Log & Level: QA Testing

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1. Overview

This document contains the qualification and acceptance testing procedures for Log & Level. This document assumes that you have some knowledge of the device and have all necessary software and hardware components. This document also assumes that the hardware is already programmed with the given software (see the user manual for specific components and software programming procedure).

2. Testing Procedures

1. Connect the mini USB to the JNEX connector on the P24 expansion board and the standard USB to the computer.

2. Open the serial terminal and connect to the correct COM port. Press the 'RESET' button once the terminal is loaded.

3. The terminal screen should read:
   > *"Welcome to Tony Abboud's ENEE440 Project*
   > *Enter your first name (<12 char): "*

4. You can now enter up to 12 characters followed by the enter key. The characters will not appear on the terminal screen. Once 12 characters are reached, the program will continue with the 12 characters entered. Enter **"John"**.

5. The terminal screen should then output the main menu:
   > *"Hello John, please select which peripheral you want to use:*
   > *A. ADC/DMA: Logging Voltage Meter*
   > *B. SPI: Accelerometer Interface"*

6. You can then enter 'A' or 'B'. The default choice if neither are entered is choice B.
7. Proceed to **section 2.1** if option A was chosen or **section 2.2** if option B was chosen.

2.1. Logging Voltage Meter (measuring a AAA battery)

1. The terminal screen should output the setting selection menu for the ADC Sample Rate. You can select A. 3 cycles, B. 15 cycles, C. 28 cycles, or D. 56 cycles, followed by the enter key. If none of the options are chosen, then the default is A. 3 cycles. Select option A.

2. Then the ADC Sample Delay Settings will display. You can select A. 5 cycles, B. 6 cycles, C. 7 cycles, or D. 8 cycles, followed by the enter key. If none of the options are chosen, then the default is A. 5 cycles. Select option A.

3. The next settings are input by the board itself. The first setting displayed on the terminal is for the over voltage. The seven segment display will show "**0000**". *Skip to step 4 for the value to enter. To enter the over voltage you use switches 1 through 8 and the rotary encoder. Switches 1, 3, 5, 7 increment the value corresponding to display 1, 2, 3, 4 respectively. Switches 2, 4, 6, 8 decrement the value corresponding to display 1, 2, 3, 4

respectively. The rotary encoder is used to control the precision. Turning the rotary encoder one click counter-clockwise will provide 1 decimal place of precision. You can turn it back one click clockwise to remove the precision. The precision is set to 0 from the start, so you can only increment/decrement the display 4 digit using switches 7 and 8. Once the rotary encoder is turned counter-clockwise (more precision), the other displays can be incremented/decremented with their respective switches. See figure 1 for the maximum voltage values possible with various rotary encoder precision.

RE Precision	Maximum Value (V)
< 1 click CCW	9
1 click CCW	9.9
2 clicks CCW	9.99
> 2 clicks CCW	9.999

Figure 1: RE Precision vs. Max Voltage

4. For the first test, we do not want the chip to shut-off, so enter a voltage **above 3.3V** as the over voltage.

5. After using the switches and rotary encoder to input the over voltage, press switch 13 to store the value entered.

6. The next setting is for the under voltage. The under voltage is entered in the same way as the over voltage, so refer to step 3 and 4 for procedure. Again, we don't want the chip to turn off, so just press switch 13 to store the value of 0V as the under voltage.

7. The terminal displays configurations being performed, then prompts the user to press switch 13 to begin logging. Before pressing sw13, connect the two jumper wires, one from **PC0** and the other from **GND.** Press switch 13.

8. The voltage will be displayed on the terminal screen, "***Voltage: x.xxxV***". The voltage is also displayed on the seven segment display, "***x.xxx***", and **LED4** will be blinking Green. Note that the first value is always 0V. Also note that when the two wires (PC0 and GND) are not connected to anything, the voltage reading is about 3.3V (voltage of the GPIO pins).

9. Connect the wire from PC0 to the '+' side of the device to be measured (such as a AAA battery) and the GND side to the '-' side of the device. The voltage will again be displayed on both the terminal and the seven segment display. Ensure that the device does not have a higher voltage than the over voltage. For a AAA battery, the voltage displayed is about 1.6V.

10. Press switch 13 to pause the application. LED4 will turn off, and the seven segment display will pause   with the last voltage displayed. The terminal will display a new menu, to either change apps, continue the program, or restart the app.

11. Select "***B. Continue using the ADC/DMA***". LED4 will continue to blink green and the voltage will again be displayed on the terminal and the 7-segment display.

12. Press switch 13 again to pause the app. Select "***C. Restart the ADC/DMA App***". You will be brought back to the setting selection menu in section **2.1.1.** Select option D for the sample time, and option A for the sample delay.

13. Again, select an over voltage above **3.3V**. For example enter 4V (press sw7 4 times). Press sw13. Enter an under voltage of only **1.7V** (RE ← 1 click CCW, press sw5 one time, press sw7 7 times). Press sw13 to store the result.

14. Ensure the two wires PC0 and GND are not touching anything. Press sw13 to begin logging. Note, the **first** value, 0000V will not cause the chip to shut off, even though this is less than 1.7V.

15. The voltage values of about 3.3V should be displayed. Now place the wire from PC0 to the '+' side of the AAA battery and the GND side to the '-'side of the AAA battery. A voltage of about 1.6V should be displayed followed by a message, "***Voltage has exceeded the over/under limit!! The chip has turned off***". LED4 has turned off and **LED2** and **LED5** are on and red. The seven segment display should be showing "**----**".

16. Keep the wires attached to the battery leads. Press sw12 to turn the chip on and continue.

17. The next voltage will be displayed, followed by the same message in step 15. Now remove the wires from the battery and press sw12.

18. The voltages will be logged on the terminal and seven segment display and **LED4** will be blinking green.

19. Press sw13 again to pause the app. Select "***A. Change to ACCEL/SPI Peripheral***".

20. The terminal will display ***"Switching Apps…"***. Proceed to **section 2.2.1**. *Note: If you have got to this step by switching apps from the accelerometer interface, then the terminal screen will also output, ***"Continuing the Accelerometer Interface app…"*** and it will pick up at **section 2.2.5**.

2.2. Accelerometer Interface

1. The terminal screen will output the main menu for the accelerometer interface. Ensure that the board is in a static position, then press sw13 to begin the application.

2. The configurations and a message "***To pause or switch peripherals, press sw13…***", will be displayed on the terminal. The accelerometer is now set up and the seven segment display will be showing "***000***". **All of the LEDs** will be on and green.

3. Tilt the board forwards, until the display value reaches 100. Tilt the board backwards until the display value reaches -225. Return the board back to the initial position so the display remains -225. Tilt the board to the right and the **LED2, 4, 5, and 6** will be lit green. Return the board back to level and all of the LEDs should return to green. Tilt the board to the left and **LED1, 2, 3, and 5** will be lit red. Return the board back to level and all of the LEDs should return to green and the display should be -225.

4. Press sw13 to pause the application. Select ***"B. Continue using the Accelerometer"***, and you will return to the accelerometer app.

5. The display will be showing -225 and **all LEDs** will be lit green (state at the end of step 3).

6. Press sw13 again. Select ***"C. Restart the Accel_SPI app"***, and you will return to step 1. Repeat steps 1 through 3. At the end of step 3, **proceed to step 7.**

7. Press sw13 again. Select ***"A. Change to ADC/DMA Peripheral"***. The terminal will display ***"Switching Apps…"***. Proceed to ***section 2.1.1***. *Note: If you have got to this step by switching apps from the logging voltage meter, then the terminal will also output ***"Continuing the voltage meter app…"*** and it will pick up at **section 2.1.18.**