BACnet Performance Products
EXACTLOGIC

ExactLogic BACnet Communicating Thermostat
EXL01620 Sequence Datasheet

Fan Coil Units

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EXACTLOGIC

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Operating Sequence

Standard Occupied

During normal occupied operation the display will show the current room temperature. The first press of either right pair of keys will show the current room setpoint. Additional presses will adjust the setpoint up or down by 0.5 degrees. The thermostat keypad will time out after 5 seconds without a key press, and the display will switch back to displaying the room temperature.

The left pair of keys allows for the adjustment of the fan speed. The current mode is shown with the first key press; additional key presses will show the adjustment to the mode. AV-62 is used to select the number of fan speeds, and AV-63 will show what speed the fan is currently set to. Refer to the table below for the values of AV-62 (Fan Mode Status) and AV63 (Fan Speed Status)

AV-62	Mode
0	AUTO Only
1	AUTO-ON
2	OFF-AUTO-ON
3	OFF-1-2-AUTO
4	OFF-1-2-3-AUTO

AV-63	Fan Speed
0	OFF
1	Fan Speed 1
2	Fan Speed 2
3	Fan Speed 3
4	AUTO
5	ON

Internal/External Thermistor Control

The thermostat control sequence can use the internal thermistor or an external thermistor connected to AI-2. Setting BV-67 to OFF (default) the thermostat will use the internal thermistor. Setting BV-67 to ON the control sequence will use the external thermistor.

The current controlling temperature is located at AV-20. This value will be displayed on the LCD of the thermostat and should be used on any workstation displays.

Control Sequence

The occupancy of the thermostat is controlled by BO-5. When active the thermostat will maintain its occupied setpoint. The deadband is controlled by the cooling/heating offset (default 1 degree). The fan will run during occupied times or with a Night Heat/Cool Request. The fan speed will modulate between the Max and Min Fan speeds (AV-47 and 48), controlled by the cooling signal. The fan speed will modulate between the Max Heat and Min Fan speeds (AV-46 and 48), controlled by the heating signal. The heating and cooling signals are determined by a PI control loop.

Heating is providing by output AO-1. The heating control signal is determined by a PI control loop that used the Supply Air Temperature Setpoint (AV-39) and the Supply Air Sensor connected to AI-3. The Supply Air Setpoint modulates between the Hi and Lo Setpoints (AV-44 and 43), and is controlled by the heating signal. In order to maintain the Supply Air Setpoint the heating output is cycled on and off. The cycle time is determined by a ratio of the heating control signal and the heating cycle period, ie (AV-42/100) * AV-36.

The thermostat also has damper control outputs that can be used for heating and cooling. The damper position will modulate from 0-100% and is controlled by the heating or cooling signal. In a heating mode the Warm Air in Duct signal (BV-8) needs to be ON, or the damper will set to full closed position.

Standard Unoccupied

During unoccupied operation the thermostat will continue to display the room temperature. When in an unoccupied state pressing one of the right pair of keys will display a message indicating the thermostat is in night mode, preventing the setpoint from being adjusted. To adjust the room setpoint when unoccupied the thermostat must be set to night override.

Control Sequence

When in the unoccupied mode, the room will be controlled by the unoccupied cooling/heating setpoints. The fan and cooling/heating stages will operate the same as the occupied control sequence.

Night Overrride

Set the night override by pressing one of the left pair of keys. The display will switch to allow the user to set the night override time. Additional presses of the keys will adjust the time up or down by 0.5 hour increments. The night override can be increased up to the override limit set at AV-73, the default is 5 hours. When the thermostat is in night override, the first press of one of the left pair of keys will display the override time remaining. Additional key presses will add/subtract 0.5 hours to the time that was remaining. When the timer reaches zero the thermostat will return to the unoccupied mode.

In the night override mode, the right pair of keys can be used to adjust the room setpoint. The thermostat keypad will time out after 5 seconds without a key press, and the display will switch back to displaying the room temperature.

The thermostat can be set to a night override by writing a value to AV-74 through BACnet. The value can not exceed the night override limit set at AV-73. If the night override time is set higher than the limit, the night override timer will be set to the limit. The night override limit default is 5 hours.

If the thermostat is commanded to the occupied mode while in night override, the override timer will be cleared to zero and the thermostat will enter the occupied mode.

Control Sequence

When the thermostat is in the override mode, the room will be controlled by the occupied cooling/heating setpoints. The fan and cooling/heating stages will operate the same as the occupied control sequence.

Note: There is no fan control in the override mode. The fan will run in the AUTO mode.

Installation

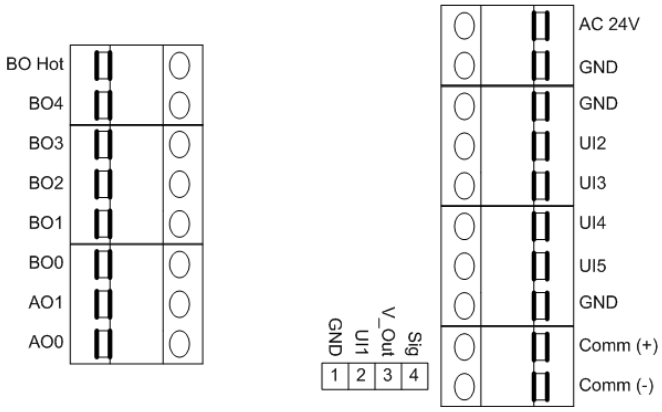

Fig. 4

*Note: Thermostat Common Relay point (BO Hot) usually 24VAC/DC or R

AC 24V.....24VAC/DC Hot
GND ..... Neutral/Ground
GND ..... Neutral/Ground
UI2 .....Universal Input 2
UI3 .....Universal Input 3
UI4 .....Universal Input 4
UI5 .....Universal Input 5
GND ..... Neutral/Ground
Comm (+)..... Network Positive Line
Comm (-).....Network Negative Line
BO Hot .....Com, 24VAC Hot for relays*
BO4 ..... Relay 5 Output, 24VAC/DC
BO3 ..... Relay 4 Output, 24VAC/DC
BO2 ..... Relay 3 Output, 24VAC/DC
BO1 ..... Relay 2 Output, 24VAC/DC
BO0 ..... Relay 1 Output, 24VAC/DC
AO1 ..... Analog Output 1, 0-10V
AO0 ..... Analog Output 0, 0-10V

1 ..... Neutral/Ground
2 .....Universal Input 1
3 .....Analog Output 2
4 .....Reserved

Output Wiring

Output/Label	Function
BO0	Fan
BO1	
BO2	
BO3	Damper Open
BO4	Damper Close
AO-1	Fan Speed 0-10 Vdc 0-100%
AO-2	Electric Heat 0-10 Vdc 0-100%

Reserved BACnet Points

The following are points reserved by the thermostat for operation.

Analog Inputs

Instance	Object Name	Description	Read/Write	Default
AI-0	Internal Thermistor	Reading of the internal thermistor in counts. 0-1024	R	variable
AI-1	Analog Input 01	Reading of the external input 1 in counts. 0-1024	R	variable
AI-2	Ext. Room Temp	Optional external room temperature input	R	variable
AI-3	Supply Air Temp	Supply Air Sensor input	R	variable
AI-4	Analog Input 04	Reading of the external input 4 in counts. 0-1024	R	variable
AI-5	Analog Input 05	Reading of the external input 5 in counts. 0-1024	R	variable

Analog Outputs

Instance	Object Name	Description	Read/Write	Default
AO-0	Fan Speed	0-10V output for control of fan speed	R/W	0.0
AO-1	Electric Heat SCR	0-10V output for control of electric heat	R/W	0.0
AO-2	Analog Output 2	Variable 0-14VDC, 150mA output	R/W	0.0

Analog Values

Instance	Object Name	Description	Read/Write	Default
AV-0	Mode of Operation	The mode that the thermostat is currently in. 0 = Heat Mode 1 = Cool Mode 2 = Idle 3 = Afterhours 4 = Unoccupied Idle 5 = Unoccupied Heat Mode 6 = Unoccupied Cool Mode	R	4
AV-1	Analog Value 001			
AV-2	Analog Value 002			
AV-3	Analog Value 003			
AV-4	Current Htg SP	The setpoint that controls heating. If the room temperature goes below this setpoint the thermostat will enter heating mode.	R	80.0°F
AV-5	Current Clg SP	The setpoint that controls cooling. If the room temperature goes above this setpoint the thermostat will enter cooling mode.	R	60.0°F
AV-6	Heating SP	The setpoint used for heating during occupied mode. This setpoint is calculated by AV-66 (Current SP) – AV-70 (Heating Offset)	R	72.0°F

AV-7	Cooling SP	The setpoint used for cooling during occupied mode. This setpoint is calculated by AV-66 (Current SP) + AV-69 (Cooling Offset)	R	74.0°F
AV-8	Heat Signal	Current heating signal as a percent	R	0%
AV-9	Cool Signal	Current cooling signal as a percent	R	0%
AV-10	Analog Value 010		R	variable
AV-11	Analog Value 011		R	variable
AV-12	Analog Value 012		R	variable
AV-13	Analog Value 013		R	variable
AV-14	Analog Value 014		R	variable
AV-15	Analog Value 015		R	variable
AV-16	Analog Value 016		R	variable
AV-17	Analog Value 017			
AV-18	Analog Value 018		R	variable
AV-19	Analog Value 019		R	variable
AV-20	Room Temp	Selected from either AI-0 or AI-2. BV-67 is used for selection. This is the value displayed on the LCD of the thermostat and should be used to display the temperature on any workstation display.	R	variable
AV-21	Analog Value 021			
AV-22	Analog Value 022			
AV-23	Analog Value 023			
AV-24	Heat Cycle Divisor	Multiplied with the electric heat signal to determine the time the heat command is off or on. (Value is AV-42/100)	R	0.1
AV-25	Damper Motor % Open	The current position of the supply air damper	R	0%
AV-26	Cooling Deviation	The difference in the zone temperature from cooling setpoint		Varies
AV-27	Heating Deviation	The difference in the zone temperature from heating setpoint		Varies
AV-28	Deviation from SP	The difference in the zone temperature from setpoint, determined by whether the zone is heating or cooling	R	Varies
AV-29	Zone Scan	Numerical representation to tell the mode the zone is in. Used for workstation graphics (100 = Full Heat, -100 = Full Cool	R	0%
AV-30	AI-0 Setup	Parameter used to set the input type. 0 = counts 1 = temperature 2 = 4-20mA 3 = 0-5V 4 = 0-10V 5 = pulse	R	1
AV-31	AI-1 Setup	See AV-30	R	0
AV-32	AI-2 Setup	See AV-30	R	0
AV-33	AI-3 Setup	See AV-30	R	0
AV-34	AI-4 Setup	See AV-30	R	0
AV-35	AI-5 Setup	See AV-30	R	0
AV-36	Electric Heat %	The electric heat control signal	R	0%

AV-37	Elec Heat ON Time	The amount of time to keep the heating output ON.	R	0 sec
AV-38	Elec Heat OFF Time	The amount of time to keep the heating output OFF.	R	0 sec
AV-39	Ht Mode Current SAT SP	The current supply air temperature setpoint	R	68°F
AV-40	Motor Deadband	Maximum percentage difference between the current damper position and the heating/cooling signal before the damper will adjust its position.	R/W	10%
AV-41	Motor Time	Amount of time to drive the damper full open/close	R/W	45 sec
AV-42	Elec Ht Cycle Period	Maximum cycle time for the Heat ON/OFF command	R/W	10 sec
AV-43	Ht SAP Lo Limit	The minimum supply air setpoint for heat mode	R/W	68°F
AV-44	Ht SAP Hi Limit	The maximum supply air setpoint for heat mode	R/W	100°F
AV-45	Filter Alarm SP	Maximum runtime for the filter before triggering an alarm (BV-28).	R/W	3000 hrs
AV-46	Max Heat Fan Speed	The maximum speed for the fan during heat mode	R/W	75%
AV-47	Max Fan Speed	The maximum speed for the fan during cool mode	R/W	100%
AV-48	Min Fan Speed	The minimum speed for the fan during heat or cool mode	R/W	40%
AV-49	Analog Value 049			
AV-50	Supply Temp Ki	Ki constant used for the PI control of the electric heat signal	R/W	0.03
AV-51	Supply Temp Kp	Kp constant used for the PI control of the electric heat signal	R/W	0
AV-52	Fan Speed Scalar In1	Minimum setpoint used to scale the heating signal used to control the fan speed.	R.W	0
AV-53	Fan Speed Scalar In2	Maximum setpoint used to scale the heating signal used to control the fan speed.	R/W	100
AV-54	Reheat Scalar In1	Minimum setpoint used to scale the heating signal used to control the electric heat supply air setpoint. (20 means do not modulate discharge setpoint until the heating signal is 20%)	R/W	20
AV-55	Reheat Scalar In2	Maximum setpoint used to scale the heating signal used to control the electric heat discharge setpoint.	R/W	100
AV-56	Filter Runtime	The number of runtime hours on the filter. Set to zero (0) after changing filter.	R/W	0 hrs
AV -57	Fan Runtime	The number of runtime hours on the fan.	R/W	0 hrs
AV-58	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-59	Pseudo Ave Time Base	Factor used to average the room temperature. A small number will allow the room temperature to change faster over time. A large number will cause the room temperature to change slower over time.	R	100
AV-60	Cal Offset	The calibration offset for the internal thermistor.	R	variable
AV-61	Space Alarm Offset	This offset +/- the Current Cooling/Heating SP is used to determine if the space is too warm/cold, and set an alarm if necessary.	R/W	5.0°F
AV-62	# of Fan Speeds	Select the number of fan speeds for a multispeed fan. 0 = Auto Only 1 = AUTO - ON 2 = Off - AUTO - ON	R/W	1

		3 = Off-1-2-AUTO 4 = Off-1-2-3-AUTO		
AV-63	Current Fan Speed	The fan speed the thermostat is currently running. 0 = OFF 1 = Fan Speed 1 2 = Fan Speed 2 3 = Fan Speed 3 4 = AUTO 5 = ON	R	4
AV-64	Vacant Clg SP	Used in Hotel Mode. When a room is known vacant, the setpoint can be set below the unoccupied setpoint.	R/W	85.0°F
AV-65	Vacant Htg SP	Used in Hotel Mode. When a room is known vacant, the setpoint can be set below the unoccupied setpoint.	R/W	55.0°F
AV-66	Room Setpoint	The occupied room setpoint	R/W	73.0°F
AV-67	Occupied Sp Hi Limit	The maximum occupied room setpoint allowed.	R/W	85.0°F
AV-68	Occupied Sp Lo Limit	The minimum occupied room setpoint allowed	R/W	55.0°F
AV-69	Clg Offset	The offset from Room Setpoint used to calculate the Occupied Cooling SP	R/W	1.0°F
AV-70	Htg Offset	The offset from Room Setpoint used to calculate the Occupied Heating SP	R/W	1.0°F
AV-71	Unoccupied Clg SP	The cooling setpoint used when the thermostat is unoccupied.	R/W	80.0°F
AV-72	Unoccupied Htg SP	The heating setpoint used when the thermostat is unoccupied.	R/W	60.0°F
AV-73	After Hours Limit	The maximum hours the thermostat is allowed to run during afterhours time. Setting this will set the thermostat to occupied operation. (0-99.9 hrs)	R/W	5.0 hrs
AV-74	After Hours Timer	The current amount of afterhours time left.	R	0.0 hrs
AV-100	Analog Value 100	Internal thermistor display descriptor. The present value is automatically transferred. The AV description holds the descriptor to display.	R	variable
AV-101	Analog Value 101	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display.	R/W	
AV-102	Analog Value 102	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	
AV-103	Analog Value 103	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	
AV-104	Analog Value 104	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	
AV-105	Analog Value 105	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	

AV-106	Analog Value 106	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	
AV-107	Analog Value 107	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	
AV-108	Analog Value 108	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	
AV-109	Analog Value 109	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	
AV-110	Analog Value 110	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	
AV-111	Analog Value 111	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	
AV-112	Analog Value 112	Display descriptor. Transfer the value to display to the present value. The AV description holds the descriptor to display	R/W	

Binary Inputs

Instance	Object Name	Description	Read/Write	Default
BI-0	Binary Input 00		R	
BI-1	Binary Input 01		R	
BI-2	Binary Input 02		R	
BI-3	Binary Input 03		R	
BI-4	Binary Input 04		R	
BI-5	Occupied Relay	Optional occupied relay	R	

Binary Outputs

Instance	Object Name	Description	Read/Write	Default
BO-0	Fan	Output for Fan Control	R/W	OFF
BO-1	Binary Output 1			
BO-2	Binary Output 1			
BO-3	Damper Open	Damper Open command	R/W	OFF
BO-4	Damper Closed	Damper Closed Command	R/W	OFF
BO-5	Scheduled Occupied	Logical point only. Used for scheduling purposes. INACTIVE is unoccupied.	R/W	OFF

Binary Values

Instance	Object Name	Description	Read/Write	Default

BV-0	Bad Sensor Alarm	Alarm for a bad internal thermistor	R	OFF
BV-1	H/C Mode	Sequence point to show analog heating or cooling. OFF = Cooling ON = Heat	R	OFF
BV-2	Binary Value 002			
BV-3	Binary Value 003			
BV-4	Binary Value 004			
BV-5	Binary Value 005			
BV-6	Binary Value 006			
BV-7	Binary Value 007			
BV-8	Warm Air in Duct	Signal used to determine if warm air is in the supply duct. This point is written to the thermostat from an external device.	R/W	OFF
BV-9	Space Alarm Delay	Delay used to prevent a space alarm after receiving an occupied command. The delay is 7200 sec	R	OFF
BV-10	Program Status	Used to determine if the sequence was loaded correctly on a BACnet Restore or power up.	R	OFF
BV-11	Binary Value 011			
BV-12	Binary Value 012			
BV-13	Binary Value 013			
BV-14	Night Heat Request	BV-16 is ACTIVE and the zone has been unoccupied for a minimum of 5 minutes.	R	OFF
BV-15	Night Cool Request	BV-17 is ACTIVE and the zone has been unoccupied for a minimum of 5 minutes.	R	OFF
BV-16	Night Heat Status	Status of the heating signal used for night heating	R	OFF
BV-17	Night Cool Status	Status of the cooling signal used for night cooling	R	OFF
BV-18	Binary Value 018			
BV-19	Binary Value 019			
BV-20	Binary Value 020			
BV-21	Binary Value 021			
BV-22	Too Warm Status	Status of the Too Warm Alarm before checking the Space Alarm Delay	R	OFF
BV-23	Too Cool Status	Status of the Too Warm Alarm before checking the Space Alarm Delay	R	OFF
BV-24	Space To Warm Alarm	The space temperature has been below the Room Set point (AV-66) – Space Alarm Offset (AV-61) for at least 7200 seconds.	R	OFF
BV-25	Space To Cool Alarm	The space temperature has been above the Room Set point (AV-66) + Space Alarm Offset (AV-61) for at least 7200 seconds.	R	OFF
BV-26	Binary Value 026			
BV-27	Binary Value 027			
BV-28	Filter Alarm	The filter runtime has exceeded the alarm setpoint (AV-45).	R	OFF
BV-29	Binary Value 029			
BV-30	Binary Value 030			
BV-31	Binary Value 031			
BV-32	Heat ON Command	Status of the Heat ON command	R	OFF
BV-33	Heat OFF Command	Status of the Heat OFF command	R	OFF
BV-34	Binary Value 034			

BV-35	Binary Value 035			
BV-36	Binary Value 036			
BV-37	Binary Value 037			
BV-38	Heating Lockout	Status for this point is transfer to the thermostat to lockout the heating	R	OFF
BV-39	Cooling Lockout	Status for this is transfer to the thermostat to lockout the cooling	R	OFF
BV-40	Occupied Status	The status of this point switches the thermostats occupancy settings. When ON, the thermostat is in Occupied Setpoint Mode or After Hours Mode.	R	OFF
BV-41	Opt. Start Warmup	A Warmup command has been sent to the thermostat. When ON the thermostat will switch to occupied settings.	R/W	OFF
BV-42	Opt. Start Cooldown	A Cooldown command has been sent to the thermostat. When ON the thermostat will switch to occupied settings.	R/W	OFF
BV-43	Occ Set point Mode	The thermostat has been commanded occupied via BO-5, or a Warmup/Cooldown command has been sent via BV-41/BV-42.	R	OFF
BV-44	After Hours Status	The thermostat has been set to after hours mode. When ON the thermostat will switch to occupied settings.	R	OFF
BV-45	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	OFF
BV-46	Binary Value 046			
BV-47	Binary Value 047			
BV-48	Binary Value 048			
BV-49	Update Descriptors	When ON descriptor changes are sent to the thermostats LCD, this point will auto reset to OFF.	R/W	OFF
BV-50	Binary Value 050			
BV-51	BI-5 for Occupancy	ON = BI will be used to indicate zone occupancy OFF = BI is not used for occupancy	R/W	OFF
BV-52	Binary Value 052			
BV-53	Binary Value 053			
BV-54	Binary Value 054			
BV-55	Binary Value 055			
BV-56	Binary Value 056			
BV-57	Binary Value 057			
BV-58	Binary Value 058			
BV-59	Binary Value 059			
BV-60	Binary Value 060			
BV-61	Binary Value 061			
BV-62	Binary Value 062			
BV-63	Binary Value 063			
BV-64	Binary Value 064			
BV-65	Binary Value 065			
BV-66	Binary Value 066			
BV-67	Room Temp Select	When OFF, the internal thermistor is selected for the control sequence. When ON, an external thermistor attached to AI-1 is selected for control of the sequence	R/W	OFF
BV-68	Backlight Off/On	When ON the LCD backlight will remain on	R/W	OFF

BV-69	Binary Value 069			
BV-70	Room Vacant Status	When ON the thermostat will run on Vacant Heating/Cooling setpoints, AV-64/AV-65.	R/W	OFF
BV-71	C/F	Sets the thermostat to display temperatures in Celsius or Fahrenheit. This point is set through the setup menu. ON = F, OFF = C	R	ON
BV-72	Binary Value 072			
BV-73	Binary Value 073			
BV-74	Hotel Mode	This point is reserved for internal use and its value cannot be changed	R	OFF
BV-100	Binary Value 100	Enable internal thermistor descriptor	R/W	ON
BV-101	Binary Value 101	Enable descriptor	R/W	OFF
BV-102	Binary Value 102	Enable descriptor	R/W	OFF
BV-103	Binary Value 103	Enable descriptor	R/W	OFF
BV-104	Binary Value 104	Enable descriptor	R/W	OFF
BV-105	Binary Value 105	Enable descriptor	R/W	OFF
BV-106	Binary Value 106	Enable descriptor	R/W	OFF
BV-107	Binary Value 107	Enable descriptor	R/W	OFF
BV-108	Binary Value 108	Enable descriptor	R/W	OFF
BV-109	Binary Value 109	Enable descriptor	R/W	OFF
BV-110	Binary Value 110	Enable descriptor	R/W	OFF
BV-111	Binary Value 111	Enable descriptor	R/W	OFF
BV-112	Binary Value 112	Enable descriptor	R/W	OFF