

Predator Unit Ventilator with CO2 - DX Controller Configuration

Features

- Demand Ventilation Control that adapts to meet IAQ specification requirements
- LONMARK compliant with space-comfort controller functional profile (8505)
- PID control minimizes offset and maintains tighter set point control to increase space comfort
- Economizer control of outside air damper that provides energy savings
- DX control with configurable minimum on/off time
- Conforms to the LONMARK interoperability guidelines, enabling information sharing with LONMARK products from other vendors.

Sequence of Operation

This configuration uses a DX coil, a hot water heating coil, and an outdoor air damper for cooling and ventilation. The Predator monitors the temperature in the room and compares it 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. When ventilation is enabled, the outdoor air damper opens to between the minimum ventilation setting and the minimum position. The Predator calculates a cooling (or heating demand) to maintain the space temperature at the occupied cooling (or heating) setpoint.

Occupied Cooling

The Predator uses the cooling demand to reset the discharge temperature setpoint within a configurable range. When outdoor conditions permit free cooling, the Predator operates the outdoor air damper to maintain the discharge temperature at setpoint. When outdoor conditions do not allow free cooling, the Predator sets the outdoor damper at the ventilation position. The DX coil is operated to maintain the space temperature at setpoint.

Occupied Heating

The Predator uses the heating demand to reset the discharge temperature setpoint within a configurable range. The Predator operates the hot water valve to maintain the discharge temperature at setpoint. The outdoor damper stays at the ventilation position. Perimeter heat is operated to maintain the space temperature at setpoint.

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

During unoccupied periods, the fan only runs when needed for heating, cooling. 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 operates the DX coil to maintain the space temperature. When the space temperature drops, the damper closes and the fan and DX coil shut 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.

Bypass Mode

Occupants may put a room into bypass mode by pressing a button on the room sensor. 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.

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.

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.

Exhaust 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.

Low Speed Fan Setting

The controller may operate a separate output to run the supply fan at low speed. A network input determines which fan speed is selected.

Occupancy Control

Occupancy Mode

The Predator controller defaults to the occupied mode of operation. Upon receipt of the 4-state LonMark occupancy override (*nviOccManCmd*), the controller will switch to the appropriate mode of operation. A brief summary of each mode follows below:

<u>LonMark</u> <u>Occupancy State</u>	<u>Mode</u>	<u>Description</u>
(0)	Occupied	Controller in Occupied mode and uses Occupied setpoints.
(1)	Unoccupied	Controller in Unoccupied mode and uses Unoccupied setpoints.
(2)	Bypass	Controller temporarily in Occupied mode and uses Occupied setpoints until the Bypass Time elapses. Controller then returns to previous occupancy state.
(3)	Standby	Controller in Standby mode and uses Standby setpoints.

If a LonMark compatible occupancy schedule input (*nviOccSchedule*) is used, the controller will use the modes and setpoints as shown above. This will allow the Predator controller to utilize the scheduling properties of other devices on the LonTalk Network.

The occupancy signal could also come from a time clock, wall switch, or occupancy sensor physically wired to one of the inputs of the Predator controller. This occupancy signal could then be shared with other controllers via the Lon Network.

Bypass Mode

If enabled (through *stptDialEn*) and the Bypass button on the Predator room sensor is pressed, the controller will be placed in the Bypass mode for the amount of time specified by the controller's configuration parameters (default 60 min. – see Table 2). If the button is subsequently pressed again prior to the expiration of the Bypass time, the timer will reset to the initial value and resume counting down.

Priorities of Occupancy Control

Occupancy overrides are prioritized as follows (listed from highest to lowest):

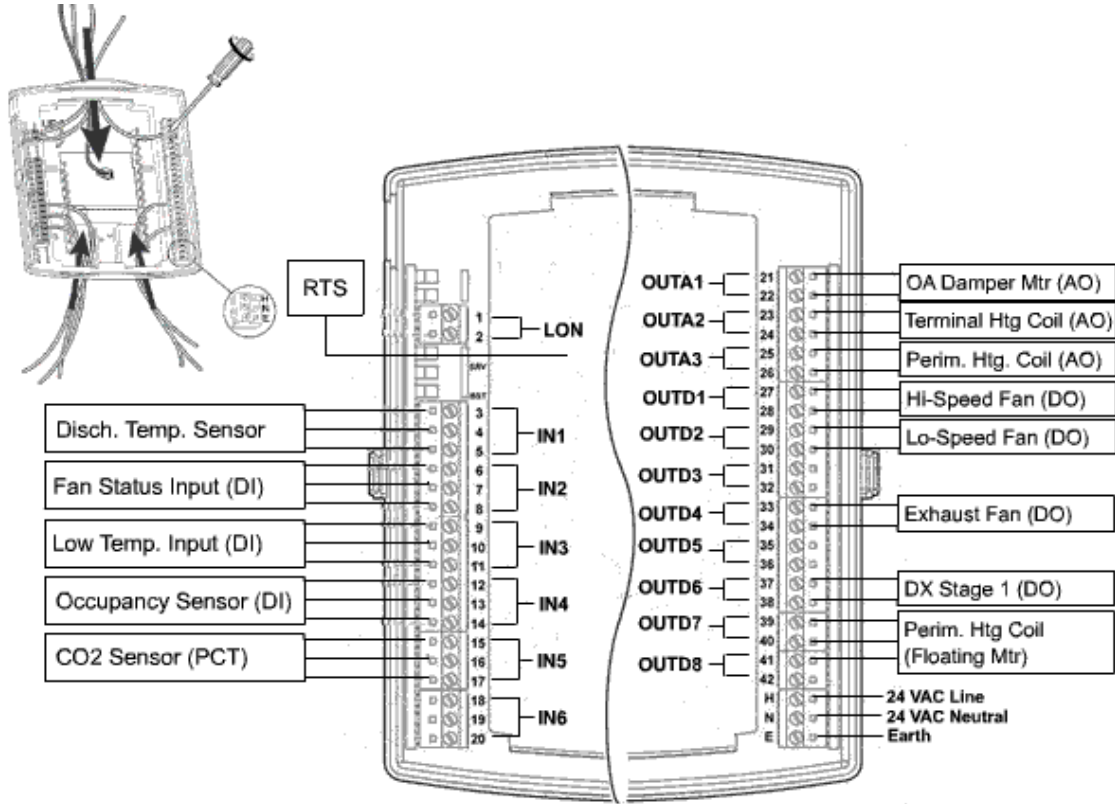
- Operator Command – A valid occupied command sent from system operator.
- Bypass Button – Button on Talon room sensor, also utilized by occupants of room.
- Occupancy Sensor/Wall Switch – Locally connected or signal via the network.
- Occupancy Schedule – Sent from network.

Hardware Map – Unit Ventilator with CO2 - DX

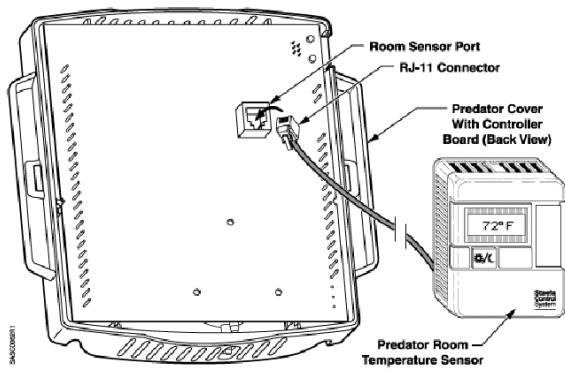
Sample Hardware Map for the Unit Ventilator with CO2 - DX Application Configuration

Configuration Property	Element	Input/Output Type	Factory Hardware Setting
inStat	statTempOffset	-	0°F 0°C
	statSetptOffset	-	0°F 0°C
Inputs	statTemp	TEMP	SPACE_TEMP
	statSetpt	TEMP	SPACE_SETPT_TEMP
	statOvrdr	DI	STAT_SWITCH_DI
	IN1	DI, TEMP	DISCH_TEMP
	IN2	DI, TEMP	FAN_STATUS_DI
	IN3	DI, PCT, TEMP	LOW_TEMP_DI
	IN4	DI, PCT, TEMP	OCC_SENSOR_DI
	IN5	DI, PCT, TEMP	SPACE_CO2_PCT
	IN6	DI, PCT, TEMP	IN_UNUSED
Outputs	OUTA1	AO	OA_DMPR_AO
	OUTA2	AO	TRM_H_COIL_AO
	OUTA3	AO	PERIM_H_COIL_AO
	OUTD1	DO, FLT_MTR	HI_SPEED_TRM_FAN_DO
	OUTD2	DO, FLT_MTR	LO_SPEED_TRM_FAN_DO
	OUTD3	DO, FLT_MTR	OUT_UNUSED
	OUTD4	DO, FLT_MTR	EXH_FAN_DO
	OUTD5	DO, FLT_MTR	OUT_UNUSED
	OUTD6	DO, FLT_MTR	DX_STAGE_1
	OUTD7	DO, FLT_MTR	PERIM_H_COIL_FLT_MTR
	OUTD8	DO, FLT_MTR	PERIM_H_COIL_FLT_MTR

Sample Wiring Diagram for Unit Ventilator with CO2 - DX Application Configuration



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:

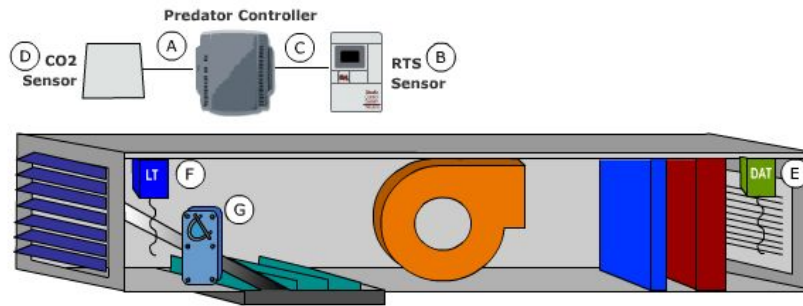
IN and AO: 20 to 22 AWG
 DO: 18 to 22 AWG
 Power: 16 to 18 AWG
 LON Network: 22 AWG
 Level 4

Transformer Requirements:

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

Predator Wiring Diagrams (Full Point Board Shown)

Bill of Materials



Tag	Description	Product #	
A	PREDATOR DX UV WITH CO2 6IN, 8DO, 3AO, 1RTS	588-520	
	PREDATOR FULL POINT WIRING BASE	587-175	
B	PREDATOR ROOM SENSORS:		
	Sensing Only	587-180	
	Override	587-181	
	Setpoint	587-182	
	Temperature Display	587-183	
	Setpoint and Override	587-184	
	Override and Temperature Display	587-185	
	Setpoint and Temperature Display	587-186	
	Setpoint, Override, and Temperature Display	587-187	
	PREDATOR ROOM SENSORS <i>WITHOUT</i> LOGO'S:		
	No Logo Sensing Only	587-550B	
	No Logo Setpoint	587-552B	
	No Logo Setpoint and Override	587-554B	
No Logo Setpoint, Override, and Temperature Display	587-557B		
C	PREDATOR ROOM SENSOR 6-CONDUCTOR PLENUM RATED CABLES:		
	25 Foot	588-100A	
	50 Foot	588-100B	
	100 Foot	588-100C	
	PREDATOR ROOM SENSOR 4-CONDUCTOR (NO NETWORK COMMUNICATION) PLENUM RATED CABLES:		
	25 Foot	588-101A	
	50 Foot	588-101B	
	100 Foot	588-101C	
	D	ROOM CO2 SENSOR	QPA63.1
E	DISCHARGE AIR 10K THERMISTOR SENSOR	587-691	
F	LOW TEMPERATURE STAT (optional)	134-1510	
G	MODULATING DAMPER ACTUATOR (optional for OAD)	GMA161.1P	
Not shown	OCCUPANCY SENSOR (optional)	587-180	
	OUTSIDE AIR 10K THERMISTOR SENSORS 0 to 120F (optional)	587-692	
	FLOATING VALVE ACTUATOR (WATER SOURCE HEAT)	SSB81U	

Configuration Table

The following table lists all of the configuration properties (CPs) available with this application. For more information on how to set these properties, please consult the *Predator Unit Ventilator with CO2 Application Guide*.

Configuration Properties – Unit Ventilator with CO2 (DX)

Name	Element	Factory Value
actDisplay		Command
bypassTime		60 min
cCoilNPurg		Off
cCoilPcool		Modulate
cCoilUnocc		Cycle
clgDmdCtrB	Pb	2.78°C (5.0°F)
	Ti	2000 seconds
	Td	0 seconds
cO2SensRng		0 ppm
dXCycTime		12 minutes
dXFanOffDly		30 seconds
dXMinOffTime		2 minutes
dXMinOnTime		2 minutes
dXStageDelay		3 minutes
dXSwitchMeth		PWM
dischTPcool		Cycle
dischTUnocc		Cycle
dischTWrmup		Cycle
dischTempRange	minTemp	32°C (89.6°F)
	maxTemp	48°C (118.4°F)
econDBand		1°C (1.8°F)
econOffset		1°C (1.8°F)
fanMinOn		2 minutes
fanOcc		On
fanStatusEn		False
fanStby		Modulate
fanWarmup		On
hCoilFanRq	percentOn	3%
	percentOff	0%
hCoilUnocc		Cycle
hCoilWrmup		Cycle
hStageCyc		10 minutes
htgClgSwit	dmdDeadband	1%
	tmpDeadband	1°C (1.8°F)
	timeDelay	6 minutes
htgDmdCtrB	Pb	5.56°C (10.008°F)
	Ti	1000 seconds
	Td	0 seconds
htgFanDelay		2 minutes
htgSwitMeth		deadBand
loTempLatch		False
maxStDelay		10 minutes
numDXStages		1
numHStages		0
numPerimStgs		0
oADFanDband		3%
oADFanOn		3%

Name	Element	Factory Value
oADFanReq	percentOn	3%
	percentOff	0%
oADamperMotr	TravelTime	90 seconds
	Reverse	False
	SyncDirection	Close
oADmdCtrB	Pb	35°C (63°F)
	Ti	200 seconds
	Td	0 seconds
oADmpr	Enable	True
	dmdAtMin	0%
	dmdAtMax	40%
oADmpr2PosEn		False
oADmprNPurg		Modulate
oADmprPcool		Modulate
oADmprUnocc		Modulate
oAMinPosVent		10%
oAStptRange	minTemp	12°C (53.6°F)
	maxTemp	18°C (64.4°F)
occSensPrior		Unoccupied
occSensorEn		False (disabled)
perimHUnocc		Modulate
perimHWrmup		Cycle
perimHtgCoil	Enable	False
	dmdAtMin	0%
	dmdAtMax	100%
perimHtgMotr	TravelTime	125 seconds
	Reverse	False
	SyncDirection	Close
spaceCO2Stpt		0 ppm
statSwitchEn		False (disabled)
stptDialEn		False (disabled)
stptOffsetSpan		2°C
tempStptLim	minTemp	19°C (66.2°F)
	maxTemp	25°C (77°F)
trmHDmdCtrB	Pb	50°C
	Ti	300 seconds
	Td	0 seconds
trmClgCoil	Enable	True
	dmdAtMin	50%
	dmdAtMax	100%
trmHtgCoil	Enable	True
	dmdAtMin	0%
	dmdAtMax	100%
trmHtgEnrgy		Electric
trmHtgMotr	TravelTime	125 seconds
	Reverse	False
	SyncDirection	Close
unocDBand		2°C (3.6°F)
ventDmdCtrB	Pb	0
	Td	0 seconds
	Ti	0 seconds
ventTempDb		5°C (9°F)

* Available on some models of the Predator Room Temperature Sensor.

Network Configuration Inputs (nci)

Name	Element	Factory Value
nciOADmprMin		10%
nciSetPnts	Occupied Cooling Stpt	23.0°C (73.4°F)
	Standby Cooling Stpt	25.0°C (77.0°F)
	Unoccupied Cooling Stpt	28.0°C (82.4°F)
	Occupied Heating Stpt	21.0°C (69.8°F)
	Standby Heating Stpt	19.0°C (66.2°F)
	Unoccupied Heating Stpt	16.0°C (60.8°F)

Control Mode Interaction Table – UV with CO2 - DX

Color Key

- Red: OFF (not used)
- Green: Active (fixed in application)
- Yellow: Selectable (configurable)

	Heat		Warmup	Cool		Night Purge	Pre-Cool	Off	Fan Only	Low Temp
	Occ	Unocc		Occ	Unocc					
Term Htg Coil	Heat Loop	Heat Loop Cycle OFF	Heat Loop Cycle Max OFF	Closed	Closed	Closed	Closed	Closed	Closed	Max (HW) Off (elec)
Perim Heat	Heat Loop	Heat Loop Cycle OFF	Heat Loop Cycle Max OFF	Closed	Closed	Closed	Closed	OFF	OFF	Heat Loop
Fan (High/Low)*	ON Demand	Demand	ON Demand	ON Demand	Demand	Demand	ON Demand	OFF	ON	OFF
OA Dmpr	Min**	Closed	Closed	Cool Loop Min**	Cool Loop Close	Cool Loop Max OFF	Cool Loop Max OFF	Closed	Closed	Close
DX Stages	OFF	OFF	OFF	Cool Loop Cycle OFF	Cool Loop Cycle OFF	Cool Loop Cycle OFF	Cool Loop Cycle Max OFF	OFF	OFF	OFF
Exhaust Fan	On***	Off	Off	On***	On***	On***	On***	off	Off	off

* Fan operates at high or low speed, as indicated by [nviFanSpeedSel](#).

**Dampers can be opened further as determined by ventilation loop

***Based on [OADmpr](#) position

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