SDongleA
V100R001C00

MODBUS Interface Definitions

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Preface

Purpose

This document describes MODBUS interface definitions, and the register of device.

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Change History

Issue	Date	Description
05	2022-07-06	This issue is the fifth official release,and includes the following changes: Chapter 2 Register Definitions 2.1Register Definitions for the SDongleA : Add definitions for WLAN-FE
04	2020-12-29	This issue is the fourth official release, and includes the following changes: Chapter 3 Communication Protocol Overview 3.2.1 Addressing Mode : Add addressing mode description 3.2.2 Frame Structure : Update device ID description
03	2020-04-08	This issue is the third official release, and includes the following changes: Chapter 2 Register Definitions 2.1Register Definitions for the SDongleA : Delete definitions for GPRS, and add for WLAN-FE
02	2019-01-23	This issue is the second official release, and includes the following changes: Chapter 2 Register Definitions 2.1Register Definitions for the SDongleA : Modify Register definitions
01	2018-12-20	This issue is the first official release

Contents

1 Introduction

The Modbus-TCP protocol is a well-known factual automation standard. This document describes Modbus-TCP functions related to communications in the SDongleA.

This document provides details about the Modbus protocol used in the SDongleA and devices managed by the SDongleA, such as inverters, environment monitor instrument, and power meter. It can be used to regulate and restrict follow-up third-party integration R&D and customizations.

1.1 Definitions of Terms and Abbreviations

Table 1-1 Terms

Name	Description
Master node	During master-slave communication, the party that initiates a communication request is referred to as the master node.
Slave node	During master-slave communication, the party that responds to a communication request is referred to as the slave node.
Broadcast address	Fixed to 0.
Register address	The address of a register is recorded in two bytes.
U16	Unsigned integer (16 bits)
U32	Unsigned integer (32 bits)
U64	Unsigned integer (64 bits)

Name	Description
I16	Signed integer (16 bits)
STR	String
MLD	Multiple bytes
N/A	Not applicable
s	Second
EPOCHTIME	Epoch seconds, the number of seconds accumulated from 1970-01-01 00:00:00
RO	Read Only
RW	Read & Write

1.2 System Requirements

Applicable model:

SDongleA-01

SDongleA-02-CN

SDongleA-03-KR

SDongleA-03-JP

SDongleA-03-AU

SDongleA-03-EU

SDongleA-03-CN

Firmware version: V100R001C00SPC100 or later

2 Register Definitions

2.1 Register Definitions for the SDongleA

Table 2-1 Register definition

No.	Signal Name	Read & Write	Type	Unit	Gain	Address	Quantity	Description
1	OS Version	RO	STR	N/A	1	30050	15	NA
2	Protocol Version	RO	U32	N/A	1	30068	2	High byte : main version. Upgrade it in the case of incompatible versions. Low byte: release version. Upgrade it in the case of compatible versions. The baseline version is D5.0. The high byte and low byte are 5 and 0 respectively.
3	Registration Key	RO	STR	N/A	1	31200	10	NA
4	SN	RO	STR	N/A	1	30015	10	NA

No.	Signal Name	Read & Write	Type	Unit	Gain	Address	Quantity	Description
5	Type	RO	U16	N/A	1	37410	1	0:N/A 2:WLAN 3:4G 5:WLAN-FE
6	Device Search Status	RO	U16	N/A	1	37411	1	0: Search completed 1: Searching 2: Search failed
7	Device Change Sequence Number	RO	U16	N/A	1	37412	1	NA
8	Maximum Number of Devices Allowed	RO	U16	N/A	1	37429	1	NA
9	Wireless Route Access Signal Strength	RO	I16	N/A	1	35104	1	0X7FFF: Disconnected 0X7FFE: Disconnected due to authentication failure [–100, 0]: Signal strength from weak to strong Not supported by SDongleA-4G
10	Monthly Used Traffic	RO	U32	MB	100	35116	2	Supported only by SDongleA-4G
11	Monthly Remaining Traffic	RO	U32	MB	100	35118	2	Supported only by SDongleA-4G
12	Average Daily Used Traffic	RO	U32	MB	100	35120	2	Supported only by SDongleA-4G
13	Traffic Status	RO	U16	N/A	1	35122	1	0: Normal 1: Warning 2: Used up 0xFF: No package configured Supported only by SDongleA-4G

No.	Signal Name	Read & Write	Type	Unit	Gain	Address	Quantity	Description
14	IMEI	RO	STR	N/A	1	35254	10	Supported only by SDongleA-4G
15	Signal Strength	RO	U16	N/A	1	35264	1	[0, 5] 0: No signal Supported only by SDongleA-4G
16	System	RO	STR	N/A	1	37430	10	Example: 2G,3G, 4G Supported only by SDongleA-4G
17	Carrier	RO	STR	N/A	1	37440	15	Unknown: Default value or query failed Supported only by SDongleA-4G
18	Total input power	RO	U32	kw	1000	37498	2	NA
19	Load power	RO	U32	kw	1000	37500	2	NA
20	Grid power	RO	INT32	kw	1000	37502	2	Greater than 0 indicates buy, less than 0 indicates sell
21	Total Battery power	RO	INT32	kw	1000	37504	2	Greater than 0 indicates charge, less than 0 indicates discharge.
22	Total active power	RO	INT32	kw	1000	37516	2	NA

No.	Signal Name	Read & Write	Type	Unit	Gain	Address	Quantity	Description
23	Reset	WO	U16	N/A	1	40205	1	Enter **0** in the data field. After receiving a command, the DSP immediately responds and then resets. After receiving a command, the inverter monitoring module sends it to the DSP. After receiving a normal response, the inverter monitoring module replies to the northbound port and resets after 3s. The system does not restart if a failure message is replied.
24	System Time	WO	EPOCHTIME	N/A	1	40500	2	[2000-01-01 00:00:00, 2068-12-31 23:59:59] Epoch seconds UTC
25	Daylight Saving Time (DST)	RW	U16	N/A	1	42900	1	0: Disabled 1: Enabled Default value: Disabled
26	Time Zone	RW	I16	min	1	43006	1	[–720, 840] Default: 480 (GMT+8 Beijing)
27	Heartbeat Period at Application Layer	RW	U16	Min	1	43064	1	[1, 65535] Default: 30 minutes

No.	Signal Name	Read & Write	Type	Unit	Gain	Address	Quantity	Description
28	TCP Heartbeat Period	RW	U16	s	1	43065	1	[0, 65535] Default: 3 minutes 0XFFFF: No heartbeat 0: 3 minutes by default
29	NMS Server	RW	STR	N/A	1	43067	30	Domain name or IP address
30	NMS Server Port 1	RW	U16	N/A	1	43097	1	[0, 65535] Default: 27250
31	SSL Encryption	RW	U16	N/A	1	43098	1	0: Disabled 1: Enabled (default)
32	NMS Server Port 2	RW	U16	N/A	1	43099	1	[0, 65535] Default: 27251
33	Port Mode	RW	U16	N/A	1	43100	1	0: Dual ports (default) 1: Single port
34	Registration Status	RW	U16	N/A	1	43101	1	0: Unregistered (default) 1: Registered
35	Unsolicited Report Interval	RW	U16	Min	1	43134	1	[5, 120] Default: 5 minutes 0xFFFF: Unsolicited report not supported If the value is not 5n, round down to the nearest integer multiple of 5.
36	Reported Data Record Period	RW	U16	Min	1	43135	1	5 minutes (default), 15 minutes, 30 minutes, 60 minutes
37	NTP Time Synchronization	RW	U16	N/A	1	43311	1	0: Disabled (default) 1: Enabled

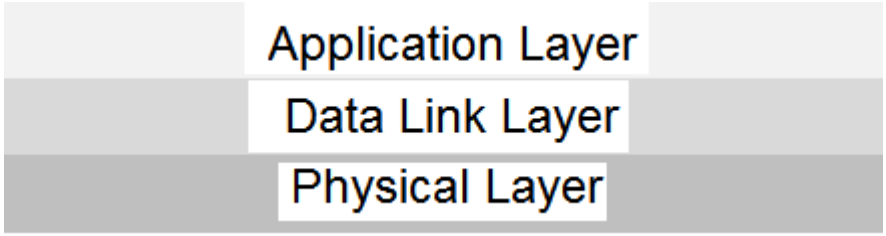
No.	Signal Name	Read & Write	Type	Unit	Gain	Address	Quantity	Description
38	NTP Server Address	RW	STR	N/A	1	43312	30	NA
39	NTP Server Port	RW	U16	N/A	1	43342	1	[0, 65535] Default: 123
40	NTP Service Time Synchronization Interval	RW	U16	min	1	43343	1	[1, 1440] Default: 5
41	Card No.	RO	STR	N/A	1	43386	10	ICCID Supported only by SDongleA-4G
42	Network Mode	RW	U16	N/A	1	43430	1	0 (default): 4G/3G/2G automatic selection 1: 3G/2G automatic selection 2: Only 2G Supported only by SDongleA-4G
43	Traffic Package	RW	U32	MB	100	43564	2	Supported only by SDongleA-4G
44	Monthly Used Traffic	RW	U32	MB	100	43566	2	Used for traffic correction Supported only by SDongleA-4G
45	Connection Port	WO	U16	N/A	1	45038	1	1: Port 1 2: Port 2 Other value: Invalid

No.	Signal Name	Read & Write	Type	Unit	Gain	Address	Quantity	Description
46	Device Operation	WO	STR	N/A	1	47402	11	First 10 registers: Determine the device to be operated based on the SN. Set the register content to the device SN. Last register: 0: Deletes inverters 1: Reset inverter alarms
47	Start Device Search	WO	U16	N/A	1	47413	1	Enter **0** in the data field.

3 Communication Protocol Overview

The Modbus-TCP communication protocol consists of the following layers:

Figure 3-1 Layers of the Modbus-TCP communication protocol



3.1 Physical Layer

Communicates over an Ethernet.

3.2 Data Link Layer

3.2.1 Addressing Mode

Support both unicast and broadcast,the rules are below:

Table 3-1 Addressing mode rules

Broadcast address	Slave address	Reserved
0	1～247	248～255

3.2.2 Frame Structure

Table 3-2 Frame structure

Data Field	Length	Description
MBAP Head	7 byte	Table3-2
Function code	1 byte	NA
Data	N byte	NA

WARNING

A Modbus-TCP frame can contain a maximum of 256 bytes.

The following table describes the format of an MBAP header:

Table 3-3 MBAP definitions

Data Field	Length (Bytes)	Description	Master Node	Slave Node
Transmission identifier	2	Matching identifier between a request frame and a response frames	Assigned by the master node; better be unique for each data frame.	The identifier of the response frame from the slave node must be consistent with that of the request frame.
Protocol type	2	0 = Modbus protocol	Assigned by the master node; 0 by default.	The identifier of the response frame from the slave node must be consistent with that of the request frame.
Data length	2	Follow-up data length	Assigned by the master node based on the actual data frame.	Assigned by the slave node based on the actual frame length.

Data Field	Length (Bytes)	Description	Master Node	Slave Node
Logic device ID	1	Identifies a SDongleA device or a subdevice accessed by the SDongleA. 100: SDongleA 1–247: Inverters or other device	Assigned by the master node based on the actual data frame request.	The identifier of the response frame from the slave node must be consistent with that of the request frame.

3.2.3 Data Encoding

Modbus uses a big-Endian to represent addresses and data. When multiple bytes are sent, the payload digit leftmost is sent first.

1. Example:

Register Size	Value
16 bits	0x1234

The system sends 0x12, and then sends 0x34.

3.2.4 Interaction Process

A communication process is always initiated by a master node. Slave nodes do not initiate communication processes.

In unicast mode, a slave node returns one response for each request from the master node. If the master node does not receive any response from the slave node in 5s, the communication process is regarded as timed out.

In broadcast mode, slave nodes receive instructions from the master node, but do not respond to the instructions.

3.3 Application Layer

3.3.1 Function Code List

Table 3-4 Function code list

Function Code	Meaning	Remarks
0x03	Read registers.	Supports continuous reading of single or multiple registers.
0x06	Write a single register.	Supports writing into a single register.
0x10	Write multiple registers.	Supports continuous writing into multiple registers.
0x2B	Read device identifiers.	Obtains device types and version numbers.

3.3.2 Exception Code List

The exception codes must be unique for each NE type. The names and descriptions are provided in the NE interface document. Different versions of the same NE type must be backward compatible. Exception codes in use cannot be assigned to other exceptions.

Table 3-5 Table of exception codes returned by an NE (0x00–0x8F are for common exception codes)

Code	Name	Meaning
0x01	ILLEGAL FUNCTION	The function code received in the query is not an allowable action for the server. This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server is in the wrong state to process a request of this type, for example because it is unconfigured and is being asked to return register values.

Code	Name	Meaning
0x02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address for the server. More specifically, the combination of reference number and transfer length is invalid. For a controller with 100 registers, the PDU addresses the first register as 0, and the last one as 99. If a request is submitted with a starting register address of 96 and a quantity of registers of 4, then this request will successfully operate (address-wise at least) on registers 96, 97, 98, 99. If a request is submitted with a starting register address of 96 and a quantity of registers of 5, then this request will fail with Exception Code 0x02 "Illegal Data Address" since it attempts to perform operations on registers 96, 97, 98, 99 and 100, and there is no register with address 100.
0x03	ILLEGAL DATA VALUE	A value contained in the query data field is not an allowable value for server. This indicates a fault in the structure of the remainder of a complex request, such as that the implied length is incorrect. It specifically does not mean that a data item submitted for storage in a register has a value outside the expectation of the application program, since the Modbus protocol is unaware of the significance of any particular value of any particular register.
0x04	SERVER DEVICE FAILURE	An unrecoverable error occurred while the server was attempting to perform the requested action.
0x06	SERVER DEVICE BUSY	Specialized use in conjunction with programming commands. The server has accepted the request and is processing it, but a long duration of time will be required to do so. This response is returned to prevent a timeout error from occurring in the client. The client can next issue a Poll Program Complete message to determine if processing is completed.
0x80	NO PERMISSION	An operation is not allowed because of a permission authentication failure or permission expiration.

3.3.3 Reading Registers (0X03)

3.3.3.1 Frame Format for a Request from a Master Node

Table 3-6 Frame format for a request from a master node

Data Field	Length	Description
Function code	1 byte	0x03
Register start address	2 byte	0x0000~0xFFFF
Number of registers	2 byte	1~125

3.3.3.2 Frame Format for a Normal Response from a Slave Node

Table 3-7 Frame format for a normal response from a slave node

Data Field	Length	Description
Function code	1 byte	0x03
Number of bytes	1 byte	2*N
Register value	2*N byte	N/A

NOTE

N indicates the number of registers.

3.3.3.3 Frame Format for an Abnormal Response from a Slave Node

Table 3-8 Frame format for an abnormal response from a slave node

Data Field	Length	Description
Function code	1 byte	0x83
Exception code	1 byte	See the **3.3.2 Exception Code List**

3.3.3.4 Example

A master node sends a request to a slave node (logic device ID: 00) to query register whose address is 32306/0X7E32. The request frame format is as follows:

Table 3-9 Example

Description		Data frame
MBAP Header	Protocol Identifier	00
		01
	Protocol Type	00
		00
	Data Length	00
		06
	Logic Device ID	00
Function Code		03
Data	Register Address	89
		C0
	Number of Registers	00
		01

Frame format of a normal response from the slave node:

1. Frame format of a normal response from the slave node

Description		Data frame
MBAP Header	Protocol Identifier	00
		01
	Protocol Type	00
		00
	Data Length	00
		04
	Logic Device ID	00
Function Code		03
Data	Bytes	02
	Register value	00
		00

Frame format of an abnormal response from the slave node:

1. Frame format of an abnormal response from the slave node

Description		Data frame
MBAP Header	Protocol Identifier	00
		01
	Protocol Type	00
		00
	Data Length	00
		03
	Logic Device ID	00
Function Code		83
Data	Error Code	02

3.3.4 Writing a Single Register (0X06)

3.3.4.1 Frame Format for a Request from a Master Node

Table 3-10 Frame format for a request from a master node

Data Field	Length	Description
Function code	1 byte	0x06
Register Address	2 byte	0x0000~0xFFFF
Register Value	2 byte	0x0000~0xFFFF

3.3.4.2 Frame Format for a Normal Response from a Slave Node

Table 3-11 Frame format for a normal response from a slave node

Data Field	Length	Description
Function code	1 byte	0x06
Register Address	2 byte	0x0000~0xFFFF
Register Value	2 byte	0x0000~0xFFFF

3.3.4.3 Frame Format for an Abnormal Response from a Slave Node

Table 3-12 Frame format for an abnormal response from a slave node

Data Field	Length	Description
Function code	1 byte	0x86
Exception code	1 byte	See the **3.3.2 Exception Code List**

3.3.4.4 Example

A master node sends a Power-On instruction (register address: 40200/0X9D08) to a slave node whose address is 01. The request frame format is as follows:

Table 3-13 Example

Description		Data frame
MBAP Header	Protocol Identifier	00
		01
	Protocol Type	00
		00
	Data Length	00
		06
	Logic Device ID	00
Function Code		06
Data	Register Address	A8
		5A
	Register Value	00
		00

Frame format of a normal response from the slave node:

1. Frame format of a normal response from the slave node

Description		Data frame
MBAP Header	Protocol Identifier	00
		01

Description		Data frame
	Protocol Type	00
		00
	Data Length	00
		06
	Logic Device ID	00
Function Code		06
Data	Register Address	A8
		5A
	Register Value	00
		00

Frame format of an abnormal response from the slave node:

1. Frame format of an abnormal response from the slave node

Description		Data frame
MBAP Header	Protocol Identifier	00
		01
	Protocol Type	00
		00
	Data Length	00
		03
	Logic Device ID	00
Function Code		86
Data	Error Code	04

3.3.5 Writing Multiple Registers (0X10)

3.3.5.1 Frame Format for a Request from a Master Node

Table 3-14 Frame format for a request from a master node

Data Field	Length	Description
Function code	1 byte	0x10

Data Field	Length	Description
Register start address	2 byte	0x0000~0xFFFF
Number of registers	2 byte	0x0000~0x007b
Number of bytes	1 byte	2*N
Register value	2*N byte	Value

NOTE

N indicates the number of registers.

3.3.5.2 Frame Format for a Normal Response from a Slave Node

Table 3-15 Frame format for a normal response from a slave node

Data Field	Length	Description
Function code	1 byte	0x10
Register address	2 byte	0x0000~0xFFFF
Number of registers	2 byte	0x0000~0x007b

3.3.5.3 Frame Format for an Abnormal Response from a Slave Node

Table 3-16 Frame format for an abnormal response from a slave node

Data Field	Length	Description
Function code	1 byte	0x90
Exception code	1 byte	See the **3.3.2 Exception Code List**

3.3.5.4 Example

A master node sends an instruction to a slave node whose address is 01 to set the active power control mode (register address: 40118/0X9CB6) to 2, and set the active power deration (register address: 40119/0X9CB7) to 50%. The request frame format is as follows:

Table 3-17 Example

Description		Data frame
MBAP Header	Protocol Identifier	00
		01
	Protocol Type	00
		00
	Data Length	00
		0B
	Logic Device ID	00
Function Code		10
Data	Register Address	9C
		B6
	Number of Registers	00
		02
	Bytes	04
	Register Value	00
		02
		00
		32

Frame format of a normal response from the slave node:

1. Frame format of a normal response from the slave node

Description		Data frame
MBAP Header	Protocol Identifier	00
		01
	Protocol Type	00
		00
	Data Length	00
		06
	Logic Device ID	00
Function Code		10

Description		Data frame
Data	Register Address	9C
		B6
	Number of Registers	00
		02

Frame format of an abnormal response from the slave node:

Table 3-18 Frame format of an abnormal response from the slave node

Description		Data frame
MBAP Header	Protocol Identifier	00
		01
	Protocol Type	00
		00
	Data Length	00
		03
	Logic Device ID	00
Function Code		90
Data	Error Code	04

3.3.6 Reading Device Identifiers (0X2B)

This command code allows reading identifiers and added packets that are relevant to the physical and function description of the remote devices.

Simulate the port of the read device identifier as an address space. This address space consists of a set of addressable data elements. The data elements are objects to be read, and the object IDs determine these data elements.

A Data element consists of three objects:

- Basic device identifier: All objects of this type are mandatory, such as the manufacturer name, product code, and revision version.
- Normal device identifier: Except the basic data objects, the device provides additional and optional identifiers and data object description. Normal device identifiers define all types of objects according to standard definitions, but the execution of this type of objects is optional.
- Extensive device identifier: Except the basic data objects, the device provides additional and optional identifiers and special data object description. All these data objects are related to the device.

Table 3-19 Reading Device Identifiers

Object ID	Object Name or Description	Type	M/O	Category
0x00	Manufacturer name	ASCII character string	M	Basic
0x01	Product code	ASCII character string	M	
0x02	Main revision	ASCII character string	M	
0x03-0x7F	--	--	--	Normal
0x80-0xFF	--	--	--	Extensive

3.3.6.1 Commands for Querying Device Identifiers

Table 3-20 Request frame format

Data Field	Length (Byte)	Description
Function code	1 byte	0x2B
MEI type	1 byte	0x0E
ReadDevId code	1 byte	01
Object ID	1 byte	0x00

Table 3-21 Frame format for a normal response

Data Field			Length	Description
Slave node address			1 byte	0x2B
Function code			1 byte	0x0E
MEI type			1 byte	01
ReadDevId code			1 byte	01
Consistency level			1 byte	--
More			1 byte	--
Next object ID			1 byte	--
Object list	First object	Object ID	1 byte	0x00
		Object length	1 byte	N

Data Field			Length	Description
		Object value	N byte	--
	...	...	...	...

Table 3-22 Object list

Object ID	Object Name or Description	Description	Category
0x00	Manufacturer name	HUAWEI	Basic
0x01	Product code	SDongleA-WLAN	
0x02	Main revision	ASCII character string, software version	

Table 3-23 Frame format for an abnormal response

Data Field	Length	Description
Function code	1 byte	0xAB
Exception code	1 byte	See the **3.3.2 Exception Code List**

3.3.6.2 Command for Querying a Device List

Table 3-24 Request frame format

Data Field	Length (Byte)	Description
Logic Device ID	1 byte	1~247
Function code	1 byte	0x2B
MEI type	1 byte	0x0E
ReadDevId code	1 byte	03
Object ID	1 byte	0x87
CRC	2 byte	--

Table 3-25 Frame format for a normal response

Data Field			Length (Byte)	Description
Logic Device ID			1 byte	1~247
Function code			1 byte	0x2B
MEI type			1 byte	0x0E
ReadDevId code			1 byte	03
Consistency level			1 byte	03
More			1 byte	--
Next object ID			1 byte	--
Number of objects			1 byte	--
Object list	First object	Object ID	1 byte	0x87
		Object length	1 byte	N
		Object value	N byte	--
	...	...	...	...
CRC			2 byte	--

Table 3-26 Object list

Object ID	Object Name	Type	Description
0x80-0x86	Reserved	--	Returns a null object with a length of 0.
0x87	Number of devices	Integer	Returns the number of devices connected to the RS485 address.
0x88	Information about the first device	ASCII character string See the device description definitions below.	Returns information only for the first device if a network element allows only one device to be connected to each RS485 address.

Object ID	Object Name	Type	Description
0x89	Information about the second device	--	--
--	--	--	--
0xFF	Information about the 120th device	--	--

3.3.6.3 Device Description Definitions

Each device description consists of all" attribute = value" strings.

Attribute label=%s; attribute label=%s; ...attribute label=%s

For example:1=SDongleA-WLAN;2=V100R001C00SPC100;3=P1.0-D1.0;4=123232323;5=2;6=1.

Table 3-27 Attribute definitions

Attribute Label	Attribute Name	Type	Description
1	Device Model	ASCII character string	SDongleA-WLAN
2	Software version	ASCII character string	--
3	Version of the communications protocol	ASCII character string	See the interface protocol version definitions.
4	SN	ASCII character string	--
5	Device number	Integer	0,1,2,3...(Assigned by NE; 0 indicates the master device to which the Modbus card is inserted)
6	Parallel network number	Integer	--

Table 3-28 Frame format for a normal response

Data Field	Length (Byte)	Description
Function code	1	0xAB

Data Field	Length (Byte)	Description
Exception code	1	See the **3.3.2 Exception Code List**

