

# 1 RS232 Protocol

## 1.1 RS232 Protocol presentation

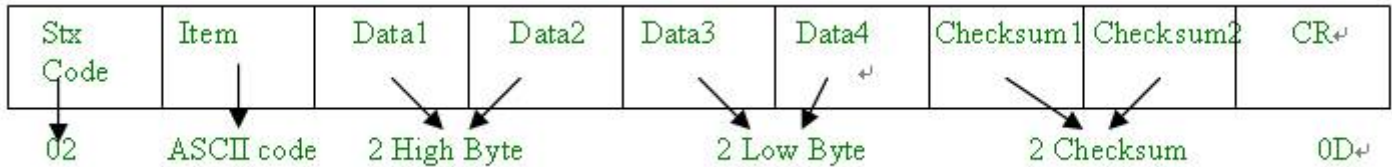
Bund rate: 19200 BPS

Data length: 8bit

Stop bit: 1bit

Parity bit: none

Data frame format:



Stx: frame start flag, always=02H

Item code: data name, valid range 20H~FFH HEX

16Bit Data: valid data ASCII

Checksum: 8bit Check sum=itemcode+16bit high byte+16bit low byte (only get the low byte) ASCII

CR: End of frame always=0DH

## 1.2: Decoding

When you get 9byte data form the RS232 port:

1: Abnegate the start flag. 1<sup>st</sup>=02H?

2: Break out the Item code byte 2<sup>st</sup>byte (Item code is the ASCII format, you should decode Item code to hex format)

3: Break out the valid data bytes 3—6byte (Valid data is the ASCII format, you should decode valid data to hex format)

4: Break out the CheckSum byte 7—8 byte (CheckSum is the ASCII format, you should decode CheckSum to hex format)

5: Break out the end byte of frame, 9 byte 0D (always 0D)

6: Colligation all the data of receive frame, you can get the information of receive data.

Notice:

You can sure the frame is availability if your receive data satisfy three condition of below.

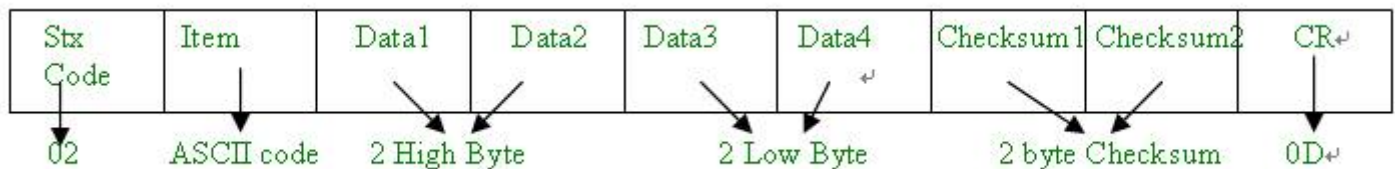
1: the start byte is 02

2: the end byte is 0D

3: checksum= ItemCode+MSB (valid data)+LSB (valid data) only get low byte

If the receive frame not satisfy these three condition at the same time, this frame is invalidation.

**For example:**



**Example1 CO2 decode:** Receive data: 02 50 30 32 46 38 34 41 0D

02 frame start flag (Stx Code)

Start of this frame, always 02

50 Item Code of receive value. (Item Code)

The Hex format of Item code, 50 → the hex format of letter "P"

30 32 46 38 valid data (Data1 Data2 Data3 Data4)

30 → ASCII code of number "0"

32 → ASCII code of number "2"

46 → ASCII code of number "F"

38 → ASCII code of number "8"

Valid data is 0x02F8

34 41 CheckSum value. (Checksum1 CheckSum2)

34 → ASCII code of number "4"

41 → ASCII code of number "A"

Checksum = ItemCode + MSB (valid data) + LSB (valid data)      only get low byte

4A = 50 + 02 + F8      only get low byte

0D end of frame, (CR)

The end byte always 0D

Colligation all the data of this frame, we got the hex format of CO2 concentration (02F8) H, from this example, you know the CO2 concentration is (02F8) H = (760) D ppm

**Example2 Temperature decode:** Receive data: 02 42 31 32 38 41 44 45 0D

02 frame start flag (Stx Code)

Start of this frame, always 02

50 Item Code of receive value. (Item Code)

The Hex format of Item code, 42 → the hex format of letter "B" temperature Item Code.

31 32 38 41 valid data (Data1 Data2 Data3 Data4)

31 → ASCII code of number "1"

32 → ASCII code of number "2"

38 → ASCII code of number "8"

41 → ASCII code of number "A"

Valid data is 0x128A

44 45 CheckSum value. (Checksum1 CheckSum2)

44 → ASCII code of number "D"

45 → ASCII code of number "E"

Checksum = ItemCode + MSB (valid data) + LSB (valid data)      only get low byte

DE = 50 + 12 + 8A      only get low byte

0D end of frame, (CR)

The end byte always 0D

Colligation all the data of this frame, we got the hex format of temperature (128A) H = (4746) D

Temperature  $\text{DegC} = 4746/16 - 273.15 = 23.475 \text{ } ^\circ\text{C} = 23.475 * 9/5 + 32 = 74.255 \text{ } ^\circ\text{F}$ .

**Example3 RH decode:** Receive data: 02 30 44 44 33 32 31 45 0D

02 frame start flag (Stx Code)

Start of this frame, always 02

41 Item Code of receive value. (Item Code)

The Hex format of Item code, 41 → the hex format of letter “A” RH Item Code.

30 44 44 33 valid data (Data1 Data2 Data3 Data4)

30 → ASCII code of number “0”

44 → ASCII code of number “D”

44 → ASCII code of number “D”

33 → ASCII code of number “3”

Valid data is 0x0DD3

32 31 CheckSum value.(CheckSum1 CheckSum2)

32 → ASCII code of number “2”

31 → ASCII code of number “1”

CheckSum = ItemCode + MSB (valid data) + LSB (valid data) only get low byte

21 = 41 + 0D + D3 only get low byte

0D end of frame, (CR)

The end byte always 0D

Colligation all the data of this frame, we got the hex format of RH (0DD3) H = (3539) D

$\text{RH} * 100 = 3539/100 = 35.39$ , RH = 35.39%.

### 1.3: RS232 Communication cable manufacture

The communication cable sort(right to left):RJ45 brown、brown-white、green、green-white、blue、blue-white、yellow、yellow-white.

RS232 Port: brown——port 2, brown-white——port 3, blue——port 5.

The cable RJ45 input ZGw08VRC, RS232 input to PC's serial port

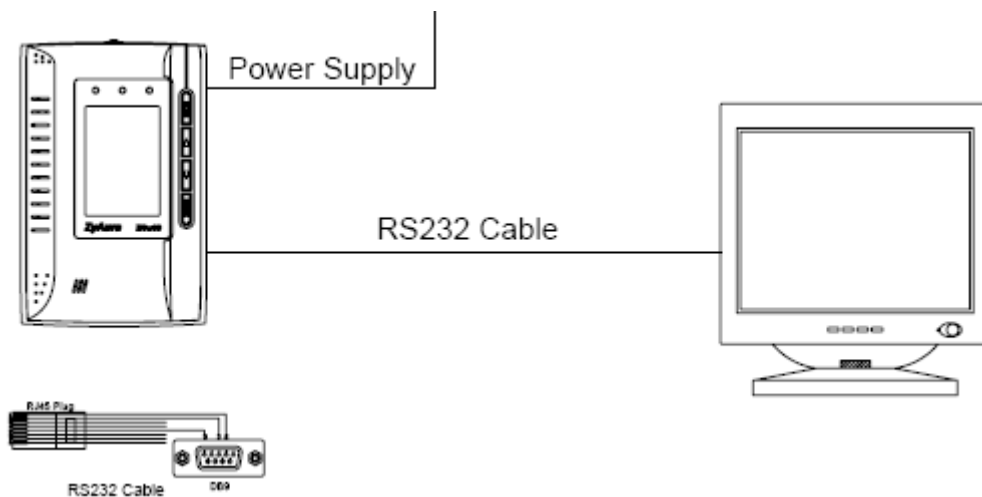
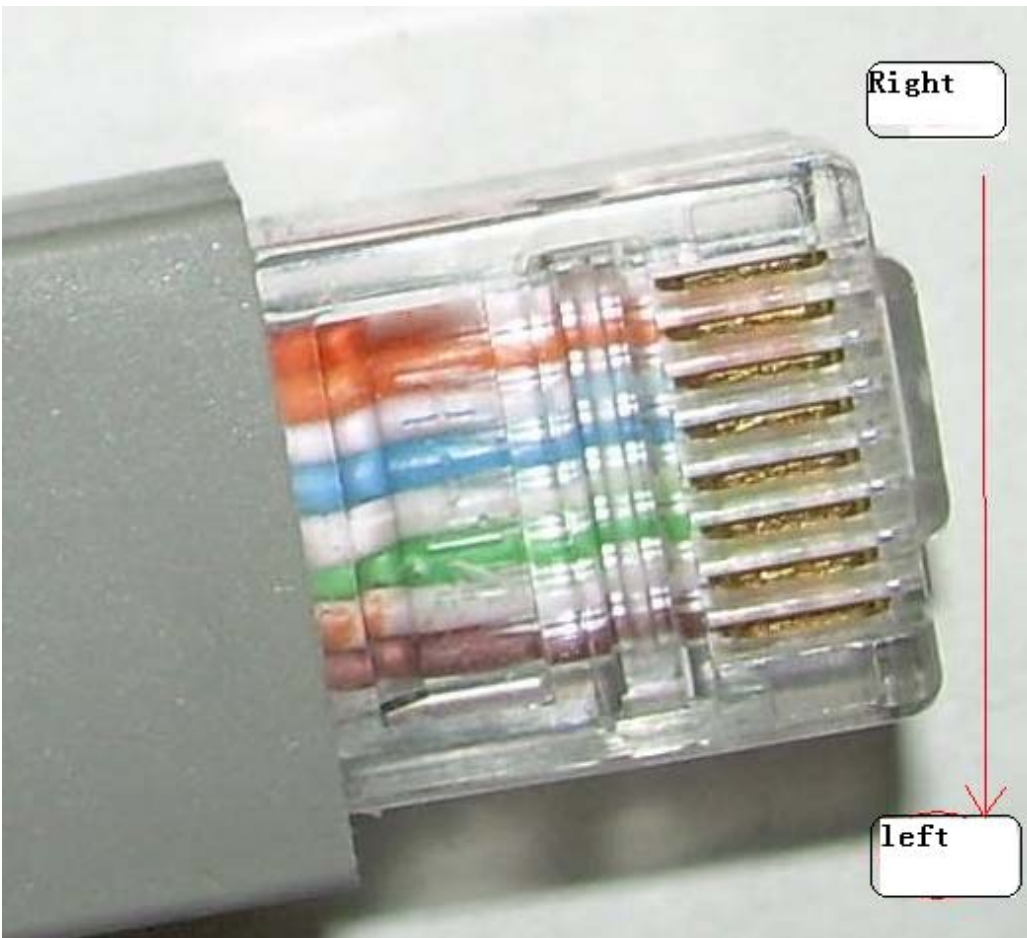
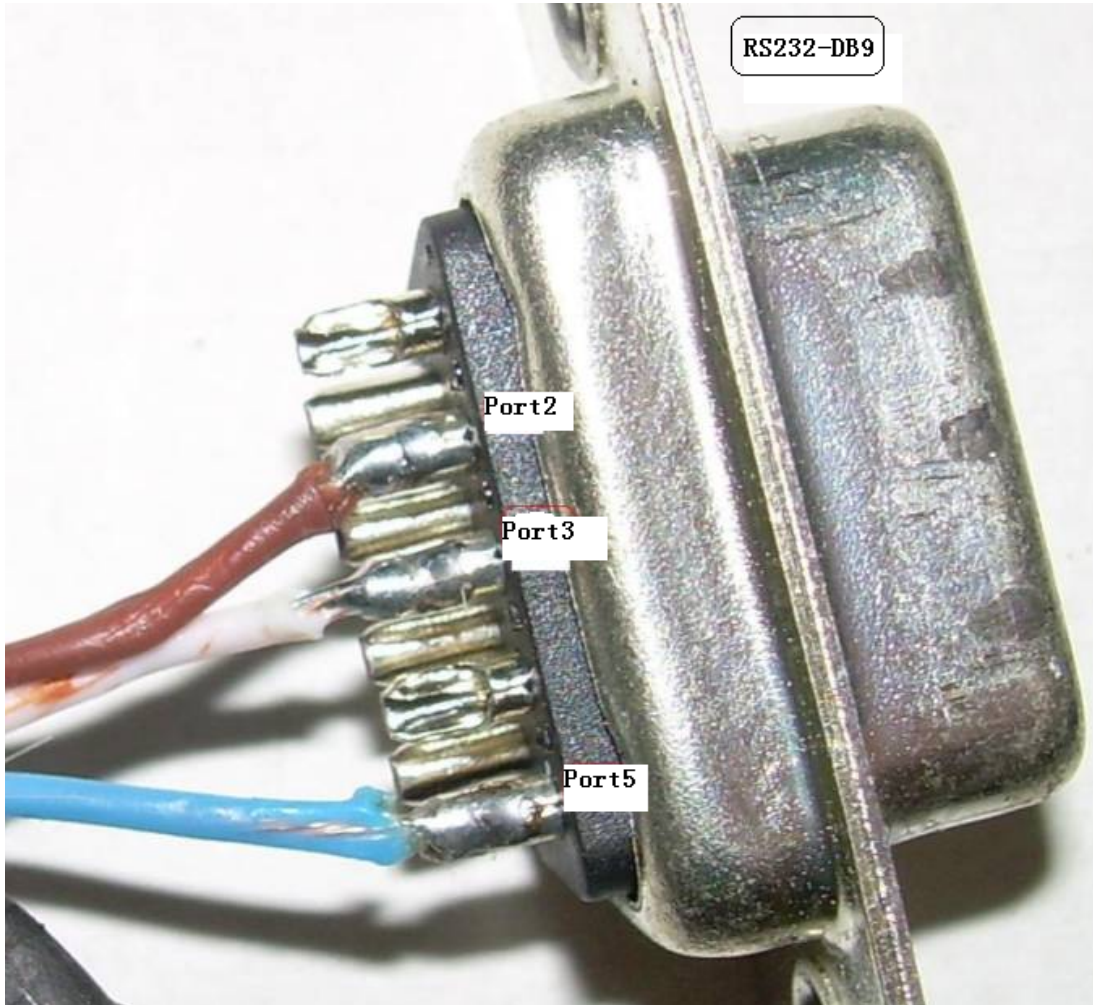


Diagram 1 (communication connect photo)



RJ45 right to left: brown, brown-white, green, green-white, blue, blue-white, yellow, yellow-white

Diagram 2 (RJ45 photo)



brown—port 2, brown-white—port 3, blue—port 5. The other wire cut off

**Diagram 3** (RS232 photo)



Diagram 4 (Communication Cable)

## 2 How to calibrate detector

### 2.1 Calibration in factory

Use standard gas, with 3 point calibration method. ....

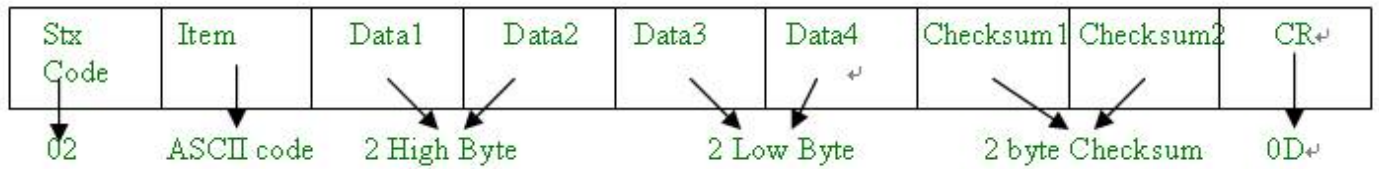
### 2.2 Calibration by user

With zero calibration method, the calibration scope is 0~65535ppm.

If we know the environment CO<sub>2</sub> concentration is 1000ppm, and the detector display 1070ppm,

We know the CO<sub>2</sub> concentration exceed about 70ppm, so we should decrease 70ppm.

Write -70ppm to the detector, (-70) D= (FFBA) H



Write "02 5D 46 46 42 41 31 36 0D"

02 frame start flag (Stx Code)

Start of this frame, always 02

5D Item Code of receive value. (Item Code)

The Hex format of Item code, 5D → the hex format of letter "J" zero calibration Item Code.

46 46 42 41 valid data (Data1 Data2 Data3 Data4)

- 46 → ASCII code of number "F"
- 46 → ASCII code of number "F"
- 42 → ASCII code of number "B"
- 41 → ASCII code of number "A"

Valid data is 0xFFBA

31 36 CheckSum value. (CheckSum1 CheckSum2)

- 31 → ASCII code of number "1"
- 36 → ASCII code of number "6"

CheckSum = ItemCode + MSB (valid data) + LSB (valid data)      only get low byte

16 = 5D + FF + BA      only get low byte

0D end of frame, (CR)

The end byte always 0D

Write "02 5D 46 46 42 41 31 36 0D" to detector, finish zero calibration.

Exanalogia:

If we know the environment CO2 concentration is 1000ppm, and the detector display 950ppm.

We need write 50ppm to detector, (50) D = (0032) H

send "02 5D 30 30 33 32 38 46 0D" to detector,

Bingo.

End .....