MP2

Programmable Process Temperature Controller

www.maxitrol.com

USER'S / PROGRAMMING GUIDE

MAXITROL

⚠ WARNING

Inappropriate and/or improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

⚠ WARNING

Disconnect power before installation to prevent electrical shock or equipment damage.

FOR YOUR SAFETY

If you smell gas:

1. **Open windows.**
2. **Do not touch electrical switches.**
3. **Extinguish any open flame.**
4. **Immediately call your gas supplier.**

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this control or other appliance is hazardous.

Please read these instructions fully prior to attempting to install, operate, and/or maintain the MP2 system. Failure to do so may result in improper operation and/or component damage.

⚠ WARNING

Installation shall conform with local codes, or in the absence of local codes, in accordance with the National Fuel Gas Code ANSI Z223.1/NFPA54 or CSA B149.1 as is applicable, and operated in accordance with the manufacturer's instructions. These instructions do not supersede OEM's installation or operating instructions. Installation, inspection, and replacement must be performed by a qualified installer or gas supplier.

This control must be electrically wired in accordance with local codes, or in the absence of local codes, with the National Electrical code, ANSI/NFPA 70 or the Canadian Electrical Code, CSA C22.1 as applicable.

General Statement

The MP2 system is intended for low temperature process applications, for example paint spray booths or other curing processes. It is ideal for temperature critical and time sensitive process applications requiring temperatures from 60°F to 240°F.

Contents

Process Menu

Process Set Point

- A maximum of (8) Process Set Points are available with a temperature range of 60°F (15°C) to 240°F (115°C).
- The Process Set Point is displayed as “SP.”
- Process Set Points not being used can be turned to an “Off” setting.

Process Times (TM02 required)

Any of the (8) Processes can be timed. Each timed Process has a range of 00:00:01 to 23:59:59. The conclusion of a timed Process will immediately proceed into the next Process. If the last Process of the program is timed, it will proceed to the selected start position (see Looping Mode, page 7) after timing out. The letter “T” will be displayed indicating a timed Process. Press the up or down arrows on the TDM02 to scroll between the screens showing the Process Set Point and the sensed temperature AND the sensed temperature with the time remaining in the Process (hh:mm:ss).

Operation Menu

Soft Start

The Soft Start feature controls the initial rate of voltage change to the modulator. Soft Start operates when switching from a lower Process temperature to a higher Process temperature. It is designed to slow the initial input rate to the burner. This feature is available in three settings: slow, medium, and fast and may be turned off. “Ss” (slow), “Sm” (medium) or “Sf” (fast) is displayed during the time the Soft Start is active. This feature is comprehensive to all Set Points.

Max Valve VDC

This feature limits the maximum voltage applied to the modulator. It has a setting range of 7 to 25 VDC. This feature is comprehensive to all Set Points.

Max Ramp VDC

This feature limits the maximum voltage applied to the modulator while operating in the Ramping mode. It has a setting range of 5 to 24 VDC. This setting cannot exceed the maximum voltage output setting. This feature is comprehensive to all Set Points.

Total Bandwidth

This feature determines the amount of temp. change required to drive the modulator from the minimum fire setting to the maximum fire setting and vice versa. This feature is used to eliminate pulsating or hunting due to an oversensitive application. Increase the Bandwidth if a pulsating or hunting condition exists for an extended period of time after a Set Point change. The feature has a range of 5°F (2.8°C) to 15°F (8.3°C). Total Bandwidth is comprehensive to all Set Points.

Offset Temp

This feature is used to maintain a desired temperature in an area not being directly sensed by the MP2 system. The average difference between the MP2 sensed discharged temperature and the desired space temperature must be known. This is the Offset. The Offset will set the MP2 sensed discharged air needed to produce the desired space temperature. Decrease (-) the Offset to maintain and control space temperature lower than MP2 discharged temperature. Increase (+) the Offset to maintain and control space temperature higher than MP2 discharged temperature. The space temperature will be displayed as the Process Set Point.

Example 80°F → -5°F → 75°F

1 Program **Offset** to -5°F.
2 Program **Process Set Point** (desired space temperature) to 75°F.
3 Therefore discharge air temperature = 80°F.
(Required MP2 discharge air temperature to maintain desired space temperature.)
4 The MP2 discharged air temp. is 80°F. The displayed Process Set Point is 75°F.

The feature has a range of -10°F (-5.6°C) to +10°F (5.6°C) and is available for each Process.

Ramping

This feature is used to step the input rate when changing from one Process Set Point to another. It is available for each Process. The Ramping Rate determines the amount of temperature change per hour in one-minute steps. It has a range of 60 Deg/hr to 900 Deg/hr. The change can be positive or negative.

Example
Process 1 = 75°F
Process 2 = 125°F
Process 2 **Ramp Rate** = 600 Deg/hr or 10 Deg/min

1 The control switches from Process 1 to Process 2.
2 The controller will immediately raise the temperature 10° and will hold it at the new set point 85°F (75°F + 10°F) until 1 minute has passed.
3 It will continue to raise it 10° each subsequent minute until it meets Process 2.
4 It will take 5 steps (10°F each) and 4 minutes to go from 75°F to 125°F.

This feature can be used with Max Ramp VDC and Soft Start to smooth the stepping. (Soft Start only works when Process Temperature increases.)

“Ramp” is displayed to indicate the Ramping feature is active.

Timers
The controller features two Timers (Timer 1 and Timer 2) that accumulate the hours of operation for each Process. Each Process has a Timer 1 and a Timer 2. The TM02 is required.

Timer 1
Timer 1 logs the hours of operation for a Process. It will log up 999 hours at which time it will automatically reset to zero. The hours can be user reset to zero at any time. It also has a programmable alarm setting to notify the user (by flashing a character in the lower right hand corner of the display) when the desired accumulated hours for the Process have been reached. It has a setting range of 1 to 999 hours. The feature is useful in maintaining maintenance requirements.

Timer 2
Timer 2 logs the hours of operation for a Process. It will log up 999 hours at which time it will automatically reset to zero. The hours can be user reset to zero at any time. The feature is useful in maintaining maintenance requirements.

Diagnostic Menu

Max Proc Temp
This feature limits the maximum temperature for each Process. It has a range of 60°F (15°C) to 240°F (115°C). It does not allow the Process Set Point to be set in excess of the Maximum Process Temperature setting.

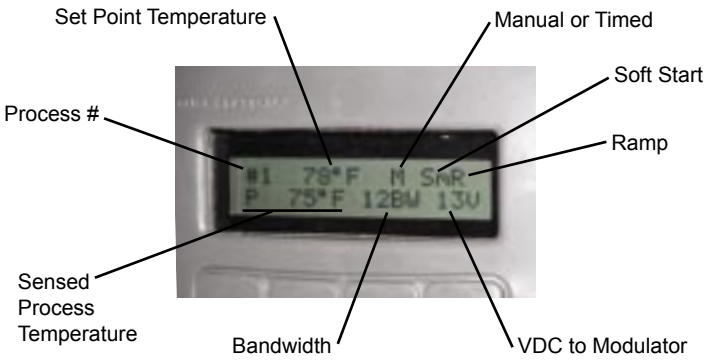
Min Proc Temp
This feature limits the minimum temperature for all Processes. It has a range of 60°F (15°C) to 240°F (115°C). It does not allow any Process Set Point to be set below the Minimum Process Temperature setting.

Calibration
This feature is used to fine-tune a particular application. Calibration shifts the Bandwidth range up or down from the factory set mean. Each application is different with variances in burners and appliances. It can be necessary to change the midpoint of the modulation range to have the Process Temperature and the actual sensed temperature match.

For sensed temperatures consistently displaying lower than the Set Point, increase (+) Calibration by number of degrees off. For sensed temperatures consistently displaying higher than the Set Point, decrease (-) Calibration by number of degrees off. It is available for each Process and has a range of –10°F (-5.6°C) to +10°F (5.6°C).

Monitor

The Monitor feature is a useful tool when setting up or troubleshooting the MP2 system. The following will appear on the display when Monitor is in the “On” position:



Looping Mode (TM02 applications only)

The looping mode feature is used to select the controllers default position on startup and after the last process of a program is completed.

Selecting “READY”

Power up:
“READY” is displayed. Requires a momentary switch closure to move the controller to the first process.
After last, manual process of a program:
After momentary switch closure to move out of the last process, controller defaults to the “READY” position.
After last, timed process of a program expires:
Controller defaults to the “READY” position.

Selecting “First Process”

Power up:
Controller begins operating in the First Process of the program.
After last, manual process of a program:
After momentary switch closure to move out of the last process, controller defaults to the First Process.
After last, timed process of a program expires:
Controller defaults to the First Process.

F/C Mode

This feature sets the control to operate in either the Fahrenheit (F) or Celsius (C) mode.

NOTE: Changing between Fahrenheit and Celsius will reset the control to factory default settings.

Software Version

Displays the version of software utilized by the controller.

Other Features

Process Indication Output

The TM02 multifunctional timer control features a Process Indication Output. Processes 1 thru 7 have a dedicated pair of terminals, labeled 1 thru 7 on the TM02. An indicator (LED, relay coil, etc...) 24 VDC 2 W maximum can be wired directly to the corresponding terminal block for each Process to be indicated.

NOTE: Process #8 does not have a dedicated process indication output.

Program Indication Output

Terminal #8 is used to indicate the controller is operating within a Program. The following voltage will be measured across the #8 terminals:

Controller in the “READY” position	0 VDC
Controller operating in any of the 8 processes making up a Program	24 VDC 2W max

Technical Data

NOTE:
The technical data listed in this manual does not include normal operating deviations that occur in the actual manufacturing process. The listed specifications may not meet the individual unit's actual specifications. Slight deviations in an individual unit's performance may be encountered due to possible changes in the controlled conditions in which the unit is tested and calibrated. Check ratings given in OEM instructions to assure the MP2 is suitable for the application.

Power Requirements	Independent 24 VAC, 40 VA capacity transformer	
Ambient Temperature Limits	**TDM02**	Operating: -40°F(-40°C) to 158°F(70°C) Non-operating: -40°(-40°C) to 185°F(85°C)
	AM02 TM02	Operating, Non-operating: -40°(-40°C) to 185°F(85°C)
Connections	AM02 to TDM02 = Standard 6 Position 4 Conductor Telephone Cable AM02 to TM02 = Ethernet Patch Cord	
Sensor	1,000 ohm RTD TS194Q use with mixing tube	
Valves	M411, M511, M611, MR212	

NOTE:
Please read safety warning instructions fully for Maxitrol Modulator Valves [MI2040] prior to attempting to install, operate, and/or maintain the MP2 system.

Components

- **AM02** Amplifier
- **TDM02** Remote Selector Display Interface
- **TM02** Auxiliary Multifunctional Timer Control (optional)
- Standard 6 Position 4 Conductor Telephone Cable, 3 feet
- Ethernet Patch Cord, 3 feet

Process Menu

Process Temperatures → Temp Set Point Process #(1 - 8) →
Off, 60°F (15°C) to 240°F (115°C)

Process Time → Time Process #(1 - 8) → Hours, Minutes, Seconds →
TM02 required
Manual, 00:00:01 to 23:59:59

Operation Menu

Soft Start → Off, Slow, Medium, Fast

Max Valve VDC → 7 to 25 VDC

Max Ramp VDC → 5 to 24 VDC

Total Bandwidth → 5°F(2.8°C) to 15°F (8.3°C)

Offset Temp → Offset Temp Process #(1 - 8) → -10°F(-5.6°C) to +10°F(5.6°C)

Ramping → Ramping Process #(1 - 8) → Off, 60 Deg/hr to 900 Deg/hr

Timers → Timer Process #(1 - 8)
TM02 required
Timer 1 → View Hours, Clear Hours, Set Alarm Hours →
Set Alarm → 0 hrs to 999 hrs
Timer 2 → View Hours, Clear Hours

Diagnostic Menu

Max Proc Temp → Max Temp Process #(1 - 8) → 60°F(15°C) to 240°F(115°C)

Min Proc Temp → 60°F(15°C) to 240°F(115°C)

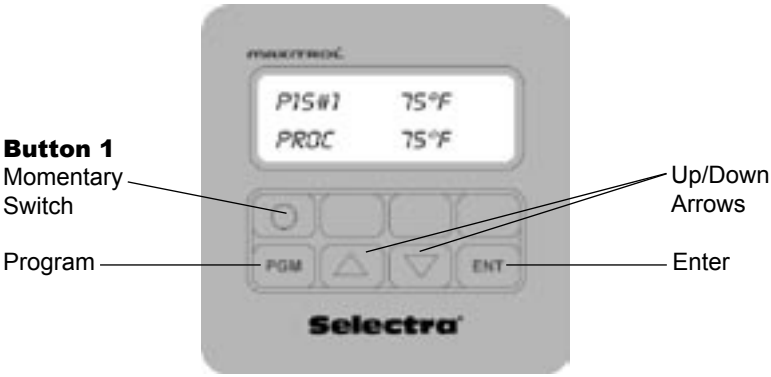
Calibration → Calibration Process #(1 - 8) → -10°F(-5.6°C) to +10°F(5.6°C)

Monitor → On, Off

Looping Mode → Ready, First Process

F/C Mode

Software Version



Programming Buttons

PGM

- Press once to initially enter programming mode.
- Press once during programming to return to the previous screen.
- Press, hold for 5 seconds and release to EXIT programming mode.

△ ▽

- Press either to scroll or advance through menus.
- Press either to change current value.

ENT

- Press once to enter into the selected menu or programming mode.
- Press once to store programmed setting.

○

- Press and release once to switch to the next Process or to move the controller from the “READY” position to the First Process.
- Press twice or hold for 10 seconds to abort a timed process.

Screen Indicators

- ****STORED**** will appear on the screen to confirm entry accepted.
- **T** indicates a timed process.
- **M** indicates a manual process.

Programming

To enter the **Process**, **Operation** and **Diagnostic Menus**

- Press PGM once.

Process Menu programming:

1 Scroll △ ▽ to the **Process Menu**, press ENT.

Process Temperatures

2 Scroll △ ▽ to **Temperatures**, press ENT.

3 **Temp Set Point Process #**, scroll △ ▽ to Set Point #, press ENT.

4 **Set Point Temp Process #, XX°F**, set △ ▽ Process Temperature value (OFF, 60°F (15°C) to 240°F (115°C)), press ENT.

5 ****Stored**** will flash 4 times to confirm entry.

6 Repeat steps 2 through 5 for Set Points #(2 - 8).

NOTE: Process #1 CAN NOT be OFF. For unused Process Temperature Set Points, press down arrow until "Off" is displayed. Set Points #(2 - 8) are factory set to "Off."

Process Times (TM02 required)

2 Scroll △ ▽ to **Times** and press ENT.
Each Process can be either Timed or Manual.

3 **Time Process #**, scroll △ ▽ to Set Point #, press ENT.
MANUAL will be the default.

4 Scroll △ ▽ to **Seconds**, **Minutes** or **Hours**, press ENT.

- a Set **Seconds**, **Minutes** or **Hours** value with △ ▽, press ENT.
- b ****Stored**** will flash 4 times to confirm entry.
- c Repeat steps 4 through 4b for each time segment.

for Manual (untimed) Processes

- d Default setting or when programmed to 00:00:00.

5 Repeat steps 2 through 4 for Set Points #(2 - 8).

Operation Menu programming:

1 Scroll △ ▽ to the **Operation Menu**, press ENT.

Soft Start

2 Scroll △ ▽ to **Soft Start** and press ENT.

3 **Soft Start**, scroll △ ▽ to **Off**, **Slow**, **Medium** or **Fast**, press ENT.

4 ****Stored**** will flash 4 times to confirm entry.

Max Valve VDC

2 Scroll △ ▽ to **Max Valve VDC**, press ENT.

3 **Max Valve VDC**, set △ ▽ voltage value (7 V to 25 V), press ENT.

4 ****Stored**** will flash 4 times to confirm entry.

Max Ramp VDC

2 Scroll △ ▽ to **Max Ramp VDC**, press ENT.

3 **Max Ramp VDC**, set △ ▽ voltage value (5 V to 24 V), press ENT.

4 ****Stored**** will flash 4 times to confirm entry.

NOTE: Voltage can not be set greater than Max Valve VDC.

Total Bandwidth

2 Scroll △ ▽ to **Total Bandwidth**, press ENT.

3 **Total Bandwidth**, set △ ▽ Bandwidth (5°F (-2.8°C) to 15°F (8.3°C)), press ENT.

4 ****Stored**** will flash 4 times to confirm entry.

Offset

2 Scroll △ ▽ to **Offset Temp**, press ENT.
3 **Offset Temp Process #,** scroll △ ▽ to Set Point #, press ENT.
4 **Offset Temp Process #**, set △ ▽ Offset (-10°F (-5.6°C) to 10°F (5.6°C)), press ENT.
5 ****Stored**** will flash 4 times to confirm entry.
6 Repeat steps 2 through 5 for Set Points #(2 - 8).

Ramping

2 Scroll △ ▽ to **Ramping**, press ENT.
3 **Ramping Process #**, scroll △ ▽ to Set Point #, press ENT.
4 **Rmp Rate Proc #**, set △ ▽ Ramp Rate (Off, 60 to 900 Deg/Hr), press ENT.
5 ****Stored**** will flash 4 times to confirm entry.
6 Repeat steps 2 through 7 for Set Points #(2 - 8).

Timers (TM02 required)

2 Scroll △ ▽ to **Timers**, press ENT.
3 **Timer Process #**, scroll △ ▽ to Set Point #, press ENT.
4 **Timer Process #**, scroll △ ▽ to **Timer 1** or **Timer 2**, press ENT.
5 **Timer 1: T1 Proc #**, scroll △ ▽ to **View Hours**, **Clear Hours** or **Set Alarm Hours**, press ENT.

View hours

a **XXX Hours**

Clear hours

b **Are You Sure?** scroll △ ▽ for **Y** or **N**, press ENT.
c If **Y**, **Timer1 Hrs Clear** flashes to confirm entry.

Set alarm hours

d **T1 Proc # Alarm**, scroll △ ▽ to set hrs, press ENT.
e **Set Timer1 Alarm** flashes to confirm entry.

6 **Timer 2: T2 Proc #**, scroll △ ▽ to **View Hours** or **Clear Hours,** press ENT.

View hours

a **XXX Hours**

Clear hours

b **Are You Sure?** scroll △ ▽ for **Y** or **N**, press ENT.

c If **Y**, **Timer2 Hrs Clear** flashes to confirm entry.

7 Repeat steps 2 through 6 for Set Points #(2 - 8).

Diagnostic Menu programming

1 Scroll △ ▽ to the **Diagnostic Menu**, press ENT.

Max Proc Temp

2 Scroll △ ▽ to **Max Proc Temp**, press ENT.

3 **Maximum Temp Process #**, scroll △ ▽ to Set Point #, press ENT.

4 **Max T Proc #**, set △ ▽ Temp. value (60°F (15°C) to 240°F (115°C)), press ENT.

5 ****Stored**** will flash 4 times to confirm entry.

6 Repeat steps 2 through 5 for Set Points #(2 - 8).

Min Proc Temp

2 Scroll △ ▽ to **Min Proc Temp**, press ENT.

3 **Min Proc Temp**, set △ ▽ Temp. value (60°F (15°C) to 240°F (115°C)), press ENT.

4 ****Stored**** will flash 4 times to confirm entry.

Calibration

2 Scroll △ ▽ to **Calibration**, press ENT.

3 **Calibration Process #**, scroll △ ▽ to Set Point #, press ENT.

4 **Cal Proc #** set △ ▽ Temp. value (-10°F (-5.6°C) to 10°F (5.6°C)), press ENT.

5 ****Stored**** will flash 4 times to confirm entry.

6 Repeat steps 2 through 5 for Set Points #(2 - 8).

Monitor

2 Scroll △ ▽ to **Monitor**, press ENT.
3 **Monitor** set △ ▽ **On** or **Off**, press ENT.
4 Either **Monitor Mode On** or **Off** will flash 3 times to confirm.

Looping

2 Scroll △ ▽ to **Looping Mode**, press ENT.
3 Scroll △ ▽ to **READY** or **FIRST PROCESS**, press ENT.
4 ****Stored**** will flash 4 times to confirm entry.

F/C Mode

2 Scroll △ ▽ to **F/C Mode**, press ENT.
3 **F/C MODE**, scroll △ ▽ to either **Fahrenheit** or **Celsius**, press ENT.
4 ****Stored**** will flash 4 times to confirm entry.

NOTE: Changing between F and C will cause the MP2 system to reset to factory defaults.

Software Version

2 Scroll △ ▽ to **Menu Software Version**, press ENT.
3 Software Version information will appear.

MP2 Process Control System

Switching to the Next Programmed Process

Push and release Button 1 on dial face (see page 11) or momentarily latch (make) a set of contacts wired to the TB1 terminal (i.e. typically accomplished by a momentary ON (normally open) switch) to proceed to the next Process. Pushing and releasing Button 1 or momentary latching of TB1 during the last Process of a program will cause the MP2 System to return to Process 1. Multiple contacts used to switch Processes are to be wired in parallel.

Aborting a Process

Same as switching to next Process, push and release Button 1 or momentarily latch TB1.

MP2 Process Control System w/ TM02 Multifunctional Timer Control

Switching to the Next Programmed Process

Timed processes

Nothing is required. The MP2 System will immediately proceed to the next programmed Process after timing out.

> NOTE: If the last Process of a program is timed, it will proceed either to the "READY" position or to the First Process. By selecting the First Process in the LOOPING Mode menu, the MP2 can be programmed into a continuous program loop (see page 7, LOOPING Mode).

Untimed (Manual) Processes

An untimed Process will remain in the Process indefinitely until Button 1 is pushed and released or TB1 is momentarily latched. Pushing and releasing Button 1 or the momentary latching of the TB1 will cause the MP2 System to proceed to the next Process. If the last Process of a program is untimed, pushing and releasing Button 1 or the momentary latching of TB1 will cause the MP2 system to proceed to the selected program start position. Multiple contacts used to switch untimed Processes are to be wired in parallel.

Aborting a Timed Process

Push and release Button 1 or momentarily latch TB1 twice within a 10 second period or latch and hold continuously for 10 seconds.

Connecting Indicator Relays

Process 1 thru 7 indicators use a corresponding pair of terminals, labeled Relay (1 - 7), on the TM02. The Program indicator uses a corresponding terminal labeled Relay 8. Wire each indicator (LED, relay coil, etc.) 24 VDC 2 W maximum directly to the desired corresponding terminal. See figure A, page 18. Note polarity where applicable.

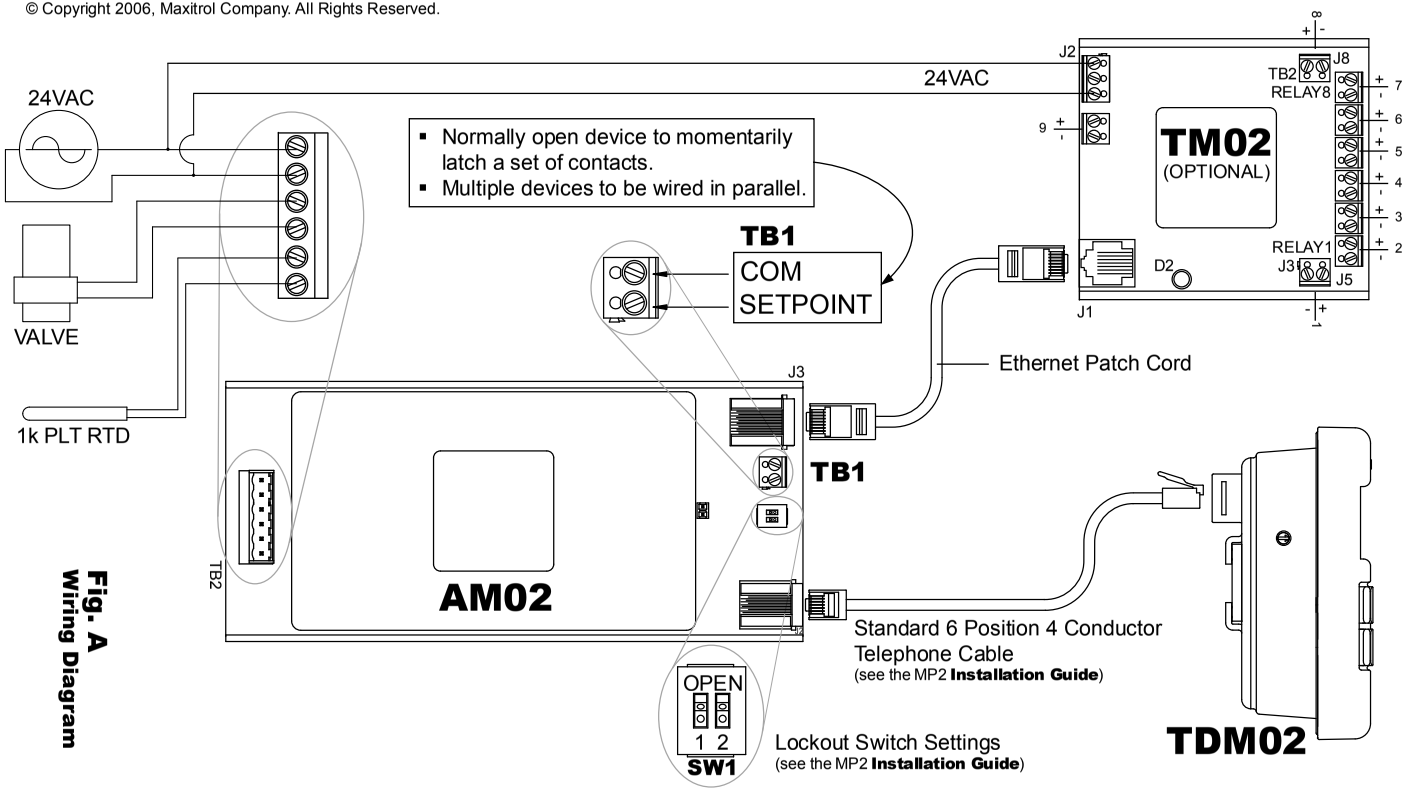


Fig. A
Wiring Diagram

Process
A single programmed temperature, or single programmed temperature and time.

Program
The combination or series of Processes.

“Ready”
Screen display. When selected, it appears prior to the start of a program involving timed processes. A momentary switch closure moves the controller from the “Ready” position to the First Process.

Manual Process
The (8) Processes can be manually timed. It is an infinite Process that terminates when it is manually switched. A momentary switch closure input to the amplifier is required to proceed to the next Process. A Manual Process displays the letter “M” to indicate it is not a timed Process.

“Manual”
Screen display. It describes the Manual Process.

Looping Mode (TM02 applications only)
The looping mode feature is used to select the controllers default position on startup and after the last process of a program is completed (see page 7).

MP2.UG.EN.07.2006

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