

# Installation, Operation and Maintenance Manual



## Automatic Polymer Makedown Systems



**Manufacturers of Quality Pumps,  
Controls, and Systems**

### Standard Product Operations

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## **Pulsafeeder Factory Service Policy**

Should you experience a problem with your Polymer Makedown System, first consult the troubleshooting guide in this operation and maintenance manual, as well as the information in the manual for your Pulsatron pump. If the problem is not covered or cannot be solved, please contact your local Pulsafeeder Sales Representative or Distributor, or our Technical Services Department for further assistance.

Trained technicians are available to diagnose your problem and arrange a solution. Solutions may include purchase of replacement parts or returning the unit to the factory for inspection and repair. All returns require a Return Authorization number to be issued by Pulsafeeder. Parts purchased to correct a warranty issue may be credited after an examination of original parts by Pulsafeeder. Warranty parts returned as defective which test good will be sent back freight collect. No credit will be issued on any replacement electronic parts.

Any modifications or out-of-warranty repairs will be subject to bench fees and costs associated with replacement parts.

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## Table of Contents

<u>Topic</u>	<u>Page</u>
Introduction.....	4
Safety .....	5
Skid Layout and Component Descriptions .....	6
Systems Overview .....	7
Supply Side.....	7
Process Side.....	8
Installation .....	9
Owner Installed Piping/Tubing, & Electrical .....	9
Schematic.....	11
Initial System Start .....	12
Initial Prime .....	12
System Operation.....	13
Polymer Makedown Process.....	13



## Introduction

Congratulations! With the Pulsafeeder Pre-Engineered Polymer Makedown System, you have the finest polymer makedown equipment platform available. This system includes the essential elements for successful installation and operation of your system(s). You are encouraged to:

### **READ THIS MANUAL!**

Pulsafeeder Pre-Engineered Polymer Makedown Systems are designed to support multi-pump installations for injection. The skid components (valves, gauges, interconnecting piping, etc.) are furnished to meet your specified operational requirements. The Dosing Pump(s), per se, may be furnished separately, so installation, operation and maintenance instructions for pump(s) are located elsewhere.

Installation, Operation and Maintenance Manual

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## Safety

Your safety is of the utmost concern to Pulsafeeder. Dosing pumps and systems can handle harsh or toxic chemicals and exposure can lead to serious injury or death. Always wear appropriate protective clothing (for example, safety glasses, gloves, coveralls, etc.) and follow safe handling procedures. Pay attention to what you're doing and note safety advisories where they are shown throughout this manual. Some examples of safety issues and precautions for Pulsafeeder Pre-Engineered Polymer Makedown Systems are:

**WARNING**

**Do NOT** use Pulsafeeder Systems (or Pulsafeeder Pumps) for flammable liquids.

**WARNING**

Prior to working on any portion of the System, disconnect pump(s) from power supply, de-pressurize the system and drain chemicals from the lines.

**WARNING**

Inspect tubing regularly and replace as necessary.  
**When inspecting tubing, wear protective clothing and safety glasses.**

**CAUTION**

If skid is exposed to sunlight, use UV-resistant tubing.

**CAUTION**

Follow directions and warnings provided with chemicals from the chemical manufacturer. User/owner is responsible for determining chemical compatibility with chemical feed pump(s) and system components.

**CAUTION**

Secure chemicals, metering pump(s) and system, making them inaccessible to children, pets and unauthorized personnel.

**WARNING**

**Always wear protective clothing** including gloves and safety goggles when working on or near chemical metering pumps and systems.

**CAUTION**

Installation and start-up of chemical dosing system will require both mechanical (plumbing) and electrical work. Only qualified and licensed plumbers and electricians should perform this.

## System Layout and Components

Figure 1, below, illustrates a static mixer polymer makedown system with integrated control and day-tank. This system can be used for two different chemicals or for redundant pump operation with one chemical. Your skid system may be less complex than this. Note the various components and their descriptions as they apply to your system.



CAUTION

**Never remove the Tank Cover without removing power to the Polymer Makedown System first.** The tank mixer blades (inside the tank) can cause serious harm or even death if allowed to come in contact with a person during operation.

Installation, Operation and Maintenance Manual

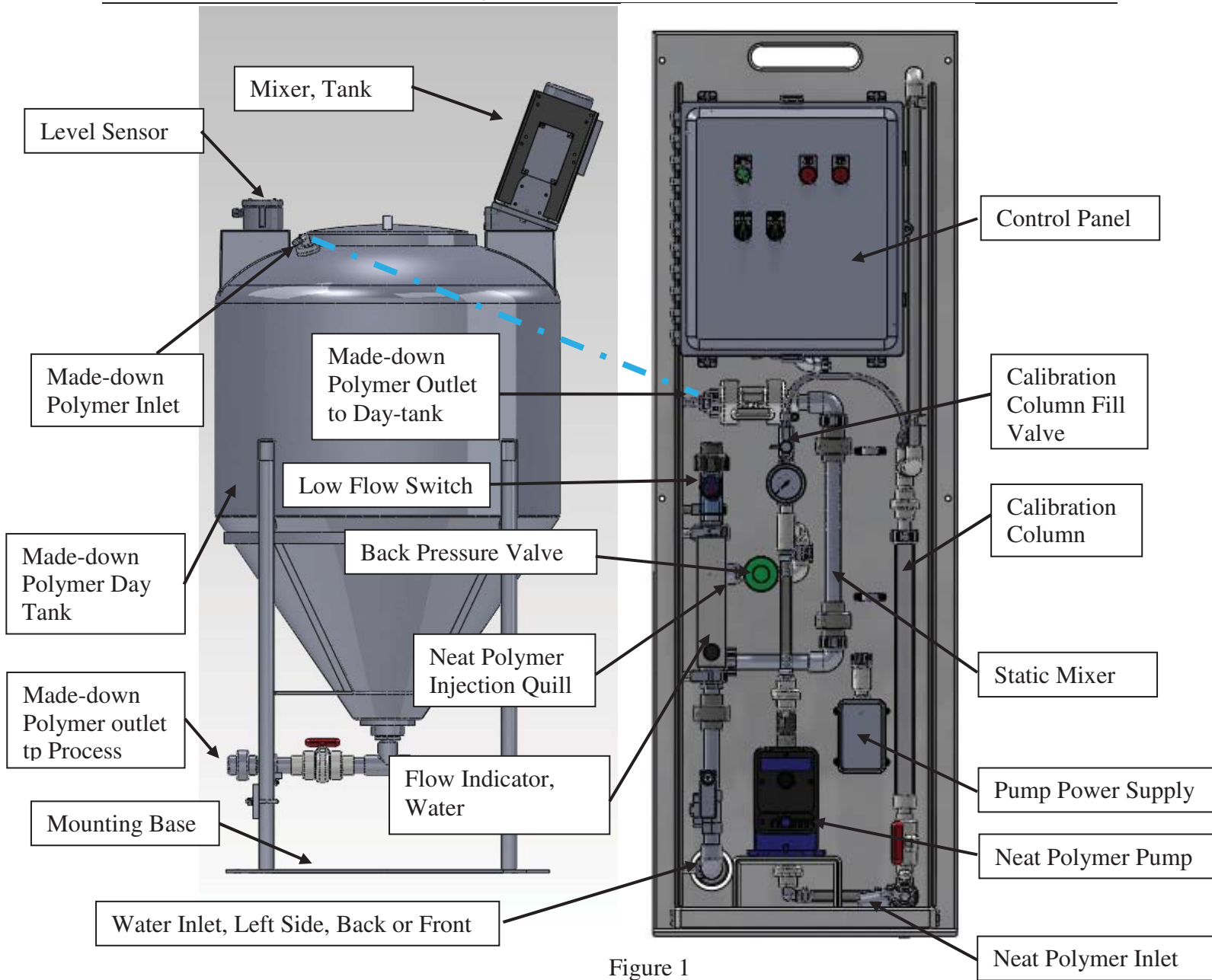


Figure 1

Installation, Operation and Maintenance Manual

## Systems Overview

The Polymer Makedown System is designed to inject neat polymer into a clean water stream and to agitate this mixture through a static mixer causing the polymer strands to expand into a ‘made-down’ aqueous solution. The solution is stored in the polymer solution day-tank and mixed occasionally with the rotary mixer located in the tank. The tank outlet is typically connected to the dosing pump(s) which inject the solution into the process application. The dosing pump(s) are not provided with the Polymer Makedown System and are not powered by the System.

## Supply Side

Dosing chemicals are usually sourced from a barrel or tote container. The source must be located above the centerline of the neat polymer pump which is referred to as a “flooded suction”. Because Neat Polymer is a high viscosity fluid, the supply should never be located below the centerline of the pump(s) which is referred to as “suction lift.” Connections to and from the Neat Polymer Tank are most commonly made with flexible hose or tubing although they may be made with hard piping. The Neat Polymer Tank should be covered to prevent contamination.

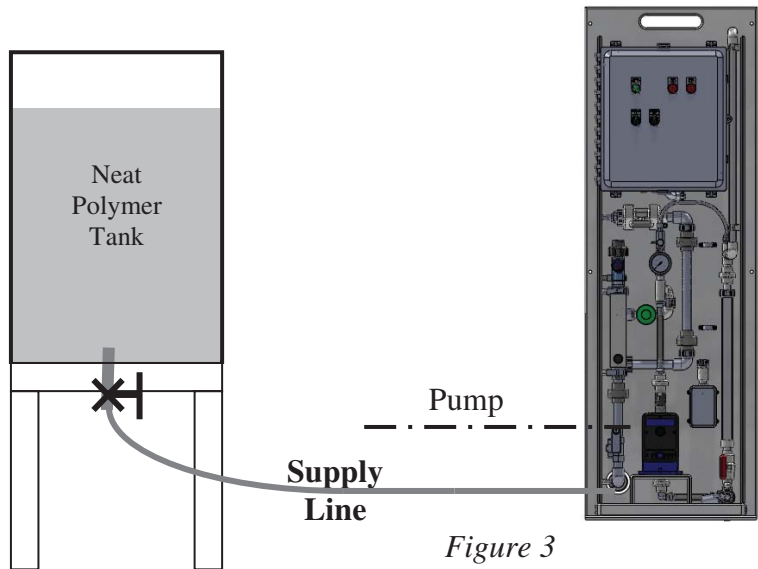
### Flooded Suction

*This is the most trouble free type of installation. Since the Supply Line tubing is filled with chemical, priming is accomplished quickly and the chance of losing prime is reduced.*

*Recommended for very low flow rate applications. e.g. 2 ml/hr, or where pumping solutions such as sodium hypochlorite or hydrogen peroxide which can form air bubbles.*

*Supply Line should gradually slope downward from the Solution Tank to the Skid Suction Connection.*

*It is strongly recommended to add a drain provision on the suction side to facilitate emptying and flushing of the system for maintenance.*



## Process side



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## Installation, Operation and Maintenance Manual

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The injection point in the served process or system **must** be higher than the top of the Solution Supply Tank to prohibit gravity feeding unless suitable backpressure is always present at the injection point.

**In applications where the injection point is below the Solution Supply Tank (example – injection into a well)** or where the injection point may be at reduced pressure (example – injection into the suction side of a pump), installation of an anti-siphon valve in the process feed line will prevent gravity feeding.

Note: For some applications where air or gas may form in the suction line, this may interrupt flow. In this case, it may be desirable to add a “Proof of Flow” device on the process side to alert if chemical injection flow is somehow interrupted. Contact your Pulsafeeder distributor.

## Installation, Operation and Maintenance Manual

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### Installation

Prior to attempting installation, familiarize yourself with the layout and components furnished with your Pulsafeeder Polymer Makedown System. These vary from system to system – review the documentation supplied with your order. Inspect your system for damage which may have occurred during transit. If damage is discovered, immediately file a claim with the carrier and contact your Pulsafeeder distributor for any required replacement parts or components.

**All systems (and pumps) have been tested with water at the factory.**



**CAUTION**

Some dosing chemicals will react with water, e.g., acids, polymers, etc. Check MSDS for the chemical to be handled. If adverse reaction with water is indicated, ensure that all portions of the skid piping, its components (and the pump) are free from water prior to filling skid system with chemical.

Polymer Makedown Systems are to be floor-mounted only. Mounting holes are provided on the skid for floor mounting. Securely attach skid and the day-tank to the floor, in a position to prevent falling or tipping.

Securely attach the provided  $\frac{3}{4}$ " x  $\frac{1}{2}$ " diameter x 10' long tubing from the system's Made-down Polymer Outlet to the Day-tank's Made-down Polymer Inlet, on the hose barbs with the hose clamps provided; refer to Figure 1 on page 6. It is best to cut this tubing to the desired length prior to installation, and be sure to support the tubing adequately over its length as its weight will increase when filled with made-down polymer.

Installation area should provide ease of access to skid components (and pumps) and the area should be kept free of clutter to enable safe operation and maintenance.

Note that pumps/motors are designed for ambient temperatures of 104°F (40°C) **maximum**. It is preferable that skid systems (and pumps) be located out of direct sunlight. If skid system is exposed to sunlight, provide protection for the pump/motor to prevent overheating and UV damage.



**CAUTION**

If skid is exposed to sunlight, use UV-resistant tubing.

### Owner-Installed Piping/Tubing

The next series of steps are the connection of your piping/tubing which include the neat polymer supply line and tank outlet for made-down polymer supply to the system.

These are your responsibility.



**WARNING**

Ensure that for all piping, tubing, fittings and other appurtenances, their materials are compatible with the liquid to be pumped and the design is suitable for the pressures and temperatures of the application. System design must ensure safety for operation and maintenance as well as for anyone who may be in proximity to the system.

Failure to do so may result in damage to equipment, personal injury or death.

## Installation, Operation and Maintenance Manual

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### Neat Polymer Supply Line

This line connects the source of the neat polymer to the Pulsafeeder Polymer Makedown System. Please refer to Figure 1 on page 6. The neat polymer source must be located above the centerline of the pump (flooded suction condition); ensure that the suction line has a gradual downward slope from the tank to the skid suction connection. The purpose of this is to prevent air pocket(s) in the suction line which could affect proper operation of the pump. Include whatever provisions you consider necessary to facilitate maintenance and operation such as isolation valve(s), drain and/or flush connections, etc., making sure that this sub-system enables **SAFE OPERATION**.

### Discharge Line

This line connects the Pulsafeeder Polymer Makedown System to your served process. Please refer to Figure 1 on page 6. If the injection point is below the dosing chemical source or if injecting into a low pressure area such as the suction of a pump, an anti-siphon/ back pressure valve should be located as close as possible to the injection point to prevent unwanted chemical feeding. Include whatever provisions you consider necessary to facilitate maintenance and operation such as isolation valve(s), drain and/or flush connections, etc., making sure that this sub-system enables **SAFE OPERATION**.

### Electrical Connection

The control panel is provided with a standard plug for connection to 115V (+/-10%) , 20A power to operate.

### Electrical Schematic

Refer to diagram on pages. 15,16,and 17.

### Initial System Start

Be sure that all selectors are in the “OFF” position before power is connected; this includes:

1. Main Power switch, marked “POWER”.
2. Neat Polymer Feed Pump switch, marked “POLY. PUMP”.
3. Water Inlet Solenoid Valve switch, marked “WATER SOL.”.
4. Polymer Tank Mixer switch, marked “MIXER”.

## Installation, Operation and Maintenance Manual



Selecting the manual operation mode marked “HAND” for any of the switches will operate that device without regard for any of the safety features or alarm modes that may be active. All safety requirements are the responsibility of the operator while in manual “HAND” mode.

## Initial Prime

The neat polymer pump must be primed before it can function within the system. This will require an initial start of the pump. It is recommended that the system piping be filled with water before polymer is introduced to the system.

1. Turn the Main Power switch to the “On” position.
2. Turn the Water Inlet Solenoid switch marked “WATER SOL.” to “HAND” position to initiate water flow.
3. Once water starts to enter the Polymer Storage Tank, turn the Water Inlet Solenoid switch marked “WATER SOL.” to “OFF” position to terminate water flow.
4. Open the Calibration Column Fill Valve; this aids in pump priming by providing a vent path to the calibration column, bypassing the Back Pressure Valve.
5. Turn “POLY. PUMP” switch to “Hand” to start the Neat Polymer Pump.
6. Observe polymer flow through the clear braided tubing connecting the pump discharge to the system piping; when present the pump is primed.
7. Turn “POLY. PUMP” switch to “OFF” to stop the Neat Polymer Pump.
8. Close the Calibration Column Fill Valve.

## System Operation

1. After the Neat Polymer Pump is primed, turn the Main Power switch, marked “POWER” to the “OFF” position.
2. Turn the Neat Polymer Feed Pump switch, marked “POLY. PUMP” to the “AUTO” position.
3. Turn the Water Inlet Solenoid Valve switch, marked “WATER SOL.” To the “AUTO” position.

## Installation, Operation and Maintenance Manual

- Optional: Turn the Polymer Tank Mixer switch, marked “MIXER” to the “AUTO” position.
- Optional: Select the Mixer Cycle desired:



- 1/9 = 1 minute “ON” followed by 9 minutes “OFF”
- 4/6 = 4 minutes “ON” followed by 6 minutes “OFF”
- 7/3 = 7 minutes “ON” followed by 3 minutes “OFF”
- 10/0 = 10 minutes “ON” with no “OFF” time; continuous operation

- Turn the Main Power switch, marked “POWER” to the “ON” position; the unit will begin to function automatically.

## Polymer Makedown Process

### ○ Process Start

- This is a polymer makedown system utilizes a batch process sequence. The makedown process is triggered to start when the high level switch in the storage tank is open, and the low level switch in the tank changes from closed to open, indicating that the level in the tank has just dropped below the low level.

### ○ Polymer Makedown for Tank Fill

- When triggered to start the controller will energize the Water Inlet Solenoid Valve to open, allowing municipal water to flow into the system. This flow is verified by the condition of the Flow Switch changing from Open to Closed contact. At the same time the Neat Polymer Pump is energized to pump neat polymer into the water flow where it is ‘made-down’ into a polymer solution and stored in the storage tank. This process continues until the High Level switch is closed, leading to the process flush cycle.
- Flow Switch Interrupt – When the Water Inlet Solenoid Valve is open, the Flow Switch status should show Closed to verify water flow in the system, and otherwise show Open indication that water flow has terminated. There are two alarm conditions that will be triggered by the Flow Switch, causing the Red ‘Flow Alarm’ light to illuminate and power supply to be removed from the Water Inlet Solenoid Valve and the Neat Polymer Pump until reset by the Flow Switch condition returning to that expected, or by removing power from the PLC allowing this alarm to reset to off when power resumes.

1. No Flow Alarm: There is a 5 second delay from the opening of the Water Inlet Solenoid Valve to reading the flow switch status for alarm. If the Flow Switch contact status is Open (indicating No Flow, or loss of incoming water) the alarm condition in will be activated.

## Installation, Operation and Maintenance Manual

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2. Undesired Flow Alarm: There is a 5 second delay following closure of the Water Inlet Solenoid Valve to the reading the flow switch status for alarm. If the Flow Switch contact status is Closed (indicating flow, or a failure of the Water Inlet Solenoid Valve to close) the alarm condition in will be activated.

- **Process Flush Cycle**

- This process begins when the Tank Fill operation has ended, triggered by the Low Level Switch in the closed condition, and the High Level Switch moving from to open to the closed condition. The Neat Polymer Pump will be de-energized and the Water Inlet Solenoid Valve will be allowed to remain open for the 'Flush Time' period of 10 seconds. When the Flush Time has expired, the Water Inlet Solenoid Valve will be de-energized allowing it to close, ending the fill process.

- **Mixer Operation – Optional Equipment**

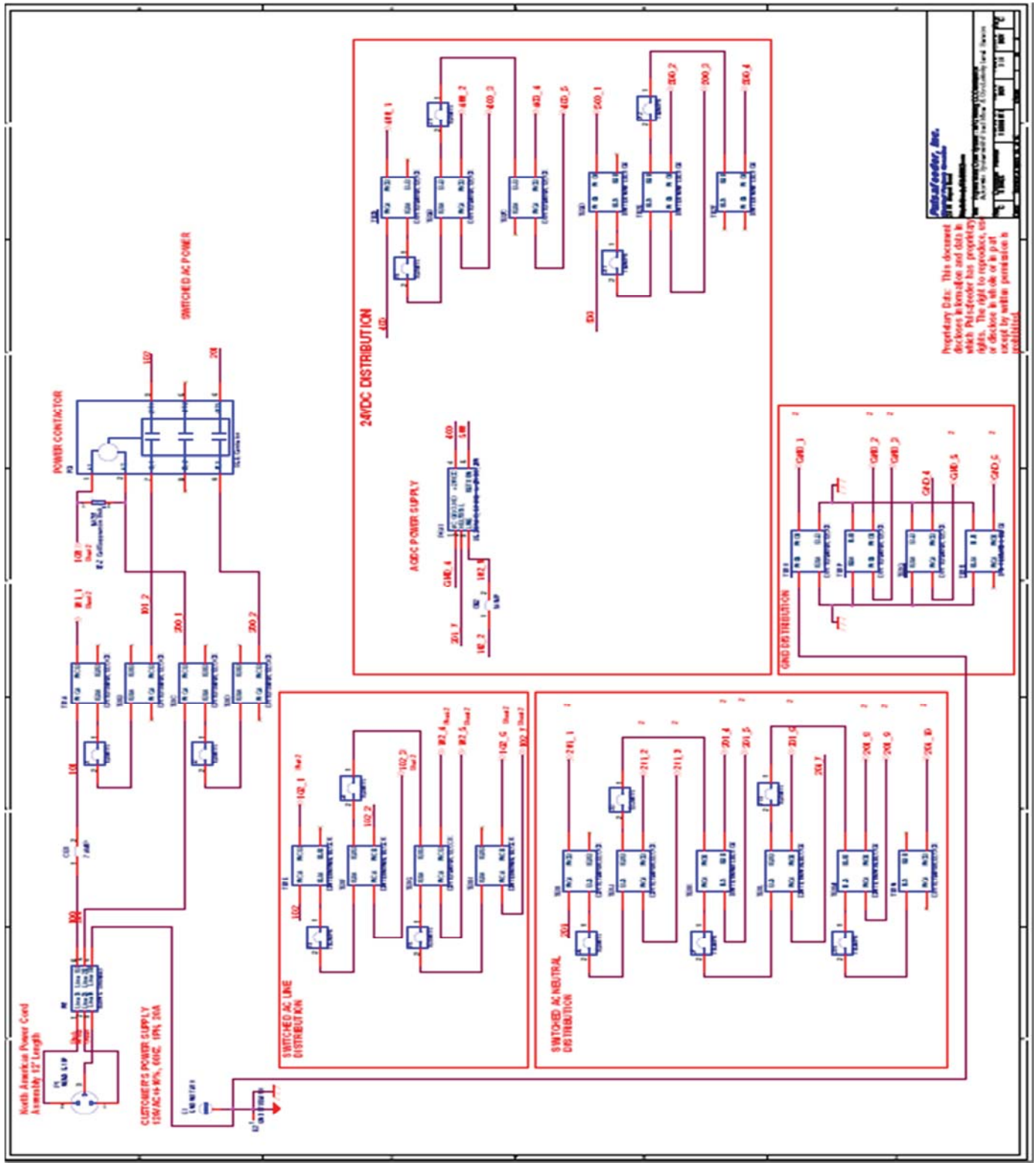
- The mixer is a 115V, 1/3Hp propeller or paddlewheel style unit that is flange mounted to the tank, with either a Fixed Speed or Variable Speed motor. It is actuated via the HOA switch on the control panel. In 'Hand' setting the mixer will run continuously. In 'Auto' mode it will follow a timer sequence as selected by the operator from a multi position switch on the control panel. For the VFD option, the speed adjustment for the mixer can be made on the mixer motor.

- **Level Sensor Operation**

- The Conductivity Level Sensor has 2 level positions that are pre-programmed into the unit, which function as a Low Level Batch Start and a High Level Batch Stop. Each reports as discrete Dry Contact signal. If the tank liquid level is above a particular set point, that contact will show as closed, if below a particular set point the contact will show as open. The 'High Level Alarm' is a separate float switch which will deactivate the system when closed. If this float ever comes in contact with polymer it should be thoroughly cleaned or replaced.
- The Ultrasonic Level Sensor has 3 level positions that are pre-programmed into the unit, which function as a Low Level Batch Start, a High Level Batch Stop and a High Level Alarm. Each reports as discrete Dry Contact signal. If the tank liquid level is above a particular set point, that contact will show as closed, if below a particular set point the contact will show as open. The 'High Level Alarm' is a separate float switch which will deactivate the system when closed. If this float ever comes in contact with polymer it should be thoroughly cleaned or replaced.

Installation, Operation and Maintenance Manual

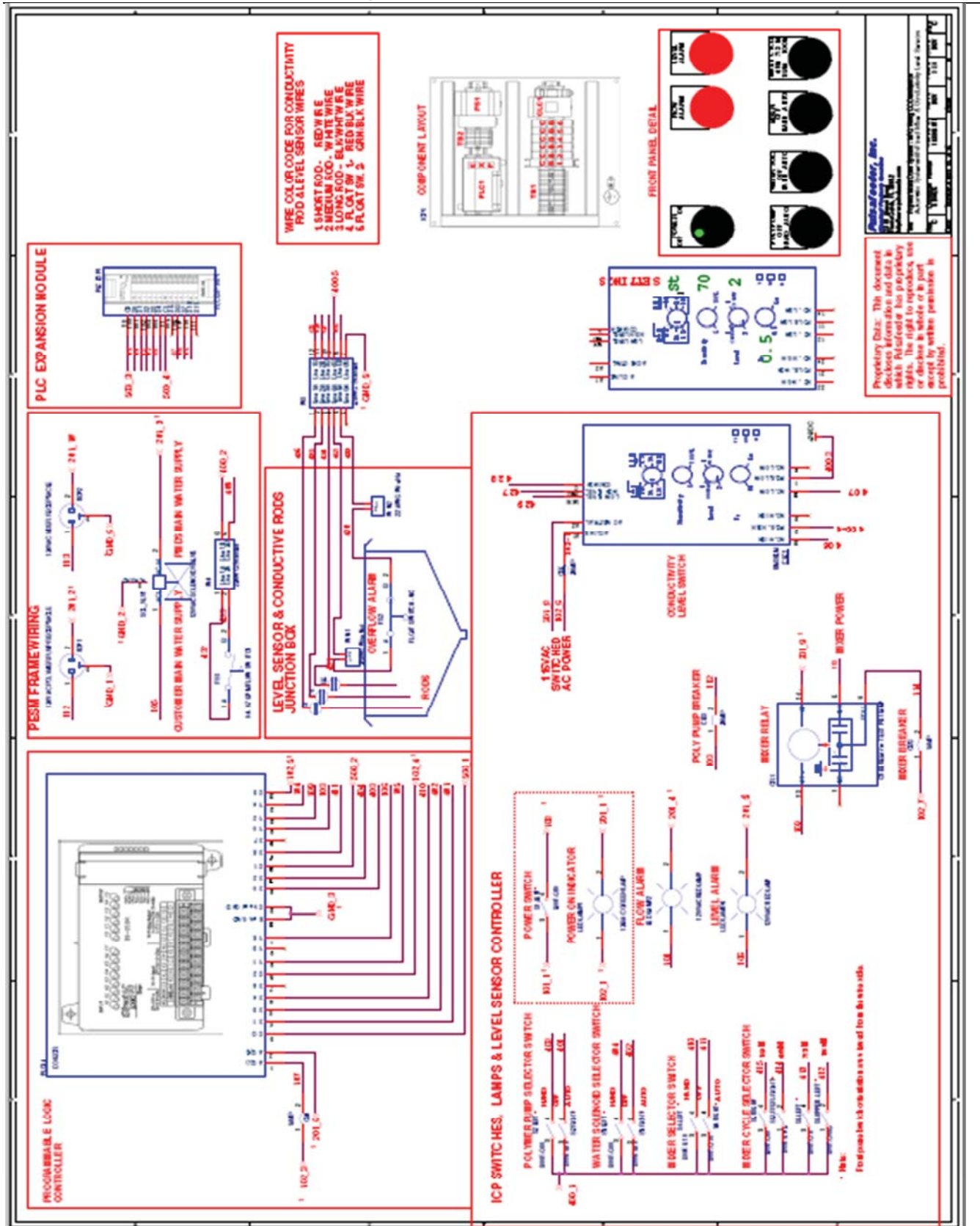
**Electrical Schematic**



1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

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Installation, Operation and Maintenance Manual



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Part No.	Description	Quantity	Lead Time
100.1	PLC Expansion Module	1	100.1
100.2	Programmable Logic Controller	1	100.2
100.3	ICP Switches, Lamps & Level Sensor Controller	1	100.3
100.4	PSM Framewiring	1	100.4
100.5	Level Sensor & Conductive Rods Junction Box	1	100.5
100.6	Component Layout	1	100.6
100.7	Front Panel Detail	1	100.7



Installation, Operation and Maintenance Manual

### FRONT PANEL HARDWARE

### TERMINAL BLOCK HARDWARE

### WIRE SUPPLIES

### NOTES

- 1) CAUTION: THE PDS PANEL MUST BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS LOCAL AND NATIONAL CODES
- 2) ALL WIRE CONNECTIONS MUST BE TERMINATED WITH FERRULES UNLESS OTHERWISE DEPICTED OTHERWISE
- 3) NETWORK NUMBER ASSIGNMENTS ARE AS FOLLOWS:  
 100 SERIES = AC LINE POTENTIALS, 120VAC  
 200 SERIES = AC NEUTRAL CONNECTIONS  
 300 SERIES = EARTH & CHARGES GROUND CONNECTIONS  
 400 SERIES = LOW VOLTAGE, 24VDC & SIGNALS  
 500 SERIES = LOW VOLTAGE COMMON & RETURN LINES
- 4) POWER MUST BE DISCONNECTED PRIOR TO CONNECTING ULTRA SENSITIVE LEVEL SWITCH CONFIGURATION FOR
- 5) DOT INDICATED WIRE CONNECTION OR JUNCTION
- 6) INDICATED WIRE IS NOT CONNECTED
- 7) WIRE COLOR CODE IS AS FOLLOWS:  
 BLACK = AC LINE, 120VAC  
 RED = CONTROLLED AC POTENTIAL, 120VAC  
 WHITE = AC NEUTRAL  
 GREEN = EARTH GROUND  
 BLUE = 24VDC, 24VDC COMMON & LOW VOLTAGE SIGNALS
- 8) SYMBOLS DEFINITIONS:  
 24VDC  
 24VDC COMMON  
 GROUND  
 CHASSIS GROUND  
 --- IS CHASSIS OFF-PAGE CONNECTION  
 --- IS CHASSIS OFF-PAGE CONNECTION
- 9) TANK SETPOINTS ARE PDS-B MODEL DEPENDENT. REFER TO CONFIGURATION GUIDE.

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