

Lab Title: Applying Embedded Tools for I²C, SPI, and USB Debugging and Development

Description: Program EEPROMs, prototype, and debug with valuable embedded tools in a hands on lab.

Objectives

Program SPI EEPROM with the Aardvark I²C/SPI Host Adapter

Learn to debug SPI with the Beagle I²C/SPI/MDIO Protocol Analyzer

Prototype I²C LEDs with the Aardvark I²C/SPI Host Adapter

Learn to debug I²C with the Beagle I²C/SPI/MDIO Protocol Analyzer

Lab Materials:

Aardvark I²C/SPI Host Adapter
Beagle I²C/SPI/MDIO Protocol Analyzer
RSKM16C29 Board
I²C/SPI Activity Board
Flash Center Software
Beagle Data Center Software
Aardvark Control Center Software

Skill Level : Basic knowledge of C, I²C, SPI, and USB protocols

Time to Complete Lab: 100 minutes

Lab Sections

- | | | |
|----------|---|-----------------------------------|
| 1 | Program SPI EEPROM | Time to complete task: 10 minutes |
| 2 | Understand and Debug SPI EEPROM | Time to complete task: 45 minutes |
| 3 | Understand, Implement, and Debug I²C LEDs | Time to complete task: 45 minutes |

1

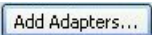


Program SPI EEPROM

Time to complete task: 10 minutes

Overview:

Students will program SPI EEPROMs in seconds using the Flash Center software program and the Aardvark adapter.

Procedural Steps

1. **Open** the Flash Center software 
2. **Click** on the "Choose Target" Icon
3. **Select** "SPI EEPROM" under device type, "Atmel" under manufacturer, "AT25080A" under part number, and press OK
4. **Click** "Add Adapters" button 
5. **Select** the Aardvark adapter
6. **Click** "Add" 
7. **Click** "Target Power" button to power the board 
8. **Go** to the File menu and **select** Load File
9. **Load** tpSPI.hex from the desktop
10. **Click** the "Program and Verify" icon to program and verify the SPI EEPROM 
11. **Close** the Flash Center software

2



Understand and Debug SPI EEPROM Code





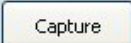




Time to complete task: 45 minutes

Overview:

Students will learn to debug the SPI EEPROM Code with the Beagle Data Center software by non-intrusively monitoring the SPI bus.

Procedural Steps:

1. **Open** tpDemo workspace
2. **Press** the "Build" button 
3. **Press** the "Go" button 
4. **Play** around with the board to discover the bug

5. **Open** the Beagle Data Center software
6. **Press** the “Connection” button 
7. **Press** the “Connect” button to connect to the Beagle I²C/SPI/MDIO Protocol Analyzer 
8. **Switch** the capture protocol to SPI 
9. **Switch** to the SPI tab 
10. **Press** the “Capture” button 
11. **Play** around with the board to get data (press the buttons on the board to collect data)
12. **Observe** and **detect** the bug using Beagle Data Center software
13. **Open** tpDemo workspace
14. **Press** the “Halt” icon to stop the CPU 
15. **Fix** the bug in the lcd_set function in the main.c tab
16. **Press** the “Build” button 
17. **Press** the “Go” button in the tpDemo workspace 
18. **Verify** that your fix works
19. **Observe** the traffic in the Beagle Data Center software
20. **Press** the “Halt” icon to stop the CPU 
20. **Press** the “Stop” button in the Beagle Data Center software and **close** the Beagle Data Center software

3




Understand, Implement, and Debug I²C LEDs





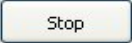


Time to complete task: 45 minutes

Overview:

Students will implement the LEDs on the I²C/SPI Activity Board by using Aardvark I²C/SPI Host Adapter, Aardvark Control Center software, Beagle I²C/SPI/MDIO Protocol Analyzer, and Beagle Data Center software.

Procedural Steps:

1. **Open** Beagle Data Center software
2. **Select** the "Connection" button 
3. **Press** the “Connect” button to connect to the Beagle I²C/SPI/MDIO Protocol Analyzer 
4. **Open** the Aardvark Control Center software
5. **Press** the “Configure Aardvark Adapter” button 

6. **Select** the first adapter on the list and **Press** “OK”
7. **Type** in 0x38 in the slave address field
8. **Attempt** to control I²C LEDs using the Aardvark Control Center software
9. **Open** up the tpDemo workspace
10. **Implement** leds_init and leds_set in main.c tab
11. **Press** the “Build” icon at the top 
12. **Press** the “Go” icon 
13. **Switch** to the Beagle Data Center software
14. **Switch** the capture protocol to I²C 
15. **Select** the I²C tab 
16. **Press** the “Capture” button 
17. **Verify** that your solution works by pressing Switch 3
18. If the solution does not work, **debug** using the Beagle Data Center software
19. **Press** the “Stop” button in the Beagle Data Center software 
20. **Switch** to the tpDemo workspace
21. **Press** the “Halt” button to halt the CPU 
22. **Press** the “Reset CPU” button 
23. **Close** all the software

Questions:

- 1.1) What techniques were used to narrow down the SPI bug?

Question:

- 1.2) What command do you need to send to the port expander to turn on every other LED starting with the first one?

Answer Page

1. What techniques were used to narrow down the SPI bug?

1. What command do you need to send to the port expander to turn on every other LED starting with the first one?
