Level 4: UART Communication

1 Prerequisites

- Passed level 2 and level 3

2 Input

- RL78/G14 RDK board
- CubeSuite+ E2.02.00l
- StarUML
- Tera Term, Communication Sample Application
- Workspace: Common Workspace → Final Exercise → L4
- Requirements for this level (see Requirements below)

3 Output

- Sequence diagram (using StarUML)
- Source code

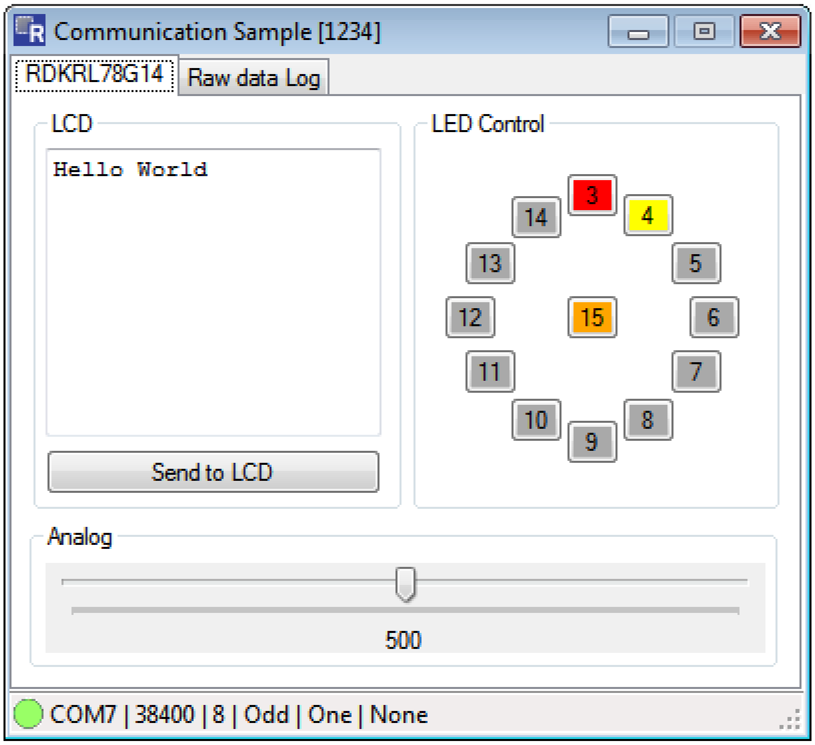
4 Task Description

You are going to write a program to send and receive information from the board to your PC through serial communication port (COM port).

The Communication Sample Application shall monitor and control the RDKRL78/G14 board through UART interface.

The monitoring function shall get the LEDs and Potentiometer status and display to the application interface.

The control function shall enable user to send the text message to the RDKRL78/G14 LCD and turn on/off the LEDs via the application interface.



Hello World

500

COM7 | 38400 | 8 | Odd | One | None

Figure 1. Example of Communication Sample Program

5 Requirements

Detail requirements of this task are described as below.

5.1 Serial communication interface configuration

- The serial communication interface shall be configured to operate in Universal Asynchronous Receiver/Transmitter (UART) mode.
- **UART1** shall be used for communication.
- Both transmission and reception data shall be configured as below:

Setting	Value
Baud Rate	38400 kbps
Data Length	8 bits
Parity	Odd
Stop Bit	1 bit
Flow Control	None

Table 1. UART configuration

5.2 Serial communication message format

5.2.1 Monitoring function message

The board shall send the LEDs message to report the LEDs status every 200ms.

The board shall send the Analog message to report the Potentiometer status every 200ms.

The format of each LEDs and Analog message shall respect following tables:

$<ID code>,L<LEDs Status>^

Field	Description
$	Character '$' indicates the start of message.
<ID Code>	Your ID code.
,	Comma character
L	Character 'L' indicates the LEDs Status message.
<LEDs Status>	LEDs Status shall be reported in 16bit value, 4 characters Hex format: HHHH The LSB bit, bit 0, shall report the status of LED3. Bit 1 shall report status of LED4 .. Bit 12 shall report status of LED15. When LED is in "on" state, the status bit shall be 1. When LED is in "off" state, the status bit shall be 0. e.g. LED3, LED4, LED 15 are in "on" state. The LEDS Status shall be 0b0001 0000 0000 0011 -> 0x1003. The LEDs status message shall be: **"$1234,L1003^"**
^	Character '^' indicates the end of message.

Table 2. LEDs Status message format

$<ID code>,A<Analog Value>^

Field	Description
$	Character '$' indicates the start of message.
<ID Code>	Your ID code.
,	Comma character
A	Character 'A' indicates the Analog value message.
<Analog Value>	The analog value is the value read from Potentiometer (VR). The analog range shall be within [0 .. 999]. e.g. If result reading from Potentiometer (VR) is 500, the Analog message shall be: "$1234,A500^
^	Character '^' indicates the end of message.

Table 3. Analog Value message format

5.2.2 Control function messages

The board shall receive a message from the PC to display text to the board's LCD.

The board shall receive a message from the PC to turn on/off the LEDs on the LEDs ring.

The format for LCD and LEDs control shall respect following tables:

$T,<line number>,<text string>^

Field	Description
$	Character '$' indicates the start of message.
T	Character 'T' indicates the text string value message.
,	Comma character
<line number>	Line number to be displayed <text string> on the board's LCD. The line number shall be within [1..8].
,	Comma character
<text string>	The text string to be displayed to the specified line number. The text string shall contain only below characters: [a..z] [A..Z] [0..9], space and underline character. The length of <text string> shall not longer than 19. e.g. To display "Hello World" message to line 1 of the LCD, following message shall be sent to the board: "$T,1,Hello World^
^	Character '^' indicates the end of message.

Table 4. LCD text message format

$L,<LED number>,<state>^

Field	Description
$	Character '$' indicates the start of message.
L	Character 'L' indicates the LED control message.
,	Comma character
<LED number>	The LED ID number. The LED number shall be within [3..15]. e.g When LED number is 3 means LED3 shall be controlled.
,	Comma character
<state>	The expected state of the LED. If <state> is 1, the LED specified by <LED number> shall turn on. If <state> is 0, the LED specified by <LED number> shall turn off. e.g To turn on LED15 from the PC, user shall press button has number 15 from the LED Control panel of Communication Sample Application. The following message shall be sent to the board: "$L,15,1^"
^	Character '^' indicates the end of message.

Table 5. LCD text message format

5.3 Handling of error

Invalid message is the message does not follow the given for mat above and message longer than 26 character.

- If an invalid message received,
  - An error message "Msg Err" shall be displayed on the LCD, line 8, position 0 from the left side.
  - LED2 shall be lighted on.
- If an UART reception error (Framing error/Parity error) occur:
  - An error message "UART Err" shall be displayed on the LCD, line 8, position 0 from the left side.
  - LED2 shall be lighted on.
- If SW3 is pressed, error message shall be cleared and LED2 shall be lighted off.

5.4 RDKRL78/G14 and application setting

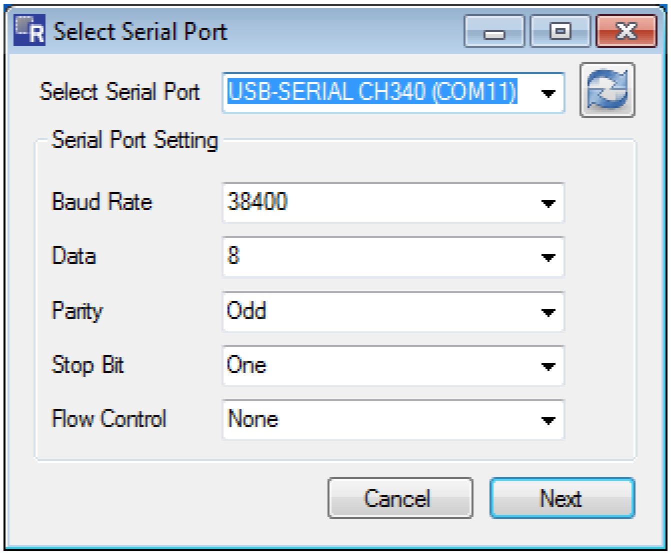
5.4.1 RDKRL78/G14 setting

Apply following SW5 setting for debugging:

SW5_1	ON
SW5_2	OFF
SW5_3	ON
SW5_4	ON

5.4.2 Communication Sample Application setting

After run the “ComSampleApp.exe”, apply the following setting:



Select Serial Port: USB-SERIAL CH340 (COM11)

Serial Port Setting

Baud Rate: 38400

Data: 8

Parity: Odd

Stop Bit: One

Flow Control: None

Figure 2. Communication Sample Application Setting

Please be noted that the “Select Serial Port” combo box might be difference with the actual run. Please select “USB-SERIAL CH340 (COMxx)”.

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