

## PIC Trainer Board Initial Test Procedures

The PIC Trainer Board is delivered with two PIC16F84A microcontroller units where either one is to be programmed with:

- (1) LED\_TEST.HEX that must be programmed with provided code (Marked as PIC 1 in Photo 2) for testing the interface between the PIC and the LEDs (LED3 – LED10), and
- (2) LCD\_TEST.HEX that must be programmed with code (marked as PIC2 in Photo 3 or Photo 4) for testing between the PIC and the Liquid Crystal Display (LCD) module.

**Note: the test codes are on BB under Orientation folder or can be downloaded from [www.ucdistancetraining.org](http://www.ucdistancetraining.org), select Download**

These tests are described below. The oscillator/resonator must be wired in **BLUE** or **BLACK** on the trainer board. There are two sets of ribbon cables (two 20-leads mixed colors in 3" and 6.5" length shown below) with male heading for you do the testing and lab exercises of the trainer board. Please refer to the following photo 1:

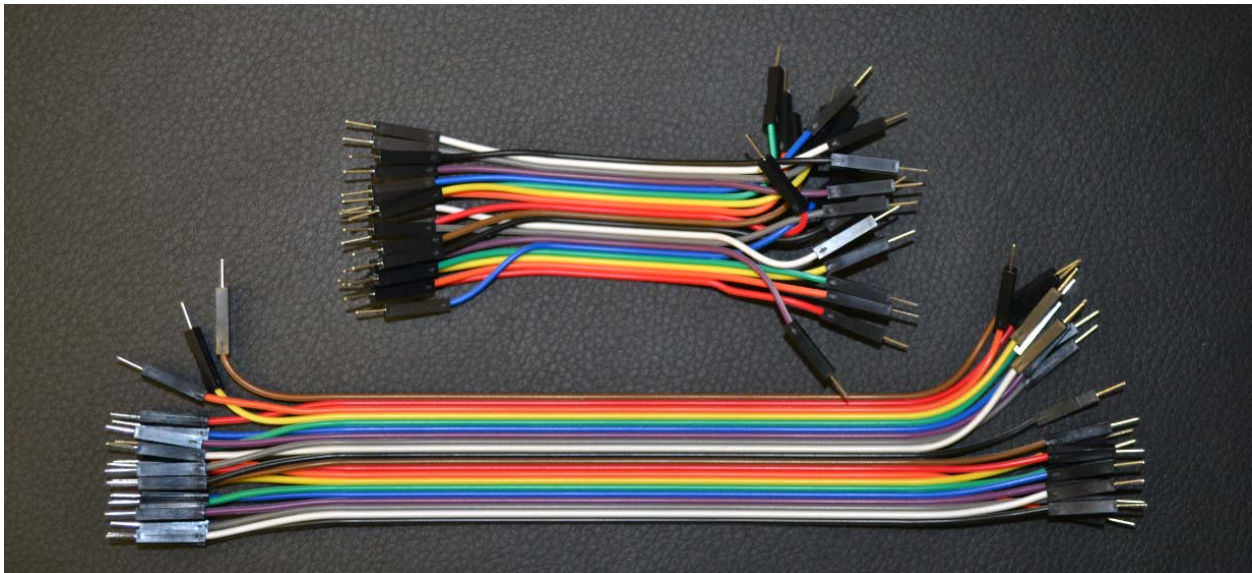


Photo1. Testing Wires: The 3" and 6.5" ribbon cables

## Test #1 – PIC16F84A-to-LED Interface

**NOTE: Refer to Figure 1, 2, or 3 and Photo 2, 3, or 4 for guidance while making connections, setting switches, and placing the PIC MCU.**

1. Connect the eight-pin jumper between **PORTB\_18P\_INTER** connector **X10** and **LED\_INTER** connector **X6**. The orientation of the jumper is not critical for this test. Interconnections presented in 8 **Brown** wires.

### Summary of the Interface Connections between X10 and X6:

**PORTB\_18P\_INTER, X10, Pin 1 (RB0) <====> X6, Pin 1**  
**PORTB\_18P\_INTER, X10, Pin 2 (RB1) <====> X6, Pin 2**  
**PORTB\_18P\_INTER, X10, Pin 3 (RB2) <====> X6, Pin 3**  
**PORTB\_18P\_INTER, X10, Pin 4 (RB3) <====> X6, Pin 4**  
**PORTB\_18P\_INTER, X10, Pin 5 (RB4) <====> X6, Pin 5**  
**PORTB\_18P\_INTER, X10, Pin 6 (RB5) <====> X6, Pin 6**  
**PORTB\_18P\_INTER, X10, Pin 7 (RB6) <====> X6, Pin 7**  
**PORTB\_18P\_INTER, X10, Pin 8 (RB7) <====> X6, Pin 8**

2. Connect two short jumpers between **RESONATOR\_INTER** connector **SV4**, Pins **1** and **3**, and **PORTA\_18P\_INTER** connector **X8**, Pins **7** and **8**. Interconnections presented in **Blue** or **Black**.

### Summary of the Interface Connections between X8 and SV4:

**PORTA\_18P\_INTER, X8, Pin 7 (OSC2) <====> SV4, Pin 1**  
**PORTA\_18P\_INTER, X8, Pin 8 (OSC1) <====> SV4, Pin 3**

3. Set switches **S1: 1 through 5 to OFF and S1: 6 through 10 ON**.
4. Set switches **S4: 1 to OFF and S4: 2 to ON**.
5. Set switches **S5: 1 through 4 to ON and S5: 5 through 8 to OFF**.
6. Set switches **S6: 1 through 8 to OFF**.
7. Lift the handle of the Zero Insertion Force (ZIF) socket, IC4.
8. Place the #1 PIC16F84A into the ZIF socket. Make certain that the notch end of the PIC is facing the handle end of the socket and that the PIC is mounted closest to the handle end of the socket.
9. Do NOT hold or press on the MCU, when lower the handle of the ZIF socket (just lower the handler).
10. Plug the wall-mounted power supply connector plug into the trainer board Power Jack, J1.
11. Plug the power supply into an outlet.
12. Follow the procedures in *“Programming\_the\_PIC16F84\_Using\_PICKit2”* (available on [www.ucdistancetraining.org](http://www.ucdistancetraining.org)) to program this PIC16F84A MCU.

**NOTE: The program will run automatically when the program is completed. The LEDs (LED3 through LED10) will turn on for about 0.5s and turn off for 0.5s. Then, LED3 – LED6 will light for 0.5s and turn off for 0.5s, followed by LED7 – LED10 turning on and off. This sequence will repeat until power is removed from the board.**



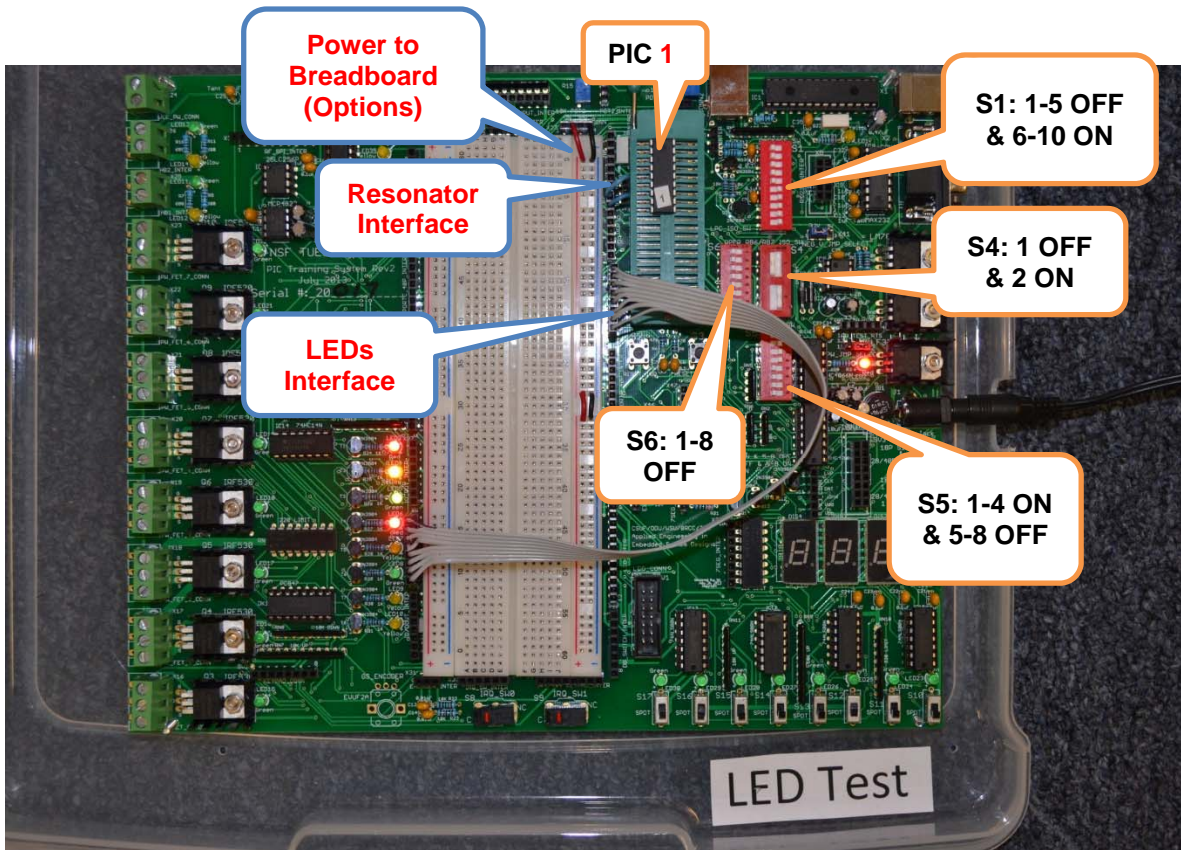


Photo 2. LED Test Settings and PIC Placement

## Test #2 – LCD Module Parallel Communications

**NOTE: If you have a LCD module that requires Negative Reference Voltage on its Vo, then skip Pages 5-8 and go straight to Pages 9-12.**

**NOTE: Refer to Figure 2 and photo 3 for guidance while making connections, setting switches, and inserting the PIC MCU.**

1. Connect the eight-pin jumper between **PORTB\_18P\_INTER** connector **X10** and **Pins 1 – 8 of LCD\_INTER** connector **X29**. Make certain that Pin 1 of X10 is connected to Pin 1 of X29. Interconnections presented in **Brown**.

### Summary of the Interface Connections between X10 and X29:

PORTB\_18P\_INTER, X10, Pin 1 (RB0) <====> X29, Pin 1  
PORTB\_18P\_INTER, X10, Pin 2 (RB1) <====> X29, Pin 2  
PORTB\_18P\_INTER, X10, Pin 3 (RB2) <====> X29, Pin 3  
PORTB\_18P\_INTER, X10, Pin 4 (RB3) <====> X29, Pin 4  
PORTB\_18P\_INTER, X10, Pin 5 (RB4) <====> X29, Pin 5  
PORTB\_18P\_INTER, X10, Pin 6 (RB5) <====> X29, Pin 6  
PORTB\_18P\_INTER, X10, Pin 7 (RB6) <====> X29, Pin 7  
PORTB\_18P\_INTER, X10, Pin 8 (RB7) <====> X29, Pin 8

2. Connect a two-pin jumper between **PORTA\_18P\_INTER** connector **X8**, **Pins 1 (RA0) and 2 (RA1)** and **LCD\_INTER** connector **X29** **Pins 10 (E) and 9 (RS)**, respectively. Again, please note: Interconnections presented in **Blue**.

### Summary of the Interface Connections between X8 and X29:

PORTA\_18P\_INTER, X8: Pin1 (RA0) <=====> X29: Pin 10 (LCD, E)  
PORTA\_18P\_INTER, X8: Pin2 (RA1) <=====> X29: Pin 9 (LCD, RS)

3. Connect a two-pin jumper between **X29**, **Pins 11 (R/W) and 12 (Vo)**, to **X27** **Pins 3 and 4 GND**. These are the ground connections to the trainer board. Interconnections presented in **Red** that are **Gnd** connections.

### Summary of the Interface Connections between X27 and X29:

POWER\_CONN, X27: Pin3 (GND) <=====> X29: Pin 11 (LCD, R/W)  
POWER\_CONN, X27: Pin4 (GND) <=====> X29: Pin 12 (LCD, Vo)

4. Connect two short jumpers between **RESONATOR\_INTER** connector **SV4**, **pins 1 and 3**, and **PORTA\_18P\_INTER**, **X8** connector **Pins 7 and 8**. Interconnections presented in **Blue** or **Black**.

### Summary of the Interface Connections between X8 and SV4:

PORTA\_18P\_INTER, X8, Pin 7 (OSC2) <====> SV4, Pin 1  
PORTA\_18P\_INTER, X8, Pin 8 (OSC1) <====> SV4, Pin 3

5. Connect the LCD 14 Pin plug to the SV1 (LCD\_CONN) socket that is located by right lower corner of the breadboard.
6. Set switches **S1: 1 through 5 to OFF and S1: 6 through 10 ON.**
7. Set switches **S4: 1 to OFF and S4: 2 to ON.**
8. Set switches **S5: 1 through 4 to ON and S5: 5 through 8 to OFF.**
9. Set switches **S6: 1 through 8 to OFF.**
10. Lift the handle of the Zero Insertion Force (ZIF) socket IC4.
11. Place the #2 PIC16F84A into the ZIF socket. Make certain that the notch end of the PIC is facing the handle end of the socket and that the PIC is mounted closest to the handle end of the socket.
12. Do NOT hold or press on the MCU, when lower the handle of the ZIF socket (just lower the handler).
13. Follow the procedures in *“Programming\_the\_PIC16F84\_Using\_PICkit2”* (available on [www.ucdistancetraining.org](http://www.ucdistancetraining.org)) to program this PIC16F84A MCU.

**NOTE: Upon completion of programming, the program will run automatically and the LCD will display the message **\*\*Congratulations\*\*** on the first line and **\*\*\*Test Complete\*\*\*** on the second line.**

If the LED test or programming is unsuccessful, or if the programming is successful, but the LCD does not display the message, please contact Dr. Steve Hsiung ([shsiung@odu.edu](mailto:shsiung@odu.edu))(757-683-4606) or Richard Seriani ([rseriani@tcc.edu](mailto:rseriani@tcc.edu))(757-410-7889) for assistance.

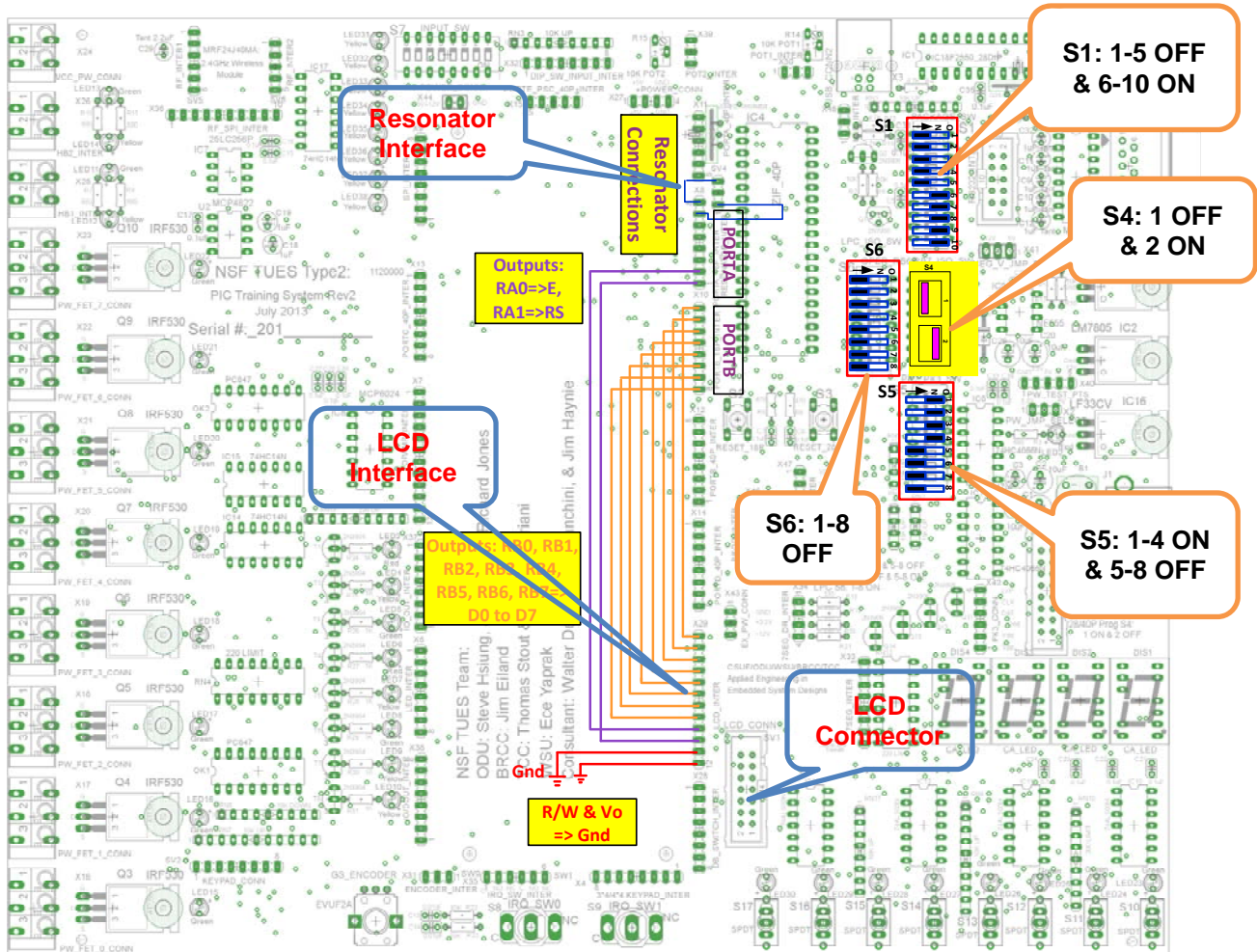


Figure 2. LCD Test Interconnections, Switch Settings, and PIC Placement

This Figure 2 only demonstrates the regular LCD module interface that does not include the LCD module requires negative reference voltage on its Vo line. Please see Pages 9-12 for details.

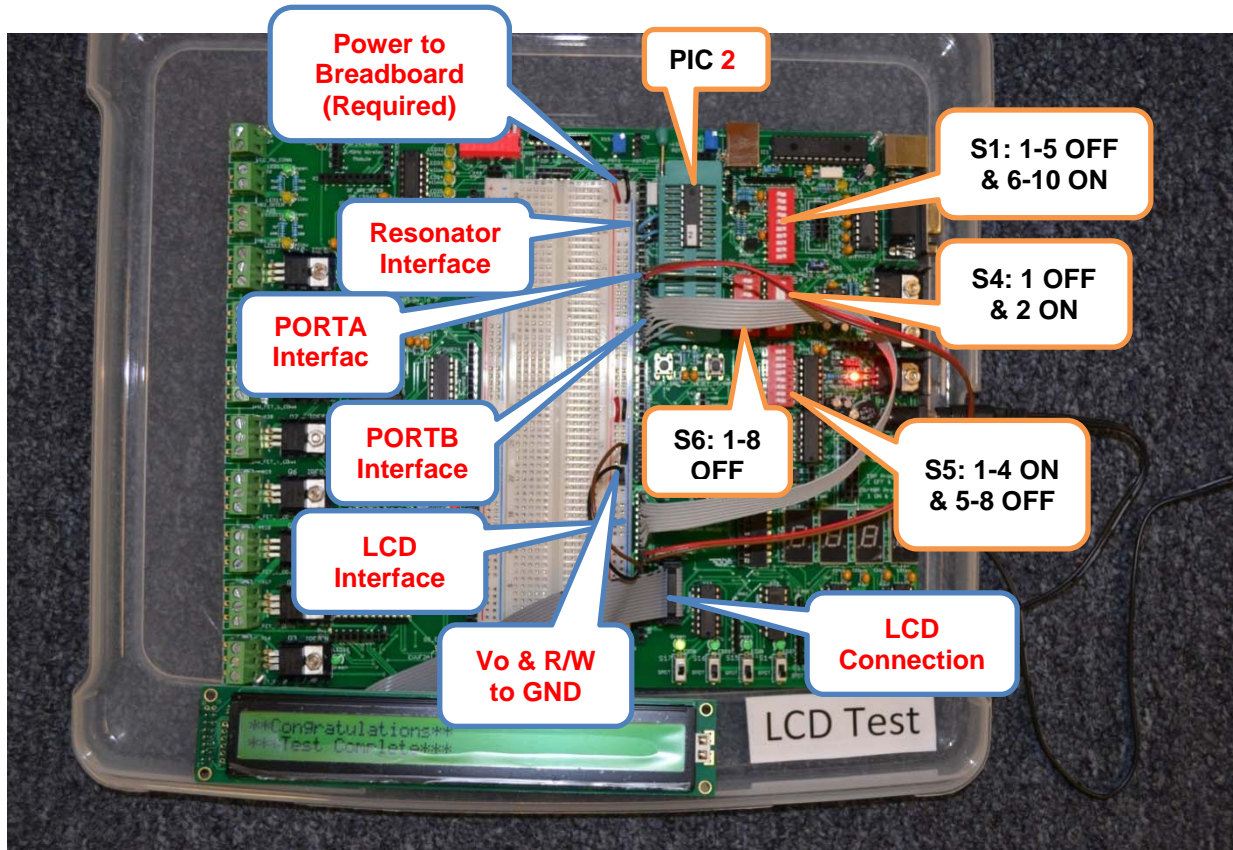


Photo 3. LCD Test Settings and PIC Placement

This Photo 3 only demonstrates the regular LCD module interface that does not include the LCD module requires negative reference voltage on its Vo line. Please see Pages 9-12 for details.



## Test #2 Alternative– LCD Module with Negative Ref. Voltage Parallel Communications

1. Connect the eight-pin jumper between **PORTB\_18P\_INTER** connector **X10** and **Pins 1 – 8 of LCD\_INTER** connector **X29**. Make certain that Pin 1 of X10 is connected to Pin 1 of X29. Interconnections presented in **Brown**.

### Summary of the Interface Connections between X10 and X29:

PORTB\_18P\_INTER, X10, Pin 1 (RB0) <====> X29, Pin 1  
PORTB\_18P\_INTER, X10, Pin 2 (RB1) <====> X29, Pin 2  
PORTB\_18P\_INTER, X10, Pin 3 (RB2) <====> X29, Pin 3  
PORTB\_18P\_INTER, X10, Pin 4 (RB3) <====> X29, Pin 4  
PORTB\_18P\_INTER, X10, Pin 5 (RB4) <====> X29, Pin 5  
PORTB\_18P\_INTER, X10, Pin 6 (RB5) <====> X29, Pin 6  
PORTB\_18P\_INTER, X10, Pin 7 (RB6) <====> X29, Pin 7  
PORTB\_18P\_INTER, X10, Pin 8 (RB7) <====> X29, Pin 8

2. Connect a two-pin jumper between **PORTA\_18P\_INTER** connector **X8**, **Pins 1 (RA0) and 2 (RA1)** and **LCD\_INTER** connector **X29** **Pins 10 (E) and 9 (RS)**, respectively. Again, please note: Interconnections presented in **Blue**.

### Summary of the Interface Connections between X8 and X29:

PORTA\_18P\_INTER, X8: Pin1 (RA0) <=====> X29: Pin 10 (LCD, E)  
PORTA\_18P\_INTER, X8: Pin2 (RA1) <=====> X29: Pin 9 (LCD, RS)

3. Connect a two-pin jumper between **X29, Pin 11 (R/W) to GND** on connector **X27 Pin 3** and **X29, Pin 12 (Vo)** to **-5V on connector X44, Pin 2**. These are the ground and Negative Reference Voltage connections to the trainer board. Interconnections presented in **Red** that are **-5V Ref and Gnd connections**.

### Summary of the Interface Connections between X27 and X29 and X44 with Neg Ref on LCD Vo:

POWER\_CONN, X27: Pin3 (GND) <=====> X29: Pin 11 (LCD, R/W)  
-POWER\_CONN, X44: Pin2 (-5v/-12v) <=====> X29: Pin 12 (LCD, Vo)

4. Connect two short jumpers between **RESONATOR\_INTER** connector **SV4**, **pins 1 and 3**, and **PORTA\_18P\_INTER**, **X8** connector **Pins 7 and 8**. Interconnections presented in **Blue** or **Black**.

### Summary of the Interface Connections between X8 and SV4:

PORTA\_18P\_INTER, X8, Pin 7 (OSC2) <====> SV4, Pin 1  
PORTA\_18P\_INTER, X8, Pin 8 (OSC1) <====> SV4, Pin 3

5. Connect the LCD 14 Pin plug to the SV1 (LCD\_CONN) socket that is located by right lower corner of the breadboard.
6. Set switches **S1: 1 through 5 to OFF and S1: 6 through 10 ON.**
7. Set switches **S4: 1 to OFF and S4: 2 to ON.**
8. Set switches **S5: 1 through 4 to ON and S5: 5 through 8 to OFF.**
9. Set switches **S6: 1 through 8 to OFF.**
10. Lift the handle of the Zero Insertion Force (ZIF) socket IC4.
11. Place the #2 PIC16F84A into the ZIF socket. Make certain that the notch end of the PIC is facing the handle end of the socket and that the PIC is mounted closest to the handle end of the socket.
12. Do NOT hold or press on the MCU, when lower the handle of the ZIF socket (just lower the handler).
13. Follow the procedures in *“Programming\_the\_PIC16F84\_Using\_PICKit2”* (available on [www.ucdistancetraining.org](http://www.ucdistancetraining.org)) to program this PIC16F84A MCU.

**NOTE: Upon completion of programming, the program will run automatically and the LCD will display the message **\*\*Congratulations\*\*** on the first line and **\*\*\*Test Complete\*\*\*** on the second line.**

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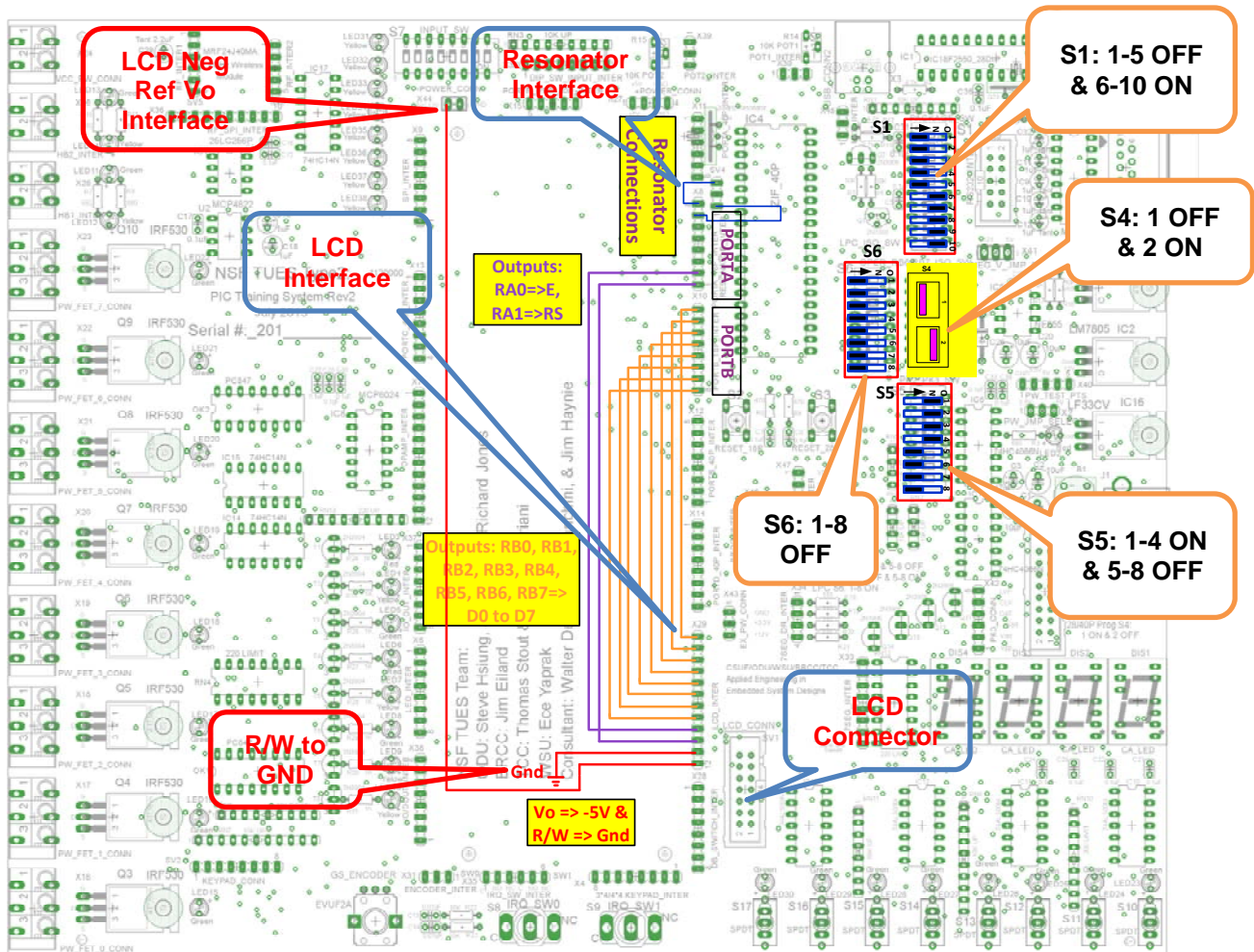


Figure 3. LCD with -5V Ref Test Interconnections, Switch Settings, and PIC Placement

This Figure 3 demonstrates the alternative LCD module that requires **Negative Ref Voltage** on its Vo line.

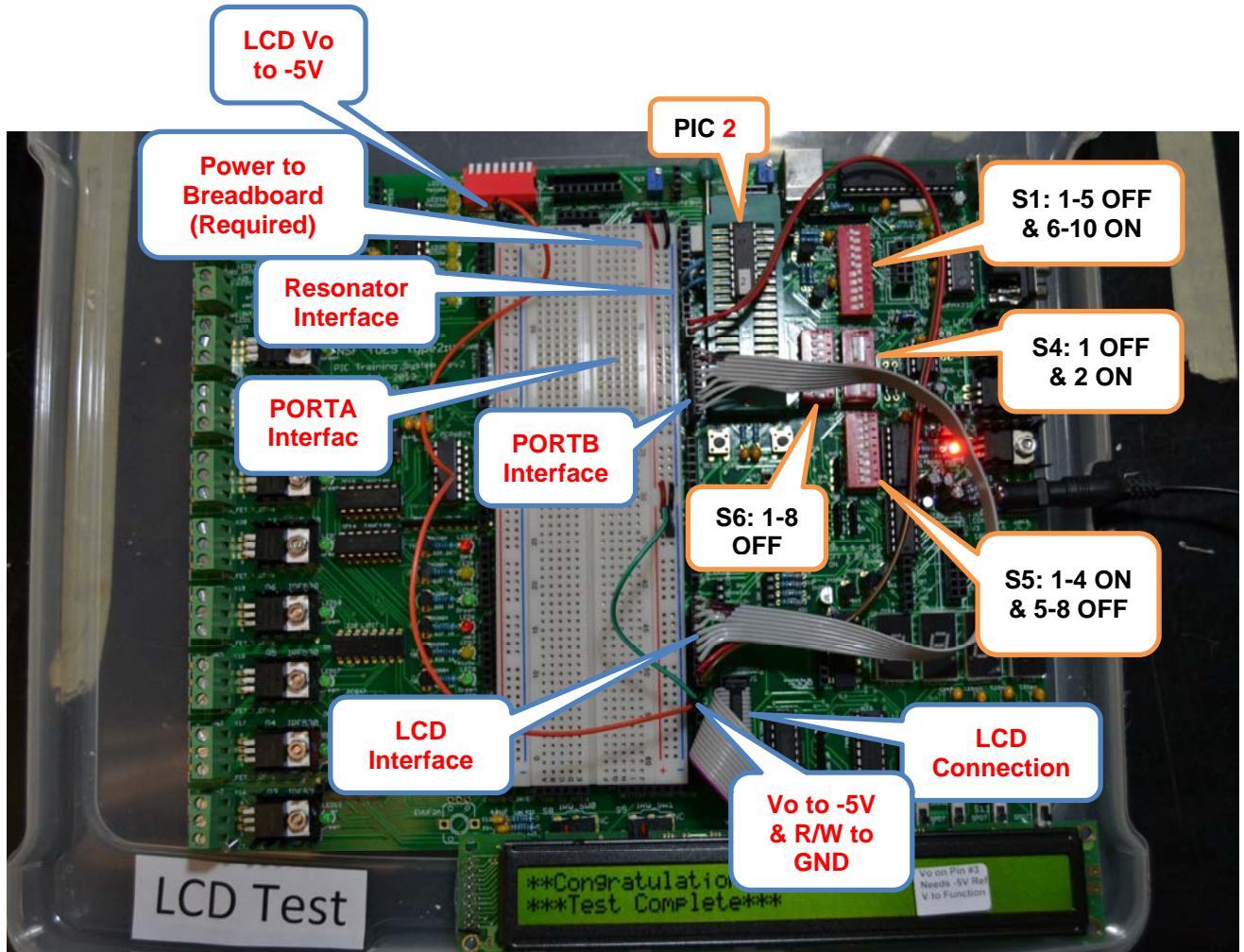


Photo 4. LCD Test Settings and PIC Placement

This Photo 4 demonstrates the alternative LCD module that requires **Negative Ref voltage on its Vo line.**