FLASHY FASHION DEVICE: System Test Plan
Version 1.0

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Version History

Version #	Revision Date	Responsible Party	Reason
1.0	22 November, 2016	Jessica Blasch	Initial compilation of source document

Table of Contents

1.0 INTRODUCTION

1.1 This Document

This document serves as reference guide for the Flashy Fashion device. Its contents cover pertinent information related to design, testing, and debugging necessary to ensure successful operation of the device.

2.0 REFERENCE DOCUMENTS

2.1 Design Documentation

2.1.1 Flashy Fashion Block Diagram

Important: The button and its connections are missing on the board schematics following; in particular the microprocessor to LCD schematic . This component will need to be added and soldered by hand to create this piece of functionality.
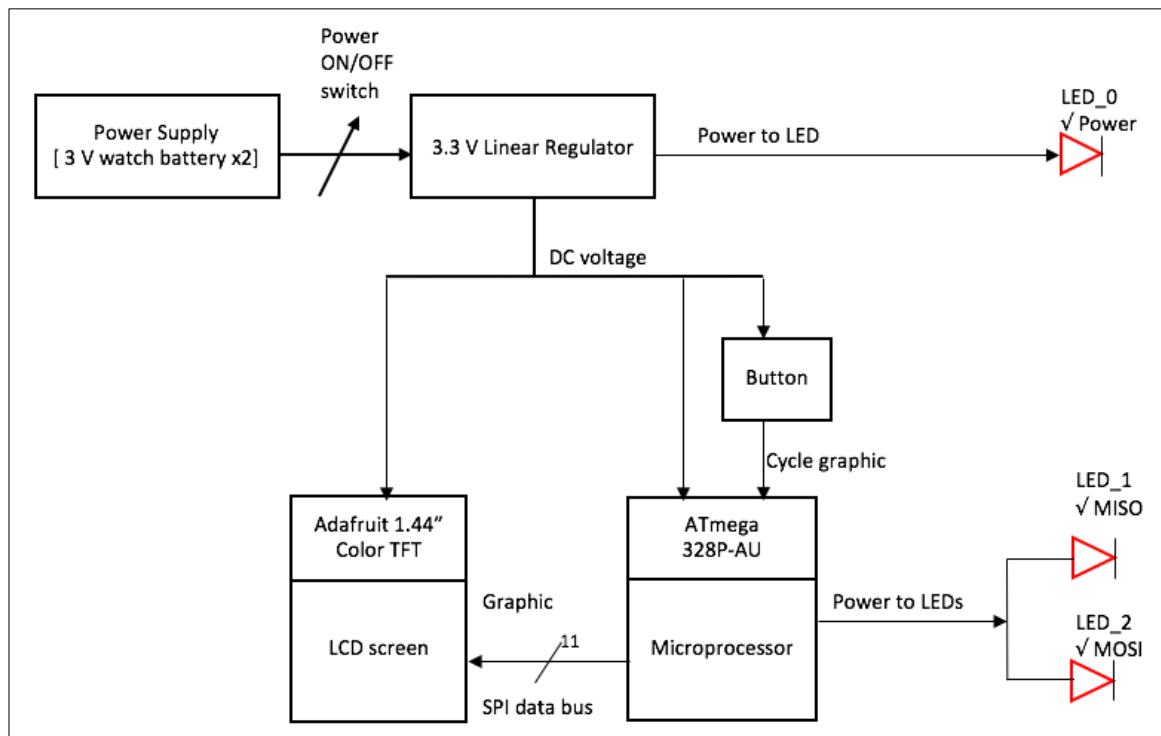
2.2.2 Power Supply and Control Switch Schematic
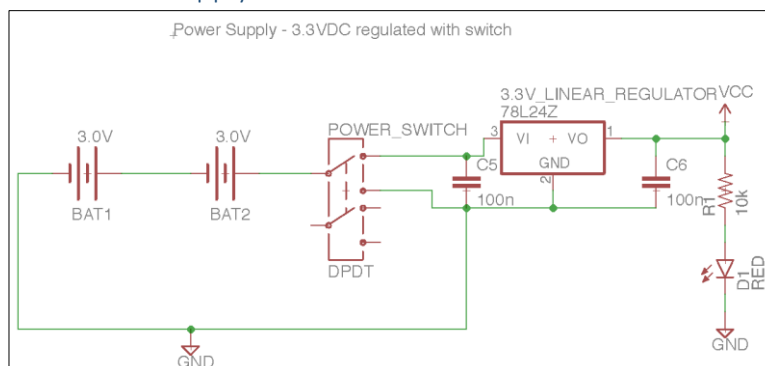
2.2.3 ATmega328P-AU Microprocessor to Breakout Board for TFT LCD Schematic

Important: The button and its connections, in the block diagram, are missing on the board schematic following. This component which is used to cycle through multiple images on the TFT LCD will need to be added and soldered by hand to create this piece of functionality. See next diagram for button schematic.
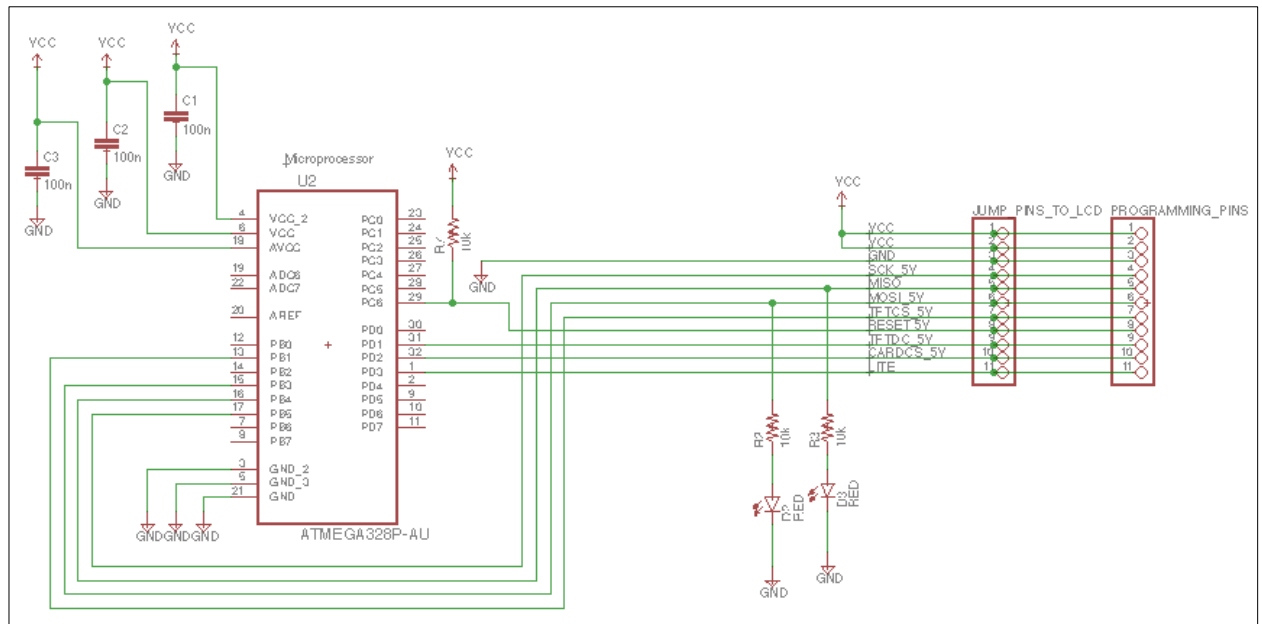
2.2.4 User Button Schematic
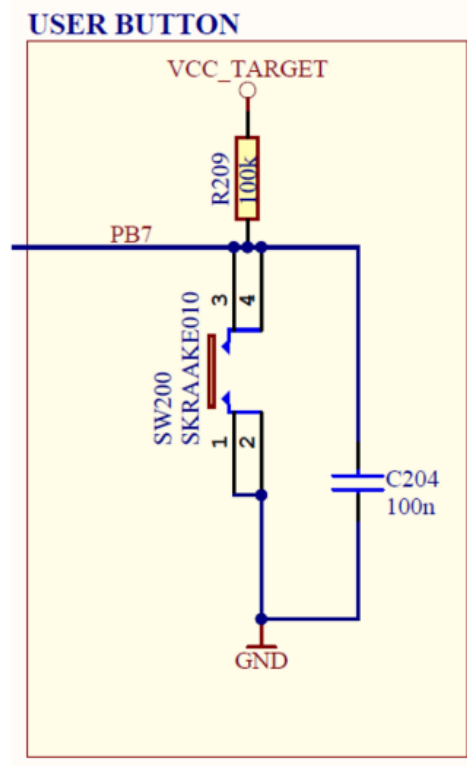
2.2.5 Adafruit 1.44" Color TFT with Micro SD Socket Schematic
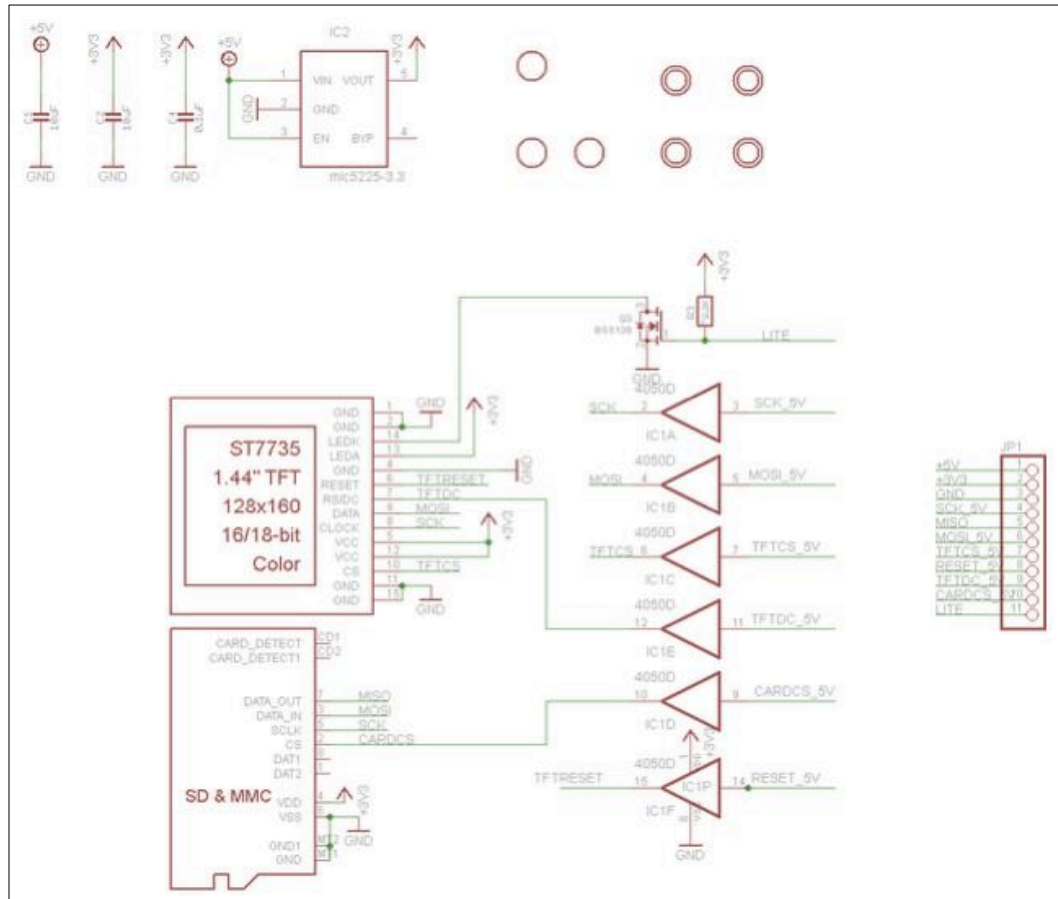
3.0 FLASHY FASHION OVERVIEW

3.1 Operational Description

To use the Flashy Fashion device, it must have 2 3 V watch batteries installed and be powered on. At least one image uploaded to the microcontroller per user manual instructions. When the button to the microcontroller is pushed, the image should cycle to allow the user to select a different display graphic.

3.2 Definition of Terminology

- PCB – Printed Circuit Board
- SPI –Serial Peripheral Interface Bus (ATmega Microcontroller)
- MOSI – Pin on TFT LCD connected to pin 16 on ATmega microcontroller
- MISO – Pin on TFT LCD connected to pin 15 on ATmega microcontroller
- TFT CS – Pin on TFT LDC connected to pin 13 on ATmega microcontroller

4.0 PRETEST PREPERATION

4.1 Test Equipment

- Multimeter
- Oscilloscope
- Video Camera with time-lapse and app. (e.g. Nest Cam indoor security camera)

4.2 Test Setup and Calibration

Tests which fall under "Functional Checks" are designed to test individual components of the system and require a multimeter, oscilloscope, and time-lapse video cam. Tests which fall under "System Tests" should be completed after all components are assembled on the pcb.

4.3 Supplemental Documentation

4.3.1 ATmega328P Microcontroller
- Datasheet Summary
- Data Sheet Complete
- Atmel ATMEGA 8-bit instruction set
- Atmel studio

4.3.2 Adafruit 1.4" TFT LCD
- ST7735R Data Sheet
- PDF Overview

4.3.3 Coding Reference
- Atmel SPI API
- Atmel's Toolchain
- Atmel Software Framework

5.0 SYSTEM TESTS

5.1 Functional Checks

5.1.1 Power Switch

Test Writer: Jessica Blasch							
Test Case Name:	Power Switch				**Test ID#:**		PWR-SW-01
Description:	Test power switch functionality				**Type:**		☐white box ☒black box
Tester Information							
Name of Tester:					**Date:**		
Hardware Ver:	Flashy Fashion 1.0				**Time:**		
Setup:	Install DPDT power switch on PCB. Place switch in OFF position, and locate lower two pads on the switch that face the batteries on the PCB. Use multimeter to take measurements as described.						
Step	**Action**	**Expected Result**	**Pass**	**Fail**	**N/A**	**Comments**	
1	Measure resistance across pads with switch in OFF position	Infinite resistance measured					
2	Turn switch to ON position	Near or zero resistance measured					
Overall test result:							

5.1.2 Voltages: Supply and Linear Regulator

Test Writer: Tyson Gieszler								
Test Case Name:		Voltage Levels				**Test ID#:**		Voltage-LVL-01
Description:		Test the amount of voltage received from the battery unit before and after the switch and regulator				**Type:**		☒ white box ☐ black box
Tester Information								
Name of Tester:						**Date:**		
Hardware Ver:		Flashy Fashion 1.0				**Time:**		
Setup:		Install battery mounts, 3.3 V regulator, and DPDT power switch on PCB. Have fresh batteries on hand and ensure power switch is OFF before beginning. Use a multimeter to measure voltages as described below.						
Step	**Action**	**Expected Result**		**Pass**	**Fail**	**N/A**	**Comments**	
1	Insert one battery cell. Make sure switch is in the OFF position. Test voltage output before and after switch.	Expected 3V +/- 10% before the Switch Expected 0V after the Switch						
2	Insert second battery. Make sure Switch is in the OFF position. Test voltage before and after the switch.	Expected 6V +/- 10% before the Switch Expected 0V after the Switch						
3	With both batteries in, slide the switch to the ON position. Test the voltage before and after the Switch. Test the voltage after the regulator.	Expected 6V +/- 10% before the Switch Expected 6V +/- 10% after the Switch Expected 3.3V +/- 5% after the regulator.						
Overall test result:								

5.1.3 Microprocessor SPI Driver Output

Test Writer: Charley Hill								
Test Case Name:		ATmega SPI output test				**Test ID#:**		SPI-01
Description:		Tests ATMEGA SPI driver to ensure correct communication from the microprocessor.				**Type:**		☒ white box ☐ black box
Tester Information								
Name of Tester:						**Date:**		
Hardware Ver:		Flashy Fashion 1.0				**Time:**		
Setup:		Connect oscilloscope probes to MOSI, SPI clock, and TFT CS. Set up debugger to have control and monitor when bytes are transmitted.						
Step	**Action**	**Expected Result**		**Pass**	**Fail**	**N/A**	**Comments**	
1	Write program to drive MOSI output on SPI interface	Bits fluctuate on an output line in accordance with manually specified bytes.						
2	Connect MOSI CS and SPI clock to oscilloscope. Repeat for all six pins.	SPI clk fluctuating in time in accordance with MOSI output and TFT CS matching designated value.						
3	Time & monitor to see if bits are coming out in correct order	SPI clock, MOSI, and TFT CS match desired output levels and timing constraints.						
Overall test result:								

5.1.4 LCD Display Image

Test Writer: Tyson Gieszler						
Test Case Name:	Display Image			**Test ID#:**		Image-DSP-01
Description:	Test to see if communication is working properly with the LCD screen			**Type:**		☐ white box ☒ black box
Tester Information						
Name of Tester:				**Date:**		
Hardware Ver:	Flashy Fashion 1.0			**Time:**		
Setup:	Ensure connections between microcontroller and TFT LCD as per schematics, hook-ups to power on, and power switch is OFF before beginning.					

Step	Action	Expected Result	Pass	Fail	N/A	Comments
1	Write code to bring TFT LCD out of sleep mode	N/A				
2	Insert both battery cells and switch to ON. Upload image following user's manual.	Display should light up and show image				
Overall test result:						

5.2 Assembled Device Checks

5.2.1 Microcontroller Button

Test Writer: Charley Willow Hill						
Test Case Name:	Button function test			**Test ID#:**		Button-01
Description:	This test will ensure the consistent function of the devices only button. It will ensure that there is an image change at every press after the initial startup.			**Type:**		☒ white box ☐ black box
Tester Information						
Name of Tester:				**Date:**		
Hardware Ver:	Flashy Fashion 1.0			**Time:**		
Setup:	Ensure complete assembly of device with current software installed and running.					

Step	Action	Expected Result	Pass	Fail	N/A	Comments
1	After complete boot process, press button and observe results.	Image changes to next image in preprogrammed sequence.				
2	Rapidly press button and observe results.	Device will jump to image further in sequence relative to the number of times the button was pushed.				
3	Hold button for extended period and observe results.	Image will continue to change until button is released.				
Overall test result:						

5.2.2 Backlight

Test Writer: Charley Willow Hill							
Test Case Name:	Backlight test.				**Test ID#:**	Backlight-01	
Description:	This test will ensure the proper functioning of the backlight				**Type:**	☒ white box ☐ black box	
Tester Information							
Name of Tester:					**Date:**		
Hardware Ver:	Flashy Fashion 1.0				**Time:**		
Setup:	Ensure complete assembly of device with current software installed and running.						
Step	**Action**	**Expected Result**	**Pass**	**Fail**	**N/A**	**Comments**	
1	After complete boot process, press button and observe results.	Backlight will turn on.					
2	Rapidly press button and observe results.	No change.					
3	Hold button for extended period and observe results.	No change.					
Overall test result:							

5.2.3 Image Cycle

Test Writer: Charley Willow Hill							
Test Case Name:	Image Cycle Test				**Test ID#:**	IMG-Cycle-01	
Description:	This test will ensure the consistent and appropriate image is displayed on device as it is intended by the user.				**Type:**	☒ white box ☐ black box	
Tester Information							
Name of Tester:					**Date:**		
Hardware Ver:	Flashy Fashion 1.0				**Time:**		
Setup:	Ensure complete assembly of device with current software installed and running.						
Step	**Action**	**Expected Result**	**Pass**	**Fail**	**N/A**	**Comments**	
1	After complete boot process, press button and observe results.	Image changes to next image in preprogrammed sequence.					
2	Rapidly press button and observe results.	Device will jump to image further in sequence relative to the number of times the button was pushed.					
3	Hold button for extended period and observe results.	Image will continue to change until button is released.					
Overall test result:							

5.2.4 LEDs: Power, MISO, and MOSI

Test Writer: Tyson Gieszler							
Test Case Name:		LED Levels			**Test ID#:**		LED-Levels-01
Description:		Test to determine if the LEDs are lighting up and not causing "brown-out" or circuit			**Type:**		☐ white box ☒ black box
Tester Information							
Name of Tester:					**Date:**		
Hardware Ver:		Flashy Fashion 1.0			**Time:**		
Setup:		Propagate all components on the PCB and test for functionality prior to this test. Ensure fresh batteries are on hand and that the power switch is OFF before beginning.					

Step	Action	Expected Result	Pass	Fail	N/A	Comments
1	Insert both battery cells. Slide Switch to ON position. Observe LED.	Power LED should be visible in normal indoor lighting. Level should be constant and not flickering.				
2	Upload and display image to the LCD screen. Observe LEDs during process.	LEDs on MISO and MOSI lines should light up and be visible in normal indoor lighting. Screen should display image completely and not become dim or shut off.				
Overall test result:						

5.2.5 Battery Lifetime Minimum

Test Writer: Tyson Gieszler							
Test Case Name:		Battery Lifetime			**Test ID#:**		Battery-Life-01
Description:		Test to determine if the battery lifetime is longer than 1 hour.			**Type:**		☐ white box ☒ black box
Tester Information							
Name of Tester:					**Date:**		
Hardware Ver:		Flashy Fashion 1.0			**Time:**		
Setup:		Propagate PCB board with all components and run tests on individual blocks before this test. Ensure fresh batteries are available before beginning.					

Step	Action	Expected Result	Pass	Fail	N/A	Comments
1	Insert both battery cells. Upload and display image that uses whole screen.	The device should display an image on the TFT LCD screen				
2	Check after 1 hour	Expectation: The system should still be displaying the image and should not have powered down at this point.				
Overall test result:						

5.2.6 Battery Lifetime Extended

Test Writer:	Tyson Gieszler					
Test Case Name:	Battery Lifetime Extended			**Test ID#:**		Battery-Life-02
Description:	This test is to see how long the system will remain powered on if run on two 3 V batteries.			**Type:**		☐ white box ☒ black box
Tester Information						
Name of Tester:				**Date:**		
Hardware Ver:	Flashy Fashion 1.0			**Time:**		
Setup:	Propagate PCB with all components and run tests on individual blocks before this test. Ensure fresh are on hand and the device should be powered OFF.					

Step	Action	Expected Result	Pass	Fail	N/A	Comments
1	Insert new battery cells.	No change				
2	Upload and display image that uses whole screen.	Image should fill the entirety of the LCD screen				
3	Note initial start time and monitor with time-lapse video, until drained, and review for time power drained.	LCD screen will have turned off from drained batteries.				
Overall test result:						