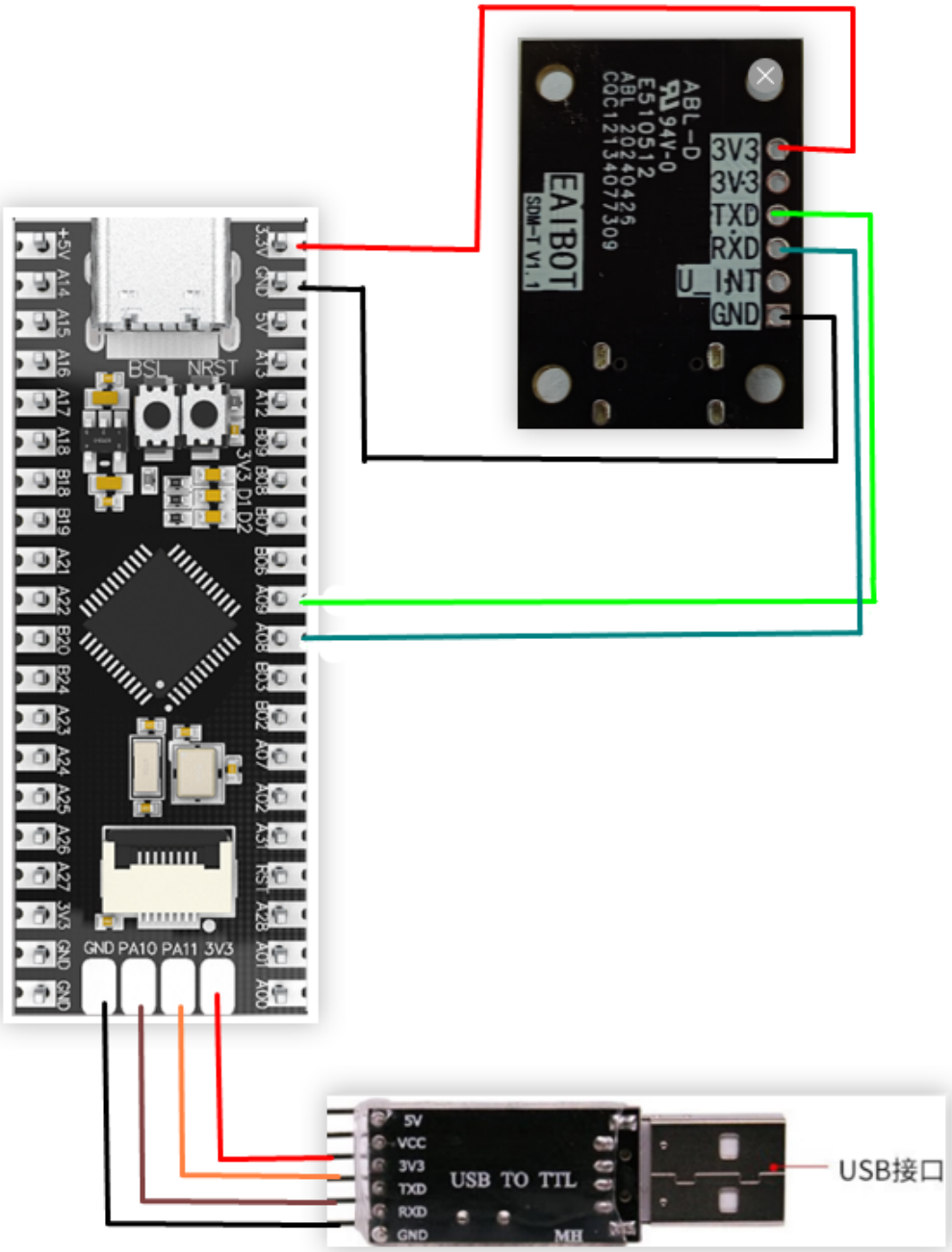
Single point laser ranging

1. Learning Objectives

The distance is measured by a single-point laser ranging module and printed to the computer's serial port assistant through the serial port.

2. Hardware Connection

Single-point laser ranging module, USB to TTL and MSPM0G3507 wiring



Note: If you don't have a TTL module, you can also use the type-c serial port directly

3. Explanation of some important parameters of SDM18

1. The SDM18 interface is shown in the figure:
   The external physical interface terminal of SDM18 is WF08006, which realizes system power supply and data communication functions.

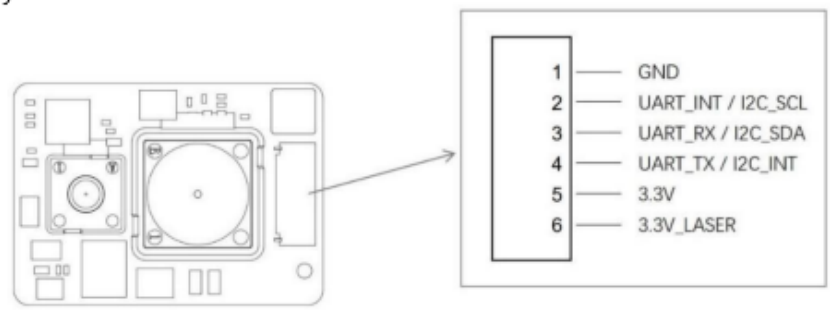


Figure 2 YDLIDAR SDM18 physical interface

2. Serial port default configuration
   The default baud rate of SDM18 is 921600

Interface	Min	Typical	Max	Unit	Remarks
UART	9600	921600	921600	bps	Signal level 3.3V, 8-bit data bit,1 stop bit, no parity

3. Important protocol commands based on the serial port (all sent in hexadecimal format)
   The default mode of SDM18 when powered on is idle mode. If you want to perform ranging, you must first issue the ranging command.

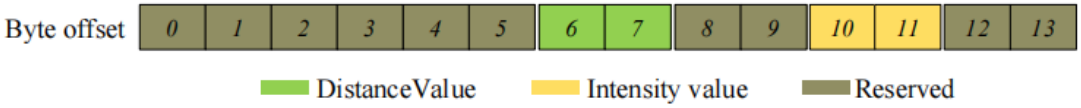
- Start ranging:A5 03 20 01 00 00 00 02 6E
- Stop ranging:A5 03 20 02 00 00 00 46 6E
- Protocol analysis of receiving ranging

Packet Header	Device Number	Device Type	Command Type	Reserved Bit	Data Length	Data Segment	CheckSum
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes	N Bytes	2 Bytes

Reply:

Packet heade	Device number	Device type	Command type	Reserved bit	Data length	Data segment	CheckSum
0xA5	0x03	0x20	0x01	0x00	0x00 00	.. ..	CRC16

The equipment contains: A5 03 20 01 00 00 0E FF FF FF FF FF FF F6 06 42 00 74 26 01 00 0B 44, the data length = 0x00 0E, i.e. the data parameter 14; the data parameter FF FF FF FF FF FF F6 06 42 00 74 26 01 00, which satisfies the following data structure:



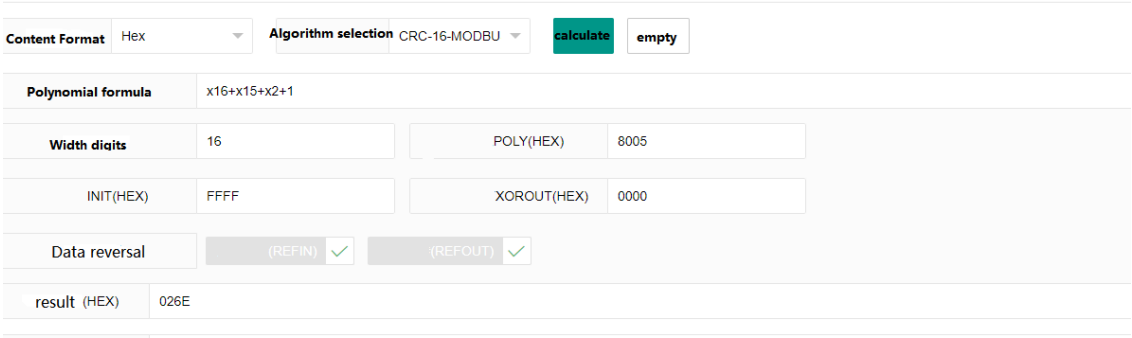
F6 06: distance value is **0x06f6 = 1782 mm**

74 26: strength value is **0x2674 = 9844**

4. Calculation of checksum
   The checksum is calculated using the CRC-16-modelbus method, and all bytes except the check digit are calculated. The following figure shows the check digit calculation result of the

commandStart Distance Measurement

A5 03 20 01 00 00 00



Other protocols will not be explained. If you are interested, you can refer to the **SDM18 Development Manual**

4. Program Description

- usart.c

```
void USART_Init(void)
{
    // SYSCFG初始化
    // SYSCFG initialization
    SYSCFG_DL_init();
    //清除串口中断标志
    //Clear the serial port interrupt flag
    NVIC_ClearPendingIRQ(UART_0_INST_INT_IRQN);
    //使能串口中断
    //Enable serial port interrupt
    NVIC_EnableIRQ(UART_0_INST_INT_IRQN);

    NVIC_ClearPendingIRQ(UART_1_INST_INT_IRQN);
    NVIC_EnableIRQ(UART_1_INST_INT_IRQN);

}

//USART1发送一个字符
//USART1 sends a character
void USART1_Send_U8(uint8_t data)
{
    //当串口1忙的时候等待
    //Wait when serial port 1 is busy
    while( DL_UART_isBusy(UART_1_INST) == true );
    //发送 Send
    DL_UART_Main_transmitData(UART_1_INST, data);;
}

//串口1发送N个字符
//Serial port 1 sends N characters
void USART1_Send_ArrayU8(uint8_t *pData, uint16_t Length)
{
    while (Length--)
    {
        USART1_Send_U8(*pData);
```

```
        pData++;
    }
}

//串口的中断服务函数
//Serial port interrupt service function
void UART_0_INST_IRQHandler(void)
{
    uint8_t receivedData = 0;

    //如果产生了串口中断
    //If a serial port interrupt occurs
    switch( DL_UART_getPendingInterrupt(UART_0_INST) )
    {
        case DL_UART_IIDX_RX://如果是接收中断  If it is a receive interrupt

            // 接收发送过来的数据保存  Receive and save the data sent
            receivedData = DL_UART_Main_receiveData(UART_0_INST);

            if((recv0_length&0x8000)==0)//接收未完成 Receiving is not completed
            {
            if(recv0_length&0x4000)//接收到了0x0d   Received 0x0d
                {
                if(receivedData!=0x0a)recv0_length=0;//接收错误,重新开始    Receive
error, restart
                else recv0_length|=0x8000;  //接收完成了 Receiving completed
                }
            else //还没收到0X0D Haven't received 0X0D yet
                {
                if(receivedData==0x0d)recv0_length|=0x4000;
                else
                    {
                    recv0_buff[recv0_length&0X3FFF]=receivedData ;
                    recv0_length++;
                    if(recv0_length>(RE_0_BUFF_LEN_MAX-1))recv0_length=0;//接收数
据错误,重新开始接收    Receive data error, restart receiving
                    }
                }
            }

            break;

        default://其他的串口中断   Other serial port interrupts
            break;
    }
}

//串口1的中断服务函数
//Interrupt service function of serial port 1
void UART_1_INST_IRQHandler(void)
{
    uint8_t receivedData = 0;

    //如果产生了串口中断
    //If a serial port interrupt occurs
    switch( DL_UART_getPendingInterrupt(UART_1_INST) )
    {
        case DL_UART_IIDX_RX://如果是接收中断  If it is a receive interrupt
```

```
        // 接收发送过来的数据保存
        //Receive and save the data sent
        receivedData = DL_UART_Main_receiveData(UART_1_INST);
        SDM18_Decode(receivedData);
        break;

        default://其他的串口中断    Other serial port interrupts
            break;
    }
}
```

- USART_Init: Initialization function of serial port 0 and serial port 1.
- USART1_Send_U8, USART1_Send_ArrayU8: Send function of serial port 1, used to send instructions to SDM18.
- UART_0_INST_IRQHandler: Receive interrupt of serial port 0, after receiving data, it can be printed on the serial port assistant.
- UART_1_INST_IRQHandler: Receive interrupt of serial port 1, used to receive data sent by SDM18 and check it.

- empty.c

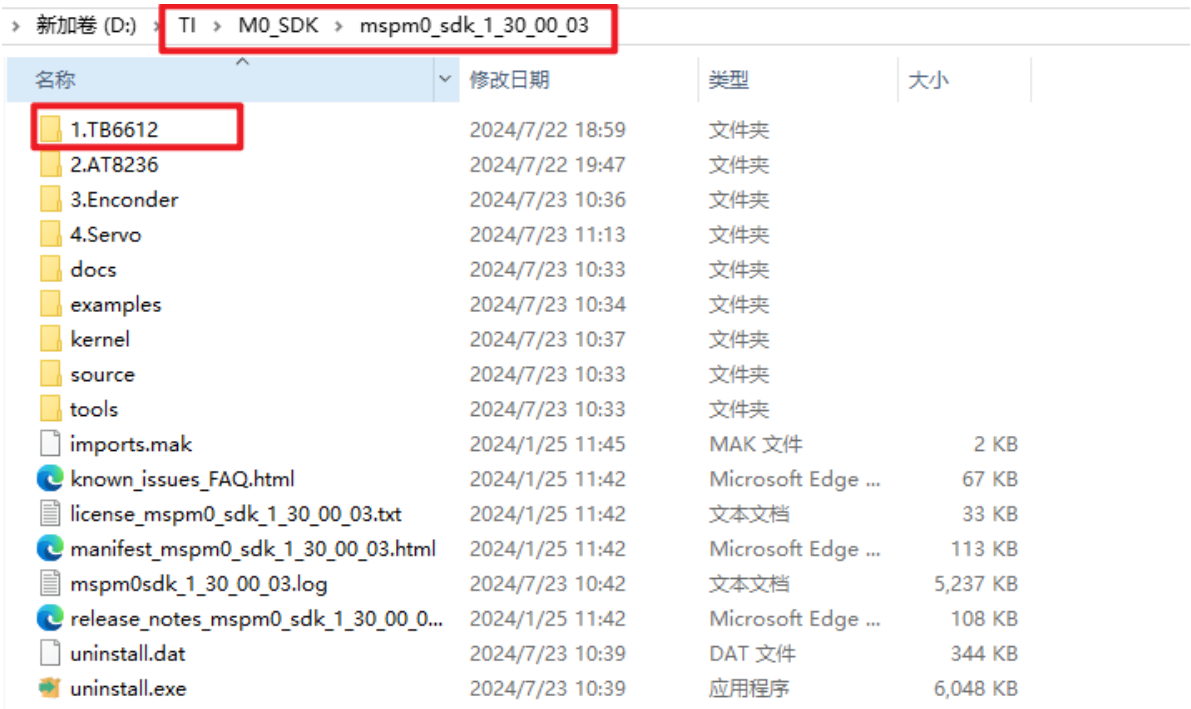
```
int main(void)
{
    USART_Init();
    printf("waiting for SDM18 start work!\r\n");
    SMD18_init(B921600);//SDM18初始化  SDM18 Initialization
    while(1)
    {
        //stop_scan();
        if(newlines == 1)
        {
            newlines = 0;//清掉它  Clear it
            //打印信息  Print information
            print_message();
            delay_ms(50);
        }

    }
}
```

Initialize the serial port and SDM18, and print the measurement data transmitted by SDM18 on the serial port every 50 milliseconds.

Note: The project source code must be placed in the SDK path for compilation.

For example, the path:D:\TI\M0_SDK\mspm0_sdk_1_30_00_03\1.TB6612



5. Experimental Phenomenon

Burn the program to MSPM0G3507, connect the wires according to the wiring diagram. Close other programs occupying the serial port, open the serial port assistant on the computer, select the serial port number, and set the baud rate to 115200. In the serial port assistant, you can see the printed distance data in millimeters (mm) and intensity information

Effect picture:

```
[2024-12-14 12:39:53.754]# RECV ASCII>
dis = 194mm      , strength = 9125


[2024-12-14 12:39:54.323]# RECV ASCII>
dis = 188mm      , strength = 9880


[2024-12-14 12:39:54.894]# RECV ASCII>
dis = 102mm      , strength = 9845


[2024-12-14 12:39:55.466]# RECV ASCII>
dis = 142mm      , strength = 9873


[2024-12-14 12:39:56.037]# RECV ASCII>
dis = 167mm      , strength = 9880


[2024-12-14 12:39:56.606]# RECV ASCII>
dis = 133mm      , strength = 9880
```