RCHT 24 / RC 24

Features

- **High performance sensing elements, temperature compensated, stable**

- **Modbus RS485 for direct digital readings**

- **4-20mA, 0-10Vdc and 0-5Vdc outputs**

- **Optional colours, e.g. red**

- **Easy troubleshooting with pluggable sensors and backplate**

- **Red/yellow/green LEDs show quality and air safety. Blue LED shows good communication**

Traffic lights		Levels (ppm)
Poor	Red	1000 - 2000
Fair	Yellow	800 - 1000
Good	Green	450 - 800
Net	Blue	Good Communication

Technical Data

Typical Application	Indoor Wall Mount
Output Signal Type	Jumper select: 4-20mA, 0-10Vdc, 0-5Vdc
Output Signal Drive	> 500Ω for mA mode, 75mA max output drive for voltage mode
Power	15-24Vac/dc +/- 10%, 1 watt typical
Operating Temp	0 to +50°C, 0-95%rH non-condensing
Plastic Housing	Flammability rating UL 94V0 file E194560
Traffic Lights	4 LEDS

CO_2	Sensor Type	Dual Beam NDIR
	Range	0 - 2000ppm, adjustable
	Accuracy	±70ppm or ±5% of reading
	Drift	<50ppm / year full scale

HUM	Sensor Type	Capacitive
	Range	0-100%rH Non-Condensing
	Accuracy	5%@25°C, 20 to 80%rH
	Drift	< 0.5% rH / year

TEMP	Sensor Type	10K thermistor
	Range	-30 to 70°C
	Accuracy	< ±0.5°C @25°C

Size	80.5 x 80.5mm (3.167 x 3.167in)

Design Features

RCHT 24 is an indoor wall mount CO_2, temperature & humidity detector designed for environment monitoring and controlling in:

- industrial

- commercial

- other buildings

Use in the traditional mode for analog output to other controllers or use Modbus RS485 to integrate over the network.

Traffic Lights

This external CO_2 detector uses the sensor module to calculate the current CO_2 levels and uses a simple "Red/Yellow/Green" LED display to show the quality and safety of the air.

When connected to the detector it will display detailed information about the current CO_2 count.

It can also accurately monitor temperature.

Order Code

| RCHT 24	0 - 2000ppm	Indoor wall mount CO_2, hum. & temp. detector
RC 24	0 - 2000ppm	Indoor wall mount CO_2 detector
OCO		Other colours optional (min. 100 pcs)

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Wiring Diagram

The diagram below shows the wiring for the usual detector mode of operation for the RCHT 24.
The detector outputs connect to a master controller using the traditional analog output signals.
RC24 only has the power and RS485 network without temperature and humidity sensors.
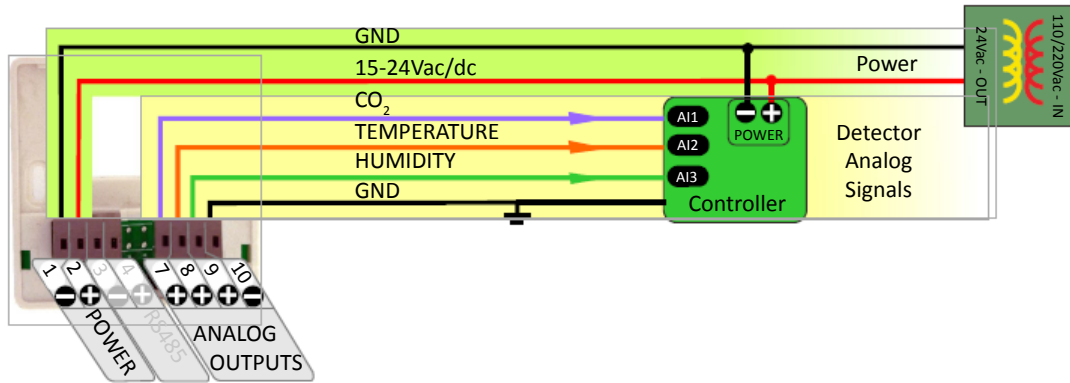
The diagram below shows the RCHT 24 working in the RS485 network; the node quantity can be up to 255 units.

A group of sensors distributed through the building can cooperate friendly through net.
The RS485 network is available for transmitting the same values digitally to other controllers.
RC24 does not have analog signals for temperature and humidity.
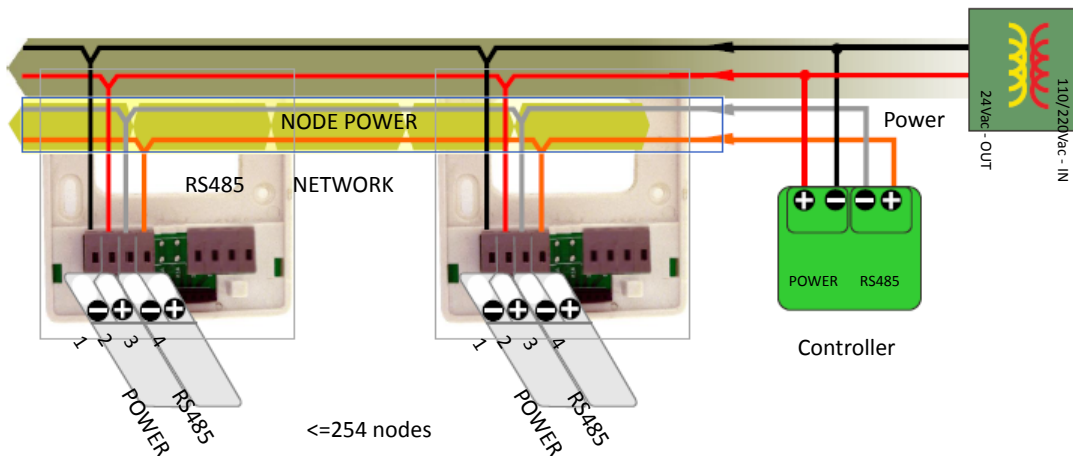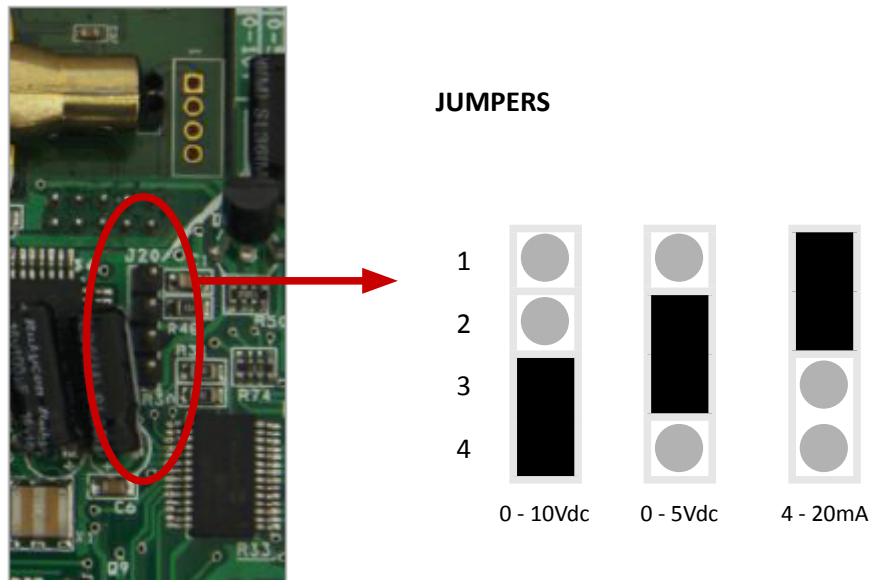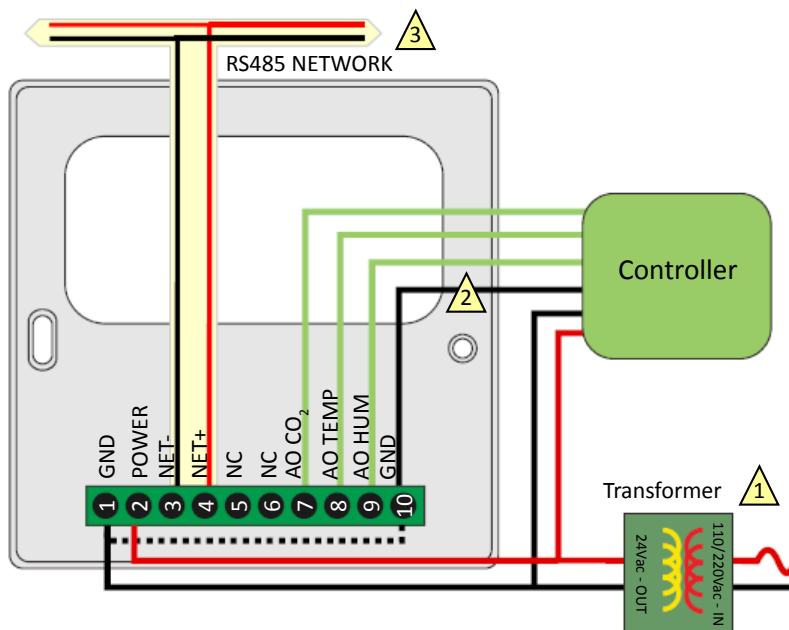

Colour options are available

Jumper Settings

In this mode the device acts as a traditional transducer where it sends out three analog signals which are CO$_2$, humidity and temperature readings.

All you need to do is to set this one single jumper to the appropriate signal type:

- 4-20mA, 0-10Vdc, or 0-5Vdc.

JUMPERS

1		
2		
3		
4		
0 - 10Vdc	0 - 5Vdc	4 - 20mA

Backplate Wiring

RS485 NETWORK

Controller

GND
POWER
NET-
NET+
NC
NC
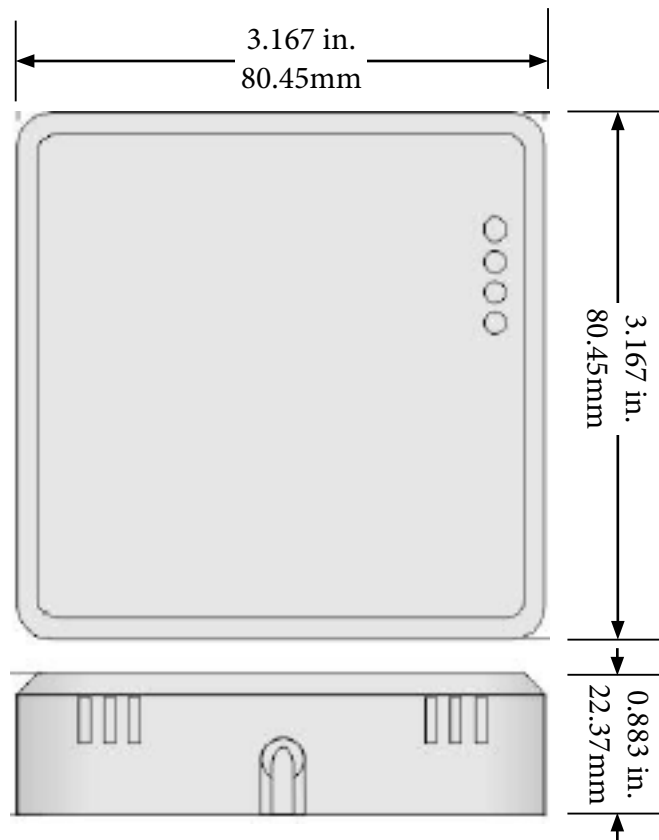AO CO$_2$
AO TEMP
AO HUM
GND

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

Transformer

24Vac - OUT
110/220Vac - IN

① Power Supply, 15 to 24Vac/dc

② Suggested GND from sensor to controller for signal return path

③ RS485 Net, 18ga twisted pair typical, optional ground & shield

Dimensions

3.167 in.
80.45mm

3.167 in.
80.45mm

0.883 in.
22.37mm

Colour Code

[ppm]	Air Quality
2100	
2000	**BAD**
1900	**Heavily contaminated**
1800	**indoor air**
1700	**Ventilation required**
1600	
1500	
1400	**MEDIOCRE**
1300	**Contaminated indoor air**
1200	**Ventilation recommended**
1100	
1000	**FAIR**
900	
800	**GOOD**
700	
600	
500	**EXCELLENT**
400	

Voltage & Current Formula

The max and min value are the range max and min value, the range can be set by the customer.
Default Temperature Range: -30 to +70 °C

Default Humidity Range: 0-100 % r.H.
Default CO2 Range: 0-2000ppm

0-10V Output	Temperature(C)=[Voltage * (max_T - min_T) + 10 * min_T] /100
	Temperature(F)=(DegC)*9/5+32
	Humidity=[Voltage * (max_H - min_H)+10 * min_H]/100
	CO2=Voltage * (max_C-min_C)/10+min
0-5V Output	Temperature(C)=[Voltage * (max_T - min_T) + 5 * min_T] /50
	Temperature(F)=(DegC)*9/5+32
	Humidity=[Voltage * (max_H - min_H) + 5 * min_H]/50
	CO2=Voltage * (max_C - min_C)/5+min_C
4-20mA	Temperature(C)=(Current-4) * (max_T - min_T) + min_T/10
	Temperature(F)=(DegC)*9/5+32
	Humidity=(Current-4) x (max_H - min_H) + min_H/10
	CO2=(Current-4) x (max_C - min_C)/16 + min_C

For example
1. Product: RCHT
2. Output range: 0-10V output (Adjust jumper to select 0-10V in PCB board)
3. The default settings R285 = 0 and R286 = 1000, that means the default output scale is 0C-100.0C, and they can be set by customer.
4. Measuring temperature output voltage: 7.8V
5. Temperature(C)=[Voltage * (max_T - min_T) + 10 * min_T] /100
   =[7.8 * (1000-0) + 10 * 0]/100
   =78C

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Address	Bytes	Register and Description
0 to 3	4	Serial Number - 4 byte value. Read-only
4 to 5	2	Software Version – 2 byte value. Read-only
6	1	ADDRESS. Modbus device address
7	1	Product Model. This is a read-only register that is used by the microcontroller to determine the product
8	1	Hardware Revision. This is a read-only register that is used by the microcontroller to determine the hardware rev
9	1	PIC firmware version
10	1	PLUG_N_PLAY_ADDRESS, 'plug n play' address, used by the network master to resolve address conflicts. See VC code for algorithms
15	1	Base address selection.0 = Protocol address,1 = PLC address.
16	1	Firmware Update Register, used to show the status of firmware updates
17 to 99		Blank, for future use
100	2	adc value of co2 voltage output, not used, read only
101	2	adc value of temperature voltage output, not used, read only
102	2	adc value of humidity voltage output, not used, read only
103	2	adc value of co2 current output, not used, read only
104	2	adc value of temperature current output, not used, read only
105	1	adc value of humidity current output, not used, read only
106	2	adc value of on board thermistor sensor, read only
107	2	adc value of on board light sensor, read only
108	2	co2 value (ppm). It will be calibrated if write to it.
109	2	co2 calibration offset. User can change it to calibrate the co2 ppm. It will be changed also if user write the data to register co2 ppm
110	1	Delta value for eliminating the pulse ppm value. The default value is 200.
111	2	Fitler times, make the ppm value go smooth. The default value is 5.
112	2	The fair alarm ppm setpoint of co2 sensor.
113	2	The poor alarm ppm setpoint of co2 sensor.
114	1	co2 alarm status:
115	1	the version number of humidity sensor
116	2	the relative humidity
117	2	the frequency value read from humidity sensor, read only
118	1	the number of calibration points of the humidity sensor
119	2	degree celsius temperature value of the humidity sensor
120	2	degree fahrenheit temperature value of the humidity sensor
121	2	celsius degree temperature value of the on board thermistor sensor
122	2	fahrenheit degree temperature value of the on board thermistor sensor
123	2	the offset for calibrating the on board thermistor sensor
124	1	select the temperature direct to analog output:
125	1	select the temperature unit direct to analog output:
		0: degree celsius
		1: degree fahrenheit, default setting
126	2	Lighting value, for feature
127	1	analog output mode, change it by setting the jumper (J20) on the board, read only

Address	Bytes	Register and Description
128	2	the minimum value of temperature directs to the analog output
129	2	the maximum value of temperature directs to the analog output
130	2	the minimum value of humidity directs to the analog output
131	2	the maximum value of humidity directs to the analog output
132	2	the minimum value of co2 directs to the analog output
133	2	the maximum value of co2 directs to the analog output
		e.g. co2 output: if the co2 ppm is 1000, the (minimum value, maximum value) = (0, 2000), then: 1. setting J20 to select 0V-10V output mode, so the co2 output is about ((1000ppm / 2000ppm - 0ppm)) * (10V - 0V)) + 0V = 3.3V 2. setting J20 to select 0V-5V output mode, so the co2 output is about ((1000ppm / (2000ppm - 0ppm)) * (5V - 0V)) + 0V = 1.65V 3. setting J20 to select 4mA-20mA outpu mode, so the co2 output is about ((1000ppm / (2000ppm - 0ppm)) * (20mA - 4mA)) + 4mA = 9.3mA

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