ExactLogic BACnet Communicating Thermostat
EXL01682 Sequence Datasheet

Boiler and Pump Control

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Operating Sequence

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.

Pump Enable

The pumps are enabled via Outside Air Enable Set point (AV-57) with a +/- 5°F deadband. When the outside air temperature drops 5°F below this setpoint the pumps are enabled, when the outside air temperature rises 5°F above this setpoint the pumps are disabled.

Boiler Enable

The boilers are enabled when either of the pump status is proven from the current sensor. If one of the pumps is operated in hand the boilers will be enabled.

Boiler Setpoint Reset

The boilers reset signal will modulate from 0 to 5Vdc or 10Vdc (AO-0) as the outside air temperature drops from OSA Temp High (AV-40) to the OSA Temp Low (AV-41). This signal is active regardless of the boiler enable. The output can be scaled with the AO-0 setup.

Control Sequence – Pump Runtime Switch

The lead/lag pumps can be configured to switch by day (24hours), week (168 hours), month (720 hours), or custom runtime hours. The selection is done via BV-60 through BV-62. If none of the BV's are selected BV-63 is selected automatically for custom runtime hours. The custom runtime hours is configured at AV-45, and defaulted to 336 hours.

The lead/lag pumps can also be switched manually via BV-26.

Control Sequence – Pump Alarms

The pump alarm/status is determined by a current sensor for each pump, AI-4 for P-1 and AI_5 for P-2. Pump alarms are determined by HI/Lo alarm setpoint for each pump, P-1 Hi/Lo setpoints are at AV-51/50 and P-2 Hi/Lo setpoints are at AV-53/52.

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Installation

```
GND
UI-2
UI-3
UI-4
UI-5
UI-6
UI-7
UI-8
UI-9
UI-10
UI-11
UI-12
UI-13
MSTP+
MSTP-
```

```
BOHot
BO-0
BO-1
BO-2
BO-3
BO-4
BOHot2
BO-6
BO-7
BO-8
GND
AO-0
AO-1
AO-2
AO-3
```

```
GND GND GND PSOut PSOut PSOut Power- Power+
```

```
GND AO-04 AO-05 AO-06 AO-07 +19Vdc GND
```

```
Temp+ Temp- MSTP+ MSTP- GND AI-01 Humidity 5VDC PS DI-01 Motion UI-12 UI-11 UI-10 AO-07
```
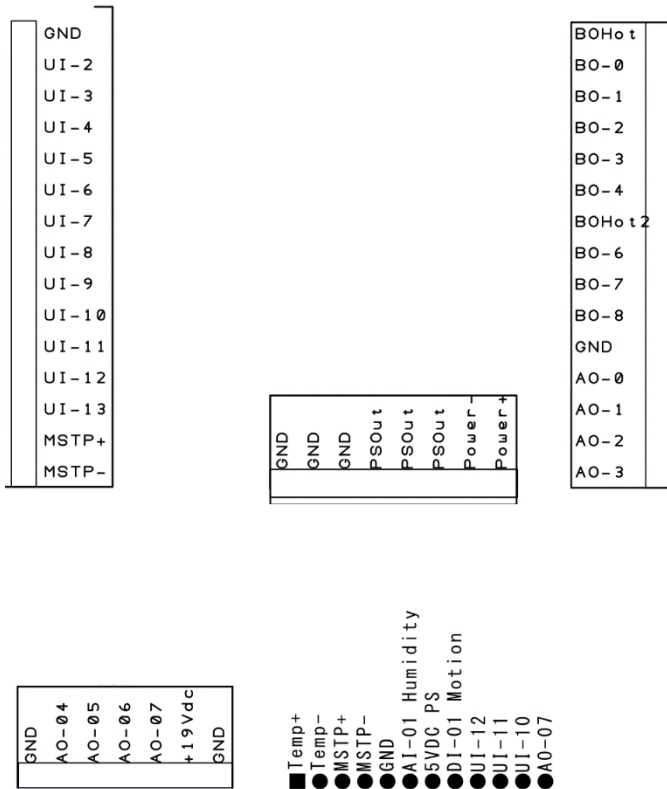
Fig. 4

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

*Note: AI-2 through AI-5 and BI-2 through BI-5 are wired to UI-2 through UI-5. Each universal Input can only be used as an AI or a BI

GND .... Neutral/Ground
UI-2 ....Universal Input 2
UI-3 ....Universal Input 3
UI-4 ....Universal Input 4
UI-5 ....Universal Input 5
UI-6 ....Universal Input 6
UI-7 ....Universal Input 7
UI-8 ....Universal Input 8
UI-9 ....Universal Input 9
UI-10 ....Universal Input 10
UI-11 ....Universal Input 11
UI-12 ....Universal Input 12
UI-13 ....Universal Input 13
MSTP + ... Network Line Positive
MSTP - ....Network Line Negative

BO Hot .... 24VAC/DC Input for Relays 1-5*
BO-0 ....Relay 1 Output, 24VAC/DC
BO-1 ....Relay 2 Output, 24VAC/DC
BO-2 ....Relay 3 Output, 24VAC/DC
BO-3 ....Relay 4 Output, 24VAC/DC
BO-4 ....Relay 5 Output, 24VAC/DC
BO Hot 2 .... 24VAC/DC Input for Relays 7-9*
BO-6 ....Relay 7 Output, 24VAC/DC
BO-7 ....Relay 8 Output, 24VAC/DC
BO-8 ....Relay 9 Output, 24VAC/DC
GND .... Neutral/Ground
AO-0 .... Analog Output 0, 0-10V
AO-1 .... Analog Output 1, 0-10V
AO-2 .... Analog Output 2, 0-10V
AO-3 .... Analog Output 3, 0-10V

GND .... Neutral/Ground
GND .... Neutral/Ground
GND .... Neutral/Ground
PSOut..24VAC/DC Hot
PSOut..24VAC/DC Hot
PSOut..24VAC/DC Hot
Power - .... Neutral/Ground
Power + ...24VAC/DC Hot

GND .... Neutral/Ground
AO-04 .... Analog Output 4, 0-10V
AO-05 .... Analog Output 5, 0-10V
AO-06 .... Analog Output 6, 0-10V
AO-07 .... Analog Output 7, 0-10V
+19Vdc .... 19V DC
GND .... Neutral/Ground

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Output Wiring

Output/Label	Function
BO0	Boiler 1 Enable
BO1	Boiler 2 Enable
BO2	Pump 1
BO3	Pump 2
BO4	
AO0	Boiler Reset
AO1	

Reserved BACnet Points

The following are points reserved by the thermostat for operation.

Analog Inputs

Instance	Object Name	Description	Read/Write	Default
AI-0	OSA Sensor	Outside Air Sensor	R	variable
AI-1	Humidity	Reading of the external input 1.	R	variable
AI-2	Hot Water Supply	Hot Water Supply Temperature	R	variable
AI-3	Hot Water Return	Hot Water Return Temperature	R	variable
AI-4	Core P-1 Amps	Pump P-1 Amps	R	variable
AI-5	Core P-2 Amps	Pump P-2 Amps	R	variable

Analog Outputs

Instance	Object Name	Description	Read/Write	Default
AO-0	Boiler Reset	0-10V or 0-5V output to Reset the Boiler Setpoint	R/W	0.0
AO-1			R/W	0.0
AO-2			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				
AV-2				
AV-3				

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AV-4	Reserved	This point is reserved for internal thermostat use and its value cannot be changed		
AV-5	Reserved	This point is reserved for internal thermostat use and its value cannot be changed		
AV-6	Reserved	This point is reserved for internal thermostat use and its value cannot be changed		
AV-7	Reserved	This point is reserved for internal thermostat use and its value cannot be changed		
AV-8				
AV-9				
AV-10	HW P-1 Cycle Status	Amount of runtime that P-1 has completed for the current cycle in hours	R	0
AV-11	HW P-1 Cycle SP	Current Cycle Time Limit. Once the runtime reaches this setpoint a Runtime Lead/Lag Switch will be triggered.	R	0
AV-12	P-2 Cycle Status	Amount of runtime that P-2 has completed for the current cycle in hours	R	0
AV-13	P-2 Cycle SP	Current Cycle Time Limit. Once the runtime reaches this setpoint a Runtime Lead/Lag Switch will be triggered.	R	0
AV-14				
AV-15			R	Variable
AV-16				
AV-17				
AV-18				
AV-19				
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				
AV-22				
AV-23				
AV-24				
AV-25	P-1 VFD Signal	VFD signal for pump 1, as a percentage	R	0%
AV-26	P-2 VFD Signal	VFD signal for pump 2, as a percentage	R	0%
AV-27				
AV-28				
AV-29				
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			R/W	0
AV-37			R/W	0
AV-38			R/W	0

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AV-39			R/W	0
AV-40	OSA Temp High 0V	Boiler Reset Outside air temperature High	R/W	60
AV-41	OSA Temp Low 10V	Boiler Reset Outside air temperature Low	R/W	-10
AV-42			R/W	0
AV-43			R/W	0
AV-44			R/W	0
AV-45	Custom Cycle Time (Hrs)	Setpoint for custom runtime switch hours	R	336 hours
AV-46	P-1 Runtime	Current P-1 runtime hours	R	0 hrs
AV-47	P-2 Runtime	Current P-2 runtime hours	R	0 hrs
AV-48	Pump Cycle Time	Current runtime hours cycle time	R	336 hrs
AV-49			R/W	0
AV-50	P-1 Lo Amps Alarm SP	P-1 pump amps below this setpoint will trigger the Lo Amp Alarm (BV-30)	R/W	1.0 amps
AV-51	P-1 Hi Amps Alarm SP	P-1 pump amps above this setpoint will trigger the Lo Amp Alarm (BV-31)	R/W	10.0 amps
AV-52	P-2 Lo Amps Alarm SP	P-2 pump amps below this setpoint will trigger the Lo Amp Alarm (BV-35)	R/W	1.0 amps
AV-53	P-2 Hi Amps Alarm SP	P-2 pump amps above this setpoint will trigger the Lo Amp Alarm (BV-36)	R/W	10.0 amps
AV-54	HWS Lo Temp Alarm SP	Low Hot Water Supply alarm setpoint	R/W	120°F
AV-55	HWR Lo Temp Alarm SP	Low Hot Water Return alarm setpoint	R/W	100°F
AV-56				
AV-57	Outside Air Enable	The setpoint used to enable the pumps. When the outside air is below this setpoint the pumps are enabled to run.	R/W	50.0°F
AV-58	Reserved	This point is reserved for internal thermostat use and its value cannot be changed		
AV-59	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	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	5.0°F
AV-62	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	0
AV-63	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	4
AV-64	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	85.0°F
AV-65	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	55.0°F
AV-66	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	73.0°F
AV-67	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	85.0°F
AV-68	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	55.0°F
AV-69	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	1.0°F

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AV-70	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	1.0˚F
AV-71	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	80.0˚F
AV-72	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	60.0˚F
AV-73	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	5.0 hrs
AV-74	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	0.0 hrs
AV-75	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R/W	0
AV-76	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-77	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-78	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-79	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-80	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-81	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-82	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-83	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-84	Reserved	This point is reserved for internal thermostat use and its value cannot be changed	R	0
AV-100	Analog Value 100	Internal thermister 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	

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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	Outside Air 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	Binary Input 05		R	

Binary Outputs

Instance	Object Name	Description	Read/Write	Default
BO-0	Boiler 1	Boiler 1 Command	R/W	OFF
BO-1	Boiler 2	Boiler 2 Command	R/W	OFF
BO-2	Pump 1	Pump 1 Command	R/W	OFF
BO-3	Pump 2	Pump 2 Command	R/W	OFF
BO-4			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				
BV-2	Lo HWS Alarm Status	Low Hot Water Supply Alarm Immediate Status	R	OFF
BV-3	Lo HWR Alarm Status	Low Hot Water Return Alarm Immediate Status	R	OFF
BV-4				
BV-5	Core Pump Start Command	The Start Command comes from the OSA Enable or a Manual Command	R	OFF
BV-6				
BV-7				
BV-8				
BV-9				

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BV-10	Program Status	Used to determine if the sequence was loaded correctly on a BACnet Restore or power up.	R	OFF
BV-11	Zone Heat Demand	Zone Heat Demand will enable the pumps and boiler when ON	R/W	OFF
BV-12	Lead HW Pump S/S Cmd	Shows the current Lead Pump command	R	OFF
BV-13	Lead Pump Alarm	Shows any Lead Pump alarms	R	OFF
BV-14	Lead Pump Status	Shows the current operational status of the Lead Pump	R	OFF
BV-15	Lag HW Pump S/S Cmd	Shows the current Lead Pump command	R	OFF
BV-16	Lag Pump Alarm	Shows any Lead Pump alarms	R	OFF
BV-17	Lag Pump Status	Show the current operational status of the Lead Pump	R	OFF
BV-18	HWS Low Temp Alarm	Low Hot Water Supply Alarm – Latched	R	OFF
BV-19	HWR Low Temp Alarm	Low Hot Water Return Alarm – Latched	R	OFF
BV-20	HotWater Alarm Reset	Reset Point for the HWS and HWR Alarms	R/W	OFF
BV-21				
BV-22	Pump P-1 Status	Show the current operational status of P-1	R	OFF
BV-23	Pump P-2 Status	Show the current operational status of P-2	R	OFF
BV-24				
BV-25	Pump Alarm Reset	Reset the Lead or Lag pump alarm	R/W	OFF
BV-26	Manual Switch Lead/Lag Pumps	Manually switch P-1 and P-2 Lead/Lag status	R/W	OFF
BV-27	Runtime Switch Lead/Lag Pumps	Runtime hours is requesting a switch of P-1 and P-2 Lead/Lag status	R	OFF
BV-28	Current lead/Lag Pump	Shows the which pump is currently in Lead and Lag status	R	OFF
BV-29				
BV-30	P-1 Lo Alarm	P-1 low pump amp alarm	R	OFF
BV-31	P-1 Hi Alarm	P-1 high pump amp alarm	R	OFF
BV-32	P-1 Hi/Lo Alarm	P-1 pump amp alarm	R	OFF
BV-33				
BV-34				
BV-35	P-2 Lo Alarm	P-2 low pump amp alarm	R	OFF
BV-36	P-2 Hi Alarm	P-2 high pump amp alarm	R	OFF
BV-37	P-2 Hi/Lo Alarm	P-2 pump amp alarm	R	OFF
BV-38				
BV-39				
BV-40	Occupied Status	The status of this point switches the thermostats occupancy settings. ON when 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

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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		OFF
BV-46			R	OFF
BV-47			R	OFF
BV-48				
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	Manual Enable Pumps	Manual Command to start pumps. The pumps will run continuously with this set to ACTIVE	R/W	OFF
BV-51	Reserved	This point is reserved for internal thermostat use and its value cannot be changed		OFF
BV-52			R/W	OFF
BV-53				
BV-54				
BV-55				
BV-56				
BV-57	Disable Splash	When ACTIVE, the "EXACTLOGIC" splash will not show after key presses	R/W	OFF
BV-58	Disable Setup Menu	When ACTIVE, there will be no access to the Setup Menu where the Network/MAC/Baud Rate is set	R/W	OFF
BV-59	Disable FSM Menu	When ACTIVE, there will be not access to the Field Service Mode where the Time/Schedule/Point Access is set	R/W	OFF
BV-60	Enable Day Cycle	Enable the runtime pump switch for one day	R/W	OFF
BV-61	Enable Week Cycle	Enable the runtime pump switch for one week	R/W	OFF
BV-62	Enable Month Cycle	Enable the runtime pump switch for one month (30 days)	R/W	OFF
BV-63	Enable Custom Cycle	Enable the runtime pump switch for a custom configured amount of hours	R/W	OFF
BV-64	Reserved	This point is reserved for internal thermostat use and its value cannot be changed		OFF
BV-65				
BV-66	Disable Pumps	When ON this point will disable the pumps	R/W	OFF
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	Reserved	This point is reserved for internal thermostat use and its value cannot be changed		OFF
BV-70	Reserved	This point is reserved for internal thermostat use and its value cannot be changed		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				
BV-73				
BV-74	Hotel Mode	Determines how the thermostats occupancy is set.	R/W	OFF

		OFF = RTU Mode, ie schedule ON = Hotel Mode, ie motion sensors		

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BV-100	Binary Value 100	Enable internal thermister 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 outside air descriptor	R/W	OFF

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