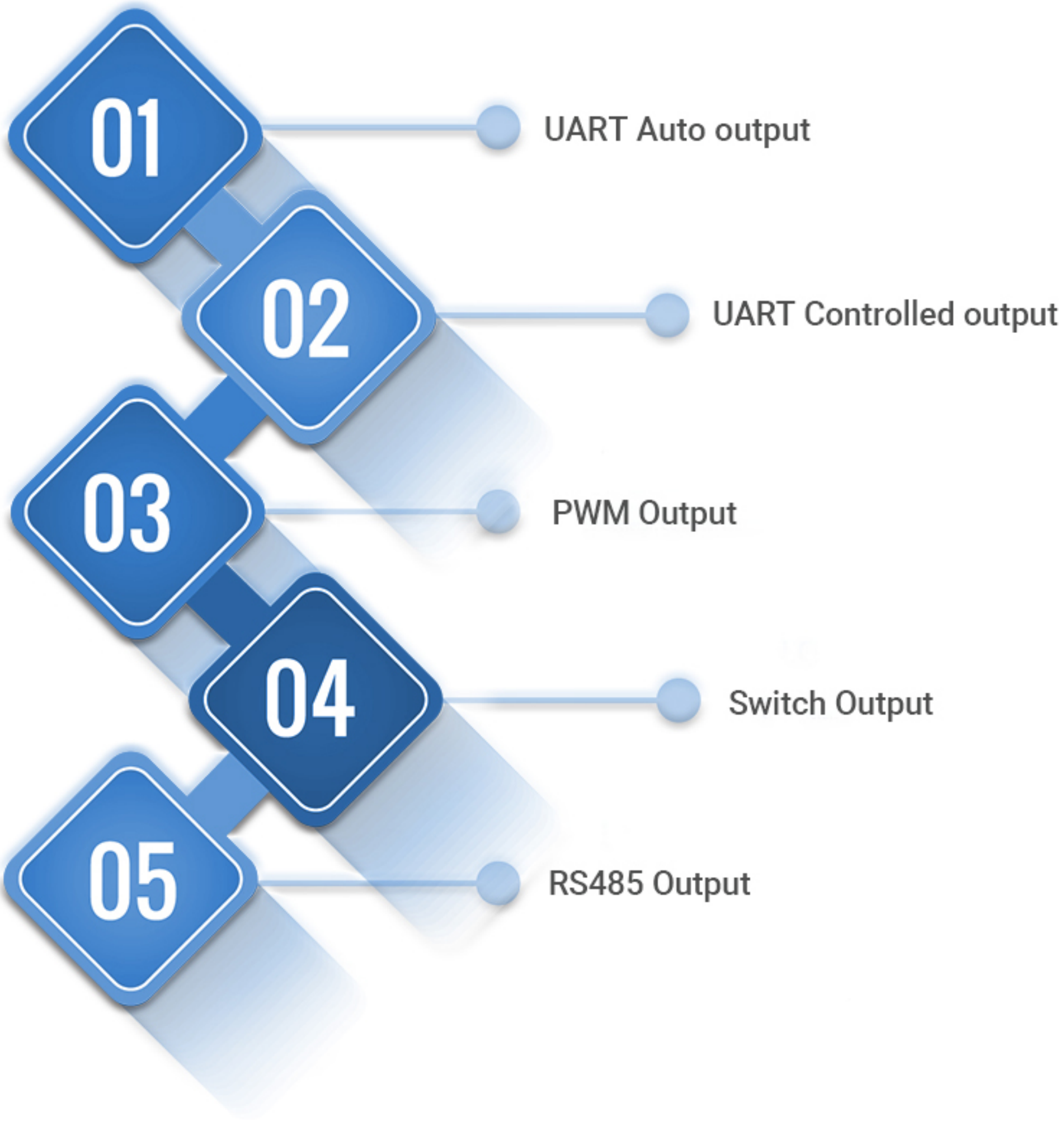
A20 Module Output Interface



1. UART Auto Output

(1) Pin definition

Pin No.	Mark	Pin description	Remark
①	VCC	Power input	
②	GND	GND	
③	RX	Processed value or Real time value output	(1)
④	TX	UART output	(1)

Note: The pin function setting followed customer's order, can't coexist with other output modes.

(2) UART instruction

When Pin(RX) is suspended or input high level, the module outputs processed value, the data is more stable, response time is 100-500ms.When the input is low level, the module outputs real-time value, the response time is 100ms.

UART	Data Bit	Stop Bit	Parity Bit	Baud Rate
TTL level	8	1	No	9600bps

(3) UART Output format

Data Frame	Description	Byte
Start Bit	0XFF OXFF	1byte
Data_H	High8 distance value	1byte
Data_L	Low8 distance value	1byte
SUM	Parity sum	1byte

(4) Example

Start Bit	Data_H	Data_L	SUM
0XFF	0X07	0XA1	0XA7

Remark: Parity sum only remain low8 value.

SUM =(start bit+ Data_H+ Data_L)&0x00FF

=(0XFF + 0X07 + 0XA1)&0x00FF

=0XA7

Distance value= Data_H*256+ Data_L=0X07A1;

Convert to decimal equal to 1953

Means current measurement distance value is 1953mm

2. UART Controlled Output

(1) Pin Definition

Pin No.	Mark	Pin description	Remark
①	VCC	Power input	
②	GND	GND	
③	RX	Trigger Signal input	(1)
④	TX	UART output	(1)

Note:

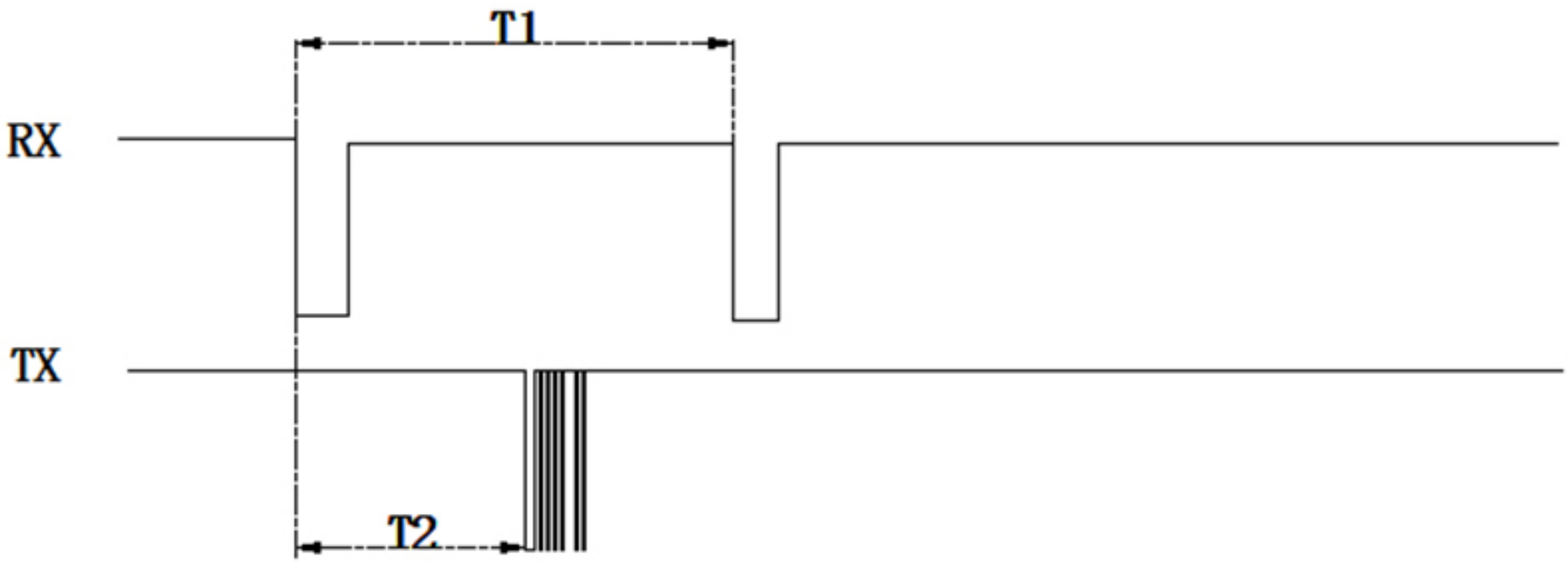
A.The pin function setting followed customer's order, can't coexist with other output modes.

(2) UART Instruction

When pin(RX) of the module receives a falling edge signal or any serial data, the module will perform a measurement, and the measured distance value will be output on pin(TX) after each measurement is completed. The trigger period of the module must be greater than 70ms.

UART	Data Bit	Stop Bit	Parity Bit	Baud Rate
TTL level	8	1	No	9600bps

(3) Timing Diagram



Remark: T1 >70ms T2=45~60ms

(4) UART Output format

Data Frame	Description	Byte
Start Bit	0XFF OXFF	1byte
Data_H	High8 distance value	1byte
Data_L	Low8 distance value	1byte
SUM	Parity sum	1byte

(5) Example

Start Bit	Data_H	Data_L	SUM
0XFF	0X07	0XA1	0XA7

Remark: Parity sum only remain low8 value.

SUM =(start bit+ Data_H+ Data_L)&0x00FF

=(0XFF + 0X07 + 0XA1)&0x00FF

=0XA7

Distance value= Data_H*256+ Data_L=0X07A1;

Convert to decimal equal to 1953

Means current measurement distance value is 1953mm

3. PWM Output

(1) Pin Definition

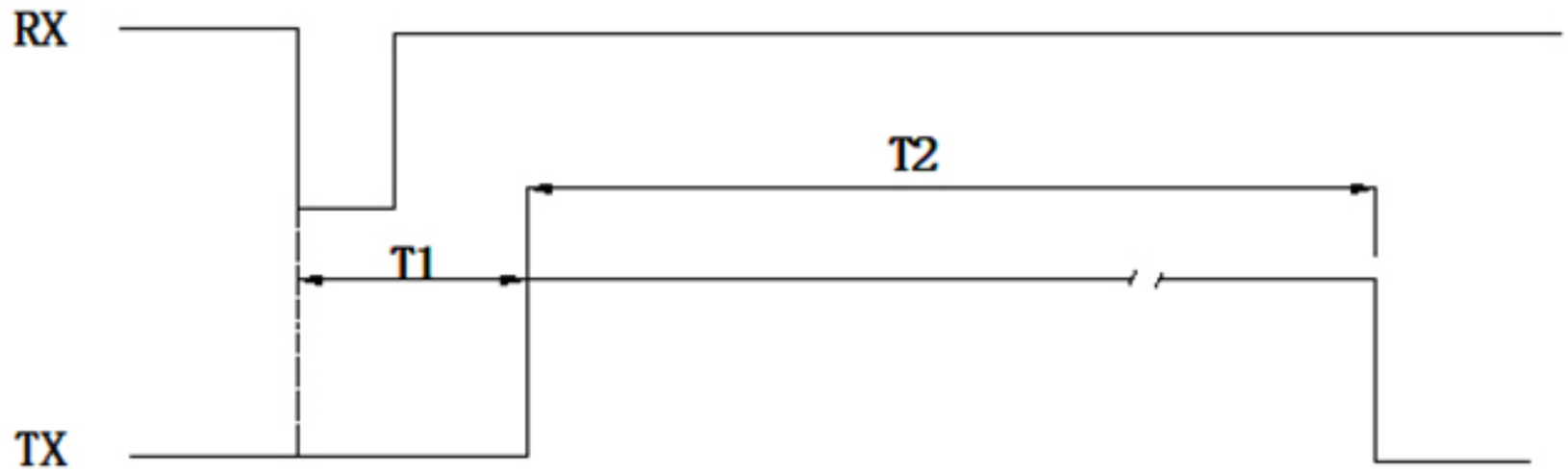
Pin No.	Mark	Pin description	Remark
①	VCC	Power input	
②	GND	GND	
③	RX	Trigger input	(1)
④	TX	PWM output	(1)

Remarks: The pin function corresponds to the output mode selected before ordering, and cannot coexist with the functions of other output modes.

(2) Instruction

The Pin(RX) of module receives a falling edge signal, the module will perform a measurement, and pin(TX) will output a TTL level PWM high-level pulse width signal. The trigger period of the module must be greater than 70ms. If the module does not detect an object, the pin(TX)will output a fixed pulse width of about 35ms.

(3) Timing Diagram



Remark: T1=10～17ms, Flat object mode: T2=0.18～35ms(Timing of PWM High-level pulse width)

(4) Formula

Formula: S=T*V/2 (S is the distance value, T is duration time of PWM high-level pulse width, the V is sound travel speed in the air). V is directly calculated at speed of 348m/S at room temperature. The simplified formula is S= T/57.5 (unit of S in centimeters and us of time T)

For example: The duration time(T3) of PWM high-level pulse width is 10000us, the S= T/57.5=10000/57.5≈173.9(cm), means 173.9cm distance value.

4. Switch Output

(1) Pin Definition

Pin No.	Mark	Pin description	Remark
①	VCC	Power input	
②	GND	GND	
③	RX	Switch negative output	(1)
④	TX	Switch positive output	(1)

Remarks: The pin function corresponds to the output mode selected before ordering, and cannot coexist with the functions of other output modes.

(2) Instruction

Factory setting a thresholds of 1.5 meter as default of this module. The module performs distance measurement every 100ms. When the distance value less than 1 meter, the Pin(TX) output high level, pin(RX) output low level.When the distance value is greater than 1.5 meter, the Pin(TX) output low level, pin(RX) output high level.

In order to improve stability, the factory defaults that when the distance value of the target is detected 3 times in a row is less than the set thresholds, it is determined that the detected target distance is less than the set thresholds. The distance value of the target detected 5 times in a row is greater than the set thresholds.

The Pin(TX) of the module only outputs high and low level signals without driving capability

(3) Threshold value setting

In order to allow users to flexibly adjust the threshold value in use, the module adds the function of modifying the threshold value through the serial port command within 400ms after power-on. through the pin(RX) to set threshold distance value.When the module threshold is set successfully, the pin(TX)returns to the successful threshold distance value.

UART	Data Bit	Stop Bit	Parity Bit	Baud Rate
TTL level	8	1	No	9600bps

Modify thresholds data format

Data Frame	Description	Byte
Start Bit	0XFB 0XFB	1byte
Command code	0X05 0X05	1byte
Data_H	High8 distance value	1byte
Data_L	Low8 distance value	1byte
SUM	Parity sum	1byte

Example

Start Bit	Command code	Data_H	Data_L	SUM
0XFB	0X05	0X03	0XE8	0XEB

Remark: Parity sum only remain low8 value.

Master: FB 05 03 E8 EB
Slave: FB 85 03 E8 00 6B
It means that the setting is successful, and the switch distance is set to 1000mm.
The threshold value range from 4-300cm.

5. RS485 Output

(1) Pin Definition

Pin No.	Mark	Pin description	Remark
①	VCC	Power input	
②	GND	GND	
③	RX	Switch negative output	(1)
④	TX	Switch positive output	(1)

Note: The pin function setting followed customer's order, can't coexist with other output modes.

(2) RS485 interface specification

Interface	Baud Rate	Data Bit	Stop Bit	Parity Bit
RS485	9600 bit/S	8	1	No

(3) RS485 Modbus protocol specification

Mode	Parity	Sensor Address	Read function code	Write function code
Modbus-RTU	CRC-16/MODBUS	Settable default 0x01	0x03	0x06

(4) RS485 Modbus protocol format

Sensor module as slave. Customer device as master.

Master request(Read):

Name	Address	Function code 0x03	Register address	Registers qty	CRC16 Parity
(Byte) Length(Byte)	1	1	2	2	2

Slave response(Read):

Name	Address	Function code 0x03	Response byte	Data zone	CRC16 Parity
(Byte) Length(Byte)	1	1	1	N	2

Master request(write):

Name	Address	Function code 0x06	Register address	Data zone	CRC16 Parity
(Byte) Length(Byte)	1	1	2	2	2

Slave response(write):

Name	Address	Function code 0x06	Register address	Data zone	CRC16 Parity
(Byte) Length(Byte)	1	1	2	2	2

(5) RS485 Modbus Register

Status	Register Address	Register Function	Type of Data	Description	Remark
Read-only	0x0100	Processing value	Unsigned, 16bit	Measurement start after received command, output distance value after algorithm processing. Unit mm, 500ms response time	
Read-only	0x0101	Real-time value	Unsigned, 16bit	The module start measuring after received command, directly output real time value, mm nit, 100ms response time.	
Read-only	0x0102	Temperature	Unsigned, 16bit	Unit is 0.1℃, 0.5℃ resolution, 100ms response time	
Read-only	0x0200	Slave address	Unsigned, 16bit	Range:0x00~0xFE, default 0x01, 0xFF as the broadcast address	

Remarks: The register data is the high byte first and the low byte last.

(6) Example

Example 1:Read processed value data

Master:01 03 01 00 00 01 85 F6

Slave=:01 03 02 02 F2 38 A1

Instruction: Sensor address is 0x01, process distance value is 0x02F2, convert to decimal is 754mm.

Example 2: Read real time value data

Master：01 03 01 01 00 01 D4 36

Slave=：01 03 02 02 EF F8 A8

Instruction：Sensor address is0x01，real time distance value is 0x02EF,convert to decimal is 751mm

Example 3: Read Temperature value data

Master:01 03 01 02 00 01 24 36

Slave:01 03 02 01 2C B8 09

Instruction: The sensor address is 0x01, Real time temperature value is 0x012C,convert to decimal is 30.0℃

Example 4: Modify slave address

Master: 01 06 02 00 00 05 48 71

Slave: 01 06 02 00 00 05 48 71

Instruction: The sensor address changed from 0x01 to 0x05.