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VARIABLE LIST

ED-RUD



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I Introduction

I.1 The room unit

ED-RUD is a slim flush-mounted room unit with backlit touch screen. It is intended to be used either for Plug'n Play with Regin's room controllers Regio^{Eedo}, Regio^{Ardo} or together with any Modbus Master controller.

All available Modbus variables are presented in the variable list in chapter 4.

I.2 The Modbus protocol

I.2.1 General

The Modbus protocol is a general-purpose protocol for data exchange between for instance control units, SCADA systems, instruments, and electricity meters. It's an asynchronous, serial Master Slave protocol. It's widely used, well documented and simple to understand.

A Modbus master can communicate with up to 247 slave units with the device ID 1-247. A protocol like Modbus consists of several layers (OSI-model). The bottom layer is always the physical layer; the number of wires and signal levels. The next layer describes the communication digits (number of data bits, stop-bits, parity etc.). Next are the layers describing the Modbus-specific functions (number of digits per message, the meaning of different messages, etc.).

I.2.2 RTU/ASCII modes

The Modbus protocol has two modes: binary (RTU) or character based (ASCII). According to the Modbus standard all devices must have the RTU mode implemented.

The room unit is a Modbus slave that uses RTU. In RTU mode all registers are transferred in binary format with two hexadecimal digits (0x00-0xFF) in each byte.

RTU mode format:

- ✓ 1 start bit
- ✓ 8 data bits
- ✓ Odd, even or no parity bit
- ✓ 1 or 2 stop bits. Normally if no parity is used then 2 stop bits should be used.
- ✓ Check sum: 16 bits CRC

I.2.3 Modbus register types

1. Coil Status Register
2. Discrete Input
3. Holding Register
4. Input Register

Supported Modbus functions:

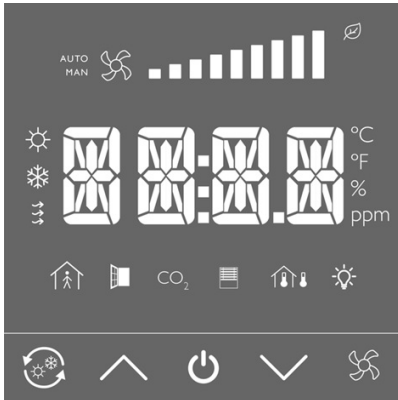
- ✓ 0x01 Read Coils
- ✓ 0x02 Read Discrete Inputs
- ✓ 0x03 Read Holding Registers

- ✓ 0x04 Read Input Registers
- ✓ 0x05 Write Single Coil
- ✓ 0x06 Write Single Register
- ✓ 0x0F Write Multiple Coils
- ✓ 0x10 Write Multiple Registers
- ✓ 0x17 Read/Write Multiple Registers

2 Display layout

2.1 The display

The display consists of segments and buttons that all can be controlled individually via the modbus master.



2.2 Buttons

2.2.1 General

There are five touch buttons available as LED-segments that may be turned on, turned off or made to blink with 2 Hz. The buttons are readable when pressed.

A button variable contains two parts. The first part is the four lower bits of the byte that is the variable. This part contains information about whether the button is currently pushed or not. The second part is the four high bits of the byte.




Reading the four low bits:



- ✓ If the button is pushed the first bit is one
- ✓ If the button is released the first bit is zero
- ✓ The 3 remaining bits of the first part will always be zero

Reading the four high bits:

- ✓ The first bit of this part is set when the button is pressed, but is not reset until the variable is read over communication.
- ✓ The 3 remaining bits of the second part is always zero.

2.2.2 Description

Symbol	Description
	Changeover button This is a combination of two segments, the outer arrows and the inner sun/snowflake. These two segments are controlled individually.
	Arrow up/Increase button
	On/Off button
















Symbol	Description
	Arrow down/Decrease button
	Fun button






2.3 Segments

2.3.1 General

All segments can be turned on, turned off and blink with 2 Hz.

2.3.2 Description

Segment	Description
	Four 16-segments LCD blocks for numeric feedback All segments are individually controllable, i.e. the digits, the "." and the two "."
	Unit °C
	Unit °F
	Unit %
	Unit parts per million
	Fan symbols Two 4 blade fans are combined. When the fan is running the fan symbols alters between showing all 8 fan blades and showing only 4, creating an illusion of fan spinning.
	Auto mode Normally used in conjunction with the fan symbol, to show that the fan is in Auto mode..
	Manual mode Normally used in conjunction with the fan symbol, to show that the fan is in Manual mode.
	Fan speed Every bar is a separate segment and may be used individually. 10 different fan speeds can be shown.
	Shows occupancy in the room. The man and the house are two separate segments that can be controlled individually of each other.
	Environmental symbol
	Shows that the controller is in cool mode
	Shows that the controller is in heat mode
	VAV symbol
	Window symbol, shows if a window is opened.

Segment	Description
	CO ₂ symbol, shows if the controller runs CO ₂ control
	Blinds symbol Shows if the controller is running blinds.
	Indoor temperature symbol This is a combination of two symbols, the house and the thermometer. They can be controlled individually.
	Outdoor temperature symbol This symbol is a combination of two segments. The house and the thermometer. The segments are individually controllable.
	Light symbol Indicates that light is on.

3 Display configuration and usage

3.1 Power up sequence

The display has a power up sequence that is executed every time the display is powered up. In the power up sequence, **only** the On/Off button will be lit up, regardless of the received communication. This means that even if there is a command to light up any other segments, the display stays in the power up sequence and only shows the On/Off button.

The Power up sequence runs for:

- ✓ A minimum of 5 seconds
- ✓ If 5 seconds has passed, the display remains in the power up sequence until a valid command is received.

The Power up sequence is used to enter the firmware configuration menu describe below. As long as the On/Off button is pressed, the Power up sequence may not be aborted.

3.2 Firmware configuration menu

3.2.1 The menu

The Firmware configuration menu is reached by pressing the On/Off button for 5 seconds while in Power up sequence. It is stored in the display and is reachable as long as the display has power. Therefore it can be used to configure communication parameters in the display, regardless if the display is connected to a master controller or not.

The menu is navigated with the arrow buttons and they are also used to adjust values. The On/Off button is used to select as well as confirm a parameter.

At the end of the menu the word EXIT appears in the display. To exit the menu press the On/Off button when in EXIT.



Note! After changing parameters, make sure to have the power on at least 5 s to ensure that the values are stored correctly.

3.2.2 Configuration

When in the Firmware configuration menu, the display answers Modbus requests as usual. However, it takes no action on commands sent to Holding registers until the Firmware configuration menu is left. Commands sent to the Input registers are handled as normal, i.e. a temperature could be returned to the master controller even if the display is in Firmware configuration menu.

3.2.3 Parameters

Table 3-1 Firmware configuration parameters

Parameter	Description	Default
1	The Modbus Address the controller uses 1...254	1
2	Modbus stop bits and Parity 0 = 8N2 1 = 8O1 2 = 8E1 3 = 8N1	2

Table 3-1 Firmware configuration parameters (continued)

Parameter	Description	Default
3	Modbus Time Out At least 1.5 times a character min = 2 ms (at 9 600 baud)	3
4	Modbus Answer delay At least 3.5 times a character min = 5 ms (at 9 600 baud)	5
5	Modbus baud rate 0 = 4800 kb 1 = 9600 kb 2 = 19200 kb 3 = 38400 kb	3

3.3 Macros

Macros are used to control several segments at a time, to create a special effect. They are defined from Modbus Holding register 60 and onwards.

Macros have precedence over single segments.

Example: If the Macro in Holding Register 62 is set, then the leftmost segments for fan speed are lit regardless of what the individual segments controls for the three leftmost fan speed segments (i.e. Holding Register 11 – 13) are set to.

4 Variable list

4.1 Input registers

Modbus address	Variable	Description	Unit	Scale
1	Regin model identification number	Regin Specific model number 9350 = model RCFD-230C	-	-
2-5	Reserved	Reserved	-	-
6	On/Off button	Status of the button 1 st bit = current status 5 th bit = status until read by communication	-	-
7	Fan button	Status of the button 1 st bit = current status 5 th bit = status until read by communication	-	-
8	Change over button	Status of the button 1 st bit = current status 5 th bit = status until read by communication	-	-
9	Up button	Status of the button 1 st bit = current status 5 th bit = status until read by communication	-	-
10	Down button	Status of the button 1 st bit = current status 5 th bit = status until read by communication	-	-
11 – 20	Reserved	Reserved	-	-
21	Internal temperature sensor	The display's internal NTC sensor value. If 26.5 °C the register shows 265.	°C	10

4.2 Holding registers

Modbus address	Variable	Description	Unit	Scale	Default
1	On/Off button	Control the visibility of the button 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
2	Fan button	Control the visibility of the button 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
3	Change over button, circles segment	Control the visibility of the button 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
4	Change over button, heat/cool segment	Control the visibility of the button 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
5	Up button	Control the visibility of the button 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0

Modbus address	Variable	Description	Unit	Scale	Default
6	Down button	Control the visibility of the button 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
7	AUTO segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
8	MAN segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
9	Fan symbol 1 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
10	Fan symbol 2 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
11	Fan bar 1 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
12	Fan bar 2 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
13	Fan bar 3 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
14	Fan bar 4 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
15	Fan bar 5 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
16	Fan bar 6 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
17	Fan bar 7 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
18	Fan bar 8 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
19	Fan bar 9 segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0

Variable list

Modbus address	Variable	Description	Unit	Scale	Default
20	Eco leaf segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
21	Sun segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
22	Snowflake segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
23	VAV segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
24	“.” segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
25	Leftmost “.” segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
26	Rightmost “.” segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
27	°C segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
28	°F segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
29	% segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
30	ppm segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
31	House (presence) segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
32	Man (presence) segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
33	Window segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0

Modbus address	Variable	Description	Unit	Scale	Default
34	CO ₂ segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
35	Blinds segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
36	House (temperature) segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
37	Inner thermometer segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
38	Outer thermometer segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
39	Light segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
40	Line above the buttons	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
41	Circle in Fan segment	Control the visibility of the segment 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0

Variable list

Modbus adress	Variable	Description	Unit	Scale	Default
42	First Digit (to the far left)	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5 6 = 6 7 = 7 8 = 8 9 = 9 10 = A 11 = B 12 = C 13 = D 14 = E 15 = F 16 = G 17 = H 18 = I 19 = J 20 = K 21 = L 22 = M 23 = N 24 = O 25 = P 26 = Q 27 = R 28 = S 29 = T 30 = U 31 = V 32 = X 33 = Y 34 = Z 35 = + 36 = - 37 = * ... 99 = empty	-	1	0
43	Second digit	See above	-	1	0
44	Third digit	See above	-	1	0
45	Forth digit	See above	-	1	0
46-54	<i>Not used</i>				
55	The Modbus slave address	1...254	-	1	1
56	Modbus stop bits and Parity	0 = 8N2, 1 = 8O1, 2 = 8E1, 3 = 8N1	-	1	2
57	Modbus Time Out	At least 1.5 times a character min = 2 (at 9 600 baud)	ms	1	3
58	Modbus Answer delay	At least 3.5 times a character min = 5 (at 9 600 baud)	ms	1	5
59	Modbus speed	0 = 4800 1 = 9600 2 = 19200 3 = 38400	kb	1	3

Modbus address	Variable	Description	Unit	Scale	Default
60	Fan Spin	Macro to make the fan spin. Combination of Fan symbol 1 segment and Fan symbol 2 segment. Together they create an effect of a spinning fan.	-	1	0
61	Change over segment	Macro to control the visibility of the segment (Change over Arrows and Sun/Snowflake are lit at the same time) 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
62	Fan speed 1 segment	Macro for the three far most left fan bar segments to light up at the same time 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
63	Fan Speed 2 segment	Macro for the three middle fan bar segments to light up at the same time 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
64	Fan Speed 3 segment	Macro for the three far most right fan bar segments to light up at the same time 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
65	Presence segment	Macro to control the visibility of the segment (Presence house and Man are lit at the same time) 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
66	Indoor temperature segment	Macro to control the visibility of the segment (Temperature house and Inner thermometer are lit at the same time) 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
67	Outdoor temperature segment	Macro to control the visibility of the segment (Temperature house and Outside thermometer are lit at the same time) 0 = Turned Off 1 = Turned On 2 = Blink 2 Hz	-	1	0
69	No decimal value	Macro used to present a value on the display without decimals min = -999, max = 9999	-	1	0
70	<i>Not used</i>				
71	One decimal value	Macro used to present a value on the display with one decimal min = -99.9, max = 999.9	-	1	0
72	<i>Not used</i>				
73	Two decimal value	Macro used to present a value on the display with two decimals min = -9.99, max = 99.99	-	1	0
74	Time	Macro used to show a value as a time in the display, e.g. 1654 is shown as 16:54.	-	1	0
75	Parameter	Macro used to show a value in the display with a P in front, e.g. 123 is shown as P123.	-	1	0



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