MACHINE SOLUTIONS INC.

USER MANUAL

BEAHM DESIGNS SPLIT DIE THERMAL BONDER

MODEL 220-B

BEAHM DESIGNS

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WELCOME

Machine Solutions, Inc. (MSI) would like to take this opportunity to thank you for purchasing your new 220-B Split Die Thermal Bonder machine. At MSI, we are dedicated to bringing innovative process development solutions to both medical device and nonmedical organizations. MSI looks forward to helping your organization provide life-improving devices to your customers, today and tomorrow.

This machine has been thoroughly tested to ensure it meets the highest quality standards and is ready for immediate integration into your production process. Your machine has undergone functional and safety testing to ensure it meets all manufacturing specifications.

MACHINE DESCRIPTION

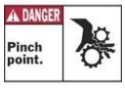
The Beahm Designs Inc. Model 220-B Split Die Thermal Bonder is a system designed for the purpose of performing high quality heat welds and balloon bonds. This unique and simple die head design of the Beahm Designs Split Die Thermal Bonder provides a low-cost quick tool alternative to RF die bonding. The three-parameter operation is easy to set-up and use and simplifies system calibration and process validation. Upgraded options such as vision system and vee-guide attachment further increase versatility and functionality. This system provides you with fast, highly repeatable bonds. Allows you to perform highly precise bonds for demanding applications such as short balloon bonds and ultra-smooth lap & butt welds. Adjustable clamp pressure varies compression force on joint. The ultra-compact design provides you with greater workspace.

SAFETY

- Place the system on a level, sturdy surface at an ergonomically viable height for the user.
- Use of eye protection when working with compressed gases and heated materials is advised.
- Connect the electrical umbilical to the die base unit.
- Connect the power cord to the main control unit.
- Connect the air supply to the system and then to a clean, dry, and filtered compressed air source.
- The maximum observed Sound Pressure Level is below 70 dBA.
- Hot die jaws will become hot during operation and, depending on temperature set-point, can cause severe skin burns if contact occurs.

Caution: high voltage. Remove power and use safety precautions when servicing.

Caution: hot surface. Contact may cause burn. Allow to cool before servicing.



Caution: pinch point. Keep hands and body parts clear while in operation.

USER ALERTS

Do not use or otherwise operate the machine in any manner other than that in which it is explicitly intended. Examples: Do not attempt to sit on or climb on the equipment, do not place heavy objects or containers of liquid on the machine, do not to insert any foreign objects into the machine and do not attempt to bypass any guards.

Note: The equipment is not for use with materials that can decompose or ignite below the maximum operating temperature of the machine. Hazards are materials that outgas hazardous substances and or ignite. (260°C/500°F).

Note: This equipment is not for use in an ATEX environment.

CONTENTS

Included with the system are the following contents:

1. IEC Power Cord
2. Foot Pedal
3. Air Pneumatic and Thermocouple Umbilical Cable
4. Heater Power Cord

Figure 1. Contents Included with the System

INSTALLATION

1. Place the system on a level, sturdy surface at an ergonomically viable height for the user.
2. System power is in the OFF position.
3. Connect the heater power cord, thermocouple umbilical cable, and air hoses between the main control unit and die base unit.
4. Connect the air supply to the system and then to a 100-125 PSI clean, dry, and filtered compressed air source.
5. Connect the main AC power to the power entry module on the rear panel.
6. Connect the foot pedal to the rear panel of the main control unit.

System Controls And Features

Located on the front and back panels of the Split Die Thermal Bonder are the following controls and/or displays and their functions:

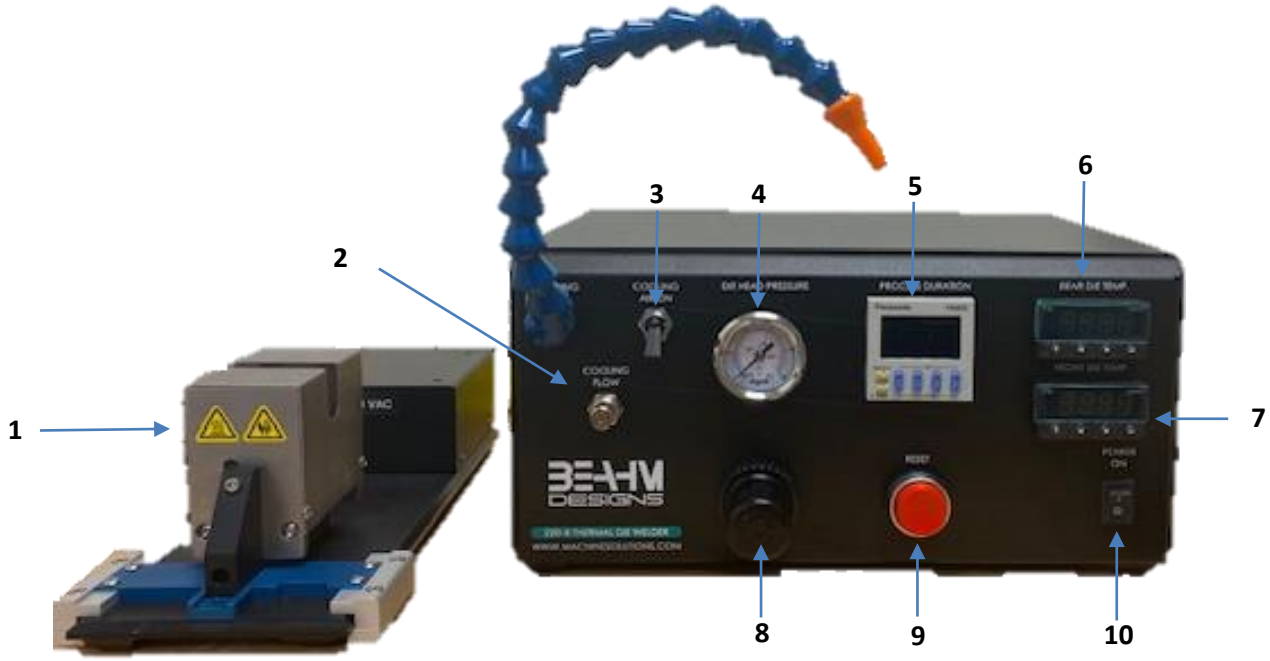


Figure 2. 220-B Split Die Thermal Bonder Front Panel

Table 1. Control and Display Functions (Front)

Item	Function
1	Thermal processing of product.
2	Controls cooling air flow rate.
3	Toggles cooling air on/off.
4	Displays die head gripper pressure.
5	Set timer to desired duration in seconds.
6	Controls the temperature of the rear die head.
7	Controls the temperature of the front die head.
8	Regulates the pressure to the die head gripper.
9	Timer resets and starts again.
10	Toggles system power and air on/off.

Figure 3. 220-B Split Die Thermal Bonder Back Panel

Table 2. Control and Display Functions (Back)

Item	Function
1	Connects to power cord
2	Protects power distribution
3	Supplies air to machine.
4	Allows connection to foot pedal.
5	Supplies air from main control unit to die base unit.
6	Supplies signal from thermocouples to main control unit.
7	Delivers power from main control unit to heaters on die base unit.

Vee-Guide Attachment (Optional Equipment)

Vee-Guide Attachment AC 226 Accessory Upgrade available, (See Figure 4. below). For additional information on Beahm Designs, Split Die Thermal Bonder Upgrades, please visit http://machinesolutions.com/our-products/

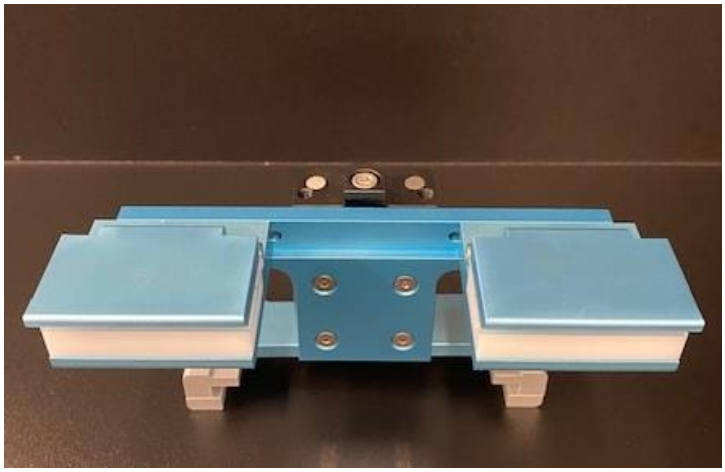


Figure 4. Vee Guide Attachment AC 226 Accessory

Cutter (Optional Equipment)

The cutter accessory for the 220B makes accurate cuts of thermoplastic material at repeatable lengths up to 280mm long. Temperature control of the blade creates consistent cutting results at temperatures of up to 500° F.

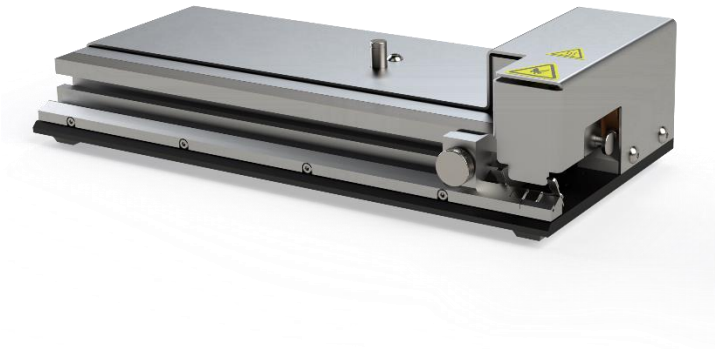


Figure 5. Cutter Accessory

Control Box Setup Changes

- Temperature Controller 2 and the associated TC2 are not used for the operation of this accessory. Only connect TC1 to the back of the cutter accessory.
    - Refer to Page 18 for information on the Omega Platinum Temperature Controller.

Cutting

Ergonomic notice: Do not use cutter for an extended period without breaks.

- Using knob above v-block, set cut distance.

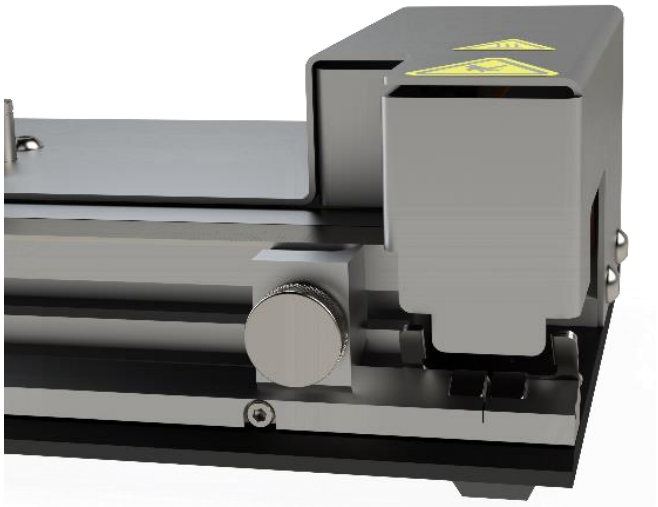


Figure 6. Knob used to set cut distance

- Flip up product clamps.
- Lay product in v-block.
- Flip down product clamps.
- Push v-block in to lock position.

Figure 7. V-Block in lock position

- Actuate 220B via the foot switch.
- Press release button.

- The v-block should return to start position.

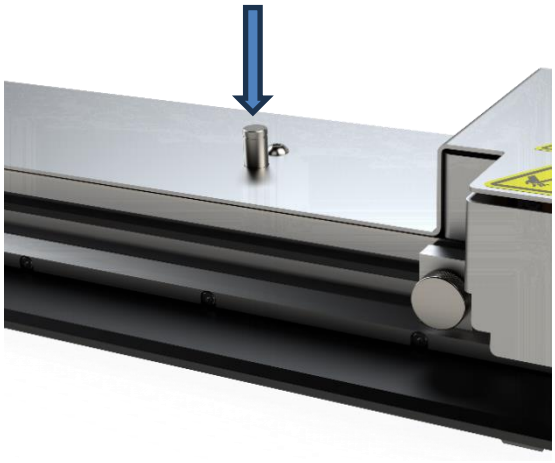


Figure 8. Release button

- Remove product from v-block.

Blade Switching

Note: The blade and surrounding metal components can and will discolor at temperatures above 400°F/200°C.

- Ensure that blade holder is cool.
- Unplug all connections on the back of the accessory.
- Blade can only be changed when it is in the retracted position.

Figure 9. Blade in retracted position

- Reach in and unscrew the knob by turning counter-clockwise.

Figure 10. Removing blade holder

- Pull the blade holder out.

Figure 11. Blade holder

- Reinstall blade holder in it's position, screwing the knob in a clockwise motion.

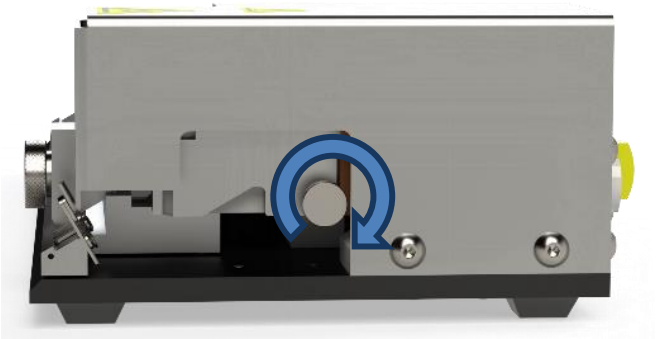


Figure 12. Reinstalling blade holder

Note: Knob only needs to be finger tight.

- Ensure that angle on operator side of machine nests with blade holder.

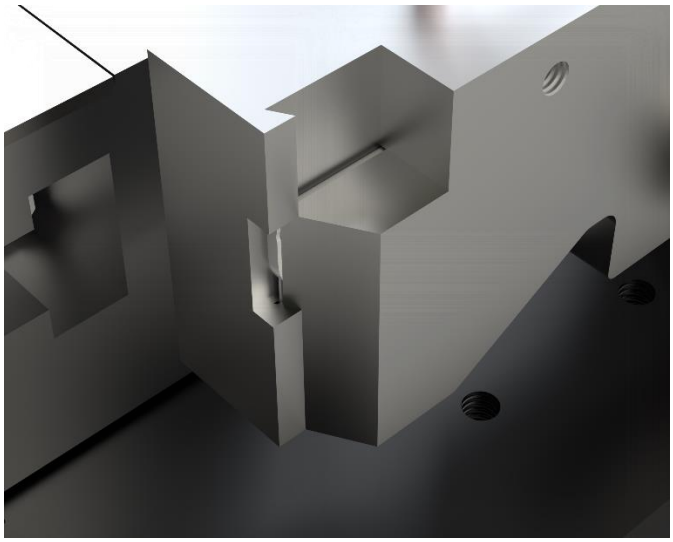


Figure 13. Blade holder securement detail

Process Development Parameters

Temperature

- Controlled with “Rear Die Temperature” temp controller.

Time

- Controlled with timer on front of 220B.

Pressure

- Controlled with regulator on front of 220B.

Speed

- Controlled with flow control. Refer to ***Figure 14. Flow control***.

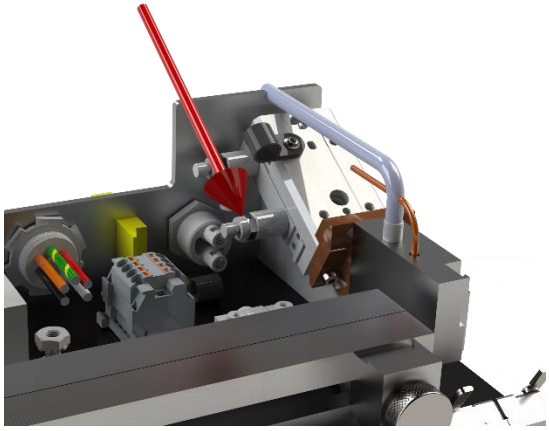


Figure 14. Flow control

PARAMETER SETTINGS

Temperature Controller

- Refer to page 19, Omega Platinum Temperature Controller.

Pressure Regulator Setting

- Rotate the regulator knob clockwise to increase air pressure, and counterclockwise to decrease air pressure output to the die head actuation cylinder.

Cooling Air ON Toggle

- Place toggle in the up position for cooling air On, and toggle down for cooling air Off.

Cooling Air Flow Adjust

- Rotate the Cooling Flow valve counterclockwise to increase the cooling air flow, and clockwise to decrease the cooling air flow.

Process Timer Setting

- Depress the upper half of the blue rocker buttons to increase time duration, depress the lower half of the blue rocker button to decrease the time duration. Depress the timer reset button for at least 1.0 seconds to accept the new value.

OMEGA PLATINUM TEMPERATURE CONTROLLER

ATTENTION: PRIOR TO MAKING ADJUSTMENTS, PLEASE SEE THE APPENDIX FOR FURTHER INFORMATION ABOUT THE OMEGA PLATINUM TEMPERATURE CONTROLLER. THE TEMPERATURE CONTROLLERS HAVE BEEN PRE-PROGRAMMED.

Adjusting Temperature on Temperature Controller(s)

Use the PRoG (Programming Mode) Menu

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
SP1	_____						Process goal for PID

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀ ▶	Navigate to **SP1** (Setpoint 1 parameter).
↵	Select the **SP1**.
◀ ▶	Set the desired temperature.
↵	Confirm the value. The heaters will ramp to correct temperature.

Resetting the Temperature Controller

Refer to Appendix A for resetting the temperature controller and all temperature control settings.

RUN PROCESS

1. Assemble components to be bonded over mandrel(s).
2. Measure bond length, tubing overlap or balloon sleeve length.
3. Position the protective sleeve over the bond area.
4. Measure the O.D. of the protective sleeve.
5. Set timer to desired duration in seconds.
6. Position components to be bonded within thermal jaws.
7. Depress footswitch.
8. To cool assembly when cycle is complete, position the heated area at the tip of the cooling air nozzle and toggle the cooling air switch to the “on” position.

MAINTENANCE

Note: Ensure the machine is unplugged for any servicing or maintenance work.
Note: Perform these steps ONLY when the machine is at room temperature.

Caution: pinch point/crush hazard. Keep fingers, hands, and clothing clear of moving parts.

Caution: hot surface. Contact may cause burn. Allow to cool before servicing.

Cleaning

1. Use 99% isopropyl alcohol to wipe down the outside of the machine. Do not attempt to clean the inside of the machine. The machine should not be washed down.
2. Cleaning should be with a soft dry cloth only.

Preventative Maintenance

1. Check the power cable for damage every 12 months and replace as needed.
2. Check setting of pre-regulator every 12 months.

Fuse Replacement

Note: Figures are reference only. They may vary depending on machine model.

1. To replace a blown fuse, turn off machine power by unplugging the power cord from the machine.
2. Remove the insert.
   a. Using a flat head screwdriver, push the fuse insert inward and turn counterclockwise to release.

Figure 15. Removing Fuse Insert

3. Fuse replacement.
   a. Remove the old fuse and replace it with the new one.

Figure 16. Fuse Replacement

4. Insert replacement.
   a. Using a flat head screwdriver, seat the insert by pushing inward and turning clockwise.

Figure 17. Fuse Insert Replacement

Die Head Replacement

Caution: Ensure the die heads are cooled to within 15°F of ambient temperature before proceeding with installation or replacement.

1. Remove the safety cover.
   - Remove two screws from the left side of the safety cover.

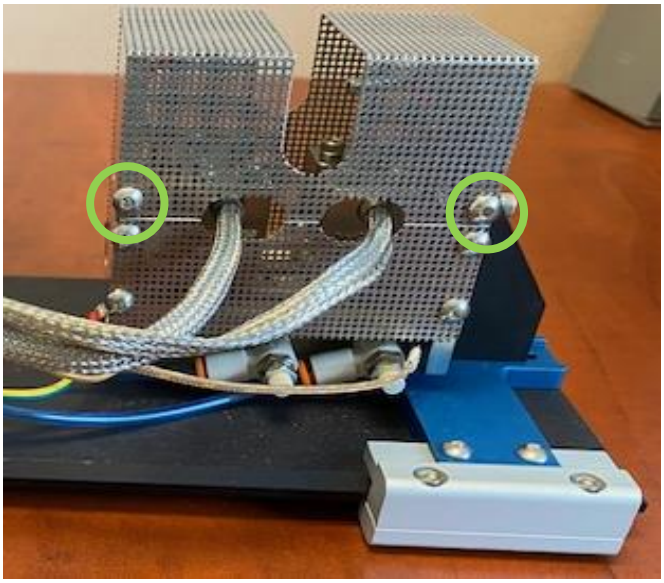


Figure 18. Screws on the Left Side of the Safety Cover

- Remove two screws from the right side of the safety cover.

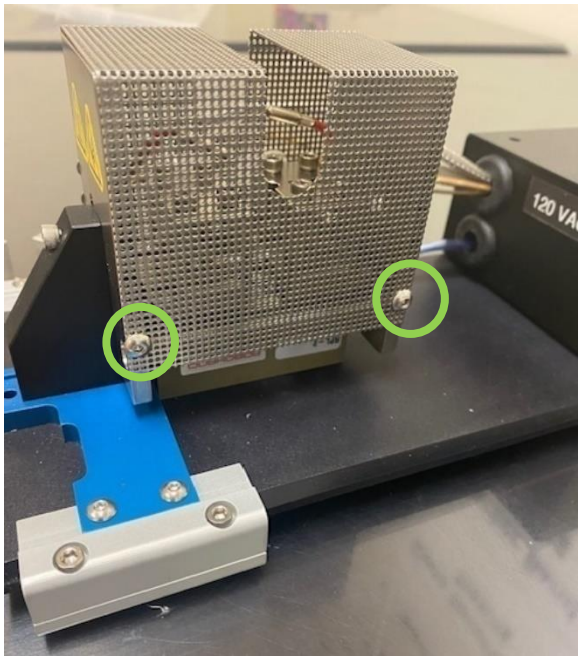


Figure 19. Screws on the Right Side of the Safety Cover

2. Remove the four screws at the base of each die head.

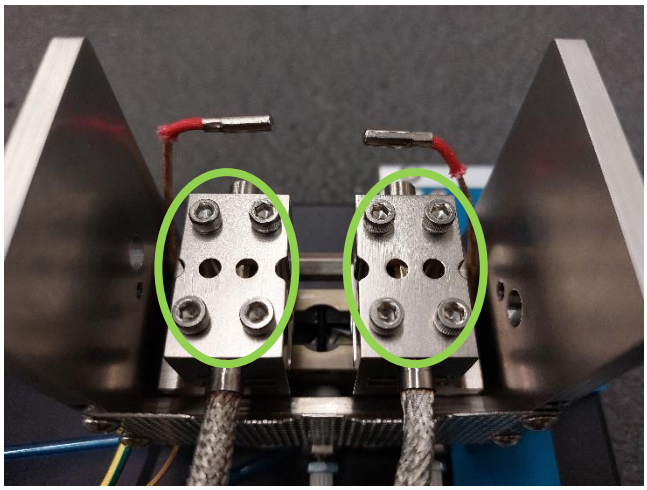


Figure 20. Screws at the Base of the Die Head

3. Position new die heads in place, install the four screws at the base of each die head. Do not overtighten the screws.

4. Install the thermocouple in the rear of each die head and gently tighten the set screw to hold them in place. **DO NOT OVER TIGHTEN.**

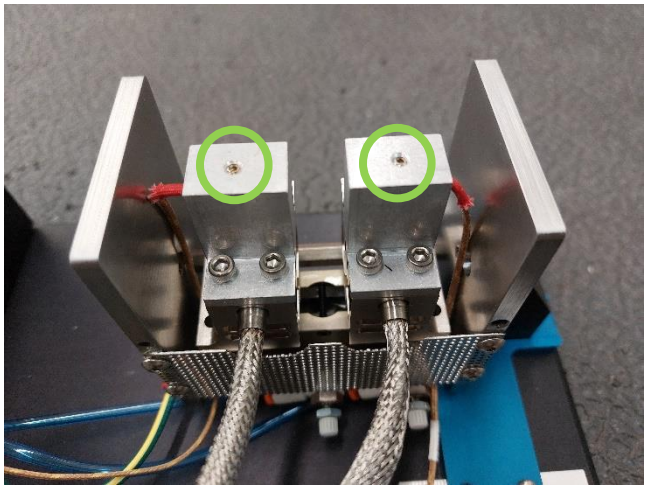


Figure 21. Die Head with Thermocouple and Set Screw

5. Reinstall the eight screws previously removed in Step 2.
6. Reinstall the Safety Cover and four screws previously removed in Step 1.

DIAGNOSTICS AND TROUBLESHOOTING

Table 3. Diagnostics and Troubleshooting

Issue	Possible Causes	Solution
Temperature not stable	• Split Dies replaced • Thermocouple loose	• Auto-tune (MSI recommends process auto-tune @ temperature.) • Re-install thermocouple
"Open" flashing on temperature controller	• T.C sensor break	• Bad thermocouple • Verify complete T.C. path
No heat at Dies	• Defective heating element • Defective power control	• Replace heating element • Contact Beahm Designs
.Err code in display	• Temperature controller • Software failure	• Replace temperature controller
System will not power on	• IEC power cord not fully connected • Fuse needs to be replaced	• Verify installation • Replace fuse

SPECIFICATIONS

Table 4. System Specifications

Description	Range	Resolution	Accuracy
Temperature	200-500° F	0.1°F/°C temperature; 10 µV process	+/- 0.03% F.S.
Air Flow	20-50 SCFH	5.0 SCFH	+/- 4% F.S.

Facilities Requirements

- Voltage: 120-240 VAC, 50/60 hz
- Wattage: 10 amps (500 watts)
- Compressed Air: 100-125 psi, clean dry compressed air

CRITICAL PARTS

For replacement or spare parts, please contact us at service@machinesolutions.com, or call 928-556-3109.

Table 5. Critical Parts List

Part Number	Description	Quantity
120V – 1153590-001 220V – 1157788-001	HEATER, CARTRIDGE	1 1
1143133-001	THERMOCOUPLE, K TYPE	1
3054593-101	BLANK DIE HEAD, PAIR	1
1350774-001	PRESSURE GAUGE	1
1161899-001	CONTROLLER, TEMP, OMEGA	1
110092-005	FUSE	2

CUSTOMER SUPPORT AND SATISFACTION

Machine Solutions Inc. is proud of the advanced engineering and quality construction of each piece of equipment that we build. It is our goal to provide equipment that exceeds the expectations of the customer. By implementing the highest standards and applying our experience to provide a quality product, we maintain an ongoing, positive working relationship with all our customers.
Machine Solutions Inc. welcomes your comments and inquiries about our products and services.

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WARRANTY AND LIMITATIONS

General Warranty

Machine Solutions Inc. (MSI) warrants its products to be free from defects in material and workmanship in normal every day use and service for a period of one year from the date of shipment from the factory in Flagstaff, Arizona. MSIs obligation under this warranty shall be limited to the repairing or replacing of the product or parts thereof which upon MSIs inspection reveals them to be defective. MSI reserves the right and option to refund the purchase price in lieu of repair or replacement upon evaluation of the returned original part. Modifications, misuse, attempted repairs by others, improper calibration or operation shall render this guarantee null and void. MSI MAKES NO OTHER WARRANTY REGARDING THIS PRODUCT, INCLUDING ANY EXPRESS OR IMPLIED WARRANTY. SPECIFICALLY, THERE IS NO WARRANTY OF MERCHANTABILITY OF THIS PRODUCT OR OF THE FITNESS OF THE PRODUCT FOR ANY PURPOSES. THE SUITABILITY OF THIS PRODUCT FOR ANY PURPOSE PARTICULAR TO THE CUSTOMER IS FOR THE CUSTOMER, IN ITS SOLE JUDGEMENT, TO DETERMINE. MACHINE SOLUTIONS, INC. ASSUMES NO RESPONSIBILITY FOR THE SELECTION OR USE OF THIS PRODUCT BY CUSTOMER. This product has not been tested or approved by the U.S. Food and Drug Administration or any other agency of the U.S. government. This product is not a consumer product as that term is defined in the Magnuson-Moss Warranty – Federal Trade Commission Improvement Act, 15 U.S.C. § 2301 et seq.

Software License

By using this equipment, and/or installing or using any of the software associated with the same, you indicate your acceptance of each of the terms of this license. Upon acceptance, this license will be a legally binding agreement between you and MSI. The terms of this license apply to you and to any subsequent user of the software. If you do not agree to all of the terms of this license (i) do not install or use the software and (ii) return the equipment and the software (collectively, equipment), including all components, documentation and any other materials provided with the equipment, to MSI. The software includes associated media, any printed materials, and any on-line or electronic documentation. Software provided by third parties may be subject to separate end-user license agreements from the manufacturers of such software. This license shall also apply to any updates, bug fixes, or newer versions of the software provided by MSI for use with this equipment.
You may: (1) Use the software only in connection with the operation of the equipment; (2) Transfer the software (including all component parts and printed materials) permanently to another person, but only if the person agrees to accept all of the terms of this license. If you transfer the software, you must at the same time transfer the equipment and all copies of the software (if applicable) to the same person or destroy any copies not transferred; and (3) Terminate this license by destroying the original and all copies of the software (if applicable) in whatever form.

You may not: (1) Loan, distribute, rent, lease, give, sublicense or otherwise transfer the software, in whole or in part, to any other person, except as permitted under the transfer paragraph above; (2) Copy or translate the User Guide included with the equipment; (3) Copy, alter, translate, decompile, disassemble or reverse engineer the software, including but not limited to, modifying the software to make it operate on non-compatible hardware; or (4) Remove, alter or cause not to be displayed, any copyright notices or startup message contained in the software programs or documentation

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Protection of Intellectual Property

The equipment and its incorporated technology (collectively referred to herein as the Technology), is protected under issued and pending patents. The Technology is the valuable and proprietary technology, including trade secret technology, belonging to MSI. Much of the Technology is nonpublic and confidential. As our customer, you agree to further assist MSI in the protection of our intellectual property as follows: You agree to keep the Technology you receive confidential at all times, and shall not, without the prior written consent of MSI, disclose the Technology, in whole or in part, to any person outside of your company. You further agree that you shall not reverse engineer, disassemble, decompile or copy the Technology without the prior written consent of MSI.

In addition, you agree that the equipment will not be used to manufacture anything other than products in which you hold intellectual property rights free of infringement of others. You may not use the equipment to manufacture any product infringing on another's patented rights. By accepting and using the equipment, you agree to defend and indemnify Machine Solutions, Inc., its officers, directors, employees and agents, from and against any claims of infringement as a result of your use of the equipment.

Regulatory Matters

All equipment validations, product validation, final product QC testing and other testing required by the U.S Food and Drug Administration are the sole responsibility of the customer. Machine Solutions, Inc. shall have no responsibility or liability for the performance of any interventional product on which this equipment is used.

APPENDIX A

Omega Platinum Temperature Controllers

ATTENTION: The initialization portion of the Omega Temperature Controller(s) has been password-protected. Some reasons for this practice to be implemented are:

- Prevent unauthorized Access.
- Avoid Tampering.
- Mitigate user errors.
- User accountability.

For additional information, please contact service@machinesolutions.com

Temperature Controller Layout and Description of Button Actions

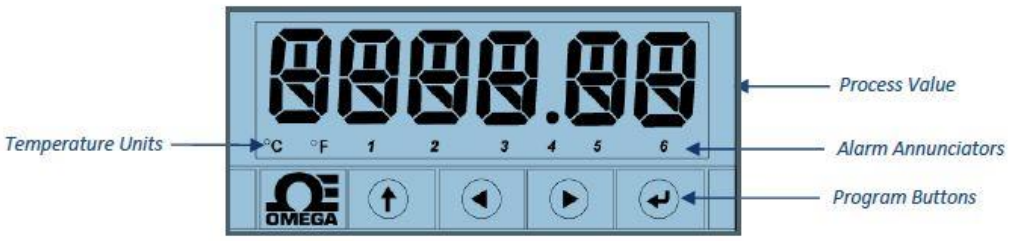

Figure A-1. Controller Layout

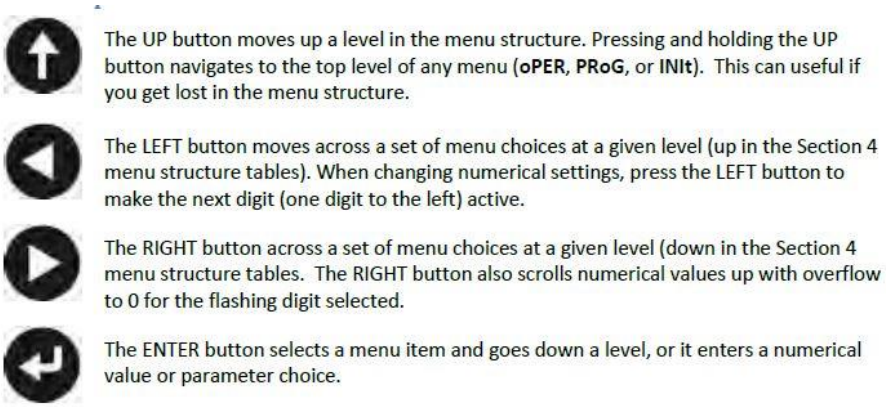

Figure A-2. Description of Button Actions

INIt	Initialization Mode: These settings are rarely changed after initial setup. They include transducer types, calibration, etc.
PRoG	Programming Mode: These settings are frequently changed. They include Set points, Control Modes, Alarms, etc.
oPER	Operating Mode: This mode allows users to switch between Run Mode, Standby Mode, Manual Mode, etc.

Figure A-3. Level 1 Menu

Auto Tune Temperature Controller(s)

Please note, the Omega temperature controllers have been auto tuned and are set for optimal performance. Contact Machine Solutions for further diagnostics and instructions.

The Autotune function will select the tuning algorithm depending on the stability of current process and the error difference between current process and the Control Setpoint (SP1). If the process is relatively stable (i.e: at room temperature), a bump test will be performed to determine the plant characteristics.
If the process is hot, or if the process is within 10% of Control Setpoint, limit cycle oscillation will be performed with the tuning setpoint taken at the process value when the Autotune function is triggered. Autotuning may be performed as many times as needed or when the operating conditions (i.e: process load, or setpoint) have changed significantly. To obtain good tuning results, ensure the process is stable prior to triggering autotune function. The process is stable when it is at ambient temperature, or it is tracking Control Setpoint (SP1) in auto mode.

Note: Ensure the temperature is at room temperature prior to starting the Auto Tune process.

Use the PRoG (Programming Mode) Menu for Steps 1-7

1. Setpoint 1 Configuration (PRoG > SP1 > #)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
SP1	_____						Process goal for PID

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀▶	Navigate to **SP1** (Setpoint 1 parameter).
▶	Select the **SP1**.
◀▶	Set the process goal value.
↵	Confirm the value.

2. (PRoG> Pld > A.to > 5.00)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	A.to	**5.00**					Set timeout time for autotune

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀▶	Navigate to **Pld**.
↵	Select **Pld**.
◀▶	Navigate to **A.to**.
↵	Select **A.to**
↵	Set to **5.00** minutes or above

3. (PRoG> Pld > GAIN > _P_ > **2.77**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	GAIN	_P_	**2.77**				Manual Proportional Band setting

	Navigate back to level 3 by pushing the ⇧ button.
◀▶	Navigate to **GAIN**.
↵	Select **GAIN**.
◀▶	Navigate to **_P_**
↵	Select **_P_**
↵	Enter **2.77**

4. (PRoG > Pld > GAIN > _I_ > **0.08**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	GAIN	_I_	**0.08**				Manual Integral Factor setting

◀▶	Navigate to **_I_**
↵	Select **_I_**
↵	Enter **0.08**

5. (PRoG> Pld > GAIN > _d_ > 23.87)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	GAIN	_d_	**23.87**				Manual Derivative Factor setting

◀▶	Navigate to **_d_**
↵	Select **_d_**
↵	Enter **23.87**

6. (PRoG > Pld > AdPt > **ENbL**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	AdPt	**ENbL**					Enable fuzzy logic adaptive tuning

	Navigate back to level 3 by pushing the ⇧ button.
◀▶	Navigate to **AdPt**
↵	Select **AdPt**
◀▶	Navigate to **ENbL**
↵	Select **ENbL**

To Begin AutoTune

7. (PRoG > Pld > tUNE > **StRt**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	tUNE	**StRt**					Enable fuzzy logic adaptive tuning

	Navigate back to level 3 by pushing the ⇧ button.
◀▶	Navigate to **tUNE**
↵	Select **tUNE**
↵	Select **StRt**
	Auto Tune starts and displays DONE when completed

Changing Temperature Units on the Temperature Controller

Use Initialization Mode (INIt > RdG > °F °C > **°F**)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	°F°C	**°F**					

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀▶	Navigate to **°F°C** (Temperature Units).
↵	Select **°F°C**.
◀▶	Navigate to **°F**
↵	Select **°F**
⇧	Select up button to go back to level 1
◀▶	Navigate to oPER
↵	Select oPER
↵	“RUN” will be displayed.
	Back to temperature readout and normal operating status.

Resetting the Temperature Controller(s) back to factory defaults.

To reset the Omega controller to factory defaults, enter the INIt (Initialization Mode) Menu and follow the steps below.

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
F.dFt	ok?						ENTER resets to factory defaults

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **F.dFt**
↵	Select **F.dFt**
◀▶	Navigate to **ok?**
↵	Select **ok?**
	The controller will now be reset. Next, enter the following MSI settings in red.

Resetting the Temperature Controller(s) back to MSI settings.

Use Initialization Mode to set the following parameters 1-7.

1. Thermocouple Input Type (INIt > INPt > t.C. > k)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
INPt	t.C.	**k**					Type K thermocouple

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **INPt** (Input parameter).
↵	Select **INPt**.
◀▶	Navigate to **t.C.** (thermocouple).
↵	Select **t.C.**
◀▶	Navigate to the **K** thermocouple type.
↵	Select **k**.

2. Decimal Point Format (INIt > RdG > dEC.P > FFF.F)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	dEC.P	**FFF.F**					Reading format -999.9 to +999.9

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀▶	Navigate to **dEC.P** (Decimal-point Format).
↵	Select **dEC.P**.
◀▶	Navigate to **FFF.F** (One decimal place).
↵	Select **FFF.F**.

3. Temperature Units (INIt > RdG > °F°C > °C)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	°F°C	**°C**					Degrees Celsius annunciator

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀▶	Navigate to **°F°C** (Temperature Units). • **°C - Degrees Celsius (factory default), °C annunciator turned on** • **°F - Degrees Fahrenheit, °F annunciator turned on**
↵	Select **°F°C**.
◀▶	Navigate to **°C**
↵	Select **°C**

4. Filter (INIt > RdG > FLtR > 8)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	FLtR	**8**					Readings per displayed value: 8

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀▶	Navigate to the **FLtR** (Filter parameter).
↵	Select **FLtR**.
◀▶	Navigate to **8** (0.4 s)**.**
▶	Select **8.**

5. Normal Color (INIt > RdG > NCLR > GRN)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	NCLR	**GRN**					Default display color: Green

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀▶	Navigate to **NCLR** (Normal Color parameter).
↵	Select **NCLR**.
◀▶	Navigate to **GRN (Green)**.
↵	Select **GRN**.

6. Brightness (INIt > RdG > bRGt > HIGH) Brightness setting = HIGH

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	bRGt	**HIGH**					High display brightness

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀▶	Navigate to **RdG** (Reading Formats).
↵	Select **RdG**.
◀▶	Navigate to **bRGt** (Brightness parameter).
↵	Select **bRGt**.
◀▶	Navigate to **HIGH** (High display brightness).
↵	Select **HIGH**.

7. Safety Features (INIt > SFty > PwoN > RSM)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
SFty	PwoN	**RSM**					RUN on power up if not previously faulted

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **INIt** (Initialization Mode).
↵	Select **INIt**.
◀ ▶	Navigate to **SFty** (Safety Features).
↵	Select **SFty**.
◀ ▶	Navigate to **PwoN** (Power On Confirmation parameter). **Note: PwoN – Requires confirmation before running automatically at startup**
↵	Select **PwoN**.
◀ ▶	Navigate to **RSM.** **Note: RSM – Program runs automatically at startup if not previously in fault state.**
↵	Select **RSM**.

8. Configure the USB port

CoMM	USb						Configure the USB port

Use Programming Mode (PRoG) to set the following parameters 9-14.

9. Setpoint 1 Configuration (PRoG > SP1 > #)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
SP1	_____						Process goal for PID

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀ ▶	Navigate to **SP1** (Setpoint 1 parameter).
◀	Select the **SP1**.
◀ ▶	Set the process goal value.
▶	Confirm the value.

Sections 10-12 are set for all models except 220B, 320B, 43B, and TF-120
For models 220B, 320B, 43B, and TF-120 skip to Section 13

10. Alarm High/Low setting (PRoG > ALM.1, ALM.2 > type > HI.Lo)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
ALM.1	**Note: This submenu is the same for all other Alarm configurations.**						
	tyPE						
		HI.Lo.					Alarm: process value outside Alarm triggers

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀ ▶	Navigate to **ALM.1 (**Alarm Configuration 1). **Note: Select Alarm Configuration to set up, change, enable, or disable Alarms. Either or both Alarms can be assigned to trigger display color changes, annunciators, and / or outputs. Either or both Alarm configurations can be assigned to multiple outputs. The ALM.1 and ALM.2 configuration menus have all the same settings and function in the same manner.**
↵	Select **ALM.1.**

◀▶	Navigate to **tyPE** (Alarm Type Parameter). **Note: This parameter will control the basic behavior of the selected alarm.**
↵	Select **tyPE**.
◀▶	Navigate to **HILo**
↵	Select **HILo**

11. Alarm high, low, color reference parameters

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
ALM.1	ALR.H	**2.5**					Alarm high parameter for trigger calculations
ALM.1	ALR.L	**2.5**					Alarm low parameter for trigger calculations
ALM.1	A.CLR	**REd**					Red display when Alarm is active

Alarm High Reference (PRoG > ALM.1 > ALR.H)

	Follow Steps in Section 10. **Note: After selecting HI.Lo setting, tyPE parameter should be showing in window.**
◀▶	Navigate to **ALR.H** (Alarm High Reference parameter).
↵	Select **ALR.H**.
◀▶	Set the Alarm High Reference value = 2.5 **Note: One arrow moves the digit and the other moves the value.**
↵	Confirm the value.

Alarm Low Reference (PRoG > ALM.1 > ALR.L)

	Follow Steps in Section 10. **Note: After selecting HI.Lo setting, tyPE parameter should be showing in window.**
◀▶	Navigate to **ALR.L** (Alarm Low Reference parameter).
↵	Select **ALR.L**.
◀▶	Set the Alarm Low Reference value = 2.5 **Note: One arrow moves the digit and the other moves the value.**
↵	Confirm the value.

Alarm Color (PRoG > ALM.1 > A.CLR > REd)

	Follow Steps in Section 10. **Note: After selecting HI.Lo setting, tyPE parameter should be showing in window.**
◀▶	Navigate to **A.CLR** (Alarm Color parameter).
↵	Select **A.CLR**.
◀▶	Navigate to **REd** (Alarm conditions are displayed in red).
↵	Select the **REd**.

12. Output as Alarm 1 (PRoG > dtR1 > ModE > ALM.1)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
dtR.1							**dtR.1** is replaced by output type. For example: oUt#
	ModE		Note: **This submenu is the same for all other outputs.**				
		ALM.1					Output is an Alarm using ALM.1 configuration

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀▶	Navigate to **dtR1** (Double Throw Mechanical Relay number 1). Note: All output channels have the same menu structure. However, only those parameters that apply for the type of output being configured appear in that output's menu.
▶	Select **dtR1**.
◀▶	Navigate to **ModE**. Note: ModE – Allows the output to be set up as a control, Alarm, retransmission, or Ramp/Soak event output; the output can also be turned off.
↵	Select **ModE**.
◀▶	Navigate to **ALM.1**. Note: ALM.1 – Set the output to be an Alarm using the ALM.1 configuration
↵	Select **ALM.1.**

Section 13 is for Models 220B, 320B, 43B, and TF-120

13. Turn Off Output Channel (PRoG > dtR1 > ModE > oFF)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
dtR.1	ModE	**oFF**					Output does nothing

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀ ▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀ ▶	Navigate to **dtR1** (Double Throw Mechanical Relay number 1). **Note: All output channels have the same menu structure. However, only those parameters that apply for the type of output being configured appear in that output's menu.**
◀ ▶	Navigate to **ModE**. **Note: ModE – Allows the output to be set up as a control, Alarm, retransmission, or Ramp/Soak event output; the output can also be turned off.**
↵	Select **ModE**.
◀ ▶	Navigate to **oFF.** **Note: oFF – Turn off the output channel**
↵	Select **oFF**.

14. PID Control Mode (PRoG > dc.1 > ModE > Pld)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
dc.1							dc.1 is replaced by output type. For example: oUt#
	ModE						
		Pld					PID Control Mode

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀▶	Navigate to **dC1** (DC Pulse output number 1). **Note: All output channels have the same menu structure. However, only those parameters that apply for the type of output being configured appear in that output's menu.**
↵	Select **dC1**.
◀▶	Navigate to **ModE.** **Note: ModE – Allows the output to be set up as a control, Alarm, retransmission, or Ramp/Soak event output; the output can also be turned off.**
↵	Select **ModE**.
◀▶	Navigate to **Pld.** **Note: Pld - Set the output to Proportional-Integral-Derivative (PID) Control Mode.**
↵	Select **Pld**.

15. Increase to SP1 (PRoG > PLD >ACtN > RVRS)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
Pld	ACtN	**RVRS**					Increase to **SP1** (i.e., heating)

	Note: If not at Level 1, push the ⇧ button to get to that level. **Level 1 = INIt, PRoG, and oPER**
◀▶	Navigate to **PRoG** (Programming Mode).
↵	Select **PRoG**.
◀▶	Navigate to **Pld.** **Note: Pld – Set the output to Proportional-Integral-Derivative (PID) Control Mode**
↵	Select **Pld**.
◀▶	Navigate to **ACtN.** **Note: ACtN – Determines the action direction for control**
↵	Select **ACtN**.
◀▶	Navigate to **RVRS.** **Note: RVRS – Off when Process Value is > Setpoint, and on when Process Value is < Setpoint (e.g., heating); deadband is applied below Setpoint (factory default)**
↵	Select **RVRS**.

A full description of features can be found here: https://assets.omega.com/manuals/M5451.pdf.

APPENDIX B

Die Head Sizing

Description: This procedure describes the process of sizing the Thermal Die Head tooling used on Beahm Bonders (model #'s 220B, 320B, 420B, 520B & 620B)

Scope: This document applies to Part # 3054593-001, and 3052819-001 (only applies to 520B and 620B) Thermal Die Heads

Tools and Equipment: Caliper or micrometer

Reference: Figure B-1. Die Head Sizing

Procedure:

1. Assemble components to be bonded over mandrel(s) (Refer to Figure B-1, Steps 1-2).
2. Measure bond length, tubing overlap, balloon sleeve length (Refer to Figure B-1, Steps 1-3).
3. Position protective sleeve (fitted PTFE, PET heat shrink, or Polyolefin heat shrink) over bond location (Refer to
4. Figure B-1. Die Head Sizing Steps 1-4).
5. For heat shrink sleeves (PET, Polyolefin etc.) shrink the sleeve onto the bond location.
6. Measure O.D. of protective sleeve at bond location (Refer to
7. Figure B-1. Die Head Sizing Steps 1-5).
8. Machine the die heads to width based on the value in Step 2.
9. Bore hole through heads .003" less than diameter value in Step 4.
10. For Balloon Shield bore size add .005" to the product OD (without sleeve).

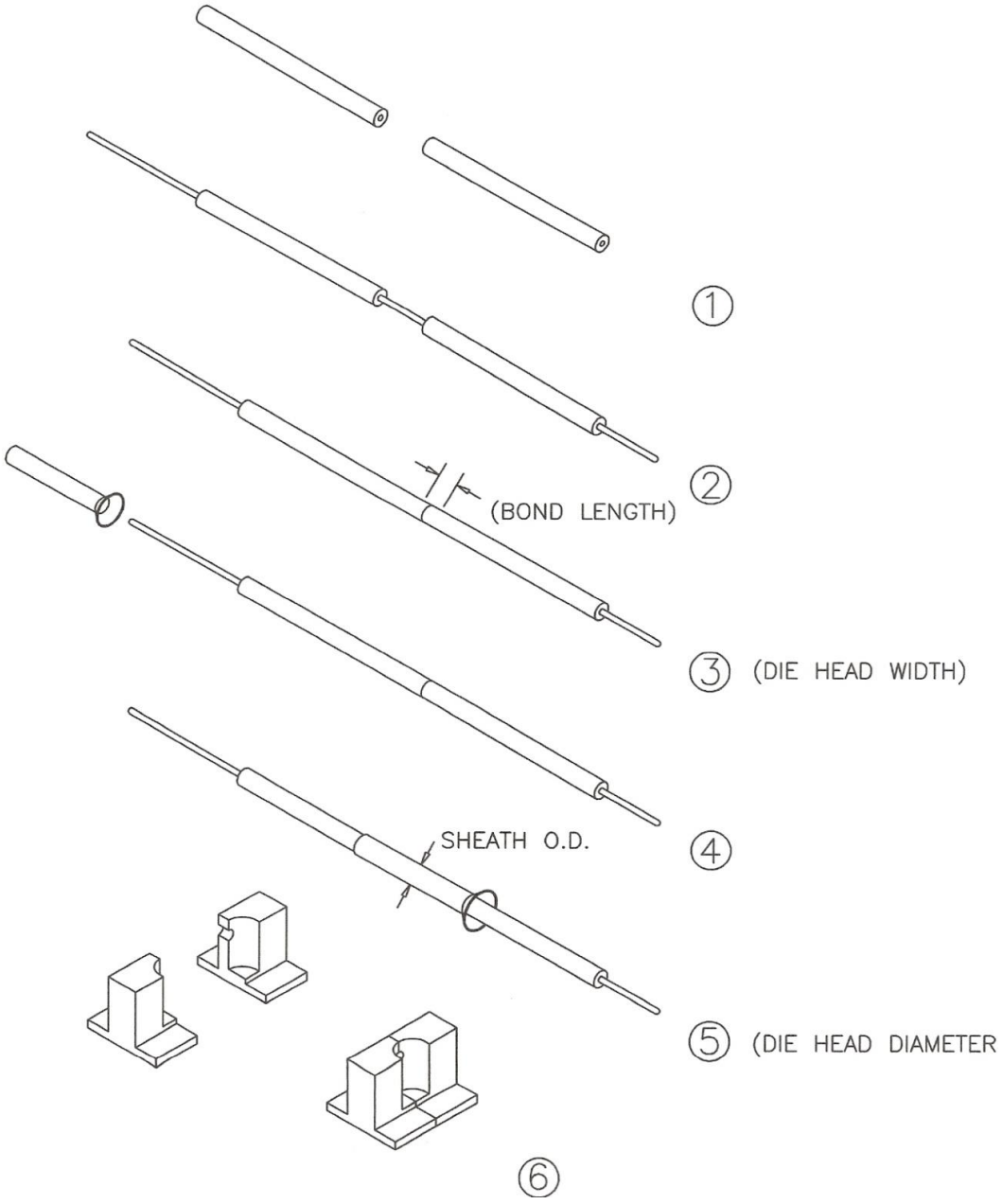

Figure B-1. Die Head Sizing