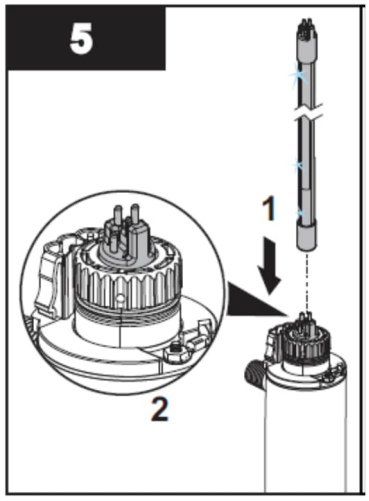
1. Shut off the water line to UV chamber and release system pressure.
2. Disconnect main power source and allow the unit to cool, (approximately 10 minutes).
3. Remove the lamp connector by squeezing the plastic locking tabs on the side of the connector.



4. Remove the UV lamp in upward direction from the UV chamber and lamp connector base. Hold the UV lamp at the ceramic ends.

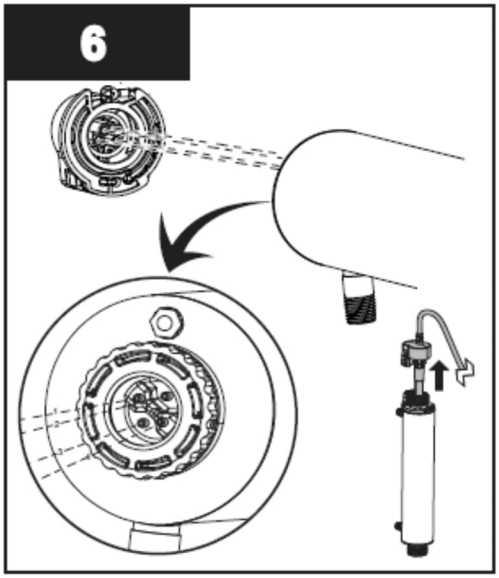


5. Wearing gloves, insert the new UV lamp fully into the UV chamber leaving about two inches of the UV lamp protruding from the UV chamber.

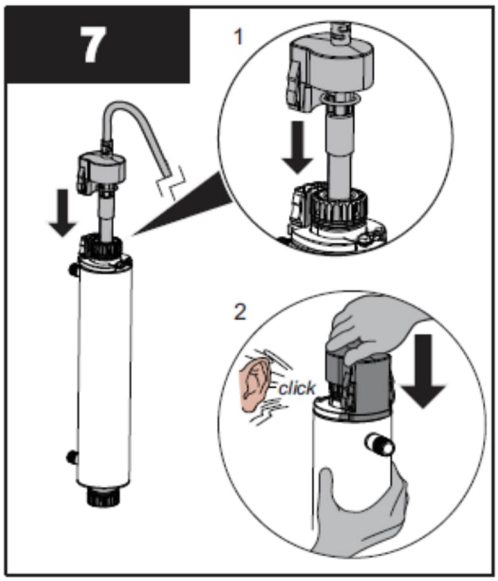


CAUTION:
Do not touch the UV lamp glass with your fingers. Any place that is touched will cause the light wavelength to be altered. If you touch the UV lamp glass, use a lint and abrasive free cloth and alcohol to remove the fingerprints from the glass.

6. Attach the connector to the UV lamp and note that the connector will only allow correct installation in one position.

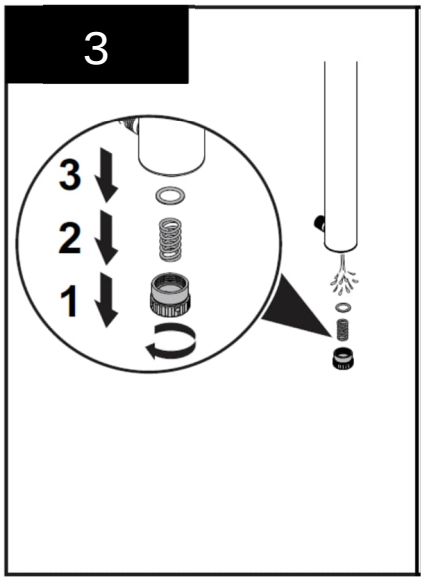


7. Push the lamp connector against lamp connector base together until an audible click is heard. Restore power and re-pressurize the system to check for leaks.

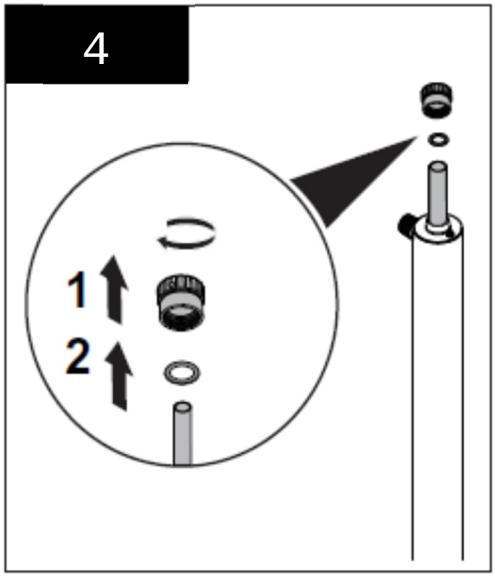


SLEEVE REPLACEMENT

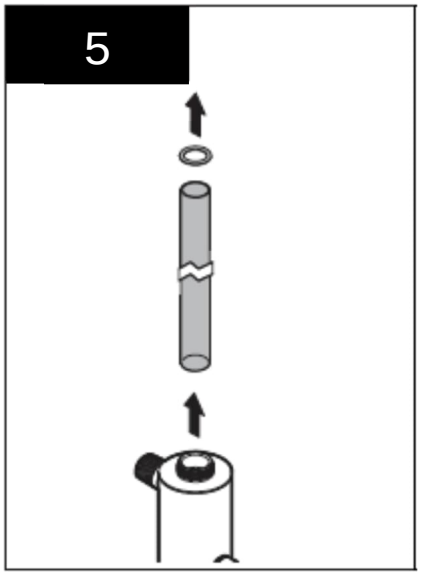
1. Shut off water supply and drain the line.
2. Remove the UV lamp. Refer to “LAMP REPLACEMENT” in previous section.
3. Remove the bottom retaining nut (1), floating spring (2), and O-ring (3) from the closed end of the chamber.



4. At the connector end, remove the retaining nut (1) and O-ring (2).

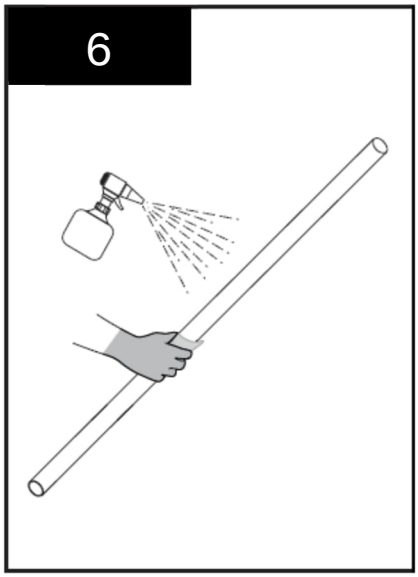


5. Carefully, remove O-ring adhering to the quartz sleeve. Remove the quartz sleeve.

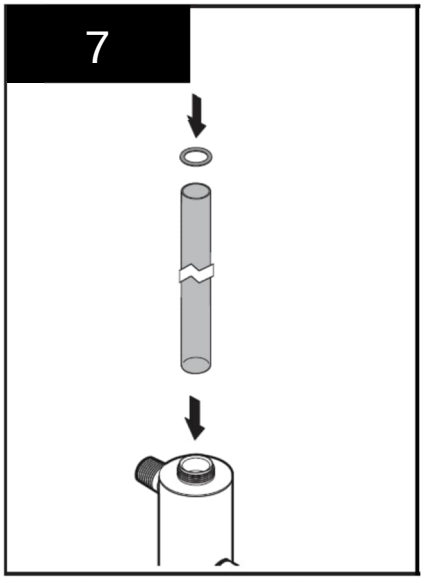


6. Clean the quartz sleeve with a cloth soaked with vinegar or some other mild acid and then rinse with water. The exterior and interior surface of the quartz sleeve should be cleaned. Running either a cotton swab or non-abrasive brush through the interior of the quartz sleeve can do this.

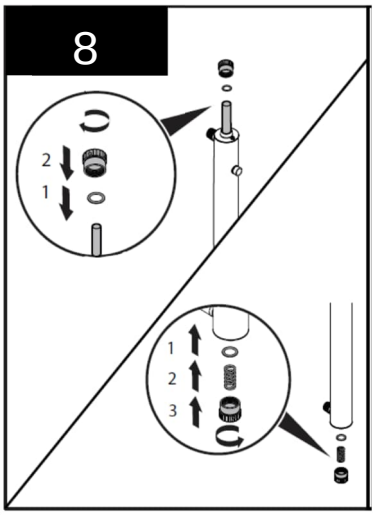
Note:
The quartz sleeve is extremely fragile and should be treated very gently. If sleeve cannot be completely cleaned or it is scratched or cracked, then replace the sleeve.



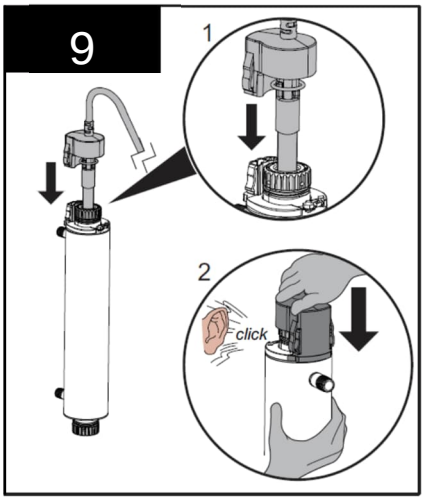
7. Reinstall the quartz sleeve in the UV chamber allowing the sleeve to protrude at equal distance on both ends of the UV chamber.



8. Reinstall the top and bottom retaining nuts, floating spring, and O-rings respectively. When service is complete, assemble the prerequisites in the reverse order of disassembly.



9. Push the lamp connector against lamp connector base together until an audible click is heard. Plug in controller and verify the POWER-ON LED display is illuminated. Re-pressurize the system to check for leaks.



10. Place a sticker on the UV unit indicating the date for the next UV maintenance or bulb replacement.
11. After the completion of the UV lamp quartz sleeve replacement, the SDS should be disinfected. Refer to the SDS Routine Maintenance Procedure in this section. During the disinfection, verify the operation of the UV lamp.

4.2.7. Acid Drum Replacement Procedure

1. Turn the appropriate Acid Transfer Switch to the **OFF** position.
2. Remove the drum suction (Dip Tube) assembly from the empty drum.

> **CAUTION:**
> Be careful not to damage the level control switch on the lower end of the Dip Tube assembly.

3. Place the dip tube in the fresh acid drum.
4. Turn the appropriate Acid Transfer Switch to the ON position.

> **NOTE:**
> Verify that the head tank will fill after replacing the tank to confirm that an air lock has not occurred in the pump inlet tubing. If air lock has occurred, perform the head tank pump purge procedure.

4.2.8. Bicarb Wand Assembly Replacement

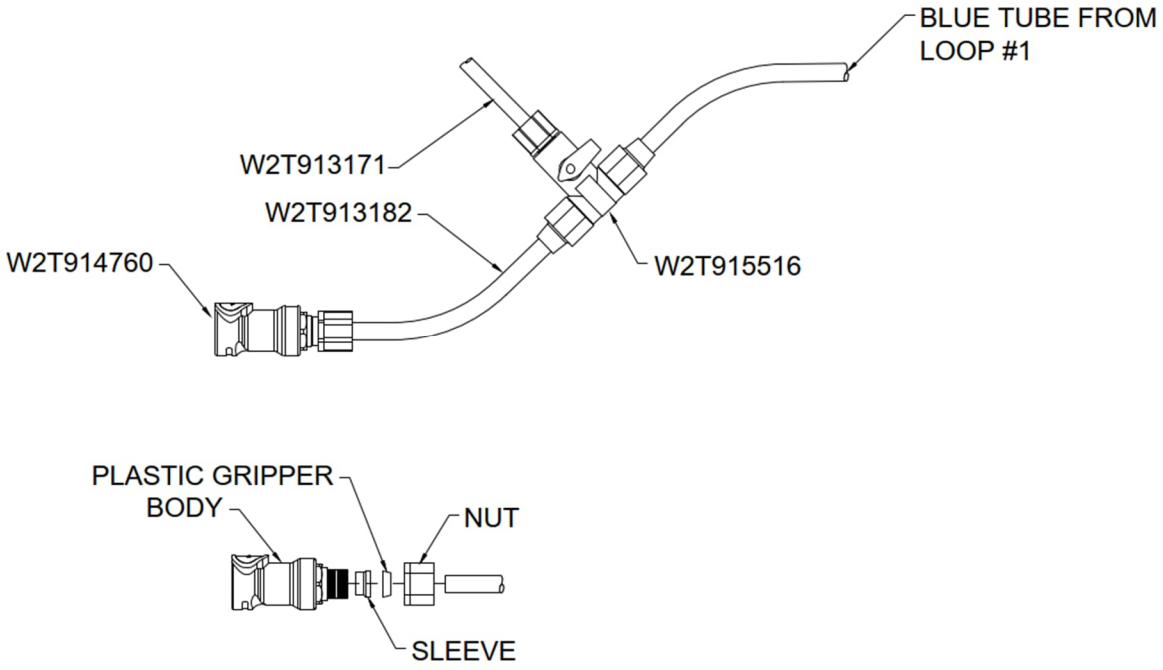


Figure 4.4: Single Loop Bicarb Wand

1. Remove the old QD by cutting the tube approximately 1/2″ from the chrome nut. Cut the tube as square as possible (straight across).
2. Loosen the nut on the QD and push the tubing in until it stops.
3. Hand tighten nut and then wrench tighten 1-1/2 to 2 turns. For more detailed instructions refer to page 4-9.

4.2.9. Alarm Test Procedures

Bicarb Mix Pump 'No Flow' Alarm (Audible Only):

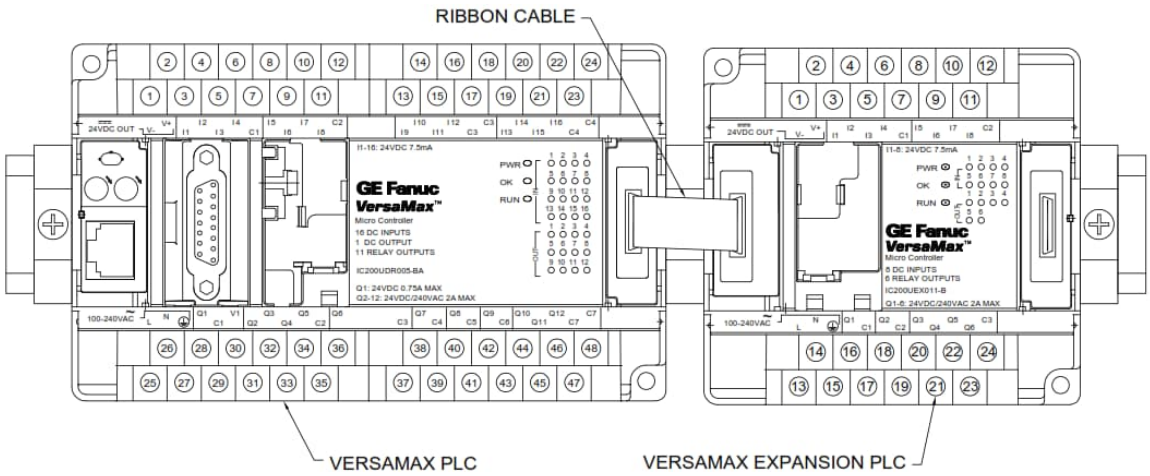


Figure 4.5: PLC

1. Fill the mix tank until the level of the fluid is above the low-level switch.
2. Set up the valves for normal mixing operation (open V-1, V-4; close V-2, V-3).
3. Turn the Mix Pump Switch **ON**. The pump should begin operating.
4. Close the Mix Pump Discharge Valve (V-1) while observing the PLC Output LED #8. The LED should illuminate, and an audible alarm should sound after a short delay. Open the valve after verifying that the alarm sounds.

NOTE: The mix pump will turn off once the alarm sounds.

5. PUSH the Alarm Mute Button to cancel the alarm.
6. The unit may be turned off and tank drained.

Acid Head Tank Low Level Switch 'Time-Out' (Audible Only):

Acid Head Tank #2 (Red Tubing):

1. Drain the head tank down to a level below the low-level switch.
2. When the low-level float is DOWN, PLC Input LED #14 should be OFF.
3. Remove relay CR4 from its base.
4. Turn Tank 2 Hand Switch **ON**; PLC Input LED #12 turns on.
5. Wait two minutes and verify that an audible alarm sounds. Turn **OFF** Tank 2 Hand Switch.
6. Replace the relay in its base.
7. Turn Tank 2 Hand Switch **ON** and verify head tank fill.

Acid Head Tank #3 (Orange Tubing)

1. Drain the head tank down to a level below the Low-Level Switch.
2. When the low-level float is DOWN, PLC-XM Input LED #3 should be off.
3. Remove relay CR5 from its base.
4. Turn Tank 3 Hand Switch **ON**; PLC-XM Input LED #1 turns on.
5. Wait two minutes and verify that an audible alarm sounds. Turn **OFF** Tank 3 Hand Switch.
6. Replace the relay in its base.
7. Turn Tank 3 Hand Switch **ON** and verify head tank fill.

Acid Head Tank #4 (Yellow Tubing)

1. Drain the head tank DOWN to a level below the low-level switch.
2. When the low-level float is DOWN, PLC-XM Input LED #7 should be off.
3. Remove relay CR6 from its base.
4. Turn Tank 4 Hand Switch **ON**; PLC-XM Input LED #5 turns on.
5. Wait two minutes and verify that an audible alarm sounds. Turn **OFF** Tank 4 Hand Switch.
6. Replace the relay in its base.
7. Turn Tank 4 Hand Switch **ON** and verify head tank fill.

Bicarb Head Tank Low Level Switch 'Time-Out' (Audible Only):

Bicarb Head Tank (Blue Tubing)

1. Drain the head tank to a level below the low-level switch.
2. When the low-level float is DOWN, PLC Input LED #6 should be off.
3. Remove relay CR1 from its base.
4. Turn Mix Pump Hand Switch to **TRANSFER**; PLC Input LED #1 turns on.
5. Wait two minutes and verify that an audible alarm sounds. Turn **OFF** Mix Pump Hand Switch.
6. Replace the relay in its base.
7. Turn Mix Pump Hand Switch to **TRANSFER** position and verify tank will fill.

Head Tank Pump Re-Prime:

CAUTION:
DO NOT use the Acid Head Tank pump to remove remaining acid from the bulk storage tank (barrel) after the low-level switch has activated. This will introduce air into the pump and may cause an air lock. Another common reason for an air lock is a tube or fitting leak on the suction side of the pump. Refer to the Tube Maintenance Procedure for correction.

CAUTION:
Clean any spillage to prevent damage to the SDS unit.

NOTE:
The Head Tank Pumps should not lose their prime under normal conditions.

1. Ensure that all connections (both threaded and tube) are secure and have no leaks.
2. Ensure that there is an adequate amount of solution in the bulk tank/mix tank.
3. Remove the tubing from the Acid/Bicarb Head Tank supply connection on the left side of the SDS frame.

WARNING:
Solution will drain from the tubing after removal. Catch any spills in a container. Observe all safety precautions.

4. Connect a 1/2″ tube to the Head Tank Supply connection and route the other end to a drain or container.
5. Turn the Acid Pump Switch to **ON** or Mix Pump Hand Switch to **TRANSFER**.
6. When solution flows from the tube, turn the switch **OFF**.
7. Reconnect the Head Tank Supply tube to the Head Tank Supply connection.
8. Turn the Acid Pump Switch to **ON** or Mix Pump Hand Switch to **TRANSFER** and check that the head tank is filling.

4.2.10. Head Tank Float Switch Function Test

> **NOTE:**
> This check is easily done during the course of a normal operating day. The bicarb mix tank fluid level should be at least 4 inches above the low-level float switch. This allows for enough bicarb solution to fill the head tank during this function test. If any function failure occurs, refer to Chapter 5, "Troubleshooting."

Bicarb Head Tank (Blue Tubing):

> **NOTE:**
> Whenever fluid level is below a float switch, the corresponding input LED should be OFF, and whenever fluid level is above a float switch, the corresponding LED should be ON.

1. Ensure that the head tank has a fluid level at least four inches above the low-level float switch. Open the SDS control box door and observe the PLC. Verify that PLC Input LED #7 is off (fluid level below switch), and Input LED #6 is on.
2. As the bicarb level drops below the low-level switch, Input LED #6 should turn off.
3. Verify that the transfer pump begins operating and the bicarb head tank begins to refill.
4. Continue to observe Input LEDs #6 and #7.
   - As the fluid level in the bicarb head tank rises, the low-level float switch should trip and Input Led #6 should turn on.
   - As the level continues to rise, the High-Level Float Switch should trip, Input LED #7 should turn on, and the bicarb transfer pump should turn off.

First Acid Head Tank (Red Tubing):

> **NOTE:**
> This check is easily done during the course of a normal operating day. The acid drum/bulk tank fluid level should be at least six inches above the low-level float switch. If any function failure occurs, refer to Chapter 5, “Troubleshooting.”
>
> **NOTE:**
> Whenever fluid level is below a float switch, the corresponding LED should be OFF, and whenever fluid level is above a float switch, the corresponding LED should be ON.

1. Ensure that the head tank has a fluid level at least four inches above the low-level float switch. Open the SDS control box door and observe the PLC. Verify that PLC Input LED #15 is off (fluid level below switch) and #14 is on.
2. As the fluid level drops below the low-level switch, the Input LED #14 should turn off.
3. Verify that the acid transfer pump begins operating and the acid head tank begins to fill.
4. Continue to observe Input LEDs #14 and #15.
   - As the fluid level in the head tank rises, the low-level float switch should trip and Input Led #14 should turn on.
   - As the level continues to rise, the high-level float switch should trip, Input LED #15 should turn on, and the acid transfer pump should turn off.

Second Acid Head Tank (Orange Tube):

> **NOTE:**
> This check is easily done during the course of a normal operating day. The acid drum/bulk tank fluid level should be at least six inches above the low-level float switch. If any function failure occurs, refer to Chapter 5, “Troubleshooting.”
>
> **NOTE:**
> Whenever fluid level is below a float switch, the corresponding LED should be OFF, and whenever fluid level is above a float switch, the corresponding LED should be on.

1. Ensure that the head tank has a fluid level at least four inches above the low-level float switch. Open the SDS control box door and observe the PLC-XM. Verify that the PLC-XM Input LED #4 is off (fluid level below switch), and PLC-XM #3 is on.
2. As the fluid level drops below the low-level switch, the PLC-XM LED #3 should turn off.
3. Verify that the acid transfer pump begins operating and the acid head tank begins to fill.
4. Continue to observe PLC-XM Input LEDs #3 and #4.
   - As the fluid level in the head tank rises, the low-level float switch should trip and PLC-XM Input Led #3 should turn on.
   - As the level continues to rise, the high-level float switch should trip, PLC-XM Input LED #4 should turn on, and the acid transfer pump should turn off.

Third Acid Head Tank (Yellow Tubing):

NOTE:
This check is easily done during the course of a normal operating day. The acid drum/bulk tank fluid level should be at least six inches above the low-level float switch. If any function failure occurs, refer to Chapter 5, “Troubleshooting.”

NOTE:
Whenever fluid level is below the float switch, the corresponding LED should be OFF, and whenever fluid level is above the float switch, the corresponding LED should be ON.

1. Ensure that the head tank has a fluid level at least four inches above the low-level float switch. Open the SDS control box door and locate the PLC-XM. Verify that the PLC-XM Input LED #8 is off (fluid level below switch) and #7 is on.
2. As the fluid level drops below the low-level switch, the PLC-XM LED #7 should turn off.
3. Verify that the acid transfer pump begins operating and the acid head tank begins to fill.
4. Continue to observe PLC-XM Input LEDs #7 and #8.
   - As the fluid level in the head tank rises, the low-level float switch should trip and Input Led #7 should turn on.
   - As the level continues to rise, the high-level float switch should trip, Input LED #8 should turn on, and the acid transfer pump should turn OFF.

NOTES:

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Solution Delivery System
(SDS)

CHAPTER FIVE:
TROUBLESHOOTING

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5.0 TROUBLESHOOTING

5.1. Acid Loop Auxiliary Transfer Pump

(Optional Device – Available Only on 'Single Acid' Systems)

Check First:

- Is the Main Power Switch **ON**?
- Is the fuse OPEN (FU-6)?
- Is the Acid Loop Return Drain Valve OPEN? (Acid Loop Return Drain Valve must be OPEN or pressure in the loop will build up, causing the high-pressure cutoff switch to turn the pump off.)

Problem A: The Loop Auxiliary Pump motor does not run.

1. Is the hand switch ON (momentary-type push-button switch)?

   NO Push the button IN. Motor will only run while button is pressed.

   YES GO TO 2

2. Is relay CR5 energized?

   NO TEST**:** Check for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the Main Terminal Barrier Strip as the neutral or common connection.
   - Wire #13 (at switch)
     No voltage - Bad wire/loose connection.
   - Wire #44 (at switch)
     No voltage - Bad switch.
   - CR5-14
     No voltage - Bad wire #44.
   - CR5-14
     Yes, voltage confirmed - Defective relay CR5 - Replace.

   YES TEST: Check for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the main terminal barrier strip as the neutral or common connection.
   - CR5-9
     No voltage - Open fuse (FU-6) – Replace fuse.
   - CR5-5
     No voltage - Defective relay CR5 – Replace relay.
   - TB1-9
     No voltage - Loose wires/poor connections – Repair as necessary.
   - TB1-9
     Yes, voltage confirmed, but motor does not operate:
     - Loose wires/poor connections - Repair as necessary.
     - Defective pump/motor unit – Replace.

Problem B: The loop auxiliary pump motor runs but does not pump.

1. Suction leak – Air entering pump inlet tubing – Correct leak (refer to Chapter 4, "Routine Maintenance").
2. Acid head tank empty – Refill (refer to Section 5.2, "Acid Transfer System").
3. Pump head defective – Rebuild or replace.
4. Loop pump bypass check valve defective – Replace.

Problem C: The auxiliary transfer pump runs and stops repeatedly in rapid succession, or runs briefly, then stops.

1. The acid drain valve is CLOSED, or the loop tubing is kinked or blocked.
   - OPEN the acid loop drain valve (usually located near the SDS main frame, on the acid loop return line).
2. The loop tubing is kinked, pinched, or otherwise obstructed.
   - Connect a drain line to one or more wall dispenser acid ports(s) and OPEN the acid loop drain valve to relieve pressure. Locate and relieve the kink or blocked loop tubing.

5.2. Acid Transfer System 'Automatic'

Check First:

- Is the main power switch **ON**?
- Is the Tank 2 switch **ON** (or Tanks 3 or 4 in multiple acid system)?
- Is the drum or bulk acid tank empty?
- Is the transfer pump fuse OPEN (1 AMP)?
- Float switch malfunction in acid head tank.
  Note: Tap gently on the side of the head tank to loosen the switch.
- The motor runs, but does not pump? GO TO D**.**

Problem A: The acid head tank is dry (1st Acid Head Tank–red tubing).

1. Is the hand switch **ON**?

   NO Turn **ON** the hand switch.

   YES GO TO 2

2. Is PLC Input LED #12 ON (signal from hand switch)?

   NO a) Loose wires/poor connections – Repair as necessary.
   - Check continuity between the -V on the PLC and HS-5 wire #36 and from HS-5 wire #36 and PLC Input LED #12.

   b) Defective switch – Replace.
   - Confirm by testing with OHM meter.

   c) Defective PLC – Replace.

   YES GO TO 3

3. Is PLC Input LED #13 ON (1st Bulk Acid Tank; ON indicates level OK)?

   NO The drum or bulk tank is empty – Refill or replace drum.

   YES GO TO 4

4. Are PLC Input LEDs #14 and #15 both OFF (1st Acid Head Tank level switches; both must be OFF (DOWN) for pump to run)?

   NO a) LED #14 ON – Low level switch stuck up or defective - Replace/repair.

   NOTE:
   Tap gently on side of head tank to release stuck switch.

   b) LED #15 ON – High level switch stuck up or defective - Replace/repair.

   NOTE:
   Tap gently on side of head tank to release stuck switch.

   YES GO TO 5

5. Is PLC Output LED #2 ON the PLC (1st Acid Transfer Pump run signal)?

   NO Defective PLC – Replace.

   YES GO TO 6

6. Is relay CR4 energized?

   NO a) Defective relay?

   TEST 1: Toggle the switch a few times while observing the relay for movement of the relay contact arm.

   NO Movement - GO TO TEST 2

   YES Movement - GO TO 7

   TEST 2: Connect a voltmeter across Terminals 13 and 14 of CR4. Refer to Illustration 6.8, "Electrical Components," in Chapter 6 for a relay base illustration.

   YES If voltage (24VAC) is confirmed, relay is defective – Replace.

   NO Possible bad wire connection between CR4-13 and TB1-24N - Repair as necessary.

   YES GO TO 7

7. TEST: Check for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the main terminal barrier strip as the neutral or common connection.

   - CR4-9
     No voltage - OPEN fuse (FU-5) – Replace.
   - CR4-5
     No voltage - Defective relay CR4 – Replace.
   - TB1-8
     No voltage - Loose wires/poor connections – Repair as necessary.
   - TB1-8
     Yes, voltage confirmed, but motor does not operate:
     a) Loose wires/poor connections - Repair as necessary.
     b) Defective pump/motor unit – Replace.

     NOTE:
     Try a sharp rap on side of motor. It may operate temporarily. Replace pump/motor as soon as reasonably possible**.**

Problem B: The acid head tank is dry (2nd Acid Head Tank [multiple acid systems only]-orange tubing).

1. Is the hand switch **ON**?

   NO Turn **ON** the hand switch.

   YES GO TO 2

2. Is PLC-XM Input LED #1 ON (signal from hand switch)?

   NO a) Loose wires/poor connections – Repair as necessary.
   Check continuity between the -V on the PLC and HS-6 wire #45 and from HS-6 wire #45 and EX-PLC Input LED #1.

   b) Defective switch – Replace.
   Confirm by testing with an OHM meter.

   c) Defective PLC – Replace.

   YES GO TO 3

3. Is PLC-XM Input LED #2 on (2nd Bulk Acid Tank level switch; ON indicates level OK)?

   NO The drum or bulk tank is empty – Refill or replace drum.

   YES GO TO 4

4. Are PLC-XM Input LEDs #3 and #4 both OFF (2nd Acid Head Tank level switches; both must be OFF (DOWN) for pump to run)?

   NO a) LED #3 ON – Low level switch stuck up or defective - Replace/repair.

   > **NOTE:**
   > Tap gently on side of head tank to release stuck switch.

   b) LED #4 ON – High level switch stuck up or defective - Replace/repair.

   > **NOTE:**
   > Tap gently on side of head tank to release stuck switch.

   YES GO TO 5

5. Is PLC Output LED #10 ON (2nd Acid Transfer Pump run signal)?

   NO Defective PLC – Replace.

   YES GO TO 6

6. Is relay CR5 energized?

   NO a) Defective relay?

   TEST 1: Toggle the switch a few times while observing the relay for movement of the relay contact arm.

   NO Movement - GO TO TEST 2

   YES Movement - GO TO 7

   TEST 2: Connect a voltmeter across Terminals 13 and 14 of CR5. Refer to Illustration 6.8, "Electrical Components," in Chapter 6 for a relay base illustration.

   YES If voltage (24VAC) is confirmed, relay is defective – Replace.

   NO Bad wire/loose connection between CR5-13 and TB1-24N - Repair as necessary.

   YES GO TO 7

7. TEST VOLTAGE: Check for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the main terminal barrier strip as the neutral or common connection.

   - CR5-9
     No voltage - OPEN fuse (FU-6) – Replace.
   - CR5-5
     No voltage - Defective relay CR5 – Replace.
   - TB1-9
     No voltage - Loose wires/poor connections - Repair as necessary.
   - TB1-9
     Yes, voltage confirmed, but motor does not operate:
     a) Loose wires/poor connections - Repair as necessary.
     b) Defective pump/motor unit – Replace.

     NOTE:
     Try a sharp rap on side of motor. It may operate temporarily. Replace the pump/motor as soon as possible.

Problem C: The acid head tank is dry (3rd Acid Head Tank [multiple acid systems only]-yellow tubing).

1. Is the hand switch **ON**?

   NO Turn **ON** the hand switch.

   YES GO TO 2

2. Is PLC-XM Input LED #5 on (signal from hand switch)?

   NO a) Loose wires/poor connections – Repair as necessary.
   Check continuity between the -V on the PLC and HS-7 wire #49 and from HS-7 wire #49 and EX-PLC Input LED #5.

   b) Defective switch – Replace.
   Confirm by testing with OHM meter.

   c) Defective PLC – Replace.

   YES GO TO 3

3. Is PLC-XM Input LED #6 ON (3rd Bulk Acid Tank level switch; ON indicates level OK)?

   NO The drum or bulk tank is empty – Refill or replace drum.

   YES GO TO 4

4. Are PLC-XM Input LEDs #7 and #8 both OFF (3rd Acid Head Tank level switches; both must be OFF (DOWN) for pump to run)?

   NO a) LED #7 ON – Low level switch stuck up or defective - Replace/repair.

   b) LED #8 ON – High level switch stuck up or defective - Replace/repair.

   YES GO TO 5

5. Is PLC-XM Output LED #2 ON (3rd Acid Transfer Pump run signal)?

   NO Defective PLC – Replace.

   YES GO TO 6

6. Is relay CR6 energized?

   NO a) Defective relay?

   TEST 1: Toggle the switch a few times while observing the relay for movement of the relay contact arm.

   NO Movement – GO TO TEST 2

   YES Movement – GO TO 7

   TEST 2: Connect a voltmeter across Terminals 13 and 14 of CR6. Refer to Illustration 6.8, "Electrical Components," in Chapter 6 for a relay base illustration.

   YES If voltage (24 VAC) is confirmed, the relay is defective – Replace.

   NO Possible bad wire connection between CR6-13 and TB1-24N - Repair as necessary.

   YES GO TO 7

7. TEST VOLTAGE: Check for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the main terminal barrier strip as the neutral or common connection.

   - CR6-9
     No voltage – Open fuse (FU-7) – Replace.
   - CR6-5
     No voltage – Defective relay CR6 – Replace.
   - TB1-10
     No voltage – Loose wires/poor connections – Repair as necessary.
   - TB1-10
     Yes, voltage confirmed, but motor does not operate:

     a) Loose wires/poor connections - Repair as necessary.

     b) Defective pump/motor unit – Replace.

     NOTE:
     Try a sharp rap on side of motor. It may operate temporarily. Replace pump/motor unit as soon as reasonably possible.

Problem D: Acid transfer pump runs but does not pump. (This applies to all acid concentrate systems.)

1. The pump has lost its prime. Ensure an adequate fluid level in the drum or bulk tank and perform the procedure in Section 3.6, “Acid Distribution Loop Purge Procedure (Internal Pump),” or the procedure in 3.7, “Acid Distribution Loop Purge Procedure (External Pump),” in Chapter 3.
2. There is a suction (air) leak in the acid transfer pump inlet tubing.
   a) Defective fitting or O-ring in any input-side tubing connection. Check the Acid Drum Draw Tube Fitting, Tank 2, Tank 3, Tank 4, Bulkhead Fitting (both sides), and Transfer Pump Inlet Fitting.
      - Replace suspect fittings.

      OR:

      - Perform the “Leak Repair” procedure in Section 4.2.3 of Chapter 4.

      a) Defective acid drum draw tube assembly (dip tube) – Replace.
3. The pump head assembly is defective.
   a) Replace pump head assembly (or entire pump/motor unit).
   b) (OPTION) Rebuild pump head assembly.
4. There is excessive distance between Bulk Storage and SDS mix frame.
   a) Accessory remote concentrate pump may be required. Refer to the “Optional Equipment” section in Chapter 1.

> **NOTE:**
> After replacing tube fittings, pump head or performing the “Leak Repair Procedure,” it may be necessary to perform the “Head Tank Pump Re-Prime” procedure to restore system to normal operation. Refer to Section 3.6, “Acid Distribution Loop Purge Procedure (Internal Pump),” or the procedure in 3.7, “Acid Distribution Loop Purge Procedure (External Pump),” in Chapter 3.

5.3. Alarm System

Problem A: Acid Drums/Bulk Tank Low Level (Audible and Visual)

1. Acid Tank 2/low level switch (red tubing):
   a) FLOAT UP
      - PLC Input LED #13 ON = No Alarm

   b) FLOAT DOWN
      - PLC Input LED #13 OFF = Input Signal
      - PLC Output LED #8 Turns ON = Audible Alarm
      - PLC Output LED #1 Turns ON = Visual Alarm (Tank 2)

   c) Replace the drum or refill the bulk tank.
2. Acid Tank 3/low level switch (orange tubing):
   a) FLOAT UP
      - PLC-XM Input LED #2 ON = No Alarm

   b) FLOAT DOWN
      - PLC-XM Input LED #2 OFF = Input Signal
      - PLC Output LED #8 Turns ON = Audible Alarm
      - PLC Output LED #9 Turns ON = Visual Alarm (Tank 3)

   c) Replace the drum or refill the bulk tank.
3. Acid Tank 4/low level switch (yellow tubing):
   a) FLOAT UP
      - PLC-XM Input LED #6 ON = No Alarm

   b) FLOAT DOWN
      - PLC Input LED #6 OFF = Input Signal
      - PLC Output LED #8 Turns ON = Audible Alarm
      - PLC-XM Output LED #1 Turns ON = Visual Alarm (Tank 4)

   c) Replace the drum or refill the bulk tank.

Problem B: Bicarb Mix Pump 'No Flow' Alarm (Audible Only)

> **NOTE:**
> The mix pump flow switch must be triggered by pump flow (PLC Input led #10 turns on) within 10 seconds of motor start, or the controller will shut down the pump and sound the audible alarm.

1. Indicates possible closed valves - Mix Pump Suction Valve (V-4) or Mix Pump Discharge Valve (V-1) - or no fluid in Mix Tank.

Problem C: Failure of audible alarm (when a known alarm condition exists).

1. Verify that the alarm condition is registered on the PLC Input LEDs.
   a) PLC Input LED #s: 6, 9, 10, 13, 14 (Any one OFF)
   b) PLC–XM Input LED #s: 2, 3, 6, 7 (Any one OFF)
2. Is PLC Output LED #8 on (power to Sonalert – audible alarm)?
   NO Defective PLC – Replace.
   YES a) Defective Sonalert – Replace.
   b) Loose wires/poor connections - Repair as necessary.

Problem D: Failure of visual indicators (when a known alarm condition exists).

1. Acid/Bulk Tank #2 (red tubing)/red lamp out?
   a) Is PLC input LED #13 OFF and PLC Output LED #1 ON?
   YES Indicator lamp burned out.
   NO Defective PLC.
2. Acid/Bulk Tank #3 (orange tubing)/red lamp out?
   a) Is PLC-XM Input LED #2 OFF, and PLC Output LED #9 ON?
   YES Indicator lamp burned out.
   NO Defective PLC.
3. Acid/Bulk Tank #4 (yellow tubing)/red lamp out?
   a) Is PLC-XM Input LED #6 OFF, and PLC-XM Output LED #1 ON?
   YES Indicator lamp burned out.
   NO Defective PLC.
4. Bicarb Mix Tank Low (blue tubing)/red lamp out
   a) PLC Input LED #9 OFF and PLC Output LED #5 ON?
   YES Indicator lamp burned out.
   NO Defective PLC.

5.4. Auto-Fill Mode Time Pre-Set (Optional)

A: Setting Instructions

Push the small button above/below each window to change settings. The lower left window should be set to **'E'**; lower right to **'m'**. The three middle windows may be set from 0-0-1 to 9-9-9 in order to set the number of minutes the timer will operate, typically 0-1-0 (10 minutes), or 0-2-0 (20 minutes).

1. If the push buttons will not change the settings displays, timer is defective and must be replaced.

B: Operation

When power is first applied, the LCD window on the timer should display a solid black block and the words '**OFF Output'**. When Auto-Fill is activated via the hand switch, the word **ON** appears (flashing) and **OFF** is hidden. During the timed ON mode, the Inlet Water Valve should be OPEN and water will flow into the mix tank. The solid black block gradually changes to a solid white block as the timer counts down to zero.

- When time period is finished, the word **OFF** appears once again and **ON** is hidden. The display remains in an all-white condition.
- RESET: Turn Auto-Fill Switch to once to START and release - Display changes to all-black condition, with **OFF** displayed.
- START: Turn Auto-Fill Switch to START once more and timer will begin counting down, with **ON** flashing.

NOTE:
The Auto-Fill Mode Timer may be cancelled and reset at any time during the countdown period by turning the switch to the START position.

CAUTION:
Resetting the timer during the countdown period will result in an incorrect volume of water in the mix tank. If the timer is initiated the fill timer will operate for the original timer setting.

Problem C: Display window (LCD) is blank.

1. Is the main power switch **ON**?
   NO Turn switch **ON.**

   YES GO TO 2

2. Check the timer input power (24VAC). Connect a voltmeter across Terminals #2 and #10 of the timer relay base. Is the correct voltage present?
   NO Loose wires/poor connections – Repair as necessary.

   YES The timer unit is defective – Replace.

Problem D: No water flow (with timer operating correctly).

1. The RO water system is OFF or the SDS supply valve is CLOSED.
2. The SDS inlet water valve is CLOSED (V-3).
3. The flow meter needle valve is CLOSED (V-8).
4. Faulty solenoid valve. Refer to Section 5.14, "Water Inlet Valve," in this chapter.

5.5. Bicarb-Loop Rapid Distribution Pump (Blue Tubing)

Check First:

- Remember that there is a one-minute delay programmed into the Loop Rapid Pump start circuit.
- Low level in the head tank (is the transfer pump switched **ON**)?
- Fuse open (FU-2)?
- Runs/stops repeatedly – Bicarb wand not plugged in correctly or occluded (clogged).

Problem A: Loop rapid pump motor does not run.

1. Is the hand switch **ON**?
   NO Place switch in the **ON** position. Wait one minute for the pump to start.

   YES GO TO 2

2. Is PLC Input LED #4 ON (signal from hand switch)?
   NO a) Loose wires/poor connections - Repair as necessary.
   Check continuity between the -V on the PLC and HS-4 and from HS-4 wire #21 and PLC Input LED #4.

   b) Defective hand switch – Replace switch.
   Confirm by testing with an OHM meter.

   c) Defective PLC – Replace.

   YES GO TO 3

3. Is PLC Input LED #6 ON (Bicarb Head Tank level switch; ON indicates level OK)?
   NO Low-level switch stuck down or defective – Visually confirm that the fluid level is above the float switch - Repair/replace.

   YES GO TO 4

4. Is PLC Output LED #3 ON?
   NO Defective PLC – Replace.

   YES GO TO 5

5. Is relay CR2 energized?
   NO Defective relay?
   a) Check the continuity between the following points and replace or repair as necessary:
      - PLC Output #3 and CR2-14
      - CR2-13 and any 24N
      - CR2-13 and CR2-14

   b) TEST: Connect a voltmeter across CR2 terminals 13 and 14. Refer to Illustration 6.8, "Electrical Components," in Chapter 6. If voltage (24 VAC) is confirmed, relay is defective - Replace.

   YES GO TO 6

6. Test for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the main terminal barrier strip as the neutral or common connection.
   - CR2-9
     No voltage - OPEN fuse (FU-2) – Replace.
   - CR2-5
     No voltage - Defective relay CR2 – Replace.
   - TB1-6
     No voltage - Loose wires/poor connections - Repair as necessary.
   - TB1-6
     Yes, voltage confirmed, but motor does not run:
     a) Loose wires/poor connections - Repair as necessary.
     b) Stuck or defective pressure limit switch in pump head – Replace pump head.
     c) Defective motor – Replace.

     NOTE:
     Try a sharp rap on side of motor. It may operate temporarily. Replace pump/motor as soon as reasonably possible.

Problem B: Loop rapid pump runs but does not pump (little/no flow).

1. The pump head is defective – Rebuild/replace.
2. Possibly a suction leak (air) entering the pump inlet tubing – Repair leak (refer to Chapter 4, “Routine Maintenance”).
3. The loop pump bypass check valve is defective – Replace.

Problem C: The loop rapid pump runs and stops repeatedly in rapid succession or runs briefly and stops.

1. The bicarb wand assembly is not connected or is improperly connected to the quick disconnect port.
   - Ensure the bicarb wand is fully connected to either the TANK or DRAIN QD port to allow flow. Pump should not be turned on while the wand is in the OPERATE QD.
2. Inspect the tubing for kinks or obstructions.
3. Inspect the bicarb wand fitting for obstructions.
   - With the wand assembly disconnected from the port, point the wand toward the drain and use a small blunt object to push the stop valve open.
4. If multiple bicarb loops are installed, make certain one of the loops return valves are fully OPEN.

5.6. Bicarb Mixing System

Problem A: The mix pump motor does not start.

Check First:
- Circuit breaker **ON** (switch – left side panel)?
- Main power switch **ON**?
- Power cord unplugged?
- Mix tank fluid level low (below low-level float switch)?
- 115 VAC at wall receptacle?

1. Is the hand switch in the MIX position?
   NO Place the switch in MIX position.

   YES GO TO 2

2. Is PLC Input LED #2 ON (mix switch on signal)?
   NO a) Loose wires/poor connections – Repair as necessary.
   Check continuity between 24 VDC COM and yellow wire on HS-2 and wire #19 and PLC Input #2.

   b) Defective switch – Replace.
   Confirm by testing with an OHM meter.

   c) Defective PLC – Replace.

   YES GO TO 3

3. Is PLC Input LED #9 ON (mix tank low level float switch; ON Indicates level OK)?
   NO a) Fill the tank above the level switch.

   b) If the tank is adequately filled (two inches above the float switch), check the switch with an OHM meter. If the switch is open, replace the float switch. If the switch is closed, check the wiring between the switch and the PLC as follows and repair as necessary:
   - TB1-COM and 24 VDC COM
   - TB1-COM and PLC Input #9
   - TB1-COM and TB1-33
   - TB1-COM and low-level float switch normally open contact

   c) Defective PLC - Replace PLC.

   YES GO TO 4

4. Is PLC Output LED #12 ON (mix pump run signal)?
   NO Defective PLC – Replace.

   YES GO TO 5

5. Is relay C-1 (motor contactor) energized (mix pump power relay)?
   - Toggle the mix pump switch **ON**/OFF a few times while observing for movement of the C-1 relay arm.

> **WARNING:**
> This relay contains exposed metal parts, which normally carry high voltage electrical power (115 VAC). Do not touch the contactor relay except as required, using appropriate, insulated test meter leads.

NO Relay C-1 problem.
TEST: Connect a voltmeter across the contactor (C-1) connections 1 and 2 with the mix pump switch **ON**. If the voltage (24 VAC) is confirmed, the relay is defective – Replace.

YES GO TO 6

6. TEST VOLTAGE: Check for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the Main Terminal Barrier Strip as the neutral or common connection.
   - TB1-4

     YES Voltage is confirmed, but the pump-motor does not run:
     a) Loose wires/poor connections at TB1-4 or TB1-N – Repair as necessary.
     b) Remove motor cover and confirm voltage (115 VAC) at the motor connections.
        - Voltage present but motor not running indicates a defective motor/pump unit – Replace.

     NO Voltage present indicates loose wires/poor connections - Repair as necessary.
   - C1-5
     No voltage - Circuit breaker tripped – Close breaker switch.
   - C1-3
     No voltage - Defective relay C1 – Replace.

Problem B: The mix pump starts but shuts down after 5-10 seconds.

> **NOTE:**
> When the pump operates correctly, the pump output flow trips a flow switch in the pump output piping (PLC Input LED #10 on indicates flow OK).

1. Is PLC Input LED #10 ON (while the pump is operating)?

   NO
   a) The pump inlet (V-4) or outlet (V-1, V-2) valve(s) is closed, causing a NO FLOW condition – Ensure that the valves are OPEN (LED #10 may light momentarily even if valves are closed).
   b) Mix tank outlet screen occluded - Clean as necessary.
   c) Loose wires/poor connections - Replace as necessary.
      Check continuity between TB1-COM and TB1-34 and TB1-34 and PLC Input #10.
   d) Flow switch stuck or defective – Replace.
      Open the mix tank and verify pump flow immediately after starting the mix pump. Flow indicates faulty switch - Replace the flow switch.

   YES LED #10 should be ON when pump is operating, normal conditions.

2. If LED #10 is ON while the pump is not operating:
   Disconnect the flow switch from its wiring and measure the resistance across the flow switch leads (with the pump not running):
   a) Infinite resistance = Normal – GO TO (c) BELOW
   b) Near–zero resistance = Switch is stuck in up position or defective – Repair or replace.
   c) Defective PLC – Replace.

Problem C: Mix pump leaks.

1. Inlet or outlet pipe fittings

   a) Remove the pipe. Replace the Teflon tape (3-4 turns); turn the pipe clockwise to tighten into the female pump head port. Operate and check for leaks. Refer to Chapter 4, "Routine Maintenance."

2. Pump housing (stainless steel cover)

   NOTE:
   A leak in the pump housing seal is usually seen as a small puddle of fluid directly below the motor. Bicarb solution is corrosive to some metals; if left unattended, it will cause damage to the pump backing plate (or motor stool). Quick action to repair the leak can help reduce maintenance and repair expense.

   a) Attempt to stop the leak by tightening the pump casing bolts.

   b) Replace the pump casing O-ring.

3. Pump shaft seal (mechanical seal)

   CAUTION:
   A leak in this area can cause damage to the motor and/or motor stool, so it is best to repair it immediately.

   a) No repair of leaking or damaged seal is possible. The shaft seal must be replaced. Refer to Section 4.2.4, "Bicarb Mix Pump Maintenance," in Chapter 4.

5.7. Bicarb Transfer 'Automatic'

Check First:

- Is the mix/transfer hand switch in TRANSFER?
- Is the fluid level in the bicarb tank adequate (above low-level float switch)?
- Is the level switch in the head tank stuck or defective? (Tap the side of the head tank to release a stuck switch.)

Problem A: The bicarb head tank is dry.

1. Is the mix/transfer hand switch in TRANSFER mode?
   NO Place switch in TRANSFER position.

   YES GO TO 2

2. Is PLC Input LED #1 ON (signal from TRANSFER ON switch)?
   NO a) Loose wires/poor connections – Repair as necessary.
   Check continuity between 24 VDC COM connection on the PLC and HS-2 and from HS-2 wire #18 to PLC Input #1.

   b) Defective hand switch – Replace switch.
   Confirm by testing with an OHM meter.

   c) Defective PLC – Replace PLC.

   YES GO TO 3

3. Is PLC Input LED #9 on?
   NO a) Float switch problem - Perform the test below.

   TEST: Disconnect the wire from the bottom of TB1-33 and connect an OHM meter between the wire end and TB1–COM.

   - If the fluid level is ABOVE the switch, the switch should be closed, indicated by a resistance reading near zero. Infinite reading indicates defective switch – Replace.

NOTE:
If the fluid level is BELOW the switch, the switch must be open, indicating an infinite resistance (PLC Input #9 OFF). If this test fails, replace the switch.

   b) Check continuity between TB1-33 and PLC Input #9 and 24 VDC on PLC and all COMs on TB1.

   b) Loose wires/poor connections – Repair as necessary.

   c) Defective PLC – Replace PLC.

   YES GO TO 4

4. Are PLC Input LEDs #6 and #7 both off (bicarb head tank level switch; both must be OFF (DOWN) for pump to run)?
   NO a) LED #6 ON indicates the low-level switch is stuck in the UP position or defective – Replace as necessary.

   b) LED #7 ON indicates the high-level switch is stuck in the UP position or defective – Replace as necessary.

   YES GO TO 5

5. Is PLC Output LED #11 on (bicarb transfer pump run signal)?
   NO Defective PLC – Replace PLC.

   YES GO TO 6

6. Is relay CR1 energized (pump power)?
   NO a) Defective relay?

   Test 1: Toggle the switch a few times while observing the relay for movement of the relay contact arm.

   NO Movement GO TO TEST 2

   YES Movement GO TO 7

   Test 2: Connect a voltmeter across Terminals 1 and 2 of CR-1.

   YES Relay defective – Replace relay.

   NO Possible bad wire connection between C-1 and TB1-24N – Repair as necessary.

   YES GO TO 7

7. TEST VOLTAGE: Check for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the Main Terminal Barrier Strip as the neutral or common connection.
   - CR1-9

   No voltage - Open fuse (FU-1) – Replace fuse.

   - CR1-5

   No voltage - Defective relay CR1 – Replace.

   - TB1- 5

   No voltage - Loose wires/poor connections – Repair as necessary.

   - TB1- 5

   YES Voltage confirmed, but motor does not operate:
   a) Loose wires/poor connections - Repair as necessary.

   b) Defective pump/motor unit – Replace.

   NOTE:
   Try a sharp rap on side of motor. It may operate temporarily. Replace pump/motor unit as soon as reasonably possible.

Problem B: Bicarb transfer pump runs but does not pump any fluid.

1. The pump has lost its prime. Ensure an adequate fluid level in the mix tank and perform the "Head Tank Pump Re-Prime Procedure" (refer to Chapter3, "System Operation").
2. There is a suction (air) leak in the transfer pump inlet tubing.
   a) Defective fitting or O-ring in any input-side tubing connection - Bicarb Suction Fitting, Bicarb Head Tank Bulkhead Fitting (both sides), or Transfer Pump Inlet Fitting - Replace suspect fittings.

   OR:

   Perform the "Leak Repair Procedure" (refer to Section 4.2.3 in Chapter 4).
3. Pump head assembly is defective.
   a) Replace pump head assembly (or entire pump/motor unit).

   b) (OPTION) Rebuild pump head assembly.

> **NOTE:**
> After replacing tube fittings, pump head, or performing "Tube Fitting Maintenance Procedure," it may be necessary to perform the "Head Tank Pump Re-Prime" procedure to restore system to normal operation.

Problem C: Head tank leaks.

1. Inspect and repair the outlet tubing fitting and float switch connections as necessary.
2. The high-level float switch malfunctions (tank overfilling).
3. Defective head tank – Cracked? – Replace.

Problem D: Head tank leaks only while transfer pump operates.

1. Defective seal on the top cover plate – Replace seal.
2. Check the fill tube fitting.

5.8. Bicarb Transfer 'Manual Override'

Problem A: Bicarb transfer pump does not run when the override switch is pressed.

1. Is PLC Input LED #5 ON (with the switch pressed)?
   NO a) Loose wires/poor connection – Repair as necessary.
   Check continuity between the 24 VDC COM on the PLC and PB-2 yellow wire and from PB-2 wire #22 and PLC Input LED #5.

   b) Defective switch– Replace switch.
   Confirm with OHM meter.

   c) Defective PLC – Replace PLC.

   YES GO TO "Bicarb Transfer 'Automatic' (Section 5.7).

NOTE:
Observe PLC Input LEDs #6 and #7.

1. The Manual Override pump will start even if Input #6 is on and will run until #7 turns on or until the timed run period (approximately 5 minutes) expires, whichever occurs first.
2. The Manual Override pump will start even if #6 and #7 are both ON (full tank). Be careful not to overfill the head tank using Manual Override.

Problem B: Bicarb transfer pump (manual override) runs but does not pump fluid.

1. Refer to “Bicarb Transfer ‘Automatic’” section, Problem B, in Section 5.7.

5.9. Distribution Loop Problems (Acid/Bicarb)

Problem A: Low Conductivity

Check First:

- Head tank empty (acid/bicarb)?
- Bicarb switch in TRANSFER?
- Mix tank low level alarm failure?
- Acid switch (Tank 2) **ON** (or Tanks 3 or 4 in multiple acid systems)?
- Drum or bulk storage tank dry?
- Loss of prime (pump runs but pumps no fluid)?

WARNING:
Distribution loop problems may result in improper quantities of concentrate fluids delivered to the dialysis machines, which can result in low or high conductivity dialysate. If the SDS system is found to be functioning properly, refer to the dialysis equipment for conductivity issues.

1. Air in the loop (acid or bicarb).
   a) The head tank is empty – Refill.
      - GO TO Section 3.5, "Bicarb Distribution Loop Purge Procedure," Section 3.6, "Acid Distribution Loop Purge Procedure (Internal Pump)," or Section 3.7, "Acid Distribution Loop Purge Procedure (External Pump)," in Chapter 3.
      - Refer to Section 5.2, "Acid Transfer," and Section 5.7, "Bicarb Transfer Automatic," for help solving the underlying problem.

   b) The head tank level is adequate, but there is a recurring air in loop problem.
      - Insufficient purge of air from loop – Repeat purge procedure. Refer to Section 3.5, "Bicarb Distribution Loop Purge Procedure," Section 3.6, "Acid Distribution Loop Purge Procedure (Internal Pump)," or Section 3.7, "Acid Distribution Loop Purge Procedure (External Pump)," in Chapter 3.
      - Air leak in tubing or fitting connections – Inspect and repair as necessary.

NOTE:
An air leak could occur at any fitting in any part of the loop or wall dispensers. Inspect all fittings, particularly those in the immediate vicinity of a dialysis machine with recurring low conductivity problems.

      - Too many machines connected to the loop – Combined demand of machines may cause significant negative pressure (vacuum) in loop. Air may then enter the loop at any marginally defective connection.

2. Incorrect fluid in the concentrate loop.
   a) Poorly mixed bicarb solution - Refer to Section 3.3, “Bicarb Solution Mix/Start-Up Procedure,” in Chapter 3.
   b) Bicarb powder not added during mixing procedure.
   c) Incorrect mixture or concentrate (acid/bicarb).
3. The loop flow is low (acid or bicarb) in normal mode (gravity feed).
   a) Air in loop - Refer to Chapter 3, “System Operation.”
   b) Kink or occluded head tank air vent tube.
   c) Kink or occluded loop tubing.
   d) Defective check valve (rapid loop pump bypass) stuck closed – Replace.

NOTE:
This valve is installed in all bicarb systems, and only in acid systems with the Acid Loop Auxiliary Pump (Internal) installed.

Problem B: High Conductivity

WARNING:
Distribution loop problems may result in improper quantities of concentrate fluids delivered to the dialysis machines, which can result in low or high conductivity dialysate. If the SDS system is found to be functioning properly, refer to the dialysis equipment for conductivity issues.

1. Incorrect acid concentrate.
2. Incorrect bicarb concentrate mixture.
3. Water flow is low (dialysate make-up water) or low pressure.

WARNING:
Do not operate either the acid loop auxiliary pump or bicarb rapid loop distribution pump with dialysis machine connected to concentrate delivery system. All dialysis machine concentrate lines must be disconnected from wall dispenser concentrate access ports prior to initiating the loop purge procedure.

Problem C: Fluid Leaks

1. Defective fittings:
   a) O-rings – Repair/replace as necessary.
   b) Cracked and/or damaged fittings – Repair/replace as necessary.
2. Scratched/scored tubing - Repair/replace as necessary.
3. Fluid leaks (external) - May indicate possible locations of 'vacuum leaks,' which in turn cause air in loop problems.

5.10. Leaks

1. General information: Any leak from any part of the system should be corrected as soon as possible. Left unattended, leaks can cause secondary damage, necessitating expensive repairs. For instance, bicarb solution leaking out of the mix pump head can enter the motor, causing damage to the motor with subsequent expense of replacement, including parts, labor and system down time.
2. Refer to the Maintenance Procedures for leak repair.

5.11. Main Power Switch

Problem A: No power (main power switch is in ON position).

Check First:
- Power cord unplugged?
- No power at electrical receptacle?
- Fuse (FU-3) or (FU-4) OPEN?

1. TEST VOLTAGE: Check for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the main terminal barrier strip as the neutral or common connection.
   a) TB1-H
      No voltage:
      - Power cord unplugged or defective.
      - Loss of main electrical power/circuit breaker.

   b) Fuse 3 (FU-3) wire #11
      No voltage:
      - Loose wires/poor connection – Repair as necessary.
      - Fuse OPEN – Replace.

   c) Defective hand switch HS-1.
      Confirm with an OHM meter.

   c) Defective relay MCR-1 - Replace as necessary.

2. TEST VOLTAGE: Test for the presence of voltage (24 VAC) at the following points, in order. Reference any terminal '24N' on the main terminal barrier strip as the neutral or common connection.
   a) Fuse (FU-4); both ends
      - No voltage on transformer end – Defective transformer – Replace.
      - No voltage on Wire #12 end of fuse – OPEN fuse (FU-4) – Replace.

   b) TB1-12 No Voltage:
      - Loose wiring between fuse (FU- 4) and TB1-12.

   c) TB 1-13 No Voltage:
      - Loose wires/poor connections – Repair as necessary.
      - MCR1 relay defective – Replace.
      - Main power hand switch defective – Replace.
        Confirm by testing with OHM meter.

5.12. Programmable Logic Controller (PLC)

General information: The PLC, or Programmable Logic Controller, is the input/output logic device which controls almost all functions of the SDS machine. It accepts various input signals from the hand switches on the control box as well as signals from the various sensors located in the mixing tank, head tank(s), and drums (acid bulk storage). It then processes these inputs and, if the correct input signals are received (and certain other conditions are met), it will then send an output signal to the appropriate component (acid transfer pump, bicarb mixing pump, etc.) to activate that component. It also monitors the status of the various systems and triggers an audible and/or visual alarm when necessary. The operating programs are factory installed and need no user adjustment.

A: Normal Operation

1. When the main power switch is turned **ON**, line power is supplied to the PLC at L and N.
2. Three (3) LED indicators on the front of the PLC should illuminate: PWR, OK and RUN.

> **NOTE:**
> Other LED indicators may also light, depending upon the status of the hand switches and float switches, but the three LEDs listed in A.2 relate to the functional status of the PLC itself. Specific input and output details are covered in the individual component/system sections of this problem-solving guide.

Problem B: PLC status indicators (PWR, OK, RUN) all OUT.

1. Test for voltage (115 VAC) between L and N on the PLC.

   NO GO TO 2

   YES Defective PLC – Replace.

2. TEST VOLTAGE: Check for voltage (115 VAC) at the following points, in order. Reference any terminal ‘N’ on the main terminal barrier strip as the neutral or common connection:

   a) TB1-H No Voltage
   - Loose wires/poor connections - Replace as necessary.
   - Power cord unplugged or defective.
   - No power at receptacle.

b) TB1-1 Voltage

NO Loose wire/poor connection - Replace as necessary.

- OPEN fuse (FU-3) (primary transformer power supply)
- Faulty transformer – Verify proper input and output voltages – Replace as necessary.
- OPEN fuse (FU-4) (transformer output) - Replace fuse as necessary.

YES a) Defective relay?

TEST: Toggle the power switch **ON**/**OFF** a few times while observing MCR1 for movement of the contact arm.

NO Defective MCR1 – Replace.

YES GO TO 3

3. Check continuity between N on the PLC and any TB1-N.

NO Continuity test fails – Loose wires/poor connections – Repair as necessary.

YES Continuity confirmed – PLC is defective – Replace PLC.

Problem C: OK and PWR both ON; RUN light OFF.

1. If the run/program switch is in the PROGRAM position:

a) Switch back to RUN mode.

2. If the run/program switch is in RUN position:

a) Defective PLC – Replace PLC.

Problem D: PWR light ON; OK and RUN both OFF.

1. Defective PLC – Replace PLC.

5.13. Ultra-Violet (UV) Sanitizer

Problem A: The UV lamp does not light.

Check First:
- Hand switch **ON**?
- Bicarb head tank empty (low level switch must be satisfied to enable UV unit)?
- Lamp is burned out?

1. Is the hand switch **ON**?

   NO Turn switch to **ON.**

   YES GO TO 2

   NOTE:
   On initial daily fill-up of an empty bicarb head tank, UV lamp will be disabled until the low-level float switch is satisfied.

2. Is PLC Input LED #3 ON (ON signal from hand switch)?

   NO a) Loose wires/poor connections – Repair as necessary.
   Check continuity between the -V on the PLC and HS-3 yellow wire and from HS-3 wire #20 and PLC Input LED #3.

   b) The hand switch is defective – Replace.
   Confirm by testing with an OHM meter.

   c) The PLC is defective – Replace.

   YES GO TO 3

3. Is PLC Input LED #6 ON (bicarb head tank level; ON indicates level OK)?

   NO a) Is the fluid level in the bicarb head tank low? – Refill.
   - Is the mix pump switch in TRANSFER?
   - Possible failure of bicarb automatic transfer, refer to **"**Bicarb Transfer 'Automatic,'" Section 5.7, for information relating to empty head tank.

   YES GO TO 4

4. Is PLC Output LED #4 ON (UV ON signal)?

> **NOTE:**
> On initial daily fill-up of an empty bicarb head tank, UV lamp will be disabled until the low-level float switch is satisfied.
>
> **NOTE:**
> UV lamp is disabled whenever the head tank does not satisfy the low-level switch within 2 minutes. This condition causes an audible alarm.

NO Defective PLC – Replace.

YES GO TO 5

5. Is relay CR3 energized (power to UV)?

NO Defective relay?

TEST 1: Toggle the switch a few times while observing the relay for movement of the relay contact arm.

NO Movement - GO TO TEST 2

YES Movement - GO TO 6

TEST 2: Connect a voltmeter across Terminals 13 and 14 of relay CR3.

YES If voltage (24 VAC) is confirmed, the relay is defective – Replace.

NO Possible bad wire connection between CR3-13 and TB1-24N - Repair as necessary.

YES GO TO 6

6. TEST VOLTAGE: Check for voltage (115 VAC) at the following points, in order. Reference any terminal 'N' on the main terminal barrier strip as the neutral or common connection.

   - CR3-9
     No voltage - Bad wiring connection between TB1-1 and CR3-9 – Repair as necessary.
   - CR3-5
     No voltage - Defective relay CR3 - Replace.
   - TB1-7
     No voltage - Bad wiring connection between CR3-5 and TB1-7 – Repair as necessary.
   - Tb1-7
     Yes, voltage is confirmed, but lamp still does not light:
     a) Defective lamp, ballast (power supply) or starter device - Replace lamp with a known good lamp. If it still does not light, replace the ballast and/or starter device.
     b) UV cover plate safety switch open or defective – Repair/replace. Confirm by testing with an OHM meter.

WARNING:
The UV sanitizer is designed to operate only with the cover in place. Do not attempt to operate the sanitizer with the cover removed. Do not attempt to remove, modify, or defeat the safety switch. Do not look directly at a lighted UV lamp. Observe the lamp operation only by means of the lamp view port located on the front cover.

5.14. Water Inlet Valve (Solenoid)

Problem A: Water does not flow into mix tank when auto fill is activated.

Check First:
- Inlet water valve CLOSED (RO water supply valve)?
- Water supply not available?
- SDS inlet water valve CLOSED (V-3)?
- Auto fill timer set incorrectly? (Refer to "Auto Fill Mode Time Preset," Section 5.4.)
- Flow meter adjust valve CLOSED (V-8)?

1. Test the solenoid valve operation by turning the hand switch to MANUAL and hold it for 5 seconds. The valve should OPEN and water should begin flowing into the mix tank.

   NO a) Another valve may be CLOSED - RO Water Supply, SDS Inlet Water Valve (V-3), or Flow Meter Adjust (V-8). - Ensure that the correct valves are OPEN.

   b) Kink in hose/obstructed pipe.

   c) Loose wires/poor connections – Repair as necessary.

   TEST: Test for the presence of voltage (24 VAC) at the following points, in order. Reference any terminals on the main terminal as neutral.

   a) TB1-13

   NO Refer to Section 5.11, "Main Power Switch."

   YES GO TO (b)

   b) Turn auto fill switch to the MANUAL position and check wire #64 on HS-8.

   NO Defective hand switch – Replace.

   YES GO TO (c)

   c) Hold the auto fill switch to MANUAL and check TB1-64.

   NO Defective solenoid – Replace.

   YES This confirms that the solenoid will operate when power is applied. GO TO 2.

2. Turn the hand switch to START several times and observe:

   a) PLC Input LED #8 lights each time the hand switch is turned to START.

      NO Loose wires/poor connections – Repair as necessary.

      - Check continuity from 24 VDC COM on the PLC and the yellow wire on HS-8 and from HS-8 wire #25 and PLC Input #8.
      - Defective switch – Confirm with OHM meter – Replace.
      - Defective PLC unit – Replace.

      YES GO TO (b)

   b) PLC Output LED #6 or #7 lights (momentarily) each time Input LED #8 lights.

      NO Defective PLC unit – Replace.

      YES GO TO (c)

   c) When Output LED #6 lights on the PLC, auto-fill timer window displays the word **ON** (flashing).

      OR:

      When Output LED #7 lights on the PLC, auto-fill timer window displays the word **OFF** (steady).

      NO a) Auto fill timer settings are incorrect – RESET (refer to "Auto Fill Timer," Section 5.4).

      b) Loose wires/poor connections – Repair as necessary.
      - Refer to the electrical schematic.

      c) Auto fill timer defective – Replace (refer to Section 5.4, "Auto Fill Mode Time Pre-Set," for additional information).

      YES GO TO (d)

   d) When auto-fill time displays **ON**, solenoid valve opens and water flows (listen for a faintly audible click).

      NO a) Loose wires/poor connection.
      - Check continuity between TB1-64 and terminal #9 on the auto flush timer base.

      b) No timer output voltage.

      TEST: Connect a voltmeter between TB1-64 and TB1-'N' and check for 24 VAC. If no voltage:

      NO Defective auto-fill timer.
      YES GO TO 3

3. Are the manual valves CLOSED? Ensure that the following valves are OPEN:
   - RO water supply
   - SDS inlet water (V-3)
   - Flow meter adjust valve (V-8)

   YES Normal operation. If no flow occurs, check valves.

Problem B: Solenoid valve fails to close.

1. When the auto fill timer displays **OFF**, the solenoid valve closes, and flow stops (listen for a click).

   NO Solenoid valve stuck OPEN.
   Toggle the auto fill switch to manual and release several times. This may clear an obstruction or free a sticky valve.
   - Valve sticks frequently – Replace.
   - Defective valve – Replace.
   - Incorrect timer setting - Refer to “Operations” chapter.

   YES Normal operation.

Problem C: Solenoid valve leaks when closed.

1. Remove QD line on V-3 with solenoid in CLOSED position. If flow continues after the hose has drained, cycle valve OPEN and CLOSED. Toggle the auto fill switch to manual and release several times. If valve still leaks, replace valve.
2. After replacement, perform step to verify proper operation of new valve.

NOTES:

Solution Delivery System
(SDS)

CHAPTER SIX:
DRAWINGS

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6.0 DRAWINGS

Illustration Notes:

1. Schematic W3T576950 is a three acid system representing all available components and is provided for reference only. Not all components shown will be present on all systems. Specific schematics are provided with each device. Schematic W3T576954 is for single-acid systems. Not all components shown will be present on all systems.
2. This manual includes drawings that cover all components and configurations available. Some drawings may not be applicable to your unit. Systems are shown with maximum configuration. Users system will depend on individual order.

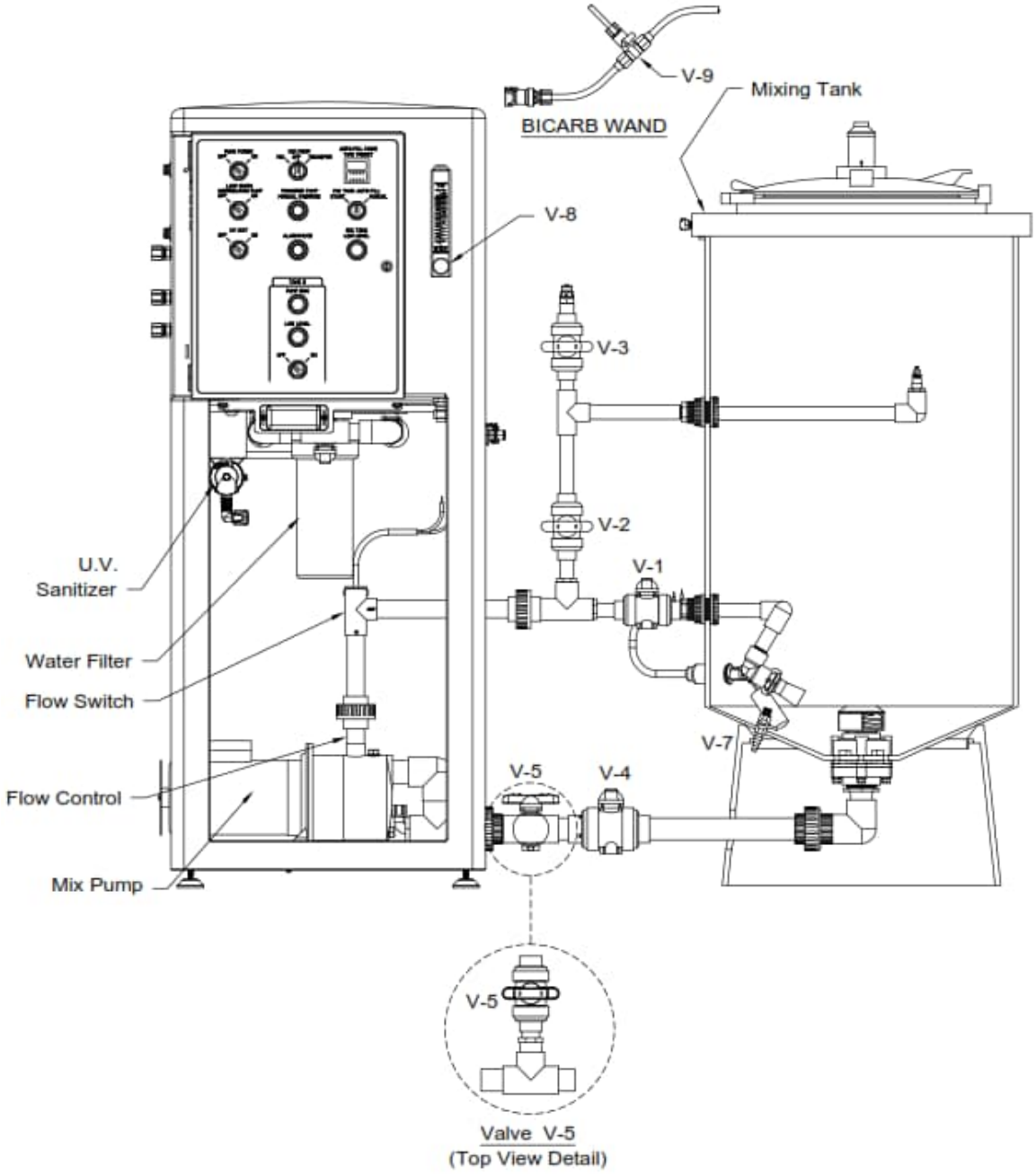


Illustration 6.1: SDS Frame and Mix Tank with Valve Callouts

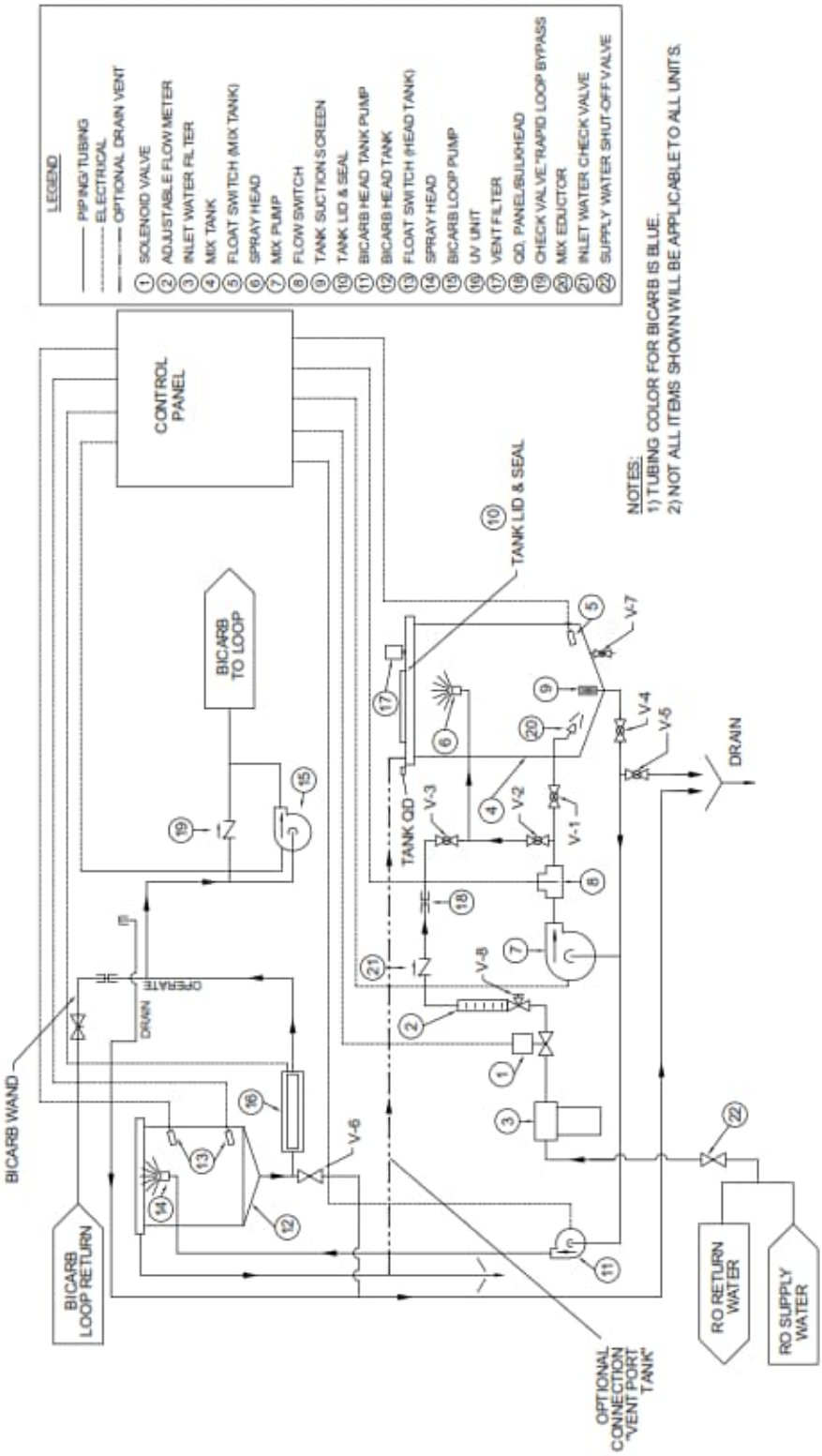


Illustration 6.2: SDS System Bicarb Process Diagram

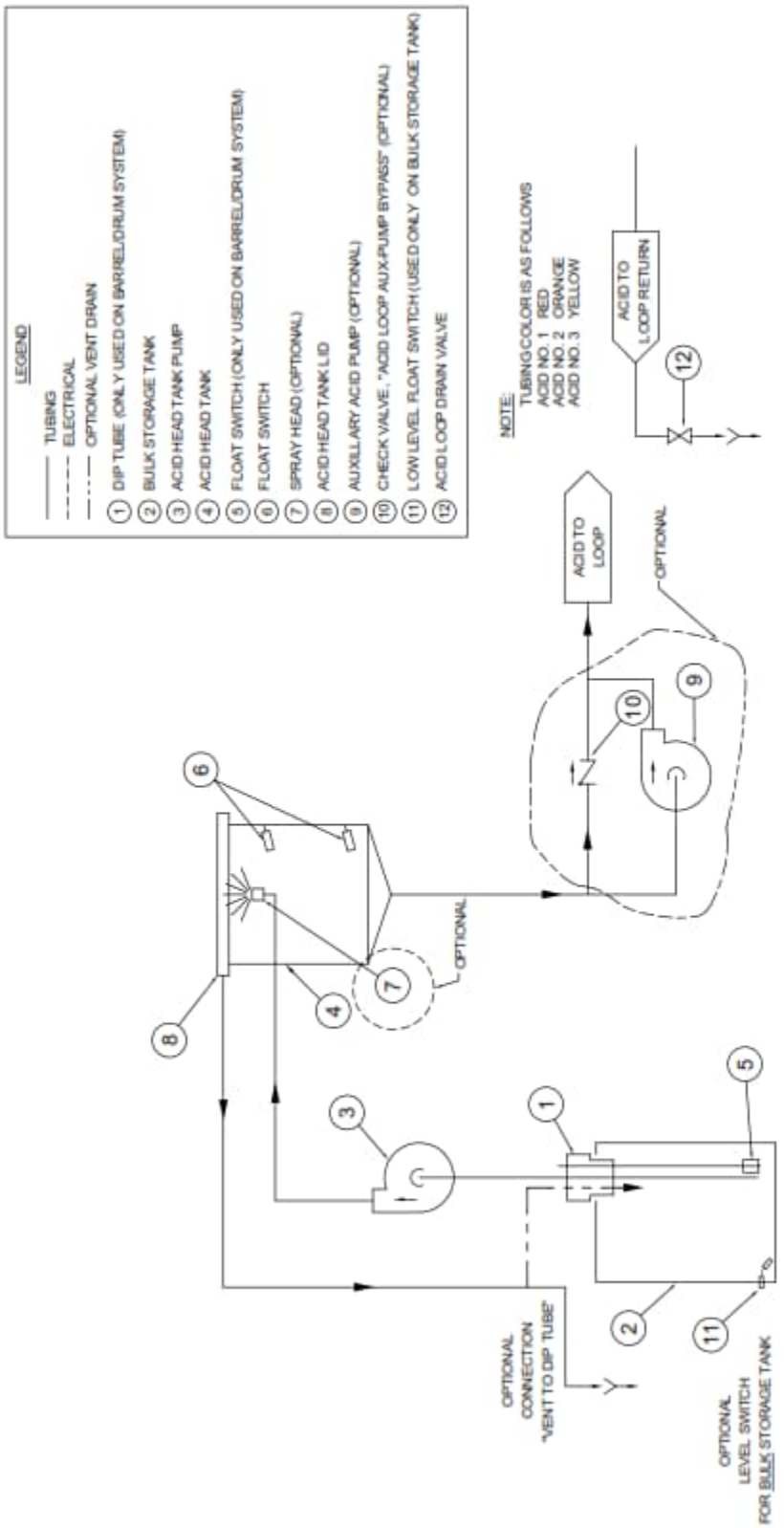
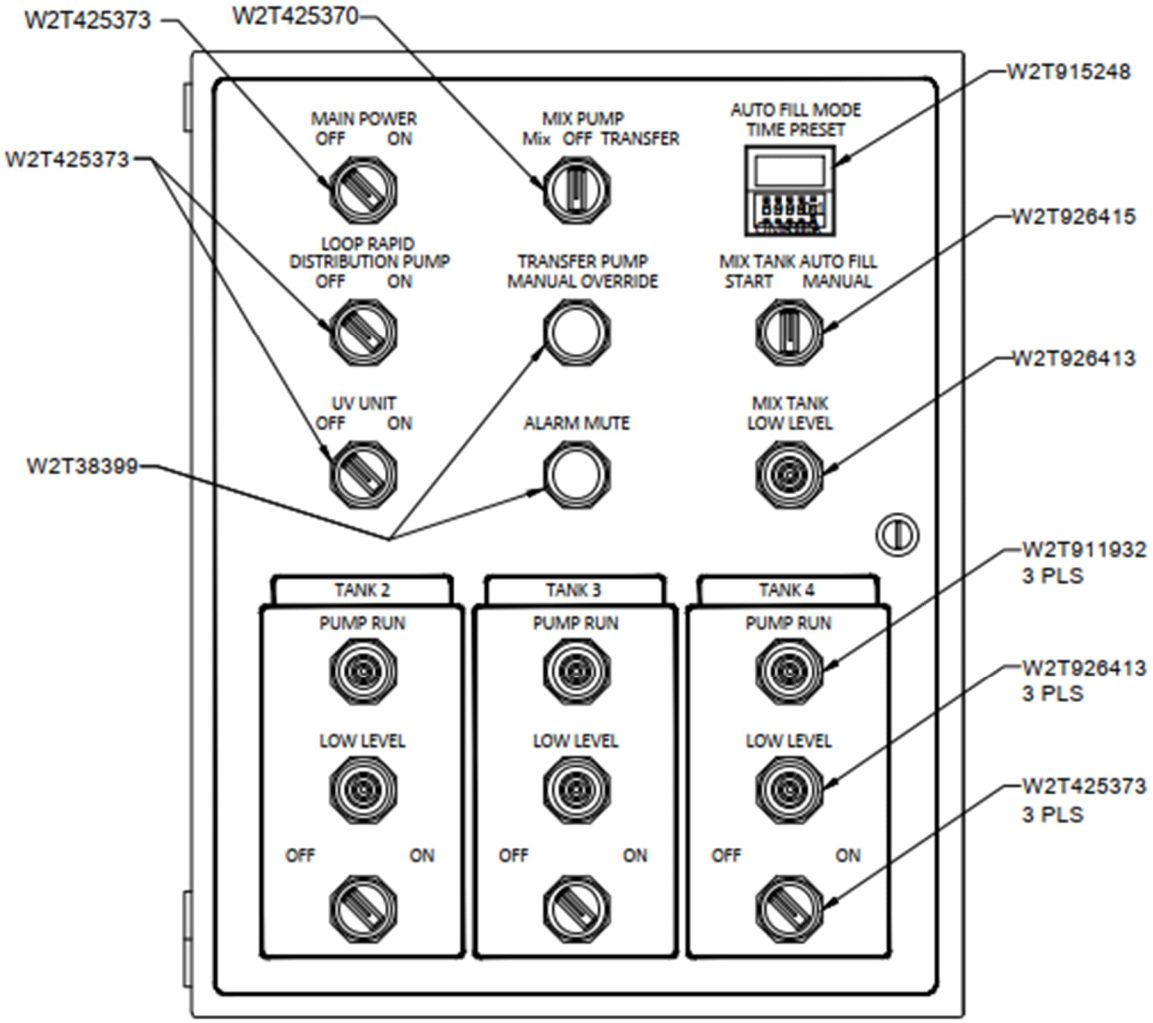
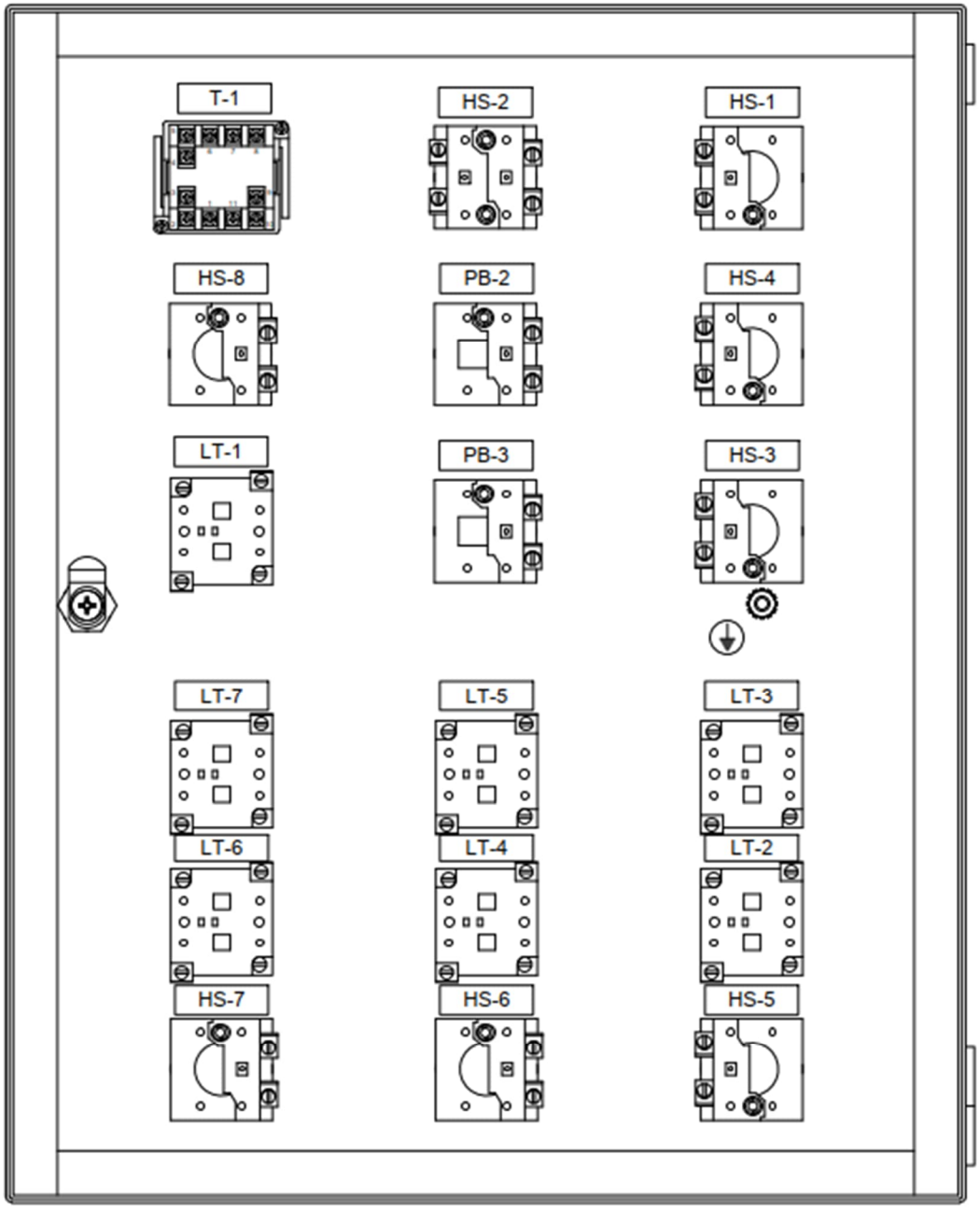


Illustration 6.3: SDS System Acid Process Diagram



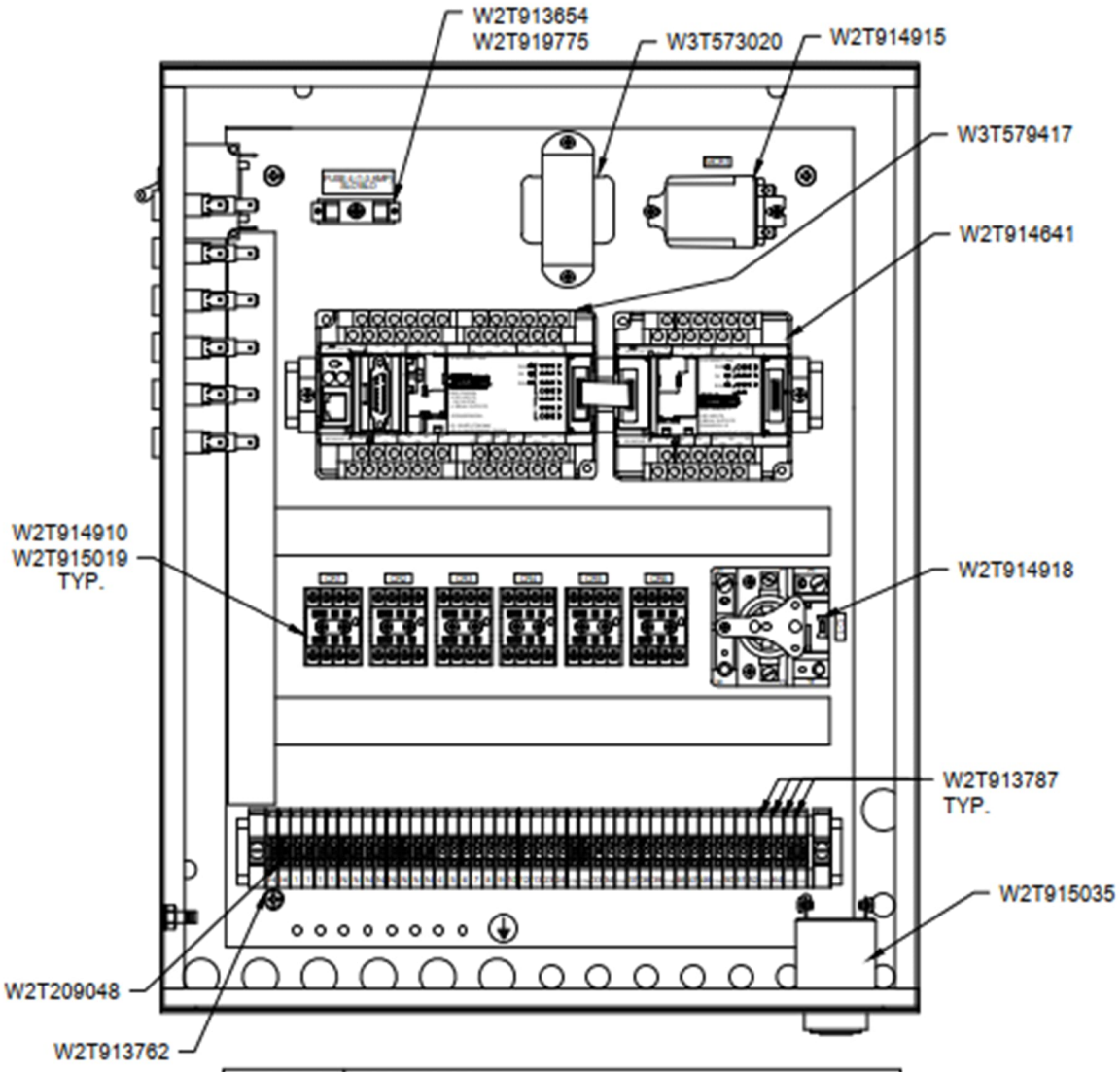
PART NO.	DESCRIPTION
W2T926306	Indicator Assy, Red, 24 Volt
W2T926307	Indicator Assy, Green, 24 Volt
W2T425373	Switch, 2 Position
W2T38399	Switch, Pushbutton
W2T425370	Switch, 3 Position
W2T915248	Timer Auto Refill
W2T926415	Switch, Momentary, 2 Position
W2T926413	Lamp, Red, 24 Volt
W2T911932	Lamp, Green, 24 Volt

Illustration 6.4: SDS Controller Door



PART NO.	DESCRIPTION
W2T234192	Timer Relay Socket, Back Mount
W2T919720	Timer Mounting Adapter

Illustration 6.5: SDS Controller (Rear View)



PART NO.	DESCRIPTION
W3T579417	PLC,PROGRAMED,VERSAMAX
W2T914910	RELAY,24V,AC~COIL,10A,DPDT (Not Shown)
W2T914915	RELAY,DPDT,24VAC 20A
W2T919775	FUSE BLOCK,SOLDER CONNECT (FUSE 4)
W2T915035	SONALERT,24V,PNL MNT,PULS
W2T914641	PLC,VERSAMAX EXP UNIT
W2T914918	RELAY,SPST,24VAC,30A
W3T573020	TRANSFORMER, 110/24 VAC
W2T913654	FUSE,1AMP,250V,TD (Fuse 4)
W2T915019	SOCKET,RELAY,8 PIN,SMALL
W2T913787	TERMINAL,SNGL,DIN,600V,30A,BLU
W2T209048	JUMPER,10P,AB
W2T913762	TERMINAL,END COVER,TAN

Illustration 6.6: SDS Electrical Controller Components

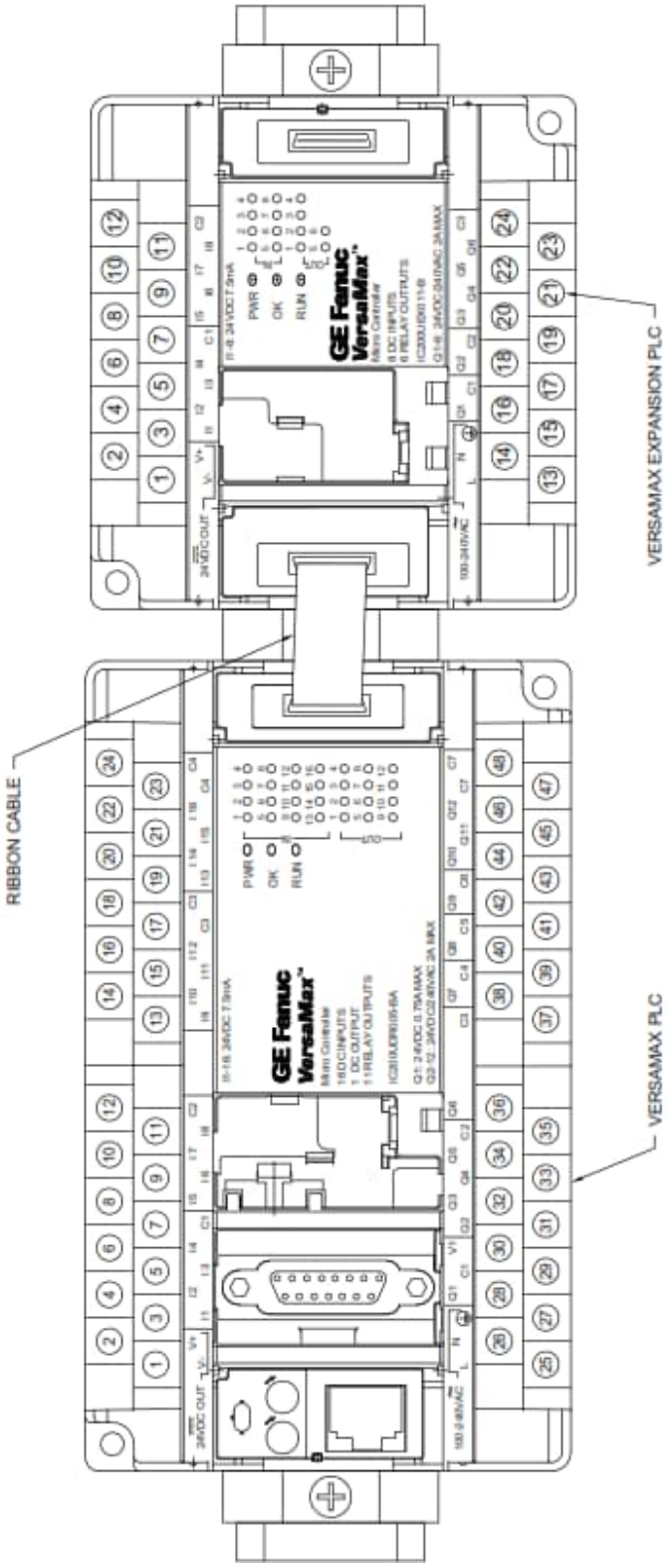


Illustration 6.7: GE VersaMax PLC

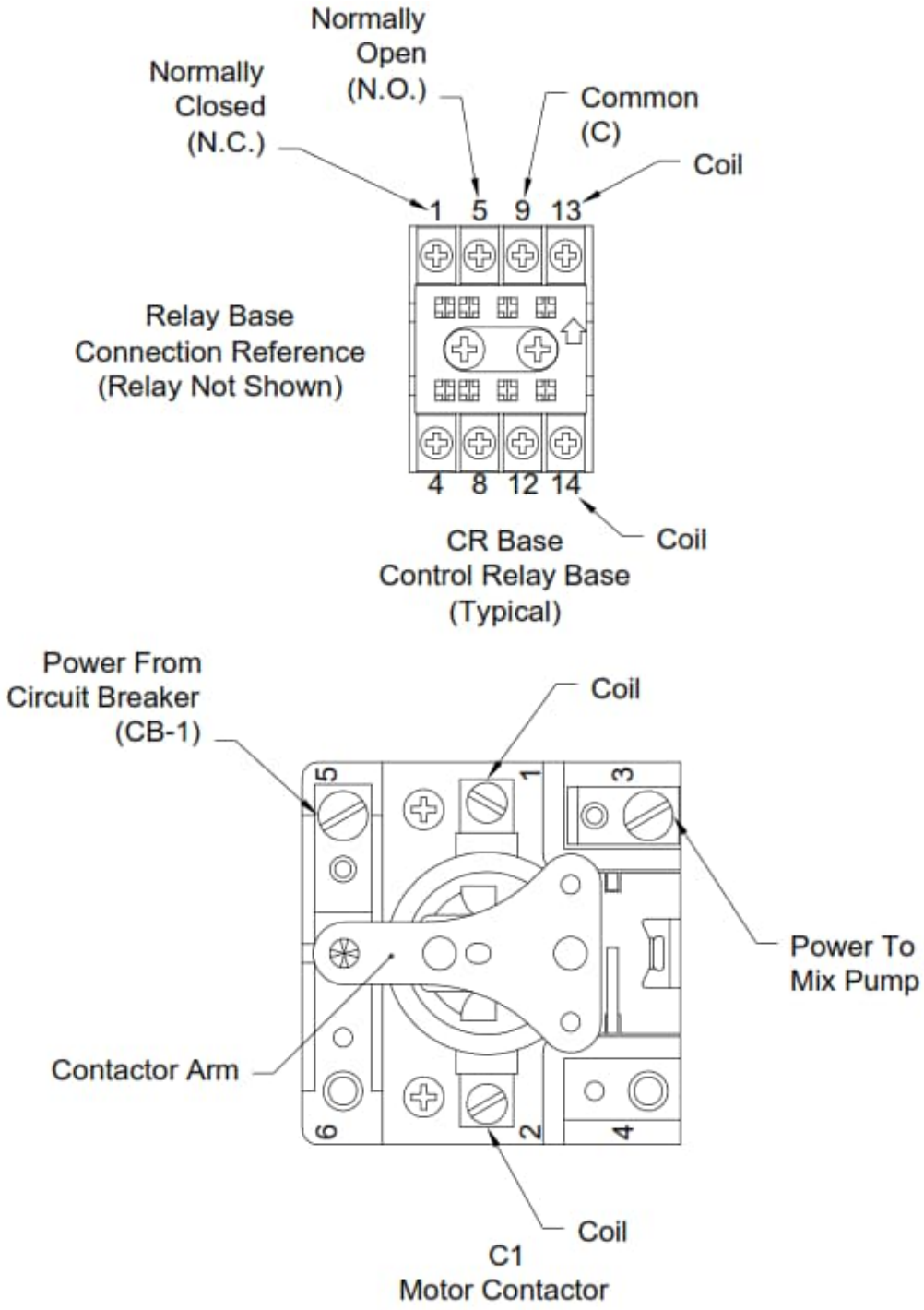


Illustration 6.8: Electrical Components (Control Relay and Motor Contactor)

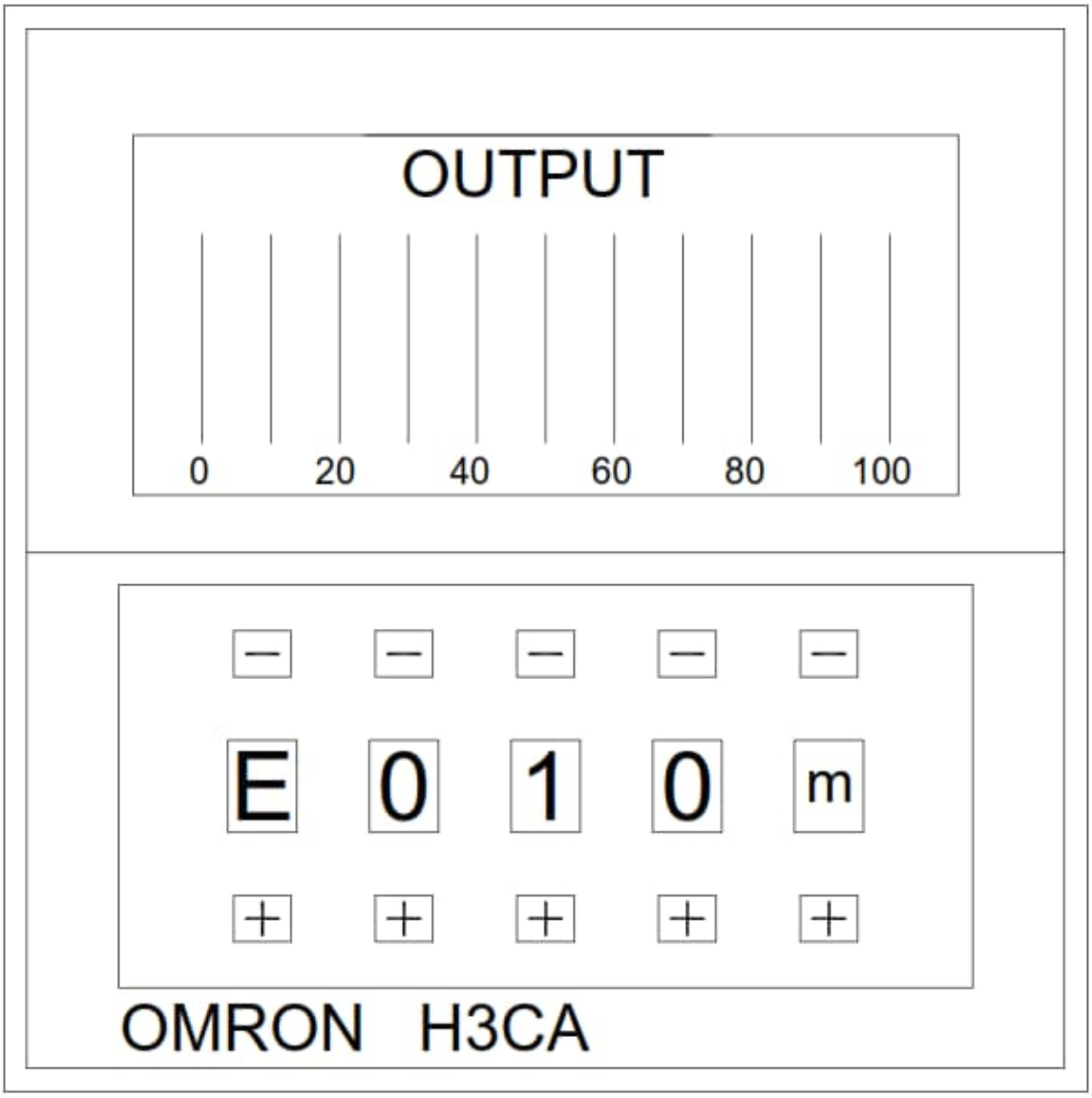
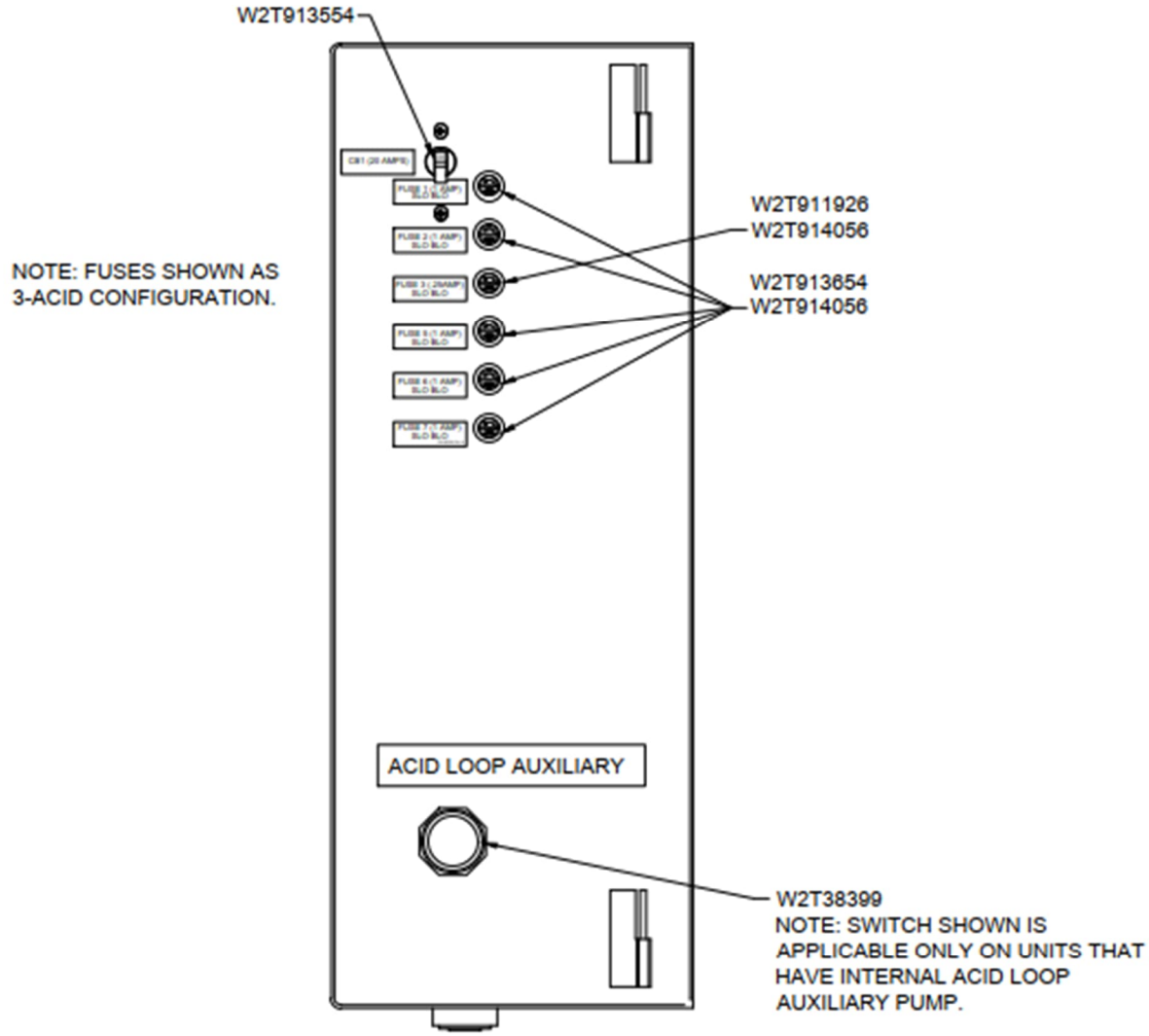


Illustration 6.9: Electrical Component (Auto Fill Timer)



PART NO.	DESCRIPTION
W2T38399	Switch, Momentary
W2T913654	Fuse, 1 Amp, 250V, Time Delay, MDL (Not Shown)
W2T914056	Fuse Holder
W2T913554	Circuit Breaker, 20 Amp
W2T911926	FUSE,1/4AMP,MDL (SLO BLO)

Illustration 6.10: SDS Controller (Left Side View)

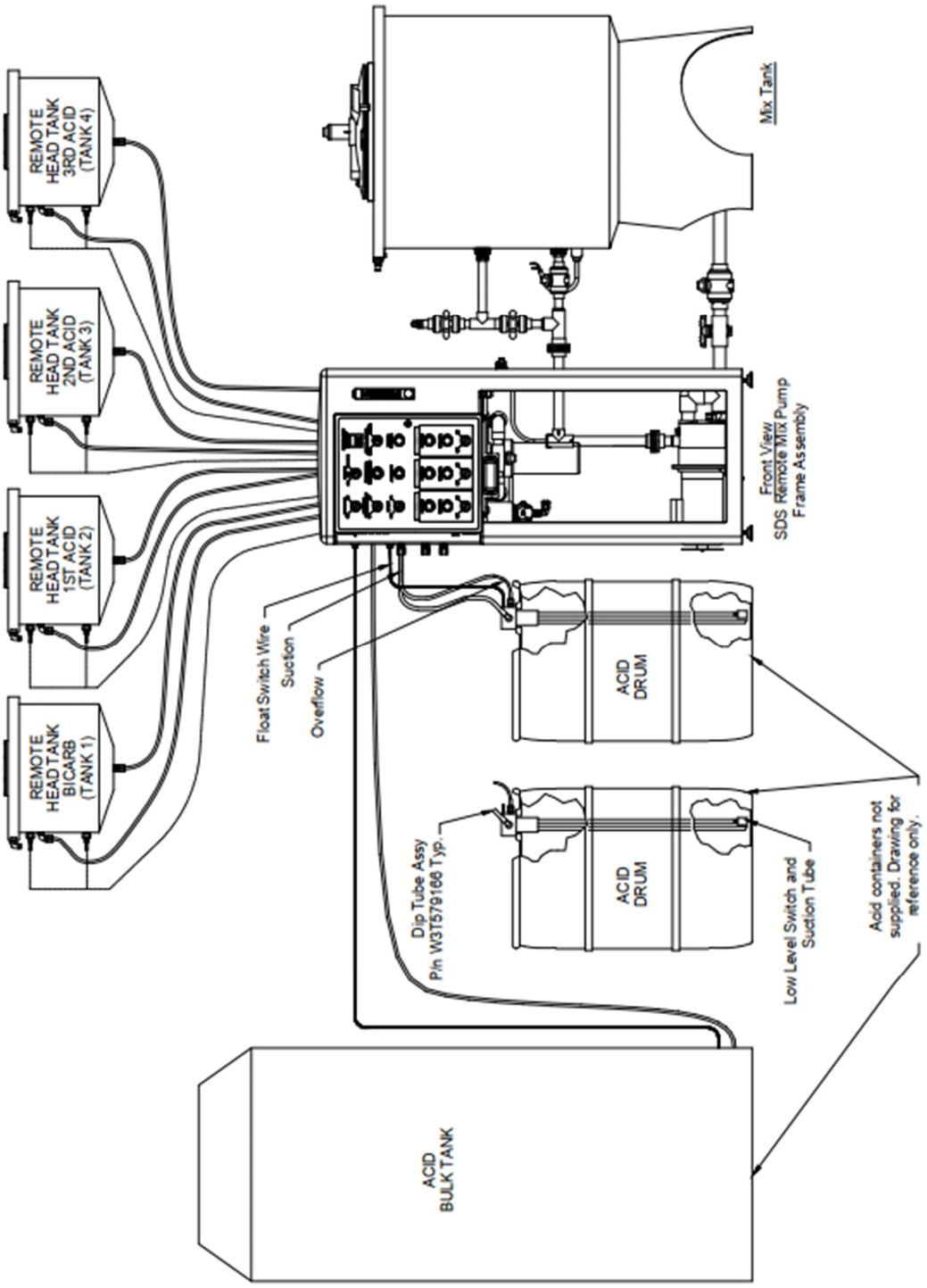


Illustration 6.11: SDS Remote System

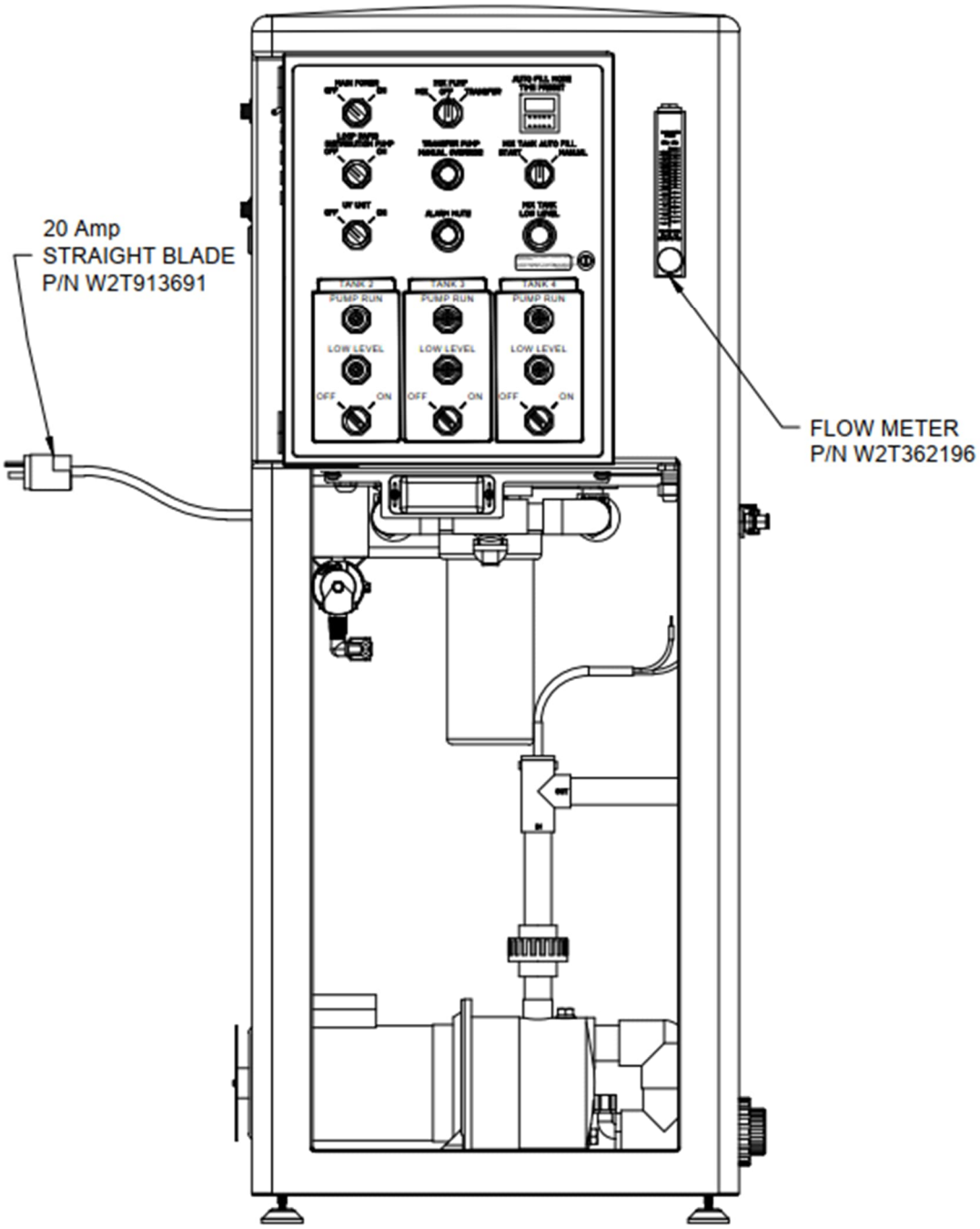


Illustration 6.12: SDS Frame (Front View)
(Three Acid Controller Shown)

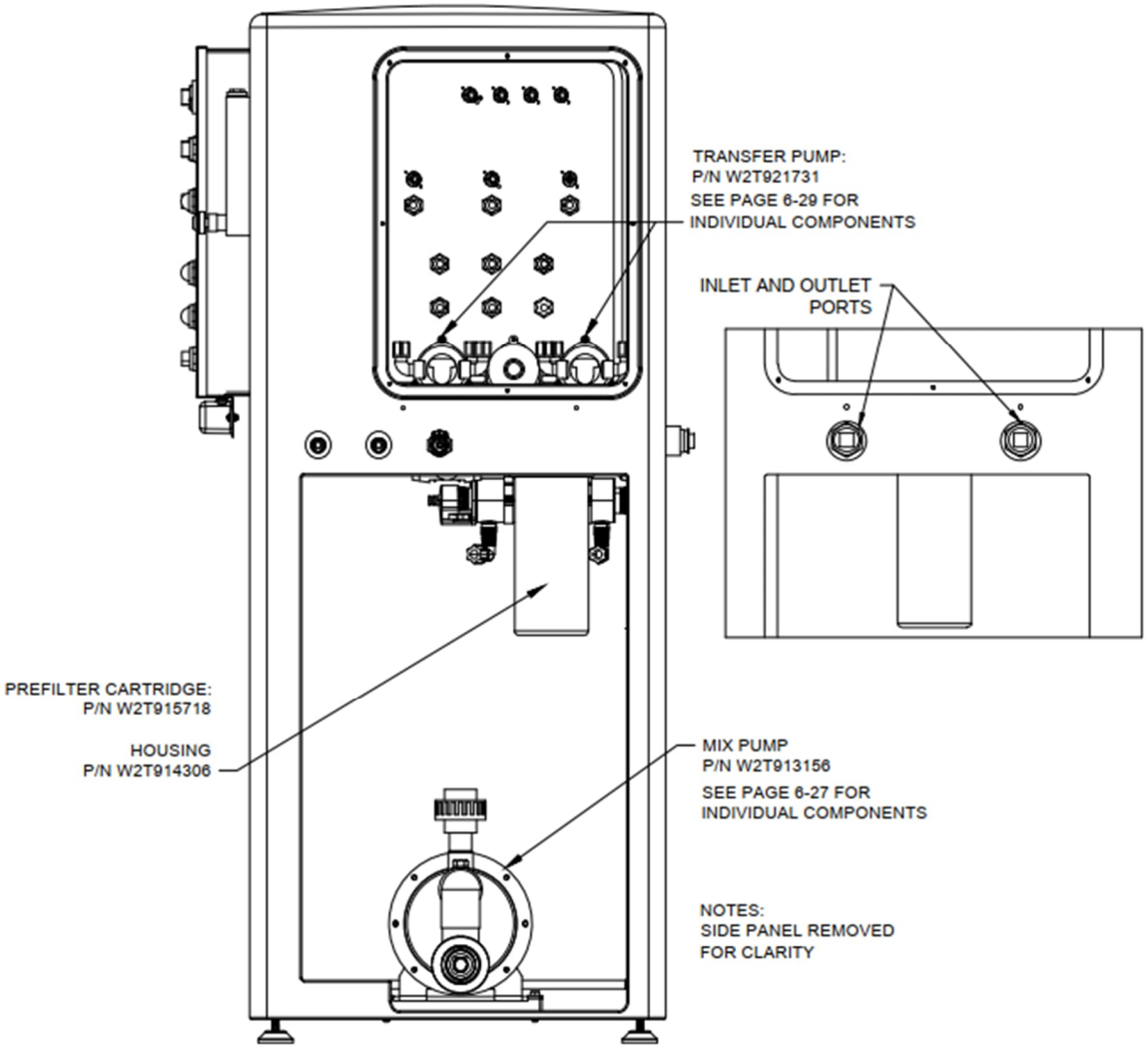


Illustration 6.13: SDS Frame (Right Side View)

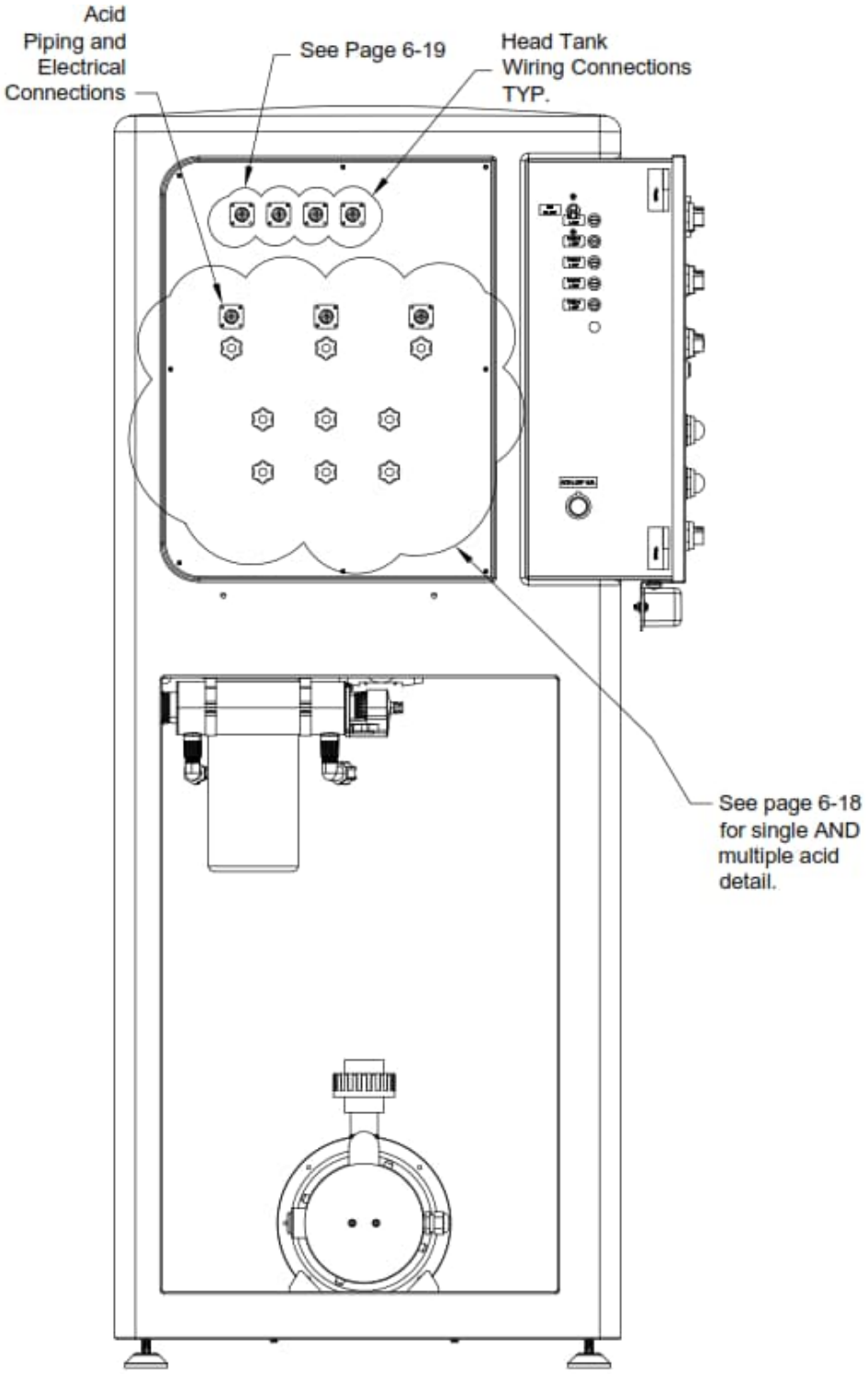
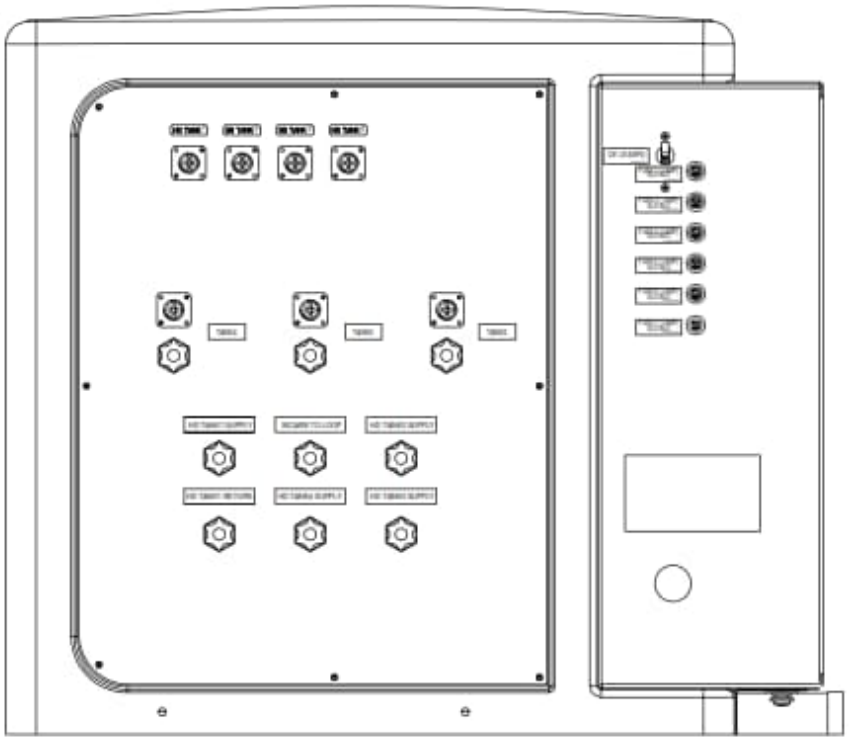


Illustration 6.14: SDS Frame (Left Side View)
(Three Acid Controller Configuration)

"Three-Acid" Assembly
(Left Side View)



"Single-Acid" W/ Aux.
Acid Loop Pump, Push
Button Switch
(Left Side View)

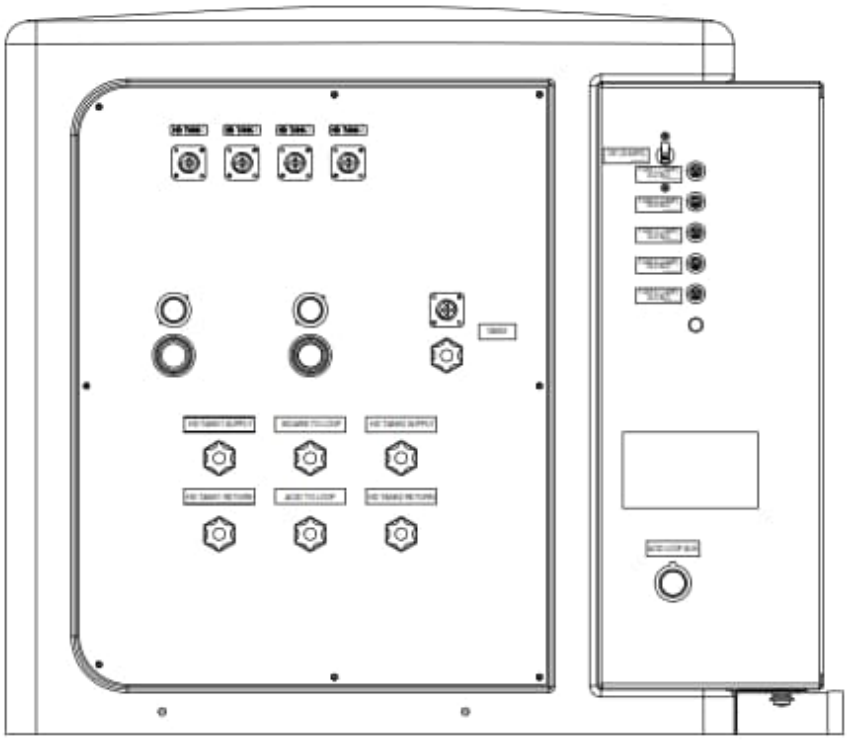


Illustration 6.15: SDS Tube Connections

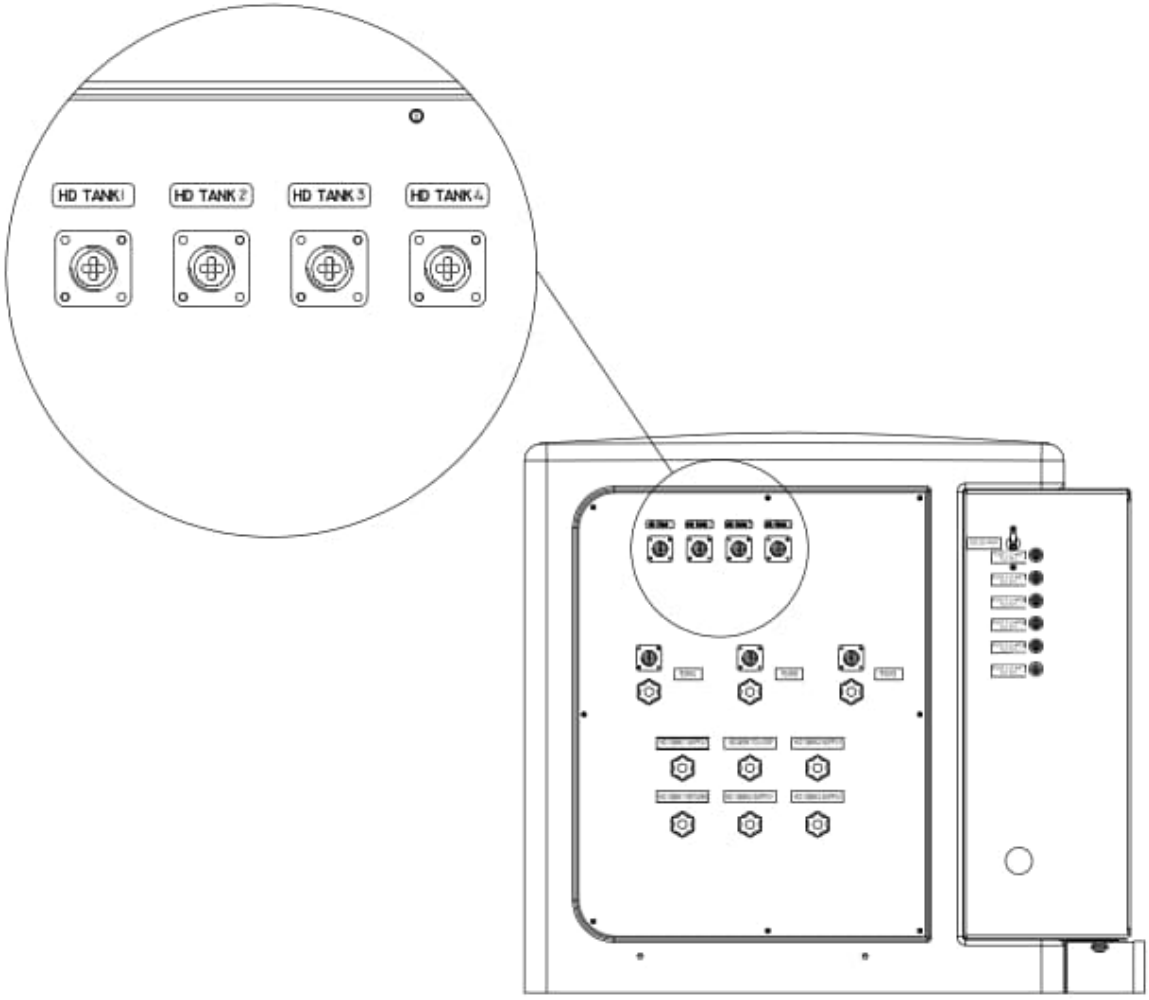
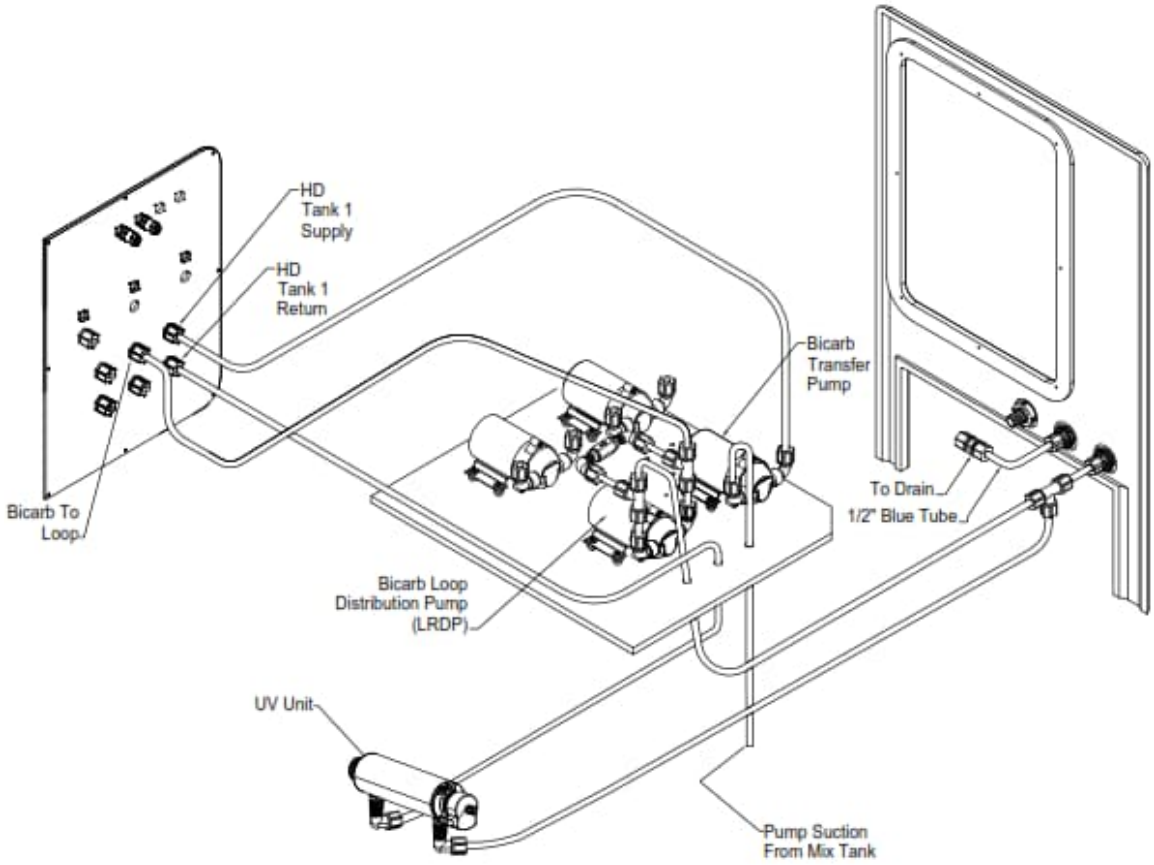
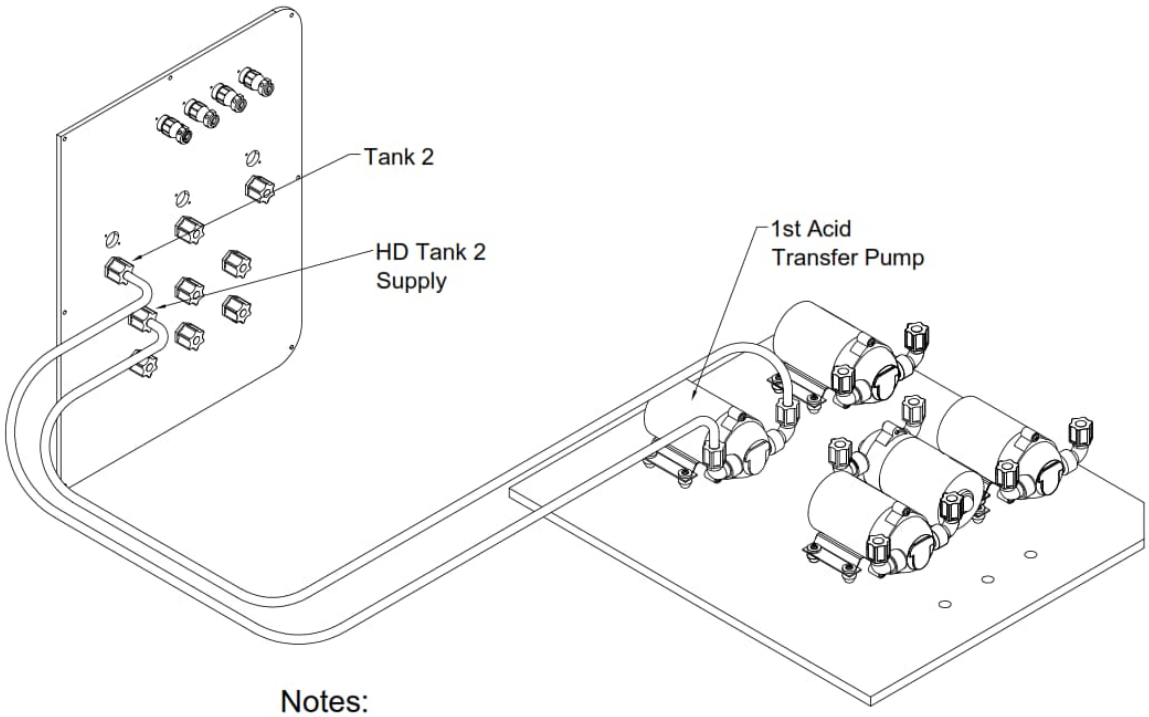


Illustration 6.16: SDS Head Tank Wiring Connections



1) Additional items shown for reference only.
2) Bicarb Configuration Valid for all SDS Units.

Illustration 6.17: SDS Bicarb Head Tank and Loop Tubing (Bicarb Tubing is 1/2″ Blue)



Notes:

1) Additional items shown for reference only.

Illustration 6.18: SDS 1st Acid Head Tank Tubing
(Acid #1 Tubing is 1/2″ Red)

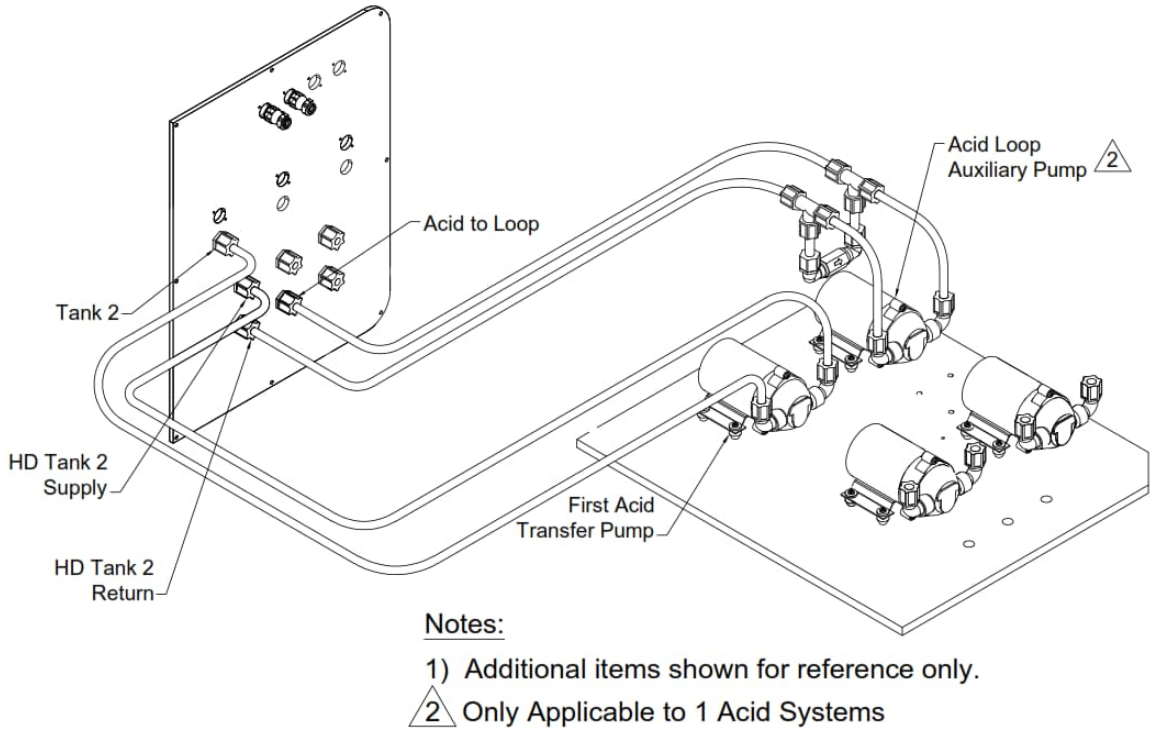
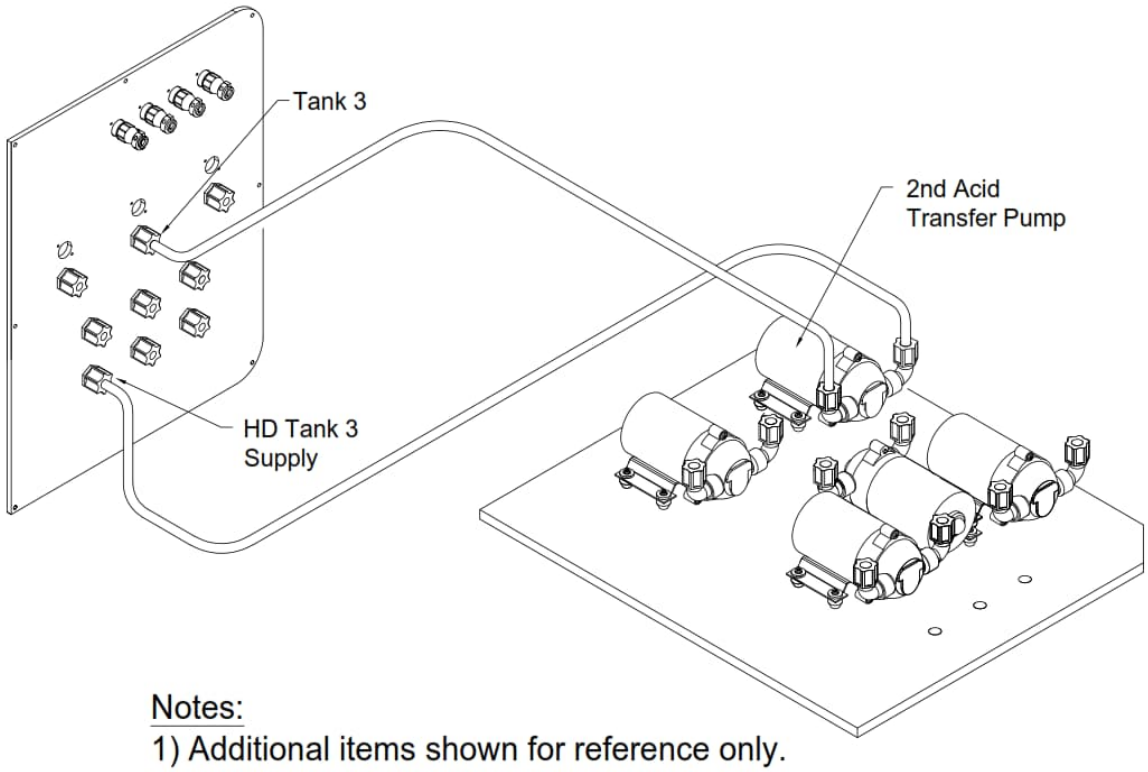


Illustration 6.19: SDS 1st Acid Tank Tubing with Auxiliary Acid Pump (Acid #1 Tubing is 1/2″ Red)



Notes:
1) Additional items shown for reference only.

Illustration 6.20: SDS 2nd Acid Pump Tubing
(Acid #2 Tubing is 1/2″ Orange)

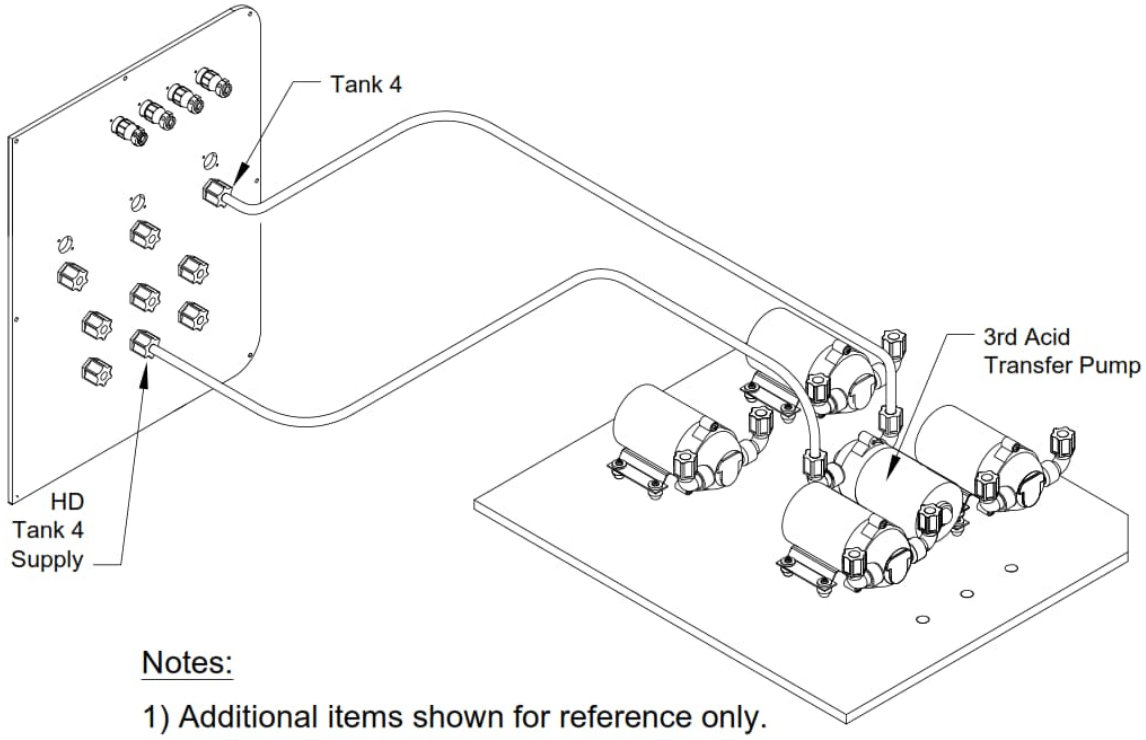
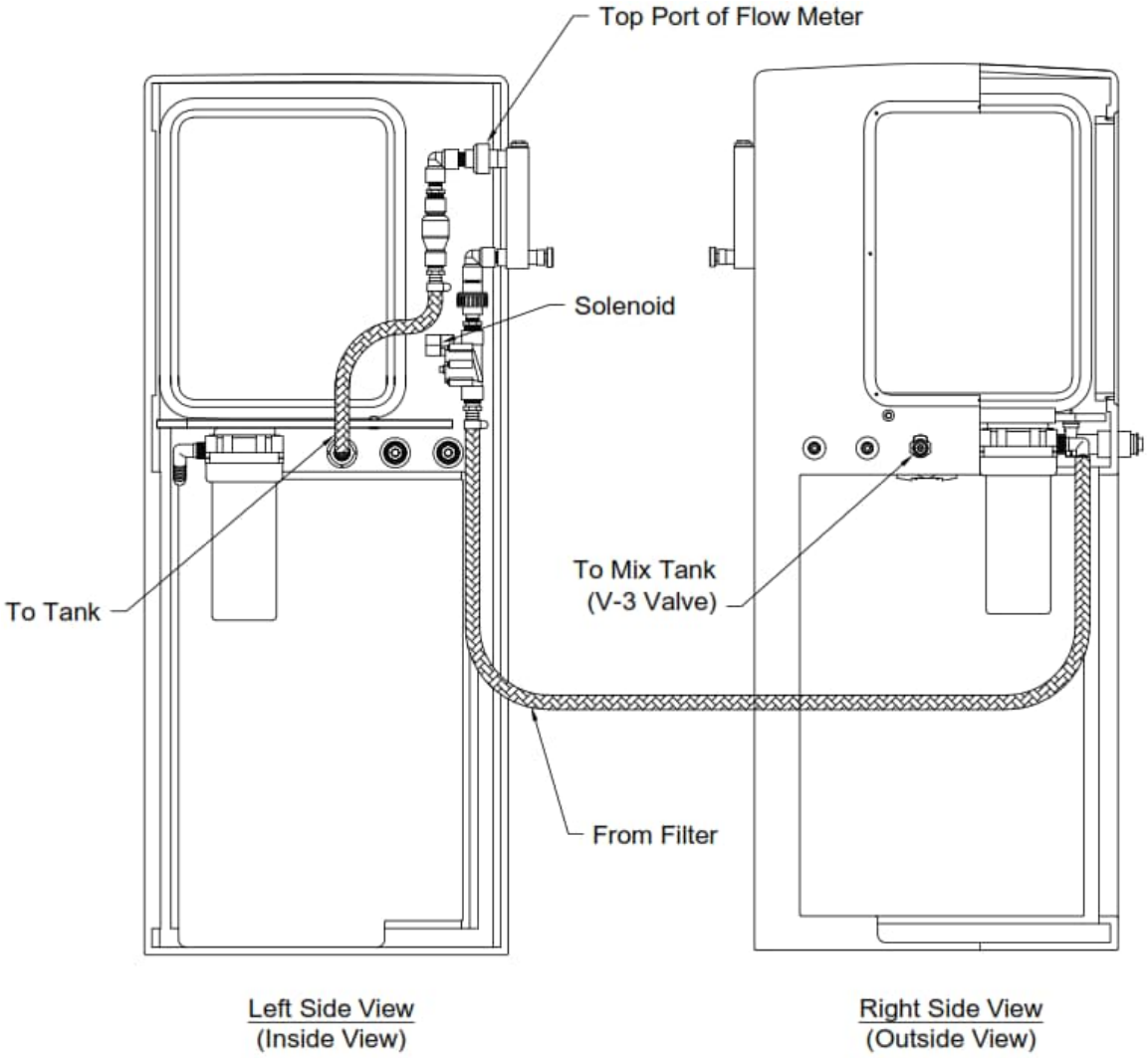


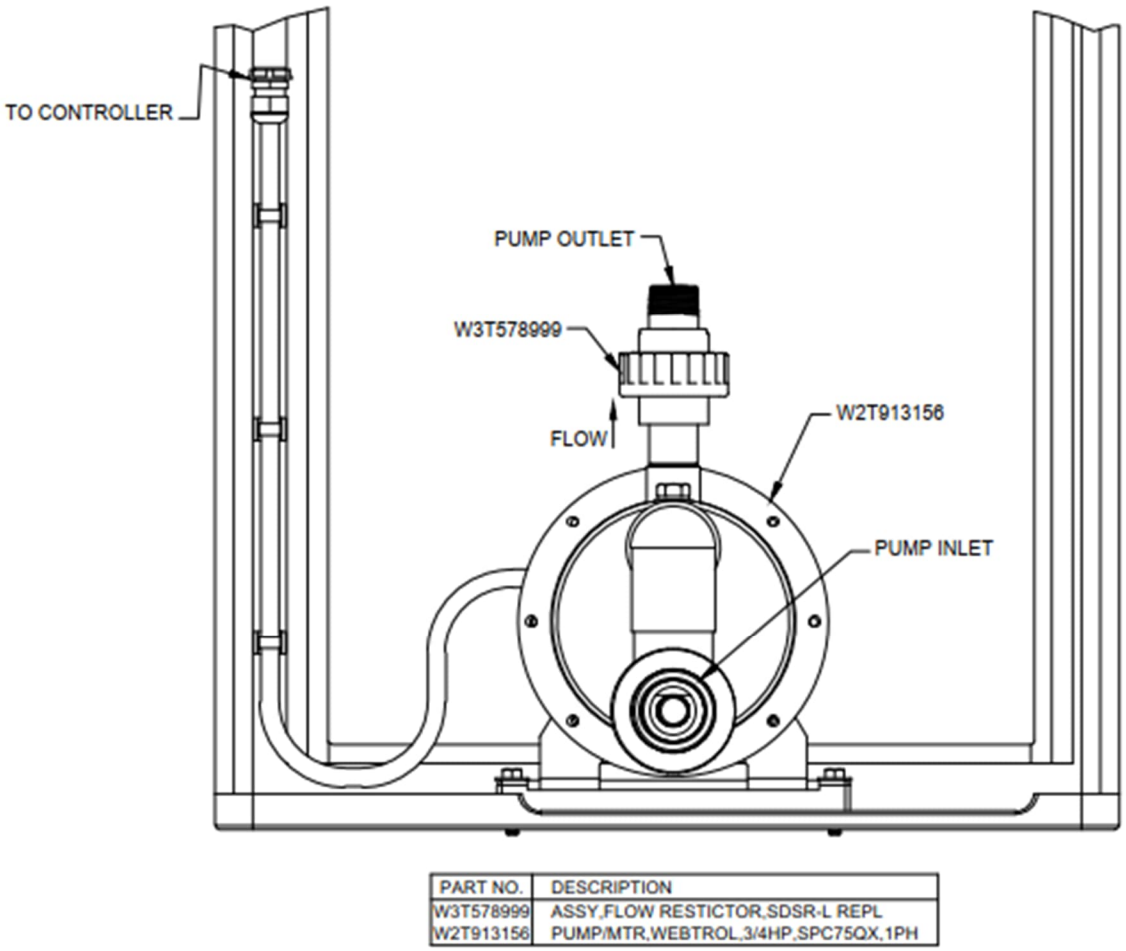
Illustration 6.21: SDS 3rd Acid Head Tank Pump Tubing
(Acid #3 Tubing is 1/2″ Yellow)



NOTE:

1) Some Items Have Been Removed for Clarity.

Illustration 6.22: SDS Braided Hose Connections (Braided Hose is ¾″)



PART NO.	DESCRIPTION
W3T578999	ASSY,FLOW RESTICTOR,SDSR-L REPL
W2T913156	PUMP/MTR,WEBTROL,3/4HP,SPC75QX,1PH

Illustration 6.23: SDS Mix Pump Replacement Parts

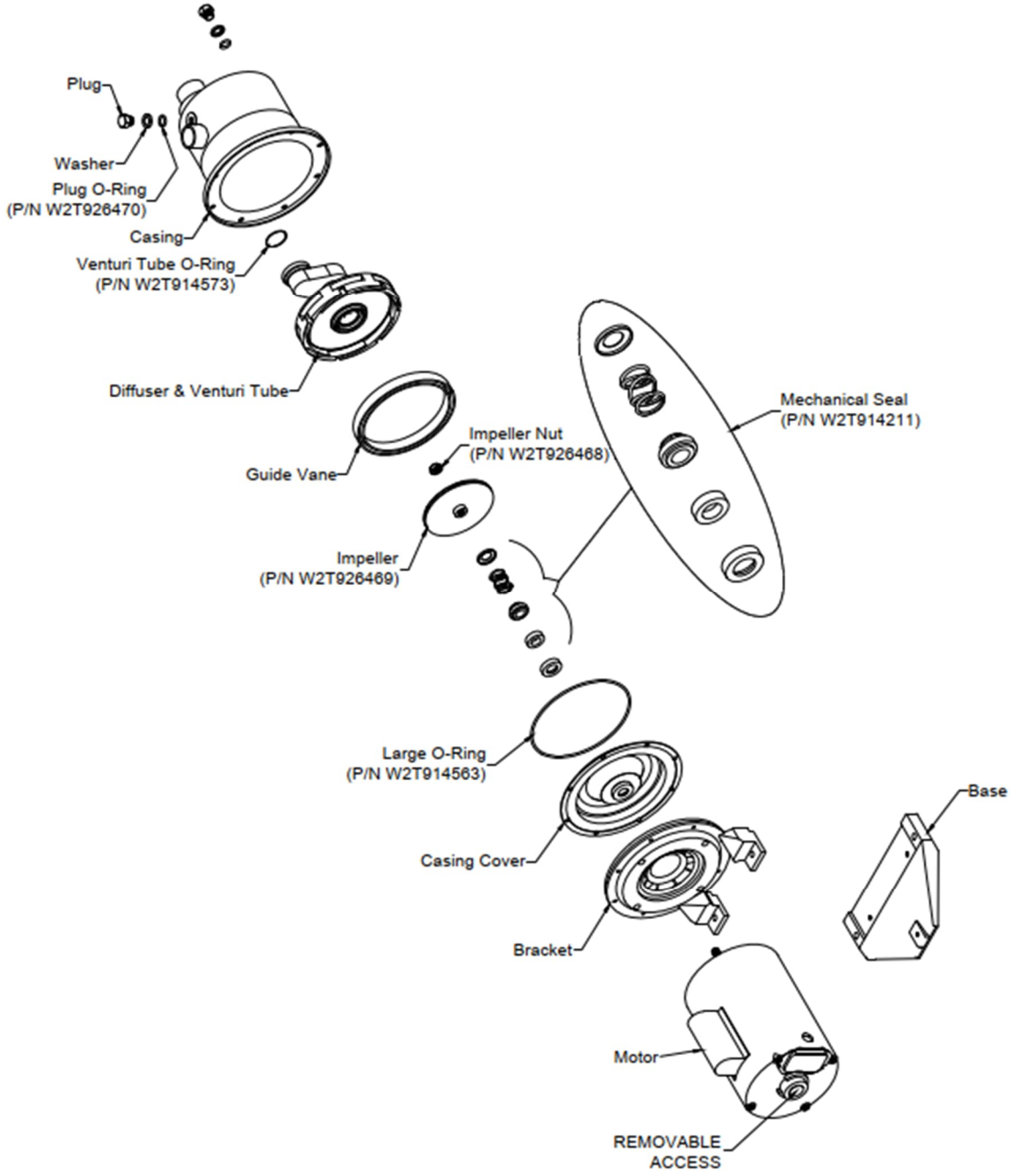
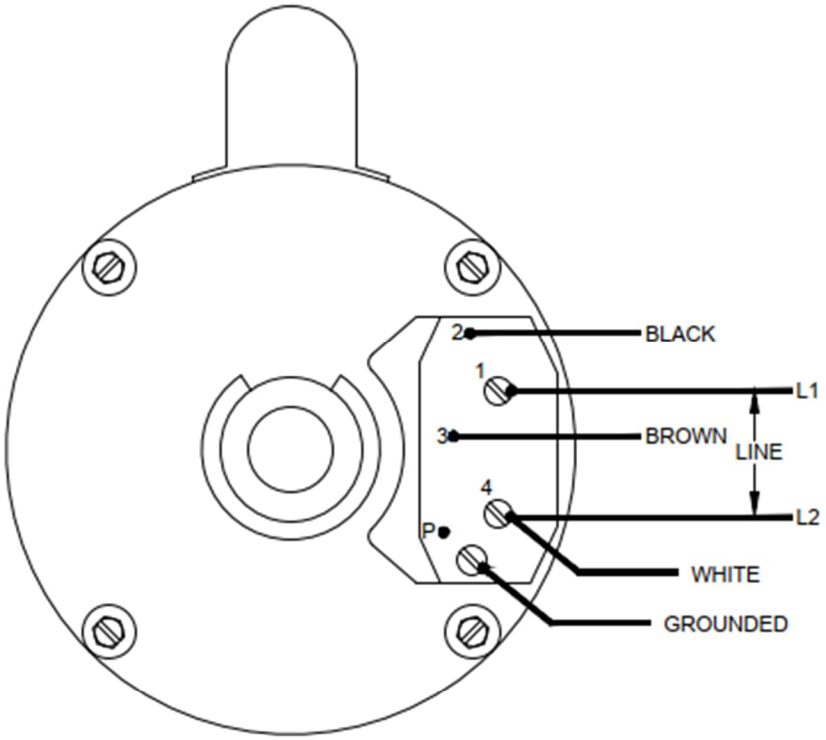


Illustration 6.24: SDS Pump/Motor Detail



115 VAC WIRING

NOTE:
1) REFERENCE ONLY, REFER TO THE MOTOR NAME PLATE DATA FOR CURRENT WIRING INSTRUCTIONS.

THE FOLLOWING ARE THE STEPS REQUIRED TO RECONFIGURE A REPLACEMENT MOTOR FROM 230 TO 115 VOLT OPERATION:

1) MOTOR CAN BE WIRED FOR 230 VOLT OR 115 VOLT OPERATION. THE SDS ELECTRICAL REQUIRES 115 VOLT CONFIGURATION.

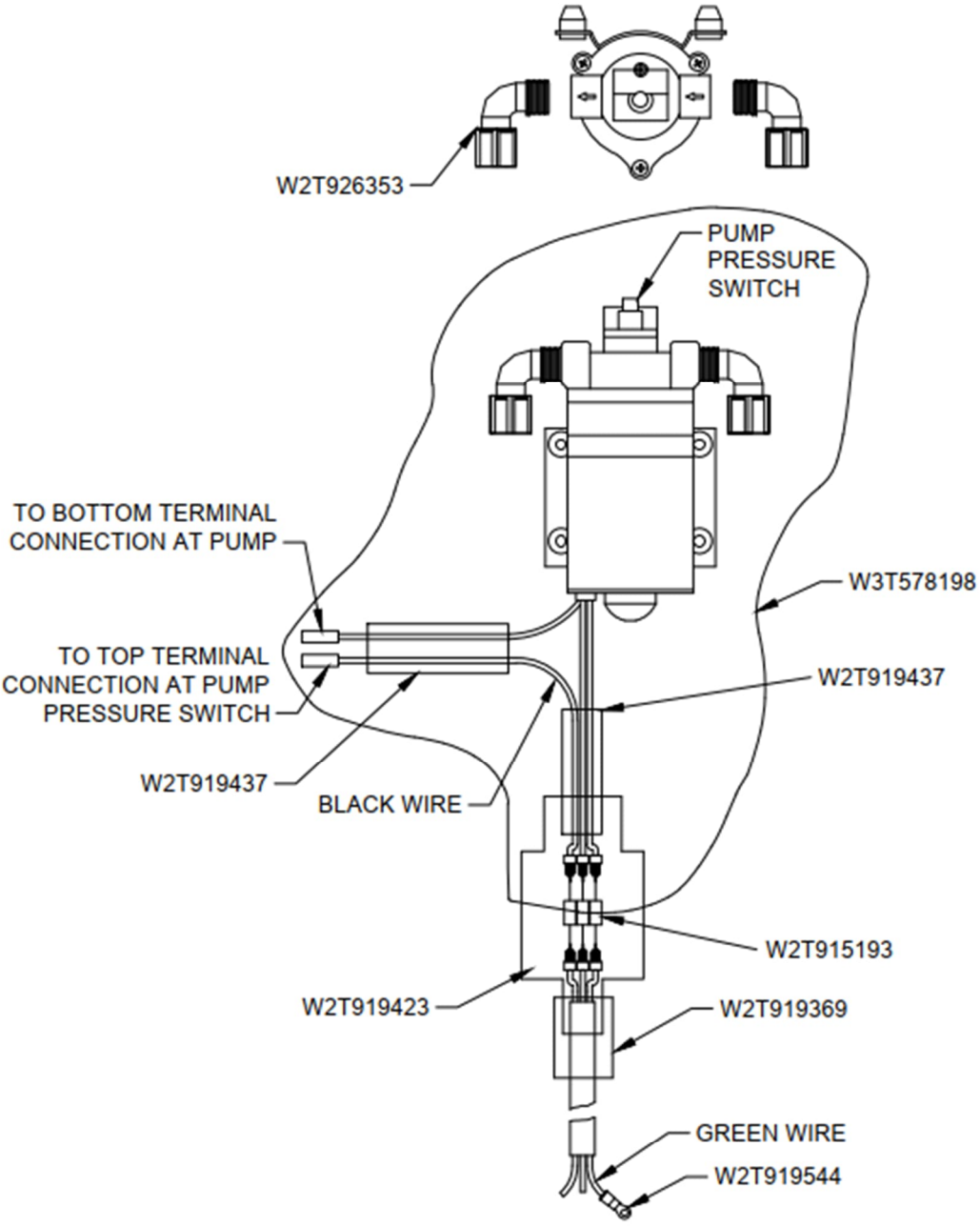
WARNING: DISCONNECT ELECTRICAL POWER PRIOR TO SERVICING.

2) REMOVE COVER. DISCONNECT BROWN WIRE FROM TERMINAL MARKED P, THE WHITE WIRE FROM TERMINAL MARKED 3, AND THE BLACK WIRE FROM TERMINAL 3.
3) RECONNECT WHITE WIRE TO TERMINAL MARKED 4.
4) RECONNECT BROWN WIRE TO TERMINAL MARKED 3.
5) RECONNECT BLACK WIRE TO TERMINAL MARKED 2.
6) CONNECT THE BLACK WIRE FROM 18-3 CORD (P/N W2T913166) TO TERMINAL 1. CONNECT THE WHITE WIRE TO TERMINAL 4, AND CONNECT THE GREEN WIRE TO THE GROUND SCREW.

WARNING: ROUTE WIRES AWAY FROM ROTATING CENTRIFUGAL SWITCH.

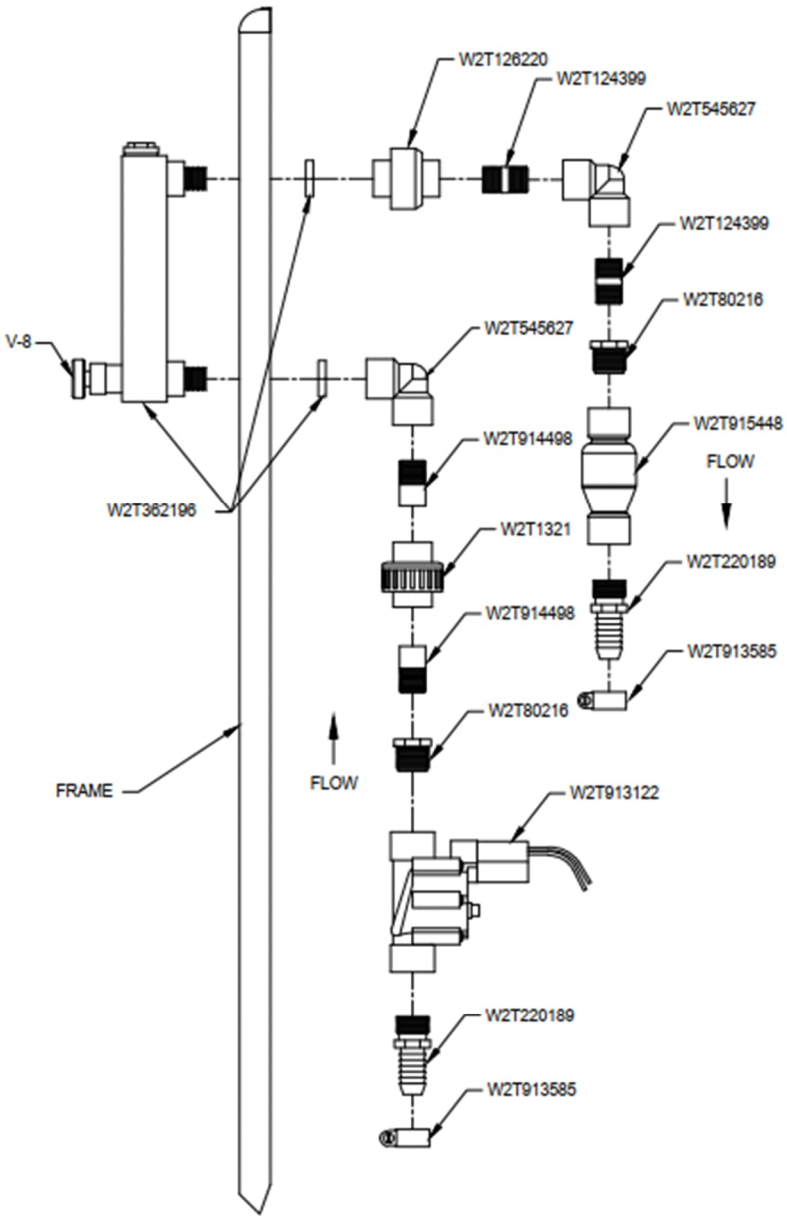
7) REPLACE COVER. REMOVE 230 VOLT STICKER FROM HOUSING. THIS WIRING IS FOR 115 VOLTS.

Illustration 6.25: SDS Pump Electrical Configuration
(Rear of Motor Shown Without Cover)



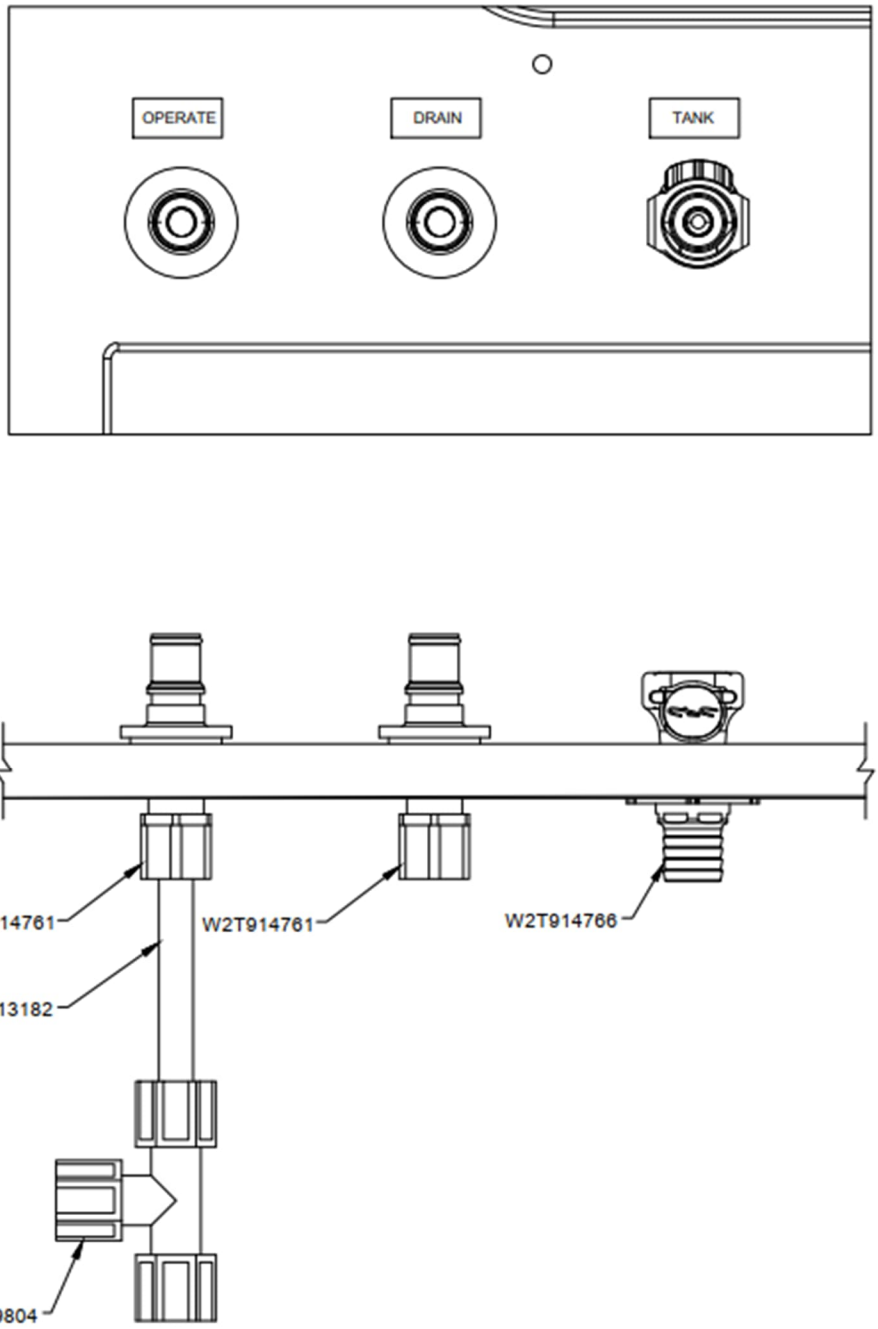
PART NO.	DESCRIPTION
W3T578198	KIT,PUMP REPLT,C,SDS,AT
W2T926353	ELBOW,PPL,MPTXTB,0.38X0.50
W2T919544	TERMINAL,RNG,14-16GA,#10
W2T915193	TERMINAL,BUTT SPLC,18-24GA,NO CRIMP
W2T919437	HEAT SHRINK,3/8,CLEAR
W2T919423	HEAT SHRINK,1",BLACK
W2T919369	HEAT SHRINK,1/2",BLK

Illustration 6.26: SDS Transfer Pump Replacement Parts



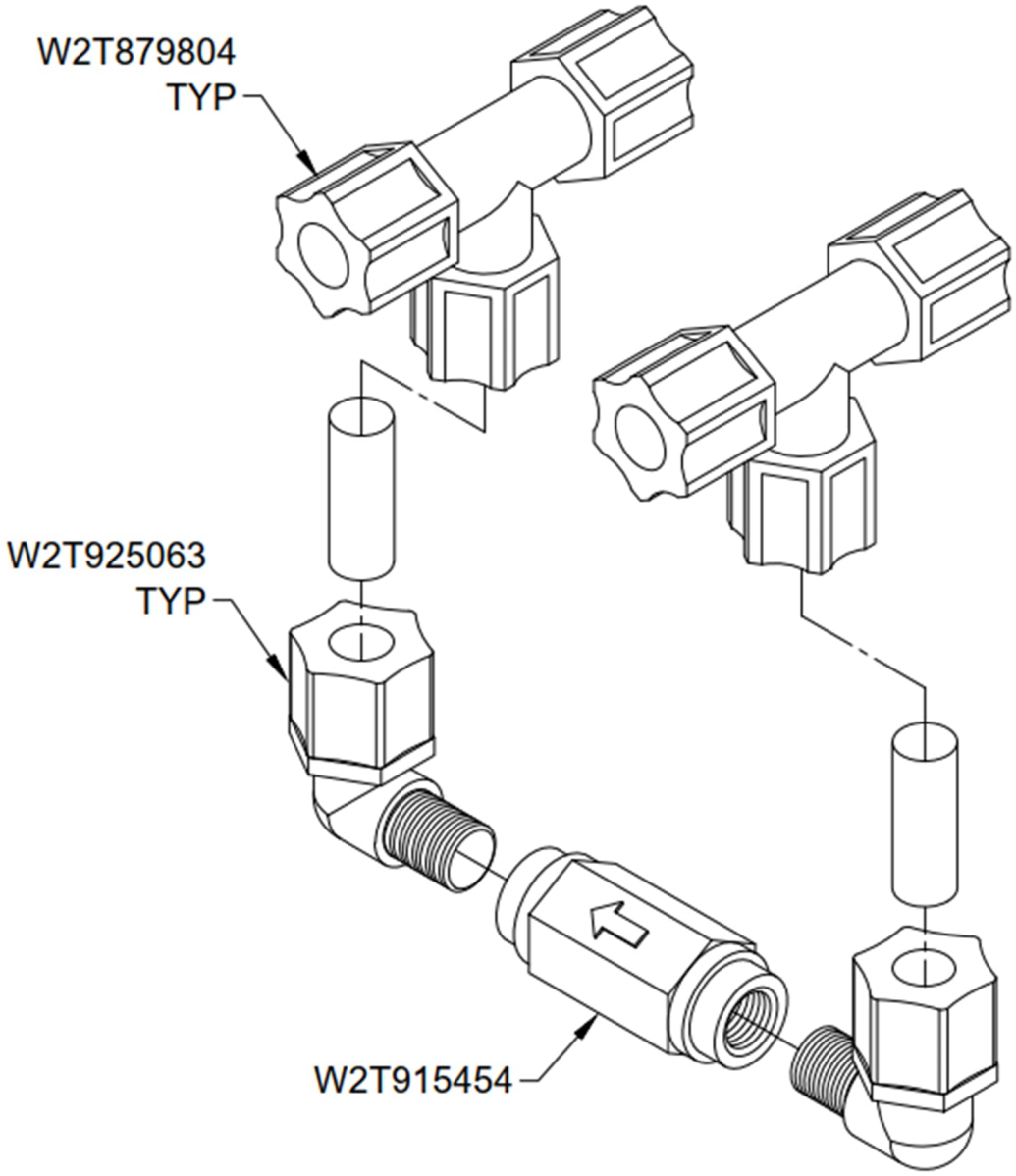
PART NO.	DESCRIPTION
W2T80216	BUSHING,RED,PVC,3/4TX1/2T
W2T126220	UNION,PVC80,1/2",FNPT,EPDM
W2T124399	NIPPLE,PVC,1/2XSHORT
W2T913122	VALVE,SOLENOID,PLST,RNBRD
W2T362196	METER,FLOW,SS,W/NEDL,5GPM
W2T915448	VALVE,CHECK,3/4FNPT,2#
W2T220189	STRAIGHT,3/4NPT X BARB
W2T913585	CLAMP,WORM GEAR,3/4" HOSE
W2T914498	NIPPLE,PVC,1/2X12,SCH80
W2T545627	ELBOW,PVC80,1/2",FNPT,SR
W2T1321	UNION,PVC,1/2 SXS,SCH 80

Illustration 6.27: SDS Flow Meter Panel Assembly



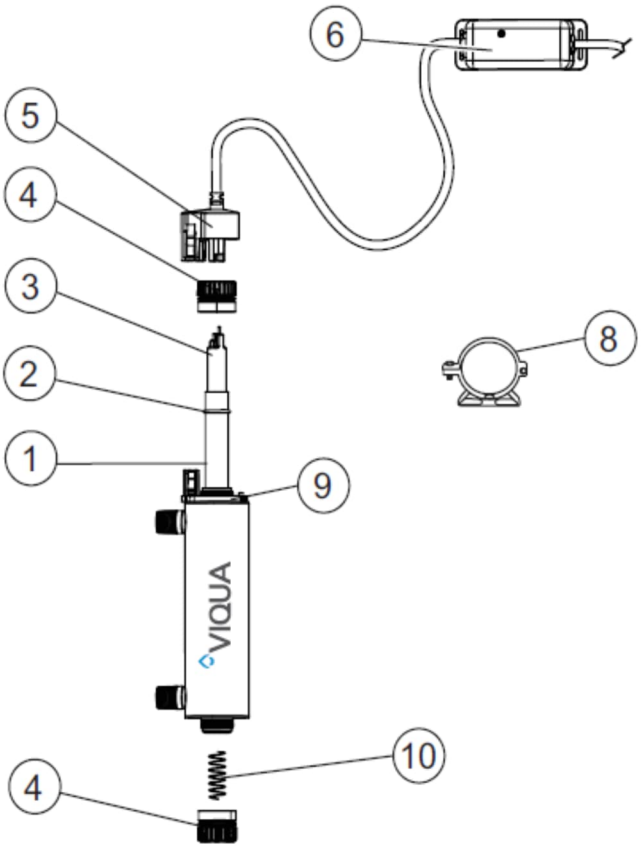
PART NO.	DESCRIPTION
W2T914766	QD,3/4 HOSEBARB,PNL MNT,FEMALE,W/CHK VLV
W2T914761	QD,1/2TUBE,PNL MNT,MALE,W/CHK VLV
W2T913182	TUBE,PE,1/2",BLUE
W2T879804	TEE,TBXTBXTB,PPL,0.50

Illustration 6.28: SDS Loop Manifold Assembly



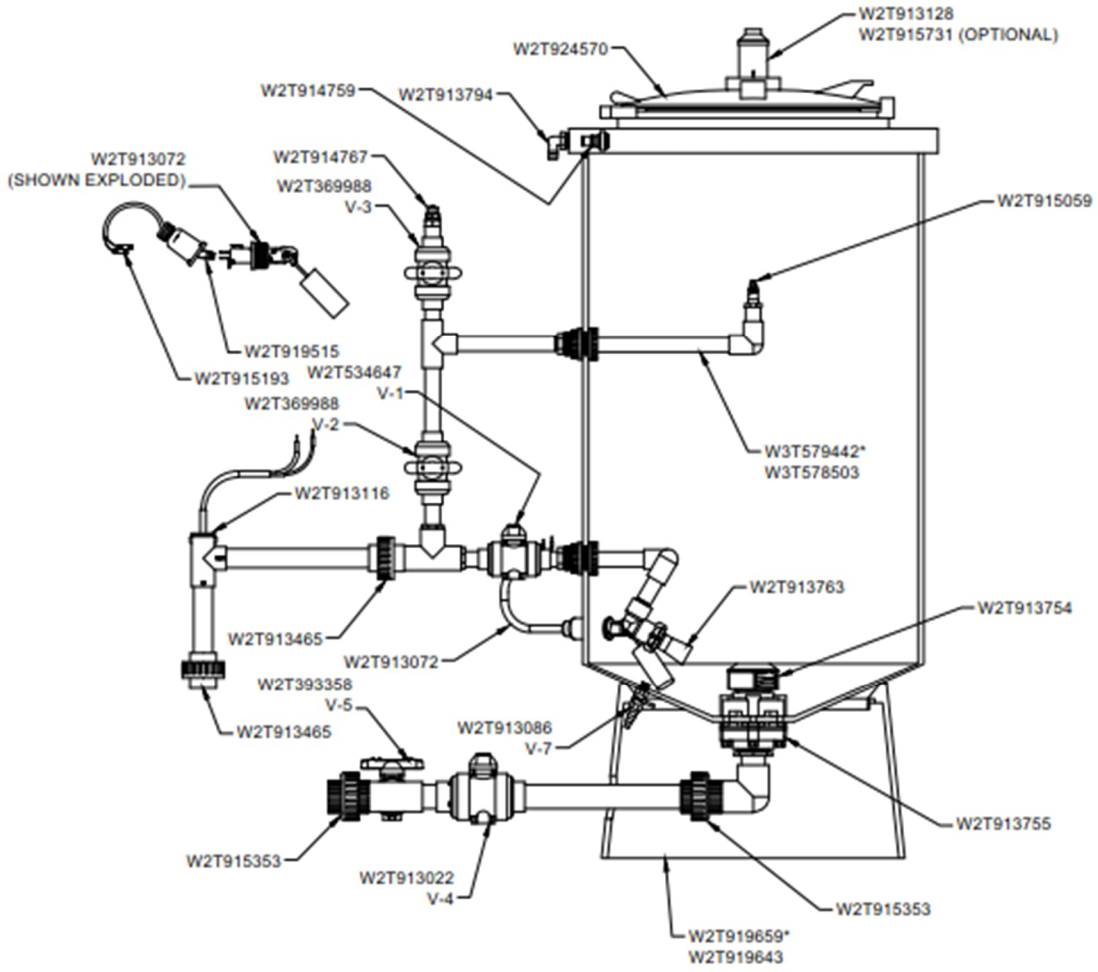
PART NO.	DESCRIPTION
W2T879804	TEE,TBXTBXTB,PPL,0.50
W2T925063	ELBOW,1/2TBX1/4MNPT,PP,JACO
W2T915454	VALVE,CHECK1/4FNPT,1#,WH

Illustration 6.29: SDS Loop Pump Bypass Check Valve Assembly



ITEM	DESCRIPTION	P/N
1	Quartz Sleeve	W2T501811
2	O-ring	--
3	Lamp	W2T180210
4	Retaining nut	--
5	Lamp connector	--
6	Controller	W2T906930
7	N/A	--
8	Mounting bracket	W2T924137
9	Lamp connector base	--
10	Spring	--

Illustration 6.30: SDS UV Lamp (Exploded View)



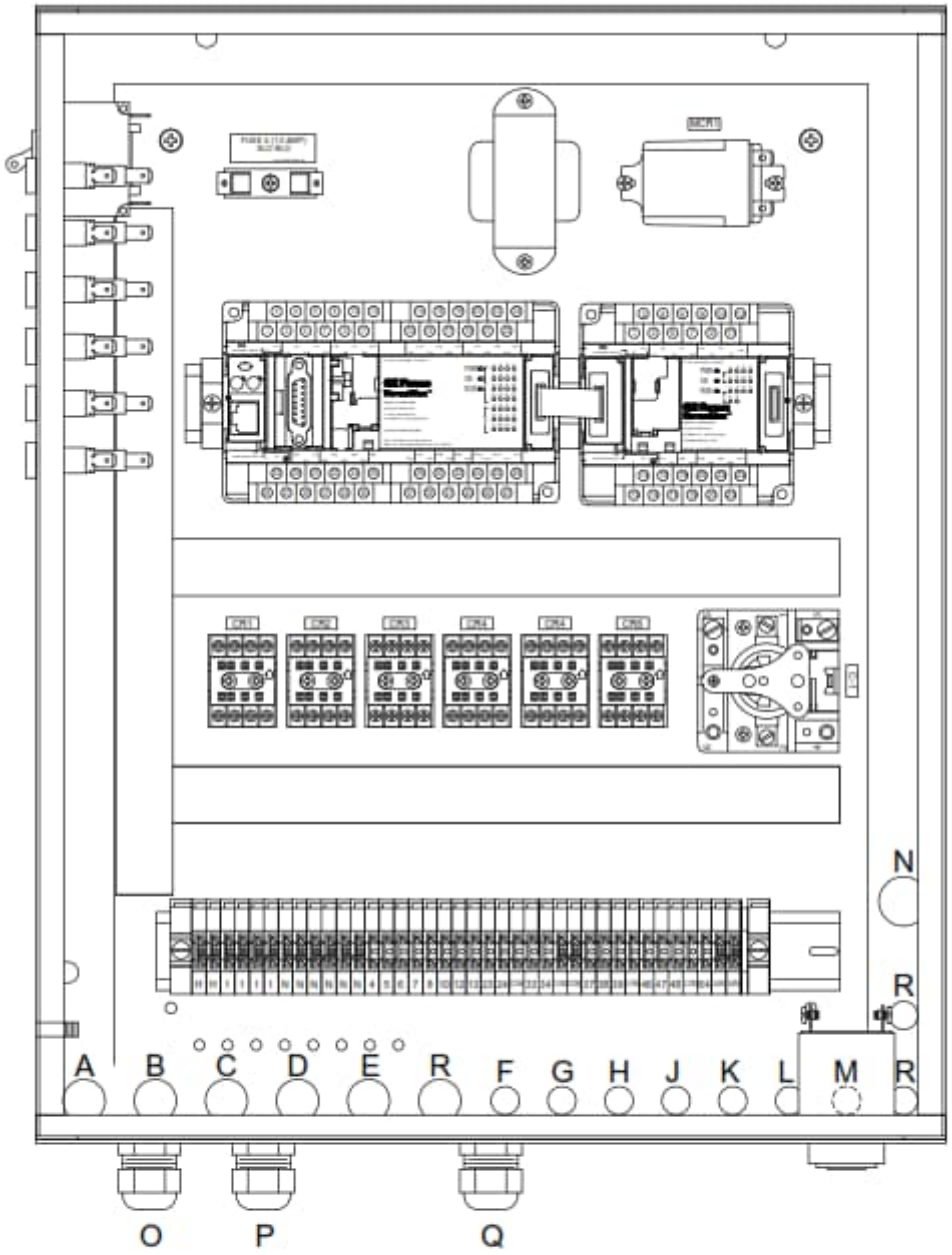
* - PARTS ARE FOR THE 100 GAL. MIX TANK.

NOTE: 70 GALLON TANK SHOWN.

PART NO.	DESCRIPTION
W3T576941	TANK MIX, 100GAL WITH PORTS
W3T576463	TANK MIX, 70GAL WITH PORTS
W3T578503	SPRAY BAR-70GAL, SDS
W3T579442	SPRAY BAR-100GAL, SDS
W3T572951	SEAL, 3/8" FLEX PVC Ø16"
W2T913072	SWITCH, FLOAT, 1/3HP
W2T914767	QD, PP, 3/4" NPT, MALE
W2T393358	VALVE, BALL UN, PVC, 1"
W2T913755	DRAIN, TANK ASSY
W2T913086	VALVE, BALL, 1/4" MNPT X BARB
W2T369988	VALVE, BALL UN, PVC, 3/4"
W2T913022	VALVE, BALL UN, PVC 1-1/4"
W2T914759	QD, PP, 1/2" MNPT X MALE

PART NO.	DESCRIPTION
W2T913465	UNION, PVC, 1" SXS, SCH80
W2T915353	UNION, PVC, 1-1/4" SXS, SCH80
W2T915059	SPRAYHEAD, PVC, 3/8"
W2T924570	TANK LID, 16", W/ Mounting RING
W2T919659*	TANK STAND, 100 GAL, CONE BOTTOM
W2T913754	DRAIN, ANTI-VORTEX
W2T913794	ELBOW, PE, 1/2" BARB X 1/2" NPT
W2T913116	SWITCH, FLOW, PVC, 1", 2 GPM
W2T919643	TANK STAND, 70 GAL, CONE BOTTOM
W2T913763	EDUCTOR, TANK MIXING, 3/8" MNPT
W2T913128	FILTER, 5M, 2" x 6", 3/8" FNPT
W2T915731	FILTER, CARBON, 2" X 10", 1/4" FNPT
W2T919515	TERM, QD, 18-22 GAL, 3/16", FEM.
W2T915193	TERMINAL, BUTT SPLC, 18-24 GAL, NO CRIMP

Illustration 6.31: SDS Mix Tank Parts



Legend

A - Transfer Pump #1 (TP1)
B - Loop Rapid Pump (TP5)
C - Transfer Pump #2 (TP2)
D - Transfer Pump #3 (TP3)
E - Transfer Pump #4 (TP4)
F - Bicarb Head Tank #1 Float Switch
G - Acid Drum #2 Low Float
H - Acid Head Tank #2 Float Switch
J - Acid Drum #3 Low Float
K - Acid Head Tank #3 Float Switch
L - Acid Drum #4 Low Float
M - Acid Head Tank #4 Float Switch
N - Mix Tank Solenoid Valve
O - Power Cord
P - Mix Tank Float Switch/Flow Tee
Q - UV Lamp
R - Access for Auxiliary Equipment

Illustration 6.32: SDS Electrical Component Connections

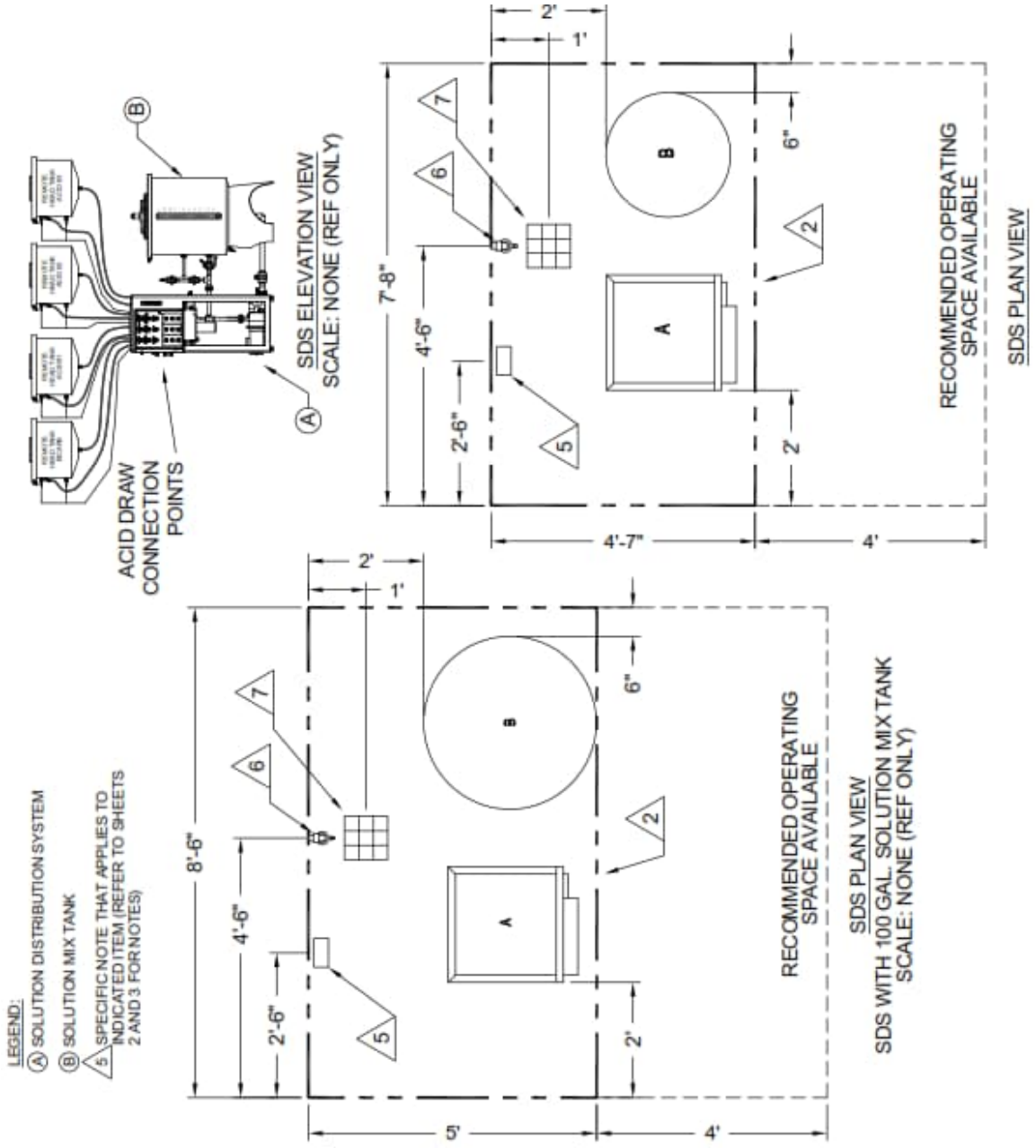


Illustration 6.33: Pre-Installation Guidelines
(1 of 2)

NOTES:

A. REMOTE SOLUTION DISTRIBUTION UNIT AND SOLUTION MIX TANK INSTALLATION REQUIREMENTS:

1. SOLUTION DISTRIBUTION UNIT AND SOLUTION MIX TANK SHOULD BE LOCATED AS CLOSE TO THE PATIENT CARE AREA AS POSSIBLE.
2. REMOTE SOLUTION DISTRIBUTION UNIT AND SOLUTION MIX TANK FOOTPRINT REQUIRED:
   a. REMOTE SOLUTION DISTRIBUTION UNIT WITH A 70 GALLON SOLUTION MIX TANK: 55"D x 92"W.
   b. REMOTE SOLUTION DISTRIBUTION UNIT WITH A 100 GALLON SOLUTION MIX TANK: 60"D x 102"W.
3. FOOTPRINT INCLUDES 24 INCHES OF CLEARANCE ON THE LEFT SIDE OF THE SOLUTION DISTRIBUTION UNIT, 24 INCHES OF CLEARANCE BEHIND, AND 6 INCHES ON THE RIGHT SIDE OF THE SOLUTION MIX TANK.
4. RECOMMENDED OPERATING SPACE AVAILABLE IN FRONT OF THE EQUIPMENT:
   a. REMOTE SOLUTION DISTRIBUTION UNIT WITH A 70 GALLON SOLUTION MIX TANK: 46"D x 92"W.
   b. REMOTE SOLUTION DISTRIBUTION UNIT WITH A 100 GALLON SOLUTION MIX TANK: 46"D x 102"W.
5. ELECTRICAL OUTLETS
   a. 120V, 1PH, 60Hz, 20AMP, STRAIGHT BLADE W/GFI
   b. 120V, 1PH, 60Hz, 20 AMP, DUPLEX
   c. LOCATE 2-1/2 FEET IN FROM LEFT SIDE OF FOOTPRINT AND 5 FEET ABOVE THE FINISHED FLOOR.
6. RO WATER SUPPLY
   a. LOCATE 4 FEET 6 INCHES IN FROM THE LEFT SIDE OF FOOTPRINT AND 4 FEET ABOVE THE FINISHED FLOOR.
   b. IF BACK FLOW PREVENTION DEVICES ARE REQUIRED, THEY MUST BE INSTALLED PER LOCAL CODES IN AN AREA SPECIFIED BY OTHERS.
   c. TERMINATE THE PIPE WITH A BALL VALVE THAT HAS A 3/4" THREADED FEMALE FITTING. VALVE TO BE INSTALLED IN THE VERTICAL POSITION.
7. FLOOR SINK
   a. MINIMUM CAPACITY: 20 GPM.
   b. LOCATE CENTER OF THE FLOOR SINK 4 FEET 6 INCHES IN FROM THE LEFT SIDE OF FOOTPRINT AND 1 FOOT IN FROM THE REAR OF THE FOOTPRINT.
8. RECOMMEND THAT THE AREA BE SLOPED TO A FLOOR DRAIN IN ADDITION TO THE REQUIRED FLOOR SINK.
9. SPACE NEEDS TO BE ALLOCATED FOR THE ACID SOLUTION DRUM. THIS CAN BE A REMOTE OR A LOCAL LOCATION.
10. REMOTE BULK ACID TANK LINES SHOULD BE ROUTED NO HIGHER THAN 7 FEET. IF THEY ARE LOCATED ABOVE 7 FEET, A REMOTE PUMP MUST BE INSTALLED.

B. HEAD TANK INSTALLATION REQUIREMENTS:

1. SOLUTION HEAD TANK(S) SUPPLIED BY MAR COR AND INSTALLED BY OTHERS PER LOCAL BUILDING CODES.
2. HEAD TANK(S) TO BE CEILING MOUNTED (WALL MOUNTING OPTION AVAILABLE).
3. HEAD TANK(S) ARE RECOMMENDED TO BE MOUNTED ABOVE THE SOLUTION DISTRIBUTION UNIT. THE HEAD TANK(S) CAN NOT BE MOUNTED MORE THAN 10 FEET AWAY FROM THE SOLUTION DISTRIBUTION UNIT.
4. SOLUTION HEAD TANK(S) WEIGHT:
   a. 10 GALLON HEAD TANK: 105 LB.
   b. 15 GALLON HEAD TANK: 150 LB.
   c. 30 GALLON HEAD TANK: 300 LB.
5. THE SOLUTION HEAD TANK(S) MUST BE MOUNTED SO THE BOTTOM FITTING ON THE HEAD TANK IS A MINIMUM OF 2 INCHES ABOVE THE HIGHEST POINT OF THE DISTRIBUTION TUBING AND 4 TO 7 FEET ABOVE THE WALL STATION(S).
6. IF THE HEAD TANK(S) ARE LOCATED MORE THAN 7 FEET ABOVE THE WALL STATION(S) A PRESSURE REDUCTION DEVICE (MAR COR PURIFICATION P/N 3024762) IS REQUIRED. ONE PRESSURE REDUCTION DEVICE IS REQUIRED PER TUBING RUN TO THE WALL STATION(S).
7. FOR ILLUSTRATION OF THE HEAD TANK AND CEILING MOUNTING HARDWARE PROVIDED, SEE DRAWING # 3019599 SHEET 1 AND 2.

C. LOOP INSTALLATION REQUIREMENTS:

1. LOOP TUBING:
   a. SIZE: 1/2"
   b. MATERIAL: POLYETHYLENE
   c. EACH SOLUTION REQUIRES A SEPARATE LOOP OF A DIFFERENT COLOR.
   d. COLOR AVAILABLE: BLUE (BICARB), RED (ACID #1), ORANGE (ACID #2), AND YELLOW (ACID #3).
2. MAXIMUM NUMBER OF PATIENT STATIONS PER LOOP: 20 STATIONS.
3. MAXIMUM LOOP LENGTH PER LOOP: 700 FEET.
4. IF THE FACILITY HAS MORE THAN 20 PATIENT STATIONS OR THE LOOP LENGTH IS MORE THAN 700 FEET, TWO LOOPS WILL BE REQUIRED FOR EACH SOLUTION.
5. LOOPS ARE TO BE INSTALLED SO THEY START & END AT THE SDS LOCATION, AND MUST HAVE 10 FEET OF EXTRA TUBING (FOR EACH SOLUTION) AT THE BEGINNING AND END OF EACH LOOP.
6. LOOPS MUST BE INSTALLED LEVEL WITH NO KINKS, PINCHED SECTIONS, SCRATCHES, MARKS (PAINT OR PLASTER), OR BLEMISHES.
7. LOOP BREAKS SHOULD ONLY OCCUR WITH A TEE FITTING AT THE PATIENT STATIONS (WALL BOX). NO IN-LINE COUPLERS OR ANY OTHER FITTING SHOULD BE USED ON THE LOOP.
8. LOOP TO BE INSTALLED WITH APPROPRIATE RESTRAINTS TO PREVENT EXCESSIVE SAGGING.
9. LOOP TUBING MAY BE INSTALLED ABOVE THE CEILING OR LOWER INCLUDING UNDER THE FLOOR.
   a. IF THE LOOP IS TO PASS UNDER THE CONCRETE SLAB TO THE WALL CHASE AND BETWEEN WALL CHASES, THE TUBING IS TO BE RUN IN 3 OR 4 INCH SCH. 40 PVC PIPE, AND MUST INCLUDE A PULL STRING BETWEEN EACH CHASE. ALL ELBOWS USED TO BE SWEEP TYPE.
   b. IF THE LOOP DISTRIBUTION LOOP(S) PASS THROUGH AN UNHEATED SPACE, THEY SHOULD BE INSULATED TO PREVENT FREEZING.
10. HIGHEST POINT OF LOOP TUBING MUST BE A MINIMUM OF 2 INCHES BELOW THE BOTTOM FITTING OF THE HEAD TANK.

D. REMOTE MONITOR REQUIREMENTS:

1. THE MOUNTING LOCATION IS SITE SPECIFIED BY THE OWNER/OTHERS. THE MONITOR IS WALL MOUNTED.
2. MONITOR MOUNTING LOCATION WALL SPACE REQUIREMENTS ARE 7 1/8" x 7 1/8" AND EXTENDS FROM THE WALL 5 1/2".
3. REMOTE WIRE RUNS (SUPPLIED AND INSTALLED BY OTHERS):
   a. FIVE EACH 18AWG NON-REPEATING MULTICOLOR WIRES OF THE APPROPRIATE SIZE AND TYPE OF CONDUIT MEETING 24VAC LOCAL CODES.
   b. REMOTE WIRE RUNS TO HAVE A 10 FOOT WHIP EXTENDING FROM THE DUPLEX JUNCTION BOX AT THE SOLUTION DISTRIBUTION UNIT. WHIP TO BE RUN WITH FLEXIBLE LIQUID CONDUIT TERMINATING WITH A 1/2" CONNECTOR.
   c. REMOTE WIRE RUNS TO HAVE A 2 FOOT WHIP EXTENDING FROM A FLUSH MOUNTED JUNCTION BOX AT THE MONITOR MOUNTING LOCATION CHOSEN BY THE OWNER/OTHERS.

Illustration 6.34: Pre-Installation Guidelines
(2 of 2)

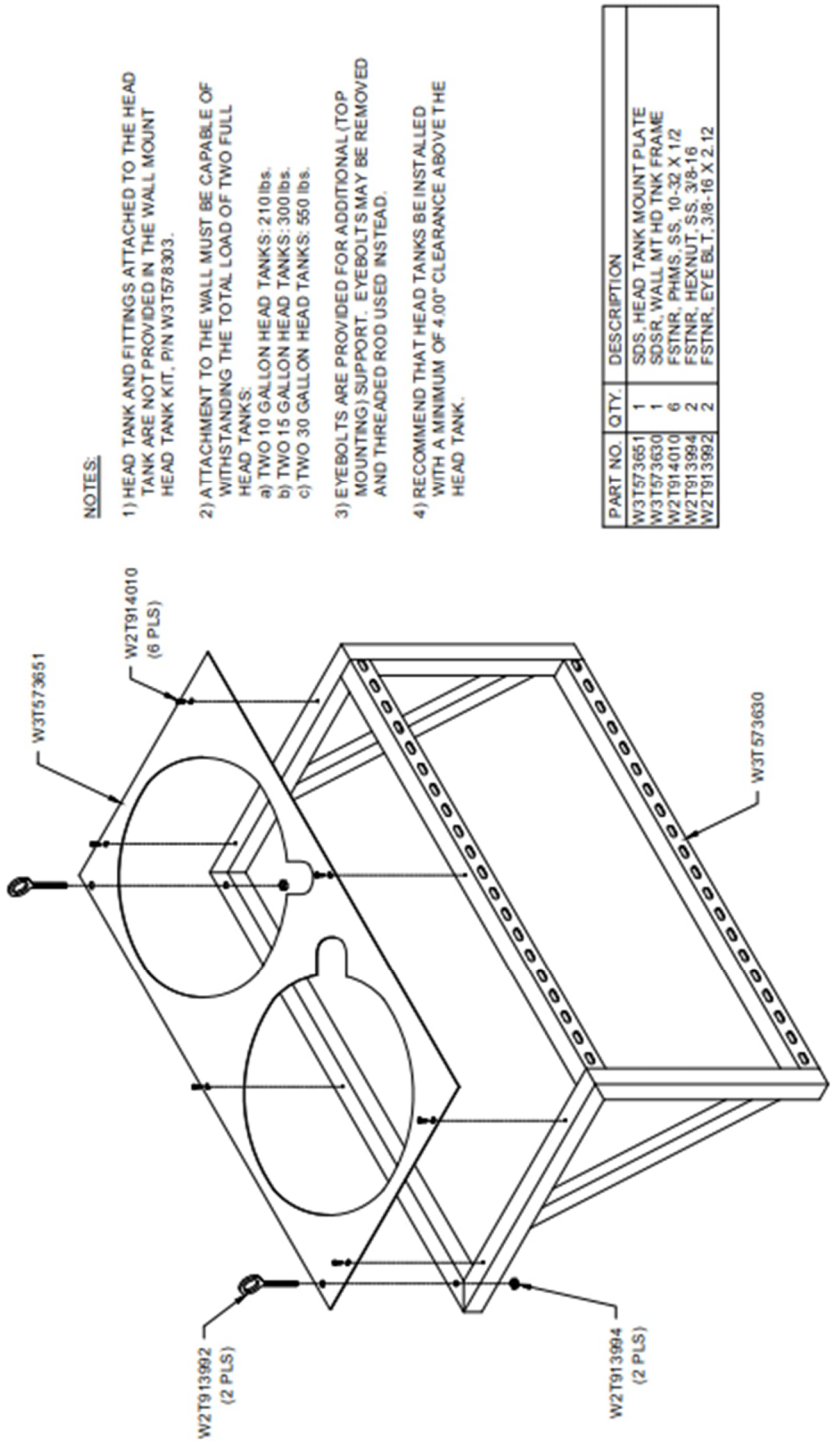


Illustration 6.35: SDS Wall Mount Head Tank Installation (1 of 2)

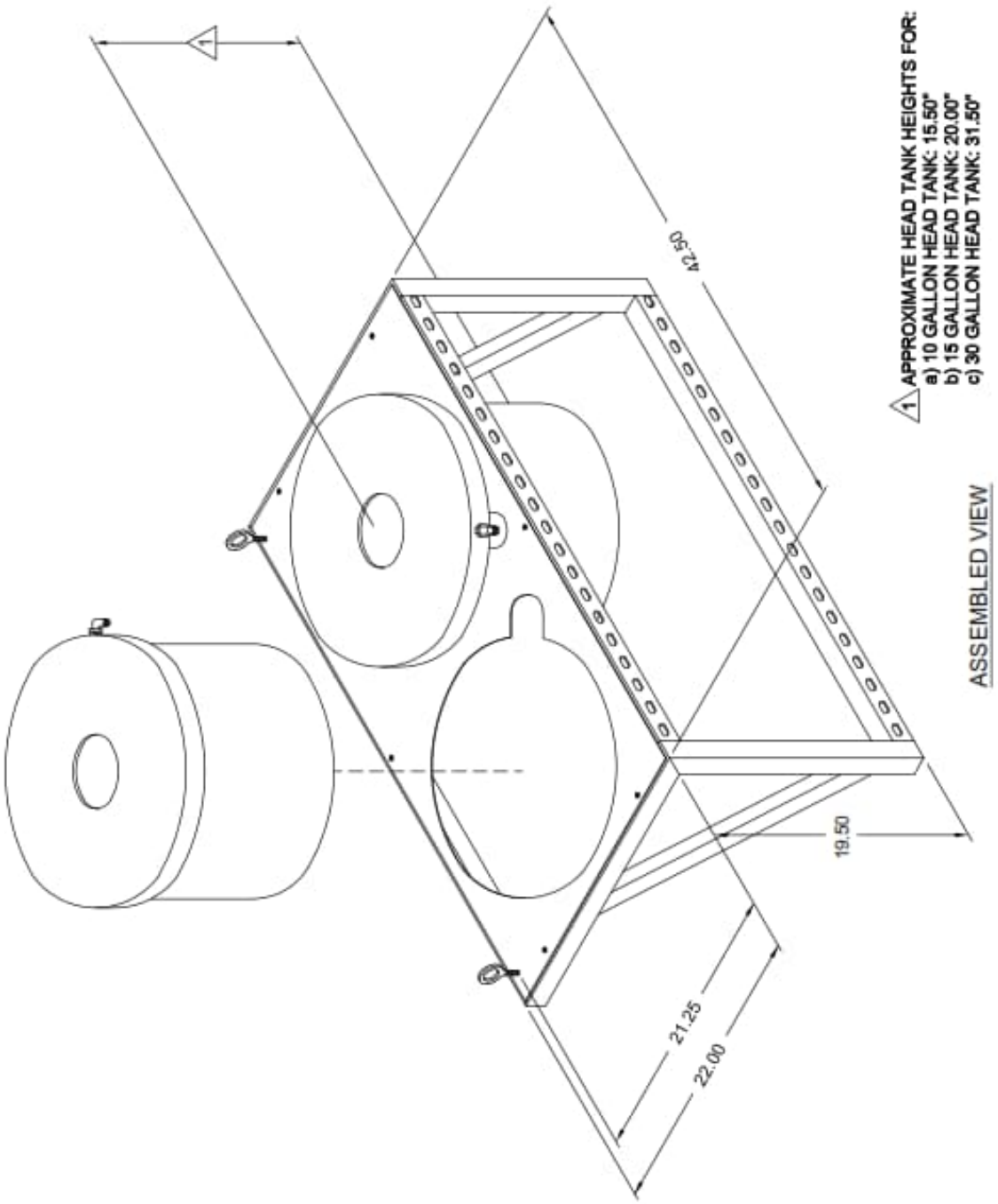


Illustration 6.36: SDS Wall Mount Head Tank Installation (2 of 2)

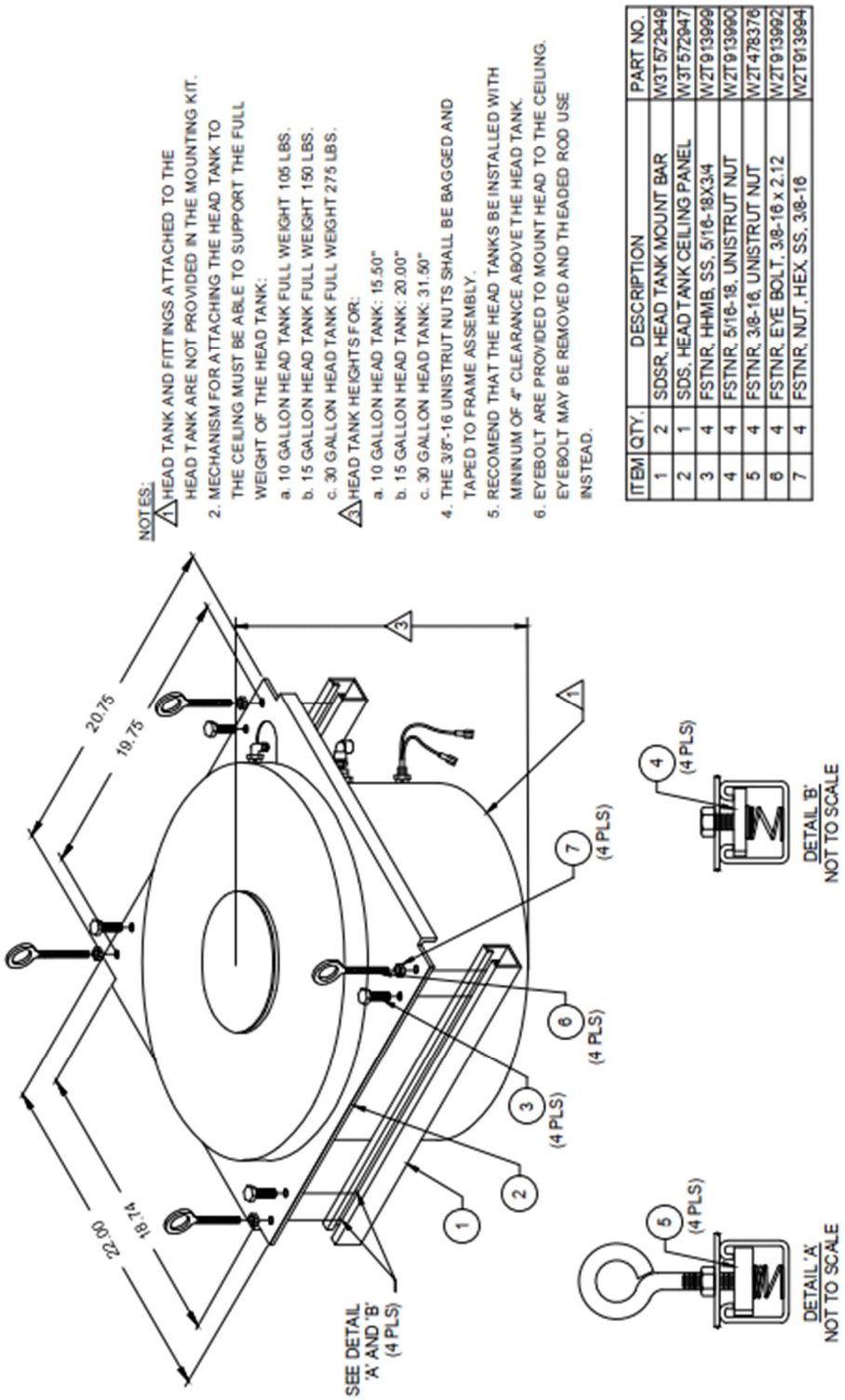


Illustration 6.37: SDS Ceiling Mount Head Tank Installation

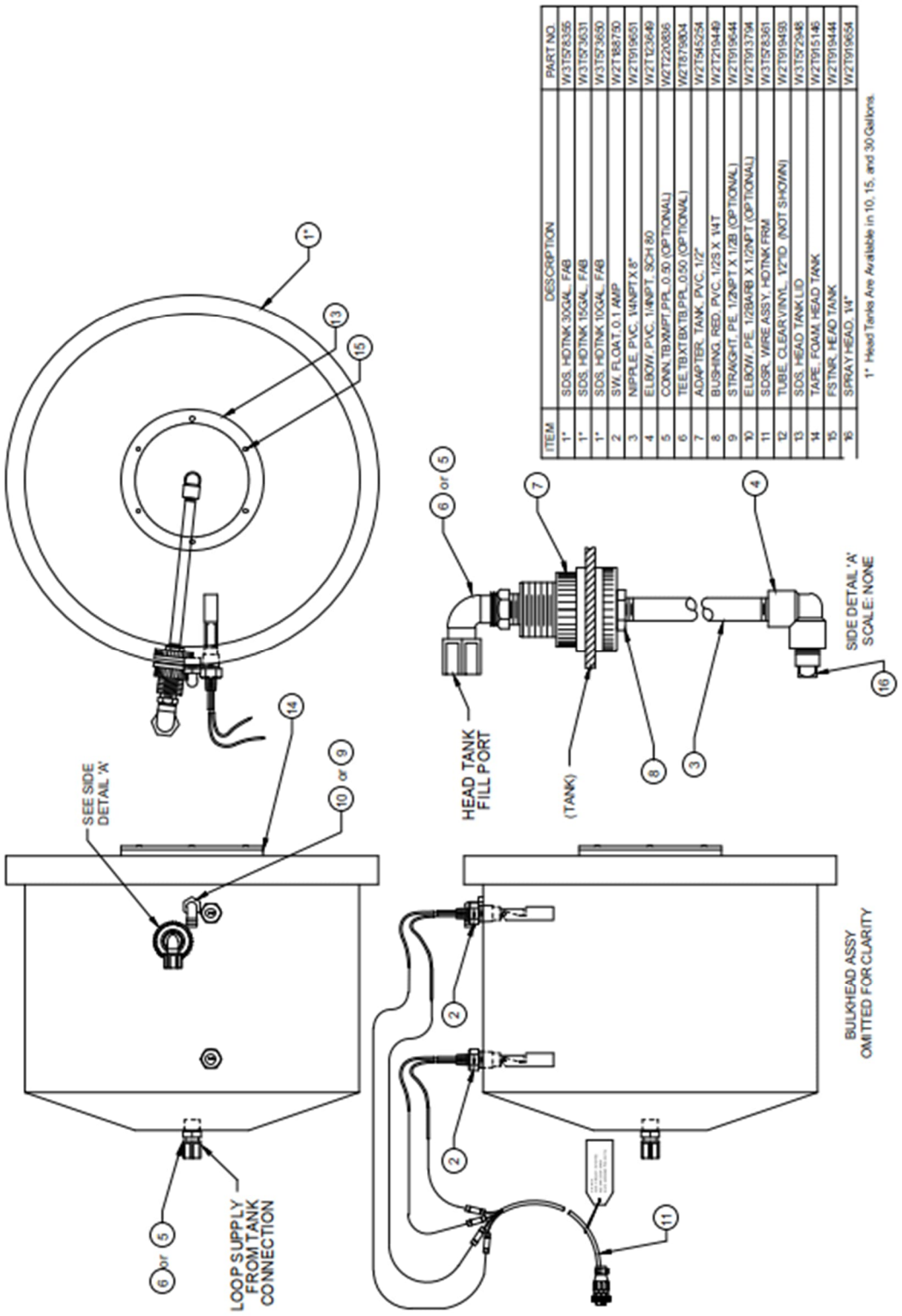


Illustration 6.38: SDS Bicarb Head Tank (10, 15 and 30 Gallon)

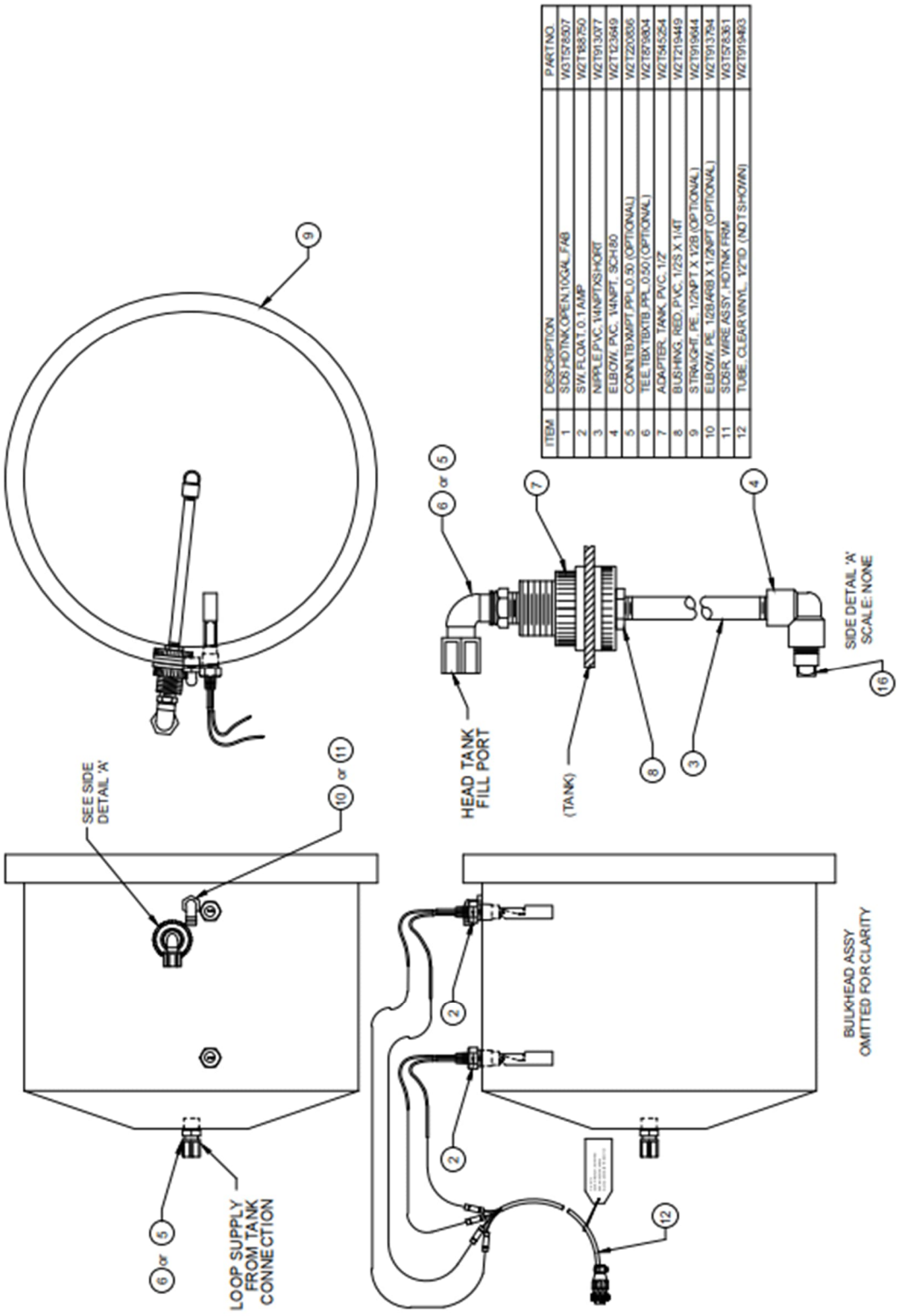
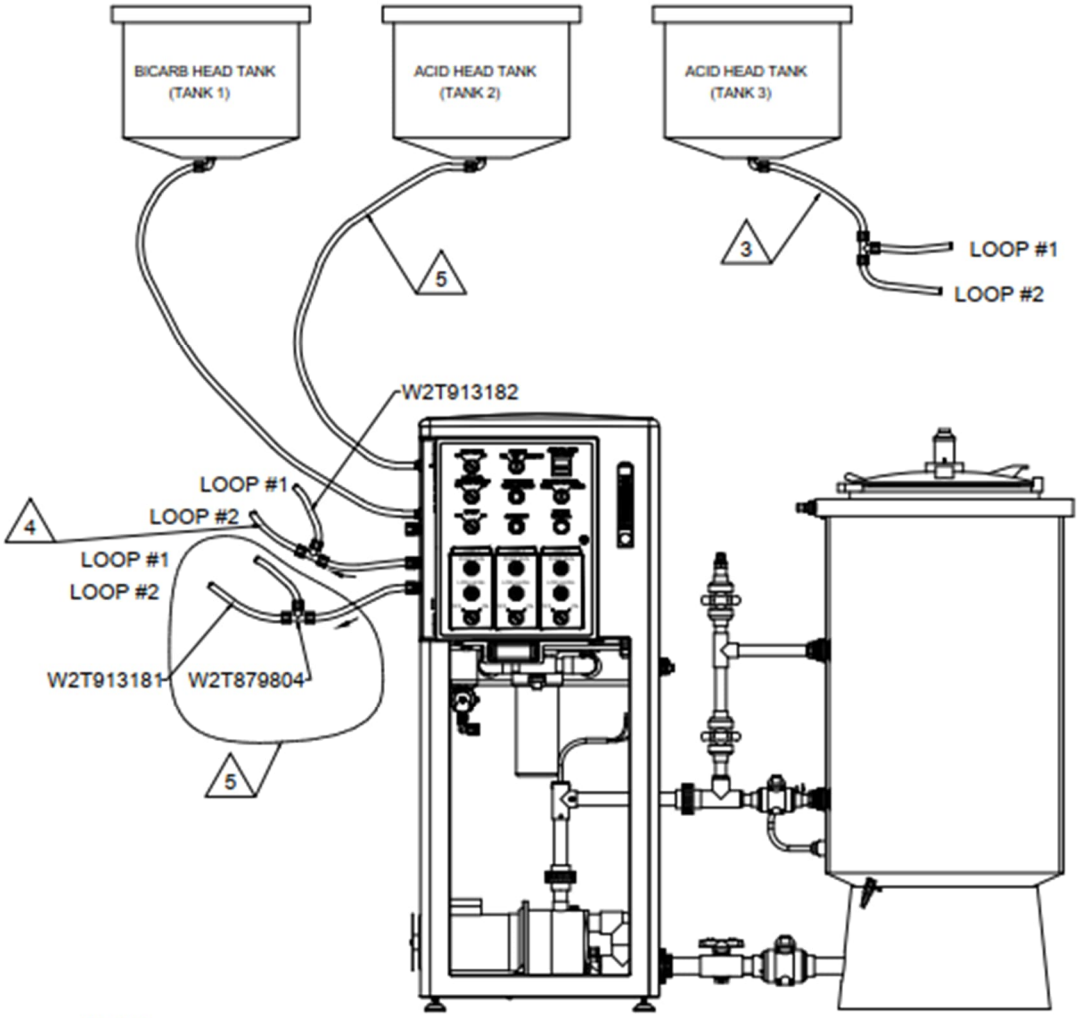


Illustration 6.39: SDS/BICARB Acid Head Tanks



NOTE:

1) INSTALL BICARB LOOP 1 & 2 INTO TUBING TEE. CONTACT TUBING TEE TO SDS UNIT.

2) REPEAT USING ACID LINES.

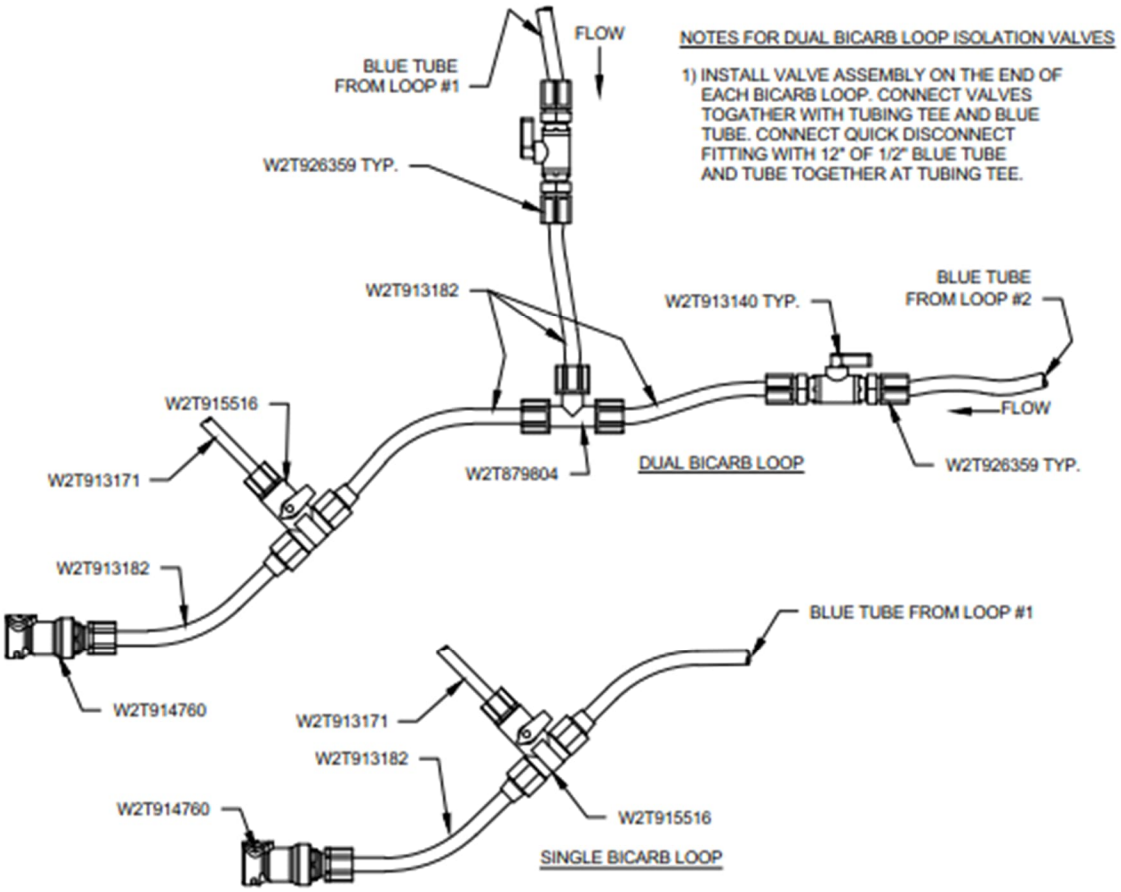
3 ACID LINE SHOWN AS 2 LOOPS FOR UNITS WITHOUT OPTIONAL ACID LOOP AUXILIARY PUMP.

4 BICARB LINE SHOWN AS 2 LOOPS.

5 ACID LINE SHOWN FOR UNIT WITH OPTIONAL ACID LOOP AUXILIARY PUMP.

PART NO.	DESCRIPTION
W2T879804	TEE, TUBE, 1/2", PPL
W2T913181	TUBE, PE, 1/2", RED
W2T913182	TUBE, PE, 1/2", BLUE

Illustration 6.40: SDS Distribution Loop Connections



NOTES FOR DUAL BICARB LOOP ISOLATION VALVES

1) INSTALL VALVE ASSEMBLY ON THE END OF EACH BICARB LOOP. CONNECT VALVES TOGATHER WITH TUBING TEE AND BLUE TUBE. CONNECT QUICK DISCONNECT FITTING WITH 12" OF 1/2" BLUE TUBE AND TUBE TOGETHER AT TUBING TEE.

NOTES FOR SINGLE BICARB LOOP

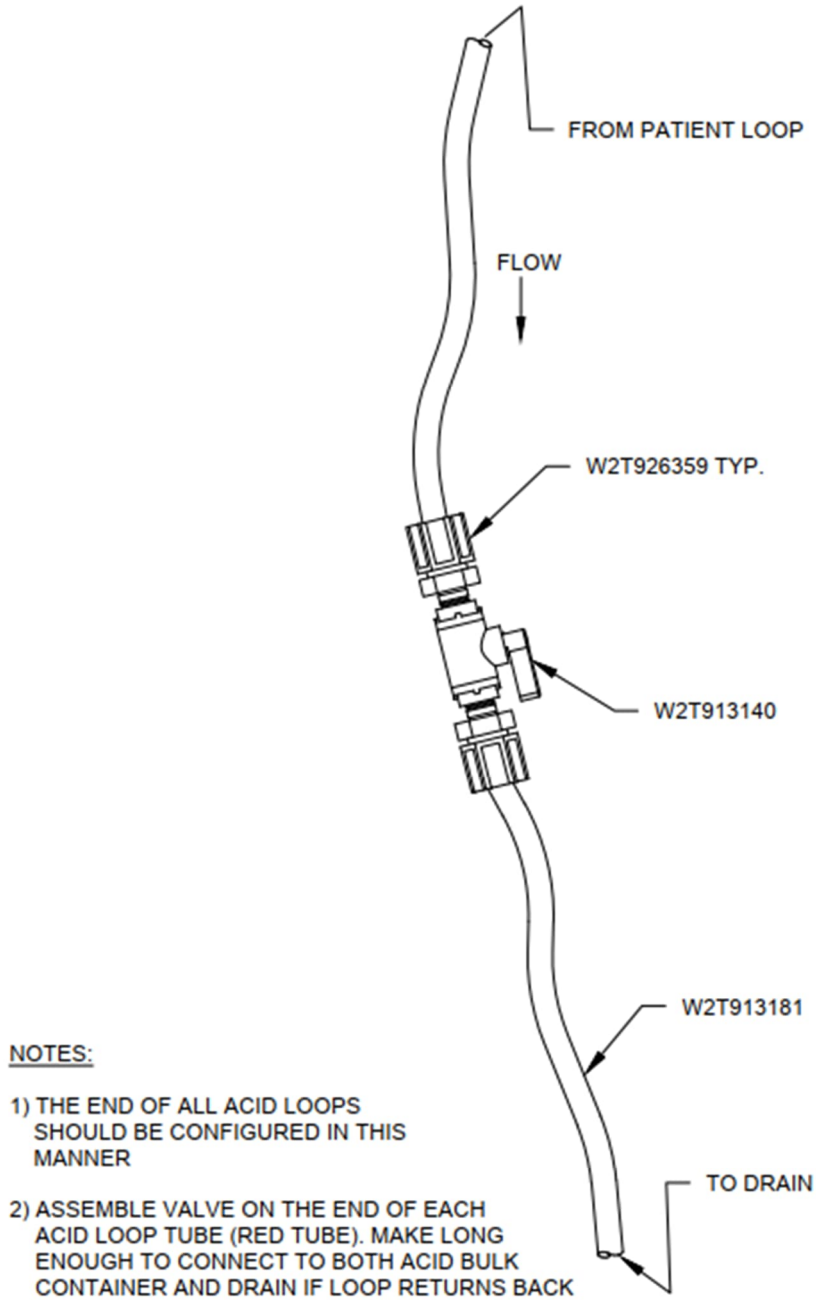
1) CONNECT QUICK DISCONNECT FITTING WITH 12" OF 1/2" BLUE TUBE.

PART NO.	DESCRIPTION
W2T926359	CONN,TBXMPT,PPL,0.50X0.25
W2T879804	TEE,TBXTBXTB,PPL,0.50
W2T427577	UNION,1/2SFX3/8SF
W2T913140	VALVE,BALL,PVC,1/4FNPT,GY
W2T914760	QD,1/2TUBE,INLINE,FEMALE,W/CHK VLV
W2T913182	TUBE,PE,1/2",BLUE

CAUTION:

1) DO NOT OPEN SAMPLE VALVE WHEN IN OPERATE MODE OR POSSIBLE CONTAMINATION AND/OR AIRLOCK MAY OCCUR. ONLY OPEN IN DRAIN PORT WHEN SAMPLING.

Illustration 6.41: SDS Bicarb Wands (Single and Dual Loop)



NOTES:

1) THE END OF ALL ACID LOOPS SHOULD BE CONFIGURED IN THIS MANNER

2) ASSEMBLE VALVE ON THE END OF EACH ACID LOOP TUBE (RED TUBE). MAKE LONG ENOUGH TO CONNECT TO BOTH ACID BULK CONTAINER AND DRAIN IF LOOP RETURNS BACK TO SDS UNIT AREA. IF ACID LINE ENDS AT A WALL BOX LOCATION, INSTALL VALVE AND ROUTE TO NEAREST DRAIN WITH AN AIR GAP.

PART NO.	DESCRIPTION
W2T926359	CONN,TBXMPT,PPL,0.50X0.25
W2T913140	VALVE,BALL,PVC,1/4FNPT,GY
W2T913181	TUBE,PE,1/2",RED

Illustration 6.42: SDS Acid Distribution Loop Return Connections

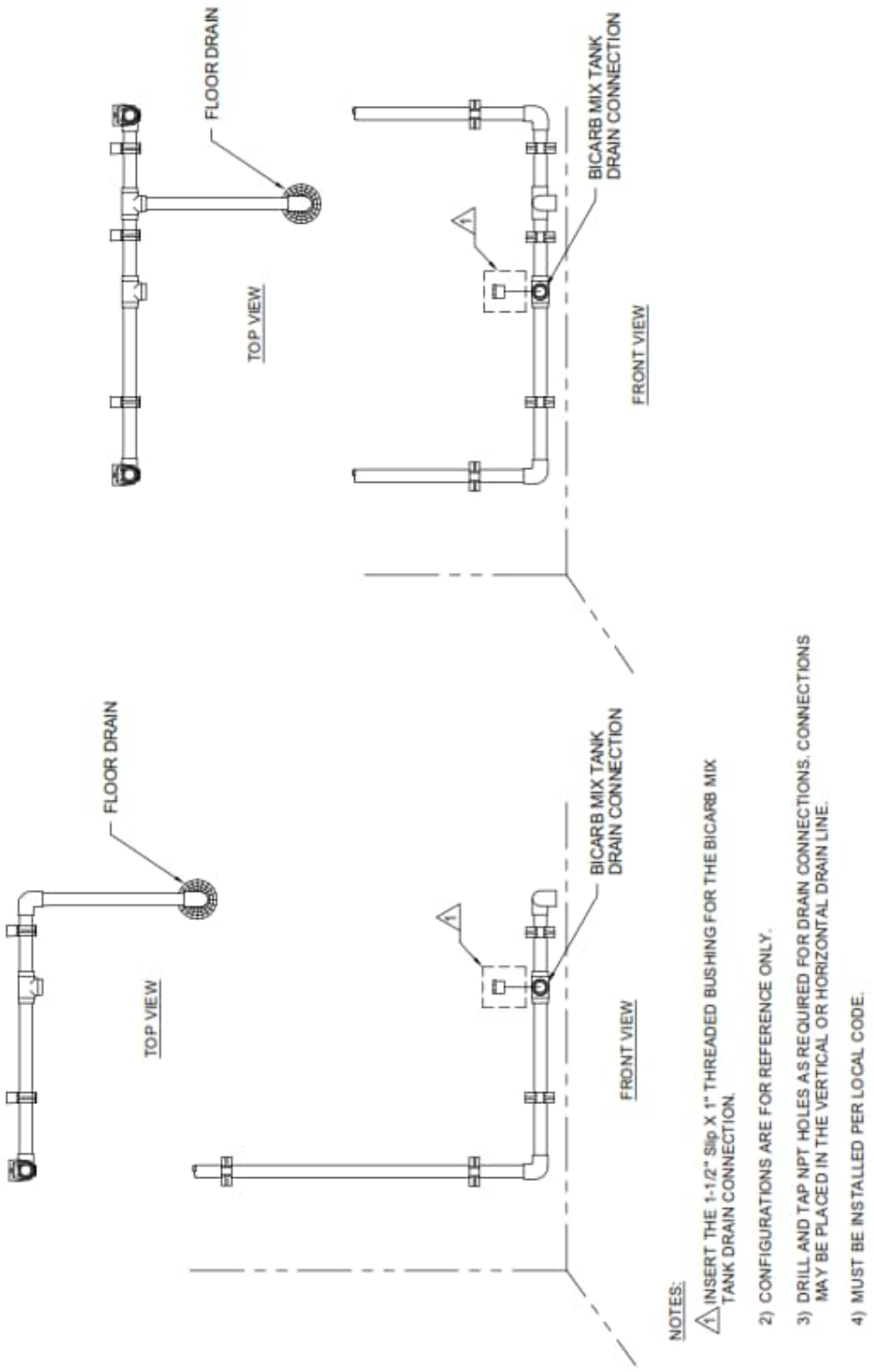
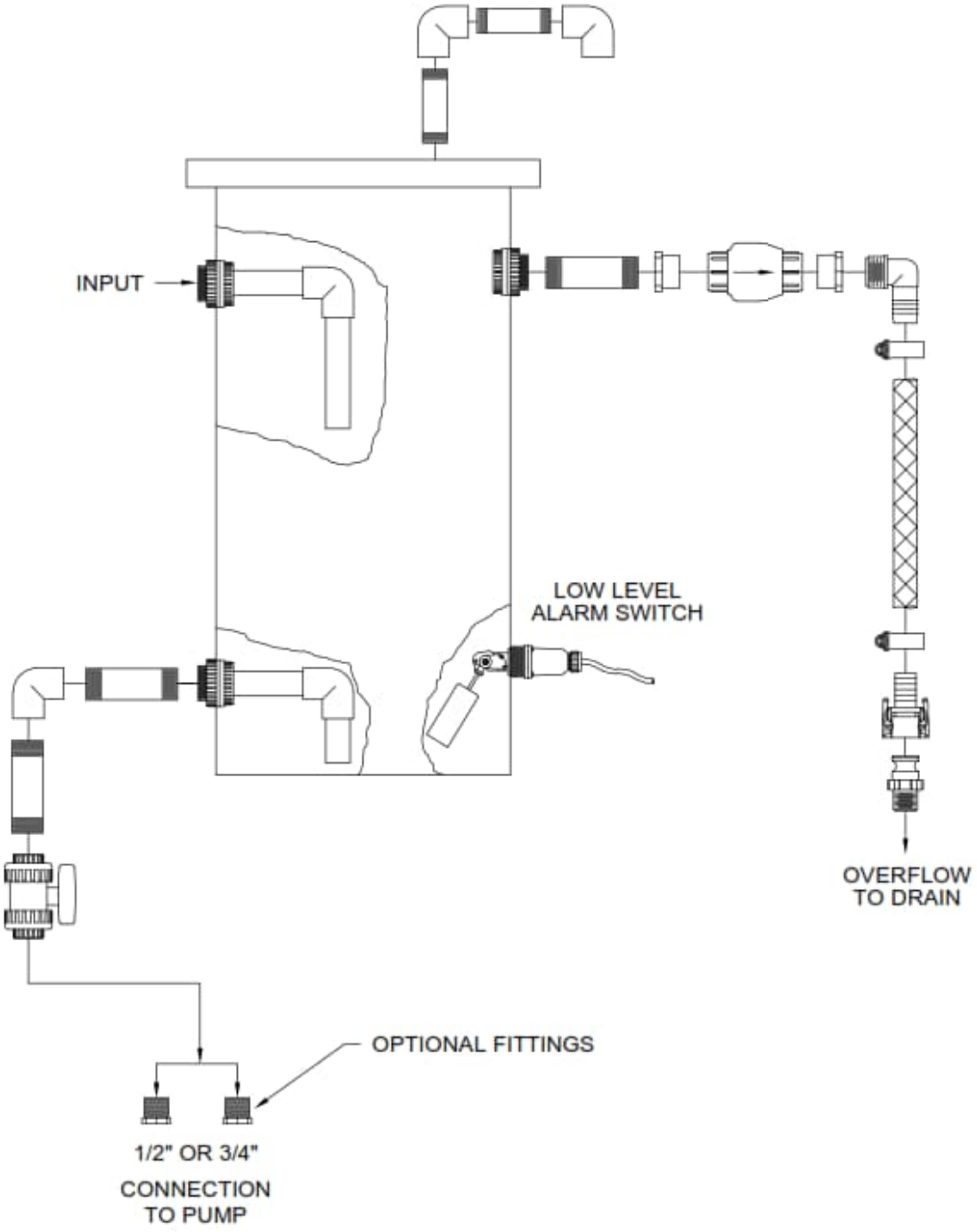


Illustration 6.43: SDS Drain Installation



Notes:

1) Bulk concentrate (acidified) tank shown for reference only.
Bulk tanks come in various shapes and sizes.

Illustration 6.44: SDS Bulk Acid Tank

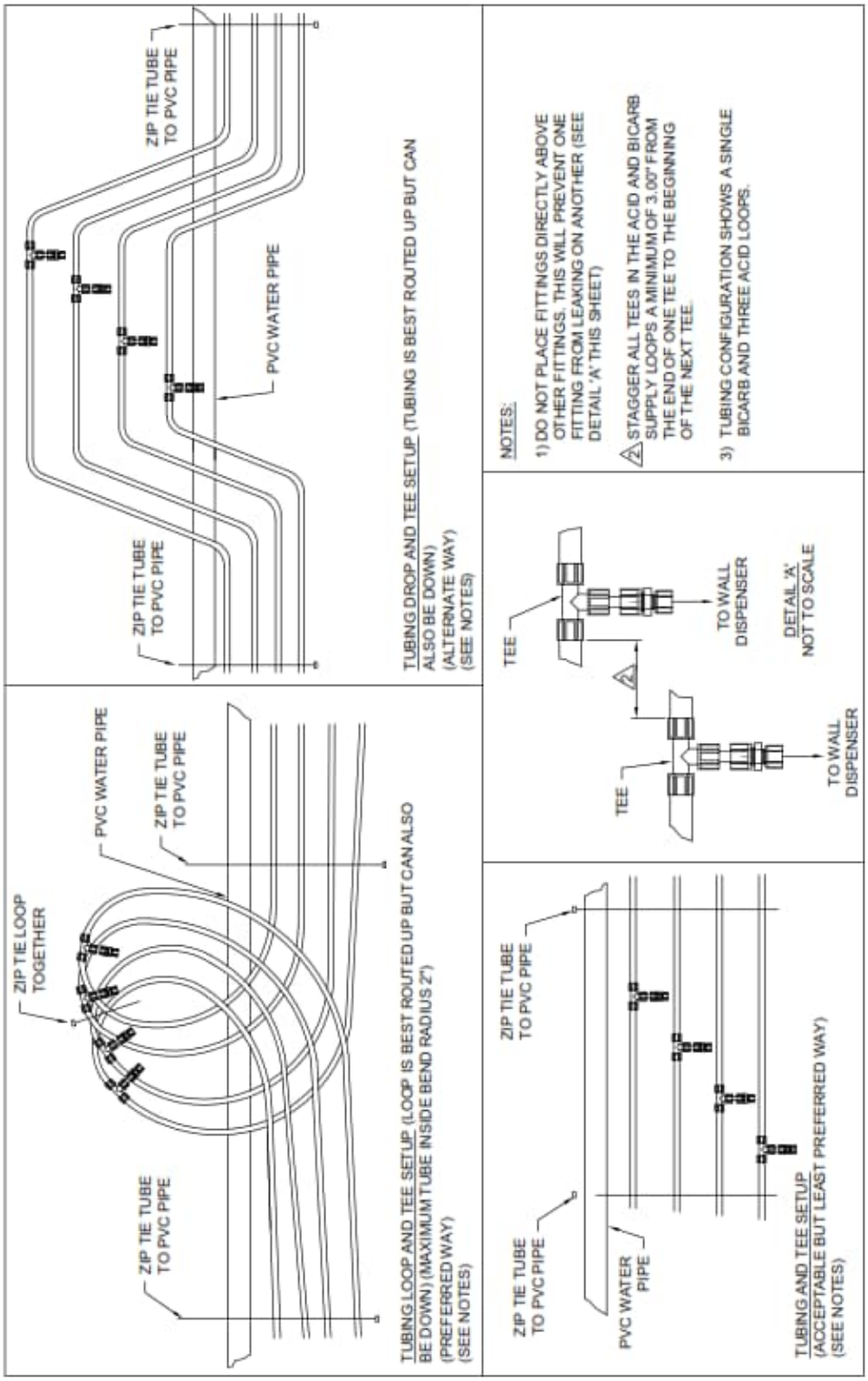
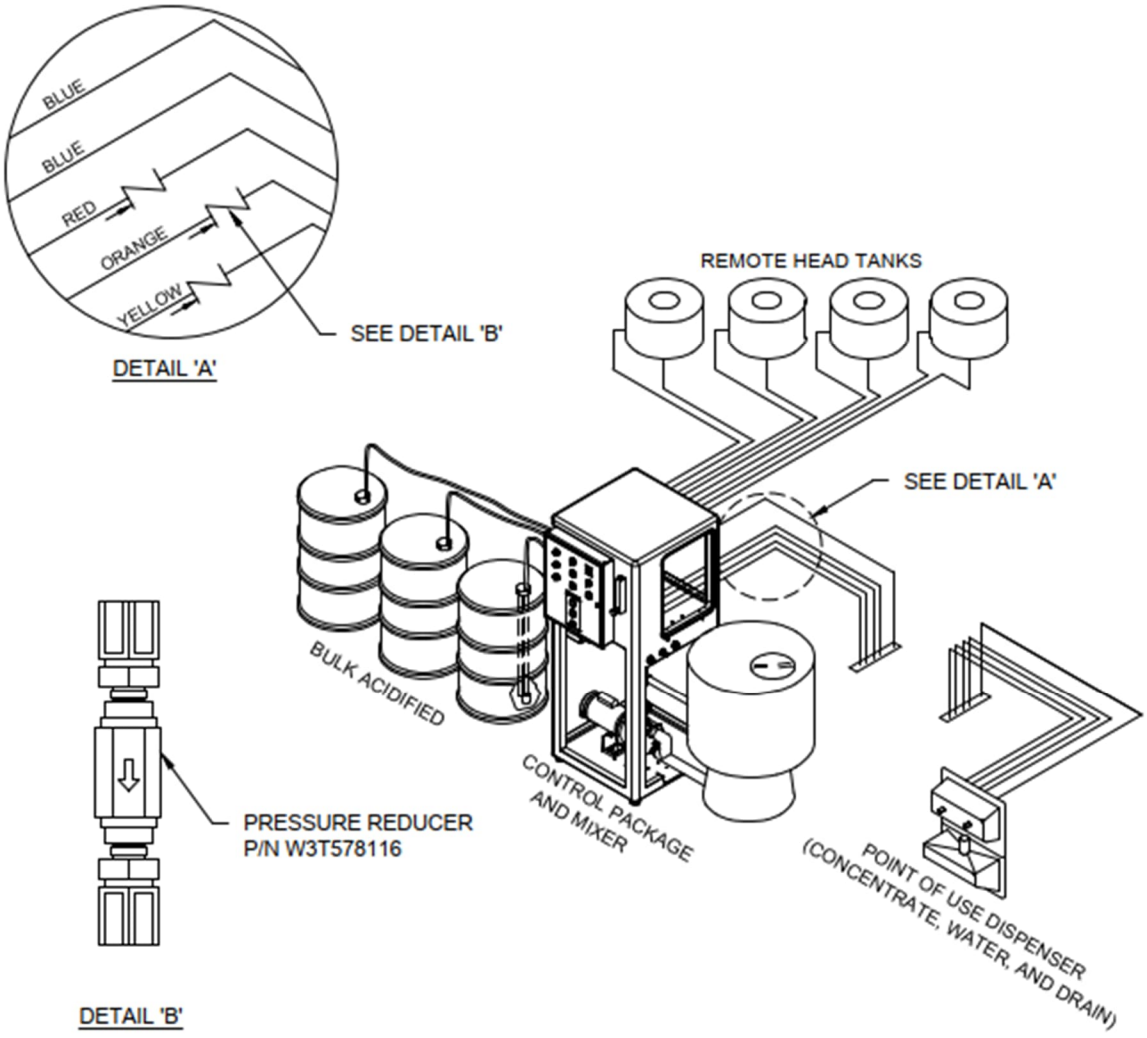


Illustration 6.45: SDS Loop Installation Guidelines



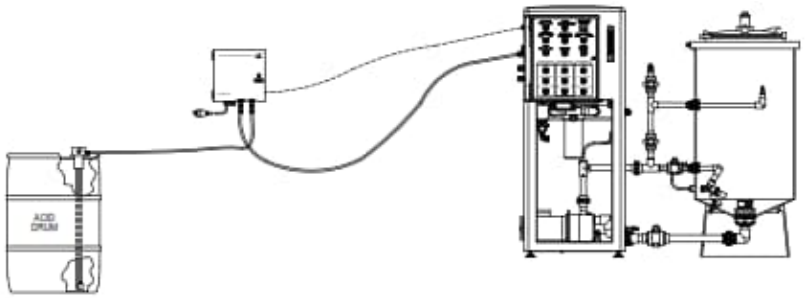
NOTES:

1) PRESSURE REDUCTION DEVICE TO BE INSTALLED IN ACID SOLUTION LINES EXITING BASE UNIT. NOTE DIRECTION OF FLOW.

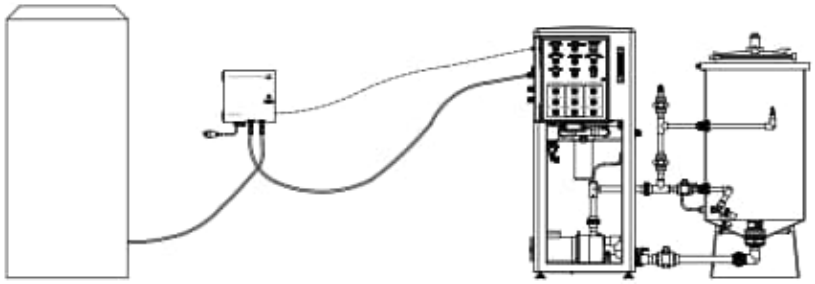
2) PRESSURE REDUCTION DEVICE TO BE INSTALLED IN BICARB LINE EXITING U.V. LAMP BUT BEFORE LINE TEES. DIRECTION OF FLOW THRU CHECK VALVE IS FROM U.V. UNIT TO TEE.

3) ONLY INSTALLED IN SYSTEMS WHEN REQUIRED.

Illustration 6.47: SDS Pressure Reduction Device Installation Instructions



REMOTE TRANSFER PUMP W/ DRUM



REMOTE TRANSFER PUMP W/ BULK STORAGE TANK

Application:

The remote transfer pump is intended to be used with the Mar Cor Purification Solution Delivery System to assist in pumping solution from a remote holding tank. Operation of the remote pump is automatic and in unison with the applicable solution on the SDS unit. One remote pump is required for each solution. The remote transfer pump box should be mounted within 5 feet of the tank and as low as allowable. The remote transfer pump must be within 250 feet but no more than a 20 feet in height differential between the remote pump and the SDS unit.

Facility Requirements:

1) Tubing(s) one, two, or three of the appropriate color(s) red, orange, yellow is routed from the SDS location to the location of the remote transfer pump box. The tubing should be left long enough (approx. 10 feet) on each end for routing to the finished devices.
2) Wiring between the SDS and transfer pump box must meet local codes for 24 volt applications and contain five wires for each separate remote transfer box.
3) A 110 volt grounded outlet within 5 feet of the remote pump box location.

Tank and Tubing Connections:

1) A 1/2" fitting is provided to connect to the bulk tank outlet. Tubing of the appropriate color is connected between the tank outlet and the remote box "pump inlet".
2) The facility installed colored tubing is connected to the remote box "pump outlet" and the appropriate connection on the SDS unit.
3) Install the 1/2" float switch into tank port for low level alarm if needed. An alternate low level device (facility installed) will need to be a open circuit for low level and a closed circuit for higher than low level.

Electrical Connections:

Remote transfer pump box connections:

1) Neutral 24 volts from SDS unit is connected to terminal strip number 3.
2) The 24 volt signal (see SDS connection list below) wire is connected to terminal strip number 4.
3) Ground wire from remote box chassis to SDS ground terminal.
4) Connect one float switch wire to the remote pump box terminal 1 and the other to terminal 2. Use quick disconnect terminals for connecting wires.

SDS connections:

1) The neutral connection(s) is to the 24N terminal.
2) The first remote pump 24 volt signal is connected to wire number 14 on control relay four.
3) The second remote pump 24 volt signal is connected to wire number 14 on control relay five.
4) The third remote pump 24 volt signal is connected to wire number 14 on control relay six.
5) Connect the low level switch wires from terminal 1 and 2 in the remote pump box to the applicable SDS bulk tank low level switch wires with quick disconnect terminals.

NOTE:

Route Tank Low Level Float Switch Cable For Remote Tank To SDS Base Unit.

Illustration 6.48: SDS Remote Acid Transfer Pump

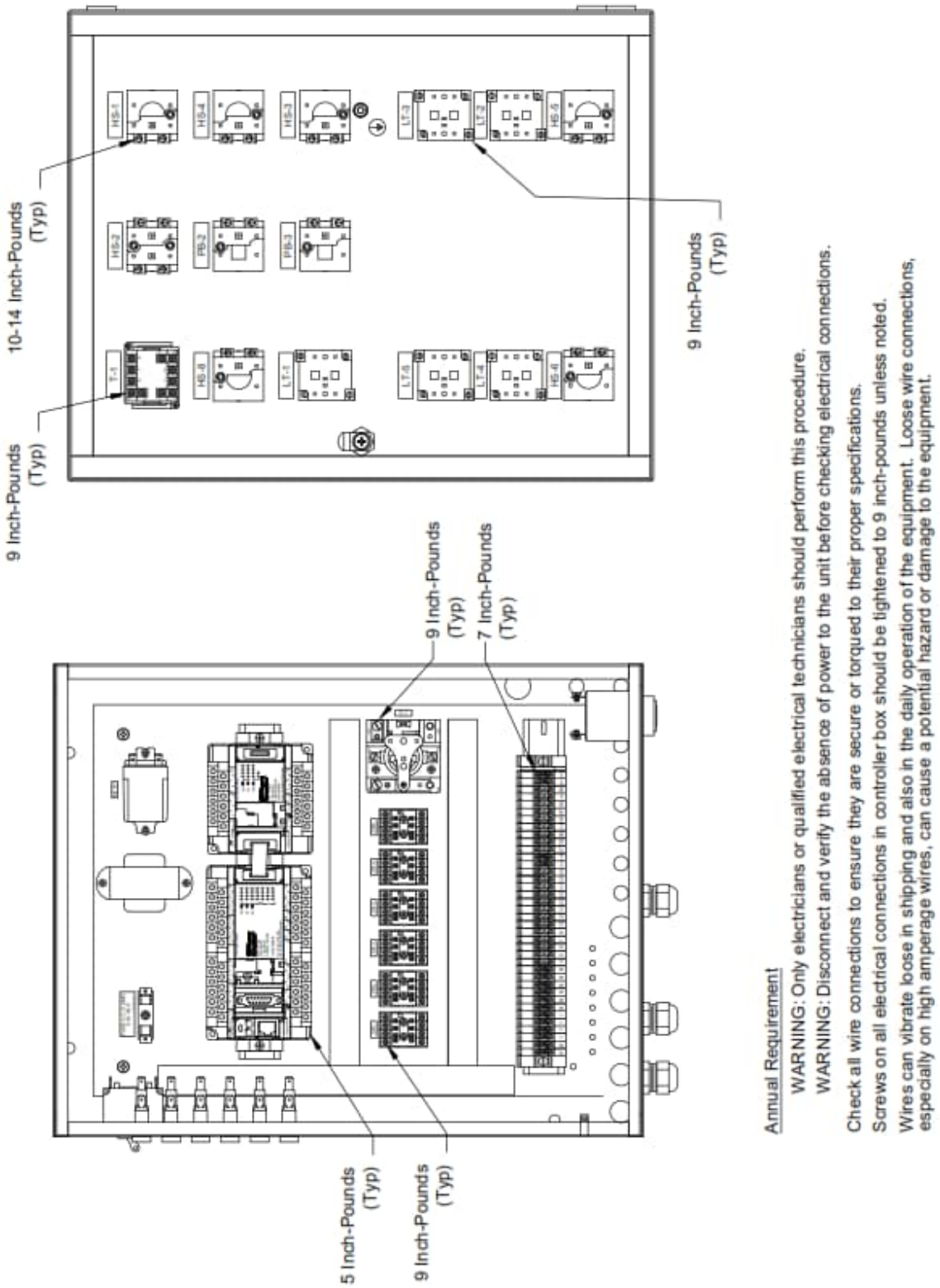
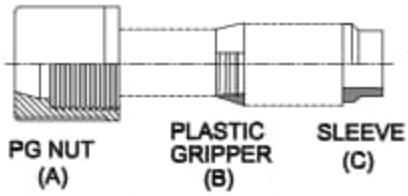


Illustration 6.49: Annual Maintenance Requirement



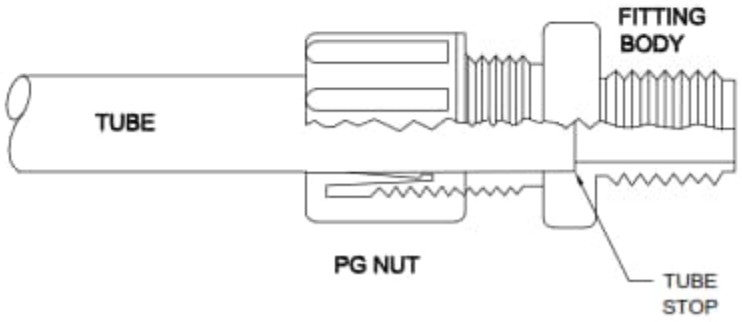
PG NUT ASSEMBLY

AS SHOWN ABOVE, INSERT GRIPPER (B) INTO NUT (A).
PUSH SLEEVE (C) INTO NUT ASSEMBLY.

INSTALLATION INSTRUCTIONS

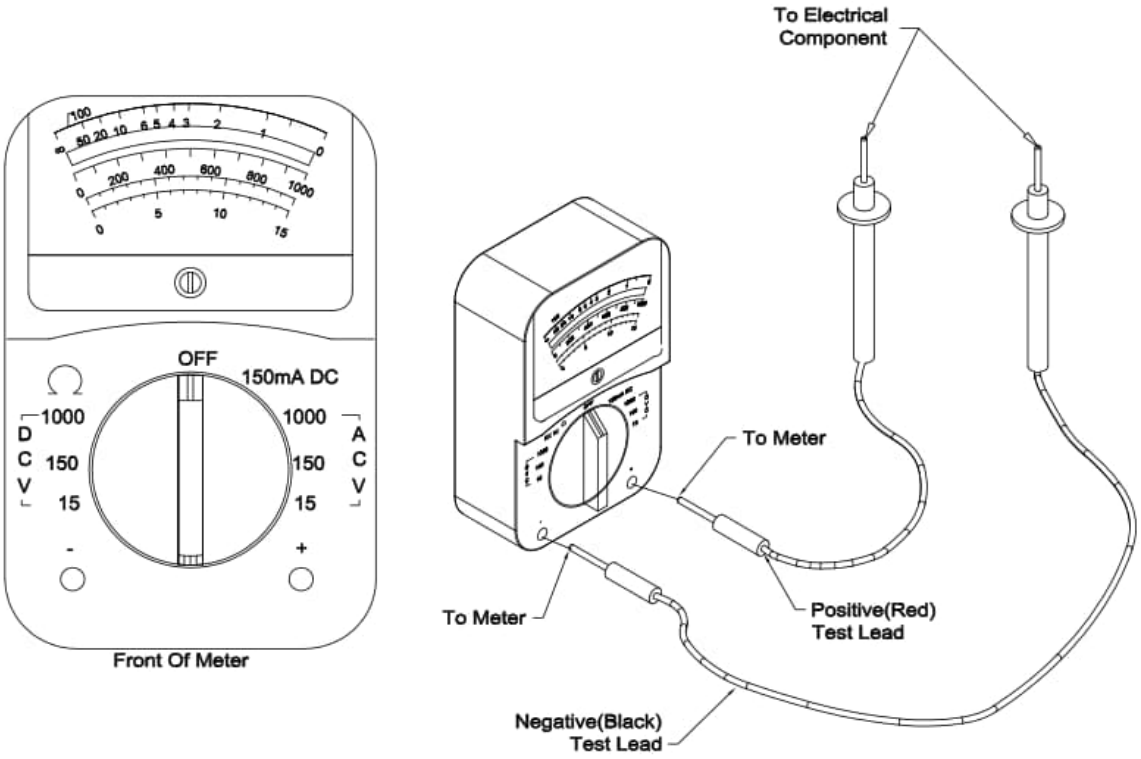
1. CUT THE TUBING END SQUARELY AND REMOVE THE INTERNAL AND EXTERNAL BURRS
2. INSERT THE TUBING THROUGH THE BACK OF THE NUT ALL THE WAY THROUGH THE NUT ASSEMBLY TO THE TUBE STOP IN THE FITTING BODY (SEE ILLUSTRATION). IF THE TUBING DOES NOT ENTER THE NUT EASILY, LOOSEN THE NUT ONE TURN AND THEN INSERT THE TUBING ALL THE WAY TO THE TUBE STOP IN THE FITTING BODY.
3. TURN THE NUT HAND TIGHT.
4. WRENCH TIGHTEN THE NUT 1-1/2 TO 2 TURNS.
5. ALL NUTS MUST BE RETIGHTENED WHEN THE SYSTEM REACHES PROJECTED OPERATING TEMPERATURE.

NOTE: SQUEAKING SOUND WHEN TIGHTENING NUT IS NORMAL. FOR PIPE THREADED CONNECTIONS, TEFLON TAPE MUST BE USED. DO NOT PUT TEFLON TAPE ON TUBING NUT THREADS, ONLY PIPE THREADS.



NOTE: IT IS NOT NECESSARY TO DISASSEMBLE THIS FITTING FOR APPLICATION. MERELY INSERT TUBING TO STOP AND TIGHTEN NUT.

Illustration 6.50: "Push-In" Fitting Instructions



WARNING: Extreme care must be exercised when using meter to test live electrical circuits.

NOTE: Drawing is provided for reference only. Refer to your meter operation instructions for complete details.

Normal 24Vac Acceptable Voltage Range (17-28 VAC)
Normal 120Vac Acceptable Voltage Range (98-130 VAC)
0 ohm (Ω) = Closed Circuit
∞ (Infinite Ω) = Open Circuit

Illustration 6.51: Volt-Ohm Meter

NOTES:

Solution Delivery System
(SDS)

CHAPTER SEVEN:
SPARE PARTS LIST

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7.0 SPARE PARTS LIST

CATALOG NO.	DESCRIPTION (ALPHABETICAL)
W2T915454*	CHECK VALVE, ¼″ FNPT, WHITE
W2T913554	CIRCUIT BREAKER, 20 AMP
W2T913754	DRAIN,ANTI-VORTEX
W2T913755	DRAIN,TANK ASSEMBLY
W2T913763	EDUCTOR, MIXING, FOR 70 & 100 GALLON TANK
W2T914306	FILTER HOUSING, 10″
W2T915718**	FILTER, 0.20 MIC, 10″ WATER
W2T913128**	FILTER, 5 MIC, 2 X 6 3/8″ VENT
W2T915731**	FILTER, GAC, 2 X 10 ¼″ VENT (REQ'D W/ OZONE)
W2T362196	FLOWMETER, W/NEEDLE, 5 GPM
W3T578999	FLOW RESTRICTOR ASSEMBLY
W2T911926	FUSE,1/4 AMP,MDL (SLO BLO)
W2T913654*	FUSE, 1 AMP SLO BLOW
W2T926469	IMPELLER, EBARA PUMP
W2T911932	INDICATOR, 24V, GREEN, (COMPLETE ASSEMBLY)
W2T914211	KIT, SEAL, SHAFT, EBARA
W2T926307	LAMP, GREEN, 24 VOLT
W2T926306	LAMP, RED, 24 VOLT
W2T180210	LAMP,UV,254NM,8.35",GRN,SE,STERI
W2T926468	NUT, EBARA IMPELLER
W2T914563	O-RING, PUMP CASE, EBARA
W2T926470	O-RING, VENT PLUG EBARA
W2T914573	O-RING, VENTURI TUBE
W3T579417	PLC, VERSAMAX MAIN MODULE
W2T914641	PLC, VERSAMAX, EXPANSION MODULE
W2T913156	PUMP, ¾ HP, MIX PUMP, EBARA
W2T914554	O-RING, HINGED LID

CATALOG NO.	DESCRIPTION
W2T914915	RELAY, 24VAC, 20 AMP (MCR-1)
W2T914918	RELAY, 24VAC, 30 AMP (C-1)
W2T914910	RELAY, 24VAC, 5 AMP (CR 1 THROUGH CR 6)
W2T914997	SILICONE SEALANT, 3 OZ
W2T501811	SLEEVE,QUARTZ,UV,10",DOE,VIQ
W2T915035	SONALERT, 24 VOLT
W2T919654	SPRAYHEAD, PVC, ¼″ HEAD TANK
W2T915059	SPRAYHEAD, PVC, 3/8″, MIX TANK
W2T425370	SWITCH, 3 POSITION (MIX/OFF/TRANSFER)
W2T926415	SWITCH, 3 POSITION, MOMENTARY (AUTO FILL/MANUAL FILL)
W2T913115*	SWITCH, FLOAT, DIP TUBE
W2T188750*	SWITCH, FLOAT, HEAD TANK OR BULK ACID TANK, 1/2″ NPT
W2T913072	SWITCH, FLOAT, MIX TANK, 1 1/4″ NPT
W2T913116	SWITCH, FLOW, 1″, 2 GPM
W2T38399	SWITCH, P-BUTTON, MOMENTARY
W3T577462	SWITCH, SPST, POWER
W2T924570	TANK LID, MIX TANK
W2T915381	UV,1GPM,304SS,120-240V,50/60HZ
W2T915146	TAPE, FOAM, TANK LID
W2T915248	TIMER, DIGITAL
W2T919610	TUBE, COIL, PVC, CLEAR
W2T913086	VALVE, BALL, 1/4″ X BARB
W2T393358	VALVE, BALL, UNION, 1″
W2T913022	VALVE, BALL, UNION, 1-1/4″
W2T369988	VALVE, BALL, UNION, 3/4"
W2T913122	VALVE, SOLENOID, PLASTIC (WATER INLET)
W3T578377	WIRE, DIP TUBE, 45’
W3T578361	WIRE, HEAD TANK REMOTE

FITTINGS COMPRESSION

CATALOG NO.	DESCRIPTION
W2T914258	CONN,TBXMNPT,PPL,1/4,JACO
W2T925063	ELBOW,1/2TBX1/4MNPT,PP,JACO
W2T913602	ELBOW,3/8TBX3/8MNPT,PP,JACO
W2T914036	FTTG,3/8MNTX1/2TB,PP,JACO
W2T925062	TEE,MALE RUN,1/2TBX3/8MNPT,JACO
W2T879805	UNION,1/2TBX1/2TB,PP,JACO
W2T911983	UNION,1/2TBX3/8TB,PP,JACO
W2T925064	UNION,BULKED,1/2TB,PP,JACO
W2T915516	VALVE,TLINK,PVC,3/8JACO,3/8QEST
W2T220836	CONN,TBXMPT,PPL,0.50
W2T926359	CONN,TBXMPT,PPL,0.50X0.25
W2T926353	ELBOW,PPL,MPTXTB,0.38X0.50
W2T394625	ELBOW,PPL,MPTXTB,0.50
W2T879804	TEE,TBXTBXTB,PPL,0.50

FITTINGS (GENERAL)

CATALOG NO.	DESCRIPTION
W2T914761*	QD, MALE, PANEL MOUNT (TANK/OPERATE)
W2T448912	QD, FEMALE, 3/4″ BARB, CAM-LOC
W2T913109	QD, FEMALE, 1″ BARB, CAM-LOC
W2T914760*	QD, FEMALE, 1/2″ TUBE (BICARB WAND)
W2T914862	QD, MALE, 3/4″ MNPT, CAM-LOC
W2T913108	QD, MALE, 1″ MNPT, CAM-LOC

* Suggested Stock Item
** Suggested Stock If Applicable To Unit

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NOTES:

Solution Delivery System

(SDS)

APPENDIX A:

TECHNOTES/LOG SHEETS

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8.0 APPENDIX A

TechNotes

In this section, you will find a variety of information related to your equipment and to dialysis water use in general.

Extra copies of TechNotes may be ordered from Customer Service at (800) 633-3080.

Please reference the number of the Technote, preceded by the letters TN, i.e., Technote 133 = TN133.

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