

Testing Methodologies

The testing of the Electronic Design Automation (ELE31EDA) assignment implemented the standard module, integration and regression testing. Both simulation and hardware test cases were developed and carried out. The software simulations was produce with Max Plus. The hardware test was performed on ALTERA UP2 Education Board and Altera-Display Board.

Test plan

All individual modules (component) that could be tested independently were examined first, against specially design white and black box test cases. Once the independent modules was tested, the integration of the seven segment decoder, segment multiplexer and the unit display driver was tested. Each module is fundamentally its own test bench with Max-Plus changing the signals default values and providing a clock. The clock divider and the decimal clock mainframe was added and re-tested. Finally the debouce button was combined and tested. These test cases were simulated in software and tested on hardware. A regression test of each user test cases was performed. The last test is the most destructive test, exploring unprecedented actions by the user. This anomaly includes turn the power off and pressing more than one button down at the same time. If the system passes these tests, then hardware is guarantee to be fully-functional.

Test cases/results

1. Module Testing

Test ID Number	Testing	Inputs/Actions	Results
1	Display the numbers zero to nine on one segment	Internally controlled	Each digit is clearly displayed.
2	When an invalid digit is passed to the segDecoder.	Internally controlled	All the segments will be off.

Component: segDecoder

Test ID Number	Testing	Inputs/Actions	Results
3	To examine any unexpected behaviour due to an unclean signal.	A push button was pressed.	The display decimal point, turned on and off with two presses.
4	To test whether the debouncing time is too long.	A push button was pressed, rapidly.	The user did not notice any delay or lack of action by the system.

Component: debouncer

2. Integration Testing

Test ID Number	Testing	Inputs/Actions	Results
5	To confirm the operations of each seven segment display of the expansion board.	"00:00:00" "18:88:88"	The output was as expected.

Components: segMultiplexer, segDecoder and displayDriver

Test ID Number	Testing	Inputs/Actions	Results
6	To test each mode. Observe the increase in speed	Dip-switch "00", "01", "10" and "11"	As the mode change the speed of the clock display increases. Also observe was that each digit that was display was expected.

Components: clockDivider, clock, displayDriver, segDecoder and segMultiplexer

Test ID Number	Testing	Inputs/Actions	Results
7	Setting the clock to watch the transition from 10:00:00 to 10:00:01	Setting of the clock	The transition was as expected.
8	Setting the clock to watch the transition from 9:59:59 to 10:00:00	Setting of the clock	The transition was as expected.
9	To change the mode and observe the increase in speed.	Changing the Dip-Switches	The speed was altered as expected.
10	When setting the time the corresponding segment flash.	The set button	The corresponding button flashed.
11	Enter test mode to observe one complete cycle of the clock.	Dip-switches	The decimal clock behaviour as expected.
12	Switch the student number over.	Dip-switches	The student numbers changes as required.

Components: all

3. Regression Testing

All tested were repeated and produce the same response.

4. Anomaly Testing

Test ID Number	Testing	Inputs/Actions	Results
11	When in set mode does the dip switches alter the operation.	Dip switches and the set mode	The dip-switch will only have an effect when test is off.
12	Testing when the advance switch has an effect.	Pressing the advance switch	The advance switch only has an effect under the set condition.
13	Does the system maintain operations when the power is turned off.	Disconnections of mains	The system loses all functionality.
14	Testing for unstable and unpredictable actions.	Pushing two buttons at the same time	The system responded to the first button pressed.