C4 controller MODBUS connection description

TABLE OF CONTENTS

1. MODBUS CONNECTION

There is a possibility to control Air Handling Unit (AHU) from external management system (BMS), which work with MODBUS data processing. For MODBUS connection are three possibilities:

1. Connect direct to control panel connection place using RS-485 data transfer interface and read data with MODBUS RTU protocol.

In this case unit operation with control panel impossible, because panel must be disconnected!

2. For operation with control panel, NET module should to be installed. In this case MODBUS RTU data reading is possible from NET module RS-232 interface.
3. The same connection as explained in section 2, but data reading is provided with MODBUS TCP from NET module TCP/IP interface.

MODBUS connection description is detailed in Figure 1.

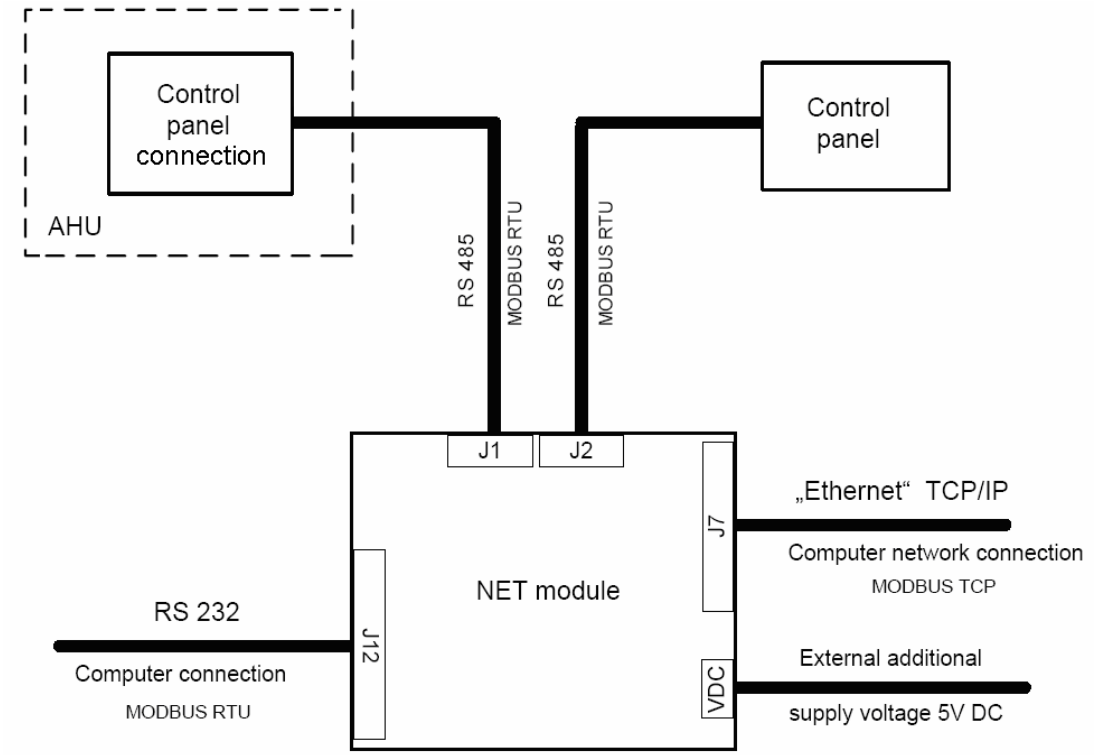

Fig. 1.

2. MODBUS CONNECTION PARAMETERS

To read data from controller, serial or TCP/IP connection must be provided. Connection parameters are fixed. Detailed information in Figure 2.

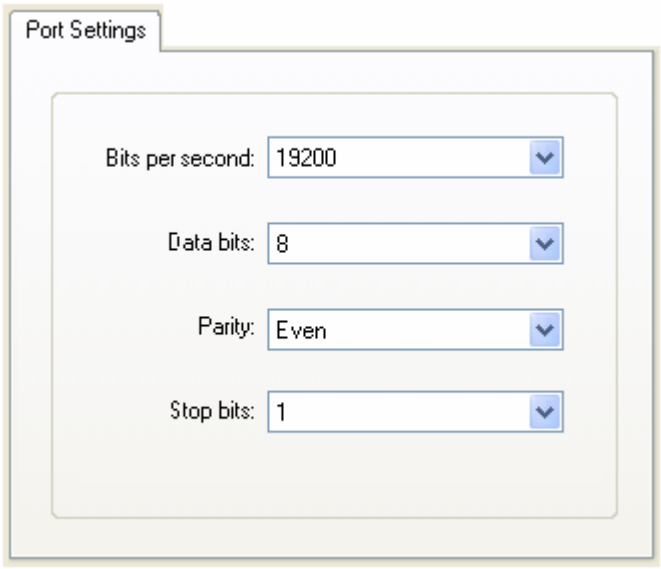

Fig.2.

If distance between AHUs and BMS computer is more than 10 meters, the ground wire is required for serial connection (not two but three wires: A, B, GND).

When the distance between AHUs and BMS is very long, line compensation resistances are recommended to ensure good connection.

3. MODBUS DATA REGISTERS

For data reading (information about AHU control: operation status, temperatures, fans speed and etc.) from registers of controller, function code 03 is used. For registers setting (turn on/off unit, set values) function code 06 or 16 is used.

Each controller board have self identification address. If only one unit is connected to the BMS, common identification address 254 can be used. In case if several units are connected (max. 20 units), each controller board must have different identification address (prepared before). For data reading from any of those controllers, address of this controller must be used (1, 2, 3 and etc.). Main data registers of controller are described in Table 1.

Table 1. MODBUS registers and description

	Register	Description	Data type	Access	Data range/values
General	10000	C4 Start/Stop	integer	R/W	1-Start, 0-Stop.
	10001	Season	integer	R/W	1-Winter, 0-Summer.
	10002	Alarm status (warnings)	binary	R	14-Service, 13-Heater off, 11-Rotor stop.
	10003	C4 configuration	integer	R	1-REGO/RECU, 2-Water/Electric, 3-EC/AC, 4-"OVR" with exhaust stop/"OVR without exhaust stop ".
	10004	Time	2x char	R/W	hh:mm (0xhhmm)
	10005	Day of the week	integer	R/W	1-Mon, 2-Tue, 3-Wed, 4-Thu, 5-Fri, 6-Sat, 7-Sun.
	10006	Month-day	2x char	R/W	mm.dd (0xmmdd)
	10007	Year	integer	R/W	2010..2200
	10008	Alarm status (stop flags)	binary	R	1-Supply sensor B1, 2-Heater overheating, 3-Water temp low, 4-Rotor stop, 5-Frost possibility, 6-Air temp high, 7-Air temp low.
	10009	Alarm status (stop code)	integer	R	3-Rotor stop, 4-Heater overheating, 9-Supply sensor B1, 19-Air temp low, 20-Air temp high, 27-Water temp low, 28-Frost possibility.
	10010	Modbus address	integer	R/W	1..100
	10011	External heater control signal type	integer	R/W	1 - 12V PWM, 0 - 0..10V (allways 0 if heater configured as water type)

	Register	Description	Data type	Access	Data range/values
Ventilation	10100	Ventilation level (manual)	integer	R/W	1..3
	10101	Ventilation level (current)	integer	R	0..4
	10102	Mode (Auto/Manual)	integer	R/W	0-Manual, 1-Auto
	10103	Intake ventilation intensity level 1 (EC)	integer	R/W	20..100 / 0
	10104	Intake ventilation intensity level 2 (EC/AC)	integer	R/W	20..100 / 0..2
	10105	Intake ventilation intensity level 3 (EC)	integer	R/W	20..100 / 0
	10106	Intake ventilation intensity level 4 (EC)	integer	R/W	20..100 / 0
	10107	Exhaust ventilation intensity level 1 (EC)	integer	R/W	20..100 / 0
	10108	Exhaust ventilation intensity level 2 (EC/AC)	integer	R/W	20..100 / 0..2
	10109	Exhaust ventilation intensity level 3 (EC)	integer	R/W	20..100 / 0
	10110	Exhaust ventilation intensity level 4 (EC)	integer	R/W	20..100 / 0
	10111	"OVR" enable	integer	R/W	1 - "OVR" enabled
	10112	"OVR" time	integer	R/W	1..90
	10113	"OVR" time(current)	integer	R	0..90

	Register	Description	Data type	Access	Data range/values
Temp.	10300	Supply air temp, C	integer	R	-30..75C^{O} (-300..750)
	10301	Setpoint temp, C	integer	R/W	10..40C^{O} (100..400)
	10302	Temp.correction, C	integer	R/W	-9..+9C^{O} (-90..90)
	10303	Temp.correction start time	2x char	R/W	hh:mm (0xhhmm)
	10304	Temp.correction stop time	2x char	R/W	hh:mm (0xhhmm)
	10305	Water temp, C	integer	R	-10..110C^{O} (-100..1100)

	Register	Description	Data type	Access	Data range/values
Alarm history	10500	Alarm history count	integer	R/W	0..50
	10501	Alarm1(newest) year	integer	R	2010..2200
	10502	Alarm1(newest) month-day	2x char	R	mm.dd (0xmmdd)
	10503	Alarm1(newest) time	2x char	R	hh:mm (0xhhmm)
	10504	Alarm1(newest) code	integer	R	4B (0x0104)
	⋮				
	10697	Alarm50 year	integer	R	2010..2200
	10698	Alarm50 month-day	2x char	R	mmdd (0xmmdd)
	10699	Alarm50 time	2x char	R	hh:mm (0xhhmm)
	10700	Alarm50 code	integer	R	4B (0x0104)

	Register	Description	Data type	Access	Data range/values
Misc	10800	Internal heater level	integer	R	0..100
	10801	External heater level	integer	R	0..100
	10802	Service time counter	integer	R	0..100 (100 - service time)
	10803	C4 program version	integer	R	v1.00 (100)
	10890	V1 0.10V calibration value	integer	R/W	-10..+10% (-100..100) (0x99C4 - Store to memory)
	10891	V2 0.10V calibration value	integer	R/W	-10..+10% (-100..100) (0x99C4 - Store to memory)
	10892	External heater level calibration value	integer	R/W	-10..+10% (-100..100) (0x99C4 - Store to memory)
	10893	Return water temp. calibration value	integer	R/W	-10..+10% (-100..100) (0x99C4 - Store to memory)

	Register	Description	Data type	Access	Data range/values
Control panel	10900	C4 Start/Stop	integer	R	1-Start, 0-Stop
	10901	Season	integer	R	1-Winter, 0-Summer
	10902	Mode (Auto/Manual)	integer	R	0-Manual, 1-Auto
	10903	Ventilation level (current)	integer	R	0..4
	10904	Setpoint temp, C	integer	R	10..40C^{O} (100..400)
	10905	Supply air temp, C	integer	R	-30..75C^{O} (-300..750)
	10906	Time	2x char	R	hh:mm (0xhhmm)
	10907	C4 configuration	integer	R	1-REGO/RECU, 2-Water/Electric, 3-EC/AC, 4-"OVR" with exhaust stop/"OVR".
	10908	Alarm status (warnings)	binary	R	14-Service, 13-Heater off, 11-Rotor stop.
	10909	Alarm status (stop code)	integer	R	3-Rotor stop, 4-Heater overheating, 9-Supply sensor B1, 19-Air temp low, 20-Air temp high, 27-Water temp low, 28-Frost possibility
Schedule	**Register**	**Description**	**Data type**	**Access**	**Data range/values**
	10200	Schedule: Mo1 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10201	Schedule: Mo1 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10202	Schedule: Mo2 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10203	Schedule: Mo2 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10204	Schedule: Mo3 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10205	Schedule: Mo3 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10206	Schedule: Tu1 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10207	Schedule: Tu1 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10208	Schedule: Tu2 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10209	Schedule: Tu2 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10210	Schedule: Tu3 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10211	Schedule: Tu3 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10212	Schedule: We1 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10213	Schedule: We1 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10214	Schedule: We2 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10215	Schedule: We2 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10216	Schedule: We3 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10217	Schedule: We3 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10218	Schedule: Th1 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10219	Schedule: Th1 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10220	Schedule: Th2 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10221	Schedule: Th2 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10222	Schedule: Th3 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10223	Schedule: Th3 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10224	Schedule: Fr1 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10225	Schedule: Fr1 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)

	10226	Schedule: Fr2 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10227	Schedule: Fr2 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10228	Schedule: Fr3 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10229	Schedule: Fr3 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10230	Schedule: Sa1 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10231	Schedule: Sa1 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10232	Schedule: Sa2 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10233	Schedule: Sa2 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10234	Schedule: Sa3 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10235	Schedule: Sa3 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10236	Schedule: Su1 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10237	Schedule: Su1 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10238	Schedule: Su2 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10239	Schedule: Su2 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10240	Schedule: Su3 start time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10241	Schedule: Su3 stop time	2x char	R/W	0x0000..0x1800 (0:00..24:00)
	10242	Schedule: Mo1 ventilation level	integer	R/W	0..3
	10243	Schedule: Mo2 ventilation level	integer	R/W	0..3
	10244	Schedule: Mo3 ventilation level	integer	R/W	0..3
	10245	Schedule: Tu1 ventilation level	integer	R/W	0..3
	10246	Schedule: Tu2 ventilation level	integer	R/W	0..3
	10247	Schedule: Tu3 ventilation level	integer	R/W	0..3
	10248	Schedule: We1 ventilation level	integer	R/W	0..3
	10249	Schedule: We2 ventilation level	integer	R/W	0..3
	10250	Schedule: We3 ventilation level	integer	R/W	0..3
	10251	Schedule: Th1 ventilation level	integer	R/W	0..3
	10252	Schedule: Th2 ventilation level	integer	R/W	0..3
	10253	Schedule: Th3 ventilation level	integer	R/W	0..3
	10254	Schedule: Fr1 ventilation level	integer	R/W	0..3
	10255	Schedule: Fr2 ventilation level	integer	R/W	0..3
	10256	Schedule: Fr3 ventilation level	integer	R/W	0..3
	10257	Schedule: Sa1 ventilation level	integer	R/W	0..3
	10258	Schedule: Sa2 ventilation level	integer	R/W	0..3
	10259	Schedule: Sa3 ventilation level	integer	R/W	0..3
	10260	Schedule: Su1 ventilation level	integer	R/W	0..3
	10261	Schedule: Su2 ventilation level	integer	R/W	0..3
	10262	Schedule: Su3 ventilation level	integer	R/W	0..3

4. SHORT DESCRIPTION ABOUT REGISTER TYPES

There are two types of data registers provided: Integer and Floating Point.

- Integer type is intended for data with whole numbers and using to read and write discrete signals like fan intensity, set point, inputs and outputs. To transfer integer decimal 16 digits data is needed 2 bytes (2x8). Example, to transfer decimal number 12345 (hexadecimal 3039) is needed two bytes or one MODBUS register.
- Floating Point type is intended for transfer numbers with fraction. In this case data will transfer in two registers (one part of data in one register, second part in another). Example, to transfer decimal float number 125,555 (hexadecimal 42FB1C29) is needed four bytes or two MODBUS registers. Number 42FB will transfer from first register, 1C29 number from second.