

MACHINE SOLUTIONS INC.



USER MANUAL

BEAHM DESIGNS BALLOON BONDER MODEL 520-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 520-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 Inc. Model 520-B CE Split Die Balloon Bonder is a system for the purpose of thermal bonding or welding thermoplastic components to other materials by means of a pair of heated dies while providing protection of the balloon or region of the materials from the process heat by means of a cooling chamber. The system features two die heads that remain at a constant process temperature vs. cycling the heat on and off. Each die head features one half of the bond diameter and are “opened” or separated from each other to allow the components to be positioned within the bored diameter. Digital timers control the bond and cool durations and integrated tooling secure the components during the process.

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 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:

- Die Base and Control Unit
- 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.

CONTROLS AND FEATURES

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

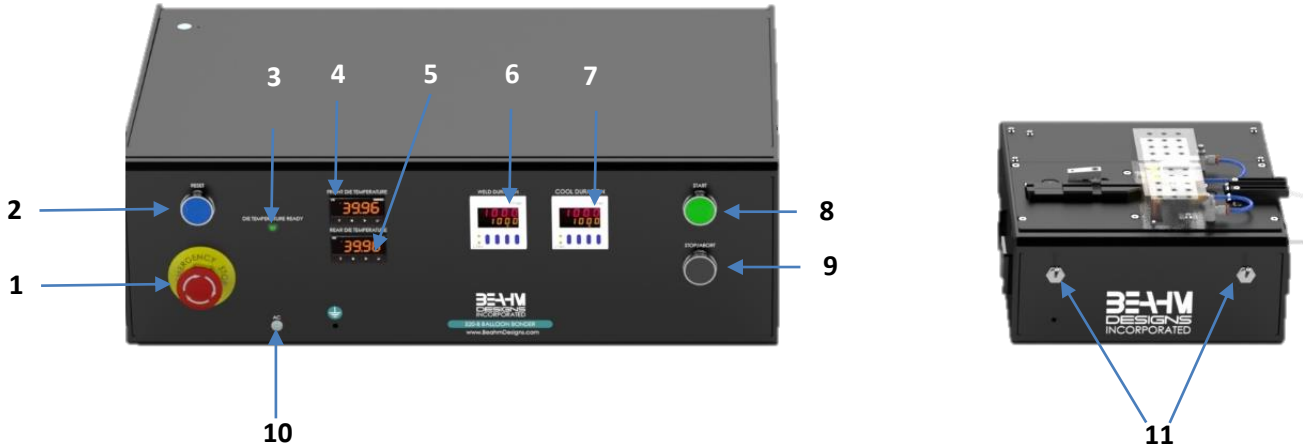


Figure 1. 520-B CE Front Panel

Table 1. 520-B CE Front Panel Controls and Functions

Item	Function
1	Disrupts power to heaters and internal components
2	Resets the system after power up and if E Stop is depressed
3	Indicates when the set temperature of the dies is reached, and a process can be initiated
4	Controls the temperature of the front die head
5	Controls the temperature of the rear die head
6	Controls the duration that the die heads are closed and/or in contact with the product
7	Controls the duration the cooling air flows
8	Initiates process sequence
9	Interrupts the process sequence and resets the system timer
10	Indicates when system AC power on by illuminating, off when not illuminated
11	Toggles the gripper and cooling shield assembly open/close



Figure 2: 520-B Back Panel

Table 2. 520-B CE Back Panel Controls and Functions

Item	Function
1	Supplies air from main control unit to die base unit
2	Supplies signal from thermocouples to main control unit
3	Allows connection to foot pedal
4	Toggles system power and air on and off
5	Connects to power cord

Set Up and Configuration

Proper alignment of the tooling is crucial to optimizing process results and repeatability. The following guidelines are the recommended methods; however all applications vary, and several iterations of tooling process development may be required and may not follow all the recommended guidelines.

Grip/Positioning Nests

This is the most forgiving of the tooling. The included, standard vee configurations are more than adequate for most applications. More important than the guide design and dimensions is alignment with the die heads. Refer to the maintenance section for the alignment procedure.

Customized nests and tooling are available. Contact Beahm Designs' sales to review the application and request a quote.

System Options

Many optional accessories are available to enhance the functionality of the system and improve process yield. Contact Beahm Designs' sales department or visit our web site www.machinesolutions.com for more information on available accessories and to request a quote. Examples of available accessories are:

- Vision systems with or without on-screen crosshair line generators.
- Laser line generators.
- Extended product support trays/guides.
- Product grip nests/alignment tooling.

Installation instructions are included with each specific accessory.

PARAMETER SETTINGS

Setting Temperature

- Depress and hold the up or down arrow key of the temperature controller to scroll to the desired temperature. After 2 seconds the new value will be accepted, and the temperature will ramp to the new set point.

Setting Heat Duration

- Depress the upper or lower half of the corresponding time digit to change its value.
- Depress the STOP/ABORT switch to reset the timer to the new value.

Setting Cool Duration

- Depress the upper or lower half of the corresponding time digit to change its value.
- Depress the STOP/RESET switch to reset the timer to the new value.

Adjusting Die Head Pressure











- Remove top plate on the control unit and rotate the **R1** regulator screw clockwise or counterclockwise until the pressure gauge displays the desired value.

OMEGA PLATINUM TEMPERATURE CONTROLLER

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.

Viewing/Returning to the Current Temperature on Temperature Controller(s)

Use oPER (Operating Mode) Menu

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RUN							

	Note: If not at Level 1, push the  button to get to that level. Level 1 = INIT, PRoG, and oPER
 	Navigate to oPER (Operating Mode).
	Select oPER .
 	Navigate to RUN .
	Select the RUN .
	Displays the current temperature.

Resetting the Temperature Controller

Refer to Appendix A on page 25 for resetting the temperature controller and all temperature control settings.

RUN PROCESS

1. Position the components to be processed such that the balloon or region to be cooled during the process is within the cooling chamber.
2. Position the bond region outside of the shield assembly and in-line with the die heads.
3. Toggle (close) the gripper and shield assembly.
4. Depress the start button or foot switch to initiate the process sequence.
5. Upon completion of the cooling cycle, toggle (open) the gripper and shield assembly and remove the materials.

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.

Exchanging Die Heads

Note: Perform these steps **ONLY** when the die heads are at room temperature.

1. Remove both guards from the top of the remote assembly.
2. Unscrew set screws holding in thermocouples to the dies a few turns and remove thermocouples. Take care to not fully remove the set screws.
3. Remove the fasteners of each die head and remove the die heads.
4. Position the replacement die heads on the die bases.
5. Re-install the fasteners at the base of each die head, **DO NOT** tighten the fasteners.
6. Manually close the die heads and ensure that they are aligned left-to-right and, while holding the heads together, tighten the fasteners.
7. Re-install both guards to the top of the remote assembly.
8. Verify alignment.

Aligning Tooling

Note: Alignment should be performed on a prepared product subassembly.

Alignment MUST be performed with system power off and dies at ambient temperature.

Alignment must be performed on a flat and reasonably level surface.

1. Prepare a product/materials assembly.
2. Position the assembly within the vee guide and shield assembly.
3. Remove the guards from the top of the remote assembly.
4. Close the die around the material subassembly.
5. Using the adjustment screw of the positioning stage adjust the Z-axis of the vee guide assembly until the material assembly is aligned with the die head bore.

6. Adjust the Z-axis and Y-axis of the shield assembly until it is aligned with the die head bore.
7. Open the dies and remove the product/material subassembly.
8. Replace the guards on the remote assembly.

Fuse Replacement

The machine has two fuses located in the power entry module on the back of the machine.

1. To replace a blown fuse, remove machine power by unplugging the power cord from the machine.
2. Remove the cover of the power entry module using a screwdriver in the screwdriver slot (see **Figure 3**).

Important: A blown fuse may indicate machine malfunction. If a fuse blows before exceeding its expected lifespan, then perform troubleshooting procedures. Contact MSI if the problem persists.

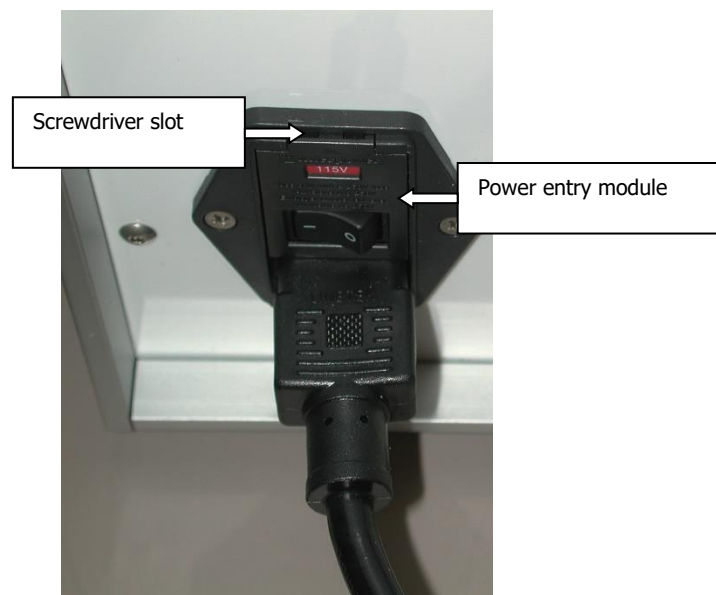


Figure 3. Fuse Replacement; Main Power

3. Remove the red fuse holder (see **Figure 4**).

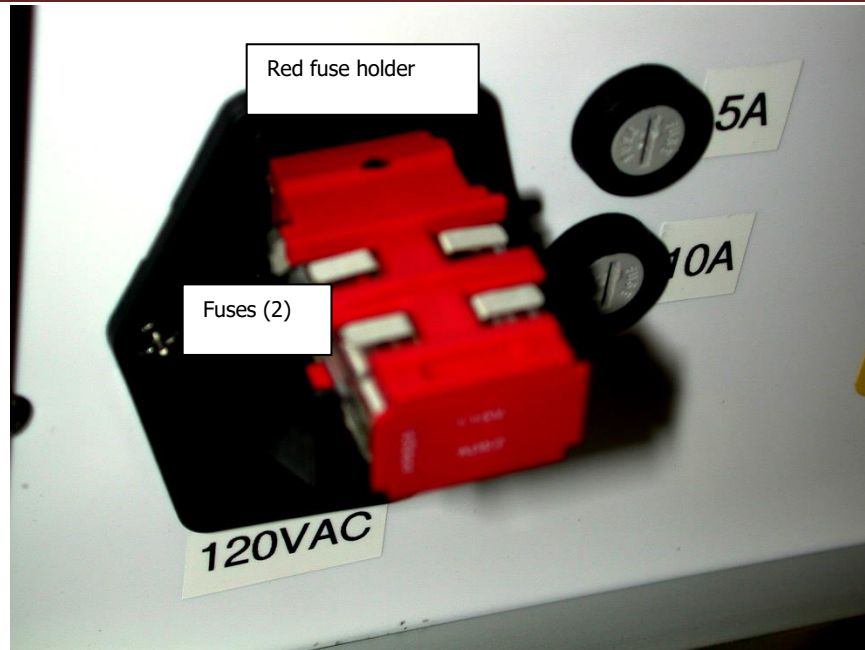


Figure 4. Power Entry Module Fuses

4. Remove the old fuse from the holder.
5. Insert the new fuse. Orientation of the fuse is not important. See machine labels for proper voltage.
6. Reinsert red fuse holder, ensuring the voltage label is right side up.

DIAGNOSTICS AND TROUBLESHOOTING

Table 3. 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 process auto-tune @ temperature.) • Re-install thermocouple(s)
“Open” flashing on temperature controller	<ul style="list-style-type: none"> • T.C Sensor Break 	<ul style="list-style-type: none"> • Bad thermocouple • Verify complete T.C. path
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 • Fuse needs to be replaced 	<ul style="list-style-type: none"> • Rotate switch knob to engage • Verify installation • Replace fuse

SPECIFICATIONS

Table 4. System Specifications

Description	Range	Resolution	Accuracy
Temperature	Ambient-500°F	0.1°F/°C temperature; 10 μV process	+/- 0.03% F.S.
Die Temperature	Ambient-500°F	N/A	±10°F
Heat Duration	1-9999 seconds	1.0 sec	± .1 sec
Cool Duration	1-9999 seconds	1.0 sec	± .1 sec
Die Pressure	0-60 psi	2.0 psi	± 1.5% F.S.

Table 5. Machine Specifications

Description	Range/Accuracy
Line Voltage	120/240 VAC (depends on configuration) 50/60 Hz. 500 watt max.
Operating environment	<ul style="list-style-type: none"> • 60 – 75°F (15 - 24°C) • 0 – 85% relative humidity, noncondensing
Storage temperature	32 – 120°F (0 – 48°C)
Approximate machine weight	50 lbs.
Approximate machine dimensions: Control Unit	Height: 7 in. Width: 22.5 in. Depth: 14 in.
Approximate machine dimensions: Die Base	Height: 6 in. Width: 9.5 in. Depth: 11 in.

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 6. Critical Parts List

Part Number	Description	Quantity
130118-001	VALVE, TOGGLE, 4WAY, 2 POSITION	2
1343250-001	VALVE, 2-WAY 24 VCD, MAC	2
1339452-001	VALVE, 5-2, 24VDC, BODY PORTED, SIDE BRACKET	1
1143311-001	RELAY, SOLID STATE, DIN MOUNT 25A DC/AC	2
1143303-001	TIMER, DIGITAL, LT4H, 24 VDC, COLOR LCD, 8 MODES	2
1143287-001	RELAY, 4VDC INTEGRATED	3
119106-001	RELAY, PLC, 24VDC, 1PDT	2
1161899-001	CONTROLLER, TEMPERATURE, 1/32 DIN, 24 VDC	2
120V 1153590-001	HEATER, CARTRIDGE	2
220V 1157788-001		2
110295-001	FAN, 40MM, 24 VDC	2
1143133-001	THERMOCOUPLE	2
1144740-001	FUSE	2

CALIBRATION

Important Notes:

- It is recommended that calibration be performed by a certified service, preferably with the system in the location of use. Calibration procedures are the domain of these service providers.
- Calibration refers to the process of verifying that each of the systems' instruments that control a process parameter is within manufacturers' specification.
- Calibration DOES NOT refer to the process of measuring the temperature at the center of the tooling and "matching" the value to the temperature controller set point.
- The measured value at the tooling may not match the temperature controller set point and the.
 1. Calibrate the temperature controller annually.
 2. Calibrate the timers annually.
 3. Calibrate the pressure gauge annually.

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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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

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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

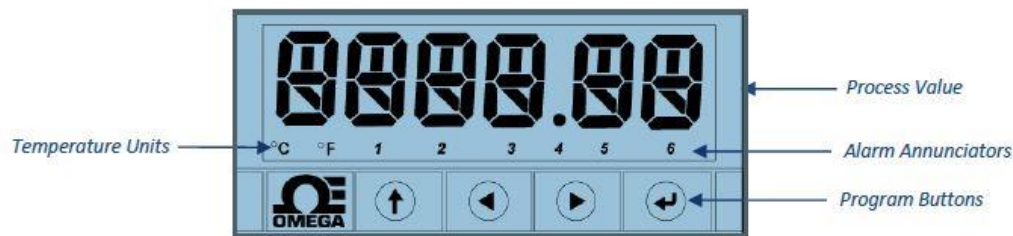


Figure A-1. Controller Layout





-  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 P_{RoG} (Programming Mode) Menu for Steps 1-7









1. Setpoint 1 Configuration (P_{RoG} > SP1 > #)

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

	<p>Note: If not at Level 1, push the  button to get to that level.</p> <p>Level 1 = INIt, P_{RoG}, and oPER</p>
	Navigate to P_{RoG} (Programming Mode).
	Select P_{RoG} .
	Navigate to SP1 (Setpoint 1 parameter).
	Select the SP1 .
	Set the process goal value.
	Confirm the value.







2. (P_{RoG}> P_{Id} > A.to > 5.00)

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
P _{Id}	A.to	5.00					Set timeout time for autotune

	<p>Note: If not at Level 1, push the  button to get to that level.</p> <p>Level 1 = INIt, P_{RoG}, and oPER</p>
	Navigate to P_{RoG} (Programming Mode).
	Select P_{RoG} .
	Navigate to P_{Id} .
	Select P_{Id} .
	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					








	<p>Note: If not at Level 1, push the  button to get to that level.</p> <p>Level 1 = INIt, PRoG, and oPER</p>
	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.

Equipment User Manual

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 .

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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 .

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 .

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	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)









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

	<p>Note: If not at Level 1, push the  button to get to that level.</p> <p>Level 1 = INIt, PRoG, and oPER</p>
	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>.