FC BAP - Modbus & analog control v0.2

Modbus RTU (RS485) & analog control

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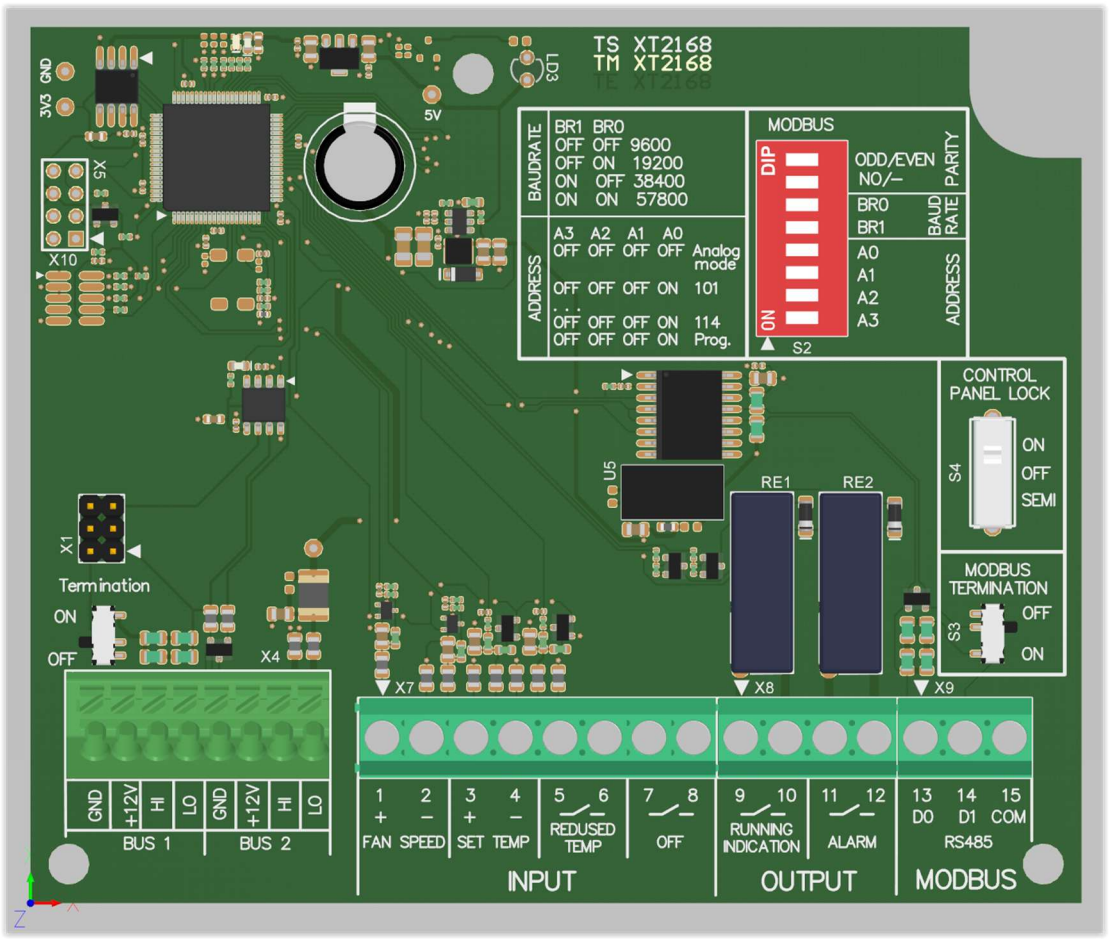

1 GENERAL

One BAP is used to control one or several units in a FC system. The units should be of the same kind, e.g. Air Curtains. All units connected, even if they are set up in zones, are controlled at the same time, either via analog or Modbus control. Analog control and Modbus feedback can also be used. In this document analog control and Modbus registers are presented.

The Maximum number of BAP units in a system is one.

2 SET-UP VIA DIP SWITCHES

The BAP should be connected anywhere in the FC bus, e.g. between air curtains or control panel. Set-up of the Modbus, or if analog control should be used, is set via the dip switches (S2) on the BAP card. I.e. there is no need to do any programming, except for setting dip switches, to use analog control or access the BAP and FC system by Modbus. When the BAP is connected it is ready to be used. It is power supplied by the FC communication bus.

2.1 Analog/ Modbus address/ ID settings

If analog control should be used A0 – A3 should be set to OFF.
If other setting is made, i.e. setting an address/ ID, Modbus control is activated.
If other ID should be used than ID's 100 – 114, last position (15) can be used to program own ID via PRM_BAP_PROG_MB_ID.

DIP 1 (A3)	DIP 2 (A2)	DIP 3 (A1)	DIP 4 (A0)	Resulting Modbus ID
OFF	OFF	OFF	OFF	Analog control
OFF	OFF	OFF	ON	101
OFF	OFF	ON	OFF	102
OFF	OFF	ON	ON	103
OFF	ON	OFF	OFF	104
OFF	ON	OFF	ON	105
OFF	ON	ON	OFF	106
OFF	ON	ON	ON	107
ON	OFF	OFF	OFF	108
ON	OFF	OFF	ON	109
ON	OFF	ON	OFF	110
ON	OFF	ON	ON	111
ON	ON	OFF	OFF	112
ON	ON	OFF	ON	113
ON	ON	ON	OFF	114
ON	ON	ON	ON	Programmable using PRM_BAP_PROG_MB_ID. (100 is default address)

2.2 Baud rate settings

DIP 5 (BR1)	DIP 6 (BR0)	Result
OFF	OFF	9600 bps
OFF	ON	19200 bps
ON	OFF	38400 bps
ON	ON	57800 bps

2.3 Parity settings

DIP 7	DIP 8	Result
ON	ON/OFF	No parity (2 stop bits)
OFF	OFF	Even parity (1 stop bit)
OFF	ON	Odd parity (1 stop bit)

3 ANALOG CONTROL

3.1 Input

The inputs are potential-free “switch” inputs.

“Fan speed”
Fan speed at door open:
0-2 V = Control Panel sets the value
2-4 V = Fan Off
4-10 V = 0% - 100% fan speed at door open
Note: If setting <2 V Auto mode is set if outdoor temperature is present via OTX, TXRF or Modbus.

“Set temp”
0-2 V = Control Panel sets the value
2-4 V = Heat Off
4-10 V = 5-35^{0}C, (1^{0}C/ 0,2 V)

“Reduced temp”

- Short circuit = BAP will set the set-point temperature to the temperature set in PIR function requirement parameter, tHi (set in control panel menu).

“Off”

- Short circuit = all units in the FC-system are deactivated, for as long as the input is set.

3.2 Output

The outputs are potential free connection (relay) which can be used for controlling or indicating to other units. (Max 3 A, 230 VAC.)

“Running indication”

- Short circuit = OK
- Open circuit = Critical alarm is active, i.e. fan or heat problem

“Alarm”

- Short circuit = OK
- Open circuit = Alarm is active

3.3 Modbus + Analog control

The analog control can be used together with Modbus, by setting: PRM_BAP_ANALOG_CTRL_ENABLE. (1 = enable, 0 = disabled)

4 REGISTER MAPS

Details for registers, such as register range and default settings, are presented in special document, FC Modbus register overview.

4.1 Easy access registers

Easy access registers contain information that is gathered from all units in the system. Every easy access register control all units in a system at the same time, using only one register. (Global parameter)

Easy access register area has a fixed register map. Most registers are 16 bit (1 register/ parameter), but alarms and uptime hours are 32 bit (occupies 2 registers – High word/low word).

Easy access register area starts from register **60000**. The resulting register number is ***60000 + offset.***

Easy access register area offers the following controls:

- Alarm reading + resetting
- Reading sensor values from system + injecting sensor values into the system (RTX, OTX, door contact).

When reading parameters and conflicting values are received, the smallest value is returned to BMS.

4.1.1 Read/Write - Easy access registers

Offset	Type	Corresponding parameter	Description
0	R/W	PRM_ALARM_RESET	High word
1	R/W	PRM_ALARM_RESET	Low word
2	R/W	PRM_SYSTEM_OFF	
3	R/W	PRM_FAN_CTRL_MODE	
4	R/W	PRM_FAN_SPEED_STEP	
5	R/W	PRM_FAN_SPEED_STEPLESS	
6	R/W	PRM_SETPOINT_NORMAL	
7	R/W	PRM_SETPOINT_DT	
8	R/W	PRM_HEAT_MODE	
9	R/W	RTX from BMS. 3000 = not reported. (0.1'c)	
10	R/W	OTX from BMS. 3000 = not reported. (0.1'c)	
11	R/W	Door contact status from BMS. 3000 = not reported. 0: closed 1: open	
12	R/W	PRM_BAP_PROG_MB_ID	
13	R/W	PRM_BAP_ANALOG_CTRL_ENABLE, 0…1	
14	R/W	PRM_BAP_UI_LOCK, 0=OFF, 1 = SEMI, 2 = ON	
15	R/W	PRM_FAN_SPEED_STEP_MIN	
16	R/W	PRM_FAN_SPEED_STEP_MAX	
17	R/W	PRM_FAN_SPEED_STEPLESS_MIN	
18	R/W	PRM_FAN_SPEED_STEPLESS_MAX	
19	R/W	PRM_OUTDOOR_LIMIT_ENABLE	
20	R/W	PRM_OUTDOOR_LIMIT_TEMP	
21	R/W	PRM_ACTN_FAN_OTXCTRL_LOWSPD	
22	R/W	PRM_ACTN_FAN_OTXCTRL_HIGHSPD	
23	R/W	PRM_ACTN_FAN_OTXCTRL_LTHS	
24	R/W	PRM_ACTN_FAN_OTXCTRL_HTHS	
25	R/W	PRM_ACTN_FAN_OTXCTRL_LTLS	
26	R/W	PRM_ACTN_FAN_OTXCTRL_HTLS	
27	R/W	PRM_ACTN_FAN_RTXCOMP_DIFFMIN	
28	R/W	PRM_ACTN_FAN_RTXCOMP_DIFFMAX	
29	R/W	PRM_ACTN_FAN_RTXCOMP_COMPMAX	
30	R/W	PRM_ACTN_FAN_ROOMHEATING_SPEED	
31	R/W	PRM_ACTN_FAN_ROOMHEATING_SPEED_STEP	
32	R/W	PRM_ACTN_HEAT_ALLOW	
33	R/W	PRM_ACTN_RETURN_WTR_TEMP_LIMIT	
34	R/W	PRM_ACTN_BYPASS_ENABLE	
35	R/W	PRM_ACTN_BYPASS_TEMP_WTA	
36	R/W	PRM_ACTN_FREEZE_PR_ENABLE	
37	R/W	PRM_FHT_FREEZE_PR_ENABLE	
38	R/W	PRM_FHT_BYPASS_TEMP_WTA	
39	R/W	PRM_FHT_BYPASS_ENABLE	
40	R/W	PRM_FHT_RETURN_WTR_TEMP_LIMIT	
41	R/W	PRM_FHT_RETURN_WTR_ENABLE	

4.1.2 Read only - Easy access registers

Offset	Type	Corresponding parameter	Description
80	R	PRM_INDOOR_TEMP	
81	R	PRM_OUTDOOR_TEMP	
82	R	PRM_BB_TEMP	
83	R	PRM_HMI_INDOOR_TEMP	
84	R	PRM_DOOR_CT_STATUS	
85	R	PRM_VESTIBULE_TEMP	
86	R	PRM_WTA_TEMP	
87	R	PRM_ACTIVE_MODE	
88	R	PRM_BATTERY_LEVEL	
89	R	PRM_HEAT_STATUS	
90	R	PRM_FAN_BAD_SIGNAL	
91	R	PRM_STATS_UPTIME_HOURS	High word
92	R	PRM_STATS_UPTIME_HOURS	Low word
93	R	Analog fan input voltage in mV (steady voltage)	
94	R	Analog fan input value (%) 3000 = Not connected, 0 = Fan off.	
95	R	Analog temperature input voltage in mV.	
96	R	Analog temperature input value (0.1'c) 3000 = Not connected.	
97	R	Analog reduced temp (PIR) input state 0…1	
98	R	Analog System Off-input state 0…1	
100	R	PRM_ALARM_A_STATUS_1	High word
101	R	PRM_ALARM_A_STATUS_1	Low word
102	R	PRM_ALARM_A_STATUS_2	High word
103	R	PRM_ALARM_A_STATUS_2	Low word
104	R	PRM_ALARM_B_STATUS_1	High word
105	R	PRM_ALARM_B_STATUS_1	Low word
106	R	PRM_ALARM_B_STATUS_2	High word
107	R	PRM_ALARM_B_STATUS_2	Low word
108	R	First active alarm from log, unit serial	High word
109	R	First active alarm from log, unit serial	Low word
110	R	First active alarm from log, alarm class, 0: A-alarm, 1: B-alarm (Fault)	
111	R	First active alarm from log, alarm ID.	

4.1.3 Alarm handling

Offset	Type	Corresponding parameter	Description
0	R/W	PRM_ALARM_RESET	High word
1	R/W	PRM_ALARM_RESET	Low word
100	R	PRM_ALARM_A_STATUS_1	High word
101	R	PRM_ALARM_A_STATUS_1	Low word
102	R	PRM_ALARM_A_STATUS_2	High word
103	R	PRM_ALARM_A_STATUS_2	Low word
104	R	PRM_ALARM_B_STATUS_1	High word
105	R	PRM_ALARM_B_STATUS_1	Low word
106	R	PRM_ALARM_B_STATUS_2	High word
107	R	PRM_ALARM_B_STATUS_2	Low word
108	R	First active alarm from log, unit serial	High word
109	R	First active alarm from log, unit serial	Low word
110	R	First active alarm from log, alarm class, 0: A-alarm, 1: B-alarm (Fault)	
111	R	First active alarm from log, alarm ID.	

Active alarms are indicated by ALARM_STATUS registers. Each bit in registers correspond to an active alarm. For example:

ALARM_A_STATUS_1: bit0 -> A1, bit4 ->A5.
ALARM_A_STATUS_2: bit0 -> A33
ALARM_B_STATUS_1: bit4 -> F5

Note: Alarms are combined from all system units. If an alarm is indicated 'active', it can be active in many units.

The first alarm log entry (first active alarm) can be read from 'First active alarm' registers, 107…110.

This active alarm can be reset by writing the alarm number (ID) to register PRM_ALARM_RESET, 0..1. If incorrect ID is written, nothing happens.

For example, if alarm A5 is active, alarm can reset by writing PRM_ALARM_RESET with value '5'. **When resetting B-alarms (faults), value to be written is 256 + alarm number -> F6 is reset with value 262.**
-> Alarm is reset. If there are more active alarms, the 'first active alarm' registers will update and show the info regarding the next active alarm.

If there are no active alarms, 'first active alarm' registers will read '0'.

4.1.4 Injecting sensor values from BMS

Offset	Type	Corresponding parameter	Description
9	R/W	RTX from BMS. 3000 = not reported. (0.1'c)	
10	R/W	OTX from BMS. 3000 = not reported. (0.1'c)	
11	R/W	Door contact status from BMS. 3000 = not reported. 0: closed 1: open	

Sensor values can be set from BMS by writing values to registers. Set values can be read. If register value is read as '3000', sensor value is not broadcasted to FC system.

When register is set with a valid value (< 1000 (100'c)), BAP will broadcast it to system and the value is used by system units. Broadcasting can be stopped by writing value >= 1000 or by restarting BAP.

4.2 System image registers – Unit ID readout

System image register area starts from 61000.

For each unit, there is a reservation of 3 registers. There is a reservation for register blocks for 20 units. **This register area is read only.**

Resulting register number:

Reg = 61000 + (Unit_idx*3) + offset.

For example, Unit3 Unit type: 61000 + (3*3) + 2 = register 61011.

Register offset	Corresponding parameter	Description
0	Serial	High word
1	Serial	Low word
2	Unit type	HMI:0 POB:1 POB3:2 BASE_E:3 LAP:4 BAP:5 BASE_W:6 BASE_T3:7 BASE_T: 8(N/A) RFS:9 POBF:10