SPEEDLINE
ELECTROVERT | Aquastorm 200

AQUEOUS CLEANING SYSTEM

AQUASTORM 200™ OPERATIONS MANUAL

Manual Part #3-9317-521-00-0, Revision 1

SPEEDLINE
ELECTROVERT

Speedline Technologies, Inc.
Hwy. 5 South, Box 709 | Camdenton, MO 65020
Tel: 573-346-3341 | Fax: 573-346-6878

SPEEDLINE
ELECTROVERT | Aquastorm 200

AQUEOUS CLEANING SYSTEM

AQUASTORM 200™
OPERATIONS MANUAL

Text Part #2-9317-521-00-0, Revision 1

Published July 30, 1999

TO OUR CUSTOMERS

The purpose of this manual is to help obtain the greatest possible return on your investment. It is suggested that new operators study the applicable sections of this manual thoroughly before operating the equipment. It is further suggested that the manual be used as a reference by maintenance personnel and as a text for training of new maintenance personnel.

This manual includes operating instructions for this equipment available at the time this manual was approved for printing. Speedline ELECTROVERT reserves the right to make changes in design and specifications and/or make improvements in the product without imposing any obligations upon itself to install them on previously manufactured products.

SPEEDLINE ELECTROVERT SALES AND SERVICES OFFICES

Speedline ELECTROVERT Customer Support Hot Line

Tel: 800-737-8110

Speedline Technologies, Inc. Main Offices

Product & Technology Center
Speedline ELECTROVERT
P.O. Box 709
Camdenton, MO 65020
Fax: 573-346-6878
Tel: 972-606-1900

24 hr Technical Service Support/ Repair Parts
Speedline ELECTROVERT
P.O. Box 709
Camdenton, MO 65020
Fax: 573-346-0002 or 573-346-6878
Tel: 800-737-8110 or 573-346-3341
e-mail:
electrovert_tse@speedline.cookson.com

Field Service Dispatch Center
U.S., Mexico, and Central America
Speedline Technologies
580-A Tollgate Road
Elgin, IL 60123
Fax: 847-289-3797
Tel: 800-498-2429 or 847-695-5750

World Wide Training Center
Speedline Technologies
580-A Tollgate Road
Elgin, IL 60123
Fax: 847-289-3797
Tel: 800-498-2429 or 847-695-5750

Regional Service Centers

North East Regional Service Center
472 Amherst St. Suite 6
Nashua, NH 03063
Fax: 603-880-8757
Tel: 603-883-2488

South East Regional Service Center
200 Technology Dr.
Alpharetta, GA 30005
Fax: 770-442-1987
Tel: 770-475-6100

North Central Regional Service Center
580-A Tollgate Road
Elgin, IL 60123
Fax: 847-289-3797
Tel: 847-695-5750

North West Regional Service Center
2968 Scott Blvd.
Santa Clara, CA 95054
Fax: 408-727-0672
Tel: 408-727-4650

South West Regional Service Center
1111 W. North Carrier Parkway
Grand Prairie, TX 75050
Fax: 972-606-1700
Tel: 972-606-1900

International Service Centers

Northern Europe & U.K.
Electrovert U.K. Ltd.
The Technology Centre
Unit 1, Pincents Kiln Industrial Park
Pincents Kiln
Calcot, Reading
Berkshire, U.K. RG31 7SD
Fax: 44 11-8-930-1401
Tel: 44 11-8-930-1400

Speedline Technologies Asia
150 Kampong Ampat
#05-08 KA Centre
Singapore 368234
Fax: 65-289 9411
Tel: 65-286 6635

Japan
Electrovert-Seitec Co., Ltd.
1538 Kanoya-cho
Hachioji City, Tokyo 193 JAPAN
Fax: 81-426-23-8350
Tel: 81-426-23-7722

Northern Europe
Speedline Technologies S.A.R.L.
65 Avenue du General De Gaulle
Immeuble le Promethee
77420 Champs-Sur Marne, France
Fax: 33 160-05-6129
Tel: 33 160-06-8181

Central Europe
Speedline Technologies, Gmbh
Daimlerstrasse 1E
D-63303
Dreieich, Germany
Fax: 49 6103-832119
Tel: 49 6103-8320

Speedline Technologies Italy
Via Liguria 2/28
I-20068 Peschiera Borromeo (MI)
Italy
Fax:39- 2 - 5530.8468
Tel: 39- 2 - 5530.8339

EQUIPMENT MANUAL QUESTIONNAIRE

The purpose of this questionnaire is to provide feedback from our customers regarding the effectiveness of the equipment manuals. Please complete the following questions and return to Speedline/ELECTROVERT. Your comments are appreciated.

Customer _____

Address _____

Contact _____ Date _____

Machine Type _____ Manual Part Number _____

Translated Manual Language _____ Part Number _____

Option Manual _____ Part Number _____

1. How often do you refer to the technical manual package?
   - ❑ Frequently
   - ❑ Occasionally
   - ❑ Seldom
   - ❑ Never
2. In what instances do you refer to the technical manual package?
   - ❑ To verify process information
   - ❑ To reference procedures (operational, maintenance)
   - ❑ To order/identify parts
   - ❑ Other (please specify) _____
3. How do you rate the overall layout of the manual package?
   - ❑ Information easy to find
   - ❑ Information difficult to find
   - ❑ If difficult, please explain _____
4. How do you rate our manuals in comparison to your other capital equipment suppliers?
   - ❑ Higher quality
   - ❑ Same general quality
   - ❑ Lower quality

   If same general or lower quality, please explain _____

   _____
5. How do you rate the accuracy of the technical information?
   - ❑ Very accurate
   - ❑ Somewhat accurate
   - ❑ Not accurate
   - ❑ Can you provide examples, with page number indicated? _____

   _____
6. What tools would make the manuals easier to use and/or find information?
   - ❑ Indexes
   - ❑ Glossaries
   - ❑ Improved Table of Contents
   - ❑ Other _____
7. Who are the main users of your equipment manuals?
   - ❑ Operators
   - ❑ Maintenance personnel
   - ❑ Process Engineers
   - ❑ Other _____
8. How do you rate the quality of the language translation (if applicable)?
   - ❑ Very accurate
   - ❑ Somewhat accurate
   - ❑ Not accurate

   If somewhat or not accurate, can you elaborate? _____

   _____

   _____

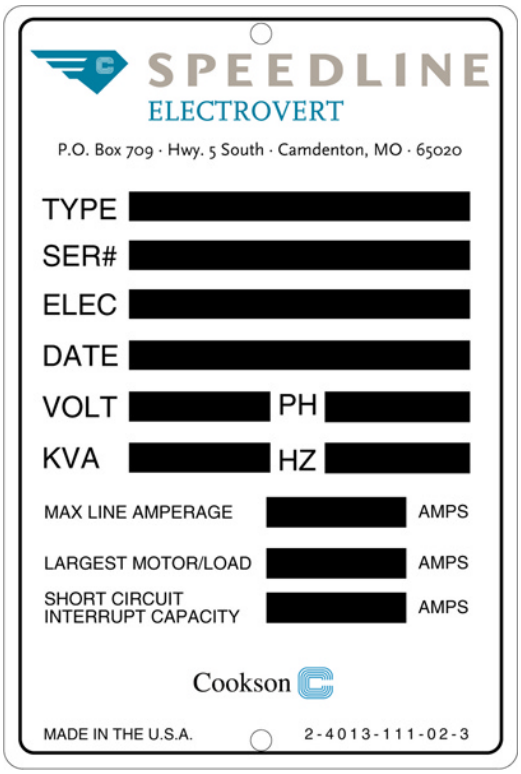
Please add any additional comments about our manuals on the back of this page.

Please return to:

Technical Publications Department at the address listed below

SPEEDLINE ELECTROVERT

Speedline Technologies, Inc.
Hwy. 5 South, Box 709 | Camdenton, MO 65020
Tel: 573-346-3341 | Fax: 573-346-6878



The serial tag information is to be filled by the user for technical support purposes. Please have the following information available when contacting Technical Support or when placing parts orders:

Machine Name
Model Number
Mechanical and Electrical Serial Numbers
Item/Kit Description

COMMON SAFETY WARNING LABELS

The following warning labels are used throughout this manual:

Notes point out information in this manual that may be of assistance to the operation or maintenance of the machine.

Caution notices are used in this manual to call attention to a situation that could cause damage to equipment.

Warning notices are used in this manual to emphasize hazardous voltages, high temperatures, high currents, or other conditions that could cause personal injury.

Danger notices are used in this manual to warn the operator that DEATH may result if a procedure is omitted or improperly performed.

Table of Contents

Aquastorm 200™ Operations Manual

SECTION 4: MACHINE SET UP

SECTION 5: CONTROLS AND INDICATORS

SECTION 6: DAILY OPERATION

SECTION 1: GLOSSARY

SECTION 2: INDEX

SECTION 1: SAFETY INFORMATION

1.1 HAZARDS

Operation of this equipment exposes personnel to potential health hazards.

HOT SURFACE HAZARDS

Figure 1: Hot Surface Warning Tag

Hot Surfaces/Burn Hazard — During normal operation this equipment and some of its components operate at temperatures up to 60–71 °C (140–160 °F). The operator must use extreme caution and wear the recommended safety garments prior to coming in contact with hot surfaces or components. Closely follow and adhere to the Warnings in this manual which pertain to hot surfaces.

Use extreme caution when working around or with hot components. Allow hot components to cool before handling whenever possible.

ELECTRICAL HAZARDS

Figure 2: Electrical Hazard Warning Tag

Risk of Electric Shock — Installation of this equipment involves exposure to situations which may result in electrical shock if procedures are not properly followed. Pay close attention to Warnings of this nature throughout the context of this manual.

When performing tests using ammeters, volt meters, or ohm meters, electrical shock hazard is present. These procedures must be performed only by an authorized electrician, electrical engineer, or service technician familiar with testing live voltage.

HIGH VOLTAGE — Installation of this equipment involves exposure to High Voltage. High Voltage can shock, burn, or cause death. Use extreme caution when performing voltage and amperage tests on live voltage. These procedures must be performed only by an authorized electrician, electrical engineer, or service technician familiar with testing live voltage.

MECHANICAL HAZARDS

Figure 3: Pinchpoint Warning Tag

Moving Parts — All moving parts of the Aquastorm system, including pulleys, sprockets, chains, and the conveyor represent potential hazards. Use caution and avoid having hands or fingers caught in any moving mechanism. Long hair, jewelry, and other parts of loose attire could be caught in moving mechanisms and cause injury.

Stop all moving parts when making adjustments or performing maintenance. When the system is running, avoid moving mechanisms. Use caution when working on or near moving parts and wear safety gear.

OTHER HAZARDS

Heavy Objects — When attempting to move heavy equipment or components, it is imperative to use the proper rigging equipment. Do not attempt to move skids or large assemblies without the use of a fork lift or other rigging equipment. Hand lifting will cause serious personal injury.

To avoid damage to the equipment and system drain fixtures located under the machine, adjust the fork lift forks to their widest position. Use fork extensions on forks if the forks do not extend at least seven (7) feet. Do not place fork lift forks at the positions indicated by the CAUTION labels. The Aquastorm 200™ and Aquastorm 100™ frame width is 153.7cm (59.9 inches).

Skin Irritation — When using certain chemicals such as descalers or saponifiers, it is important to follow the MSDS (Material Safety Data Sheet) guidelines for proper handling and usage. Wear appropriate clothing and safety articles when using descaler and saponifier solutions. Skin or eye irritation will occur if not handled properly.

1.2 SAFETY PRECAUTIONS

Electrical work should only be performed by a qualified electrician.

Prior to applying power for the first time, ensure that the system is properly grounded.

Post No Smoking signs in the work area and provide measures for enforcement.

Exercise caution when using strong cleaning agents, solvents, and other chemicals. MSDS guidelines contain specific uses and safety precautions which must be thoroughly understood and strictly followed. If in doubt about any safety notices, contact the manufacturer for clarification.

Avoid prolonged skin contact and inhalation of chemicals and fumes.

Operating this equipment may introduce burn hazards. Avoid contact with all hot surfaces, hot water, and steam. The viewing glass can reach temperatures in excess of 71 °C (160 °F). Take extreme caution to avoid touching the glass surfaces. Water temperatures reach and/or exceed 71 °C (160 °F). Steam may escape from the system cabinet when windows are opened during operation or for maintenance, installation, upgrade, or repair procedures. Steam causes serious burns. Avoid contact with steam.

Protective clothing is required for servicing hot machine components or areas of the machine which come in contact with chemical applications. Protective clothing includes the following approval agency and items:

ANSI (American National Standard Institute) approved:

- Safety Goggles

NIOSH (National Institute for Occupational Safety and Health)

OR

MSHA (Mine, Safety and Health Administration) approved:

- Respirator
- Steel Toe Safety Shoes
- High Temperature, Acid, and Water Resistant Gloves
- Apron
- Long-Sleeved garment

Fumes can generate from certain saponifies, defoamers, descalers, cleaning solvents, or other chemicals used during operation. Take precautions to avoid accumulation of flammable vapors. Whenever harmful fumes are present, a proper extraction (exhaust) system must be provided. Refer to the manufacturer MSDS for information and safety precautions concerning their products and system exhaust specifications.

Refer to specific chemical manufacturers MSDS guidelines for disposal and/or removal and handling of waste materials resulting from chemical operating processes.

All operators should be provided with an NIOSH or MSHA approved Respirator to provide effective protection from airborne residue resulting from certain saponifiers, defoamers, descalers, cleaning solvents or other chemicals used during operation.

The chemicals and cleaning agents recommended for use with Aquastorm systems are not products of Electrovert. Please refer to the specific chemical manufacturer Material Safety Data Sheet (MSDS) for specific use, handling, and safety procedures for chemical and cleaning agent applications.

1.3 LOCK OUT-TAG OUT

Be sure to perform Lock Out – Tag Out steps before beginning maintenance, installation, or upgrade procedures. Refer to the following steps when performing any maintenance, installation, or upgrade procedures on an Aquastorm 200™ System:

1. Identify the types of energy sources used, potential hazards, and all control devices.
2. Notify all affected employees.
3. Turn off all operating controls.
4. Locate all energy sources.
5. Isolate all energy sources by blocking, bleeding and/or venting stored energy as found in springs, hydraulic systems and pneumatic systems.
6. Lock out the main power switch in the OFF position.

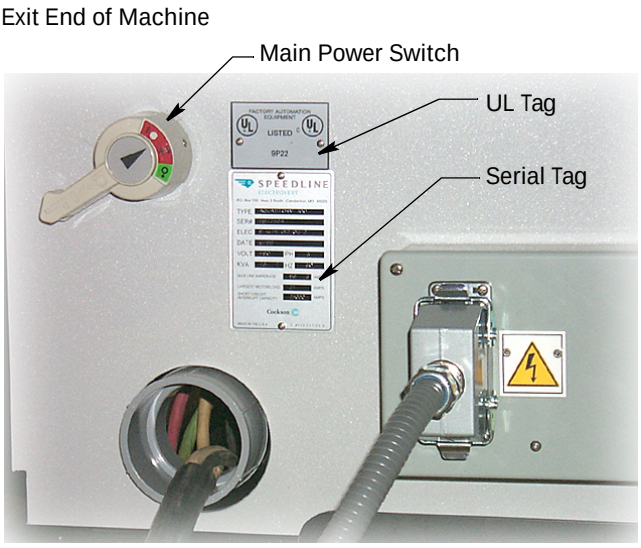


Figure 4: Main Power Switch Location

7. Test operating controls. Put all controls in the On position. Be sure no one can get hurt before testing.
8. Return all operating controls to the Off position before proceeding.
9. Perform the required task or maintenance procedure.
10. Remove lock out device only after the equipment is fully assembled and all affected employees are notified.
11. The person who attaches a lock out device is responsible to remove the device.

INITIAL PREPARATION

Before beginning maintenance, installation, upgrade, or repair procedures, be sure to perform Lock Out – Tag Out steps.

To prepare for system access:

1. Ensure there are no Printed Circuit Boards (PCB) or other product in the system.
2. Locate the Lower Control Panel at the entrance end of the system.
3. Power down all operating sections of the machine by pressing the Off buttons on the Lower Control Panel.

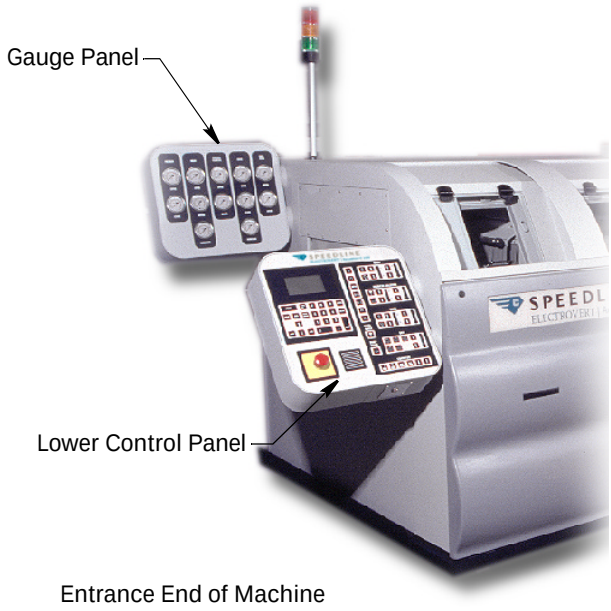


Figure 5: Gauge Panel and Control Panel Location

Figure 6: Aquastorm 200™ Lower Control Panel

LOCK OUT MAIN POWER SWITCH

To attach a lock out-tag out device:

1. Locate the main power disconnect switch at the exit end of the system.

DANGER Electrical current used can kill. DO NOT TOUCH live electrical components inside the electrical enclosure.

2. Turn the main disconnect switch to the OFF position.
3. Pull the tab and insert the Lock Out device.
4. Secure the Lock Out device in place.

Figure 7: Exit End of Machine

5. On systems with an optional EPS (Emergency Power Supply) battery backup installed, toggle the battery control to the Off position.
6. The system is ready for maintenance, installation, upgrade, or repair procedures on electrical, and plumbing devices.

1.4 PERFORM REQUIRED WORK

Proceed with the specific maintenance, installation, upgrade, or repair procedures required. Follow the directions in the manuals supplied with the system.

WARNING Components in the system become hot during normal system operation. Heated sections of the machine produce steam. To prevent burns, allow heated sections or hot components to cool or wear required safety clothing when accessing heated areas of the machine for maintenance, installation, upgrade, or repair procedures.

1.5 RESUME/BEGIN OPERATION

Prior to removing the Lock Out device and resuming system operation, ensure the following is complete:

- Perform and complete each scheduled maintenance, installation, upgrade, or repair operation
- Replace any worn parts, if necessary
- Complete all required cleaning steps, if necessary
- Replace all enclosures removed during maintenance, installation, upgrade, or repair procedures
- Latch or appropriately tighten down all enclosures removed during maintenance, installation, upgrade, or repair operations

CAUTION If items removed during maintenance, installation, upgrade, or repair procedures are not properly replaced, damage to the equipment can occur.

REMOVE LOCK OUT DEVICE

The person who attaches a lock out device is responsible to remove the device.

1. At the exit end of the machine unlock the lock out device.
2. Place the Main Power Disconnect in the On position.
3. On systems with an optional EPS (Emergency Power Supply) battery backup installed, toggle the battery control to the On position.
4. Resume normal system operation.

SECTION 2: TECHNICAL DATA

2.1 FACILITY REQUIREMENTS

These general facility requirements pertain to the Aquastorm 200™ system and cover all possible options available. During preliminary preparation and system set up refer only to those items relating to the system ordered or purchased.

WATER REQUIREMENTS

The Fill and Final Rinse water supplies must be separate.

The immersion heaters in the recirculating wash and rinse tanks heats incoming tap or treated water after an initial waiting period. Electrovert recommends supplying heated water 60–71 °C (140–160 °F) to the recirculating wash, rinse, and optional chemical isolation tanks in order to maintain operating temperatures.

EXHAUST REQUIREMENTS

The following exhaust specifications assist in determining an exhaust blower capable of exhausting the system. Measure all exhaust measurements at the machine exhaust port. Proper exhaust ensures correct machine operation and safety.

Electrovert recommends an independent, separate blower for this equipment due to the high volume requirements and condensate build up resulting from normal operation.

Contact your local HVAC specialist for blower requirements and ventilation hook-up.

Table 1: Facility Requirements

Water Requirements		
Final Rinse Water supply must be separate from Fill water supply.	Schedule Temperature Flow Rate Nominal Pressure	80, 3/4 in. NPT CPVC pipe 60–71° C (140–160° F) 11–19 L/Min (3–5 Gal./Min.) 2.8–3.3 kg/cm^2 (35–40 PSI)
Fill	Schedule Temperature	80, 3/4 in. NPT CPVC pipe 60–71° C (140–160° F)
System Drain	Common Constant	1-1/2 in. NPT, CPVC pipe 38 L/Min. (10 GPM)
Exhaust Requirements		
Recommended venting material	5.4 cm (10 in.) diameter minimum Seamless stainless steel or PVC air duct.	
Total for standard two (2) dryer system	68 M^3/min. @ 2.5 cm (2400 SCFM @ 1.0 in.) H_2O static pressure	
Total for optional add-on dryers #3 and #4	102 M^3/min. @ 2.5 cm (3600 SCFM @ 1.0 in.) H_2O static pressure Port #1 34 M^3/min. @ 2.5 cm (1200 SCFM @ 1.0 in.) H_2O static pressure Port #2 34 M^3/min. @ 2.5 cm (1200 SCFM @ 1.0 in.) H_2O static pressure Optional Port #3 and Port #4 34 M^3/min. @ 2.5 cm (1200 SCFM @ 1.0 in.) H_2O static pressure	

Exhaust Notes:
Measure all exhaust measurements at the machine exhaust port. Recommend an independent separate blower due to the high volume requirements and condensate build up resulting from normal operation.

Table 1: Facility Requirements

Capacities	
Recirculating Wash Tank	300 Liter (80 gallon)
Recirculating Rinse Tank	189 Liter (50 gallon)
Optional Enhanced Chemical Isolation Tank	95 Liter (25 gallon)
Optional Sump Pump	38 Liter (10 gallon)
Optional Treatment Interface Tank	66.24 Liter (17.5 gallon)
Specifications	
Wash Section	Standard – 5 HP @ 220 L/Min. (58 gpm) Hurricane – 10 HP @ 439 L/Min. (116 gpm) Heaters – Two (2) 16 KW Heaters – 32 KW Total
Optional Enhanced Chemical Isolation	Tank Heater One (1) 16 KW Total Optional Drag-Out Blower 7.5 HP, 3 Ph, 460 VAC, 500 CFM Turbine Blower
Rinse Section	Standard – 5 HP @ 220 L/Min. (58 gpm) Hurricane – 10 HP @ 439 L/Min. (116 gpm) Heaters – Two (2) 16 KW Heaters 32 KW Total
Dryer Blower #1	Standard Turbine Blower – 7.5 HP, 3 Ph, 460 VAC, 500 CFM Option 1 Turbine Blower – 10 HP, 3 Ph, 460 VAC, 600 CFM Option 2 Turbine Blower – 15 HP, 3 Ph, 460 VAC, 875 CFM
Dryer Blower #2	Standard Turbine Blower – 7.5 HP, 3 Ph, 460 VAC, 500 CFM Option 1 Turbine Blower – 10 HP, 3 Ph, 460 VAC, 600 CFM
Optional Radiant Heater	Two (2) 1800 Watt Radiant Heater panels; 3.6 KW Total
Conveyor	1/8 HP, 90 VDC Motor, 0.0–3.65 MPM (0–12 FPM) (0.0–4.57 Meters/Min.)
CheckMate™ Conveyor	Two (2), 1/8 HP, 90 VDC Motors, 0–15 FPM (0.0–4.57 Meters/Min.)
Sump Pump	3/4 HP, 3 pH, 460 VAC, 50 gpm (189 L/Min.)

2.2 ELECTRICAL REQUIREMENTS

For systems with 220 V electrical configurations, the customer is responsible to provide a system electrical disconnect capable of protecting the Aquastorm 200™ at the amperages specified. Systems with 380 and 460 V electrical configurations include a system disconnect.

Table 2: Electrical Requirements

Standard Electrical Configuration	460 VAC, 3 PH, 60 Hz (214 amps maximum) Includes system high voltage disconnect
Optional Electrical Configuration	220 VAC, 3 PH, 60 Hz (428 amps maximum) No high voltage disconnect 380 VAC, 3 PH, 50 Hz (259 amps maximum) Includes system high voltage disconnect
Pump and Blower Upgrade Level 1 Wash or Rinse Module Optional Chemical Isolation Dryer Modules	 Upgrades pumps to 10 HP Adds a 7.5 HP Enhanced Chemical Isolation blower And/Or Adds a tank immersion heater Upgrades blowers to 10 HP And/Or Adds an IR Dryer to Dryer #2
Pump and Blower Upgrade Level 2 Wash or Rinse Module Optional Chemical Isolation Dryer Module	 Upgrades pumps to 10 HP Adds a tank immersion heater Adds an IR Dryer to Dryer #2 And/Or Upgrades Dryer #2 to 15 HP
Enclosed CLS (Closed Loop System) Standard Power Optional Power	 460 VAC, 3 phase, 60 Hz. (40 Amps) 380 VAC, 3 phase, 50 Hz (48 Amps)

CALCULATE FLA

To calculate the FLA (Full Load Amps) for a specific system configuration, use the following formula and the specific KVA ratings listed by module in Table 3 on page 8.

$$\text{Amps Required} = \frac{\text{Total Machine kVA x 1000}}{\text{(1.732) x (Machine Voltage)}}$$

NOTE The normal operating power is 80-85% of the maximum power required, depending on process parameters and operational load for the product being run.

Table 3: Aquastorm 200™ Modules

MODULE	TOTAL POWER
Controls	3 kVA
Wash Module	
Heaters (2 @ 16 kVA)	32.kVA
5 HP Pump (Std.)	5 kVA
10 HP Pump (Opt.)	10 kVA
Chemical Isolation Level 1 (Opt.)	
7.5 HP Blower (Std.)	7.7 kVA
Enhanced Chemical Isolation Level 2 (Opt.)	
7.5 HP Blower (Std.)	7.7 kVA
Enhanced Chemical Isolation Level 3 (Opt.)	
7.5 HP Blower (Std.)	7.7 kVA
Single 16 kVA Heater (Std.)	16 kVA
Rinse Module	
Heaters (2 @ 16 kVA)	32 kVA
5 HP Pump (Std.)	5 kVA
10 HP Pump (Opt.)	10 kVA
Dryer Module #1	
7.5 HP Blower (Std.)	7.7 kVA
10 HP Blower (Opt.)	10 kVA
15 HP Blower (Opt.)	14.6 kVA
Dryer Module #2	
7.5 HP Blower (Std.)	7.7 kVA
10 HP Blower (Opt.)	10 kVA
IR Heaters (Opt.)	3.6 kVA

MODULE	TOTAL POWER
Add-On Single Dryer (Opt.)	
7.5 HP Blower (Std.)	7.7 kVA
10 HP Blower (Opt.)	10 kVA
15 HP Blower (Opt.)	14.6 kVA
Add-On Dual Driver (Opt.)	
Dual Dryer Module #1	
7.5 HP Blower (Std.)	7.7 kVA
10 HP Blower (Opt.)	10 kVA
15 HP Blower (Opt.)	14.6 kVA
Dual Dryer Module #2	
7.5 HP Blower (Std.)	7.7 kVA
10 HP Blower (Opt.)	10 kVA
IR Heaters (Opt.)	3.6 kVA

2.3 DIMENSIONS

Refer to the following drawing and table for overall system dimensions and information. Refer to SECTION 3: Aquastorm 200™ System on page 13 for specific module dimensions and operation information.

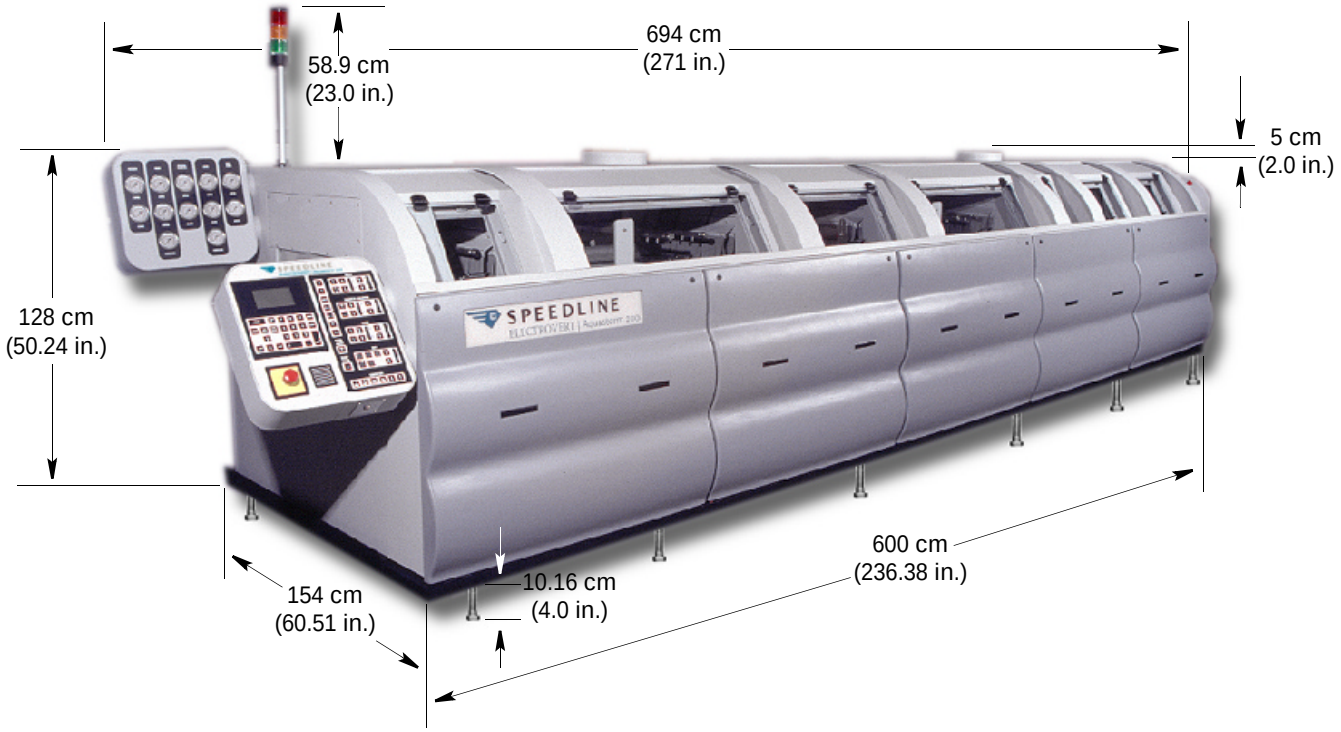


Figure 8: Aquastorm 200™ Cabinet Dimensions

Table 4: Dimensions and Optional Features

Aquastorm 200™	
Standard System Main Cabinet (Frame)	600 cm (236.38 in.) L x 154 cm (60.51 in.) W x 128 cm (50.24 in.) H
Standard System Overall Dimensions	Main Cabinet, Control Panel, Sound Enclosure – 691 cm (272 in.)
Aquastorm 200™ Standard Features	
Leveling Feet	10.16 cm (4 in.)
Exhaust Vent	5 cm (2.0 in.) from the top of the Main Cabinet
Aquastorm 200™ Options	
Optional Inlet Conveyor	85.8cm (33.8 in.)
Optional Status Tower	58.9cm (23.2 in.) from top of Main Cabinet
Optional Treatment Interface System	133.6 cm (52.1 in.) L x 68.3 cm (26.7 in.) W x 81.62 cm (32.13 in.) H
Optional Sump Pump	61.6 cm (24 in.) L x 42.5 cm (16.6 in.) W x 61.8 cm (24.1 in.) H

Table 4: Dimensions and Optional Features

Optional Add-On Single Dryer Module #3 Configured as a third drying station	Add-on or stand-alone unit – 79 cm (31 in.) W Temperature monitor via thermocouple sensor LCD readout on operator control panel. Two (2) tubular stainless steel height adjustable upper airknives One (1) fixed lower tubular stainless steel airknife 7.5 HP high-velocity centrifugal blower Air cooled – 14 m^3/min. @ 97 cm (500 cfm @ 46 in.) of water Blower Upgrade 1 10 HP high-velocity centrifugal blower Air cooled – 18 m^3/min. @ 117 cm (600 cvm @ 46 in.) of water Blower Upgrade 2 15 HP high-velocity centrifugal blower Air cooled – 25 m^3/min. @ 147 cm (875 cvm @ 58 in.) of water Airknife Option Electrosonic™ Air Knife package
Optional Add-On Dual Dryer Module Blower #3 and Blower #4	Two (2) sections – 79 cm (31 in.) W — Total 158 cm (62 in.) W Temperature monitor via thermocouple sensor LCD readout on operator control panel Two (2) tubular stainless steel height adjustable upper airknives One (1) fixed lower tubular stainless steel airknife 7.5 HP high-velocity centrifugal blower Air cooled – 14 m^3/min. @ 97 cm (500 cfm @ 46 in.) of water Blower Upgrade 1 for Blower #3 10 HP high-velocity centrifugal blower Air cooled – 18 m^3/min. @ 117 cm (600 cvm @ 46 in.) of water Blower Upgrade 2 for Blower #3 15 HP high-velocity centrifugal blower Air cooled – 25 m^3/min. @ 147 cm (875 cvm @ 58 in.) of water Airknife Option for Blower #3 Electrosonic™ Air Knife package Blower Upgrade 1 for Blower #4 10 HP high-velocity centrifugal blower Air cooled – 18 m^3/min. @ 117 cm (600 cvm @ 46 in.) of water Blower Upgrade 2 for Blower #4 15 HP high-velocity centrifugal blower Air cooled – 25 m^3/min. @ 147 cm (875 cvm @ 58 in.) of water Airknife Option for Blower #4 Electrosonic™ Air Knife package Radiant Panel Drying Station for Blower #4 Two (2) 1.8 kW (3.6 kW total) elements: One (1) upper and One (1) lower panel Temperature monitor and controller Thermocouple LCD readout capabilities

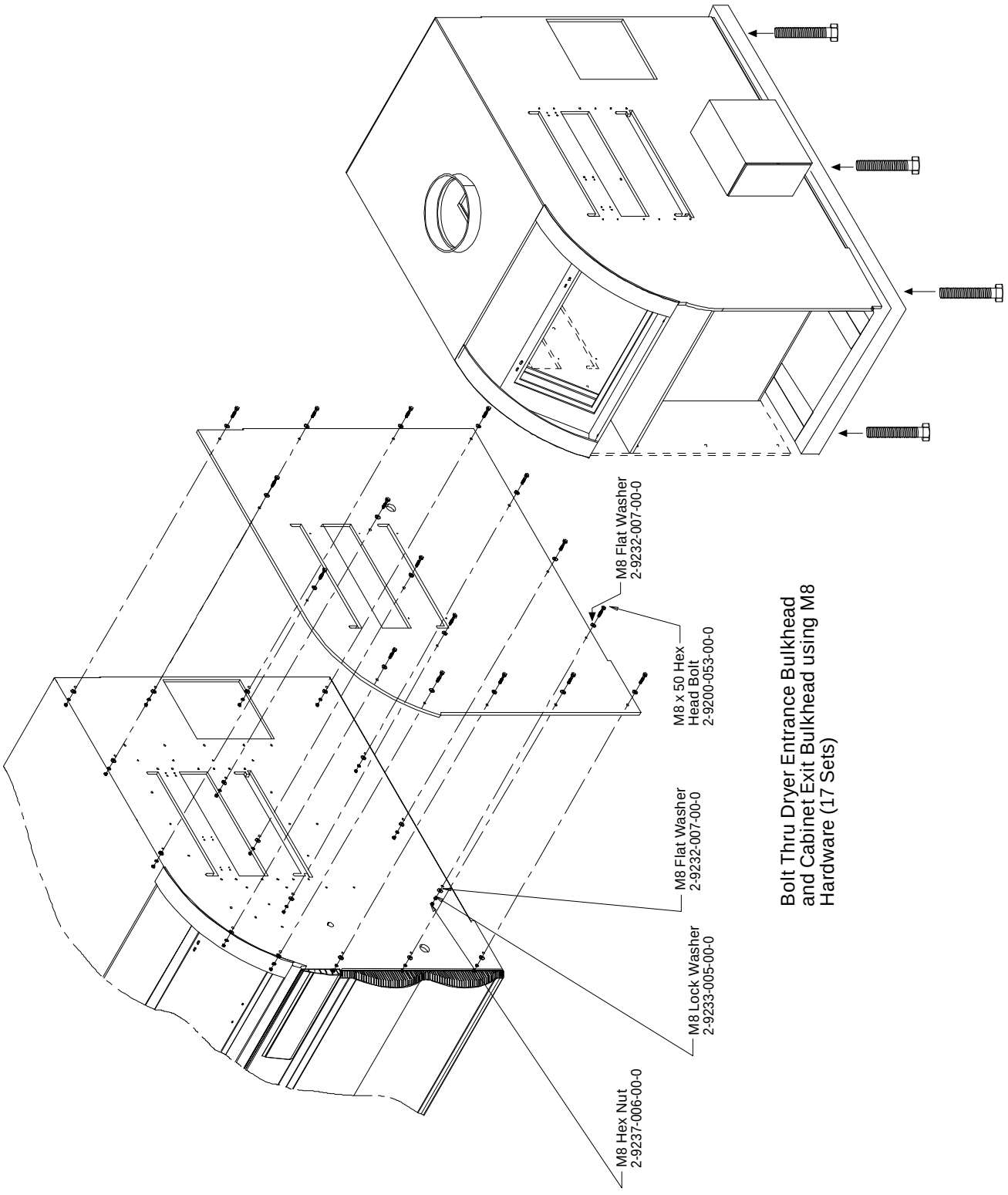


Figure 9: Optional Add-On Dryer Module Drawing

This page intentionally left blank.

SECTION 3: AQUASTORM 200™ SYSTEM

3.1 SYSTEM DESCRIPTION

The Aquastorm 200™ aqueous cleaning system provides automated, aqueous cleaning, contaminant fluid and particle removal from Printed Circuit Board (PCB) assemblies. After processing PCB assemblies through wavesolder or reflow systems, the Aquastorm 200™ process zones provide efficient cleaning and drying to complete the operation.

The futuristic designed, one-piece constructed cabinet is built of ½ in. and ¼ in. custom textured polypropylene that resists scratching and is aesthetically pleasing. Easily removable front and rear access panels are constructed of light weight, molded ABS (Acrylonitrile-Butadiene-Styrene). Triple welded tanks and stainless steel plumbing complete the Aquastorm 200™ package.

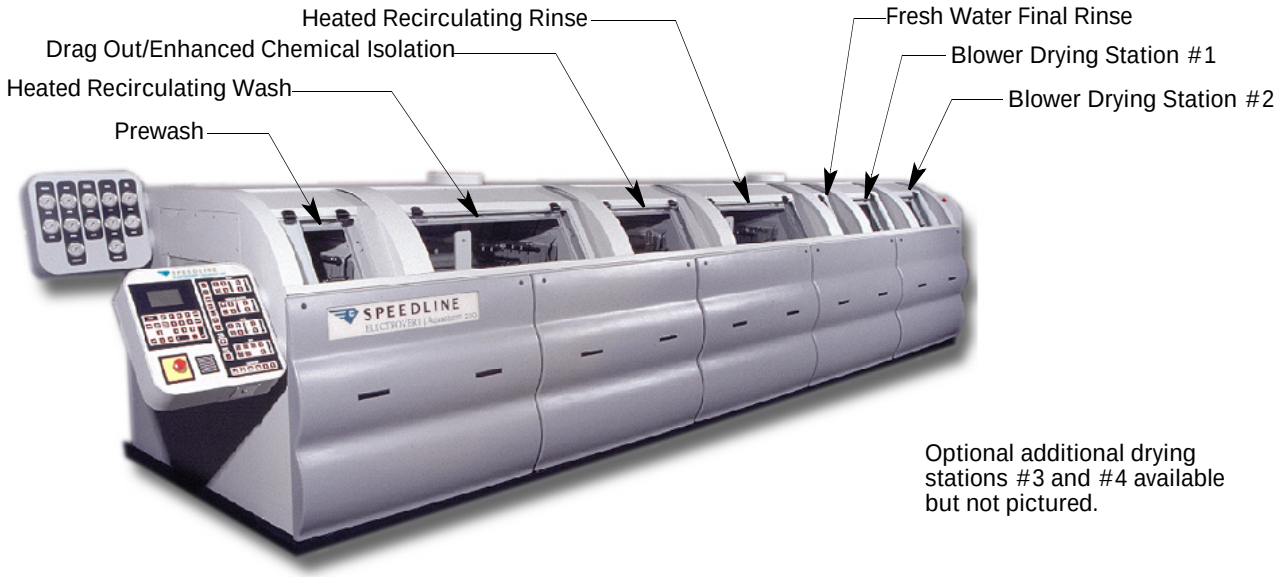


Figure 10: Aquastorm 200™ Process Zones

3.2 SYSTEM CONTROLS

A single custom control panel and separate gauge panel, located at the entrance end of the system, provide complete Aquastorm 200™ operator control.

Using a membrane touch pad panel with graphic symbols, a multi-line LCD (Liquid Crystal Display) with membrane keypad, and an internal computer with fiber optic interface connections the operator easily manages all system functions. Indicator lights provide system water level, temperature level, pump operating indication, blowers, fill/drain solenoids, radiant heaters, and conveyor status.

The Aquastorm 200™ is configured with front mounted stainless steel pressure gauges for all wet sections. The gauges mount at the entrance end of the system for easy operator viewing and monitoring.

Figure 11: Aquastorm 200™ Control Panel and Gauge Panel

3.3 CONVEYOR

The stainless steel wire belt conveyor is a 0.95 cm (3/8 in.) pitch 50.8 cm (20 in.) wide speed controlled wire mesh belt. The conveyor belt transports PCB assemblies for cleaning and drying in a single pass through the Aquastorm 200™ system. Usable conveyor width is 46 cm (18 in.). Optionally the wire belt conveyor may be configured with a 61 cm (24 in.) providing a 56 cm (22 in.) usable width.

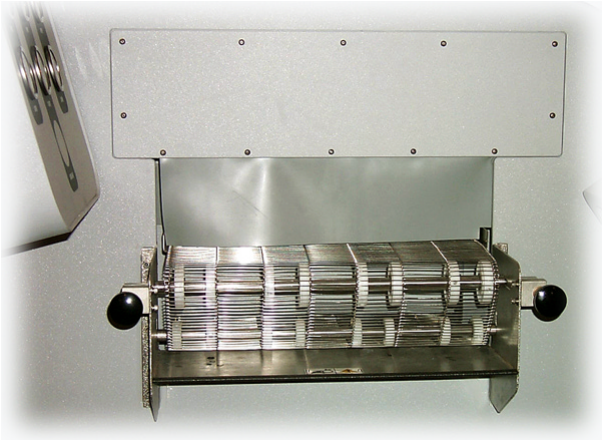


Figure 12: Standard Conveyor Entrance End

3.4 NOISE SUPPRESSION

The noise suppression hood suppresses the noise level equal to or better than 80 dBA maximum measured 1 meter (3 ft.) above the floor and 1 meter (3 ft.) from the Aquastorm 200™ enclosure.

To facilitate PCB removal the noise suppression hood incorporates a 46 cm (18 in.) exit conveyor extension. The extension protrudes 15.24 cm (6 in.) past the exit end of the cabinet.

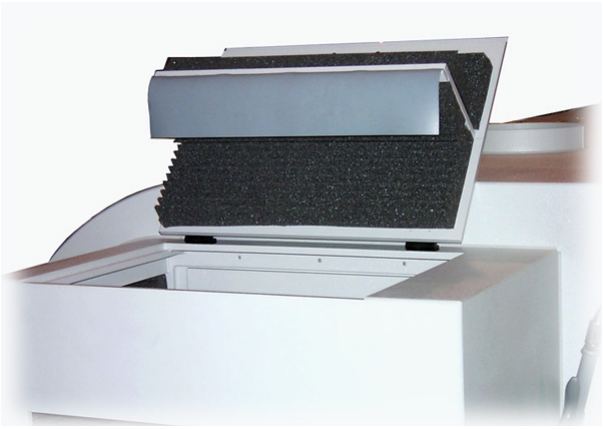


Figure 13: Noise Suppression Hood

3.5 PREWASH

The 36 cm (14 in.) prewash module includes two (2) upper spray manifolds and two(2) lower spray manifolds. Power cascade comes from the recirculating wash tank. Optionally direct prewash to the drain or to cascade to the recirculating wash. When operating the prewash directly to drain, set the prewash operating pressure lower than the final rinse pressure to prevent excess water consumption in the wash module.

Figure 14: Prewash Module

Figure 15: Prewash Rear View

3.6 HEATED RECIRCULATING WASH

The recirculating wash module measures 122 cm (48 in.) and contains four (4) upper spray manifolds and four (4) lower spray manifolds powered by a 5 hp pump. It comes standard with a 303 liter (80 gal.) tank and two (2) 16 kW immersion heaters. Heater and water temperatures display on the LCD keypad. The internal computer continually monitors and controls tank temperature with a thermocouple device. If temperatures exceed 82 °C (180 °F), the tank high temperature alarm indicator illuminates, an audible alarm sounds, and the tank heaters shut off.

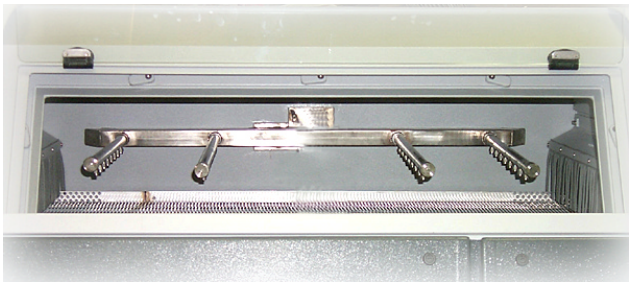


Figure 16: Heated Recirculating Wash Module

Figure 17: Wash Tank Rear View

Liquid level float switches monitor the tank fluid level. If the tank fluid level falls below the low level float switch, the tank heaters shut off, the tank level alarm indicator illuminates, and an audible alarm sounds.

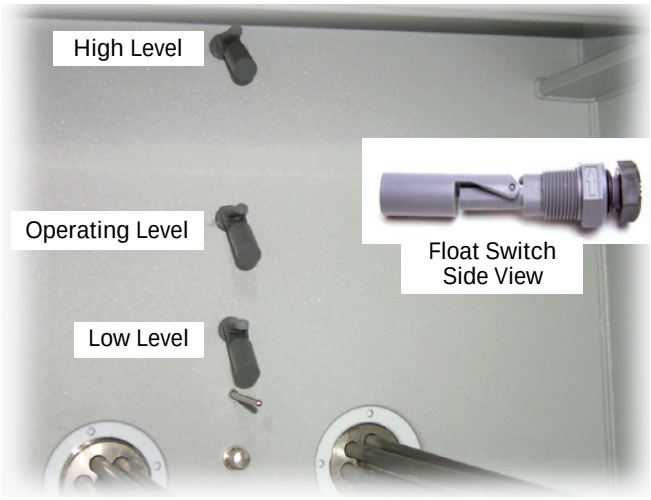


Figure 18: Float Switches Inside Tank

A fill solenoid activated by the low and/or operating liquid level float switch in the wash tank provides automatic wash tank fill capabilities. When the tank is empty, the fill solenoid activates to fill the system tank. During normal operation, if the water level falls below normal operating level, the fill solenoid activates and fills the wash tank.

Hurricane Jet™ Option

The wash module can be enhanced with an optional Hurricane Jet™ performance kit. The Hurricane Jet™ manifold mounts between the standard four (4) upper spray manifolds. The performance kit provides a 10 hp pump to replace the standard 5 hp pump.

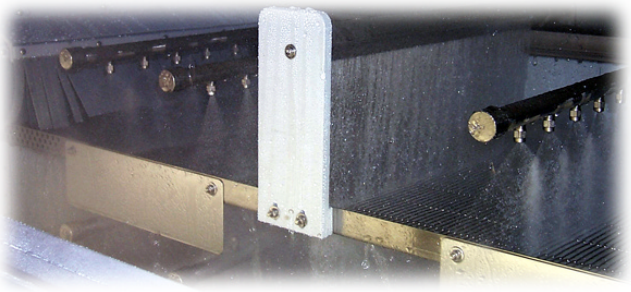


Figure 19: Hurricane Jet™ Option

3.7 DRAG OUT/ENHANCED CHEMICAL ISOLATION

The drag out/enhanced chemical isolation module is 30.5 cm (36 in.) wide. Four (4) separate configurations are available:

- Standard chemical isolation
- Level 1 chemical isolation
- Level 2 chemical isolation
- Level 3 chemical isolation

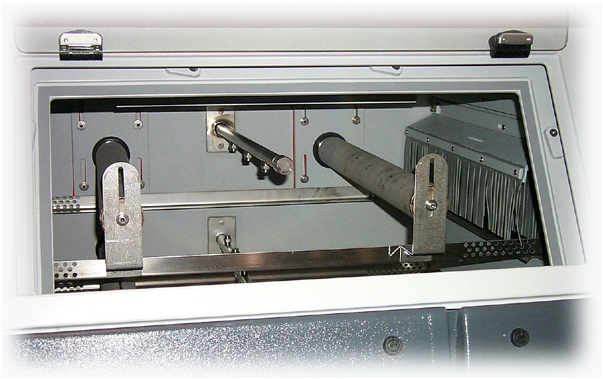


Figure 20: Chemical Isolation Module

Figure 21: Chemical Isolation Rear View

STANDARD CHEMICAL ISOLATION

This configuration does not include airknives or spray manifolds. Excess water drips from PCB assemblies as it passes through this module. The dripping allows fewer contaminants to carry over from the wash to the rinse section.

NOTE When adding saponifier to the wash module and recirculating rinse water, standard chemical isolation configuration does not provide adequate separation of wash and rinse water.

CHEMICAL ISOLATION BLOWER OPTION

To enhance the chemical isolation module an optional 7.5 hp turbine blower can be installed. Blower air enhances excess water removal from PCB assemblies.

LEVEL 1 CHEMICAL ISOLATION

Includes the turbine blower, and three (3) stainless steel airknives, one (1) lower and two (2) upper. Blower air removes and squeegees excess contaminant containing water from PCB assemblies. Excess water removed via the first set of airknives is routed back to the wash section. This helps prevent saponifier loss and reduces cross contamination risk between wash and rinse modules.

LEVEL 2 CHEMICAL ISOLATION

Includes the same blower and airknife configurations as Level 1 and adds three (3) more spray manifolds one (1) upper and (2) lower. The spray manifolds are positioned between the airknives.

The spray bar water supply comes from an external feed supplied by the customer. A low volume spray enhances removal of remaining saponifier solutions. This configuration of chemical isolation is routed directly to the drain to eliminate any cross contamination.

LEVEL 3 CHEMICAL ISOLATION

Includes both Level 1 and Level 2 features and is supplied with an on-board 95 liter (25 gallon) tank in lieu of an external water source plumbing configuration. A 1/8 hp internal recirculation pump powers the spray manifolds. The tank includes one (1) 16 kW immersion heater, auto fill, tank liquid level floats, and rinse to chemical isolation cascade. Level 3 provides increased isolation between wash and rinse modules and conserves water use.

3.8 HEATED RECIRCULATING RINSE

The recirculating rinse module measures 122 cm (48 in.) and contains four (4) upper spray manifolds and four (4) lower spray manifolds powered by a 5 hp pump. It comes standard with a 189 liter (50 gal.) tank and two (2) 16 kW immersion heaters. Heater and water temperatures display on the LCD keypad. The internal computer continually monitors and controls tank temperature with a thermocouple device. If temperatures exceed 82 °C (180 °F), the tank high temperature alarm indicator illuminates, an audible alarm sounds, and the tank heaters shut off.

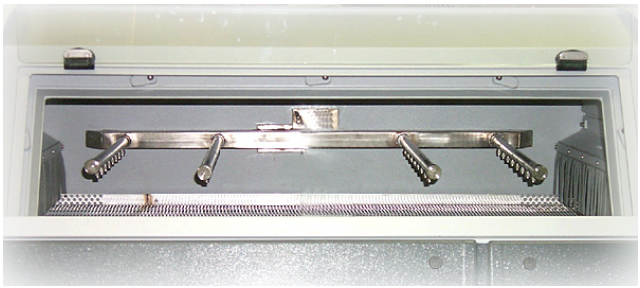


Figure 22: Heated Recirculating Rinse Module

Figure 23: Rinse Tank Rear View

Liquid level float switches monitor the tank fluid level. If the tank fluid level falls below the low level float switch, the tank heaters shut off, the tank level alarm indicator illuminates, and an audible alarm sounds. Figure 18 on page 15 shows float switch location inside the tank.

A fill solenoid activated by the low and/or operating liquid level float switch in the wash tank provides automatic wash tank fill capabilities. When the tank is empty, the fill solenoid activates to fill the system tank. During normal operation, if the water level falls below normal operating level, the fill solenoid activates and fills the wash tank.

The recirculating rinse tank is configured with a cascade pipe to the recirculating wash tank. Flow through the cascade pipe, from rinse to wash, is controlled by a ball valve. Run O/A (Organic Acid) or water soluble applications with the valve in the open positions. Run rosin or saponifier applications with the valve in the closed position, to eliminate any possible contamination in the cascade pipe.

Enhanced Chemical Isolation Level 3

If the system is configured with an on-board tank in the chemical isolation section, a cascade pipe from the recirculating rinse tank to the chemical isolation is also supplied. The valve on this cascade pipe remains closed for O/A applications. When running saponifier processes, slightly open the ball valve on the cascade pipe to the chemical isolation tank. This prevents an excess amount of saponifier build up in the chemical isolation tank. Adjust the valve opening depending upon the type of saponifier used and the product mix or product configuration.

Hurricane Jet™ Option

The wash module can be enhanced with an optional Hurricane Jet™ performance kit. The Hurricane Jet™ manifold mounts between the standard four (4) upper spray manifolds. The performance kit provides a 10 hp pump to replace the standard 5 hp pump.

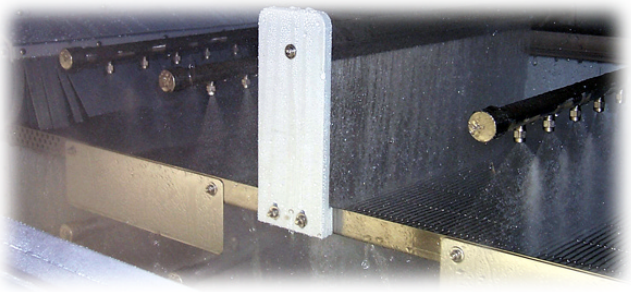


Figure 24: Hurricane Jet™ Option

3.9 FINAL RINSE

The final rinse module is 46 cm (18 in.) long and consists of two (2) upper and two (2) lower stainless steel spray manifolds. A fresh water inlet, preferably heated DI (dionized) water, facility supplied, rinses the PCB assemblies and cascades into the recirculating rinse tank.

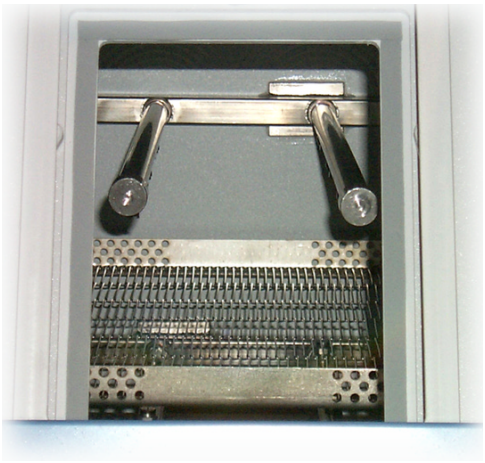


Figure 25: Final Rinse Module

Figure 26: Final Rinse Rear View

3.10 BLOWER DRYING

Each blower module, #1 and #2, measures 76 cm (30 in.) and is configured with two (2) upper, height adjustable, and one (1) lower, fixed, stainless steel airknives. A high velocity, high volume 7.5 hp turbine blower delivers air to the airknives. Each blower module contains thermocouple sensors to provide temperature readout via the LCD keypad.

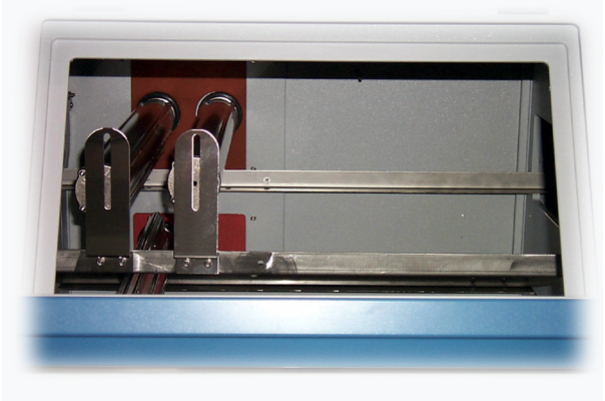


Figure 27: Blower Drying Module

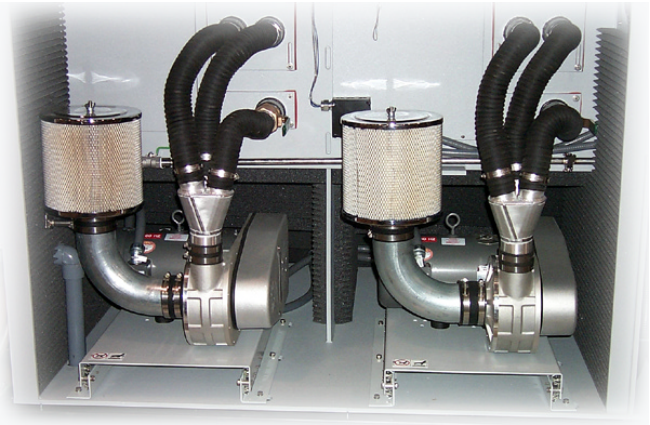


Figure 28: Blower Rear View

BLOWER ENHANCEMENTS

Blower module #1 is upgradable to a 10 or 15 hp blower to ensure maximum drying efficiency prior to PCB assemblies exiting the system. In general 15 hp blower applications work best with large, heavy PCB assemblies. Smaller PCB assemblies can become airborne, or lodged in the conveyor system.

RADIANT HEATER

Blower module #2 may be configured with an optional radiant heater. The radiant heater incorporates two (2) 1800 watt radiant heater panels, one (1) upper panel and one (1) lower panel for a total of 3600 watts. A thermocouple sensor provides radiant heater control and readout. The thermocouple provides digital temperature readout via the LCD keypad.

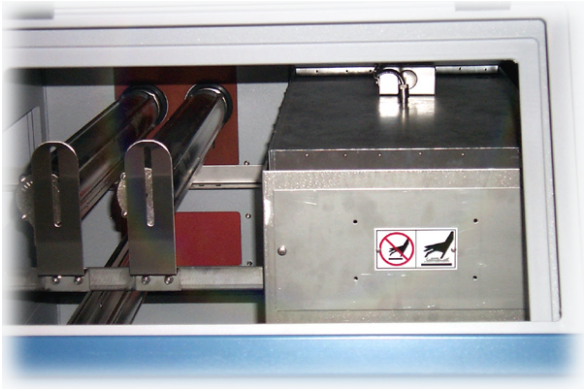


Figure 29: Dryer Module with Radiant Heater

ADDITIONAL DRYING STATIONS

The Aquastorm 200™ can optionally be configured with one (1) or two (2) additional blower drying modules, #3 and #4. The third drying module is configured the same as blower dryer #1 and can include any of the same options. The fourth drying module is configured the same as blower dryer #2 and can include any of the same options.

ELECTROSONIC™ AIRKNIFE

To enhance blower drying, replace the standard cylindrical airknives with Electrosonic™ ariknives. The unique teardrop design of the Electrosonic™ airknife maximize air velocity as it blows through the slot and produces a sheet of air. The adjustable slot allows for optimal air delivery depending on blower configuration. All Electrosonic™ airknives are adjusted according to voltage, Hz, and blower size.

Based on residual weight gain testing performed on a variety of PCB assemblies run at 2, 4, and 6 fpm, drying performance with Electrosonic™ airknives enhanced performance 25–68% over traditional cylindrical airknife systems.

Figure 30: Electrosonic™ Airknife

3.11 CONFIGURATION DIAGRAMS

Stainless steel spray manifolds and airknives deliver water and air to the Aquastorm 200™ system in the following configurations.

STANDARD CONFIGURATION

Table 5: Standard Configuration

Prewash	Two (2) upper and two (2) lower manifolds
Recirculating Wash	Four (4) upper and four (4) lower manifolds
Drag Out/Chemical Isolation	No airknives
Recirculating Rinse	Four (4) upper and four (4) lower manifolds
Final Rinse	Two (2) upper and two (2) lower manifolds
Blower Dryer #1	Two (2) upper and one (1) lower manifolds
Blower Dryer #2	Two (2) upper and one (1) lower manifolds

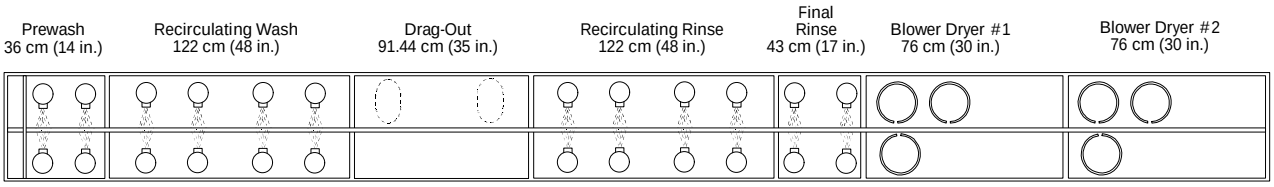


Figure 31: Standard Configuration Diagram

OPTIONAL CONFIGURATION

Table 6: Optional Configuration

Prewash	Two (2) upper and two (2) lower manifolds
Recirculating Wash	Four (4) upper and four (4) lower manifolds and one (1) Hurricane™ Jet
Drag Out/Chemical Isolation	Two (2) upper airknives and one (1) lower airknife One (1) upper and one (1) lower chemical isolation spray manifold
Recirculating Rinse	Four (4) upper and four (4) lower manifolds and one (1) Hurricane™ Jet
Final Rinse	Two (2) upper and two (2) lower manifolds
Blower Dryer #1	Two (2) upper and one (1) lower Electrosonic™ Airknives
Blower Dryer #2	Two (2) upper and one (1) lower Electrosonic™ Airknives and IR Dryer

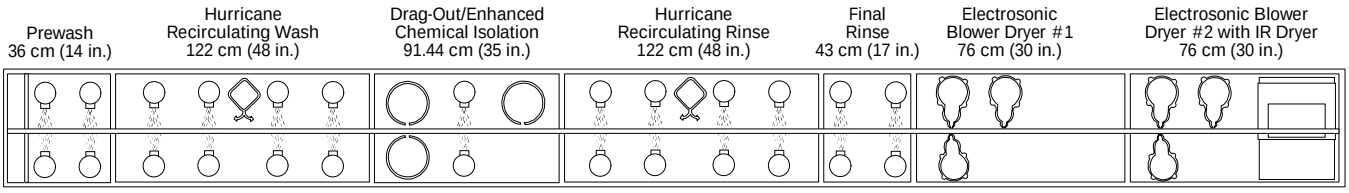


Figure 32: Optional Configuration Diagram

3.12 PLUMBING

All rear system plumbing, including fill and final rinse inlets is comprised of 3/4 in, 1-1/2 in. and 2.0 in. orbitally welded, tubular stainless steel pipe with quick-release clamps. The welded stainless steel provides smooth transition, minimize pressure drops, and eliminate leaks.

Figure 33: Stainless Steel Plumbing Connections

All internal upper and lower spray manifold plumbing is stainless steel, reducing corrosion and maintenance factors.

Quick-release clamps and Teflon™ O-rings ensure quick and easy field upgrades.

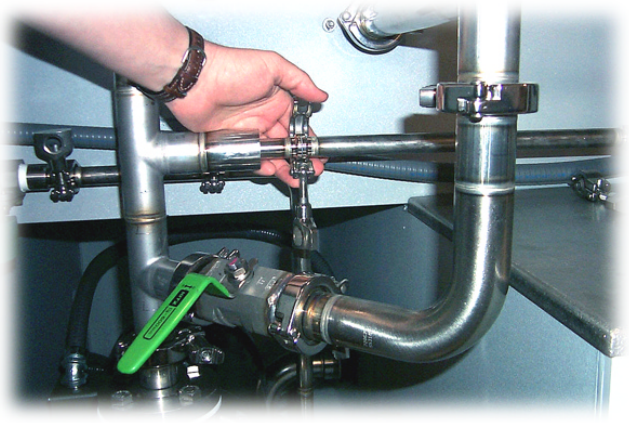


Figure 34: Removing Quick-Release Clamp

All drain lines are 1-1/2 in. CPVC with brass solenoid drain valves. Stainless steel solenoid valves are optional.

3.13 EXHAUST

To permit fine tuning of system exhaust, internal slide gate dampers are designed into the one-piece construction of the internal portion of the cabinet. Completely adjustable slide gate dampers are included in the prewash, drag out/enhanced chemical isolation, blower dryer #1, and blower dryer #2 modules. From the front of the system, access the dampers through the access windows of the specific module. From the rear of the system access the dampers at the bulkhead wall.

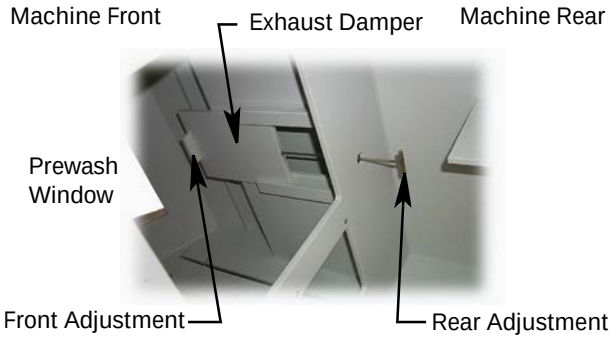


Figure 35: Adjust Exhaust Damper

3.14 OPTIONS

Several options enhance Aquastorm 200™ system operation. Common options are discussed here or elsewhere in this manual. Options discussed in detail in the Aquastorm Series Options Manual include:

- Air Intake Ports
- Bag Filters
- Blower Fail Detect
- Conveyor inlet and exit extensions and Checkmate™ hold down conveyor
- Water Heating System
- Detergent injection
- Hurricane Jet™ Configurations
- Keyswitch password protection
- Light tower
- pH monitors
- Rear Emergency Stops (E-Stops)
- Resistivity
- SCAT (Side Connector Airknife Technology)
- Sump Pump
- Treatment Interface
- UPS (Uninterruptible Power Supply)

INTERIOR LIGHTING

The Aquastorm 200™ system may be configured with three (3) fluorescent light fixtures to provide maximum interior system viewing. These cost efficient, 40 watt, 110 VAC fixtures allow the operator to observe the entire cleaning process as product passes through each module of the system.

Figure 36: Optional Utility Sink

UTILITY SINK

Located at the exit end of the system to the rear of the sound enclosure, the utility sink connects to the incoming fill line and drains into the system main drain plumbing. A single goose-neck faucet and spray wand offer easy cleanup.

PHOTOCELLS

The photocell provides an automatic stand by mode for PCB detection. The photo sensor and reflector mount on the entrance and exit ends of the conveyor system. Photocell operation sequentially starts pumps, blowers, and final rinse water as PCB assemblies pass by and are detected. When PCB assemblies exit the system, based on a fixed time and distance, photocell operation stops the pumps, blowers, and final rinse water. The conveyor remains in operation to move new PCB assemblies into the system. The system may also be configured to allow the blower to remain On with the conveyor.

Figure 37: Photocell Sensor

Figure 38: Photocell Reflector

FLOW METERS

Optional flow meters assist in maintaining a constant full level flow balance throughout the Aquastorm 200™ system. Two (2) flow meters are available. One (1) installs in the prewash module plumbing. The other installs in the final rinse module plumbing.

To achieve optimum system operation ensure the same amount or slightly more water flows into the final rinse as flows into the prewash.

Figure 39: Prewash Module Flow Meter

Figure 40: Final Rinse Module Flow Meter

CONVENIENCE PACKAGE

A convenience package incorporating four (4) features which promote and facilitate easy maintenance is available. The convenience package includes:

- Utility Sink
- Slide-out blower access
- Exhaust demisting filter
- On-board tool kit

Utility Sink

Refer to Utility Sink on page 22 for detailed information.

Exhaust Demisting Filters

Two (2) strategically located wet section filters help reduce water consumption and chemical use. One (1) filter mounts just before the prewash module at the entrance end of the conveyor. The other filter mounts in the enhanced chemical isolation module.

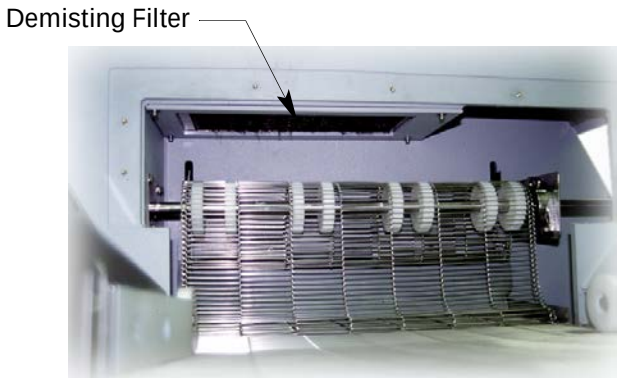


Figure 41: Prewash Demisting Filter

Slide-out Blower Access

Available for all system blowers. Each blower mounts on its own slide-out base for easy maintenance or upgrades. As soon as the blower is disconnected from the blower housing and the slide mount bolts are removed, the blower slides out for easy access.

Figure 42: Blower Slide-out Access

Took Kit

The on-board tool kit includes tools and common replacement parts for the Aquastorm 200™ system. The following items fit into the tool box. A convenient storage cabinet for the tool kit is located at the exit end of the system in front of the sound enclosure.

Figure 43: Tool Kit Storage Compartment

- 3/32 Hex wrench
- Metric set of Allen keys
- 3/8 in. Drive, 3/4 in. hex socket
- Set of metric sockets
  Ratchet
  3 in. extension
  7–14, 17, 19 mm sockets
- Socket adapter 3/8 in. F x 1/4 in. M
- 1/4 in. Drive, 5.5 mm socket
- 1/2 in. Drive, 24 mm socket
- 3/8 in. Drive, 1/2 in. socket
- 3/8 in. Drive, 9/16 in. socket
- 3/8 in. Drive, 5/16 in. hex bit
- 1-1/8 in. Max., 10 in. adjustable wrench
- Stainless steel probe–Nozzle cleaning tool
- 4 mm, ball tip hex key driver
- 5 mm, ball tip hex key driver
- 3/16 in., ball tip hex key driver
- Screwdriver with reversible bits
  #1 and #2 phillips
  3/16 and 5/16 slotted
- 3/8 F to 1/2 M socket adapter
- Two (2) sets of sst. wirebelt connecting links
- 3/4 in. Teflon gasket for tubular plumbing
- 1-1/2 in.Teflon gasket for tubular plumbing
- 2.0 in Teflon gasket for tubular plumbing
- Hurricane Jet™ orifice cleaning tool
- Tool box

SECTION 4: MACHINE SET UP

4.1 PRE-START CHECK

Prior to initial start up or daily Aquastorm 200™ operation, perform the following system checks.

CONVEYOR

1. Inspect the conveyor to ensure there are no obstructions or anything that could hinder free movement.
2. Inspect conveyor wire belt tension and ensure the belt does not extend more than 38.1 mm (1.5 in.) from its relaxed state.
    - Check the tension at the entrance end of the conveyor. Place the index finger of your hand behind the belt at a point mid-way in the vertical travel of the belt.
3. For systems configured with the optional inlet conveyor ensure the wire belt tension is acceptable and angle adjust is correct.
4. For systems configured with the optional photocell, ensure the photocell is clean and free of debris. Verify the photocell emitter and reflector are properly aligned.

SPLASH SHIELDS AND WINDOWS

1. Clean all splash shields and windows.
2. Ensure splash shields are in place.
3. Place all tempered glass windows down in the closed position.

ELECTRICAL ENCLOSURES AND MAINTENANCE PANELS

1. Verify that the high voltage electrical panel, located behind the fourth and fifth front access panels near the exit end of the system are closed and latched.
2. Verify that the system low voltage electrical panel, located behind the first and second front access panels near the entrance end of the system are closed and latched.
3. Ensure all front and rear access panels are locked in place prior to machine operation.

FACILITY CONNECTIONS

1. Ensure the Aquastorm 200™ system drain is connected to the facility drain.
2. Ensure the facility water supply to the fill and final rinse connections are turned On.
3. Check and ensure the facility exhaust is activated.
4. On 380V or 460V systems, turn On the system disconnect at the exit end of the system to activate facility power.
5. On 220V systems turn On or connect the customer supplied facility power source.

When facility power to the system is On, the following system functions activate or are enabled:

- Liquid Crystal Display (LCD) illuminates and displays the system status
- Main Power Off indicator illuminates red
- Fill and drain solenoids
- The following level indicators illuminate green when the tank is at operating level:
    - Wash tank
    - Rinse tank
    - Optional chemical isolation tank
- The following temperature indicators illuminate green when the tank reaches operating temperature:
    - Wash tank
    - Rinse tank
    - Optional chemical isolation tank
- Conveyor Off indicator illuminates red
- Optional interior lights illuminate
- Internal hard drive boots up
- High temperature monitors on the West 6700 in the low voltage electrical enclosure illuminate

TEMPERATURE SET POINTS

Define and verify the following temperature set points using the LCD interface key pad:

- Wash tank
- Rinse tank
- Optional chemical isolation tank
- High and low deviation levels

OPTIONAL PHOTOCELL

Located at the entrance end of the Aquastorm 200™ the ensure the photocell sensor emitter and reflector are aligned to provide proper detection of product as it enters the system.

OPTIONAL AUTO DETERGENT INJECT SYSTEM

If configured with this option, ensure the suction line of the detergent injection system is inserted into the detergent reservoir prior to operation. Refer to the Aquastorm Series Options Manual for detailed detergent injection set up and operation.

OPTIONAL pH MONITOR

If configured with this option, ensure the buffer solution cap is removed from the end of the pH probe prior to filling the wash tank. Refer to the Aquastorm 200™ Option Manual for detailed pH monitor set up and operation.

Ensure buffer solution moisture is maintained on the pH electrodes to prevent drying. As soon as the buffer solution cap is removed, initiate System Start Up and fill the wash tank.

4.2 SYSTEM CONTROL PANEL

The Aquastorm 200™ basic controls and Indicators are integrated into a Membrane Key Pad Unit. The Key Pad Unit includes the following controls:

- Liquid Crystal Display (LCD) Interface Key Pad
- Membrane Key Pad Controls
- Audible Alarm Speaker
- Emergency Stop Switch

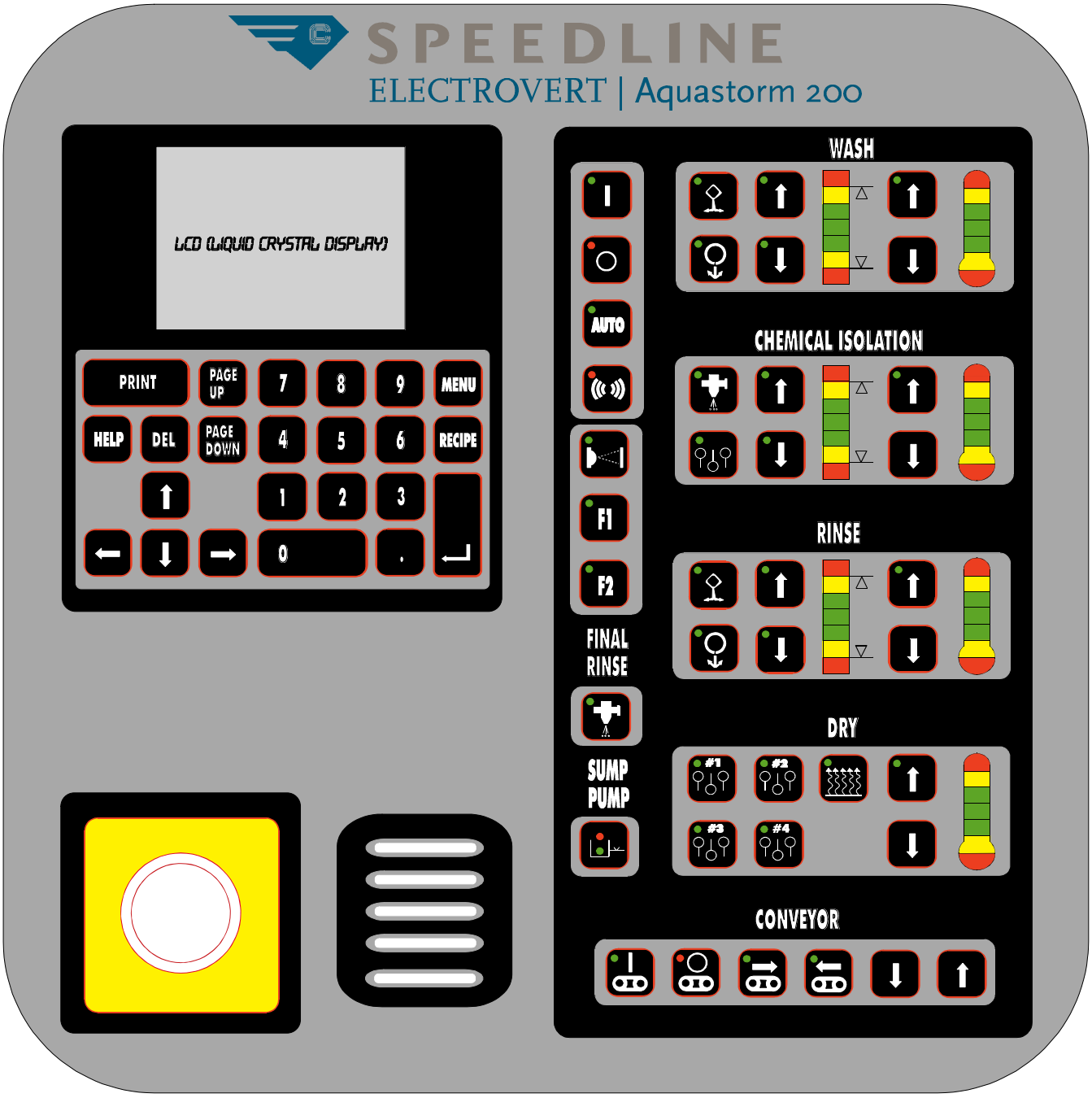


Figure 44: System Control Panel Layout

4.3 MEMBRANE KEY PAD CONTROLS

The main group of controls form the custom Membrane Key Pad and consist of light emitting diode indicators and touch sensitive controls that produce an audible tone when pressed. The purpose of each control is shown with a distinct symbol.

The level indicator and temperature indicator illuminate the center green bar when the operating level or set point is reached. Color bars above and below indicate high or low conditions and directly affect the operation of the specific module.

See SECTION 5:Controls and Indicators on page 39 for specific control and indicator use and operation.

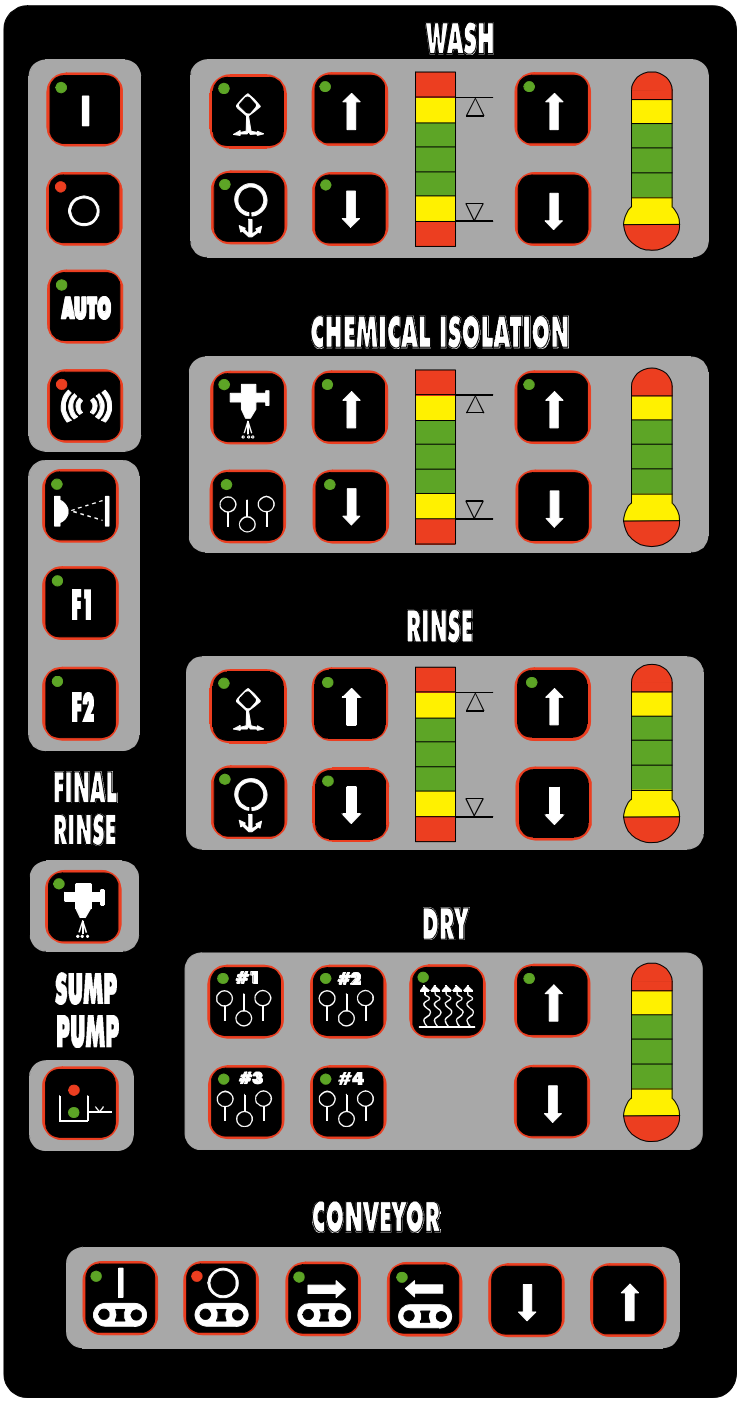


Figure 45: Membrane Key Pad

4.4 LCD INTERFACE KEY PAD

The LCD (Liquid Crystal Display) interface key pad provides digital display of system information, allows the operator to control system functions, and perform set up procedures for the following functions. An asterisk next to an item indicates an optional feature.

- Wash Temperature
- Chemical Isolation Temperature*
- Rinse Temperature
- Dryer Section Temperatures
- Radiant Heater Temperatures
- Conveyor Speed
- System Configuration
- Auto Start Timer
- Alarm Process
- System Date and Clock
- pH Levels*
- Resistivity Levels*

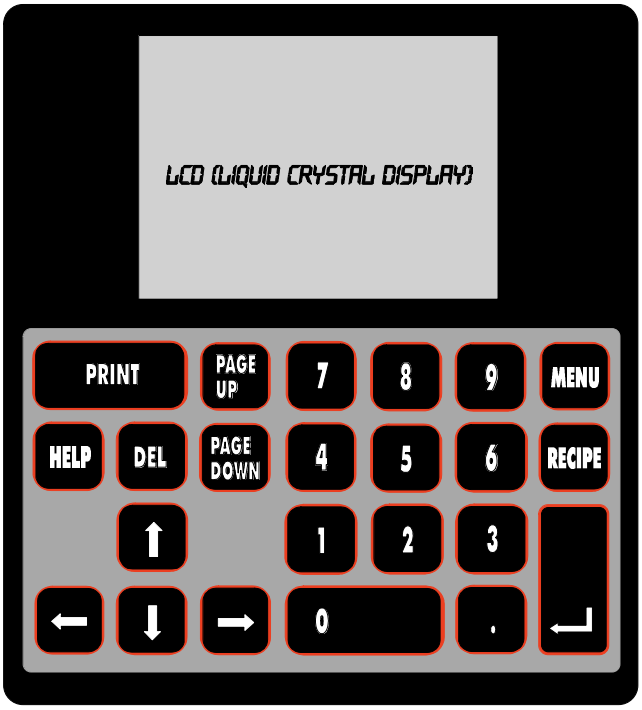


Figure 46: LCD Interface Key Pad

4.5 LCD KEY PAD SCREENS

The following interface screens convey operation information or provide operator interface for system set up.

- Main Screen
- Configuration
- Timer
- Alarm Process
- System Clock and Date
- Alarm Display

MAIN SCREEN

The main screen displays standard and optional module system information, module set points, and actual module temperatures. Depending on system modules and options the main screen can continue to a second page.

CONFIGURATION SCREEN

Use the three configuration screens to configure, add, or remove system options.

TIMER SCREEN

The timer screen allows the operator to set specific times on selected days for automatic start up and shut down of the Aquastorm 200™ system.

ALARM PROCESS

Use the alarm process screen to configure specific software alarms and their related priority. Depending on the specific process application alarms are configured as Ignore, Warning, or Shutdown.

SYSTEM CLOCK AND DATE

The clock and date screen displays the current date and time as configured in the internal computer. In the event of a power loss, or when changing to or from daylight savings time, this feature permits date and time computer adjustments.

ALARM DISPLAY

This screen provides a readout of configured alarms as they occur.

4.6 SET UP SET POINT VALUES

A flashing square cursor displays on the LCD key pad screen next to a component. Use the up and down arrows to move the cursor to the desired component.

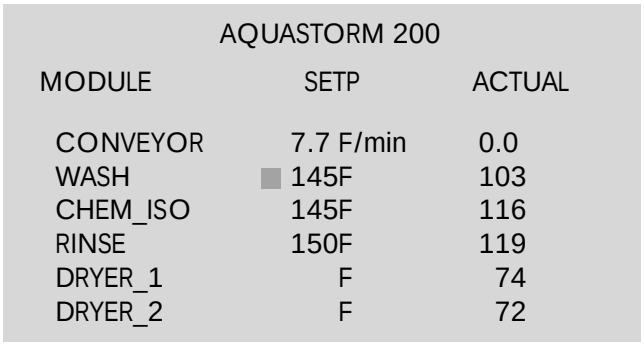


Figure 47: LCD Key Pad Screen with Square Flashing Cursor

Use the number keys on the LCD interface key pad to enter the desired number or press the up and down arrow keys on the key pad to increase or decrease the set point number. Press Enter to complete the set point process.

When entering a value the flashing square cursor disappears and an underscore appears below the value. The underscore remains below the value until the operator presses the Enter key to accept the value.

Figure 48: LCD Key Pad Screen with Underscore Cursor

4.7 FILL TANKS

The operator must manually fill the tanks when starting the Aquastorm 200™ the first time or when a tank has been drained for maintenance purposes.

To fill tanks:

1. Ensure facility water supply to the Aquastorm 200™ is properly connected and turned On.
2. Press the System Main Power On Control to enable the following circuits:
   - Wash, rinse, and optional chemical isolation tank fill solenoids
   - Optional enhanced chemical isolation blower
   - Immersion heater
   - Optional status tower
   - All other sub-systems
3. The Main Power Off control indicator turns Off.
4. Manually press the Fill control on the system control panel for the wash, rinse, or optional chemical isolation tank.
5. The fill control activates the fill solenoid and begins the fill process.

Tank liquid level must reach the operating level float switch before immersion heaters activate. When heaters activate the Immersion Heater On indicator illuminates green.

6. When the wash, rinse, and optional chemical isolation tank water level reaches the high make-up level float switch, the fill solenoid turns Off.
7. Water is only added to tank(s) when the water level drops below the operating level switch in the wash, rinse, or optional chemical isolation tank.

4.8 ADJUST TEMPERATURES

Enter the wash, rinse, and optional chemical isolation tank temperature set points.

To enter temperature set points:

1. Ensure system power is On.
2. Press the up or down arrow on the key pad to move the flashing square cursor next to wash on the LCD interface key pad Main Screen.
3. Enter the temperature set point using the number keys on the LCD interface key pad.
4. Acceptable temperature set point values range from 60–70 °C (140–158 °F).
5. When the correct temperature set point displays, press the Enter key on the key pad to accept the new value.
6. Repeat Step 2. through Step 5. to enter temperature set points for the rinse tank, optional chemical isolation tank, and optional radiant heater.

4.9 ADJUST CONVEYOR SPEED

Adjust conveyor speed to move product efficiently through the cleaning modules.

To adjust conveyor speed:

1. Ensure system power is On.
2. Press the up or down arrow on the key pad to move the flashing square cursor next to conveyor on the LCD interface key pad Main Screen.
3. Enter the speed set point value using the number keys on the LCD interface key pad. Acceptable speed set point values range from 0–3.66 MPM (0–12 fpm).
4. When the correct conveyor speed set point displays, press the Enter key on the key pad to accept the new value.

4.10 OPTIONAL PHOTOCELL SET UP

The photocell sensors mount on the optional inlet conveyor extension. Perform the alignment and sensitivity adjustments to efficiently identify product.

To align photocell:

1. Ensure system power is On.
2. Remove any objects obstructing the emitter path.
3. Check the green LED on the photocell emitter.

Figure 49: Photocell Emitter

4. Adjust the photocell emitter and reflector so the green indicator on the emitter illuminates with normal movement at the entrance end of the conveyor.

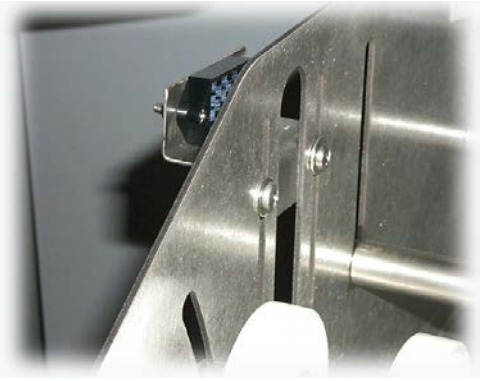


Figure 50: Photocell Reflector

5. Place product with the lowest components for processing in the path of the photocell emitter and reflector.

6. Loosen the screws securing the photocell emitter mounting bracket and photocell reflector mounting bracket enough to allow slight vertical movement of both.

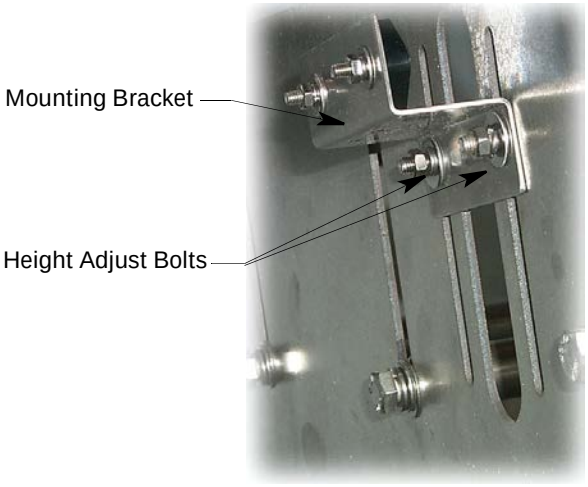


Figure 51: Photocell Height Adjust

7. Slowly lower or raise the emitter and reflector until the LED on the photocell emitter does not illumine.
8. Secure the mounting hardware on the photocell emitter and photocell reflector mounting brackets.
9. Ensure the photocell components remain in the set position.
10. After securing the mounting hardware, verify the green LED still operates by removing sample product from the photocell path.
11. If the green LED on the photocell emitter does not illumine when product is removed, repeat Step 6. through Step 10. until the photocell is properly mounted.

To adjust photocell sensitivity:

1. Ensure system power is On.
2. Remove any objects obstructing the emitter path.
3. Verify photocell alignment.
4. Place product with the lowest components for processing in the path of the photocell emitter and reflector.

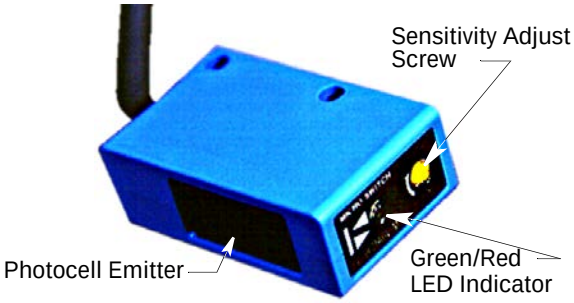


Figure 52: Photocell Sensitivity Adjust

5. Turn the sensitivity adjustment screw on the photocell emitter clockwise in ¼ turn increments until the green LED remains illuminated.
6. To determine the point of sensitivity, turn the sensitivity adjustment screw on the photocell emitter counterclockwise in ¼ turn increments until the LED flashes between red and green.
7. To complete the sensitivity adjustment, turn the sensitivity adjustment screw clockwise ¼ turn.

4.11 WEST 6700 TEMPERATURE CONTROL

The West 6700 control provides a safety circuit for the Aquastorm 200™ system. The control unit ships preset from the factory.

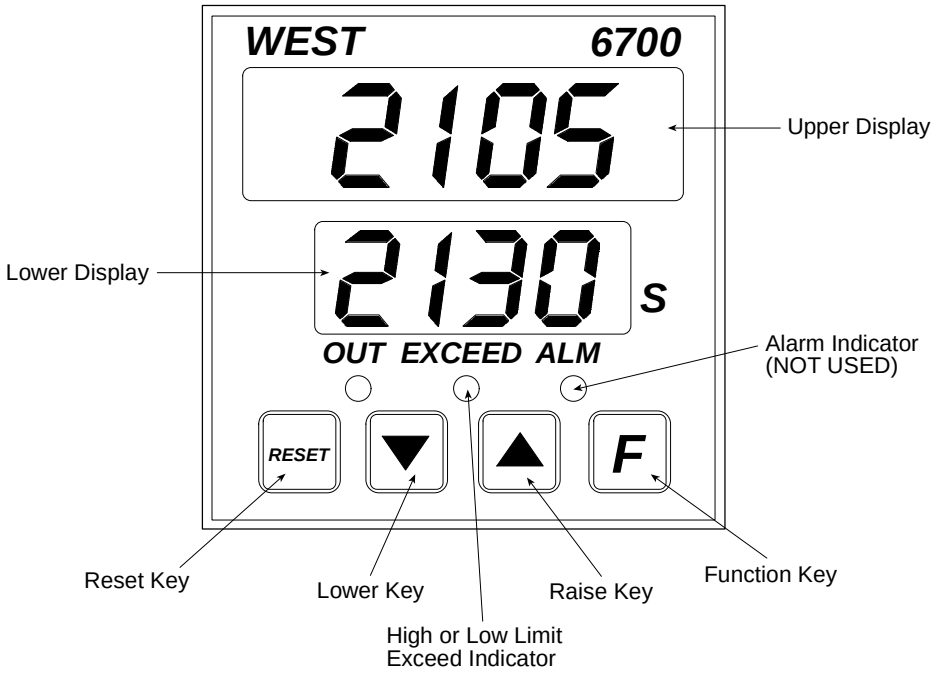


Figure 53: West 6700 Temperature Control Panel

Use the following to configure a replacement unit or to change operation from degrees Fahrenheit to degrees celsius.

CAUTION

Improper WEST 6700 control adjustment could damage the equipment.

The operator may review configuration values and not make changes. Any change made and saved in the Configuration Mode affects all Setup Mode values. When exiting configuration mode, the four (4) decimal points on the upper digital display illuminate to indicated changes were made and saved. The operator must change setup mode values when changes are made and saved.

	Values
, nPt	1418 (F) 1417 (C)
CtrL	It ,
ALA1	P_h ,
ALA2	P_h ,
CJC	EnAb
Loc	10

Figure 54: Configuration Mode Menu

To enter configuration mode:

1. Ensure power to the temperature controller is turned OFF.
2. Turn power to controller back ON.
3. Within 30 seconds of activating power to the controller, simultaneously press and hold the Function Key and Raise Arrow keys for approximately five (5) seconds until the lower display reads *inPt*.
4. The operator may step through the configuration mode parameters using the Function Key. The lower display shows a mnemonic parameter identifier. The upper display shows the current value or setting of the parameter.
5. If necessary, press the Raise or Lower arrow keys to adjust the value or setting. When the value or setting changes, the upper display flashes indicating the new value or setting is not confirmed or saved.
6. Press the Reset Key to confirm or save the new value or setting.
7. Repeat Step 5. and Step 6. for the remaining configuration mode values or settings.
8. To exit Configuration Mode, simultaneously press and hold the Function Key and Raise Arrow keys. The Operator Mode displays.

NOTE If no activity occurs in configuration mode for two (2) minutes, the West 6700 automatically exits to Operator Mode.

	Value
SP	230
F iLt	2.0
hYSt	1
L_A1	21. (F) 100 (C)
h_A2	212 (F) 100 (C)
Loc	10

Figure 55: Set Up Mode Menu

To enter setup mode:

1. After completing all configuration mode settings, ensure the controller remains in Operator Mode for more than 30 seconds.
2. Simultaneously press and hold the Function Key and Raise Arrow keys until the lower display reads *ULoc*.
3. Press the Raise Arrow key until the upper digital display reads *10*.
4. Press the Function Key until *FiLt* displays.
5. Use the Raise and Lower Arrow keys and enter the values listed in Figure 55 on page 34.
6. Press the Reset Key to confirm or save the new values.
7. Repeat Step 5. and Step 6. for the remaining setup mode values.

NOTE DO NOT change the value in the *Loc* field.

8. To exit Configuration Mode, simultaneously press and hold the Function Key and Raise Arrow keys.

4.12 CASCADE SET UP

The Aquastorm 200™ operates either Rosin Flux or Organic Acid Flux (O/A) cleaning configurations. Open or close specified cascade valves to run one or the other.

Ensure power to the system is turned off and locked out. Refer to 1.3 Lock Out-Tag Out on page 3 for detailed instructions. Drain all system tanks prior to performing cascade set up.

WARNING **Hot Surfaces – Burn Hazard.** Allow hot plumbing to cool prior to performing cascade set up. Plumbing components operate at temperatures up to 60–71 °C (140–160 °F). If it is necessary to work on hot components, use extreme caution and wear appropriate safety garments. Refer to 1.2 Safety Precautions on page 2 for detailed information.

ORGANIC ACID (O/A) CASCADE

When cleaning Organic Acid (O/A) applications, ensure cascade between modules operates. Adjust the cascade pipe ball valve as described.

NOTE See Rosin Cascade on page 36 when using a saponifier in combination with an Organic Acid (O/A) flux.

To set up for O/A flux cascade:

1. Ensure system power is Off.
2. Perform Lock Out/Tag Out steps.
3. Drain system tanks.
4. Remove the rear panels.
5. Access the rear prewash section.
6. Locate the two (2) valves exiting the prewash module.
   - The prewash drain contains a ball valve control
   - The prewash cascade contains a ball valve and permits prewash effluent to cascade back to the recirculating wash tank
7. Turn the ball valve on the prewash drain to the Open position to allow prewash effluent to drain directly out of the system.

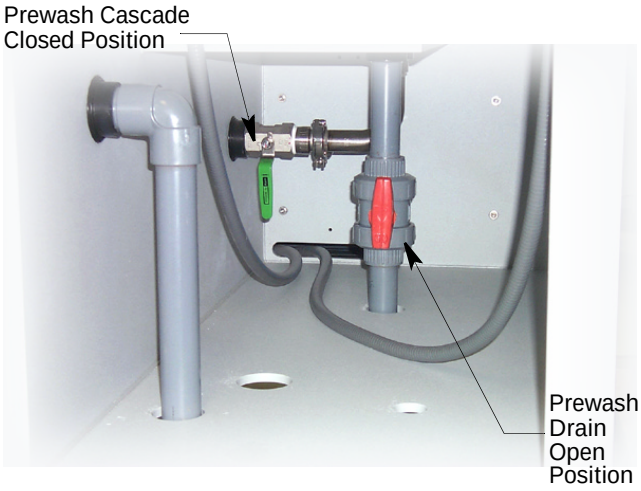


Figure 56: Rear Prewash Section

8. Turn the ball valve on the prewash cascade to the Closed position to prevent cascading of prewash to the recirculating wash module.
9. Access the rear recirculating rinse section.
10. Locate the cascade pipe from the recirculating rinse tank to the recirculating wash tank.
11. Turn the ball valve located on this cascade pipe to the Open position to permit cascading to occur.

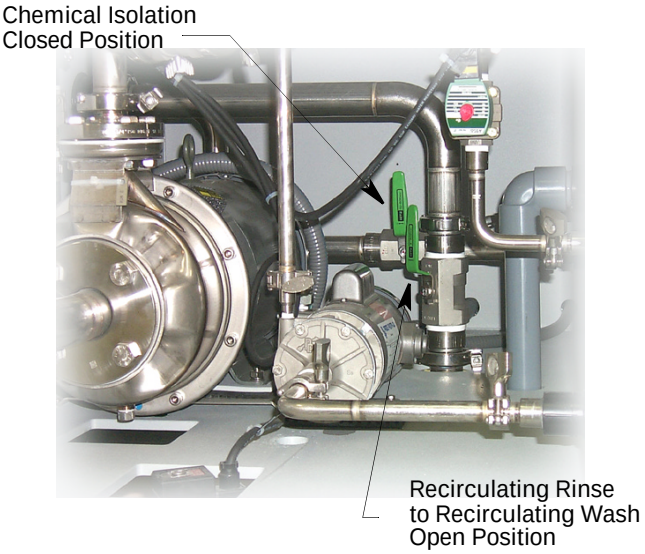


Figure 57: Rear Recirculating Rinse Section

12. For systems configured with the optional enhanced chemical isolation tank, locate the cascade pipe from the recirculating rinse tank to the chemical isolation tank.

13. Turn the ball valve to a Completely Closed position to ensure chemicals in this section remain isolated and prevent cross-contamination between the wash and rinse modules.
14. Remove Lock Out/Tag Out tags.
15. Turn system power On.
16. Fill system tanks and resume operation.

ROSIN CASCADE

When cleaning rosin flux applications using saponifiers, ensure chemicals are kept segregated. Adjust the cascade pipe ball valve as described.

To set up for rosin flux cascade:

1. Ensure system power is Off.
2. Perform Lock Out/Tag Out steps.
3. Drain system tanks.
4. Remove the rear panels.
5. Access the rear prewash section.
6. Locate the two (2) valves exiting the prewash module.
   - The prewash drain contains a ball valve control
   - The prewash cascade contains a ball valve and permits prewash effluent to cascade back to the recirculating wash tank

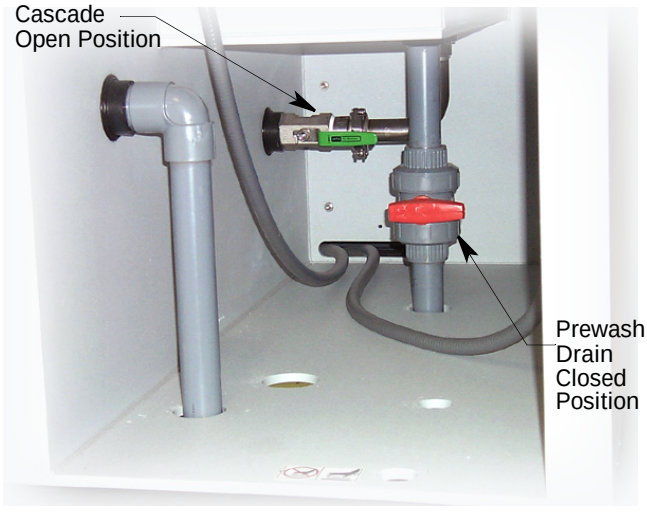


Figure 58: Rear Prewash Section

7. Turn the ball valve on the prewash drain to the Closed position to prevent prewash effluent from draining directly out.
8. Turn the ball valve on the prewash cascade to the Open position. This allows cascading of prewash to the recirculating wash module.
9. Access the rear recirculating rinse section.
10. Locate the cascade pipe from the recirculating rinse tank to the recirculating wash tank.
11. Turn the ball valve located on this cascade pipe to the Closed position. This prevents cascading from occurring and keeps saponifier solutions separate.

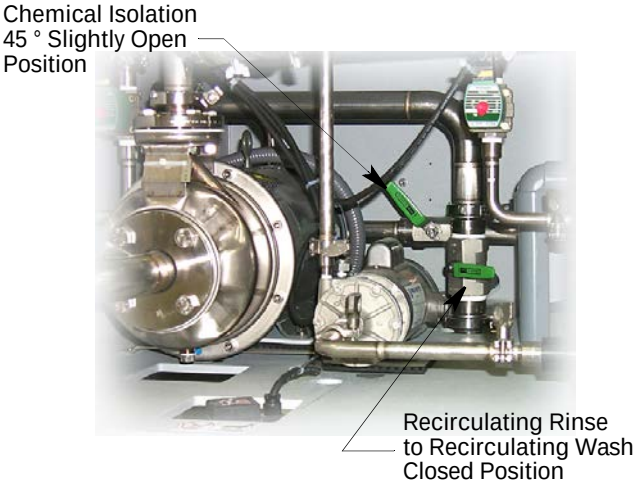


Figure 59: Rear Recirculating Rinse Section

12. For systems configured with the optional enhanced chemical isolation tank, locate the cascade pipe from the recirculating rinse tank to the chemical isolation tank.
13. Turn the ball valve to approximately a 45° angle to Slightly Open the position.
14. Remove Lock Out/Tag Out tags.
15. Turn system power On.
16. Fill system tanks and resume operation.

4.13 SOFTWARE UPGRADE

In an effort to enhance Aquastorm 200™ control, the operating software is sometimes upgraded in the field. Install software when an upgrade floppy arrives, or in the unlikely event of a computer component failure.

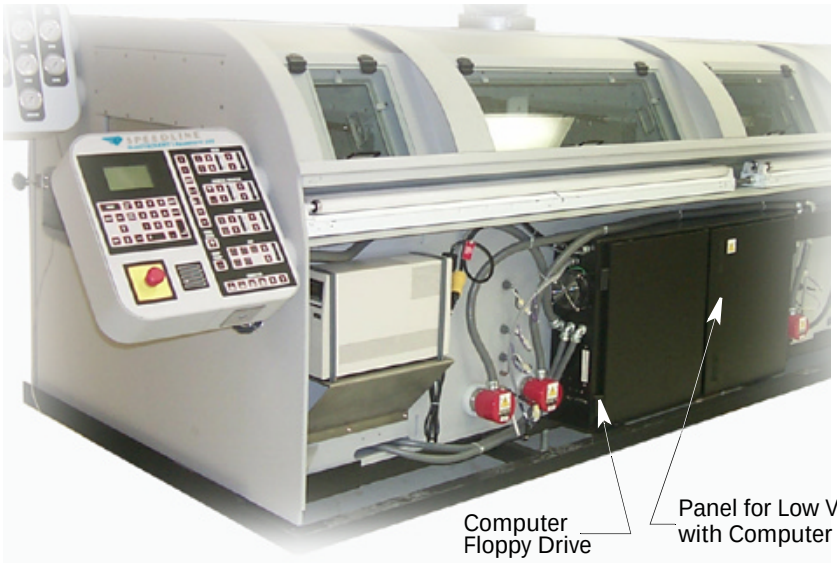


Figure 60: Front Entrance End – Panels Removed

To install software:

1. Starting from the exit entrance end of the cabinet, remove the front access panels.
2. Insert the 3.5 in. software upgrade diskette into the 3.5 in. floppy drive located on the left side of the low voltage control box toward the entrance end of the machine.
3. Press the black Reset button just below the floppy drive.
4. The floppy drive green LED indicator illuminates while the computer reads from the disk and the computer re-boots.
5. Wait until the LED goes off. Press the floppy eject button to remove the floppy diskette.
6. Press the black Reset button again to reboot the system using the new software.
7. Replace front access panels, starting with the front entrance end.
8. Resume normal system operation.

Figure 61: Floppy Drive and Reset Button

4.14 PROCESS TROUBLESHOOTING

This section lists possible problem scenarios the operator may encounter during Aquastorm 200™ operation. It also recommends action to asses and/or correct the problem.

WATER TEMPERATURE

The most important factor for obtaining clean, dry product under most conditions is water temperature. Ensure water temperature is maintained between 60–71 °C (140–160 °F) to assure the cleanest PCB assemblies possible.

WATER CLEANLINESS

The cleaner the water introduced into a PCB assembly within any aqueous cleaning process, the lower the contaminant level. It is recommended that the operator or quality inspector verify water quality at predetermined intervals.

PROCESS CHEMISTRY

Depending on the chemicals and materials applied during the PCB assembly processing, such as flux and solder paste, varying concentrations of saponifier or neutralizers may be required in the Wash section. The optional automatic detergent injection system may require adjustment for maintaining proper concentration levels. Too high or too low of a concentration will directly affect cleanliness levels. For more details on detergent injection, refer to the Aquastorm 200™ Options Manual.

WATER PRESSURE

The amount of water pressure applied to PCB assemblies being cleaned determines the amount of flux residue and other contaminant removal accomplished. Adequate pressure helps ensure contaminants entrapped under components are removed without damage to the PCB assembly.

CONVEYOR SPEED

Conveyor speed affects almost all other aspects of the aqueous cleaning process. Slower speeds provide longer dwell times in the Wash and Rinse sections, assuring a cleaner product. Slower speeds also allow a longer drying period.

COMPONENT TEMPERATURE

The temperature of the PCB assembly and its components as it enters the Aquastorm 200™ system is important to the cleaning process. It is best to clean PCB assemblies while they are still hot from the wave or reflow soldering system.

SPRAY NOZZLE ANGLE

The angle of the spray nozzle in relation to the horizontal conveyor is pertinent to the cleaning of various types of components on any PCB assembly. High velocity spray at sharper angles flushes and cleans on, under, and around different configurations. Different product configurations may require an angle change to achieve optimum cleaning.

BLOWER AIRKNIVES

The upper blower airknife height is adjustable. These adjustment are critical for the removal of any moisture on the board prior to entering the dryer sections.

DRYER TEMPERATURE

Precise control of optional radiant heater temperature in the second dryer module enhances the ability to dry surface mounted components of most PCB assembly configurations.

SECTION 5: CONTROLS AND INDICATORS

5.1 CONTROL PANEL LAYOUT

The Aquastorm 200™ basic controls and Indicators are integrated into a Membrane Keypad Unit. The Keypad Unit includes the following controls:

- LCD Interface Keypad
- Membrane Keypad Controls
- Audible Alarm Speaker
- Emergency Stop Switch

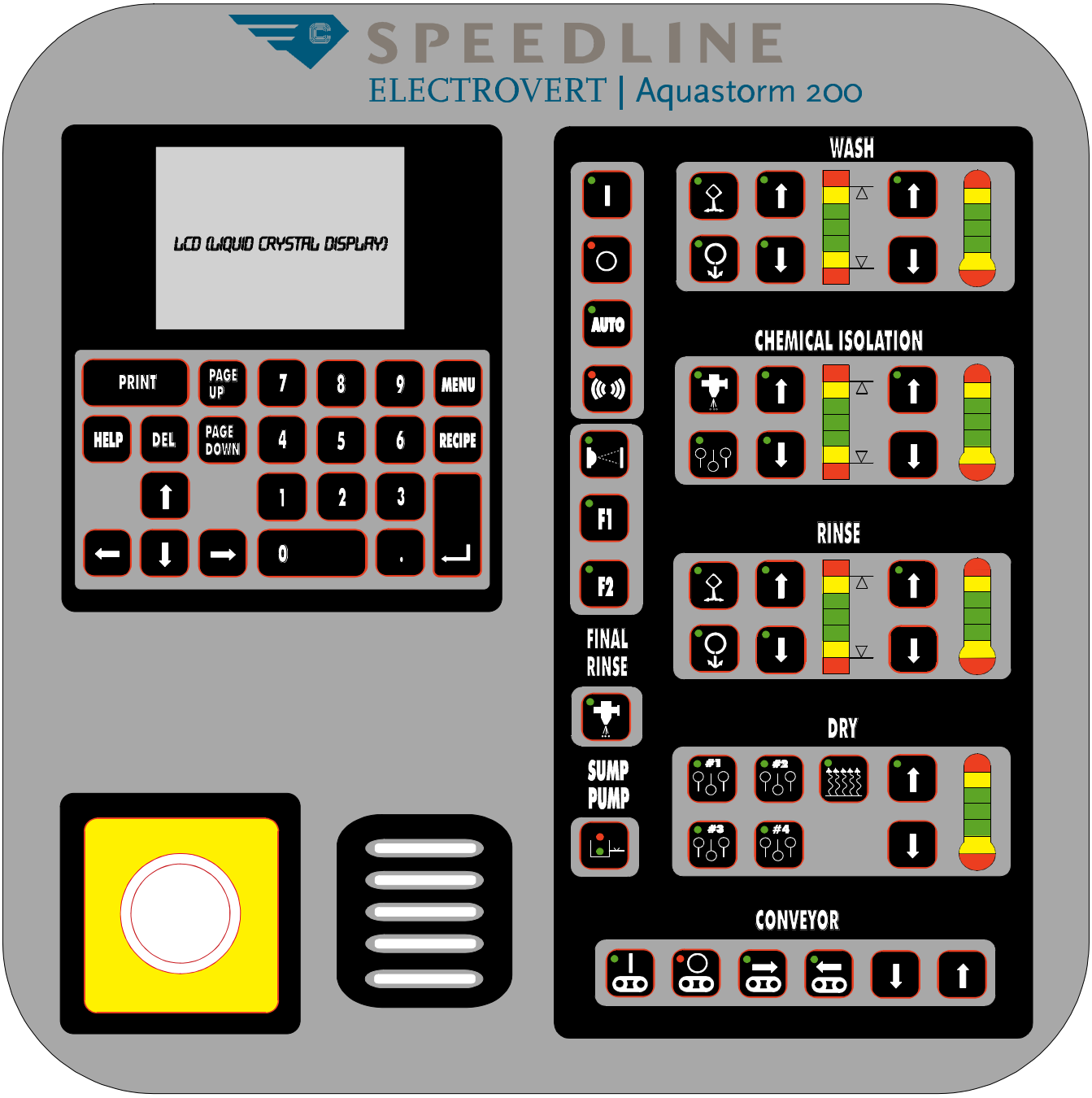


Figure 62: System Control Panel Layout

5.2 MEMBRANE KEYPAD CONTROLS

The main group of controls form the custom Membrane Keypad and consist of light emitting diode indicators and touch sensitive controls that produce an audible tone when pressed. The purpose of each control is shown with a distinct symbol.

The level indicator and temperature indicator illuminate the center green bar when the operating level or set point is reached. Color bars above and below indicate high or low conditions and directly affect the operation of the specific module.

- Ensure the system disconnect at the exit end is turned On for 380V or 460V systems.
- Ensure the customer supplied facility power source is turned On or connected for 220V systems.

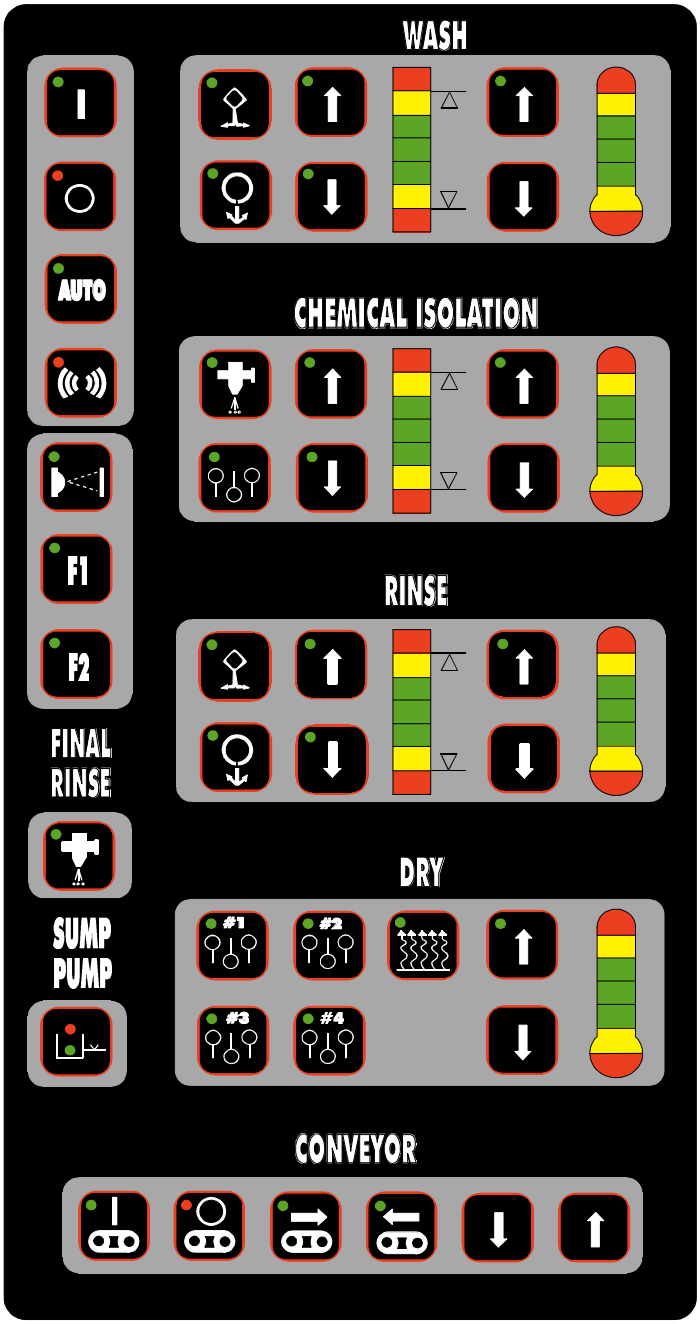


Figure 63: Membrane Keypad

POWER ON CONTROL

Press this key pad control to enable power to all modules of the Aquastorm 200™.

- The Power On green indicator illuminates
- When power is On, tank heaters activate if tanks are at operating levels
- The Power Off indicator turns Off

POWER OFF CONTROL

Press this key pad control to disable power to all modules of the Aquastorm 200™.

- The Power Off red indicator illuminates
- Any operating subsystems immediately shut Off
- The Power On indicator turns Off
- The Conveyor Off indicator illuminates
- Tank temperature indicators remain illuminated

Risk of Electric Shock – Turning power Off using the power Off control DOES NOT disable power to the system. To disable system power turn Off power at the main disconnect or facility power safety disconnect.

ALARM ACKNOWLEDGE

Configure process alarms with Warning, Shutdown, or Ignore actions. Process alarms configured as Ignore do not activate an alarm. Process alarms configured as Warning or Shutdown initiate an audible alarm.

Figure 64: Audible Alarm Speaker

Hardware alarms are fixed within the system and always initiate an audible alarm. In the alarm list, items marked with an asterisk are hardware related and not user programmable.

Wash Section

High Temperature
Low Temperature
High Temperature Shutdown *
High Level *
Low Level *

Optional Chemical Isolation Section

High Temperature
Low Temperature
High Temperature Shutdown *
High Level *
Low Level *

Rinse Section

High Temperature
Low Temperature
High Temperature Shutdown *
High Level *
Low Level *

Dryer Section #1

High Temperature Shutdown *

Dryer Section #2

High Temperature Shutdown *

Dryer Section #2 with Optional Radiant Oven

High Temperature
Low Temperature
High Temperature Shutdown *

Dryer Section #3

High Temperature Shutdown *

Dryer Section #4

High Temperature Shutdown *

Dryer Section #4 with Optional Radiant Oven

High Temperature
Low Temperature
High Temperature Shutdown *

Other Alarms

Emergency Stop *
Saponifier Low Level
Optional Treatment Interface Tank Low Level
Optional Treatment Interface Tank High Level *
Optional Sump Pump High Level *
Optional Checkmate™ Conveyor Jam *

Alarm Process

The audible alarm sounds on the original occurrence of an alarm until the Alarm Acknowledge control is pressed.

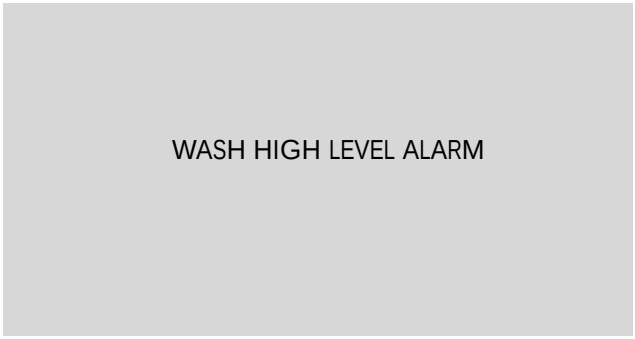


Figure 65: Sample Alarm Message

When an alarm occurs:

- Alarm message displays on the LCD
- Audible alarm sounds
- Red LED on Alarm Acknowledge Control flashes
- If alarm is configured as Shutdown, the system goes into Power Off state

Responding to an alarm:

- Operator press the Alarm Acknowledge control
- Alarm message clears from the LCD and the Main Menu displays
- Audible alarm stops
- If the alarm condition remains active, the red LED on the Alarm Acknowledge Control continues to flash
- If the alarm condition is cleared, the LED stops flashing

When restarting the system after clearing a Shutdown alarm condition, the system Power Off control remains illuminated. Press the Power On control to bring the system back into operation. If Power On is pressed and the alarm condition remains active, the alarm re-occurs.

LEVEL INDICATOR

The wash, rinse, and optional chemical isolation modules of the membrane key pad include a high/low liquid level indicator. The tank level indicator provides the following information to the operator.

NOTE These instructions assume process alarms are configured with Warning or Shutdown action.

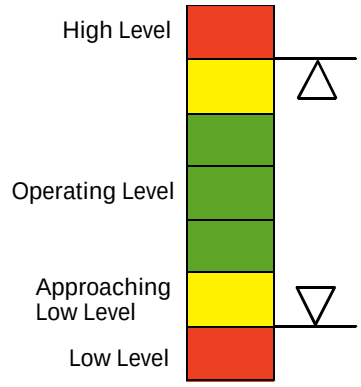


Figure 66: Level Indicator

Tank level indicators:

1. If the tank liquid level reaches the high level the following occurs:
   - Audible alarm sounds
   - Alarm acknowledge indicator flashes red
   - Tank high level red indicator illuminates
   - LCD displays the specific high level alarm
   - Fill solenoid for the tank disables
2. When liquid in the tank is at operating level the green indicator illuminates.
3. If the tank liquid level drops below the operating level float switch, but is not at low level the following occurs:
   - Tank low level amber indicator illuminates
   - If the tank fill solenoid is activated, the tank fill indicator flashes and the tank fills with liquid
4. If the tank liquid level reaches the low level the following occurs:
   - Audible alarm sounds
   - Alarm acknowledge indicator flashes red
   - Tank low level indicator illuminates red
   - LCD displays the specific low level alarm
   - Tank heaters disable
   - Tank pump or external feed solenoid disables
5. If a float switch hardware problem exists in a tank all tank level indicators illuminate.

TEMPERATURE INDICATOR

The wash, rinse, and optional chemical isolation modules of the membrane key pad include a high/low temperature indicator. The tank temperature indicator provides the following information to the operator.

NOTE These instructions assume process alarms are configured with Warning or Shutdown action.

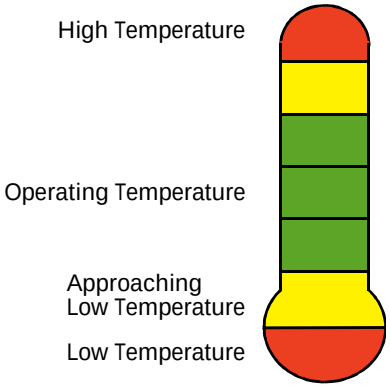


Figure 67: Temperature Indicator

Tank temperature indicators:

1. If the tank temperature exceed 82 °C (180 °F) the following occurs:
   - Audible alarm sounds
   - Alarm acknowledge indicator flashes red
   - Tank high temperature red indicator illuminates
   - Optional status tower flashes red
   - LCD displays the specific high temperature alarm
   - Tank heater disables
   - System shuts down
2. When tank temperature exceeds set point temperature by the value set for alarming the following occurs:
   - Audible alarms sounds
   - Alarm acknowledge indicator flashes red
   - Tank high temperature red indicator illuminates
   - Optional status tower flashes red
   - LCD displays the specific high temperature alarm
   - Tank heaters disable
   - System shuts down
3. When temperature is at operating set point the green indicator illuminates.
4. If the tank temperature falls below set point temperature by the value set for alarming the following occurs:
   - Audible alarms sounds
   - Alarm acknowledge indicator flashes red
   - Tank low temperature indicator illuminates red
   - Optional status tower flashes red
   - LCD displays the specific high temperature alarm

AUTO SEQUENCE MODE

AUTO The Auto Sequence Mode control sequentially starts each module of the system eliminating the need for an operator to manually press each control for system start up.

To initiate Auto Sequence Mode:

1. Ensure the Power On control is turned On.
2. Verify the wash, rinse, and optional chemical isolation tanks are full and the operating level, and immersion heater On indicators illuminate green.
3. If the tanks are empty or below operating level, the fill indicators flash green indicating the tanks are filling. The operating level and immersion heater indicators do not illuminate.
4. Check the LCD Main Screen to ensure an asterisk displays to the left of each module.
5. When pressed, the Auto Sequence Mode initiates the following actions.
   - Conveyor activates and begins to operate at the preset set point
   - Fill solenoids activate
   - Float switch begins operation
   - Optional radiant heaters begin heating to their preset set point

6. When the tanks reach operating level, the system activates the following subsystems in the order listed at two (2) second intervals:
   - Wash pump
   - Optional chemical isolation blower
   - Optional chemical isolation pump
   - Rinse pump
   - Final rinse solenoid
   - Blower #1
   - Blower #2
   - Optional blower #3
   - Optional blower #4
7. The following LCD control interface functions are now in operating condition:
   - Conveyor speed
   - Wash temperature
   - Optional pH readout
   - Optional chemical isolation temperature
   - Rinse temperature
   - Optional final rinse resistivity
   - Dryer #1 temperature
   - Dryer #2 temperature
   - Optional radiant heater #2 temperature
   - Optional dryer #3 temperature
   - Optional dryer #4 temperature
   - Optional radiant heater #4 temperature

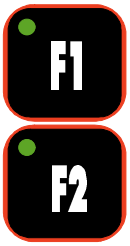
PHOTOCELL CONTROL

The photocell control on the membrane key pad turns the optional photocell control On or Off. When activated, the green LED indicator illuminates.

As long as product passed by the optional photocell sensor at the entrance end of the conveyor, each module of the system remains operational. When the last product exits the system, and no additional product is detected at the entrance, all modules of the system shut down at the same time, except the conveyor. When the photocell detects new product entering the system, all modules previously operating, resume operation in the following order:

- Wash pump
- Optional chemical isolation blower
- Optional chemical isolation pump
- Rinse pump
- Final rinse solenoid
- Blower #1
- Blower #2
- Optional blower #3
- Optional blower #4

F1 AND F2 FUNCTION KEYS



The F1 and F2 configurable function keys remain in development. Future applications of the Aquastorm series aqueous cleaning system will include specific actions for these keys.

FINAL RINSE CONTROL

The final rinse control activates the final rinse solenoid. When active, the green final rinse indicator illuminates green. To deactivate the final rinse solenoid, press the control again. The green indicator no longer illuminates indicating the final rinse solenoid is no longer active.

The final rinse control also activates and deactivates the CLS (Closed Loop System) pump on Aquastorm 200™ systems configured with the optional Resys CLS Treatment Interface System. Whenever the final rinse remains active the CLS is also active.

SUMP PUMP INDICATOR

The sump pump indicator illuminates red when a high level condition occurs in the sump pump reservoir. If the condition is detected the following occurs:

- Pump indicator illuminates red
- Alarm message displays on the LCD
- Audible alarm sounds
- Red LED on Alarm Acknowledge Control flashes
- All drain solenoids disable

Correct the high level condition and clear the alarm prior to resuming operation.

WASH/HURRICANE PUMP CONTROL

Press this control to activate or deactivate the wash and optional hurricane pump. This control also activates the prewash spray manifolds. When turned On, the indicator illuminates green.

WASH JIC PUMP CONTROL

The JIC pump control remains in development. Future applications of the Aquastorm series aqueous cleaning systems will include this control.

WASH TANK CONTROLS

Wash Tank Fill Control

The wash tank fill control activates the wash tank fill solenoid.

To fill the wash tank:

1. Ensure the Power On control is turned On.
2. Press the wash tank fill control.
   - The green indicator flashes to signify the tank is filling
   - When full, the green indicator stops flashing and remains illuminated
   - The green indicator illuminates if the water level in the tank is at operating level
3. When starting the system using the Auto Start Timer function the following occurs:
   - The fill solenoid automatically initiates to fill the wash tank if the water is below operating level and tank fill control green indicator flashes
   - If the tank is at operating level, the green indicator illuminates
4. During normal operation, if the water level falls below the operating level float, the following occurs:
   - The fill indicator begins flashing
   - The fill solenoid activates and initiates filling the tank to operating level.
   - To stop the automatic fill sequence, press the wash tank fill control while the tank is filling.

Wash Tank Drain Control

The wash tank drain control activates the wash tank drain solenoid. Press the wash tank drain control to empty the wash tank. The drain control indicator illuminates green to indicate the tank is draining. The drain solenoid remains open until the wash tank drain control is pressed and the indicator no longer illuminates.

Wash Tank Level Indicator

This indictor displays the status of the water level in the wash tank. For detailed information on the indicator refer to Level Indicator on page 42.

Wash Tank Immersion Heaters Control

The operator cannot enable or disable the immersion heaters using this control. It is an indicator only.

The control illuminates green to indicate when the wash tank immersion heaters are turned On. The indicator turns Off when the heaters are off due to a high temperature condition or wash tank low water level.

The LCD key pad displays an asterisk next to WASH when the tank heaters are turned On. No asterisk displays when the heaters are turned Off.

Press the control to increase the wash tank temperature set point. When pressed once and released, the temperature set point increases one (1) degree. When pressed and held, the wash tank temperature set point increases until the control is released. The actual temperature and temperature set point display on the LCD.

Wash Tank Decrease Temperature Control

Only use the decrease temperature control to decrease the wash tank temperature set point.

Press the control to decrease the wash tank temperature set point. When pressed once and released, the temperature set point decreases one (1) degree. When pressed and held, the wash tank temperature set point decreases until the control is released. The actual temperature and temperature set point display on the LCD.

Wash Tank Temperature Indicator

This indictor displays the temperature of the wash tank. For detailed information on the indicator refer to Temperature Indicator on page 43.

OPTIONAL CHEMICAL ISOLATION CONTROLS

Chemical Isolation Control

Press the chemical isolation On/Off control to activate the internal pump or external feed solenoid.

The control illuminates green to indicate the chemical isolation option is turned On. The indicator turns Off when the chemical isolation control is pressed again. When turned Off, the internal pump or external feed solenoid deactivate.

If the enhanced chemical isolation module is configured with the optional blower, the blower must be turned On before enabling the internal pump or external feed solenoid. This ensures no liquid is allowed to enter the lower airknife orifice.

Chemical Isolation Blower Control

Press the chemical isolation blower On/Off control to activate the optional turbine blower.

The control illuminates green to indicate the turbine blower is activated. When pressed again, the control indicator turns Off and power to the blower deactivates.

Chemical Isolation Tank Fill Control

The optional chemical isolation tank fill control activates the chemical isolation tank fill solenoid.

To fill the chemical isolation tank:

1. Ensure the Power On control is turned On.
2. Press the optional chemical isolation tank fill control.
   - The green indicator flashes to signify the tank is filling
   - When full, the green indicator stops flashing and remains illuminated
   - The green indicator illuminates if the liquid level in the tank is at operating level
3. When starting the system using the Auto Start Timer function the following occurs:
   - The fill solenoid automatically initiates to fill the chemical isolation tank if the liquid is below operating level and tank fill control green indicator flashes
   - If the tank is at operating level, the green indicator illuminates
4. During normal operation, if the liquid level falls below the operating level float, the following occurs:
   - The fill indicator begins flashing
   - The fill solenoid activates and initiates filling the tank to operating level.
   - To stop the automatic fill sequence, press the chemical isolation tank fill control while the tank is filling

Chemical Isolation Tank Drain Control

The chemical isolation tank drain control activates the chemical isolation tank drain solenoid.

Press the chemical isolation tank drain control to empty the chemical isolation tank. The drain control indicator illuminates green to indicate the tank is draining. The drain solenoid remains open until the chemical isolation tank drain control is pressed and the indicator no longer illuminates.

Chemical Isolation Tank Level Indicator

This indictor displays the status of the liquid level in the chemical isolation tank. For detailed information on the indicator refer to Level Indicator on page 42.

Chemical Isolation Tank Immersion Heaters Control

The operator cannot enable or disable the immersion heaters using this control. It is an indicator only.

The control illuminates green to indicate when the chemical isolation tank immersion heaters are turned On. The indicator turns Off when the heaters are off due to a high temperature condition or chemical isolation tank low liquid level.

The LCD key pad displays an asterisk next to CHEM ISO when the tank heaters are turned On. No asterisk displays when the heaters are turned Off.

Press the control to increase the chemical isolation tank temperature set point. When pressed once and released, the temperature set point increases one (1) degree. When pressed and held, the chemical isolation tank temperature set point increases until the control is released. The actual temperature and temperature set point display on the LCD.

Chemical Isolation Tank Decrease Temperature Control

Only use the decrease temperature control to decrease the chemical isolation tank temperature set point.

Press the control to decrease the chemical isolation tank temperature set point. When pressed once and released, the temperature set point decreases one (1) degree. When pressed and held, the chemical isolation tank temperature set point decreases until the control is released. The actual temperature and temperature set point display on the LCD.

Chemical Isolation Tank Temperature Indicator

This indictor displays the temperature of the chemical isolation tank. For detailed information on the indicator refer to Temperature Indicator on page 43.

RINSE/HURRICANE CONTROL

Press this control to activate or deactivate the rinse and optional hurricane pump. When turned On, the indicator illuminates green.

RINSE JIC PUMP CONTROL

The JIC pump control remains in development. Future applications of the Aquastorm series aqueous cleaning systems will include this control.

RINSE TANK CONTROLS

Rinse Tank Fill Control

The rinse tank fill control activates the rinse tank fill solenoid.

To fill the rinse tank:

1. Ensure the Power On control is turned On.
2. Press the rinse tank fill control.
   - The green indicator flashes to signify the tank is filling
   - When full, the green indicator stops flashing and remains illuminated
   - The green indicator illuminates if the water level in the tank is at operating level
3. When starting the system using the Auto Start Timer function the following occurs:
   - The fill solenoid automatically initiates to fill the rinse tank if the water is below operating level and tank fill control green indicator flashes
   - If the tank is at operating level, the green indicator illuminates
4. During normal operation, if the water level falls below the operating level float, the following occurs:
   - The fill indicator begins flashing
   - The fill solenoid activates and initiates filling the tank to operating level.
   - To stop the automatic fill sequence, press the rinse tank fill control while the tank is filling.

Rinse Tank Drain Control

The rinse tank drain control activates the rinse tank drain solenoid. Press the rinse tank drain control to empty the rinse tank. The drain control indicator illuminates green to indicate the tank is draining. The drain solenoid remains open until the rinse tank drain control is pressed and the indicator no longer illuminates.

Rinse Tank Level Indicator

This indictor displays the status of the water level in the rinse tank. For detailed information on the indicator refer to Level Indicator on page 42.

Rinse Tank Immersion Heaters Control

The operator cannot enable or disable the immersion heaters using this control. It is an indicator only.

The control illuminates green to indicate when the rinse tank immersion heaters are turned On. The indicator turns Off when the heaters are off due to a high temperature condition or wash tank low water level.

The LCD key pad displays an asterisk next to RINSE when the tank heaters are turned On. No asterisk displays when the heaters are turned Off.

Press the control to increase the rinse tank temperature set point. When pressed once and released, the temperature set point increases one (1) degree. When pressed and held, the rinse tank temperature set point increases until the control is released. The actual temperature and temperature set point display on the LCD.

Rinse Tank Decrease Temperature Control

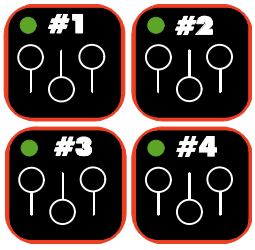
Only use the decrease temperature control to decrease the rinse tank temperature set point.

Press the control to decrease the rinse tank temperature set point. When pressed once and released, the temperature set point decreases one (1) degree. When pressed and held, the rinse tank temperature set point decreases until the control is released. The actual temperature and temperature set point display on the LCD.

Rinse Tank Temperature Indicator

This indictor displays the temperature of the rinse tank. For detailed information on the indicator refer to Temperature Indicator on page 43.

BLOWER CONTROLS



Press blower control #1 and #2 to activate the blowers.

Press blower control #3 and/or #4 if the system is configured with either or both of these optional blowers.

The control illuminates green to indicate when the each blower is turned On. The indicator turns Off when the blower is turned Off.

RADIANT HEATER CONTROL

Radiant Heat On/Off Control

Press the radiant heater On/Off control to activate the optional radiant oven in Dryer #2 and optional Dryer #4 if configured.

The control illuminates green to indicate when the each radiant heater is turned On. The indicator turns Off when the radiant heaters are turned Off.

The LCD key pad displays an asterisk next to RADIANT HEATER when the radiant heaters are turned On. No asterisk displays when the radiant heaters are turned Off.

Prior to turning the radiant heater on ensure a temperature set point is defined in the LCD interface.

Radiant Heat Increase Temperature Control

The operator cannot enable or disable the radiant heaters using this control. It is an indicator only.

The control illuminates green to indicate when the radiant heater is turned On. The indicator turns Off when the radiant heater is turned Off.

Press the control to increase the radiant heater temperature set point. When pressed once and released, the temperature set point increases one (1) degree. When pressed and held, the rinse tank temperature set point increases until the control is released. The actual temperature and temperature set point display on the LCD.

Radiant Heater Decrease Temperature Control

Only use the decrease temperature control to decrease the radiant heater temperature set point.

Press the control to decrease the radiant heater temperature set point. When pressed once and released, the temperature set point decreases one (1) degree. When pressed and held, the radiant heater temperature set point decreases until the control is released. The actual temperature and temperature set point display on the LCD.

Radiant Heater Temperature Indicator

This indictor displays the temperature of the radiant heater. For detailed information on the indicator refer to Temperature Indicator on page 43.

CONVEYOR CONTROLS

Conveyor On Control

Press the conveyor on control to activate power to the conveyor. The conveyor will not operate in any direction without the conveyor on control activated.

The control illuminates green to indicate when the conveyor is turned On. The indicator turns Off when the conveyor is turned Off. The conveyor forward control illuminates green indicating forward movement of the conveyor. The conveyor operates at the set point speed. The speed set point displays on the LCD.

The LCD key pad displays an asterisk next to CONV when the conveyor is turned On. No asterisk displays when the conveyor is turned Off.

Conveyor Off Control

Press the conveyor Off control to stop conveyor movement. The conveyor Off red indicator illuminates indicating power to the conveyor is disabled.

Conveyor Forward Control

The conveyor forward control is and On/Off indicator. When the green indicator illuminates, the conveyor is operational.

The conveyor moves forward at the set point speed. The speed set point displays on the LCD.

Conveyor Reverse Control

Press the conveyor reverse control to reverse the conveyor direction. The green indicator illuminates to indicate the conveyor is operating in the reverse direction.

The operator uses conveyor reverse when a conveyor jam occurs. Temporary operation of the conveyor in the reverse direction allows the operator to remove the jam.

When operating in reverse, the conveyor operates for a fixed time at a fixed speed, then stops conveyor operation. When the conveyor stops, the conveyor Off indicator illuminates red to indicate the conveyor is Off.

Pressing the conveyor Off control while operating in reverse immediately stops conveyor movement.

To abort a conveyor reverse operation and immediately revert to forward conveyor movement, press the conveyor forward control.

Decrease Speed Control

Press the decrease speed control to decrease conveyor speed.

Press the control to decrease the conveyor speed set point. When pressed once and released, the conveyor speed set point decreases one (1) fpm. When pressed and held, the conveyor speed set point decreases until the control is released. The speed set point displays on the LCD.

Increase Speed Control

Press the increase speed control to increase conveyor speed.

Press the control to increase the conveyor speed set point. When pressed once and released, the conveyor speed set point increases one (1) fpm. When pressed and held, the conveyor speed set point increases until the control is released. The speed set point displays on the LCD.

EMERGENCY STOP (E-STOP) SWITCHES

Two (2) large red push-pull switches allow the operator to halt system operation in the event of an emergency. The E-stop switches are wired in series. Pressing one (1) turns Off power to all system modules and stops process in all modules.

WARNING

Risk of Electric Shock – Turning power Off using the Emergency Stop (E-Stop) control DOES NOT disable power to the system. To disable system power turn Off power at the main disconnect or facility power safety disconnect.

One (1) emergency stop switch is located on the operator control panel at the front entrance end of the machine. The second switch is located on the sound enclosure at the front exit end of the machine. Two (2) additional emergency stop switches are optional. When configured, they mount at the rear entrance and exit ends of the machine.

Figure 68: Entrance End Emergency Stop Switch

Figure 69: Exit End Emergency Stop Switch

E-Stop conditions

The following conditions constitute an emergency situation and will completely shut down system operation:

- Depressing any E-Stop switch
- An immersion heater reaches high temperature shut down mode
- A dryer module reaches high temperature shut down mode

Restart the machine

Prior to turning power On and resuming operation, correct the emergency situation and ensure all emergency stop switches are pulled to the Out position.

5.3 LCD INTERFACE KEY PAD

The Liquid Crystal Display (LCD) interface key pad provides digital display of system information, allows the operator to control system functions, and perform set up procedures for the following functions. An asterisk next to an item indicates an optional feature.

- Wash Temperature
- Chemical Isolation Temperature*
- Rinse Temperature
- Dryer Section Temperatures
- Radiant Heater Temperatures
- Conveyor Speed
- System Configuration
- Auto Start Timer
- Alarm Process
- System Date and Clock
- pH Levels*
- Resistivity Levels*

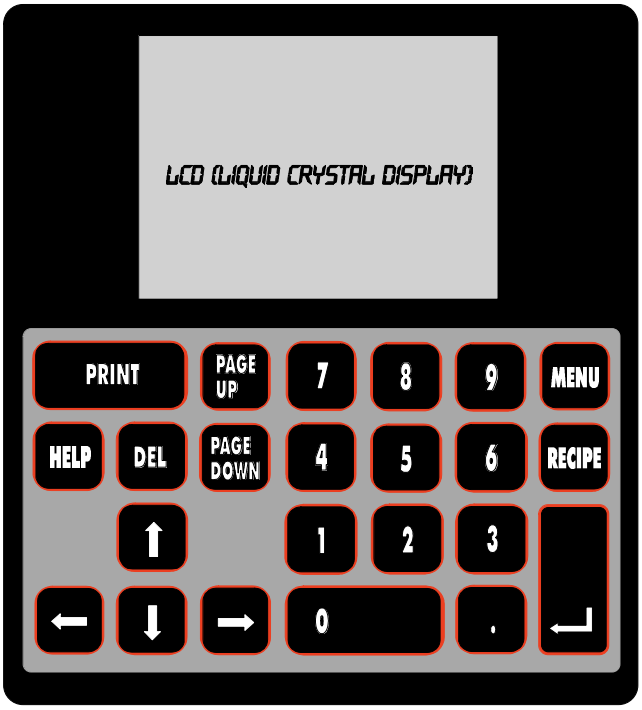


Figure 70: LCD Interface Key Pad

5.4 LCD KEY PAD FUNCTIONS

The following key pad control descriptions explain the use of each control as it appears on the LCD interface key pad.

- Menu
- Enter
- Number
- Page Up/Page Down
- Up, Down, Left, Right Arrows
- Recipe
- Print
- Help
- Del(ete)

MENU

Pressing the menu control displays the Main Menu, Configuration, or Timer screens. Press the menu control repeatedly to toggle between the screens.

ENTER

Press the enter key to accept changes made to main menu set points, system configuration, timer setup, clock and date setup, and alarm process values.

NUMBER KEY PAD

Use the number keys to enter set point values, adjust time settings, set system clock and date and enter alarm process values.

PAGE UP/PAGE DOWN

The page up and page down arrow keys allow the operator to scroll up or down through the separate pages of the main, configuration, and alarm process screens.

UP/DOWN ARROWS

Use the up and down arrow keys to move the underline screen cursor up or down on the LCD screen to review or adjust values on all menu screens.

LEFT/RIGHT ARROWS

Use the left and right arrow keys to move the underline screen cursor left or right between fields within the timer, system clock and date, and alarm process menu screens.

RECIPE, PRINT, HELP, DEL

The Recipe, Print, Help, and Del(ete) controls remain in development. Future applications of the Aquastorm series aqueous cleaning systems will include these controls.

5.5 LCD KEY PAD SCREENS

The following interface screens convey operation information or provide operator interface for system set up.

- Main Screen
- Configuration
- Timer
- Alarm Process
- System Clock and Date
- Alarm Display

MAIN SCREEN

The main screen displays standard and optional module system information, module set points, and actual module temperatures. Depending on system modules the main screen can continue to a second page.

AQUASTORM 200

MODULE	SETP	ACTUAL
CONVEYOR	7.7 F/min	0.0
WASH	145F	103
RINSE	150F	119
DRYER_1	F	74
DRYER_2	F	72
PW_FLOW	17.0 LPM	

Figure 71: LCD Key Pad Main Screen

CONFIGURATION SCREEN

Use the four (4) configuration screens to configure, add, or remove system options.

CONFIGURATION

MODEL	200
TEMP_UNITS	F
SPEED_UNITS	F/min
CHECKMATE	NO
pH MONITOR	NO
WASH PUMP	HURRICANE
RINSE PUMP	HURRICANE

Figure 72: LCD Key Pad Configuration Screen #1

RESISTIVITY	NONE
DRYER #2	BLOWER ONLY
DRYER #3	NO
DRYER #4	NO
SUMP TANK	STANDARD
SUMP TANK #2	NONE
C/I SPRAY	PUMP
C/I BLOWER	YES

Figure 73: LCD Key Pad Configuration Screen #2

LIGHT TOWER	YES
BOARD_TRACKING	YES
SAPONIFIER	YES
UPS	NO
CONV PITCH	3/8
KEYSWITCH	DISABLE
BLOWER FAIL	NO
SYS_CLOCK	SET

Figure 74: LCD Key Pad Configuration Screen #3

ALARM_PROCESS	SET
WATCH_DOG	TEST
PRE_WASH_FLOW	YES
FINAL_RINSE_FLOW	YES
FLOW_UNITS	GPM
GAS_HEAT	NO

Figure 75: LCD Key Pad Configuration Screen #4

CAUTION

System software may lock up if the operator attempts to configure items that do not exist on the system.

The configuration screens interface with the system software. When an option is added to the system or removed from the system, the operator adds, or removes the option(s) on the configuration screens.

Press the Menu key on the LDC Interface key pad to access the main configuration screen. To scroll between the configuration screens press the page up or page down keys. To move the underline screen cursor to a specific option press the up or down arrow keys. Press the Enter key to toggle between selection choices. The following table lists configuration options.

Table 7: Configuration Selections

SYSTEM COMPONENT	SELECTION CHOICES
MODEL	100/200
TEMP_UNITS	C/F
SPEED_UNITS	F/Min. M/Min.
CHECKMATE	YES/NO
pH MONITOR	YES/NO
WASH PUMP	STANDARD/HURRICANE
RINSE PUMP	STANDARD/HURRICANE
RESISTIVITY	NONE/YES
DRYER #2	BLOWER ONLY/BLOWER + IR
DRYER #3	YES/NO
DRYER #4	YES/NO
SUMP TANK	RECYCLE/NONE/STANDARD
SUMP TANK #2	NONE/STANDARD
C/I SPRAY	YES/NO
C/I BLOWER	YES/NO
LIGHT TOWER	YES/NO
BOARD_TRACKING	YES/NO
SAPONIFIER	YES/NO
UPS	YES/NO
CONV PITCH	1/4 / 3/8
KEYSWITCH	DISABLED/ENABLED
BLOWER FAIL	YES/NO
SYS_CLOCK	SET
ALARM_PROCESS	SET
WATCH_DOG	TEST
PRE_WASH_FLOW	YES/NO
FINAL_RINSE_FLOW	YES/NO
FLOW_UNITS	L/MIN/GPN
GAS_HEAT	YES/NO

Press the Menu key to accept the changes. The following message briefly displays then the system returns to the main menu.

Figure 76: Update Message

MODEL — Ensure Aquastorm 200™ displays.

TEMP_UNITS — Use the Celsius or Fahrenheit scale to display temperature readings.

SPEED_UNITS — Use feet per minute imperial units or meters per minute metric units for conveyor speed display.

OPTIONS — Indicates whether any of the following options is installed. For detailed information, refer to the Aquastorm 200™ Options Manual.

Checkmate™	pH Monitors
Resistivity	Sump Tank
Light Tower	UPS
Keyswitch	Gas Heat

Flow Meters for Prewash or Final Rinse

WASH PUMP/RINSE PUMP — If installed, toggle to hurricane. For normal operation choose standard.

IR HEATER/DRYER #2 — Indicates when an IR heater is installed and whether Dryer #2 has a blower installed or blower and IR heater.

C/I SPRAY–C/I BLOWER — For optional chemical isolation, indicate whether or not the optional spray enhance or optional blower is installed.

BOARD TRACKING — Board tracking is provided via photocells mounted on the optional inlet conveyor.

CONV PITCH — Standard wire mesh belt spacing is 3/8. Choose 1/4 when the optional wire mesh belt is used.

BLOWER FAIL — When configured with this option, any amperage change in blower operation initiates an alarm situation.

SYSTEM CLOCK AND DATE

The clock and date screen displays the current date and time as configured in the internal computer. In the event of a power loss, or when changing to or from daylight savings time, this feature permits date and time computer adjustments.

NOTE Keep in mind the internal system clock is a 24 hour clock.

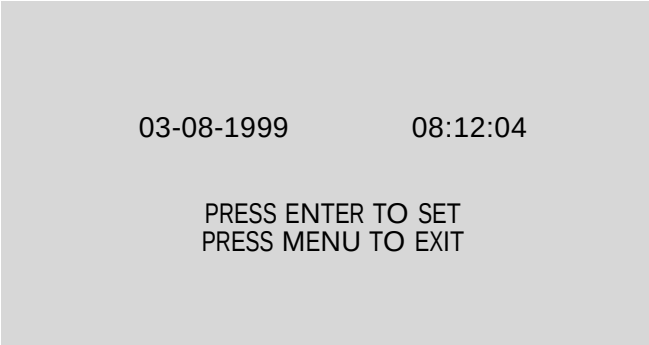


Figure 77: System Clock and Date Screen

To set system clock and date:

1. Press the menu key on the LCD interface keypad to access configuration screen #1.
2. Press the page down key twice to display configuration screen #3.
3. Press the down arrow key until the underline cursor blinks in line with SYS_CLOCK.
4. Press the enter key to access the DATE/ CLOCK utility.
5. Press the arrow keys to move the underline cursor between fields.
6. Use the number keys to enter the correct date and time.
7. Press the enter key to accept the changes.
8. Press the menu key twice to exit the DATE/ CLOCK utility and bypass the Auto Timer screen.
9. The changes made are saved and the main screen displays.

TIMER SCREEN

The timer screen allows the operator to set specific times on selected days for automatic start up and shut down of the Aquastorm 200™ system.

NOTE The timer is based on the 24 hour internal system clock. Ensure the correct time and date are set on the internal clock before setting the automatic timer.

Figure 78: LCD Key Pad Timer Screen

To configure the automatic timer:

1. Press the menu key twice on the LCD interface keypad to access the timer screen.
2. Press the up and down arrow keys until the underline cursor blinks in line with the day requiring editing.
3. Press the left and right arrow keys to move between the Start, Stop, and Enable fields.
4. When the underline cursor is in the start field, press the number keys to enter the required start time. The start time must be set to a time prior to the stop time.
5. Press the enter key to accept the start time.
6. Move the underline cursor to the stop field. Press the number keys to enter the required stop time. The timer runs on a 24 hour clock. For example to stop at 5:00 pm enter 17:00:00 in the stop time field.
7. Press the enter key to accept the stop time.
8. Move the underline cursor to the enable field.
9. Press the enter key to toggle between Yes and No. Yes enables the timer for a specific day and No disables it.
10. Repeat Step 3. through Step 9. to set the timer for each day of the week.
11. After entering all timer screen information, press the menu key to save the changes made and return to the main screen.

ALARM PROCESS

Use the alarm process screen to configure specific software alarms and their related priority. Depending on the specific process application alarms are configured as Ignore, Warning, or Shutdown.

ALARM	BAND	ACTION	REALARM
CONV	1.0 FPM	WARNING	05 MIN
WASH	10 F	SHUTDOWN	05 MIN
CHEM	10 F	IGNORE	05 MIN
RINSE	10 F	SHUTDOWN	05 MIN
BLWR	10F	WARNING	05 MIN
PW_FL	3.8 LPM	IGNORE	05 MIN
FR_FL	3.8 LPM	IGNORE	05 MIN

Figure 79: LCD Key Pad Alarm Process Screen

Configure process alarms for the following processes:

- Wash high and low temperatures
- Optional chemical isolation high and low temperatures
- Rinse high and low temperatures
- Optional radian heater high and low temperatures
- Conveyor speed deviation
- Resistivity level deviation
- pH level deviation
- Saponifier tank level

To set alarm values:

1. Press the menu key on the LCD interface keypad to access configuration screen #1.
2. Press the page down key three (3) times to display configuration screen #4.
3. Press the down arrow key until the underline cursor blinks in line with ALARM_PROCESS.
4. Press the enter key to access the ALARM_PROCESS screen.
5. Refer to the following fields to complete alarm process configuration.

   Alarm – The module or component

   Limit – The set point deviation level. When the actual reading reaches the set limit in the plus or minus direction, the designated alarm activates.

   Action – Select the alarm condition level. Press the enter key to toggle between the three options:

   IGNORE – No alarm or LCD display activates.

   WARNING – An audible alarm and LCD display activate. The system remains in operation.

   SHUT DOWN – An audible alarm and LCD display activate. The system shuts down operation.

   Realarm – Configure this value to reinitiate an alarm if it is not corrected when it first activates. The realarm value set point is from 1–99 minutes.
6. Use the left and right arrow keys to toggle between fields and numeric characters in the Limit and Realarm fields.
7. Use the number keys to enter digits.
8. Use the up and down arrow keys to choose the specific module or component for alarm adjustment.
9. After configuring all alarms, press the menu key twice to save the changes made to the alarm values and return to the main screen.

ALARM DISPLAY

This screen provides a readout of configured alarms as they occur.

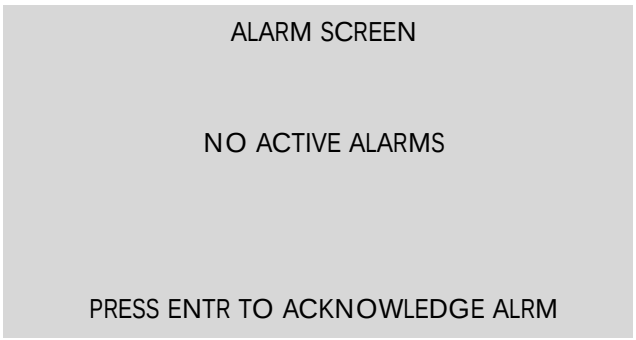


Figure 80: Alarm Acknowledge

WATCH DOG TEST

The watch dog test is an internal software utility that re-boots the internal computer system in the case of a lock up.

ALARM_PROCESS	SET
WATCH_DOG	TEST
PRE_WASH_FLOW	YES
FINAL_RINSE_FLOW	YES
FLOW_UNITS	GPM
GAS_HEAT	NO

Figure 81: LCD Key Pad Watch Dog Test

To perform the watch dog test:

1. Press the menu key on the LCD interface keypad to access configuration screen #1.
2. Press the page down key three (3) times to display configuration screen #4.
3. Press the down arrow key until the underline cursor blinks in line with WATCH_DOG.
4. Press the enter key.
5. The system shuts down and the computer re-boots.

5.6 GAUGE PANEL

The gauge panel displays the water pressure in the Prewash, Wash, Optional Chemical Isolation, Rinse, and Final Rinse modules. Actual pressure rating depends on the pump horsepower rating. The table lists average pressure readings for the pumps.

Table 8: Gauge Panel Readings

PUMP RATE	PRESSURE READING
1/3 hp	103.5 – 138 kPa (15 – 20 psi)
5 hp	552 – 586.6 kPa (80 – 85 psi)
10 hp	621 kPa (90 psi)

PRESSURE CHECKS

On 1/3 hp pumps, if the pressure increases by 138 kPa (5 psi) check and clean nozzles in the optional chemical isolation module. On 5 hp or 10 hp pumps, if the pressure increases by 138kPa (5 psi) check and clean the nozzles in the module where the increase displays. In the Wash and Rinse modules also check the optional hurricane jet nozzle.

When an optional Bag Filter is installed, if the pressure drops by 69 kPa (10 psi) perform Lock Out-Tag Out steps, (refer to 1.3 Lock Out-Tag Out on page 3) check, and clean or replace the bag filter.

NOTE Ensure regular preventive maintenance is performed on all nozzles. Refer to the Aquastorm Series Maintenance Manual for procedures.

Figure 82: Gauge Panel Layout

SECTION 6: DAILY OPERATION

Prior to turning power On to the Aquastorm 200™ system complete the Pre-Start Checklist and Set Up procedures outlined in SECTION 4: Machine Set Up on page 25. Ensure the operator is familiar with the controls and indicators on the control panel prior to operating the system.

6.1 ELECTRICAL POWER

FACILITY POWER

Activate power to the Aquastorm 200™ by turning On the main power disconnect located at the exit end of the system for 380V and 460V systems. On 220V systems turn On the facility power source.

The following indicate power to the system is On:

- Interior lights illuminate
- Computer boots up
- Power is enabled to the control panel

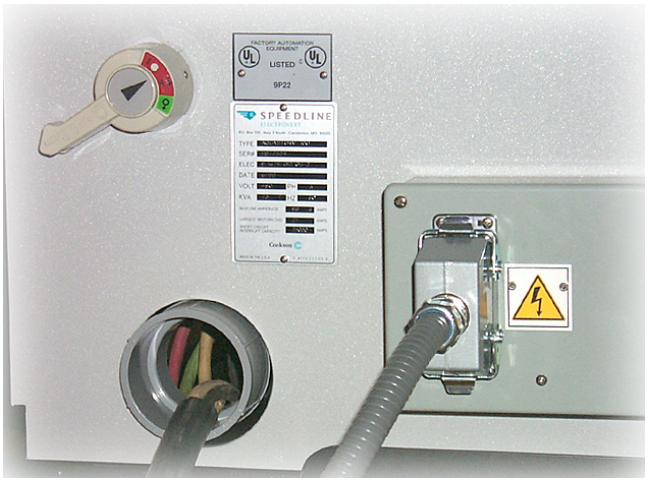


Figure 83: Main Power Disconnect

SYSTEM POWER

Press the Power On control on the membrane keypad. All Aquastorm 200™ subsystems are enabled. If tank levels are at operating level, immersion heaters activate.

6.2 INITIAL START UP

When starting the Aquastorm 200™ for the first time, the system parameter settings display factory defaults. Prior to operating pumps, blowers, and optional radiant heaters, it is necessary to change one (1) or more of the default parameter settings.

CONVEYOR	(No Default – Must be Set)	
WASH	65 °C	150 °F
CHEM_ISO	65 °C	150 °F
RINSE	65 °C	150 °F
DRYER_1		
IR_HEATER	65 °C	150 °F

Figure 84: Factory Default Settings

Refer to previous sections in this manual to adjust temperature set points, conveyor speed, fill system tanks, and initiate operation.

6.3 ACTIVATE SUBSYSTEMS

Use the membrane control panel to initiate the following in the sequence listed.

To activate subsystems:

1. Press the conveyor On control to activate the conveyor.
2. Press the wash module hurricane pump On/Off control to activate the optional wash Hurricane™ pump. The prewash module spray nozzles, wash module spray nozzles, and optional Hurricane™ Jet spray nozzle energize.
3. Press the chemical isolation module blower On/Off control to activate the optional drag out blower. The blower air knives in the optional chemical isolation module energize.
4. Press the rinse module hurricane pump On/Off control to activate the optional rinse Hurricane™ pump. The rinse module spray nozzles and optional Hurricane™ Jet spray nozzle energize.
5. Press the final rinse On/Off control to activate the final rinse module solenoid and the optional treatment interface pump. The final rinse solenoid, spray nozzles, and optional treatment interface pump energize.
6. Press each blower On/Off control to individually activate the blowers.
7. Press the radiant heater On/Off control to turn the IR heater On for operation.

AUTO START TIMER

If configured, the auto start timer eliminates production delays by auto enabling the system fill solenoid and the wash and rinse tank immersion heaters prior to system start up. Ensure power to the Aquastorm 200™ remains turned On for the auto start timer to work properly.

Configure daily start and stop times for each day of the week using the timer function and the LCD interface keypad. See Timer Screen on page 54 for detailed timer set up.

6.4 SYSTEM SHUT DOWN

Shut down the Aquastorm 200™ when performing preventive maintenance or in an emergency situation.There are two (2) shut down procedures for the Aquastorm 200™, normal and emergency.

NORMAL SHUT DOWN

Use the membrane control panel to initiate the following in the sequence listed.

To manually shut down subsystems:

1. Press the radiant heater On/Off control to stop IR heater operation.
2. Press each blower On/Off control to individually turn each blower Off.
3. Press the final rinse On/Off control to stop the final rinse module solenoid and the optional treatment interface pump. The final rinse solenoid, spray nozzles, and optional treatment interface pump operations stop.
4. Press the rinse module hurricane pump On/Off control to stop the optional rinse Hurricane™ pump. The rinse module spray nozzles and optional Hurricane™ Jet spray nozzle operations stop.
5. Press the chemical isolation module blower On/Off control to stop the optional drag out blower. The blower air knives in the optional chemical isolation module stop.
6. Press the wash module hurricane pump On/Off control to stop the optional wash Hurricane™ pump. The prewash module spray nozzles, wash module spray nozzles, and optional Hurricane™ Jet spray nozzle operations stop.
7. Press the conveyor Off control to stop the conveyor.
8. Perform the post shut-down clean and check of the system. For detailed information on maintenance refer to the Aquastorm 200 Maintenance Manual.

EMERGENCY SHUT DOWN

The Emergency Stop (E-Stop) control immediately stops all Aquastorm 200™ processing. Any PCB assemblies in process could be damaged or adversely affected when the system is stopped in this manner.

CAUTION

Use the Emergency Stop (E-Stop) controls only in response to situations that place operators or equipment in danger. DO NOT use E-Stop controls to routinely shut the system down. This causes line surges and could affect machine performance.

Press one (1) of the two (2) large red push-pull switches. One (1) emergency stop switch is located on the operator control panel at the front entrance end of the machine. The second switch is located on the sound enclosure at the front exit end of the machine. The E-stop switches are wired in series. Pressing one (1) turns Off power to all system modules and stops process in all modules.

Figure 85: Entrance End Emergency Stop Switch

WARNING

Risk of Electric Shock – Turning power Off using the Emergency Stop (E-Stop) control DOES NOT disable power to the system. To disable system power turn Off power at the main disconnect or facility power safety disconnect.

Two (2) additional emergency stop switches are optional. When configured, they mount at the rear entrance and exit ends of the machine.

Restart the machine

Prior to turning power On and resuming operation, correct the emergency situation and ensure all emergency stop switches are pulled to the Out position.

Figure 86: Exit End Emergency Stop Switch

6.5 OPERATION TROUBLESHOOTING

This section lists possible problem scenarios the operator may encounter during Aquastorm 200™ operation. It also recommends action to asses and/or correct the problem.

Refer to the Aquastorm 100 and Aquastorm 200 Installation Manual, Aquastorm Series Maintenance Manual, or Aquastorm Series Options Manual for detailed information as required.

Table 9: Operation Troubleshooting Chart

SYMPTOM	PROBABLE CAUSE	RECOVERY
No heat in wash, rinse, or optional chemical isolation tanks.	Immersion heater burned out	Replace immersion heater.
	Temperature set point set too low	Adjust temperature to correct setting.
	Thermocouple is defective	Replace thermocouple.
	Fuse is blown	Replace fuse.
	Immersion heater contactor defective	Replace immersion heater contactor.
	Low level float switch deactivates immersion heaters	Contact Technical Support.
	Scale buildup on heaters and reducing heat output	Perform descaling procedure.
Low level alarms	Make up level float switch sticks	Clean or replace float switch.
	Low level float switch sticks	Clean or replace float switch.
	Scale build up on or around float switches	Perform descaling procedure.
	Unbalanced water flow gpm in/gpm out	The volume of water entering Final Rinse should be equal to the volume of water exiting Prewash. Adjust flow as required.
	Drain solenoid stuck in open position	Perform Lock Out-Tag Out steps (See 1.3 Lock Out-Tag Out on page 3) and clean or replace the solenoid.
Photocell does not activate wash, rinse, and final rinse modules	Photocell sensitivity adjusted too low	Follow photocell set up steps (See 4.10 Optional Photocell Set Up on page 31).
	Condensation on photocell emitter or reflector	Clean photocell emitter and reflector with a clean soft cloth
	Misaligned photocell	Realign photocell (See 4.10 Optional Photocell Set Up on page 31).
	Dirty photocell emitter or reflector	Clean photocell emitter and reflector with a clean soft cloth

Table 9: Operation Troubleshooting Chart

SYMPTOM	PROBABLE CAUSE	RECOVERY
High level alarms	Drain solenoid defective	Perform Lock Out-Tag Out steps (See 1.3 Lock Out-Tag Out on page 3) and clean or replace the solenoid.
	Clogged drain	Perform maintenance procedure on tank where drain is located.
	High level float switch stuck	Clean or replace float switches as required.
	Unbalanced water flow gpm in/gpm out	The volume of water entering Final Rinse should be equal to the volume of water exiting Prewash. Adjust flow as required.
Jerky conveyor belt	Nylon sprocket not aligned with wire belt	Loosen the set screw on the sprocket, reposition the sprocket on the shaft, and retighten the set screw.
	Wire belt tension too loose	Refer to the wire belt tensioning information in the Installation or Maintenance manual and adjust.
	Conveyor speed control out of calibration	Refer to the calibration section in the Maintenance Manual.
Excess steam escapes entrance or exit end of system	Clogged spray nozzles	Check nozzles and clean or replace as required.
	Scale buildup	Perform descaling procedure.
	Clogged recirculation filter	Check and clean or replace filter
Final rinse water does not activate	Defective final rinse solenoid	Replace the final rinse solenoid.
	Broken or loose wire connection.	Perform Lock Out-Tag Out steps (See 1.3 Lock Out-Tag Out on page 3) and repair the wire.
	Facility water supply diminished or not activated	Replenish or activate facility heated water supply.
Immersion heater over-temperature sensor does not reset	Immersion heater and over-temperature sensor need replacement	Contact Technical Support for assistance in the replacement process.

This page intentionally left blank.

APPENDIX A: GLOSSARY

A.1 INTRODUCTION

The following guide lists industry terms as they relate to printed circuit assembly cleaning. Many of the definitions are from the IPC (Institute For Interconnecting And Packaging Electronic Circuits) web site (www.ipc.org).

ABOUT SMEMA

The Surface Mount Equipment Manufacturers Association (SMEMA) is a non-profit organization of companies manufacturing equipment or producing software for surface mount board production.

Its objectives are to:

- Promote standards for the interface and operation of equipment
- Provide users with the ability to select equipment with the assurance that the equipment will interface easily
- Advance SMT and promote its use
- Investigate areas where the association can act to the benefit of all member companies

A.2 ELECTRONICS CLEANING TERMS AND DEFINITIONS

ABSORPTION — The penetration of one substance into the inner structure of another termed the absorbent.

ACID — A substance that ionizes in solution to release the positive ion of the solute. The strength of tile acid is proportionate to the amount of ions released in solution. The strongest acids have the lowest pH readings, i.e. closest to I.O.

ACIDITY — The quantitative capacity of a water or water solution to neutralize an alkali or base. It is usually measured by titration with a standard solution of sodium hydroxide and expressed in terms of its calcium carbonate equivalent.

ADSORBED CONTAMINANT — A contaminant which is attracted to the PWB surfaces and held captive in the form of a gas or liquid.

ADSORBENT — A material, usually solid, capable of holding gasses, liquids and/or suspended matter at its surface and in exposed pores. Activated carbon is a common adsorbent used in water.

ADSORPTION — The process in which matter adheres to the surface of an adsorbent.

AERATION — The process in which air is brought into intimate contact with water, often by spraying water through air or by bubbling air through water. Aeration may be used to add oxygen to the water for the oxidation of matter such as iron, or to cause the release of dissolved gasses such as carbon dioxide or hydrogen sulfide from the water.

AIRKNIFE — A means, usually a slotted tube, by which air can be directed into a focused flow toward a surface. Airknife shapes and orifices can vary. The term airknife can also refer to the curtain or “knife” of air itself. Typically airknives are fed by high velocity or high volume blowers.

ALKALINITY — The quantitative capacity of a water or water solution to neutralize an acid. It is usually measured by titration with a standard acid solution of sulfuric acid and expressed in terms of its calcium carbonate equivalent.

ANHYDROUS — Free of water.

ANION — A negatively charged ion that migrates to an anode, as in electrolysis.

ANION EXCHANGE — An ion exchange process in which anions in solution are exchanged for other anions from an ion exchanger.

AZEOTROPE — A solvent blend that has the same composition and characteristics in the vapor phase as it does in the liquid phase, This property enables all azeotropic solvent to go from the liquid state to the boiling state (evaporation) and be cooled (condensed) back to the liquid state for recovery or distillation. DuPont's Vertret™ III SMT is an example of an azeotrope.

BASE — A substance that ionizes in solution with water to release negatively charged hydroxyl (OH,) ions. The strength of the base is proportionate to the amount of hydroxyl ions released in solution. The strongest bases have the highest pH readings, i.e. closest to 14.0. (Base is also referred to as alkali or alkaline).

BED — The ion exchanger or filter media in a column or other tank or operational vessel.

BIODEGRADABILITY — The propensity of a substance to decompose by microorganisms normally found in the environment.

B.O.D/C.O.D. — Biological oxygen demand/ chemical oxygen demand. A relative measure of impact, in terms of oxygen demand, of dissolved and colloidal organic matter oil the biological units (bacteria) required to maintain a properly functioning waste treatment facility. Chemical additives to aqueous cleaning systems will often raise BOD/COD over the acceptable limits of the POIV.

BRACKISH WATER — Water containing dissolved solids in the range of 1,000 to 10,000 mg/l.

BRINE — A strong solution of salt(s), such as the sodium chloride brine used in the regeneration of ion exchange water softeners, but also applies to the mixed sodium, calcium, and magnesium chloride waste solution from regeneration.

CFC — Abbreviation for Chlorofluorocarbon.

CFC-113 — A common name for the most common CFC solvent–1,1,2-trichloro-1,2,2-trifluoroethaiie. CFC-113 has an ODP of approximately O.8.

CALORIE — The amount of heat necessary to raise one gram of water one degree centigrade (at 1 atmosphere pressure). A Calorie (with a capital *C*) is the amount of heat needed to raise one kilogram of water one degree centigrade.

CAPACITY — An expression of the quantity of an undesirable material which can be removed by a water conditioner between servicing of the media, i.e., cleaning, regeneration, or replacement, as determined under standard test conditions.

CAPILLARY ACTION — The interaction between a liquid and a small diameter opening in a solid. Because of surface tension, the liquid is drawn into tile opening by this action. The Young-Laplace equation of differential pressure can demonstrate this phenomenon.

CASCADE SYSTEM — A configuration whereby cleansed water is used in one tank, or section, and overflows to the previous tank or section relative to board movement. A typical example would be deionized water entering the final rinse section of a cleaner, flowing to a recirculating rinse section, then to a wash, then to a prewash, and then to drain. Thus, the board assembly is exposed to progressively cleaner water as it moves through tile system. This flow configuration is typically used when cleaning without wash additives, such as with water soluble fluxes.

CATION — A positively charged ion that migrates to a cathode during electrolysis.

CATION EXCHANGE — Ion exchange process in which cations in solution are exchanged for other cations from an ion exchanger.

CHEMICAL ISOIATION — Term developed by Hollis Automation referring to an enhanced drag-out section in an in-line cleaner. Instead of a simple airknife/blower combination, chemical isolation uses a low-flow water spray in between two sets of airknives to flush residual wash water from connector bodies, under components, etc. The water from this section may be supplied from the rinse section, from its own tank, or from an external source.

CHEMICAL COMPATIBILITY — This term refers to the acceptability of use of a chemical relative to the machine in which it's used, and tile product it cleans. Some chemistries will have degradable effects on equipment and/or boards. Chemical compatibility should be verified prior to implementing a cleaning process.

CHLORINE — A gas Cl_2, widely used in the disinfection of water and an oxidizing agent for organic matter, iron, etc.

CHLORINATOR — A mechanical device specifically designed to feed chlorine gas or solutions of its compounds, such as hypochlorites, into a water supply in proportion to the flow of water.

CHLORINATED POLYVINYL (CPVC) — A plastic often used in cleaner plumbing which is similar to commercially available PVC found in domestic plumbing, however, it can handle greater temperatures and pressures. It is available in Schedule 40 or Schedule 80 grades, with 80 being the most durable. CPVC plumbing is easy to work with because it does not require threading or welding, it is glued. CPVC also works well with Deionized water.

CHLOROFLUOROCARBON (CFC) — A compound consisting of carbon, hydrogen, chlorine, and fluorine to have a negative impact oil the earth's protective ozonosphere. These compounds are being phased out of production by edict of the Montreal Protocol.

CLEANLINESS TESTING — Any of a family of tests used to verify a required cleanliness specification. Testing may include residual ionic evaluation (conductivity testing), surface insulation resistance testing (SIR), chromatography evaluation.

COAGULATION — The process in which very small, finely divided solid particles, often colloidal in nature, are agglomerated into larger particles.

CONCENTRATE — Waste water which is sent to the drain from a reverse osmosis (RO) machine.

CONORMAL COATING — A protective material applied in a thin, uniform layer to a printed wiring assembly.

CONDENSATION — The change of state from a gas to a liquid.

CONDUCTIVITY — The quality or power to carry electrical current. In water, conductivity is related to the concentration of ions capable of carrying electrical current.

CONDUCTIVITY TESTING — Also known as residual ionic evaluation, solvent extract resistivity testing and Omegameter/Ionograph testing. A quantitative evaluation of residual conductive (ionic) material left on a board in which this material is expressed as an equivalent of micrograms of salt (NACI) per square inch. This test involves immersing the board in a known volume of solution of isopropyl alcohol and deionized water at a known initial conductivity. In some machines this solution is heated and agitated during the test period. During the typical 10 minute test, residual ionics go into solution, thus increasing the conductivity of the solution. By analyzing this change in conductivity relative to the surface area of tile board, an equivalent measurement of contamination call be determined. There are many specifications covering this test, but the most quoted is Mil-P-28809.

CONTAMINANT — An impurity that may or may not affect the performance of a circuit assembly. Typically, contaminants are classified as polar, non-polar or particulate in nature.

CONTAMINATION — The addition of foreign matter to a substance which reduces the value of the substance, or interferes with its intended use.

CORROSION — The destructive disintegration of metal by electrochemical means.

DECANT — In semi-aqueous cleaning most hydrocarbon-based and terpene-based solvents will separate from water and rise to tile top in a tank. This enables tile solvent to be recovered from water, as in when wash SA solvent is carried or dragged out into tile water rinse section, by separating into a weir.

DEFOAMING AGENT — An additive to wash or rinse tanks in a cleaner which will reduce the tendency to produce a head of foam in the tank.

DEIONIZATION (DI) — The removal of all ionized minerals and salts (both organic and inorganic) from a solution by a two-phase ion exchange procedure. The term is often used interchangeably with demineralization.

DEIONIZED WATER — Water which has had a degree of positive and negative ions removed so as to decrease its conductivity (raise resistivity). Typically, this is done in the ion exchange process. in general, the highest degree of deionization possible under normal conditions will result in resistivity of 18.2 meg-ohms. Tap water has resistivity as low as 1-5 kilo-ohms. In addition to having low conductivity potential, DI water is prone to absorbing ions aggressively in the rinse process. Because of low dissolved mineral content, DI water is also less prone to leaving water spots on a board. In the cleaning process, it is rarely necessary to deionize to the 18.2 meg-ohm extent. Desired results can usually be achieved in the 500k to 3 meg-ohm range.

DEMINERALIZATION — The removal of ionized inorganic minerals and salts (not organic materials) from a solution by two-phase ion exchange process similar to deionization.

DENDRITIC GROWTH — An indicator of electro-migration. The appearance of stalk-like growth between conductors to which a bias voltage has been applied indicating that electrolytic transfer has occurred, and, hence a potential problem for current conductivity exists. This is a visual test usually tinder 2-8X magnification.

DETERGENT — A cleaning agent that exerts an emulsifying action at polar/non-polar interfaces, as in oil/water, so as to separate them and enable them to be rinsed away.

DISINFECTION — A process in which pathogenic (disease-producing) bacteria are killed; may involve disinfecting agents such as chlorine or physical process such as heating.

DISSOLVED SOLIDS — The weight of matter in true solution in a stated volume of water; includes both inorganic and organic matter; usually determined by weighing the residue after evaporation of the water at (105° or 180°C) (221° or 356°F).

DISTILIATION — A process of boiling, evaporation, and condensation of a substance for purification by separating out contaminants. This process was typically used for recovery of solvents in CFC cleaning. Multiple distillations are required for extreme purity.

DRAG-OUT — The carryover of water, wash chemistry, and/or contaminants in solution from one functional section of a cleaner to another.

EFFLUENT — The stream emerging from a unit, system, or process, such as the softened water from an ion exchange softener or run-off to a drain.

ELUTION — The stripping of ions from an ion exchange material by other ions, either because of greater affinity or because of much higher concentration.

ELECTRICAL LEAKAGE — A phenomenon associated with the degradation of surface insulation resistance on a circuit board leading to partial conduction of current electrical trace and on to the substrate.

EMULSION — A suspension of small globules of one liquid in a second liquid with which the first will not mix. This can occur with some semi-aqueous solvents in water.

EQUIVALENT PER MILLION — A unit of concentration used in chemical calculations. To calculate, divide the concentration in ppm or mg/L by the equivalent weight.

EVAPORATION — The process by which a liquid vaporizes into the surrounding atmosphere. This process can generally be accelerated by adding heat. One cause of the loss of water in a cleaning system is evaporation.

FEED WATER — Any water fed into a machine.

FINAL RINSE — The last wet section of a cleaner. Typically, this is where deionized water is introduced to the machine. It may or may not cascade to preceding sections.

FILTER — A device or system for the removal of solid particles (suspended solids); includes mechanical, adsorptive, oxidizing, and neutralizing filters.

FILTRATION — The process of separating suspended solids from a liquid by forcing the mixture through a porous barrier.

FLASH POINT — The temperature at which a volatile liquid mixes with air in such proportions as to produce a flammable gaseous mixture. This mixture will flash when exposed to a flame or spark, but will not necessarily continue to support combustion.

FLOCCULATION — The agglomeration of finely divided suspended solids into larger, usually gelatinous particles; the development of a *floc* after treatment with a coagulant by gentle stirring or mixing.

GRAIN (gr.) — A unit of weight equivalent to 0.0648 gram or 1/70000 of a pound.

GRAIN PER GALLON (gpg) — A common basis for reporting water analyses in the United States and Canada; one grain per US gallon equals 17.12 milligrams per liter (mg/L). One grain per British (Imperial) gallon equals 14.3 milligrams per liter or parts per million.

GREENSAND — A natural mineral, primarily composed of complex silicates, which posses ion exchange properties.

HALIDES — A compound containing fluorine, chlorine, bromine, iodine, or astatine. These materials are sometimes present in the activators of soldering fluxes. Halide residues must be cleaned off the circuit board.

HARDNESS — A characteristic of natural water due tot he presence of dissolved calcium and magnesium; water hardness is responsible for most scale formation in pipes and water heaters. Hardness is usually expressed in grains per gallon, parts per million, or milligrams per liter.

HARD WATER — Water containing a total hardness of one grain per gallon or more of calcium carbonate or other minerals which tend to collect on cleaner tank walls and in plumbing, forming a hard-to-remove scum layer.

HYDRATION — The chemical combination of water into a substance.

HYDROLOGIC CYCLE — The water cycle, including precipitation of water from the atmosphere as rain or snow, flow of water over or through the earth, and evaporation or transpiration to water vapor in the atmosphere.

HYDROPHILIC — Having a strong tendency to absorb, attract, or be dissolved in water.

HYDROPHOBIC — Incapable of dissolving in water. Water "fearing."

HYGROSCOPIC — The tendency of a material to readily absorb water, usually from the air.

INFLUENT — The stream entering a unit, system, or process, such as the water entering the prewash, wash, chemical isolation, rinse, or final rinse sections of an aqueous cleaner or the hard water entering an ion exchange water softener.

INORGANIC — A chemical compound not having the element carbon, with the exception of carbon dioxide and compounds containing the carbonate radical.

ION — A positively or negatively charged particle. Ionic residues are conductive.

ION EXCHANGE — A reversible process using coated resins called anionic and cationic in which ions are released from an insoluble permanent material in exchange for other ions in a surrounding solution. The direction of the exchange depends upon the affinities of the ion exchange for the ions present and the concentration of the ions in the solution. Typically, this process is combined with a carbon tank to remove organic contaminants and a bag or cartridge filter to remove large particulates. This process is used to deionize water.

IONIC CONTAMINATION — Residual material left on a board that is ionic in nature, and, therefore, is potentially conductive.

IRON BACTERIA — Organisms which are capable of using ferrous iron, either from the water or from steel pipe, in their metabolism and precipitating ferric hydroxide in their sheaths and gelatinous deposits.

ISOLATING CURTAINS — Flexible curtains, usually silicone rubber or BUNA-N, mounted between cleaner stages to help limit overspray and drag-out.

MANGANESE GREENSAND — Greensand which has been processed to incorporate in its pores and on its surface the higher oxides of manganese.

MEDIA — The selected materials in a filter that form the barrier to the passage of certain suspended solids or dissolved molecules.

MICRON — A linear measure equal to one millionth of a meter, or 0.00003937 inch. The symbol for the micron is the Greek letter µ.

NO-CLEAN FLUX — A low residue flux that can be left on the substrate. As components become more complex, very weak flux that leaves a small residue becomes a problem.

NON-POLAR — A substance that will not breakdown electrically into positive and negative components in solution. A non-polar contaminant can only be removed by a non-polar solvent. Rosin is a non-polar contaminant.

ODP — Ozone-depleting potential.

ORGANIC — Containing carbon.

ORGANIC ACID FLUX (O/A) — Active flux easily removed with water. Provides excellent Printed Circuit Board (PCB) solderability.

OSMOSIS — A process of diffusion of a solvent such as water through a semipermeable membrane which will transmit the solvent but impede most dissolved substances.

OZONE — An unstable form of oxygen (O^3), which can be generated by an electrical discharge through air or regular oxygen or the action of ultraviolet light or a strong electric field. It has the property of blocking the passage of dangerous wavelengths of ultraviolet light. Although it is a desirable gas in the atmosphere, it is toxic to living organisms at ground level. It is a strong oxidizing agent and has been used in water conditions as a disinfectant.

OZONE DEPLETING POTENTIAL — A relative index indicating the extent to which a chemical product may cause ozone depletion. The reference level of 1.0 is the potential of CFC-11 and CFC-12 to cause ozone depletion. If a product has an ozone depletion potential of 0.5, a given weight of the product in the atmosphere will, in time, deplete half the ozone that the same weight of CFC-11 will deplete.

pH — The measure of acidity or alkalinity of a solution or the reciprocal of the logarithm of the hydrogen ion concentration. The pH scale is from zero to 14, with 7.0 considered neutral; greater than 7.0 is alkaline (basic) and less than 7.0 is acidic. The greater the deviation from 7.0, the stronger the acid or base. There are many tests to determine pH, the most common being litmus paper.

PARTICULATE CONTAMINATION — General classification of residues left on a board that are not attributed to flux. This may be router dust, room dust, metal shavings, etc.

PERMEATE — Describes water that has passed through a reverse osmosis membrane.

POLAR — A term describing a substance at the atomic level which will breakdown in solution into positive and negative electrical components. A polar contaminant can only be dissolved by a polar solvent. Water is a polar solvent.

POLYPROPYLENE — A polymer of propylene that is a thermoplastic resin. It is often used in the manufacture of cleaning systems because of its ease of assembly, resistance to chemicals, and cost-effectiveness.

POTABLE WATER — Water which is suitable for human consumption.

POTW — Publicly Owned Treatment Works. Refers to a community's public sewage treatment facility.

ppm — The abbreviation for parts per million.

PRECIPITATE — To cause a dissolved substance to form a solid particle which can be removed by settling or filtering, such as in the removal of dissolved iron by oxidation, precipitation, and filtration.

PREWASH — The first stage in a cleaner. The function of this section is to remove gross contamination to drain, without carrying over into the recirculating wash station. In straight aqueous (non-saponified) systems, this stage should always go to drain or in a closed loop recycle system. In saponified systems, this stage should not be plain water, but should be an extension of the wash section, spraying saponified water on to the board.

PRESSURE EQUALIZATION AND BALANCING — Refers to a setup process in a cleaner whereby the upper spray manifolds and airknives are biased to a slightly higher pressure than the lowers so as to avoid a tendency for the board to lift up off the conveyor belt from the pressures delivered by the lower manifolds and airknives.

PROCESS WINDOW — A term used to describe the range of settings for various process parameters within which success of the process is achieved.

PUMP PERFORMANCE CURVE — A curved graph supplied by a pump's manufacturer plotting flow on one axis and pressure on the other. A properly designed cleaner will have spray manifolds optimized so that pressure and flow fall along this curve. An increase in pressure results in a corresponding decrease in flow, and vice versa.

REGENERANT — A solution of chemical compound used to restore the capacity of an ion exchange system. Sodium chloride brine is used as a regenerant for ion exchange water softeners, and acids and bases are used as regenerants for cation and anion resins used in demineralization.

RESIDUAL — The amount of a specific material remaining in the water following a water treatment process; may refer to material remaining as a result of incomplete removal or to material meant to remain in the treated water.

RESIN — A solid or semi-solid organic (synthetic) compound lacking a crystalline structure. Resins are characterized by the lack of a definite melting point, and are usually not conductors of electricity. Natural resins originate in plants, such as pine sap, and are not water soluble. The rosin used in flux is a resin. Synthetic resins may have many or all of the properties of natural resins.

REVERSE OSMOSIS (RO) — A mechanical process that reverses, by the application of pressure, the flow of water in a natural process of osmosis so that the water passes from the more concentrated to the more dilute solution through a semipermeable membrane. Membrane porosity determines the purity of the water. The smaller the pores in the membrane, the more pure the resultant water, however, smaller pores allow lower flow rates.

RINSE — A stage in the cleaning process of removing residual soils or wash solutions left

from the previous stage. In a cleaning system, there may be multiple rinses, they may cascade, they may have fresh water inputs, and/or they may recirculate.

ROSIN — A naturally occurring resin, usually associated with pine sap. It is widely used in flux.

- R = Rosin, non-activated
- RMA = Rosin, mildly activated
- RA = Rosin activated

SALT — A compound formed by the reaction between an acid and a base. The hydrogen ion of the acid is replaced by the metal associated with the base, and tile hydroxyl ion of the base is replaced by the negative ion from the acid. The hydrogen and hydroxyl ions combine to form water. A common example of the formation of a salt is table salt, NaCl, formed from the reaction of hydrochloric acid, HCl, and sodium hydroxide, NAOH. Salts ionize in water and are conductive.

SAPONIFIER — A general term applied to a solution of organic or inorganic bases and various agents, such as wetting agents and dispersants, for promoting the removal of non-water soluble contaminants, such as rosin fluxes, greases, oils, etc. The removal of rosin flux is based on the chemical reaction between acids in the rosin and the alkaline saponifier, which results in a water soluble or dispersible rosin “soap.”

SATURATED SOLUTION — A solution in which the solvent can accept no more solute. The result of adding more solute is usually particles in suspension or which precipitate to the bottom of the containment vessel.

SEMI-AQUEOUS — As applied to cleaning, refers to a process of cleaning with a solvent in the wash stage, typically a terpene, hydrocarbon, or alcohol blend, followed by water rinse (s).

SOFT WATER — Processed water in which the calcium and/or magnesium ions causing hardness have been replaced through a water softening process with sodium ions. Caution must be taken when using softened water, as opposed to deionized water, in rinse stages because it may increase residual ionic readings.

SOFTENED WATER — Any water that is treated to reduce hardness minerals to 17.1 mg/L (1.0 gpg) or less, expressed as calcium carbonate.

SOLIDS CONTENT — In rosin fluxes, refers to the percentage by-weight of rosin and other solids in a particular formulation.

SOLUTION — A homogeneous mixture in which a solid, liquid or gas is dissolved in a liquid, called a solvent, and it forms a clear or transparent mixture.

SPRAY BAR — A pipe plumbed from a feed manifold having one or more spray nozzles on it.

SUBLIMATION — A physical process whereby a solid evaporates directly into a vapor without passing through a liquid phase. Evaporation of dry ice is an example of this.

SURFACE INSULATION RESISTANCE TEST (SIR) — An accelerated aging test that evaluates the resistance on the surface of a board which undergoes temperature and humidity cycling. Typically this test involves a grid test pattern on the board which has a bias voltage applied during testing. if conductive material remains on the board, when exposed to temperature and humidity cycling, this will manifest itself by decreasing the surface insulation resistance, which will be measurable. Mil-Std 2000 includes the acceptable test measurements. SIR testing usually takes 168 hours. While this test is highly accurate at the area evaluated, it does not provide an overall analysis for the entire board surface.

SURFACE TENSION — A property of liquids whereby molecular forces tend to contract the volume into a form with the least surface area. The higher the surface tension, the greater the tendency of a droplet to bead up from a flat surface. Droplets with lower surface tension tend to spread out, or wet the surface. Surface tension, in and of itself, is not an accurate measurement of a droplets ability to penetrate a tight space. Capillary action must also be evaluated. As a general rule, higher surface tension favors penetration, but lower tension favors rinsability. Surfactants can reduce surface tension of a liquid.

SURFACTANT — A chemical agent that acts upon a liquid to reduce its surface tension.

SUSPENSION — A mixture of liquid or solid in a liquid that is not a true solution because discrete droplets or particles are visible, and the solution is not clear. If the particles are small enough to pass through a filter, or do not settle out after standing, the mixture is called a colloid.

THERMAL COEFFICIENT OF EXPANSION — The incremental factor of change in dimension of a material due to temperature rise. These factors become important when mating different materials to each other. If they expand at dissimilar rates, the method of attachment must compensate for the differing growth rates to avoid stress fractures, leaks, etc.

TOTAL DISSOLVED SOLIDS (TDS) — The weight of solids per unit of volume of water which are in true solution, usually determined by the evaporation of a measured volume of filtered water and determination of the residue weight.

TURBINE BLOWER — A combination of a motor driving a rotary fan assembly, typically via belt, at very high rpm (relative to direct drive, or "squirrel cage" blowers). The effect is to produce a high velocity air flow which has proven to be very effective in drying when directed through an air knife.

ULTRASONIC CLEANING — A process in which ultrasonic energy is added to a liquid to impart energy to it and enhance its cleaning ability. Ultrasonic energy causes alternate rarefication and compression of the liquid to create small vacuum cavities which then collapse or implode during compression. This is a rapid process, called cavitation, and it is responsible for developing the scrubbing action and ability to penetrate blind areas which is unique to ultrasonics. The cavity size is determined by the frequency used. Low frequencies generate large, but relatively few, cavities with high cleaning ability. High frequencies generate a great number of small cavities, which have good penetrating ability. There is an optimization that must be achieved, with 40 KHz being the best "all-around." The cleaning chemistry's physical characteristics also affect cleaning ability. The solution will ideally soften the soils, yet must activate and rinse easily.

V-JET NOZZLE — A general term applied to spray nozzles which project a pattern like the letter "v" with the vertex emanating from the nozzle orifice. The spray may be flat or slightly elliptical. A round pattern is indicative of a cone nozzle.

VAPOR PRESSURE — The pressure exerted by a vapor in equilibrium with its solid or liquid phase. The pressure exerted by the vapor depends on temperature. The higher the vapor pressure, the greater the volatility and evaporation rate.

VESICATION — A blistering defect which may occur on boards with conformal coatings when excessive residues are present.

VOLATILE ORGANIC COMPOUND (VOC) — Constituents that will evaporate at their temperature of use and which, by a photochemical reaction, will cause atmospheric oxygen to be converted into potential smog-promoting tropospheric (ground level) ozone under favorable climatic conditions.

VOIATILITY — The relative rate of evaporation of a liquid.

WASH — Refers to the functional section or process within a cleaner in which the primary removal of contaminants takes place. The wash may be with straight water, straight solvent chemistry, or a mixture of water and saponifier or solvent.

WATER PURIFICATION — Any process that involves removing or reducing the level of suspended or dissolved contaminants from a water supply.

WATER SOFTENING — The removal of calcium and magnesium, the ions which are the principle cause of hardness, from water.

WATER SOLUBLE — Capable of being dissolved in or by water.

WHITE RESIDUE — A general name for a milky white residue that sometimes appears on the board after the cleaning process. There are many possible causes for this, some of which are functionally harmful, and some not. Possible causes include incomplete flux residue removal, leeching of material from the laminate, and incomplete cure of the solder resist on the board.

APPENDIX B: INDEX

D

E

F

G

H

I

L

M

N

O

P

R

S

T

U

W