Lab 1 – Clock using LCD and Arduino

18644 – Mobile hardware for software engineers

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INTRODUCTION

In this lab two basic devices are used to build the clock. First, Arduino, an open source prototyping platform. Second, basic16*2 LCD from Sparkfun Electronics. Respective pins were directly connected using wires.

CONNECTIONS

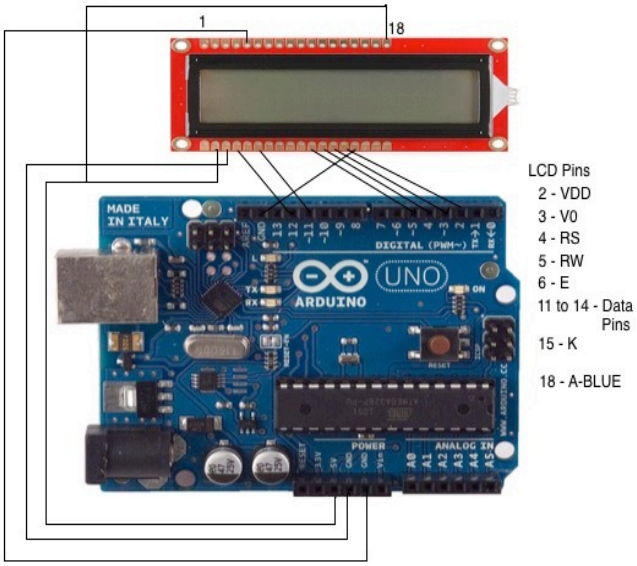

FIGURE 1 - CONNECTION DIAGRAM

Figure 1 shows the connection diagram. Details of pins used and connections are summarized below:

- LCD 6 (E) to Arduino 11 (MOSI) – Enable pin enables writing to registers.
- LCD 4 (RS) to Arduino 12 (MISO) – Register select pin control the data writing to LCDs' memory.
- LCD 11 to 14 (Data pins) to Arduino 2 to 5 – Data pins to write to LCDs' registers
- LCD 5 (RW) to Arduino GND – This pin is used to select read or write mode. For the purpose only writing is done so connected to ground.
- LCD 2 (VDD) to Arduino 5v – This pin gives power to LCD.
- LCD 3 (V0) to Arduino GND – It is contrast pin and thus connected to ground.
- LCD 15 (K) to Arduino GND – It is backlight power supply pin connected to ground as color pin is used.
- LCD 18 (A-BLUE) to Arduino 5v – It is blue backlight pin connected to 5v.

CLOCK FUNCTIONALITY

I have synced current time from mac to Arduino and then the current time on Arduino was displayed to LCD.

When the program executes it waits for the time on serial port, "waiting for sync" message is displayed on LCD to indicate starting state. It is also written on serial port (serves to verify functionality). Serial port messages are verified on serial monitor window of Arduino Interface.

Serial input to the Arduino board was given using command line on mac as shown in Figure 2. TZ_Adjust variable is used to send current time in EST time zone.

```
Vishals-MacBook-Pro:~ root# TZ_adjust=-4;  echo T$(($(date +%s)+60*60*$TZ_adjust
)) > /dev/cu.usbmodemfd121
```

FIGURE 2 - COMMAND FOR CLOCK SYNC

Time serial example provided in Arduino interface was used as base to display clock time on LCD. External time header file was added to interface and used to set Arduino time and also to display current date/time in desired format as shown in Figure 3. Output in serial monitor is shown in figure 4.

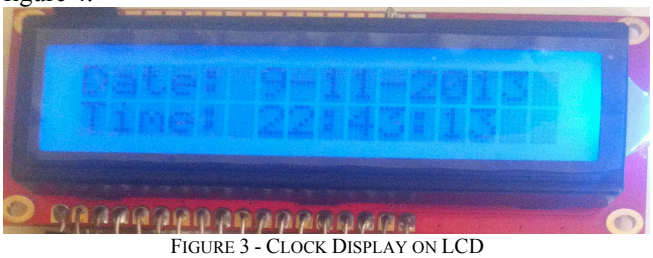

FIGURE 3 - CLOCK DISPLAY ON LCD

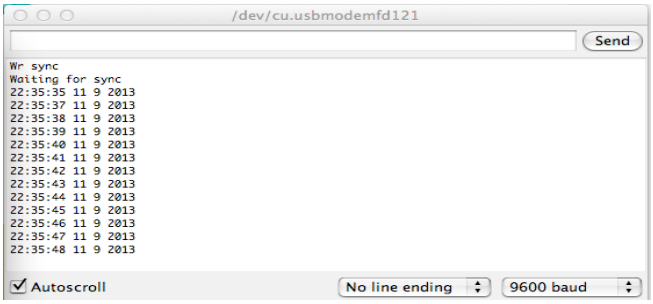

FIGURE 4 - CLOCK DISPLAY ON SERIAL MONITOR WINDOW

CONCLUSION

In conclusion, current date & time were displayed on LCD using Arduino, which was in turn synced with current time on Mac.

With same hardware as base, NTP sync could be implemented. Also chess clock can be implemented with additional buttons considering two-row LCD display.

REFERENCES

[1] Arduino example of Liquid Crystal display, online, http://arduino.cc/en/Tutorial/LiquidCrystal

[2] Arduino Time Library, online, http://playground.arduino.cc/Code/Time and http://www.pjrc.com/teensy/td_libs_Time.html

[3] LCD 10862 datasheet, online, https://www.sparkfun.com/products/10862