Experiment 5

Title: Transmitting and Receiving Messages using UART communication

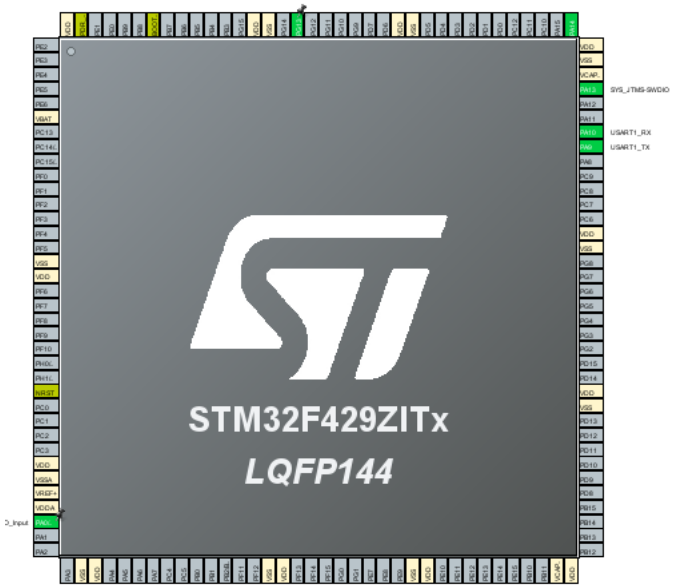
Aim: Transmitting and Receiving Messages using UART communication (If switch is pressed display message LED is on otherwise display message LED is off)

Tool used: Tool used for this assignment is **STM32CubeIDE**.

Procedure:

1. Create a new STM32 project with a suitable project name.
2. IOC UI will open in that configure desired pins as input/output.
3. In system core select SYS.
4. In Mode select debug as serial wire.
5. In connectivity select USART1(mode asynchronous) and in parameter settings make baud rate 9600 bits/sec.
6. Select PA0 as input(switch) and PG13 as LED.
7. Press Ctrl+S to generate the code.
8. In the main.c file add the desired code.
9. Go to Project-> Build Project
10. Connect the discovery Board and go to Run-> Run.

CubeMX pin diagram:



Code:

```
/* USER CODE BEGIN Header */
/**

******************************************************************************
***
  * @file           : main.c
  * @brief          : Main program body

******************************************************************************
***
  * @attention
  *
  * Copyright (c) 2023 STMicroelectronics.
  * All rights reserved.
  *
  * This software is licensed under terms that can be found in the LICENSE file
  * in the root directory of this software component.
  * If no LICENSE file comes with this software, it is provided AS-IS.
  *

******************************************************************************
***
  */
/* USER CODE END Header */
/* Includes ------------------------------------------------------------------*/
#include "main.h"

/* Private includes ----------------------------------------------------------*/
/* USER CODE BEGIN Includes */

/* USER CODE END Includes */

/* Private typedef -----------------------------------------------------------*/
/* USER CODE BEGIN PTD */

/* USER CODE END PTD */

/* Private define ------------------------------------------------------------*/
/* USER CODE BEGIN PD */

/* USER CODE END PD */

/* Private macro -------------------------------------------------------------*/
/* USER CODE BEGIN PM */

/* USER CODE END PM */

/* Private variables ---------------------------------------------------------*/
```

```
UART_HandleTypeDef huart1;

/* USER CODE BEGIN PV */

/* USER CODE END PV */

/* Private function prototypes -----------------------------------------------*/
void SystemClock_Config(void);
static void MX_GPIO_Init(void);
static void MX_USART1_UART_Init(void);
/* USER CODE BEGIN PFP */

/* USER CODE END PFP */

/* Private user code ---------------------------------------------------------*/
/* USER CODE BEGIN 0 */
unsigned char MSG1[]="STM32 Sending Data \r\n";
unsigned char MSG2[]="Received the string \r\n";
unsigned char MSG3[]="\r\n";
unsigned char MSG4[]="Switch is pressed \r\n";
unsigned char MSG5[]="LED is On  \r\n";
unsigned char MSG6[]="LED is Off \r\n";
unsigned char RX_BUFFER[30];
unsigned char RX_Success;
/* USER CODE END 0 */

/**
  * @brief  The application entry point.
  * @retval int
  */
int main(void)
{
  /* USER CODE BEGIN 1 */

  /* USER CODE END 1 */

  /* MCU Configuration--------------------------------------------------------*/

  /* Reset of all peripherals, Initializes the Flash interface and the Systick. */
  HAL_Init();

  /* USER CODE BEGIN Init */

  /* USER CODE END Init */

  /* Configure the system clock */
  SystemClock_Config();

  /* USER CODE BEGIN SysInit */
```

```
  /* USER CODE END SysInit */

  /* Initialize all configured peripherals */
  MX_GPIO_Init();
  MX_USART1_UART_Init();
  /* USER CODE BEGIN 2 */

  /* USER CODE END 2 */

  /* Infinite loop */
  /* USER CODE BEGIN WHILE */
  //HAL_UART_Transmit(&huart1,MSG1,21,100);
  while (1)
  {
    /* USER CODE END WHILE */
     if(HAL_GPIO_ReadPin(GPIOA,GPIO_PIN_0)==1)
     {
          HAL_UART_Transmit(&huart1,MSG4,20,100);
     }
     RX_Success=HAL_UART_Receive(&huart1,RX_BUFFER,1,500);

     /*if(RX_Success==HAL_OK)
     {
          HAL_UART_Transmit(&huart1,MSG2,22,100);
          HAL_UART_Transmit(&huart1,RX_BUFFER,10,100);
          HAL_UART_Transmit(&huart1,MSG3,2,100);
     }*/


     if((RX_Success==HAL_OK)&&(RX_BUFFER[0]=='1'))
     {
          HAL_GPIO_WritePin(GPIOG,GPIO_PIN_13,1);
          HAL_UART_Transmit(&huart1,MSG5,13,100);
     }
     if((RX_Success==HAL_OK)&&(RX_BUFFER[0]=='0'))
     {
          HAL_GPIO_WritePin(GPIOG,GPIO_PIN_13,0);
          HAL_UART_Transmit(&huart1,MSG6,13,100);
     }

    /* USER CODE BEGIN 3 */
  }
  /* USER CODE END 3 */
}

/**
  * @brief System Clock Configuration
  * @retval None
  */
void SystemClock_Config(void)
```

```
{
  RCC_OscInitTypeDef RCC_OscInitStruct = {0};
  RCC_ClkInitTypeDef RCC_ClkInitStruct = {0};

  /** Configure the main internal regulator output voltage
  */
  __HAL_RCC_PWR_CLK_ENABLE();

__HAL_PWR_VOLTAGESCALING_CONFIG(PWR_REGULATOR_VOLTAGE_SCALE
3);

  /** Initializes the RCC Oscillators according to the specified parameters
  * in the RCC_OscInitTypeDef structure.
  */
  RCC_OscInitStruct.OscillatorType = RCC_OSCILLATORTYPE_HSI;
  RCC_OscInitStruct.HSIState = RCC_HSI_ON;
  RCC_OscInitStruct.HSICalibrationValue = RCC_HSICALIBRATION_DEFAULT;
  RCC_OscInitStruct.PLL.PLLState = RCC_PLL_NONE;
  if (HAL_RCC_OscConfig(&RCC_OscInitStruct) != HAL_OK)
  {
    Error_Handler();
  }

  /** Initializes the CPU, AHB and APB buses clocks
  */
  RCC_ClkInitStruct.ClockType =
RCC_CLOCKTYPE_HCLK|RCC_CLOCKTYPE_SYSCLK
                              |RCC_CLOCKTYPE_PCLK1|RCC_CLOCKTYPE_PCLK2;
  RCC_ClkInitStruct.SYSCLKSource = RCC_SYSCLKSOURCE_HSI;
  RCC_ClkInitStruct.AHBCLKDivider = RCC_SYSCLK_DIV1;
  RCC_ClkInitStruct.APB1CLKDivider = RCC_HCLK_DIV1;
  RCC_ClkInitStruct.APB2CLKDivider = RCC_HCLK_DIV1;

  if (HAL_RCC_ClockConfig(&RCC_ClkInitStruct, FLASH_LATENCY_0) != HAL_OK)
  {
    Error_Handler();
  }
}

/**
  * @brief USART1 Initialization Function
  * @param None
  * @retval None
  */
static 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 = 9600;
  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;
  if (HAL_UART_Init(&huart1) != HAL_OK)
  {
    Error_Handler();
  }
  /* USER CODE BEGIN USART1_Init 2 */

  /* USER CODE END USART1_Init 2 */

}

/**
  * @brief GPIO Initialization Function
  * @param None
  * @retval None
  */
static void MX_GPIO_Init(void)
{
  GPIO_InitTypeDef GPIO_InitStruct = {0};
/* USER CODE BEGIN MX_GPIO_Init_1 */
/* USER CODE END MX_GPIO_Init_1 */

  /* GPIO Ports Clock Enable */
  __HAL_RCC_GPIOA_CLK_ENABLE();
  __HAL_RCC_GPIOG_CLK_ENABLE();

  /*Configure GPIO pin Output Level */
  HAL_GPIO_WritePin(GPIOG, GPIO_PIN_13, GPIO_PIN_RESET);

  /*Configure GPIO pin : PA0 */
  GPIO_InitStruct.Pin = GPIO_PIN_0;
  GPIO_InitStruct.Mode = GPIO_MODE_INPUT;
  GPIO_InitStruct.Pull = GPIO_NOPULL;
  HAL_GPIO_Init(GPIOA, &GPIO_InitStruct);

  /*Configure GPIO pin : PG13 */
  GPIO_InitStruct.Pin = GPIO_PIN_13;
  GPIO_InitStruct.Mode = GPIO_MODE_OUTPUT_PP;
  GPIO_InitStruct.Pull = GPIO_NOPULL;
```

```
  GPIO_InitStruct.Speed = GPIO_SPEED_FREQ_LOW;
  HAL_GPIO_Init(GPIOG, &GPIO_InitStruct);

/* USER CODE BEGIN MX_GPIO_Init_2 */
/* USER CODE END MX_GPIO_Init_2 */
}

/* USER CODE BEGIN 4 */

/* USER CODE END 4 */

/**
  * @brief  This function is executed in case of error occurrence.
  * @retval None
  */
void Error_Handler(void)
{
  /* USER CODE BEGIN Error_Handler_Debug */
  /* User can add his own implementation to report the HAL error return state */
  __disable_irq();
  while (1)
  {
  }
  /* USER CODE END Error_Handler_Debug */
}

#ifdef  USE_FULL_ASSERT
/**
  * @brief  Reports the name of the source file and the source line number
  *         where the assert_param error has occurred.
  * @param  file: pointer to the source file name
  * @param  line: assert_param error line source number
  * @retval None
  */
void assert_failed(uint8_t *file, uint32_t line)
{
  /* USER CODE BEGIN 6 */
  /* User can add his own implementation to report the file name and line number,
     ex: printf("Wrong parameters value: file %s on line %d\r\n", file, line) */
  /* USER CODE END 6 */
}
#endif /* USE_FULL_ASSERT */
```

Output:

```
COM7

11:25:19.307 -> Switch is pressed
11:25:29.543 -> LED is On
11:25:33.557 -> LED is Off
```

```
COM7

11:26:01.330 -> Switch is pressed
11:26:10.864 -> LED is On
```

Functions used:

HAL_GPIO_ReadPin(GPIOx,GPIO Pin Number);

HAL_UART_Transmit (&handle_variable_name,MSG,strlen(MSG),Timeout);

HAL_UART_Receive (&handle_variable_name,RX_BUFFER,strlen(RX),Timeout);

HAL_GPIO_WritePin(GPIOx,GPIO Pin Number,1/0);

Result: Basic STM32Cube project for transmitting and receiving messages with the help of UART communication was built using STM32CubeIDE.