Newland

SCANNING MADE SIMPLE

FM3281 Grouper

Stationary Scanners

RS485 protocol description

Version:1.0

Description of RS485 Protocol on FM3281

Introduction

The RS485 communication interface of FM3281 has two working modes. Non-slave mode and slave mode. In non-slave mode, the device communicates with the host one to one. In slave mode, multiple devices (all configured in slave mode) can be mounted to the RS485 bus of the same host for one-master and multi-slave communication.

Non-slave Mode

In non-slave mode, only one FM3281 is connected to an RS485 bus. After obtaining the barcode, the FM3281 directly sends the barcode to the upper computer. The communication mode between the device and the host is similar to RS232/CDC.
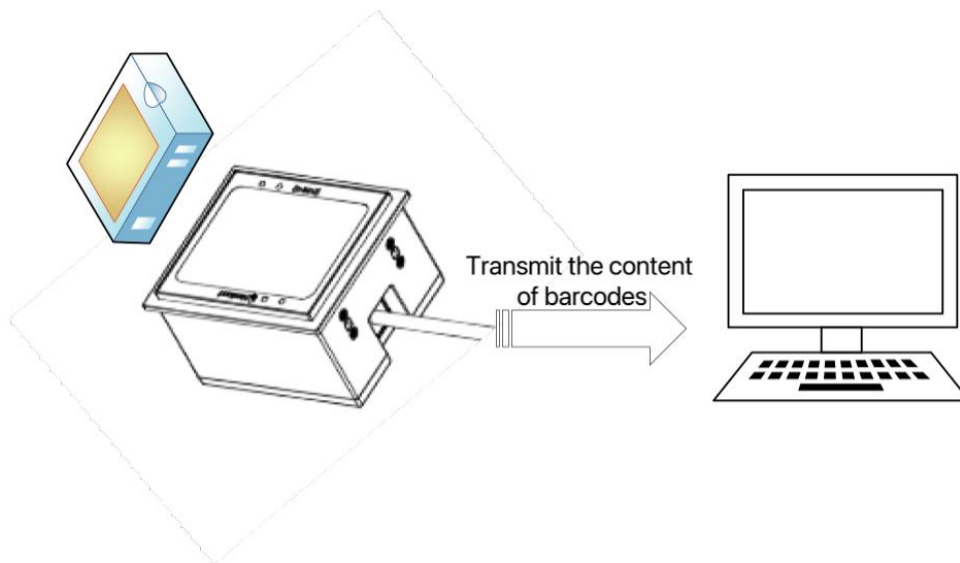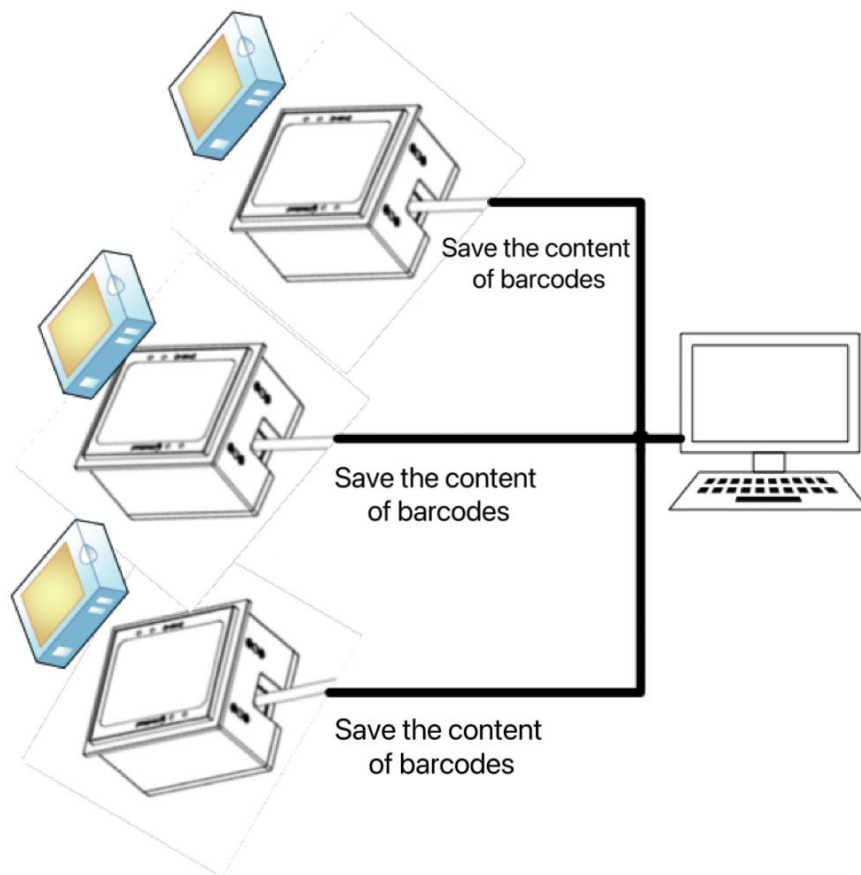

Slave Mode

In slave mode, multiple FM3281 are mounted on the same RS485 bus, and each scanner has a unique address on this bus. To prevent data conflicts on the RS485 bus, the slave does not actively send data on the bus, and all interactions are initiated by the host. The slave will only answer the request from the host. Therefore, in slave mode, FM3281 will not actively send data to the upper computer when scanning code or reading NFC successfully, but store the information. When the host initiates a data acquisition instruction, if the address information in the instruction matches itself, the slave computer of the address responds and replies the stored code word to the upper computer/host.

In slave mode, the new barcode content overwrites the old barcode content. After the host takes the barcode content, the barcode content will be emptied. The barcode content will not be saved when FM3281 is restarted.

In slave mode, FM3281 will flash a blue light when receiving data, and a green light will be superimposed if the parsing command is successfully executed (This feature was implemented in later versions).

Unified commands related to RS485 slave mode
- 485SLV: Sets the mode of RS485.
  - INTSLV1: In 485 communication mode, the device works in slave mode.
  - INTSLV0 indicates that in the RS485 communication mode, the device works in one-to-one communication mode or non-slave mode.
- 485ADD: Sets the address of the slave. The value ranges from 00 to FF. Note If the value is set to 00, the address is cleared. In the words, the FM3281 which is set to 00 has no address.

Set the slave mode of the RS485
The default (factory) mode of RS485 is the non-slave mode. Users can directly enter EASYSET for address settings by using the RS485 interface or CDC interface. For example, the customer wants a device to be configured in slave mode and the address is 0x20. Users can send 485ADD20 and then 485SLV1. At this time, the RS485 slave configuration of the device has been completed. Note that the 485SLV instruction must be sent last after all other configuration instructions have been sent because once the 485SLV1 is configured, the device will enter the slave mode. At this time, the original command communication protocol is no longer applicable, and EASYSET cannot be used.

In addition to the RS485 slave address and RS485 slave mode configured by the unified commands, users can also configure through the Setting barcode. E.g. users can scan the below setting barcode if they would like to set the scanner in RS485 slave mode and get the address as 0x20.

@485ADD20

@485SLV1

RS485 Communication Protocol in Slave Mode

After the address is configured and the scanner is deployed, the master-slave communication can be performed. Users need to know the communication protocol of the 485 master and slave.

The complete one-frame format of the protocol is shown below. All contents are hexadecimal data.

Child node address	Functional Code	Length of Data	Data	CRC
1 byte	1 byte	1 byte	0 - 251 byte(s)	2 bytes CRC low | CRC high

The length of a frame is a maximum of 256 bytes, starting from the address and ending with 2 bytes of CRC16 (low bytes first, high bytes last). It comes with 1 byte of function code. The RS485 slave protocol of this design only supports two functional codes 0x42 and 0x43. The function code is followed by this 1-byte data length, indicating the length of subsequent data sections (excluding CRC).

0x42 (Unified Instruction Set and Serial Trigger Instruction)

Function code 0x42 indicates that subsequent data sections are unified instruction sets or serial trigger instructions.

Request command initiated/sent by the host

Functional Code	1 byte	0x42
Length of the Request Data	1 byte	N
Content of Data	N byte(s)	The content must be consistent with the content of the unified command set serial programming.

The correct execution response of a slave

Functional Code	1 byte	0x42
Length of the response data	1 byte	N
Content of data	N byte(s)	The content must be consistent with the content of the unified command set serial programming.

Error/Wrong response from a slave

Functional Code	1 byte	0xC2
Length of the response data	1 byte	0x01
Content of data	1 byte	0x03

Example (In all the subsequent examples, the slave's address is 0x20)

Set the device to level trigger mode in slave mode.

The unified command set for setting level trigger is **@SCNMOD0**

The response is: **02 01 30 30 30 30 40 53 43 4e 4d 4f 44 30 06 3b 03**

Then in slave mode, the command is: **20 42 10 7e 01 30 30 30 30 40 53 43 4e 4d 4f 44 30 3b 03 a5 91**

Child node address	Functional Code	Length Of Data	Data	CRC
0x20	0x42	0x10	7e 01 30 30 30 30 40 53 43 4e 4d 4f 44 30 3b 03	a5 91 CRC low | CRC high

The response is：**20 42 11 02 01 30 30 30 30 40 53 43 4e 4d 4f 44 30 06 3b 03 22 52**

Child node address	Functional Code	Length of Data	Data	CRC
0x20	0x42	0x11	02 01 30 30 30 30 40 53 43 4e 4d 4f 44 30 06 3b 03	22 52 CRC low | CRC high

As the same unified command set that enables serial firing **is @SCNTCE1**

The corresponding data transmitted through the serial port is **7e 01 30 30 30 30 40 53 43 4e 54 43 45 31 3B 03**

The response is: **02 01 30 30 30 30 40 53 43 4e 54 43 45 31 06 3b 03**

In slave mode, the command is: **20 42 10 7e 01 30 30 30 30 40 53 43 4e 54 43 45 31 3B 03 e7 a5**

Child node address	Functional Code	Length of Data	Data	CRC
0x20	0x42	0x10	7e 01 30 30 30 30 40 53 43 4e 54 43 45 31 3B 03	E7 A5 CRC low | CRC high

The response is: **20 42 11 02 01 30 30 30 30 40 53 43 4e 54 43 45 31 06 3b 03 96 63**

Child node address	Functional Code	Length of Data	Data	CRC
0x20	0x42	0x11	02 01 30 30 30 30 40 53 43 4e 54 43 45 31 06 3b 03	96 63 CRC low | CRC high

Example of Serial Trigger

Assuming the serial trigger command is **01540**4, the serial trigger command used in slave mode is:
20 42 03 015404 11 F3
The response is**: 20 42 03 01 54 04 11 F3**
If the serial triggering function is disabled or the serial triggering instruction is incorrectly filled, the response is **20 C2 01 03 EB 89**

0x43 (Gets Cached Data)

Request command initiated/sent by the host

Functional Code	1 byte	0x43
Length of the Request Data	1 byte	0x01
Content of Data	1 byte	0x00: Obtain the data of barcode 0x01OObtain the data of NFC

The correct execution response of a slave

Functional Code	1 byte	0x43
Length of the response data	1 byte	N
Content of data	N byte(s)	The content of data

Error/Wrong response from a slave

Functional Code	1 byte	0xC3
Length of the response data	1 byte	0x01
Content of data	1 byte	0x03

Example

The content of a bar code is **6970158563297**

The end suffix is enabled on the device. The end character content is **0x0d 0x0a**

The interaction process is as follows

Send: **20 43 01 00 fb a0**

Child Note Address	Functional Code	Length of Content	Data	CRC
0x20	0x43	0x01	0x00	fb a0 CRC low | CRC high

Response: **20 43 0f 36 39 37 30 31 35 38 35 36 33 32 39 37 0d 0a 33 1e**

Child Note Address	Functional Code	Length of Content	Data	CRC
0x20	0x43	0x0f	36 39 37 30 31 35 38 35 36 33 32 39 37 0d 0a	33 1e CRC low | CRC high

If FM3281 does not have cached barcode data this time, the response is: **20 43 00 41 3a**

Child Note Address	Functional Code	Length of Content	Data	CRC
0x20	0x43	0x00	/	41 3a CRC low | CRC high

If the length of the barcode is more than 251 bytes, the slave will send the data in different packets. Assuming that the barcode is 400 bytes, the first packet sends the first 251 bytes, and the second/last packet sends the rest 149 bytes.

```
410  IN    20 43 fb 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39
           30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31
           32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33
           34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35
           36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37
           38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39
           30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31
           32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 27 10
           20 43 95 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30
           31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32
           33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34
           35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36
           37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 32 29
```

Demonstration of RS485 Slave Mode

Assume that two slaves are located on the same RS485 bus. The address of slave A is 0x20, and that of slave B is 0x30. Both A and B are working in level trigger mode. The serial trigger is enabled for both devices. Serial trigger commands are 0x01 0x54 0x04. The barcode is expected to be read at several times every day. The process is as follows:
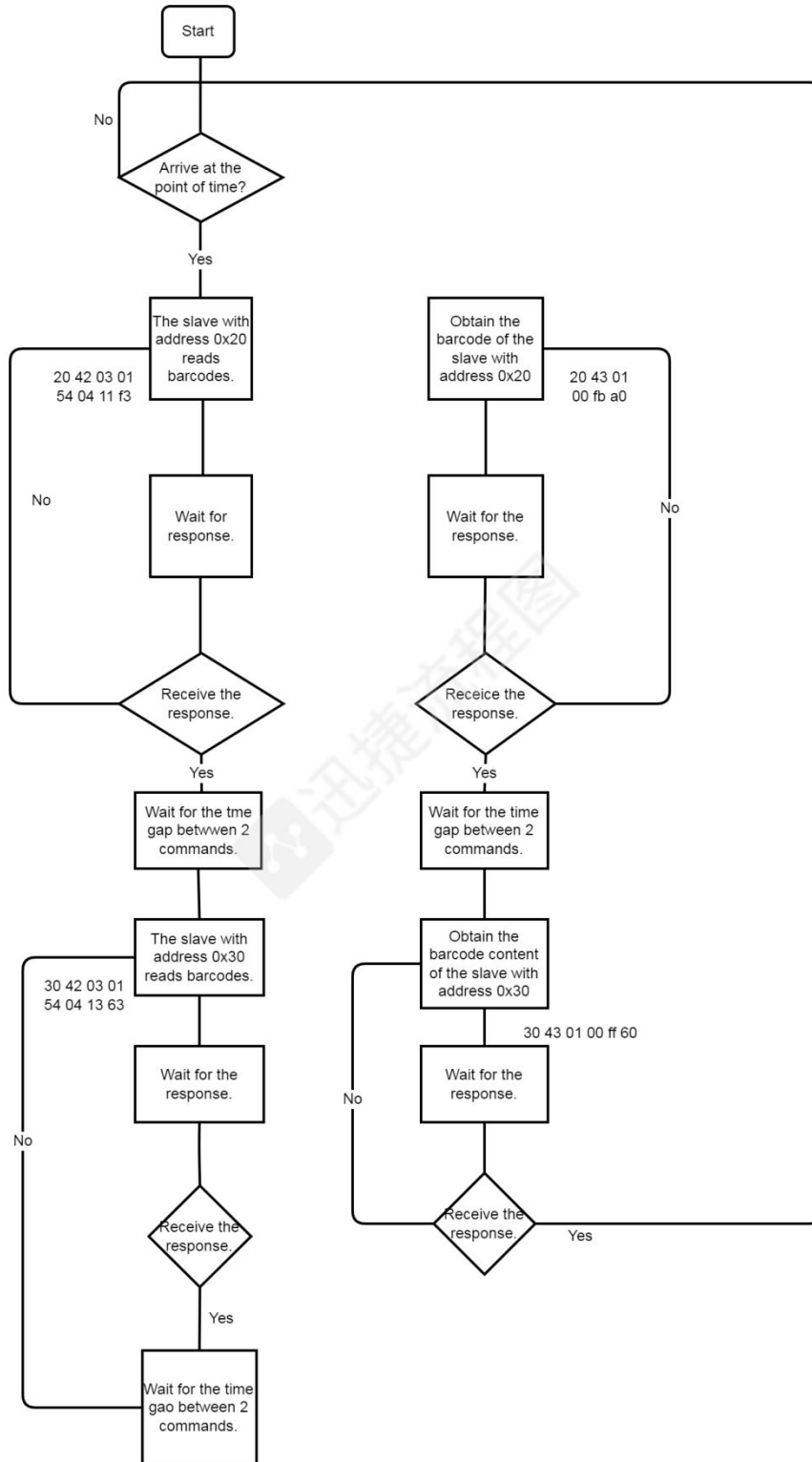
Some Suggestion

1. How to find an FM3281 (slave) with a specified address in a batch of slaves?
If users would like to find the location of the device at address 0x20, they can send the buzzer BEEPON command to package it according to the slave protocol. The FM3281 with address 0x20 will beep in the device heap for them to find its location.

2. How to bind devices to addresses more accurately?
In slave mode, knowing the address of an FM3281 is a prerequisite for interaction. Therefore, in order to accurately bind the device to its address, it is recommended to place its address setting code near the working area of the FM3281.
This can also facilitate the replacement of the FM3281. The new FM3281 can be replaced by scanning the address setting code of the working area of the original one.

@485ADD20
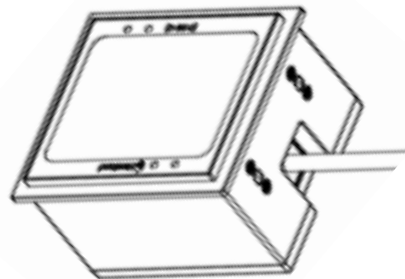
Matters Needing Attention in RS485 Slave Mode
Rules in Interaction
Because the RS485 bus is a half-duplex bus, at the same time, the direction of data transmission on the bus is one-way, that is, can only be sent, or can only be received. As a result, the host needs to wait for the response from the slave before performing subsequent interaction operations. If this criterion is not followed, two devices may send data at the same time, causing unstable bus levels and data disorder. This criterion applies not only to slave mode but also to normal mode. In addition, since multiple devices are mounted on the same bus in slave mode, this guideline must be followed more strictly. At the same time, in order to ensure the stability of interaction, after receiving the response, the host needs to conduct an instruction delay before sending the next instruction. The delay time depends on the specific time. The minimum is not less than 150ms.
- Must not allow both slave mode and non-slave mode devices to exist on the same bus.
- Devices with the same address must not exist on a bus.