LABORATORY OF EMBEDDED SYSTEMS DEVELOPMENT TECHNOLOGY

Exercise 1

Topic: The use of I²C bus by the example of GPIO expander and Real-Time Clock RTC modules

1. Laboratory stand

The laboratory stand consists of a PC with System Workbench for STM32, STM32F429I-Discovery evaluation board with microcontroller STM32F429ZIT6U (Fig. 1), GPIO expander module with PCF8574 device (Fig.2), LED module (Fig.3), set of Male-Male Breadboard Jumper Wires (Fig.4), Real Time Clock DS1307 (Fig.5.) and mini USB wire.

Fig.1. STMicroelectronics STM32F429I-DISCO evaluation board
2. Laboratory task

1. Refer to the documentation **UM1662: Getting started with the STM32F429 Discovery kit** (Appendix 1).
2. Refer to the documentation **UM1670: Discovery kit for STM32F429/439 lines** (Appendix 2).
3. Refer to the datasheets of **STM32F429xx** ARM Cortex-M4 MPU (Appendix 3).
4. Refer to the datasheets of **PFC8574** and **DS1307** (Appendix 4 and 5).
5. Connect LED module (Fig.3) with GPIO expander module (Fig.2). Connect GPIO expander with STM32F429I-DISCO evaluation board by using **I2C3** bus (refer Appendix 3 to choose the correct pin number). **Pay particular attention to the power pins!**
6. Connect to the system RTC module also using **I2C3** bus.

| Note 1!
| All connections should be checked by the teacher before supplying power to STM32F429I-DISCO Evaluation Board! |

7. By using the existing project in the folder E:\SW\TRSW\LAB1 perform communication between STM32F429I-DISCO evaluation board and PFC8574 device. Implement two directions counter of the expander port (P0-P6) in one of seven code. Counting direction should be selected by the port P7 state. **While performing laboratory tasks the help file to the HAL library may be helpful (Appendix 6). The state of expander ports should be visualized on the LCD screen.**
8. Connect to the system a RTC module with DS1307 device (see Appendix 5).
9. Add to the project procedures for communication with the RTC module that reads the current time which should be presented on a TFT LCD screen.
10. Add to the project procedures for communication with the RTC module that sets the current time.
11. Configure the port SQ of DS1307 device to generate waveform frequency of 1 Hz. This signal can be visualized by LED8 on the LED module.
12. Complete additional task indicated by the teacher.
13. Using ST-LINK Utility upload original firmware (Original_firmware.bin) to the STM32F429I-Discovery (See Appendix 7).