



CO2 Sensor Transmitter

Features

- CO₂, Temperature and Humidity measurement
- 3 high sensitivity sensors
- 0 - 10V Analog Voltage and 0-20mA Current Output
- Supply Voltage is 24Vac or 24Vdc
- RS485(MODBUS) Communication
- Alarm function of air status warning
- User can check CO₂ level, Temperature and Humidity easily through display
- Compact box of size 82mm x 82mm x 25mm



Model : TT300

Application

This monitor measures the indoor air quality (IAQ).

Installed in the living room or bed room, Air-Q measures the level of CO₂, temperature and humidity to maintain fresh air quality.

The Air-Q is a highly sensitive 3 sensors and comes in a compact size at a low cost.

Analog output can be connected with other systems (ex. Ventilation or BEMS system) of Air-Q thus help notifying the air quality regularity. It ensure that Air-Q can automatically control the air conditioner, humidifier or other ventilation devices.

Table 1. General Specifications

Parameter	Min	Typ	Max	Unit	Notes
Power Supply	23.5	24	24.5	V	
CO2 Measuring Range	0	-	10000	ppm	
Accuracy (CO2)	+/-30Ppm +/-5%				Above 0 °C
	+/-50ppm +/-7%				Below 0 °C
Temperature Measuring Range	-10	-	50	°C	
Accuracy (Temperature)	-0.4	-	+0.4	°C	
Humidity Measuring Range	0	-	80	%	
Accuracy (Humidity)	-4	-	4	%	

Table 2. Interface Specifications

Parameter	Min	Typ	Max	Unit	Notes
RS485 Recommended Request Time	500	1000	-	ms	
Analog Output Range	0	-	10	V	25mV = 25ppm
0-20mA Current Output Range	0	-	20	mA	1mA = 500ppm
Response Time (for Analog and Current Output)	-	1	-	s	
Alarm 'On' State (Relay 'On' State)	-	2000	-	ppm	Alarm will be triggered

RS 485 Interface

The TT300 communicates with other devices over RS485 bus. MODBUS follows RS485 communication standard. See, Table 4, for configuration of RS485 communication.

Table 3. Communication Configuration

Baud rate	9600 bps
Stop Bits	1 bit
Parity Check	None
Data Length	8 bits

The details about request and response protocols are given in, Table 5. And this protocol is followed by RTU (Remote Terminal Unit). Description of MODBUS Protocol is given in, Table 6.

Table 4. MODBUS Protocol

No. of Bytes	1	1	2	2	2
Tx	Slave ID	Function Code	Starting Address	Request Quantity	CRC

No. of Bytes	1	1	1	n	2
Rx	Slave ID	Function Code	Data Length	Data[n]	CRC

Table 5. MODBUS Protocol Byte Description

Name	Bytes	Description
Slave ID	1	Set Device ID, through a rotary switch.
Function Code	1	Reading and Writing Request Code.
Starting Address	2	Starting address of data bytes.
Request Quantity	2	Number of sensors to be loaded with data.
Data Length	1	Number of data bytes.
Data[n]	n	Number of data bytes (n), sent by sensor. (Each device sends 2 data bytes)
CRC	2	Error checking according to CRC16 standard.

See Picture1, This touch switch is for configuration of RS485 Slaves' Device ID.

If you touch the switch for 5 seconds, you hear a beeping sound. You can see the ID increase each time you touch again after you release your finger from the switch. After setting the desired ID, press the switch again for 5 seconds. When you hear a beep, the ID setting is completed.

Picture 1. Touch Switch



List of functions is given in, Table 7 and address of each sensor is given in Table 8.

Table 6. Function Code Table

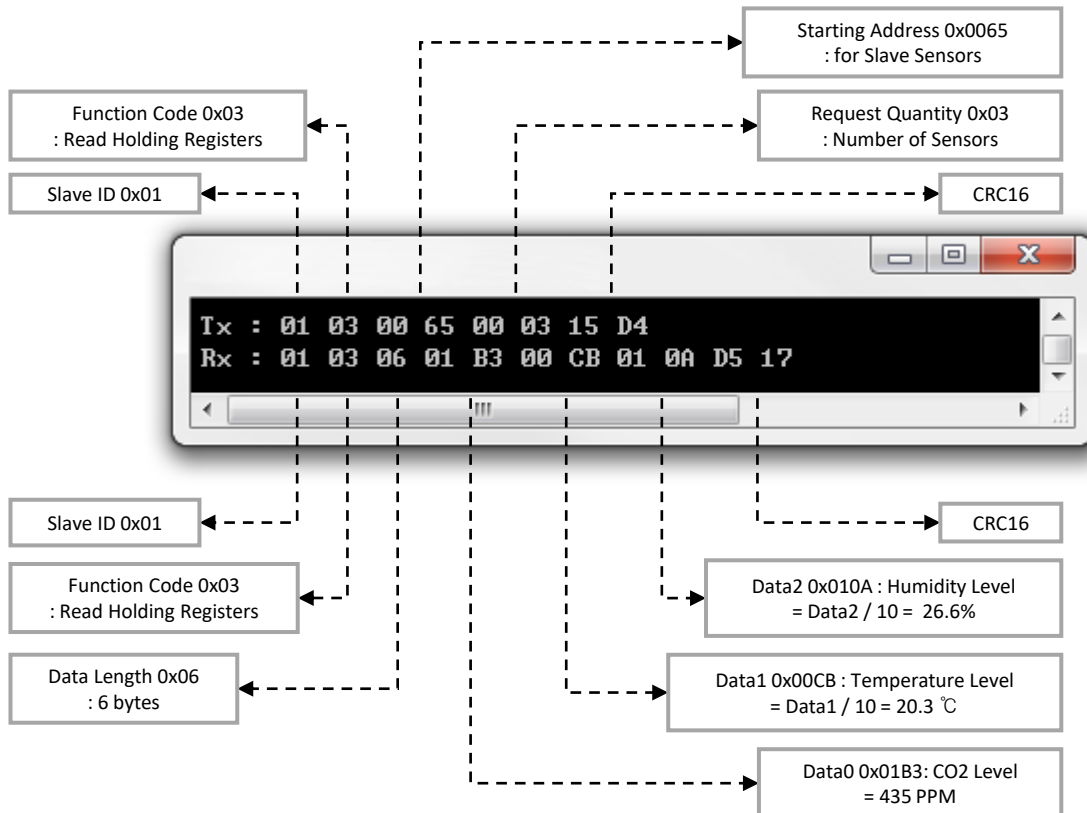
Function Description	Function Code
Read Holding Registers	0x03

Table 7. Sensor Address Table

Sub Device	Starting Address
CO2	0x0065
Temperature	0x0066
Humidity	0x0067
Slave (This Transmitter)	0x0069

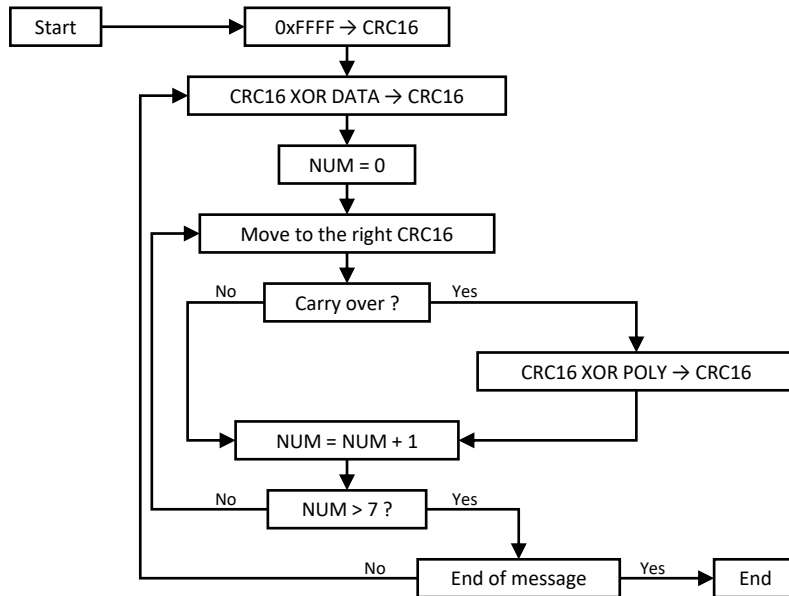
This is an example of serial communication protocol.
 There is an example of CRC calculation for serial communication, on the page 6.

Example 1. Read Holding Registers



That is how the calculation of CRC (Cyclic Redundancy Check) is done. CRC16 is used in MODBUS RTU Mode. See figure 1, This figure is flow chart of CRC16 calculation and an example in C language for it.

Figure 2. Flow Chart



Example 2. CRC16 Calculation

```

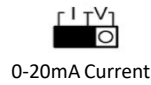
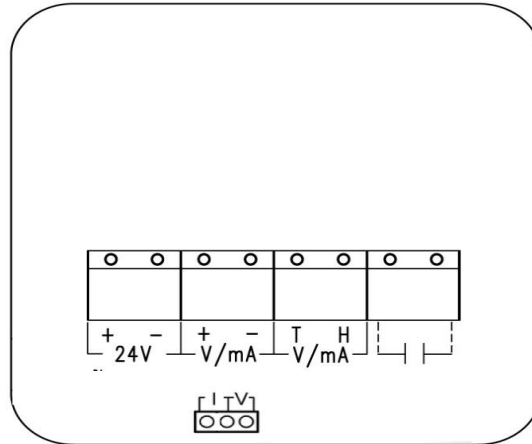
#define POLYNORMALIAL 0xA001
unsigned short CRC16(unsigned char *puchmsg, int dataLength){
    int i;
    unsigned short crc, flag;
    crc = 0xFFFF;

    while(usDataLen--){
        crc ^= *puchmsg++;
        for (i=0; i<8; i++){
            flag = crc & 0x0001;
            crc >>= 1;
            if(flag){ crc ^= POLYNORMALIAL; }
        }
    }
    return crc;
}

void main(void){
    unsigned char data[8] = {0x01, 0x01, 0x00, 0x00, 0x00, 0x03, 0, 0};
    unsigned short crc16;
    crc16 = CRC16(data, 6);
    data[6] = (unsigned char)((crc16>>8) & 0x00FF);
    data[7] = (unsigned char)(crc16 & 0x00FF);
}
  
```

Analog Voltage Or 0-20mA Current Output Select

To set Analog Voltage or Current Output, Follow the below picture.



Connector Pin Description

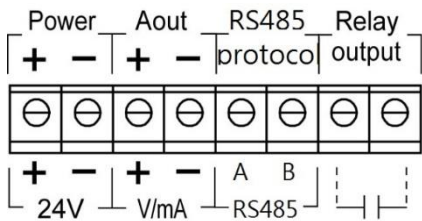
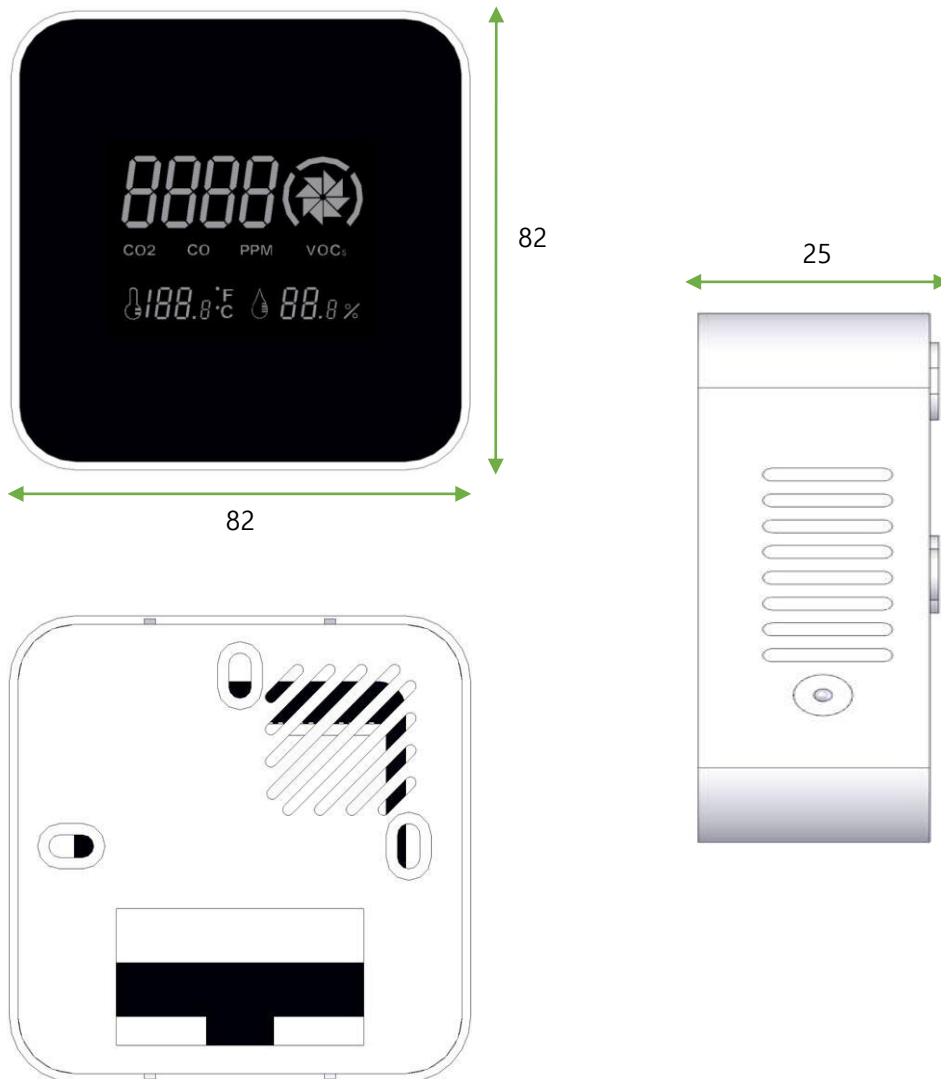


Table 8. Pin Description

Value	Description
Power	Operation at 24VAC or 24VDC
Aout	Analog Voltage or 0-20mA Current Output
RS485	RS485 Communication
Relay Output	Output when over 2,000 PPM

Dimension



Dimension 1. Product Dimension

Cautions on Usage

- Do not Use this device for outdoor use. This product is manufactured only for indoor use.
- This product must abide by the operating temperature/humidity and the storage temperature/humidity. Do not leave or use the device for longtime in a highly damped place in which humidity is near 95%RH.
- The standard test condition in which the product was tested is $25^{\circ}\text{C}\pm 3^{\circ}\text{C}$, $50\pm 30\%$ RH. Signal may vary slightly with environmental condition.
- Be careful when install and use as vibration/shock/falling and cause a serious damage on the sensor.
- We do not guarantee the performance of this device in case of user installation, disassembling, assembling it at his discretion. when installing and inspection is necessary Please, contact our technicians.
- Sensor using NDIR is influenced by air pressure. It can be used without correction within 300m above the sea level. However, add the output value by $\pm 1.0\%$ per 100m height above 300m.
- Do not use it for medical, life or safety purpose.
- Use when it is fixed, but not use while it is in motion.

Warranty Information

During this 1 year period, our liability hereunder is limited to the replacement of the products.

The warranty is void if the product has been damaged by accident, unreasonable use, negligence, tampering or other causes not arising from defects in material or workmanship and extends to the original consumer of the product only. Do not disable the alarm.

Revision History

Table 9. Revision History

Revision	Description	Date	Approved
1.0	Initial Release	22 October 2018	DH Jeong



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We do not guarantee the performance of this device in case of disassembling, operating without complying with instructions in this document.

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