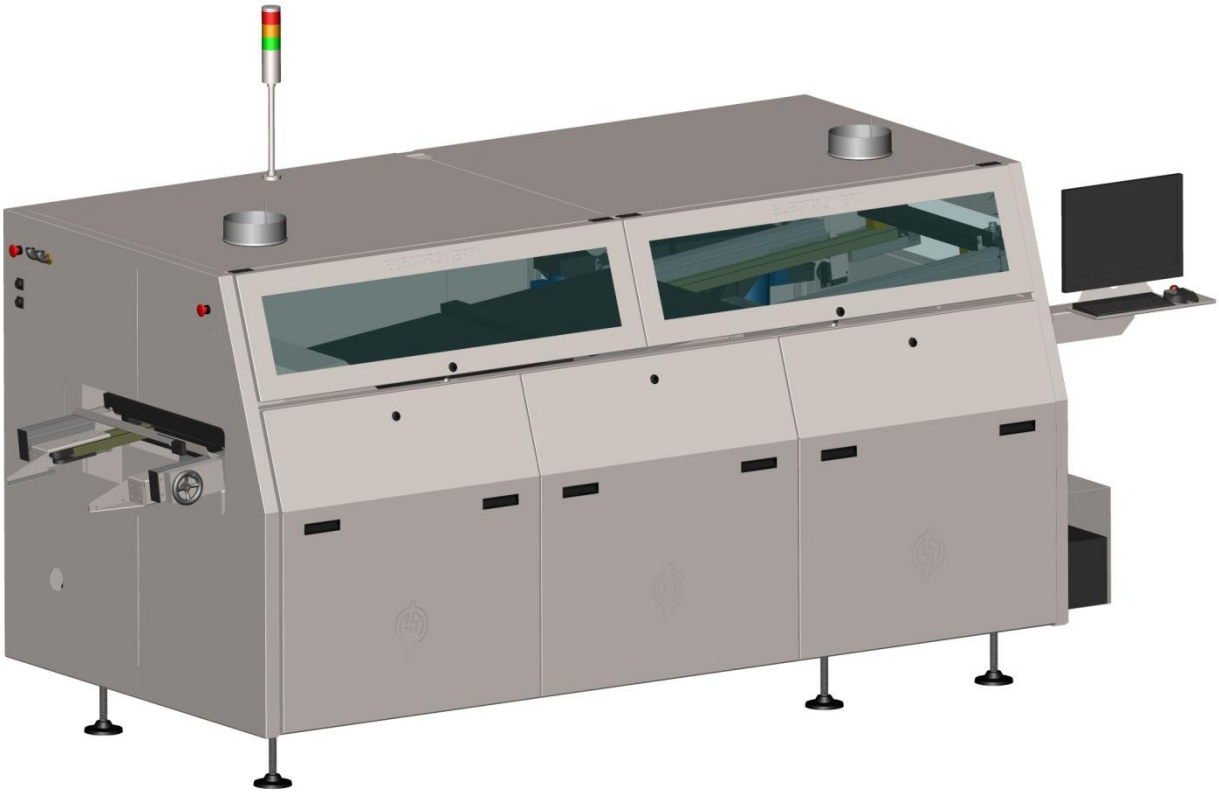
VectraES$_2$™

WAVE SOLDERING SYSTEM



MAINTENANCE & SETUP MANUAL

Manual Part #2-9317-971-00-0

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An ITW Company

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 maintenance 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.

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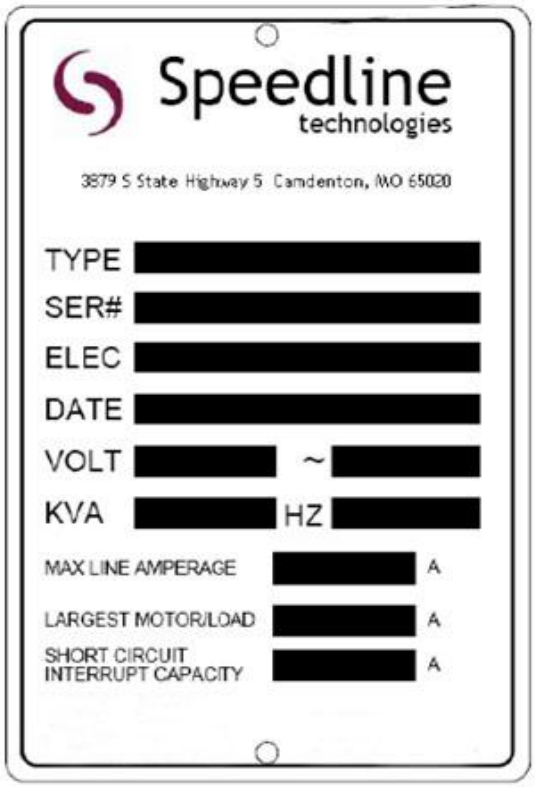
SECTION 1: SAFETY INFORMATION

1.1 SERIAL NAMEPLATE

Below is an example of a machine serial nameplate containing important information. The nameplate is located at the rear, unload end of the machine.



The serial nameplate information is to be recorded 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

Serial Number

Item/Kit Description

1.2 HAZARDS

Maintenance of this equipment exposes personnel to potential health and safety hazards. Listed below are warning tags installed on the system that warn of hazards that may be encountered during installation. Refer to the following information to ensure a safe operating environment for personnel.

Lead Hazard

Maintenance of this equipment may involve exposure to lead which may cause serious health hazards. Always wear protective clothing and an approved breathing apparatus when handling or working around products containing lead. Consult local authorities for acceptable lead limits in the air and in blood as these limits vary by region.

Burn Hazard

Maintenance of this equipment involves exposure to situations which may result in burn hazards if procedures are not properly followed. During normal operation, some components of this equipment operate at temperatures up to 301°C (575°F). The machine hoods, glass, conveyor, conveyor rails, fingers, rail guards, and boards moving through the system can reach temperatures in excess of 66°C (150°F) and can cause severe skin burns. The operator must use extreme caution and wear the recommended safety garments prior to coming in contact with hot surfaces or components.

Liquid Metal Eruption Hazard

Maintenance of this equipment involves exposure to molten metal which may erupt during the heat-up process. Also, any foreign liquids permitted to enter a molten metal solder pot will result in violent eruptions. Always wear appropriate safety glasses and high temperature gloves and garments when working around the solder pot.

Flammable

Maintenance of this equipment involves potential fire hazards due to excessive heat, as well as the normal sparks created by electric motors during operation. Flux and solvents used in the soldering process may contain flammable components. Keep all other flammable materials and solvents clear of the solder machine. Never stop the system with boards inside the machine.

Electrical Hazard

Maintenance of this equipment involves exposure to high voltage, which 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. Prior to applying power for the first time, ensure that the system is properly grounded.

Mechanical Hazard

Maintenance of this equipment involves exposure to mechanical hazards. Stop all moving parts when making adjustments or performing maintenance. 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.

Weight Hazard

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, 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.

Breathing Hazard

Noxious fumes are created during the soldering process. The gases and vapors emitted from the solder and flux are contained in the machine and should be avoided. Inhaling noxious vapors may cause headaches, eye redness, stomach aches, and breathing problems.

Compressed Gas Hazard

Compressed air and nitrogen can cause explosion of components inside the machine if not regulated below the maximum pressure as listed in the Engineering Data Sheet.

Foreign Material Hazard

Supply the machine nitrogen inlet only with nitrogen that has a purity of ≤4ppm. Use of other gases could interfere with the process and introduce additional safety hazards.

Skin Irritation Hazard

When using certain chemicals such as lubricants or solvents, it is important to follow the MSDS guidelines for proper handling and usage. Wear appropriate clothing and safety articles when using chemicals.

Inerting Hazard

Running the machine with nitrogen purges the oxygen from the space. This can lead to asphyxiation if the machine is not properly exhausted.

1.3 SAFETY PRECAUTIONS

Post electrical safety lock-out and tag-out procedures in the work place and ensure that all electrical, service, and maintenance personnel are familiar with the appropriate procedures. Mark and label all power supply sources used for the equipment to ensure that the lock-out and tag-out process is easily accomplished. Ensure an adequate exhaust system is installed that filters and monitors the system. Clean and monitor the exhaust ventilation system on a regular basis.

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

Keep an approved fire extinguisher near the machine at all times. Familiarize all personnel with the operation and use of the fire extinguisher. When extinguishing a flux fire, first turn off the system’s input power. Do not point the extinguisher directly at the flux or solder.

Maintain a safety perimeter of at least 1219 mm (48 in.) around the machine for efficient operation and maintenance.

Exercise caution when using strong cleaning agents, solvents, lubricants 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.

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

Remove all protective clothing and wash thoroughly before eating, drinking, or smoking.

1.4 LOCK-OUT / TAG-OUT

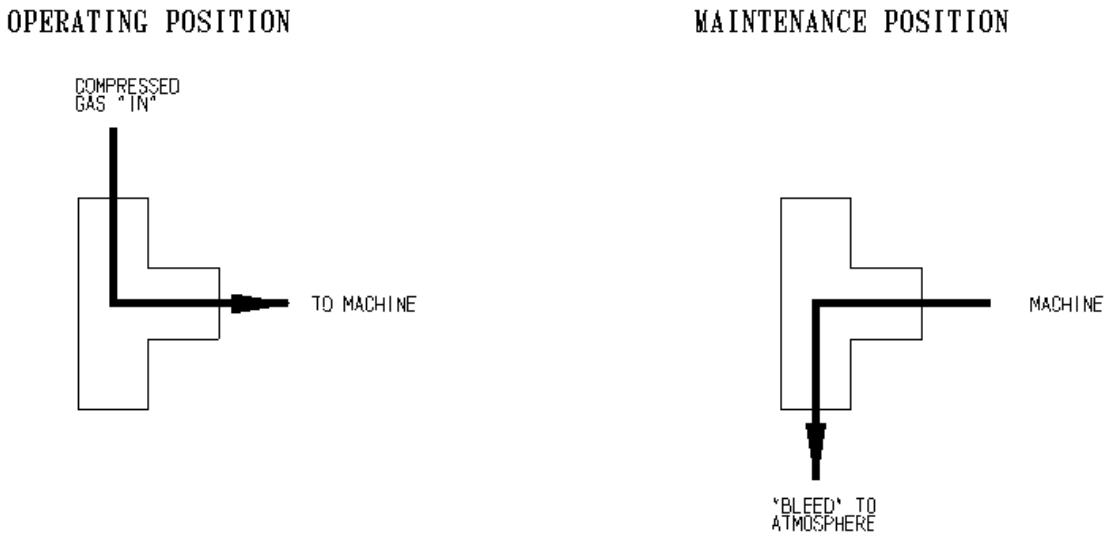
Be sure to perform Lock-out / Tag-out steps before beginning maintenance, installation, or upgrade procedures. Since lock-out/tag-out procedures and policies vary from company to company, the information here is provided as a recommended guideline. Each company must establish their own specific policies and procedures.

Attach Facility Lock-Out/Tag-Out Devices:

1. Ensure there are no boards or other product in the system.
2. Notify all affected employees.
3. Locate and identify all facility energy sources used, potential hazards, and all control devices.
4. Turn off all operating controls.
5. Locate the facility main power input to the system.
6. Turn the facility main power input device to the “OFF” or “STOP” position.
7. Secure the facility main power lock-out device in place.
8. Turn the facility compressed gas supplies to the “OFF” position.
9. Secure the facility compressed gas supply lock-out device in place.
10. Test operating controls. Put all controls in the “ON” position. Be sure no one can get hurt before testing.
11. Return all operating controls to the “OFF” position before proceeding.

Attach Machine Lock-Out/Tag-Out Devices:

1. Locate the main power disconnect switch at the rear of the system and turn to the “OFF” position.
2. Pull the tab and insert the lock-out device.
3. Secure the main power lock-out device in place.
4. Verify all manual compressed gas regulators and flow control valves for any fluxer/solder options are open to allow gas lines to be relieved of pressure.
5. Slowly turn the customer supplied 3-way manual diverting valves on the compressed gas inlets to the maintenance position to bleed the gas lines inside the machine. It is recommended that a rigid bleed line be installed along with the diverting valve to direct bleeding gas safely away from maintenance personnel.



6. Secure the compressed gas lock-out device in place.
7. The system is ready for maintenance, installation, upgrade, or repair procedures.

Remove Lock-Out/Tag-Out Devices:

1. Notify all affected employees.
2. Remove the lock-out device from the compressed gas diverting valve and return the valve to the operating position.
3. Remove the lock-out device from the facility compressed gas supplies.
4. Remove the lock-out device from the facility main power source.
5. Turn the facility main power source and compressed gas supplies to the “ON” position.
6. Remove the main power lock-out device from the rear of the machine.
7. Place the main power disconnect switch in the “ON” position.
8. Resume normal system operation.

1.5 REMOVAL OF DROSS

Breathing lead dust, which is nearly invisible, can cause lead poisoning. Always ensure the solder system ventilation is on and operating at the specifications listed in the **Engineering Data Sheet** or **Sales Drawing** prior to working around the solder pot. To avoid inhalation, wear the proper safety approved breathing apparatus recommended by the solder supplier for use with wave soldering equipment. Remove all protective clothing after de-drossing and store in a place where it will not spread contamination. Wash thoroughly before eating, drinking, or smoking after working around lead.

The dross container must have a lid and be closed to prevent dust scattering during handling and transporting dross. Airborne particles can be minimized by dampening with water after it has cooled to room temperature. The solder pot and container to which the dross is transferred must be enclosed and under effective exhaust ventilation. A method should be developed for dross removal within the machine enclosure. Where this is not practical, the possibility of providing local exhaust ventilation should be considered to minimize the escape of dross particles into the atmosphere.

Return the dross to a secondary smelter for reclamation of metal contents.

1.6 EXHAUST VENTILATION CLEANING

Clean the exhaust ventilation system on a regular basis as the fumes generated during the normal wave soldering process may contain lead particles. It is essential to install an adequate exhaust ventilation system capable of removing potentially dangerous lead emissions from the machine. Refer to the **Engineering Data Sheet** or **Sales Drawing** for exhaust capacity requirement and follow the below recommendations.

1. Establish an exhaust filtration system which is based on activated carbon as a filter medium. This system must be placed in-line with the exhaust venting system so that the emissions created from the soldering processes are captured. Also ensure that the units do not interfere with the soldering operations.
2. Monitor the lead content of the air in the workplace at regular intervals during operations. Check air quality on a regular basis due to variables in the environment that may cause changes in the movement of air throughout the course of a working day.
3. On a scheduled basis, dismantle and clean the exhaust ventilation duct work and filtration media using the appropriate safety measures for handling lead. Regular cleaning prevents contaminant build-up, reduces the risk of fire, and improves the efficiency of the exhaust system.

1.7 MAINTENANCE SCHEDULE

Maintenance Procedure	Hours of Operation				
	8	40	160	520	1040
Clean incoming board detect sensor	●				
Inspect conveyor for smooth operation	●				
Verify lubrication of conveyor chains/width shafts	●				
Verify lubrication of conveyor drive mechanism	●				
Inspect for bent or dirty conveyor fingers	●				
Clean finger cleaner screen filter	●				
Clean any spills on/around fluxer and preheaters	●				
Wipe residue from fluxer airknife (if equipped)	●				
Wipe residue from underneath top preheaters/covers	●				
Remove dross from solder surface	●				
Verify flux and solder levels	●				
Clean inside and outside of machine windows	●				
Wipe residue/debris from interior/exterior of machine	●				
Lubricate conveyor chain, shafts, drive mechanism		●			
Clean finger cleaner brushes, nozzles, and trays		●			
Clean foam fluxer aerators (if equipped)		●			
Inspect calrod preheater elements		●			
Verify pump belt tension		●			
Clean solder level sensor, bar feeder (if equipped)		●			
Clean solder wave height sensor (if equipped)		●			
Clean electrical cabinet cooling fan filters		●			
Inspect conveyor width adjust chain tension			●		
Clean finger chains and conveyor rails			●		
Clean finger cleaner reservoir			●		
Inspect fluxer tubing for cracks, leaks, etc.			●		
Lubricate fluxer drawer slides			●		
Lubricate solder pot jacking stand tubes/chain			●		
Clean residue from exhaust sensor lines			●		
Clean solder nozzles, flowducts, pumps, etc.			●		
Clean convection preheater blowers (if equipped)				●	
Check solder contamination level				●	
Inspect electrical connections					●

SECTION 2: SYSTEM SETUP

2.1 THEORY OF OPERATION

Once the VectraES$_2$™ main disconnect switch is activated, the machine powers up the computer and the machine software running under Windows XP starts up and is ready for operation. The VectraES$_2$™ modules and parameters are set via the user interface prior to processing product.

After all system parameters have been satisfied, PCB's can be placed onto the conveyor system at the load end of the machine. The conveyor system transports the PCB's through the subsystem components.

A photocell sensor at the load end of the conveyor detects product entering the system. When product passes the photocell, a signal is sent to the VectraES$_2$™ software to start counting the PCB's being processed.

When operating in Standby mode, the photocell communicates to the software when boards are no longer present in the machine within a defined window. Standby allows the solder wave(s) to run at reduced speeds until boards are detected entering the system again in order to reduce dross formation.

As product passes over the fluxer, flux is applied to the bottom side of the board. Flux application is available in either foam or spray form. Foam fluxers operate continuously after activation until manually deactivated through the system software. Spray fluxers are configured with separate photocells which activate the flux unit as product passes. Either flux module used incorporates an exhaust hood to extract fumes.

When PCB's exit the flux module, they begin entering the preheat zone to activate and dry the flux. Preheat is also important in heating the PCB's to a specific temperature to prevent thermal shock upon entering the solder wave, as well as ensuring proper solder flow to components and circuitry.

Preheater temperatures are monitored through the VectraES$_2$™ software. Temperature is automatically adjusted as necessary to maintain the desired parameter setpoint defined in the recipe. It is important that operators determine preheat parameters required for each preheat module to achieve optimum soldering results for each product being processed.

Next, the PCB's are conveyed across the solder wave(s). Solder is pumped from the solder pot through the solder nozzle(s). As solder is being pumped it forms a wave of solder which is applied to the bottom side of the board as it is conveyed across. The PCB's then exit the machine at the unload end of the cabinet via the conveyor system.

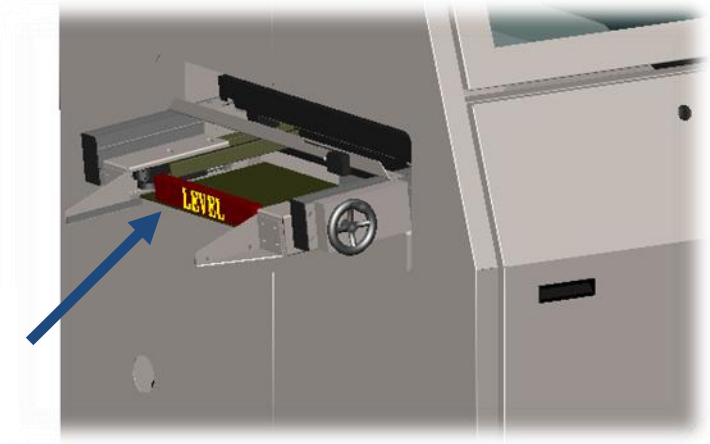
The VectraES$_2$™ main exhaust system extracts and vents fumes out of the machine via the customer supplied exhaust ventilation system.

2.2 CONVEYOR SETUP

Set up the conveyor by verifying parallelism and levelness using the following procedures.

1. Use a tape measure to check the distance between the front and back conveyor rails at each width adjust screw shaft.

2. If the distances measured at all three (3) locations are within 1.5 mm (0.06 in.) the conveyor is within tolerance. If it is outside this tolerance consult the Corrective Maintenance section of this manual for adjustment procedures.
3. Place a board or plate in the conveyor at the load end of the machine making certain it is completely seated and positioned in the fingers.
4. Place a spirit level across the plate perpendicular to board travel.



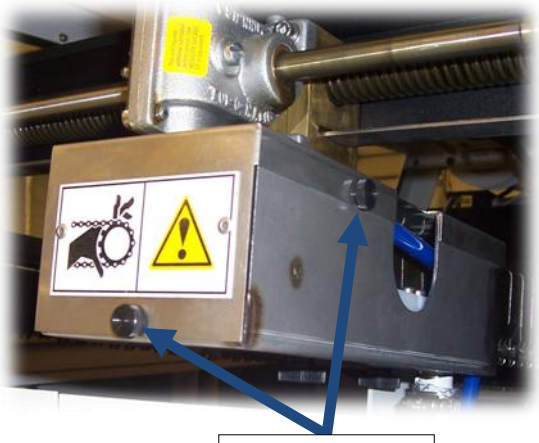
5. If conveyor is not level, verify that the machine frame is level.
6. Consult the Corrective Maintenance section of this manual if adjustment is necessary.
7. Repeat steps 3 through 6 at the unload end of the conveyor.

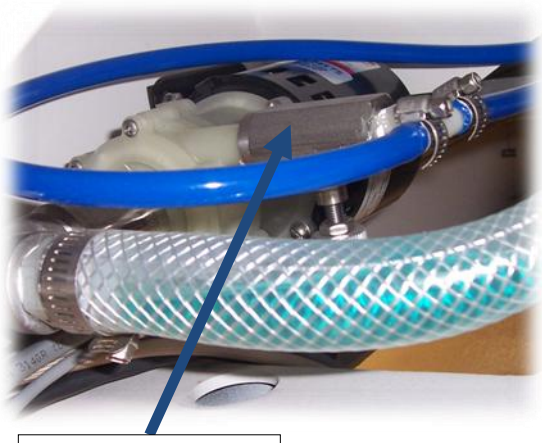
2.3 FINGER CLEANER SETUP

Set up the finger cleaner using the following procedures.

1. Access the finger cleaner tank through the rear, unload door.
2. Verify the drain valve located under the tank is completely closed before filling.

3. Remove cover and fill the reservoir with solvent that is compatible with the machine and process chemistry. Fill to about 25 mm (1 in.) below the top of the tank. Do not overfill. Re-install cover.
4. Turn on the finger cleaner pump and verify fluid flow through each finger cleaner nozzle assembly. The nozzles are accessed by loosening the two (2) small thumb screws and removing the cover on each assembly. The flow can be increased or decreased as desired by adjusting the flow control valve mounted near the pump under the finger cleaner reservoir.





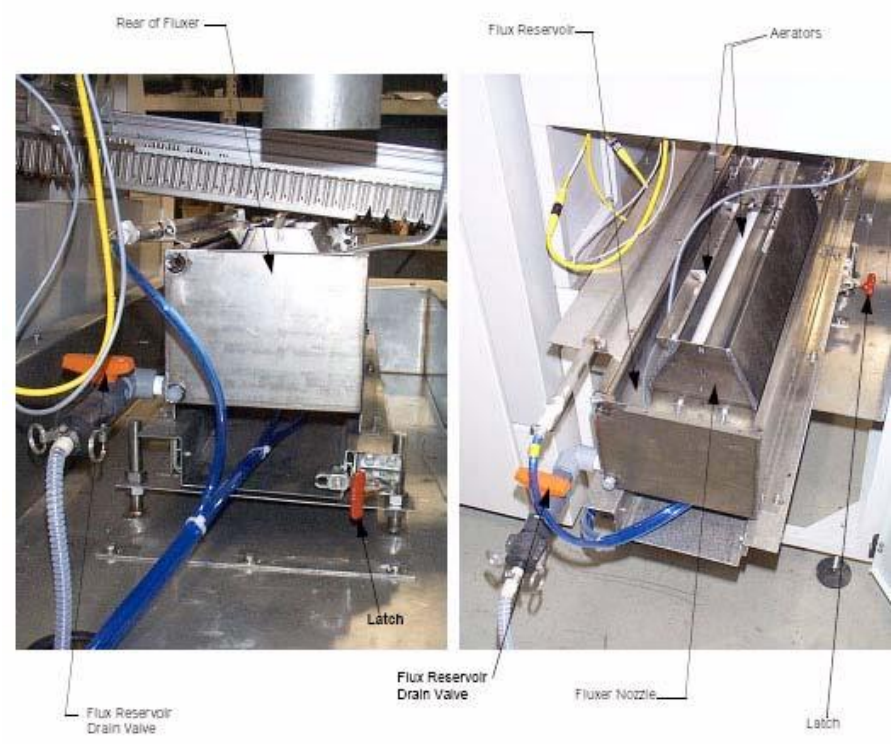
2.4 FLUXER SETUP

Set up the fluxer using the following procedures. If equipped with a ServoSpray™ or ServoJet™ fluxer, follow steps 1, 2, &10 and then refer to the corresponding fluxer manual for further instructions.

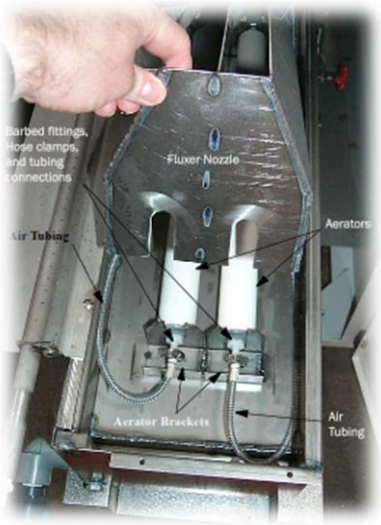
The foam fluxer consists of a fluxer reservoir, nozzle, aerators, airknife, and pneumatic controls for process regulation. The aerators are submerged in the flux under a nozzle. When the fluxer is activated, air is introduced to the aerators and forced through the pores of the aerators causing the flux to foam up inside the nozzle, forming a foam head on top of the nozzle. As a PCB passes over the foam head, the underside of the PCB is coated with a flux film. After this the PCB passes over an airknife that blows excess flux from the PCB and evenly distributes the flux over the entire bottom

surface of the PCB. The pneumatic controls allow for manual adjustment of the foam head and airknife pressure.

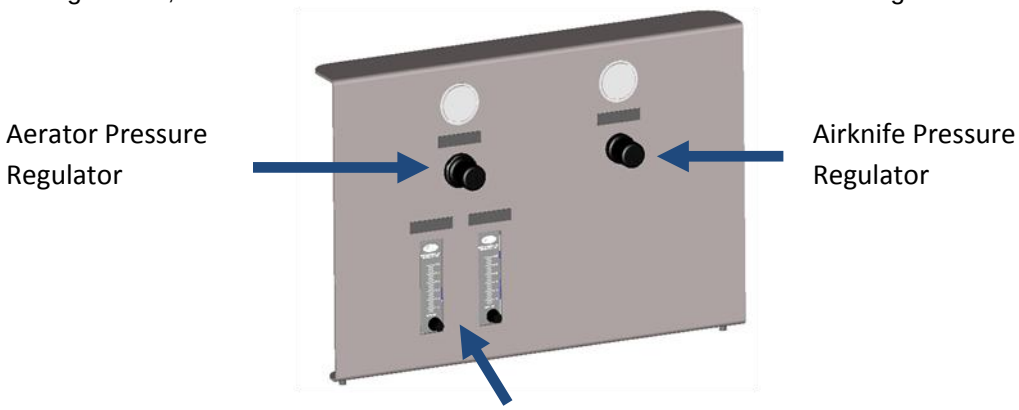
1. Access the fluxer through the rear, load door.
2. Place a spirit level on the fluxer and verify levelness in both X and Y directions. If adjustment is necessary, there are four (4) standoff bolts in each corner of the fluxer support. Recommended foam fluxer height is approximately 12.7 mm (0.50 in.) from the bottom of the PCB to the load side of the nozzle.



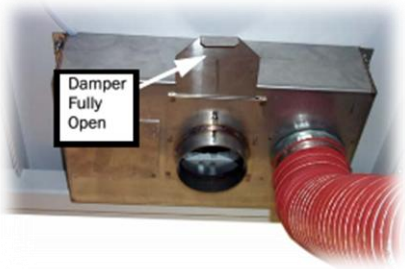
3. Slide the fluxer out from the rear and remove the fluxer nozzle from the reservoir.
4. Remove the aerators from the cleaning reservoir and connect the air line tubing in the fluxer reservoir to each of the barbed ends on the aerators and secure with hose clamps.



5. Install aerators in the brackets mounted to the base of the fluxer reservoir and re-install the fluxer nozzle.
6. Adjust the airknife by loosening the set screw at the rear of the unit. Recommended position is between vertical (0°) and ten degrees (10°) toward the load end of the system.
7. Verify the drain valve on the fluxer tank is completely closed before filling.
8. Fill the reservoir with flux that is compatible with the machine and process chemistry. Fill to 25 mm (1 in.) above the top of the aerators.
9. Use the flow and pressure controls on the pneumatic panel at the front of the machine to optimize the aerator and airknife settings. A typical foam head is approximately 13 mm (0.5 in.) high with small uniform bubbles and typical airknife operating pressure is 103.4 kPa (15 psig). For best foaming results, refer to the flux manufacturer's data for recommended settings.



10. Open the slide damper fully on the load exhaust manifold to maximize fume evacuation from the main machine enclosure. This damper can be adjusted to a slightly closed position if more exhaust is required at the flux exhaust hood and less is required from the main machine enclosure. This damper should never be fully closed.



2.5 PREHEATER SETUP

The machine may be configured with calrod radiant heaters, forced-air convection heaters, or a combination of the two. Forced-air convection generally provides more efficient heat transfer, better temperature uniformity, and improved drying of water based fluxes compared to radiant heat. Top preheaters are mounted in fixed-position trays with no adjustment required. Bottom preheaters can be set up for required lead clearance using the following procedures.

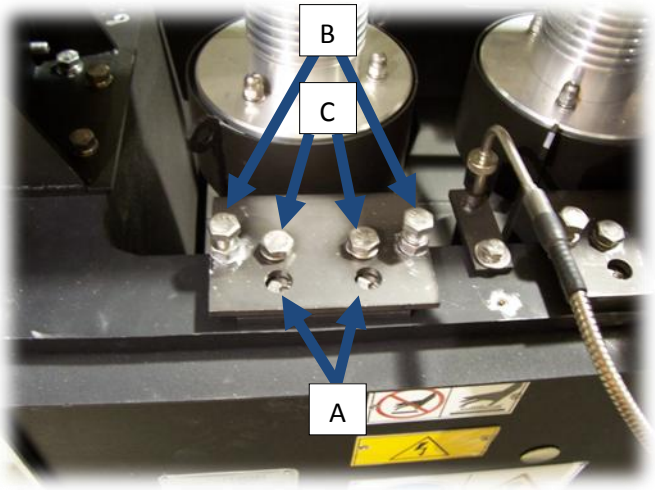
1. Access the heaters by raising the front machine hoods and removing the front access panels.
2. Measure the distance from the highest point of each bottom preheater to the bottom of the PCB. Recommended setting is 12.7 mm (0.50 in.) clearance.
3. If additional lead clearance is required, preheaters can be lowered by removing each of the four (4) mounting bolts one at a time and relocating in another hole. Each staggered hole corresponds to a change of 6.4 mm (0.25 in.) of lead clearance.

2.6 SOLDER MODULE SETUP

The Ultrafill™ nozzle system provides a soldering solution to reduce process defects, minimize costs, and lower the daily maintenance requirements in both tin-lead and lead-free soldering. The unique design features allow either air or nitrogen operation without the need to change components. Detailed assembly drawings of all solder module components are included in the machine package and are a good reference when performing the following procedures.

For optimum performance of the Ultrafill™ system, it is important that the nozzle and flowduct settings remain consistent and the solder level is maintained at a height of no more than 12.7 mm (0.50 in.) from the top of the solder pot. The system is designed to be self-positioning and require only minor adjustments after initial setup. A solder nozzle setup tool has been provided in the machine toolkit to aid the following setup process.

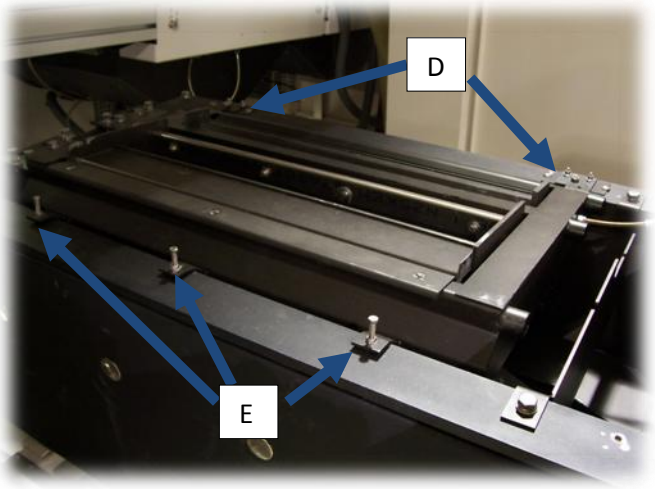
1. Refer to the following pictures for identification of all adjustment points for the solder module.



A: Load-to-unload nozzle positioning bolts

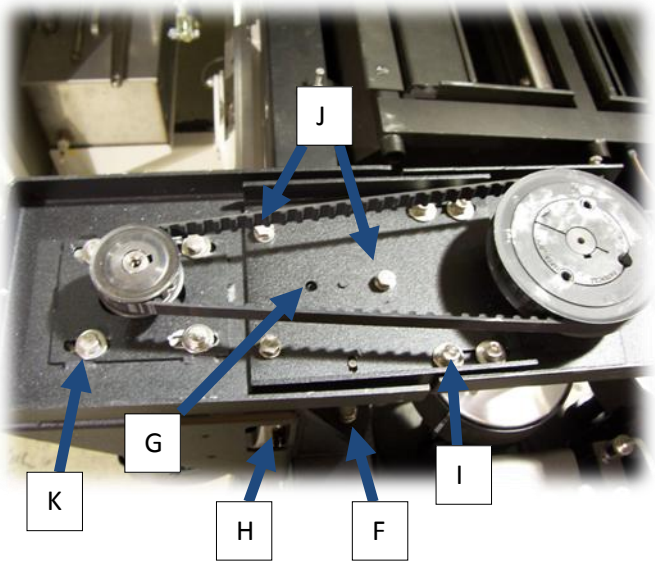
B: Front-to-back and load-to-unload nozzle leveling bolts

C: Lockdown bolts used to secure nozzle/flowduct positioning after setup



D: Front-to-back and load-to-unload Ultrafill™ shroud positioning bolts

E: Ultrafill™ shroud height adjustment bolts



F: Front-to-back motor bracket adjustment bolts

G: Motor bracket height adjustment bolt

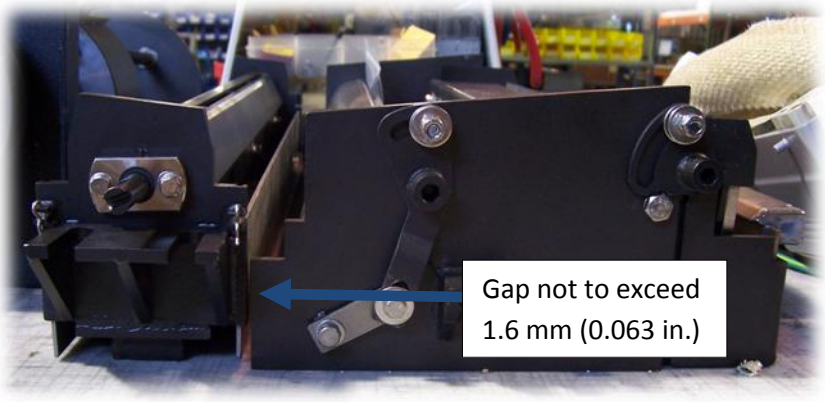
H: Motor bracket height lock down bolts

I: Solder pump load-to-unload adjustment bolts

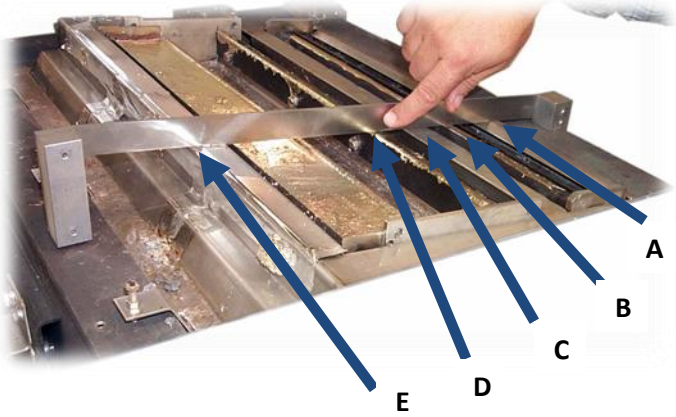
J: Solder pump lock down bolts

K: Belt tensioning bolts

2. If equipped with a dual wave system, position nozzles using positioning bolts “A” so that there is no more than 1.6 mm (0.063 in.) gap between the nozzle frames. The Ultrafill™ shroud must not be installed in order to verify this.



3. Place the Ultrafill™ shroud on the solder pot and use positioning bolts “D” to align the shroud with the nozzles.
4. Place the nozzle setup tool as illustrated below and verify all points of contact. Use adjustment bolts “B” and “E” to set nozzles and shroud to these points. This sets the nozzles on a 6° plane that is at the optimum height of 3.0 mm (0.125 in.) above the leading edge of the solder pot.

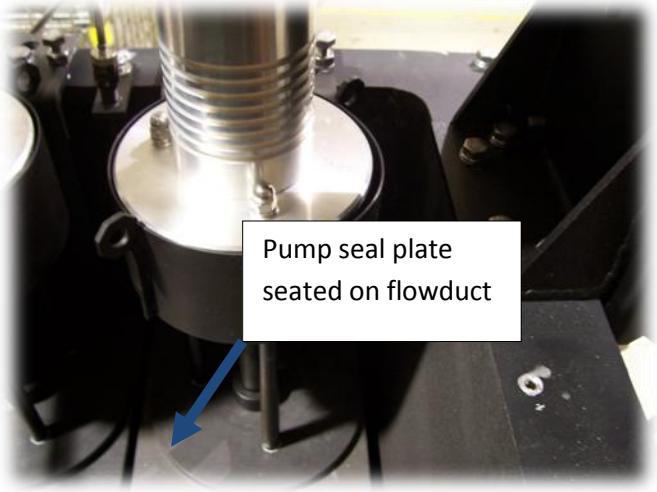


Contact Points	Description
A	Chip Entrance Plate
B	Chip Baffle
C	Chip Exit Plate
D	Lambda Curve Plate
E	Lambda Exit Plate

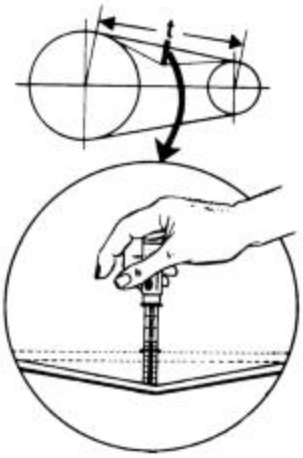
5. Place a level along the front lip of the solder pot and along the nozzle curve plates to verify the nozzles are level with the solder pot. Use adjustment bolts “B” alternating from front-to-back with incremental adjustments until nozzles are level with the solder pot.

6. Secure bolts “B” and “E” with locknuts and tighten bolts “C” to lock down nozzle/flowduct assemblies.

7. Place solder pumps on flowducts making sure the seal plates are completely seated on the flowducts.



8. Use adjustment bolts “F” to align the motor bracket with the solder pump bracket.
9. Use adjustment bolt “G” to vertically align the motor bracket with the solder pump bracket.
10. Tighten lock down bolts “H”.
11. Use adjustment bolts “I” to align the solder pump bracket with the positioning pins in the motor bracket.
12. Tighten lock down bolts “J”.
13. Pull the motor away from solder pot to tension the belt and tighten bolts “K”. Proper belt tension is achieved when three (3) pounds of pressure applied with a belt tension gauge at the mid-point of the belt span results in a 15.9 mm (0.63 in.) deflection of the belt.

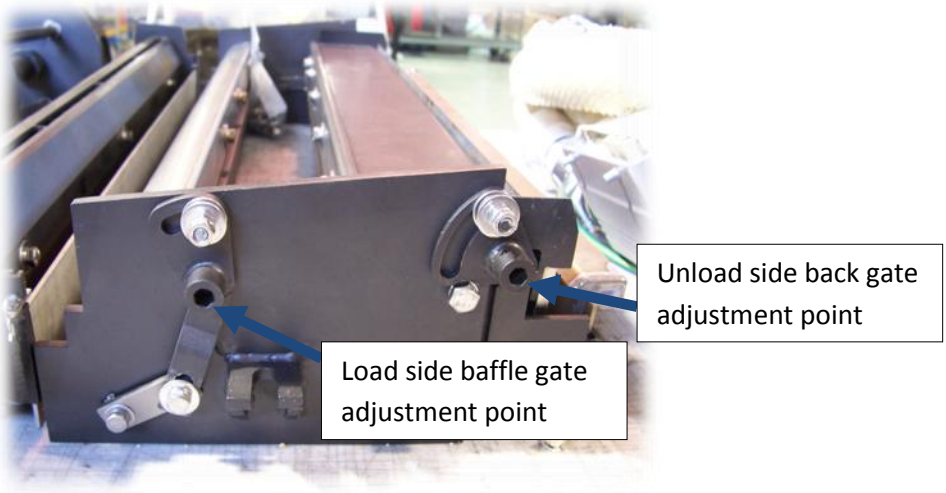


2.7 SOLDER WAVE SETUP

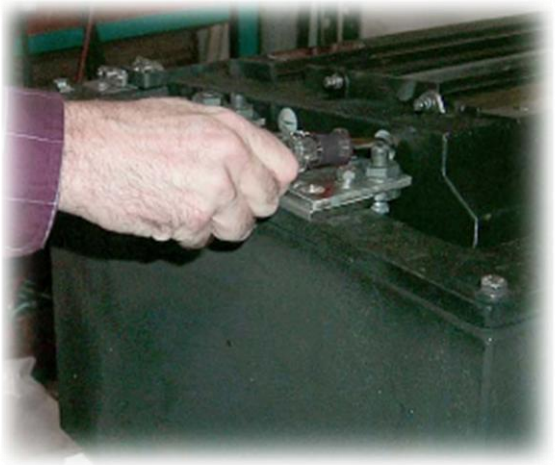
The Ultrafill™ main wave should have a mirror-like smoothness on the flattest portion of the wave with little or no turbulence or rippling. The solder wave should appear to be stagnant until a PCB comes in contact with the leading edge of the wave. If oxidation is indicated

(cloudy areas developing), the solder nozzle may not be level or the back gate may not be adjusted properly. The volume of solder flowing over the exit weir should be minimal and the backflow should be even and uniform across the full width of the exit. Use the following procedures to properly set up the solder waves.

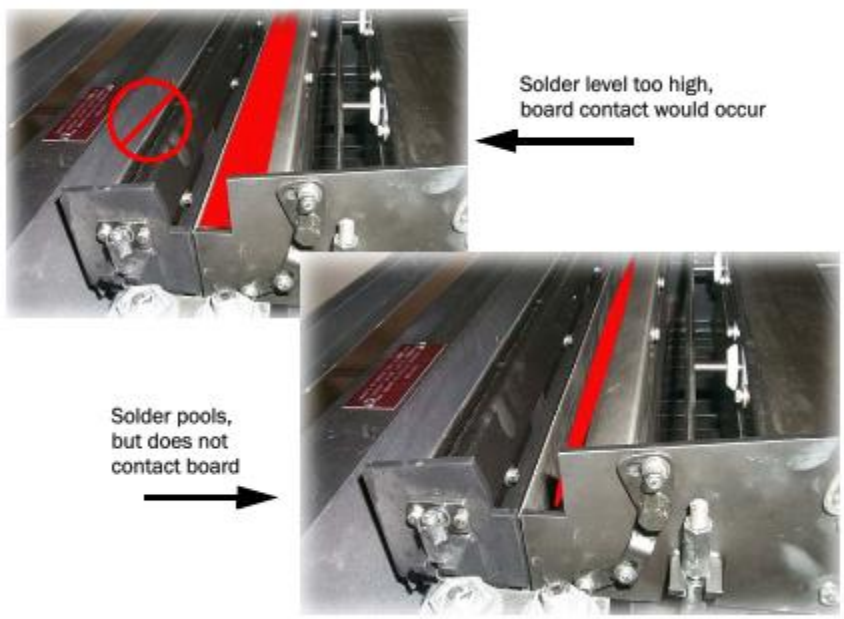
1. Determine the longest lead length on the PCB's and set the wave depth equal to the lead length plus 2.0 mm (0.079 in.).
2. The main wave nozzle has a load side baffle gate and an unload side back gate that should be adjusted for proper operation. These are accessed by inserting the provided hex wrench through the holes in the front of the Ultrafill™ shroud.



3. Raise the unload side back gate to a level where the solder just barely flows over the gate. This will change the depth of the wave so it may take a few iterations of adjusting the gate and varying the motor speed to achieve the optimum wave characteristics and depth.



4. Adjust the load side baffle gate to achieve proper "pooling" of solder between the gate and curve plate. Solder should pool in this area but not high enough to contact the PCB in process. This decreases dross accumulation.



5. Adjust the slide plate located at the unload end of the Ultrafill™ shroud to approximately 3.3-6.4 mm (0.13-0.25 in.) from the solder flowing over the back gate of the main nozzle. Verify that the product doesn't flood the solder over this plate when passing through the wave.

2.8 NITROGEN SETUP (if equipped)

Nitrogen settings may vary by process requirements but the recommended settings are achieved by following these procedures.

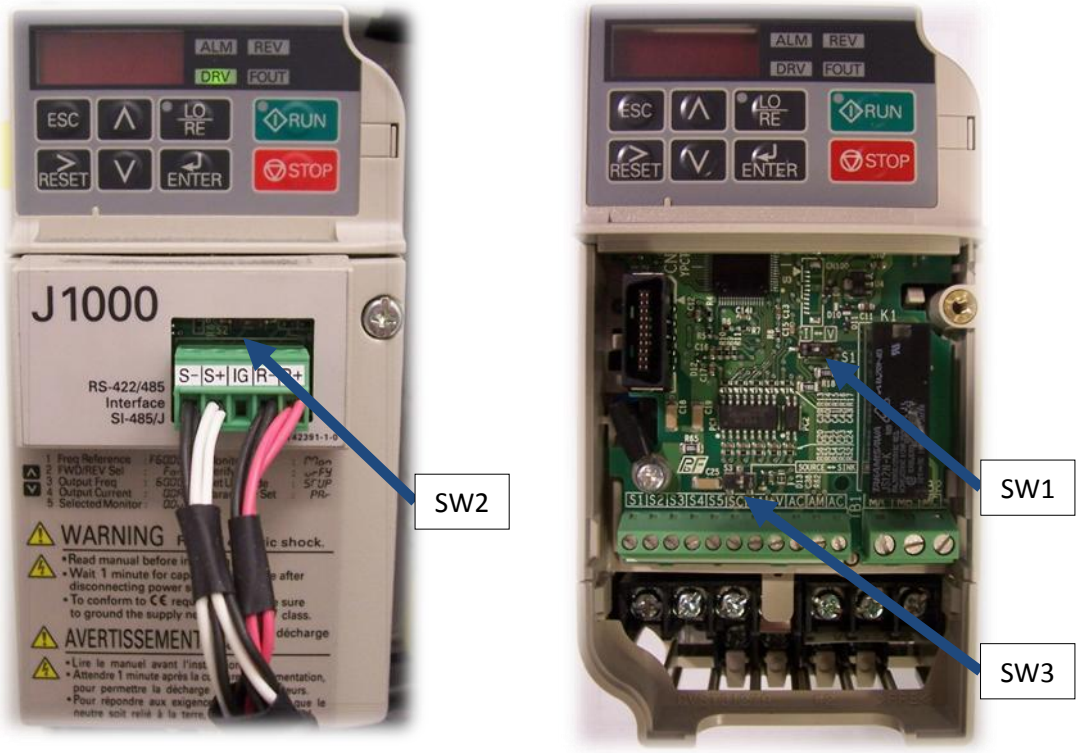
1. Adjust the nitrogen pressure regulator valve so the pressure gauge indicates 303 kPa (44 psig).
2. Adjust the flow control valves for each of the four (4) flowmeters to the below settings. When making changes to the flow settings, always return to step #1 to ensure the nitrogen pressure remains at 303 kPa (44 psig).

SECTION 3: CALIBRATION

3.1 VARIABLE SPEED DRIVES

The machine may be equipped with two (2) to four (4) variable speed drives depending on configuration. The following procedure details the setting of each of these drives.

1. Remove the front cover and set SW1 to “V” and SW3 to “SINK”.



2. Set SW2 to “OFF” for all drives except for the last drive at the end of the communication cable, which is set to “ON”.
3. The parameter settings for the drive are as follows:

Parameter	Setting
A1-01	2
B1-01	2
B1-02	2
H5-01	See drive chart
H5-02	4
H5-03	1
H5-06	10
H5-07	01

Drive	Setting
Shared	1
Lambda	2
Chip	3
Rotary	4

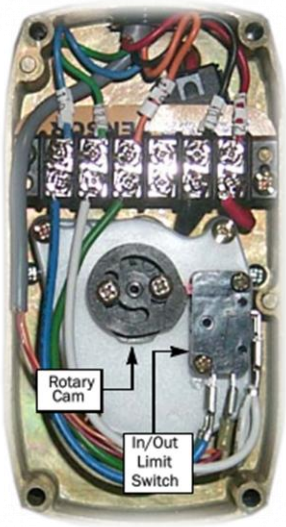
4. Apply power to the drive and press the UP arrow key until “PAr” is displayed.
5. Press the ENTER key to enter the parameter setting menu.

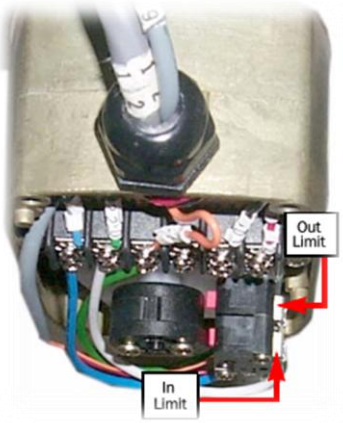
6. When “A1-01” is displayed, press the ENTER key to display the parameter value. To change the value, press the RESET key until the digit is blinking. Use the UP arrow key to change its value to “2” and press the ENTER key to confirm the change. The display automatically returns to “A1-01”.
7. Press the RESET key once to change the display from “A1-01” to “B1-01”.
8. Repeat the method in steps 6 & 7 until all parameter settings are entered.
9. Press the ESC key until back at the initial display.
10. Power down the drive and wait 60 seconds before powering back up.

3.2 SOLDER POT IN/OUT LIMIT CALIBRATION

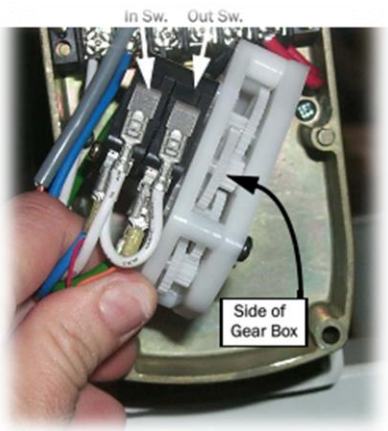
It is critical to the operation of the machine that the solder pot in/out limit switches are set correctly. Read through the following procedures completely before performing the calibration.

1. Remove the cover from the rollout actuator to expose the in/out limit switches and rotary cam.

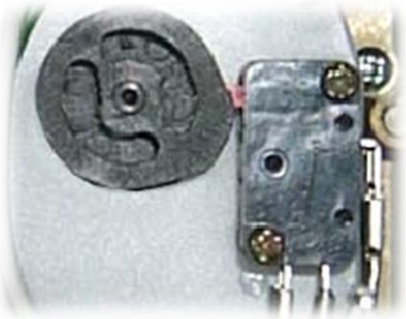




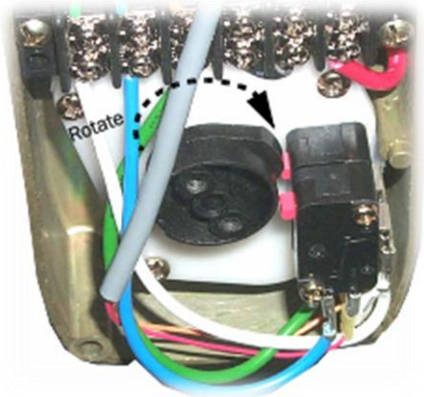
2. Remove the outermost cam by removing the two (2) screws securing it and remove the white gear assembly with switches attached by removing the three (3) screws securing it. Make sure all wires remain intact.



3. Rotate the out limit cam counter-clockwise by using the white gears on the side of the gear assembly. Stop the cam just before the switch engages as shown below and then re-install the gear assembly.



4. Verify the rollout stand is prepared to receive the solder pot and roll the pot out via the machine software until a “Solder Rollout Motor Overtorque Alarm” activates and the pot stops movement.
5. Remove the white gear assembly again and rotate the out limit cam clockwise until the limit switch engages. A click will be heard when the lobe of the cam contacts the switch.

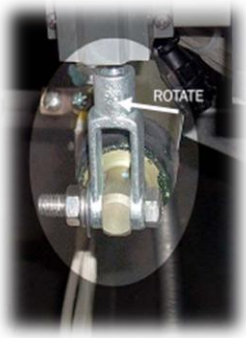


6. Replace the white gear assembly and move the solder pot in a short distance and back out via the machine software to verify the out limit switch stops the pot before the actuator reaches the end of its stroke and causes the overtorque alarm.
7. Roll the solder pot in via the machine software until a “Solder Rollout Motor Overtorque Alarm” activates and the pot stops movement.
8. Replace the in limit cam and position it so that the switch is just contacted which is confirmed by an audible click.

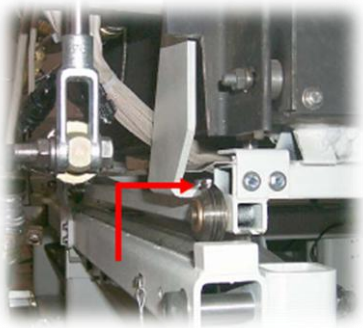
9. Move the solder pot out a short distance and back in via the machine software to verify the in limit switch stops the pot before the actuator reaches the end of its stroke and causes the overtorque alarm. The actuator cover can be replaced at this time.
10. When the pot is at the in limit position, verify that the trolley is centered over the front and rear jacking stand capture brackets. If it is not centered do not raise the pot and continue with the following procedures. If it is centered, do not proceed…the in/out limit calibration is complete.

11. Disconnect the rollout connecting shaft by unscrewing it from the actuator clevis.

12. Manually center the trolley over the jacking stand capture brackets.
13. Turn the actuator clevis clockwise or counter-clockwise to retract or extend the piston of the actuator until the clevis and connecting shaft are aligned. Each turn moves the actuator piston approximately 6 mm (0.25 in.).



14. Re-connect the rollout connecting shaft to the actuator clevis. In the event that the pot cannot be adjusted satisfactorily with the actuator adjustment, there is a small amount of adjustment in the connecting shaft bracket that is mounted to the top of the trolley.

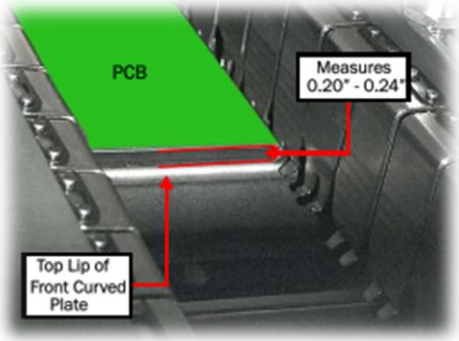


15. Move the solder pot out approximately 50 mm (2.0 in.) via the machine software and then move it back in allowing the limit switch to stop the actuator.
16. Verify that the trolley is centered over the jacking stand capture brackets and that the proximity switch illuminates just prior to limit switch engagement and stays illuminated after the pot stops.

3.3 SOLDER POT UP LIMIT CALIBRATION

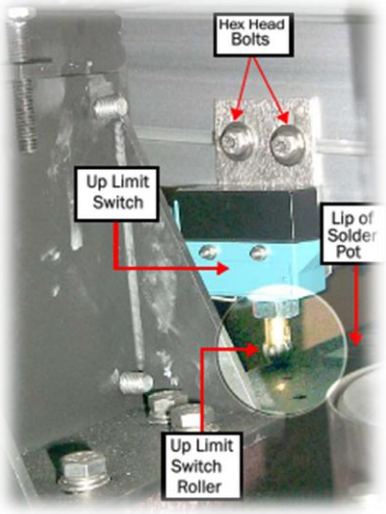
The solder pot up limit switch is located on the back of the rear support rail next to the main wave pump motor. Use the following procedures for proper calibration.

1. Verify lead clearance has been properly calibrated per the instructions provided in the machine software/help manual.
2. Place a PCB in the conveyor positioned over the leading edge of the front main wave curve plate.
3. Raise the solder pot via the machine software to the “UP” position.
4. Use calipers to measure the distance between the bottom of the PCB and the top of the curve plate. If this distance is in the range of 5.1-6.1 mm (0.20-0.24 in.) and the up limit switch has been engaged, calibration is complete. If not, proceed to the next step.



5. Manually adjust the jacking stand height until the distance between the PCB and nozzle fall within the specification of step 4.

6. Loosen the bolts securing the up limit switch bracket to the support rail and adjust the height of the switch until it engages with the lip of the solder pot. There is an audible click when the switch engages.



7. Tighten the switch bracket bolts.
8. Move the solder pot down slightly via the machine software until the switch dis-engages.
9. Move the solder pot to the “UP” position via the machine software and verify the measurement of step 4.

3.4 JACKING STAND TRANSDUCER CALIBRATION

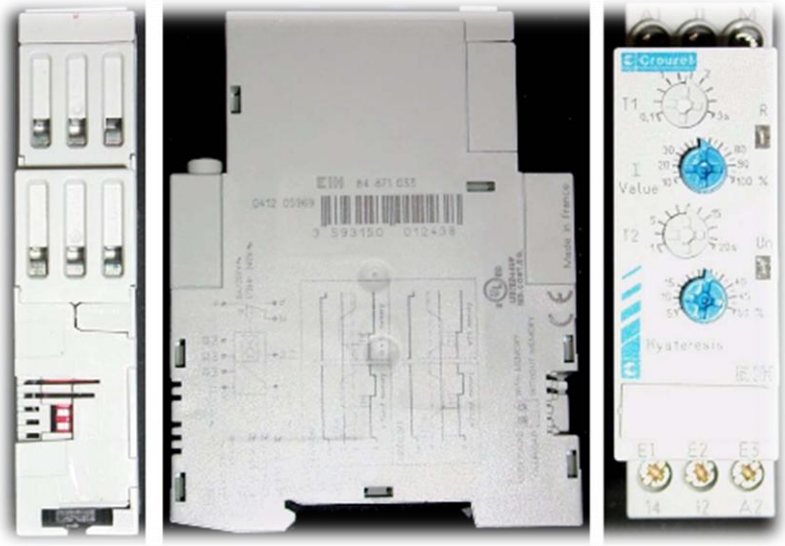
The solder pot jacking stand linear positioning transducer is located inside the framework of the jacking stand beneath the solder pot. Use the following procedures for proper calibration.

1. Verify lead clearance has been properly calibrated per the instructions provided in the machine Software Manual.
2. Move the solder pot via the machine software to a lead clearance of 12.7 mm (0.50 in.).
3. Verify the voltage value for the transducer by clicking on Modules > Analog IO and reading the value for “Jacking Stand”. If this value is 6.663V, calibration is complete. If not, proceed to the next step.
4. The voltage value can be changed by turning the threaded eye bolt connected to the linear transducer mounted inside the frame of the jacking stand. Turning this bolt counter-clockwise increases the voltage, turning it clockwise decreases the voltage. Adjust until the value reads 6.663V and then re-tighten the lock nut on the eye bolt.

5. The lead clearance must be re-calibrated after making adjustments.

3.5 PREHEATER BLOWER FAIL DETECT CALIBRATION

The machine may be equipped with one (1) or more current sensors depending on machine configuration. These sensors detect a blower failure in the convection preheaters and can be calibrated using the following procedures.



1. Set the two (2) dip switches on the back side of the sensor to “Under Current” and “Without Memory”.
2. Set the four (4) dials on the face of the sensor as follows:

T1	1.5
I	35%
T2	1.1
Hyst.	27.5%

3. Turn the preheater on to 177°C (350°F) and allow the current draw to stabilize for five (5) minutes after the temperature reaches setpoint.

4. Disconnect the blower and verify that the sensor indicates a fault condition (LED on) and sounds an alarm.
5. Re-connect the blower and verify the fault clears and the machine software alarm can be cleared.
6. Stop the preheater and repeat this procedure for each current sensor.

SECTION 4: DAILY MAINTENANCE

The following section lists the suggested maintenance to be performed after every 8 hours of machine operation. Maintenance intervals are largely dependent on various factors including production throughput, process parameters, and machine configuration. This schedule is a recommended guideline to aid customers in creating preventative maintenance schedules according to their individual processes.

4.1 CONVEYOR 

Daily maintenance on the conveyor should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Clean the incoming board detect photocell mounted at the load end of the machine with a non-abrasive lint-free cloth dampened with an anti-static liquid computer screen cleaner.
2. Inspect the conveyor for smooth operation when running. Noise, knocking, and vibration may be caused by lack of lubrication, improper alignment of rails or chains, or improper alignment of the drive motor and shaft.
3. Verify the width adjust chain and screw shafts are free from debris and are sufficiently lubricated.
4. Verify the conveyor drive shaft is free from debris and sufficiently lubricated.
5. Inspect the conveyor fingers for bent, dirty, or missing fingers. Refer to the Corrective Maintenance section of this manual for finger replacement procedures.
6. Remove any solder deposits from the conveyor rails.
7. Remove and clean the finger cleaner screen filter mounted in the finger cleaner reservoir.

4.2 FLUXER 

Daily maintenance on the fluxer should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Clean up any flux or solvent spills or drips on or around the fluxer or any of its components using a solvent or detergent that is compatible with the spill and machine components.
2. Wipe any residue from the underneath of the fluxer exhaust hood.
3. Wipe off any residue from the fluxer airknife, if equipped.

4. If a foam fluxer is not going to be used for a period of several hours, it is recommended that the tank be covered or drained into a sealable container and the fluxer components be cleaned with solvent or detergent. This will prevent excessive evaporation of thinner and changes to the flux density.
5. Verify level of flux and thinner and refill as necessary.

4.3 PREHEATER

Daily maintenance on the preheaters should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Clean up any flux, solvent, or solder spills or drips on the bottom preheaters using a solvent or detergent that is compatible with the spill and machine components.
2. Wipe any residue from the underneath surface of any top preheaters or preheater covers.

4.4 SOLDER

Daily maintenance on the solder module should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Roll the solder pot out on the rollout stand and position a dross container near the pot at waist height.
2. Use a spatula to move surface dross to an accessible area of the solder pot for removal.
3. Lift up on the solder pump dross collars using a screwdriver or high temperature gloves and move dross from underneath the collars.

4. Scoop the dross from the solder pot using a sieve ladle. Allow any molten solder to drain from the ladle back into the pot before moving to the dross container.
5. After surface dross has been removed, gently stir the molten solder around the solder pumps and nozzles to cause dross that is constrained below the surface to rise to the top.
6. Again move the dross to an accessible area and remove it with the sieve ladle.
7. Secure the lid to the dross container once all dross has been removed from the pot and placed inside.
8. Carefully add new solder to the pot until the level is within 12.7 mm (0.50 in.) of the lip of the pot.
9. Clean up any solder spills around the solder module and jacking stand.

4.5 GENERAL 

Daily maintenance on the machine should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Use a window cleaner and paper towels to clean the inside and outside of the front windows to ensure clear visibility of the soldering process.
2. Use a clean, lint-free cloth and an ammonia based cleaner, such as window cleaner, to remove dirt, dust, or grease from the interior and exterior painted surfaces.
3. Use isopropyl alcohol or a mild concentration of flux thinner to remove flux residue from painted surfaces. Wipe off immediately as these chemicals may deteriorate the paint.

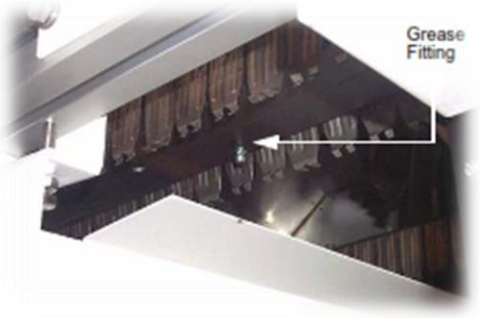
SECTION 5: WEEKLY MAINTENANCE

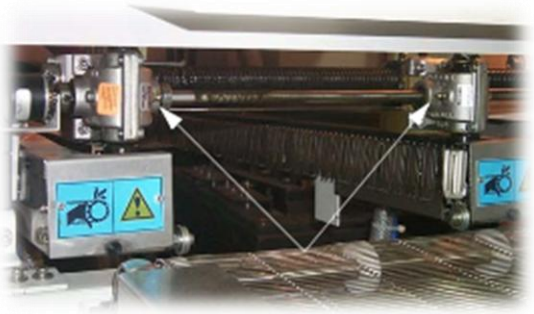
The following section lists the suggested maintenance to be performed after every 40 hours of machine operation. Maintenance intervals are largely dependent on various factors including production throughput, process parameters, and machine configuration. This schedule is a recommended guideline to aid customers in creating preventative maintenance schedules according to their individual processes.

5.1 CONVEYOR 

Weekly maintenance on the conveyor should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

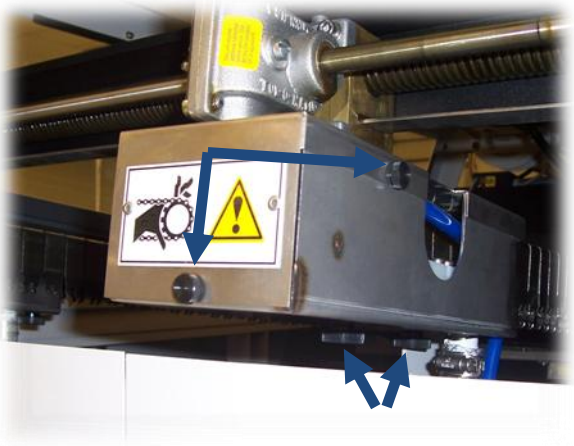
1. Use a grease gun with Jet-Lube AP-1 high temperature grease to lubricate the conveyor rails and conveyor drive gearboxes while the conveyor is running slowly. Do not over-lubricate or grease will drip from the conveyor components.





2. Using the same grease applied to an applicator brush, apply lubricant to each of the three (3) conveyor width adjust screw shafts. Run the conveyor width to the in and out limits after lubrication.

3. Loosen the two (2) small thumb screws on each finger cleaner assembly to remove the top cover and remove the two (2) large thumb screws to remove the assembly from the conveyor rail.



4. Clean out the tray and brushes and inspect the fluid holes in the nozzles for blockages.
5. Inspect the silicone wipers for wear before re-installing finger cleaner assemblies.

5.2 FLUXER

Weekly maintenance on the fluxer should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. If equipped with a foam fluxer, visually inspect the aerators for cracks, clogging, or physical deterioration.
2. Inspect all aerator tubing, connectors, and clamps to make sure all connections are leak-free and not damaged or deteriorated.
3. If flux bubbles from aerators are no longer small, uniform, and distributed evenly over the aerator’s surface, the aerators may need to be cleaned by soaking in a compatible flux thinner for ten (10) minutes or more.
4. If an aerator is clogged, it can be purged by supplying it with clean and dry compressed air at 70 kPa (10 psig) for ten (10) minutes while submerged in a clean reservoir of a compatible flux thinner.
5. If an aerator continues to generate an uneven array of bubbles, it should be replaced.

5.3 PREHEATER 

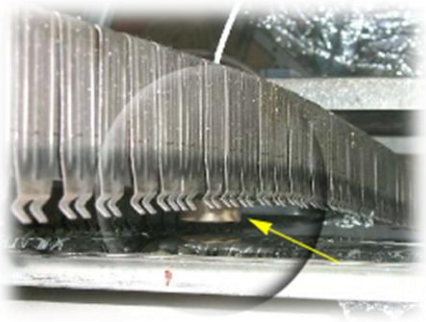
Weekly maintenance on the preheaters should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. If equipped with calrod radiant heaters, a defective element may not generate a machine alarm for inability to reach setpoint. Visual inspection is required.
2. Turn on calrod radiant heaters and view from the load or unload end of the machine for all elements visibly “glowing”.
3. If any element is suspected to be defective, a resistance measurement is necessary to determine functionality. Refer to the Corrective Maintenance section of this manual for further instructions.

5.4 SOLDER  

Weekly maintenance on the solder module should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Remove the solder pump belt covers and check the solder pump belt tension using the procedure in the Solder Module Setup section of this manual.
2. If equipped with solder level sensor, remove the cover and lift the float mechanism from the reservoir. Clean the dross from the float and remove any dross in the reservoir.
3. If equipped with solder bar feeder, remove any debris inside the feeder that could inhibit operation of the unit.
4. If equipped with wave height sensor, use a clean, lint-free cloth soaked with compatible solvent to wipe an residue from the sensor.



5.5 GENERAL 

Weekly maintenance on the machine should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Remove the plastic cover and filter from the cooling fan located on the unload bottom side of the electrical enclosure. This cover snaps into place.

2. Soak the filter in soapy water and allow it to dry completely before replacing.

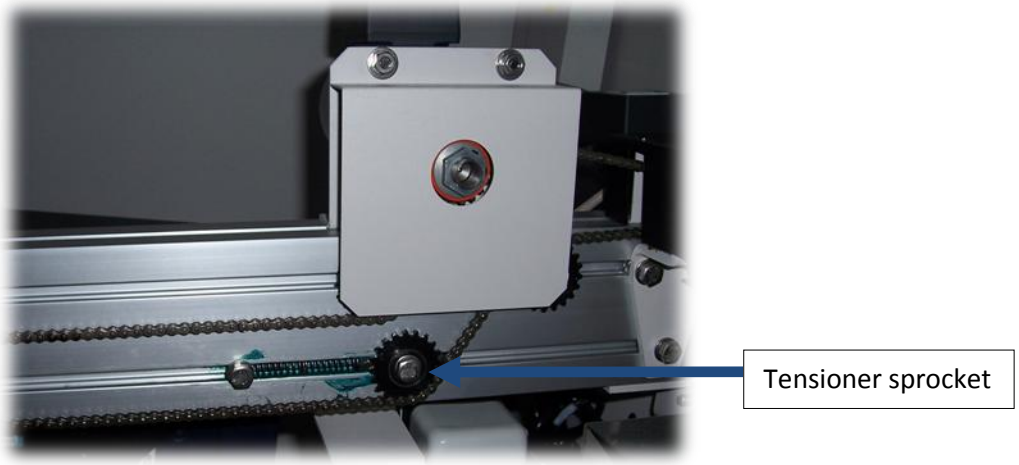
SECTION 6: MONTHLY MAINTENANCE

The following section lists the suggested maintenance to be performed after every 160 hours of machine operation. Maintenance intervals are largely dependent on various factors including production throughput, process parameters, and machine configuration. This schedule is a recommended guideline to aid customers in creating preventative maintenance schedules according to their individual processes.

6.1 CONVEYOR

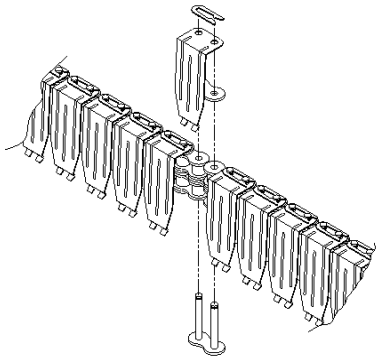
Monthly maintenance on the conveyor should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Inspect the width adjust chain for proper tension. Tension adjustment is possible at the inside of the rear conveyor support rail toward the unload end.

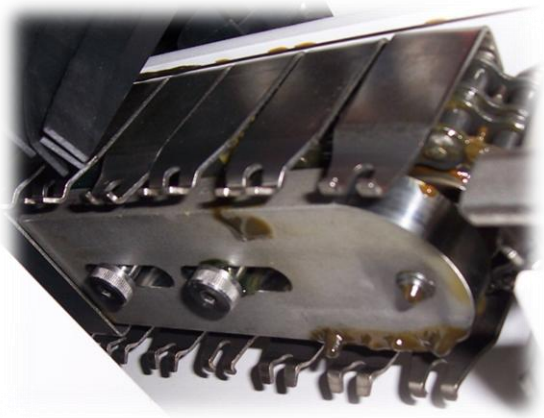


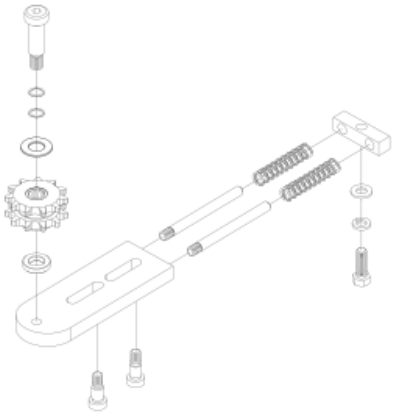
2. Apply Jet-Lube AP-1 grease with an applicator brush to the slot in the extrusion where the width adjust chain tensioner sprocket slides.

3. The conveyor chains must be removed and cleaned to prevent flux and solder build-up. Remove the chain guards from the load end of the conveyor rails and slowly run the conveyor until the chain master links are traveling around the load end sprocket. The master links are identified by red paint on top of the fingers and chain clips.
4. Disconnect the chains being careful of the spring tension on the chains supplied by the tensioner assembly on the load end. Refer to the Corrective Maintenance section of this manual for finger chain removal/installation instructions.



5. Remove the conveyor chains from the rails.
6. Clean the rails using a nylon bristle brush and mineral spirits or solvent/detergent compatible with the machine and process. Then wipe clean and dry with clean, lint-free rags.
7. Soak the finger chains in mineral spirits for approximately 10 – 20 minutes. Allow to air dry completely.
8. Lubricate the chains with Tribol E 1433/100 synthetic chain oil. The chain must be submerged until the oil has penetrated completely through all interlocking links.
9. Remove the two (2) shoulder bolts securing the tensioner to the bottom of the conveyor rails on the load end.





10. Apply Jet-Lube AP-1 grease with an applicator brush to the slots in the tensioner plate, the top of the tensioner plate, and the tensioner rods.
11. Re-install the tensioner assemblies and finger chain assemblies.
12. Use a grease gun with Jet-Lube AP-1 high temperature grease to lubricate the conveyor rails while the conveyor is running slowly. Do not over-lubricate or grease will drip from the conveyor components.
13. The finger cleaner reservoir should be drained with the system “off” through the gravity drain line.

14. Place the end of the drain hose in a container of appropriate size and material and open the drain valve.
15. Clean the reservoir while it is draining to allow residue at the bottom to drain.
16. Flush the reservoir with cleaning fluid then wipe the reservoir clean and dry.
17. Close the drain valve and refill with fluid to about 25 mm (1 in.) from the top of the tank.

6.2 FLUXER

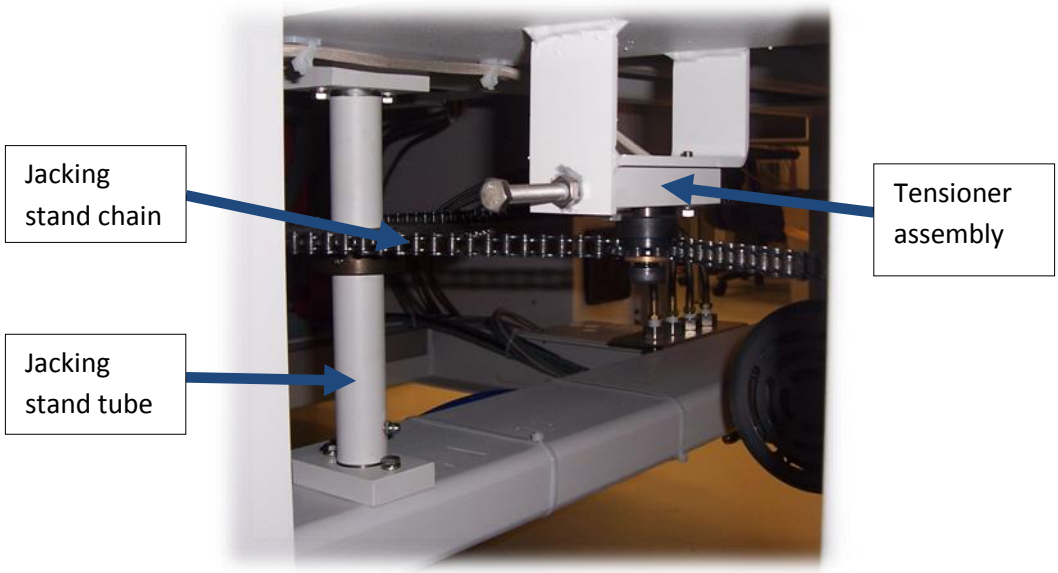
Monthly maintenance on the fluxer should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Inspect all fluxer hoses and tubing for cracks, leaks, or hardness and replace as necessary.
2. Open the fluxer drawer slides and clean with a rag and compatible solvent to remove flux residue and allow to dry.
3. Apply Jet-Lube AP-1 grease with an applicator brush to the slides and wipe off any excess grease when the slides are closed.

6.3 SOLDER

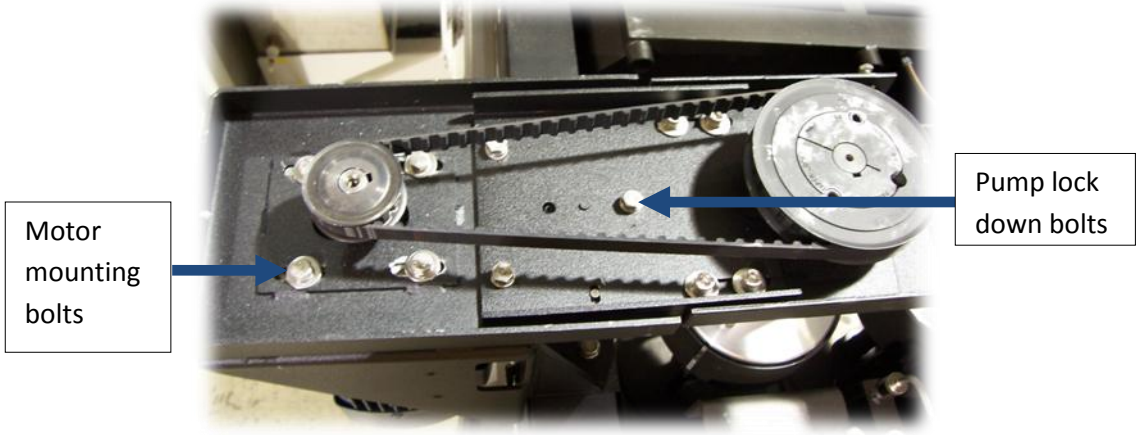
Monthly maintenance on the solder module should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. Inspect the jacking stand chain for proper tension. This is confirmed by approximately 12.7 mm (0.50 in.) of side-to-side movement at the midpoint of the chain span between the front and back sprockets. Tension adjustment is possible at the front of the jacking stand.



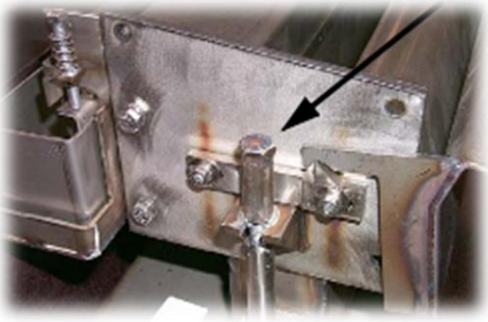
2. Apply Jet-Lube AP-1 grease with an applicator brush to the jacking stand chain.
3. Use a grease gun with Jet-Lube AP-1 grease to lubricate each of the four (4) jacking stand tubes.
4. Inspect the hoses connected to the exhaust sensor switches and clean or replace them if they contain residue build-up. The sensor switches are located on each side of the electrical enclosure and the hoses connect the sensors to pressure tubes in the exhaust ducts.

5. With the solder pot in the “out” position and the solder molten, the solder pump(s), flowduct(s),and nozzle(s) should be removed and cleaned.
6. Remove the solder pump belt cover.
7. Loosen the four (4) motor mounting bolts to release the tension on the pump belt and remove the belt.

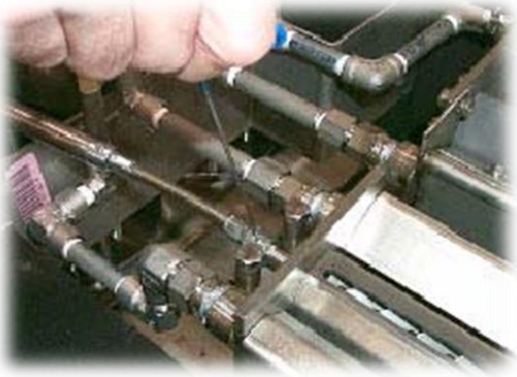


8. Remove the three (3) pump lock down bolts and slowly lift the pump straight up from the pot-watch for dripping solder.
9. Immediately scrape dross and solder from the pump shaft sleeve, shaft, base plate, and impeller while the pump is still hot.
10. Disconnect nitrogen lines from nozzles/shroud if equipped.
11. Remove the two (2) shroud lock down bolts and slowly lift the shroud from the pot and immediately scrape dross/solder from all surfaces.

12. Loosen the nozzle lock down nut on each end of the main wave nozzle and then swing the lock downs clear of the nozzle.

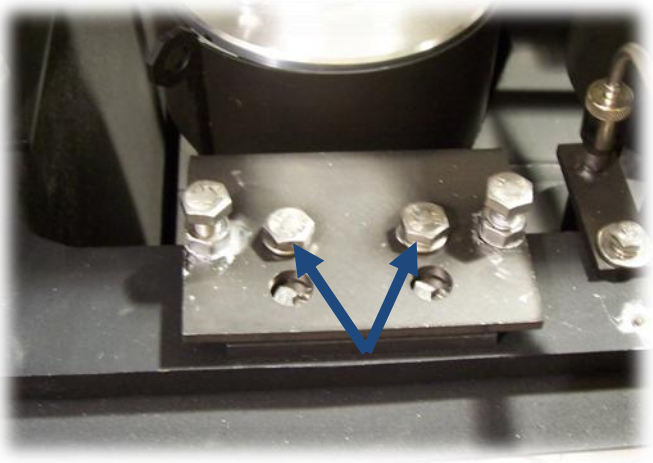


13. Carefully lift the nozzle from the flow duct and immediately scrape dross/solder from all surfaces.
14. Using the tabs on each end of the vane element lift the element from the flowduct and immediately scrape dross/solder from all surfaces.
15. If equipped with rotary chip nozzle, loosen the lock down nuts and then swing the lock downs clear of the nozzle. There are two (2) nuts at the rear and one (1) at the front.
16. Loosen the set screw that attaches the flexible drive shaft to the nozzle element shaft.



17. Carefully lift the nozzle from the flowduct and immediately scrape dross/solder from all surfaces. Rotate the shaft and clear all dross/solder from the vanes. The curve plate may have to be removed from the nozzle to completely clean around the vanes of the shaft.
18. Remove the solder pot divider plate secured by two (2) bolts.

19. Remove the two (2) lock down bolts on each end of the flowducts that secure the flowducts to the solder pot.



20. Carefully lift the flowduct from pot allowing all solder to drain back into the pot before removing by tilting it toward the pump end. Immediately scrape dross/solder from all surfaces paying particular attention to the inside corners of the duct as dross tends to build-up in these locations.
21. Remove all dross from solder pot before re-installing components. The use of Kleenox® may be employed to extract the good solder contained in the dross.
22. Apply Loctite® Anti-Seize compound to all hardware that was loosened or removed.
23. Re-install all components in the reverse order of removal. Make certain the vane element of the main wave is installed with the smaller vanes toward the solder pump.
24. Refer to the Solder Module Setup section of this manual for proper setup procedures.

SECTION 7: QUARTERLY MAINTENANCE

The following section lists the suggested maintenance to be performed after every 520 hours of machine operation. Maintenance intervals are largely dependent on various factors including production throughput, process parameters, and machine configuration. This schedule is a

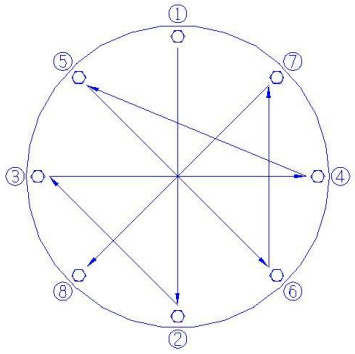
recommended guideline to aid customers in creating preventative maintenance schedules according to their individual processes.

7.1 PREHEATER 

Quarterly maintenance on the preheater module should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

1. If equipped with convection preheat, unplug the power cable to the blower.


2. Remove the eight (8) bolts that secure the blower to the preheater assembly.
3. Remove the blower by pulling it straight away from the preheater assembly. Be careful to never handle the blower by the impeller or place the blower resting on the impeller.
4. Use compressed air to blow dust from around windings and external rotor.
5. Use an approved cleaning solvent or denatured alcohol to clean blower impeller. DO NOT CONTACT THE ELECTRICAL CONNECTIONS OR UPPER PART OF THE BLOWER WITH SOLVENT.
6. Wipe down impeller with water soaked rag and allow it to dry completely.
7. Install blower and guard and tighten mounting screws in a criss-cross pattern and torque to 1.4 N-m (12 in-lb).



8. Re-connect power cable.

7.2 SOLDER  

Quarterly maintenance on the solder module should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

Solder must be kept at reasonable levels of purity to ensure consistent soldering results. A small sample of solder should be sent to the manufacturer for analysis of impurities. This will indicate if the solder is contaminated to the point of requiring to be drained and replaced with new solder.

SECTION 8: SEMI-ANNUAL MAINTENANCE

The following section lists the suggested maintenance to be performed after every 1040 hours of machine operation. Maintenance intervals are largely dependent on various factors including production throughput, process parameters, and machine configuration. This schedule is a recommended guideline to aid customers in creating preventative maintenance schedules according to their individual processes.

8.1 ELECTRICAL CONNECTIONS 

Semi-annual maintenance on the machine should be performed with the machine in “Stopped” mode, unless otherwise instructed, by following the below procedures.

The electrical connections in the machine should be inspected as it is possible for them to become loose during production use.

1. Disconnect power from machine.
2. Visually inspect electrical connections at each convection blower for loose or damaged connections.
3. Visually inspect electrical connections in electrical cabinet for loose connections.
4. Clean any dust on any electrical connections with compressed air.
5. Verify proper torque of connections listed in the following table.

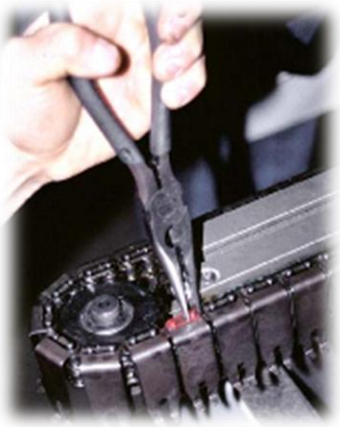
Device	Torque	
	N-m	in-lb
CB (Circuit Breakers)	2.0	17.5
SSR (Power Side-Larger Screw)	2.3	20.0
SSR (Control Side-Smaller Screw)	1.1	10.0
Main Contactor	4.0	35.0
Main Disconnect Switch	5.1	45.0
PE (Main Ground)	4.0	35.0

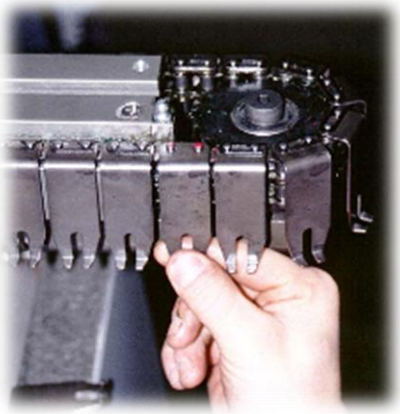
SECTION 9: CORRECTIVE MAINTENANCE

9.1 CONVEYOR FINGER REPLACEMENT 

Replace damaged conveyor fingers using the following procedures.

1. Remove the load end chain guard from the rail with the damaged finger.
2. Operate the conveyor at low speed until the damaged finger is turning the radius of the load end sprocket.
3. Use a pair of needle nose pliers to remove the spring clip that secures the finger to the chain.



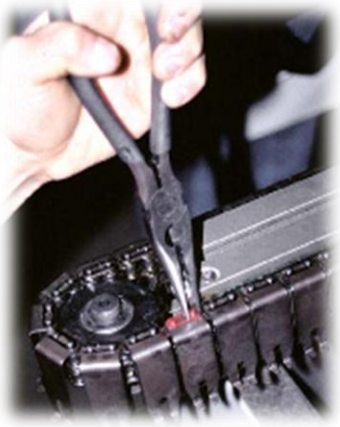


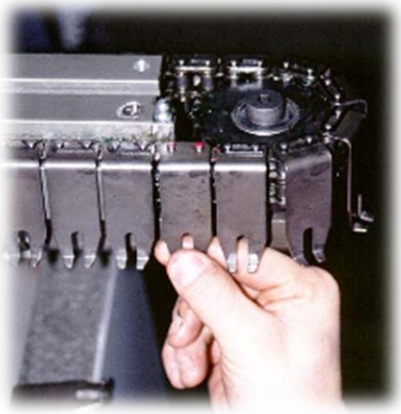
4. Remove the damaged finger by lifting it off of the chain pins and install the replacement finger.
5. Install a new spring clip over the finger so that the largest end of the “U” shaped clip points in the direction of conveyor travel. Snap the clip in position using a pair of needle nose pliers.
6. Re-install the chain guard.

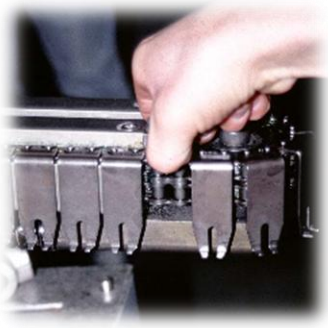
9.2 FINGER CHAIN REMOVAL/INSTALLATION

Replace damaged conveyor fingers using the following procedures.

1. Remove the load end chain guards from the rails.
2. Operate the conveyor at low speed until the master connecting link is turning the radius of the load end sprocket. This link is identified by red paint applied to the top of the finger and spring clip.
3. Use a pair of needle nose pliers to remove the spring clip that secures the finger to the chain.

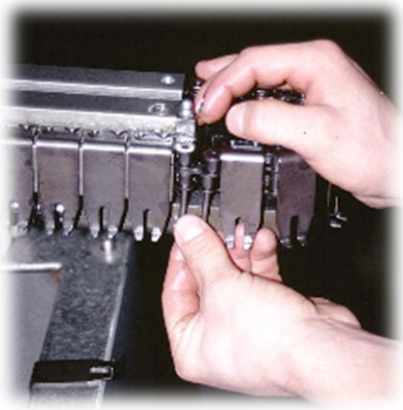


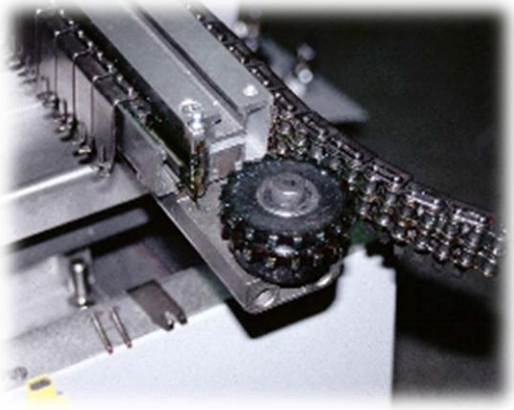




4. Remove the finger by lifting it off the chain pins and then remove the top link from the chain.

5. While applying pressure on the end of the chain tensioner, remove the connecting link from the underside of the chain.

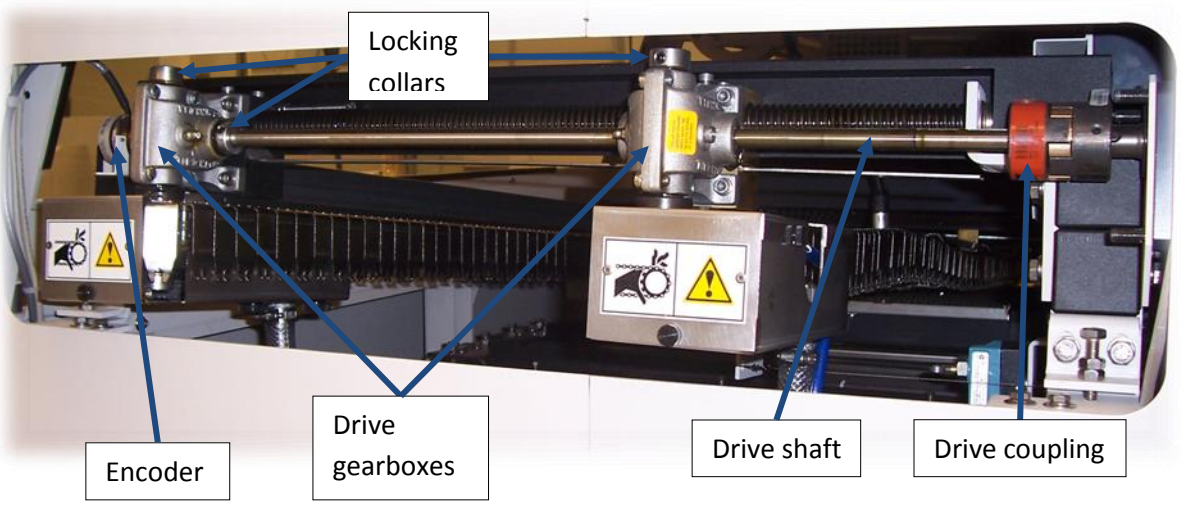




6. Remove the center section of the chain link.
7. Slowly pull the chain out from the rail. The finger cleaner assemblies will likely have to be removed to allow the finger chain to bypass the teeth on the unload drive sprocket.
8. To re-install, guide the chain back into the aluminum track of the rail and lubricate the chain by applying Jet-Lube AP-1 grease with an applicator brush during the inserting process.
9. While applying pressure to the chain tensioner, install the chain connecting link and center section of the link in reverse order as removed.
10. Install the top link of the chain and install the finger.
11. Install a new spring clip over the finger so that the largest end of the “U” shaped clip points in the direction of conveyor travel. Snap the clip in position using a pair of needle nose pliers.
12. Operate the conveyor at a slow speed to check for smooth operation.
13. Re-install the chain guard.

9.3 CONVEYOR DRIVE GEARBOX REPLACEMENT

Replace a worn out conveyor drive gearbox using the following procedures. Refer to the following picture for a description of components.



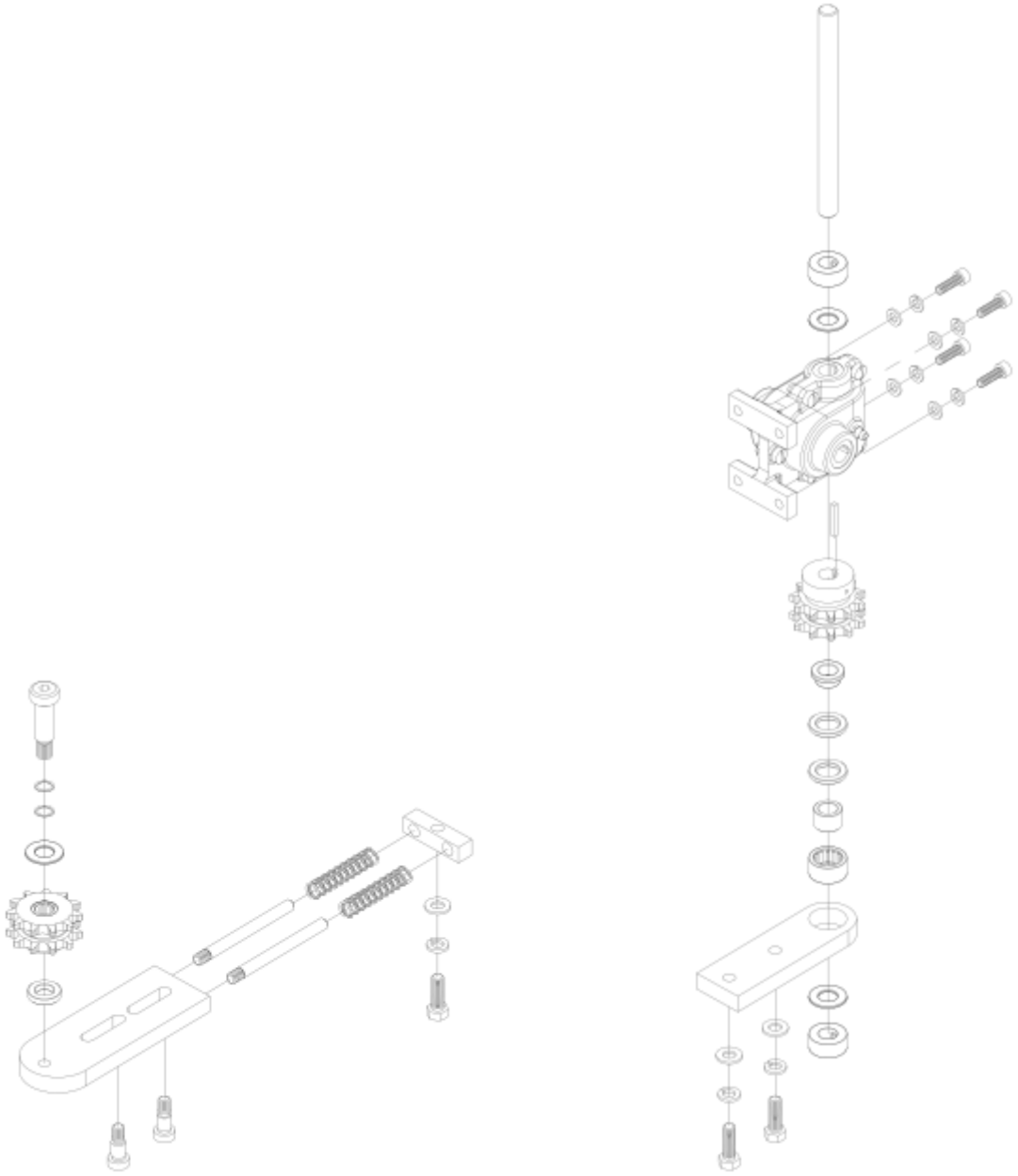
1. Loosen the set screw in the drive coupling that secures it to the drive shaft.
2. Loosen the set screw in the encoder that secures it to the drive shaft.
3. Remove the two (2) screws that secure the encoder to the mounting bracket.
4. Loosen the set screw in the locking collar on the drive shaft at the back of the front rail gearbox.
5. Locate the plastic or cardboard tubes in the tool kit. These must be inserted into a gearbox simultaneously while removing a shaft from the gearbox to keep the internal components intact.
6. Slide the drive shaft out the front of the machine and insert the tubes into the gearboxes as the shaft is being removed.
7. Remove the locking collar on the vertical shaft that goes through the gearbox.
8. Remove the four (4) bolts that secure the gearbox to the rail mounting block.
9. Slide the gearbox up and off of the vertical shaft and insert the tube simultaneously into the gearbox. If the front rail gearbox is being replaced, there is a sheet metal cover mounted to the machine frame that may have to be removed.
10. Line up the key in the new gearbox with the removed one and slide the new gearbox onto the vertical shaft. Allow the shaft to push out the cardboard or plastic tube inserted in the gearbox as it is being slid onto the shaft.
11. Secure the gearbox to the rail mounting block with the four (4) bolts removed earlier.
12. Install the locking collar on the vertical shaft.
13. Insert the drive shaft from the front of the machine through the gearboxes allowing the shaft to push out the tube inserts. Slide until the front side locking collar that was not removed meets the front rail gearbox. Remember to place the locking collar on the shaft before inserting through the rear rail gearbox.
14. Secure the drive coupling to the drive shaft.
15. Secure the locking collar up against the back side of the front rail gearbox.
16. Secure the encoder to the mounting bracket and tighten the setscrew on the drive shaft.
17. Use a grease gun with Jet-Lube AP-1 grease to lubricate the replaced gearbox.
18. Place the gearbox tube inserts into the tool kit for future use.
19. Operate the conveyor at a slow speed to check for smooth operation.

9.4 CONVEYOR OVERHAUL 

After long periods of use, there are several conveyor components that can become worn and require replacement. The indications of a conveyor in need of overhaul generally include conveyor shuttering or vibrating while running, particularly while under a substantial load. A conveyor overhaul can be performed using the following procedures.

1. Remove the finger cleaner assemblies as detailed in the Conveyor Weekly Maintenance section of this manual.
2. Perform the finger chain removal procedure as detailed in the Corrective Maintenance section of this manual.
3. Clean the finger chains and conveyor rails as detailed in the Conveyor Monthly Maintenance section of this manual.
4. Carefully inspect the conveyor rails for wear throughout the length, paying particular attention to the inside (PCB side) track chain guides. Replace if inspection reveals excessive wear.

5. Inspect the brass chain riser mounted inside the rear track of the rear rail above the solder pot for excessive wear. Replace if necessary.
6. Inspect the load and unload end finger chain sprockets for tooth wear. Replace if necessary.
7. Use the following diagrams to identify the components of the load and unload end sprocket assemblies.



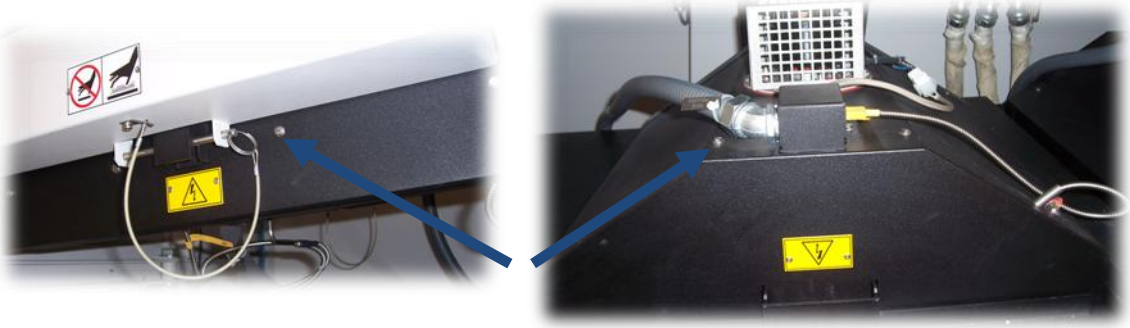
8. Remove the shoulder bolt securing the load end sprocket and inspect the bolt for wear. Replace if necessary.
9. Inspect the needle bearing in the load sprocket for locked needles and lubrication. Lubricate with Jet-Lube AP-1 grease or replace the sprocket/bearing assembly as necessary.
10. Loosen the setscrew and remove the lower locking collar on the vertical gearbox shaft.
11. Remove the two (2) bolts that secure the unload end sprocket assembly mounting plate to the rail.

12. Remove the mounting plate and inspect the unload end needle bearing for locked needles and lubrication. Lubricate with Jet-Lube AP-1 grease or replace as necessary.
13. If the unload sprocket requires replacement, loosen the setscrew and raise the vertical gearbox shaft until the sprocket is free. Do not completely remove this shaft from the gearbox without inserting the tube that is inside the machine tool kit.
14. Replace all brass bushings before reassembling components.
15. Re-assemble the sprocket assemblies in the reverse order.
16. Re-install finger chain and finger cleaner assemblies.
17. Operate the conveyor at a slow speed to check for smooth operation.

9.5 PREHEATER ELEMENT REPLACEMENT 

Preheater elements can be replaced without removing the preheaters from the machine. However, if equipped with quick-connect electrical plugs, removing the preheaters with two (2) people may make the task easier. Top heaters can simply be lifted off the supports. Bottom heaters are removed by pulling the clevis pin in the front, tilting the preheater down, and lifting it off the back clevis pins.

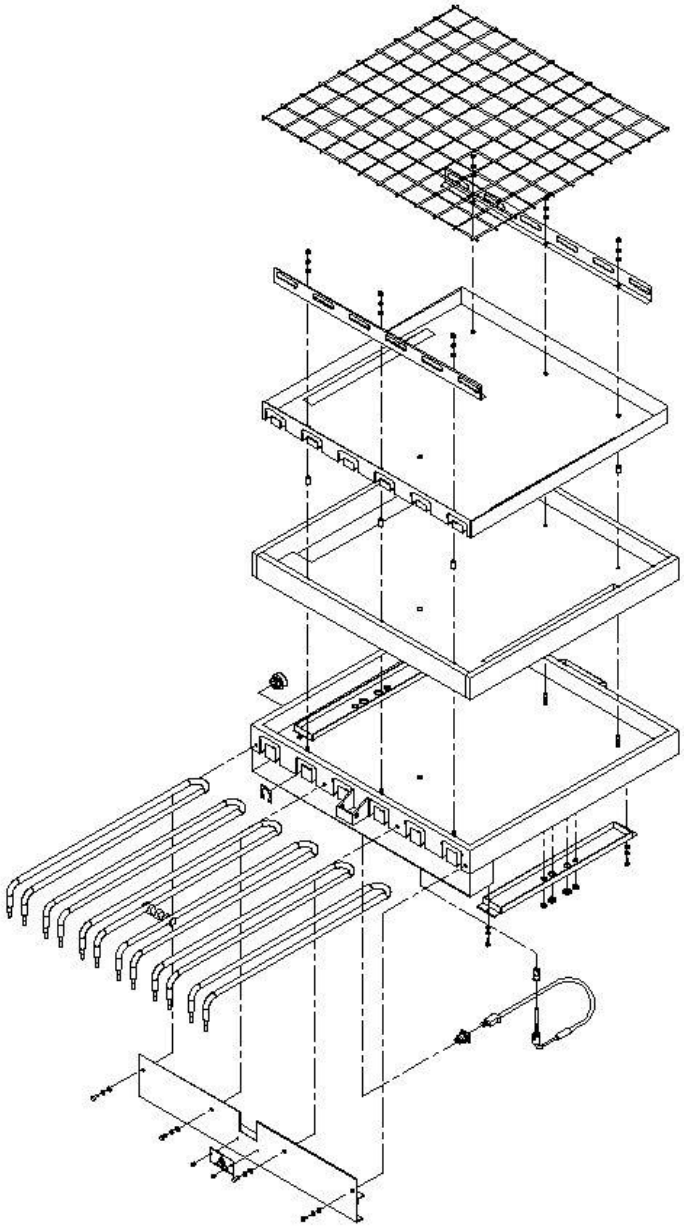
1. Verify machine is powered down and lock-out/tag-out procedures have been performed.
2. Remove the four (4) screws that secure the front cover of the preheater.

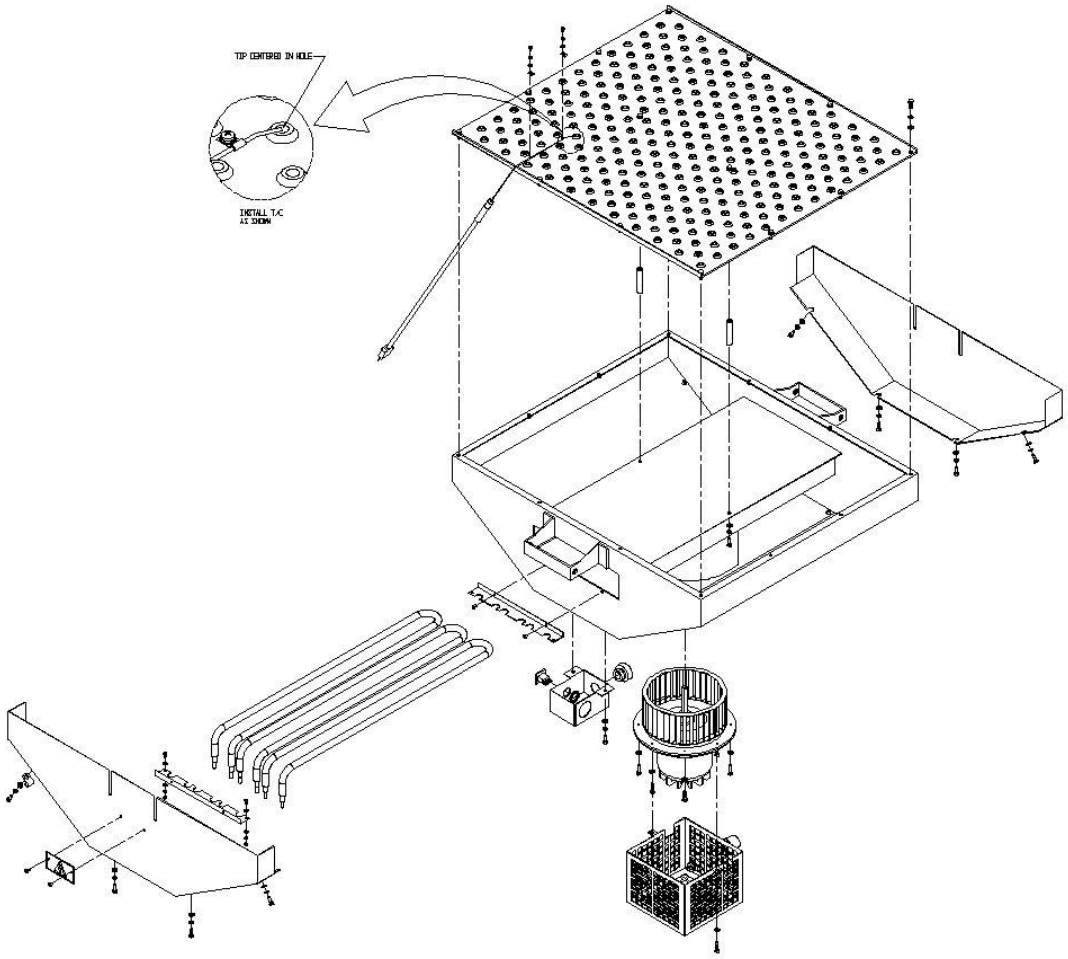


3. Disconnect the wires from one (1) element at a time and use an ohm meter to check the resistance of the element. The values should be within ±5% of the values in the following chart according to the voltage configuration of the machine.

Machine Configuration	Resistance
380/415V	80.0 Ω
440/480V	105.8 Ω

4. If the element is good, re-connect wires as they were and check the next element. If not, use the following diagrams to aid in replacing the element. All elements slide out the front of the preheater assembly. If either of the center two (2) elements are bad in a calrod IR heater, take special care to not damage the thermocouple block assembly that touches these elements. Also, make certain this block gets repositioned properly against the new element.





5. Reassembly all preheater components making certain all electrical heater connections are securely tightened and wires are not pinched.
6. Turn on preheaters to normal process temperatures and verify setpoints are achieved and steady.

9.6 SOLDER POT HEATER REPLACEMENT

Check and replace solder pot heaters using the following procedures.

1. Roll the solder pot out to the maintenance position and verify machine is powered down and lock-out/tag-out procedures have been performed.
2. Remove the six (6) screws that secure the back cover to the solder pot. Remove the lower screws first. Take care when removing this cover as it is backed with insulation which should be handled with gloves.

3. Disconnect the wires from one (1) heater at a time and use an ohm meter to check the resistance of the heater. The values should be within ±5% of the values in the following chart according to the voltage configuration of the machine.

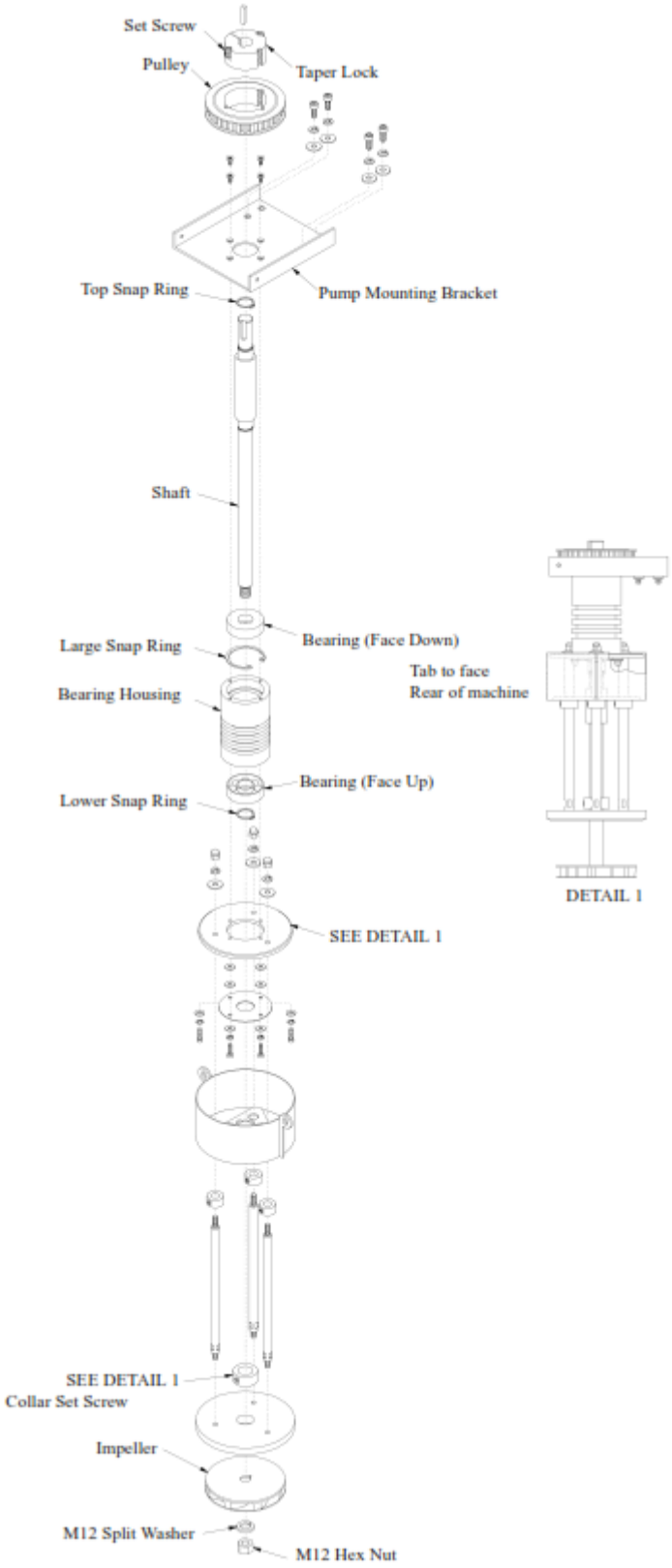
Machine Configuration	Resistance
380/415V	80.0 Ω
440/480V	28.8 Ω

4. If the heater is good, re-connect wires as they were and check the next heater. If not, continue with the following procedures to replace the heater.
5. Remove the five (5) hole plugs in the sheet metal cover of the solder pot in line with the failed heater.

6. Create a hole in the insulation behind each hole plug to insert a 13mm socket and loosen the each of the five (5) bolts directly in line with the holes. Do not remove the bolts completely…only loosen enough to slide the failed heater out the back side of the pot.
7. Slide the new heater in and position it according to the other heaters and then tighten the five (5) bolts that secure it to the side of the pot.
8. Re-install hole plugs, rear cover with insulation, and wires making certain all electrical heater connections are securely tightened and wires are not pinched.

9.7 SOLDER PUMP BEARING REPLACEMENT

Replace solder pump bearings using the following diagram and procedures. Apply Loctite® Anti-Seize compound to all hardware that is loosened or removed during this procedure.



1. Remove the taper lock/pulley assembly from the shaft by removing the two (2) setscrews securing the assembly to the shaft.
2. Remove the pump mounting bracket from the bearing housing by removing the four (4) screws securing these items together.
3. Remove the top snap ring from the shaft.
4. Remove the impeller from the shaft by removing the nut securing it to the bottom of the shaft.
5. Loosen the shaft locking collar near the flowduct seal plate.
6. Remove the three (3) acorn nuts securing the connecting rods to the bearing housing mounting plate and separate the assembly.
7. Remove the four (4) lower bearing housing mounting screws.
8. Remove the lower snap ring from the shaft.
9. Press against the top of the shaft to push the lower bearing from the housing.
10. Slide the lower bearing from the shaft. Note that the bearings are a tight fit on the shaft and removal may require force.
11. Use a bearing puller or shaft to tap the upper bearing out of the bearing housing.
12. Fill and pack the replacement bearings with Krytox® Grease.
13. Use a press to install the lower bearing into the bearing housing so that the open bearing side is facing inside the housing. Make sure the bearing is pressed in straight and flush with the housing face.
14. Insert the shaft through the housing and lower bearing and slide the upper bearing down the shaft so that the open side is facing inside the housing. Press the upper bearing into the housing until it seats on the housing retaining ring.
15. Install new retaining rings on the shaft near each bearing.
16. Re-install the four (4) lower bearing housing mounting screws.
17. Re-install the connecting rod assembly and tighten the three (3) acorn nuts.
18. Re-install the impeller on the shaft.
19. Tighten the shaft locking collar approximately 2 mm (0.08 in.) from the flowduct seal plate.
20. Re-install the pump mounting bracket.
21. Re-install the taper lock/pulley assembly.

9.8 ROTARY CHIP BUSHING REPLACEMENT

Replace rotary chip bushings using the following procedures. These graphite bushings are very brittle so much care must be given when installing the new bushings.

1. Remove the bushing/sleeve assemblies at each end of the nozzle by removing the two (2) screws at each end that secure these to the nozzle end plates. Be careful not to move the shaft toward the back of the nozzle or the shaft may fall down inside requiring removal of the curve plate to re-install it.

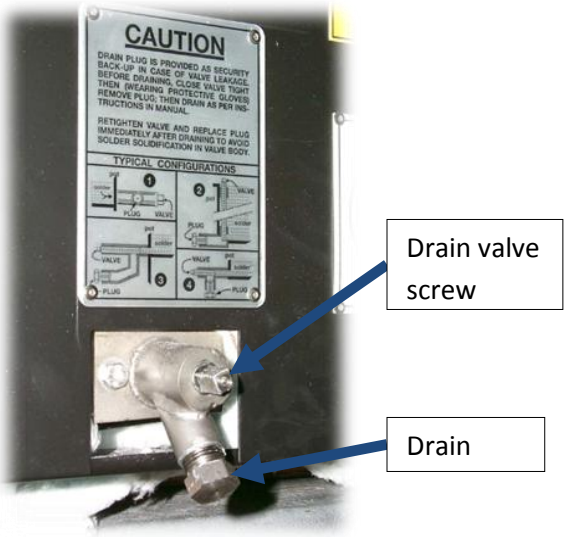
2. Simultaneously install the new bushing assemblies gently onto each end of the shaft again making certain not to push the shaft toward the back of the nozzle.

3. Once the bushing assemblies are seated against the nozzle end plates on both ends, apply Loctite® Anti-Seize compound to the two (2) screws for each end and install them hand-tight…do not tighten securely at this point.
4. Spin the shaft several times to ensure it spins freely. If it does not, adjust the positioning of the bushing assemblies. If this does not fix it, further disassembly of the nozzle to remove the shaft and inspect for straightness is necessary.
5. Tighten the hardware securing the bushing assemblies evenly and with equal torque.
6. Again verify that the shaft spins freely. Re-adjust bushing assemblies if required.

9.9 SOLDER POT DRAINING/CLEANING

Drain and clean the solder pot using the following procedures.

1. Roll the solder pot out to the maintenance position and remove all solder pot components from the pot as instructed in the Solder Monthly Maintenance section of this manual.
2. Dedross the solder pot removing both the surface dross and any dross concealed beneath the surface.
3. Acquire enough stainless steel containers necessary to accommodate the entire solder pot capacity. Limit the size of the containers for ease of handling and lifting.
4. Heat the solder to 288°C (550°F) and then turn off and lock out the machine power to eliminate the possibility of overheating the solder pot heaters.
5. Place a stainless steel container for draining directly beneath the solder drain valve at the rear of the solder pot.
6. Ensure that the drain valve screw is tightly closed and then remove the safety drain plug. Turn the drain valve screw counterclockwise to open the valve and clockwise to close it.



7. Install a drain extension, if available. This recommended drain extension is made of stainless steel threaded directly into the drain plug fitting on the end of the solder drain valve to reduce the risk of splashing solder.
8. Open the drain valve and commence draining the solder pot. Do not allow the drain containers to overfill and make certain to close the drain valve before changing containers.

9. While the safety drain plug is removed and the drain valve screw is fully extended during the draining process, apply Loctite® Anti-Seize compound to the threads.
10. When the solder pot has completely drained, close the drain valve screw immediately while the pot is still hot so that the screw threads do not seize in solidified solder.
11. Remove the drain extension, if applicable, and re-install the safety drain plug.
12. Immediately remove any residual dross and solder from the inside of the solder pot.
13. Load the solder pot with bars, pellets, or ingots to its capacity and cover with a blanket while it is heating.

14. Once the solder is melted, re-install solder module components and add solder if necessary to fill to 12.7 mm (0.50 in.) from the top lip of the pot.