






# **Intelligent Device Management**

**HART-MUX**

**User Manual**

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Symbol Definition	
	<b>WARNING:</b> Indicates information that a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	<b>RISK OF ELECTRICAL SHOCK:</b> Indicates information that Potential shock hazard where HAZARDOUS LIVE voltages greater than 30V RMS, 42.4V peak, or 60V DC may be accessible.
	<b>ESD HAZARD:</b> Indicates information that Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices
	<b>ATTENTION:</b> Identifies information that requires special consideration.
	<b>TIP:</b> Identifies advice or hints for the user.

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# HART Multiplexer HART-MUX User Manual

## Section 1 Overview

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HART-MUX is a hardware module for HART equipment management. By connecting HART-MUX to signal loop of 4~20mA, equipment management for HART instruments in field is realized. Besides, HART-MUX can also be applied with control systems not supporting HART signal, such as PLC, SIS, JX-300XP and so on. AI/AO modules of these control systems acquire and output analog of 4~20mA, and HART-MUX executes communication between HART instrument and equipment management software.

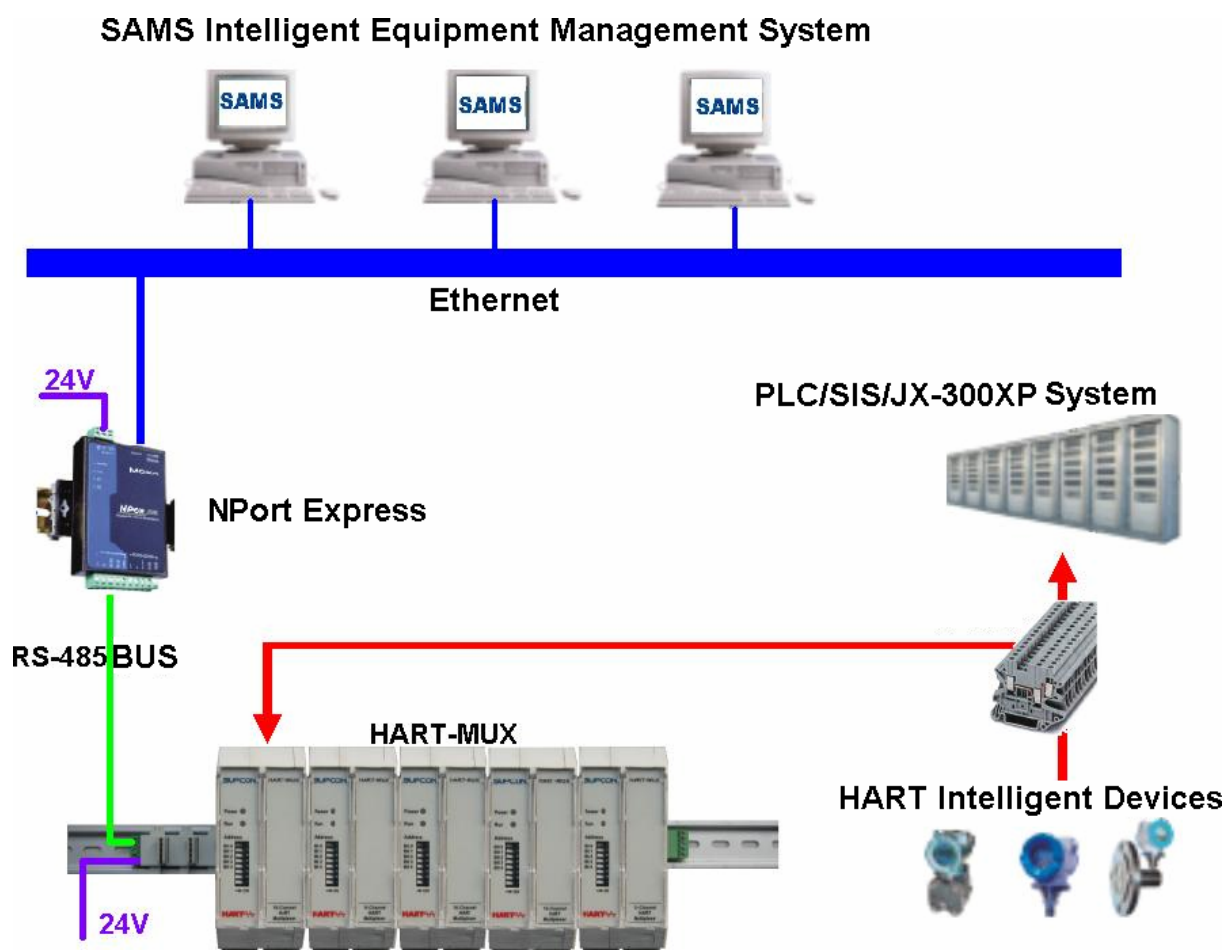
HART-MUX can constitute a complete intelligent equipment management software with control system not supporting HART, deconcentrator, serial device server or RS-232/RS-485 converter, and equipment management network.

One HART multiplexer HART-MUX can connect HART signal of 16-channel, and is compatible for communication in burst mode and with hand-held communicator. It also can convert 16-channel HART signal to RS-485 signal via its multiplexing conversion and data processing module.

HART-MUX gets power supply from underplate bus on the lead rail. RS-485 bus of HART-MUX in the same rail be connected via underplate bus. At most 32 HART-MUX modules can be connected to the same RS-485 bus.

RS-485 bus can be changed to Ethernet via serial device server, or changed to RS-232 to connecting with upper computer via RS-485/RS-232 converters. Equipment management software can perform data acquisition, configuration and management for intelligent device conforming to HART protocol.

The system structure chart taking serial device server as converter is shown in Figure 1-1.



**Figure 1-1 System structure chart**

Details of equipment management software please refer to corresponding user manuals.

## Section 2 Performance Index

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Performance index of HART-MUX is shown in Table 2-1.

**Table 2-1 Performance index of HART-MUX**

Item	Index
Product Name	HART Multiplexer
Model	HART-MUX
Channel Number	16
Isolation Voltage Between System and Field	500V
Isolation Voltage Between System and RS-485 Communication Interface	500V
Maximum Modules Supported by One RS-485 Bus	32
Matching Equipment Management Software	SAMS V2.30 and above InPlant IDM V3.0 and above
Power Supply Voltage	24V±10%
Installation	By NS 35 Rail
Surge Shock	Industry 3 <sup>rd</sup> Level (1000V)
Group Pulse Immunity	Industry 3 <sup>rd</sup> Level (1000V)
Static Discharge	Industry 3 <sup>rd</sup> Level (Contact: 6000V Empty Discharge: 8000V)
Environment Temperature	(-20~70)°C
Environment Humidity	0~95%RH (no condensation)

## Section 3 Usage Instruction

### 3.1 Appearance



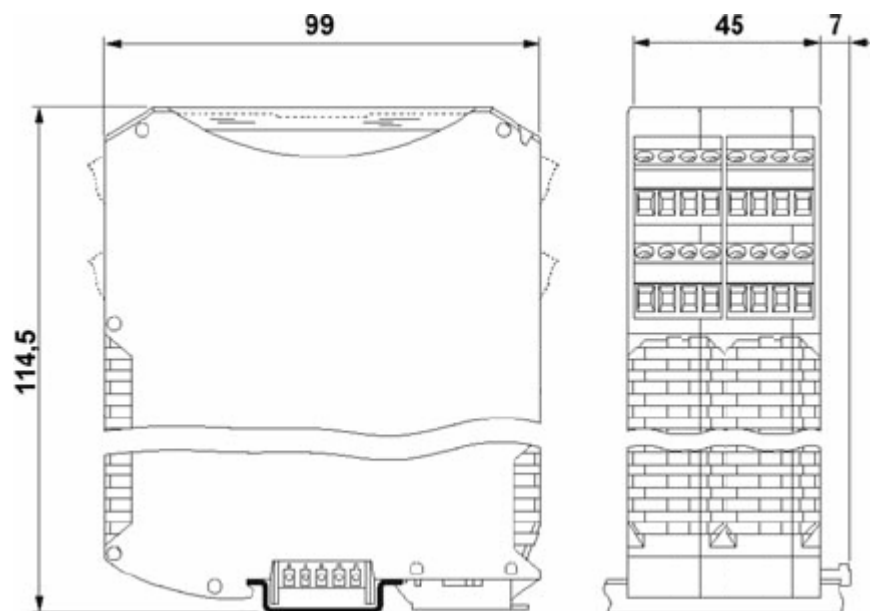
**Figure 3-1 Appearance of HART-MUX**

Module panel is shown in Figure 3-2. The two indicator LEDs on panel indicate the working status of module. DIP switch set the address of module in RS-485 bus.



**Figure 3-2** Front panel of HART-MUX

The size (mm) of HART-MUX is shown in Figure 3-3.



**Figure 3-3** Size chart of HART-MUX

### 3.2 Indicator LED Instruction

There are two indicator LEDs on the front panel of HART-MUX.



- Power LED indicates the power supply status of module.
- Run LED indicates the running status of module.

**Table 3-1 LED instruction**

LED	Power	Run
Meaning		
Status	Indicate Power Supply	Indicate Running Status
OFF	Fault	Fault
ON	Normal	Fault
Flashing	——	Normal

### 3.3 DIP Switch Settings

There is an 8-bit DIP switch on the front panel of module, as shown in Figure 3-2. It is used to set the address of module in RS-485 bus. When put the DIP switch to right, it means ON, otherwise, it means OFF.

Instruction of DIP switch settings is shown in Table 3-2.

**Table 3-2 Instruction of DIP switch settings**

Mark	Switch No.	Address
Bit0	8	+1
Bit1	7	+2
Bit2	6	+4
Bit3	5	+8
Bit4	4	+16
—	3	—
—	2	—
—	1	—
		Show 32 module addresses from 0 to 31.

For example, when setting bits 8, 7, 6, 5, 4 as OFF, OFF, ON, OFF, ON respectively, it means that the address is 20.




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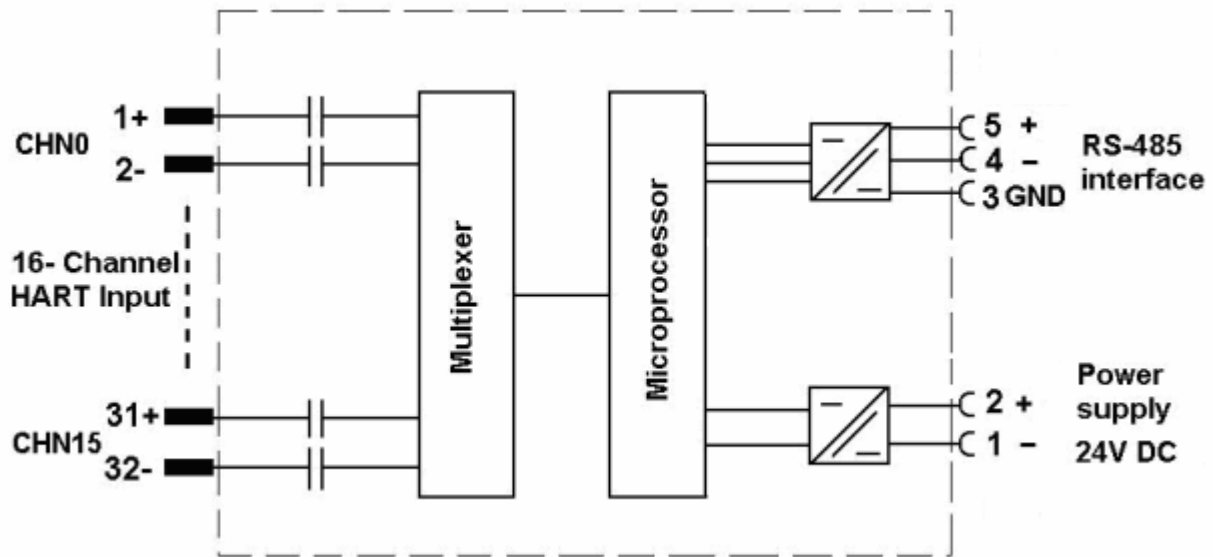
**Tip:**

The switch numbers 1, 2, 3 have no real meaning and are often set as OFF.

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## Section 4 Interface Characteristics

Interface chart of HART-MUX is shown in Figure 4-1.



**Figure 4-1** Interface chart of HART-MUX

HART signals of 16-channel in field enter module via terminals 1~32 and in capacitive coupling mode. The internal multiplexing switch circuit can switch the signals of 16-channel, and the processor and modulating and demodulating module can process and convert data of 16-channel. The module performs data interaction with upper computer via RS-485 bus (underplate terminals 3, 4, 5) on underplate. At the same time, the 24VDC power source can supply power via underplate bus terminals 1, 2 for module.

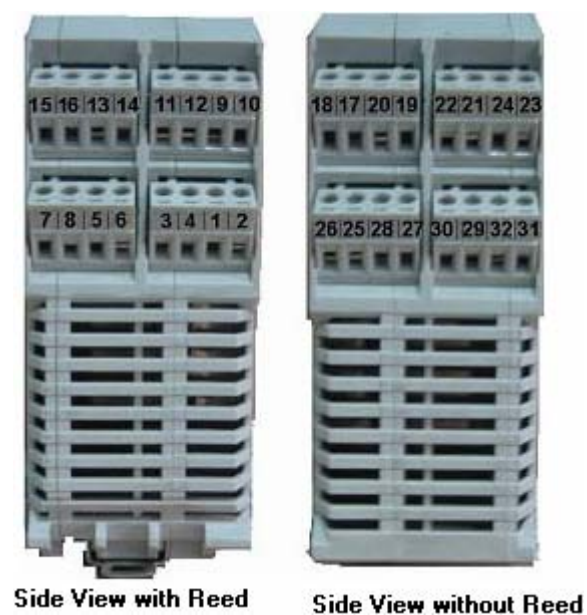
The isolation voltage between power circuit, RS-485 communication circuit and HART communication circuit is 500VAC. Besides, capacitance isolation is applied between HART-MUX and circuit loop of (4~20)mA, to prevent from interference for analog signal.

### 4.1 Terminal Definition

HART-MUX has two kinds of terminals:

- I/O signal terminal in module, which is used to connect HART signal.
- Underplate terminal, which is used to connect power source and RS-485 bus.

### 4.1.1 I/O Signal Terminal



**Figure 4-2** Signal terminal layout

Terminal definition is shown in Table 4-1.

**Table 4-1** Terminal definition

Terminal Serial No.	Definition	Terminal Serial No.	Definition
1	CH1+	17	CH9+
2	CH1-	18	CH9-
3	CH2+	19	CH10+
4	CH2-	20	CH10-
5	CH3+	21	CH11+
6	CH3-	22	CH11-
7	CH4+	23	CH12+
8	CH4-	24	CH12-
9	CH5+	25	CH13+
10	CH5-	26	CH13-
11	CH6+	27	CH14+
12	CH6-	28	CH14-
13	CH7+	29	CH15+
14	CH7-	30	CH15-
15	CH8+	31	CH16+
16	CH8-	32	CH16-

### 4.1.2 Underplate Terminal

The underplate terminal row is shown in Figure 4-3. RS-485 signal line and 24V power line can connect both to terminal row in left or right, and the terminal matched resistor can connect to another side. The two sides' terminals are connected internally and correspondingly.



**Figure 4-3 Underplate terminal row layout**

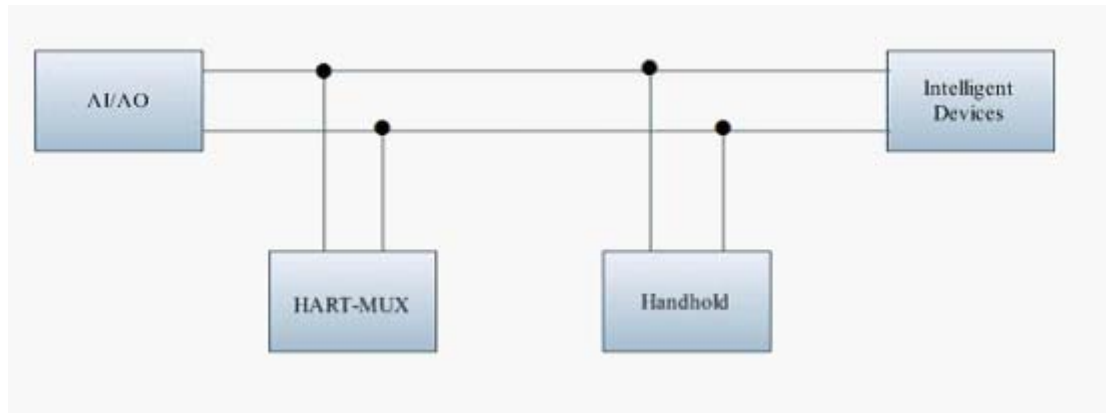
Definitions of underplate terminal are shown in Table 4-2.

**Table 4-2 Definition of back panel terminal**

Terminal Serial No.	Definition
1	24V-
2	24V+
3	RS-485 GND
4	RS-485 -
5	RS-485 +

## 4.2 Connection with HART Loop

HART-MUX supports communication with HART intelligent devices. Connection method of HART-MUX in control system is shown in Figure 4-4.



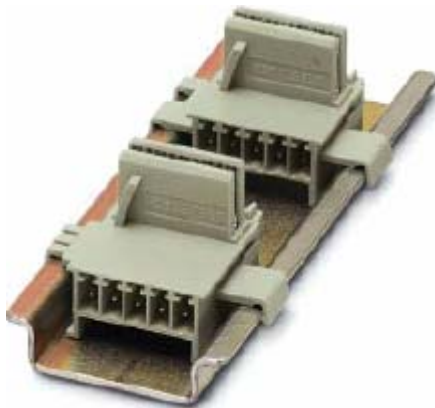
**Figure 4-4** *Connect to intelligent devices*

## 4.3 Installing and Uninstalling

HART-MUX can be installed on NS 35 rail conforming for EN50022 specifications.

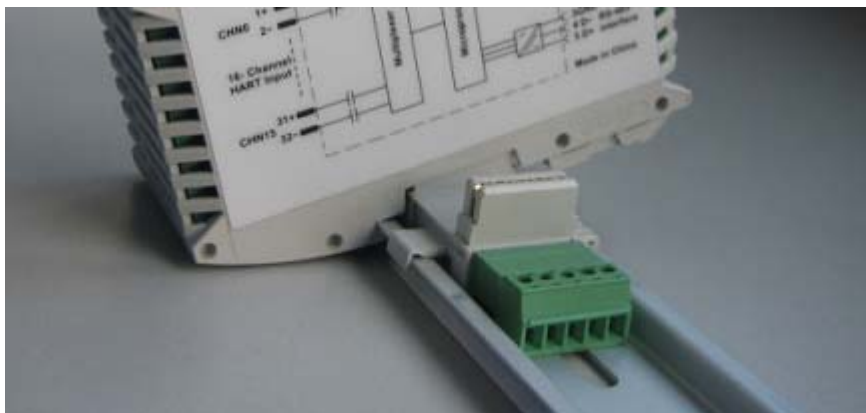
Steps to installing HART-MUX:

1. Install the underplate bus terminals (in model of ME 22.5 TBUS) to NS 35 rail, and connect them. Besides, install underplate terminal (in models of IMC 1.5-3.81 and MC 1.5-3.81) on both sides.



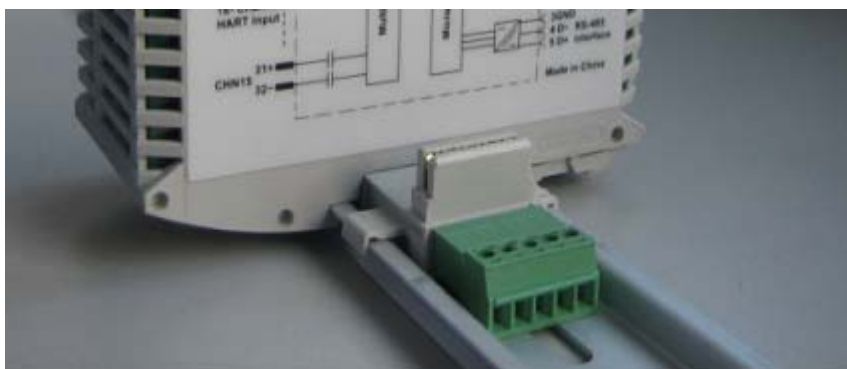
**Figure 4-5** *Back panel bus terminal (ME 22.5 TBUS)*

2. As shown in Figure 4-6, insert HART-MUX module to one side of NS 35 rail, press the module to insert the module to another side of rail.



**Figure 4-6 Module installation (1)**

After installation completed, the module is shown in Figure 4-7.



**Figure 4-7 Module installation (2)**

When uninstalling the module, use a straight screwdriver to insert to the quadrate hole on sheet metal at the bottom of module. Then push the sheet metal to remove the module from rail.

## Section 5 Engineering Application

### 5.1 Connection of RS-485 Bus

RS-485 signal can be converted to Ethernet signal via serial device server, and communicate with upper computer software. The network connection is shown in Figure 5-1. RS-485 bus should apply twin cable, and its two terminals should be added with a terminal matched resistor of 120ohm respectively. The terminal matched resistor can apply general thick-film resistor of 0.25W, and the precision should be not less than 5%.

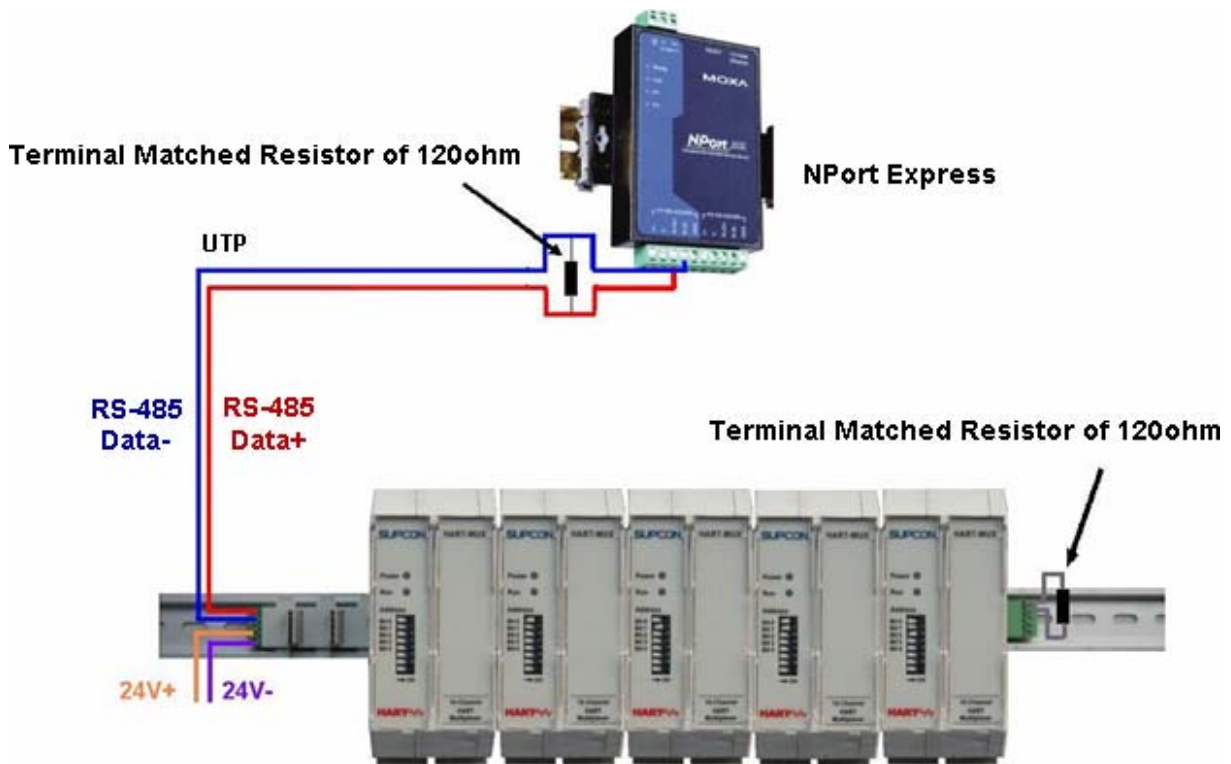


Figure 5-1 Connection of RS-485 bus

### 5.2 Example

The field instrument is HART intelligent transmitter, which should connect JX-300XP control system, and its point number is 800.

Firstly, count the number of HART-MUX modules. As each module can connect 16-channel signal, it needs 50 modules.

Secondly, as each RS-485 bus can connect 32 modules at most, it needs 2 RS-485 buses. For example, one RS-485 bus connects 30 modules and another bus connects 20 modules.

Addresses of modules in the same bus cannot repeat. User can set address via DIP switch on panel.

Serial device server NPort5232 of MOXA is recommended. One serial device server can connect 2 RS-485 buses. A 2-port serial device server is needed in this example.

Besides, the field signal line is divided to two channels via deconcentrator. One channel connects SUPCON JX-300XP control system, another channel connects HART-MUX.



## Section 6 Fault Analysis and Maintenance

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*Table 6-1 Common faults and maintenance*

Serial No.	Fault Description	Reason and Maintenance
1	RUN LED is flashing.	CPU, program or module faults.
2	POWER LED is dark or OFF, other LEDs are all in fault status.	Power supply is abnormal, check the power source voltage.
3	In the Intelligent device management software, the module number is less than actual number.	Check whether the HART-MUX addresses are conflicting.
4	Cannot communicate with equipment management server.	Check the connection of RS-485 and Ethernet.
5	Cannot communicate with instrument.	Check whether the instrument connection is supplied with power normally, and whether the instrument supports HART communication.

## Section 7 Revision

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*Table 7-1 Retrofit list of the version*

Document Version	Applicable Product Version	Remarks
V1.0 (2012-9-27)	HART-MUX-V10.10.00	
V1.0 (2012-11-12)	HART-MUX-V10.10.00	Add the environment humidity index. Change FAIL LED to RUN LED.
V1.0 (20130701)	HART-MUX-V10.10.00	Change the figure of signal terminal layout.
V1.1 (20161011)	HART-MUX-V10.10.00	Add instruction of trademarks in the page of declaration.
V1.2 (20190430)	HART-MUX-V10.10.00 HART-MUX-V12.10.00	Add code, improve picture resolution Add the new version
V1.3 (20221117)	HART-MUX-V10.10.00 HART-MUX-V12.10.00	Add matching software information