1   Example of using Heating Valve Actuator (profile A5-20-06)

This document explains the communication between the valve actuator and gateway EnOcean/BACnet. For complete information, please see the EEP specification of the A5-20-06 profile published by EnOcean Alliance via the EEP Viewer Tool and check also the user manual of your valve actuator.

This is a general description. Valve actuators may have specific configuration options, which are accessible by a local interface (e.g. buttons) or by special software utility provided by the manufacturer.

References:

[1] A5-20-06: http://tools.enocean-alliance.org/EEPViewer/profiles/A5/20/06/A5-20-06.pdf
[2] EEP Viewer: http://tools.enocean-alliance.org/EEPViewer/

1.1   Overview

The profile A5-20-06 is a bidirectional communication profile. The status information is reported through A5-20-06 DIRECTION-1 and the valve actuator is controlled by A5-20-06 DIRECTION-2 telegram. A single channel must be configured, as shown in Fig. 1.1. In this example, CH1 is used.
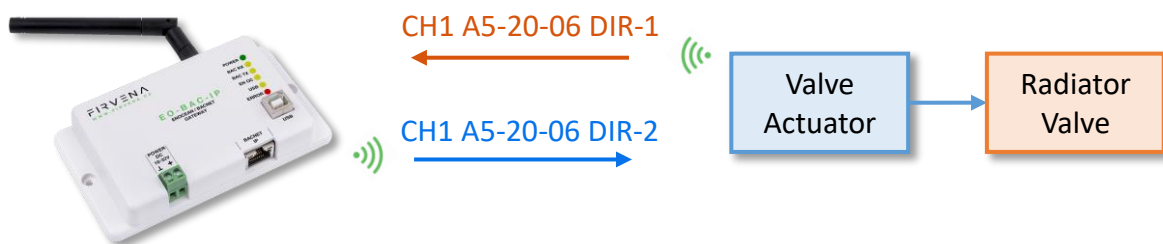

Fig. 1.1 Overview

The communication is driven by the actuator itself to minimize the power consumption. The valve actuator is in the sleep mode most of the time. When the valve actuator wakes up, it reports its state and waits for A5-20-06 DIR-2 message. The gateway must respond within 1s, faster is better, because it minimizes the time the radio receiver of the valve is on, thus reducing the power consumption. The gateway usually responds within 50 ms.

The communication flow is as follows:

1. The control system enters the current values into the gateway (DIRECTION-2)
2. Nothing happens, gateway is waiting for the actuator to wake up
3. The valve actuator wakes up, sends a status message (DIRECTION-1) and switches to receive mode
4. The gateway responds with the current values that were previously stored (DIRECTION-2)
5. The valve actuator switches off reception and uses the new values (position change)
6. The valve actuator returns to low power mode

The "SEND_OPTION" must be set to value "3:OnReceive", otherwise, the gateway will not respond to A5-20-06 DIR-1.

	Telegram counter	0...65535	21
	Telegram age	0...65000 s	7s
MSV 100195	SEND	1:None;2:SendNow;...	3:OnReceived ⌄
MSV 199	CONFIG	1:FREE;2:ASSIGNED	2:ASSIGNED

Apply   Cancel   Send Now

1.2 Linking Procedure

One channel has to be configured to receive and send the telegrams A5-20-06. To link the device to a channel, do the bidirectional teach-in (= pairing) procedure (see Fig. 1.2):

1. Click the "Add new" icon, a dialog box appears.
2. Check "LRN enable"
3. Choose the channel number 1.

Channel 1 is now in the teach-in mode.

4. Push the pairing button to transmit a teach-in telegram (see note 1).
5. Gateway receives the telegram and sends a teach-in response.
6. The device is automatically saved to the selected channel and its data is available through the BACnet interface.
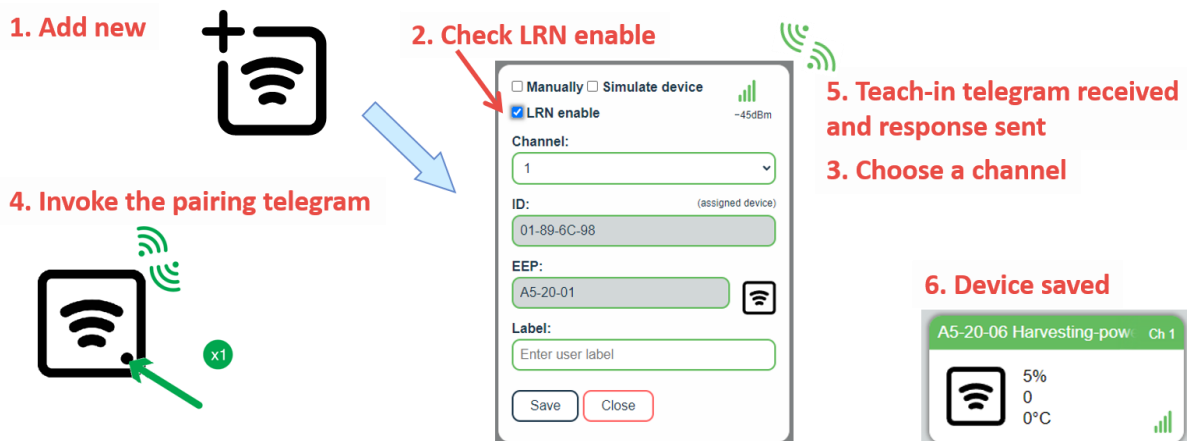

Fig. 1.2 Linking a device to the gateway – bidirectional teach-in procedure

Notes:
1) *The point 4 is manufacturer specific, please refer to the datasheet or manual of the device.*

1.3 Description of the BACnet Interface

Division into RX and TX directions:

Object ID	Value Name	Range	Value	
AI 100	Actual Position	0...100 %	0%	
AI 101	Local Offset Mode	0:Relative;1:Absolute	0:Relative	
AI 102	Local Offset (absolute)	0...40 °C	0°C	
AI 103	Local Offset (relative)	-5...5 °C	48°C	
AI 104	Temperature Selection	0:Ambient;1:Feed	0:Ambient	
AI 105	Temperature (ambient)	0...40 °C	74°C	
AI 106	Temperature (feed)	0...80 °C	0°C	
AI 107	Harvesting Status	0:Not harvesting;1:H…	0:Not harvesting	
AI 108	Charge Level	0:Low;1:Sufficient	0:Low	
AI 109	Window Open	0:Not detected;1:Det…	0:Not detected	
AI 110	Radio Error	0:False;1:True (>= 6 …	0:False	
AI 111	Signal Strength	0:Strong;1:Weak	0:Strong	
AI 112	Actuator Obstructed	0:False;1:True	0:False	
AI 190	Telegram counter	0...65535	3	
AI 191	Telegram age	0...65000 s	91s	
AO 100100	Valve Position	0...100 %	0 %	
AO 100101	Temperature Setpoint	0...40 °C	0 °C	
AO 100102	Temperature from RCU	0...40 °C	0 °C	
AO 100103	Reference Run	0:False;1:True	0:False	
AO 100104	Radio Interval	0:Auto;1:2 min;2:5 mi…	0:Auto	
AO 100105	Summer Mode	0:False;1:True	0:False	
AO 100106	Setpoint Selection	0:Valve position;1:Te…	0:Valve position	
AO 100107	Temperature Selection	0:Ambient;1:Feed	0:Ambient	
AO 100108	Standby Mode	0:False;1:True	0:False	
	Telegram counter	0...65535	3	
	Telegram age	0...65000 s	91s	
MSV 100195	SEND	1:None;2:SendNow;3…	3:OnReceived	
MSV 199	CONFIG	1:FREE;2:ASSIGNED	2:ASSIGNED	

DIRECTION-1: Status (applies to the AI block)

DIRECTION-2: Commands, actual values (applies to the AO block)

Apply   Cancel   Send Now

There are two control modes:

1. Control by temperature (°C): the temperature control loop is executed in the valve actuator
   a. The local temperature sensor is used (part of the valve actuator)
   b. The actual temperature is provided by the control unit based on an external temperature sensor (see "Temperature from RCU" value)
2. Control by valve position (%): the valve position is set directly, the temperature control loop is executed in the control unit

Following pictures illustrates the different modes, related values are emphasised.

Mode 1a: Control by temperature, internal temperature sensor:

AO 100100	Valve Position	0...100 %	0 %
AO 100101	Temperature Setpoint	0...40 °C	24 °C
AO 100102	Temperature from RCU	0...40 °C	0 °C
AO 100103	Reference Run	0:False;1:True	0:False
AO 100104	Radio Interval	0:Auto;1:2 min;2:5 mi…	0:Auto
AO 100105	Summer Mode	0:False;1:True	0:False
AO 100106	Setpoint Selection	0:Valve position;1:Te…	1:Temperature
AO 100107	Temperature Selection	0:Ambient;1:Feed	0:Ambient
AO 100108	Standby Mode	0:False;1:True	0:False

Mode 1b: Control by temperature, "Temperature from RCU":

AO 100100	Valve Position	0...100 %	0	%	
AO 100101	Temperature Setpoint	0...40 °C	24	°C	
AO 100102	Temperature from RCU	0...40 °C	21	°C	
AO 100103	Reference Run	0:False;1:True	0:False ⌄		
AO 100104	Radio Interval	0:Auto;1:2 min;2:5 mi...	0:Auto ⌄		
AO 100105	Summer Mode	0:False;1:True	0:False ⌄		
AO 100106	Setpoint Selection	0:Valve position;1:Te...	1:Temperature ⌄		
AO 100107	Temperature Selection	0:Ambient;1:Feed	0:Ambient ⌄		
AO 100108	Standby Mode	0:False;1:True	0:False ⌄		

Mode 2: Control by valve position:

AO 100100	Valve Position	0...100 %	50	%	
AO 100101	Temperature Setpoint	0...40 °C	0	°C	
AO 100102	Temperature from RCU	0...40 °C	0	°C	
AO 100103	Reference Run	0:False;1:True	0:False ⌄		
AO 100104	Radio Interval	0:Auto;1:2 min;2:5 mi...	0:Auto ⌄		
AO 100105	Summer Mode	0:False;1:True	0:False ⌄		
AO 100106	Setpoint Selection	0:Valve position;1:Te...	0:Valve position ⌄		
AO 100107	Temperature Selection	0:Ambient;1:Feed	0:Ambient ⌄		
AO 100108	Standby Mode	0:False;1:True	0:False ⌄		

1.3.1 Explanation of different values

Setpoint Selection: gives the type of setpoint to be used (AO100100 or AO100101).

Local Offset: the user can locally change the temperature setpoint (e.g. by buttons), the new value is communicated to control system based on **Local Offset Mode**:

- **Absolute:** used when *Setpoint Selection = 1* **(Mode 1)**.
- **Relative:** used when *Setpoint Selection = 0* **(Mode 2)**, relative change is communicated because the valve actuator does not know the absolute value of the temperature setpoint in Mode 2 (Valve Position and Temperature Setpoint share the same byte in the telegram).

Temperature Selection: two temperatures are measured, but only one of them is sent in a single telegram. This is due to the telegram length constraints (max data length is 4 bytes).

- **Ambient**: temperature from the local temperature sensor
- **Feed**: temperature of the valve (heating medium)

The type of the reading is selected by AO100107. AI104 tells which of the two objects AI105 or AI106 has been updated. In other words, what type of value was present in the last telegram.

Summer Bit: activation of the summer mode, communication interval will be increased to 8 hours. It is used to reduce power consumption in summer when the energy cannot be harvested.

Harvesting Status: indicates if the energy is being harvested (water is warm enough to harvest energy).

Charge Level: status of the energy storage

Window Open: valve actuator can detect window opening based on the ambient temperature trend