

# Modbus-RTU Communication Protocol

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This document mainly introduces the 485 communication protocols for four types of our equipment, all adopting the standard Modbus protocol specification and extended specifications. The basic settings for the 485 Modbus-RTU communication protocol for these four types of equipment are as follows: Baud rate 9600; No parity bit, Data bits 8, Stop bit 1; CRC16-Modbus; Electrical interface selection Half-duplex RS485. The four main types of equipment are:

1. Communicating with the Control Host to read concentration information.
2. Communicating with the Gas Detector (including single-channel host) to read concentration information.
3. Communicating with the Temperature and Humidity Detector to read temperature and humidity data.
4. Communicating with the Fixed Composite Detector to read four concentration data.

The following provides detailed explanations and examples for the specific communication of these four types of equipment.

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1. Upper Computer (PLC/DCS) as Communication Master, connecting to Control Host to read detector concentration:

F1	03	00	00	00	01	90	FA
Host Addr	Read Cmd	Data Start Addr		Data Quantity		CRC Check	

Host Reply:

F1	03	02	00	00	F8	51
Host Addr	Reply Cmd	Data Length	Concentration Data		CRC Check	

When the internal address code of the Control Host is set to 01, the actual PLC communication address is 241 (0xF1). To distinguish it from gas detectors, the communication address of the host is the original address code plus 240. The communication delay does not exceed 100 milliseconds.

The Control Host's internal Holding Registers (16bit) store the detector gas concentration values. Holding register addresses from 40001-40099 can read the concentration of 99 detectors, corresponding to the gas concentration values of detectors with address codes 1-99. Read as many registers as the number of detectors actually installed by the user; the values of registers corresponding to uninstalled detectors are invalid.

When the value stored in the register (address 40001-40099) does not exceed the range, it is the integer of the actual gas concentration value and requires no conversion. Values with decimal points are stored directly as integers; the PLC/DCS system needs to configure the decimal point position.

When the value stored in the register (address 40001-40099) exceeds the range, it indicates a detector error.

- Gas concentration value display: 10000; indicates internal detector error, zero drift.

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- ▶ Gas concentration value display: 20000; indicates communication error between Control Host and detector;
- ▶ Gas concentration value display: 30000; indicates the Control Host has shielded the probe;

## 2. Control Host (PLC/DCS) as Communication Master, connecting to Gas Detector (Single-channel host) to read concentration directly:

01	03	00	00	00	01	84	0A
Probe Addr	Read Cmd	Register Addr		Data Quantity		CRC Check	

Detector Reply:

01	03	02	00	00	B8	44
Probe Addr	Reply Cmd	Data Length	Concentration Data		CRC Check	

When the internal address code of the detector is set to 01, the actual PLC communication address is set to 01. The communication delay does not exceed 30 milliseconds.

The detector's internal Holding Register (16bit) stores the detector gas concentration value. The holding register address is 40001, allowing one value to be read. Only one register number can be read; requests beyond this will not receive a data reply.

When the value stored in the register (address 40001) does not exceed the range, it is the unsigned integer of the actual gas concentration value and requires no conversion. Detectors with decimal points store the value directly as an integer; the PLC/DCS system needs to configure the decimal point position.

When the value stored in the register (address 40001) exceeds the range,

- ▶ Gas concentration value display: 10000; indicates internal detector error, possible zero drift

## 3. Control Host (PLC/DCS) as Communication Master, connecting to Temperature and Humidity Detector to read data directly:

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When the actual device address code of the Temperature and Humidity probe is 01. The temperature and humidity data are obtained using address code 01 and address code 02 respectively. (Equivalent to the temperature and humidity probe having two address codes; temperature data is read using the current address code, humidity data is obtained using the current address code plus one.)

Read format as follows:

Reading Temperature using current detector address code 01 as an example:

01	03	00	00	00	01	84	0A
Temp Addr	Read Cmd	Register Addr		Data Quantity		CRC Check	

Detector Reply:

01	03	02	01	2B	F9	CB
Temp Addr	Reply Cmd	Data Length	Temp Data (29.9)		CRC Check	

Reading Humidity using current detector address code 01 as an example

02	03	00	00	00	01	84	0A
Humi Addr	Read Cmd	Register Addr		Data Quantity		CRC Check	

Detector Reply:

02	03	02	02	A0	FD	5C
Humi Addr	Reply Cmd	Data Length	Humi Data (67.2) °C		CRC Check	

The detector's internal Holding Registers (16bit) store the detector's temperature and humidity values. The holding register address for both temperature and humidity is 40001, allowing one value to be read. Even if more are requested, only one data point is replied. The data type is a signed integer. Decimal point data is stored as an integer; the PLC/DCS system needs to configure the decimal point position itself.

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Temperature/Humidity value display: 10000; indicates internal detector error, possible sensor failure.

### 4. Control Host (PLC/DCS) as Communication Master, connecting to Fixed Composite Detector to read data directly:

When reading each gas concentration from the composite detector, it is necessary to add F4 to the number of data read for each gas and send the requests one by one.

Using current detector address code 01 as an example for reading:

#### First Gas

01	03	00	00	00	01	84	0A
Probe Addr	Read Cmd	Register Addr		Data Quantity		CRC Check	

Detector Reply:

01	03	02	00	32	29	91
Probe Addr	Reply Cmd	Data Length	Conc. Data (50)		CRC Check	

#### Second Gas

01	03	00	F4	00	01	C5	F8
Probe Addr	Read Cmd	Register Addr		Data Quantity		CRC Check	

#### Third Gas

01	03	01	E8	00	01	05	C2
Probe Addr	Read Cmd	Register Addr		Data Quantity		CRC Check	

#### Fourth Gas

01	03	02	DC	00	01	44	48
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Probe Addr	Read Cmd	Register Addr	Data Quantity	CRC Check
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The detector's internal Holding Registers (16bit) store the detector gas concentration values. Decimal point data is stored as integers; the PLC/DCS system needs to configure the decimal point position itself.