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USERGUIDE

UGH028/ACHV

Thermolator with Moldscan Control

⚠ **WARNING - Reliance on this Manual Could Result in Severe Bodily Injury or Death!**

This manual is out-of-date and is provided only for its technical information, data and capacities. Portions of this manual detailing procedures or precautions in the operation, inspection, maintenance and repair of the product forming the subject matter of this manual may be inadequate, inaccurate, and/or incomplete and cannot be used, followed, or relied upon. Contact Conair at info@conairgroup.com or 1-800-654-6661 for more current information, warnings, and materials about more recent product manuals containing warnings, information, precautions, and procedures that may be more adequate than those contained in this out-of-date manual.

NOTE

WHEN CONTACTING THE FACTORY ABOUT YOUR THERMOLATOR WITH MOLDSCAN CONTROL, PLEASE GIVE THE FOLLOWING INFORMATION:

1. MODEL NUMBER
2. SERIAL NUMBER
3. DATE OF MANUFACTURE

CAUTION

BEFORE TURNING UNIT ON...

1. MAKE SURE UNIT IS CONNECTED TO FUSED DISCONNECT AT PROPER VOLTAGE AND IS EARTH GROUNDED.

2. MAKE SURE WATER CONNECTIONS ARE MADE USING HOSES WITH ADEQUATE PRESSURE AND TEMPERATURE RATINGS FOR 125 PSI AND 250°F.

3. WATER SUPPLY SHOULD BE CAPABLE OF SUPPLYING 15 GPM AT 15 PSI.

4. MAKE SURE ALL MANUAL VALVES IN SYSTEM ARE OPEN.

5. MAKE SURE DRAIN LINE IS CLEAR, USE AN OPEN DRAIN.

6. CONSULT OPERATING MANUAL FOR DETAILED INSTRUCTIONS.

BASIC SPECIFICATIONS

Control range: 50°F. (+10°C) to 250°F (121°C)

Heating: Operation: Time Proportioning; Operating alternately or simultaneously

Capacity: 12 KW, through two 6 KW circuits (std.)
9 KW (Opt.)

Cooling: Operation Time proportioning; two types

Direct - (Open Circuit) Cooling from water supply direct to process.

Indirect - (Closed Circuit) Cooling from water supply, through Heat Exchanger, to process

Heat Exchanger Surface Area: 5.5 sq. ft. (7.7 sq. ft. optional)

Pump Motor: 1 HP (standard) 3/4, 1-1/2, 2, 3 HP

Connections:	Water Supply	1" NPT
	To Process	1" NPT for 3/4 & 1 HP Models 1-1/4" NPT for 1-1/2, 2 & 3 HP Models
	From Process	2" NPT
	Drain	1" NPT
Dimensions:	Width	15-1/2" (387 mm)
	Depth	26" (650 mm)
	Height	25" (625 mm)
	Weight	Approximately 200 lbs.
	Shipping Weight	225 lbs.
Voltage:	230/3/60 or 460/3/60	

AMPERAGE (PER HP RATING)

	3/4 HP	1 HP	1-1/2 HP	2 HP	3 HP
230V	33 A	34 A	36 A	37 A	40 A
460V	16.5 A	17 A	18 A	18.5 A	20 A

I. DESCRIPTION

The Thermolator with Moldscan Control is a microcomputer based PID mold temperature controller, featuring time proportioning in the cooling mode and in the heating mode.

The basic design of the Conair Thermolator consists of two tanks connected together at the top, with an immersion heater connected in two 6 kw circuits installed in one of these tanks. The "water inlet" and "from process" lines are connected to this heater tank; the pump inlet line is connected to the other. The pump outlet goes directly "to process."

In the direct cooling model (Figure 1) the cooling line is connected at the top between the two tanks and discharges into the drain line. The cooling line also acts as a vent and is opened by a solenoid valve, triggered from the control.

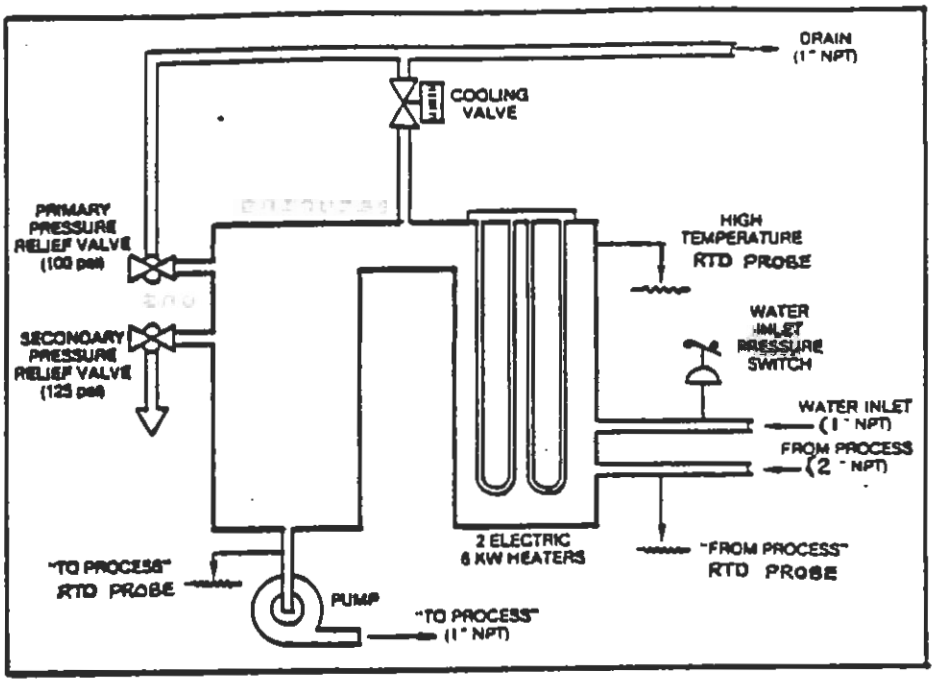
In the indirect cooling model (Figure 2), a 5.5 sq. ft., two pass heat exchanger is installed in the second tank. The water inlet to the heat exchanger is connected to the "water supply" line, and the outlet discharges into the drain line through a solenoid valve. A vent line connected between the two tanks discharges into the "drain line" through a separate solenoid valve.

1. Pressure Control

A primary pressure relief valve, set for 100 psi, relieves the pressure increase due to the expansion of water during heating, and discharges into the drain line.

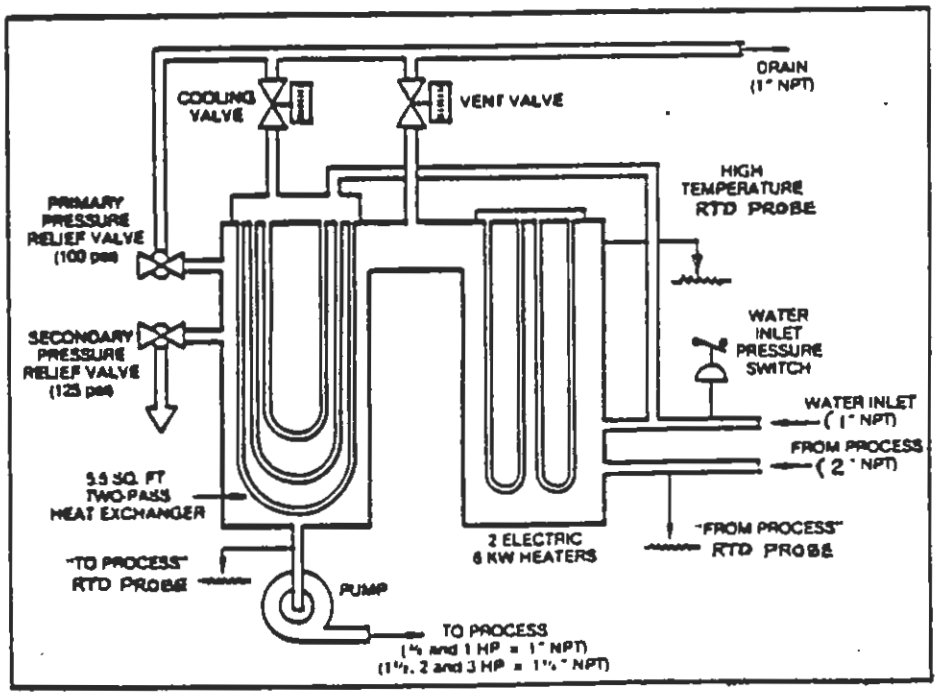
A second pressure relief valve, connected to the same fitting and set for 125 psi, relieves potential excessive pressure generated within the Thermolator. This valve discharges inside the enclosure and is not connected to the drain line.

A pressure switch installed in the "water supply" line will keep the Thermolator from running if the pressure is less than 15 psi or will shut it down if the water supply pressure drops to 10 psi. This insures that there will be sufficient water pressure to the Thermolator before it will operate.



THERMOLATOR DIRECT COOLING SCHEMATIC PIPING DIAGRAM

FIGURE 1.



THERMOLATOR INDIRECT COOLING SCHEMATIC PIPING DIAGRAM

FIGURE 2.

2. Temperature Control

The main RTD Probe is inserted into the pump inlet line (except in remote operation) and senses the "to process" temperature. A second RTD Probe in the return line senses the "from process" temperature. There is also a high temperature RTD Probe inserted in the heater tank which causes the heaters to be turned off and the cooling valve to open if water temperature reaches 265°F.

a. See Section 3.2.8.2. for Remote Operation

3. Control Panel

The control panel consists of two major components; the printed circuit board and label assembly and the subpanel assembly.

The printed circuit board and label assembly includes the microcomputer and other solid state components, as well as the display and digital setpoint. It performs all the control and monitoring functions. The subpanel assembly contains the control transformer, fuses, starter, and contactors required to operate the pump and the heater.

II. INSTALLATION

1. Place the Thermolator as close as possible to the mold.

2. Connect the water lines to the appropriate outlets. The positions of the outlets are shown on the back of the machine cover.

a. Use as large a hose as practical to make these connections in order to eliminate unnecessary restrictions.

b. Use hoses with temperature and pressure ratings adequate for operation at 125 psi and 250°F.

c. The water supply must be capable of maintaining 15 psi at the Thermolator while it is in the cooling cycle.

d. Connect the drain line to an open drain where there is no possibility of a back pressure being applied to the Thermolator. If available, connect drain line to return of tower or chiller circuit.

3. Connect control panel to power supply.

a. Use cable of a size adequate to carry the maximum amps shown on the name plate.

b. Connect to a switch of the proper rating for the maximum amps shown on the name plate.

c. Use fuses of the proper rating for the maximum amps shown on the name plate.

d. Be sure to ground the Thermolator, and follow all applicable electrical codes to insure a safe installation.

4. Check pump rotation.

a. Remove cover from the Thermolator.

b. Remove drip cover from motor to make motor shaft visible.

c. Turn water supply on.

d. Turn power on at the disconnect switch.

e. Turn Thermolator on. It will:

1. Start to go through a 30 second vent cycle.

2. Then, the pump will start.

f. As soon as the pump starts, stop the Thermolator and by looking at the end of the shaft, determine if it is running in the direction of the rotation arrow attached to the side of the motor.

g. If it is necessary to change the direction of the rotation:

1. Turn power off at the disconnect switch.

2. Interchange any two wires at the input power terminal strip.

3. Repeat steps e. and f. to determine that pump is now running in the right direction.

III. OPERATION

1. Make sure the Thermolator is connected to an adequate power supply, and that the unit is properly grounded.

2. Make sure all water lines are properly connected with hoses of the proper rating.

3. Make sure all hand valves are open.

4. Make sure that the drain line on the Thermolator is connected to an open drain.

5. Open the water supply valve. A minimum of 15 psi pressure is required for the Thermolator to run. In order to avoid nuisance tripping during operation, the water supply should be able to maintain 15 psi while the Thermolator is in the cooling cycle.

6. Turn the power on.

7. Turn the Thermolator on. The ON/OFF switch will light and the "POWER ON" light will come on indicating power is on.

8. The vent valve will open and vent the Thermolator for 30 seconds. This will be shown by the "Cooling" light being on. This vent period will allow air to be vented from the Thermolator. To stop the vent cycle, push the "Manual/Cancel Vent" button. (see Section 3.3)

On the direct cooling Thermolator, the vent valve is also the cooling valve; on the indirect cooling Thermolator, there are separate valves for venting and cooling. The operation of both models, however, is the same.

9. After 30 seconds, the pump will start and the vent valve will stay open for another 30 seconds. This is shown by the "Cooling" light being on and the "Pump" light coming on.

10. The vent valve closes after the second 30 second vent period as shown by the "Cooling" light going out. This vent period will allow air to be vented from the entire system.

The vent valve will open for 1 to 2 seconds each hour of operation to allow air to be vented from the system.

11. Depress the "Setpoint Keys" to adjust the setpoint to the desired operating temperature. (see Section 3.1 & 3.2)

12. On start-up, the "Function Display" will indicate #1 which corresponds with the "TO PROCESS/REMOTE" temperature (see Section 3.1 & 3.2). The "TO PROCESS" temperature will be displayed on the "Actual Display", except in remote operation (see Section 3.2.8.2.).

In remote operation, the unit will control the temperature of the remote sensor by heating or cooling the process liquid.

"Function Displays" #1 thru #8 determine what "Function" will be displayed on the Actual and Setpoint Displays (see Section 3.2)

13. The heater will come on as shown by the "Heat" light and the Thermolator will heat until it reaches setpoint.

14. If at this time sufficient heat is not being added to the process sytem by the application, the heaters will cycle on and off to maintain setpoint temperature.

15. If at this time additional heat is being added to the process system by the application, the cooling valve will cycle on as shown by the "Cooling" light and off to maintain setpoint temperature.

16. The Thermolator will now operate normally to maintain setpoint temperature.

17. Overtemperature

If the actual temperature of the water reaches 265°F., as sensed by the high temperature RTD probe, the heaters will be disconnected, the cooling valve will open and the pump will shut down. The "HI-TEMP LIMIT" light will come on. When the Thermolator trips out on overtemp, it will be necessary to switch it off to reset it. Before the Thermolator is placed back in operation, it should be checked by qualified personnel to determine and correct the cause of the problem.

18. Underpressure

If the water supply pressure drops to 10 psi, the Thermolator will shut down, after a two second delay. This will be shown by the "Low Pressure Supply" light coming on. As soon as pressure is restored, it will start itself.

19. If the pump motor trips out because of an overload, the Thermolator will shut down and the "OVERLOAD" light will come on.

To restart the Thermolator:

a. Turn Thermolator off.

b. Turn main disconnect off.

c. Remove cover from control panel by removing six machine screws and pulling the cover off.

d. Reset the overload relay on the pump starter.

e. Replace control panel cover and bolt it down with the six machine screws.

f. Turn main disconnect on.

g. Turn Thermolator on.

h. Before the Thermolator is placed back in operation, the cause of the overload should be determined and corrected.

IV. ADJUSTMENTS

The Thermolator is adjusted at the factory and requires no field adjustments.

The two pressure relief valves are set at the factory to relieve at the proper pressures and for safety reasons should not be tampered with.

The pressure switch is also adjusted at the factory to open and close at the required pressures and also for safety reasons should not be tampered with. Under no circumstances should it be removed or disconnected, or in any way rendered inoperative.

The high temperature RTD Probe is not adjustable and UNDER NO CIRCUMSTANCES should it be removed, disconnected or in any other way rendered inoperative.

V. TROUBLESHOOTING AND MAINTENANCE

The Thermolator should be cooled down to 120°F. or less before servicing in order to avoid burns caused by coming in contact with hot parts.

All servicing and troubleshooting should be done only by a qualified electrician or serviceman after observing the necessary safety precautions.

CONTACT WITH LIVE PARTS WILL CAUSE SERIOUS OR FATAL INJURY.

The Thermolator has built-in alarms and a troubleshooting aid (see Section 4.0).

If the Thermolator malfunctions, the first step in the trouble-shooting procedure should be to check all the alarm LED's (see Section 4.1) and displayed alarms (see Section 4.2) which, in all possibility, will show what the problem is. If the cause of the trouble cannot be determined from the alarm LED's and displayed alarms, the following list will be of help.

SYMPTOM	PROBABLE CAUSE	REMEDY
Nothing happens when Thermolator is turned on; Thermolator does not run; display does not come on; indicator lights do not light.	Main disconnect not turned on.	Turn on main disconnect.
	One or more fuses blown in main disconnect.	Look for short circuit, correct problem & replace fuses.
	Low supply voltage.	Supply voltage must be within ± 10% of nameplate voltage.
	Circuit breaker on control circuit is tripped.	Find & correct short in control circuit & reset breaker.
	Defective computer board.	Replace computer board.
When Thermolator is turned on, the display and all indicating lights come on but Thermolator does not run.	Inadequate voltage supply.	Voltage supply must be within ±10% of nameplate voltage.
When Thermolator On/Off switch is turned on, the switch lights up, the power on & low pressure supply lights come on, display comes on but Thermolator doesn't start.	Insufficient supply water pressure.	Make sure that supply water line valve is open and that supply pressure to Thermolator is at least 15 PSI.

SYMPTOM	PROBABLE CAUSE	REMEDY
Normal operation, but during cooling the Thermolator stops momentarily & restarts. Low pressure supply light flashes on & off.	Insufficient supply water to supply enough water while Thermolator cools.	Increase supply line pressure. Increase size of water supply line to Thermolator.
Thermolator trips out on high temperature; cooling valve opens, pump & heaters shut off, & high temperature light & cooling light come on.	Heater contactor welded together.	Replace contactor.
	Faulty probe.	Replace probe.
	Faulty computer board.	Replace computer board.
Thermolator appears to run normally, heats or cools as required but there is no display or heat or cool indicator lights.	Defective computer board.	Replace computer board.
Thermolator runs, it appears to cool indicator light comes on, but temperature continues to rise.	Defective or partially plugged cooling solenoid valve.	Replace cooling solenoid valve.
	Partially plugged cooling and/or drain lines.	Clean lines
When heat light is on, but Thermolator does not come up to temperature.	Defect heater contactor(s).	Replace contactor.
	Defect heater.	Replace heater.
	Defective computer board.	Replace computer board.
When pump light is on, but pump doesn't run.	Faulty pump starter.	Replace pump motor.
	Faulty pump motor.	Replace pump motor.
	Defective computer board.	Replace computer board.

VI THERMOLATOR MASTER SERIES MOLDSCAN CONTROL
TABLE OF CONTENTS

1.0 Description

The basic function of the Thermolator Moldscan Control is to maintain a constant liquid temperature circulating through a mold (to process), or to maintain a constant mold temperature (remote operation), depending on which operational mode is selected.

It does this by heating the liquid if it is below setpoint, or cooling it if it is above setpoint. Cooling is done by opening a valve to let hot liquid out of the drain which in turn will let cool liquid in the supply. This cool liquid will then mix with the hot and bring the overall temperature of the liquid down.

There are two different modes in the basic operation, to process and remote. The To Process mode monitors the circulating fluid at the outflow to the mold and tries to maintain a constant temperature. The remote operation is basically the same except instead of trying to maintain a constant liquid temperature, it uses a remotely mounted sensor to control the mold temperature. (see Section 3.2.8.2.)

Other sensors and switches insure safe operation and provide monitoring capabilities.

2.0 Configuration

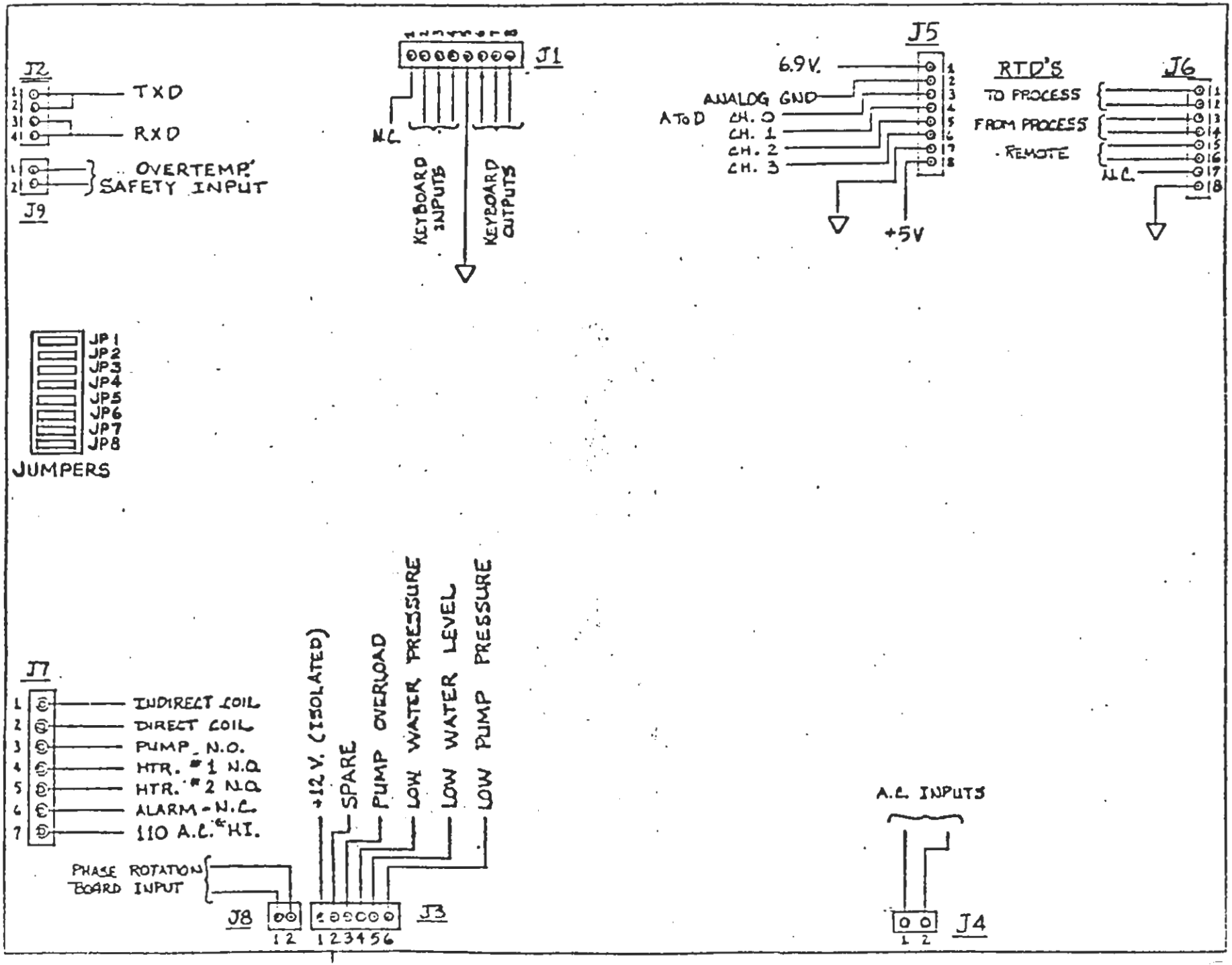
Hardware Jumpers - The Microprocessor board provides seven jumpers for selecting the desired mode of operation. Figure 3 is a diagram of the component side of the control board which shows the location of jumpers as well as connector locations.

1. Direct cool/Indirect cool
3. Degrees F./Degrees C.

All jumpers for each unit will be installed to customer's specification before shipment from Conair, and should not be modified. The remaining jumpers should not be altered by the customer.

2.1 Direct Cool/Indirect Cool Jumper

Direct cool units cool by letting hot liquid directly from the circulating out allowing cool liquid in. Jumper 1 is not installed on direct cool units. Indirect units cool the circulating fluid through a heat exchanger. Jumper 1 is installed on indirect cool units.


J2
TXD
RXD
OVERTEMP. SAFETY INPUT
J9
J1
N.C.
KEYBOARD INPUTS
KEYBOARD OUTPUTS
J5
6.9V.
ANALOG GND
A TO D
CH. 0
CH. 1
CH. 2
CH. 3
+5V
RTD'S
TO PROCESS
FROM PROCESS
- REMOTE
J6
N.C.
JP1
JP2
JP3
JP4
JP5
JP6
JP7
JP8
JUMPERS
J7
INDIRECT COIL
DIRECT COIL
PUMP N.O.
HTR. #1 N.O.
HTR. #2 N.O.
ALARM - N.C.
110 A.C. HI.
PHASE ROTATION BOARD INPUT
+12 V. (ISOLATED)
SPARE
PUMP OVERLOAD
LOW WATER PRESSURE
LOW WATER LEVEL
LOW PUMP PRESSURE
J8
1 2
J3
1 2 3 4 5 6
A.C. INPUTS
J4
1 2

FIGURE

2.2. Degrees F./Degrees C. Jumper

Jumper 3 out selects degrees F.

3.0 Operation

Figure 4 is a photograph of the front panel as it appears on domestic Thermolator Moldscan Control Units. This section will describe the operation of the Control in detail.

3.1 Pushbutton Inputs

There are 6 pushbutton inputs on the front panel. They are as follows:

1. UP FUNCTION
2. DOWN FUNCTION
3. UP SETPOINT
4. DOWN SETPOINT
5. ALARM SILENCE
6. MANUAL/CANCEL VENT

3.1.1. Function Keys

UP FUNCTION and DOWN FUNCTION keys are used to select a function. (see 3.2)

3.1.2. Setpoint Keys

UP SETPOINT and DOWN SETPOINT keys are for changing setpoint temperature. (see 3.2)

3.1.3. Alarm Silence Pushbutton

ALARM SILENCE does exactly that. It silences an alarm but does not correct the alarm condition and will not allow the unit to operate if the error is a fatal one. (see Section 4.0) The machine will not operate until the error is corrected. The ALARM SILENCE is also used for entering data during calibration. (see Section 3.2.8.)

3.1.4. Manual/Cancel Vent Pushbutton

MANUAL/CANCEL VENT will cancel the vent cycle during startup when pressed (for domestic units only). See Section 3.3. for a description of the vent cycle. During normal operation, the unit can be vented manually by pressing the "Manual Cancel Vent Button."

3.2. Digital Display

The front panel display functions are as follows:

1. Actual (3 digit)
2. Set Point (3 digit)
3. Function

For functions that have no setpoints or no actual, that display is blank.

The function display determines what "Function" will be displayed on the actual and setpoint displays. (On start-up, the Function Display is 1). The following is a list of the functions:

1. TO PROCESS/REMOTE
2. FROM PROCESS
3. DELTA TEMPERATURE
4. HIGH LIMIT
5. LOW LIMIT
6. ALARM BAND
7. 7 DAY TIMER
8. DIAGNOSTICS

3.2.1. TO PROCESS/REMOTE (Function Display 1) is the main process function (see Section 3.2.8.2) All cooling and heating functions are controlled from this temperature. The TO PROCESS probe senses the liquid temperature and turns on the heating or cooling, depending on which side of setpoint it is on. The upper limit of this setpoint is set by the programmable "HIGH LIMIT" function, and the lower limit by the "LOW LIMIT" function.

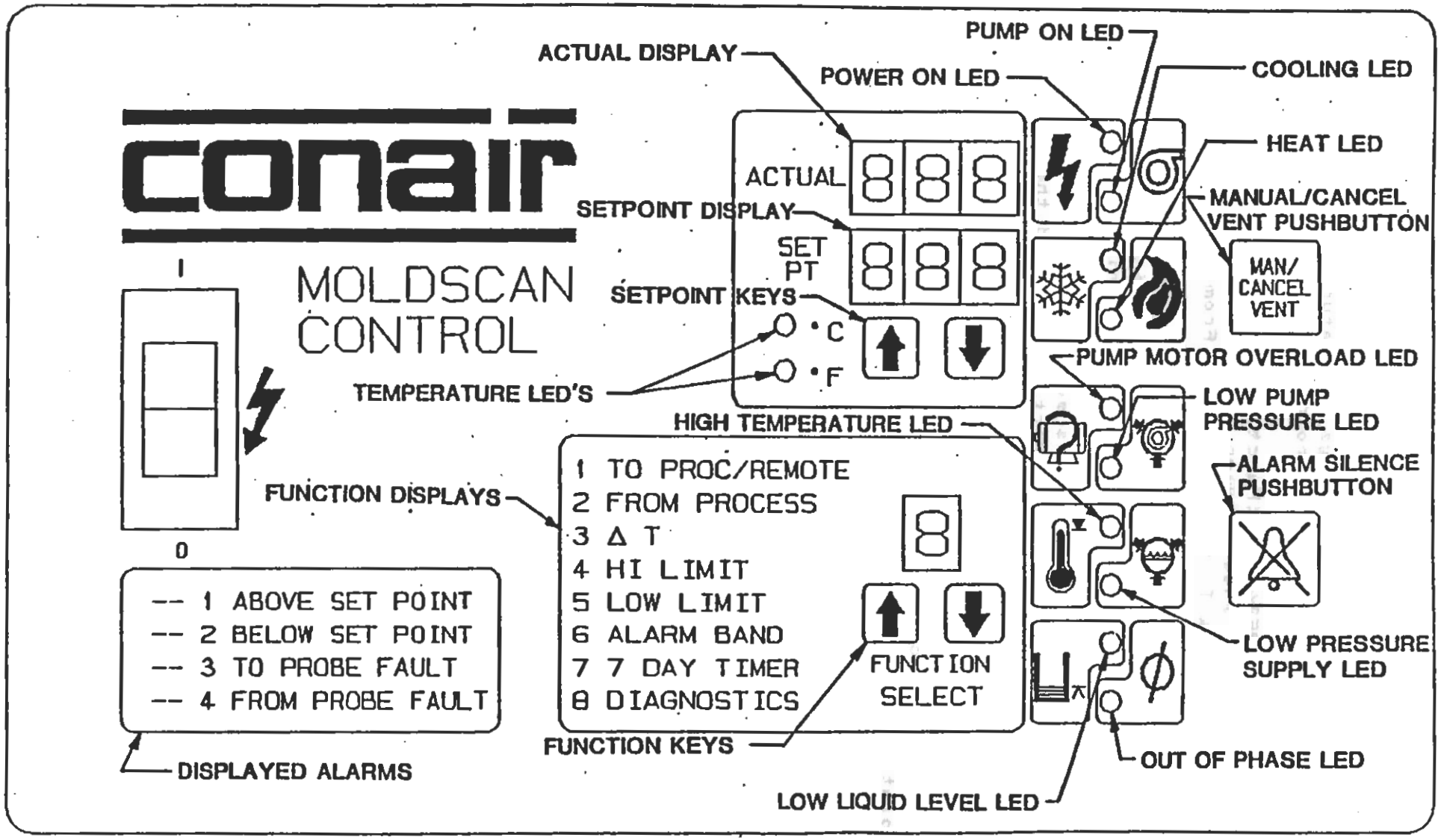

conair
MOLDSCAN CONTROL
ACTUAL DISPLAY
POWER ON LED
PUMP ON LED
COOLING LED
HEAT LED
MANUAL/CANCEL VENT PUSHBUTTON
ACTUAL
SETPOINT DISPLAY
SET PT
SETPOINT KEYS
MAN/ CANCEL VENT
TEMPERATURE LED'S
°C
°F
PUMP MOTOR OVERLOAD LED
LOW PUMP PRESSURE LED
HIGH TEMPERATURE LED
ALARM SILENCE PUSHBUTTON
FUNCTION DISPLAYS
1 TO PROC/REMOTE
2 FROM PROCESS
3 Δ T
4 HI LIMIT
5 LOW LIMIT
6 ALARM BAND
7 7 DAY TIMER
8 DIAGNOSTICS
FUNCTION SELECT
LOW PRESSURE SUPPLY LED
-- 1 ABOVE SET POINT
-- 2 BELOW SET POINT
-- 3 TO PROBE FAULT
-- 4 FROM PROBE FAULT
DISPLAYED ALARMS
FUNCTION KEYS
OUT OF PHASE LED
LOW LIQUID LEVEL LED

FIGURE 4

3.2.2. FROM PROCESS (Function Display 2) is a monitor function only. It monitors and displays the return process liquid temperature. There is no setpoint associated with this function.

3.2.3. DELTA TEMPERATURE (Function Display 3) calculates and displays the difference between the TO PROCESS and FROM PROCESS temperatures (Delta T = To Process - From Process). There is no setpoint associated with this function.

3.2.4. HIGH LIMIT (Function Display 4) is a programmable upper limit to the "to process" setpoint. This function does not have an "actual" display but does have a "setpoint" display. The absolute upper limit of this setpoint is set by the range jumpers #1, #2, and #3 (see Section 2.0) and the lower limit for this function is the value programmed in the "TO PROCESS/ REMOTE" setpoint.

3.2.5. LOW LIMIT (Function Display 5) is a programmable lower limit of the "to process" setpoint. The lower limit of this setpoint is 0 degrees F. and the upper limit is the value programmed in the "TO PROCESS/REMOTE" function.

Example: HIGH LIMIT setpoint : 200 degrees F.
TO PROCESS setpoint : 150 degrees F.
LOW LIMIT setpoint : 100 degrees F.

The operator cannot adjust the "to process" setpoint to a value above the HIGH LIMIT or below the LOW LIMIT.

3.2.6. ALARM BAND (Function Display 6) sets the point around the TO PROCESS setpoint where the alarm sounds if the TO PROCESS temperature exceeds. There is a setpoint display but no actual. The adjustment range is 2 to 30.

Example: ALARM BAND setpoint = 5 degrees
TO PROCESS setpoint = 200 degrees

The alarm will sound anytime the TO PROCESS actual temperature varies more than plus or minus 5 degrees. The only exception to this is when the machine is first turned on, the alarm will not sound until the TO PROCESS/REMOTE actual first reaches setpoint then varies.

3.2.7. SEVEN DAY TIMER (Function Display 7) is a programmable hour timer that will delay the moldscan for the programmed numbers of hours. When a number is programmed into the setpoint, the system will shut down (unless a high temperature condition exists), the timer will start to time out, and the "actual" display will show the current time left to go. After the timer times out, the machine will start up. The maximum time is 500 hours, the minimum is 1.

3.2.8. DIAGNOSTICS (Function Display 8) has a number of subfunctions that are used to diagnose and setup the operation of the control. The subfunctions are:

Access Code (754 for access)
1. Low Heat (1=yes, 0=no)
2. Remote Operation (1=yes, 0=no)
3. To Process Calibration (one more "Level", 973 for access)
4. From Process Calibration (one more "Level", 973 for access)
5. Remote Calibration (one more "Level", 973 for access)
6. Do not use
7. Do not use
8. Machine Stop
9. Manual PID Select
10. Proportional Band
11. Integral Gain
12. Derivative Gain
13. Integral Time
14. Derivative Time

The access code is used to lock out any changes in the diagnostics section unless a number 754 is programmed into the access code.

To select a particular diagnostics sub-function, follow the instructions below:

1. Press the function down key until Function 8 is displayed.
2. Change the setpoint to 754 using the setpoint up or down keys.

3. Press the Function Down key to get down into diagnostics. Three zeros should appear on the setpoint display at this time.

4. Select the desired diagnostics program using the setpoint up and down pushbuttons.

5. Press the function down button to get down into the selected diagnostics program. The current setpoint for the selected program will appear on the "Actual" display.

6. To change the setpoint (displayed on the "Actual" display), use the setpoint up and down keys.

7. To get out of a diagnostics program and into another, press the function up key which returns you to Step 4.

8. To get out of diagnostics, press the Function up key again.

3.2.8.1. The LOW HEAT (1) function selects one heater (50%) or both heaters (100%). If low heat is selected, only one heater at a time will come on. The heaters will alternate; one heat cycle, heater 1 will energize, the next cycle, heater 2 will energize. When LOW HEAT is not selected both heaters will come on together. This is selected by setting a 1 for low heat, or a 0 for full heat, in the actual display.

3.2.8.2. REMOTE OPERATION (2) uses the remote temperature sensor as the primary control function instead of the "to process" sensor. In this mode the "to process" sensor limits the absolute liquid temperature to 250 F. The actual display will read the remote sensor instead of the to process sensor. Remote is selected by setting a 1 for remote operation, or a 0 for local, in the actual display.

3.2.8.3. All of the other "CALIBRATE" functions (3), (4), (5), are used to calibrate the three sensors in software. Each unit has been calibrated at Conair before shipment.

CAUTION:

Only qualified personnel should make these adjustments and at this point it is recommended that when the front cover is removed from the enclosure, a sheet of plexiglas or other suitable insulating material be placed over the bottom 2/3 of the enclosure to prevent accidental contact with live parts which can cause serious or fatal injury.

To calibrate any of the three analog temperature inputs, a 100 ohm platinum RTD simulator is recommended. If a simulator is not available, the following resistance table can be used:

Temperature C	Resistance Ω
0	100.00
50	119.40
100	138.50
150	157.32
200	175.84
250	194.08
300	212.03
350	229.69

1. Disconnect power to the unit.

2. Detach the front panel from the chassis.

3. Disconnect the desired RTD input from the board, and connect the RTD simulator in its place.

4. Replace the front panel with the RTD simulator box at easy access and reconnect power.

5. Turn the unit on and access the diagnostics function as described earlier.

6. Select the desired calibration program: (3) To Process, (4) From Process, (5) Remote, and press the Function Down key. '000' will appear on the setpoint display.

7. Change the setpoint to 973 using the setpoint Up and Down key, and press the Function Down key to run the calibration program.

8. The unit asks for 0 degrees C. by placing 001 for "TO PROCESS", 002 for "FROM PROCESS" or 003 for "REMOTE" on the "Actual" display. Select 0 degrees C. on the RTD simulator and press the alarm silence key to enter the value.

9. After a brief pause the unit will ask for 50 degrees C. by placing 051 for "TO PROCESS", 052 for "FROM PROCESS" or 053 for "REMOTE" on the "Actual" display. Select 50 degrees C. on the RTD simulator and press the alarm silence key to enter this value.

10. The unit will continue asking for temperatures in 50 degree C. increments thru and including 350 degrees C. Repeat the previous steps simulating the temperature asked for on the RTD simulator.

11. After entering a value for 350 degrees C., the "actual" display will then return to all zeros. If at this time it is desired to calibrate another channel, repeat the above procedure.

12. Pressing the Function Up key returns the system to the operate mode.

It is recommended to return to Function 1 when not changing setpoints. This is done by pressing the Function Up key until Function 1 is displayed.

All of these diagnostic functions, except access code, are stored in the non-volatile memory.

The date stored in the nonvolatile memory will have a check sum generated to insure the integrity of the data. If the data has changed, the alarm will sound and the "actual" display will flash "---5" once a second. The machine will not operate in this condition. To enable it to operate, the operator will need to go into diagnostics and set the machine up again. (see Section 4.2.6.)

3.2.8.4. MACHINE STOP (8) locks the unit and prevents anyone from starting it when a "1" is programmed in. To unlock the system, the operator must access the diagnostics and change the MACHINE STOP bit to zero.

3.2.8.5. MANUAL PID SELECT (9)

0 Selects preset PID parameters (normal setting).
1 Selects adjustable PID parameters (Functions 10-14).

NOTE: Refer to a book on PID control tuning before attempting to adjust the PID functions. Set the derivative and integral gains to minimum and adjust the proportional band to 60. Decrease the proportional value until the process becomes unstable (oscillates).

Increase the derivative time and gain to minimize the overshoot in process temperature when the unit is first turned on or when the setpoint is changed.

After the process temperature has stabilized, adjust the integral time and gain until the droop in the process temperature is eliminated.

3.2.8.6. PROPORTIONAL BAND (10)

Adjusts the band where time proportioning of the heat or cool begins (with the integral and derivative set at 0). The normal range is 10 to 50.

3.2.8.7. INTEGRAL GAIN (11)

Adjusts the "GAIN" or influence that the integral has on the control action. The integral function prevents droop in the actual temperature by continuously integrating the error between the average temperature and setpoint. Normal range is 0-20.

3.2.8.8. DERIVATIVE GAIN (12)

Adjust the "GAIN" of the derivative or rate action. This function anticipates what control action to take, in order to minimize overshoot, by measuring the time rate of change of the process temperature. Normal range is 0-10.

3.2.8.9. INTEGRAL TIME (13)

Adjusts the time in between integral samples. Units are in microprocessor "ticks" (600 = 1 minute). Normal range 300-3000.

3.2.8.10. DERIVATIVE TIME

Adjusts the time in between derivative samples. Units are in microprocessor "ticks" (600 = 1 minute). Normal range is 10-300.

3.3. Vent Cycle

All domestic Thermolator Moldscan units go through a 60 second vent cycle on power-up to insure the heater tank is full of liquid. The vent (cool) output will come on for 30 seconds after which the pump comes on and the vent stays on for another 30 seconds. After this period the vent will turn off and the unit will go into normal operation. From then on the vent will come on for two seconds every hour.

The "Manual/Cancel Vent" pushbutton (domestic only) will cancel the vent cycle on start up and turn the vent on while the button is held in normal operation.

4.0. ALARMS

All Thermolator Moldscan units provide alarms and in some cases, safety shutdowns for malfunctions in the temperature control systems. An alarm consists of turning on a 115/230 VAC 50/60 Hz. 1 amp alarm output (can be used for driving a siren or flashing light), and either an alarm LED lighting on the front panel or a message appearing on the "actual" display.

4.1. Alarm LED's

The following illustrates the LED alarms as they appear on the front panel.

PUMP MOTOR OVERLOAD

LOW PUMP PRESSURE
(Export units only)

HIGH TEMPERATURE

LOW PRESSURE SUPPLY

LOW WATER LEVEL
(Export units only)

OUT OF PHASE
(Optional)

4.1.1. Pump Motor Overload: The entire system will shut down if the pump motor overloads.

4.1.2. Low Pump Pressure: This alarm will not appear on domestic units.

4.1.3. High Temperature: A high temperature alarm occurs when the temperature of the liquid in the heating tank goes above a preset value (265 degrees F. on water units). If this alarm occurs, both heaters are shut off and cooling and alarm is turned on. The system will not run again until the temperature drops below the preset value and the power is cycled off and on. This alarm bypasses the microcontroller in case it is malfunctioning.

4.1.4. Low Supply Pressure: If the fluid supply pressure drops below 10 psi, the unit will shut down completely and activate the alarm.

4.1.5. Low Water Level alarm is only used on export models.

4.1.6. Phase: The Thermolator Moldscan units can be supplied with an optional 3-phase rotation protection board to prevent the pump from running backwards. If this alarm occurs on initial start-up, follow the procedure below:

1. Disconnect power
2. Remove front cover.
3. Reverse 2 leads of the 3-phase input
4. Replace front cover
5. Reconnect power

4.2. DISPLAYED ALARMS

4.2.1. The remaining alarms are displayed on the front panel "actual" display. An appropriate alarm number will be flashed once a second on the display and the alarm output will be activated. The following is a list of possible alarms.

"ACTUAL" Display	ALARM
--1	Above setpoint
--2	Below setpoint
--3	To Process Probe Fault
--4	From Process Probe Fault
--5	Remote Probe Fault
--6	Data Error
--7	Hardware Error

4.2.2. ABOVE SETPOINT alarm results when the actual temperature exceeds the alarm band described in Section 3.2.6. "--1" will flash once a second on the "Actual" display, and since this is not a critical error, the unit will continue to operate.

4.2.3. BELOW SETPOINT occurs when the actual temperature goes below the alarm band described in Section 3.2.6. "--2" will flash once a second and the unit will continue to operate.

The two alarms above will not occur on startup. They will only occur after the actual temperature reaches setpoint and then deviates.

4.2.4. TO PROCESS PROBE FAULT can cause serious problems. When this malfunction occurs, the system shuts down and flashes "--3" on the "Actual" display and activates an alarm.

4.2.5. FROM PROCESS PROBE FAULT is not a fatal malfunction and will not shut the system down. This alarm will only be activated when Function 2 (From Process) is displayed.

4.2.6. REMOTE PROBE FAULT will shut down the system and display "--5" on the "Actual" display only when "REMOTE" operation is selected.

All Probe Fault Alarms are a result of bad readings from the respective probes. (Usually an excessively high or low reading caused by a probe malfunction or bad connection)

4.2.7. DATA ERROR is caused by a loss of integrity of the data stored in non-volatile RAM. "--6" will flash once a second on the "Actual" display, the alarm will sound, and the machine will not operate until new setpoints have been entered. The setup data in diagnostics will also have to be checked and possibly changed in order to operate the unit. (see Section III, 2)

4.2.7. HARDWARE ERROR: If "--7" is flashed once a second on the "Actual" display during startup, return the board to Conair at your earliest convenience.

We're Here to Help

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

How to Contact Customer Service

To contact Customer Service personnel, call:

From outside the United States, call: 814-437-6861

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

Before You Call ...

If you do have a problem, please complete the following checklist before calling Conair:

- ❒ Make sure you have all model, serial and parts list numbers for your particular equipment. Service personnel will need this information to assist you.
- ❒ Make sure power is supplied to the equipment.
- ❒ Make sure that all connectors and wires within and between loading control and related components have been installed correctly.
- ❒ Check the troubleshooting guide of this manual for a solution.
- ❒ Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.
- ❒ Check that the equipment has been operated as described in this manual.
- ❒ Check accompanying schematic drawings for information on special considerations.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Departments for a nominal fee.

EQUIPMENT GUARANTEE

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair's guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

PERFORMANCE WARRANTY

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated and maintained in the recommended manner as outlined in our quotation or specifications.

Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices or improper operation.)
- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.
- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair's Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid.

Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

WARRANTY LIMITATIONS

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.