

Embedded Controller programming for Real Time Systems Assignment 2

Name: Hsuankai Chang

Email: hsuankac@umich.edu

1. **Test the software after pressing key b, g and other keys multiple times (but not t) slowly first. Then, press b or g a few times quickly and watch what you notice and see on the screen. Write your observation/comments here or in the code.**

When I press b or g slowly, everything will be printed out correctly. When I try to press b or g faster, I can see that the board stops responding to the key I press in. I suspect it is because the delay in the b and g function is 1 second, in the 1 second time frame, the UART 1 Rx buffer/FIFO has been exhausted, we do not clear the buffer/FIFO fast enough, so it stops responding.

The screenshot shows an IDE with a C program for an STM32 microcontroller. The code includes prompts for pressing 'g', 'b', and 't'. It uses `logMsg` for logging and `HAL_Delay` for delays. A variable `buf` is used to store received characters. The code is currently at line 147, which is an `if` statement checking for 'g'. Overlaid on the IDE is a Tera Term window connected to COM4, showing the serial output. The output displays the prompts and the received characters 'g', 'b', and 't' as they are pressed.

```
129 logMsg(&huart1, "Enter g for toggling Green LED \r\n");
130
131 logMsg(&huart1, "Enter b for toggling Blue LED \r\n");
132
133 logMsg(&huart1, "Enter t to change timeout value to 1 ms \r\n");
134
135 /* USER CODE END 2 */
136
137 /* Infinite loop */
138 /* USER CODE BEGIN WHILE */
139 while (1)
140 {
141     /* USER CODE END WHILE */
142
143     /* USER CODE BEGIN 3 */
144     logGetMsg(&huart1);
145     char buf[100];
146
147     if(in[0] == 'g')
148     {
149         snprintf(buf, sizeof(buf), "Received char %c\r\n", in[0]);
150         logMsg(&huart1, buf);
151         HAL_GPIO_TogglePin(LED2_GPIO_Port, LED2_Pin);
152         HAL_Delay(1000);
153     }
154     else if(in[0] == 'b')
155     {
156         snprintf(buf, sizeof(buf), "Received char %c\r\n", in[0]);
157         logMsg(&huart1, buf);
158         HAL_GPIO_TogglePin(LED3_WIFI_LED4_BLE_GPIO_Port, LED3_Pin);
159         HAL_Delay(1000);
160     }
161     else if(in[0] == 't')
```

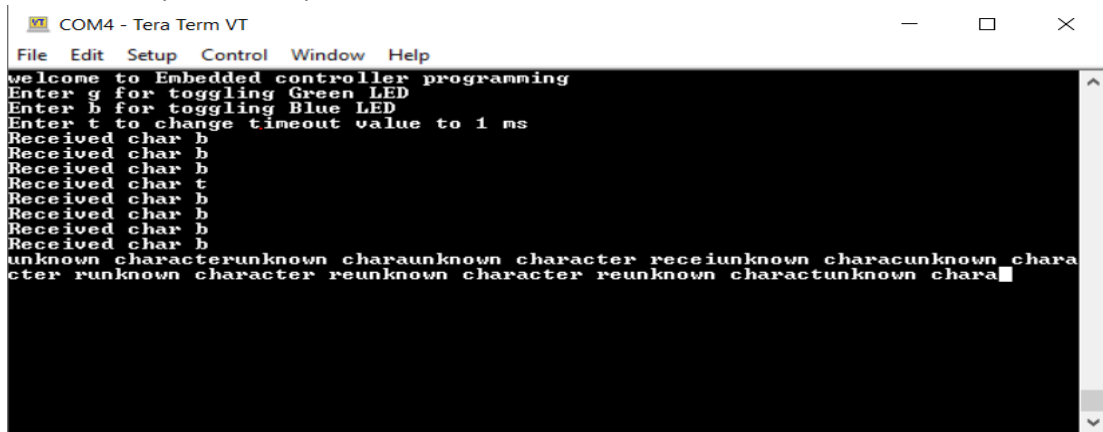
COM4 - Tera Term VT

```
File Edit Setup Control Window Help
Welcome to Embedded controller programming
Enter g for toggling Green LED
Enter b for toggling Blue LED
Enter t to change timeout value to 1 ms
Received char g
Received char g
Received char b
Received char b
Received char t
Received char t
```

2. **Enter t to change the UART timeout to 1 ms and repeat step 4. Watch what you notice and see on the screen. Write your observation/comments here or in the code**

I noticed that the whole sentence can not be printed out on the console correctly. It may be the timeout for the UART transmit is less than the time it needs to send out the entire char array, so

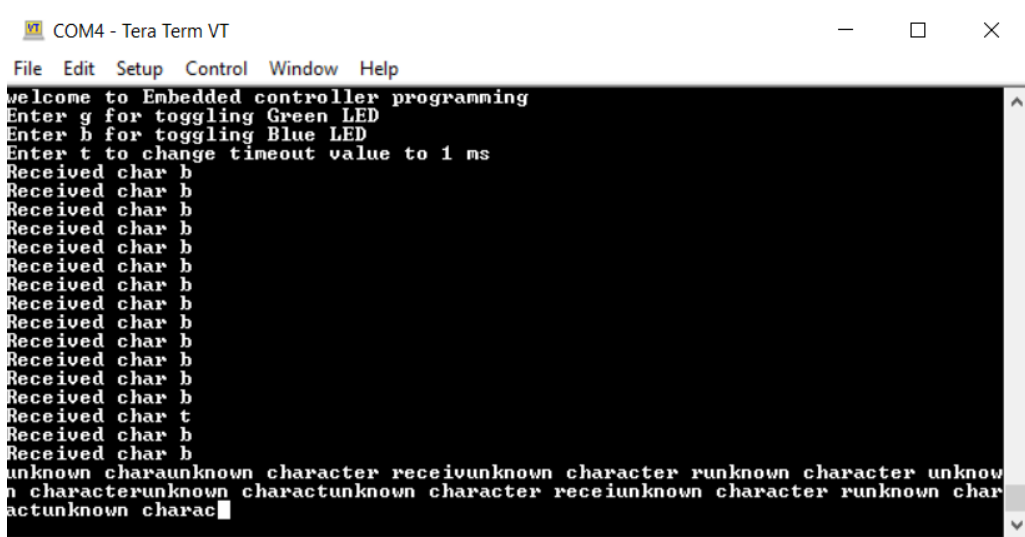
the char array is not complete.



```
COM4 - Tera Term VT
File Edit Setup Control Window Help
welcome to Embedded controller programming
Enter g for toggling Green LED
Enter b for toggling Blue LED
Enter t to change timeout value to 1 ms
Received char b
Received char b
Received char b
Received char t
Received char b
Received char b
Received char b
Received char b
unknown characterunknown charaunknown character receiunknown charaunknown chara
acter runknown character reunknown character reunknown charactunknown chara
```

3. Repeat step 4 but reduce the LED delay to 10 ms (It was set to 1 sec in 3.3 and 3.4 above). Watch what you notice and see on the screen. Write your observation/comments here or in the code.

I found out when I press b or g, the LED respond is much faster, since we have lowered the delay time to 10 ms. However, when I press t to change the UART timeout, I still can not see the whole sentence, since the timeout is less than the time UART takes to transmit the whole char array.



```
COM4 - Tera Term VT
File Edit Setup Control Window Help
welcome to Embedded controller programming
Enter g for toggling Green LED
Enter b for toggling Blue LED
Enter t to change timeout value to 1 ms
Received char b
Received char b
Received char b
Received char b
Received char b
Received char b
Received char b
Received char b
Received char b
Received char b
Received char b
Received char b
Received char b
Received char b
Received char t
Received char b
unknown charaunknown character receivunknown character runknown character unknow
n characterunknown charactunknown character receiunknown character runknown char
actunknown charac
```