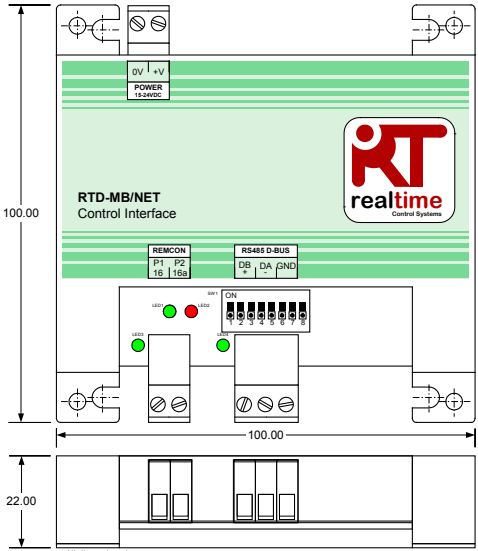
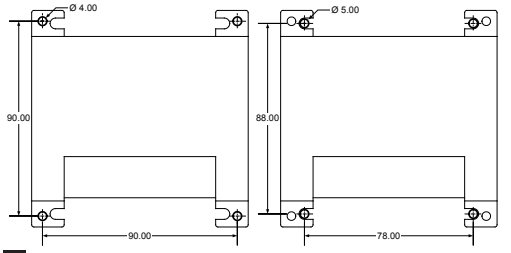
RTD-MB/NET

Installation Instructions

English Installation Instructions



realtime
Control Systems


Ø 4.00
90.00
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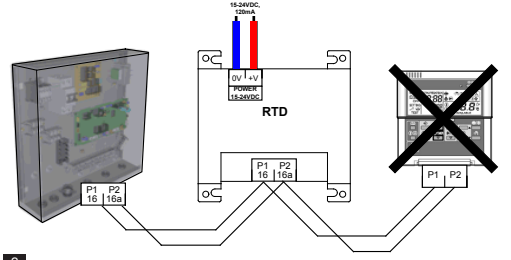
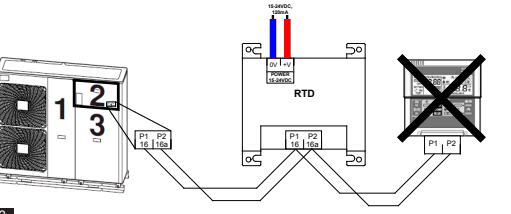
Ø 5.00
88.00
78.00

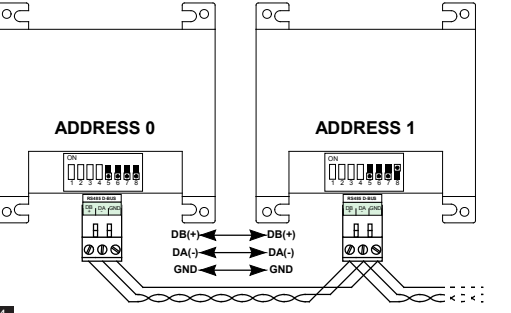
1


15-24VDC, 120mA
0V
+V
POWER 15-24VDC
RTD
P1
P2
16
16a

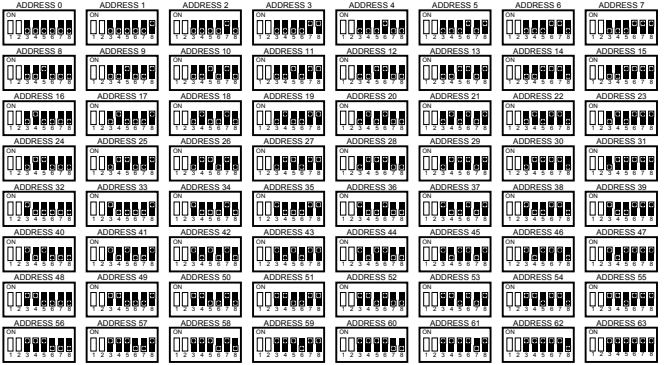
2


1
2
3
15-24VDC, 120mA
0V
+V
POWER 15-24VDC
RTD
P1
P2
16
16a

3

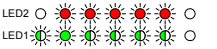

ADDRESS 0
ADDRESS 1
ON
RS485 D-BUS
DB
DA
GND
DB(+)
DA(-)
GND

4

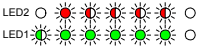


5

6a



6b



6c

7a

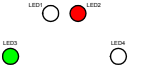
7b

8a

8b

8c

9



⚠ Warnings and Cautions

All cable connections to the device must be adequately secured by suitable strain relief fasteners

The RTD must either be mounted in a suitable metal enclosure or plastic enclosure with a flammability rating of at least IEC60695-11-10 V-1. Do not install it inside the Control Box or Monoblock. In all cases access by non-qualified persons must be prevented (the enclosure may not be accessible without a tool). The unit can be mounted horizontally or vertically

The RTD must be powered from an external 15-24VDC, 120mA supply. When the RTD is powered from a non-SELV supply, all external wiring and electrically attached devices must be suitably insulated to prevent access by non-qualified persons. Where this is not possible, the RTD must be powered from an SELV supply (Voltage below 42V supplied from a safety isolating transformer or equivalent and adequately separated from live parts).

RS485 Cables must use stranded 24awg shielded or unshielded twisted pair to Cat3, Cat4 or Cat5 specification. Use a twisted pair for connections DB,DA and an extra core for connection GND. Install RS485 cable as shown in Figure 4.

For Small Monoblock Heating only and Heating / Cooling EBHQ006 - 008, Heating Only EKCBH008, Heating and Cooling EKCBX008, RTD-MB/NET P1, P2 terminals to be connected to the X2M terminal strip inside the Control Box in Figure 2 (P1 to 16, P2 to 16a).

For Large Monoblock Heating Only EDHQ011 - 016 and Heating / Cooling EBHQ011 - 016, RTD-MB/NET P1, P2 terminals to be connected to the X2M terminal strip inside the Compartment 2 as shown in Figure 3 (P1 to 16, P2 to 16a).

Specifications

Electrical

Supply	15V-24V DC, 120mA Regulated
Power	<2.5VA
Connectors	Rising clamp to 0.75mm^2 cable

Environmental

Temperature	
Storage	-10oC to 50oC
Operation	0oC to 50oC
Humidity	0-90% RH non-condensing

Network

P1P2	<500m
RS485	<500m

Your product is marked with the symbol shown to the left. This symbol on the product indicates that this product must not be disposed of with your other household waste. Inappropriate disposal may be harmful. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. Units must be treated at a specialized treatment facility for re-use, recycling and recovery. By ensuring this product is disposed of correctly, you will help to prevent potential negative consequences for the environment and human health. Please contact the installer or local authority for more information.

Observe precautions for handling Electrostatic Sensitive Devices

Additional information, including Fault Codes are available from ***www.realtime-controls.co.uk/rtd***

RTD-MB/NET Installation Instructions

The RTD-MB/NET is a Modbus interface for monitoring and control of Daikin LT Altherma Small Monoblock 006/008 class Heating Only & Reversible Heating/Cooling Models and Large Monoblock 011/014/016 class Heating Only & Reversible Heating/Cooling Models

Installation

MOUNTING (FIGURE 1)

The RTD must either be mounted in a suitable metal enclosure or plastic enclosure with a flammability rating of at least IEC60695-11-10 V-1. Do not install it inside the air-conditioning unit. In all cases access by non-qualified persons must be prevented (the enclosure may not accessible without a tool). The unit can be mounted horizontally or vertically

MOUNTING PILLARS	SCREW MOUNTING
The RTD-MB/NET is supplied with 4 mounting pillars that can be used to mount with compatible mounting holes	The RTD-MB/NET can be mounted using screws of up to 5mm diameter.

POWER SUPPLY (FIGURE 2,3)

The RTD requires a 15V to 24VDC 120mA external power supply.

P1,P2 NETWORK (FIGURE 2,3)

For Small Monoblock Heating only and Heating / Cooling EBHQ006 - 008, Heating Only EKCBH008, Heating and Cooling EKCBX008, RTD-MB/NET P1, P2 terminals to be connected to the X2M terminal strip inside the Control Box in Figure 2 (P1 to 16, P2 to 16a). When the RTD is connected, the standard unit remote controller can not be installed on the same network.

For Large Monoblock Heating Only EDHQ011 - 016 and Heating / Cooling EBHQ011 - 016, RTD-MB/NET P1, P2 terminals to be connected to the X2M terminal strip inside the Compartment 2 as shown in Figure 3 (P1 to 16, P2 to 16a). When the RTD is connected, the standard unit remote controller can not be installed on the same network.

ARC448 User Interface MUST be Removed as RTD-MB/NET can only be connected WITHOUT User Interface. If ARC448 is connected then LED2 and LED3 on the RTD will be ON to indicate a connection error (Figure 9). The RTD will report a U8 fault condition under this condition.

RS485 NETWORK INSTALLATION (FIGURE 4)

The RS485 D-Bus network requires a twisted pair cable connecting terminals DB(+) and DA(-) on each RTD as shown below. Terminal DB must be connected to all other DB terminals. Terminal DA must be connected to all other DA terminals. In addition the common terminal GND on all devices must be connected together. If a shielded cable is used then the shield can be used for this purpose. It is recommended that the GND connection is connected to local Earth at one point only. The network must be installed as a daisy-chained point-to-point Bus configuration, Star and Ring connections must NOT be used.

RS485 NETWORK LENGTH

Standard installation for total network distances of up to 500m can be achieved following the basic daisy-chaining method showed in the above diagram. The network can be extended further using RS485 repeaters.

LED FUNCTIONALITY (Figures 6 to 8)

When the RTD-MB/NET is powered up, or if it looses communication with the indoor PCB the RTD-MB/NET enters P1,P2 search mode. If P1,P2 communications are not re-established after 1 minute the RTD-MB/NET will raise an alarm which will be indicated in the Modbus Fault Registers. LED behaviour is shown in the following figures

Power-Up sequence: Factory Configuration	Figure 6a
Power-Up sequence: Custom Configuration	Figure 6b
P1,P2 Search. After power-up and during unit configuration	Figure 6c
No Fault State	Figure 7a
Unit Fault	Figure 7b
Device configuration error	Figure 8a
AC Unit Missing (U5 Fault)	Figure 8b
RS485 Communications timeout	Figure 8c
ARC448 Incorrectly Connected (Not supported)	Figure 9

LED Key:

○ OFF	☼ ON	☼ Flashing

Modbus Protocol

MODBUS CONFIGURATION

Network	3 wire RS485
Mode	Modbus RTU Slave
Baud	9600*
Parity	None*
Stop bits	1
Register Base	0

**RTD interfaces can be configured with different baud rate and parity settings if required*

Modbus address range 0 to 63 set using SW1 (Figure 6).

*Details of the Modbus Protocol can be found in the **Modicon Modbus Protocol Reference Guide** available on the internet.*

MODBUS REGISTERS

The RTD-MB/NET supports two types of register, analogue *Holding Registers* and analogue *Input Registers*. Register Addresses are '0' based in the range 0..65535.

Register Type	Access	Function
Holding Register	Read/Write	Control and Command Registers
Input Register	Read Only	Readback and Monitoring Registers

All analogue and digital values are accessed through these registers. All register values are 2 byte (16 bit) values except where otherwise indicated.

Different data types are returned using the following conventions

Data Type	Range	Convention
Digital	0..1	=0: FALSE, <>0 : TRUE
16 bit Integer (signed)	-32768.. 32767	Two's complement
16 bit Integer (unsigned)	0..65535	No scaling required
32 bit Integer (unsigned)	0.. 4294967295	Stored in two consecutive registers R,R+1 R contains the High 16 bit Word R+1 contains the Low 16 bit Word
x100 Temperature	-327.68.. 327.67	Temperatures values are generally returned *multiplied by 100* to allow greater precision. To allow for negative temperature the value is returned as a *signed integer,* this means that any value greater than 32767 must be converted into a negative value by subtracting 65536. Examples: A readback value of 2150 is a positive temperature so: 2150 / 100 = 21.50°C A readback value of 65036 is a negative temperature so: 65036 – 65536 = -500 -500 / 100 = -5.00°C

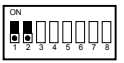
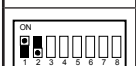
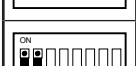
Registers are accessed using standard Modbus functions. The following four functions are supported by the RTD interface.

Function Code (hex code)	Function Name	Register Count
03 (03h)	Read Holding Registers	1..10
04 (04h)	Read Input Registers	1..10
06 (06h)	Preset Single Holding Register	1
16 (10h)	Preset Multiple Holding Register	1..10

In this document, Holding registers are written as **`H0010`** where '**`H`**' indicates *Holding* register and '**`0010`**' indicates the register address 0010. Similarily Input registers are referred to as **`I0010`** where '**`I`**' indicates an *Input* register

MODBUS MASTER TIMEOUT

The RTD can be configured to operate with an optional Modbus Master timeout. In this configuration if no Holding Register writes occur for a period of 120 seconds then a timeout event will occur and the system will be switched either on or off with the last configured operating mode and setpoint. In a timeout condition the RTD Leds will indicate an *RS485 Communications Timeout* as illustrated in the *LED Functionality* section of this datasheet. SW1 DIP Switch settings to enable or disable Modbus Master Timeout are shown in the following table.

Switch Setting	Function
	No Timeout
	Timeout if no Holding Register WRITE command for 120 seconds. Heating/Cooling OFF Domestic Hot Water OFF
	Timeout if no Holding Register WRITE command for 120 seconds. Heating/Cooling ON Domestic Hot Water ON

SPECIAL MODBUS REGISTER VALUES

The Modbus Input and Holding registers will return special values under certain conditions as shown in the following table.

Register Value (unsigned)	Signed Format	Hex Format	Indication
32767	32767	0x7FFF	Register not implemented
32768	-32768	0x8000	Function not available
32769	-32767	0x8001	Waiting for value

Depending on model, certain Holding Register and Input Register functionality may not be available. After a reset, or in cases where functionality is not available for the attached model the register value will report 32768 : 'Function not available'.

After connecting and identifying the system, the value 32769 : 'Waiting for value' will be reported by all registers that are waiting for live data from the connected LT Altherma system.

Control Functions

UNIT CONTROL

Unit Control functions are availalble in Holding Registers `H0001` to `H0013`. All Unit Control Registers can be treated as *signed 16 bit integers*.

Holding Register	Name	Range
H0001	Leaving water setpoint in heating mode	25~55°C*
H0002	Leaving water setpoint in cooling mode†	5~22°C*
H0003	Heating/Cooling Mode†	1..2 (1=Heating, 2=Cooling)
H0004	Heating/Cooling ON/OFF	0..1 (0:Off, 1:On)
H0009	Quiet mode operation	0..1 (0:Disable, 1:Enable)
H0010	Domestic Hot Water Setpoint†	25~80°C*
H0012	Domestic Hot Water ON/OFF†	0..1 (0:Off, 1:On)
H0013	Domestic Hot Water Booster Heater†	0..1 (0:Idle, 1:Start)

†Available functions may vary by model and option settings

*Setpoint Range Limits may vary by model and field settings

GROUP READBACK

The following input registers give common readback values for unit operation.

Input Register	Name	Range
I0021	Unit ERROR	0..1 (0:No Error, 1:Error)
I0022	Unit ERROR Code	RTD ASCII Format
I0030	Circulation pump operation	0..1 (0:Off, 1:On)
I0031	Compressor Run	0..1 (0:Off, 1:On)
I0032	Booster Heater Run†	0..1 (0:Off, 1:On)
I0034	Backup Heater Level 1,2	0..2 (0:Off, 1,2: Level)
I0035	Defrost/start up mode	0..1 (0:Off, 1:Busy)
I0040	Leaving Water Temperature	°C x100 Temperature
I0042	Inlet Water Temperature	°C x100 Temperature
I0043	Domestic Hot Water Temperature†	°C x100 Temperature
I0044	Outside Air Temperature	°C x100 Temperature
I0045	Liquid Refridgeration Temperature	°C x100 Temperature

†Available functions may vary by model and option settings

For Error code information refer to Daikin Service manual

FAULT CODES

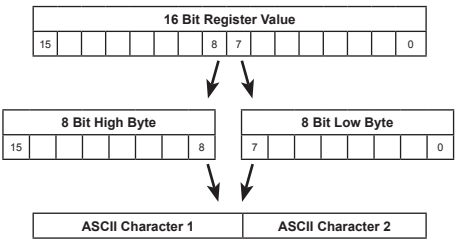
Fault codes are encoded using a standard table to allow standard Daikin fault codes to be generated from the readback value. The **no fault** value is 255.

Special fault codes generated by the RTD are as follows

Code Value	Meaning
0	Waiting for data
255	No Fault
14384	(80) Group Fault, timeout on no units found
14388	(84) Unit Missing, reported if unit data previously observed

All other codes are Daikin fault codes. The full table of fault code values is available from ***http://www.realtime-controls.co.uk/rtd***

Fault codes returned from a Modbus Input register are 16 bit values. The fault code is encoded in the 16 bit value by encoding the two 8 bit fault characters in the high and low byte parts of the 16 bit value. Each of the 8 bit values represents an ASCII text character.



Example:

A fault code value of 16697 is returned.

HighByte(16697) = 65 = ASCII Character ‘A’

LowByte(16697) = 57 = ASCII Character ‘9’

Fault Code: ‘A9’