



MICROPROCESSOR TEMPERATURE CONTROLLER INSTRUCTION MANUAL

MODELS

GMC-2438

GMC-2538

GMC-2838

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Overview

The Gaumer MC-2438, 2538, and 2838 are microprocessor based fuzzy logic controllers. While the algorithms used by the control are quite complicated, setup is quite simple. In fact you can use the controller right out of the box setting only the set point temperature and then letting the control auto tune. This is sufficient for the vast majority of applications.

The parameters are set through 4 levels of menus. Most applications should be able to be setup using only the first level. It is extremely unusual to have to enter the third and fourth level. Once the control is setup, the operator should be able to make any adjustments at level 1. The functions accessed at each level are as follows:

First Level

- Setpoint Temperature
- Output Percentage
- Auto Tuning
- Alarm 1 Setpoint
- Alarm 2 Setpoint (where applicable)
- Alarm 3 Setpoint (where applicable)

Second Level

- Proportional Band
- Integral Time
- Derivative Time
- Dead-band Time
- Auto Tuning Offset
- Proportional Cycle
- Hysteresis
- Proportional Band (For Output #2 if installed)
- Integral Time (For Output #2 if installed)
- Derivative Time (For Output #2 if installed)
- Proportional Cycle (For Output #2 if installed)
- Hysteresis (For Output #2 if installed)
- Output 1 Gap (For Output #2 if installed)
- Output 2 Gap (For Output #2 if installed)
- Function Lock

Third Level

- Input Selection and Range
- Analog Zero Set
- Analog Span Set
- Decimal Point Position
- Lower Setpoint Limit
- Upper Setpoint Limit
- Analog Zero Set (For Output #2 if installed)
- Analog Span Set (For Output #2 if installed)
- Alarm Mode
- Alarm Time
- Alarm Mode (For Alarm #2, if installed)

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- Alarm Time (For Alarm #2, if installed)
- Alarm Mode (For Alarm #3, if installed)
- Alarm Time (For Alarm #3, if installed)
- Alarm Hysteresis
- Low Calibration
- High Calibration
- Low Calibration (For Output #2 if installed)
- High Calibration (For Output #2 if installed)
- Low Calibration, Transmitter. (not used)
- High Calibration, Transmitter. (not used)
- Motor Timer
- Wait (For program operation)
- Hysteresis for Motor Control
- Communication ID number
- Baud Rate
- SV Compensation
- PV Compensation
- Temperature Units
- Soft Filter
- Cascade
- Action Mode (Heat or Cool)
- Control Action
- Frequency

Level 4 (Control Settings)

These settings should only be accessed by factory authorized personnel.

Quick Setup

For most applications you should be able to use the control directly out of the box. Simply hook the unit up per the schematic at the back of the manual and perform the following steps:

- The unit comes from the factory set to use a J thermocouple, input range of 0-792° F, upper set point limit of 400° F, and a lower set point limit of 0° F (These values are displayed when the unit is turned on). If you need to change these limits please see the instructions for changing level 3 parameters, otherwise proceed to the next step below.
- Press the ? key to select digits to change the SV (set point value). Press the ? or ? key to change the digits up or down. Press the SET key to keep this setting.
- Press the SET key again to access auto tuning. Press the ? key to change the value. Press the ? or ? to change the value to "yes".
- Press the SET key again to access the alarm value and change it if necessary.
- Press the SET key again and allow the unit to auto tune. The auto tune light (AT) will remain on until the unit cycles several times and locks in the process parameters. **WARNING: THE AUTOTUNE FEATURE ON THIS CONTROLLER MAY OVERSHOOT THE PROCESS TEMPERATURE. WHEN AUTOTUNING TEMPERATURE SENSITIVE PROCESSES, THE TEMPERATURE MUST BE MONITORED AT ALL TIMES DURING THE AUTOTUNING PROCESS. CONTACT THE GAUMER CUSTOMER CARE DEPARTMENT WITH ANY QUESTIONS REGARDING THIS FEATURE.**
For more detailed instructions or to change other parameters, please read on.

Changing Parameters

As mentioned earlier, there are 4 levels of menus. The menus are accessed as described in each menu

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section. Once inside a menu level the keys perform the following functions.

- SET Saves current value and moves to next item on menu.
- ? Selects digit to change.
- ? Moves digit up.
- ? Moves digit down.

If you press the A/M (auto/manual) key the unit automatically returns to Level 1. If no keys are pressed for 1 minute, the unit automatically returns to Level 1.

Level 1 Parameters

The unit is automatically in level 1. Pressing the SET key cycles through the parameters in the following order.

SV	This is the setpoint value in degrees.
OUtL	Output Percentage (only displays and is accessible in manual mode).
At	AutoTuning Status
AL 1	Alarm 1 setpoint
AL 2	Alarm 2 setpoint (if installed)
AL 3	Alarm 3 setpoint (if installed)

Level 2 Parameters

To access the Level 2 parameters, hold the SET key for 5 seconds. Pressing the SET key cycles through the parameters in the order shown below. To return to Level 1 hold the SET key for 5 seconds or the unit will return automatically if no keys are pressed for 1 minute. There should be no reason to adjust these parameters unless the unit fails to stabilize in the auto-tuning mode.

P 1	Proportional Band setting. Input range 0-200%. Set at 0% for on/off control. Use the proportional band to adjust the gain (response speed of the system). Ideally, the band should be slightly wider than the natural oscillations of the system. The band should be set at 1 and gradually increased until oscillation stops. Equilibrium will be reached, but not necessarily at the setpoint.
. I	Integral Time. Range: 0-3600 sec. Set at 0 for Integral off. After setting up the proportional band, set the integral time at a high value and continue to decrease until the system just starts to oscillate and then back off.
d 1	Derivative Time. Range: 0-900 sec. Set at 0 for Derivative off. The purpose of adjusting the derivative time is to reduce or eliminate overshoot. Set the derivative at a small value then increase the set point. If the temperature overshoots, increase the derivative time in small increments until overshoot is reduced. If the system becomes too sluggish, decrease the derivative time.
db 1	Dead-band time compensation. Range 0-1000 sec.
AtUL	Auto tuning offset. Range 0-USPL. Used to hold process at a offset value from the actual setpoint value.
Cyt 1	Proportional cycle. Range 0-150 sec. When using SSR output, set to 1, 4-20mA Set to 0, When using relay output, it is normally set at 10.
HyS 1	Hysteresis. Range 0-1000. Only used for on/off control. This is the amount of "swing" from the setpoint before the heater turns on or off.
P 2	Proportional Band setting for second output. Input range 0-200%. Set at 0% for on/off control. Use the proportional band to adjust the gain (response speed of the system). Ideally, the band should be slightly wider than the natural oscillations of the system. The band should be set at 1 and gradually increased until oscillation stops. Equilibrium will be reached, but not necessarily

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	at the setpoint.
. 2	Integral Time for second output. Range: 0-3600 sec. Set at 0 for Integral off. After setting up the proportional band, set the integral time at a high value and continue to decrease until the system just starts to oscillate and then back off.
d 2	Derivative Time for second output. Range: 0-900 sec. Set at 0 for Derivative off. The purpose of adjusting the derivative time is to reduce or eliminate overshoot. Set the derivative at a small value then increase the set point. If the temperature overshoots, increase the derivative time in small increments until overshoot is reduced. If the system becomes too sluggish, decrease the derivative time.
Cyt 2	Proportional cycle for second output. Same as Cyt 1
HyS 2	Hysteresis for second output. Same as HyS 1
GAP1	Main Control Gap. Only used with second output. Set to turn <u>off</u> early when approaching the setpoint.
GAP2	Sub Control Gap. Only used with second output. Set to turn <u>on</u> early when approaching the setpoint.
LCK	Lock Set Up. <ul style="list-style-type: none"> • 0000 No locks on. • 0100 Can only enter and edit levels 1 & 2. • 0110 Can enter levels 1 & 2, but only edit level 1. • 0001 Can only enter level 1 and edit setpoint. • 0101 Everything is locked out except the lock parameter.

Level 3 Parameters

To access the level 3 parameters, make sure lock is set at 0000 (see level 2 instructions). Press the Set key and the ? key and hold for five seconds. Pressing the Set key cycles through the parameters.

inP1	Selects the input device and range, see table 1 for complete range.
AnL1	Analog zero set
AnH1	Analog span set.
dP	Sets the position of the decimal point.
LSPL	Lower setpoint limit. (Must be within the input range).
USPL	Upper setpoint limit. (Must be within the input range)
AnI2	Analog zero set for second output (when ordered).
AnH2	Analog span set for second output (when ordered).
Ald1	Alarm mode (Alarm 1). See table 2 for modes available.
Alt1	Alarm 1 time mode. 0=flicker alarm, 99.59=continuous alarm, in between setting=delay time.
Ald2	Alarm mode (Alarm 2). See table 2 for modes available.
Alt2	Alarm 2 time mode. 0=flicker alarm, 99.59=continuous alarm, in between setting=delay time.
Ald3	Alarm mode (Alarm 3). See table 2 for modes available.
Alt3	Alarm 3 time mode. 0=flicker alarm, 99.59=continuous alarm, in between setting=delay time.
HYSa	Hysteresis of alarm, range 0-1000.
CLO1	Calibrate the low value of output. Range: lower-upper setpoint. (Current output only).
CHO1	Calibrate the high value of output. Range: lower-upper setpoint. (Current output only).
CLO2	Calibrate the low value of second output. Range: lower-upper setpoint. (Current output only).
CHO2	Calibrate the high value of second output. Range: lower-upper setpoint. (Current output only).
PUO5	Compensate PV
Unit	Temperature units. C, F, A (analog)
SOft	Soft filter. Adjust the response time of PV. A larger value means faster response time. Range 0-5000. Set at 1000 for default.
OUd	Action mode. Heat or cool.
OPAd	Control action. PID or fuzzy.

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Hz	Frequency. 50 or 60
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Level 4 Parameters

Changing these parameters turns on and off access to the various controller functions. These parameters should only be accessed by a Gaumer Process Heater representative or distributor. To access these parameters, go to the LCK parameter in level 2 and set it at 1111, then press and hold the set key for 5 seconds. Setting a digit at 1 turns the function on, setting it at 0 turns it off.

	First Digit	Second Digit	Third Digit	Fourth Digit
SEt1	Alarm 2	Alarm 1	Auto Tuning	Output Percentage
SEt2	Second Output analog zero and span	Lower and upper setpoint limit	Analog zero, span, decimal point	Alarm 3
SEt3	Alarm time 2	Alarm mode 2	Alarm time 1	Alarm mode 1
SEt4	Low and high calibration	Hysteresis of alarm	Alarm time 3	Alarm mode 3
SEt5	ID no and Baud rate	Motor timer, wait mode, motor hysteresis	Output 2 low and high calibration	Transmitter low and high calibration.
SEt6	Soft filter	Temperature units	PV compensation	SV compensation
SEt7	Frequency	Control Action	Action mode	Cascade
SEt8	Do not change!	In program mode, 0=Start from 0, 1=Start from PV	In program mode 0=No power failure, 1=with power failure	In program mode 0=No repeat, 1=Program repeat
SEt9	Transmitter PV	Transmitter SV	Transmitter MV1	Remote SV

Table 1 Input Ranges

Type	Code	Range
K	K1	0-200 C; 0-392 F
K	K2	0-400 C; 0-752 F
K	K3	0-600 C; 0-1112 F
K	K4	0-800 C; 0-1472 F
K	K5	0-1000 C; 0-1832 F
K	K6	0-1200 C; 0-2192 F
J	J1	0-200 C; 0-392 F
J	J2	0-400 C; 0-752 F
J	J3	0-600 C; 0-1112 F
J	J4	0-800 C; 0-1472 F
J	J5	0-1000 C; 0-1832 F
J	J6	0-1200 C; 0-2192 F
R	r1	0-1600 C; 0-2912 F
R	r2	0-1769 C; 0-3216 F
S	S1	0-1600 C; 0-2912 F
S	S2	0-1769 C; 0-3216 F



Table 2 - Alarm Selection

Code	Description	Inhibit
01	Deviation High Limit Alarm	Yes
11	Deviation High Limit Alarm	No
02	Deviation Low Limit Alarm	Yes
12	Deviation Low Limit Alarm	No
03	Deviation High/Low Limit Alarm	Yes
13	Deviation High/Low Limit Alarm	No
04/14	Deviation High/Low Limit Range Alarm	No
05	Absolute Value High Limit Alarm	Yes
15	Absolute Value High Limit Alarm	No
06	Absolute Value Low Limit Alarm	No
16	Absolute Value Low Limit Alarm	Yes
07	Segment End Alarm (Use for Program Only)	
17	Program End Alarm (Use for Program Only)	
08	System Error Alarm-on	
18	System Error Alarm-off	
09	Heater Break Alarm (Single Phase)	
19	On Delay Timer Alarm	
00/10	None	

Inhibit – Alarm does not work the first time.