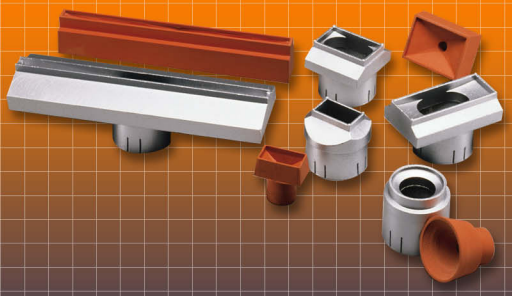
PCBRM12 &15

Users Manual #3006.00.903

Selective Soldering & Rework
of Multi-Leaded,
Through Hole Components



AIR-VAC

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PCBRM12 & 15
USERS MANUAL

Part No: 3006.00.903
Rev: 04.00
Date: 8-8-03

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1 Introduction/Getting Started

Air-Vac is always willing to assist our customers with any technical or operating questions. If you have any questions on machine parameters, correct nozzle requirements, options, procedures or maintenance, ***please do not hesitate to call.***

Air-Vac Engineering Company, Inc.
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Technical Support: solder.tech@air-vac-eng.com

1.0 Warranty

Air-Vac Engineering Company warrants its equipment for a period of one (1) year from date of shipment on all parts, materials and labor costs required to repair the system except for component parts that are considered "wear and tear" items which are warranted for ninety (90) days. These include, but are not limited to, heaters, belts, lights, vacuum cups and tubing.

Air-Vac agrees to repair or replace any or all such equipment that may prove to be defective within the warranty period, without expense, excluding shipping to the owner. This warranty shall not apply to any products that have been repaired or altered except by Air-Vac Engineering.

Services under warranty shall not affect an extension of the warranty period, nor will a new warranty period be granted for the parts, which were replaced/repaired. The title of the replaced parts will automatically pass to Air-Vac.

Air-Vac reserves the right to reject replacement under this warranty where, in the sole opinion of Air-Vac, the defect is due to obvious misuse and/or improper maintenance of the module or any part thereof.

The express and/or implied warranty of Air-Vac is limited to the replacement and/or repair of any item defective in material and/or workmanship. Other damages, if any, direct or consequential are expressly excluded from this warranty.

Air-Vac shall be liable under this warranty only if 1) Air-Vac receives notice during the appropriate warranty period (90 days or 1 year as applicable); 2) The products are operated in accordance with the supplied documentation; and 3) Such products are, to Air-Vac's satisfaction, determined to be defective.

When contacting Air-Vac for warranty inquiries, please provide the following information:
- *Order number which the parts were shipped*
- *Model and serial number of the product*
- *Reason for warranty*

Products cannot be returned to Air-Vac without authorization – please call for an RMA #.

1.1 Unpacking

Shipping Weight: - 170 lbs.

Shipping Dimensions (W x D x H): - 43" x 34" x 30"

IMPORTANT!!

DO NOT LIFT OR PULL HERE AT POINTS INDICATED, DAMAGE TO SYSTEM MAY RESULT.

- Position module on a level surface which can provide adequate support for weight.
- Accessories are normally shipped in box with module. Please inspect carefully and check that all items have been shipped.
- Save shipping box for any future shipping.

1.2 Material Check List

The following 'Machine Section' is a checklist of items shipped with all PCBRM units.

MACHINE TOOL KIT - 12050 SERIAL NUMBER# _____

DESCRIPTION	QUANTITY	PART NUMBER	CHECK √
Sleeve Baffle	1	12011	
Extractor Tool	1	IC-10	
Extractor Tool	1	EX-2	
Set of fuses (packed in small plastic case): - 15 amp - 1/2 amp - 3/4 amp - 3/10 amp	1 2 2 2 2	 9002.04.043 9002.04.038 9002.04.035 9002.04.040	
5/32" Tee Handle Allen Wrench	1	12050B	
¼" Spintite Sprocket Wrench	1	12050A	
Graphite Anti-Sieze	1	AS15	
Bubble Level	1	12015	
Allen Wrench Set	1	12055	
3mm Allen Wrench	1	12050L	

MACHINE ACCESSORIES

DESCRIPTION	QUANTITY	PART NUMBER	CHECK √
Footswitch	1	12870	
Bailer	1	SL5	
Pot Cover	1	12590	
Manual	1	3006.00.903	
Ladel	1	9008.99.315	
Spatula	1	9008.99.314	
Gloves (pair)	1	12050M	

1.2.1 Spare Parts

PCBRM12 MODULE

DESCRIPTION	QUANTITY	PART NUMBER	CHECK √
Sleeve Baffle	1	12011	
Pump Assembly	1	12401	
Drive Belt (Hi Temp)	1	12467	
Pump Bearings (set of 2)	1	9001.09.020	
Thermocouple & Fitting (Process Temp.)	1	12801	
Temperature Controller (Process)	1	12860	
Cycle Controller Board	1	12862	
Solid State Relay, Pot	1	12865	

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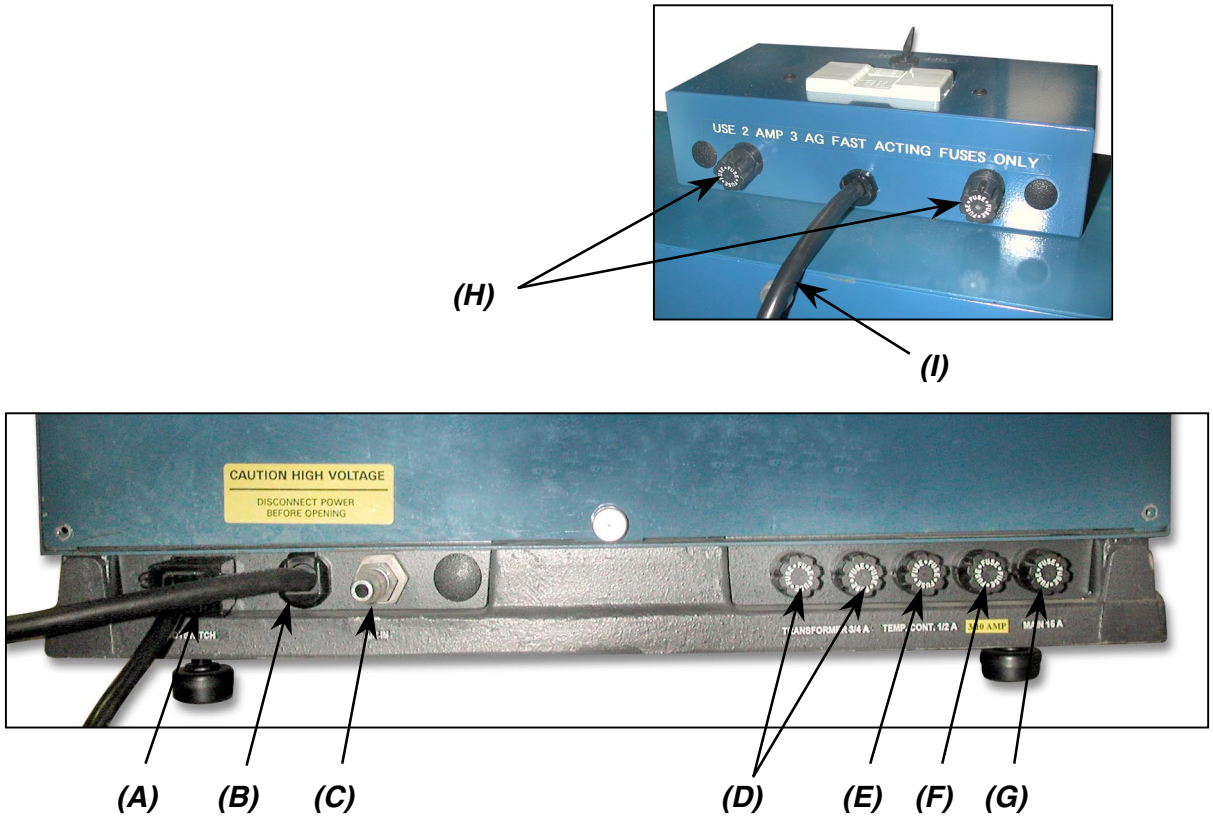
2 Set Up, Overview & Installations

2.0 Set Up

Facility Requirements - PCBRM12 Specifications

- Physical Dimensions: 32"W x 26"D x 26"H
- Maximum Board Size: 22"W x 21"D
- Solder Capacity: 35 lbs.
- Total Weight with Solder: 125 lbs.
- Electrical Requirements: 208/220VAC, 13 Amps, 50/60 Hz, Single Phase, 2500 Watts. Plug = 15A, 250VAC, Nema 6-15P.
- Compressed Air: 40-80 psi - clean moisture-free air

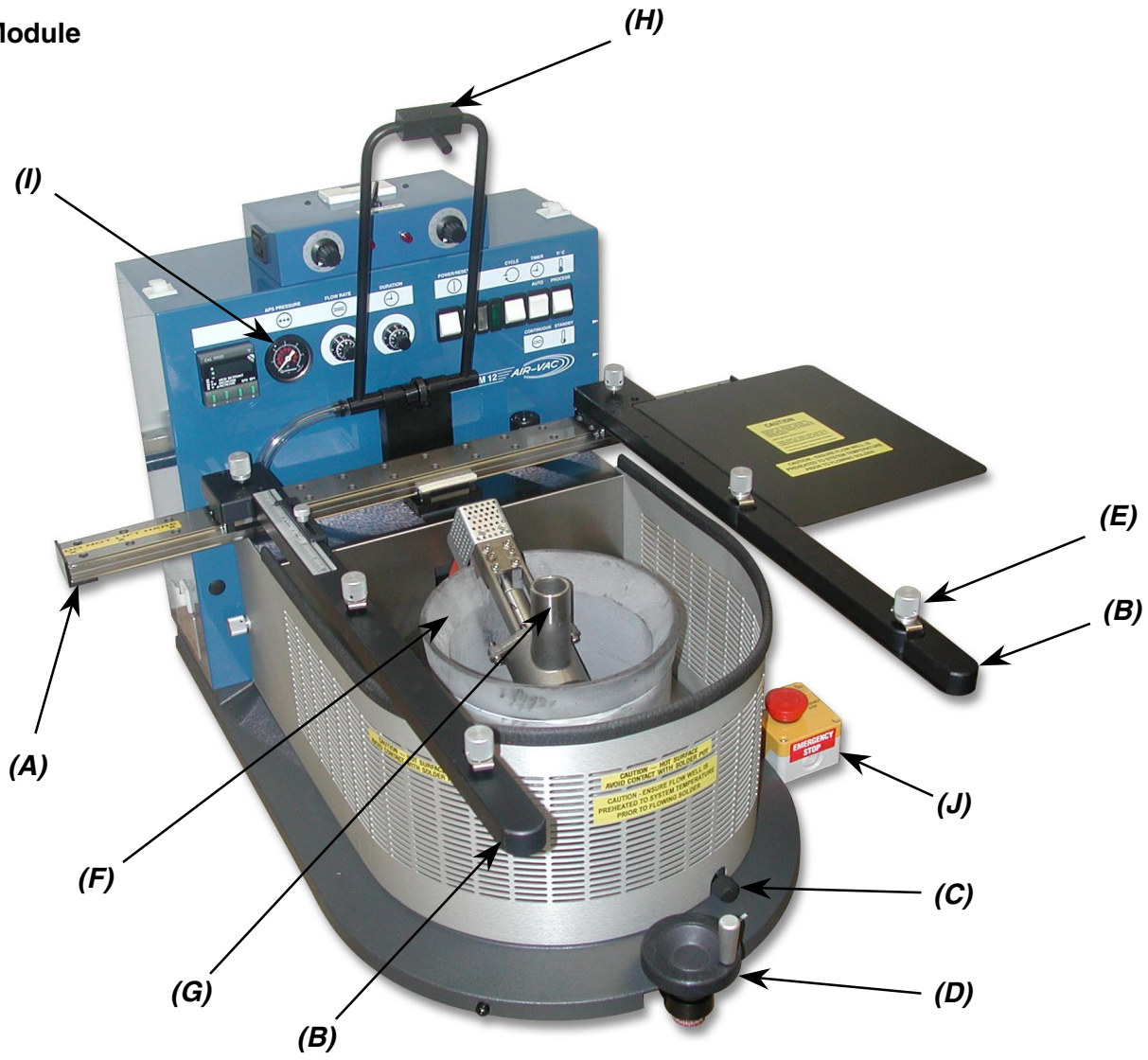
External Connections – PCBRM12 (rear of machine)



(A) Footswitch (machine will not operate if the footswitch is not connected)
(B) Main power cord (220V)
(C) Compressed air line (thread size 1/8-27 NPT(F))
(D) Transformer fuses (3/4 amp)
(E) Temperature Controller fuse (1/2 amp)
(F) Motor fuse (3/10 amp)
(G) Main fuse (15 amp)
(H) Heater fuses (2 amp)
(I) Power cord for external heater box (110V)

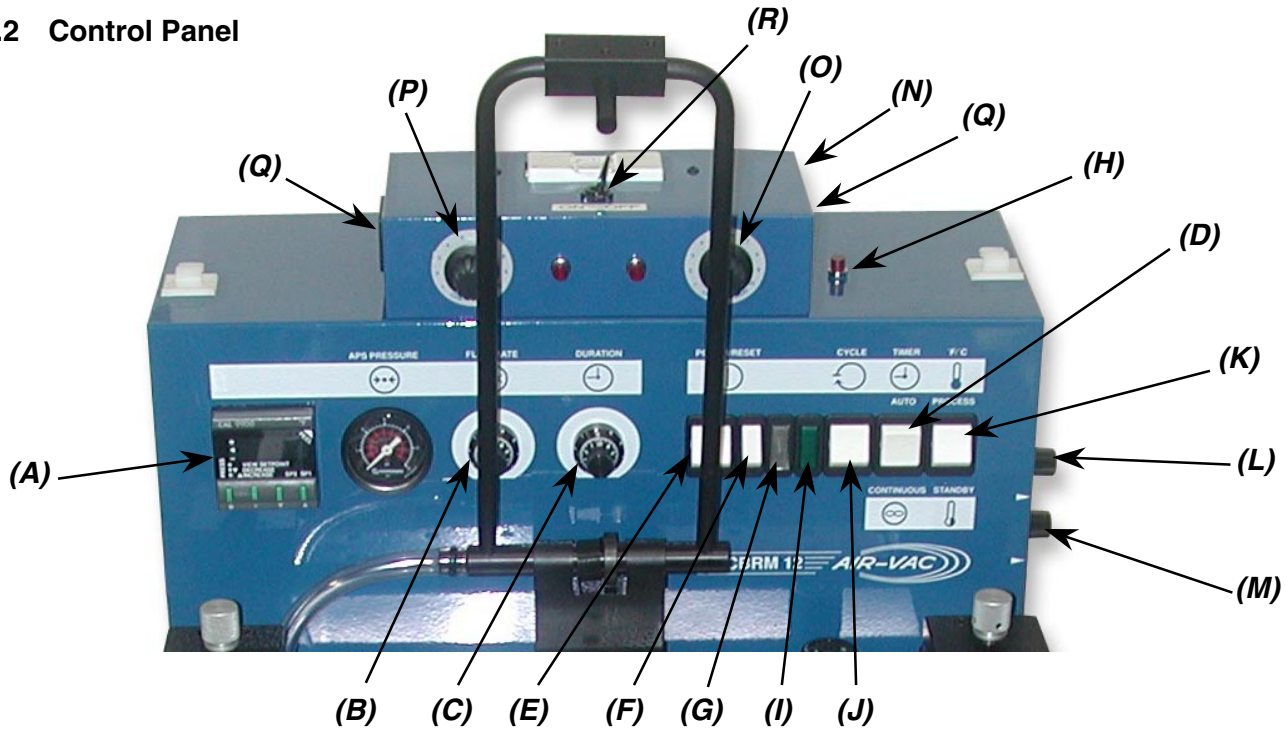
2.1 PCBRM12 Overview

2.1.1 Module



(A) X-Axis Carrier Rail - Cantilever carrier rail adjusts to hold PCB up to 22"W.
(B) PCB Carrier Arms - Carrier arms hold PCB up to 21" deep. PCB Stops with reference scale provides one time set-up of repetitive assemblies.
(C) X-Axis Carrier Lock - Once PCB is aligned over flow well, the carrier is locked in place.
(D) Z-Axis Height Adjustment - Adjusts height of PCB in relation to the flow well.
(E) PCB Locks - Locks PCB firmly in place in carrier arms.
(F) Solder Pot
(G) Solder Pump
(H) Air Blow Off Arm - Blows low pressure air thru holes in PCB of removed component to clear them of solder.
(I) Air Pressure Gauge – For air blow off.
(J) Emergency Stop – Shuts system down immediately if required.

2.1.2 Control Panel



(A) Digital Temperature Controller - Microprocessor provides two programmable set points: Process Temperature and Standby/Interlock Temperature. Digital readout of actual temperature is accurate within +/-1% of full scale. (Thermocouple is located at bottom of solder pot).
(B) Solder Flow Rate Control – Process flow rate can be varied and controlled during the duration cycle. There are three Solder Flow Rate Controls: Ramp Up, Process, and Ramp Down. The Flow Rate Control adjusts the pumping speed of the solder to produce a level flowing wave through the Flow Well. Too low of speed will not pump the solder against the pcb contacting all the component leads. Too high a setting will cause solder to flood the board surface.
(C) Solder Duration Control – The length of the time solder flows in one cycle can be set. The process cycle can be started by either depressing the START ON the Footswitch or pressing the CYCLE Start-switch.

- ***(D) Mode Switch - Automatic Mode*** – With the Timer Switch in the Automatic Mode, specific timing logic is available up to 60 seconds and is adjusted and set by the Duration Control. The settings between 1 and 5 give the range used for most applications. If the cycle needs to be interrupted, pressing the STOP ON of the Footswitch will stop the cycle.
- ***(D) Mode Switch - Continuous Mode*** – With the Mode Switch in Continuous, the Duration Control Logic and Cycle Start Switch are now by-passed. Solder will flow until the STOP pedal is depressed. Solder flow will not resume until the STOP pedal is released. The Continuous Mode is operator controlled.

Note:

THE CENTER POSITION OF THE MODE SWITCH (D) IS "OFF".

(E) Main Power Switch – ON/OFF provides electrical power to the systems.
(F) Relatch Switch – Resets Main Power after unit is turned off or Emergency stopped.
(G) White Light – Indicates Main Power is on.
(H) Transformer Breakdown Light – Indicates failure of transformer coil isolation.

(I) Green Light – Indicates solder is molten and the machine is ready to cycle.
(J) Cycle Switch – Activates the Cycle Duration with Mode Switch in Automatic Mode.
(K) Temperature Controller – Controls temperature of solder.
(L) Ramp Up Flow Rate - Adjusts motor start speed of the pump, either quickly or slowly. To increase ramp time, turn knob counter-clockwise. To decrease, turn clockwise.
(M) Ramp Down Flow Rate - Adjusts motor stop speed of the pump, either quickly or slowly. This can help to produce a better solder joint. To increase ramp time, turn the knob counter-clockwise, to decrease turn clockwise.

Note:

FLOW RATE INFLUENCES THE TOTAL DURATION/PROCESS CYCLE. RAMP DOWN FLOW RATE INFLUENCES THE TIME WHEN THE AIR IS ACTIVATED FOR THE AIR CLEANING SYSTEM. FOR SOLDERING, SET RAMP DOWN TO "0". FOR DESOLDERING, SET TO "10".

(N) Flow Well Heater Box – Used when external heaters are required for heating large flow wells.
(O) Heater Control Right (high/low) – Adjusts right flow well heater from low to high temp.
(P) Heater Control Left (high/low) – Adjusts left flow well heater from low to high temp.
(Q) Left & Right Plugs – Plug heater for flow wells here.
(R) ON/OFF Switch

2.2 PCBRM12 Installation

2.2.1 Leveling Module

CAUTION:

OPERATION OF THIS MODULE INVOLVES PUMPING OF MOLTEN SOLDER. ALL NORMAL SAFETY PRACTICES SHOULD BE OBSERVED WITH SPECIAL ATTENTION TO THE FOLLOWING:

SAFETY GLASSES SHOULD BE WORN AT ALL TIMES.

DO NOT MOVE MODULE WHILE SOLDER IS MOLTEN.

DISCONNECT POWER BEFORE SERVICING MODULES.

CAUTION:

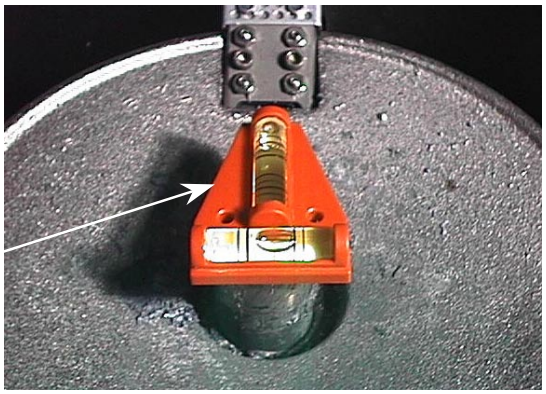
LEVELING OF MODULE SHOULD NOT BE ATTEMPTED WITH MOLTEN SOLDER IN THE POT.

Note:

LEVELING IS CRITICAL TO PROVIDE CORRECT SOLDER FLOW.

- Level machine on table.
- Place the level (supplied with tool kit) on ***Pump Housing (A)***. Level machine (front to back and side to side) by adjusting the Leveling Legs.
- After leveling is completed, lock legs with jam nuts.

(A)

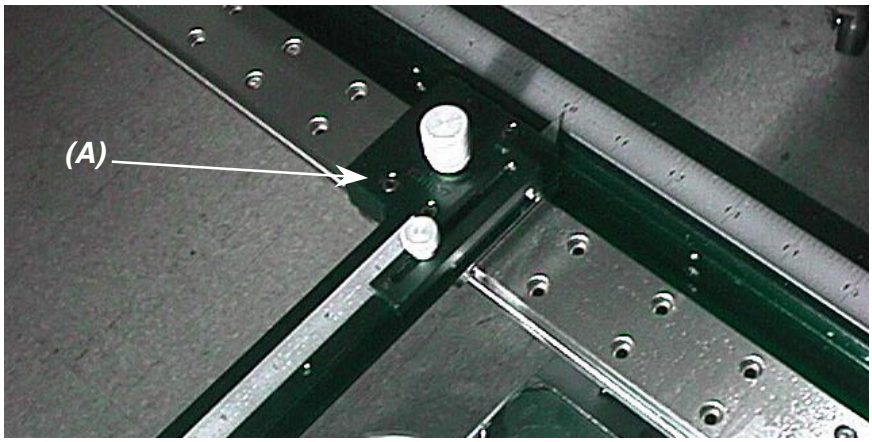


2.2.2 Carrier Arm Installation

- Fasten carrier arm with four ***mounting screws (A)***, do not tighten.
- Locate ***square (B)*** against ***carrier rail (C)*** and side of ***carrier arm (D)***. Hold firmly in place and tighten screws.
- Fasten other carrier arm with four mounting screws, do not tighten.
- Hold right carrier arm against the left carrier arm. Hold firmly together and tighten screws.

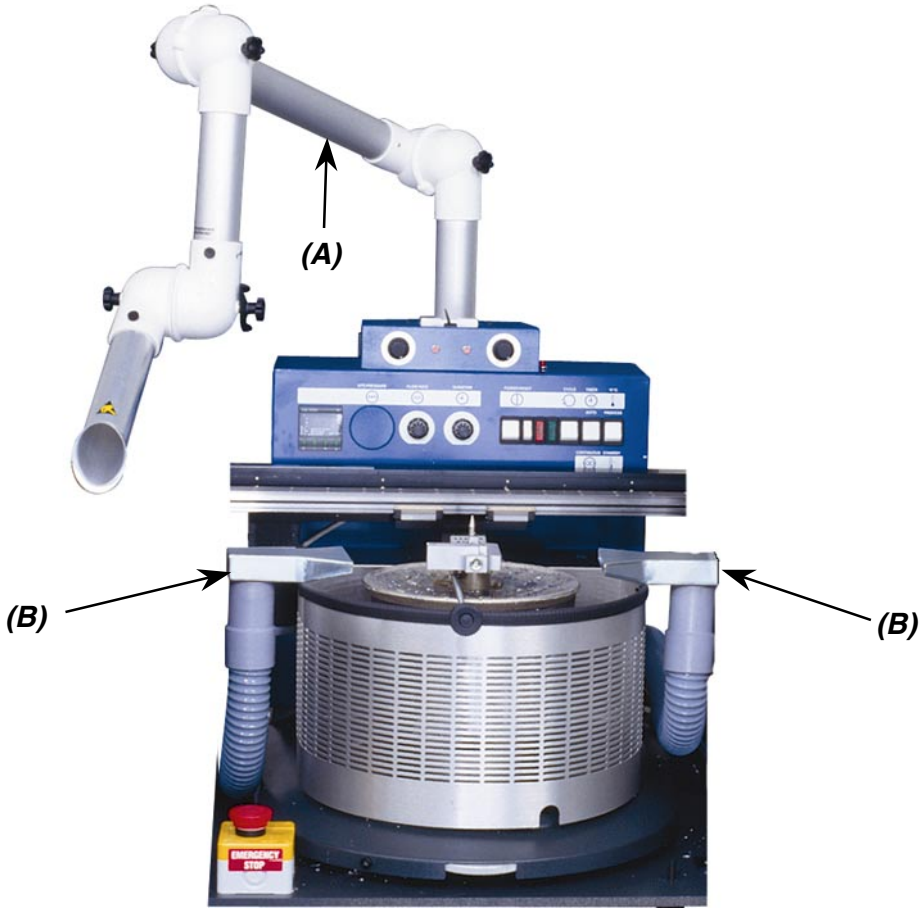
CAUTION:

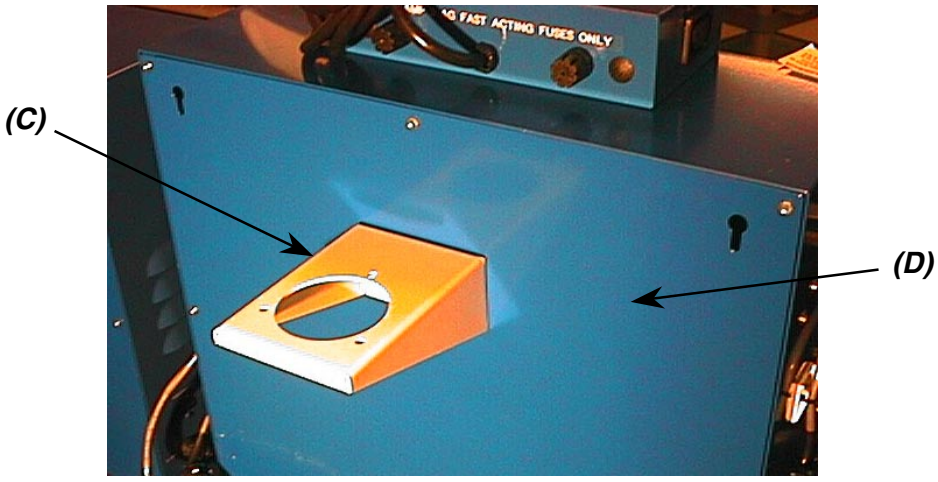
NEVER REMOVE END STOP OF CARRIER RAIL (E). BEARINGS WILL BECOME UNUSABLE.



2.2.3 Fume Extraction Manifold Assembly Installation (option)

- Fume Extraction Manifold consists of an ***overhead arm & 4" diameter hose (A)*** and ***two exhaust nozzles and 2" diameter hoses (B)*** which can be attached to an in-house or separate filtration system.
- Overhead arm mounts to ***bracket (C),*** which mounts to ***PCBRM back panel (D).***



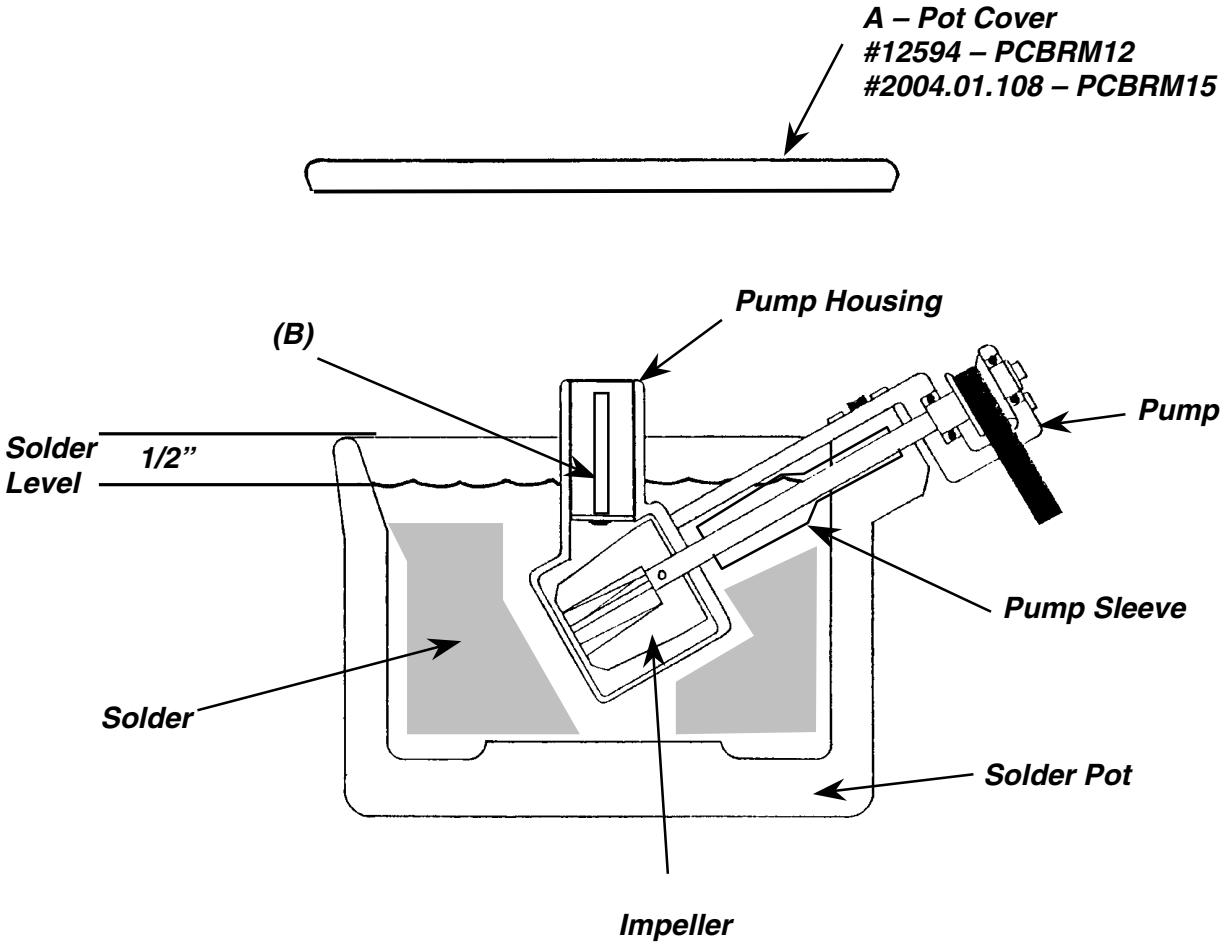


2.2.4 Adding Solder

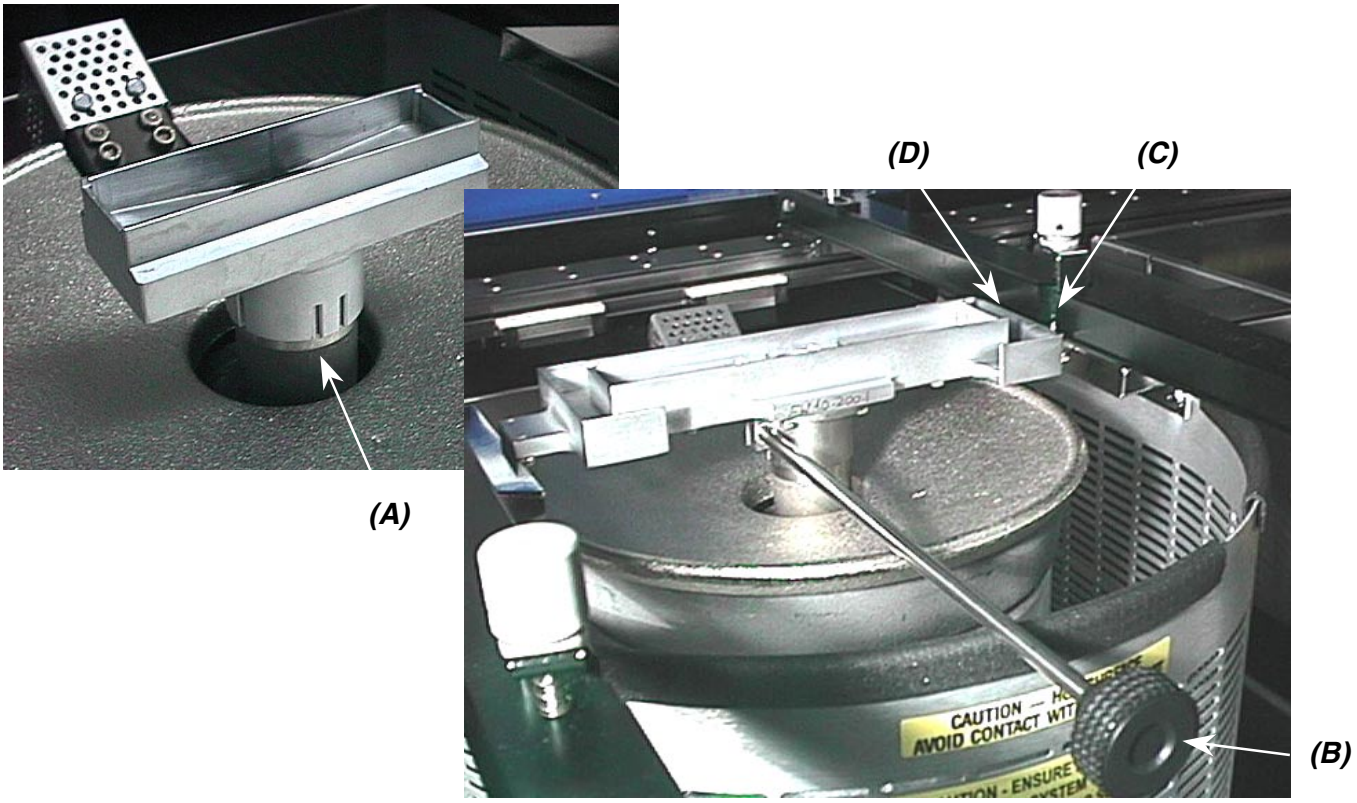
CAUTION:

USE INSULATED GLOVES WHEN WORKING AROUND HEATED AREA. BE CERTAIN THE MODE SWITCH IS IN THE OFF POSITION (NEUTRAL POSITION.)

- Remove ***Pot Cover (A).***
- Insert ***Baffle Sleeve Assembly (B)*** into Pump.
- Power up system by depressing main power and reset switch on the PCBRM module.
- When the pot reaches 500°F (260°C), place solder bars into pot until solder level covers Baffle Sleeve Assembly (1/2" from top of pot).
- Using gloves provided, place pot cover back on pot once solder has melted.
- Power up preheater panels (for Stepper System only).



2.2.5 Flow Well Installation



- Use insulated gloves to seat ***Flow Well*** to ***Solder Pump Housing.***
- Adjust ***Spring Tabs (A)*** to insure flow well maintains position (or tighten ***Clampable Shank (B)*** if supplied.)
- Using the ***Vertical Adjustment,*** lower ***Carrier*** to allow ***Carrier Arms (C)*** to touch side of ***Flow Well (D).***
- Adjust Flow Well parallel to carrier arms or use the edge of the PCB as a guide to square the flow well.
- Connect power to flow well heaters, if applicable.
- After flow well has heat soaked, cycle machine with mode switch in continuous. Slowly increase flow rate until solder flows thru flow well openings, solder must flow evenly to all openings.

CAUTION:

SOLDER MAY SOLIDIFY IN FLOW WELL IF NOT HEAT SOAKED. DO NOT INCREASE FLOW RATE. ALLOW FLOW WELL TO HEAT SOAK FURTHER.

- Adjust height of board carrier to solder wave using carrier height adjustment wheel.
- A space of approximately 3/32" (or 2.4mm) between the top of the flow well and the bottom of the pcb. Molten solder must flow through this space, contact all leads and flow freely back into the solder pot.
- Insufficient clearance could force the solder to flow up through the barrels of the board and flood the top of the board. It could also create a safety concern forcing solder under pressure out of narrow flow well/pcb openings.
- Solder can also deflect along the bottom of the pcb to adjacent component leads.
- Too great of a clearance could prevent the solder from reaching the entire lead pattern.

2.2.5.1 Standard Flow Wells & Air Cleaning Hoods

The flow well must be larger than the component lead pattern to insure that all leads are within the solder wave. Generally an edge distance of 3/32" is added around the lead pattern and on long connectors where heat dissipates at the end of the well, an edge distance of 3/8" is recommended.

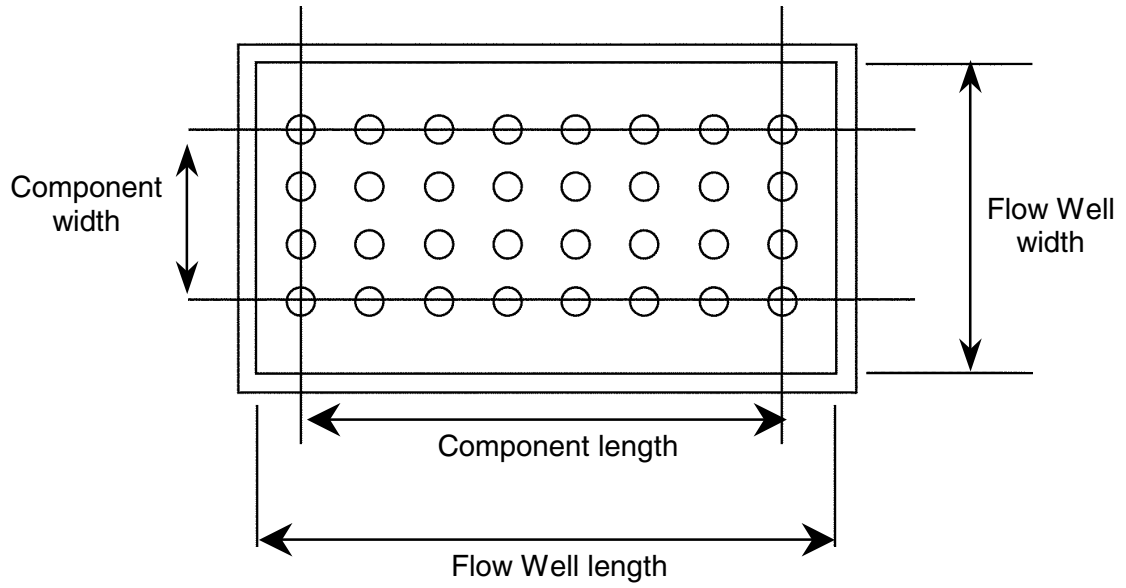
Note:

NORMALLY CLEANING HOOD DIMENSIONS ARE THE SAME AS FLOW WELL DIMENSIONS. WHERE DENSITY AND/OR ADJACENT COMPONENT CONFIGURATIONS PRESENT AN INTERFERENCE PROBLEM, HOODS CAN BE MODIFIED TO MORE CLOSELY CONFORM TO LEAD PATTERNS.

Dimension (W" x L")	Flow Well Part Number	Dimension (W" x L")	Flow Well Part Number
1/4 x 1 1/4	FW8-40	7/8 x 1 5/8	FW28-52
3/8 x 1 3/8	FW12-44	1 x 1 7/16	FW32-46
3/8 x 2 3/16	FW12-70	1 1/8 x 1 1/8	FW36-36
3/8 x 2 3/4	FW12-88	1 1/4 x 1 1/4	FW40-40
3/8 x 3 1/4	FW12-104	1 3/8 x 1 3/8	FW44-44
½ x 29/32	FW16-29	1 ½ x 1 ½	FW48-48
½ x 1	FW16-32	1 3/4 x 1 3/4	FW56-56
3/4 x 1 5/16	FW24-42	2 x 2	FW64-64
3/4 x 1 ½	FW24-48	1/4 x 4	FW8-128
3/4 x 2	FW24-64	3/8 x 5	FW12-160
3/4 x 2 3/16	FW24-70	½ x 5	FW16-160
3/4 x 2 ½	FW24-80		

Flow Well Sizing

- The size is basically determined by the component pin centerline distances.
- The contact area must include every lead of the pattern to be contacted by flowing solder. The length and width dimensions must provide generous heat contact and ease for operator component positioning.

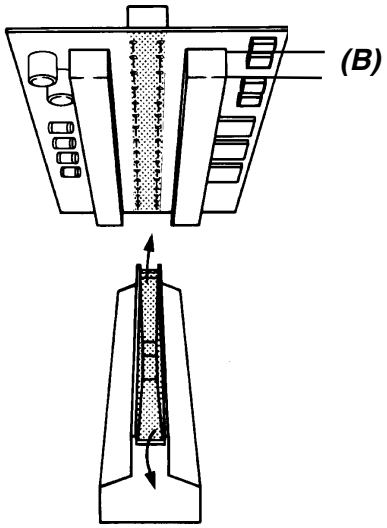


2.2.5.2 Special Soldering/Desoldering Applications

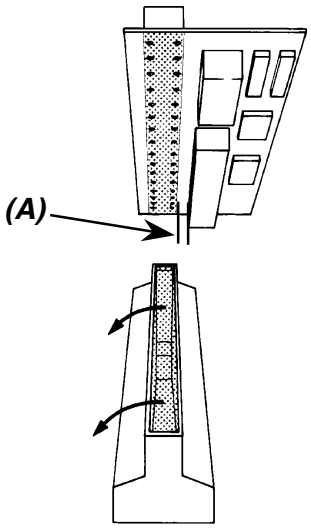
- Special Flow Wells and Cleaning Hoods can be manufactured for specific applications where issues of clearance, adjacent components and mixed technology boards are concerns.
- Consult Air-Vac for details concerning your specific requirements and the optimum solution.
- A detailed dimensioned customer print and sample of the assembly are critical to design.

Flow Wells determine the size, shape and direction of the solder wave:

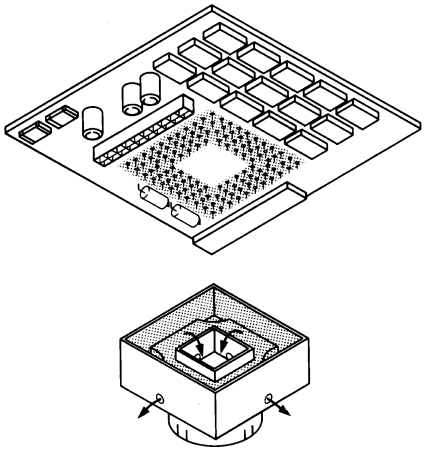
- Bottom side critical areas must be addressed. Edge distances ***(A)*** and height of bottom side components ***(B)*** must be known.



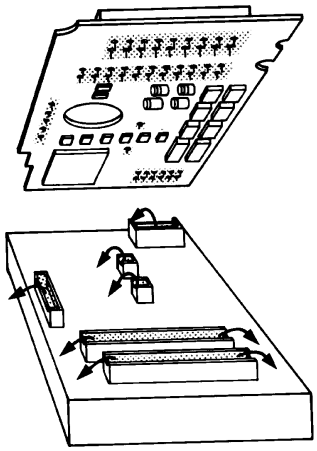
For double-sided boards, solder flow is directed away from adjacent bottom-side components.



For edge connectors, solder flows away from the board.



The solder flow can be directed inward, Protecting components near the lead pattern and limiting heat to adjacent area or components.



The solder flow can be directed to large select areas for multiple soldering of components.

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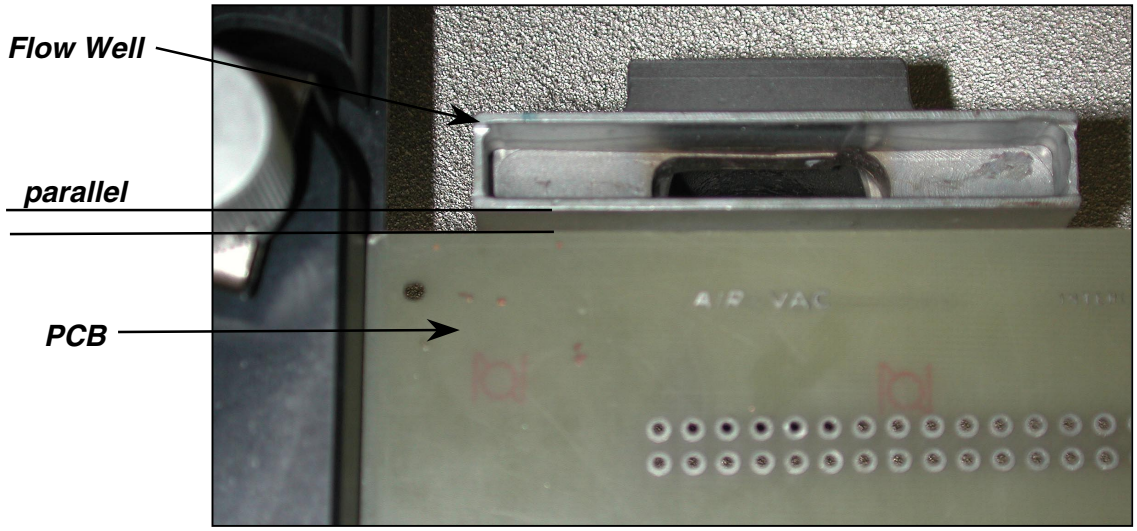
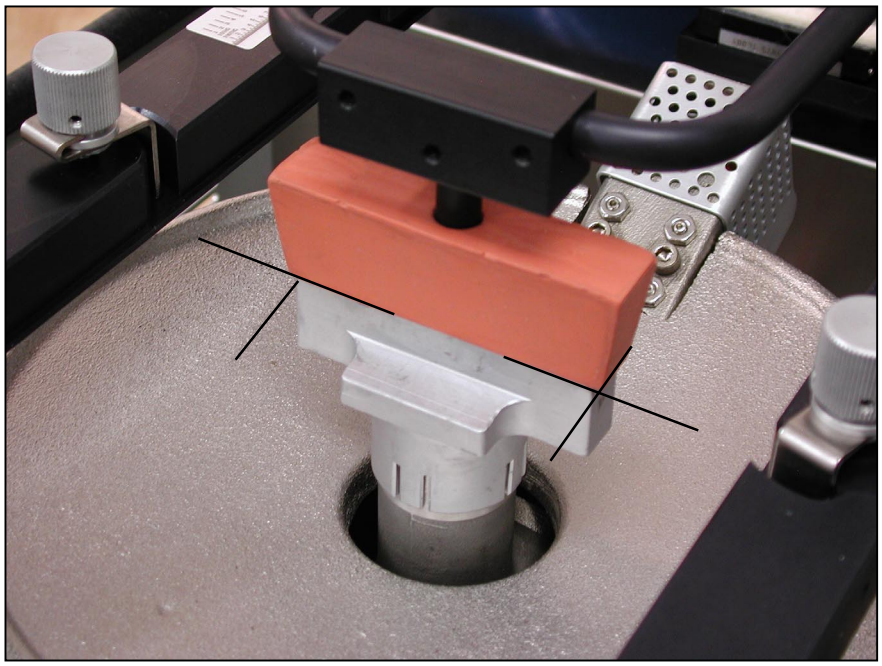
3 Procedures/Applications

3.0 Component Removal Procedure

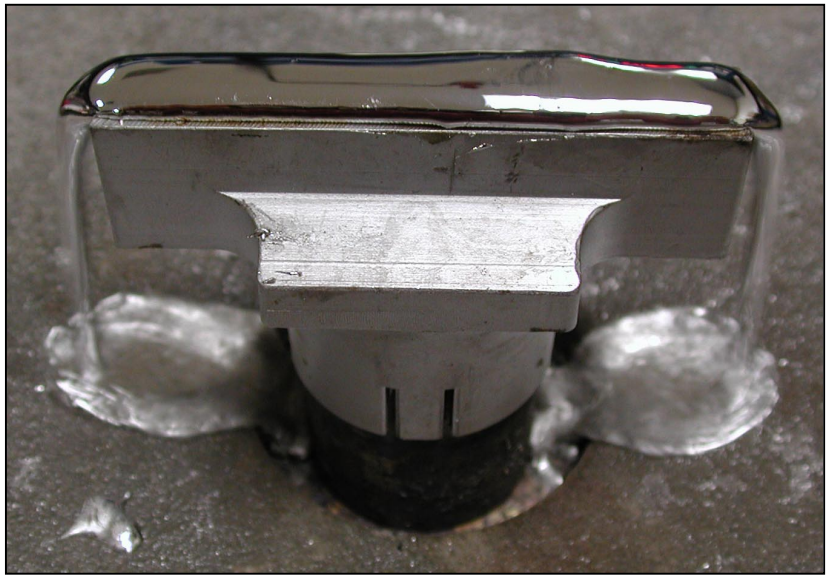
- Flow well should be placed on pump housing and pushed all the way down. Adjust tabs on flow well for a tight fit to pump. Use the edge of the PCB as a guide to square flow well to carrier arms (as shown).



- **Set hood alignment**: Hood must be positioned exactly over the flow well with the faces of the hood and well parallel and square to one another.



- Push the main power and reset switches. Set the temperature switch to "Process" position. Process temperature is factory set at 500°F (adjust as required).
- When the unit has heated (typically 45 minutes), and solder is molten, the machine is ready for cycle.
- Set flow rate control to the setting that produces a level solder wave.



- Set timer switch to either "Auto" or "Continuous". If "Auto" is used, set duration control for the time desired.
- Flux the entire lead pattern. Position the component over the flow well using the air-cleaning hood as a locator. Secure PCB with the board carrier locking screws and lock carrier. For repetitive (same PCB's) adjust the y-stop.
- With PCB in carrier, use the carrier height adjustment wheel to adjust to the proper height (typically 1/16" between PCB and well).
- Start solder flow with either cycle switch on control panel or footswitch.
- Observe component leads and when all leads are molten, lift component from board using an extractor tool that firmly grasps the component body. If solder is still flowing, interrupt cycle by depressing right pedal or footswitch. Component should lift out easily. If not, solder may not be completely melted.

Note:

IN AUTO MODE THE END OF SOLDER FLOW IS INDICATED BY AN AUDIBLE SIGNAL. DO NOT ATTEMPT TO REMOVE COMPONENT AFTER THE SIGNAL. THE PCB MUST REMAIN RIGID AND HORIZONTAL DURING THE REMOVAL PROCESS. DO NOT PULL THE BOARD UPWARD AWAY FROM THE WAVE OR PUSH DOWNWARD INTO THE WAVE SINCE THIS WILL CAUSE "FLOODING". ON BOARDS THAT ARE LARGE OR VERY FLEXIBLE, IT MAY BE ADVISABLE TO CONSTRUCT A FRAME TO HOLD BOARD IN PLACE.

3.0.1 Special Techniques

Clinched Leads
IC component with flexible leads that have been machine inserted or with only a minimal number of leads fully clinched, can normally be removed by using a rocking or twisting motion as opposed to lifting straight out. A slight upward motion straightens the lead as it passes through the plated-through-hole. An IC component with all leads crimped flush to the board or components with thick leads, should have the leads pre-straightened.

Solder Temperature
The actual solder temperature contacting the PCB is approximately 10°F less than the temperature that appears on the digital controller. The best temperature for removal is not necessarily the same as the temperature used for wave soldering. The lack of preheat and the presence of solid solder joints vs. leads in empty holes, results in different heat sink conditions, making the operating temperature for desoldering higher than for soldering in many applications. Icicling on the component leads is an indication of too low a solder temperature setting

3.1 PCB Hole Cleaning Procedure

The hole cleaning operation starts immediately at the end of the component removal procedure. Referring back to the component removal cycle, there will be an audible signal that indicates solder has stopped flowing against the PCB. At this point, lower the air cleaning hood. It is important that sufficient downward pressure be applied to insure a good seal between the hood and board surface. However, excessive pressure can force the board to contact the flow well stand offs.

Low pressure air comes on automatically 1½ seconds after the solder stops flowing, forcing the molten solder to drop from the holes into the empty flow well. The 1½ seconds delay prevents pressurized air from coming in contact with the flowing solder.

The bottom of the PCB may have bridging or icicling caused by the moving air. The next operation of resoldering of the replacement component will eliminate these conditions.

Depending upon the heat sink characteristics of the board, the number of leads, and shapes of the lead pattern, there will be some holes that will not be completely clear of solder. A vacuum desoldering tool can be used to clear these remaining holes. Air-Vac offers the PVSG80V120 Desoldering Tool which reheats the solder and vacuums it away, leaving the hole clear.

3.2 Soldering Replacement Component

After the holes have been cleaned, flux the leads of the replacement component, insert into PCB, and start the cycle to solder the component. Where leads are "free", exert a slight downward force on the component to prevent "floating" of the component when the solder wave contacts the leads.

3.3 Specific Production Soldering Applications

In addition to component removal and replacement, the PCBRM12 is commonly used for Selective Soldering in the production process.

Small Sub-Assemblies
The PCBRM12 has many advantages compared to hand soldering sub-assemblies. The average solder cycle is 5-10 seconds regardless of the number of component leads. The heat exposure on the PCB is less, since the average solder temperature is 500°F, compared to soldering irons that are higher. Operator skill is minimal, since the solder cycle is controlled and the entire area is soldered at once.

Seating Soldered Components
In production wave soldering, a common problem is the "floating" of components that do not have clinched leads resulting in components that are not properly seated. These components can be positioned over the flow well and as the solder is flowing and all joints are molten, downward force may be used to properly seat the component.

Selective Soldering
For a variety of reasons, many components cannot be on the board during the production wave or drag soldering and cleaning operation. These components have to be soldered on the board individually in a secondary operation. Rather than hand soldering these components, they can be positioned over the flow well and wave soldered without reflowing components already on the board. Very common selective soldering applications are for edge connectors that cannot be on the board due to pallet restrictions and components like switches and relays that cannot go through the cleaning process.

3.4 Temperature Controller

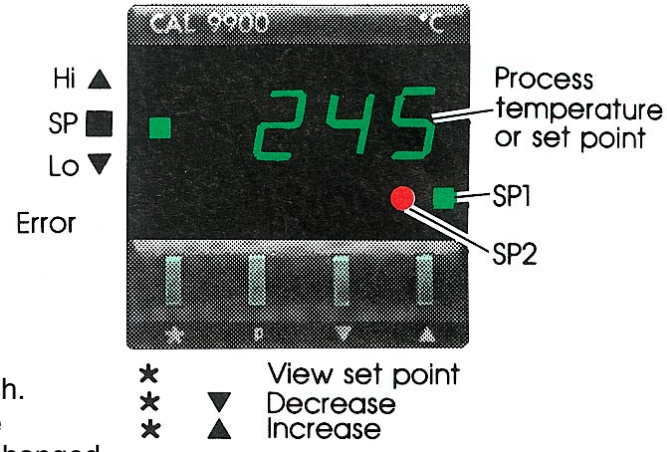
3.4.1 Programmable Set Points

The Programmable Digital Readout Temperature Controller has two set points that are programmable. Set point one (SP1) is the process temperature; set point two (SP2) is the standby/interlock temperature. The temperature selector switch determines which set point is activated.

Process Temperature (SP1). The process temperature determines the temperature of the flowing solder during the rework and soldering cycles. The controller is connected to a thermocouple located at the bottom of the solder pot. The actual temperature contacting the bottom of the printed circuit board is approximately 10°F less than the process temperature, which is factory set at 500°F.

Standby/Interlock Temperature (SP2). ***The standby/interlock temperatures are the same temperature.*** The standby temperature minimizes oxidation by automatically reducing the temperature when the module is not being used. The purpose of the interlock temperature is to prevent the pump motor from operating until the solder reaches a molten condition. SP2 is factory set at 70°F less than the process temperature (500°F - 70°F = 430°F).

To Change SP1 or SP2 –
Follow These Procedures



- SP1 Temperature:
  1. With the power and reset switches on, press the *key and the SP1 setting will flash.
  2. By holding the *key down and pressing the ▼ and ▲ keys, the SP1 setting may be changed.
  3. When the keys are released, the display automatically returns to actual solder temperature.

- SP2 Temperature
  1. With the power and reset switched on, depress the "P" key with a pointed object. The digital display will show numbers with a decimal point and the number to the right of the decimal point will flash.
  2. Use the ▼ and ▲ keys to bring the flashing number to 2 at the right side of the decimal point.
  3. Press the *key to change the left side of the decimal. Press the ▼ and ▲ keys to set the differential temperature (range available is 0 - 99°F).
  4. Press "P" to lock in memory. Display will automatically return to actual solder temperature.

Note:

SP1 AND SP2 LIGHTS WILL REMAIN LIT UNTIL EACH TEMPERATURE IS REACHED. THE ▲ LIGHT INDICATES A TEMPERATURE HIGHER THAN PROCESS TEMPERATURE. THE ▼ INDICATES A TEMPERATURE LOWER THAN THE PROCESS TEMPERATURE.

3.4.2 Panel Display

Digital Display

The four digit digital display normally shows process temperature to 1°C or 1°F. It is also used to display the set-point value (flashing) and the FUNCTION and OPTION list.

- Functions – Function numbers are on the right.
- Options – Option numbers are on the left of the floating decimal point.

Control Keys

- User Mode:
  - * - Displays set-point (flashing)
  - *▲ - Keyed together increases set-point
  - *▼ - Keyed together decreases set-point
- Setter Mode:
  - P – Entry to FUNCTION and OPTION List and Exit to normal display and process temperature
  - ▲▼ - Indexes FUNCTION/OPTION number up or down in single digits
  - * - Changes adjustment from FUNCTIONS to OPTIONS and vice-versa (ie. Toggling)

Error Indicator

This is situated to the left of the digital display and the three LED's display the difference between set-point and process temperatures in five steps.

• (515°+)	"△"	3% or more above SP
• (505°-515°)	△	1% to 3% above SP
• (495°-505°)	■	within 1% of SP - 500°
• (505°-515°)	▽	1% to 3% below SP
• (515°+)	"▽"	3% or more below SP

Output Indicators

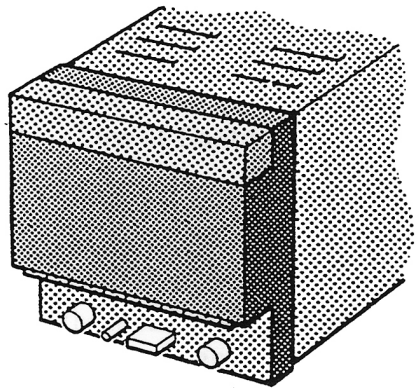
The two separate LED's beneath the digital display indicate:
□ - Illuminated SP1 output ON (green)
● - Illuminated SP2 output ON (amber)

3.4.3 Parameter Lock

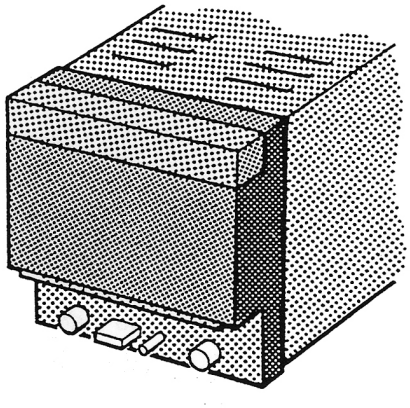
The chosen parameters may be permanently locked into memory by removing or altering the position of the link behind the lower front fascia as shown below. When the parameter lock has been applied, only the setter adjustments are possible.

Note:

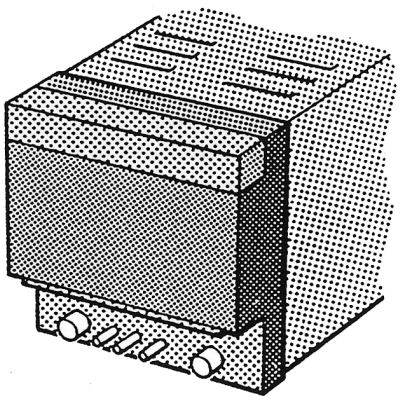
LOCKED POSITIONS (2) AND (3) ARE ALTERNATIVES AND THAT THE LINK SOCKET IS IN THE "INACTIVE" POSITION IN (2).



Parameter Setting
Position (1)



Parameter Setting
Locked Position (2)



Parameter Setting
Locked Position (3)

Note:

IT IS IMPORTANT TO SWITCH OFF BRIEFLY AFTER CHANGING LINK POSITION.

Setter Adjustments (when parameter lock is applied)
The setter can perform the following operations by depressing the recessed key P.

- Adjust the second set-point – SP2.
- Lock the main set point – SP1 to prevent adjustment by the operator.

3.4.4 Fault Indication

Temperature display, on a fault indication, is replaced by 'EE' flashing, followed by a digit. This indicates that an error has been detected in the system. Action should be taken as follows:

- EE1 – Sensor Burnout – Check sensor and/or connections then key*
- EE2 – Temporary System Error Self Clearing
- EE8 – Loss of Calibration
- EE9 – NVM Data Fault (non volatile memory)

Note: Repair & Re-calibration

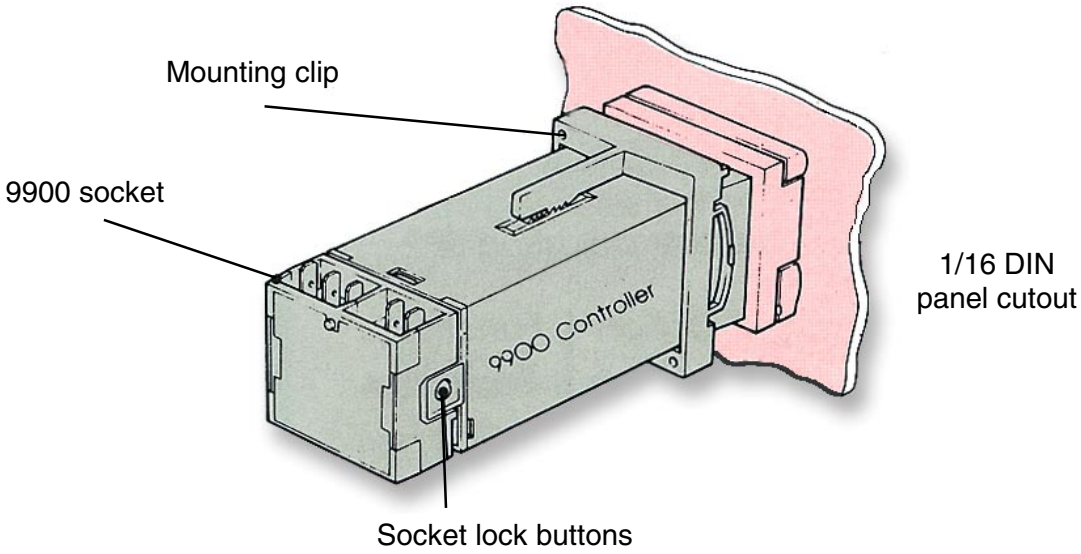
DUE TO THE NATURE OF ITS DESIGN, THE 9900 CAN ONLY BE REPAIRED AND RE-CALIBRATED BY USING SPECIAL EQUIPMENT AND SHOULD BE RETURNED TO AIR-VAC IF FOUND TO BE FAULTY.

Note:

TO RESET EE9 FAULT (CAUSED BY SPIKING), TURN OFF MACHINE, PRESS 'P' IN AND TURN ON POWER UNTIL DISPLAY COMES ON LINE. PARAMETER LOCK NEEDS TO BE IN THE SETTING POSITION.

3.4.5 Temperature Controller Installation

- Remove the socket by pressing in the lock buttons.
- Slide the controller into the cut out.
- Fit the mounting clip by pressing it firmly against the panel, jacking screws optional.
- Plug on the socket.



3.4.6 Setting Parameters of Temperature Controller (also refer to Cal control booklet)

1. With unit ON, remove lower front panel of temperature controller. Set parameter lock to parameter setting position; white tab will need to be located on the right two pins. Replace panel.
2. PRESS "P"; right side of decimal point will be flashing.
3. Using ▼▲ buttons, program .15.
4. PRESS *, then ▼▲ buttons to reach 1. — 1.15 – Clears Unit to default settings
5. PRESS "P", display will read 0.16 -- 0. must be flashing (if 0. is not flashing, PRESS *).
6. PRESS ▼▲ to reach 1
7. PRESS * (16. must be flashing) — Display should read 1.16
8. PRESS ▼▲ to reach 19
9. PRESS *, then ▼▲ to reach 2 — Display should read 2.19
10. PRESS *, ▼▲ 22
11. PRESS *, ▼▲ 1 — Display should read 1.22
12. PRESS *, ▼▲ 2
13. PRESS *, ▼▲ 70 (SP2) — Display should read 70.2
14. PRESS *, ▼▲ 4
15. PRESS *, ▼▲ 5 — Display should read 5.4
16. PRESS *, ▼▲ 5
17. PRESS *, ▼▲ 6 — Display should read 6.5
18. PRESS *, ▼▲ 6
19. PRESS *, ▼▲ 5 — Display should read 5.6
20. PRESS *, ▼▲ 7
21. PRESS *, ▼▲ 5 — Display should read 5.7
22. PRESS *, ▼▲ 8
23. PRESS *, ▼▲ 7 — Display should read 7.8
24. PRESS "P"
25. To set process temperature (SP1), PRESS * and hold – at the same time PRESSING ▼▲ to desired temperature.
26. Set parameter lock to its locked position. The white tab will need to be on the left two pins.

To Check Program:
1. PRESS "P"
2. PRESS ▲

Program #'s should read as follows:

0.0	0.13
0.1	0.14
70.2	0.15
0.3	1.16
5.4	0.17
6.5	0.18
5.6	2.19
5.7	0.20
7.8	0.21
0.9	1.22
0.10	7.23
0.11	--24
0.12	0.25

Table of Contents

4 Maintenance/Troubleshooting

4.0 Preventative Maintenance Schedule

CAUTION:

ALL SAFETY PRACTICES MUST BE OBSERVED.

Daily:

- **Clean exterior of machine to rid of solder deposits, flux, and dirt.**
  - Use household cleaners like "409".
  - For non-water soluble dirt (flux) use mineral spirits.

Note:

WHEN CLEANING BE CAUTIOUS OF PAINTED SURFACES, LABELS, OR PLASTIC (SWITCHES)- PROLONGED CONTACT OF SOLVENTS WILL ATTACK SURFACE.

- **Remove dross from flow well and pot cover.** The inherent nature of solder generates dross as a by-product which must be removed periodically depending on the module usage and in-house criteria. Dross removal can be accomplished only when solder is molten.
- **Remove dross from top of solder bath.** Remove dross from around impeller shaft. A fine black powder will collect at the surface where the rotating impeller shaft enters the molten solder. Remove with spatula tool. Dispose of dross in a metal container. The dross is at a very high temperature and should not contact anything that can melt or catch fire.
- **Report any problem to supervisor.** Fix any problems before further damage to the machine or customer assemblies occur.

Weekly:

- **Apply film of oil on all surfaces which solder may fall (except pot cover).** Apply 3 in 1 household oil to metal surfaces (around solder pot area) to inhibit solder and flux from permanently sticking to them. Remove side shields to get access.

Note:

SOLDER POT MUST NOT BE HEATED.

- **Apply oil to board carrier.** To protect from rusting apply oil to rails and arms of carrier. If rust appears, it can be removed with WD40 and fine emery cloth or scotch brite pads.

Note:

THE CARRIER RAIL IS SUSCEPTIBLE TO THE ENVIRONMENT. IT IS STRONGLY RECOMMENDED TO CLEAN AND OIL CARRIER FREQUENTLY.

- **Add Solder (as required).** Sufficient volume of solder must be in pot to cover the screen of the sleeve baffle. If not, dross will develop and be transferred to the assembly when the machine is cycled.

4.1 Solder Removal

- Use Solder Bailer to transfer solder to a container with a capacity of 150 cubic inches or more. Most of the solder can be removed with the bailer. Weight of solder is 35 lbs.

CAUTION!!

SOLDER IS HOT. USE EXTREME CAUTION.

4.2 Pump Cleaning

Pump bracket, housing, impeller and shaft are all rugged, stainless steel. The pump bearings are lubricated with a high temperature grease. Heat is not the main reason for their failure – rather it is dirt (dross, flux).

Note:

WHEN REMOVING PUMP FOR CLEANING, SOLDER MUST BE REMOVED FROM POT.

To Clean Pump

1. Hold pump in a vise for disassembly.

2. Do not remove leveling screws.

3. Clean all parts (except pump bearings) thoroughly:
   - Use mineral spirits to remove dirt.
   - Use a wire brush for easy to get at areas.
   - Use a scraping tool for hard to reach areas.

4. Inspect parts before reassembling (especially pump bearings). Check bearings for free, smooth action – no binding or rough action, if so, replace.

Assembly (see Disassembly Procedure)

1. Be certain when assembling the pump housing to pump bracket that the alignment guides are lined up exactly. This will insure that the pump is level when installed back onto the machine. If they are not lined up or if the leveling screws were removed, the result will be an un-level solder wave and very poor soldering or desoldering processes.

2. Spin pump shaft to be certain that the pump is assembled correctly before placing back on machine.

Note:

ONCE PUMP IS INSTALLED ONTO THE MACHINE, CHECK THE LEVEL OF THE PUMP. IF ADJUSTMENT IS NEEDED, REFER TO PUMP LEVELING PROCEDURE.

4.3 Pump Disassembly & Cleaning

CAUTION

SOLDER WILL BE HOT

1. Remove Pump Baffle (P) using needle nose pliers while pump is in the pot with solder.
2. Remove solder from pot using ladle supplied with unit.

Note

ALLOW MACHINE TO COOL BEFORE REMOVING PUMP FROM POT.

3. Remove two screws holding pulley guard to pump.
4. Remove two screws holding pump to pot.
5. Remove two screws holding pump housing (B) to pump bracket (A) and remove housing (B).

Note

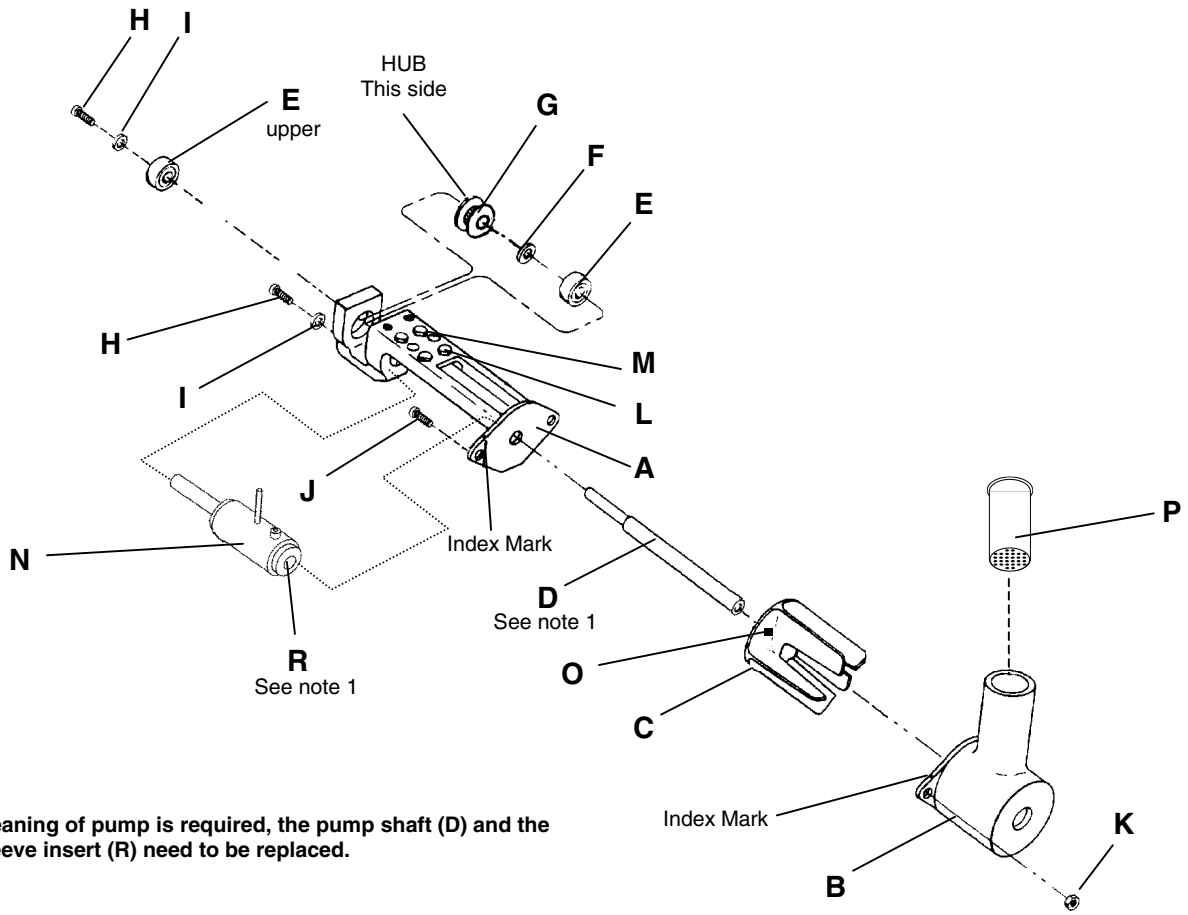
DO NOT LOOSEN OR REMOVE THE FOUR LEVELING NUTS (L) AND SET SCREWS (M) OR THE PUMP WILL NEED TO BE RE-LEVELED UPON INSTALLATION.

6. Loosen the two set screws on the pump pulley (G).
7. Remove the two bearing retaining screws (H) and washer (I).
8. Slide the pump shaft (D) with impeller (C) out of the pump bracket (A). Pump sleeve (N) will drop away at this point.
9. Remove pump bearings (E), spacer (F) and pulley (G) from pump bracket (A).

Note

INSPECT BEARINGS FOR SMOOTH MOVEMENT. REPLACE IF NECESSARY.

10. Remove pump shaft (D) from impeller (C) and discard.
11. Remove pump sleeve insert (R) and discard.
12. Clean all parts of solder and dirt using a wire brush or a tool to scrape solder from pieces.
13. Re-assemble pump as shown in drawing as follows:
    - Insert lower bearing into pump bracket.
    - Turn bracket upside down and insert pulley (hub side) into upper bearing hole.
    - Place spacer on top of pulley.
    - Insert shaft into bracket, through pump sleeve, bearing spacer and pulley.
    - Turn bracket over and insert upper bearing.
    - Install bearing retaining screws (H) and (I).
    - Tighten pulley set screws.
    - Install impeller onto shaft – before tightening the set screw be certain the play from the shaft and bearings will not cause impeller to hit pump bracket face. Allow for this clearance before tightening set screw.
    - Spin shaft with fingers and check for any interference. Correct as required.
    - Install pump housing (B) to bracket (A). Be certain the index marks are aligned exactly before tightening. If they are not, the pump will not be level.
    - Spin shaft with fingers and check for any interference between impeller and housing.
14. Pump is now ready for installation back into pot. Use anti-seize on the mounting screws when installing. Alternate tightening screws until snug. DO NOT OVERTIGHTEN. Over-tightening could cause pump to become un-level.
15. Check level of pump to carrier arms. Re-level if required.



NOTE 1:
When cleaning of pump is required, the pump shaft (D) and the pump sleeve insert (R) need to be replaced.

NOTE 2:
To replace the complete pumping system for the PCBRM12, request these 3 items; pump assembly, pump sleeve assembly (N) & baffle sleeve assembly (P).

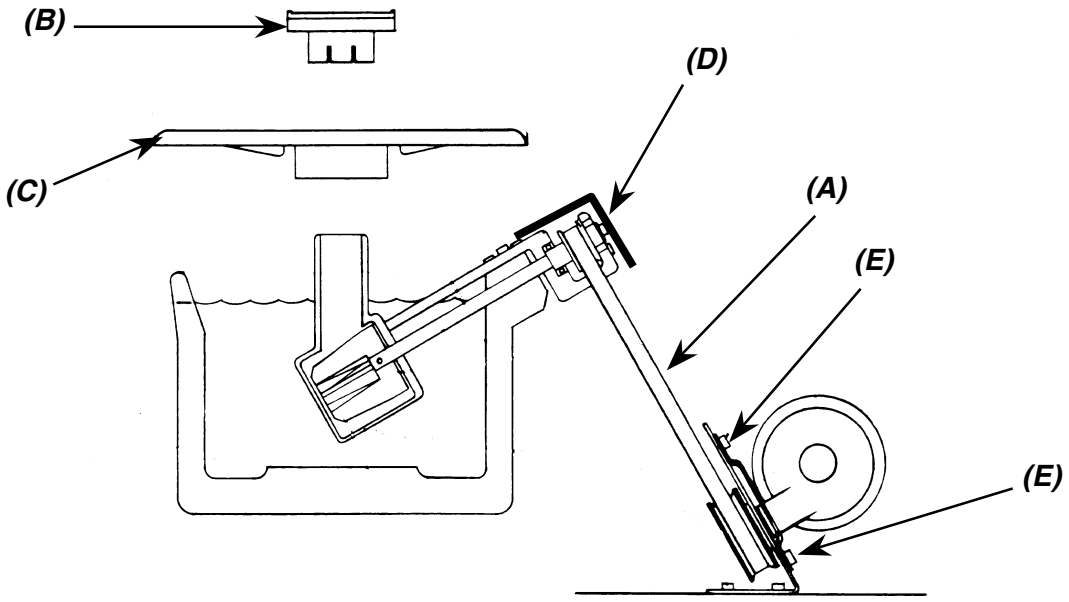
Item	Description	Qty.	Part# (PCBRM12)	Part# (PCBRM15)
-	**Pump Assembly-PCBRM12**	**1**	**12401**	**----------**
-	**Pump Assembly-PCBRM15**	**1**	**----------**	**2004.01.040**
A	Pump Bracket	1	12412	2004.01.102 (gray iron)
B	Pump Housing	1	12411	2004.01.101 (gray iron)
C	Pump Impeller	1	12410	2004.01.100 (gray iron)
D	Shaft	1	12413	2004.01.103 (titanium)
E	Bearing	2	9001.09.02	9001.09.020
F	Spacer	1	12464	12464
G	Pulley	1	12453	12453
H	Screw, 6-32 x 1/4 Button Hd	2	60A	60A
I	Washer, #6 SAE	2	9A	9A
J	Screw, 10-32 x 5/8	2	22A	9000.00.000 (titanium)
K	Nut, 10-32	2	26B	9000.06.002 (titanium)
L	Nut, 6-32 x	4	8B	8B
M	Set Screw, 6-32 x 5/16	4	11A	11A
N	Pump Sleeve Assembly	1	12403	2004.01.041 (titanium)
O	Set Screw, 10-32 x 3/8	1	50A	9000.10.249 (titanium)
P	Baffle Sleeve Assembly	1	12011	2004.01.043 (titanium)
Q	Pump Mounting screws (10-32 x ½)	2	23A	23A
R	Pump Insert	1	12418	12418

4.3.1 Replacement of Pump Bearings:

- Follow all the steps outlined in **Pump Disassembly.**
- After Impeller and Shaft Assembly are removed, the Impeller Pulley, Bearing Spacer, and Lower Bearing can be removed.
- Remove Bearing Retainer Hex Screw and Washer, allowing removal of Upper Bearing.
- Use graphite lubricant on screws.

4.3.2 Replacement of Drive Belt (A):

- Disconnect electrical power.
- Remove Rear Cover Screws (4).
- Remove Flow Well (B) & Pot Cover (C).
- Remove Belt Guard Hex Screws (2) and ***Belt Guard (D)***.
- Loosen Screws (4) holding ***Motor (E)***. Slide motor as high as possible.
- Remove Drive Belt (A).
- Replace Drive Belt and reassemble.



4.4 Pump Leveling

This procedure is for leveling of the solder pump:

- after the pump has been disassembled for cleaning
- after a new pump is installed
- or for releveling of the currently installed pump

Tools Needed:

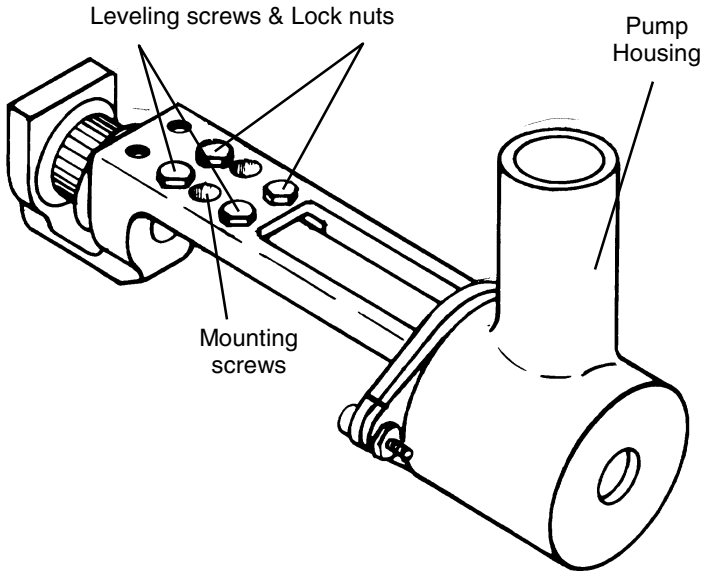
- 1/16" Allen wrench, 5/16" Cresent wrench, bubble level

Note:

ALL STEPS MUST BE PERFORMED IN SEQUENCE FROM START TO FINISH TO INSURE PROPER LEVEL AND TROUBLE-FREE OPERATION OF THE PCBRM MODULE. IT IS RECOMMENDED THAT THE SOLDER BE REMOVED FROM THE POT AND THE MACHINE TURNED OFF BEFORE EXECUTING THIS PROCEDURE.

If the pump has been cleaned and the (4) leveling set screws and locking nuts have not been removed, then mount the pump onto the solder pot and snug only the mounting screws, alternating from one to the other. **DO NOT OVER TIGHTEN.**

Locate the carrier rail to its most centered position. Place a level on the carrier rail and note the position of the bubble. Place the level on the pump housing stack. Note the level of the bubble. Place the level on the pump housing stack. THE PUMP LEVEL MUST MATCH THE CARRIER ARMS LEVEL. If the bubbles match, no leveling is necessary. If they are off, proceed to step #1 of the leveling procedure.



Steps:

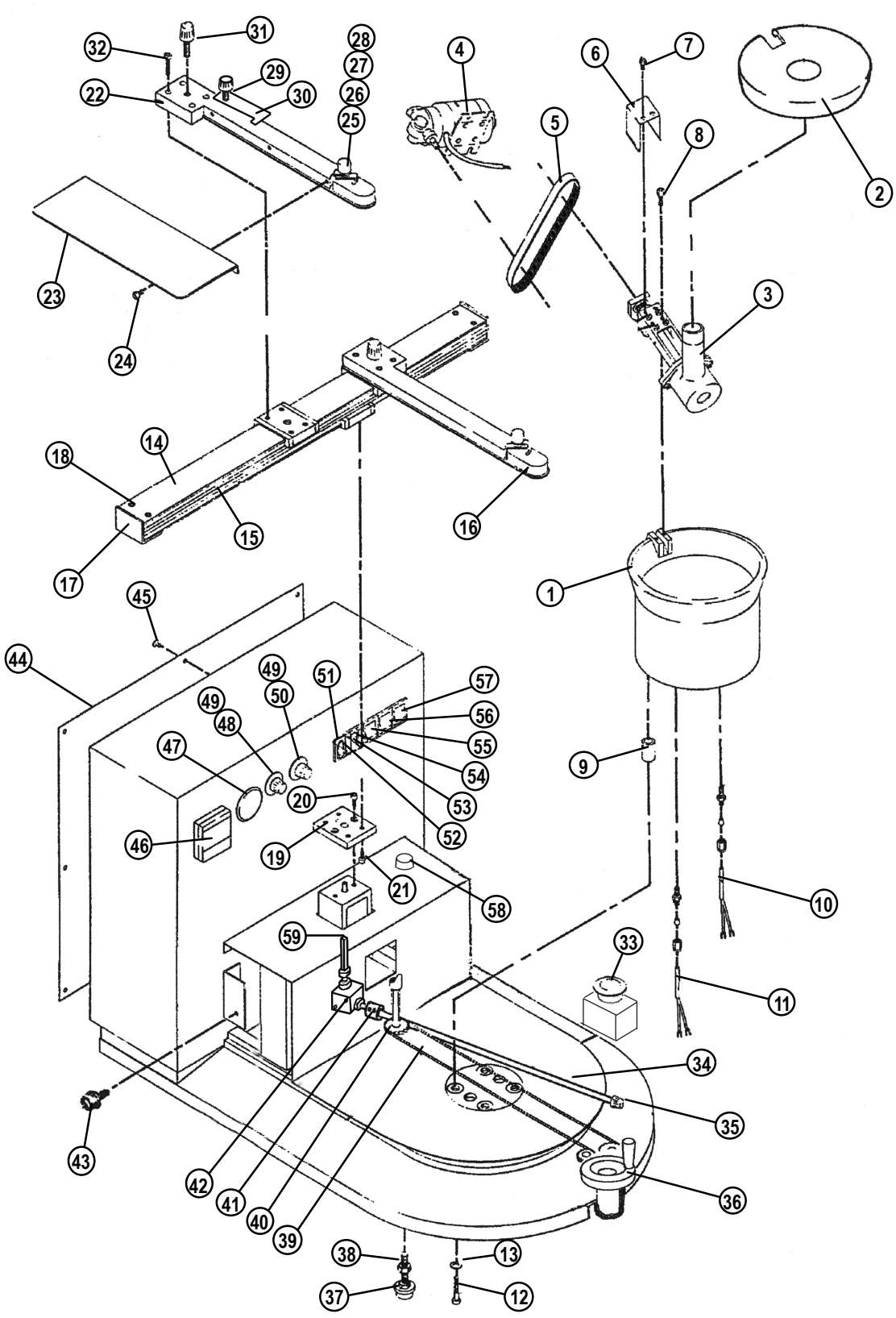
1. Step #1 must take place with the pump removed from the solder pot. Loosen the (4) hex nuts and back out the (4) set screws far enough so they do not protrude through the pump.
2. Mount the pump onto the solder pot and snug the mounting screws. **DO NOT OVER TIGHTEN.**
3. Bring to bear the (4) leveling screws.

Note:

WHEN ADJUSTING THE PUMP, THE TWO MOUNTING SCREWS NEED TO BE LOOSENED PRIOR TO MAKING ADJUSTMENTS TO ANY OF THE LEVELING SCREWS. THEN, SNUG BACK DOWN TO READ THE LEVEL. TWO SET SCREWS NEED TO BE ADJUSTED IN ANY ONE ADJUSTMENT. EXAMPLE – WHEN LEVELING THE PUMP TO THE CARRIER ARMS, EITHER THE RIGHT TWO SCREWS WILL BE ADJUSTED TOGETHER, OR THE LEFT TWO SCREWS WILL BE ADJUSTED TOGETHER. IT IS ALSO VERY CRITICAL TO ADJUST BOTH SCREWS EXACTLY THE SAME AMOUNT.

4. Locate the level in the carrier arm as if it were a PCB. Note the position of the bubble. Place the level on the pump housing stack the same way. Note the difference between the two bubbles. Determine which two leveling screws will need to be adjusted and by how much. **THE PUMP HOUSING STACK MUST MATCH THE CARRIER ARMS.**
5. Re-check the level of the pump and lock down the (4) hex nuts. **DO NOT OVER TIGHTEN.**
6. To level the machine, place level on the pump housing and level the machine North-to-South, and East-to-West. Bring the bubble dead center in both positions. Lock legs in place with jam nut.

4.5 Mechanical Breakdown – Exploded View



Mechanical Breakdown - Parts List

	Description	Qty.	Part Number
1.	Solder Pot	1	12510
2.	Solder Pot Cover – PCBRM12	1	12594
	Solder Pot Cover – PCBRM15	1	2004.01.108
3.	Pump Assembly, only – PCBRM12	1	12401
	Pump Assembly, only – PCBRM15	1	2004.01.040
4.	Motor Assembly	1	12420
5.	Drive Belt - High Temperature	1	12467
6.	Belt Guard	1	12461
7.	Belt Guard Hex Screw	2	59A
8.	Pump Mounting Screw	2	23A
9.	Pot Spacer	4	12511
10.	Thermocouple/Process with fitting	1	12801
11.	Thermocouple/Override with fitting	1	12802
12.	Pot Screw	4	21A
13.	Washer, Pot Screw	4	33A
14.	UPPER CARRIER RAIL	1	12365
15.	Lower Carrier Rail	1	12366
16.	Right Carrier Arm Assembly	1	12305
17.	Rail Stop	2	12315
18.	Screw, 6-32 x 3/4, Rail Stop	4	6B
19.	Adaptor Plate	1	12325
20.	Adapter Screw	2	22A
21.	Carrier Attach Screw	8	30A
22.	Left Carrier Arm Assembly	1	12304
23.	Heat Shield	1	12322
24.	Screw, 6-32 x 1/4, Heat Shield	3	1A
25.	Bracket	1	12316
26.	Spring	1	12374
27.	Knob	1	12319-1
28.	Washer, #10	1	53A
29.	Y-Stop Knob	1	0100.03.046
30.	Y-Stop	1	12326
31.	Carrier Arm, Lock Knob	2	12306
32.	Arm Attach Screw	4	29B
33.	E-Stop	1	12837
34.	Carrier Lock Shaft	1	12320
35.	Carrier Lock Knob	1	12356
36.	Z-Crank Assembly	1	12CK
37.	Leveling Legs	4	12151
38.	Hex Nut, 5/16	1	36A
39.	Height Adjustment Belt	1	12CK6
40.	Drive Rod Gear	1	12353
41.	Coupling	1	12362
42.	Gear Box	1	12358
43.	Pot Shield Knob	2	12308
44.	Rear Panel	1	12812
45.	Rear Panel Screw	8	13B
46.	Temperature Controller	1	12860
47.	Air Gauge	1	12757
48.	Flow Potentiometer - 50k	1	9002.05.018
49.	Knob and Dial	2	9002.18.001
50.	Duration Potentiometer - 25k	1	9002.05.017
51.	Power Switch	1	12856
52.	Reset Switch	1	12853-2
53.	Power Light	1	12877-Z
54.	Cycle Light	1	12876
55.	Cycle Switch	1	12854
56.	Mode Switch	1	12855
57.	Temp Switch/Power	1	12856
58.	Air Regulator	1	9001.12.006
59.	Drive Shaft	1	12359

4.6 Troubleshooting

All PCBRM units are tested prior to shipping. Temperature controllers are programmed and tested at 500°F.

4.6.1 Common Problems/Solutions

Temperature Controller Over-Shoots Set Point Temperature

1. Loss of Power (E-Stop, turn off)
   - Temperature will settle back to set point temperature (15-20 min)
2. Switching from "Stand-By" to "Process"
   - Temperature will settle back to set point temperature (15-20 min)
3. Temperature Controller 12860 Parameters have been altered
   - See parameter set-up sheet
4. Temperature Controller 12860 out of Calibration (temperature wanders up and down, and will not settle to set point temperature)
   - Send unit back to Air-Vac for recalibration
5. Faulty Thermocouple 12887 (temperature settles at something other than set point temperature, temperature runs away, unit shuts off)
   - Check temperature of solder with external probe to determine that temperature of the solder is what the temperature controller is reading.
   - If temperature agrees with the controller reading (other than set point), see #4.
   - If temperature of solder does not agree with controller reading (other than set point), change the thermocouple 12865.
   - If temperature of solder is excessive and the controller reads the same or the unit shuts off, replace the pot relay 12865.
6. Consult Air-Vac for further help.
   -

Machine will not turn on, or turns on for a short period and shuts off

1. Defective latching relay 12879.
2. Consult Air-Vac for further help.

Pump Motor will not run

1. Motor fuse blown

   WARNING

   DO NOT REPLACE MOTOR FUSE WITH ANY OTHER FUSE BESIDES 250V3AG, 3/10 AMP. INCORRECT FUSING CAN RESULT IN DAMAGE TO SYSTEM. IF MOTOR FUSE STARTS TO BLOW CONTINUOUSLY, SOLDER PUMP NEEDS TO BE REMOVED, DISASSEMBLED AND THOROUGHLY CLEANED.

2. Footswitch not plugged in.
3. SP2 – activated on temperature controller – see 0 #'s 3-5.
4. Stand-by switch activated.
5. Pump seized.
6. Set point temperature set too low – solder not molten.
7. Consult Air-Vac for further help.

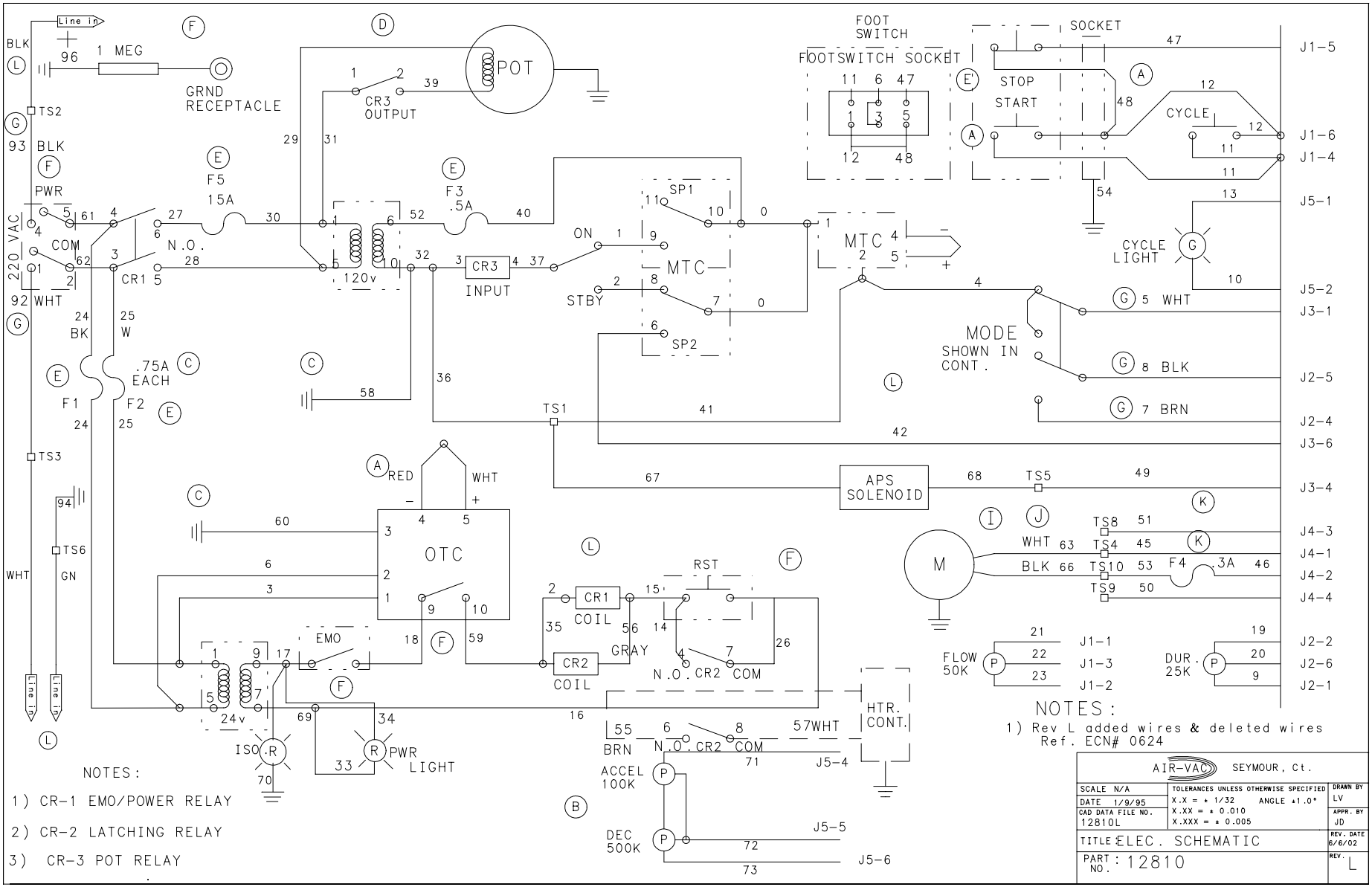
Poor Solder Results

1. Un-level pump (see leveling procedure).
2. Un-level machine (see leveling procedure).
3. Z-Axis height not set correctly.
4. Baffle not being used.
5. Flow duration not set correctly.
6. Ramp up/down not set correctly.
7. Consult Air-Vac for further help.

Excessive Fluctuation of Solder Wave

1. Replace motor belt.
2. Motor belt tension too tight.
3. Solder pump needs to be removed from pot, disassembled and thoroughly cleaned.
4. Consult Air-Vac for further help.

Table of Contents



NOTES:

1) CR-1 EMO/POWER RELAY

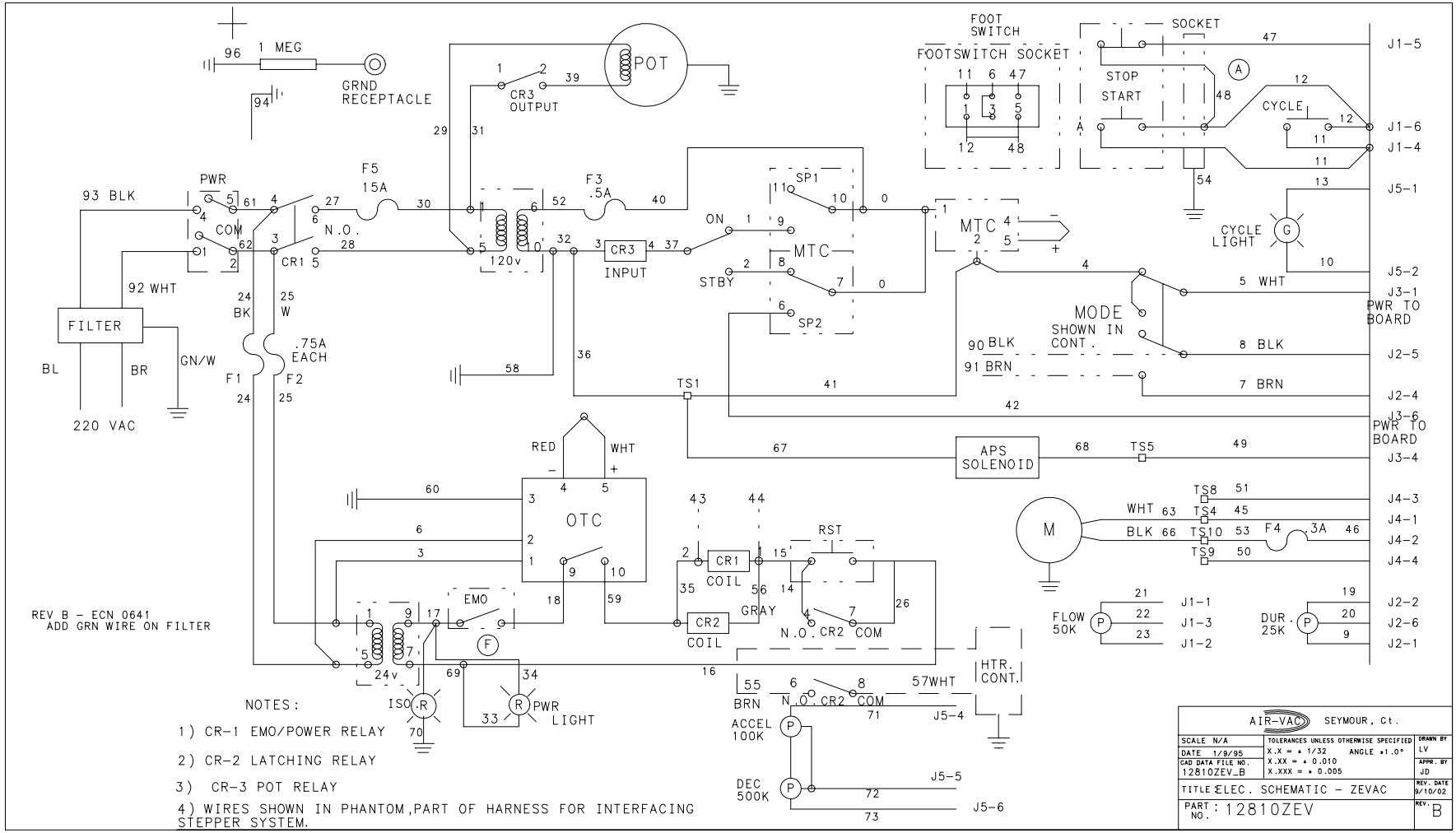
2) CR-2 LATCHING RELAY

3) CR-3 POT RELAY

NOTES:

1) Rev L added wires & deleted wires
Ref. ECN# 0624

AIR-VAC SEYMOUR, Ct.		
SCALE N/A	TOLERANCES UNLESS OTHERWISE SPECIFIED	DRAWN BY LV
DATE 1/9/95	X.X = ± 1/32 ANGLE ±1.0°	
CAD DATA FILE NO. 12810L	X.XX = ± 0.010 X.XXX = ± 0.005	APPR. BY JD
TITLE ELEC. SCHEMATIC		REV. DATE 6/6/02
PART NO. 12810		REV. L



NOTES:

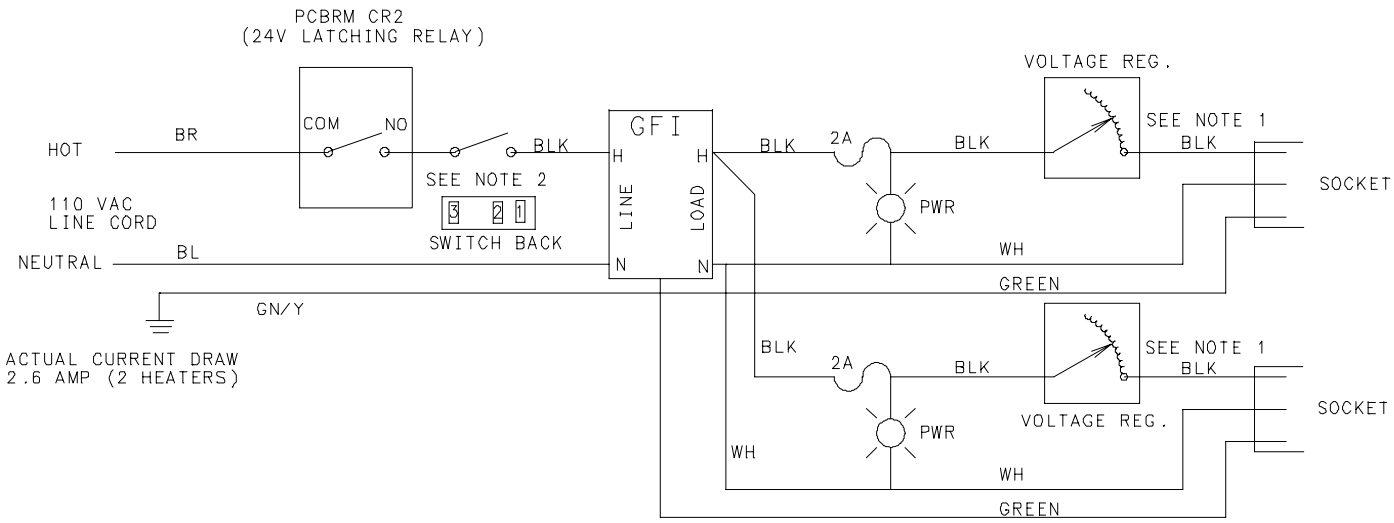
1) CR-1 EMO/POWER RELAY

2) CR-2 LATCHING RELAY

3) CR-3 POT RELAY

4) WIRES SHOWN IN PHANTOM, PART OF HARNESS FOR INTERFACING STEPPER SYSTEM.

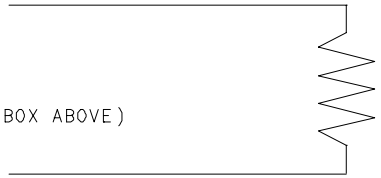
AIR-VAC SEYMOUR, Ct.		
SCALE N/A	TOLERANCES UNLESS OTHERWISE SPECIFIED	DRAWN BY LV
DATE 1/9/95	X.X = ± 1/32 ANGLE ±1.0°	
CAD DATA FILE NO. 12810ZEV_B	X.XX = ± 0.010	APPR. BY JD
	X.XXX = ± 0.005	
TITLE: ELEC. SCHEMATIC – ZEVAC		REV. DATE 9/10/02
PART NO.: 12810ZEV		REV. B



NOTES: 1 THIS WIRE IS WHITE FROM THE VOLTAGE REGULATOR AND NEEDS TO BE MADE BLACK WITH A PIECE OF HEATSHRINK TUBE.

2 WIRE SWITCH USING TERMINALS 1 & 2

3 USE ONLY 2 AMP FAST ACTING FUSES



110 VAC PLUG
(GOES TO SWITCH BOX ABOVE)

CARTRIDGE HEATER (200w)

TOLERANCE UOS	X.XX = ±.010 ANGLE ±1.0° X.XXX = ±.005				
MATERIAL	NONE				
CHAMFER	REMOVE BURRS AND SHARP EDGES U.O.S	D		ADDED CURENT DRAW	7/2/99
FINISH	NONE	C		REMOVED NEUTRAL FUSES FOR ONTARIO HYDRO	3/18/99
USED ON		REV	ZONE	DESCRIPTION	DATE
REPLACES #.	FILE: 12821-5D				
SCALE: none	INCH / 3RD ANGLE PROJECT.	DRAWN BY JD	DATE: 6/8/94		
		CHECKED BY JD	DATE: 7/2/99		

TITLE: ELEC. SCHEMATIC OPTIONS

AIR-VAC SEYMOUR, CT.

PART NO: 12821-5 REV. D