

CHILLER CONTROL MODEL 200

INSTALLATION AND OPERATION MANUAL

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MUELLER[®]
REFRIGERATION PRODUCTS

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SECTION 1.0 - INTRODUCTION

1.1 General

The Mueller® Model 200 chiller control is designed to provide control of the chilled water temperature, up to four stages of refrigeration, and up to two circulation pumps. This manual provides the basic information necessary to install, start-up, and operate this chiller control. The information supplied in this manual must be followed to prevent damage to the equipment.

1.2 Description of the Equipment

The Mueller Model 200 chiller control is designed to control chilled water temperature. The chiller control will accommodate 208/60/3, 230/60/3, or 460/60/3 electrical input. Outputs to control chiller water temperature are 24 volt to operate up to four stages of refrigeration. It will also control the operation of a chiller circulation pump (up to 5 hp), a process circulation pump (up to 5 hp), and optional water level control and fill solenoid valve.

1.3 Electrical Components

All wiring must be performed in compliance with the National Electric Code (NEC) and local codes.

The control box contains fuses and circulation pump overloads for system protection. Fuse and overload failures require troubleshooting to determine the cause of failure and replacement with the same fuses.

The electronic temperature control can be set for temperature control of chilled water and temperature display in Fahrenheit or Celsius. Programming is described in Section 3.0.

SECTION 2.0 - INSTALLATION

2.1 Inspection

Because it is possible for equipment to be damaged during shipment, we recommend that you make a thorough inspection of all equipment as soon as it is received. Carefully inspect equipment for hidden damage.

2.2 Safety

A qualified electrician in accordance with local and NEC regulations must perform all electrical connections.

2.3 Chiller Control Location

The chiller control should be wall mounted in a location close to the chiller and circulation pump(s), free from direct water contact, and accessible for operation and service.

Connect all field wiring in accordance to the wiring diagram in Section 4.1.

2.4 Temperature Sensor Installation

A temperature sensor is provided and is 5 feet in length. It is important that the temperature sensor wires are properly connected to the temperature control with the 25 feet of shield cable provided.

The temperature sensor should be strapped to the bottom side of the chiller inlet pipe, between the solenoid valve and the chiller. The sensor needs to be firmly attached to the pipe, but caution should be used to not crush the sensor. After attaching the sensor it must be insulated to protect it from reading ambient temperatures.

2.5 Electrical Requirements and Field Wiring Instructions (208-240/60/3 Models)



1. Connect a fused disconnect providing a 208-240/60/3 power supply to terminals L1, L2, and L3 in the electrical enclosure.
2. Ensure that the primary connections on the transformer are connected for the proper supply voltage, connections H1 and H2 for 208 VAC or H1 and H3 for 240 VAC supplies.
3. Connect the 24 VAC control circuit wiring for each condensing unit to the corresponding terminals S1-S4 located in the electrical enclosure.
4. Check and adjust magnetic starter overload amperage setting according to Table 1.
5. Ensure that 1-amp fuses are in place for the primary supply of the transformer.
6. Ensure that the circulation pump is wired for 208-240 VAC. (Check the circulation pump for proper rotation after the reservoir has been filled with liquid. Do not operate the pump dry.)
7. Inspect and tighten all factory and field wiring connections before applying power.

2.6 Electrical Requirements and Field Wiring Instructions (460/60/3 Models)



1. Connect a fused disconnect providing a 460/60/3 power supply to terminals L1, L2, and L3 in the electrical enclosure.
2. Ensure that the primary connections on the transformer are connected for the proper supply voltage, connections H1 and H6 for 460 VAC supplies.
3. Connect the 24 VAC control circuit wiring for each condensing unit to the corresponding terminals S1-S4 located in the electrical enclosure.
4. Check and adjust magnetic starter overload amperage setting according to Table 2.
5. Ensure that 0.5-amp fuses are in place for the primary supply of the transformer.
6. Ensure that the circulation pump is wired for 460 VAC. (Check the circulation pump for proper rotation after the reservoir has been filled with liquid. Do not operate the pump dry.)
7. Inspect and tighten all factory and field wiring connections before applying power.

Table 1 - 240 VAC, 3 Phase

Motor HP	Amp Draw Pump Motor	Amp Draw Transformer	Amp Range	Fuse Part No.	Fuse Amperage	Overload Part No.
0.5	2.0	.31	1.6-2.5	507785	1 AMP	9842339
.75	2.8	.31	2.5-4.0	507785	1 AMP	9842342
1.0	3.6	.31	2.5-4.0	507785	1 AMP	9842342
1.5	5.2	.31	4.0-6.3	507785	1 AMP	9842362
2.0	6.8	.31	6.3-9.0	507785	1 AMP	9842343
3.0	9.6	.31	9.0-12.5	507785	1 AMP	9842382

Table 2 - 480 VAC, 3 Phase

Motor HP	Amp Draw Pump Motor	Amp Draw Transformer	Amp Range	Fuse Part No.	Fuse Amperage	Overload Part No.
0.5	1.0	.16	1.0-1.6	9820107	.5 AMP	9842757
.75	1.4	.16	1.0-1.6	9820107	.5 AMP	9842757
1.0	1.8	.16	1.6-2.5	9820107	.5 AMP	9842339
1.5	2.6	.16	2.5-4.0	9820107	.5 AMP	9842342
2.0	3.4	.16	2.5-4.0	9820107	.5 AMP	9842342
3.0	4.8	.16	4.0-6.3	9820107	.5 AMP	9842362
5.0	7.6	.16	6.3-9.0	9820107	.5 AMP	9842343

2.7 Condensing Unit Low-Voltage Circuit Wiring

To ensure proper operation of the temperature control staging connect the condensing unit control circuits as follows:

- a. Connect condensing unit number one to the control circuit S1, terminal numbers 2 and 6.
- b. Connect condensing unit number two to the control circuit S2, terminal numbers 2 and 7.
- c. Connect condensing unit number three to the control circuit S3, terminal numbers 2 and 8.
- d. Connect condensing unit number four to the control circuit S4, terminal numbers 2 and 9.

2.8 Installation of Optional Flow Switch

The purpose of a flow switch is to disengage the condensing units from operation should a loss of chilled solution occur to the evaporator. This prevents damage to the condensing units due to the lack of heat transfer through the evaporator and liquid slugging of the compressor.

If a flow switch is used, it should be a normally open switch and installed in the chiller solution circulation loop.

Remove the jumper between terminals 4 and 5 in the electrical enclosure and wire the flow switch in series between terminals 4 and 5.

SECTION 3.0 - ELECTRONIC TEMPERATURE CONTROL PROGRAMMING

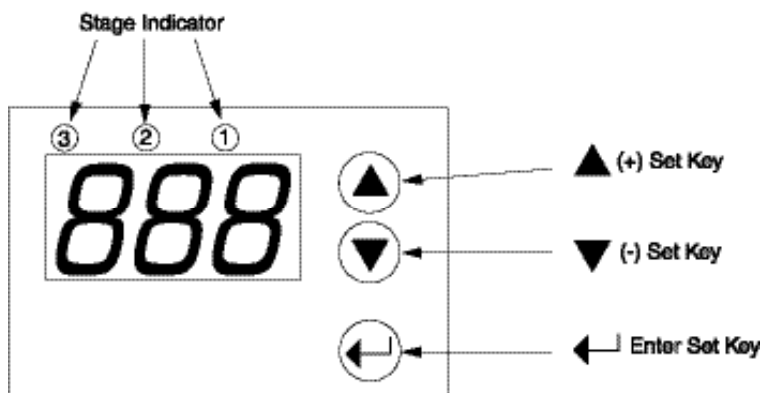
3.1 Power On Sequence of Operation

- A. When the selector switch is in the “OFF” (left) position:
1. Power is supplied to the temperature controller and a temperature is displayed. Setpoints may be changed any time power is supplied to the temperature controller. The temperature displayed may not be a true reading of the tank temperature if the circulation pump is not running.
 2. All other functions of the chiller control are disabled.
- B. When the selector switch is in the “ON” (center) position:
1. Power is supplied to the temperature controller and a temperature is displayed. Setpoints may be changed any time power is supplied to the temperature controller. The temperature displayed may not be a true reading of the tank temperature if the circulation pump is not running.
 2. The chiller circulation pump is on. Make sure the system has adequate solution to prevent the pump from running dry.
 3. The temperature controller can turn the condensing unit(s) on if the solution temperature is above the setpoint.
- C. When the selector switch is in the “chiller/process pump” (right) position:
1. All of the functions of the chiller loop (see Section B2 above) remain.
 2. The process pump is on.

3.2 Error Messages

	CAUSE	OUTPUTS
F1	Sensor Failure	All outputs OFF
HI	Sensor > High Alarm	Alarm message displayed outputs ON or OFF according to setpoint
LO	Sensor < Low Alarm	Alarm message displayed output ON or OFF according to setpoint
EE	Program Failure	All outputs OFF

Figure 1 - Temperature Control



3.3 Temperature Control Lock and Unlock Features

The temperature control is equipped with a locking feature to prevent unauthorized adjustments to the calibration, temperature setpoints, and unit of measure.

LOCK—To lock the temperature control, press and hold the $\leftarrow + \blacktriangle + \blacktriangledown$ keys in sequence. The display will show a series of dashes “- - -.” Continue to hold the three keys (approximately 10 seconds) until the display changes from a series of dashes “- - -” to the current sensor probe temperature. If the series of dashes “- - -” are not displayed within 2-3 seconds after initiating this key pad sequence, release the three keys and repeat the lock process from the beginning (see note below).

UNLOCK—To unlock the temperature control, press and hold the $\leftarrow + \blacktriangle + \blacktriangledown$ keys in sequence. The display will show a series of dashes “- - -.” Continue to hold the three keys (approximately 10 seconds) until the display changes from a series of dashes “- - -” to the current sensor probe temperature. If the series of dashes “- - -” are not displayed within 2-3 seconds after initiating this key pad sequence, release the three keys and repeat the lock process from the beginning (see note below).

Note: The three keys **must be pressed and held in sequence** —*not simultaneously*. The simplest method to initiate the three key “Lock/Unlock” sequence is by pressing and holding the \leftarrow key with the left thumb, then the \blacktriangle key with the right thumb while rolling the pad of the right thumb downward to press and hold the \blacktriangledown key.

LOCK VALIDATION —To validate that the controller is in the locked position, press and hold the key until the setpoint temperature is displayed. If the display immediately reverts back to current sensor probe temperature when the \leftarrow key is released, the controller is locked. If the display shows the setpoint setting for 5-8 seconds after releasing the \leftarrow key, the controller is not locked.

3.4 Self-Test Procedure

A self-test procedure allows the user to verify that the LED’s in the electronic controller are operating correctly before the control is put in service.



IMPORTANT: Disconnect all loads (refrigeration and circulation pump motor) before beginning the self-test procedure!

Conforming to the instructions in the note above, press and hold the \blacktriangle key and \blacktriangledown key in sequence, holding both keys together for 5 seconds. All LED’s and stage indicators will illuminate in a sequence, then the display will go blank. Cycle supply power off, then on to resume normal position.

3.5 Temperature Controller Programming

Prior to making any adjustments, the temperature controller must be unlocked as instructed in Section 3.3. After each specific program modification or setting change, the \leftarrow key must be pressed to retain the new setting valve. Sections 3.6 - 3.11 provide detailed programming instructions.

3.6 Direct Cool Mode

The electronic controller must be programmed for the “Direct Cool Mode” when used with the chiller.

Mode	Display	
Direct Cool	“4d”	← Mandatory setting for “LS” chiller
Reverse Heat	“4r”	} ← Not used for this application.
Dead Band	“4b”	
Independent SP	“4i”	

3.8 Stage 1 (S1) Setpoint Programming

- a. With the temperature controller unlocked, press and hold the \leftarrow key for 3 seconds until the setpoint is displayed.
- b. Immediately press the \blacktriangle or \blacktriangledown key until the desired setpoint is displayed.
- c. Press the \leftarrow key to retain the new setting in memory.
- d. The setpoint (S1) may be reviewed at anytime by pressing the \leftarrow key for 3 seconds.

Note: The setpoint adjustment described above is for Stage 1 (S1) only. The differential for Stage 1 (H1) and all setpoint and differential programming for Stages 2, 3, and 4 are located in Section 3.9.

3.9 Operating Parameter Programming

- a. With the temperature controller unlocked, press and hold the \leftarrow key for 7 seconds until (H1) is displayed.
- b. Press the \leftarrow key a second time to access the value or setting for (H1).
- c. Immediately press the \blacktriangle or \blacktriangledown key until the desired value or setting is displayed.
- d. Press the \leftarrow key to retain the new setting in memory.
- e. Press the \leftarrow key again for the next operating parameter: (S2), (H2), (S3), (H4), etc.
- f. Repeat steps (b) through (e) for access and programming of the remaining parameters shown in Section 3.10. After all changes have been entered allow the control to sit idle until the current temperature is displayed.

3.10 Operating Parameter Chart

Code	Recommended Settings	Range Adjustment	4d Direct Cooling Parameter Description
S1	34 ¹	34 to 55	Setpoint Stage 1
H1	1 ¹	1 to 9	Differential stage 1
S2	2 ¹	1 to 40	Setpoint stage 2 (differential to stage 1)
H2	1 ¹	1 to 9	Differential stage 2
S3	3 ¹	1 to 40	Setpoint stage 3 (differential to stage 1)
H3	1 ¹	1 to 9	Differential stage 3
S4	4 ¹	1 to 40	Setpoint stage 4 (differential to stage 1)
H4	1 ¹	1 to 9	Differential stage 4
LL	15	-45 to HL	Lower setpoint limit
HL	55	LL to 99	High setpoint limit
Cc	2	0 to 9 minutes	Anti-short cycling
CH	0	N/A	N/A
rt	0	0 to 99 min/unit	Soft start
AH	40	0 to 50	High alarm related to setpoint
AL	-5	-50 to 0	Low alarm related to setpoint
Ad	1	1 to 9	Alarm differential
At	30	0 to 99 minutes	Alarm time delay
So	0	-/+ 20	Sensor offset (used to calibrate sensor if needed)
Un	1	0 = C & 1 = F	Temperature units of measure (Celsius or Fahrenheit)
Pu	1	1 to 99 seconds	Display updating time delay
iF	0	N/A	Binary input (0-not used)
Sb	10 ²	1-20	Binary set back (not used)
1d	0	N/A	N/A
iS	5	3-90 seconds	Interstage time delay (see Figure 2)

¹See Section 3.7 to 3.9.

²Factory set. Does not apply when "iF" is 0.

NOTE: While programming the temperature controller make sure that the enter \leftarrow key is pressed to enter the desired value. After 10 seconds of inactivity, the display will return to its normal function. Any setting changes will take effect immediately after the enter \leftarrow key is pressed.

3.11 Temperature Control Calibration Accuracy

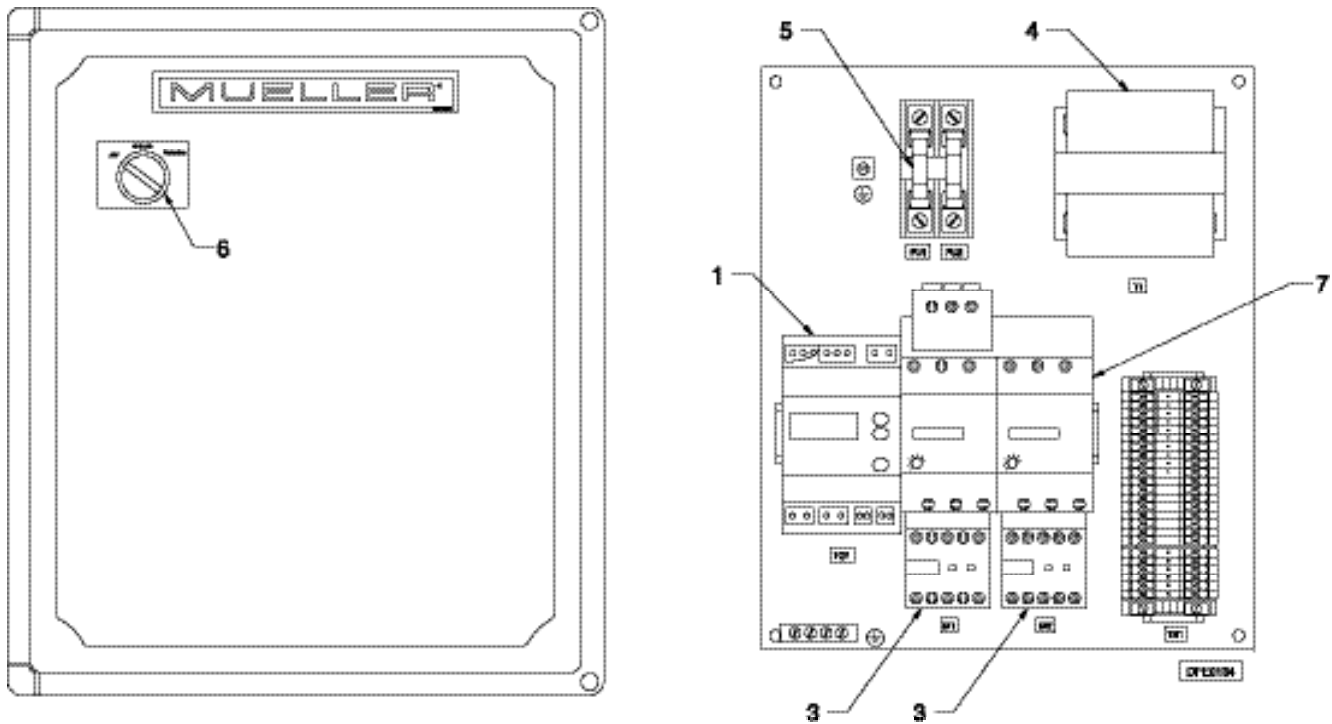
Once the installation wiring is completed for the chiller control box, check the calibration accuracy of the temperature control as outlined below:

- a. Allow the product temperature to stabilize for a minimum of 15 minutes.
- b. Using an accurate electronic thermometer, determine the actual temperature of the solution.
- c. If the known product temperature does not correspond with the temperature display, the temperature control will require an operating parameter correction. This procedure is described in Sections 3.8 and 3.9, and is adjusted using the "So" code.

4.2 Wiring Diagram, Model 200 Control Box, Part No. 9001878 (Attached)

SECTION 5.0 REPLACEMENT PARTS

5.1 Replacement Parts Diagram



5.2 Replacement Parts List

ITEM	PART NO.	DESCRIPTION
1	9843159	CONTROL, TEMPERATURE, ELECTRONIC, 4 STAGE, 24 VAC
2	8824392	SENSOR, TEMPERATURE CONTROL, .25" DIA BULB WITH 108" LEADS
3	9842366	CONTACTOR, 3-POLE, 9.6 AMP, 24 VAC COIL
4	9843162	TRANSFORMER, 75VA, 208-480 VAC PRIMARY, 24 VAC SECONDARY
5A	507785	FUSE, 1 AMP, 600 VOLT, BUSS FNQ-R-1, 230 VOLT MODELS
5B	9820107	FUSE, .5 AMP, 600 VOLT, BUSS FNQ-R-1/2, 480 VOLT MODELS
6	9842325	SWITCH, SELECTOR, 3-POSITION, 24 VAC, WITH 1 NC & 1 NO CONTACT
7A	9842757	OVERLOAD, MOTOR STARTER, MANUAL RESET, 1.0 - 1.6 AMPS
7B	9842339	OVERLOAD, MOTOR STARTER, MANUAL RESET, 1.6 - 2.5 AMPS
7C	9842342	OVERLOAD, MOTOR STARTER, MANUAL RESET, 2.5 - 4.0 AMPS
7D	9842362	OVERLOAD, MOTOR STARTER, MANUAL RESET, 4.0 - 6.3 AMPS
7E	9842343	OVERLOAD, MOTOR STARTER, MANUAL RESET, 6.3 - 9.0 AMPS
7F	9842382	OVERLOAD, MOTOR STARTER, MANUAL RESET, 9.0 - 12.5 AMPS

SECTION 6.0 - WARRANTY

WARRANTY

Mueller® Model 200 Chiller Control

One-Year Parts Warranty

Paul Mueller Company (hereafter referred to as *Company*) will repair or (at the *Company's* option) replace any part or portion of a Mueller Chiller Control found to be defective in workmanship or material under normal use, service, and installation procedures, for a period of one (1) year from date of installation by the original purchaser-user, or eighteen (18) months from the date of shipment from the *Company* factory, whichever occurs first. This warranty covers replacement of parts or repair of the equipment only. (See General Provisions.)

Claim Procedures for One-Year Parts Warranty

All defective parts covered by the one-year parts warranty, must be returned to the *Company* with an attached Returned Goods Tag (Form O-209) and with transportation cost prepaid. Current instructions provided by the *Company's* Refrigeration Products Department for return procedures must be followed to receive warranty.

General Provisions

Transportation and inspection costs incurred by the *Company* will be charged to the purchaser/user if returned material is not found to be defective. This warranty does not cover items such as mileage, product loss, cost of substitute storage facilities, parts and labor charged by others, or consumable items such as rubber goods, glass, etc. The above will constitute the *Company's* total responsibility. The above warranties will not apply in the event of abuse, misuse, negligence, improper installation procedures, alterations by unauthorized service, damage by flood, fire, windstorm, lightning, or acts of God. Oral statements made by employees, or representatives of the *Company*, will not constitute warranties. The above warranties apply only to the original purchaser-user and original installation location and are not transferable.

This warranty is effective on Mueller Chiller Controls purchased within the continental United States and Canada. Contact the Mueller International Sales Department for warranty provisions and policies outside of the continental United States and Canada.



Paul Mueller Company

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(6/00)

SECTION 7.0 - INSTALLATION AND SERVICE NOTES

Customer Name:

Address:

Telephone:

Dealer Name:

Address:

Telephone:

Chiller Control Model:

Serial No.:

Date of Installation:

Notes:



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