ESE 381

Lab 6: AVR128DB48 I2C Module with Sparkfun 20 x 4 SerLCD and LM75 Temperature Sensor

3/28/2025

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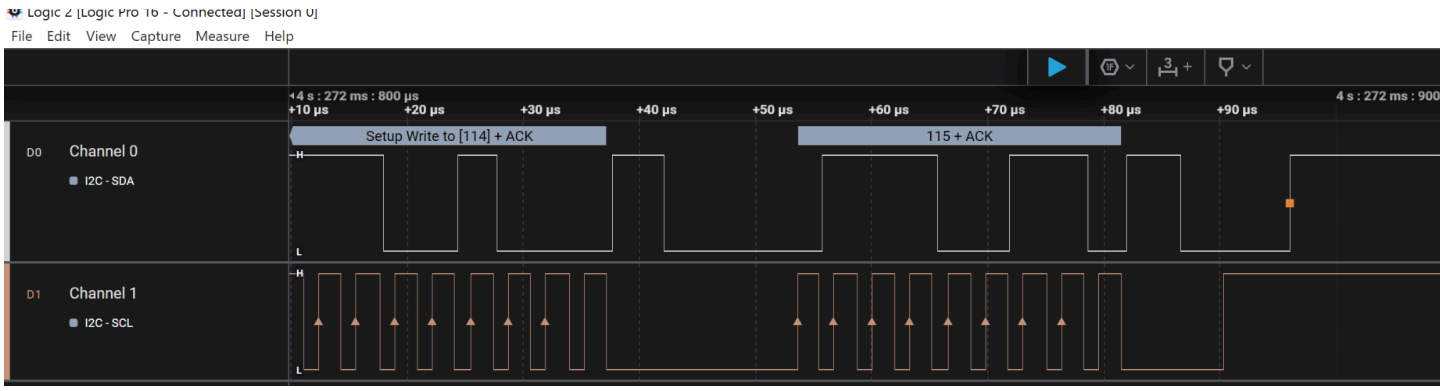
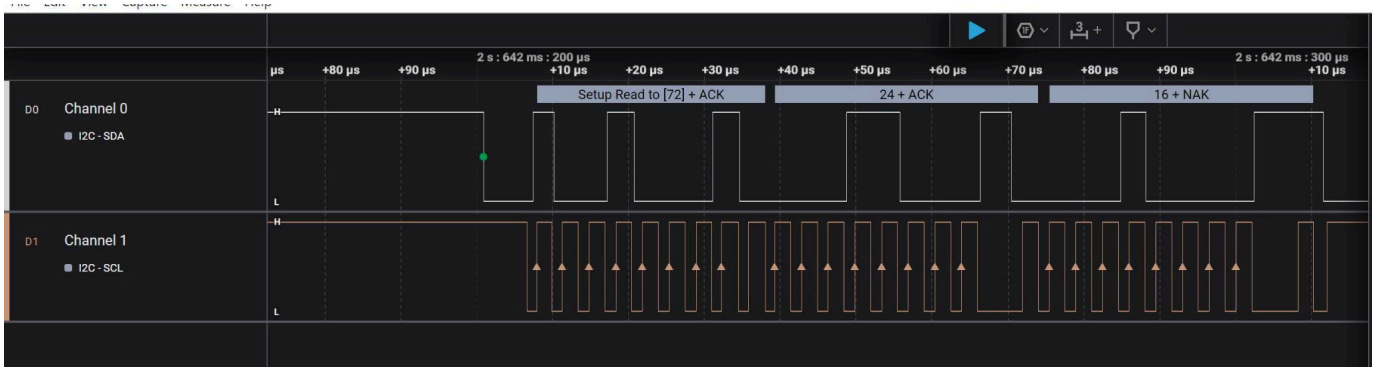
Section: L02 Bench 7

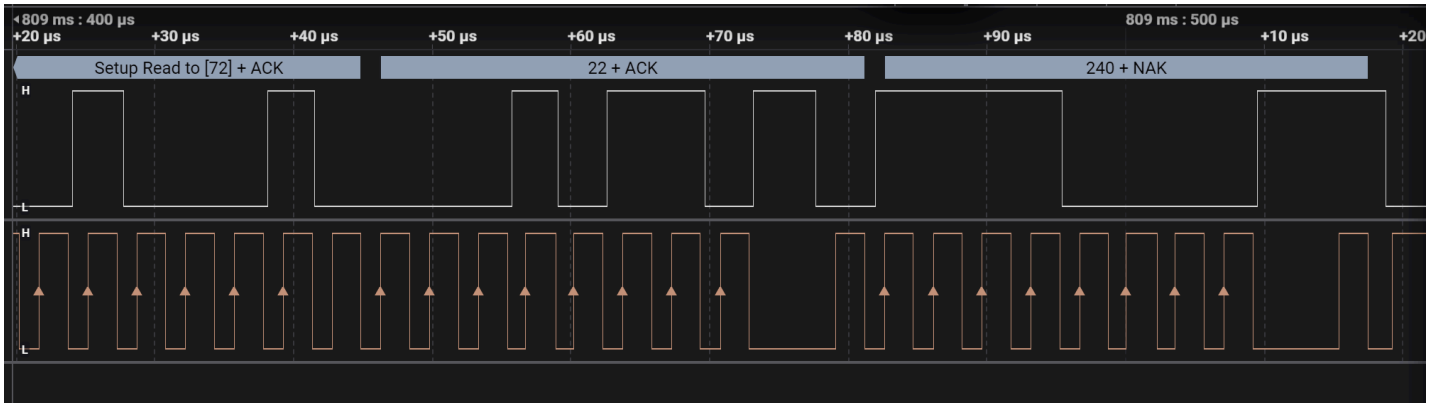
SerLCD_write_TWIO_test Saleae Logic Wave Capture



Read_LM75_Temp Saleae Logic Wave Capture



Display_LM75_TEMP Salae Wave Capture



1.

- **Question:** What is the highest SCL clock frequency possible for the LM75? Detail your method of determination. Also, describe the SCL frequency at which you operate your LM75 and your basis for this setting.

- **Answer:** The minimum period for the SCL clock suitable for I2C with the LM75 is specified in its datasheet as 2.5 microseconds, equating to a frequency of 400kHz.

2.

- **Question:** What should be the entered value in the MBAUD register to achieve the maximum desired SCL clock frequency? Provide your calculation steps.

  Answer: To compute the value for the MBAUD register:

  F_scl = F_clk_per / (10 + 2*BAUD + F_clk_per*T_r)

  $BAUD = (f_{CLK\_PER} / (2 * f_{SCL})) - (5 + ((f_{CLK\_PER} * T_R) / 2))$

  BAUD = (4MHz / (2 * -4MHz)) - (5 + ((4MHz * 0.282microsecond) / 2))

  BAUD ≈ -0.564

- The ideal BAUD register value is 1, allowing the system to maintain frequency within the maximum allowable range as BAUD value increments lead to frequency reduction.

3.

- **Question:** Which setting should the DBGRUN bit have within the DBGCTRL register during software debugging and why?

- **Answer:** The DBGRUN bit should be set to 1. This ensures that the two-wire interface (TWI) remains fully operational during the debugging process, preventing potential issues such as failure to transmit acknowledgment bits.

4.

- **Question:** On the Saleae Logic Analyzer, what do the red square and green circle indicate?

- **Answer:** The red square and green circle on the Saleae Logic Analyzer signify the START and STOP conditions, respectively. The START condition indicates when the bus is active, and the STOP condition indicates when the bus is released and returns to an "idle" state.

5.

- **Question:** Who should provide the acknowledgment after a byte transfer, the master or the slave?

- **Answer:** The master should issue the acknowledgment to ensure the slave continues to send necessary data as required.

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B

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to me

3/28/2025 14:57:01,harsh.raithatha@stonybrook.edu,Muhammad Sharjeel,115185427,Sig. 1: LT1 - Verify SerLCD_write_TWIO_test,100,

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to me

3/28/2025 15:08:14,uma.sivadasan@stonybrook.edu,Muhammad Sharjeel,115185427,Sig. 2: LT2 - Verify Read_LM75_temp,100,

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to me

3/28/2025 15:40:42,uma.sivadasan@stonybrook.edu,Muhammad Sharjeel,115185427,Sig. 3: LT4 - Verify temp_meas_LM75,100,