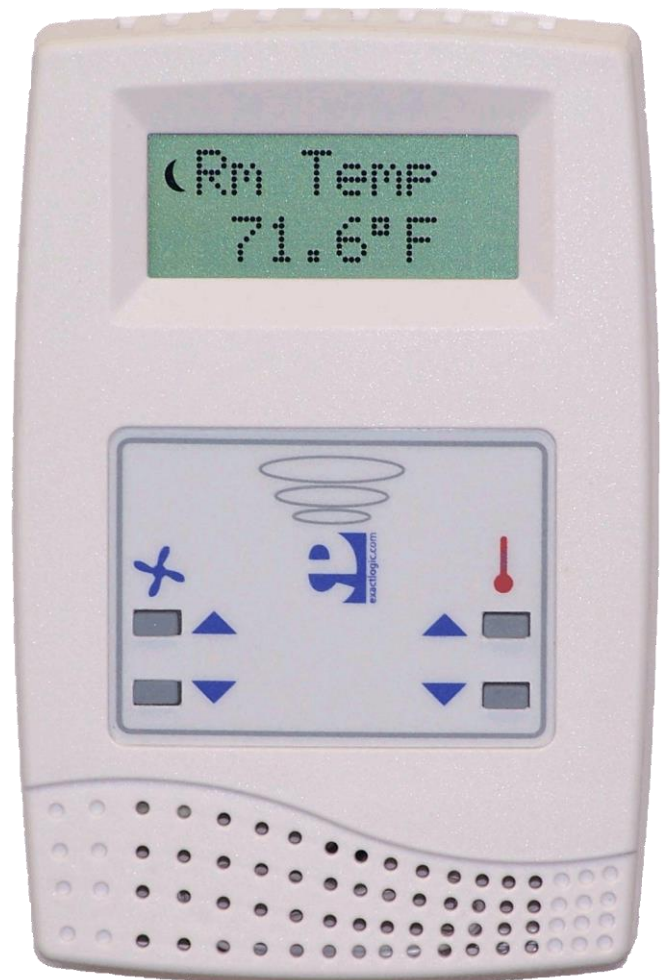


# ExactLogic BACnet Communicating Thermostat EXL01680 Sequence Datasheet

Lead Lag 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.

### Control Sequence – Pump Enable

The pumps are enabled via Outside Air Enable Set point (AV-57). When the outside air temperature drops below this setpoint the pumps are enabled.

### 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 VFD Controls

VFD signals for pump control are found at AO-0 for P-1 and AO-1 for P-2. The modulating signal is calculated using the pressure Setpoint (AV-55) and the Pressure Input (AI-5). If there is no pump status on P-1 or P-2 the corresponding AO will be disabled.

### Control Sequence – Pump Alarms

The pump alarm/status is determined by a current sensor for each pump, AI-3 for P-1 and AI\_4 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.

## Installation

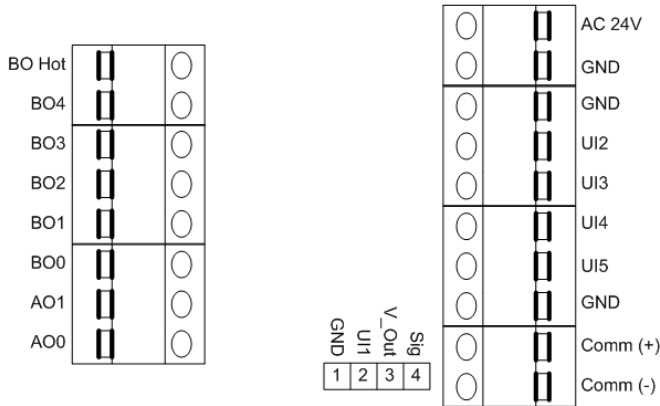


Fig. 4

\*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	P-1 Command
BO1	P-2 Command
BO2	
BO3	
BO4	
AO0	P-1 VFD Signal
AO1	P-2 VFD Signal

## Reserved BACnet Points

The following are points reserved by the thermostat for operation.

### Analog Inputs

Instance	Object Name	Description	Read/Write	Default
AI-0	Room Temp	Reading of the internal thermistor.	R	variable
AI-1	Analog Input 01	Reading of the external input 1.	R	variable
AI-2	Supply Pres/Ext Temp	Used for 2 Pressure Sensor Applications (Supply/Return) for Differential Pressure Calculation or a custom Universal Input	R	variable
AI-3	Core Pump 1 Amps	Reading of P-1 pump amps	R	variable
AI-4	Core Pump 2 Amps	Reading of P-2 pump amps	R	variable
AI-5	Diff Press/Ret Pres	With only 1 Differential Pressure Sensor (wire here) With 2 Pres. Sensors (Wire Return Pressure Here)	R	variable

### Analog Outputs

Instance	Object Name	Description	Read/Write	Default
AO-0	P-1 VFD Command	0-10V output for control of P-1 VFD signal	R/W	0.0
AO-1	P-2 VFD Command	0-10V output for control of P-2 VFD signal	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	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	Analog Value 008			

AV-9	Analog Value 009			
AV-10	P-1 Cycle Time Status	Amount of runtime that P-1 has completed for the current cycle in hours	R	0
AV-11	P-1 Cycle Setpoint	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 Time Status	Amount of runtime that P-2 has completed for the current cycle in hours	R	0
AV-13	P-2 Cycle Setpoint	Current Cycle Time Limit. Once the runtime reaches this setpoint a Runtime Lead/Lag Switch will be triggered.	R	0
AV-14	Analog Value 014			
AV-15	Differential Pres.	Differential Pressure Reading	R	Variable
AV-16	Analog Value 016			
AV-17	Analog Value 017			
AV-18	Analog Value 018			
AV-19	Analog Value 019			
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	Analog Value 024			
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	Analog Value 027			
AV-28	Analog Value 028			
AV-29	Analog Value 029			
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	P-1 VFD Scalar In1	Input scaling factor for pump 1	R/W	0
AV-37	P-1 VFD Scalar In2	Input scaling factor for pump 1	R/W	100
AV-38	P-1 VFD Scalar Out1	Output scaling factor for pump 1	R/W	0%
AV-39	P-1 VFD Scalar Out2	Output scaling factor for pump 1	R/W	100%
AV-40	P-2 VFD Scalar In1	Input scaling factor for pump 2	R/W	0
AV-41	P-2 VFD Scalar In2	Input scaling factor for pump 2	R/W	100
AV-42	P-2 VFD Scalar Out1	Output scaling factor for pump 2	R/W	0%
AV-43	P-2 VFD Scalar Out2	Output scaling factor for pump 2	R/W	100%
AV-44	KI SP	KI tuning SP for Pump Speed	R/W	1
AV-45	Custom Cycle Time (Hrs)	Setpoint for custom runtime switch hours	R	336 hours

AV-46	P-1 Runtime (Hrs)	Current P-1 runtime hours	R	0 hrs
AV-47	P-2 Runtime (Hrs)	Current P-2 runtime hours	R	0 hrs
AV-48	Pump Cycle Time (Hrs)	Current runtime hours cycle time	R	336 hrs
AV-49	KP SP	KP tuning SP for Pump Speed	R/W	.5
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	Analog Value 054			
AV-55	Core Water Pressure SP	Water pressure setpoint used to determine the modulating signal to control the VFD commands	R/W	1.5"
AV-56	Analog Value 056			
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	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	Analog Value 062		R/W	0
AV-63	Analog Value 063		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-75	Reserved	This point is reserved for internal thermostat use	R	0

		and its value cannot be changed		
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-100	Analog Value 100	<b>Internal thermister display descriptor.</b> 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	<b>Outside Air Display descriptor.</b> 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	P-1 Command	Pump 1 Command	R/W	OFF
BO-1	P-2 Command	Pump 2 Command	R/W	OFF
BO-2	Binary Output 2		R/W	OFF
BO-3	Binary Output 3		R/W	OFF
BO-4	Binary Output 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	Binary Value 001			
BV-2	Binary Value 002			
BV-3	Binary Value 003			
BV-4	Binary Value 004			
BV-5	Core Pump Start Command	The Start Command comes from the OSA Enable or a Manual Command	R	OFF
BV-6	Binary Value 006			
BV-7	Binary Value 007			
BV-8	Binary Value 008			
BV-9	Binary Value 009			
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	Lead Pump Start Command	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 Pump Start Command	Shows the current Lead Pumps 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	R	OFF



		Pump		
BV-18	Binary Value 018			
BV-19	Binary Value 019			
BV-20	Binary Value 020			
BV-21	Binary Value 021			
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	Binary Value 024			
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	Binary Value 029			
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	Binary Value 033			
BV-34	Binary Value 034			
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	Binary Value 038			
BV-39	Binary Value 039			
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
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	P-1 VFD Run	P-1 VFD enable command	R	OFF
BV-47	P-2 VFD Run	P-2 VFD enable command	R	OFF
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	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	Sup/Ret Pres.	Enable When Using 2 Pressure Sensors(Supply	R/W	OFF

	Enable	AI-2 & Return Ai-5) for Differential Pressure Calculation		
BV-53	Binary Value 053			
BV-54	Binary Value 054			
BV-55	Binary Value 055			
BV-56	Binary Value 056			
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	Cycle Time Enable - Day	Enable the runtime pump switch for one day	R/W	OFF
BV-61	Cycle Time Enable - Week	Enable the runtime pump switch for one week	R/W	OFF
BV-62	Cycle Time Enable - Month	Enable the runtime pump switch for one month (30 days)	R/W	OFF
BV-63	Cycle Time Enable - Custom	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	Binary Value 065			
BV-66	Disable Core Pumps	When ON this point will disable and lockout all analog and binary outputs.	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	Binary Value 072			
BV-73	Binary Value 073			
BV-74	Hotel Mode	Determines how the thermostats occupancy is set. OFF = RTU Mode, ie schedule ON = Hotel Mode, ie motion sensors	R/W	OFF
BV-100	Binary Value 100	<b>Enable internal thermister descriptor</b>	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

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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