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Homework 6: Test Plan

ECE 411: Fall Term

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Test Plan

Unit Tests

- Regulated Power Supply Test
 - Partially Assembled Board with Only Power Circuitry
 - Power Adapter Brick (9V @ 2A)
 - Oscilloscope
- IR Receiver Test
 - IR receiver module
 - Oscilloscope
 - IR remote that uses a 38 KHz carrier wave, and can either be programmed to send any code or sends the code that the IR receiver accepts (codes follow the NEC standard and are outlined in programming documentation)
- Servo Motor Test
 - Servo Motor
 - Signal Generator
- Light Dependent Resistor Test
 - Standalone LDR
 - Multimeter
 - Flashlight (exact light intensity not important)
 - Lux Meter
 - LDR specs datasheet

Integration Tests

- Test MCU with IR receiver
 - Partially Assembled Board that has just the MCU (with supporting circuitry) and IR receiver (with supporting circuitry)
 - Test Firmware (that will send received IR code to computer using debug wire)
 - Computer with Atmel Studio
- Test MCU with LDR
 - Partially Assembled Board that has just the MCU (with supporting circuitry) and LDR (with supporting circuitry)
 - Test Firmware (that will send light reading to computer using debug wire)

- Computer with Atmel Studio
- Flashlight
- Lux Meter
- Test MCU with Servo
 - Partially Assembled Board that has just the MCU (with supporting circuitry) and Servo
 - Test Firmware (that will simulate various servo operations)
 - Computer with Atmel Studio
- Test MCU with Servo and LDR
 - Partially Assembled Board that has just the MCU (with supporting circuitry), LDR (with supporting circuitry), and Servo
 - Equipment from LDR and Servo Integration Tests
- Test MCU with IR receiver, LDR, and Servo
 - Fully Assembled Board
 - Test Firmware (that is a combination of all the other test firmware, to test each subsystem at the same time)
 - All Equipment from other Integration Tests

Parametric Tests

- Do blinds meet power consumption (Under 2.5 Watts Power Per Hour)
 - 3 Fully Assembled Systems
 - Wattage Meter
 - AC Output Power Source
 - Test Firmware (to simulate typical blinds usage)
- Do blinds meet speed requirements (Close or open under 10 sec)
 - 3 Fully Assembled Systems
 - Stopwatch
- Do blinds meet noise requirements (No more than 40 dB)
 - Sound Level Reader
 - Test Firmware (to simulate typical blinds usage)

Functional Tests

Please note for all the functional tests, the following equipment is required: fully assembled system and production firmware

- Power LED
- RGB LED Correctly Displays System Status
- Up Button Test
- Down Button Test
- Programming Button Test
- Automatic Mode Test
 - Timer
 - Lux Meter
 - Variable Light Source

Exhaustive Testing

- What happens if the user presses all the buttons at once
 - Window Shades Controller
 - IR Remote

Stress Tests

- Servo Maximum Current Limit Verification
 - Assembled system
 - Various weights to hang from the blinds
 - Ammeter to measure the current
- Physical Forces Applied to Controller Enclosure
 - 3 Window Shades Controllers
 - Various weights
- Continuously Move the Blinds Up and Down
 - Fully Assembled System

Installation Tests

Please note for all the installation tests, the following equipment is required: window shades controller, servo motor, 6 position ribbon cable, power adapter, tools (screw driver), mounting brackets with screws

- Install Window Shades Controller
- Install Servo Motor and LDR

Use Testing

- Can user open/close the blinds
 - Fully assembled system
 - Window shades controller
 - IR transmitter
- Can user calibrate the blinds correctly
 - Fully assembled system
 - Window shades controller
- Can user set the correct mode for blinds
 - Fully assembled system
 - Window shades controller

Error Testing

- Remember System State on Power Loss
 - Fully assembled system
 - Power Adapter
 - Outlet
- What happens if blinds get stuck
 - Fully assembled system
 - What happens if user pulls on blinds
 - Fully assembled system
 - Ammeter & Voltmeter
- What happens if the Up or Down buttons get stuck
 - Window shades controller

Environmental Testing

- How does LDR perform when the weather is cloudy vs. sunny
 - Fully assembled system
 - Window
 - Light With Variable Brightness
 - Lux Meter

Test Case #1: Automatic Mode Functional Test

Test Writer: Aleksey Prozapas						
Test Case Name:		Automatic Mode Functional Test				Test ID #: AWS-23
Description:		Verify that the servo turns on and spins in the correct direction when daylight is present (>300 lux) and when daylight is absent (<300 lux).				Type: Black Box
Tester Information						
	Name of Tester:					Date:
Hardware Ver:		1.0				Time:
Test Equipment:		<ul style="list-style-type: none">Fully Assembled SystemProduction FirmwareTimerLux MeterVariable Light Source				
Setup:		Make sure initially the shades are installed in window frame. Program the MCU to window length by pressing and holding until blinds reach the bottom of the window frame. Make sure the system is switched to autonomous mode.				
	Action	Expected Result	P	F	N/A	Comments
1	Adjusts light to 300 lux intensity	Servo should not move, blinds stay in same position.				
2	Wait +6 minutes	Servo should not move, blinds stay in same position.				
3	Adjusts light below 300 lux intensity	Servo should not move, blinds stay in same position.				
4	Wait +6 minutes	Servo turns counter clockwise and closes the blinds to the programmed value.				
5	Adjusts light to 300 lux intensity	Servo should not move, blinds stay in same position.				
6	Wait +6 minutes	Servo should not move, blinds stay in same position.				
7	Adjusts light greater 300 lux intensity	Servo should not move, blinds stay in same position.				

8	Wait +6 minutes	Servo turns counter clockwise and closes the blinds completely to the programmed value				
	Note:	Use Lux Meter to measure light intensity				
Overall test result:						

Test Case #2: Servo Current Draw Limit

Test Writer: Svyatoslav Zhuchenyha						
Test Case Name:		Servo Current Draw Limit			Test ID #: AWS-13	
Description:		Test used to verify that the servo current limiting resistor (R12) limits the servo’s current draw to no greater than 220mA, leaving the rest of the circuit with enough current to operate effectively.			Type: White Box	
Tester Information						
	Name of Tester:					Date:
Hardware Ver:		1.0			Time:	
Test Equipment:		<ul style="list-style-type: none">Fully Assembled Automated Window Shades Controller PCBParallax Continuous Rotation Servo (#900-00008)AC 100-240V to 9V/2A Barrel Jack Power AdapterFully Assembled Window Shades Demo Unit (with controller and servo installed)AmmeterFemale-Female jumper wire2.5 lb weight5 lb weight10 lb weight15 lb weightDuct Tape				
Setup:		Ensure that window shade demo unit is fully assembled, programed and calibrated, with all components are installed and functional. Attach an ammeter (set to mA) between the controller and the servo by; connecting via the jumper wire, the positive terminal of the ammeter to pin 4 of connector J2 on the controller PCB, and the negative terminal to the VCC pin of the servo. Ensure that the device is powered on, the system is in manual mode and the window shades are in the fully open position.				
	Action	Expected Result	P	F	N/A	Comments
1	Attach the 2.5 lb weight to the bottom of the window shades with tape.	The shades should remain stationary.				
2	Press the “Down” Button and	The current drawn by the servo				

	allow the shades to fully extend to the closed position and stop. Record the maximum current reading you observed on the ammeter	as measured by the ammeter should not exceed 220mA				
3	Press the “Up” Button and allow the shades to fully extend to the original open position and stop. Record the maximum current reading you observed on the ammeter. Remove the attached weight	The current drawn by the servo as measured by the ammeter should not exceed 220mA				
4	Attach the 5 lb weight to the bottom of the window shades with tape.	The shades should remain stationary.				
5	Press the “Down” Button and allow the shades to fully extend to the closed position and stop. Record the maximum current reading you observed on the ammeter	The current drawn by the servo as measured by the ammeter should not exceed 220mA				
6	Press the “Up” Button and allow the shades to fully extend to the original open position and stop. Record the maximum current reading you observed on the ammeter. Remove the attached weight.	The current drawn by the servo as measured by the ammeter should not exceed 220mA				
7	Attach the 10 lb weight to the bottom of the window shades with tape.	The shades should remain stationary.				
8	Press the “Down” Button and allow the shades to fully extend to the closed position and stop. Record the maximum current reading you observed on the ammeter	The current drawn by the servo as measured by the ammeter should not exceed 220mA				
9	Press the “Up” Button and allow the shades to fully extend to the original open position and stop. Record the maximum current	The current drawn by the servo as measured by the ammeter should not exceed 220mA				

	reading you observed on the ammeter. . Remove the attached weight.				
10	Attach the 15 lb weight to the bottom of the window shades with tape.	The shades should remain stationary.			
11	Press the “Down” Button and allow the shades to fully extend to the closed position and stop. Record the maximum current reading you observed on the ammeter	The Servo should not be able to lift the weight, The current drawn by the servo as measured by the ammeter should not exceed 220mA			
12	Press the “Up” Button and allow the shades to fully extend to the original open position and stop. Record the maximum current reading you observed on the ammeter	The Servo should not be able to lift the weight, The current drawn by the servo as measured by the ammeter should not exceed 220mA			
13	Remove the weight from the shades and restore system to normal operating conditions, with the only load on the servo being the shades themselves.	The system should remain fully functional with no damages components or functions			
Overall test result:					