

MACHINE SOLUTIONS INC.



USER MANUAL

BEAHM DESIGNS BALLOON BONDER MODEL 420-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 420-B Balloon Bonder machine. At MSI, we are dedicated to bringing innovative process development solutions to both medical device and nonmedical organizations. The MSI proprietary segmental technology has been successfully implemented in manufacturing clean rooms on five continents, and continues to expand – meeting, growing, and facilitating the abilities of device companies around the globe. MSI looks forward to helping your organization provide life-improving devices to your customers, today and tomorrow.

MACHINE DESCRIPTION

The Beahm Designs Thermal Die Bonder with Axial Compression is equipped with dual Pneumatic tubing grips, centerline adjustment, adjustable compression, and variable timed cooling. The 420B provides a low-cost quick tool alternative to RF die bonding. The seven-parameter operation is easy to set-up and use and simplifies system calibration and process validation. This system provides you with fast, highly repeatable bonds. It also 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. Ultra compact design provides you with greater workspace.

SAFETY

- Use of eye protection when working with compressed gases and heated materials is advised.
- The maximum observed Sound Pressure Level is below 70 dBA.



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 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:

- Axial Compression Thermal Die Bonder
- IEC Power Cord

INSTALLATION

1. Place the system on a level, sturdy surface at an ergonomically viable height for the user.
2. Connect the electrical umbilical to the die base unit.
3. Connect the power cord to the main control unit.
4. Connect the air supply to the system and then to a clean, dry, and filtered compressed air source.

SYSTEM CONTROLS AND FEATURES

Located on the front panel are the following controls and/or displays and their function.

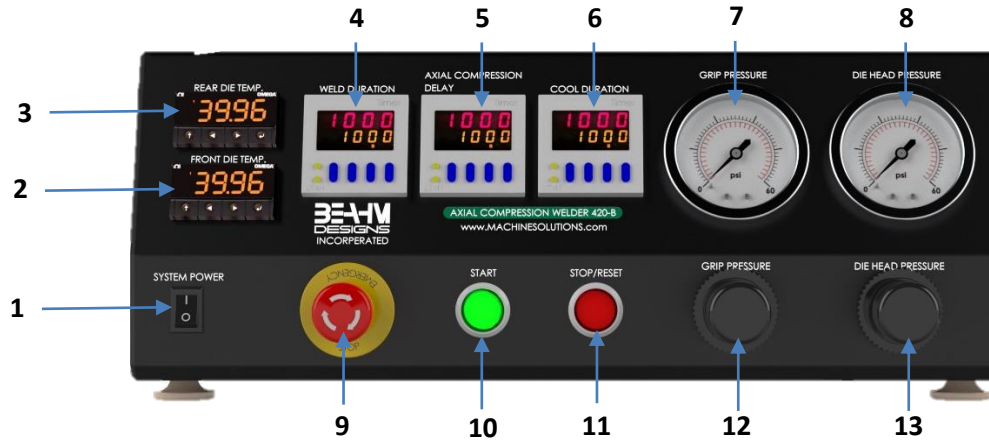


Figure 1. 420-B Front Panel

Table 1. Control and Display Functions

Item	Function
1	Toggles system power and air on and off.
2	Controls the temperature of the front die head.
3	Controls the temperature of the rear die head.
4	Controls the duration that the die heads are closed and/or in contact with the product.
5	Controls compression delay time.
6	Controls the duration the cooling air flows.
7	Displays the grip pressure.
8	Displays the pressure applied to the die head actuation cylinder.
9	Disrupts power to heaters and internal components.
10	Initiates process sequence.
11	Interrupts the process sequence and resets the system timer. Resets the system after power up and if E Stop is depressed
12	Controls the pressure to the product grips.
13	Regulates the pressure of the die head actuation cylinder.

RUN PROCESS



Caution: Die jaws will become hot during operation and depending on temperature set-point, can cause severe skin burns if contact occurs.

1. Switch main power on.
2. Set the die temperature on EACH temperature controller.
3. Set heat timer to desired duration in seconds.
4. Set Axial Compression Delay Timer to desired duration in seconds.
5. Set Cool Timer to desired duration in seconds.
6. Adjust Die Head pressure.
7. Adjust Tubing Grip Pressure.
8. Position components to be bonded within thermal jaws.
9. Depress footswitch/push start button.
10. Remove components upon completion of cool duration.

PARAMETER SETTINGS

Temperature Controller

Note: Verify what model temperature controller is on the machine

- Refer to page 11, Omron Temperature Controller.
- Refer to page **Error! Bookmark not defined.**, Omega Platinum Temperature Controller.
- Refer to page 24, Eurotherm Temperature Controller.

Pressure Regulator Setting

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

Process Timer Setting

- Depress the upper half of the rocker buttons to increase time duration, depress the lower half of the rocker button to decrease the time duration. Depress the timer reset button to accept the new value.

OMRON TEMPERATURE CONTROLLER

Note: Verify what model temperature controller is on the machine

The parameter settings for the temperature controllers have been pre-configured prior to shipment from Machine Solutions, Inc. However, if further details are required, refer to the Omron operating instructions for the model-E5GC temperature controllers included with the manufacturer's literature (delivered with the machine).



Figure 2. Omron E5GC Temperature Controller

Setting Temperature Controller Parameters

The parameter settings, as defined by Machine Solutions, Inc. for specific operational functionality of the individual temperature control units, are detailed below. It is recommended that these parameter settings remain as they appear in the sections to follow. If parameters are changed incorrectly and cannot be restored, please contact service@machinesolutions.com.

Autotuning Temperature Controller

Re-tune the temperature controller if dies are changed or modified, or to correct instability at process temperature.

1. Start with machine at ambient temperature.
2. Power on the machine. Ensure the heater switch (if applicable) is switched to "off" for the next two steps. If machine is not equipped with heater switch, ensure steps are completed quickly to minimize pre-heating.
3. Set controller to process temperature.
4. Follow the procedure shown in Figure 3.
5. If applicable, switch heater switch to "on" once controller is back to home screen. Controller will wait for temperature to stabilize before starting.

Note: Autotune is active when light next to "TUNE" is lit. The procedure may take up to 30 minutes.

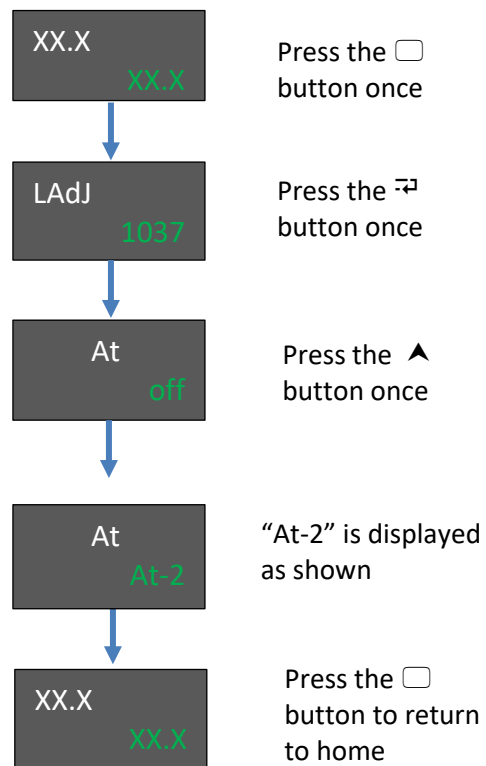


Figure 3. Auto Tune Enable

Configuration of Temperature Controller Alarm

Even after a successful autotune, temperatures may still have a small degree of instability. Temperatures may also drop unexpectedly if there is a fault with the equipment or if accessories are accidentally unplugged. To ensure the equipment notifies operators in the case of an unexpected temperature change, the temperature controllers are programmed with an alarm. Machine Solutions, Inc. recommends a temperature tolerance of $\pm 2.5^{\circ}\text{F}$, allowing the temperature to either rise or drop by as much as 2.5°F before the alarm activates. The procedure for configuring the temperature controller alarm is outlined in Figure 4.

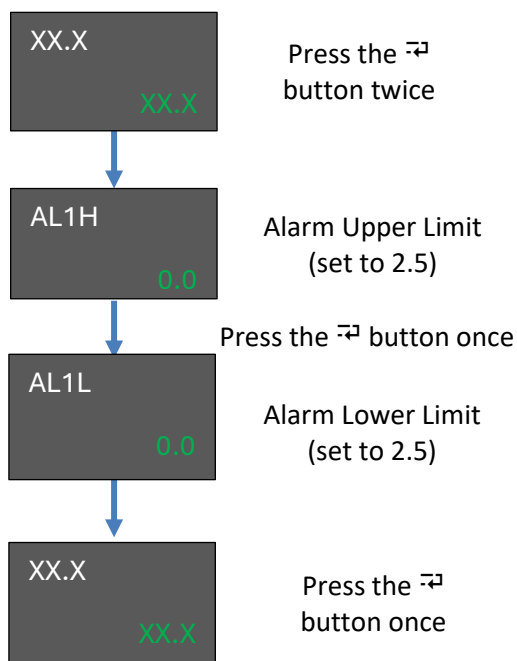


Figure 4. Temperature Alarm Setup

Setting Temperature Controller Offset

If there is a difference between the temperature measured by the thermocouple and the actual temperature of the head, then you may wish to adjust the temperature display with an offset.

There may be a temperature disparity between the temperature controller readout and the actual temperature at the working surfaces of the machine's dies (measured with an external standard). A temperature offset may be desired to reduce or eliminate this disparity.

Offset range -199.9 to 999.9 °F/°C

The following diagram, Figure 5, shows the procedure for inputting a known temperature offset:

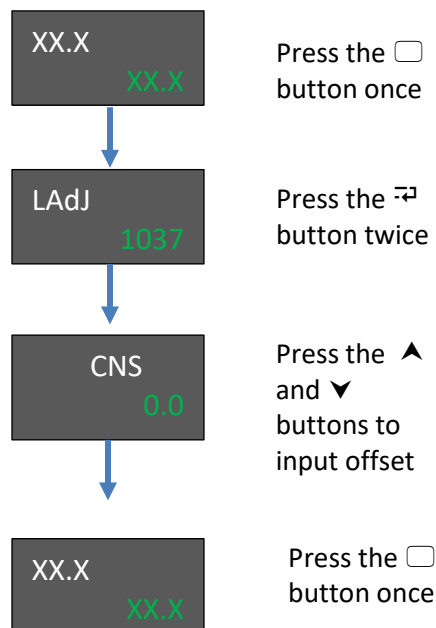








Figure 5. Temperature Offset

EUROTHERM TEMPERATURE CONTROLLER MODEL 3216

Note: Verify what model temperature controller is on the machine.

Note: Auto-tuning can be performed at any temperature set point within the system operating specifications. This machine needs to be auto tuned at the temperature and air flow that your product will be processed at.

Auto-Tuning

1. Ensure heater power is off and heater is at room temperature.
2. Enter the process temperature setpoint using the  or  buttons.
3. Press  until **R.TUN** is displayed.
4. Press  or  to select On.
5. Press  to begin the auto tune process.
6. Turn heater power ON.

Please note, after following this sequence, auto tune can take several minutes to start and complete.

A full description of auto-tune and the purpose of other parameters in the level 2 list is given in the 3200 Manual located online at <https://www.eurotherm.com/download/3200-engineering-manual-ha028651-iss-15/>

Switching from Fahrenheit to Celsius

1. Press and hold the page button (left most) until Lev 1 appears.
2. Press up arrow to Lev 2 appears.
3. Press scroll to code 0.
4. Press up arrow key for code 2.
5. Press scroll button until units appear.
6. Press up or down arrow key to select C.

OMEGA PLATINUM TEMPERATURE CONTROLLER








Note: Verify what model temperature controller is on the machine.

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 on page 24 for resetting the Omega temperature controller and all temperature control settings.

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: Ensure that the die heads are cooled to within 15 degrees of ambient temperature before proceeding with replacement.

Cleaning

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

Exchanging Die Heads

- Loosen the set screw located on the top of each die head and withdraw the thermocouple.
- Remove the four screws at the base of each die head.
- Position new die heads in place of removed die heads, install four screws at the base of each die head. Do not overtighten the screws.
- Install the thermocouple in the rear of each die head and gently tighten the set screw to hold them in place.

DIAGNOSTICS AND TROUBLESHOOTING

Table 2. Diagnostics and Troubleshooting

Issue	Possible Causes	Solution
Temperature not stable.	<ul style="list-style-type: none"> Die heads replaced Thermocouple loose 	<ul style="list-style-type: none"> Auto-tune (MSI recommends auto-tune to process temperature starting from ambient temperature.) Re-install thermocouple(s)
“S.ERR” displayed (Omron temperature controller)	<ul style="list-style-type: none"> T.C Sensor Break 	<ul style="list-style-type: none"> Replace thermocouple Verify complete T.C. path
“Open” displayed (Omega temperature controller)		
“S.br” displayed (Eurotherm temperature controller)		
Die heads do not close.	<ul style="list-style-type: none"> Air pressure is too low Timer set to “0” Valve defective 	<ul style="list-style-type: none"> Increase air pressure Increase Heat Duration Replace valve
Die head(s) do not heat.	<ul style="list-style-type: none"> Loose connection to main control unit Defective Temperature controller 	<ul style="list-style-type: none"> Verify secure connections Replace temperature controller
.Err code in display.	<ul style="list-style-type: none"> Temperature controller software failure 	<ul style="list-style-type: none"> Replace temperature controller
System will not power on.	<ul style="list-style-type: none"> Emergency stop switch depressed IEC power cord not fully connected 	<ul style="list-style-type: none"> Rotate switch knob to engage Verify installation

SPECIFICATIONS

Table 3. System Specifications

Description	Range	Accuracy
Die Temperature	Standard: Ambient-500°F High Temp Option: Ambient-750°F	± 10°F
Weld Duration	1-9999 seconds	± .1 sec
Axial Compression Delay	1-9999 seconds	± .1 sec
Cool Duration	1-9999 seconds	± .1 sec
Die Head Pressure	0-60 psi	± 2 psi
Gripper Pressure	0-60 psi	± 2 psi
Axial Compression	0-100 psi	± 10 psi

Facilities Requirements

- Voltage: 120/240 VAC (depends on configuration) 50/60 Hz.
- Wattage: 500 max.
- Compressed Air: 60-125 psi, 0.5 SCFM, filtered 50 micron or greater, oil and water free

CRITICAL PARTS

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

Table 4. Critical Parts List

Part Number	Description	Quantity
1153590-001	HEATER, CARTRIDGE, 120VAC, 1.5in, 100w (configuration specific)	2
1157788-001	HEATER, CARTRIDGE, 220VAC, 1.5IN, 100W (configuration specific)	
1143133-001	THERMOCOUPLE, K TYPE, 0.125 OD	2
1153460-001	SOCKET TIMER	1
1143303-001	TIMER, DIGITAL, LT4H, 24VDC, COLOR LCD, 8 MODES	3
1161899-001	TEMP CONTROLLER	2
110114-002	CONTROLLER, TEMP, OMRON	2
1143287-001	RELAY, 24VDC INTEGRATED	2
119106-001	RELAY, MODULE THIN, 24V, DIN RAIL N1PDT	1
1145619-001	RELAY, 24VDC, INTEGRATED, 4PDT	1
1343250-001	VALVE, 2-WAY 24 VCD, MAC	2
1330445-003	VALVE, 5-2, 24VDC, BODY PORTED	3

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. MSI's obligation under this warranty shall be limited to the repairing or replacing of the product or parts thereof which upon MSI's 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.

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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

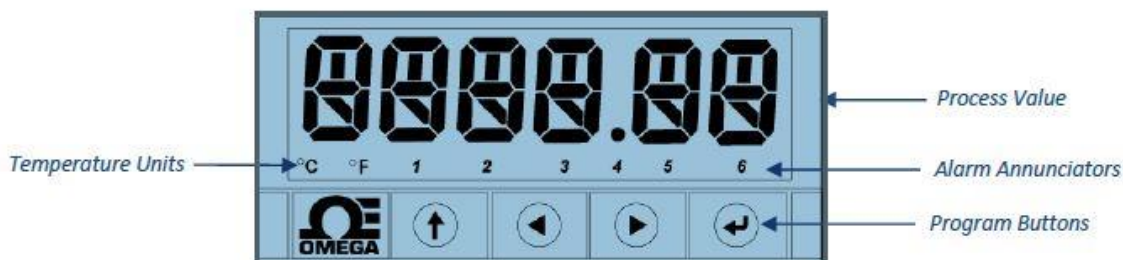


Figure A-1. Controller Layout





-  The UP button moves up a level in the menu structure. Pressing and holding the UP button navigates to the top level of any menu (oPER, PRoG, or INIt). This can be useful if you get lost in the menu structure.
-  The LEFT button moves across a set of menu choices at a given level (up in the Section 4 menu structure tables). When changing numerical settings, press the LEFT button to make the next digit (one digit to the left) active.
-  The RIGHT button moves across a set of menu choices at a given level (down in the Section 4 menu structure tables). The RIGHT button also scrolls numerical values up with overflow to 0 for the flashing digit selected.
-  The ENTER button selects a menu item and goes down a level, or it enters a numerical value or parameter choice.

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> PId > A.to > 5.00)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
PId	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 PId .						
	Select PId .						
	Navigate to A.to .						
	Select A.to						
	Set to 5.00 minutes or above						

3. (PRoG> PId > GAIN > _P_ > 2.77)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
PId	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 > PId > GAIN > _I_ > 0.08)

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

	Navigate to _I_
	Select _I_
	Enter 0.08






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

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

	Navigate to _d_
	Select _d_
	Enter 23.87

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





Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
PId	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 > PId > tUNE > **StRt**)














Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
PId	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). <ul style="list-style-type: none"> • °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 .

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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
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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	<u>2.5</u>					Alarm high parameter for trigger calculations
ALM.1	ALR.L	<u>2.5</u>					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)

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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 > PId)










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						
		PId					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 PId . Note: PId - Set the output to Proportional-Integral-Derivative (PID) Control Mode.
	Select PId .

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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>.