customer manual

ORIGINAL INSTRUCTIONS

SAFETY PRECAUTIONS – IMPORTANT SAFETY INFORMATION

NOTE
Keep all decals clean and legible, and replace them when necessary.

CAUTION
*This symbol (black print on yellow background) indicates that there is something that could damage the machine or **cause bodily harm** if not handled properly. Refer to the manual for further instructions.*

HOT SURFACE.
This symbol (black print on yellow background) indicates that a given surface becomes hot during normal operation of the machine. Care must be to avoid direct skin contact with this surface.

HIGH VOLTAGE
This symbol (black print on yellow background) indicates that high voltage is present in the vicinity. Only trained technicians should be working in such an area. Normal procedures for working in such an area dictate that the machine be powered down, and the power be removed by unplugging the main power cord from the facility's power supply outlet. In circumstances where this is not possible, the technician must exercise extreme care to avoid contact between body parts, conductive tools, and electrical conductors.

WEAR PROTECTIVE CLOTHING
This symbol directs the operator to wear protective clothing when operating the machine. Most specifically cotton gloves and long sleeve cotton shirts which protect the operator from hot surfaces which may be encountered.

KEEP HANDS OUT OF AREA
This symbol warns the operator to keep hands and fingers out of the moving belts on the machine.

SAFETY PRECAUTIONS — AVOID INJURY — READ THIS FIRST!

Safeguards are designed into this application equipment to protect operators and maintenance personnel from most hazards during equipment operation. However, certain safety precautions must be taken by the operator and repair personnel to avoid personal injury, as well as damage to the equipment. For best results, application equipment must be operated in a dry, dust-free environment. Do not operate equipment in a gaseous or hazardous environment.

Carefully observe the following safety precautions before and during operation of the equipment:

Always wear approved eye protection while operating equipment.

Moving parts can crush and cut. Always keep guard(s) in place during normal operation.

Always insert power plug into a grounded receptacle to avoid electrical shock.

Electrical shock hazard.

Observe main electric on/off switch.

Always turn off the main power switch and disconnect the electrical cord from the power source when performing repair or maintenance on the equipment.

Ensure that guards are in place and secure to equipment.

Do not operate the equipment without guards in place..

Use caution when working with this equipment.

Never insert hands into installed equipment.
Never wear loose clothing or jewelry that may catch in moving parts of the equipment.

Never alter, modify, or misuse the equipment.

Never enter the electrical enclosure immediately after turning off the machine power switch and disconnecting the electrical cord from the power source. High residual voltages may be present in the electrical enclosure. Read the warning label on the electrical enclosure lid before entering the enclosure.

SUPPORT CENTER

CALL TOLL FREE 1-800-522-6752 (CONTINENTAL UNITED STATES AND PUERTO RICO ONLY)

The **Support Center** offers a means of providing technical assistance when required. In addition, Field Service Specialists are available to provide assistance in the adjustment or repair of the application equipment when problems arise which your maintenance personnel are unable to correct.

INFORMATION REQUIRED WHEN CONTACTING THE SUPPORT CENTER

When calling the Support Center regarding service to equipment, it is suggested that a person familiar with the device be present with a copy of the manual (and drawings) to receive instructions. Many difficulties can be avoided in this manner.

When calling the Support Center, be ready with the following information:

1. Customer Name
2. Customer Address
3. Person to contact (name, title, telephone number, and extension)
4. Person Calling
5. Equipment number (and serial number if applicable)
6. Product part number (and serial number if applicable)
7. Urgency of request
8. Nature of problem
9. Description of inoperative component(s)
10. Additional information/comments that may be helpful

Model 17 Belt Heater

Figure 1

1. INTRODUCTION

When reading this manual, pay particular attention to DANGER, CAUTION, and NOTE statements.

DANGER
Denotes an imminent hazard that may result in moderate or severe injury.

CAUTION
Denotes a condition that may result in product or equipment damage.

NOTE
Highlights special or important information.

NOTE
Dimensions in this customer manual are in U.S. customary units. Figures are not drawn to scale.

1.1. General

A. Model 17

The Model 17 Belt heater provides a controlled process system, suitable for processing a variety of products, including heat-shrinkable tubing, solder paste applications, and thermal curing of various products. The Model 17 is a table top unit consisting of a pivoting upper heater chamber and base, direct drive tractor belt system with lower heater element and integral electrical enclosure. See Figure 1.

The Model 17 Belt Heater operates at either a nominal 110 VAC or 220 VAC 50/60 Hz supply voltage and incorporates two 3.93” wide X 10.00” long 1000 W heater elements. Refer to the Electrical Specifications in Section 1.6 for Model 17 part numbers and their appropriate supply voltages.

The Model 17 is a table top unit. Overall dimensions of the unit are approximately 18" W x 44" L x 15" H. The two key process parameters, conveyor speed and heater element temperature are controlled using closed loop electronic modules. Speed settings range from 0 to 8 feet/minute, and temperature settings range from ambient to 600°C, however settings below 0.8 feet per minute are not recommended. The Model 17 is designed to run continuously at the recommended settings.

The Model 17 also contains many self-diagnostic and safety features. These include alarms, indicator lights and cool down circuitry. Indicator lights and alarms tell the operator when the unit is ready for product processing and alert the operator if temperature is out of range, or if a heater fault (heater element open circuit) occurs. Also, when the OFF ("O") push button is pressed, the Model 17 goes into a 20 minute Cool Down mode that allows the conveyor and fans to run without the heater elements. This prevents components in the machine from being repeatedly exposed to high temperatures when powered down.

B. Model 17R

The Model 17R Belt Heater has a reverse belt warm up feature in addition to the features listed above for the standard Model 17 machines. During the warm up period, the conveyor belts will run in the reverse direction preventing product from being loaded into the machine. After the machine's temperature reaches the preset operating range, the belts will run in the forward direction for normal operation. During the cool down mode, the conveyor belts will reverse direction when the machine's temperature falls below the preset operating range.

NOTE
It is the user's responsibility to independently verify all process parameters and settings immediately after equipment is installed. The user must also maintain and adjust the equipment, monitor the process, and inspect the installed product to ensure that process requirements are met on an ongoing basis.

1.2. Left-Right Conventions

In this document, left and right are always defined with respect to the operator when standing in a normal working position. That is, standing in front of and facing the Model 17.

1.3. Safety Features

Cool Down Circuit
To prevent equipment damage, a timer circuit allows the fans and belt to continue running after the OFF ("O") button is pressed. This circuit will shut off power to the heater elements while allowing the conveyor and fans to run for a period of 20 minutes, at which time all power will shut off automatically.

Over Temperature Circuit
In the event of an over-temperature condition in the upper chamber, a thermal switch mounted above the upper heater element will disable power to the heating elements and place the unit into cool down mode. The POWER ON Indicator light will turn off, and the unit will not restart until the over-temperature condition has cleared and the thermal switch again closes. See *Over Temperature Switch* Below for more information.

Emergency Stop Button
There is an Emergency Stop button located below the entry feed tray. Pressing this button will kill all power to the Model 17. *Do not use the Emergency Stop Button for normal shut down as it will defeat the cool down circuit.*

Temperature Alarm
The Model 17 has a temperature alarm band preset at the factory to indicate to the operator when the process temperature is above or below the set point temperature by 20°C. The red alarm light is located on the left side of the control.

1.4. Components and Controls

Circuit Breaker
All mains circuitry is protected from electrical overload by the Main Circuit Breaker (1CB) located on the right side of the Control Enclosure. It may be left on indefinitely and should be turned OFF only after the Model 17 has completed its Cool Down mode. *Do not use the Circuit Breaker for normal shut down as it defeats the cool down circuit.*

ON ("I") Push Button (Figure 2)
This button is used to turn the machine on at the beginning a shift, or to restore power to the heater elements during the Cool Down mode. It is located on the front of the Control Enclosure.

OFF ("O") Push Button (Figure 2)
This button is used to turn off the Model 17. Pressing this button puts the Model 17 in the cool down mode, shutting off power to the heater elements. After the OFF ("O") button is pressed, the conveyor and fans continue to operate for 20 minutes, allowing the Model 17 cool to a safe temperature. At the end of this Cool Down period, the conveyor and fans will shut OFF automatically. The OFF ("O") push button is located on the front of the Control Enclosure.

"On" Indicator (Figure 2)
This Model 17 "On" indicator is located between the ON ("I") and OFF ("O") push buttons. When illuminated, it indicates that the Model 17 is in normal operating mode with power applied to the heater elements. If it is not illuminated, the Model 17 is completely shut down, or in Cool Down mode, which means there is no power applied to the heater elements.

Fuses (Figure 2)
There is (1) fuse protecting the Model 17 control circuitry. This fuse is labeled 1 Fuse (1FU), and is located on the right side of the Control Enclosure. The fuse is a 1 amp, 5x20mm IEC high breaking time delay fuse. There are (2) fuses on the motor controller terminal board to protect the AC line input and the DC armature output.

NOTE

These fuses are both 1 amp ¼" x 1 ¼" type MDL

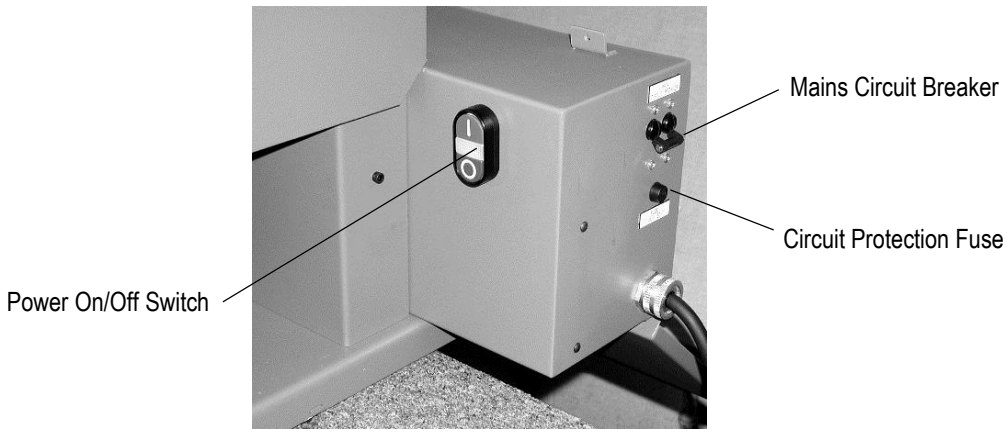


Figure 2

Temperature Controller (Figure 3)
The temperature controller uses type K thermocouple (integral to the upper heater element) to close the temperature loop. The heater element temperature set point may be adjusted from 0 to 600°C for different types and sizes of assemblies and tubing. UP and Down arrows on the face of the controller adjust the temperature set point. The Temperature Controller is located on the left side of the Control Enclosure.

Belt Speed Controller (Figure 3)
The belt speed controller is a precision 3 digit potentiometer with a range of 000 to 999. The value set on the potentiometer divided by 125 corresponds to the actual belt speed in feet per minute. Caution, setting the belt speed potentiometer at less than 100 is not recommended as it will significantly reduce belt life. Example; A potentiometer setting of 400/125 = 3.20 feet per minute belt speed.

Upper and Lower Heater Cycling LED Indicators (Figure 3)
Two (2) Green LED indicator lights located above the temperature controller provide a visual indication that both heating elements are passing current through the elements. These LED's will pulse with the cycling of power to the elements (approximately ½ second interval. If one of the LED's is not flashing it may indicate that a heating element has failed.

Temperature Out of Range Indicator (Figure 3)
The red Out of Range indicator light is located on the left side of the control enclosure. During warm-up of the Model 17 the red light will illuminate until the process temperature of the controller is within ±20°C of the temperature set point. Should the process set point be changed during normal operation, the indicator will illuminate until the process temperature is again within ±20°C of set point.

NOTE

For the Model 17R, the conveyor belts will run in the reverse direction when the "Temperature Out of Range" indicator is illuminated.

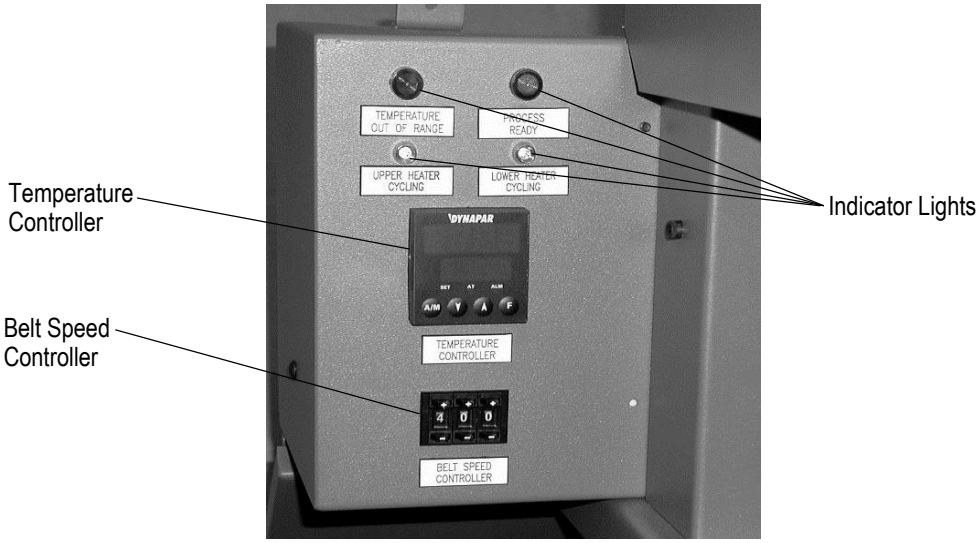


Figure 3

Process Ready Indicator (Figure 3)
The Process Ready light is located on the left side of the control enclosure. When the heating element temperature falls within the allowable processing temperature limits, the green Process Ready light will illuminate. *The operator must not run product through the Model 17 unless this indicator is on.* The factory setting for this indicator is ±20°C of the temperature set point. This value is set in the Band Alarm 2 location in the Temperature Controller.

NOTE

For the Model 17R, the conveyor belts will run in the forward direction only when the "Process Ready" indicator is illuminated.

DANGER

Emergency Stop *(Figure 4)*

The Emergency Stop button is located below the entry feed tray. Pressing this button will kill all power to the Model 17. Do not use the Emergency Stop Button for normal shut down as it will defeat the cool down circuit, stop the belt movement in the heating chamber, and MAY CAUSE THE BELTS TO CATCH ON FIRE!.

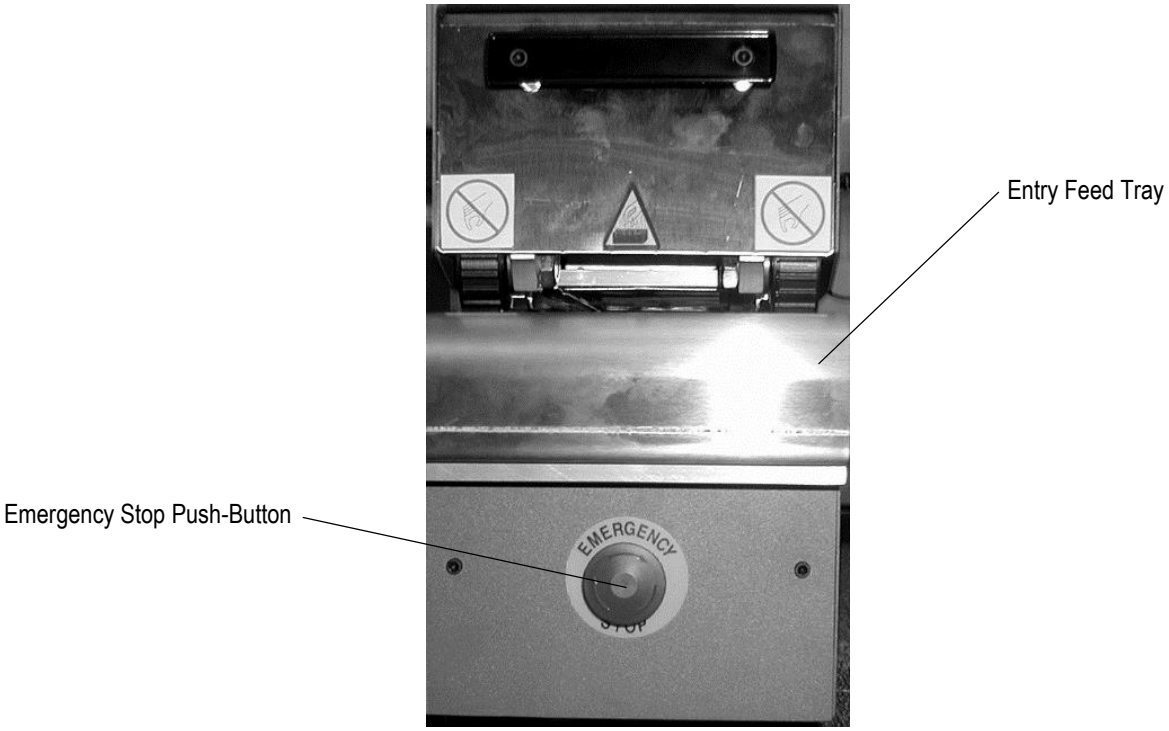


Figure 4

Entry Feed Tray (Figure 5)
The Entry Feed Tray has visual guides located on the centerline of the heating elements and either side of the centerline to assist the operator in positioning the spice joint and centering the tubing on the center of the splice joint before feeding the assembly into the drive belts.

Upper Heating Chamber (Figure 5)
The upper heating chamber pivots from the rear of the unit and can be lifted to inspect, clean and replace the heating element.

Support Rod (Figure 5)
The support rod will support the upper chamber in the open position for easy access to the inside of the processing chamber. The rod is normally stored in a retaining clip on the right side of the lower side panel.

Heater Elements (Figure 5)
Two (2) infra-red heater elements, one upper and one lower are used in the Model 17. Each element is rated 1000 Watts. The upper heater element contains an integral “K” type thermocouple.

Upper Belts (Figure 5)
The upper belts are free moving belts, driven by the lower belt set when the unit is in the closed position. The belt pulleys are fitted to needle bearing cam followers in the front and rear of the heating chamber.

Upper Chamber – Support Rod
Elements – Belts and Guides

Figure 5

Upper Floating Belt Backup Rails (Figure 5)
The upper heating element is attached to a spring loaded belt backup system. The spring loaded backup rails allow pressure to be applied to multiple assemblies as they pass though the unit. The spring system can be adjusted to accommodate large diameter assemblies while maintaining a fixed distance from the heating element to the top side of the assembly.

Lower Belt Guides (Figure 5)
The lower belt guides are a high temperature phenolic designed to guide the belts and prevent them from tracking off the lower pulleys.

Over Temperature Switch (Figure 6)
The Over Temperature Switch is located on top of the upper heater element. The switch protects the machine from over temperature conditions resulting from faulty control components or shorted thermocouple wiring. When an excessive temperature is sensed, the switch trips and causes the unit to automatically enter Cool Down mode. The Power ON indicator light will turn off and the Temperature Out of Range indicator light will illuminate as soon as the ±20°C processing band is exceeded.

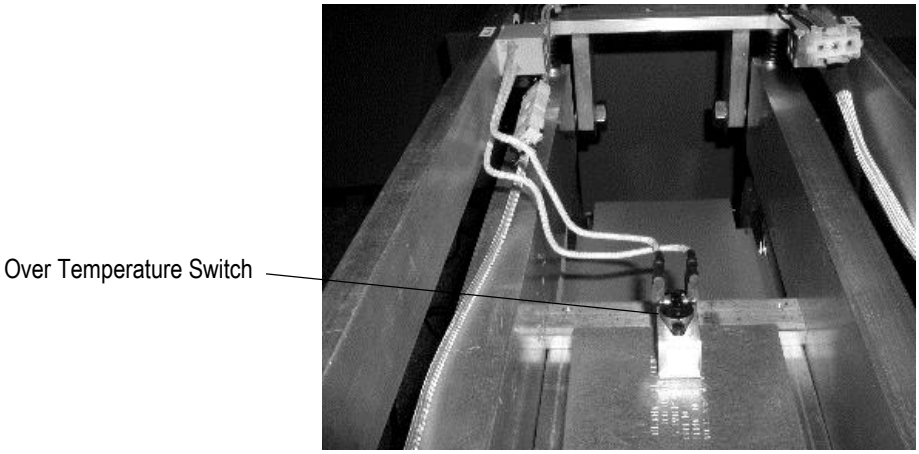


Figure 6

Drive Motor (Figure 7)
The drive motor is a 90 VDC double output shaft gear motor, mounted to the base of the Model 17. The drive pulleys mount directly to output shafts.

Drive Motor Assembly

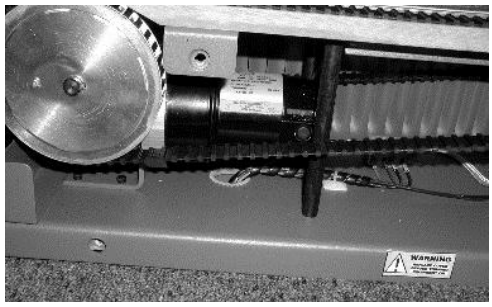


Figure 7

Cooling Fans (Figure 8)
Two (2) cooling fans are mounted in the upper panel of the Model 17. The fans have a plug connection that must be disconnected as the upper cover is removed and reconnected during the reinstallation of the top cover.

CAUTION
Always reconnect the fans during reinstallation of the cover to prevent Over Temperature conditions from occurring.

Cooling Fans and Plug Connection

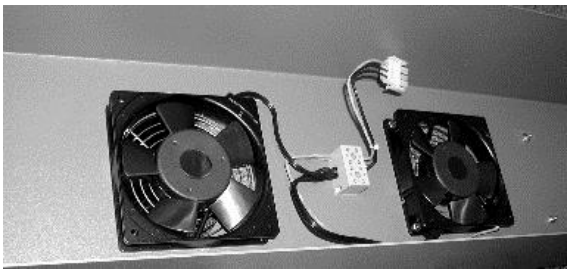


Figure 8

Access Panels (Figure 9)
The Model 17 has 3 access panels for service on the components of the unit. The left and right side panels are fixed with (4) ¼ turn fasteners. The top panel is also fixed with (4) ¼ turn fasteners. The upper panel also mounts the (2) cooling fans.

CAUTION
These access panels should never be removed with power connected to the unit.

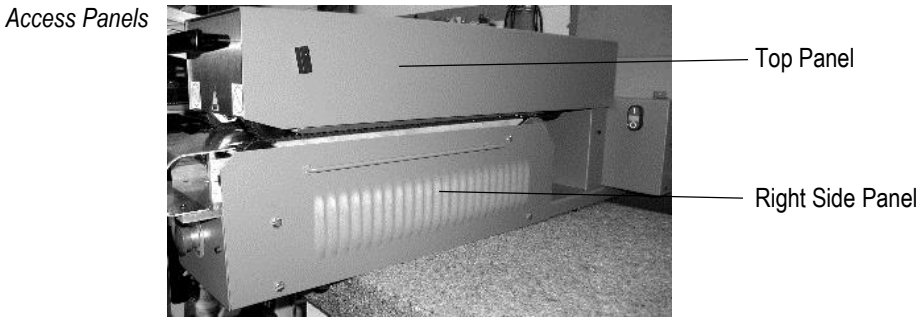


Figure 9

Eccentric Upper Chamber Adjusting Cam (Figure 10)
Two (2) Eccentric Cams are located near the rear pivot of the upper chamber. The cams permit the upper chamber to be opened slightly on the front end of the unit for processing large diameter wires and bundles that would otherwise cause difficulty for the operator to load in to the opposing belts. The cams are preset at the factory for typical assemblies. The cams should not be removed or adjusted such that the upper entry pulleys cause the lower belts to deflect downward at the start of the lower belt backup rail.

CAUTION
Removal or improper adjustment of these cams will cause wear and reduced life of the drive belts.

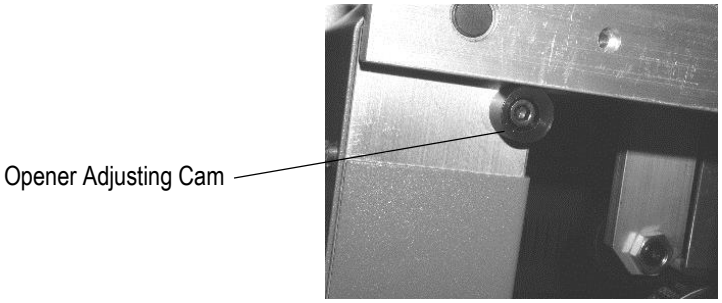


Figure 10

1.5. CONTROL ENCLOSURE LAYOUT

The Control Enclosure (Figures 11A, 11B and 11C) houses the bulk of the electrical and electronic components. All items are identified by schematic designation. Tables 1, 2, and 3 define each of the items.

A. Model 17 Control Enclosure Layout (110 Version)

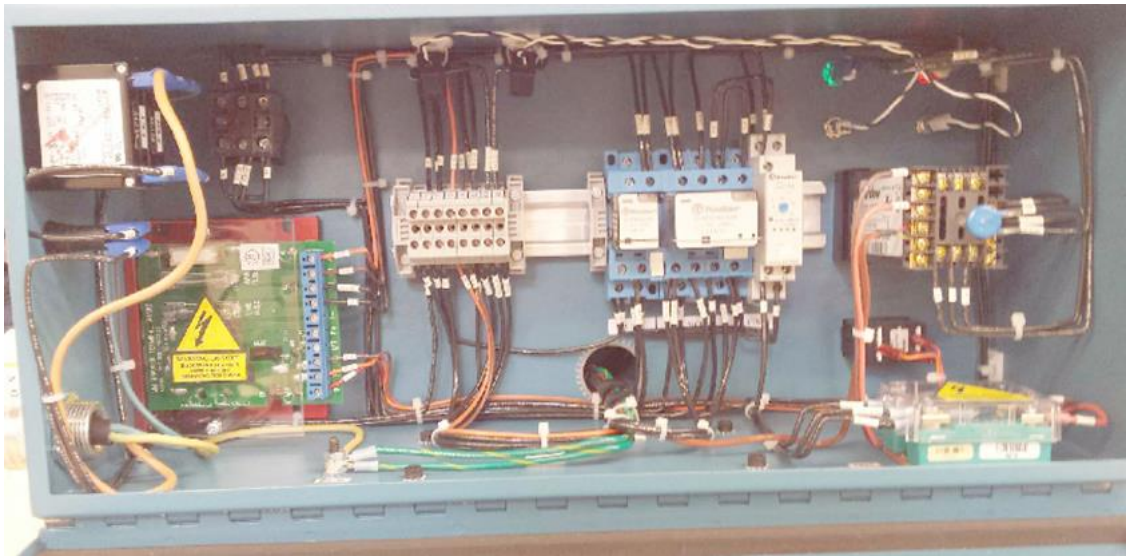


Figure 11A

B. Model 17 Control Enclosure Layout (220 Version)

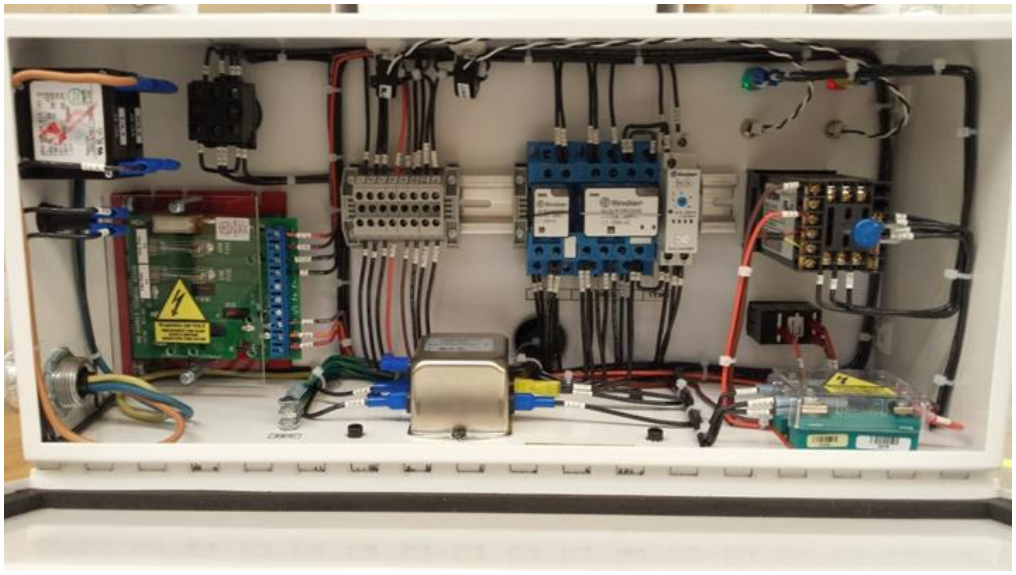


Figure 11B

C. Model 17R Control Enclosure Layout

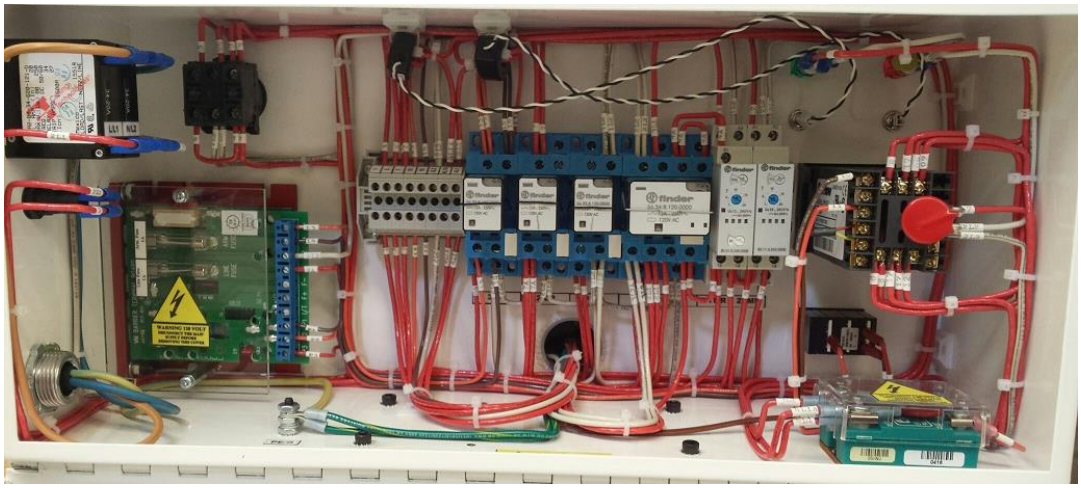


Figure 11C

D. Model 17, 110 VAC Schematic Designations

MODEL 17, 110 VAC, SCHEMATIC DESIGNATIONS	
DESIGNATOR	**DESCRIPTION**
1CB	Circuit Breaker, 2 Pole, 20 A, 250 VAC, 50/60 Hz, UL, CSA, VDE Approved
FUSE 1	Fuse, IEC 5x20 mm, Low Breaking, Time Delay, 250 V, 1 A
E-STOP / 1PB	Push Button, Red Mushroom, 1NC Contact, Twist to Release
POWER ON / 2PB POWER OFF / 2PB LT 1 / 2PB	Dual Push Button w/ 115 VAC Neon Pilot Light, Red “O” Button, Green “I” Button, 1 NO Contact on “I” Button, 1 NC Contact on “O” Button
TS2	Over Temperature Switch
MCR	Relay, 4PDT, 10A, 220 VAC Contacts, 115 VAC 50/60Hz Coil, VDE Approved
1TMR	Timer, Delay on Break, 20 Minute Delay Time, 1 A, 115/220 VAC 50/60 Hz
1CR	Relay, 2PDT, 10 A, 220 VAC Contacts, 115 VAC 50/60Hz Coil, VDE Approved
MOTOR CONTROL	KBMM SCR Drive Motor Controller, 115 VAC Input, 90VDC Armature Output
SP1 SPEED CONTROL	Digital Potentiometer, 3 Digit, 5K, 2 Watt, 0.1%
LINE FUSE ARM FUSE	Fuse, ¼” x 1 ¼”, Time Delay, 250V, 1 A MDL1
DRIVE MOTOR	Motor, 90VDC, 468:1 Ratio, Dual Output Shaft
FAN 1, FAN 2	Fan, 4.7” Square, 115 VAC, 81 SCFM
TEMP CONT	Partlow Temperature Controller, 1/16 DIN, Type K Input, 4 VDC Output, 0.5 Sec. Cycle Time
MOV1, MOV2	Transient Voltage Surge Suppressor (MOV), 275 VAC, 20 mm Disk
LT 2	Ind. Light, 115/230 VAC Neon, Green
LT 3	Ind. Light, 115/230 VAC Neon, Red
1SSR	Solid State Relay, 24-330 VAC, 50 A Output, 4-20 VDC Input, w/ Safety Cover
CT1, CT2	Current Transformer
1 LED, 2 LED	Diode, LED, Green
HEATER 1 T/C 1	Upper Heater Element, IR, 1000 W, 115 VAC, w/Type K Thermal Couple
HEATER 2	Lower Heater Element, IR, 1000 W, 115 VAC
TB1, TB2, TB3, TB4	Terminal Blocks
PL1, PL2, PL3	Plug Connectors
1TS	Terminal Strip, AB 1492-W4, 600 VAC/DC, 30 AMP

Table 1

E. Model 17, 220 VAC Schematic Designations

MODEL 17, 220 VAC, SCHEMATIC DESIGNATIONS	
DESIGNATOR	**DESCRIPTION**
1CB	Circuit Breaker, 2 Pole, 20 A, 250 VAC, 50/60 Hz, UL, CSA, VDE Approved
FLT 1	Line Filter 1
FUSE 1	Fuse, IEC 5x20 mm, Low Breaking, Time Delay, 250 V, 1 A
E-STOP / 1PB	Push Button, Red Mushroom, 1NC Contact, Twist to Release
POWER ON / 2PB POWER OFF / 2PB LT 1 / 2PB	Dual Push Button w/ 230 VAC Neon Pilot Light, Red “O” Button, Green “I” Button, 1 NO Contact on “I” Button, 1 NC Contact on “O” Button
TS2	Over Temperature Switch
MCR	Relay, 4PDT, 10A, 220 VAC Contacts, 220 VAC 50/60Hz Coil, VDE Approved
1TMR	Timer, Delay on Break, 20 Minute Delay Time, 1 A, 220 VAC 50/60 Hz
1CR	Relay, 2PDT, 10 A, 220 VAC Contacts, 220 VAC 50/60Hz Coil, VDE Approved
MOTOR CONTROL	KBMM SCR Drive Motor Controller, 230 VAC Input, 90VDC Armature Output
SP1 SPEED CONTROL	Digital Potentiometer, 3 Digit, 5K, 2 Watt, 0.1%
LINE FUSE ARM FUSE	Fuse, ¼” x 1 ¼”, Time Delay, 250V, 1 A MDL1
DRIVE MOTOR	Motor, 90VDC, 468:1 Ratio, Dual Output Shaft
FAN 1, FAN 2	Fan, 4.7” Square, 230 VAC, 81 SCFM
TEMP CONT	Partlow Temperature Controller, 1/16 DIN, Type K Input, 4 VDC Output, 0.5 Sec. Cycle Time
MOV1, MOV2	Transient Voltage Surge Suppressor (MOV), 275 VAC, 20 mm Disk
LT 2	Ind. Light, 230 VAC Neon, Green
LT 3	Ind. Light, 230 VAC Neon, Red
1SSR	Solid State Relay, 24-330 VAC, 50 A Output, 4-20 VDC Input, w/ Safety Cover
CT1, CT2	Current Transformer
1 LED, 2 LED	Diode, LED, Green
HEATER 1 T/C 1	Upper Heater Element, IR, 1000 W, 230 VAC, w/Type K Thermal Couple
HEATER 2	Lower Heater Element, IR, 1000 W, 230 VAC
TB1, TB2, TB3, TB4	Terminal Blocks
PL1, PL2, PL3	Plug Connectors
1TS	Terminal Strip, AB 1492-W4, 600 VAC/DC, 30 AMP

Table 2

F. Model 17R, 110 VAC Schematic Designations

MODEL 17R, 110 VAC, SCHEMATIC DESIGNATIONS	
DESIGNATOR	**DESCRIPTION**
1CB	Circuit Breaker, 2 Pole, 20A, 250VAC, 50/60 Hz, UL, CSA, VDE Approved
1,2PB,1LT	Dual Push Button w/ 115 VAC Neon Pilot Light, Red “O” Button, Green “I” Button, 1 NO Contact on “I” Button, 1 NC Contact on “O” Button
MOTOR CONT	KBMM SCR Drive Motor Controller, 115 VAC Input, 90VDC Armature Output
CRM	Relay, 4PDT, 10A, 220 VAC Contacts, 115 VAC 50/60Hz Coil, VDE Approved
1CR,2CR,3CR	Relay, 2PDT, 10A, 220 VAC Contacts, 115 VAC 50/60Hz Coil, VDE Approved
1TMR	Timer, Delay on Break, 20 Minute Delay Time, 1 A, 115/220 VAC 50/60 Hz
TEMP CONT	Partlow Temperature Controller, 1/16 DIN, Type K Input, 4 VDC Output, 0.5 Sec. Cycle Time
SPEED POT	Digital Potentiometer, 3 Digit, 5K, 2 Watt, 0.1%
1SSR	Solid State Relay, 24-330 VAC, 50 A Output, 4-20 VDC Input, w/ Safety Cover
1TS	Terminal Strip, AB 1492-W4, 230 VAC, 10 AMP
LT 2	Ind. Light, 115/230 VAC Neon, Green
LT 3	Ind. Light, 115/230 VAC Neon, Red
CT1, CT2	Current Transformer
1, 2 LED	Diode, LED, Green
FUSE 1	Fuse, IEC 5x20 mm, Low Breaking, Time Delay, 250 V, 1 A
FUSE 2,3	Fuse, ¼” x 1 ¼”, Time Delay, 250V, 1A MDL1
MOV1,2	Transient Voltage Surge Suppressor (MOV), 150VAC, 20 mm Disk
DRIVE MOTOR	Motor, 90VDC, 468:1 Ratio, Dual Output Shaft
E-STOP	Push Button, Red Mushroom, 1NC Contact, Twist to Release
FAN 1,2	Fan, 4.7” Square, 115 VAC, 81 SCFM
2TMR	Timer, Delay on Power, 36 Second Delay Time, 1 A, 115/230 VAC 50/60 Hz
TS2	Over Temperature Switch
HEATER 1 T/C 1	Upper Heater Element, IR, 1000 W, 115 VAC, w/Type K Thermal Couple
HEATER 2	Lower Heater Element, IR, 1000 W, 115 VAC
TB1, TB2, TB3, TB4	Terminal Blocks
PL1, PL2, PL3	Plug Connectors

Table 3

1.6. Specifications

Input Power			
TE Part Number	*Conveyer Oven Description*		*Voltage, Frequency, Current*
2280355-1	Model 17, 220 VAC		208-240 VAC, 50/60 Hz, 1PH, 15A with ground
2280355-3	Model 17, 110 VAC		100-120 VAC, 50/60 HZ 1PH, 20A with ground
2280355-4	Model 17R, 110 VAC, Reverse Belt		100-120 VAC, 50/60 HZ 1PH, 20A with ground
Heating Elements	Stamped Foil IR Elements		3.93" wide x 10.00" long - 1000 Watts
Conveyor Width			8.0"
Electrical Enclosure Width			18.0"
Electrical Enclosure Depth			6"
Fuses	1FU		5x20 mm, 1.0A Time Delay Low Breaking (Littelfuse #21801.0)
	2,3FU		¼" x 1 ¼", 1A Time Delay (MDL 1)
Temperature Control			Partlow Temp. Control w/ Type K T/C interface
Operating Temperature			Ambient to 600°C
Physical Environment			Temperature: 4.4°-40°C [40°-104°F]
			Relative Humidity: Less than 95% (Non-Condensing)
Conveyor Speed			0.8 to 8.0 feet/minute (100 to 999 potentiometer setting)
	Speed (ft/min)	*Secs/ft*	*Potentiometer Setting*
	0.8	75.0	100
	1.6	37.5	200
	2.4	25.0	300
	3.2	18.8	400
	4.0	15.0	500
	4.8	12.5	600
	5.6	10.7	700●
	6.4	9.4	800●
	7.2	8.3	900●
	8.0	7.5	999●
Conveyor Dimensions			19" W x 44" L x 16 " H
Conveyor Weight			150 lb.
Shipping Container Dimensions			24" W x 48" L x 18" H
Shipping Weight			200 lb.
Noise Level			<70 dBa

●When running below 115 VAC, the speeds on these settings will be slower. This will not affect any products as the fastest speed required is 5 feet per minute.

Figure 12

2. PREVENTING EQUIPMENT DAMAGE

CAUTION

●To prevent over heating of conveyor belt, do not set the speed potentiometer to less than 100.

●For normal shutdown, press the OFF ("O") button. When the machine cool down cycle completes (20 minutes), the conveyor and fans stop running.

●For normal maintenance and repair, after the cool down cycle, turn off the circuit breaker and unplug the machine. Do not attempt to bypass the circuit breaker.

●Do not set the temperature above 600°C. Operating the Model 17 above 600°C will shorten the life of the heater elements.

●Do not cover the fan vents. Covering the vents by setting objects on or next to them may cause uneven heating, or over heating of components.

●An exposed thermocouple wire due to abrasion of the insulation will cause an over temperature condition which can destroy components of the Model 17 and cause inconsistent processing of assemblies. When replacing the covers, ensure that no wires get pinched between the cover and the frame.

●Excessive conveyor belt tension can cause premature belt wear. Tension the belts as called out in Section 5.4.A of this manual.

●Emergency Stop: In the case of a product catching fire, excessive smoke, sparks, grinding noises, or any other signs of malfunction, press the Emergency Stop button. Then (with gloved hands) raise the Upper Chamber with one hand, and manually remove any assemblies which may be in the heating chamber to prevent fire damage. Contact Maintenance Personnel to investigate the cause of the problem before restarting the machine.

NOTE

Such malfunctions are the only reasons to press the E-Stop while the belts and fans are still running. DO NOT use this as the normal shut down procedure as it will defeat the cool down circuit.

3. SETUP

3.1. Unpacking, Transport, Handling, and Storage

1. The Model 17 has a mass of 68 Kg [150 lbs]. When unpacking, transporting, handling or moving the unit to storage, it is recommended that no less than two persons or a lift truck be used for the process. When storing the unit, it should be placed in a suitable crate, 61 cm [24 in.] x 121 cm [48 in.] x 46 cm [18 in.] tall, and stored indoors away from any harmful effects of weather or other hazards.
2. Remove the Model 17 from its shipping container and check for damage. Inspect the shipping container and unit for any evidence of damage during shipment. If you believe there has been damage, contact the shipping agent immediately.
3. Set the Model 17 on a sturdy, flat, level surface. Choose a work area with enough room around the unit for loading and unloading parts. Make sure the surface is at the proper elevation for the operator so as to prevent undue back strain. Also allow room for routine maintenance and repair.
4. Provide adequate ventilation. Allow enough clearance above and around the unit so that the fans can circulate cooling air without obstruction. Do not place anything on the Top Assembly and cover the fan vents.
5. Provide sufficient area lighting. Adequate lighting will prevent undue eyestrain on the operator and enhance the general safety of the work area.
6. Remove the packing material from between the heater elements. Check between the heater elements to ensure no foreign material is in contact with the heater elements. Remove and discard this material.

3.2. Inspection (Power Off)

At the completion of the unpacking sequence, follow these steps to inspect the Model 17 before making any electrical connections. If you believe there is damage that may have been caused during shipping, contact the shipping agent immediately.

1. Inspect the heater elements for damage. Visually check the heater elements for evidence of cracking or chipping of the glass face during shipment. The heater screws should be snugly fastened to heater trays.
2. Ensure that the covers are in place and secure. There are four (4) quarter-turn fasteners that secure the top cover and each of the lower side covers. All other covers and guards are secured with screws.

3.3. Electrical Connections

Attach an appropriately rated power plug to the end of the power cord. Refer to the input power specifications in Section 1.6. This plug serves as the disconnecting means for the machine during service operations. The power cord insulation colors are defined below:

Brown	=	L1
Blue	=	L2/N
Green/Yellow	=	PE Ground (Protective Earth)

NOTE
This unit is designed for industrial use only. As such, it is to be connected to an industrial power system. This unit is not intended to be connected to a public power system.

3.4. Inspection (Power On)

After completing the Power Off inspection, and the electrical connections sequence have been completed, follow these steps to complete the inspection and set up of the Model 17.

1. Switch the Circuit Breaker On.
2. Ensure the Emergency Stop is not depressed. A ¼ counterclockwise turn will release the E-Stop.
3. Press the ON ("I") button. With the temperature set above ambient and the conveyor speed control set above 100, the heaters, conveyor, and fans will begin to function.
4. Set the temperature controller to 600°C, and the speed control potentiometer to 999 (maximum).
5. Change the digital-speed control from maximum (999) to minimum (100) to verify that the belt speed increases and decreases smoothly, with no jerky motion or excessive noises.
6. Wait approximately 5 minutes for the temperature to reach its setpoint. When this occurs, the Temperature Out of Range Indicator will turn off and the Processor Ready Indicator will turn on.
7. The lower display on the temperature controller face indicates the temperature set point, the upper display indicates the actual heater element temperature. Both displays should read within 2°C of the same temperature during normal operation. See Figure 13.
8. Press the OFF ("O") button. The conveyor and fans will continue to run for 20 minutes. At that point the heater elements will have cooled to a safe temperature and the conveyor and fans will turn off and all displays will power off.

CAUTION
Using the Emergency Stop or circuit breaker as the normal shut down procedure defeats the automatic cool down circuit and will cause heat damage to the Model 17.

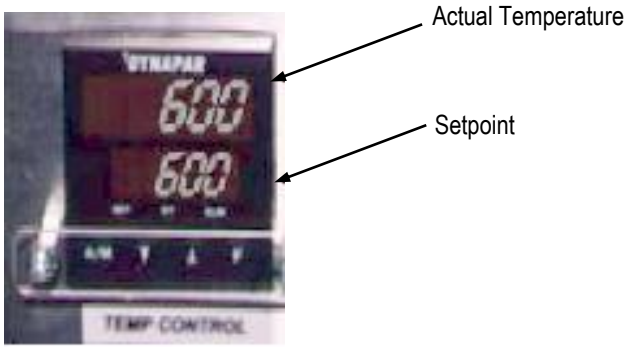


Figure 13

4. OPERATION

After the Model 17 has been set up and inspected as described on the preceding pages, read the following warnings carefully and proceed with the steps in sections 4.1 to 4.4 for normal operation.

DANGER

●Only trained qualified personnel are to operate this machine. To minimize the risks of burns, electrical shock, or other injuries, all safety precautions must be observed.

●Because this piece of equipment is first and foremost an oven, it contains hot components and surfaces which can cause burns. The conveyor belt and work pieces exiting the oven will be hot. Protective clothing and equipment such as cotton gloves, long sleeved cotton work shirt and protective eye wear are required for safe operation.

●Opening the electrical panel while the machine is powered may cause electrical shock. Always press the OFF ("O") button (if machine is hot, allow it to cool down), turn OFF the circuit breaker, and unplug the Model 17 prior to any electrical maintenance or repair.

●If hands, hair, clothing, or any other foreign objects are caught by the unit's moving parts, you could be injured and the equipment could be damaged. Operate the unit with all guards and covers in place.

●Emergency Stop - In the case of a product catching fire, excessive smoke, sparks, grinding noises, or any other signs of malfunction, press the Emergency Stop button. Then (with gloved hands) raise the Upper Chamber with one hand, and manually remove any assemblies which may be in the heating chamber to prevent fire damage. Contact Maintenance Personnel to investigate the cause of the problem before restarting the machine. ***Such malfunctions are the only reasons to press the E-Stop while the Model 17 is still running.***

●Do not use the circuit breaker or Emergency Stop as your normal shut down procedure as it will defeat the cool down circuit and will cause heat damage to the Model 17.

●To keep the Model 17 in optimum working condition, please follow all of the maintenance procedures described in Section 5.1 and 5.2.

●This machine is designed for use on industrial power systems. Do not connect it to a public power system.

4.1. Power On and Warm-Up

1. Verify that the machine is plugged in to the proper power source, that the circuit breaker is ON, and the E-Stop is not depressed and the speed control is set to 100 or greater.
2. Press the ON ("I") Button
3. Set the temperature controller to the correct set point temperature for your application. Remember, Temperature above 600°C will greatly reduce heater element life.
4. Set the belt speed to the proper setting for your application. Always set the belt speed at or above 100. A setting of less than 100 will cause belt over-heating. Refer to the table in the Specifications Section 1.6 to translate dial setting to actual belt speed.
5. Take note of indicator lights while machine is warming up. The control power light located between the ON ("I") and OFF ("O") buttons on the control enclosure will be illuminated. The Temperature Controller will display heater element temperature and setpoint temperature.
6. Allow the Model 17 to warm up for about 10 minutes. It takes about 5 minutes for heater elements to reach the set point, allow an additional 5 minutes of soak time and processing can begin.

4.2. Model 17R Conveyor Belt Operation

1. When the Power On pushbutton is activated the conveyor belts will start running in reverse preventing loading of parts.
2. The On Delay Start-Up Dwell Timer provides power to the motor controller for approximately 36 seconds, this delay allows the temperature controller to power up and set the internal alarms that control the drive direction.
3. At 36 seconds the dwell timer times out and switches, applying power to the temperature controller alarms and alarm 1 energizing relay 2CR.
4. Once the start-up timer switches, the Temperature “Out of Range” Indicator light will illuminate as the oven temperature rises.
5. When the actual temperature reaches -21°C of set point, alarm 1 de-energizes relay 2CR removing power to the motor controller.
6. When the actual temperature reaches -19°C of set point, Alarm 2 energizes both relay 2CR and 3CR.
7. Relay 3CR when energized reverses the motor leads polarity to the drive motor and relay 2CR re-applies power to the motor controller.
8. The conveyer belts will now travel in the forward direction allowing loading of parts.
9. When power is turned off, the belts will continue to run in the forward direction until the actual temperature reaches -19°C of set point.
10. At -19°C of set point, Alarm 2 will then de-energize both relay 2CR and 3CR.
11. When the actual temperature reaches -21°C of set point, alarm 1 energizes relay 2CR applying power to the motor controller and the conveyer belts will again travel in the reverse direction.

4.3. Loading and Unloading

At the completion of the Power On and Warm-up sequence, follow these steps to process assemblies.

1. Prepare the assembly.
2. Center the splice joint and tubing on the centering marks of the entry feed tray.
3. Holding the assembly on outside of the feed tray, push the assembly forward into the opposing belts. Use caution to keep hands and fingers clear of the belts as the harness is drawn into the conveyor.
4. Remove the assemblies from the discharge collection area at the rear of the unit. Be sure to wear gloves when handling the completed assemblies as they may still be warm at discharge.

4.4. Power OFF and Cool-Down

1. At the end of the work shift, press the OFF ("O") button. The conveyor and the fans will continue to run for 20 minutes, until a safe temperature has been reached, at which time they will shut off automatically.
2. Take note of indicator lights while machine is cooling down. The control power light located between the ON ("I") and OFF ("O") buttons on the control enclosure will not be illuminated. The Temperature Controller will display heater element temperature and setpoint temperature. The Temperature Out of Range indicator light will be illuminated.

NOTE
For Model 17R, the belts will reverse when the temperature drops below preset operating range.

CAUTION
DO NOT use the Circuit Breaker or E-stop for the normal shutdown procedure. This defeats the automatic cool down cycle and will cause heat damage the Model 17.

5. MAINTENANCE

The Model 17 is a very low maintenance machine, however, a few minutes each week will ensure reliability and the long life of the unit. The following are guidelines for daily, weekly, and monthly maintenance procedures that will keep the Model 17 in optimum working condition.

DANGER
●These procedures should be performed only by trained qualified personnel. To minimize the risks of burns, electrical shock, or other injuries, all safety precautions must be observed.

●Always perform maintenance operations on a cool machine. If the machine is already hot, place the machine in cool down mode by pressing the OFF ("O") button. The conveyor and the fans will continue to run for 20 minutes. At this point, the heater elements will likely remain too hot to allow work on the machine. To avoid any burns or injury, initiate a second cool down cycle by pressing the ON ("I") button, and the immediately pressing the OFF ("O") button, and wait for it to complete, the machine should now be cool enough to begin maintenance.

CAUTION
Do not use solvents for cleaning. Solvents are unnecessary and may damage some components of the unit.

5.1. Daily Maintenance

Before the daily production begins, while the Model 17 is cool, take a few minutes to perform the following steps.

1. Inspect and clean any dirt from the surfaces of the unit. Use a damp cloth to clean any stainless steel or painted surfaces. Black oxide steel surfaces should be cleaned with a dry cloth. A household spray cleaner such as Formula 409 or Windex may be used on stainless steel or painted surfaces to remove dirt that a damp cloth will not remove. Likewise dirt on black oxide steel surfaces that cannot be removed with a dry cloth can be removed using a cloth dampened with WD-40 or other lightweight oil.
2. Inspect the heater elements. Look for any accumulation of debris or film on the heater elements. If necessary, clean the glass surface of the heater elements using a damp cloth. Windex may also be used for this purpose.
3. Verify that the temperature controller is not set above 600°C.

CAUTION
Operating the Model 17 at a set point above 600°C will shorten the life of the heater elements.

4. General condition check. As the Model 17 warms up for normal operation, check the general condition of the unit. Ensure that both fans are working properly, and listen for any abnormal noises. The conveyor should be run smoothly without a jerky motion. Check to see that all guards and covers are securely in place. Make any repairs or adjustments necessary to return the unit to proper working order.

5.2. Weekly Maintenance

1. Clean the inside of the Model 17. With the Model 17 still cool at the beginning of the day, turn off the circuit breaker and unplug the unit. Remove the upper and lower covers. Using an air hose or cloth, clean any dirt, dust, tubing, or anything which has been trapped inside the unit.
2. Check the Conveyor Belt for tension. Belt tension can be determined by lifting the lower timing belts approximately midpoint of the length. Proper tension should allow the belt to be lifted between ¾ inch and 1 inch from the lower belt guide. If the belts can be lifted more than this amount, re-adjust the tension. Upper timing belt tension should be between ¼ inch and ½ inch at midpoint. The upper belts should move freely when pulled by hand.
3. Check the Upper Idler pulleys. With the unit open, pull lightly on the upper belts while observing the pulleys, the belts should move smoothly.
4. General condition check. As the conveyor runs, check the general condition of the unit and listen for abnormal noises. Ensure that all the fans are working properly. Make any repairs or adjustments necessary to return the unit to proper working order.
5. Verify conveyor belts run in the reverse direction when machine temperature is outside the preset operating range (Applies to Model 17R ONLY).

5.3. Semi-Annual Maintenance

Inspect the motor brushes. Remove the brushes from the motor brush receptacles. If they are not at least ¼ inch long, replace them.

5.4. Maintenance Procedures

CAUTION
Always perform maintenance procedures on a cool machine.

A. Belt Tension Adjustment and Replacement

If the upper or lower belts are too loose, tracking problems may occur as well as excessive wear on the belts. The following tensioning procedures should be followed for tensioning and replacement of both the upper and lower belts.

Lower Belt Tensioning and Replacement Steps (Figure 14):

Lower Belt Tensioning

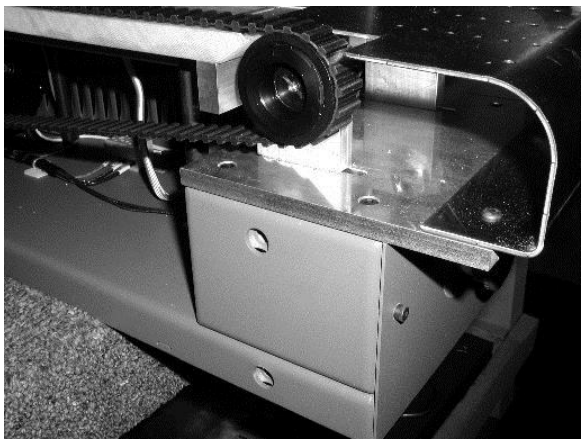


Figure 14

1. Allow the unit to completely cool down.
2. Turn off circuit breaker and unplug the power cord from the facility's power outlet.
3. Remove the right and left lower side panels.
4. Loosen the #10 screw that secures the lower belt guide to the motor cover forward of the rear drive pulleys. See Figure 15.

5. Remove the entry feed tray.
6. Remove the E-Stop cover and unplug the E-Stop plug connector.
7. Loosen the two (2) screws on each pulley mounting block located in the cavity that houses the E-stop.
8. If the belt is being replaced, slide the pulley mounting blocks forward, remove the old belt and install a new belt over the pulleys. Be sure to seat the teeth of the belt in the timing grooves.

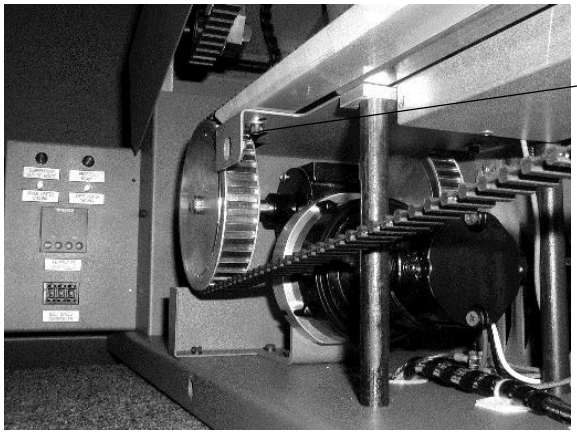


Figure 15

9. Pull forward on the pulley mounting block with sufficient force to cause the belt to be lifted ¾ inch at midpoint.
10. Tighten the two (2) screws securing the pulley mounting blocks to the aluminum mounting plate.
11. Plug the E-Stop into the receptacle and replace the cover with screws and star washers.
12. Tighten the #10 lower belt guide screw to the motor cover and verify that the guide is aligned with the drive motor pulley.
13. Replace Feed tray and side covers.
14. Reconnect power and turn on the unit.
15. Verify that the belts are tracking properly.

Upper Belt Tensioning and Replacement Steps (Figure 16):

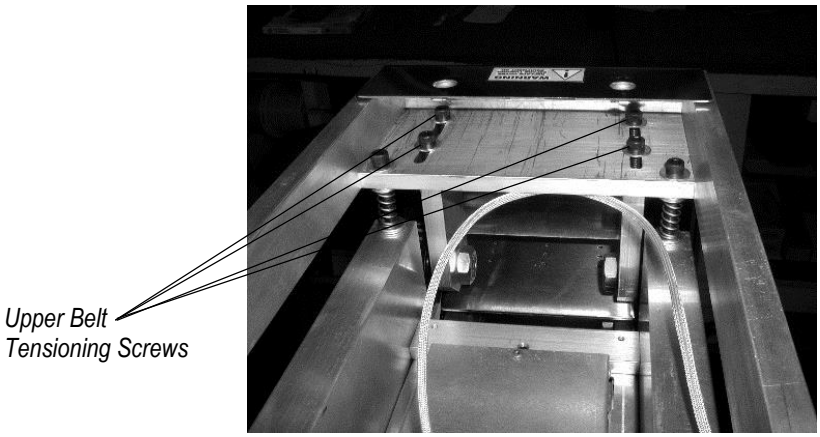


Figure 16

1. Allow the unit to completely cool down.
2. Turn off circuit breaker and unplug the power cord from the facility's power outlet.
3. Loosening the four (4) ¼ turn fasteners on the top of the upper cover.
4. Gently lift the front of the upper cover upward and spread the front such that the prop rod mounting block screw clears the upper frame.
5. Reach into the upper cover and disconnect the fan plug connector.
6. Lift off the upper cover.
7. Remove the opener handle from the front stainless shield of the upper chamber.
8. Remove the front stainless upper cover.
9. Loosen the two (2) screws on each upper pulley mounting block.
10. If the belt is being replaced, slide the pulley mounting blocks forward, remove the old belt and install a new belt over the pulleys. Be sure to seat the teeth of the belt in the timing grooves.
11. Pull forward on the pulley mounting block with sufficient force to cause the belt to be lifted ½ inch at midpoint.
12. Tighten the two (2) screws securing the pulley mounting blocks to the aluminum mounting plate.
13. Replace the front stainless cover.
14. Replace the opener handle.
15. Slide the top cover over the upper frame and reconnect the fan plug to the receptacle position the cover and tighten the ¼ turn fasteners.
16. Reconnect power and turn on the unit.
17. Verify that the belts are tracking properly.
18. Verify that both fans are running.

B. Upper Heater Element Replacement

1. Turn off circuit breaker and unplug the power cord from the facility's power outlet
2. Loosening the four (4) ¼ turn fasteners on the top of the upper cover.
3. Gently lift the front of the upper cover upward and spread the front such that the prop rod mounting block screw clears the upper frame.
4. Reach into the upper cover and disconnect the fan plug connector.
5. Lift off the upper cover.
6. Disconnect the upper heater element power leads and unplug the thermocouple connector. See Figure 17.

Upper Heater Power Leads and Thermocouple

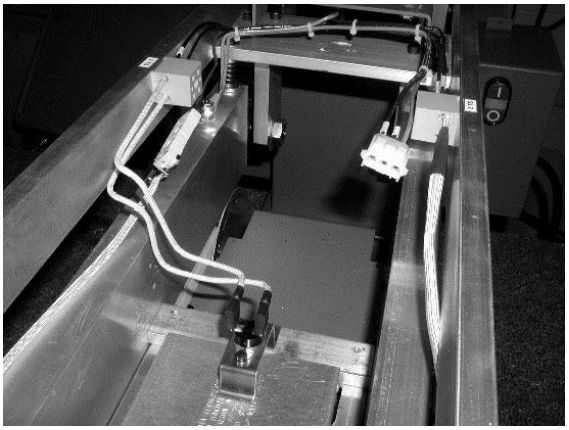


Figure 17

7. Raise the upper chamber and securely block the chamber in an open position.
8. Remove one of the button head cap screws securing the upper heater element in place.
9. Use one hand to hold the upper heater element while removing the second the button head cap screw.
10. Gently remove the upper heater element from position while sliding cables out of the access slot provided.
11. Replace components in reverse sequence to which they were removed.
12. Verify heater, fan, and thermocouple operation.

C. Lower Heater Element Replacement

1. Turn off circuit breaker and unplug the power cord from the facility's power outlet.
2. Remove the right and left lower side panels.
3. The lower heater element connector is housed under the left side belt guard. To provide access it will be necessary to remove the front belt guard, and left side belt guards. This includes the front, center, and rear left side belt guards. See Figure 18.

Lower Heater Power Termination

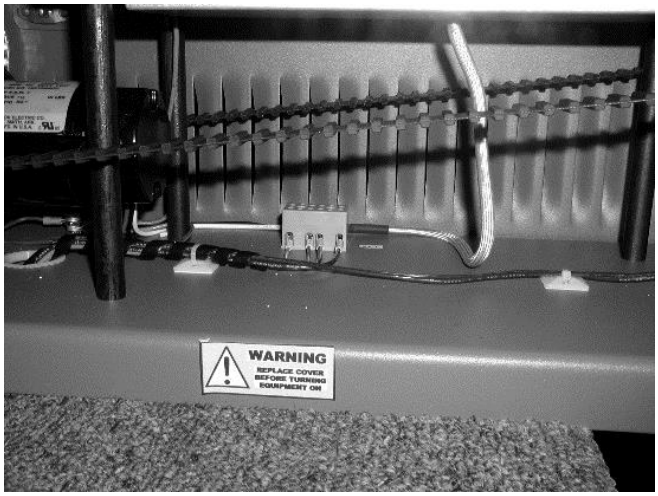


Figure 18

4. Disconnect the power leads from the terminal block on the base of the unit.
5. Remove the two button head cap screws securing the lower heater element in place and remove the element.
6. Install the new heater element.
7. Replace components in reverse sequence to which they were removed.
8. Test heater.

6. TROUBLESHOOTING

DANGER

● Some troubleshooting procedures require the Model 17's power to be ON. To minimize the risk of burns, electrical shock, or other injuries, these procedures should be performed only by a qualified Maintenance Person, and all safety precautions must be observed.

● Wear protective gloves to prevent possible burns or electrical shock.

● The heater elements remain hot after the conveyor and fans stop moving. To avoid any burns or injury during maintenance, initiate a second cool down cycle and wait for it to complete, before beginning. (See item 3 in Section 2 "Preventing Equipment Damage").

6.1. Troubleshooting Guide

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
No Power in the Unit	Main Power Source Not Connected	Connect Power
	Emergency Stop is Depressed	Turn and Release Emergency Stop
	Circuit Breaker is Off	Turn on Breaker
	Over Temperature Switch is Activated	Wait for Switch to Cool Down
	Over Temperature Switch is Faulty	Replace Switch
	Circuit Breaker is Defective	Replace Circuit Breaker
	ON (“I”) Button has Not Been Pressed	Press the ON (“I”) Button
	ON (“I”) Button is Defective	Replace the ON (“I”)/OFF (“O”) Button
	Fuse 1FU Blown	Replace Fuse
	Cool Down Timer is Defective	Replace as Necessary
	Master Control Relay is Defective	Replace MCR
Heater Elements Will Not Reach Setpoint	Heater Elements Failed	Replace Heater Elements
	Thermocouple Lead Wire is Faulty Between Controller and Heater Element	Repair as Necessary
	Thermocouple in Upper Heater Element is Faulty	Replace Upper Heater Element
	Solid State Relay is Defective	Replace ISSR
	Temperature Controller Defective	Replace Controller
	Master Control Relay Defective	Replace MCR
	Temperature Controller Not Programmed Correctly	Reset Controller Parameters
Temperature Control Varies	Thermocouple Lead Wire is Faulty	Repair the Thermocouple Wire as Necessary or Replace the Upper Heater Element
	Temperature Controller is Programmed Incorrectly	Reset Internal Parameters
	Excessive Air Movement Around the Unit	Check for External Fans or Air Conditioning Which May be Blowing Excessive Air at the Unit
No Heat in the Unit	Solid State Relay is Defective	Replace ISSR
	Master Control Relay is Defective	Replace MCR
	Temperature Controller Setpoint Set Too Low	Increase Setpoint as Necessary
	Temperature Controller is Programmed Incorrectly	Reset Parameters
	Temperature Controller is Defective	Replace the Controller
	Electrical Connections are Faulty	Ensure the Integrity of Connections
Heater Elements go “Over Temperature”	Solid State Relay is Defective	Replace ISSR
	Fan is Defective	Replace the Defective Fan
	Thermocouple Lead is Shorted	Repair Short
	Temperature Controller is Defective	Replace Controller

Figure 19 (cont’d)

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Automatic Cool Down Isn't Functioning	Cool Down Timer is Defective	Replace 1TMR
	Electrical Connections are Faulty	Ensure the Integrity of Connections
Fans Do Not Operate	Fan is Defective	Replace Defective Fan
	Fan Wiring is Faulty	Check Wiring and Connections
	Electrical Connections to the Fan are Faulty	Ensure the Integrity of Connections
	Fan is Defective	Replace Fan
Conveyor Does Not Move	Main Power Source Not Connected	Connect Power
	Set Screws and Keys Loose on Drive Sprockets	Replace/Reposition Keys, Tighten Set Screws
	Electrical Connections to the Motor are Faulty or Motor is Unplugged	Check All Connections from the Motor Controller to the Motor. Check Motor Plug
	Motor is Defective	Inspect the Motor Brushes. Replace Brushes or Motor as Required
	Speed Dial Set to Less than 100	Increase Speed Setting
	Motor Controller is Defective	Replace Motor Controller
	Speed Potentiometer is Defective	Ensure that the Speed Varies Through the Entire Range of the Potentiometer. Replace as Necessary
	*Start-up Timer Defective	Replace 2TMR
	*Relay 2CR Defective	Replace 2CR
*Conveyor Belts Do Not Change Directions at Temp in Band	Start-up timer settings incorrect	Verify Settings
*Conveyor Belts Reverse Direction During Normal Operation	Start-up timer Defective	Replace 2TMR
	Relay 3CR Defective	Replace 3CR
No Variable Speed Control	Motor Controller is Defective	Replace Controller
	Digital Speed Control is Defective	Replace as Necessary
	Electrical Connections Between Potentiometer and Motor Controller are Faulty	Ensure the Integrity of Connections. Repair as Required

*Model 17R, PN 2280355-4 ONLY

Figure 19 (end)

6.2. Heater Element Test

If a heater element has failed, one of the heaters cycling LED's on the front control panel will not be blinking. The following procedure is to determine if the LED or the heater element has failed.

1. If the Model 17 is not already cool, allow the machine to cool down. (Follow instructions in item 3 in Section 2 "Preventing Equipment Damage"). When the machine is cool, turn off circuit breaker, and unplug the power cord.
2. Measure the element resistance. The heater element resistance can be measured between wire number 4L1 and 3L2 on the terminal strip in the control enclosure.
   a. For a Model 17, 220 VAC Belt Heater: if both elements are operating, the resistance should be between 25Ω and 30Ω. If one element has failed, the resistance will be between 50Ω and 60Ω.
   b. For a Model 17, 110 VAC Belt Heater: if both elements are operating, the resistance should be between 6Ω and 8Ω. If one element has failed, the resistance will be between 13Ω and 16Ω.
   c. For a Model 17R, 110 VAC Belt Heater: if both elements are operating, the resistance should be between 6Ω and 8Ω. If one element has failed, the resistance will be between 13Ω and 16Ω.

6.3. Thermocouple Check

NOTE
The upper heater element and thermocouple are a single unit. If the wire or insulation cannot be repaired, the upper heater element must be replaced.

1. When the machine is cool, turn off the circuit breaker, and unplug the power cord.
2. Remove the top sheet metal cover.
3. Disconnect the thermocouple plug and measure the resistance across the pins on the end connected to the upper heater element thermocouple (male side of connector). If the resistance is less than 2Ω, the fault likely lies between the female side of the connector and the temperature controller. If the resistance is greater than 2Ω, but less than infinity (∞ Ω), replace the upper heater element. If the resistance is infinity (∞ Ω), the wire is broken. Trace the circuit though the length of the wire. If a break is found, it can be repaired, otherwise, the break is likely inside the upper heater element and the element must be replaced. Continue with the following procedure.
4. Unplug the temperature controller from its housing. This is done by firmly grasping the sides of the front control panel and applying a strong forward force in conjunction with a slight side to side rocking force. The front ¼ inch of the control panel and all active electrical components will separate from the control housing. All terminals of the control housing will then be open circuit.
5. Open the control enclosure cover to provide access to rear of the temperature controller.
6. Attach Ohmmeter to thermocouple lead wires. With the thermocouple connector still separated, remove female receptacle from the mount and then remove the cable clamp/cover from the female receptacle. Attach ohmmeter leads to the two thermocouple sockets which are now exposed. Place a jumper across terminal 4 and 5 on the rear of the temperature controller. The resistance should be less than 2Ω. If the resistance is greater than this value, the wire is broken. Remove the jumper. The resistance should read infinity (∞ Ω). If the resistance is less than infinity (∞ Ω), the wire is shorted. Continue with the following procedure. Repair or replace either the wire or the upper heater element as appropriate.

6.4. Cool Down Circuit Test

When the OFF ("O") button is pressed, it actuates an electronic timer (1TMR) located in the control enclosure. The following test must be performed with the power on and the control enclosure open.

DANGER
Only a qualified electrician should perform this test, as power to the Model 17 is required. Electrical insulating gloves should be worn and all electrical safety precautions followed when performing this procedure.

1. Measure the timer input power. While the Model 17 is on and operating normally, measure the voltage between terminal #A1 and #A2 on 1TMR (wires #3 and #2L2). The voltage read should be the line voltage.
2. Measure the timer output power. While the Model 17 is on and operating normally, measure the voltage between terminal #18 and #A2 on 1TMR (wires #7 and #2L2). The voltage read should be the line voltage.
3. Measure the timer "initiate" signal. While the Model 17 is on and operating normally, measure the voltage between terminal #B1 and #A2 on 1TMR (wires #4A and #2L2). The voltage read should be the line voltage. Press the OFF ("O") button, the voltage should drop below 50 VAC. (The actual reading will vary depending on the type of meter used.)

6.5. Solid State Relay/Temperature Controller Test

The temperature controller uses a time proportioning 12 VDC signal to control the solid-state relay.

DANGER
Only a qualified electrician should perform this test, as power to the Model 17 is required. Electrical insulating gloves should be worn and all electrical safety precautions followed when performing this procedure.

NOTE
The first part of this test is performed while the temperature controller is demanding full power to the heater elements. The second part of the test is performed with the temperature controller is demanding no power to the heater elements.

1. With the temperature controller set to its normal operating setpoint (≈ 600°C), allow the Model 17 to cool by pressing the OFF ("O") button and waiting for the 20 minute cool down cycle to complete.
2. Open the control enclosure cover and remove the transparent cover on the solid state relay. It snaps on and off.
3. Plug in the unit, turn ON circuit breaker and press the ON switch.
4. Press the ON ("I") button to power up the Heater Elements.
5. Measure the input voltage on the solid state relay. When full power is being demanded, the voltage across terminals #3 and #4 on 1SSR (wires #10 and #11) should be approximately 12 VDC. If no voltage is present, check the output of the temperature controller and the electrical connections between the temperature controller and the solid state relay.
6. Measure the output voltage. With 10 to 12 VDC across the input terminals of 1SSR, the output voltage across terminals #1 and #2 (wires #3L1 and #4L1) should be approximately 0 VAC. If the voltage present is significant (>30 VAC), the solid state relay is exhibiting an open circuit condition and should be replaced.
7. Lower the set point of the temperature controller to 0°C. This will result in the temperature controller demanding no power from the heater elements.
8. Measure the input voltage on the solid state relay. The voltage across terminals #3 and #4 (wires #10 and #11). The voltage should be approximately 0 VDC.
9. Measure the output voltage. The voltage across terminals #1 and #2 (wires #3L1 and #4L1) should be the line voltage. If there is no voltage present, the solid state relay is shorted and must be replaced.

6.6. Over Temperature Switch Test

If the Over Temperature Switch has failed or has tripped, the unit will not start when the ON ("I") button is pressed. To positively identify the failure, perform the following steps.

1. If the Model 17 is not already cool, allow the machine to cool down. Since the machine will not run, you will simply have to wait for the cool down cycle to complete. When the machine is cool, turn off circuit breaker, and unplug the power cord.
2. Measure the Over Temperature Switch resistance. The Over Temperature Switch resistance can be measured between wires #5 and #6 on the terminals strip located in the control enclosure. The resistance of the Over Temperature Switch should be under 2Ω. If the resistance is high or infinite, indicating an open circuit, the switch has failed and should be replaced.

6.7. Drive Circuit Test

The drive circuit consists of the motor, motor controller, and speed potentiometer.

DANGER
Only a qualified electrician should perform this test, as power to the Model 17 is required. Electrical insulating gloves should be worn and all electrical safety precautions followed when performing this procedure.

A. Motor Controller

1. Open the control enclosure cover to gain access to the motor controller.
2. Press the ON ("I") button to start normal operation of the Model 17.
3. Measure the input AC voltage across terminals L1 and L2, wires #7 & #2L2. The voltage measured should be the line voltage. If not, check control power fuse (1FU). If control power is on, i.e. power is evident at motor controller terminals, check the line fuse on the motor controller.
4. Adjust the speed pot to maximum speed (999).
5. Measure the DC output voltage. With the speed set at maximum, the voltage measured across terminals A- and A+ (wires #A+ & #A-), should be approximately 65-130 VDC. If there is incoming voltage but no output voltage, the motor controller is probably defective.

B. Motor Resistance

1. Turn off circuit breaker and disconnect the power from the Model 17.
2. Open the control enclosure cover to gain access to the motor controller.
3. Disconnect motor leads from A+ and A- terminals.
4. Measure armature resistance. Using an ohmmeter measure the resistance between motor leads. This resistance should be between 70 and 100Ω. If the resistance is higher or lower, replace the motor.

C. Motor Brush Inspection

Unscrew the brush receptacles located on either side of the motor casing and remove the brushes. They should be at least ¼ inch in length. Replace as necessary.

NOTE
When reinstalling the brushes, ensure that they are seated in the same orientation as when they were removed. Take caution when removing the brushes as they are spring-loaded.

7. CALIBRATION AND ADJUSTMENTS

7.1. Motor Controller / Speed Calibration

The motor controller (Figure 20) must be calibrated every time one of the following occurs:

- Motor is changed
- Motor controller is changed
- Speed potentiometer is changed

NOTE
Only the MIN and MAX trimpots are used for calibration purposes. The IR, and CL trimpots are set at the factory and should not be adjusted.

Motor Controller

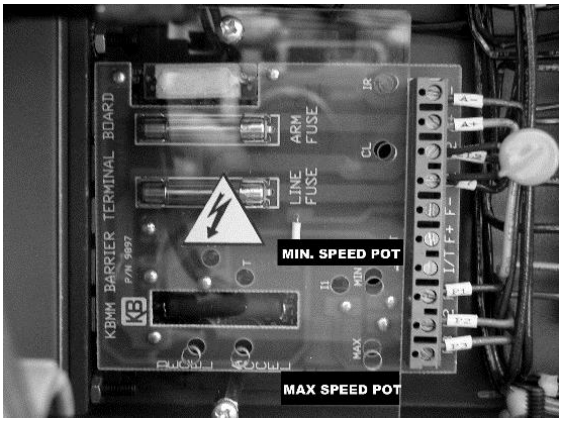


Figure 20

It is recommended that this operation is performed on a totally cooled machine with a 20°C temperature set point. To determine conveyor belt speed you will need to measure the time required for the conveyer belt to travel a given distance. To accomplish this, place two pieces of masking tape near the top of the right side lower cover. Place one piece near the front of the conveyor. This will be the 0 inch datum. Place the second piece 12 inches from the 0 inch datum. Mark the tape with lines so that you will have exactly 12 inches between the lines.

1. Measure the conveyor speed at the 999 speed setting. The target is 8.0 feet per minute (1 feet in 7.5 seconds). If it the speed is not within limits, adjust the MAX trimpot slightly in the clockwise direction to increase the speed, or counterclockwise direction to reduce the speed.

NOTE
If the input voltage is below 115 VAC, the belt speed will be below 8.0 ft/min. To calibrate, use the 600 and 100 settings. At a setting of 600, the belt speed should be 12 inches in 12.5 seconds.

NOTE
Adjusting the MAX trimpot affects the MIN setting and vise-versa.

   a. Load a rigid wire into the belts of the conveyor belt. Using a stopwatch, begin timing when the marker passes the 0 inch datum. Stop timing when the marker passes the 12 inch datum. The time should read 7.5 ±0.5 seconds. If it is more, the conveyor is running too slow. If it is less, the conveyor is running too fast.

2. Measure the belt speed at the 100 speed setting. The target speed is 0.8 feet per minute (12 inches in 75 seconds). If it the speed is not within limits, adjust the MIN. trimpot slightly in the clockwise direction to increase the speed, or counterclockwise direction to reduce the speed.

   a. Place a marker on the front of the conveyor belt. Using a stopwatch, begin timing when the marker passes the 0 inch datum. Stop timing when the marker passes the 12 inch datum. The time should read 75 ±2.0 seconds. If it is more, the conveyor is running too slow. If it is less, the conveyor is running too fast.

3. Repeat the above steps until the maximum and minimum speed targets are reached. The process may take a few adjustments to meet both requirements.

7.2. Temperature Controller Thermal Calibration

DANGER
This procedure requires the Model 17's power to be ON. To minimize the risk of burns, electrical shock, or other injuries, these procedures should be performed only by a qualified Maintenance Person, and all safety precautions must be observed.

DANGER
This Calibration must be performed with the Model 17 operating and the temperature within the chamber at process temperature set-point. Wear protective gloves to prevent possible burns during this calibration.

To ensure that all Model 17 processors are operating at the same heating element temperature and to ensure reliable results when using the recommended installation conditions, the processor should be calibrated using the following procedure:

NOTE
The processor must be calibrated every time one of the following occurs:

- *Either heating element is changed*
- *Motor is changed*
- *Motor controller is changed*
- *Speed potentiometer is changed*
- *Temperature controller is changed*

A. UHI-250 PROBE Calibration: (TE Part Nos. for Probe: 7-1192190-9; for Extension Cable 2-1197377-7)

1. Using a universal heat indicating probe such as a UHI-250, set the belt speed to 250.
2. Record the probe value, the reading should be 130°C.
3. Adjust the Temperature Offset ("OFFS") in accordance with the steps listed below:
   a. Set the temperature set point to 600°C.
   b. Set the belt speed to a setting of 250, or 2.00 fpm.
   c. Pass the UHI-250 temperature probe through the processor a minimum of three times and record the maximum temperature reading. The target temperature is 130°C. If the measured temperature is not 130°C ±5°C, continue with Steps (1) thru (6).
      (1) Press and hold the "↺" (Scroll) key while pressing the "△" key to access the Program Selection Menu.
      The upper display will indicate "OPtr" (Operator Mode)
      (2) Press the "△" once to display "SEtP" (Setup Mode).
      (3) Press the "↺" key twice to scroll the display to "OFFS" (Offset). The current offset will be displayed in the lower display window.
      (4) Adjust the offset of the controller using the "▽" or "△" keys. Use the "△" arrow if the recorded probe temperature is higher than the target temperature; use the "▽" arrow if the recorded temperature is lower than the target temperature.
      (5) Once the offset is adjusted, press and hold the "↺" key while pressing the "△" key to display the program selection mode "SEtP".
      (6) Press the "▽" once to display "OPtr".
   d. Press the "↺" key once to exit the program mode and return the controller normal operation. The displays will show actual temperature and set-point temperature.

NOTE
As a rule of thumb, adjust the offset two degrees for every one degree the actual probe readings vary from the target temperature.

This equation can also be used to estimate the offset:

Adjust offset = (Avg. probe – Target) x 2

Example 1: If the probe temperature is 140°C then the offset would be approximately up 20°:
+20 = (140 – 130) x 2 in the Up direction.

Example 2: If the recorded temperature is 120°C, then adjust the offset down 20°:
-20 = (120 – 130) x 2 in the Down direction.

NOTE
Allow the processor to re-stabilize for a minimum of 5 minutes after every offset adjustment.

7.3. Temperature Controller

The internal parameters of the temperature controller are preset at the factory. The only reason these parameters (other than temperature set point) should be changed is when calibrating the Model 17. It is a good idea, however, to periodically check to ensure that no one has tampered with the settings. See Section 7.3.B for internal program parameters.

A. Changing Temperature Set Point

The number in the bottom display is the set point and upper number is the actual heater element temperature.

1. To change the temperature set point, press the "▽" or "△" keys. The "▽" key decreases the value and the "△" key increases it. The set point is displayed in °C.
2. In case of thermocouple failure, an error message “OPEN” will appear in the upper display.

B. Parameter Settings and Temperature Controller Operation

The internal parameters of the temperature controller are preset at the factory; however, it is a good idea to periodically check to ensure that no one has tampered with them.

NOTE
If you are having trouble navigating the below described menus and cannot get out of one of the many controller modes, do not panic. The temperature controller will return to the control mode if there is no key entry activity for 2½ minutes.

The Partlow temperature controller has five operating modes. The unit powers up in the Operator Mode by default.

Operator Mode

Figure 21 shows the parameters accessible from Operator Mode (OPtr). These parameters can be reached by pressing the ↺ (Scroll) button.

ACTION	UPPER DISPLAY	LOWER DISPLAY	DESCRIPTION	FACTORY SETTING
---	Actual Temperature	Temperature Setpoint	Normal Instrument Operation	600
↺	Ramping Setpoint	SPrP	Actual Ramping Value of Setpoint	N/A (Read Only)
↺	Setpoint Ramp Rate	rP	Setpoint Ramp Rate (°C/Hour)	9999
↺	Active Alarms	ALSt	2 = Alarm 2 Active, 1 = Alarm 1 Active (Visible Only if an Alarm is Active)	N/A (Read Only)

Any value displayed in the Lower Display window that is not a read only parameter can be changed by pressing the △ or ▽ button.

Do not change the Setpoint Ramp Rate (rP) from its factory value of 9999.

Figure 21

Mode Selection

To select a mode, press and hold the ↺ button then depress the △ button. Once in the select mode, use the △ or ▽ button to locate the desired mode then press ↺ to proceed within that mode.

Figure 22 shows the five modes employed by the Partlow controller.

ACTION	MODE	UPPER DISPLAY	LOWER DISPLAY	DESCRIPTION
---	Operator	OPtr	SLct	Nor4mal Instrument Operation
▽	Auto-Tuning	Atun	SLct	Invoke Pre-Tune or Self-Tune
▽	Product Information	inFo	SLct	Partlow Product Information
▽	Configuration	ConF	SLct	Configure Device
▽	Setup	SEtP	SLct	Tailor Settings

To exit from any mode, press and hold the ↺ button then depress the △ button. Select the new mode using the △ or ▽ button, and enter the desired mode by pressing the ↺ button.

Always return to the Operator (OPtr) mode to return to normal operation.

Figure 22

Configuration Mode

To select the Configuration Mode (ConF), press and hold the ↺ button then depress the △ button. Once in the select mode, use the △ or ▽ button to locate the Configuration Mode then press ↺ to proceed with the configuration. Use the △ or ▽ button to change the value in the upper display until it matches the value shown in Figure 23, then press the "AUTO/MANUAL" button to register the value in the upper display window.

NOTE
If you do not press the "AUTO/MANUAL" button after changing the parameter in the upper display, the setting will revert to the previous value.

ACTION	PARAMETER	UPPER DISPLAY	LOWER DISPLAY	DESCRIPTION
↺	Input Type	YC	inPt	Type K thermocouple
↺	Range Upper Limit	760	ruL	Upper Range for Scaling (°C)
↺	Range Lower Limit	-100	rLL	Lower Range for Scaling (°C)
↺	Control Type	SnGL	Ctyp	Single control (heat only)
↺	Primary Output Action	rEV	Ctrl	Reverse acting (for heating)
↺	Alarm 1 Type	dE	ALA1	Alarm 1 = Deviation Alarm
↺	*Alarm 1 Type*	*bAnd*	*ALA1*	*Alarm 1 = Band*
↺	Alarm 1 Value	-20	dAL1	Deviation Alarm = -20 °C
↺	*Alarm 1 Value*	*21*	*bAL1*	*Band Alarm = 21 °C*
↺	Alarm 1 Hysteresis	1	Ahy1	Alarm 1 Hysteresis = 1 °C
↺	Alarm 2 Type	bAnd	ALA2	Alarm 2 = Band Alarm
↺	Alarm 2 Value	20	bAL2	Band Alarm = 20 °C
↺	*Alarm 2 Value*	*19*	*bAL2*	*Band Alarm = 19 °C*
↺	Alarm 2 Hysteresis	1	AHy2	Alarm 2 Hysteresis = 1 °C
↺	Loop Alarm	diSA	LAEn	Loop Alarm disabled
↺	Alarm Inhibit	nonE	Inhi	No alarms inhibited
↺	*Alarm Inhibit*	*Both*	*Inhi*	*Both*
↺	Output 1 Usage	Pri	USE1	Use Output 1 for primary control
↺	Output 2 Usage	A2_d	USE2	Use Output 2 for Alarm 2
↺	*Output 2 Usage*	*A2_r*	*USE2*	*Use Output 2 for Alarm 2*
↺	Output 3 Usage	A1_r	USE3	Use Output 3 for Alarm 1
↺	Display Strategy	2	diSP	Use second display strategy
↺	Configuration Lock Code	0	CLoc	Configuration Menu unlocked

Red italic items are for Reverse belt machine.

To exit from Configuration Mode, press and hold the ↺ button then depress the △ button. Select the new mode using the △ or ▽ button and enter the desired mode by pressing the ↺ button.

Always return to the Operator (OPtr) mode to return to normal operation.

Figure 23

Setup Mode

To select the Setup Mode (SEtP), press and hold the ↺ button then depress the △ button. Once in the select mode, use the △ or ▽ button to locate the Setup Mode then press ↺ to proceed with the setup.

Use the △ or ▽ button to change the value in the upper display until it matches the value shown in the table below, then press the ↺ button to register the value in the upper display window. There is no need to press the "AUTO/MANUAL" button to register the value when operating in the Setup Mode. Note that display values in Figure 24 that show a question mark (?) are read only or values that are determined by the user. They vary depending on user settings or the state of the machine.

ACTION	PARAMETER	UPPER DISPLAY	LOWER DISPLAY	DESCRIPTION
↺	Input Filter Time Constant	0.5	FiLt	Time constant of 0.5 second used for input filter
↺	Temperature Offset	?	OFFS	Actual value determined by factory or field calibration
↺	Primary Power	?	PPW	Power output (Read only)
↺	Primary Proportional Band	3.2	Pb_P	Proportional Band setting (Actual setting may vary slightly)
↺	Automatic Reset	1.15	ArSt	Integrator time setting (Actual setting may vary slightly)
↺	Rate	.18	rAtE	Derivative time setting (Actual setting may vary slightly)
↺	Bias (Manual reset)	0	biAS	Bias setting is off
↺	Setpoint Upper Limit	700	SPuL	Setpoint Upper Limit is 700 °C
↺	Setpoint Lower Limit	-100	SPLL	Setpoint Lower Limit is -100 °C
↺	Primary Output Power Limit	100	OPuL	Control Output = 100% (Not limited)
↺	Output 1 Cycle Time	0.5	Ct1	Control output cycle time is 0.5 seconds
↺	Deviation Alarm 1	-20	dAL1	Deviation Alarm = -20 °C
↺	*Band Alarm 1*	*21*	*bAL1*	*Band Alarm = 21 °C*
↺	Alarm 1 Hysteresis	1	AHy1	Alarm 1 Hysteresis Value = 1 °C
↺	Band Alarm 2	20	bAL2	Band Alarm = 20 °C
↺	*Band Alarm 2*	*19*	*bAL2*	*Band Alarm = 19 °C*
↺	Alarm 2 Hysteresis	1	AHy2	Alarm 2 Hysteresis Value = 1 °C
↺	Auto Pre-Tune	diSA	APt	Auto Pre-Tune capability is disabled
↺	Auto/Manual Control Selection	diSA	PoEn	Auto/manual control selection is disabled
↺	Setpoint Ramping	EnAb	SPr	Setpoint Ramping capability is disabled
↺	Setpoint Ramp Rate Value	9999	rP	Setpoint Ramp Rate Not Applicable
↺	Setpoint	600	SP	Setpoint 600 °C (factory setting – actual setpoint determined by application requirements)
↺	Setup Lock Code	0	SLoc	Setup Menu unlocked

Red italic items are for Reverse belt machine.

To exit from Setup Mode, press and hold the ↺ button then depress the △ button. Select the new mode using the △ or ▽ button, and enter the desired mode by pressing the ↺ button.

Always return to the Operator (OPtr) mode to return to normal operation.

Figure 24

Automatic Tuning Mode

Variations in system dynamics may occur due to normally occurring differences in the thermal characteristics of heater elements originating from different manufacturing lots, different materials or changes brought about by improved heater element design. Therefore, if you find that the factory-installed parameters yield unsatisfactory performance, you may wish to perform a Pre-Tuning operation when replacing heater elements. To perform a Pre-Tuning operation you must enter the Automatic Tuning Mode.

Before performing the Pre-Tuning operation it is important to first allow the system to reach the setpoint operating temperature, then press the O (off) button and allow the actual temperature to fall at least 100 °C below the setpoint temperature.

Press the I (on) button and immediately enable Pre-Tuning by following the steps below.

Note that the table in Figure 25 details the parameters located in the Automatic Tuning Mode menu.

ACTION	PARAMETER	UPPER DISPLAY	LOWER DISPLAY	DESCRIPTION
↺	Pre-Tune	OFF	Ptun	Pre-Tune Capability is Disabled
↺	Self-Tune	OFF	Stun	Self-Tune Capability is Disabled
↺	Tune Lock	0	tLoc	Automatic Tuning Menu Unlocked

Enter select mode by pressing and holding the ↺ button then depressing the △ button. Use the △ or ▽ button to locate the Automatic Tuning Mode (Atun) then press ↺ button to proceed with the operation.

Use the ↺ button to select the Pre-Tune (Ptun) parameter then depress the △ button to turn on the Pre-Tuning operation. You are now performing a Pre-Tuning operation.

Do not change the value of the Self-Tune (Stun) parameter or the Tune Lock (tLoc) parameter when in the Automatic Tuning Mode menu.

Watch the display windows. The Lower Display should read Ptun, and the Upper Display should read On. When the value in the Upper Display changes from On to OFF, the Pre-Tuning operation has successfully completed. Exit the Automatic Tuning Mode by pressing and holding the ↺ button then depress the △ button. Select the new mode using the △ or ▽ button, and enter the desired mode by pressing the ↺ button.

The entire process should take one or two minutes depending on the actual heater element temperature when the Pre-Tune process is invoked.

Always return to the Operator (OPtr) mode to return to normal operation.

Figure 25

Product Information Mode

To select the Product Information Mode (inFo), press and hold the ↺ button then depress the △ button. Once in the select mode, use the △ or ▽ button to locate the Product Information Mode then press ↺ to proceed with the interrogation.

All information in the Product Information Mode menu is read only. As such, the △ and ▽ and "AUTO/MANUAL" buttons serve no purpose when operating within this menu. Note that display values in Figure 26 that show a question mark (?) are read only values that vary from unit to unit.

ACTION	PARAMETER	UPPER DISPLAY	LOWER DISPLAY	DESCRIPTION
↺	Input Type	Uni	In_1	Input 1 Is A Universal Type Input
↺	Option 1 Module Type	SSr	oPn1	Output 1 Module = + 3 To 5 VDC For Driving A Solid State Relay
↺	Option 2 Module Type	rLy	oPn2	Output 2 Module = Relay Contact
↺	Option 3 Module Type	rLy	oPn3	Output 2 Module = Relay Contact
↺	Auxiliary Module Type	nonE	oPnA	No Auxiliary Module Used
↺	Firmware Type	?	FW	Value Displayed Is Firmware Type
↺	Firmware Issue	?	ISS	Value Displayed Is Firmware Issue
↺	Product Revision Level	?	PrL	Value Displayed Is Product Revision Level
↺	Date of Manufacture	?	dOM	Manufacturing Date Code (mmyy)
↺	Serial Number 1	?	Sn1	First Four Digits Of Serial Number
↺	Serial Number 2	?	Sn2	Middle Four Digits Of Serial Number
↺	Serial Number 2	?	Sn2	Last Four Digits Of Serial Number

Figure 26

8. REVISION SUMMARY

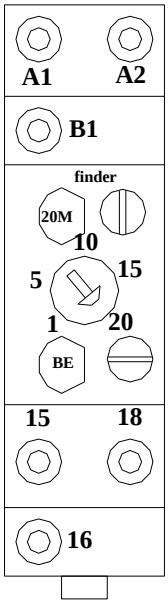
- Updated document to corporate requirements
- Updated title
- Added or changed text in Paragraphs 1.1, 3.3, 6.2.2, 6.4, 6.7, and 7.1.1; Heater Elements in Paragraph 1.4; tables in Figures 12 and 19;
- Updated Figure 11, Added new Tables 1 and 2 and new Schematics in Section 10
- Added Model 17R (Reverse Belt)
- Revised heater element test resistance readings for Model 17 110VAC version
- Revise Figures 23 and 24 to include Reverse Belt Machine Settings and remove footnote "*Model 17R, PN 2280355-4 ONLY " under Figure 24

9. DWELL TIMER SETTINGS

9.1. Model 17

DWELL TIMER SETTING
FOR MODEL 17

COOL DOWN TIMER
OFF DELAY
P/N 1-2280624-8



SET TO "20 MIN"
SET POINTER TO "20"
SET FUNCTION TO "BE"

Figure 27

9.2. Model 17R

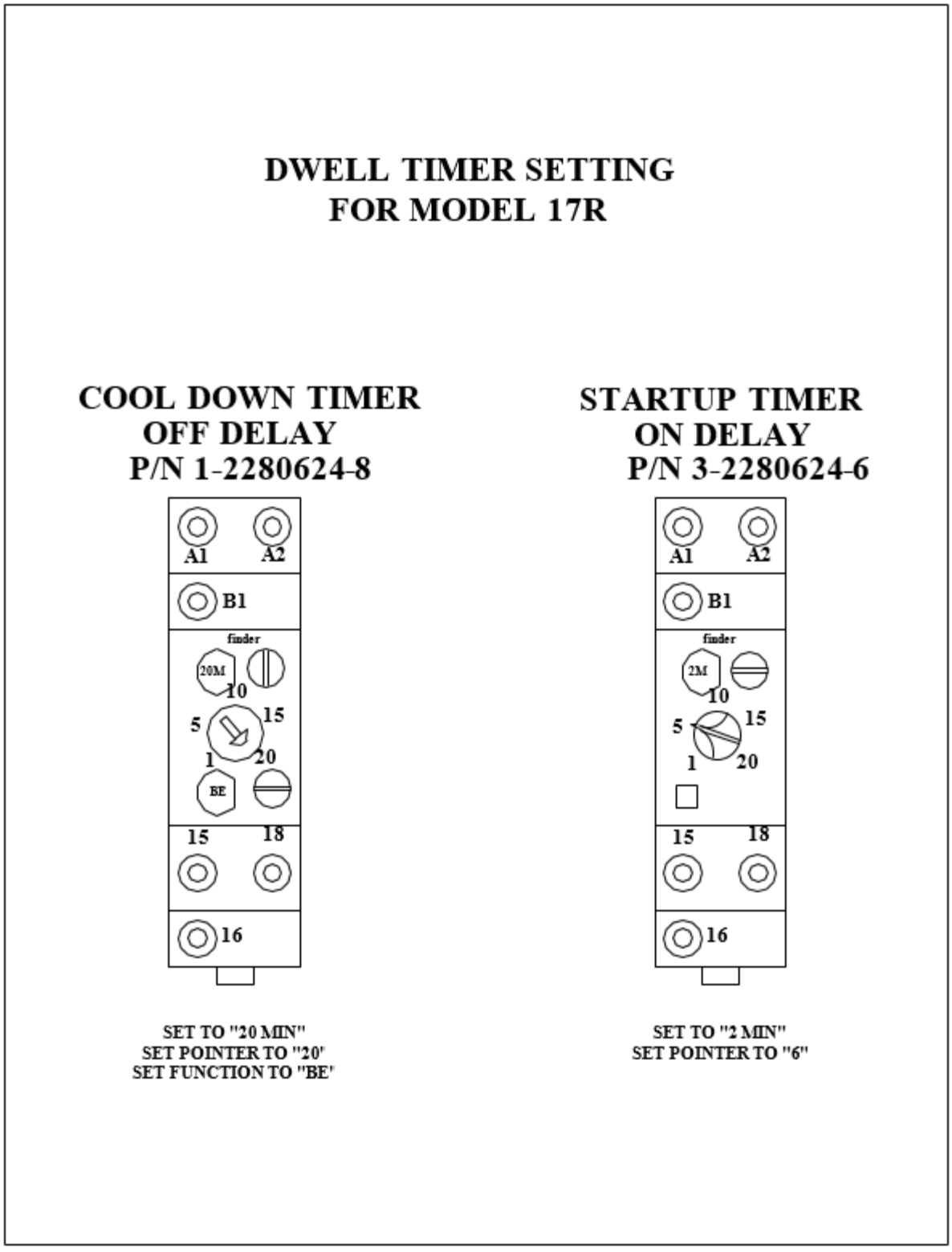


Figure 28

10. ELECTRICAL SCHEMATICS

10.1. Model 17, 110 VAC

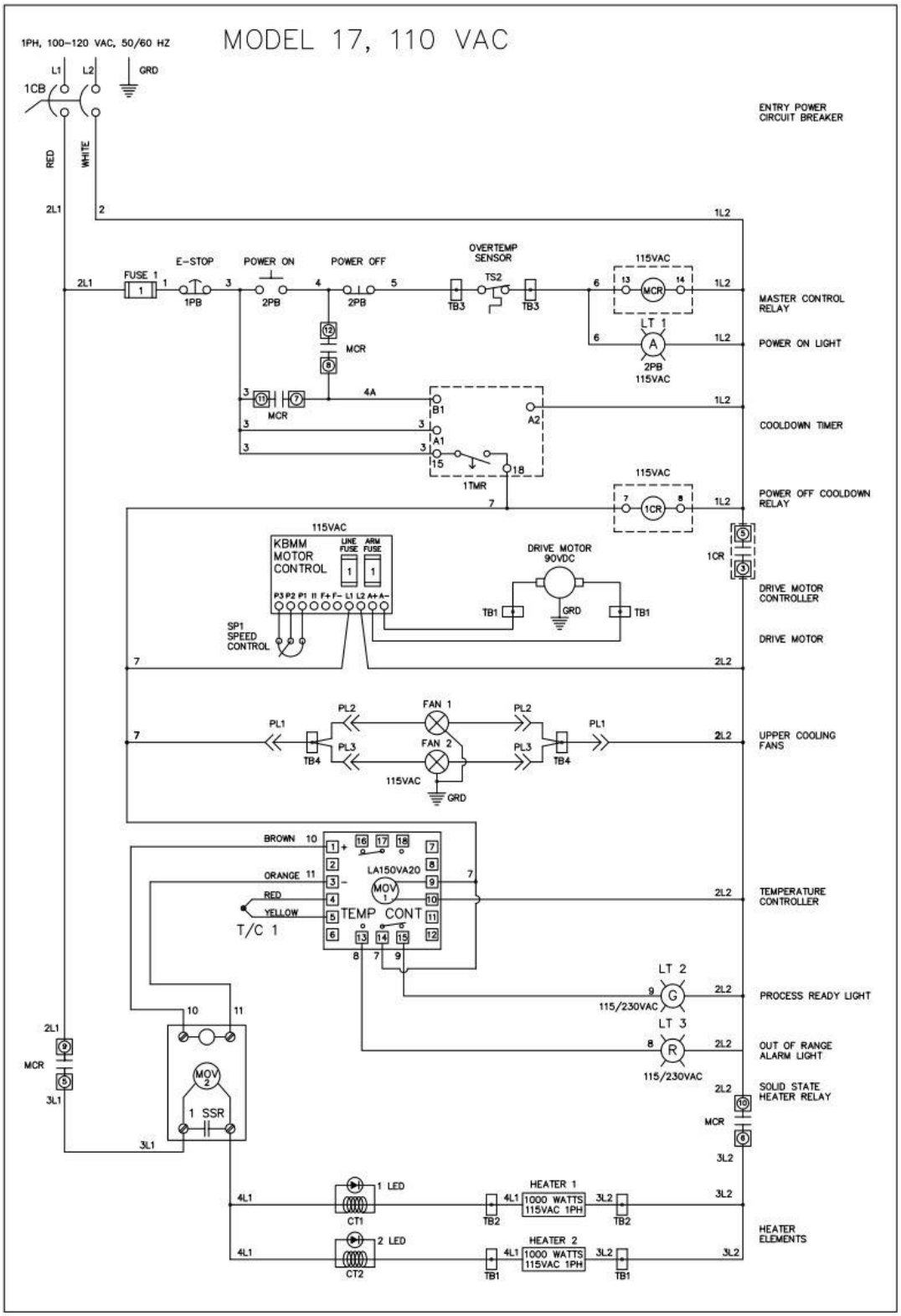


Figure 29

10.2. Model 17, 220 VAC

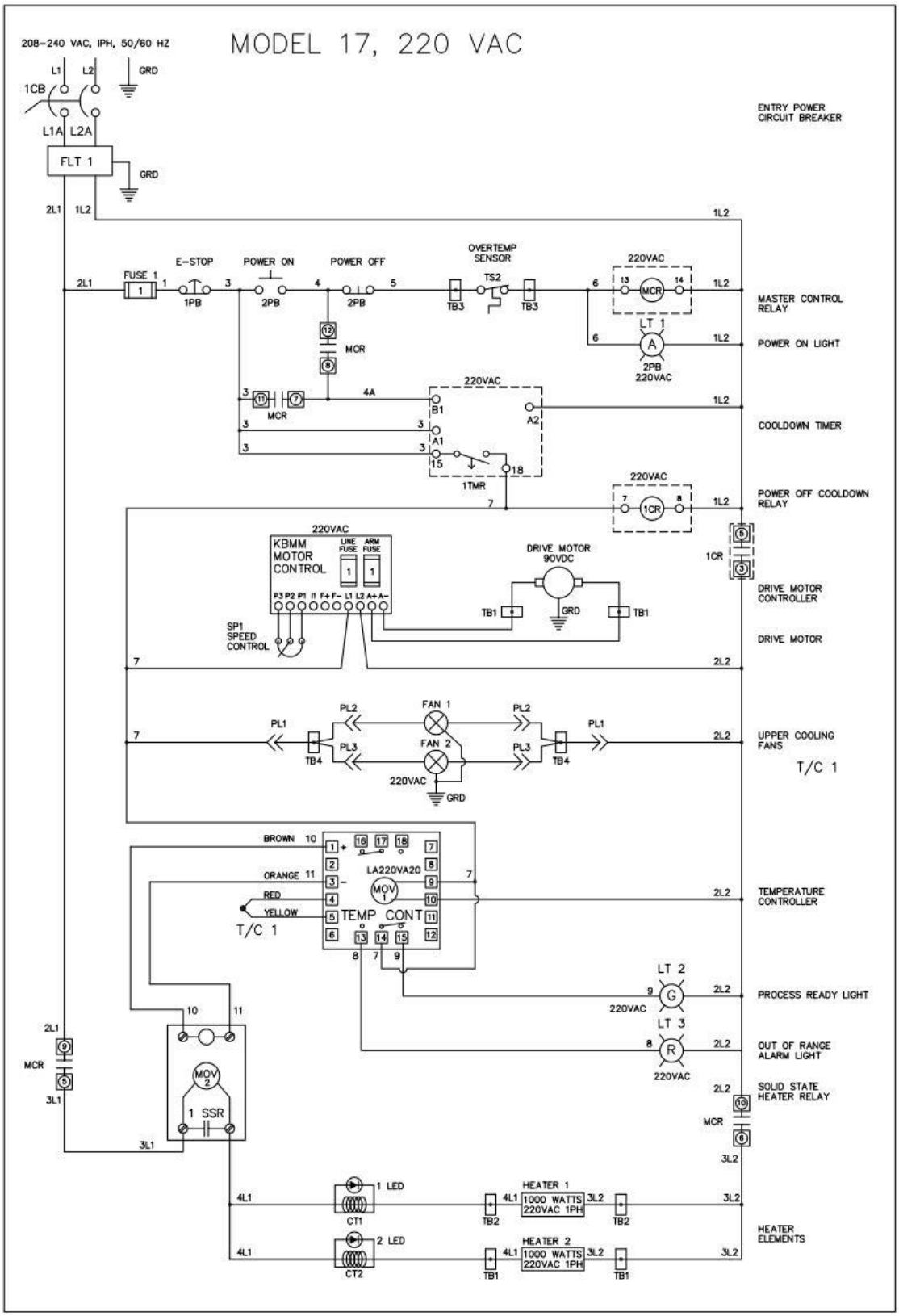


Figure 30

10.3. Model 17R

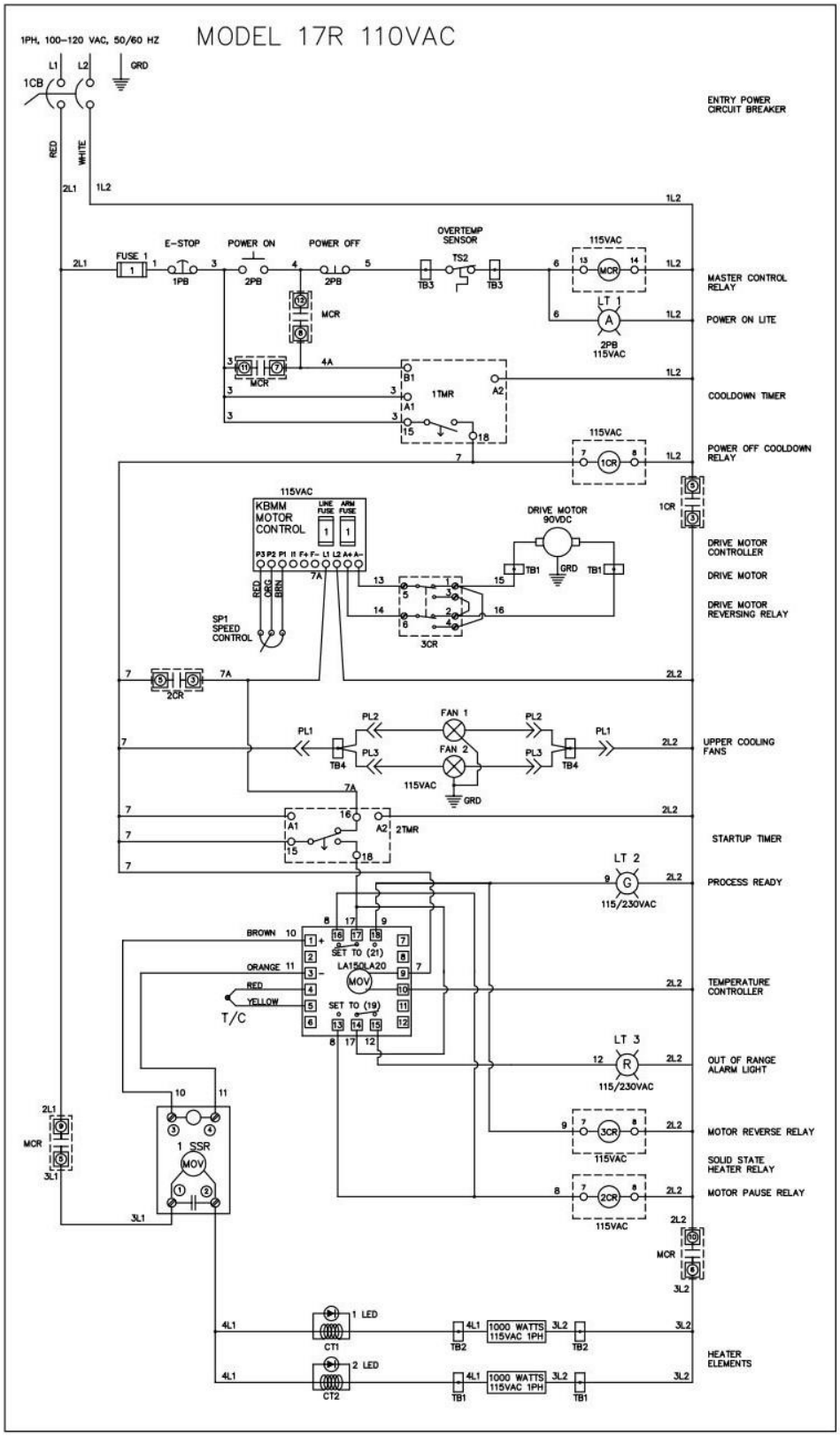


Figure 31