

Figure 1. Unit Ventilator with Dehumidification and Heating/Chilled Water Control.

Features

- Certified to fit LonMark[®] Space Comfort Control Profile 8505.
- Dehumidification cycle to maintain comfort and IAQ.
- Discharge temperature control for smooth transitions between psychometric processes.
- PID control minimizes offset and maintains tight control.
- Standby mode enables energy savings during occupied hours for rooms that are not always used. When occupants are sensed the controller quickly responds to maintain comfort levels.
- Diversity control, through a demand limit input, maximizes comfort by maintaining even air distribution to all zones during morning warm-up or pre-cool operation.
- Configurable operation to meet a variety of sequence requirements.
- Conforms to the LonMark interoperability guidelines, enabling information sharing with LonMark products from other vendors.

Sequence of Operation

General

This example configuration uses a chilled water coil for cooling and dehumidification, a hot water heating coil, and an outdoor air damper for cooling and ventilation. The Predator monitors the temperature and humidity in the room and compares them to selected setpoints. As the monitored conditions change, the control algorithm operates the heating and cooling equipment to efficiently maintain the specified room setpoints.

Occupied Control

The fan may be configured to run throughout the occupied periods, or to cycle with need for heating or cooling. The outdoor air damper opens to at least the minimum ventilation setting.

Cooling

The Predator calculates the discharge air temperature that keeps the room temperature at the cooling setpoint. When outdoor conditions permit free cooling, the Predator sequences the outdoor air damper and the chilled water coil to maintain the discharge of the unit at the temperature that meets the load in the space. When outdoor conditions do not allow free cooling, the Predator sets the outdoor damper at the ventilation minimum and operates the chilled water coil to maintain the discharge temperature at setpoint.

Heating

The Predator calculates the discharge air temperature that keeps the room temperature at the heating setpoint. The Predator operates the hot water valve to maintain the discharge from the unit at the calculated temperature setpoint. The outdoor damper stays at the ventilation minimum.

Dehumidifying Mode

When the humidity in the space goes above the setpoint, the Predator opens the cooling coil valve, sets the outdoor damper at the ventilation minimum, and operates the hot water valve to temper the discharge from the unit and prevent overcooling the space. When the humidity in the space drops (below the level defined by the space humidity setpoint minus a deadband), the Predator returns to the heating or cooling mode.

Standby Control

Spaces that are not occupied on a routine basis (conference rooms, etc.) can be placed into standby mode during normally scheduled occupancy times. This saves energy by applying conservative setpoints and eliminating unnecessary ventilation.

Unoccupied Control

General

During unoccupied periods, the fan only runs when needed for heating, cooling, or dehumidifying.

The Predator may be configured to individually apply or lock out each heating and cooling device (hot water valve, OA damper, chilled water valve) during unoccupied periods.

Unoccupied Cooling Mode

When the space temperature rises beyond the unoccupied cooling setpoint, the fan starts. If free cooling is available, and the OA damper is enabled for unoccupied operation, the Predator modulates the damper to maintain the discharge setpoint and cools the space. If further cooling is required, the Predator modulates the chilled water valve to maintain the discharge setpoint. When the space temperature drops, the valve and damper close and the fan shuts off. The hot water valve stays closed.

Unoccupied Heating Mode

When the space temperature drops below the unoccupied heating setpoint, the fan starts. The Predator modulates the hot water valve to maintain the discharge setpoint and warms the space. When the space temperature rises, the valve closes and the fan shuts off. The OA damper and the chilled water valve stays closed.

Unoccupied Dehumidifying Mode

When the humidity in the space goes above the setpoint, the Predator starts the fan, opens the cooling coil valve, and operates the hot water valve to temper the discharge from the unit and prevent overcooling the space. The OA damper stays closed. When the humidity in the space drops (below the level defined by the space humidity setpoint minus a deadband), the Predator maintains the heating or cooling mode if necessary, or it shuts off the fan and the coils.

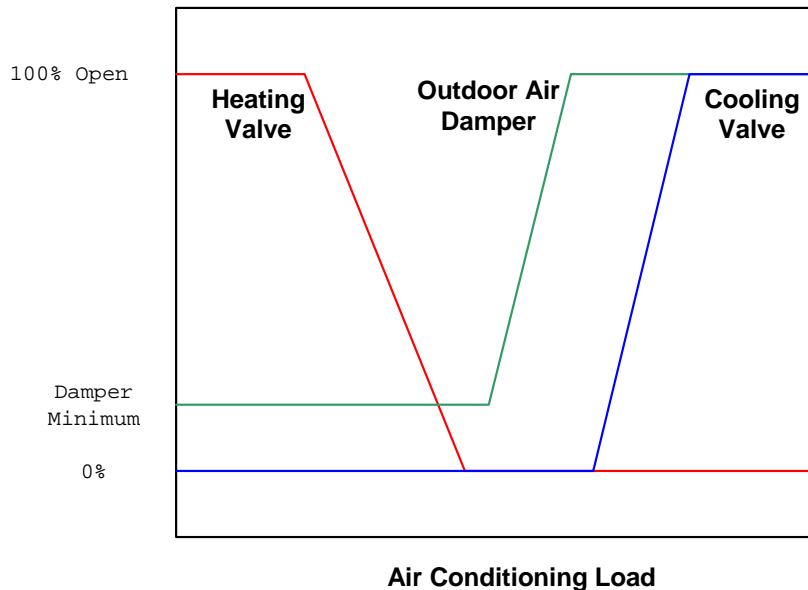
Bypass Mode

Occupants may put a room into bypass mode by pressing a button on the thermostat. This runs the equipment as in the occupied mode during periods scheduled for un-occupancy.

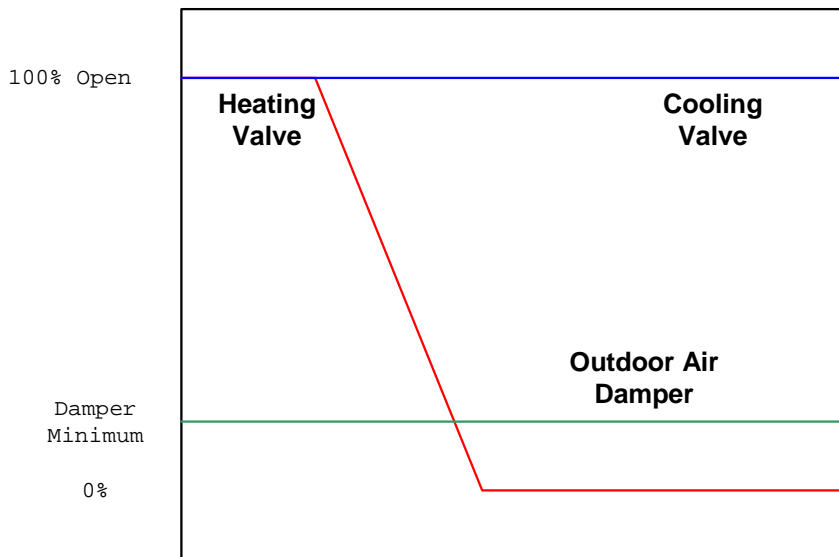
Morning Warm-up

During warm-up, the Predator applies the occupied heating setpoint. It may be configured to run at full heat capacity, at a fixed discharge temperature, or to gradually apply heating as in the occupied mode. It does not dehumidify during warm-up as in the occupied mode.

Control Sequence Diagram



Dehumidification Sequence Diagram



Optional Functions

Room Temperature Sensor Sharing

The Predator Room Temperature Sensor may share its value with other controllers on the LONTalk[®] network via a network binding. This is most commonly done when multiple terminal units serve a room or area.

Wall Switch

An optional maintained contact wall switch may be used to control the occupancy mode of a room. Rooms with variable occupancy (conference rooms, etc.) can use this device to control occupancy and the lights with one switch.

Occupancy Sensor

Another useful option is to utilize an occupancy sensor to control the occupancy mode of the Predator controller. The function of this device would be similar to the wall switch above, but an occupant entering the room would not perform any manual action to put the room into occupied mode. If the schedule is in the occupied mode and the occupancy sensor does not detect people in the room, the room will go into the standby mode enabling energy savings while maintaining occupant comfort.

Analog Damper Actuator

The Predator supports use of a Siemens OpenAir[™] GMA161.1U (or GMA161.1P – plenum type) or similar damper actuator when 0-10 VDC position control is desired.

Relief Fan

The Predator supports operation of a two-state relief device: fan or damper. When the supply fan is on and the OA damper opens beyond a selected range, the relief device is activated.

High Speed Fan Setting

The controller may operate a separate output to run the supply fan at high speed. This is applied whenever the unit starts in the unoccupied mode. It is also applied for the first few

seconds of occupancy.

Demand Control Ventilation (DCV)

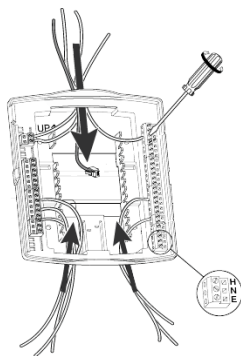
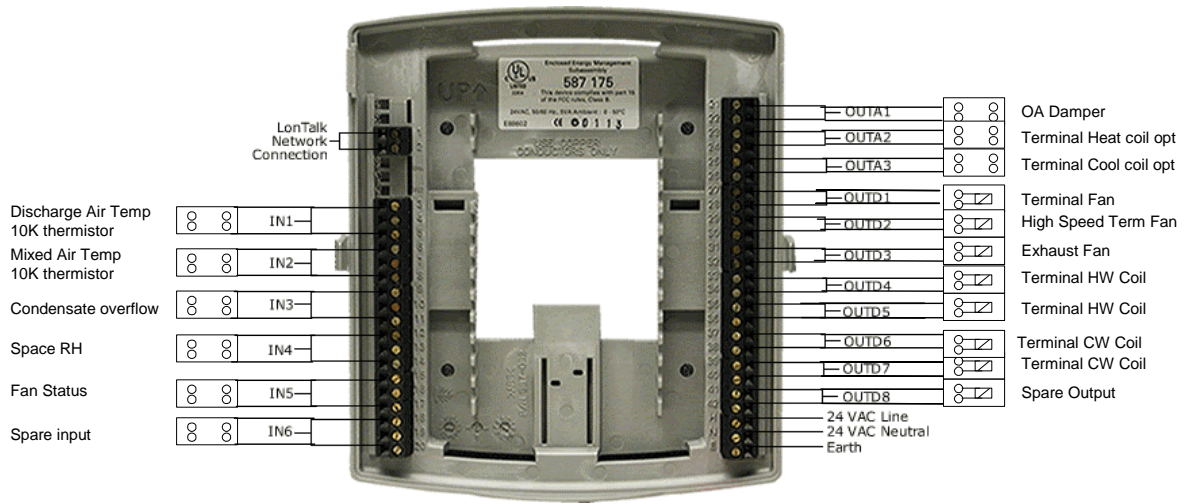
During occupied mode, the outdoor air damper opens to the design ventilation setting and stays open. The controller supports demand-controlled ventilation by allowing another node to dynamically adjust the minimum ventilation setting.

Hardware Map – Unit Vent with Dehumidification

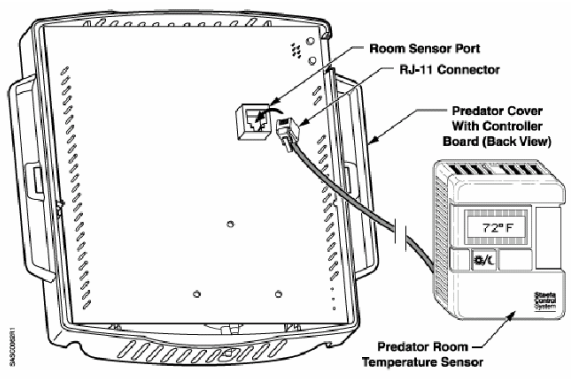
Configuration Property	Element	Input/Output	Factory Hardware Setting (Unit Ventilator CW)
inputs	StatTemp	TEMP	SPACE_TEMP
	StatSetpt	TEMP	SPACE_SETPT_TEMP
	StatOvrd	DI	STAT_SWITCH_DI
	IN1	DI, TEMP	DISCH_TEMP
	IN2	DI, TEMP	MIXED_TEMP
	IN3	DI, PCT, TEMP	CONDENSATE_OVRFLW_DI
	IN4	DI, PCT, TEMP	SPACE_HUMIDITY_PCT
	IN5	DI, PCT, TEMP	FAN_STATUS_DI
outputs	OUTA1	AO	OA_DMPR_AO
	OUTA2	AO	TRM_H_COIL_AO
	OUTA3	AO	TRM_C_COIL_AO
	OUTD1	DO, FLT_MTR	TRM_FAN_DO
	OUTD2	DO, FLT_MTR	HI_SPEED_TRM_FAN_DO
	OUTD3	DO, FLT_MTR	EXH_FAN_DO
	OUTD4	DO, FLT_MTR	TRM_H_COIL_FLT_MTR
	OUTD5	DO, FLT_MTR	TRM_H_COIL_FLT_MTR
	OUTD6	DO, FLT_MTR	TRM_C_COIL_FLT_MTR
	OUTD7	DO, FLT_MTR	TRM_C_COIL_FLT_MTR
	OUTD8	DO, FLT_MTR	SPARE_OUT1

Table 1. Hardware Map

Wiring Diagram



Note: Route wiring from either the bottom opening when using a J-box or from the base sides as shown in the picture when flat or din rail mounting. The image above is for illustrative purposes only.



RJ-11 6-Pin Connector from the Predator Room Temperature Sensor to the Controller.

Wiring Recommendations:

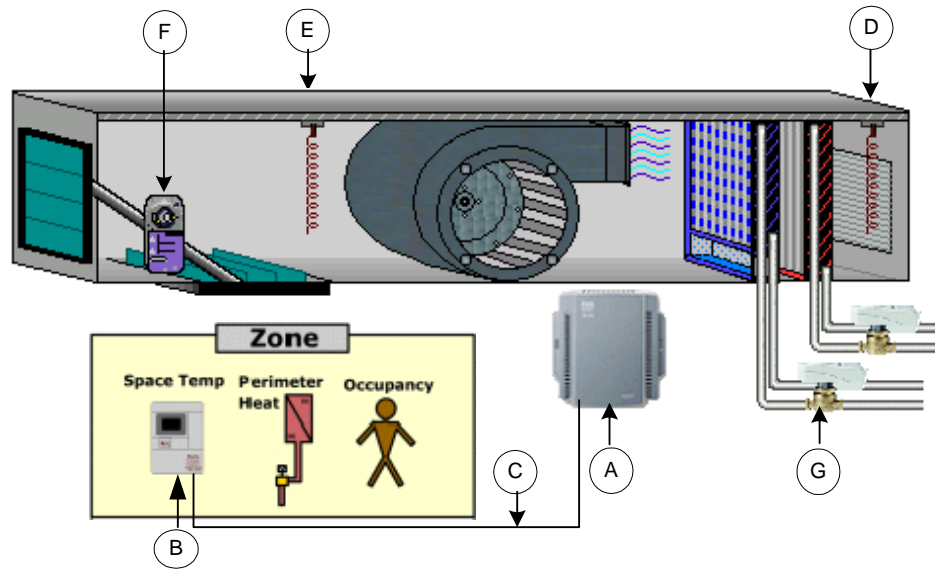
IN and AO:	20 to 22 AWG
DO:	18 to 22 AWG
Power:	16 to 18 AWG
LON Network:	22 AWG Level 4

Transformer Requirements:

Type: Class 2, 24 VAC, 50/60Hz

Figure 2. Predator Wiring Diagrams.

Bill of Materials



Tag	Description	Product #
A	Predator UV with Dehumidification AHU 6IN, 8DO, 3AO, 1RTS Predator Full Point Wiring Base	588-510 587-175
B	Predator Room Sensors: Sensing Only Override Setpoint Temperature Display Setpoint and Override Override and Temperature Display Setpoint and Temperature Display Setpoint, Override, and Temperature Display Predator Room Sensors <i>without</i> Logo's: No Logo Sensing Only No Logo Setpoint No Logo Setpoint and Override No Logo Setpoint, Override, and Temperature Display	587-180 587-181 587-182 587-183 587-184 587-185 587-186 587-187 587-550B 587-552B 587-554B 587-557B
C	Predator Room Sensor 6-Conductor Plenum Rated Cables: 25 Foot 50 Foot 100 Foot Predator Room Sensor 4-Conductor (no network connection) Plenum Rated Cables: 25 Foot 50 Foot 100 Foot	588-100A 588-100B 588-100C 588-101A 588-101B 588-101C
D	Supply Air Duct Temperature 10K thermistor 40 to 150F	587-691
Not shown	Space Humidity Sensor s 5% sensing only 2% sensing only 5% RH and Temperature 2% RH and Temperature 5% RH and Temperature with display and override	587-190 587-191 587-192 587-193 587-194
E	Low Temperature Detector	134-1510
F	Modulating (0-10Vdc) damper actuator 62 lb. In.	GMA161.1P
G	Floating valve actuator	SSB81U

Configuration Tables

The application configuration tables below are typical for a UV with Dehumidification

Application Component	Configuration Item	Element	Desired Setting
Unit Vent Core	nciSetPnts	OccupiedClg*	
		StandbyClg	(n/a if standby mode is not used)
		UnoccupiedClg	
		OccupiedHtg*	
		StandbyHtg	
		UnoccupiedHtg	
	htgClgSwit	DmdDeadband	
		TmpDeadband	TIP: Usually set to zero (default) unless the heating and cooling setpoints are very close.
		TimeDelay	TIP: Five minute default usually works well. However, you may need to extend the delay if reaction to the end of the dehumidification cycle causes unnecessary switching between heating and cooling.
		maxStDelay	
Dehumidification Control	spaceRHBand		
	HumSetpt		

Control Mode Interaction Table

Due to the large horizontal size of the control mode chart, it is split into the following two parts:

- Chart 1: Dehumidification, Heat, Warm-up and Cooling Modes
- Chart 2: Night Purge, Pre-cool, Off, Fan Only, Condensate Overflow, Fan Proof Failure and Low Temp Modes

Control Mode Chart 1 (Dehumidification, Heat, Warm-up and Cool Modes)

	Dehumid		Heat		Warmup	Cool	
	Occ	Unocc	Occ	Unocc		Occ	Unocc
Term Htg Coil (HW)	Heat Loop	Heat Loop Cycle Off	Heat Loop	Heat Loop Cycle Off	Heat Loop Cycle Max Off	Closed	Closed
Staged Heat (Elec)	Heat Loop	Heat Loop Cycle Off	Heat Loop	Heat Loop Cycle Off	Heat Loop Cycle Max Off	Off	Off
Fan	On	Cycle	On Cycle	Cycle	On Cycle	On Cycle	Cycle
OA Dmpr	Min	Closed	Min	Closed	Closed	Cool Loop Closed	Cool Loop Closed
Trm Clg Coil	Open	Open	Closed	Closed	Closed	Cool Loop	Cool Loop Cycle Off
Relief Fan	Demand	Off	Demand	Off	Off	Demand	Demand

Color Key: Red = OFF (not used); Green = Active (fixed in application); Yellow = Selectable (configurable)

Chart 2: Night Purge, Pre-cool, Off, Fan Only, Condensate Overflow, Fan Proof and Low Temp Modes

	Night Purge	Pre-Cool	Off	Fan Only	Condensate Overflow	Fan Proof Failure	Low Temp
Term Htg Coil (HW)	Closed	Closed	Closed	Closed	Closed	Closed	Open
Staged Heat (Elec)	Off	Off	Off	Off	Off	Off	Off
Fan	Demand	On Cycle	Off	On	Off	Off	Off
OA Dmpr	Cool Loop Max Off	Cool Loop Max Closed	Closed	Closed	Closed	Closed	Closed
Trm Clg Coil	Cool Loop Cycle Off	Cool Loop Max Off	Closed	Closed	Closed	Closed	Open
Relief Fan	Demand	Demand	Off	Off	Off	Off	Off

Color Key: Red = OFF (not used); Green = Active (fixed in application); Yellow = Selectable (configurable)

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