MicroVent and MicroVent Vision
Operating Manual
2013

1 Operating Modes

1.1 MicroVent System

The MicroVent system has seven modes of operation which determine when the fans will operate. When a new mode is selected it will not take effect until the temperatures are displayed. When the system starts in any mode, it will try to deliver air into the plenum at the programmed 'Plenum Set-point Temperature', by modulating the Intake Air System (IAS).

1.1.1 Off Mode
The fans will not run. The system is effectively shut down, but will still provide temperature, humidity, and CO_2 readings.

1.1.2 Constant Mode
The fans will run regardless of temperatures. The IAS will move to a position that will allow the system to deliver air to the plenum at the plenum set-point temperature if conditions permit.

1.1.3 Automatic Mode
In Automatic Mode the system will start under two conditions:
1. The Return Air temperature reaches the Return Air Start Set-point and the outside air is considered available for cooling. The fans will continue to run until the return air temperature reaches the Return Air Stop Set-point or outside air becomes unavailable.
2. Plenum Air temperature reaches the Low Plenum Start Set-point. The fans will turn on and run for 10 minutes in an effort to increase the plenum temperature. If the plenum temperature continues to decrease below the Low Plenum Shutoff Set-point, the system will shut down.

1.1.4 Timed Mode
The fans will operate as in constant mode during the times selected by the user, otherwise the fans will be off. There are a total of 8 timed runs available to the user by default. If all 8 run numbers are used than run number 9 will become available and so on. Each one can be set to start and run the system at a particular time for a given duration.

1.1.5 Timed Automatic Mode
This mode is a combination of a timed and automatic run. The fans will operate as if in constant mode during the times selected by the user regardless of temperatures, otherwise the fans will operate as in automatic mode.

1.1.6 Timed if Cool Air Available Mode
The fans will operate as in timed mode during the times selected by the user,

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but only if the outside air is considered available for cooling.

1.1.7   Timed or Cool Air Available Mode

The fans wills will operate under two conditions:
1. During the times selected by the user.
2. When the outside air is available for cooling.

1.2   MicroVent Vision Modes

The Micro Vent Vision operating modes can be selected on a timed basis, so that the user could use one or all of the 4 operating modes during a 24 hour time period. These modes operate the same as they do for the MicroVent system. The 'Commit Page' button must be pressed to have a mode change to come into effect. The MicroVent Vision system allows for the selection of the following operating modes:

1.2.1   Off

1.2.2   Constant

1.2.3   Automatic

1.2.4   Cool Air Available

2 Display Modes

2.1   MicroVent Display Modes
1. Monitor Mode
2. Program Mode
3. Records Mode

2.1.1   Monitor Mode

Monitor Mode provides the following information:
1. Temperatures (Return, Plenum, Outside)
2. Relative Humidity, CO_2, and Auxiliary Temperatures
3. Errors

The UP arrow will scroll through these various monitor mode displays.

2.1.1.1   Multiple Bins

If the system has more than one bin, pressing the UP arrow will display the Temperatures for Bin 2, and so forth.

2.1.2   Program Mode

The Operation Mode and Program Settings are adjusted in the Program Mode. Press the SELECT button to change the display to the Operation Mode. The UP and DOWN arrows will scroll through the settings. Press the

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SELECT button on the operation mode or program setting that is required to be changed (the mode or setting will flash when it is able to be changed) and use the UP and DOWN arrows to adjust the operation mode or program settings.

2.1.2.1   Multiple Bins

If the system has more than one bin, pressing the SELECT button will first show Bin 1.   To change the operation mode or program settings for Bin 2 (or any subsequent bins), press SELECT to flash the Bin number and use the UP and DOWN arrows to scroll through the bin numbers.

2.1.3   Records Mode

The Recorded Temperatures can be displayed by pressing the DOWN arrow in Monitor Mode. The most recent record is displayed first. Continue to press the DOWN arrow to see earlier records.

2.2   MicroVent Vision Display Screens

The MicroVent Vision system has 4 Display Screens to choose from on the top of the display:

2.2.1   System Status

The Temperatures, Relative Humidity, CO_2, Bin Status, Operation Mode, Outside Air Availability, and Refrigeration Status, are displayed on the System Status Screen.

2.2.2   Bin Settings

On the Bin Settings Screen the following options appear on the bottom of the screen: Basic, Modes, Fan Speed, Refrigeration/Heating, CO_2, Purge Times, and Humidity

2.2.3   System Settings

System Settings includes the System Password, Recording Interval, Time, Date, and an option to record temperatures when and event occurs.

2.2.4   Records

The Records Screen brings up a Query Menu, where Bins, Temperatures, RH, CO_2, Events, and Time Intervals can be selected for viewing.   Events are shown in a tabular form, while Temperatures, RH, and CO_2 can be displayed in tabular or graphical form.

3 System Programming

For the purpose of this operation manual, all settings will first be explained for the MicroVent system in the order they appear in the program mode. Following this description, the additional settings will be addressed for the MicroVent Vision system. For each setting, points and

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features will be made for each of the MicroVent (*MV*) and MicroVent Vision (*MVV*) system.

3.1   Bin Number #
This option is available in multiple bin systems.
MV: Select a Bin number by pressing the SELECT button.   All subsequent Set-points will pertain to that Bin number.
MVV: Multiple bins will be displayed on the same Screen for all Bin Setting Screens. (Some systems may need to Change the Bin Number on the top of the Screen; this button will be found next to the System Status Button).

3.2   Operation Mode
This setting allows the user to select the desired operation mode.
MV: This setting refers to the seven modes described in section 1.
MVV: This setting is located on the Mode Option on the Bin Settings Screen as described in section 1.8.

3.3   Plenum Set-point
The plenum set-point is the desired temperature of the supply air to be delivered to the pile. Changing the plenum set-point will change all other temperature set-points by the same amount.
MVV: This setting is located on the Basic Option of the Bin Settings Screen.

3.4   Target Temperature Set-point
If desired, the plenum set-point can be automatically increased or decreased gradually over a desired time period (in days). The system will make this adjustment once a day at midnight to reach this target temperature.
MVV: Located on the Basic Option.

3.5   Target Drop Period (*MV*) or Days to Target (*MVV*)
Select the amount of days desired to reach the target plenum set-point temperature. The target temperature will be reached in the number of days under ideal conditions. The following setting (3.6) will provide an exception to this feature.
MV: This option will be displayed only if the plenum set-point does not equal the target temperature set-point.
MVV: Located on the Basic Option. This setting will have no function if the target temperature set-point is equal to the plenum set-point.

3.6   Plenum no more than x degrees below return (*MV*) or Max target difference (*MVV*)
This setting is the limit for which the target set-point adjustment will be made in relation to the return air temperature. It prevents the plenum set-point to be lowered without the return air temperature following the same trend.
MV: This option will be displayed only if the plenum set-point does not equal the target temperature set-point.
MVV: Located on the Basic Option. This setting will have no function if the

target temperature set-point is equal to the plenum set-point.

3.7   Low Plenum System Starts (*MV*) or Low Plenum Start (*MVV*)

The low plenum start setting is only effective if operating in the Automatic or Timed-Automatic operating mode. If the plenum temperature drops below this setting the fans will start with the IAS closed in an attempt to increase the plenum temperature with heat from the pile.

MV: This setting will only be available if the operating mode is in Automatic or Timed-Automatic.

MVV: Located on the Basic Option. This setting will only have function during the time periods in which the system is operating in Automatic mode.

3.8   Low Plenum System Stops (*MV*) or Low Plenum Stop (*MVV*)

The low plenum stop setting is always in effect for all operation modes. The system will stop and the IAS will close if the plenum temperature reaches this setting. Likewise the system will not start if the plenum temperature is at this setting.

MVV: Located on the Basic Option.

3.9   Return Air Temperature System Starts (*MV*) Return Air Start Temperature (*MVV*)

The return air start setting is only effective if operating in the Automatic mode or Timed-Automatic mode. The system will start when the return air temperature reaches this setting.

MV: This setting will only be available if the operation mode is in Automatic or Timed-Automatic.

MVV: Located on the Basic Option. This setting will only have function during the time periods the system is operating in Automatic mode.

3.10   Return Air Temperature System Stops (*MV*) Return Air Stop Temperature (*MVV*)

The return air start setting is only effective if operating in the Automatic mode or Timed-Automatic mode. The system will stop when the return air temperature reaches this setting.

MV: This setting will only be available if the operation mode is in Automatic or Timed-Automatic.

MVV: Located on the Basic Option. This setting will only have function during the time periods the system is operating in Automatic mode.

3.11   Timed Runs

The system has a default of 8 timed runs per bin, if all the 8 timed runs are used, timed run 9 will be made available and so forth.

MV: This option is available in the following operation modes: timed, timed-automatic, timed or cooling air, or timed if cooling air. xx:xx represents the time; xM represent AM or PM; xhr and xmin represents the number of hours and minutes respectively the system will be on during that timed run.

MVV: Timed Runs can be selected on the Mode Option. All four operating modes can be added to the 24 hour time clock for any given period of time. The time intervals can be displayed in 2 hr, 1hr, 30 min, or 15 min periods.

Settings 3.12, 3.13 and 3.14 are for systems with Refrigeration Control
Setting 3.15 is for systems with Frequency Drive Control
Setting 3.16 is for systems with Reconditioning
Proceed to Setting 3.17 for systems that do not have these features
All of these settings are present on the MicroVent Vision System

3.12   Outside Cooling
Cooling with outside air can be disabled for systems that have refrigeration control.
MVV: Located on the Refrigeration/Heating Option on the Bin Settings Screen. This setting **will** take effect when Refrigeration is disabled.

3.13   Refrigeration
This setting is only available on systems with refrigeration control. Refrigeration systems can be automatically controlled to achieve the desired plenum set-point. Selecting Enable turns on the refrigeration control.   If the refrigeration has multiple stages, the desired number of stages can be enabled.
MVV: Located on the Refrigeration/Heating Option.

3.14   High plenum temperature shutoff
This setting is only available when refrigeration is enabled; if the plenum temperature reaches this set-point, the system will shut off.
MVV: Located on the Refrigeration/Heating Option but is only functional with refrigeration enabled.

3.15   Frequency Drive (*MV*) or Fan Speed (*MVV*)
Frequency drive control (fan speed control) can be enabled to allow the system to control the speed of the fans automatically. The following settings will be made available when this setting is enabled.
MVV: Located on the Fan Speed Option of the Bin Settings Screen.

3.15.1   Fans at max speed at or above (*MV*) or Max speed temperature (*MVV*)
This setting is only available if the Frequency Drive feature is enabled. It refers to the return air temperature at which the system will control the fans at maximum speed.
MVV: Located on the Fan Speed Option.

3.15.2   Fans at min speed at or below (*MV*) or Min speed temperature (*MVV*)
This setting is only available if the Frequency Drive feature is enabled. It refers to the return air temperature at which the system will control the fans

at minimum speed.
> *MVV:* Located on the Fan Speed Option.

The fan speed will be controlled between the minimum and maximum speed according to the return air minimum and maximum temperatures.

If refrigeration and frequency drive control are enabled the following settings will be available for the MicroVent System.
All of these settings are present on the MicroVent Vision System.

3.15.3 When cool air available fan speed = xx%
> This is the speed the fans will run when cool air is available.
> > *MVV*: Located on the Fan Speed Option. The automatic speed control is also available based on the maximum and minimum speed return air temperatures.

3.15.4 When refrigeration is on fan speed = xx%
> This is the speed the fans will run when the refrigeration system is running.
> > *MVV*: Located on the Fan Speed Option. The automatic speed control is also available based on the maximum and minimum speed return air temperatures.

3.15.5 When refrigeration is off and air is unavailable fan speed = xx%
> This is the speed the fans will run when refrigeration is enabled, but not required, and cool air is unavailable.
> > *MVV*: Located on the Fan Speed Option. The automatic speed control is also available based on the maximum and minimum speed return air temperatures.

3.15.6 Speed when purging
> Is only available on the MicroVent Vision system. This is the speed the fans will run during a purge. It is located on the Fan Speed Option. The automatic speed control is also available based on the maximum and minimum speed return air temperatures.
> > *MV*: The MicroVent system default speed when purging is 100%

3.15.7 Fan speed
> Is only available on the MicroVent Vision system. This is the speed the fans will run if refrigeration is not running, cool air is not available, and there is no purge occurring. It is located on the Fan Speed Option. The automatic speed control is also available based on the maximum and minimum speed return air temperatures.

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3.15.8   Order of precedence for MicroVent Vision Speed Control:
Speed when air unavailable and refrigeration is running.
Speed when purging
Speed when air available
Fan speed

3.16   Reconditioning (Warm-up)
Reconditioning can be enabled to warm a pile rather than cool. If enabled the system looks for warm outside air that is available to raise the plenum temperature.
MVV: Located on the Refrigeration/Heating Options on the Bin Settings Screen.

3.17   Cool Air Available (*MV*) or Difference for Cool Air Available (*MVV*)
This setting defines how cool or warm the outside air must be in terms of the plenum set-point or the return air temperature to be considered available for cooling or warming.
There is a 1.8 degree differential between the temperature at which air becomes available and the temperature at which it becomes unavailable (see insert for a detailed example).
MV: The cool air available difference as well as the cool air reference are located on the same setting.
MVV: Located on the Basic Options as two separate settings.

The **Reference** for the outside air to be considered available can be one of the following:
- ➢ Return air temperature (useful in the fall of the year, when the pile and return temperatures can be significantly higher then the plenum set-point)
- ➢ Plenum set-point (most often used during cooling and holding periods)

Differential or **Offset**
- ➢ There is a 1.8 degree differential between the temperature when air is available and the temperature when it becomes unavailable, as can be seen in the following **example**:
  - ➢ Plenum Set-point: 50
  - ➢ Cool air available: 2 degrees below plenum set-point
  - ➢ Air is available at 48 and becomes unavailable at 49.8
- ➢ A smaller differential (**less than 2 degrees** below plenum set-point) will result in **warming** your pile and possibly **condensation**

Absolute Minimum Settings
- ➢ 2 degrees below plenum set-point
- ➢ 3 degrees below return air
- ➢ If your return air temperature is more than **1 degree** warmer than the plenum Set-point, this setting **must be increased.**

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3.18   CO$_2$ Purge

MV: The CO$_2$ purge function can be enabled with systems that have this feature and can be operated in the following manners:

    1. By Clock: The system will purge during the selected purge times.
    2. By Sensor: The system will purge based on a CO$_2$ sensor.
    3. By Clock or Sensor: The system will purge during the selected purge times or based on the sensor during non selected purge times.
    4. By Clock and Sensor: The system will purge during the selected purge times if the sensor reading requires a purge.

MVV: The CO$_2$ purge function is always present and can be operated in the following manners:

    1. The function needs to be enabled on the CO$_2$ Option on the Bin Settings Screen
    2. The user can select timed purges on the Purge Times Option on the Bin Settings Screen.
    3. If the system has a CO$_2$ sensor, the user can also select timed sensor based purges on the Purge Times Option.

3.18.1   *MV*: Start purge #xx at xx:xx xM for xx minutes

There are 8 purge runs by default and additional purge runs will be added if purge number 8 is used. The time xx:xx xM can be selected and the duration xx minutes for the system to purge can be determined.

3.18.2   *MV*: Start when CO$_2$ goes above _____ (ppm).
MVV: CO$_2$ purge start level. Located on the CO$_2$ Option of the Bin Settings Screen.

3.18.3   *MV*: Stop when CO$_2$ goes below _____ (ppm).
MVV: CO$_2$ purge stop level. Located on the CO$_2$ Option.

3.18.4   *MV*: Don't purge if outside air is below xx degrees.
MVV: Min outside purge temperature. Located on the CO$_2$ Option.

3.18.5   *MV*: Don't purge if outside air is above xx degrees.
MVV: Max outside purge temperature. Located on the CO$_2$ Option.

3.18.6   *MV*: Low plenum shutoff when purging.
MVV: Low plenum stop temperature during CO$_2$ purge.
If the plenum temperature reaches this setting the system will stop and the IAS will close. This setting is usually set 1 degree below the Low Plenum Shutoff (Setting 3.8).

3.18.7   *MV*: High plenum shutoff when purging (is only present when refrigeration is enabled).
MVV: High plenum shutoff stop temperature during CO$_2$ purge (only has

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function when refrigeration is enabled). Located on the CO_2 Option.
If the plenum temperature reaches this setting the system will stop and the IAS close.

3.18.8   Max ____^{O} above set-point when purge.
This is the maximum increase in plenum temperature from the plenum set-point the system will allow during a purge before starting to close the IAS.
MVV: Located on the CO_2 Option.

3.18.9   Min ____^{O} below set-point when purge
This is the maximum decrease in plenum temperature from the plenum set-point the system will allow during a purge before starting to close the IAS.
MVV: Located on the CO_2 Option

3.19   Relative Humidity Set-point
This option is only available on systems with humidity sensors. The selection should be set to the desired humidity of the supply air.
MVV: This setting is located on the Humidity Option of the Bin Settings Screen.

3.19.1   Humidifier Cycle
The Humidifier Cycle setting can be used as a duty cycle for humidification systems. The on and off times can be set for any chosen time on a minute basis.
MVV: Located on the Humidity Option.

3.19.2   Humidifier Pulse
The Humidifier Pulse setting can be used to pulse the humidification system on and off on a second basis (Should not be used for humidicells).
MVV: Located on the Humidity Option.

3.20   Record Temperature Intervals
The MicroVent (Vision) system(s) records the temperatures, RH, and CO_2 levels at regular time intervals. The time intervals can be: 15 or 30 minutes, 1, 2, 4, 8, or 24 hours.
MVV: Located on the System Settings Screen.   The MVV systems has additional interval options of 20 seconds and 1 minute. Additionally, the temperatures, RH, and CO_2 levels can be recorded when an event occurs.

3.21   Date
This option is used to set the date the system used when storing records and events.
MVV: Located on the System Settings Screen.

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3.22   Current Time
>   This option is used to set the time which the system uses for timed runs and storing records and events.
>   *MVV*: Located on the System Settings Screen

3.23   Recorded Events
>   This option is for display only and allow the viewing of recorded events for the current bin. Press the select button and use the UP and DOWN arrows to vew the events and the time of their occurrence.
>   *MVV*: Recorded Events can be viewed on the Records Screen.

3.24   Accumulated Fan Time
>   This option is for display only and represents the amount of time the fans have been operating since the system was installed. It does not keep track of time the fans were operated in the manual function.
>   *MVV*: Accumulated Fan Time is not displayed.

4 System Errors

If the system detects a error in a bin, it will shut that bin off and flash the red outside light.
>   *MV*: The error can be displayed by pressing the UP arrow while the system is shut down and the red light is flashing.
>   *MVV*: The error is displayed on the System Status Screen.
>   The following is a list of possible errors:

Error	Description
Low plenum temp (ext)	The mechanical low temperature switch has been tripped.
Low plenum temp (int)	The low plenum stop temperature has been reached
Loss of air pressure	The pressure switch has been tripped indicating the fans are not running when they should
Check fan overload	The fan overload has been tripped
Temp out of range	One of the temperature sensors is reading higher than possible due to a sensor failure
Loss of fan current	The fans are not operating when they should
Frequency Drive Fault	One or more frequency drives have shut down

4.1 Restarting the system

The error must be fixed. As an example, if the error is a low plenum temperature, the plenum air must be warmed before the error can be cleared.

MV: The error then needs to be cleared from the system by pressing the SELECT button while the error is displayed.

MVV: The error needs to be cleared from the system by pressing on the error button on the System Status Screen.

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