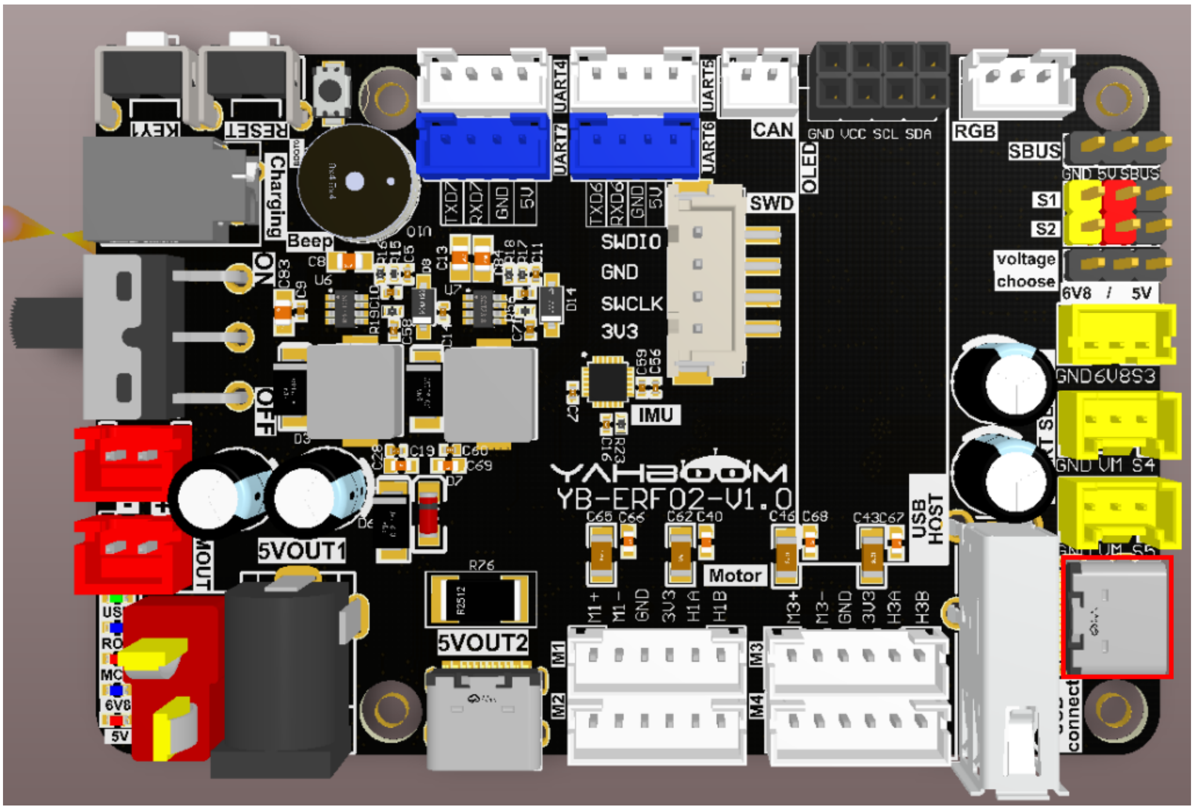
Serial communication

1. Experimental Purpose

Use the serial port on the STM32 control board to learn how to receive and send data.

2. Hardware Connection

As shown in the figure below, the CP2104 serial port chip is an onboard component, so no external devices are required. Please connect the Type-C data cable between the computer and the USB Connect port on the STM32 control board.



If the CP2104 serial port driver is not installed, please open the browser and enter the following URL to download, decompress and install it.

```
https://www.silabs.com/documents/public/software/CP210x_Windows_Drivers.zip
```

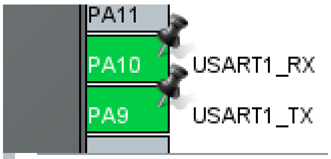
3. Core code analysis

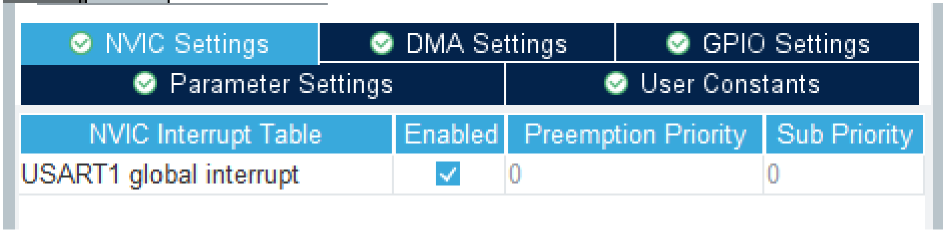
The path corresponding to the program source code is:

```
Board_Samples/STM32_Samples/Uart
```

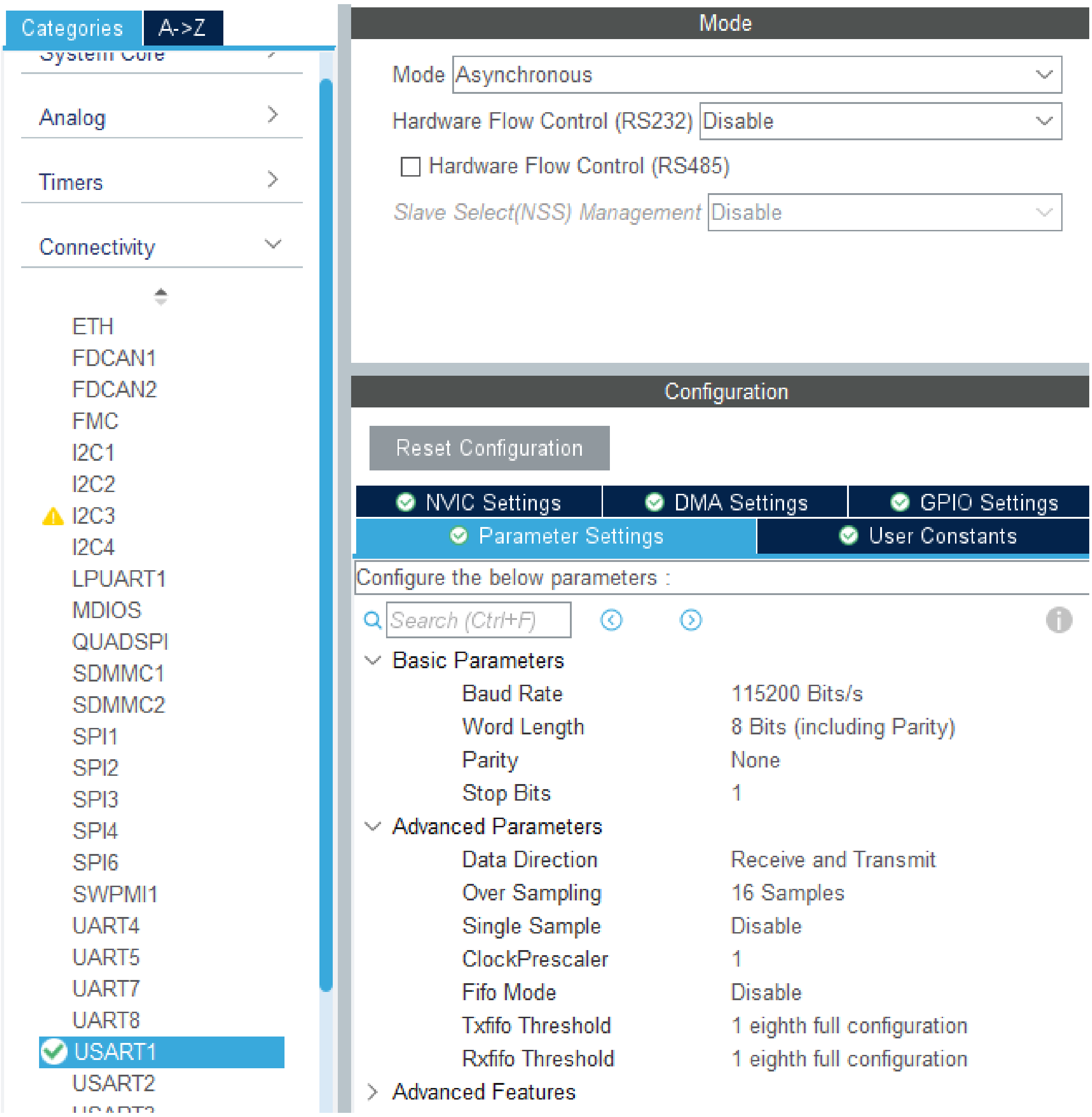
Here we take serial port 1 as an example. UART1_TXD of serial port 1 corresponds to hardware PA9, UART1_RXD corresponds to hardware PA10, and the baud rate is set to 115200, 8-bit data, 1 stop bit, and no parity check.

Note: PA9/PA10 can also be used as multiplexed pins, redirecting their function to the low-power serial port LPUART1.





NVIC Interrupt Table	Enabled	Preemption Priority	Sub Priority
USART1 global interrupt	☑	0	0



Mode

Mode Asynchronous

Hardware Flow Control (RS232) Disable

□ Hardware Flow Control (RS485)

Slave Select(NSS) Management Disable

Configuration

Configure the below parameters :

Basic Parameters

Baud Rate	115200 Bits/s
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters

Data Direction	Receive and Transmit
Over Sampling	16 Samples
Single Sample	Disable
ClockPrescaler	1
Fifo Mode	Disable
Txfifo Threshold	1 eighth full configuration
Rxfifo Threshold	1 eighth full configuration

Advanced Features

```
void MX_USART1_UART_Init(void)
{
  /* USER CODE BEGIN USART1_Init 0 */

  /* USER CODE END USART1_Init 0 */

  /* USER CODE BEGIN USART1_Init 1 */

  /* USER CODE END USART1_Init 1 */
  huart1.Instance = USART1;
  huart1.Init.BaudRate = 115200;
  huart1.Init.WordLength = UART_WORDLENGTH_8B;
  huart1.Init.StopBits = UART_STOPBITS_1;
  huart1.Init.Parity = UART_PARITY_NONE;
  huart1.Init.Mode = UART_MODE_TX_RX;
  huart1.Init.HwFlowCtl = UART_HWCONTROL_NONE;
  huart1.Init.OverSampling = UART_OVERSAMPLING_16;
  huart1.Init.OneBitSampling = UART_ONE_BIT_SAMPLE_DISABLE;
  huart1.Init.ClockPrescaler = UART_PRESCALER_DIV1;
  huart1.AdvancedInit.AdvFeatureInit = UART_ADVFEATURE_NO_INIT;
  if (HAL_UART_Init(&huart1) != HAL_OK)
  {
    Error_Handler();
  }
  if (HAL_UARTEx_SetTxFifoThreshold(&huart1, UART_TXFIFO_THRESHOLD_1_8) !=
HAL_OK)
  {
    Error_Handler();
  }
  if (HAL_UARTEx_SetRxFifoThreshold(&huart1, UART_RXFIFO_THRESHOLD_1_8) !=
HAL_OK)
  {
    Error_Handler();
  }
  if (HAL_UARTEx_DisableFifoMode(&huart1) != HAL_OK)
  {
    Error_Handler();
  }
  /* USER CODE BEGIN USART1_Init 2 */

  /* USER CODE END USART1_Init 2 */
}
```

Redefine the printf function to print data to serial port 1.

```
int _write(int file, char*p, int len)
{
  HAL_UART_Transmit(&huart1, (uint8_t *)p, len, 0xFFFF);
  return len;
}
```

Enable serial port interrupt request data.

```
HAL_UART_Receive_IT(&huart1, (uint8_t *)&RxTemp, 1);
```

Receive serial port data and then print it out through the serial port.

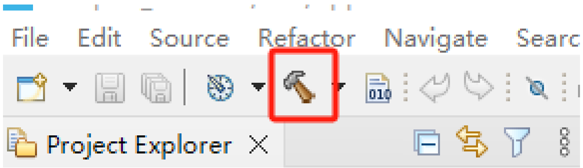
```
void HAL_UART_RxCpltCallback(UART_HandleTypeDef *huart)
{
    /* Prevent unused argument(s) compilation warning */
    UNUSED(huart);
    /* NOTE: This function should not be modified, when the callback is needed,
              the HAL_UART_RxCpltCallback can be implemented in the user file
     */
    // Test sending data. In actual application, data should not be sent in
interruption
    // Test sending data. In practice, data should not be sent during interrupts

    HAL_UART_Transmit(&huart1, (uint8_t *)&RxTemp, 1, 0xFFFF);

    // Continue receiving data
    HAL_UART_Receive_IT(&huart1, (uint8_t *)&RxTemp, 1);
}
```

Loop function that prints a string of characters every second.

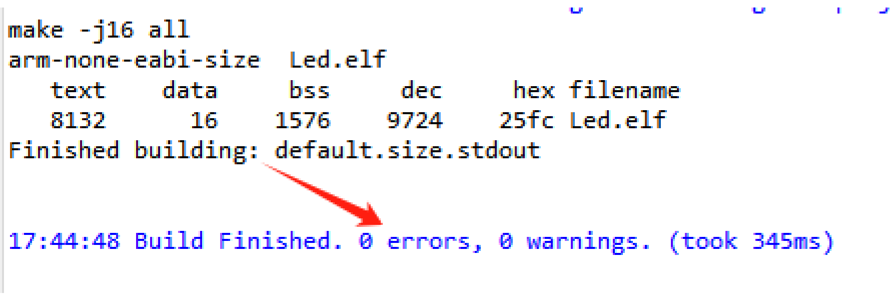
```
while (1)
{
    print_count++;
    if (print_count % 100 == 0)
    {
        printf("count:%d\n", print_count/100);
    }
    App_Led_Mcu_Handle();
    HAL_Delay(10);
}
```

4. Compile, download and burn firmware

Select the project to be compiled in the file management interface of STM32CUBEIDE and click the compile button on the toolbar to start compiling.



If there are no errors or warnings, the compilation is complete.



```
make -j16 all
arm-none-eabi-size  Led.elf
   text    data     bss     dec     hex filename
   8132      16    1576    9724    25fc Led.elf
Finished building: default.size.stdout


17:44:48 Build Finished. 0 errors, 0 warnings. (took 345ms)
```

Press and hold the BOOT0 button, then press the RESET button to reset, release the BOOT0 button to enter the serial port burning mode. Then use the serial port burning tool to burn the firmware to the board.

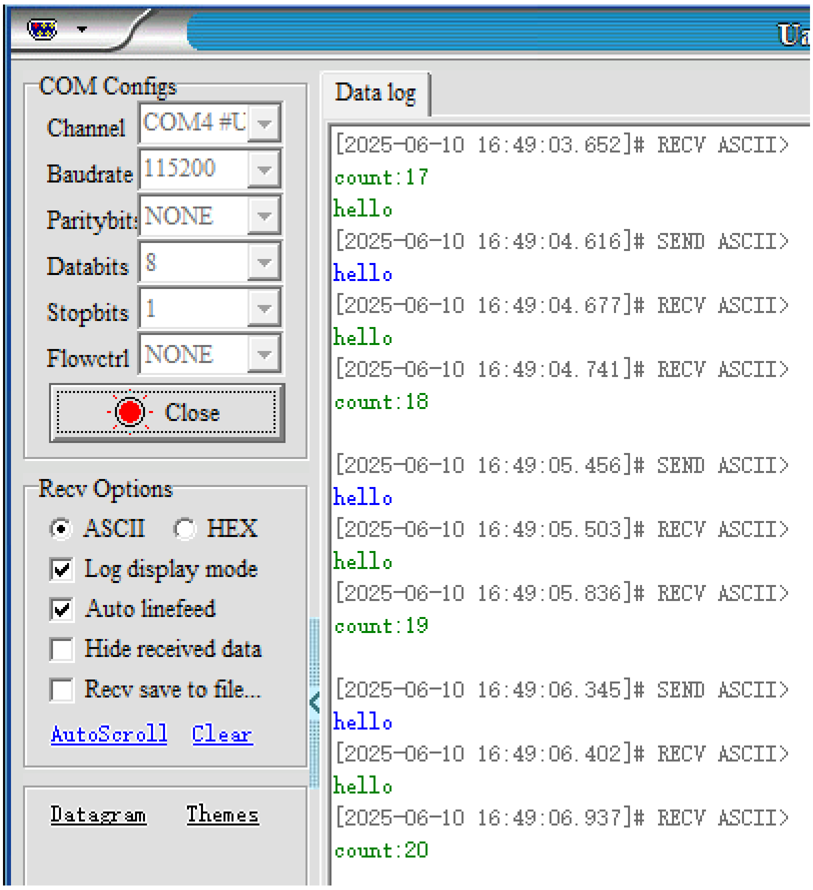
If you have STlink or JLink, you can also use STM32CUBEIDE to burn the firmware with one click, which is more convenient and quick.

5. Experimental Results

The MCU_LED light flashes every 200 milliseconds.

Connect the control board to the computer via a Type-C data cable, open the serial port assistant (specific parameters are shown in the figure below), and you can see that the serial port assistant will display print count:xx, and the count value will automatically increase by 1 per second.

The serial port assistant sends the character hello, and the expansion board will automatically return the character hello.



COM Configs

Channel COM4 #U

Baudrate 115200

Paritybit NONE

Databits 8

Stopbits 1

Flowctrl NONE

Recv Options

● ASCII ○ HEX

☑ Log display mode

☑ Auto linefeed

□ Hide received data

□ Recv save to file...

```
[2025-06-10 16:49:03.652]# RECV ASCII>
count:17
hello
[2025-06-10 16:49:04.616]# SEND ASCII>
hello
[2025-06-10 16:49:04.677]# RECV ASCII>
hello
[2025-06-10 16:49:04.741]# RECV ASCII>
count:18

[2025-06-10 16:49:05.456]# SEND ASCII>
hello
[2025-06-10 16:49:05.503]# RECV ASCII>
hello
[2025-06-10 16:49:05.836]# RECV ASCII>
count:19

[2025-06-10 16:49:06.345]# SEND ASCII>
hello
[2025-06-10 16:49:06.402]# RECV ASCII>
hello
[2025-06-10 16:49:06.937]# RECV ASCII>
count:20
```