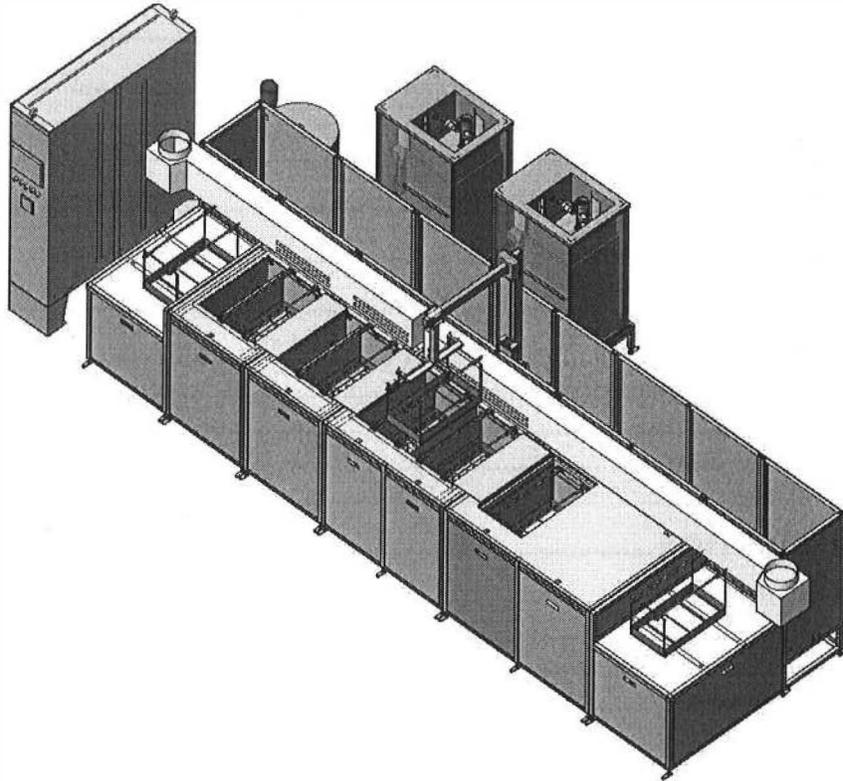


WP534

# **BLACKSTONE~NEY ULTRASONICS**



## **AQ-5-1728 CAL 100**

### **CLEANING SYSTEM**

#### **OPERATOR AND SYSTEM MANUAL**

#### **CONDITIONS OF USE**

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## **1. INTRODUCTION**

### **1.1 Description of Equipment**

This system is an Aquarius™ Ultrasonic Cleaning System Model AQ-5-1728, a five station system consisting of two ultrasonic wash tanks, two ultrasonic rinse tanks, and a hot air dryer with a left to right process flow.

### **1.2 Extent of the Manual**

This manual describes how to install and operate your Blackstone~NEY Ultrasonics ultrasonic cleaning system and provides guidelines on how to check its performance and routinely care for your equipment to ensure long lasting and efficient operation.

### **1.3 Availability of Support**

Blackstone~NEY Ultrasonics products are designed and built to the highest standards and are very reliable. As with any piece of equipment, some parts may eventually wear out or fail. With the help of this manual you should be able to care for and maintain your equipment should minor problems arise. If you encounter problems not addressed in this manual, Blackstone~NEY Ultrasonics has a skilled and efficient technical support team available to help you. Call (716) 665-2340 or (800) 766-6606.

In order to minimize downtime should a problem occur, it is recommended that you order the recommended spare parts identified in the attached Spare Parts List.

---

## 2. CLEANING EXPLAINED

### 2.1 Ultrasonic Cleaning Explained.

Ultrasonic energy is sound beyond the range of human hearing. We generally consider frequencies above 16,000 cycles per second (16 kHz) ultrasonic.

When a sound wave travels through air, the air is compressed and stretched as the wave passes through. Unlike air, liquids are not elastic and cannot stretch in this way. Consequently, if the sound wave is big enough (i.e. has a high enough amplitude relative to its wavelength) it will literally tear the liquid apart, forming extremely small vacuum pockets within the liquid. These vacuum pockets, known as **cavitation bubbles**, act as strain relievers in the liquid. They form during the negative pressure part of the sound wave and collapse during the high-pressure part of the following wave. Cavitation bubbles can grow over several waves before collapsing.

The collapse of a cavitation bubble is an implosion that generates extremely high pressures and temperatures. The high pressure and temperature lasts for a brief period of time in a small volume within the liquid. A combination of three things provides the implosion energy:

1. Compression from the ultrasonic wave
2. Compression from surface tension in the bubble
3. Atmospheric pressure on the vacuum

If air is suspended in the liquid, this tends to be released into the cavitation bubble. In this case, there will not be a true vacuum and the strength of the implosion will be greatly reduced.

The action of millions of cavitation implosions per second has the effect of scrubbing the surface of any object immersed in the liquid. The scrubbing action acts more quickly and on a much finer scale than any other known means of scrubbing or scouring. Because sound travels through metals and many other materials, the ultrasonic energy penetrates into blind holes and complex shapes, including surface pores in metals, which are unreachable by other methods.

The result is faster, more efficient cleaning. Cavitation is often strong enough to break ionic bonds holding insoluble contaminants to a surface. Ultrasound works particularly well with appropriate cleaning chemicals—detergents, surfactants, turpentine's, aqueous and non-aqueous compounds, etc.

### 3. SAFETY SUMMARY

Your Blackstone~NEY Ultrasonics Cleaning System has a robust, industrial design that should provide years of reliable operation, but the system is vulnerable to damage if operated improperly. Improper use can also compromise operator safety.

Blackstone~NEY Ultrasonics does not accept any responsibility for the results of improper use of the system. Furthermore, improper use may void the warranty.

#### 3.1 Warnings and Cautions

Warning, caution and note statements located throughout this manual indicate essential operating and maintenance procedures, practices, or conditions.



**Warnings** are for the protection of personnel.



**Cautions** are for the protection of equipment and property.



**Notes** provide information important for proper equipment use.

#### 3.2 Review of System Documentation

Read this and the other accompanying manufacturers' manuals completely before installing or operating your cleaning system. This equipment should be installed, operated, and maintained only by competent and qualified personnel who are fully aware of potential hazards.

#### 3.3 Safe Operation

Do not operate equipment unless installed in accordance with this manual.

Do not immerse hands or other body parts in the ultrasonic cleaning tank. This can cause skin irritation from contact with cleaning chemicals, oils and contaminants and exposure to high-intensity ultrasonic energy.

Do not operate the system with volatile, explosive, combustible or acidic liquids.

Do not operate the unit unless the liquid tanks are full. If you operate the tanks when they are not full, you risk damaging the equipment and voiding the warranty.

Do not allow liquids in the tanks to boil or operate near their boiling temperature. Prevent boiling by knowing the boiling point of the liquids used in your cleaning process. These situations can permanently damage the system and will void the warranty.

Do not rest objects on the bottom of the ultrasonic tanks. This will dampen the ultrasonic energy. Operation in this manner may void the warranty. Always place parts to be cleaned in a suitable parts carrier that stands off the bottom of the tank.

### 3.4 Electrical Connections

Be sure the system is properly connected to a power supply that matches the ratings indicated on the serial tags. Also, make certain that all ultrasonic generators are properly connected and grounded.

### 3.5 General Precautions

The following safety precautions are based on OSHA recommendations and are intended to ensure personal safety and protect property. These precautions are not related to any specific procedure and do not appear elsewhere in this manual. You must understand and apply these general safety precautions during the phases of operation and maintenance. Operating personnel must observe all safety requirements at all times.

#### 3.5.1 Live Circuits

Do not replace components or make adjustments inside equipment with the electrical supply turned on. Because of charges retained by capacitors, danger may exist even when system power is off. To avoid injuries, always turn off the power, then discharge and ground a circuit before touching it. Adhere to all lockout/tag-out requirements.

#### 3.5.2 Resuscitation/Standby Person

Personnel working with or near dangerous voltages should be trained in resuscitation methods. Do not attempt internal service or adjustment of equipment unless another person capable of rendering aid and resuscitation is present.

#### 3.5.3 Finger Rings/Jewelry

Finger rings and other jewelry can cause serious injuries. Remove rings, watches, and other metallic objects that may create shock or burn hazards. Unless specifically allowed by shop safety procedures, remove finger rings during all maintenance activity.

#### 3.5.4 Compressed Air

Do not apply compressed air to any portion of the system unless directed to do so by this manual or by a Blackstone~NEY Ultrasonics Technical Service representative.

#### 3.5.5 Cleaners/Chemicals/Personal Protection

Some cleaning agents and chemicals have adverse effects on skin, eyes, and the respiratory tract. Observe the manufacturers' warning labels and material safety data sheet (MSDS) instructions for proper handling, storage and disposal, and current safety directives. Use chemicals only in authorized areas and wear proper protective clothing when necessary. Follow all other precautions appropriate to hazards associated with liquid cleaning agents. Consult the designated safety officer for specific protection equipment and ventilation requirements.

### 3.5.6 Lockout/Tag-out

Be aware of the hazards associated with unguarded machinery parts, capacitors, gaseous and wet pipe systems, spring-loaded devices, etc. Lockout and tag-out the energy source prior to performing maintenance, adjustments, or other procedures that would bypass safety guards, barriers, or otherwise expose personnel to hazardous energy sources.

## 4. SYSTEM DESCRIPTION

### 4.1 System Specifications

Approximate Overall dimensions	240" LR x 71" FB x 90" high
Tank working dimensions	17"LR x 28" FB x 12" LL
Individual bath capacity	approx. 25 gallons
Tank construction	316L SS
Power supply	480 volts, 3Ø, 60 Hz, 60 FLA
Ultrasonic Generators	Neptune® series in the Wash Tanks and Rinse Tanks
Ultrasonic Power	All U/S Tanks: 1000 Watts at 25 kHz
Heat	8,000 Watts in Wet Tanks. 10,000 Watts in Dryer Tank.

The system described in this manual consists of these components:

1. The cleaning unit, which includes a load and unload station, 4 wet process tanks, and hot air dryer tank.
2. The CAL-100 hoist, with 100 pounds of maximum load capacity, which carries parts carriers from the loading station, through the various tanks in the cleaning unit, to the unloading station.
3. The control cabinet, which contains the PLC / touch-screen operator interface and all necessary electrical and electronic equipment to control and coordinate the operation of the cleaning unit and all ultrasonic generators.
4. Two Pro-Sep oil removal systems.

### 4.2 Construction

- All stainless steel frame, tanks, panels, plumbing, pumps and valves.
- Enclosure, with bolt-on panels where required, to protect operator from moving parts.
- NEMA enclosure houses electrical components.
- Operator control via a touch-screen interface mounted on the NEMA enclosure.
- Single main electrical connection.
- Tank bottoms are flat with drain port designed to drain completely.

### 4.3 Operator Controls and Indicators

Operator controls and indicators include:

- System Power On/Off buttons
- Emergency Off button and cable
- Hoist Enable and Hoist Auto/Manual switches

- Touch-screen controls

## 4.4 System Overview

### 4.4.1 Stage 1: Load Station

Stage 1 is a load station.

### 4.4.2 Stage 2: Wash Tank # 1

Wash tank#1 is an ultrasonic tank. The media in this tank is Aqueous Detergent. Features of the tank include:

- Ultrasonics: 1000 Watts at 25 kHz. Neptune® series generators.
- Approximately 25 gallon tank capacity.
- Heat: 8,000 Watts, with temperature control. Immersion heaters are mounted through fittings on the back of the tank with stainless steel covers. Entire tank is insulated using 1” thick thermal insulation to retain heat in the tank.
- Stainless steel pump with filtration.
- Each filter is equipped with isolation valves on inlet and outlet sides.
- Automatic level control.
- Overflow fitting is provided on tank which is plumbed to main drain header to prevent water flooding on the floor.
- Low liquid level protection in tank and weir to protect heater, ultrasonic and pumps.
- 1” manual tank drain feature is provided for this tank.
- Pro-Sep oil removal system.

### 4.4.3 Stage 3: Wash Tank # 2

Wash tank#1 is an ultrasonic tank. The media in this tank is Aqueous Detergent. Features of the tank include:

- Ultrasonics: 1000 Watts at 25 kHz. Neptune® series generators.
- Approximately 25 gallon tank capacity.
- Heat: 8,000 Watts, with temperature control. Immersion heaters are mounted through fittings on the back of the tank with stainless steel covers. Entire tank is insulated using 1” thick thermal insulation to retain heat in the tank.
- Stainless steel pump with filtration.
- Each filter is equipped with isolation valves on inlet and outlet sides.
- Automatic level control.
- Overflow fitting is provided on tank which is plumbed to main drain header to prevent water flooding on the floor.
- Low liquid level protection in tank and weir to protect heater, ultrasonic and pumps.
- 1” manual tank drain feature is provided for this tank.

- Pro-Sep oil removal system.

#### 4.4.4 Stage 4: Rinse Tank # 1

Rinse tank#1 is a rinse tank with a cascaded single-sided overflow to drain.. The media in this tank is DI water. Features of the tank include:

- Approximately 25 gallon tank capacity.
- Ultrasonics: 1000 Watts at 25 kHz. Neptune® series generators.
- Heat: 8,000 Watts, with temperature control. Immersion heaters are mounted through fittings on the back of the tank with stainless steel covers. Entire tank is insulated using 1” thick thermal insulation to retain heat in the tank.
- Low liquid level protection in tank to protect heater.
- 1” manual tank drain feature is provided for this tank.

#### 4.4.5 Stage 5: Rinse Tank # 2

Rinse tank#2 is a rinse tank with a cascade single-sided overflow to Rinse tank#1. The media in this tank is DI water. Features of the tank include:

- Approximately 25 gallon tank capacity.
- Ultrasonics: 1000 Watts at 25 kHz. Neptune® series generators.
- Heat: 8,000 Watts, with temperature control. Immersion heaters are mounted through fittings on the back of the tank with stainless steel covers. Entire tank is insulated using 1” thick thermal insulation to retain heat in the tank.
- Low liquid level protection in tank to protect heater and ultrasonics.
- 1” manual tank drain feature is provided for this tank.

#### 4.4.6 Stage 6: Dryer

The normal operating temperature of the dryer is 170° -250° F. Heated air is circulated from the sides of the tank, over the parts and out through openings in tank bottom to blower. Features of the dryer include.

- 10,000 Watt resistance heat.
- Closed loop circulation.
- Adjustable temperature up to 250° F controlled through PLC
- Air circulation at approximately 1000 SCFM
- Built-in cool down period

#### 4.4.7 Stage 7: Unload Station

Stage 7 is an unload station.

## 4.5 System Components

### 4.5.1 Ultrasonics

Ultrasonic transducers are mounted to the bottom of all tanks with ultrasonics. A series of advanced piezoelectric transducers provide 960 Watts of ultrasonics in each tank.



**NOTE:** To maximize ultrasonic cleaning action and minimize excess noise, filtration and sparging is suspended during ultrasonic cycles.

### 4.5.2 Heating

Immersion Heaters provide 8,000 Watts of heat in all liquid tanks. The On/Off Controller regulates process temperatures.



**WARNING:** Allow the heaters to cool before draining the tanks. Damage to the heaters could occur if the tanks are drained while the heaters are still hot.

### 4.5.3 Particulate Filtration

A pump and filter system removes solid waste materials from the cleaning liquid. A cartridge filter, with 10 micron ratings, is located under the deck.

### 4.5.4 Liquid Level Protection

Operation of the heaters, ultrasonics and re-circulation pump ceases in a tank if the liquid level in that tank is low as detected by liquid level sensors (proximity).

### 4.5.5 Drainage

Tank drains are plumbed to the back of the system for connection by the customer.



**Caution:** Allow tanks to cool for 30 minutes before draining. Failure to do so can result in premature heater failure.

## 4.6 The CAL-100 Programmable Automated System

The CAL-100 programmable automated material handling system consists of a motorized pick-up arm designed to carry the parts carrier suspended from a motor driven carriage and cantilevered lift arm. This material handling system moves on linear rails attached to the rear of the console frame. The vertical drive is a ball screw hoist. The horizontal drive is a belt driven system.

A programmable logic controller, designed to simplify your parts handling chores and provide a reliable total cleaning cycle to assure quality results, consistently controls the CAL-100. This system has a maximum load capacity of 100 lbs. and carries parts from the load station through the various cleaning tanks to the unload station. Horizontal and vertical travel speeds have independent adjustments. The horizontal speed is 0-180 FPM; the vertical speed is 0-100 FPM. The factory set speeds are set at values lower than the maximum.

The system permits the selection of several product codes, with up to ten (10) recipe programs each, to be stored in the PLC. Recipe 10 will be set as a run-out/tank skipping recipe program. These recipe programs control the different tank programs. The different tank programs can be selected to cycle sequentially. The computer will wait to begin a program, leaving the carrier at the load pickup, until the appropriate wash tank is empty.

The basic machine functions (load, wash, rinse, dryer and unload) are the building blocks of simple programs. The three basic components are the vertical motor drive, horizontal motor drive, and motor directional reverse. An AC motor, with encoder, senses distance traveled. In addition, PLC outputs are available to control external system elements, such as:

- Heat ON/OFF/AUTO or Ultrasonics ON/OFF/AUTO

Each of these wash tank and rinse tank controls are explained in greater detail in Section 6.3.

The control system assumes the load, wash, rinse, dryer and unload stations are located along the length of the system and assumes pick-up and drop-off points and any intermediate dwell points are customer variables. The process time for each part load is also a user-determined factor that depends on the type of soil, cleanliness requirements, and the specific heat per pound of mass.

The time required for process, dwell, and drip dry are on timers. This facilitates easy customer modification of each process to optimize the total cleaning cycle.

Refer to the accompanying PLC manual for detailed programming and operating instructions.

**WARNING:** Keep hands away from the ball joint hoist after a crash occurs.

## 5. INSTALLATION PROCEDURE

Blackstone~NEY Ultrasonics personnel, who are properly trained and qualified in their duties, should perform installation and commissioning. Only similarly trained and qualified personnel should perform any installation procedures in the event that the equipment is moved to a different facility. The following information is provided as a guideline only.

### 5.1 Receiving

The system consists of:

1. Cleaning unit with removable panels taped in place
2. CAL-100 programmable hoist
3. NEMA Control cabinet with generators.

Inspect the packaging thoroughly to ensure no damage occurred in transit. If damage is found, notify the carrier immediately to process a claim and, if the damage justifies it, return the unit to Blackstone~NEY Ultrasonics. If the packages are intact, unpack them carefully and inspect their contents. Ensure that all packaging material has been removed and that items have not been damaged in transit. If there has been any damage or if components are missing, notify Blackstone~NEY Ultrasonics at (716) 665-2340.

### 5.2 General Installation Instructions

Connect the generators to the power supplies and transducers. The cables are clearly labeled to ensure that they are connected to the associated generator. Match the numbers found on the cable with the match number printed on the generator's serial tag.



**NOTE:** It is important to connect each transducer to the correct generator, as they are factory matched to optimize performance.

Make sure the generator switches are OFF. Press the O on green switches on front of generators.

Connect the plumbing to the appropriate water supplies and drains, see section 5.3.2.



**NOTE:** Be certain to take into account all federal, state and local environmental, safety and other regulations when connecting the tank drain outlet to your facility's waste water system. Consult chemical MSDS, if applicable, for disposal requirements.

Using the cables provided, connect the control cabinet to the cleaning unit.

Connect the main power supply to the disconnect switch in the upper right corner of the NEMA cabinet. The power supply should be 480 volt, 3 phase, 60 Hz, see section 5.3.1 Power Connections for details. Turn on the generators by pressing the I on the green switches on the front of the generators. When you close the control cabinet, power will be available to the system. Turn the power on at this time.

All tanks are filled via manual valves except for the three final rinse tanks. They will be filled automatically to just above the level probes. Check for leaks in all tanks.

---

### 5.3 Utility Connections

#### 5.3.1 Power Connections

The system operates on a 480 volt, 3 phase, 60 Hz power supply connected to the main switch in the control cabinet.

Each terminal and its matching wire have the same number. Refer to the electrical drawing for details.

#### 5.3.2 Plumbing Connections

Inlet plumbing connections and drains are at the rear of the unit approximately 9" from the floor. Valves are accessible by removing front lift-off panels. Refer to the plumbing drawing for details.

This completes the installation and checkout procedure. Your system is now ready for use. If you find problems as you check the system, or in subsequent operation, please contact our Service Department. If you find problems obtaining acceptable results when using the system, please contact our Applications Engineering Department. Call (716) 665-2340 or (800) 766-6606.

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## 6. SYSTEM CONTROLS OVERVIEW

The controls for the system are located on the main electrical enclosure and consist of two pushbuttons, two selector switches, and a touch-screen operator interface panel. In addition, there is an emergency off mushroom pushbutton and pull cord across the front of the equipment. If there is instrumentation used by the system, these devices will be located at the main electrical enclosure also.

### 6.1 Power On and Power Off

These momentary pushbutton switches turn control power on and off to the system. When turned on, the power on pushbutton and the operator interface are illuminated.

### 6.2 Emergency Off

This red mushroom-style pushbutton switch shuts off all control power. Once this button is pushed, it must be reset before control power can be restored. The button is reset by turning the knob in the direction of the arrows, or by pulling it out to its full extension. The pull cord has a separate reset switch that must be toggled if its mushroom-style push button is pressed.

### 6.3 Mode Manual/Auto

This two position selector switch is used to choose between manual or automatic mode of operation. When in manual the hoist can be maneuvered using the operator interface screens. In addition, when placed into the manual position, the selector switch will prevent the cycle from starting or running.

### 6.4 Hoist Hold/Enable

This two position selector switch is used to temporarily pause the motion of the material handling system, without interrupting the cycle in process. When placed into the hold position hoist motion will stop, but other processing continues as normal. When returned to the enable position, the hoist will continue from where it had left off. Also, when manually moving the hoist from the operator interface, this switch must be placed into the enable position before the hoist can be maneuvered.

### 6.5 Home Keyed Switch (If equipped)

Used to set the overall hoist(s) alignment to the cleaning console, and only required if replacing a servo drive, servo motor, or after changing the relationship of hoist(s) and console without the use of the servo system. When performing this procedure, all axis positions will be updated. To perform this procedure home the hoist(s) if able, make adjustments to the hoist(s) position using the joystick while in manual mode, insert the key into the switch, and turn to assign all axis to there new home positions.

## **6.6 PLC/Operator Interface**

The combination of the PLC and operator interface is the “heart” of the control system. The operator interface touch screen is used to provide input to, and receive information from the PLC. The following section in this manual describes in detail the function of the operator interface.

---

## 7. OPERATOR INTERFACE INSTRUCTIONS

### 7.1 General

The touch sensitive operator interface is used to interact with the system and control operations, make changes, or observe useful information. Adjustments are made by touching the screen with a finger. Use of other items including pens, pencils, etc. may cause damage to the touch sensitive screen, and should be avoided. Every attempt has been made to make the interface as “intuitive” and user-friendly as possible, but initially there is some familiarization required, which is the intent of this section.

### 7.2 Menu Bar/Menu Buttons

At the top of each screen is a menu bar that is used for accessing other screens. Pressing a menu button on the menu bar will bring up other displays. Some screens are password protected, and require a login password to be entered before those screens can be accessed. In general, screens used for day-to-day equipment operation do not require a password, while those screens used for maintenance and process setup do require a password.

### 7.3 Next/Back Page Buttons

Located on some screens are buttons labeled next and back. Use these buttons to access additional screens that are an extension of the current screen being displayed.

### 7.4 Numeric and Alpha-Numeric Pick Boxes

Input of numeric or alpha numeric values for a number of setup and process parameters is accomplished by using special pick boxes. Touching a numeric or alpha-numeric pick box causes a keypad to pop up on the screen. Use the keypad to enter a value at the pick box location.

### 7.5 Selection Boxes

Selection boxes have a predetermined range of values that can be entered into a table. The next consecutive value is displayed, and replaces the previous value each time the selection box is pressed. For instance, a recipe selector box would change from recipe 1 to recipe 2.

### 7.6 Mode Switches

A mode switch sets the state of instrumentation and devices to either an auto, on, or off state. Similar to selection boxes, the next state is selected each time the mode switch is pressed. An example would be pump on or pump off. The function of the auto state changes depending on the device being activated. See the tank screens for additional information on the auto state of a specific device.

## **7.7 Help Buttons**

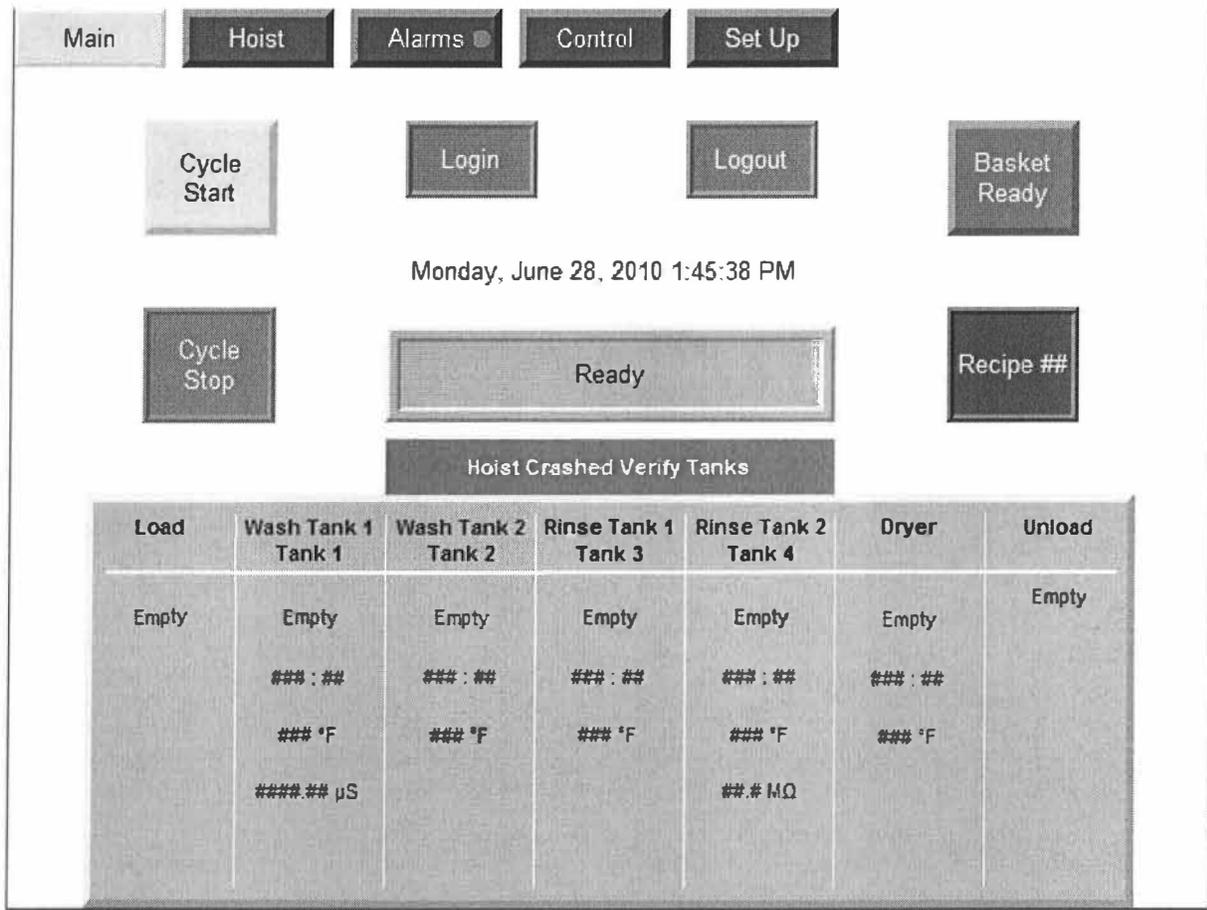
For convenience most screens have a help button that will display information on top of the current screen. These notepads contain general information about the screen and its operators, along with some helpful hints about the operation. To close a notepad, simply press the close button located in the upper right hand corner.



## 7.8 OPERATOR SCREENS

### 7.8.1 Main Screen

The main screen displays general information, and provides the basic controls for operation of the equipment. For this reason, it is the preferred screen to be left showing most of the time.



At the top of the screen is a menu bar that contains menu buttons to access other screens. It will be required to enter a password here to access most of the screens in the menu bar. Pressing the login pick box will bring up a dialog box in which to enter a user name and password. To log out of the system simply press the logout pushbutton. The current user will also be logged out of the system when another user logs in.

In the middle part of the screen is a message banner that displays general system conditions such as “cycle running”, “hoist in manual mode”, or “alarm”. Refer to this banner if the system does not operate as expected. The cycle can be started when the message banner displays “ready”.

To begin operation place the mode selector switch to auto, and the hoist selector switch to enable. Press the recipe selection box until the desired recipe has been selected. Press cycle start, and place a basket onto the load station. The recipe selection for each basket can be random, and the system will keep track of each one when the hoist picks up the basket on the load station.

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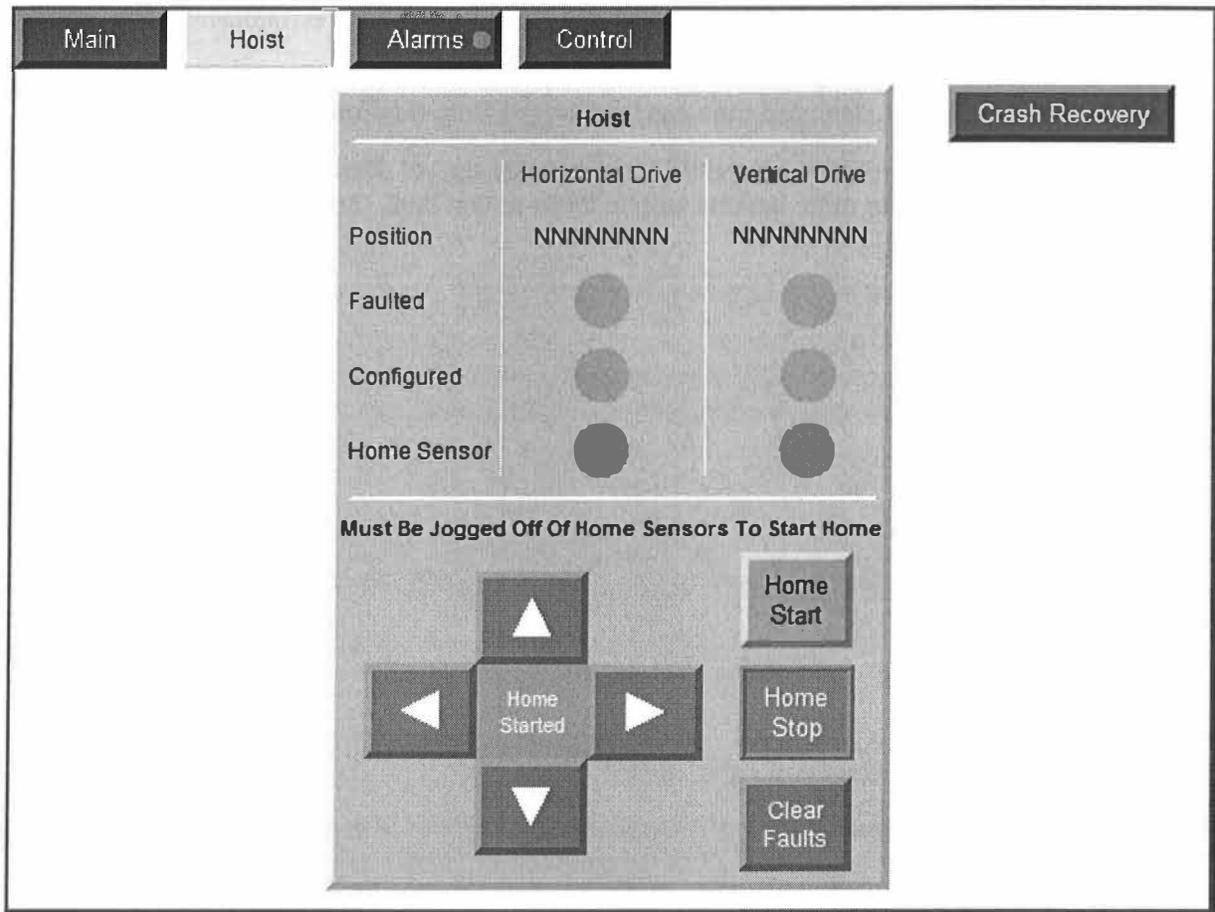
At the bottom of the screen is a table that displays information for each tank or station, and in general tells how the process is preceding. Recipes are tracked at each station, even when the equipment has been through a power cycle, and each process tank has a count down timer that will display the programmed time remaining. The operation of devices and instrumentation in the process tanks are protected from a low level condition, and will shut off during such time as indicated by a low level message.

The display for the current day, date, and time can be changed from the Config screen.

Note: The displayed temperature should remain inside the set dead band, but if outside the ready band, no more baskets will be taken to that tank. See the heat screen for more details.

## 7.8.2 Hoist Screen

Use the hoist screen to manually maneuver the material handling system, or automatically home the hoist.



The material handling systems can be manually maneuvered using the joystick. Place the mode selector switch into the manual position, and the hoist selector switch into the enable position. To automatically home the hoist put the mode selector switch into auto, the hoist selector switch into enable, and press the home start pushbutton. The information above the joystick can be used to verify the operation of the encoders, check the status of the drives, and determine if the homing cycle was successful.

**Note:** If the hoist crashes for any reason, or is manually moved, it will be required to home the hoist. In either case there will be an associated message displayed either on the main screen message banner, or on the alarm history screen.

If the home started light is on and the vertical axis has moved up and the horizontal has not started moving verify that the vertical home sensor is on. If not, switch to manual and jog down a few inches and then repeat homing procedure.

### 7.8.3 Crash Recovery

The crash recovery screen is used to manually move baskets if the hoist crashes or there is a Fault Level 1 while in motion. When this happens a red message banner appears on the Main Screen and the Crash Recovery Screen. Cycle cannot be restarted until the carrier is verified.

**Hoist**

Hoist Crashed  
Verify Tanks

Recipe On Hoist = ##

Wash 1 Tank 1    Wash 2 Tank 2    Rinse 1 Tank 3    Rinse 2 Tank 4    Dryer

##    ##    ##    ##    ##

Moving From Load To Tank 1

**Crash Recovery**

1. Switch To Manual
2. Jog Hoist With Carrier To Destination Or Leave In Pick Up Tank. Press Verify Tanks To Determine
3. If Carrier Moved Manually Enter Recipe Number For Destination Tank
4. Enter '0' In Pick Up Tank To Clear Pick Up Tank
5. Jog Hoist Up And Close All Lids. Clear All Hoist Faults.
6. Press Verify Tanks

Hoist

Must Be Jogged Off Of Home Sensors To Start Home

Home Started

Home Start

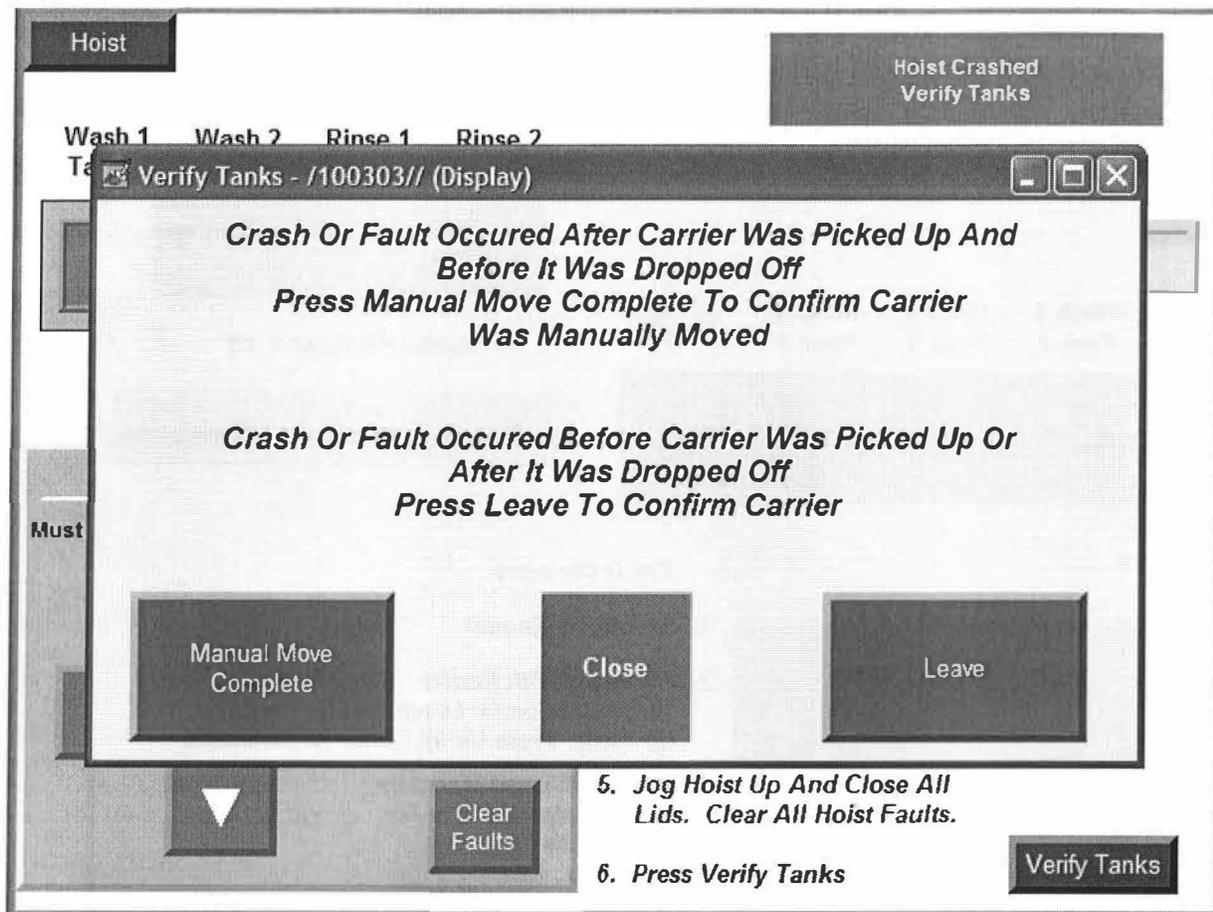
Home Stop

Clear Faults

Verify Tanks

If the crash or fault occurred after the carrier was picked up and before it was dropped off then the carrier needs to be manually jogged to the destination. The green message banner displays the pickup and drop off move the hoist was making. Once the carrier is manually moved to the drop off destination enter '0' in the pick up tank and the recipe number that is on the hoist in the destination tank. Then press Verify Tanks.

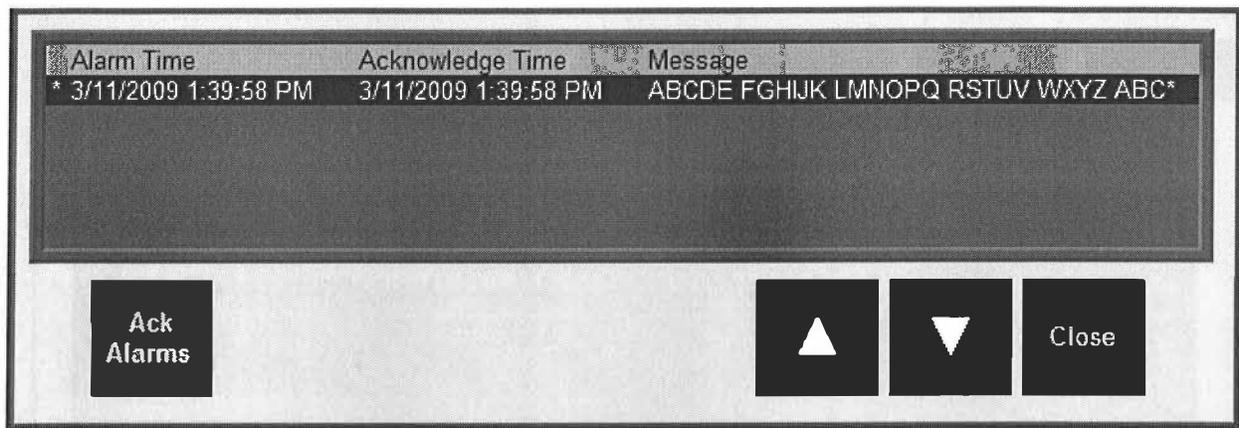
If the crash or fault occurred before the carrier was picked up or after it was dropped off then no manual move will be required. Press Verify Tanks.



Press Manual Move Complete or Leave to verify the carriers are in the correct position. If not sure then close and recheck.

#### 7.8.4 Alarm Message Banner

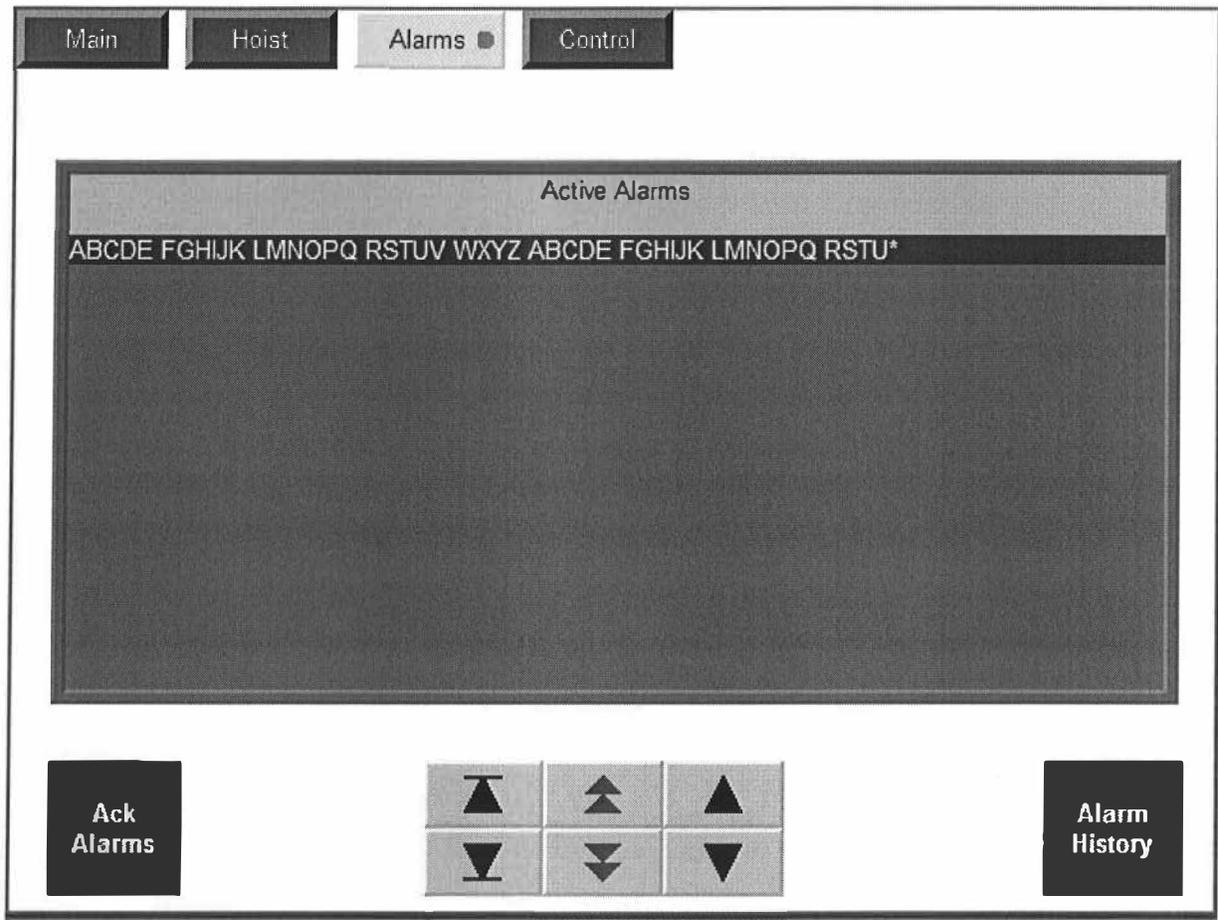
The alarm message banner reports alarms when they occur.



Use the pushbutton located below the alarm messages box to acknowledge an alarm, and to close the banner and remove it from the screen. Acknowledging the alarm brings up the next consecutive alarm if more than one has occurred.

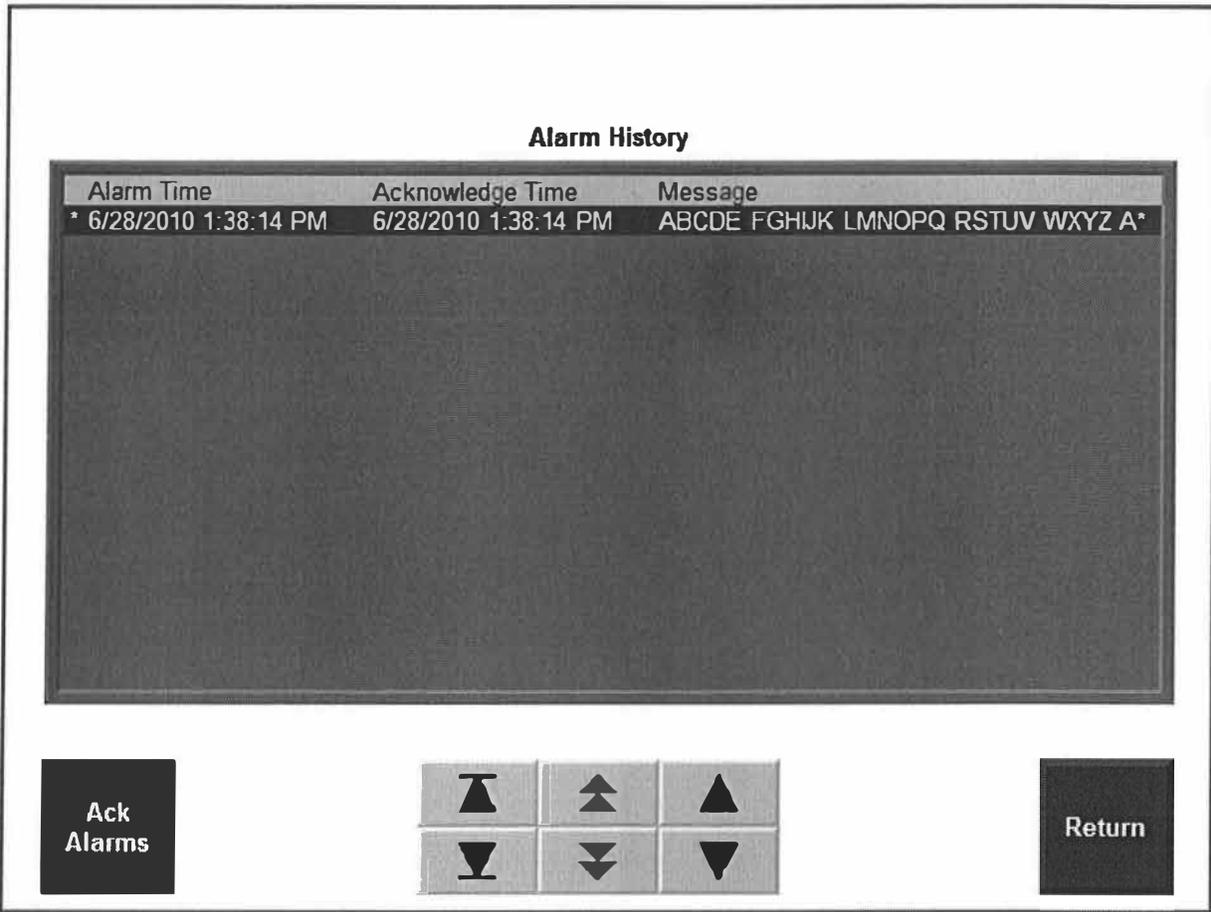
### 7.8.5 Active Alarms

The alarm screen displays only the active alarms. Pressing alarm history will display the alarm history screen.



### 7.8.6 Alarm History Screen

The alarm history table provides a record of the past 100 alarms, along with a time and date stamp.

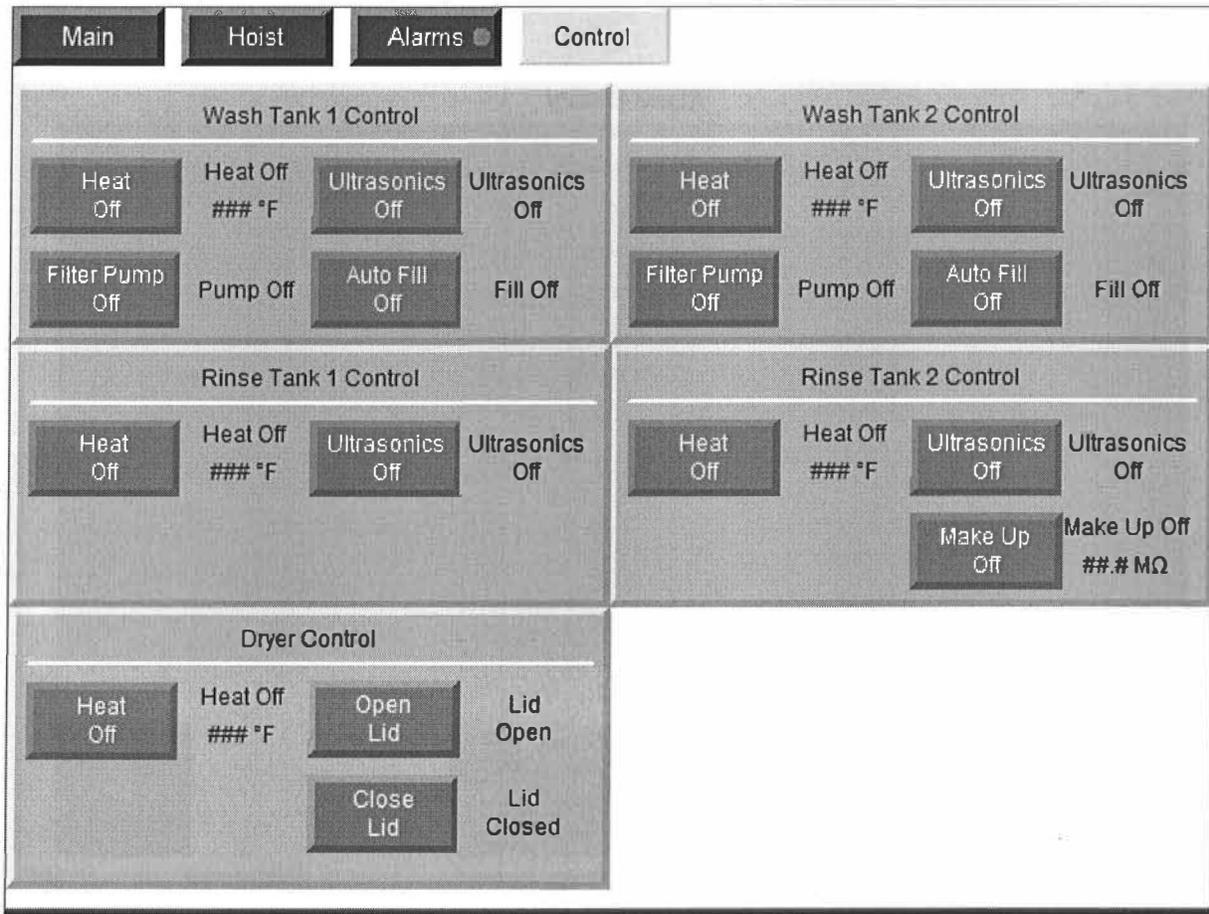


Use the pushbuttons on the alarm history table to go to the top or bottom of the list, scroll up or down through each alarm record, or page up or down through the entire list.

An asterisk is used to indicate active alarms in the alarm history list.

### 7.8.7 Control Screen #1

The control screens are used to access instrumentation and components of the equipment, and to view information regarding the operation.



In most instances the mode switch of each device should be placed into the auto state to get the complete benefits that the system has to offer.

The fill mode switch is used to automatically fill and maintain the liquid level inside the process tank. A sensor is mounted on the tank wall which controls the water inlet solenoid, and is programmed with a delay to prevent excessive water hammer. The indicator to the right of the mode switch tells when the process tank is filling.

The drain mode switch is used to automatically drain the process tank. The tank heater must be off for a period of one hour before the tank can be drained. To the right of the mode switch is an indicator for the drain valve, and a count down timer that is used to keep track of the time remaining before the tank can be drained. Devices that could be damaged by a low level condition are turned off before the tank is drained. This is an extra precaution should the liquid level sensor malfunction.

The make-up switch also fills the tank, but is generally used to add clean water into the rinse tanks during processing, and either raise the resistivity or freshen the water. Make-up water is regulated through a flow meter, and should be adjusted to a minimum flow to prevent excessively cooling down the water inside the tank, unless the water supply is also hot.

The spray mode switches are used to turn the spray on or off.

The heat mode switch is used to automatically maintain the temperature of the solution in the tank to a setpoint entered into the temperature table located on the heat screen. Heat will only turn on in the auto state when the programmed time in the weekly timer table is true. To the right of the mode switch is the indicator that tells when the heat is on, and the actual temperature reading in the process tank.

The filter pump is used to maintain the water purity inside the process tank, and should run almost continuously while the system is being used. Because the filter pump adversely affects the action of ultrasonic cleaning, it is prevented from operating while the ultrasonic generator(s) are on. To the right of the mode switch is the indicator that tells when the filter pump is on.

The combination of flowing water up from the bottom of the tank to the surface, and moving floating contaminants over the weir is the operation of the sparger and pump. Particles are removed from the parts while the ultrasonic cycle is running, rise to the surface and flow over the weir, and then pass through a filter that removes them from the tank before they can re-deposit back onto the parts. To the right of the mode switch is the indicator that tells when the sparger pump is on.

When the ultrasonic mode switch is placed into the auto state, the ultrasonic generator(s) will turn on during the cycle for the predetermined time, frequency, and power programmed into the recipe tables. When placed into the on state, the ultrasonic generators will operate at the frequency and power set here, using the selection box and numeric pick box. The indicators to the right of the mode switch, selection box, and numeric pick box tells when the ultrasonic generator(s) are on, operating frequency, and actual power output.

When the dryer heat mode switch is placed into the auto state, the dryer blower will turn on while the cycle is running, and the temperature will be maintained to the setpoint in the heat screen table. The indicators to the right of the mode switch tell when the heat is on, and what the actual temperature is in the process tank.

The lid can be manually opened or closed using the associated pushbuttons. The indicator to the right of each pushbutton tells when the lid is either fully opened or closed.

**Hint:** If the heat does not turn on when expected, check the temperature setpoint, and weekly timer settings. See the heat screens for more details.

## 7.8.8 Heat Screen

The heat screen is used to set the temperature setpoint and process deviation for each tank.

	Temperature Setpoint	Deviation High	Deviation Low
Wash Tank 1	### °F	+ ## °F	- ## °F
Wash Tank 2	### °F	+ ## °F	- ## °F
Rinse Tank 1	### °F	+ ## °F	- ## °F
Rinse Tank 2	### °F	+ ## °F	- ## °F
Dryer	### °F	+ ## °F	- ## °F

Resitivity

Touch the numeric pick boxes to enter values into the temperature table for each tank. Adjust the temperature setpoint and the deviations, which allows product to be processed in each tank. The offset is used for calibration. If the tank temperature reads lower or higher than the calibration instrument then enter the + or – offset so the current temp equals the calibrated temperature.

Hint: New product will not be picked up from the load station until all temperatures are within the process temperature setpoint deviations.

## 7.8.9 Resistivity

Set the process low limit, high limit and offset. The offset is for calibration.

	Current	Res/Con Low Limit	Res/Con High Limit	Res/Con Offset
Wash Tank 1	####.## $\mu\text{S}$	####.## $\mu\text{S}$	####.## $\mu\text{S}$	#### $\mu\text{S}$
Rinse Tank 2	##.# $\text{M}\Omega$	##.# $\text{M}\Omega$	##.# $\text{M}\Omega$	##.# $\text{M}\Omega$

<<Back

## 7.8.10 Pre Heat Screen #1

The pre-heat screen is used to determine the heat activation time for each tank. Press the back button to access the first heat screen which contains the temperature table.

Weekly Timer (Event #1)				
Day	Heat On Time		Heat Off Time	
Sunday	## Hr	## Min	## Hr	## Min
Monday	## Hr	## Min	## Hr	## Min
Tuesday	## Hr	## Min	## Hr	## Min
Wednesday	## Hr	## Min	## Hr	## Min
Thursday	## Hr	## Min	## Hr	## Min
Friday	## Hr	## Min	## Hr	## Min
Saturday	## Hr	## Min	## Hr	## Min

Next>>

Touch the numeric pick boxes to enter values into the weekly timer table, for turning on and off the heat in each tank, for each day of the week. All values entered into the weekly timer table are considered to be in military time.

**Note:** The heat mode switch for each tank must be set into the auto state. See the tank screens for more details. The indicator light located at the top of the screen on the pre heat selector will blink green when heat is being activated from the event timer.

## 7.8.11 Pre Heat Screen #2

See pre heat screen #1 for a general description of this screen.

Main	Temp	Pre Heat	Recipes	Alignment	Tank Clear
------	------	----------	---------	-----------	------------

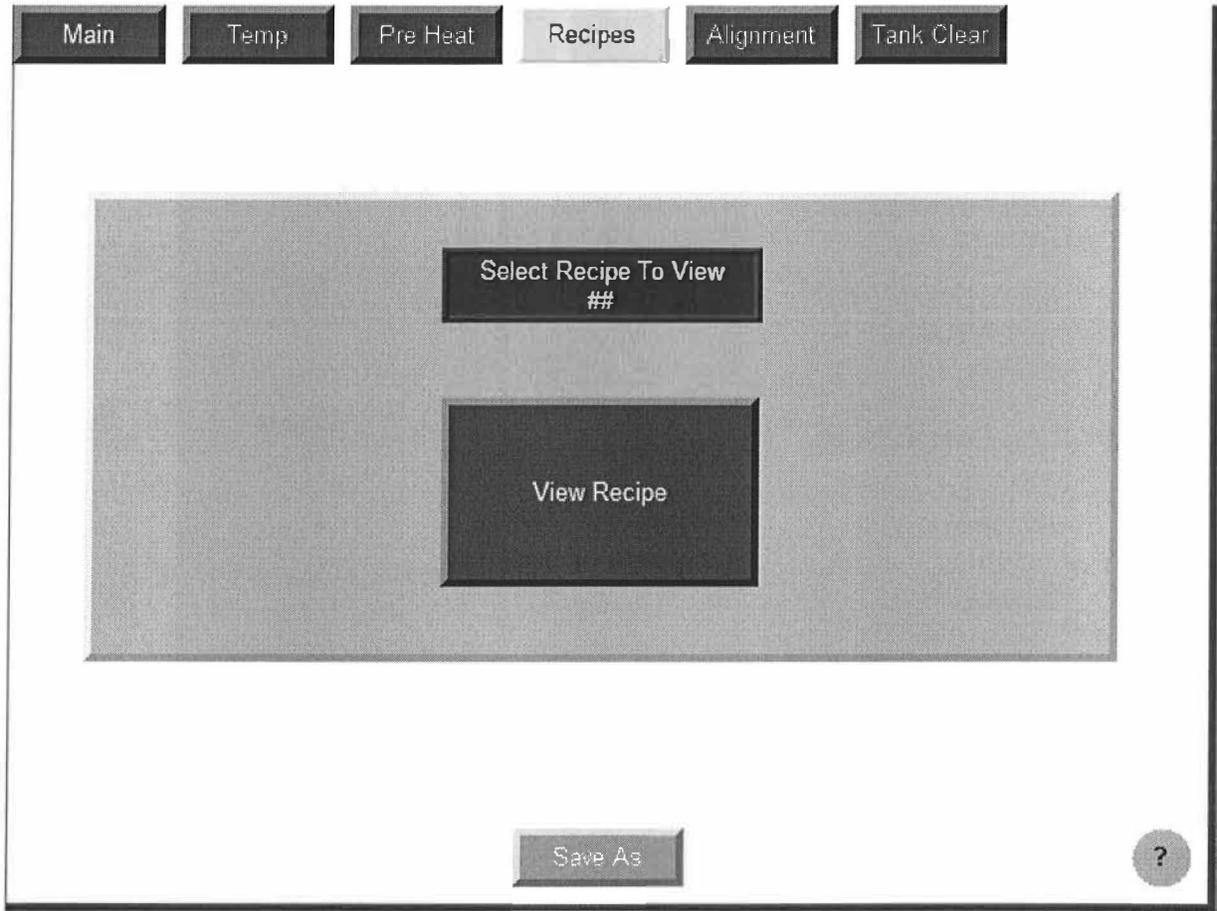
Weekly Timer (Event #2)				
Day	Heat On Time		Heat Off Time	
Sunday	## Hr	## Min	## Hr	## Min
Monday	## Hr	## Min	## Hr	## Min
Tuesday	## Hr	## Min	## Hr	## Min
Wednesday	## Hr	## Min	## Hr	## Min
Thursday	## Hr	## Min	## Hr	## Min
Friday	## Hr	## Min	## Hr	## Min
Saturday	## Hr	## Min	## Hr	## Min

<<Back
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### 7.8.12 Recipe Select Screen

The recipe select screen is used to select which recipe to view and save the recipe in to memory.



Press the selection box to view a recipe. After making the changes to the recipe, press the save pushbutton to save the recipe.

### 7.8.13 Recipe Screen

The recipe screen is used to view and change programmed recipes. Press the next/back buttons to access other program screens.

The screenshot displays the Recipe Screen interface. At the top left is an "Exit" button, and at the top right is a help icon (?). The main area is titled "Recipe ##". Below this title are five panels for different process tanks:

- Wash Tank 1:** Ultrasonic Time (## Min, ## Sec), Sparger Time (## Min, ## Sec), Drip Time (## Sec).
- Wash Tank 2:** Ultrasonic Time (## Min, ## Sec), Sparger Time (## Min, ## Sec), Drip Time (## Sec).
- Rinse Tank 1:** Ultrasonic Time (## Min, ## Sec), Drip Time (## Sec).
- Rinse Tank 2:** Ultrasonic Time (## Min, ## Sec), Drip Time (## Sec).
- Dryer:** Dwell Time (## Min, ## Sec).

A central "Save" button is located between the Rinse Tank 2 and Dryer panels.

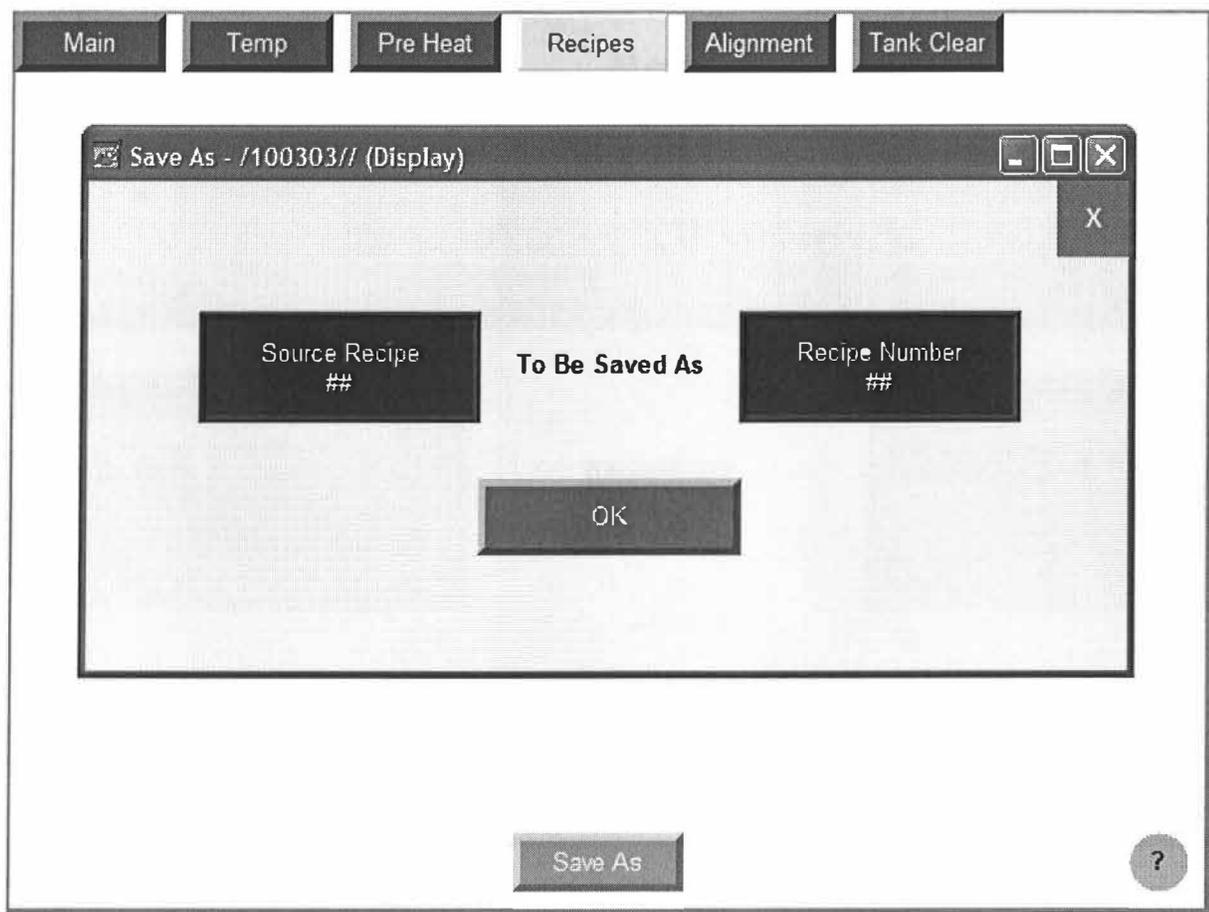
The recipe number being viewed or changed is displayed at the top of this table. To program the recipe for this process tank, touch the numeric pick boxes or selection boxes to enter values into the recipe table.

At the bottom of the recipe table is the basket drip time pick boxes. When the material handling system removes a basket from a wet process tank, the basket will be suspended above the tank, allowing the basket to drip and minimize carryover.

**Note:** Until the save pushbutton is pressed no recipes will be changed, providing a close without saving option.

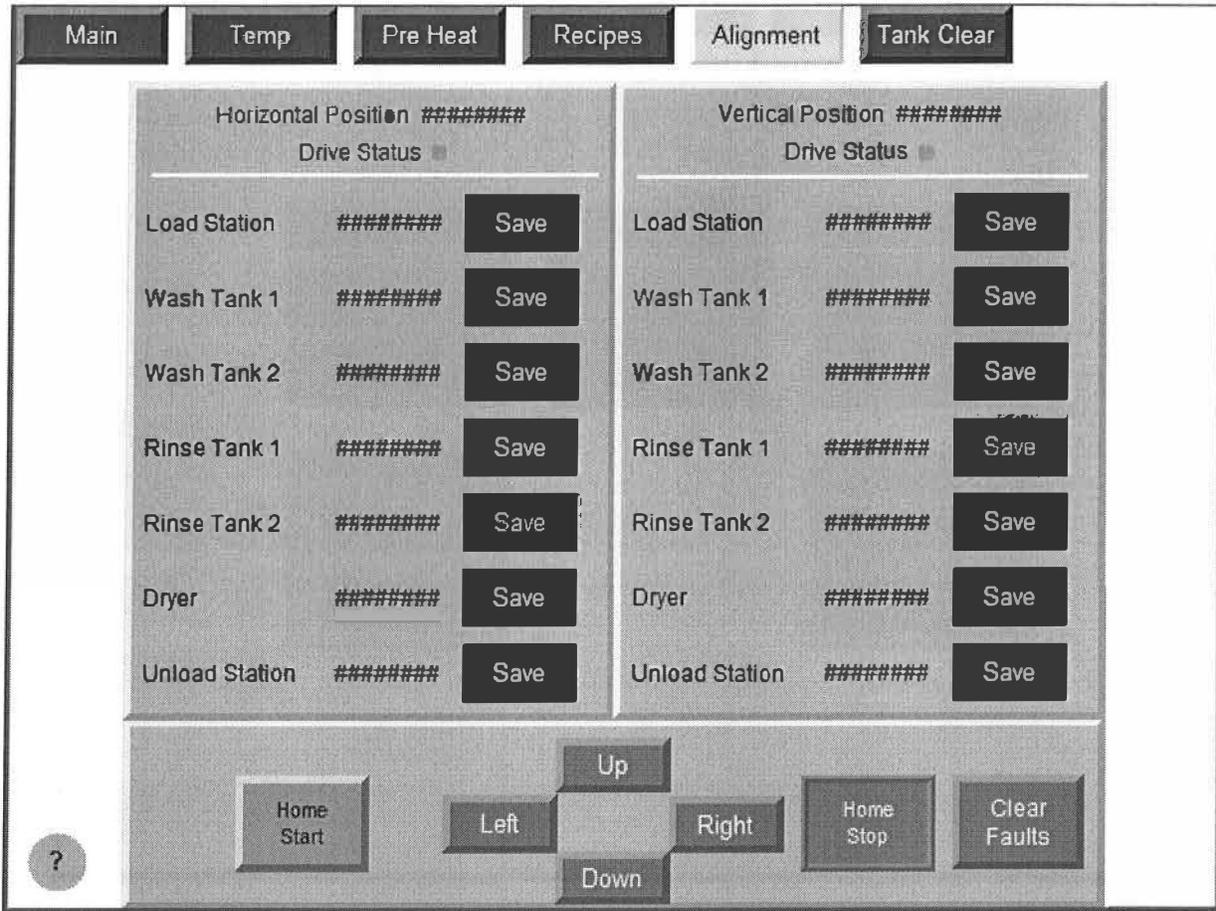
## 7.8.14 Recipe Save As

Once a recipe has been created it can then be used to save as another recipe number. Enter the recipe you wish to save in the Source Recipe and the save as number in Recipe Number then press Ok. An example would be to save recipe 1 as recipe 2. Recipe 1 is the source and recipe 2 is the save as recipe number.



### 7.8.15 Alignment Screens

The alignment screens are used to align the material handling system with the bench. Only qualified maintenance personnel should attempt to make changes to these screens. Press the next/back buttons to access other alignment screens.



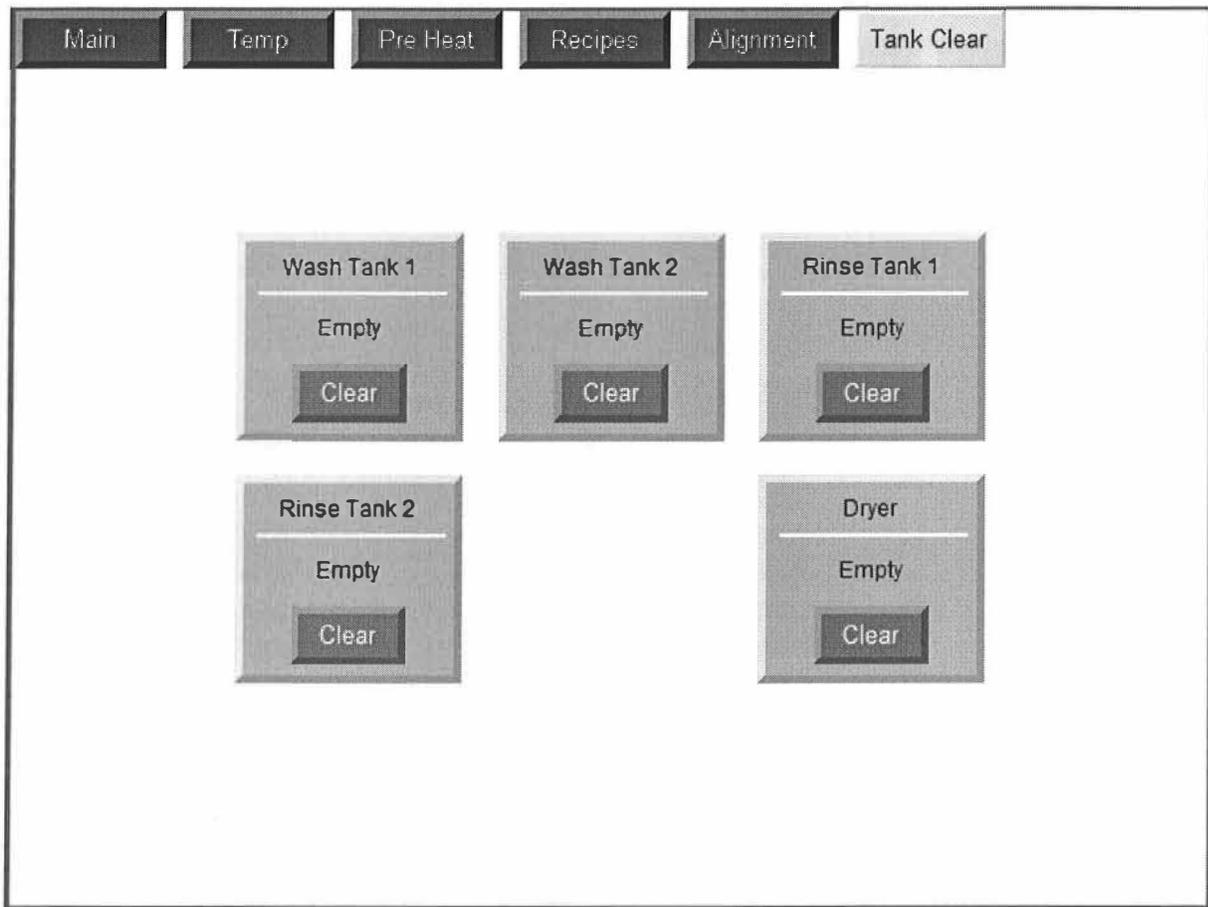
Refer to the hoist screen for information on manually maneuvering the material handling system.

The positions and settings table is used to accurately align the material handling system to the bench. Changes can be made to the factory settings to make subtle alignment corrections.

**Note:** It is important that the values in the position and settings tables be written down for future record should they be inadvertently changed, or the PLC memory becomes corrupt.

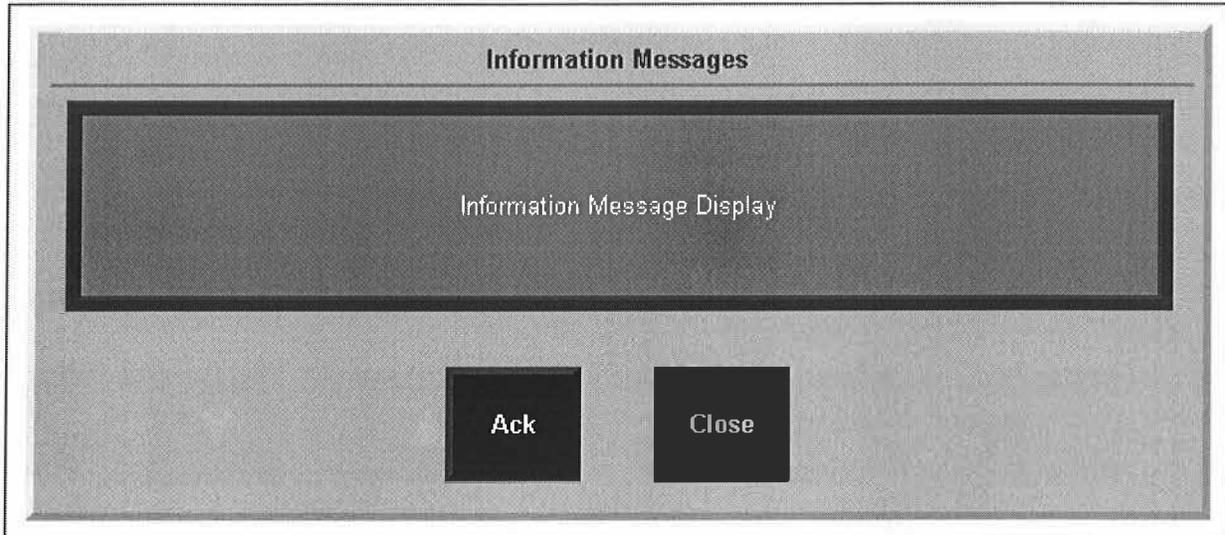
### 7.8.16 Tank Clear

The recipe in each tank can be cleared of a basket altogether. To make a change, stop the process cycle, remove any basket desired and press the clear pushbutton and then home the hoist.



### 7.8.17 Information Message Banner

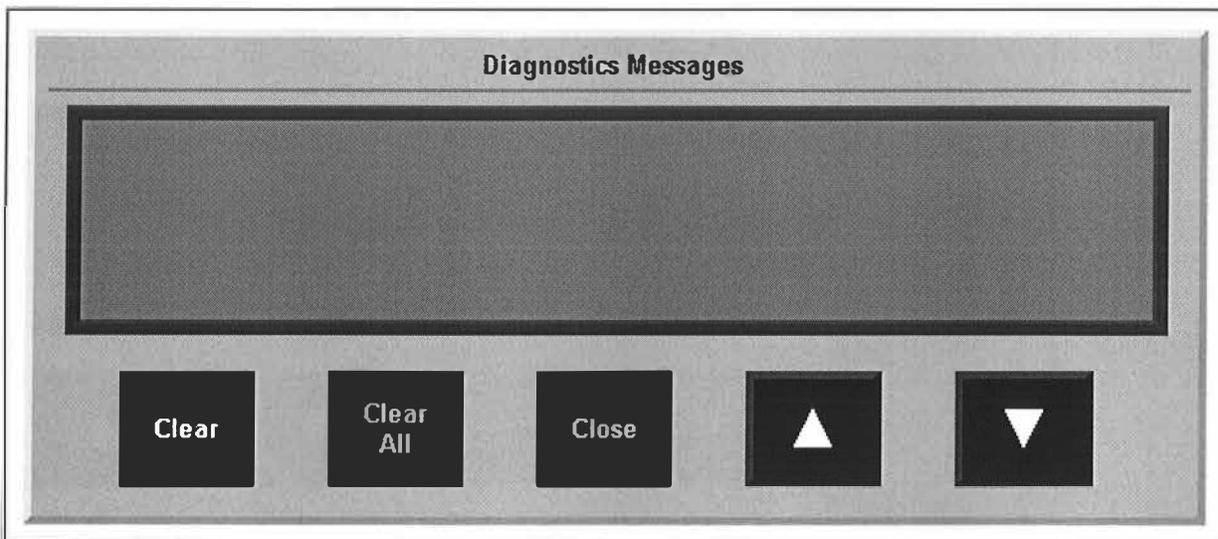
The information message banner provides messages related to the operator interface only, and not the overall system. An example would be a message telling the operator that they are attempting to go to a screen that is already being displayed.



Use the pushbuttons located below the information messages box to acknowledge a message, or close the banner and remove it from the screen.

### 7.8.18 Diagnostic Message Banner

The diagnostics message banner provides messages related to the operator interface only, and not the overall system. An example would be a message telling the operator that communication has been lost between the PLC and operator interface.



Use the pushbuttons located below the diagnostics messages box to clear a message, clear all messages, close the banner and remove it from the screen, or scroll through each individual message.

**Note:** A record of past 200 messages will be kept in the diagnostics messages table until they are cleared.

## 8. MAINTENANCE

### 8.1 Preventive Maintenance

Due to its design, the Aquarius™ Ultrasonic Cleaning System requires a minimum amount of preventive maintenance. Preventive maintenance on the filters and liquid level sensor probes, when regularly performed, will enhance the overall system operation.

### 8.2 System

Each month inspect the entire ultrasonic cleaning system for leaks at all fittings and valves. Additionally inspect the pneumatics for wear as well as proper operation of the dryer components.

### 8.3 Filters

Pressure gauges are linked to filter housing groups to assist predicting how often to replace the Wash Tank filters. Soils removed, liquid used through the cleaning process, and unit usage each affects filter capacity. Tracking the intervals between filter changes will establish a regular schedule.

Dryer pneumatics and control cabinet filters must be cleaned and/or changed regularly to ensure optimum performance of the system and minimum contamination of the parts being dried. Control Cabinet filters should be cleaned whenever excessive contamination appears to be built up. Consult manufacturer's recommendation for replacing control cabinet filters. Contact our Parts Department at 716-665-2340 for replacement parts.

### 8.4 Liquid Level Sensor Probes

All liquid tanks have point style level sensors (tuning fork type) that are essential to the proper and safe operation of the system. These sensors must be kept free of contaminants for proper operation.



**CAUTION:** Over time contamination can build up on the sensors, preventing them from properly sensing liquid levels or causing the sensors to toggle off and on. If toggling of level sensors occurs, shut down the system and perform maintenance.

### 8.5 Hoist

Note that the following suggested intervals assume extreme continuous operation throughout the period. Actual intervals should be pro-rated to the amount of actual operation.

#### Every 6 Months:

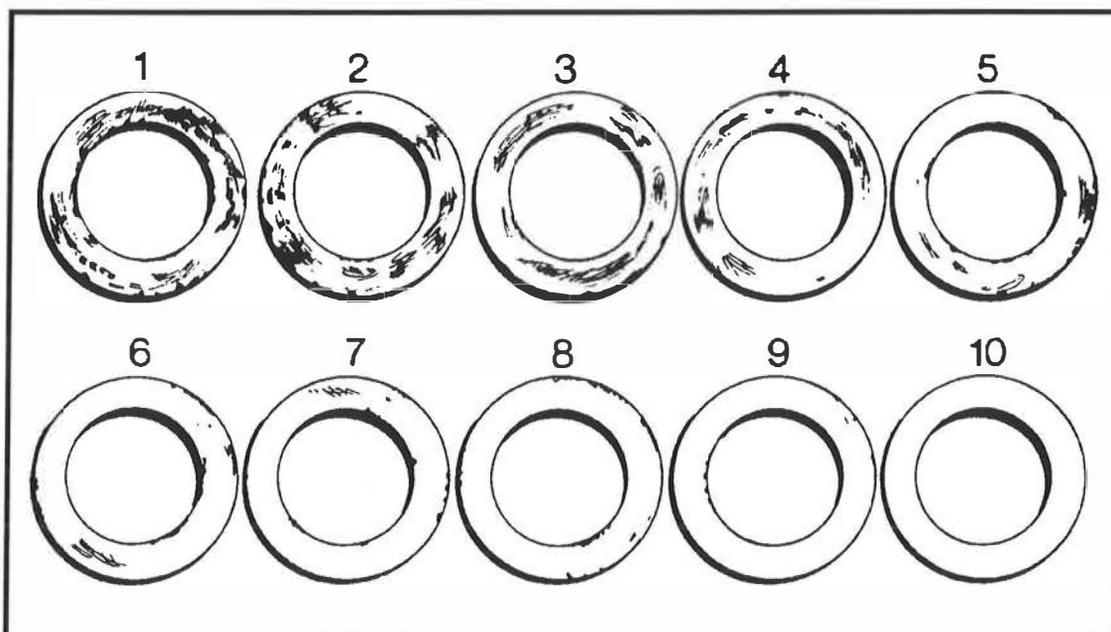
- Grease the vertical ball nut and internal linear guides via the zerk fittings on the actuator mount plate. Note that only one side needs to be lubricated – top and bottom (see OEM Lubrication Instructions in Rexroth Compact Module Manual pages 21 to 22 – CKK 20-145 on the CD for further information).
- Inspect proximity sensors to assure proper adjustment and function.

- Check the horizontal belt condition and tension.
- Check all fasteners and setscrews for tightness. Do not tighten ball nut mount bolts or crash spring tension screws.

### 8.6 Performance Verification

In order to verify the proper functional performance of your system, you need a Performance Kit (Part No. 4050114), which consists of five ceramic rings, five pencils and a bottle of Water Wetter. Use the following procedure.

1. Fill the cleaning tank with water and add two ounces of Water Wetter.
2. Bring the water to operating temperature (normally 130°F - 160°F).
3. Using a pencil supplied with the kit, coat the smooth side of each of the five ceramic rings with pencil lead. Cover at least 95% of the surface of each ring.
4. Place the rings face up in an "X" pattern in the cleaning carrier. One ring should be in the center of the carrier and the others approximately 1-inch in from each corner.
5. De-gas the liquid in the tank by operating the ultrasonics continuously for 10 minutes.
6. Turn OFF the ultrasonics and allow the system to settle for 30 seconds.
7. Turn ON the ultrasonics and lower the carrier into the tank. Start timing as soon as the ceramic rings are immersed in the liquid.
8. Gently move the carrier up and down approximately ½-inch (1-cm) for thirty seconds.
9. After 30 seconds, turn the ultrasonics OFF and remove the carrier.
10. Compare each ring with the comparison chart below and grade the rings accordingly.
11. Add the five scores together. A minimum total score of 30 is acceptable.



## 8.7 Return Procedure

If you want your unit repaired by Blackstone~NEY Ultrasonics:

- Call the service department for approval to return the unit. A Service Technician may ask for further tests to be performed in order to establish the cause of the problem prior to giving a cost estimate or authorizing a return. Blackstone~NEY Ultrasonics will not accept units without either a Purchase Order Number or a Return Authorization Number.
- Package the unit in its original packaging if it is still available, or provide sufficient packaging to protect fragile electronic components and assemblies during shipment.
- Ship the unit to Blackstone~NEY Ultrasonics, freight prepaid.

## 9. TROUBLESHOOTING, REPAIR OR REPLACEMENT PROCEDURES

### 9.1 System Clear Out

Follow these steps to clear all baskets out of the system:

- a. Create a recipe with 0 time at each station.
- b. Manually enter this recipe number at each station
- c. Place mode selector switch in Auto Mode and start the cycle.

### 9.2 Generator Replacement

Follow these steps to replace a generator:

- a. Turn off and lock out power to the system.
- b. Open control cabinet door.
- c. Disconnect the RF cable and Power Cable at the connectors on the back of the generator.
- d. Reconnect the RF cable connector and Power cable.
- e. Put the generator in its designated location. Switch the generator ON.
- f. Close the control cabinet door.
- g. Reconnect power to the system.

### 9.3 Tank Heater Replacement

Follow these steps to replace a wet tank heater element:



**CAUTION:** If the element had been functioning recently, allow it to cool before handling.

- a. Drain the tank.
- b. Turn off and lock out power to the system.

- c. Lift out the front and back panels.
- d. Cut away the insulation from the front or back of the tank.
- e. Using a nut driver, remove the supply wires.
- f. Check the heater with an ohmmeter. Failed heater(s) will read “Open”, shorted heater will read “ ”, and a bad but not failed heater will read a wrong resistance value.
- g. Unscrew/remove the heater element.
- h. Install the replacement heater element.
- i. Replace the supply wires.
- j. Tape the insulation back in place with insulation tape. Use a hot domestic iron to secure the insulation tape in place.
- k. Replace the outer panels.
- L. Reconnect power to the system.

#### 9.4 Filter Replacement Procedure

- a. Close filter isolation valves.
- b. Unscrew the canister from the filter top.
- c. Remove the old filter from canister.
- d. Replace the used filter element with a new one.
- e. Use care in tightening the O-ring to avoid damaging it.
- f. Screw the housing back in place. Take care not to damage the gaskets around the top of the housing.
- g. Open the isolation valves.



**NOTE:** Filter elements should be changed periodically and whenever the flow through the system is visibly reduced, which is a sign that the filter is becoming blocked. The intervals between changing a given filter will soon become apparent, and a regular schedule for changing or cleaning it can then be established.

#### 9.5 Solenoid Repair/Replacement

Follow these steps to repair the solenoid:

- a. Turn off the main water supply.
- b. Turn off and lock out power to the system.
- c. Remove the lower back panel.
- d. Remove the clip from the solenoid valve.
- e. Disconnect the wires in the junction box.
- f. Remove the solenoid coil from the junction box.
- g. Replace the coil in reverse order.
- h. Remove four screws from the top of the valve body and lift off the top.

- i. Replace all the internal parts with parts from the kit.
- j. Replace the coil.
- k. Replace the clip.
- l. Replace the back panel.
- m. Reconnect power to the system.

## 10. WAYS TO ACHIEVE EFFECTIVE ULTRASONIC CLEANING

The cleaning action of almost any detergent, soap, or solvent improves through the application of ultrasonics. The cavitation intensity achieved in the cleaning tank scrubs the surface of parts and allows the cleaning solution to be more effective than it would be using dip, spray, agitation or brush methods. Ultrasonics can reach into the smallest cavity or blind hole, cleaning a part inside and out. Cleaning efficiency is dependent on several properties of the cleaning liquid, as identified below.

### 10.1 Temperature

Temperature has a dramatic effect on the ultrasonic cleaning process. Changes in temperature produce different results in different liquids. In general, an increase in the temperature results in higher cavitation intensity and better cleaning, as long as the temperature is not too close to the boiling point of the liquid. Temperature also has a direct bearing on the speed and effectiveness of most chemical reactions. Water cavitates most effectively between 140°F and 160°F. A caustic/water solution, however, continues to increase in chemical cleaning effectiveness up to its boiling point.

As a rule, all liquids should be used at temperatures at least 10°F below their boiling points. Beyond this, however, each application may require its own unique balance between ultrasonics, chemistry and temperature.

Some chemicals are designed especially to work at lower temperatures. Operation of these at high temperatures can cause chemical breakdown and ineffective cleaning.

There are many cleaning chemicals that are formulated to be used only with ultrasonics. Blackstone-Ney Ultrasonics will be pleased to provide assistance should you have difficulty finding the best combination of chemistry and procedure for your cleaning needs. If you need assistance, call our Applications Engineering Department.



**WARNING:** Take full account of the MSDS data for any cleaning chemical being used. Operation near or above the flash point of any material is hazardous and can cause noxious fumes.

### 10.2 Degassing

Liquids containing dissolved gas produce low cavitation intensity because the gas diffuses into cavitation bubbles and acts as a cushion to the implosion of the bubble. As a result, there is no violent implosion and no useful scrubbing effect.

Eliminate dissolved gas liquids using the following process.

1. Heat the liquid to a temperature a little higher than the planned operating temperature. Warmer liquids cannot retain as much suspended gas as colder liquids.
2. Add a detergent or cleaner containing a wetting agent to speed up the degassing process.
3. Operate the ultrasonics for at least 15 minutes or until you can no longer see air bubbles generated in the liquid.

### 10.3 Part Exposure

In order for a surface to be cleaned, it must be exposed to the ultrasonically activated cleaning liquid. This requires proper placement within the parts carrier. The most common mistakes made, and the proper remedies for these mistakes, include the following.

- Improper placement of parts results in air pockets, where no cleaning action occurs. A part with a blind hole traps an air bubble if the hole is facing down. Avoid this by using care in positioning parts in the carrier or by rotating the part vertically once it has been submerged.
- Overloading carriers with small parts can sometimes result in cleaning the first several layers of parts only, while the middle layers do not see the ultrasonic effect. In general, clean large numbers of parts a few at a time using shorter cleaning cycles.

### 10.4 Parts Materials

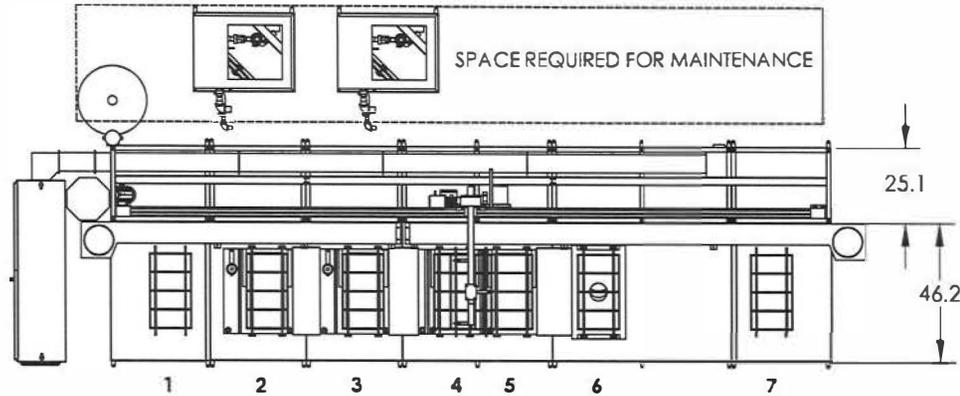
Many materials absorb sound. Generally, these materials are not suitable for ultrasonic cleaning because they tend to absorb the ultrasonic energy and reduce the intensity of cavitation. Ultrasonics is highly effective with metals, glasses, ceramics and many plastics. It is less effective with fabrics, "soft" plastics, sponges or rubber. There are exceptions to this, with a good example being the use of ultrasonics to improve the efficiency of dyeing artificial fabrics.

### 10.5 Erosion

Over time, the scrubbing action of cavitation will wear away the surface of any object in the tank. This is also true of the tank itself, but it typically takes many years before the effect is serious. Softer metals, such as aluminum, are more liable to erode than hard metals such as stainless steel. To protect your parts and equipment from untimely erosion, do not leave the ultrasonics on or leave parts in the tank longer than necessary.

## **11. ATTACHMENTS**

### **11.1 DRAWINGS**



POWER REQUIREMENTS:  
480V, 3 PHASE, 60 HZ

- PROCESS STEPS:  
AQ-5-1728 with CAL-100  
1) : LOAD TABLE  
2) : ULTRASONIC WASH TANK-1  
3) : ULTRASONIC WASH TANK-2  
4) : ULTRASONIC RINSE TANK-1  
5) : ULTRASONIC RINSE TANK-2  
6) : HOT AIR DRYER  
7) : UNLOAD TABLE

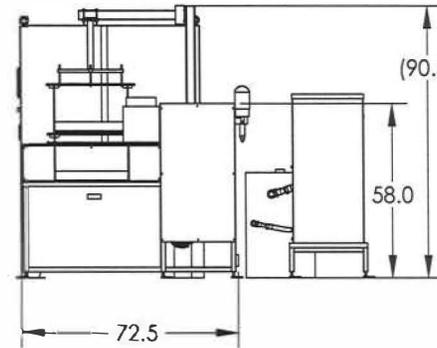
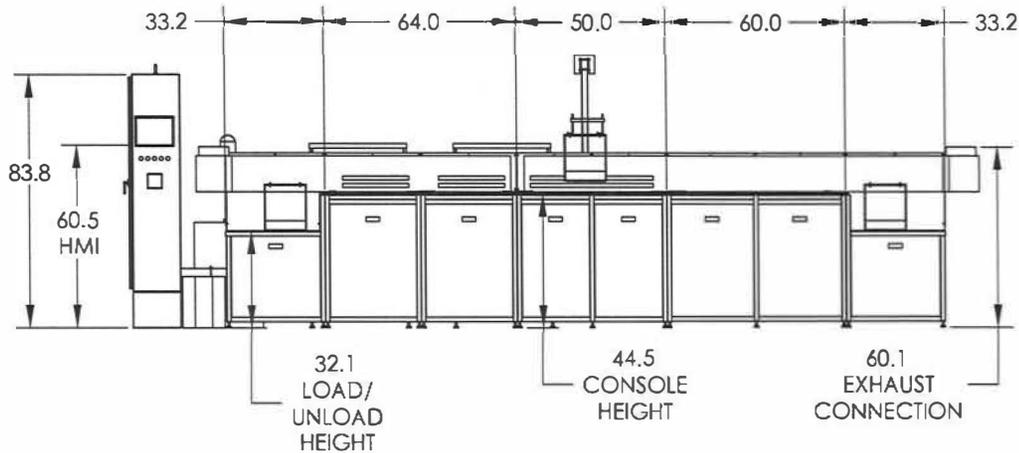
- NOTES:  
1. TANK WORKING DIMENSIONS (APPROX.):  
17"LR X 28" FB X 12" LIQUID LEVEL  
2. THIS DRAWING IS SIMPLIFIED TO SHOW OVERALL DIMENSIONS  
3. COMPRESSED AIR SUPPLY OF 3 SCFM @ 80 TO 100 PSI REQUIRED TO OPERATE AUTOMATED LID  
4. DI WATER SUPPLY 5 GPM MIN @ 20 TO 40 PSI REQUIRED  
5. ALL EXHAUST VENTILATION REQUIREMENTS ARE TO BE MET BY CUSTOMER SUPPLIED POWERED EXTRACTION SYSTEM  
6. CAL-100 AUTOMATION WITH MAXIMUM LOAD CAPACITY OF 100 POUNDS  
7. REFER TO QUOTE # P-10-24127-SWC FOR DETAIL LISTING OF SYSTEM FEATURES AND DESCRIPTION.

REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	PRODUCTION RELEASE			
A	ADDED PROCESS, OSCILLATOR, Pump TO DRUM	02/24/10	JRS	
B	ADDED DIMENSIONS	03/05/10	JRS	

**APPROVAL DRAWING**

APPROVED

BY \_\_\_\_\_  
DATE \_\_\_\_\_  
APPROVED AS IS   
APPROVED WITH CHANGES NOTED

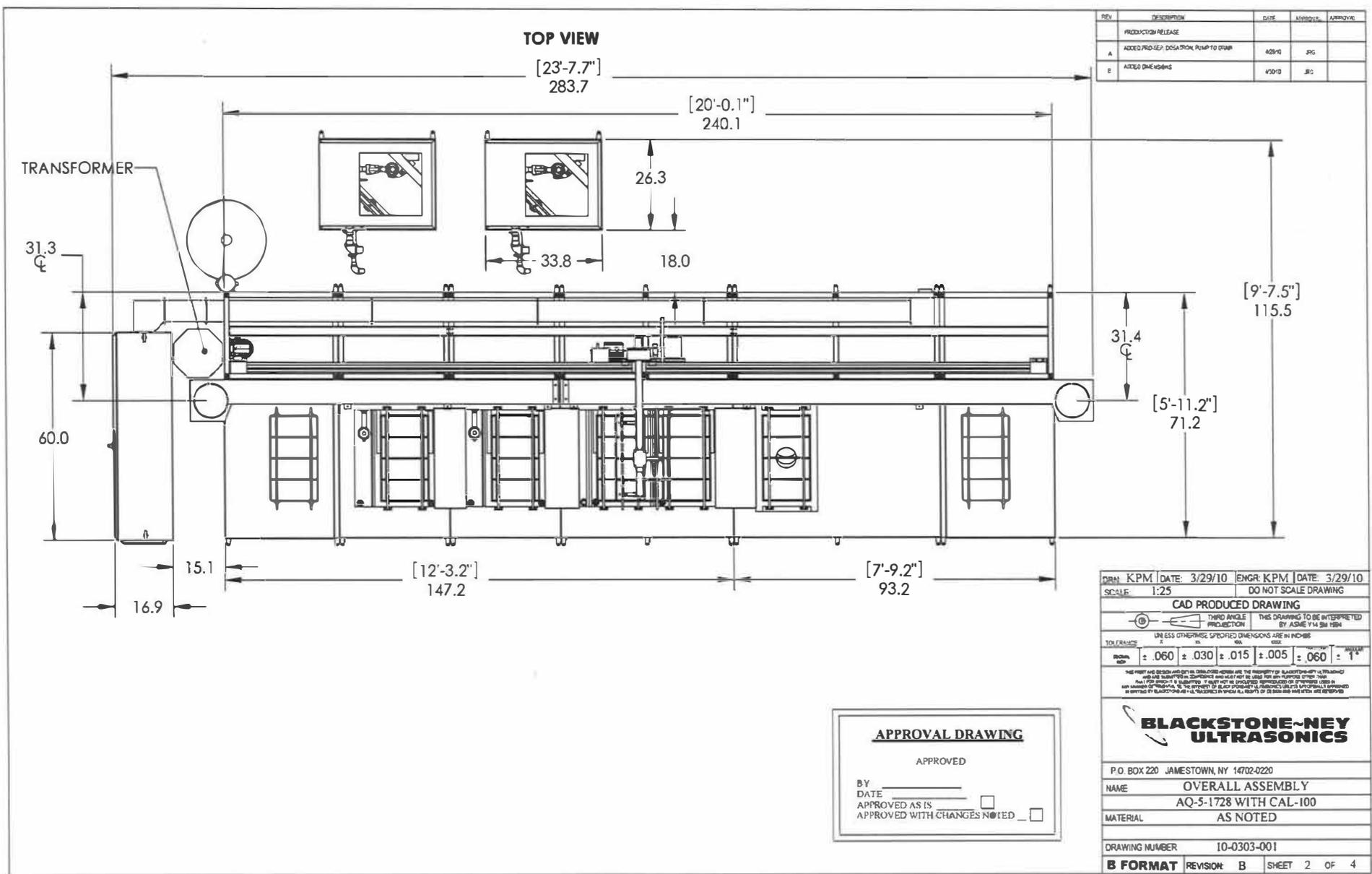


DRN: KPM	DATE: 3/29/10	ENGR: KPM	DATE: 3/29/10
SCALE: 1:40	DO NOT SCALE DRAWING		

CAD PRODUCED DRAWING			
THIRD ANGLE PROJECTION		THIS DRAWING TO BE INTERPRETED BY ASME Y 14.5M 1984	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			
TOLERANCE	±	±	±
INCH	± .060	± .030	± .015
MILL	± .005	± .002	± .001
ANGLE	± .060	± .015	± 1°



NAME	OVERALL ASSEMBLY
	AQ-5-1728 WITH CAL-100
MATERIAL	AS NOTED
DRAWING NUMBER	10-0303-001
<b>B FORMAT</b>	REVISION B SHEET 1 OF 4



DRN: KPM	DATE: 3/29/10	ENGR: KPM	DATE: 3/29/10
SCALE: 1:25	DO NOT SCALE DRAWING		
<b>CAD PRODUCED DRAWING</b>			
 THIRD ANGLE PROJECTION		THIS DRAWING TO BE INTERPRETED BY ASME Y14.5M 1994	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			
TOLERANCES			
FINISH	± .060	± .030	± .015 ± .005 ± .060 ± .1"
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<b>BLACKSTONE~NEY ULTRASONICS</b>			
P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME: OVERALL ASSEMBLY			
MATERIAL: AS NOTED			
DRAWING NUMBER: 10-0303-001			
<b>B FORMAT</b> REVISION: B SHEET 2 OF 4			

**APPROVAL DRAWING**

APPROVED

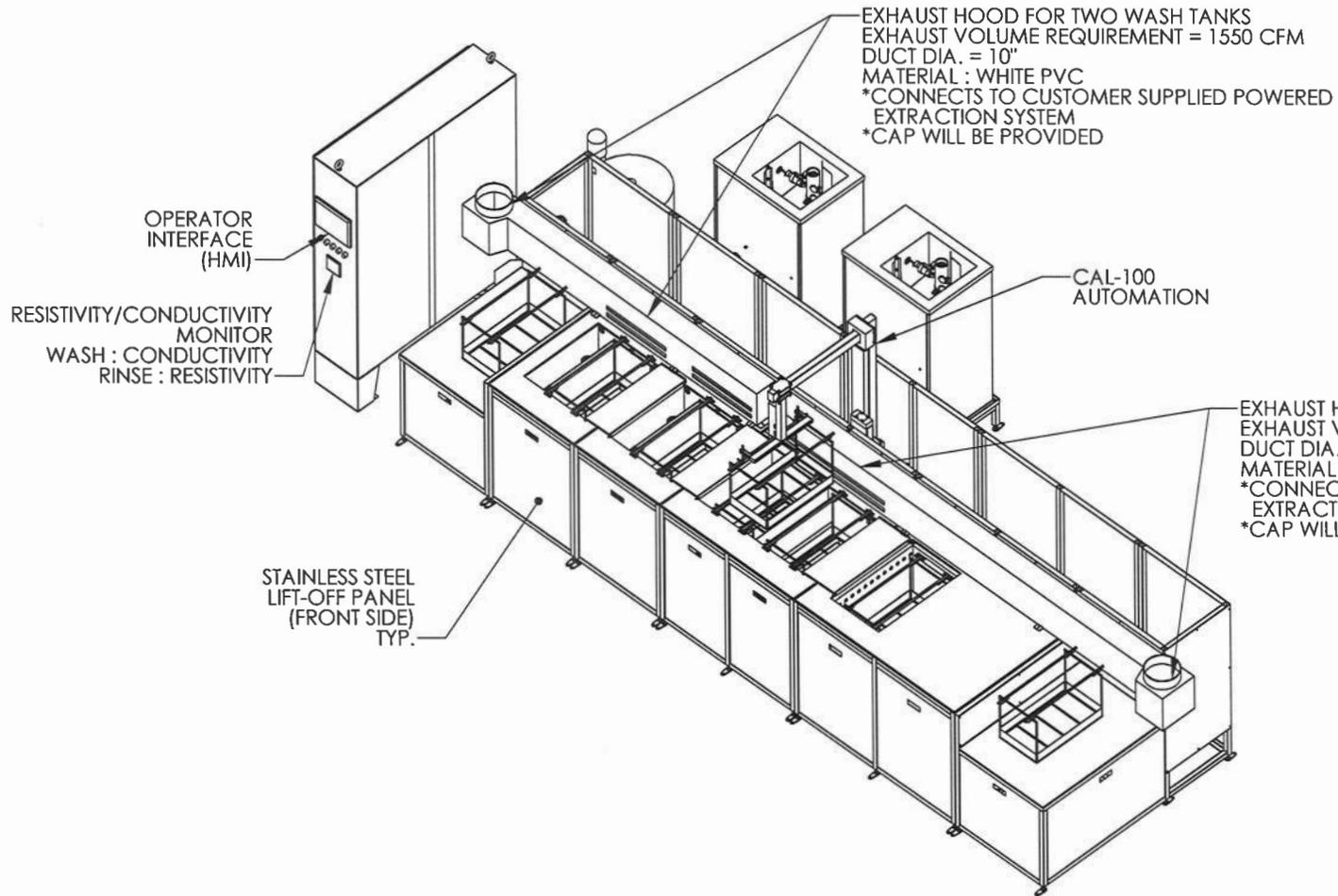
BY \_\_\_\_\_

DATE \_\_\_\_\_

APPROVED AS IS

APPROVED WITH CHANGES NOTED

**FRONT ISOMETRIC VIEW**



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	PRODUCTION RELEASE			
A	ADDED PRO-SEP, DIGATION, PUMP TO DRAIN	4/29/10	JRG	
B	ADDED DIMENSIONS	4/30/10	JRG	

**APPROVAL DRAWING**

APPROVED

BY \_\_\_\_\_

DATE \_\_\_\_\_

APPROVED AS IS

APPROVED WITH CHANGES NOTED

DRN: KPM	DATE: 3/29/10	ENGR: KPM	DATE: 3/29/10
SCALE: 1:30	DO NOT SCALE DRAWING		
<b>CAD PRODUCED DRAWING</b>			
THIRD ANGLE PROJECTION		THIS DRAWING TO BE INTERPRETED BY ASME Y14.5M 1994	
<small>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES</small>			
<small>TOLERANCE</small>			
<small>FINISH</small>	<small>± .060</small>	<small>± .030</small>	<small>± .015 ± .005 ± .060 ± 1*</small>
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<b>BLACKSTONE-NEY ULTRASONICS</b>			
P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME OVERALL ASSEMBLY			
AQ-5-1728 WITH CAL-100			
MATERIAL AS NOTED			
DRAWING NUMBER 10-0303-001			
<b>B FORMAT</b> REVISION: B SHEET 3 OF 4			

REAR ISOMETRIC VIEW

REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	PRODUCTION RELEASE			
A	ADDED PRO-SEP, DOSATION, PUMP TO GRAB	4/29/10	JRG	
B	ADDED DIMENSIONS	4/30/10	JRG	

**APPROVAL DRAWING**

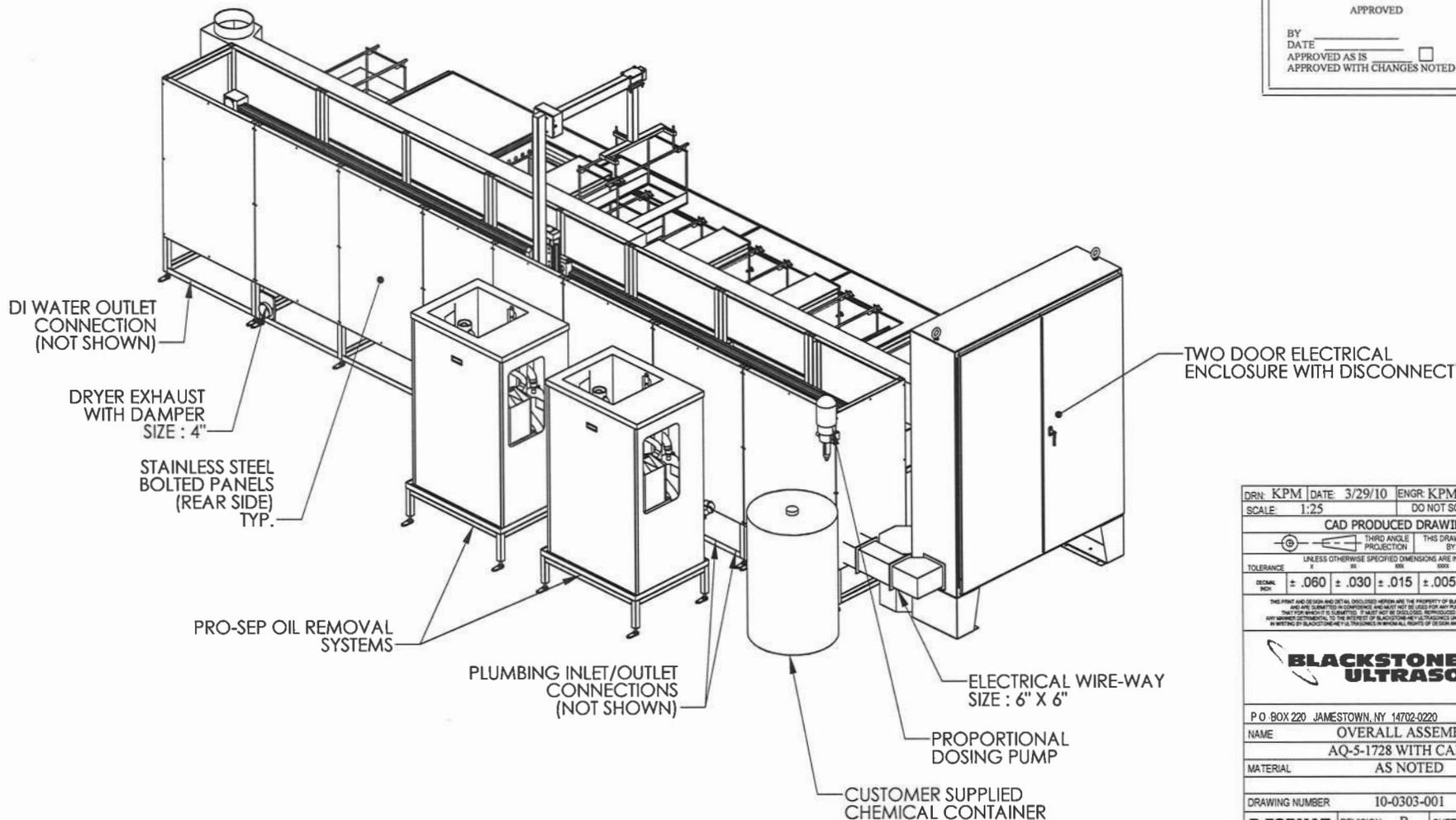
APPROVED

BY \_\_\_\_\_

DATE \_\_\_\_\_

APPROVED AS IS

APPROVED WITH CHANGES NOTED



DRN: KPM	DATE: 3/29/10	ENGR: KPM	DATE: 3/29/10
SCALE: 1:25	DO NOT SCALE DRAWING		

**CAD PRODUCED DRAWING**

THIRD ANGLE PROJECTION THIS DRAWING TO BE INTERPRETED BY ASME Y14.5M 1994

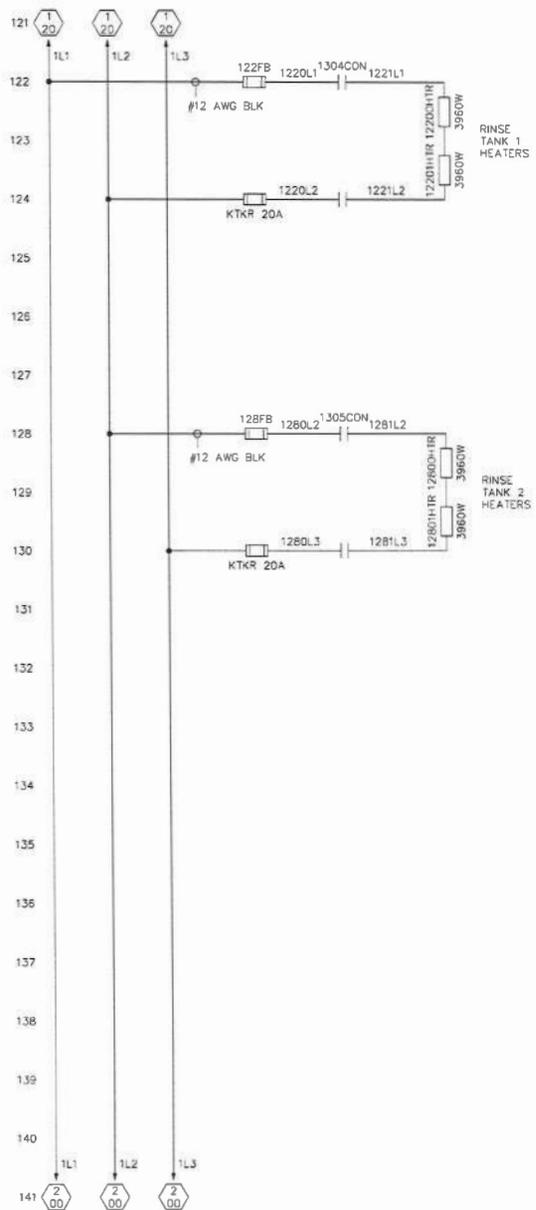
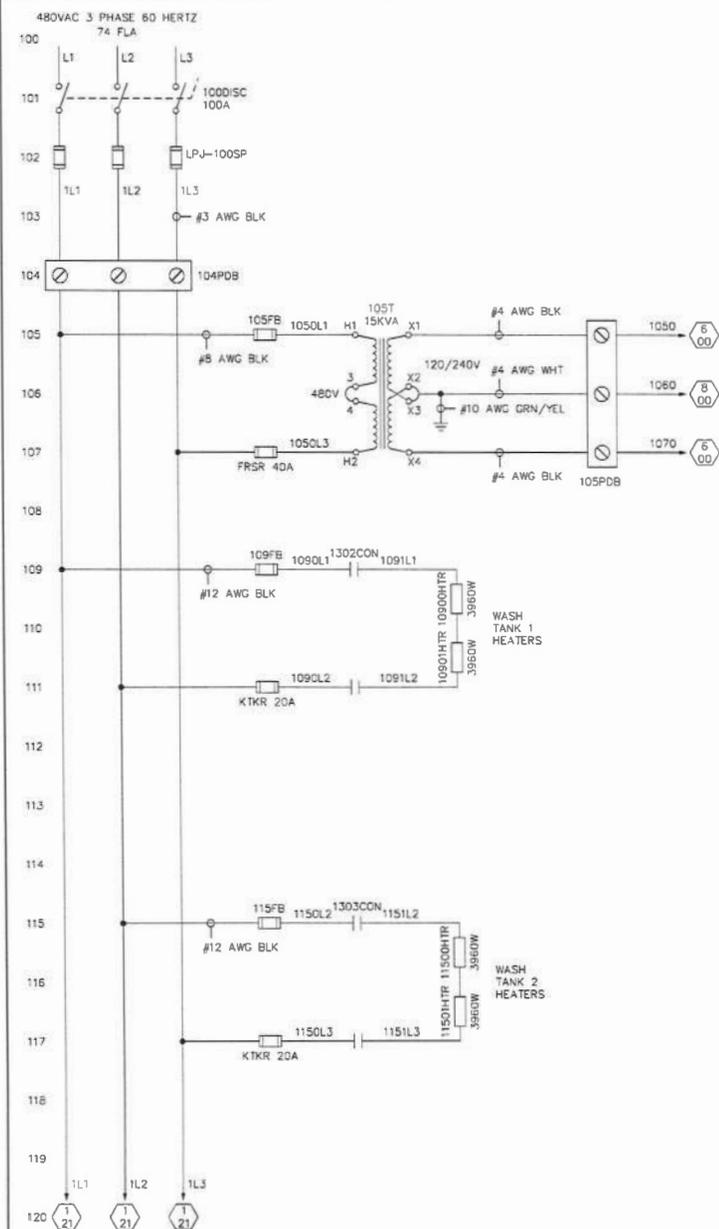
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCE	BY	XXX	XXX	XXX	XXX	XXX
DIMEN INCH	± .060	± .030	± .015	± .005	± .060	± .1"

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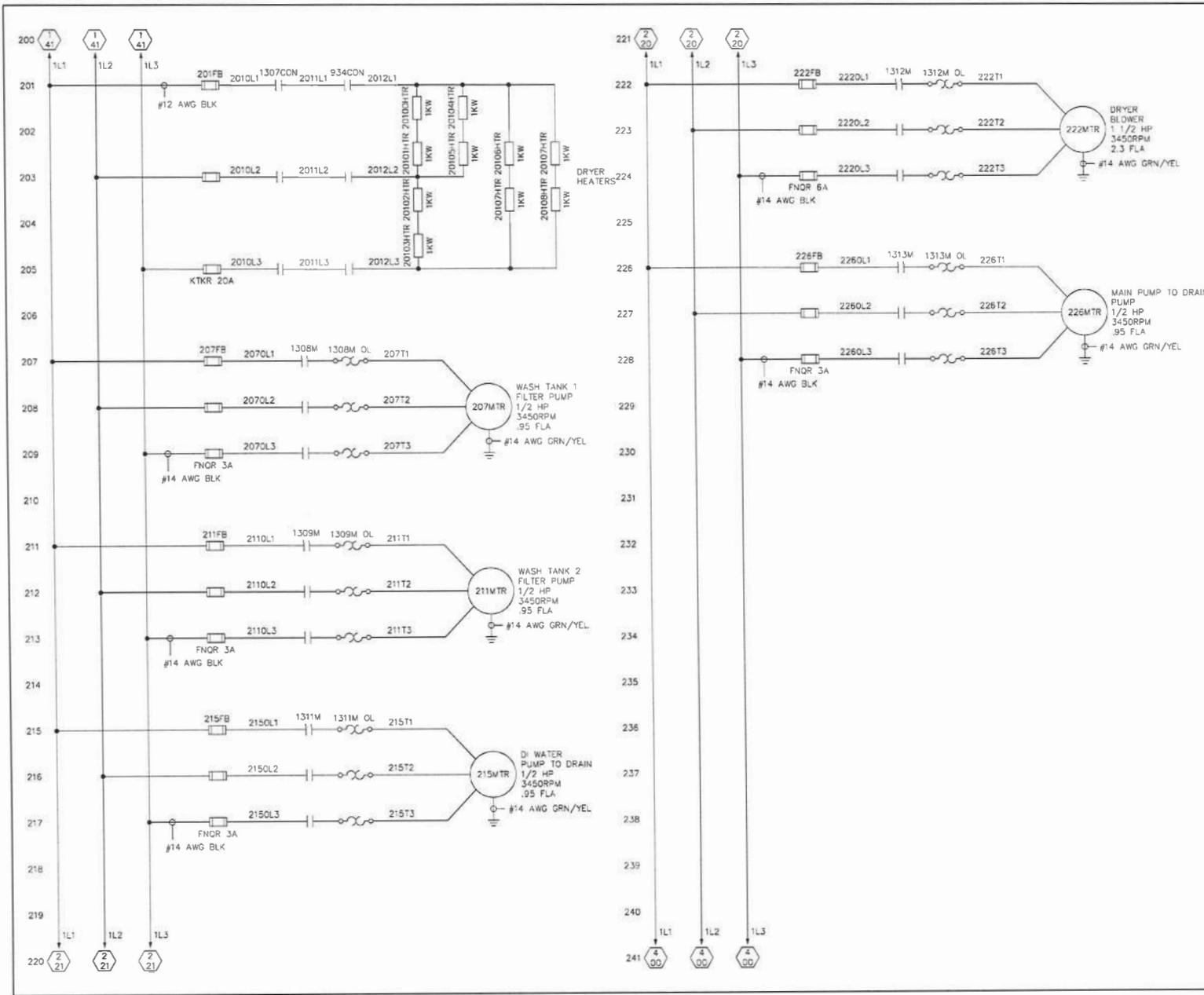


P.O. BOX 220	JAMESTOWN, NY 14702-0220
NAME	OVERALL ASSEMBLY
	AQ-5-1728 WITH CAL-100
MATERIAL	AS NOTED
DRAWING NUMBER	10-0303-001
<b>B FORMAT</b>	REVISION: B SHEET 4 OF 4



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

DRN: BSH	DATE:	ENGR: BSH	DATE: 6/2/10
SCALE: -		DO NOT SCALE DRAWING	
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
Metric mm	±	mm	FRACTIONAL
DECIMAL INCH	±	0.30 ± 0.15 ±	ANGULAR ± 1°
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P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL AQ-5-1728			
PART NUMBER 10-0303-002			
B FORMAT REVISION: A SHEET 1 OF 14			



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

DRN: BSH	DATE:	ENGR: BSH	DATE: 6/2/10
SCALE: -		DO NOT SCALE DRAWING	
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC	±	±	FRACTIONAL
DECIMAL	±	±	± 1/32
INCH	±	±	± 1"
<small>THIS DRAWING AND ALL DIMENSIONS HEREAFTER ARE THE PROPERTY OF BLACKSTONE-NEY ULTRASONICS AND ARE SUBJECT TO CHANGE AND SHALL NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUBMITTED. NO PARTS OR MATERIALS SHALL BE ORDERED OR PURCHASED WITHOUT THE WRITTEN APPROVAL OF BLACKSTONE-NEY ULTRASONICS UNLESS SPECIALLY APPROVED IN WRITING BY BLACKSTONE-NEY ULTRASONICS. IN WITNESS WHEREOF, SIGNATURES OF DESIGN AND PRODUCTION ARE HEREBY GIVEN.</small>			
<b>BLACKSTONE-NEY ULTRASONICS</b>			
P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL AQ-5-172B			
PART NUMBER 10-0303-002			
B FORMAT REVISION: A SHEET 2 OF 14			

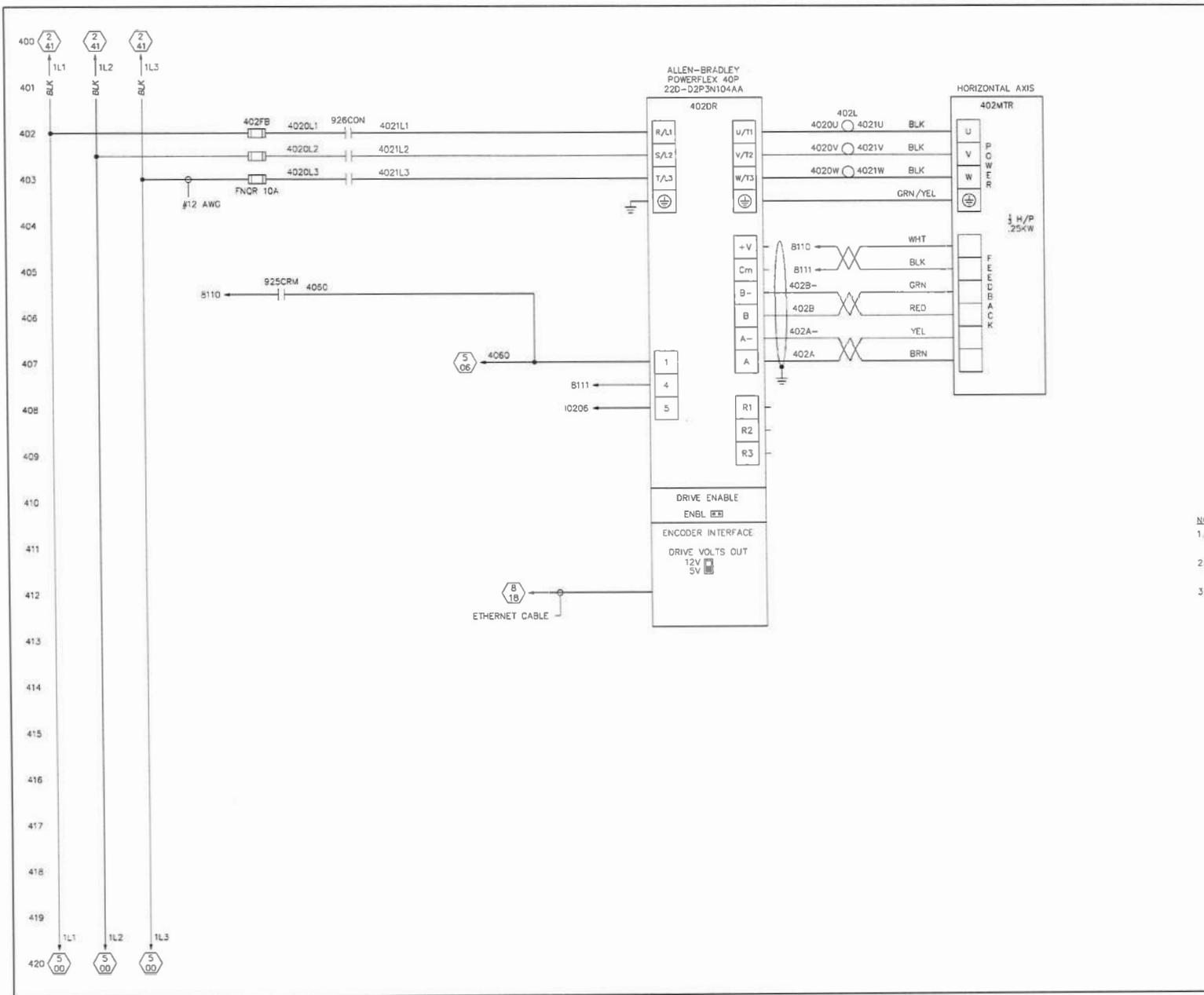
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REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

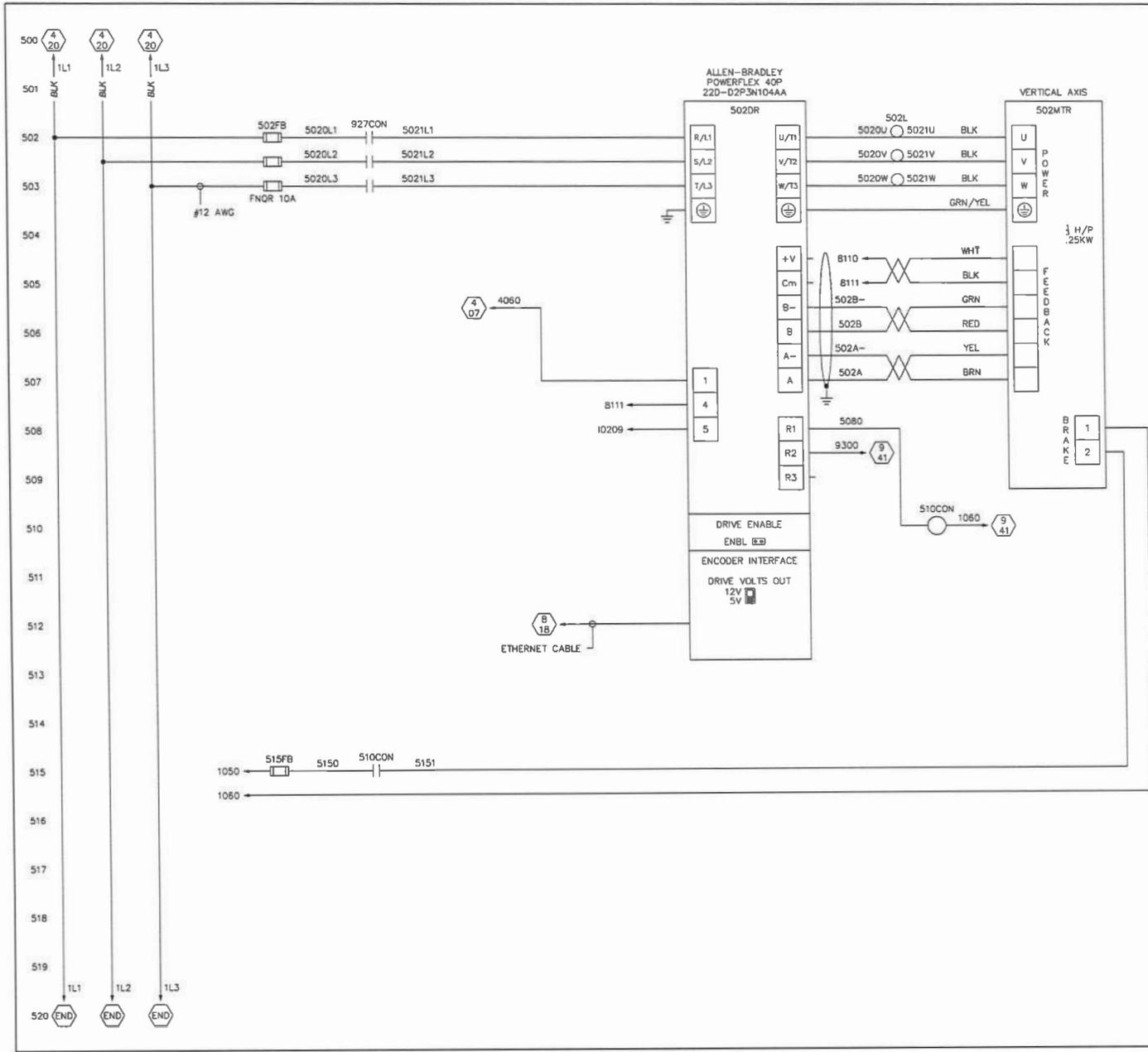
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SCALE: --	DO NOT SCALE DRAWING		
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC MM	±	XX XXX	FRACTIONAL XXX ± 1/32
DECIMAL INCH	±	± .030 ± .015	ANGULAR ± 1°
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 <b>BLACKSTONE-NEY ULTRASONICS</b>			
P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL AQ-5-1728			
PART NUMBER 10-0303-002			
B FORMAT REVISION: A SHEET 3 OF 14			



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

- NOTES:
1. SET SELECTOR SWITCH ON ALL POWER-FLEX 40P VARIABLE SPEED CONTROLLERS FOR SOURCING INPUTS (SRC)
  2. REMOVE THE ENABLE JUMPER WIRE BETWEEN PINS 1 AND 11 AND REMOVE THE ENABLE JUMPER.
  3. ENCODERS TO BE WIRED FOR 24VDC. ENCODER INTERFACE SELECTOR IS NOT USED AND CAN BE LEFT EITHER 5 OR 12V

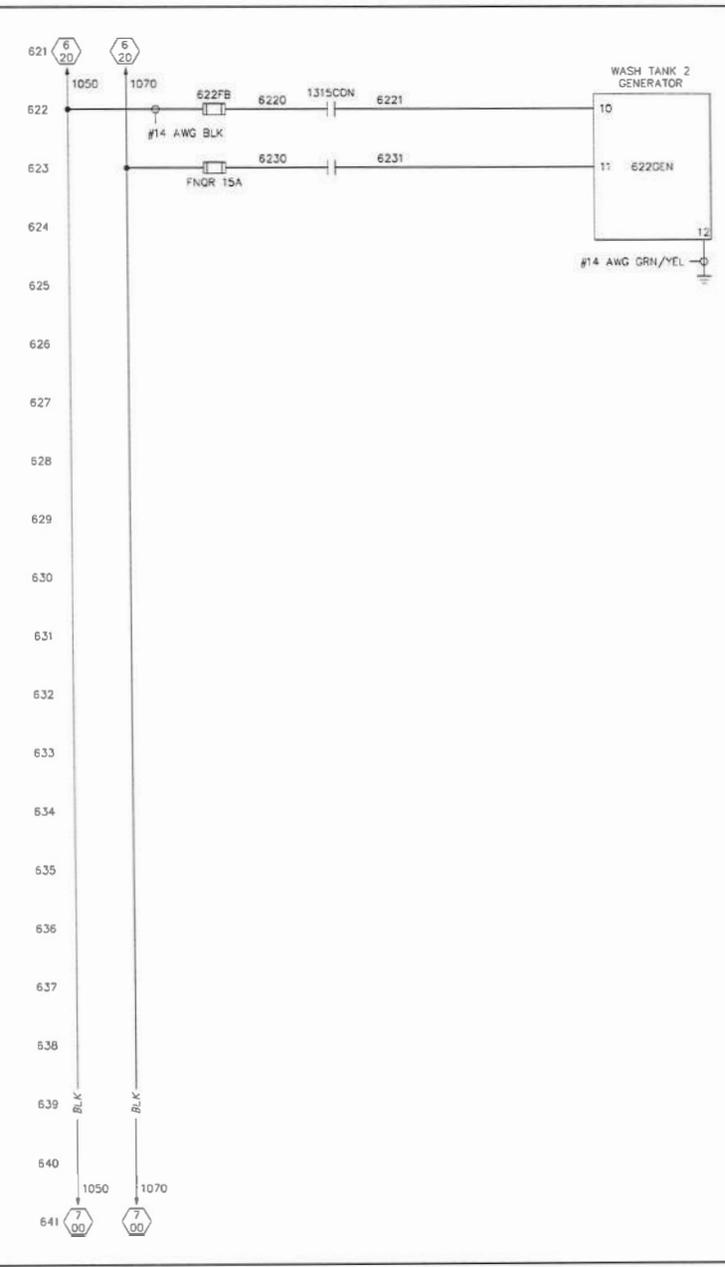
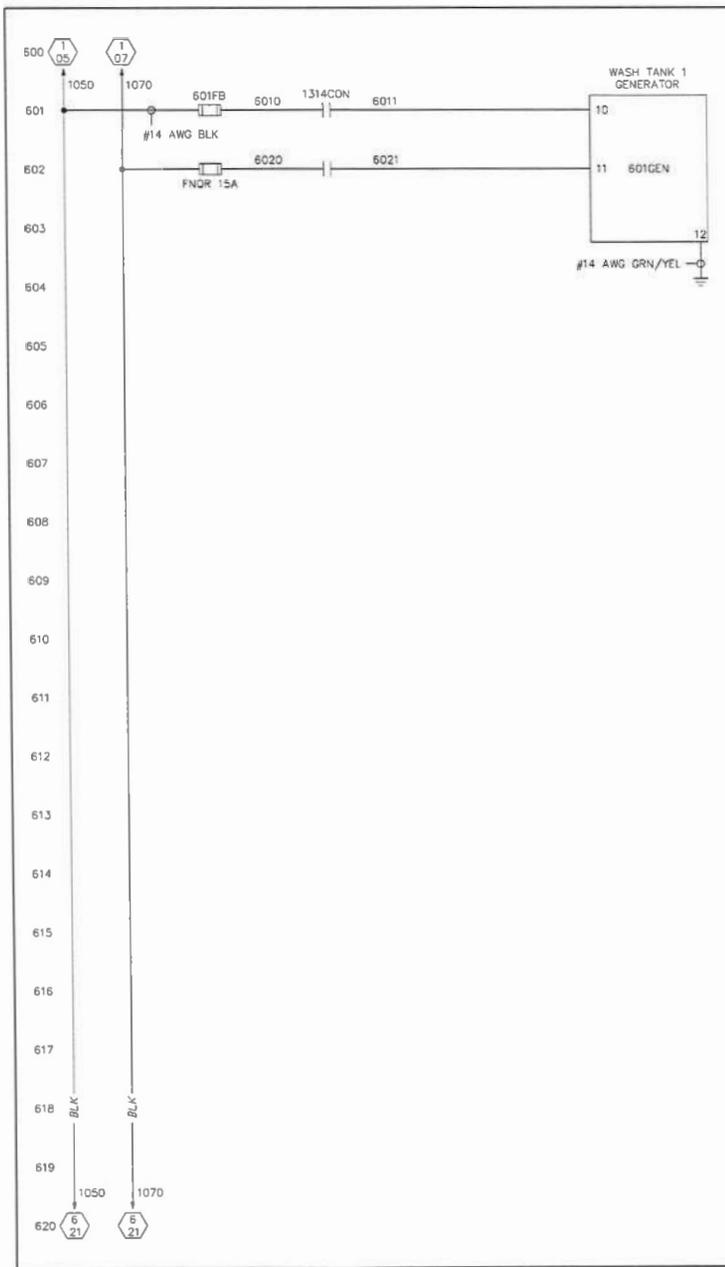
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SCALE: -		DO NOT SCALE DRAWING	
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC	XX	XXX	XXXX
FRAC	±	±	±
SEC	± .030	± .015	± 1/32
ANG	±	±	±
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P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL 40-5-1728			
PART NUMBER 10-0303-002			
B FORMAT REVISION: A SHEET 4 OF 14			



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

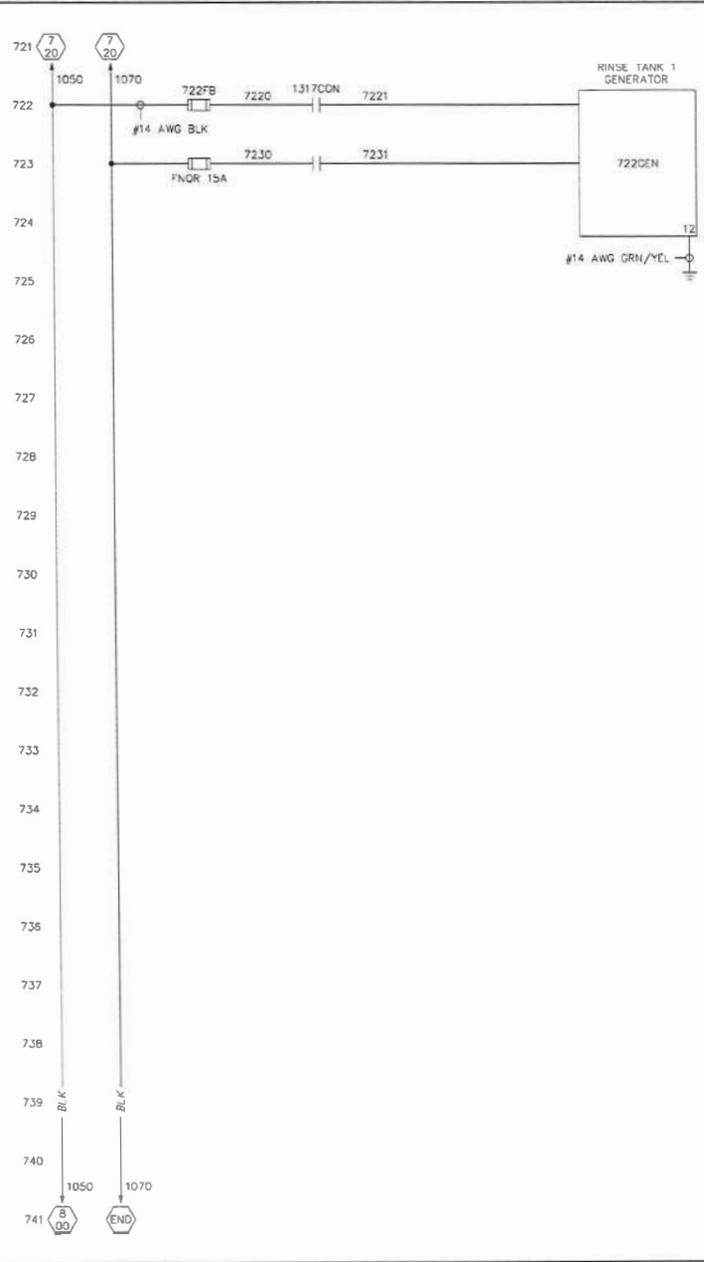
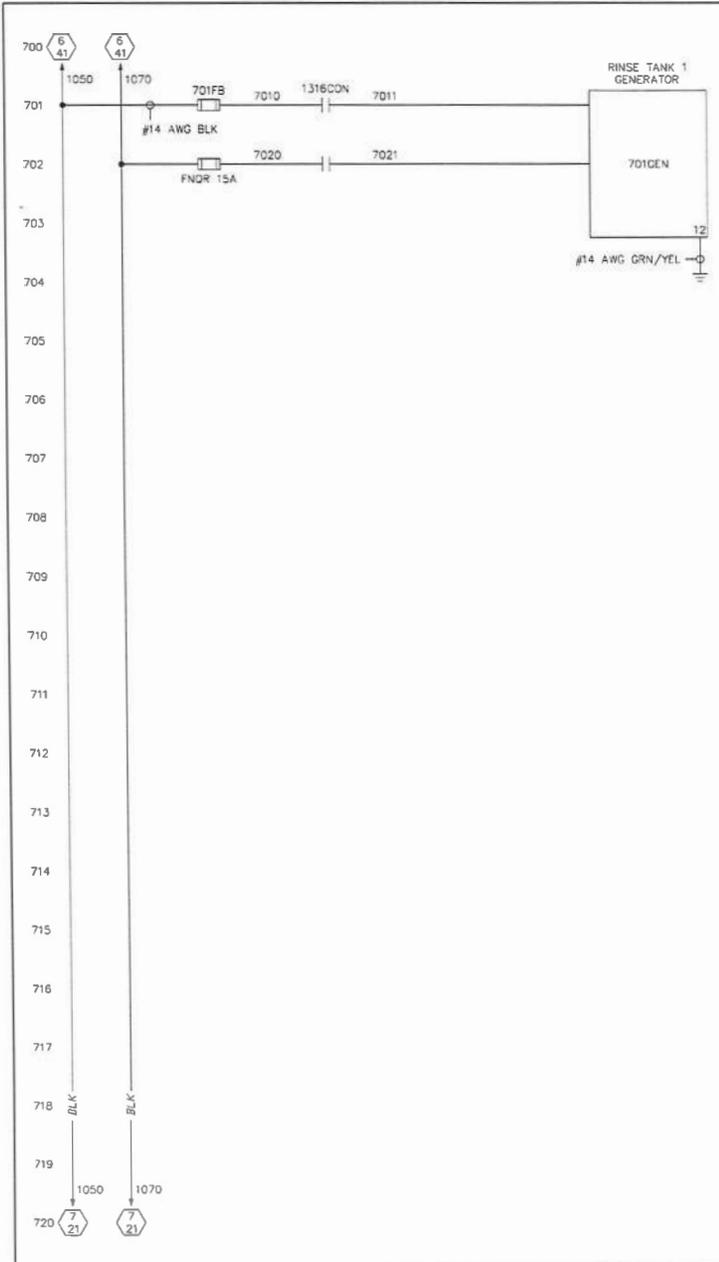
- NOTES:
1. SET SELECTOR SWITCH ON ALL POWER4FLEX 40P VARIABLE SPEED CONTROLLERS FOR SOURCING INPUTS (SRC)
  2. REMOVE THE ENABLE JUMPER WIRE BETWEEN PINS 1 AND 11 AND REMOVE THE ENABLE JUMPER.
  3. ENCODERS TO BE WIRED FOR 24VDC. ENCODER INTERFACE SELECTOR IS NOT USED AND CAN BE LEFT EITHER 5 OR 12V

DRN: BSH	DATE:	ENGR: BSH	DATE: 6/2/10
SCALE: -		DO NOT SCALE DRAWING	
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC	±	±	±
DECIMAL	±	±	±
INCH	±	±	±
		±	±
		±	±
P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL AQ-5-1728			
PART NUMBER 10-0303-002			
B FORMAT REVISION: A SHEET 5 OF 14			



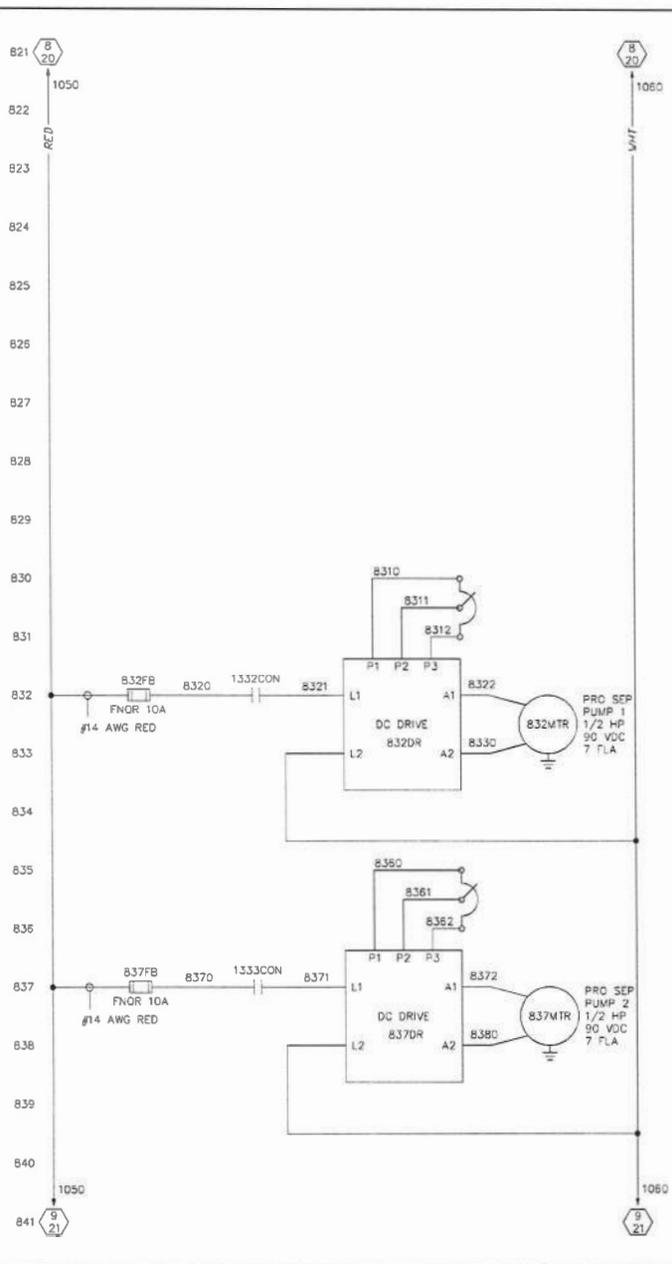
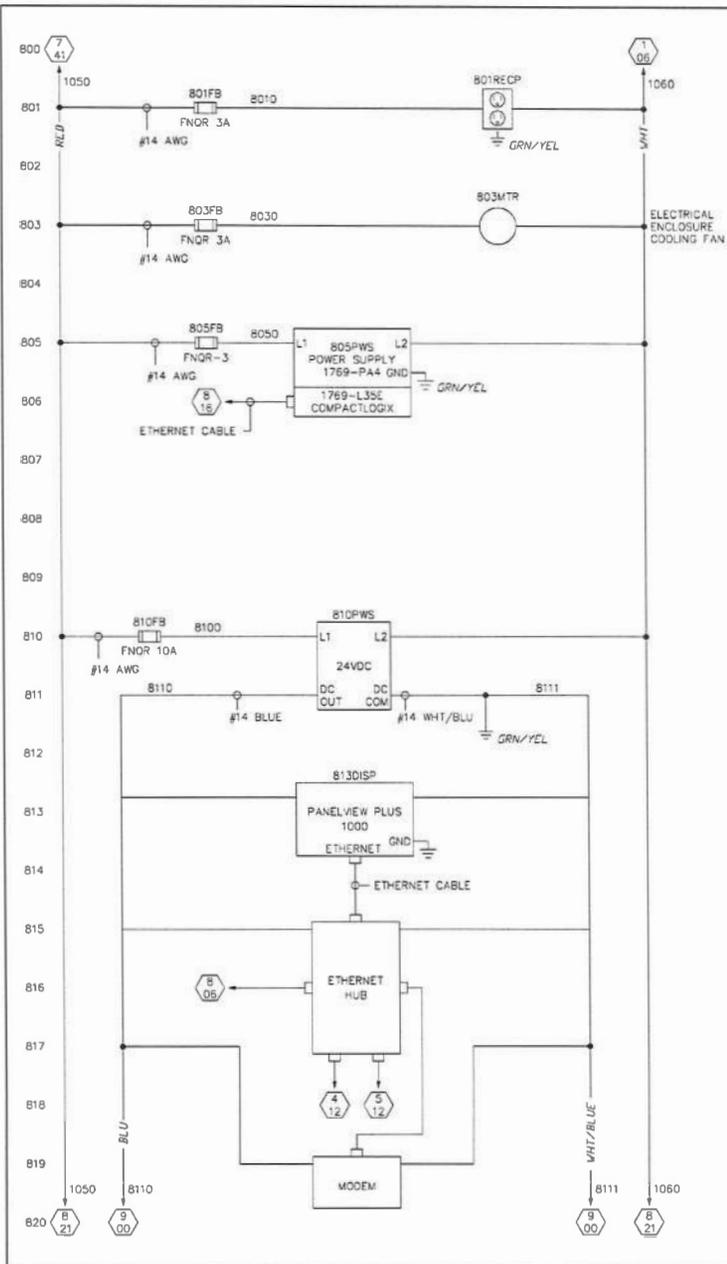
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	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

DRN: BSH	DATE:	ENGR: BSH	DATE: 6/2/10
SCALE: -		DO NOT SCALE DRAWING	
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
WTRG	±	±	±
SECAL	±	±	±
INCH	± .030	± .015	± 1"
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NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL AQ-5-1728			
PART NUMBER 10-0303-002			
B FORMAT		REVISION: A	SHEET 6 OF 14



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

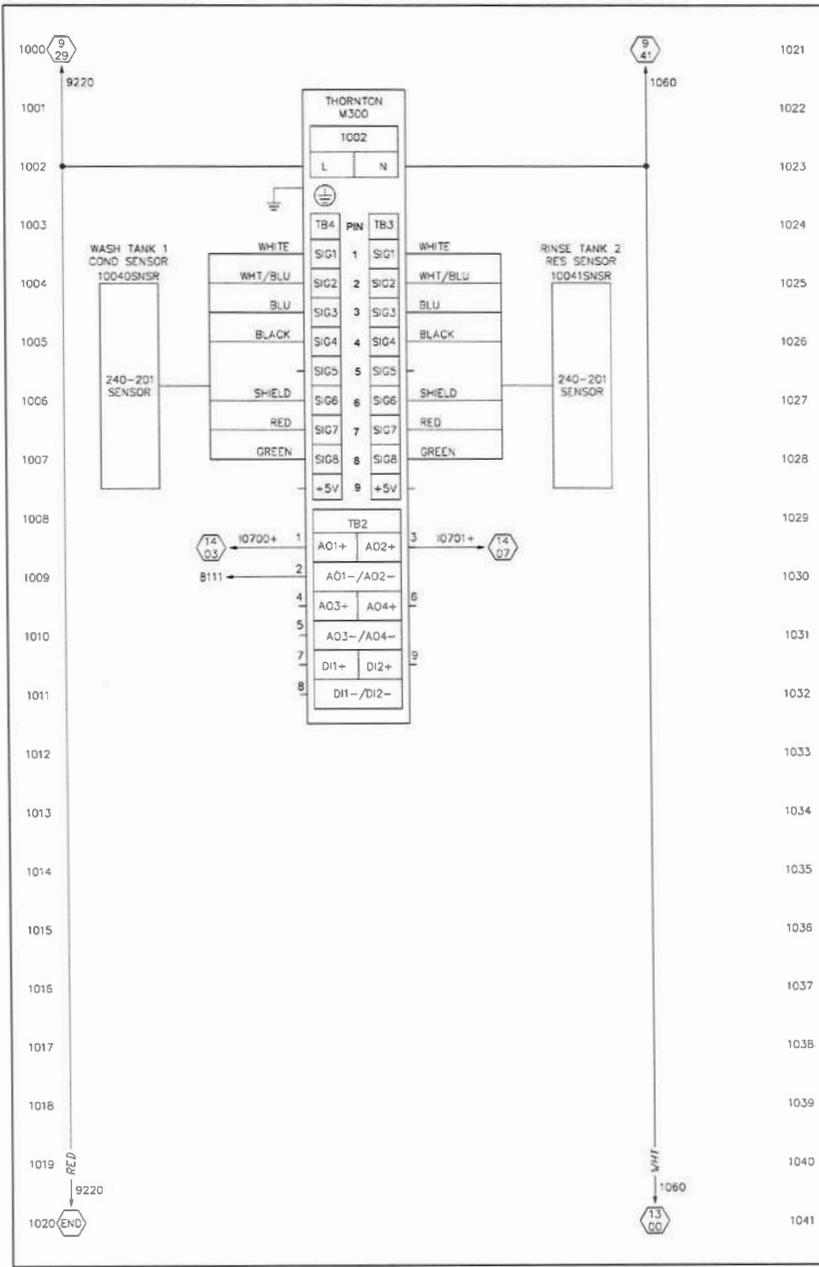
DRN: BSH	DATE:	ENGR: BSH	DATE: 6/2/10
SCALE: —	DO NOT SCALE DRAWING		
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC	±	XXX	FRACTIONAL
MM	±		1/32
DECIMAL	±	.030	ANGULAR
INCH	±	.015	± 1°
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P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL A0-5-1728			
PART NUMBER 10-0303-002			
B FORMAT REVISION: A SHEET 7 OF 14			



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

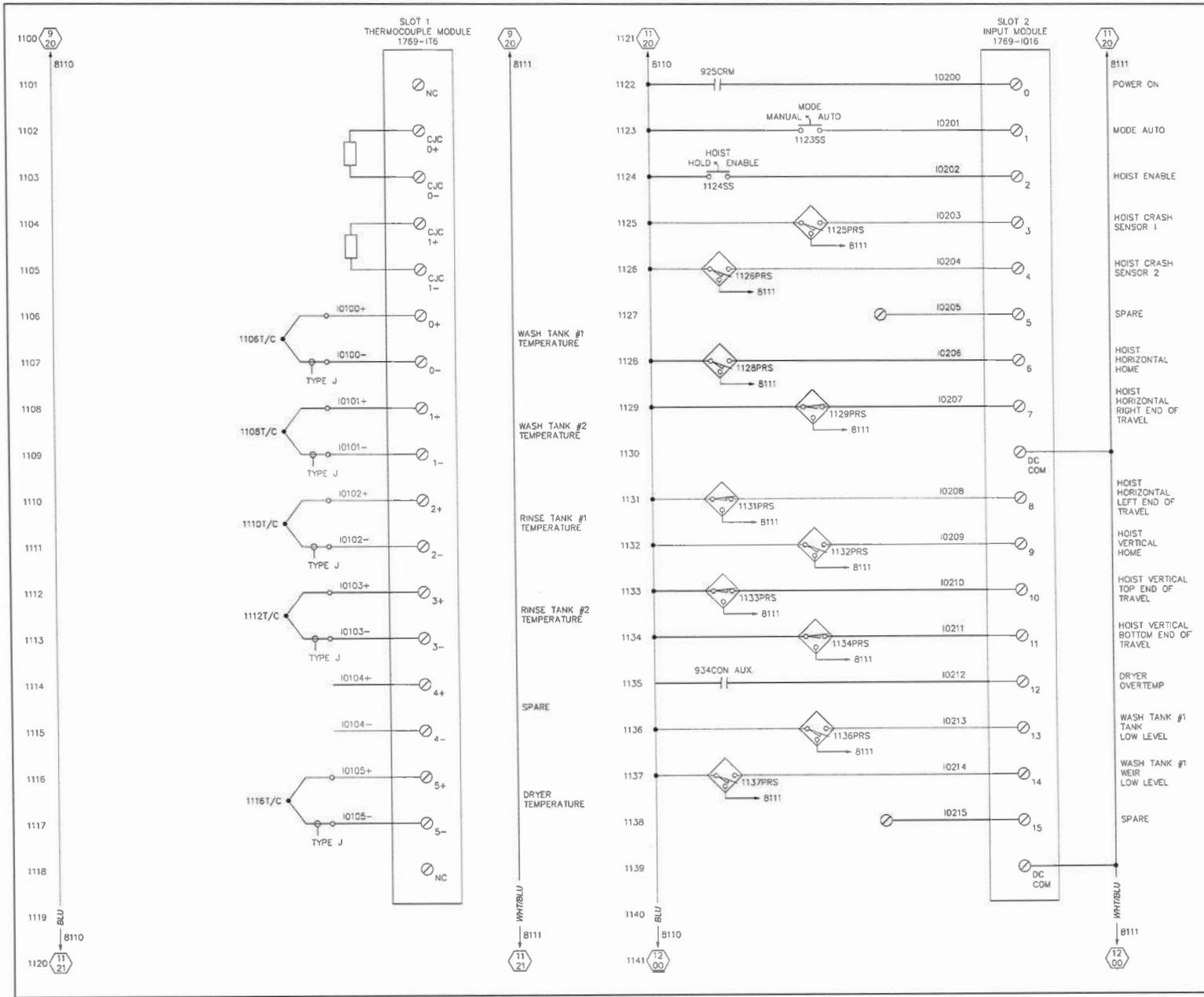
DRN: BSH	DATE:	ENGR: BSH	DATE: 5/2/10
SCALE: -		DO NOT SCALE DRAWING	
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC	XXX	XXXX	FRACTIONAL
DECIMAL	± .30	± .15	± 1/32
ANGULAR			± 1'
<small>THIS PRINT AND DESIGN AND DETAIL, INCLUDING HEREIN ARE THE PROPERTY OF BLACKSTONE-NEY ULTRASONICS AND ARE QUANTIFIED IN CONFIDENCE AND MUST NOT BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUBMITTED. IT MUST NOT BE REPRODUCED, REPRODUCED OR OTHERWISE USED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF BLACKSTONE-NEY ULTRASONICS. PERMISSION IS GRANTED TO REPRODUCE THIS DRAWING ONLY FOR THE PROJECT AND SYSTEM FOR WHICH IT WAS SPECIFICALLY APPROVED IN WRITING BY BLACKSTONE-NEY ULTRASONICS. IN WHOM ALL RIGHTS OF DESIGN AND INVENTION ARE RESERVED.</small>			
<b>BLACKSTONE-NEY ULTRASONICS</b>			
P.O. BOX 220 JAMESTOWN, NY 14702-D220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL AQ-5-1728			
PART NUMBER 10-C303-002			
B FORMAT REVISION: A SHEET 8 OF 14			



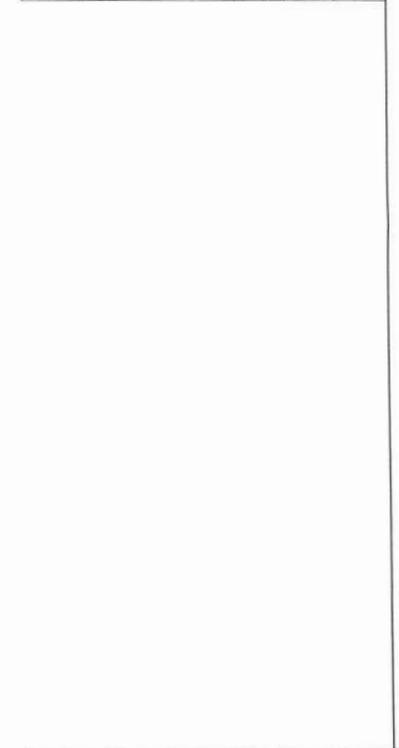


REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

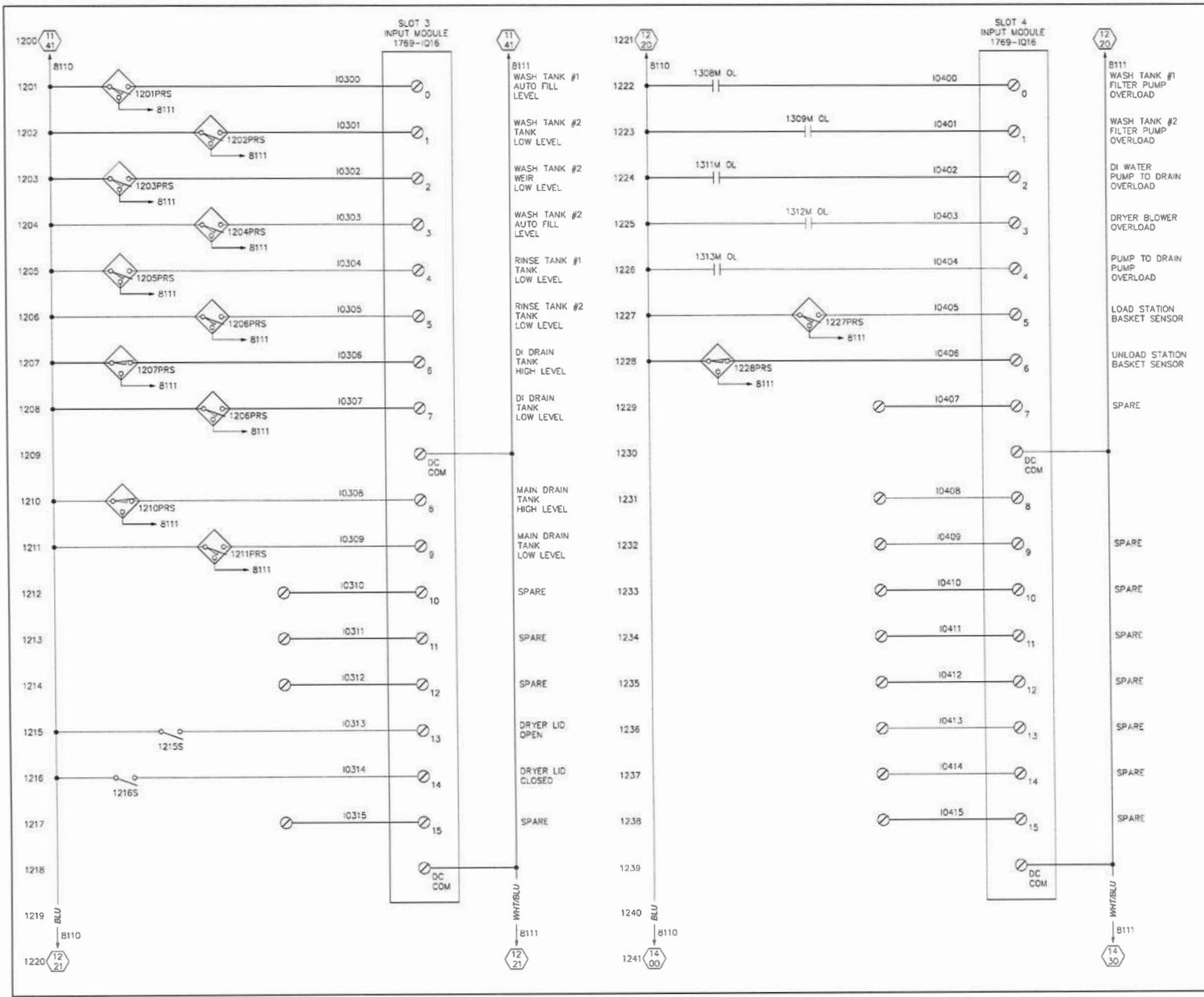
DRN: BSH	DATE:	ENGR: BSH	DATE: 6/2/10
SCALE: -		DO NOT SCALE DRAWING	
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC	XX	XXX	XXXX
FRACTIONAL	1/32		
DECIMAL	± 0.30	± 0.15	± 1"
<small>THIS PRINT AND DESIGN AND DETAIL ENCLOSED HEREIN ARE THE PROPERTY OF BLACKSTONE-NEY ULTRASONICS AND ARE NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF BLACKSTONE-NEY ULTRASONICS. UNLESS SPECIFICALLY APPROVED IN WRITING BY BLACKSTONE-NEY ULTRASONICS IN WRITING, ALL RIGHTS OF DESIGN AND INVENTION ARE RESERVED.</small>			
<b>BLACKSTONE-NEY ULTRASONICS</b>			
P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL AQ-5-1728			
PART NUMBER 10-0303-002			
B FORMAT REVISION: A SHEET 10 OF 14			



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

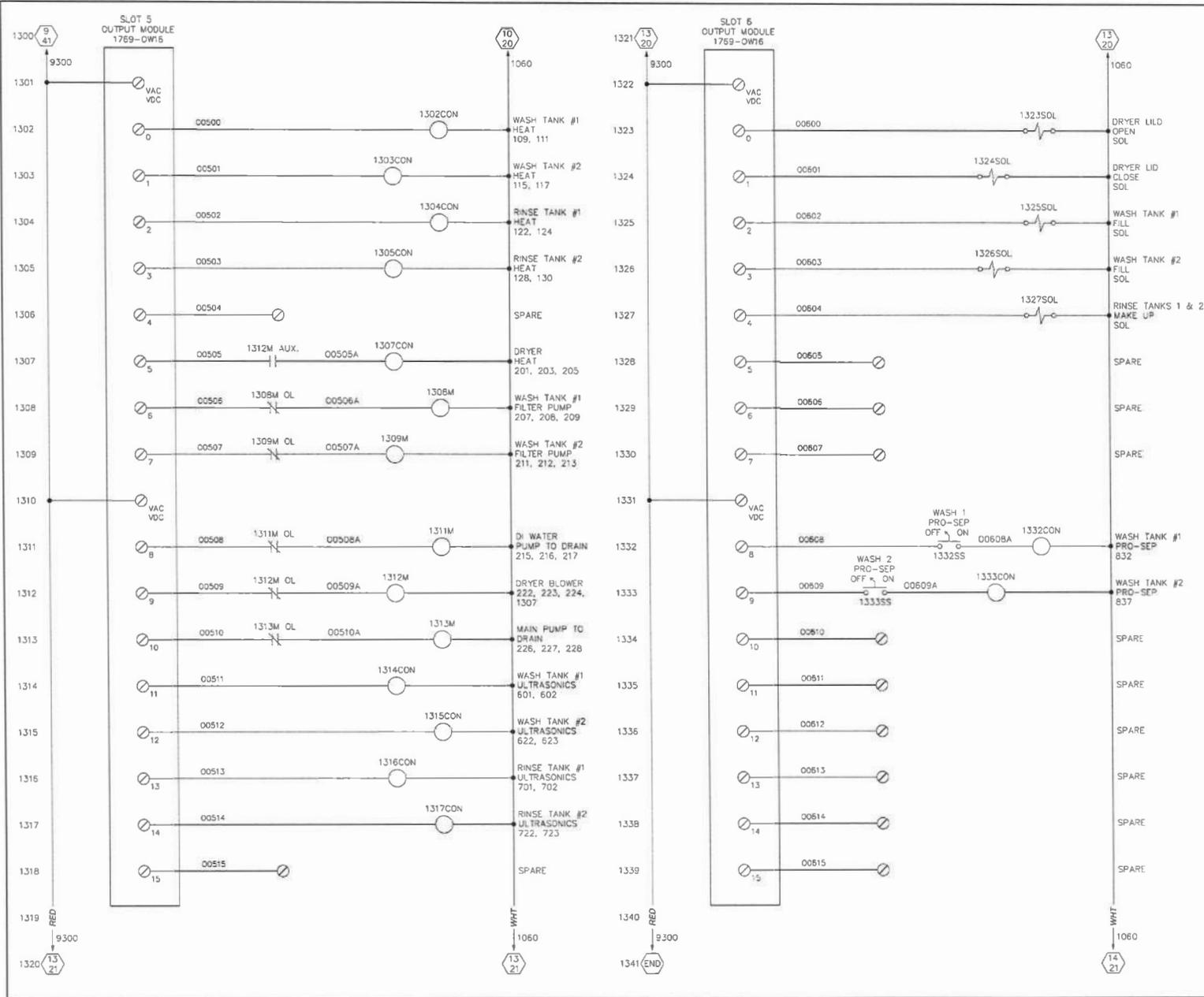


DRN: BSH	DATE:	ENGR: BSH	DATE: 6/2/10
SCALE: -	DO NOT SCALE DRAWING		
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC	mm	mm	FRACTIONAL 1/32
DECIMAL	inch	inch	ANGULAR 1°
<small>THIS PRINT AND DESIGN AND DETAIL UNLESS OTHERWISE NOTED ARE THE PROPERTY OF BLACKSTONE-NEY ULTRASONICS AND ARE QUOTED BY PERMISSION AND MAY BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SUBMITTED. IF ANY USE OF THIS DOCUMENT IS MADE WITHOUT THE WRITTEN PERMISSION OF BLACKSTONE-NEY ULTRASONICS, THE USER ASSUMES ALL LIABILITY FOR ANY DAMAGE, LOSS OF PROFITS, OR OTHER CONSEQUENCES THAT MAY BE INCURRED BY THE USER. THIS DOCUMENT IS PROVIDED AS IS WITHOUT WARRANTY OF ANY KIND, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM ALL APPLICABLE REGULATORY AGENCIES AND AUTHORITIES.</small>			
<b>BLACKSTONE-NEY ULTRASONICS</b>			
P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL AC-5-1728			
PART NUMBER 10-0303-002			
B FORMAT REVISION: A SHEET 11 OF 14			



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

DRN: BSH	DATE:	ENGR: BSH	DATE: 6/2/10
SCALE: -		DO NOT SCALE DRAWING	
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
DECIMAL	FRACTIONAL	ANGULAR	
± .030	± 1/32	± 1°	
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<b>BLACKSTONE-NEY ULTRASONICS</b>			
P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME ELECTRICAL SCHEMATIC FOR			
MATERIAL AQ-5-1728			
PART NUMBER 10-0303-002			
B FORMAT REVISION: A SHEET 12 OF 14			



REV	DESCRIPTION	DATE	APPROVAL	APPROVAL
	INITIAL RELEASE			
	PRODUCTION RELEASE			
	AS BUILT UPDATES	8/13/10	BSH	

DRN: BSH	DATE:	ENGR: BSH	DATE: 6/2/10
SCALE: - DO NOT SCALE DRAWING			
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC	mm	mm	FRACTIONAL
DECIMAL	±	±	±
	± 0.30	± 0.15	± 1/32
			ANGULAR
			± 1°

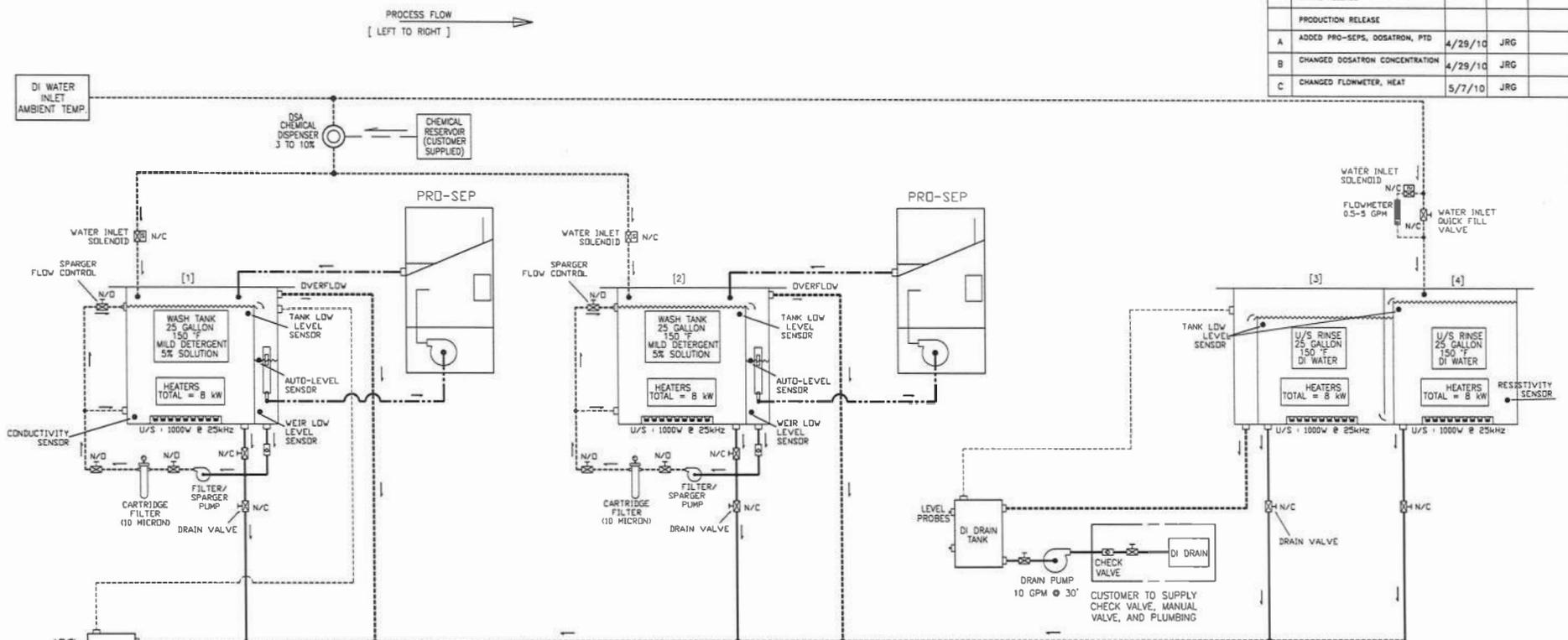
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**BLACKSTONE-NEY  
ULTRASONICS**

P.O. BOX 220 JAMESTOWN, NY 14702-0220  
 NAME ELECTRICAL SCHEMATIC FOR  
 MATERIAL AQ-5-172B  
 PART NUMBER 10-0303-002  
**B FORMAT REVISION: A SHEET 13 OF 14**



REV	DESCRIPTION	DATE	APPROVAL
	INITIAL RELEASE		
	PRODUCTION RELEASE		
A	ADDED PRO-SEPS, DOSATRON, PTD	4/29/10	JRG
B	CHANGED DOSATRON CONCENTRATION	4/29/10	JRG
C	CHANGED FLOWMETER, HEAT	5/7/10	JRG



- NOTES:
1. THIS IS A SCHEMATIC REPRESENTATION OF PLUMBING, ACTUAL LOCATIONS ARE NOT SHOWN.
  2. REFER TO PIPE LEGEND FOR PIPE/TUBE SIZES.
  3. TEMPERATURE WILL BE MAINTAINED IN THE RINSE TANKS WITH A MAXIMUM CASCADE FLOW OF .5 GPM

**APPROVAL DRAWING**

APPROVED

BY: \_\_\_\_\_  
 DATE: \_\_\_\_\_  
 APPROVED AS IS:   
 APPROVED WITH CHANGES NOTED:

PIPE LEGEND	
-----	1/2" S.S. TUBING
-----	3/4" S.S. TUBING
-----	3/4" S.S. PIPE
-----	1" NPT S.S. PIPE
-----	1.5" NPT S.S. PIPE
-----	1.5" HOSE
-----	3/8" FLEXIBLE HOSE

LEGENDS	
	-- BALL VALVE
	-- SOLENOID VALVE
	-- CHECK VALVE
	-- FILTER
	-- PUMP

DRN: KPM	DATE: 3/25/10	ENGR: KPM	DATE: 3/25/10
SCALE: -		DO NOT SCALE DRAWING	
<b>CAD PRODUCED DRAWING</b>			
TOLERANCE UNLESS OTHERWISE SPECIFIED			
METRIC	XX	XXX	XXXX
±	±	±	±
0.05	0.10	0.15	0.20
FRACTIONAL	± 1/32		
±	±		
0.005	0.005		
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<b>BLACKSTONE-NEY ULTRASONICS</b>			
P.O. BOX 220 JAMESTOWN, NY 14702-0220			
NAME PLUMBING SCHEMATIC			
MATERIAL AD-5-1728 WITH CAL-100			
MATERIAL AS NOTED			
PART NUMBER 10-0303-004			
B FORMAT REVISION: C SHEET 1 OF 1			

## 11.2 RECOMMENDED SPARE PARTS LIST

This is a list of possible failure components and replacement spares. Take into consideration your company's production demands when ordering quantities of needed spare parts, losses due to not readily available parts should be considered. If not ordering parts at this time please save this list for reference to part numbers when ordering in the future.

### 11.2.1 Mechanical Spare Parts List

Description	Part Number	UOM	Qty
<b>Mechanical Spare Parts - One Time Use</b>			
FILTER:OPEN AIR INTAKE	4490074	ea.	1.00
FILTER:CARTRIDGE:POLY:10 MICRON:10"	4490078	ea.	1.00
<b>Mechanical Spare Parts - Long Term</b>			
VALVE:SOLENOID:5 PORT:3 POSITION:CC:110 VAC:DIN CONNECTION:SURGE SUP W/ LIGHT	101664	ea.	1.00
BAR STOCK : UHMW : SQUARE - 3/4" X 3/4" , 200 F,(ORDERED IN 5 FT LENGTH)	103753	ea.	2.00
PUMP:CENTRIFUGAL:SS:1/2 HP:240/480 VAC:3 PH:60 HZ:3500 RPM:CARBON,SIL-CARBIDE,VITON SEALS	104898	ea.	1.00
SOLENOID VALVE:SS:110VAC:NC: 3/4" NPTZERO DIFF:DIN CONNECTOR	106390	ea.	1.00
SOLENOID VALVE:316SS:1/2" NPT:ZERO DIFFERENTIAL:120 VAC:DIN:SURGE SUPPRESSION:FPM SEAL	106613	ea.	1.00
POWER TRANS.:COUPLING:14MM X 14MM ID ENDS:NO KEYWAY:SERVO INSERT STYLE WITH CLAMPING HUBS	107587	ea.	1.00
GEARMOTOR:RATIO 6:1:230/460V-3PH-60HZ:1668 RPM INPUT:1/3HP:W/BRAKE-3.7FTLB 110/460VAC:18MM HOLLOW SHAFT:MOUNT POSITION V6:	107585	ea.	1.00
GEARMOTOR:RATIO 47:1:230/460V-3PH-60HZ:1668 RPM INPUT:1/3HP:25MM HOLLOW SHAFT:MOUNT POSITION B7:	107586	ea.	1.00
FLOW CONTROL:ELBOW:METER OUT:1/4:TUBE X 1/4"NPT	4530062	ea.	2.00
POCKET PULL:PLASTIC:BLACK	4660061	ea.	1.00
HANDLE:PLASTIC:BLACK	4660066	ea.	1.00
CAM FOLLOWER 1" DIA, 21/32 WIDE, SEALED	6000777	ea.	4.00

## 11.2.2 Electrical Spare Parts

Description	Part Number	UOM	Qty
<b>Controllers</b>			
PANELVIEW PLUS 1000 OPERATOR INTERFACE, TOUCHSCREENETHERNET & RS232, 3.1 FIRMWARE OR HIGHER	102034	ea.	1.00
MODULE:INPUT:24VDC SINKING/SOURCING:16 POINT	101061	ea.	1.00
PLC: COMPACTLOGIX POWER SUPPLY: 120/240 VAC INPUT 4A, 5VDC, 2A, 24VDC	103790	ea.	1.00
MODULE:16 POINT AC/DC RELAY OUTPUT	103791	ea.	1.00
MODULE:COMPACTLOGIX:CONTROLLER: ETHERNET CONTROLLER	103789	ea.	1.00
MICROLOGIX 1500 PROGRAMMABLE CONTROLLER THERMOCOUPLE MODULE, 6 CHANNEL	4880338	ea.	1.00
SENSOR: RESISTIVITY MONITOR	107264	ea.	1.00
SENSOR: RESISTIVITY SENSOR	101133	ea.	1.00
CONTROLLER:TEMPERATURE HIGH LIMIT:AUTO RESET:TYPE J THERMOCOUPLE:0-1000 DEGREES F:120VAC	103524	ea.	1.00
CONTROLLER:POWERFLEX 40P AC DRIVE:480VAC:3PH:1HP	107398	ea.	1.00
CONTROLLER:POWERFLEX ETHERNET ADAPTER	107399	ea.	1.00
<b>Sensors</b>			
SENSOR: LEVEL LIMIT SWITCH: NPT 3/4": 3 WIRE, PNP:10-35VDC: 212 DEG F M12: NEMA 4X: GENERAL PURPOSE	106585	ea.	2.00
PROX SWITCH (INDUCTIVE) 12MM, 10-30 VDC, NO, PNPSHIELDED, 3 WIRE, M12 QD	108318	ea.	2.00
SENSOR:PHOTOELECTRIC: RETRO-REFLECTIVE; DETECTING 1.5M: M12 CONNECTOR: PNP	106286	ea.	2.00
SENSOR:MTG. BRACKET:LANDSCAPE MOUNTING	106383	ea.	4.00
WIRE CONNECTOR:MINI:FEMALE:TYPE-J THERMOCOUPLE	4590102	ea.	1.00
WIRE CONNECTOR:MINI:MALE:TYPE-J THERMOCOUPLE	4590103	ea.	1.00
THERMOCOUPLE, KAPTON PEEL STICK TYPE J(ADHESIVE BACKED THERMOCOUPLE IN PARTS BOOK)	4620108	ea.	4.00
THERMOCOUPLE:TYPE- J: 3/16"DIA X 6"LONG:UNGROUNDDED	102367	ea.	1.00

CABLE: 4PIN M12 MICRO DC: 5M; STRAIGHT	108095	ea.	6.00
CABLE MALE M12 PLUG CONNECTOR WITH FAST CONNECTION SYSTEM	103178	ea.	6.00

### Heater Elements

HEATER:STRIP:1000W:240V	4690134	ea.	8.00
HEATER:FINSTRIP:1500W:240V19.5" X 18.5" X 15.25"	107976	ea.	4.00

### Relays, Contactors, and Motor Starters

CONTACTOR: 3 POLE: N.O. AUX.: 23/32 AMP:110/120 VAC COIL	4680194	ea.	4.00
OVERLOAD RELAY:SOLID STATE:3 PHASE:TRIP CLASS 10:1.0 - 5.0 AMP	105929	ea.	1.00

### Fuses

FUSE:KTK-R:20A:600V	4650063	ea.	9.00
FUSE:FNQ-R:15A:600V	4650181	ea.	10.00
FUSE:FNQ-R:3A:600V	4650190	ea.	10.00
FUSE:FNQ-R:6A:600V:TIME DELAYFNQ-R/CCMR	4650191	ea.	3.00
FUSE:FNQ-R:10A:600V:TIME DELAY	4650087	ea.	6.00
FUSE:600V:FRS-R:40A	4650154	ea.	2.00
FUSE:LOW PEAK:DUAL-ELEMENT:TIME DELAY:CLASS J:100 AMP	101431	ea.	3.00

### Pro Sep

VARIABLE SPEED DC MOTOR CONTROLLER	103165	ea.	1.00
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### 11.3 WARRANTY



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## **WARRANTY**

Manufacturer warrants that all Products meet Manufacturers production and quality assurance specifications before being released for distribution. Manufacturer further warrants that:

- (a) all products shall be free from defects in material and workmanship for a period of one (1) year from the date of shipment;
- (b) all ultrasonic generators shall be free from defects in material and workmanship for an additional one (1) year period (for a total of two (2) years) from the date of shipment; and
- (c) the bonding of transducers shall be free from defects in material and workmanship for a period of ten (10) years from the date of shipment.

Manufacturer shall replace or repair, at its option, any Product or item covered by this warranty which is determined by Manufacturer, upon examination, to be defective in workmanship or material within the applicable warranty period, provided that such Product or item has been properly installed, maintained, lubricated and serviced within the limits of normal usage as specified by Manufacturer and properly used under recommended operating conditions. SUCH REPAIR OR REPLACEMENT SHALL BE THE EXCLUSIVE REMEDY AVAILABLE IN CONNECTION WITH THIS WARRANTY.

This warranty shall not apply to: (a) cavitation erosion of tank and immersible transducer surfaces, which is a normal occurrence and develops over time in the operation of ultrasonic cleaning equipment; (b) any Product or component which has been misused, altered or modified; or (c) expendable items such as fuses, bulbs, or similar parts having a useful life inherently shorter than twelve (12) months.

Any components of the Products which are not manufactured by Manufacturer are sold subject to the respective manufacturer's conditions of sale, and Customer shall be entitled to such benefits as Manufacturer may receive under any contract with such manufacturer or under any warranty given by such manufacturer, provided such benefits are transferable. Manufacturer shall have no liability to Customer in the event any such manufacturer fails to honor any such warranty or to meet any liability which may arise by reason of any defect in such components or parts.

Any action for breach of this warranty or other action related to the sale of the Products must be commenced within one (1) year after such cause of action arises.

Any and all production or performance specifications supplied by Manufacturer are strictly estimates based upon Manufacturers analysis of the material or parts to be processed, interpretation of tolerance and accuracy requirements, assumptions of facilities available and operator skill. NO SUCH PRODUCTION OR PERFORMANCE ESTIMATE SHALL CONSTITUTE A WARRANTY OR GUARANTEE OF PRODUCTION OR PERFORMANCE RESULTS.

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