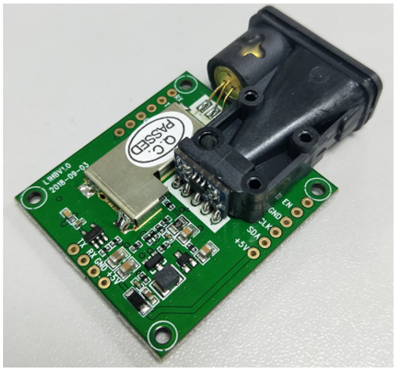
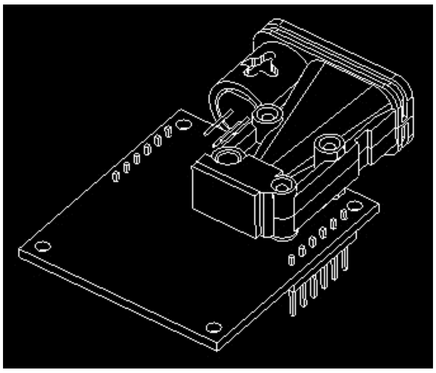
TW10S Laser ranging module specification v2.0

2019.07.21

Product Image

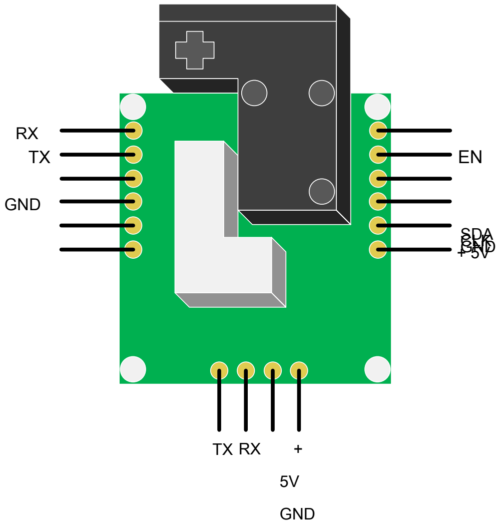




Features Description

1. By detecting the phase difference of the laser, the perceived object distance, can reach millimeter resolution;
2. Temperature adaptable, less drift amount;
3. High signal to noise ratio so that the color of the object, the surface roughness of the material, and less effect on the detection result;
4. Small size, easier to use;
5. 6PIN 2.54mm double pin / hole or 5PIN 2.54mm single pin / hole convenient way to use embedded on the motherboard.

Electrical wiring diagram



A. 6PIN 2.54mm double row pin / hole interfaces . Wherein the power interface: + 5VDC, GNDUART then

Mouth: 3.3V **LVTTL level** ,among them **RX** To receive, **TX** To transmit; two wire serial interface: CLK is the clock line,

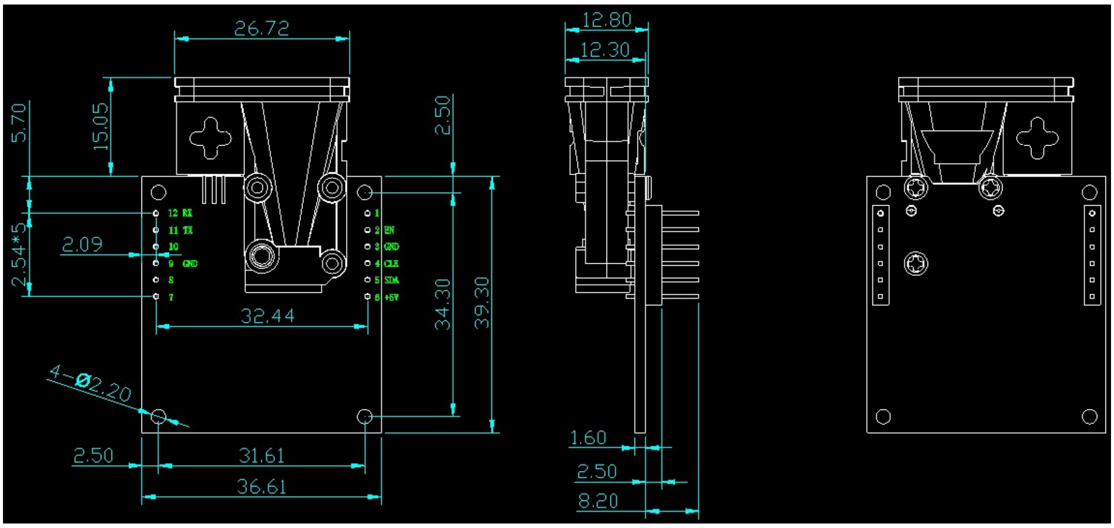
SDA data line;

B. 4PIN 2.54mm single pin / hole interface. Wherein the power interface: + 5VDC, GND UART interfaces:

3.3V **TTL level** ,among them **RX** To receive, **TX** To send; C. EN foot function,

please contact us FAE communication.

Dimensions



Specifications

Measuring range	0.05 ~ 40m * (1)
Resolution	1mm
measurement accuracy	± (1.5mm + D * 5 extreme) * (2)
The data output rate	Continuous measurement mode: 1 ~ 10Hz (typically 5Hz) fast continuous measurement mode: from about 10Hz / 20Hz / 30Hz * (3)
Laser Type	630 ~ 670nm, Class II, <1mW
Pilot Light	Red Laser
Mode of operation	Single data / continuous data / external trigger
Connector	6PIN 2.54mm double row pin / hole 5PIN 2.54mm single pin / hole
Data interface	**UART (3.3V LVTTL)**
letter of agreement	MODBUS_RTU ASCII CUSTOM_HEX
Power supply	+ 5VDC

Power	<0.6W
range of working temperature	- 15 ° ~ 50 °
Storage temperature	- 20 ° ~ 60 °
Storage humidity	RH85%

* (1) with highly reflective plate may measure a greater distance. It may be provided through the downlink instruction scale value and the maximum is 80 meters. * (2) in harsh environments, such as outdoors in the sun, the performance will be affected, with target plate may be used to improve performance. * (3) fast mode, the recycled light signal is weak, the error becomes large, there are certain requirements on the measurement target and the distance. Not suitable for outdoor use during the day.

letter of agreement

Baud Rate: 9600/19200/38400/115200, 38400 default format: 8n1

ASCII text communication protocol format

instruction	Features
iGET: X	Acquisition parameters
iSET: X, Y	Setting parameters
iSM	Single measurement
iACM	Continuous measurement
iFACM	Fast continuous measurement
iHALT	Stop measurement
iLD: X	Laser on / off

<CR> <LF>: represents a carriage return "\ r \ n".

Offset distance (iGET: 1 / iSET: 1, X)

² Get offset from Host] [iGET: 1 OFFSET = [L1] X <CR> <LF>

OK <CR> <LF>

² Disposed offset from Host]

[iSET: 1, X

[L1] OK <CR> <LF> wherein X Offset distance, in millimeters, the range of -10000 to 10000, default 0

ü For example

Disposed offset from -10 mm - iSET: 1, -10

Range (iGET: 2 / iSET: 2, X)

² Get range [Host]

iGET: 2

RANGE = [L1] X <CR> <LF> OK <CR> <LF>

² Set the range [Host]

iSET: 2, X

[L1] OK <CR> <LF> wherein X Value for the range, in millimeters, of 500 to 80,000, 40,000 default (40 m)

ü For example

Set the range 60 m - iSET: 2, 60,000

Baud rate (iGET: 3 / iSET: 3, X)

² Set the baud rate

[Host] iSET: 3, X

[L1] OK <CR> <LF> wherein X Baud rate, support 9600/19200/38400/57600/115200, default 38400

ü For example

Set the baud rate 9600 - iSET: 3, 9600

Protocol format type (iGET: 4 / iSET: 4, X)

² Get Protocol Type Host] [iGET: 4 [L1] PROTOCOL = X <CR> <LF>

OK <CR> <LF>

² Set the range [Host]

iSET: 4, X

[L1] OK <CR> <LF> wherein X Value protocol format type. 0 = MODBUS RTU protocol; 1 = ASCII protocol; 2 = HEX protocol; default is 1 = ASCII protocol;

NOTE: The parameter influences the power module status L1: Effective the protocol type format, then run on power-up initialization completion information output power and automatic measurement mode.

ü For example

Setting MODBUS RTU protocol - iSET: 4, 0

Output from a digital format (iGET: 5 / iSET: 5, X)

² Takes the output from the digital format Host] [iGET: 5 DATATYPE =

[L1] X <CR> <LF> OK <CR> <LF>

² Output from a digital format is provided Host]

[iSET: 5, X

[L1] OK <CR> <LF> wherein X It is output from a digital format definition. M bit units, three decimal places = 0; 1 = four decimal places; default = 0 to three decimal places;

ü For example

Set the output format of four decimal numbers from - iSET: 5, 1

Slave device address (iGET: 6 / iSET: 6, X)

² Slave device address acquiring Host] [iGET: 6 [L1] ADDRESS = X <CR>

<LF> OK <CR> <LF>

² Set Host slave device address []

iSET: 6, X

[L1] OK <CR> <LF> wherein X Is (involving MODBUS-RTU protocol) address of the slave device. Range 1 to 247. The factory default is 1

ü For example

Set slave device address 4 - iSET: 6, 4

Measuring output rate (iGET: 7 / iSET: 7, X)

² Host obtain measurement output rate] [iGET: 7 FREQUENCY = [L1] X <CR>

<LF> OK <CR> <LF>

² Measuring the output rate setting Host]

[iSET: 7, X

[L1] OK <CR> <LF> wherein X To measure the output rate. Support 10/20/30. The factory default is 30, represents the output rate of about 30HZ NOTE: The parameter measured in rapid succession and then the active mode.

ü For example

Measuring the output rate setting 20 - iSET: 7, 20

Automatic power measurement identity (iGET: 8 / iSET: 8, X)

² Get automatic power measurement identity Host] [iGET: 8 AUTMEAS =

[L1] X <CR> <LF> OK <CR> <LF>

² Automatically set the power measurement

identity Host] [iSET: 8, X

[L1] OK <CR> <LF> wherein X Power measurement is automatically identified. Range = 0 to 2.0 automatic power measurement is invalid; 1 = power measured automatically and continuously; 2 = measured power automatically in rapid succession; factory default is 0. Note: Automatic measuring electrical functions required to set the protocol format type (iSET: 4, X).

ü For example

Automatic power provided continuous measurement - iSET: 8, 1

Single measurement (the iSM)

Ø [Host] request iSM

[L1] D = normal response X m, N # <CR> <LF> E = error response Y <CR>

<LF> wherein X Distance information (e.g., one meter

-1.000);

N Is an amount of return light (e.g., 500);

Y Appendix illustrated as fault code (e.g., 258); a single

measurement is completed, the laser off.

ü For example

D = 1.314m, 520 # <CR> <LF> It represents a distance of 1.314 m, an amount of return light 520 E = 258 <CR>

<LF> Indicate out of range

Continuous measurement (IACM)

Ø [Host] request iACM

[L1] D = normal response X m, N # <CR> <LF> E = error response Y <CR>

<LF> Description resolved with a single measurement (the iSM)

NOTE: Host instruction sent once only, after the module is responsive L1 continuously measured and output information.

Fast continuous measurement (iFACM)

Ø [Host] request iFACM

[L1] D = normal response X m <CR> <LF>

E = error response Y <CR> <LF> wherein X Distance

information (e.g., one meter -1.000);

Y Fault code (e.g., 258) described in Appendix;

ü For example

D = 1.314m <CR> <LF> It represents a distance of 1.314 m, an amount of return light 520 E = 258 <CR>

<LF> Indicate out of range

NOTE: Host instruction sent once only, after the module is responsive L1, and outputs the measurement information in rapid succession.

Stop measurement (iHALT)

Ø [Host] request iHALT

[L1] response STOP <CR> <LF> OK <CR> <LF>

Continuous measurement or rapid continuous measurement mode, sends the command to stop the measurement, laser off.

Laser On Off (iLD: X)

Ø The laser is turned on

Host] [request iLD: 1

[L1] response LASER OPEN <CR> <LF> OK <CR> <LF>

Ø Laser close

[Host] request iLD: 0

[L1] response LASER CLOSE <CR> <LF> OK <CR> <LF>

MODBUS RTU communication protocol

Request Frame format				
1Byte	1Byte	2Bytes	2Bytes	2Bytes
address code	function code	initial address	Register number (N)	CRC

Response frame format				
normal				
1Byte	1Byte	1Bytes	2 * N Bytes	2Bytes
address code	function code	Byte count	Register values	CRC
abnormal				
1Byte	1Byte	1Bytes	2Bytes	
address code	error code	Exception code	CRC	
Exception code definition: 0x01: Error Function code 0x02: Error start address 0x03: Error Number Register 0x04: Error register value 0x05: CRC Error 0x06: Equipment Busy Example Error Code: 0x83 = Parameter + 0x80				

CRC code calculation: the calculation range from the CRC code start address to the end of the bytes of the CRC, the CRC16 of the first 8-bit byte, the upper eight bits after. See Appendix

Measurement distance: register address and data format

Register Address Register	Description	Return value data format
0x00 0x0F	Measure the distance	4Bytes measured distance (high front and low at the rear)

Example:

Read the measured distance

Description Function code address code starting address register number CRC

Send: 0x01 0x03 0x00 0x0F 0x00 0x02 0xF4 0x08

Normal response (as measured from 57.505m):

description Address code Function Code 1 byte count register value of the register 2 CRC value

Normal response: 0x01 0x03 0x04 0x00 0x00 0xE0 0xA1 0x72 0x4B

Note (from the entry instruction is 4 bytes, 0x00 0x00 0xE0 0xA1, distance 0x0000E0A1, converted to decimal 57505mm) normal response:

0x01	0x03	0x04	0x80 0x00	0x01 0x05	0x12 0x60

Note distance (this entry instruction is 4 bytes, 0x80 0x00 0x01 0x05, the highest bit is 1 indicates a measurement fault, the fault code 0105H = 261,

Indicate out of range)

If the start address of an error response is as follows:

description	Address code error code Exception code CRC				
Error response:	0x01	0x83	0x02	0xC0 0xF1	(Start address wrong)

Note: MODBUS RTU communication protocol details, please contact us

CUSTOM HEX communication protocol

Request Frame format				
Header		data		check
1Byte	1Byte	1Byte	1Bytes	1Bytes
Header 1	Header 2	function code	Parameter (standby)	BCC
A5	5A	02- single measurement continuous measurement 04- 03- 05- rapid continuous measurement Stop measurement	00	XOR checksum: header + Data
Response frame format				
Header		data		check
1Byte	1Byte	1Byte	4Bytes	1Bytes
Header 1	Header 2	function code	Distance values or fault codes	BCC
B4	69	Normal: Function code error: 0x80 | function code	Endian	XOR checksum: header + Data

NOTE: CUSTOM HEX communication protocol does not support parameter Gets or sets

Single measurement

Function Code: 02

[Host] request: A5 5A 02 00 FD

[L1] normal response: B4 69 02 00 00 01 90 4E

Error response: B4 69 82 00 00 01 02 5C

² Normal response, 00,000,190 distance measurement value, 0x00000190 (hexadecimal) = 400 (X Hexadecimal), that is 400mm.

² Error response, the function code 82 indicates a high level of fault, the fault code is 0x00000102 (hexadecimal Ltd.) = 258 (decimal), indicates out of range (see Appendix fault code instructions)

Continuous measurement

Function code: 03

[Host] request: A5 5A 03 00 FC

[L1] normal response: B4 69 03 00 00 01 90 4F

Error response: B4 69 83 00 00 01 02 5D resolved with the "single measurement"

Fast continuous measurement

Function code: 04

[Host] request: A5 5A 04 00 FB

[L1] normal response: B4 69 04 00 00 01 90 48

Error response: B4 69 84 00 00 01 02 5A resolved with the "single measurement"

NOTE: As the protocol does not operate parameters, can be measured by the rate set ASCII text protocol.

Stop measurement

Function Code: 05 [Host] request: A5 5A 05 00 FA

[L1] reply: B4 69 05 00 00 00 00 D8 stop the measurement, the laser is turned off.

appendix

CRC check

/ * CRC High byte value table * / const

u8 auchCRCHi [] = {

0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80,0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,

```
0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81,

0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,

0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,

0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,

0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,

0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,

0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00,

0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,

0x81, 0x40};
```

```
/ * CRC Low byte value table * / const

u8 auchCRCLo [] = {

0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05, 0xC5, 0xC4, 0x04, 0xCC,

0x0C, 0x0D, 0xCD, 0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09, 0x08, 0xC8, 0xD8, 0x18,

0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C, 0xDC, 0x14, 0xD4, 0xD5,

0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3, 0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33,

0xF3, 0xF2, 0x32, 0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E,

0xFE, 0xFA, 0x3A, 0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA,

0xEE, 0x2E, 0x2F, 0xEF, 0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26, 0x22,

0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1, 0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7,

0x67, 0xA5, 0x65, 0x64,0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F, 0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB,

0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA, 0xBE, 0x7E, 0x7F, 0xBF, 0x7D,

0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5, 0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70,

0xB0, 0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C,

0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49,

0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C, 0x44, 0x84, 0x85, 0x45, 0x87,

0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40};0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,

0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x91, 0x51, 0x93, 0x53,

0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E,

0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E,

0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C, 0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83,

0x41, 0x81, 0x80, 0x40};0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5, 0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3,

0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55,

0x95, 0x94, 0x54, 0x9C, 0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58,

0x98, 0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C, 0x44,

0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40};0x4E, 0x8E, 0x8F,

0x4F, 0x8D, 0x4D, 0x4C, 0x8C, 0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41,

0x81, 0x80, 0x40};0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C, 0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46,

0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40};
```

```
u16 CRC16 (u8 * Start_Byte, u16 Num_Bytes) {
    u8 uchCRCHi = 0xFF;                 // CRC high byte initialization

    u8 uchCRCLo = 0xFF;                 // CRC low byte initialization

    u16 uIndex;                         // CRC lookup table pointer

    while (Num_Bytes--) {

        uIndex = uchCRCLo ^ * Start_Byte ++;          // CRC calculation

        uchCRCLo = uchCRCHi ^ auchCRCHi [uIndex]; uchCRCHi

      = auchCRCLo [uIndex];}

    return (uchCRCHi << 8 | uchCRCLo);}
```

BCC XOR checksum

```
u8 BCC (u8 * dat, u16 len) {

    u8 i; u8 bcc = 0; for (i = 0; i

    <len; i ++) {

        bcc ^ = dat [i];}

    return bcc;}
```

error code		
Decimal	Hex	Explanation
0	0	No error
140	8C	CUSTOM HEX protocol function code error
141	8D	CUSTOM HEX protocol checksum error
142	8E	CUSTOM HEX protocol parameter error
252	FC	Temperature is too high
253	FD	Temperature is too low
255	FF	Calculation failed or weak reflection
256	100	Strong reflections
258	102	Out of range
285	11D	Abnormal photosensitive device
286	11E	Laser tube abnormalities
290	122	Hardware exception

MODBUS_RTU exception code	
0	No error
0x01	Function code error
0x02	Starting address error
0x03	Register the number of errors
0x04	Register value error
0x05	CRC error
0x06	Heavy equipment