ALCP2004 Loop Control Panel

Microtemp Controller II

Installation, Operation and Maintenance Manual

TABLE OF CONTENTS

MICROTEMP CONTROLLER II

Introduction

The Microtemp Controller II (MT II) is a microprocessor based control that operates the main and standby circulating pump to control cooling, heating, and flow in a closed loop water source heat pump system.

The controller accomplishes this by controlling individual stages (outputs) of cooling and heating equipment with programmable set points. By making these set points programmable, various weather conditions and equipment sizes are easily accommodated. The MT II also monitors water flow in the loop. The MT II automatically activated a standby circulating pump upon flow lost.

The control also allows the loop pump to be turned "off" on a scheduled basis. An ambient temperature sensor and pump override input provide an override to the schedule when either the outside temperature of the building temperature falls below a specified set point, or by activation of the pump override input during scheduled "off" times.

Throughout this manual the words Microtemp Controller II will be used in the abbreviated form MT II.

Specifications

Electrical:

Input Voltage: 120 VAC +/- 10% @ 60Hz

Power: 4 Watts Max.

Operating Conditions:

Temperature: 45 to 110°F

Humidity: 0 to 90% non-condensing

Dimensions: 16.5"H x 15"W x 6.5"D

Control Outputs: 24 to 240 VAC @ 2.0 Amps Max. for each Output

Flow and Pump Override Input: DRY CONTACT ONLY

Temperature Inputs: 5 VDC @ 600 microAmps

Range: 0 to 130°F

Accuracy: +/- .5°F

Installation

INSTALLATION MUST BE DONE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE AND ALL APPLICABLE LOCAL CODES.

⚠ WARNING

TO PREVENT DAMAGE TO PERSONNEL AND EQUIPMENT, DISCONNECT POWER BEFORE INSTALLING THE CONTROLLER.

INSTALLATION MUST BE DONE BY QUALIFIED PERSONNEL.

THE PANEL MUST HAVE A SOLID EARTH GROUND.

⚠ WARNING

THE PANEL MUST NOT BE EXPOSED TO RAIN OR CONDENSING HUMIDITY. IF THE PANEL WILL BE EXPOSED TO MOISTURE, INSTALL IT IN A WATER TIGHT ENCLOSURE (RISK OF ELECTROCUTION AND EQUIPMENT DAMAGE).

⚠ WARNING

TO PREVENT STATIC DAMAGE TO THE PANEL, INSTALLERS AND USERS SHOULD GROUND THEMSELVES PRIOR TO TOUCHING THE PANEL.

⚠ WARNING

ALL LOW VOLTAGE WIRING (TEMPERATURE SENSORS, FLOW SWITCH, AND PUMP OVERRIDE) MUST BE IN A SEPARATE CONDUIT AND AWAY FROM 120 VAC WIRING.

⚠ WARNING

PLACE POWER FOR CONTROLLER (120 VAC) IN A SEPARATE CONDUIT AND ON A SEPARATE BRANCH CIRCUIT.

1) Unpack and inspect the MT II

Installers should ground themselves to prevent static damage to the control.

While inspecting check the control for:

A) Damage to the panel: if there is damage, notify the carrier immediately.

B) All items on the packing list are in the box.

C) The Plexiglas display windows are firmly attached to the control cover.

D) The electronic control and output boards are firmly attached to the panel.

2) Installing the Controller

Install the MT II on a wall or mounting surface so that the panel can be wired with electrical conduit. The display on the panel should be approx. 60" above the floor (eye level) for good display viewing. (See fig. 1)

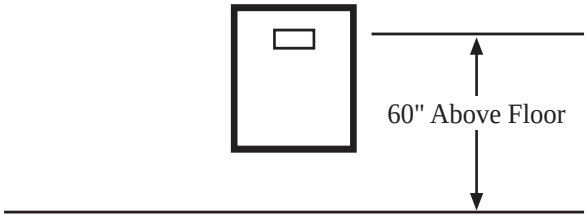


Figure 1

3) Connect the low voltage wiring.

⚠ WARNING

ALL LOW VOLTAGE WIRING (TEMPERATURE SENSORS, FLOW SWITCH, AND PUMP OVERRIDE) MUST BE IN A SEPARATE CONDUIT AND AWAY FROM 120 VAC WIRING.

Temperature Sensors:

The MT II utilizes two temperature sensors, one for water loop temp. and another for ambient temp. (see fig. 2). Each sensor has three wires that connect into the MT II. A well is provided for installing the water sensors into the system.

The connections for the sensors, flow switch, and pump

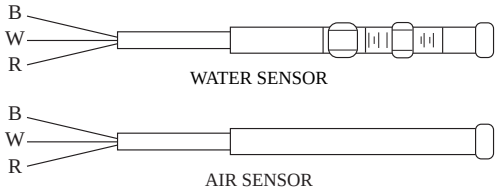


Figure 2

override are located inside the MT II panel (See fig. 3).

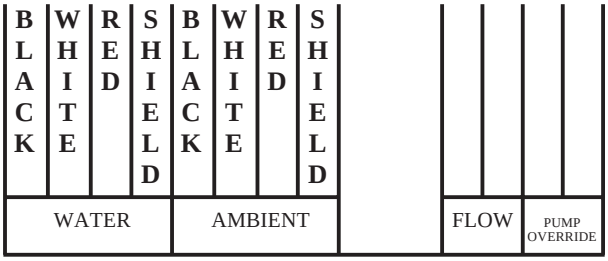


Figure 3

A sensor well comes with the MT II. Installation of the well provides a convenient method for sensor placement and service.

The sensors are supplied with 60' of cable. If shorter cables are desired, cut the cable and re-insert into the control. Figure 3a illustrates the wiring connections into the terminal block.

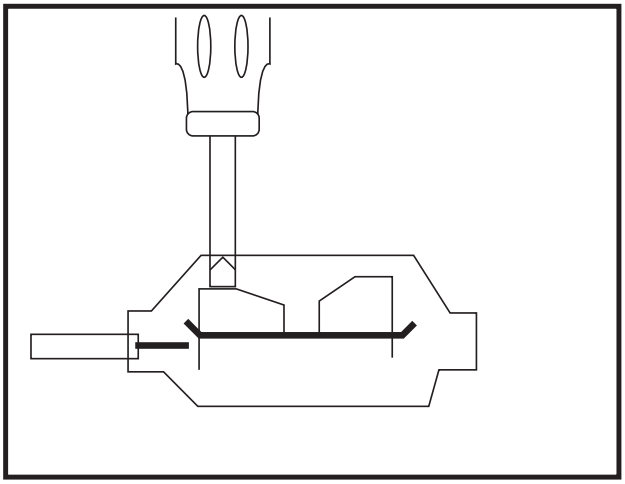


Figure 3a

4) MT II Outputs:

The MT II system consists of 16 or 24 solid state relays. Figure 4 shows the layout of the output boards.

Of the 16, or 24 solid state outputs located inside the panel, 4 are dedicated. They are: **Alarm, System Shutdown, Pump 1, and Pump 2**. There are also 12, or 20 undedicated outputs that can be wired to control system requirements. Figure 4 shows the layout of the output boards.

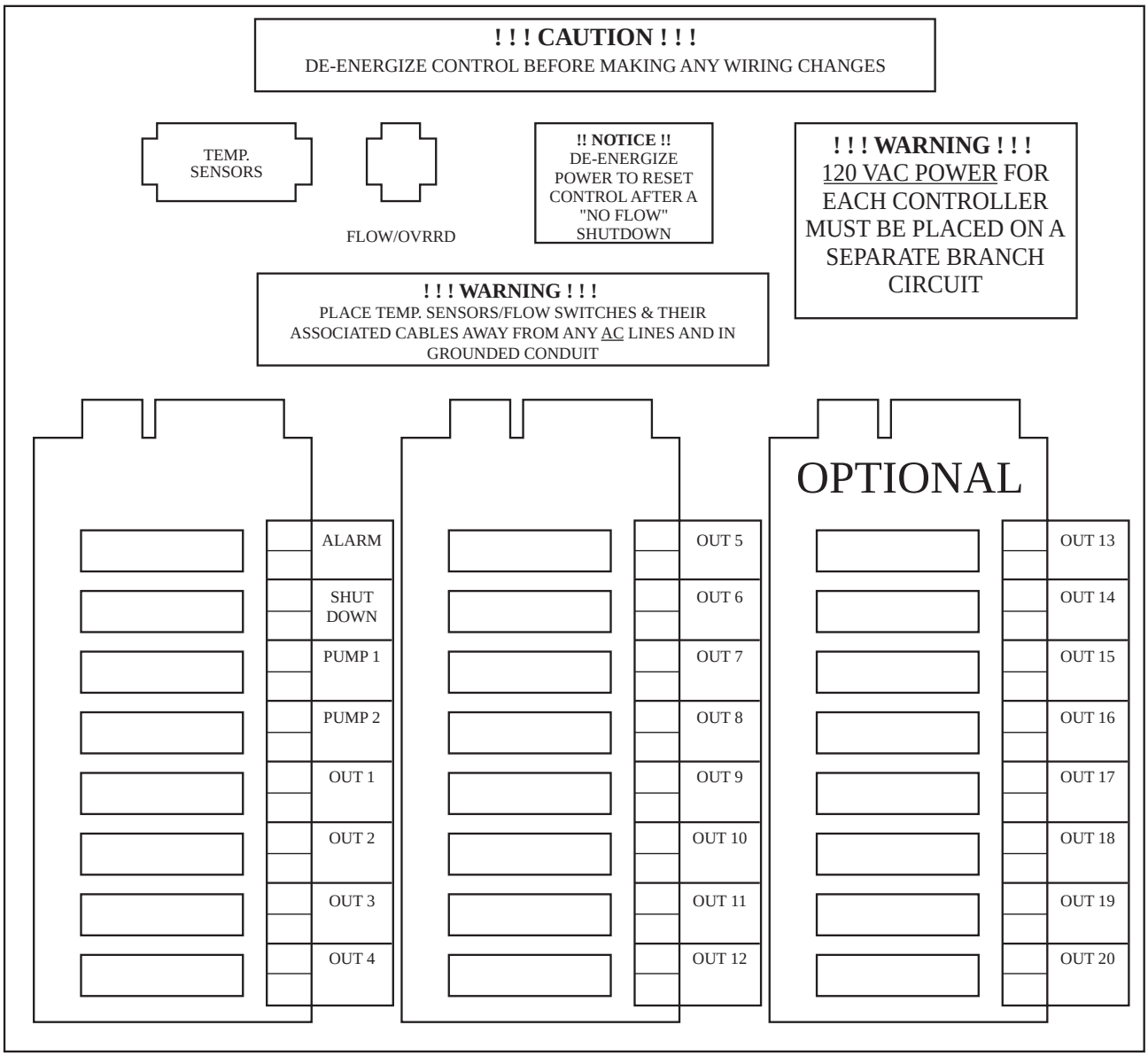


Figure 4

Figure 5 is an example of a two pump system with two stages of heating, and two stages of cooling. Since all outputs are fully programmable, any output (with the exception of the dedicated ones) can be used for heating or cooling. In this example Output 1 and Output 2 are used to operate boilers. Output 3 and Output 4 are controlling cooling towers.

The "Alarm" output can be connected to an external alarm that activates "High Temperature, Low Temperature, or No Flow" conditions.

When the Loop exceeds programmed safety limits the "Shutdown" output activates. A possible use for this output could be an automatic phone dialer.

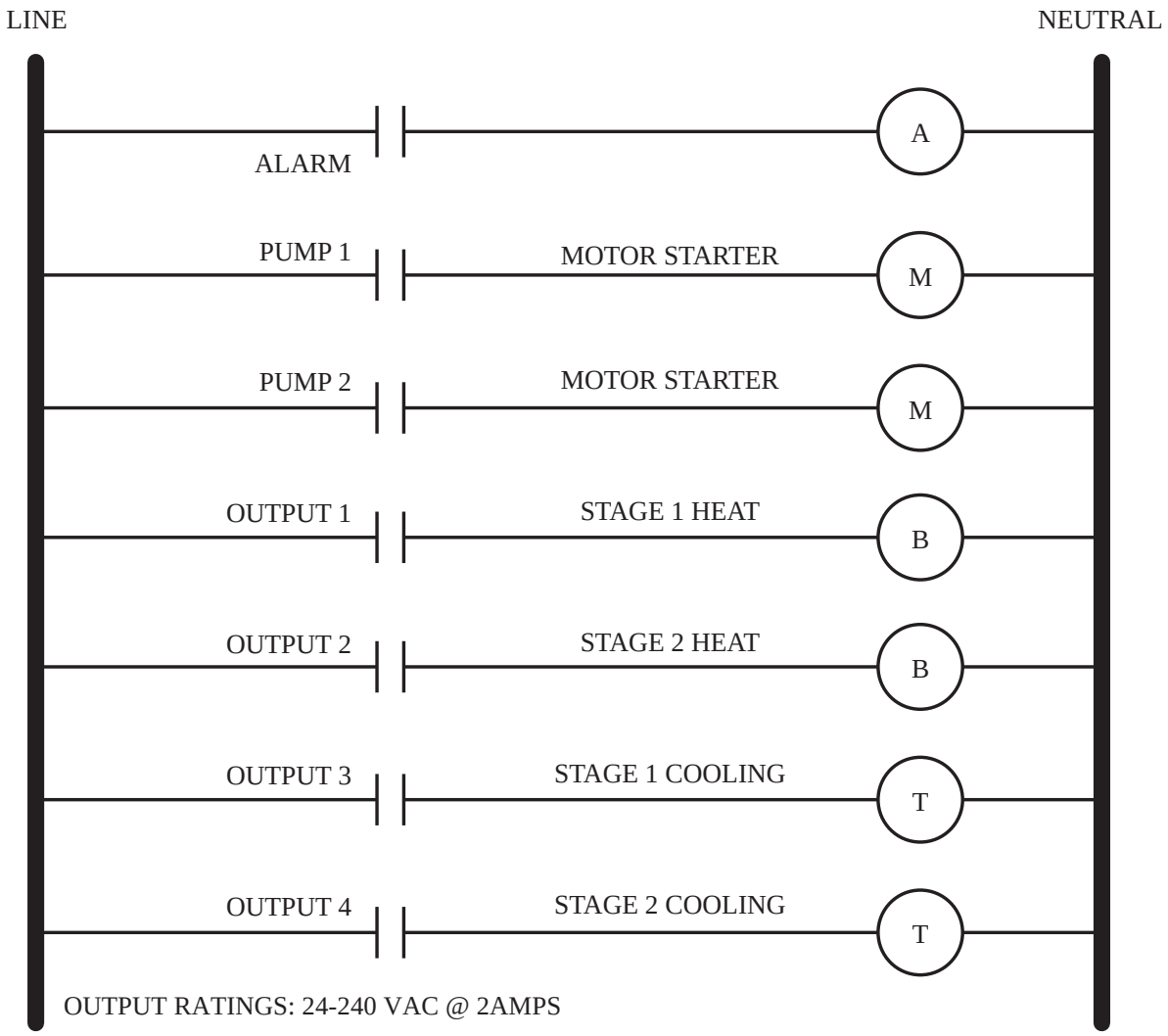


Figure 5

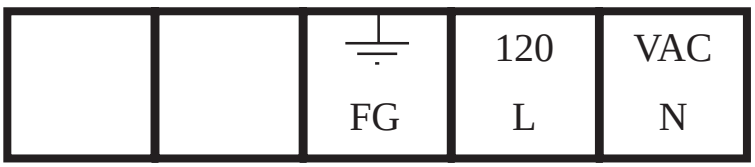
5) Power Wiring Connections:

Power for the MT II is 120 VAC @ 60Hz. Power MUST be wired on a SEPARATE CIRCUIT. Connecting other devices in parallel with the MT II power may introduce electrical interference or noise to the control.

Use Figure 6 for Power Wiring Connections located inside the panel.

Make sure that either the temperature sensors or the simulator are connected to the control before applying 120 VAC.

6) Energize Power to Control:
   A) System status appears on the display.
   B) Power light and Pump (1 or 2) light illuminates.
   C) Pump (1 or 2) output activates.



L - LINE
N - NEUTRAL
FG - FIELD GROUND

Figure 6

Operation

MT II controls heating & cooling stages to maintain the loop water temperature. Each stage has programmable "on" and "off" temperature set points allowing control to be field modified to suit each installation.

When the "on" set point is greater than the "off" set point, the stage is a cooling stage (i.e. cooling tower). A cooling stage is activated when the Loop temp. rises above the "on" set point (88), and de-activates when the Loop temp. falls below the "off" set point (85).

When the "on" set point is less than the "off" set point, the stage is a heating stage (i.e. boiler). A heating stage is activated when the Loop temp. falls below the "on" set point (62) and de-activates when the Loop temp. rises above the "off" set point (65).

Programming the stage "on" and "off" temperature settings to 99 allows the stage to operate with respect to time. This function operates the stage by "time" only.

The MT II provides automatic switch over to a standby pump. The lead pump is programmable.

The control sequence for a "No Flow" condition is as follows:

a) After 1 sec. "NO FL" appears on the display.

b) After 10 sec. the control switches to the standby pump.

c) If flow is restored, the standby pump remains active and "FLOW" reappears on the display. If the "No Flow" continues for another 10 sec. after the standby pump activates, then the "Alarm" light, and output activate, along with the "System Shutdown" light and output. NO FLOW SHUT-DOWN appears on the display.

MT II also includes a 24 hour time clock that allows the system pumps, and outputs to be turned off during unoccupied periods. An ambient sensor and pump override input are provided to override the scheduled off time. The override insures pump operation during night setback conditions to prevent freeze ups.

NOTE: If an output is programmed to operate on "time" only, it will not turn off when the pumps do. The output will operate on its own time schedule.

MT II displays alarms and shutdowns for "HIGH" and "LOW" loop water temperature conditions. A warning causes the "Alarm" light and output to activate. Programming different set points for warnings and shutdowns allows a warning to be given before a shutdown occurs.

Modes of Operation:

MT II has two modes of operation.

1) Run Mode

2) Program Mode

NOTE: TO ENTER PROGRAMMING MODE SEE PG. 8

Run Mode:

The run mode displays the current system status.

"WATER=77 OA=67"
"FLOW TUE 15:33"

Run mode display

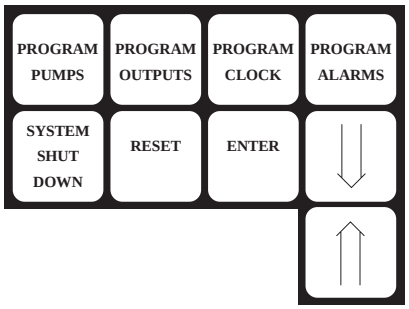
a) Water Loop = **77°F**
b) Ambient = **67°F**
c) System has **Flow**
d) The day and time - **Tuesday 3:33 pm (Mil. 15:33)**

Each output corresponds with a light on the front cover of the MT II. When a light for a particular output is "on" the relay activates also.

Program Mode:

Use the Program Mode to review or alter system status.

Key List



Programming

The following list describes each programming key:

ENTER — Use to access the Program Mode and enter data into memory.

⇧ ⇩ — Used to change data during Program Mode. The "UP" arrow means increment and the "DOWN" arrow means decrement. May be single stepped or changed rapidly by keeping pressure on key for approx. 2 seconds.

RESET — Used to return to the Run Mode from Program of system shutdown due to "High" or "Low" temperature. ** SEE NOTE 1**

SYSTEM SHUT DOWN — Used to shut down the control without de-energizing.

PROGRAM PUMPS — Used to program pump operation, ambient override, and lock code.

PROGRAM OUTPUTS — Used to program outputs 1-20.

PROGRAM CLOCK — Used to program year, month, day, day of the week (1-7), hour, and minute.

PROGRAM ALARMS — Used to program low temp., high temp., low temp. shutdown, and high temp. shutdown.

Programming Information

Lock Code	A 4 digit code entered into the control that allows access for programming. The default lock code is 5555.
Default Code	A 4 digit access code that allows the user to completely clear the MT II memory. The code is 2715.
NOTE 1	To reset the control from a "NO FLOW" shutdown, power must be de-energized and then restarted.

Entering the Program Mode

The following programming examples will familarize the operator with the MT II.

Example #1: Entering the Program Mode

Key Pressed	Display
ENTER	LOCK CODE 5555 **
ENTER	LOCK CODE 5555 **
ENTER	PROGRAM MODE

Pumps, ouputs, times, alarms, and settings may be entered once in the program mode.

NOTE Unless the lock code is changed, 5555 allows access to the program mode.

Example #2: Programming output #5 to activate cooling at 75°F and de-activate at 73°F (remember to enter the **Program Mode** first).

Key	**Display**	**Comment**
PROGRAM OUTPUTS	Program Out 01	
⇑	Program Out 02	Increment output
⇑	Program Out 03	Increment output
⇑	Program Out 04	Increment output
⇑	Program Out 05	Increment output
ENTER	Program Out 05 Temp On 060	Current temp. "on" setting
Keep constant pressure on ⇑ Key		
after 2 seconds the numbers will change rapidly	Program Out 05 Temp On 075	Setting changed to 75°F
ENTER	Program Out 05 Temp Off 062	Current "off" temp. setting
same procedure used in Temp On	Program Out 05 Temp Off 073	Setting changed to 73°F
ENTER	Program Out 05	Ready to program another output
ENTER	Program mode	Ready to program another funcation
RESET	WATER=XX OA=XX FLOW DAY TIME	Back to Run mode

Example #3: Programming output #6 to activate heating at 76°F and de-activate at 80°F (remember to enter the **Program Mode** first).

Key	**Display**	**Comment**
PROGRAM OUTPUTS	Program Out 01	
⇑	Program Out 02	Increment output
⇑	Program Out 03	Increment output
⇑	Program Out 04	Increment output
⇑	Program Out 05	Increment output
⇑	Program Out 06	Increment output
ENTER	Program Out 06 Temp On 060	
Keep constant pressure on ⇑ Key		
after 2 seconds the numbers will change rapidly	Program Out 06 Temp On 076	Setting changed to 76°F
ENTER	Program Out 06 Temp Off 062	Current "off" temp. setting
same procedure used in Temp On	Program out 06 Temp Off 080	Setting changed to 80°F
ENTER	Program Out 06	Ready to program another output
RESET	Program mode	Ready to program another function
RESET	WATER=XX OA=XX FLOW DAY TIME	Back to Run mode

Example #4: Programming output #3 to activate at 3:30am and de-activate at 5:30pm Monday-Friday (remember to enter the **Program Mode** first).

Key	**Display**	**Comment**
PROGRAM OUTPUTS	Program Out 01	
⇑	Program Out 02	Increment output
⇑	Program Out 03	Increment output
ENTER	Program Out 03 Temp On 065	Current temp. "on" setting
Keep constant pressure on ⇑ Key after 2 seconds the numbers will change rapidly upward	Program Out 03	Setting changed to 099
ENTER	Program Out 03 Temp Off 067	Current temp. "off" setting
Same procedure used in Temp On	Program Out 03 Temp Off 099	Setting changed to 099
ENTER	03 TIME ON 12:00 MON-FRI **	Current time setting
Use ⇑ ⇓ Keys to change hour to 03	03 TIME ON 03:00 MON-FRI **	
ENTER	03 TIME ON 03:00 MON-FRI **	
Use ⇑ ⇓ Keys to change min. to 30	03 TIME ON 03:30 MON-FRI **	Time On 3:30am

Key	Display	Comment
ENTER	03 TIME OFF 12:00 MON-FRI **	Current time setting
Press ⇧ ⇩ Keys until 17 appears	03 TIME OFF 17:00 MON-FRI **	
ENTER	03 TIME OFF 17:00 MON-FRI **	
Press ⇧ ⇩ Keys until 30 appears	03 TIME OFF 17:30 **	Setting changed to 17:30 (5:30pm mil)
ENTER	03 TIME ON12:00 SATURDAY **	Only on "time" MON-FRI
RESET	PROGRAM MODE	
RESET	WATER=XXX OA=XXX FLOW DAY TIME	Return to run mode

Example #5: Programming Pump #1 for continuous operation.

Key	Display	Comment
PROGRAM PUMPS	PUMP ON 00:00 MON-FRI **	Current time setting
Press ⇧ ⇩ Keys until hour = 24	PUMP ON 24:00 MON-FRI **	Pump on set to 24:00 (continuous operation Mon-Fri)
ENTER	PUMP ON 24:00 MON-FRI **	
ENTER	PUMP OFF 12:00 MON-FRI **	When using 24:00 "On" time an "Off" time isn't needed

ENTER	PUMP OFF 12:00 MON-FRI **	
ENTER	PUMP ON 12:00 SATURDAY **	
Press ⇧ ⇩ Keys until hour = 24	PUMP ON 24:00 SATURDAY **	Saturday cont. operation
ENTER	PUMP ON 24:00 SATURDAY **	
ENTER	PUMP OFF 12:00 SATURDAY **	
ENTER	PUMP OFF 12:00 SATURDAY **	
ENTER	PUMP ON 12:00 SUNDAY **	
Press ⇧ ⇩ Keys until hour = 24	PUMP ON 24:00 SUNDAY **	Sunday cont. operation
ENTER	PUMP ON 24:00 SUNDAY **	
ENTER	PUMP OFF 12:00 SUNDAY **	
ENTER	PUMP OFF 12:00 SUNDAY **	
ENTER	OUTSIDE AIR TEMP OVERRIDE XX	"XX" = Current setting
Press ⇧ ⇩ Keys to alter setting	OUTSIDE AIR TEMP OVERRIDE NN	"NN" = New setting
ENTER	AUTO CYCLE = 0 1=ON 0=OFF	

Press ⇧ ⇩ Keys
to change from 0 to 1

ENTER

LEAD PUMP
1

Press ⇧ ⇩ Keys
to change from 1 to 2

ENTER

LOCK CODE 5555
**

Press ⇧ ⇩ Keys
to alter digits 1&2

ENTER

LOCK CODE 5555
**

Press ⇧ ⇩ Keys
to alter digits 3&4

ENTER

PROGRAM
MODE

RESET

WATER=XXX OA=XXX
FLOW DAY TIME

Back to Run mode

Example #6: Programming the clock (don't forget the lock code)

Key	**Display**	**Comment**
PROGRAM CLOCK	PROGRAM CLOCK YEAR XX	"XX" = Current year setting
Press ⇧ ⇩ Keys to change year	PROGRAM CLOCK YEAR 95	

ENTER	PROGRAM CLOCK MONTH XX	"XX" = Current month setting
Press ⇧ ⇩ Keys to change month	PROGRAM CLOCK MONTH NN	"NN" = New month setting
ENTER	PROGRAM CLOCK DATE XX	"XX" = Current day setting
Press ⇧ ⇩ Keys to change day	PROGRAM CLOCK DATE NN	"NN" = New day setting
ENTER	PROG CLOCK DAY SUN=1, SAT=7 X	"X" = Current setting
Press ⇧ ⇩ Keys to change setting	PROG CLOCK DAY SUN=1, SAT=7 N	"N" = New setting
ENTER	PROGRAM CLOCK HOUR XX	"XX" = Current hour setting
Press ⇧ ⇩ Keys to change hour	PROGRAM CLOCK HOUR XX	"NN" = New hour setting
ENTER	PROGRAM CLOCK MINUTES XX	"XX" = Current minutes setting
Press ⇧ ⇩ Keys to change minutes	PROGRAM CLOCK MINUTES XX	"XX" = New minutes setting
ENTER	PROGRAM MODE	
RESET	WATER=XXX OA=XXX FLOW DAY TIME	Return to run mode

Example #7: Programming Alarms (remember lock code)

Key	Display	Comment
ENTER	PROGRAM MODE	
PROGRAM ALARMS	LOW TEMP ALARM XX	"XX" = Current setting
Press ⇑ ⇓ Keys to change setting	LOW TEMP ALARM NN	"NN" = New setting
ENTER	HIGH TEMP ALARM XX	"XX"=Current setting
Press ⇑ ⇓ Keys to change setting	HIGH TEMP ALARM NN	"NN" = New setting
ENTER	LOW TEMP SHUTDOWN XX	"XX"=Current setting
Press ⇑ ⇓ Keys to change setting	LOW TEMP SHUTDOWN NN	"NN" = New setting
ENTER	HIGH TEMP SHUTDOWN XX	"XX"=Current setting
Press ⇑ ⇓ Keys to change setting	HIGH TEMP SHUTDOWN NN	"NN" = New setting
ENTER	PROGRAM MODE	
RESET	WATER=XXX OA=XXX FLOW DAY TIME	Return to run mode

Example #8: Programming a System Shutdown (don't forget the lock code)

Key	Display	Comment
ENTER	PROGRAM MODE	
SYSTEM SHUT DOWN	SYSTEM SHUTDOWN	Control is shut down until reset

APPENDIX A
SIMULATOR

The Simulator allows the user to easily check the operation of the MT II. We recommend that a simulator remain on site for testing purposes.

To use the Simulator:

1) De-energize Controller.

2) Disconnect temperature sensors and flow switch inputs.

3) Connect simulator (use Fig. A1).

4) Energize controller.

Rotating the "WATER TEMP" knob raises and lowers the water temperature to check operation of the program. To check a "No Flow" condition, switch the simulator to NO FLOW. The MT II runs through a NO FLOW sequence.

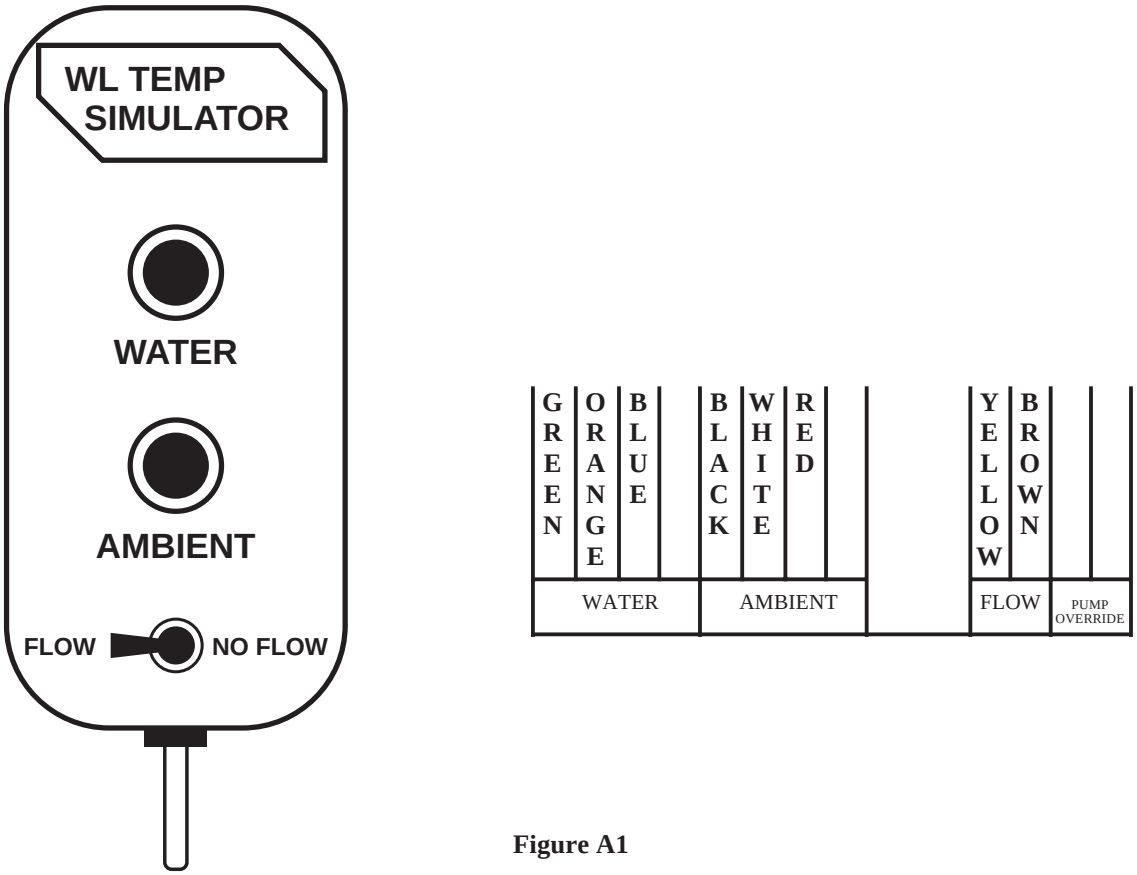


Figure A1

APPENDIX B
TROUBLESHOOTING

POWER LIGHT OUT

a) Check fuse: FU1, replace if necessary
b) Check power cable from power supply to control board

If Power Light remains "out" Call GC Controls for service information.

TEMPERATURE SENSOR TESTING:

The temperature sensor can be easily tested in the field using a 9 volt battery and a digital volt meter.

SET METER TO DC VOLTS.

CONNECTIONS:

BLK SENSOR WIRE - BATTERY "-"
WHT SENSOR WIRE - METER VOLTS
RED SENSOR WIRE - BATTERY "+"
METER COMMON - BATTERY "-"

The voltage display on the meter is the actual temperature (ie. .750 volts = 75°F)

NOTE: If you should have any questions regarding the MT II, GC Controls is just a phone call away (607-656-4117).

APPENDIX C

PUMP OVERRIDE INPUT

By connecting thermostats (or switches) in parallel and wiring into the "pump override input" located inside the MT II, the system can be by-passed during pump time "off" conditions. Fig. C1 illustrates the connection to the control. If any set of contacts "close", the loop system activates. When the contacts "re-open", the system remains active for 30 minutes then de-energizes.

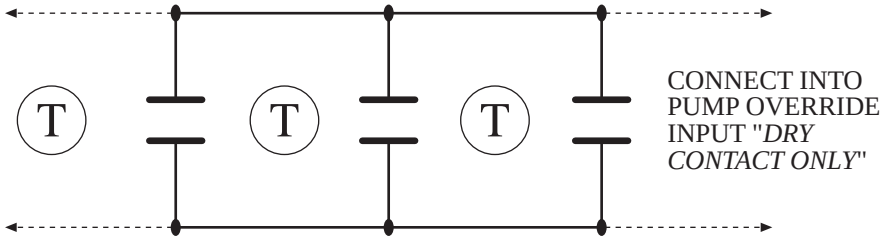


Figure C1

DATA SHEET

BUILDING ______________________ PAGE ______ OF _______
AND
LOCATION ______________________
____
____

OUTPUT# __________ TEMP ON __________ TEMP OFF __________ TIME ON __________ TIME OFF ________

COMMENTS ____
____

OUTPUT# __________ TEMP ON __________ TEMP OFF __________ TIME ON __________ TIME OFF ________

COMMENTS ____
____

OUTPUT# __________ TEMP ON __________ TEMP OFF __________ TIME ON __________ TIME OFF ________

COMMENTS ____
____

OUTPUT# __________ TEMP ON __________ TEMP OFF __________ TIME ON __________ TIME OFF ________

COMMENTS ____
____

OUTPUT# __________ TEMP ON __________ TEMP OFF __________ TIME ON __________ TIME OFF ________

COMMENTS ____
____

OUTPUT# __________ TEMP ON __________ TEMP OFF __________ TIME ON __________ TIME OFF ________

COMMENTS ____
____

OUTPUT# __________ TEMP ON __________ TEMP OFF __________ TIME ON __________ TIME OFF ________

COMMENTS ____
____

MICROTEMP CONTROLLER II
DATA SHEET

PAGE _____ OF _____

TEMPERATURE ALARM SETTINGS:

LOW WARNING _____ LOW SHUTDOWN _____

HIGH WARNING _____ HIGH SHUTDOWN _____

COMMENTS: _____

_____

_____

PUMP TIMEOUT:

TIME OFF _____ TIME ON _____

COMMENTS: _____

_____

_____

AMBIENT OVERRIDE:

TEMP ON _____ TEMP OFF _____

COMMENTS: _____

_____

_____

LEAD PUMP # _____ AUTO CYCLE _____

COMMENTS: _____

_____

_____

7300 S.W. 44th Street
Oklahoma City, OK 73179
Phone: 405-745-6000
Fax: 405-745-6058
www.climatemaster.com

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Rev.: 1/99