Lab 6: LCD

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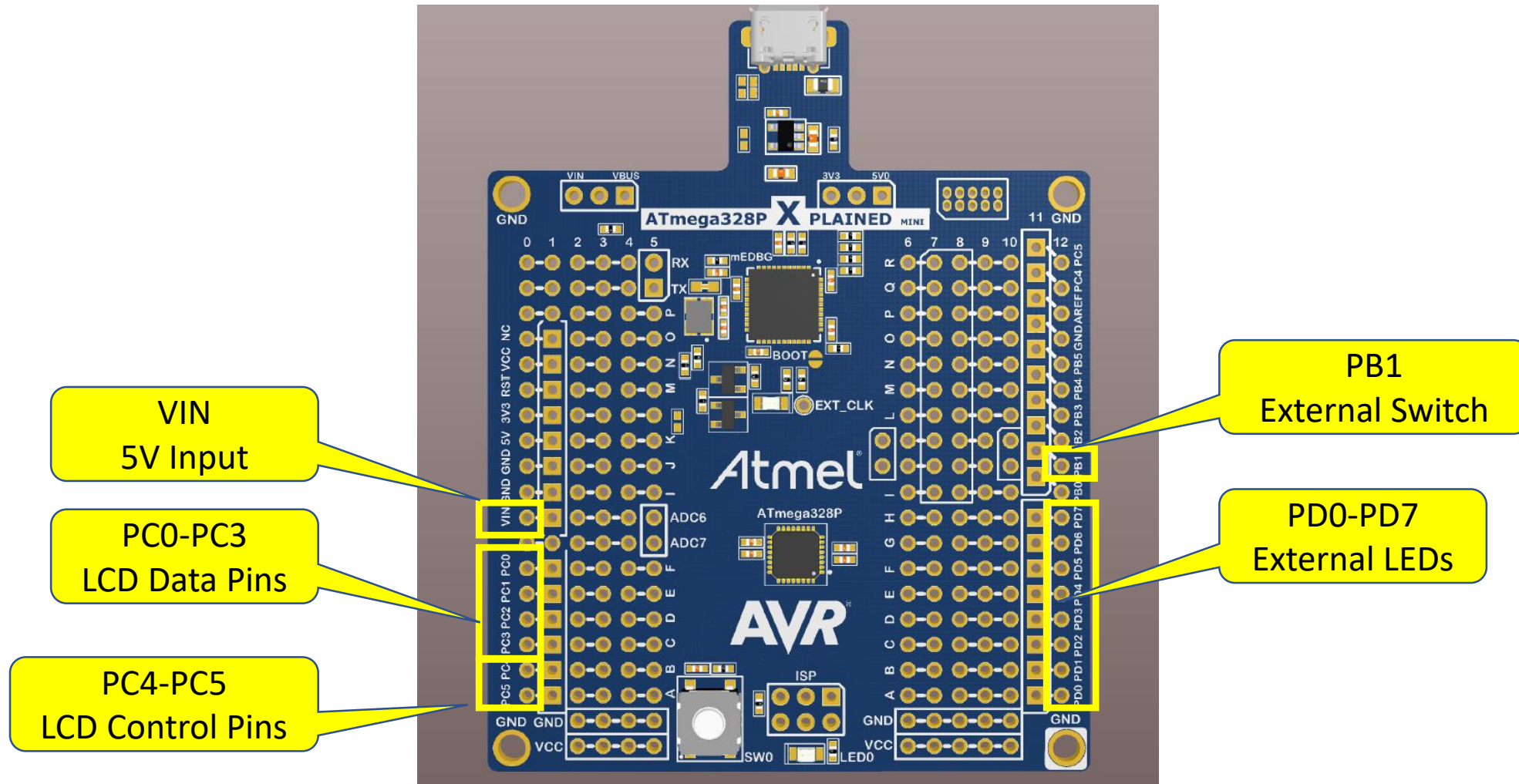TA: S M Rakiul Islam

ECE 3411
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ATmega328P Xplained Mini Pin Allocation

VIN
5V Input

PC0-PC3
LCD Data Pins

PC4-PC5
LCD Control Pins

PB1
External Switch

PD0-PD7
External LEDs

# Soldering the Connectors for LCD

- Insert a 16-pin male header in LCD pads from the bottom and solder from the top.

Pin1: V_{SS} → GND

Pin2: V_{CC} → 5V

Pin3: V_c → GND/1.3v

Pin4: RS → PC4

Pin5: R/W → GND

Pin6: E → PC5

Pin7: DB0 → N/C

Pin8: DB1 → N/C

Pin9: DB2 → N/C

Pin10: DB3 → N/C

Pin11: DB4 → PC0

Pin12: DB5 → PC1

Pin13: DB6 → PC2

Pin14: DB7 → PC3

PIN details of LCD

- Use 4 bit configuration for LCD
- Interface with explained mini as in table
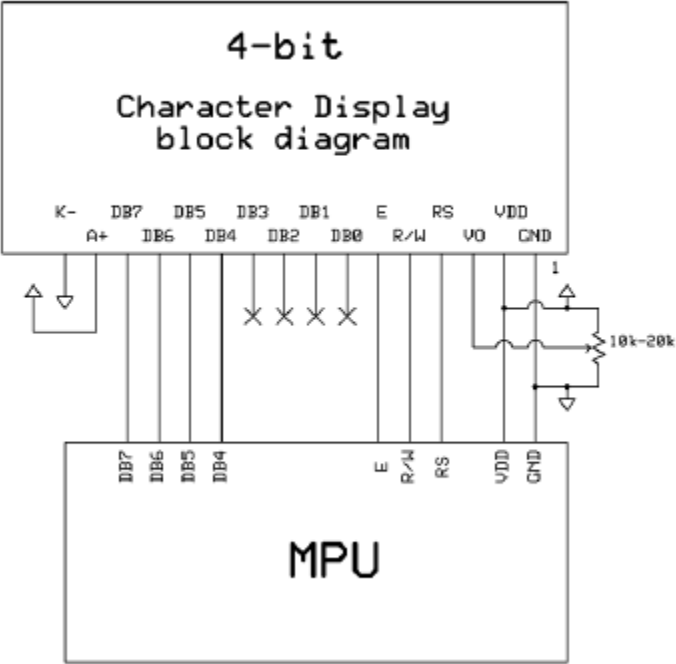
Pin No.	Symbol	External Connection	Function Description
1	V$_{SS}$	Power Supply	Ground
2	V$_{DD}$	Power Supply	Supply Voltage for logic (+5.0V)
3	V$_0$	Adj. Power Supply	Supply Voltage for contrast (approx. 1.3V)
4	RS	MPU	Register Select signal. RS=0: Command, RS=1: Data
5	R/W	MPU	Read/Write select signal, R/W=1: Read R/W: =0: Write
6	E	MPU	Operation Enable signal. Falling edge triggered.
7-10	DB0 – DB3	MPU	Four low order bi-directional three-state data bus lines. These four are not used during 4-bit operation.
11-14	DB4 – DB7	MPU	Four high order bi-directional three-state data bus lines.
15	LED+	Power Supply	Backlight Anode(+5.0V via on-board resistor)
16	LED-	Power Supply	Backlight Cathode (Ground)

4-bit Character Display block diagram

No.	Symbol	Connections with ATmega328P
1, 3	V$_{SS}$, V$_{EE}$	GND
2	V$_{CC}$	5V
4	RS	PC4
5	R/W	GND (Always Write to LCD)
6	E	PC5
7-10	DB0-DB3	Not Connected
11-14	DB4-DB7	PC0-PC3
15	Anode	5V
16	Cathode	GND

LCD Interfacing: for 14 pin

- We are going to use the LCD in 4-bit mode
  - Only 4 data wires are required instead of 8
- LCD pin assignment is as follows:

No.	Symbol	Connections with ATmega328P
1, 3	V_{SS}, V_{EE}	GND
2	V_{CC}	5V
4	RS	PC4
5	R/W	GND (Always Write to LCD)
6	E	PC5
7-10	DB0-DB3	Not Connected
11-14	DB4-DB7	PC0-PC3
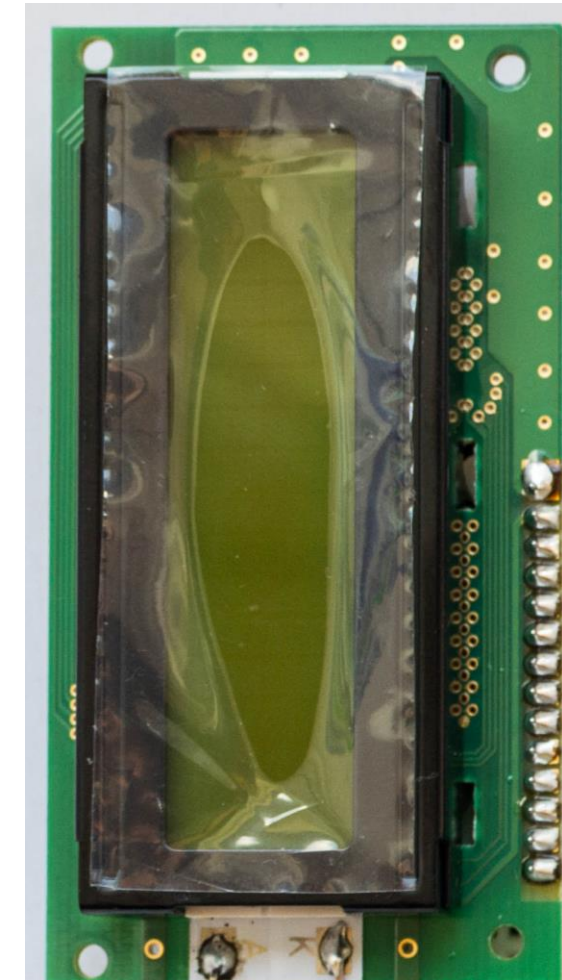
Pin1: V_{SS} → GND
Pin2: V_{CC} → 5V
Pin3: V_{EE} → GND
Pin4: RS → PC4
Pin5: R/W → GND
Pin6: E → PC5
Pin7: DB0 → N/C
Pin8: DB1 → N/C
Pin9: DB2 → N/C
Pin10: DB3 → N/C
Pin11: DB4 → PC0
Pin12: DB5 → PC1
Pin13: DB6 → PC2
Pin14: DB7 → PC3

Pin16: ANODE → 5V

Pin15: CATHODE → GND

Wiring the Breadboard (for LCD)

b1-b14
LCD Connectors

j1-j18
Xplained Mini Connectors
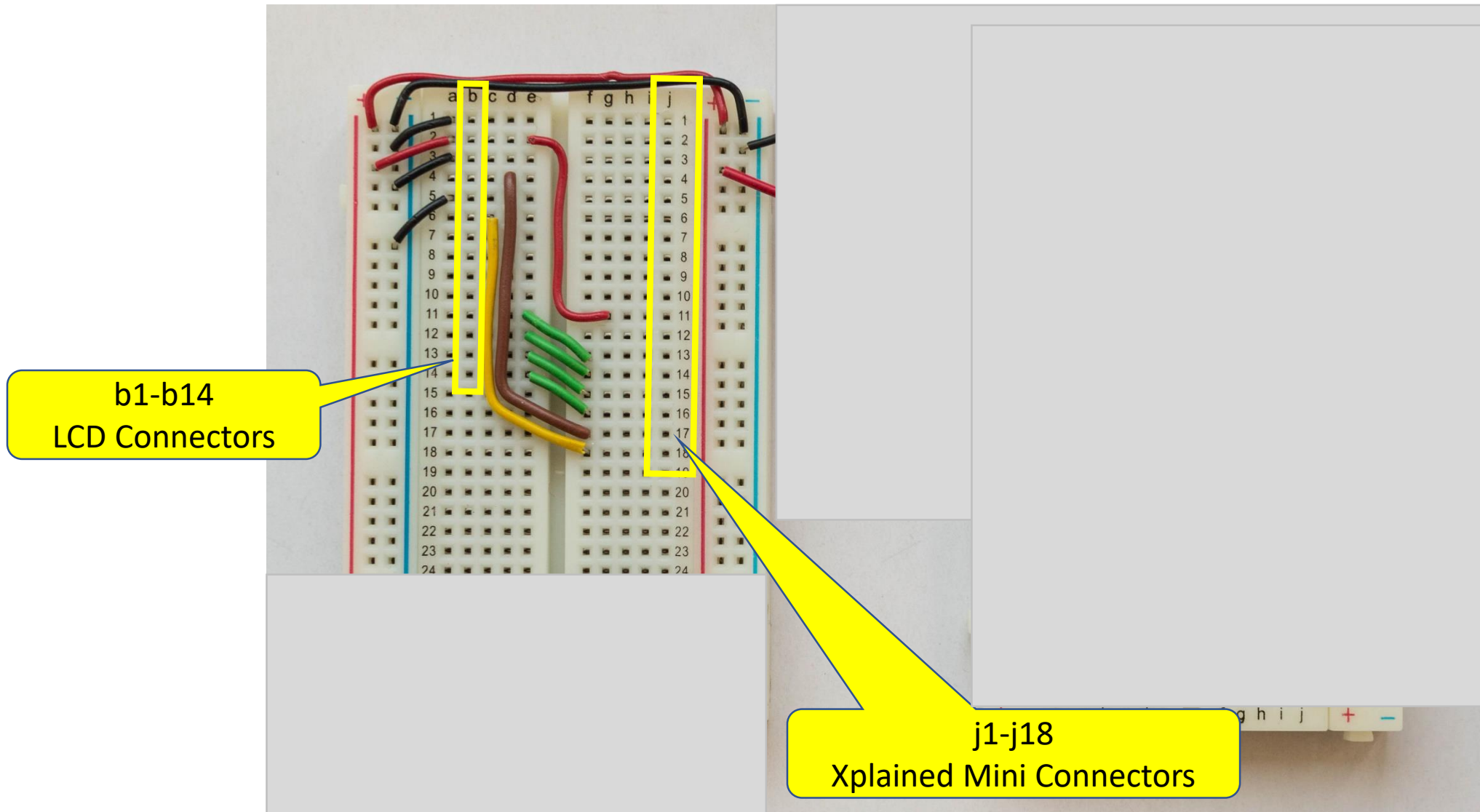
Connections

- Connect the board as in Fig.1.
- Use the diagrams of the following slides to connect LCD properly
- Connect LCD power and control pin properly
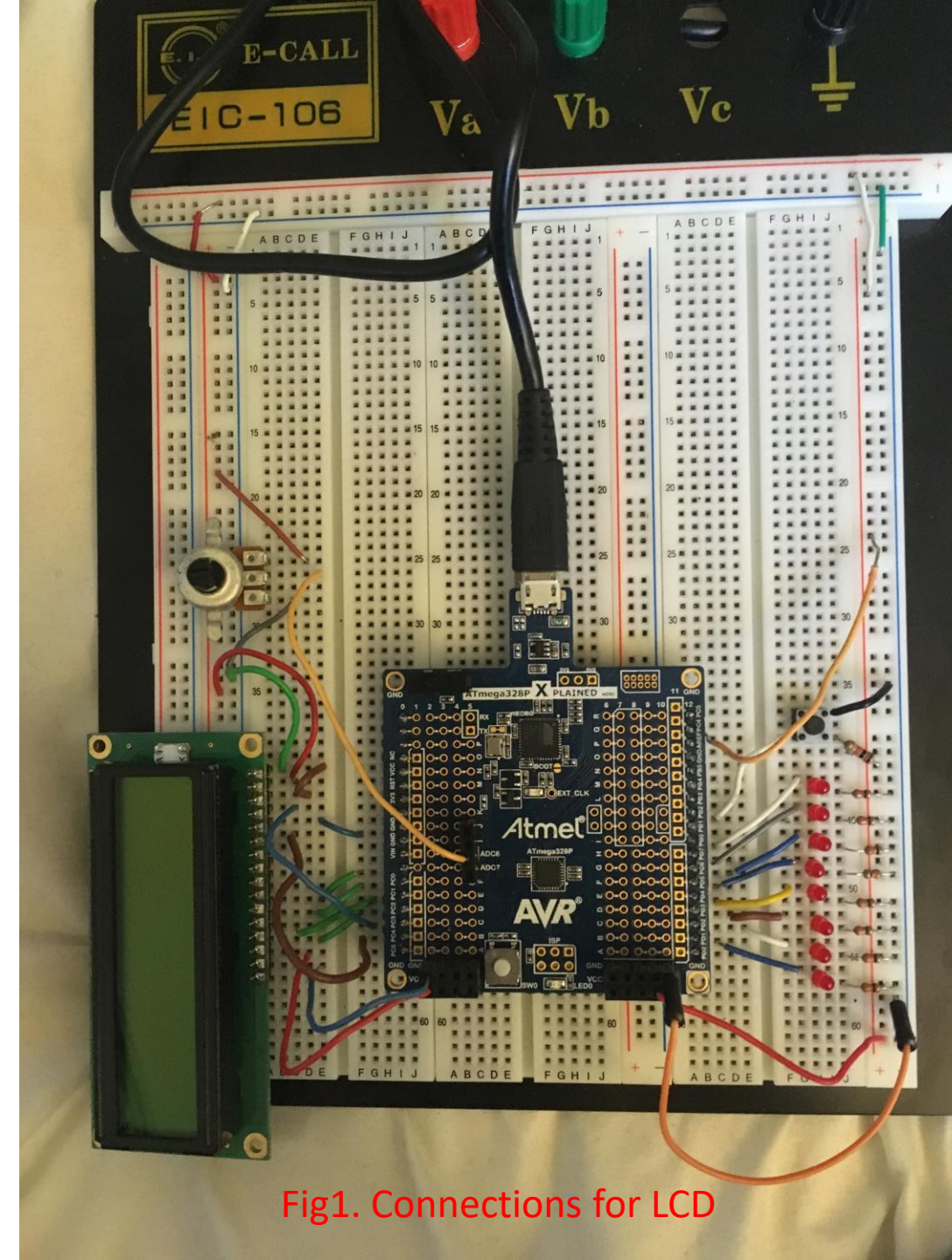- Use the datasheet to understand LCD connection more

Fig1. Connections for LCD

LCD Test Program

```c
// ------- Preamble -------- //
#define F_CPU 16000000UL       /* Tells the Clock Freq to the Compiler. */
#include <avr/io.h>            /* Defines pins, ports etc. */
#include <util/delay.h>        /* Functions to waste time */
#include "lcd_lib.h"           /* LCD Library */

int main(void) {
    // -------- Inits --------- //
    initialize_LCD();           /* Initialize LCD */

    LcdDataWrite('A');          /* Print a few characters for test */
    LcdDataWrite('B');
    LcdDataWrite('C');

    // ------ Event loop ------ //
    while (1) {
            /* Nothing to do */
    } /* End event loop */
    return (0);
}
```