

Unit Test Documentation for Digital Watch System

- Test Design Specification
- Test Case Specification
- Test Summary Report

Project Team

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1 Introduction

1.1 Objectives

본 문서는 Digital watch system 의 unit test 를 위한 design 문서이다.

요구사항으로부터 도출한 test 요소들을 실제 test 가 가능한 case 로 만들기 위한 design 문서이다.

2 System test design specification

2.1 Test design specification identifier

DWS-UTD-00-00

2.2 Features to be tested

2.2.1 Processes in SRA

Table 1 Process List for Unit Test

NUMBER	Subject	Input	Output	Exists
1.1	Button A Interface	-	-	TRUE
1.2	Button B Interface	-	-	TRUE
1.3	Button C Interface	-	-	TRUE
1.4	Button D Interface	-	-	TRUE
1.5	Button indicator	-	Backlight state Button entry	TRUE
1.6	Backlight indicator	-	Backlight state	TRUE
2.1.1	Central Controller	-	trigger	TRUE
2.1.2	Backlight Controller	-	current time	TRUE
2.1.3	Display Controller	-	trigger/current time/stopwatch value	TRUE
2.1.4	Time Collector	Current time	Current time	TRUE
2.1.5	Time Setting Controller	Trigger	Cursor position	TRUE
2.1.6	StopwatchController	Trigger	Stopwatch value/tirgger	TRUE
2.1.7	Backlight on	Enable/Disable	-	TRUE

2.1.8	Increase Number	Trigger	Current time	TRUE
2.1.9	Change Cursor	-	Current time	TRUE
2.1.10	RunSW	-	Stopwatch value	TRUE
2.1.11	Lap time	-	Lap time value	TRUE
2.1.12	ResetSW	-	Stopwatch value	TRUE
2.1.13	Display Indicator	Mode value	-	TRUE
2.2.2	Time keeping Display	Trigger/Current time	-	TRUE
2.2.3	Time setting Display	Trigger/Current time	-	TRUE
2.2.4	Stopwatch Display	Trigger/Current time/Stopwatch value	-	TRUE

2.3 Approach refinements

2.3.1 Brute force testing

DWS의 각 모듈이 요구사항을 만족하는지를 확인하기 위하여, 요구사항에 정의된 내용과 각 Process 기반하여 test case를 작성한다. 그 이외의 예외 상황에 대해서는 test case를 작성하지 않는다.

2.4 Feature pass/fail criteria

DWS의 각 모듈(프로세스)은 SRA에 정의되어 있는 요구사항을 모두 만족해야 한다.

3 System test case specification

3.1 Test items

Table 2 Test Case List 참조

4 System test summary report

4.1 Test summary report

Figure 1 Unit Testing Report 참조

4.2 Evaluation

DFD의 각 프로세스의 입/출력 정보가 없음
변수에 관한 정보가 부족
숫자값에 대한 정보가 부족

모든 Control Process 에서 어떤 경우에 각 State 의 상태와 같아지는 지 알 수 있도록 State 당 변수의 상태를 기술해야 함

Table 2 Test Case List

No.	Su ite	Process Name	Test Input	Expected	Feat ure	DFD	Description	Note
1.1.	1	Central Controller	ModeValue=0; ButtonA_interface();	ModeValue=2	1.2.1	2.1.1	A 버튼을 누르면 TimeSetting 모드로 변환한다.	
1.2.	1	Central Controller	ModeValue=2; ButtonA_interface();	ModeValue=0	1.2.2	2.1.1	A 버튼을 누르면 TimeKeeping 모드로 변환한다.	
1.3.	1	Central Controller	ModeValue=0; ButtonC_interface();	ModeValue=1	1.1.4	2.1.1	C 버튼을 누르면 StopWatch 모드로 변환한다.	
1.4.	1	Central Controller	ModeValue=1; ButtonC_interface();	ModeValue=0	2.1.7	2.1.1	C 버튼을 누르면 TimeKeeping 모드로 변환한다.	
1.5.	1	Central Controller	ModeValue=2;	Trigger="Time setting Controller"	1.2.1	2.1.1	TimeSettingMode 로 변환한다.	
1.6.	1	Central Controller	ModeValue=1;	Trigger="Stopwat ch Controller"	1.1.1	2.1.1	Stopwatch Controller 로 변환한다	
2.1.	2	Backlight Controller	p_ED = DISABLE; ButtonD_interface();	p_ED = ENABLE;	3.1.1	2.1.2	D 버튼을 누르면 BackLight 가 켜진다.	
3.1.	3	Time Collector	current_time[SEC]=0;	current_time[SEC] =1;	1.1.2	2.1.4	초가 1 증가한다	

3.2.	3	Time Collector	current_time[MIN]=0;current_time[SEC]=59;	current_time[MIN]=1;current_time[SEC]=0;	1.1.2	2.1.4	초가 59 일 때, 00 이 된다	
3.3.	3	Time Collector	current_time[HOURL]=0;current_time[MIN]=59;current_time[SEC]=59;	current_time[HOURL]=1;current_time[MIN]=0;current_time[SEC]=0;	1.1.2	2.1.4	분이 59 이고 초가 59 일 때 시간이 1 증가하며 나머지는 초기화된다.	#define HOUR 1 #define MIN 2 #define SEC 0
3.4.	3	Time Collector	current_time[DAY]=1;current_time[HOURL]=11;current_time[MIN]=59;current_time[SEC]=59;	current_time[DAY]=0;current_time[HOURL]=0;current_time[MIN]=0;current_time[SEC]=0;	1.1.2	2.1.4	PM 11 : 59 : 59 초일 때 Day 가 1 늘어난다.	#define DAY 5 #define MONTH 4 #define YEAR 3
3.5	3	Time Collector	current_time[YEAR]=1;current_time[MONTH]=12;current_time[DAY]=31;current_time[HOURL]=11;current_time[MIN]=59;current_time[SEC]=59;	current_time[YEAR]=1;current_time[MONTH]=2;current_time[DAY]=1;current_time[HOURL]=11;current_time[MIN]=59;current_time[SEC]=59;	1.1.2	2.1.5	12 년 12 월 31 일 PM 11 : 59 : 59 초일 때 다음 초는 13 년 1 월 1 일이다.	#define AMPM 7 #define AM 0 #define PM 1

4.1.	4	Time Setting Controller	Button_entry[2]=1;cursor_position=SEC;	cursor_position= HOUR	1.2.3	2.1.5	TimeKeeping mode 에서 C 버튼을 누르면 설정 대상은 다음과 같은 순서로 선택된다. 초 → 시간
4.2.	4	Time Setting Controller	Button_entry[2]=1;cursor_position=HOUR;	cursor_position= MIN	1.2.3	2.1.5	시간 → 분
4.3.	4	Time Setting Controller	Button_entry[2]=1;cursor_position=MIN;	cursor_position= YEAR	1.2.3	2.1.5	분 → 년
4.4.	4	Time Setting Controller	Button_entry[2]=1;cursor_position=YEAR;	cursor_position= MONTH	1.2.3	2.1.5	년 → 월
4.5.	4	Time Setting Controller	Button_entry[2]=1;cursor_position=MONTH;	cursor_position= DAY	1.2.3	2.1.5	월 → 일
4.6.	4	Time Setting Controller	Button_entry[2]=1;cursor_position=DAY;	cursor_position= SEC;	1.2.3	2.1.5	일(요일) → 초
4.7.	4	Time Setting Controller	Button_entry[1]=1;cursor_position=SEC;current_time[SEC]=0;	current_time[SEC]=1;	1.2.6	2.1.5	선택된 부분에서 B 버튼을 누르면 선택된 부분이 1 씩 증가한다.

4.8.	4	Time Setting Controller	Button_entry[1]=1;cursor_position=SEC;current_time[SEC]=59;	current_time[SEC]=0;	1.2.7	2.1.5	선택 된 부분이 최대치가 된 상태에서 다시 B 를 누르면 최저 값으로 변한다.
4.9.	4	Time Setting Controller	Button_entry[1]=1;cursor_position=MIN;current_time[MIN]=0;	current_time[MIN]=1;	1.2.6	2.1.5	선택된 부분에서 B 버튼을 누르면 선택된 부분이 1 씩 증가한다.
4.10.	4	Time Setting Controller	Button_entry[1]=1;cursor_position=MIN;current_time[MIN]=59;	current_time[MIN]=0;	1.2.7	2.1.5	선택 된 부분이 최대치가 된 상태에서 다시 B 를 누르면 최저 값으로 변한다.
4.11.	4	Time Setting Controller	Button_entry[1]=1;cursor_position=HOURL;current_time[HOURL]=0;	current_time[HOURL]=1;	1.2.6	2.1.5	선택된 부분에서 B 버튼을 누르면 선택된 부분이 1 씩 증가한다.
4.12.	4	Time Setting Controller	Button_entry[1]=1;cursor_position=HOURL;current_time[HOURL]=11;	current_time[HOURL]=0;	1.2.7	2.1.5	선택 된 부분이 최대치가 된 상태에서 다시 B 를 누르면 최저 값으로 변한다.
4.13.	4	Time Setting Controller	Button_entry[1]=1;cursor_position=DAY;current_time[DAY]=1;	current_time[DAY]=2;	1.2.6	2.1.5	선택된 부분에서 B 버튼을 누르면 선택된 부분이 1 씩 증가한다.
4.14.	4	Time Setting Controller	Button_entry[1]=1;cursor_position=DAY;current_time[MONTH]=1;current_time[DAY]=31;	current_time[DAY]=1;	1.2.7	2.1.5	선택 된 부분이 최대치가 된 상태에서 다시 B 를 누르면 최저 값으로 변한다.

4.15	4	Time Setting Controller	Button_entry[1]=1;cursor_position=DAY;current_time[YEAR]=2012;current_time[MONTH]=2;current_time[DAY]=29;	current_time[DAY]=1;	1.2.6	2.1.5	선택 된 부분이 최대치가 된 상태에서 다시 B 를 누르면 최저값으로 변한다.
4.16	4	Time Setting Controller	Button_entry[1]=1;cursor_position=DAY;current_time[YEAR]=2012;current_time[MONTH]=3;current_time[DAY]=31;	current_time[DAY]=1;	1.2.6	2.1.5	선택 된 부분이 최대치가 된 상태에서 다시 B 를 누르면 최저값으로 변한다.
4.17	4	Time Setting Controller	Button_entry[2]>0	Trigger=CHANGE_CURSOR	1.2.3	2.1.5	TimeKeeping mode 에서 C 버튼을 누르면 설정 대상은 다음과 같은 순서로 선택된다. 초 → 시간
5.1.	5	Stopwatch Controller	Stopwatch_value[0]=0;running_flag = 1;	Stopwatch_value[0]=1;	2.1.1	2.1.6	B 를 누르면 시간측정을 시작한다. 다시 한 번 B 를 누르면 정지한다.
5.2.	5	Stopwatch Controller	Button_entry[2]=1; Stopwatch_value[0]=0;running_flag = 0;	running_flag=1;	2.1.1	2.1.6	B 를 누르면 시간측정을 시작한다. 다시 한 번 B 를 누르면 정지한다.

5.3	5	Stopwatch Controller	Mode_Value=1;runnin g_flag=1; Button_entry[0]=1;	Mode_Value=2;	2.1.3	2.1.6	B 를 눌러서 시작한 이후 A 버튼을 누르면 A 를 눌렀을 때의 시간을 보여준다
5.4	5	Stopwatch Controller	running_flag=0; Button_entry[0]=1; stopwatch_Value[0]=1;	Stopwatch_value[0]=0;	2.1.6	2.1.6	시간 측정 정지 이후에 A 를 누르면 초기화한다.
5.5	5	Stopwatch Controller	Mode_Value==1;Butto n_entry[1]=1;	Trigger=stopSW	2.1.3	2.1.6	

Figure 1 Unit Testing Report

CUnit - A Unit testing framework for C.
<http://cunit.sourceforge.net/>

Automated Test Run Results

Running Suite suite1			
	Running test test 1.1 ...	Passed	
	Running test test 1.2 ...	Passed	
	Running test test 1.3 ...	Passed	
	Running test test 1.4 ...	Passed	
	Running test test 1.5 ...	Passed	
Running Suite suite2			
	Running test test 2.1 ...	Passed	
Running Suite suite3			
	Running test test 3.1 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	115
Condition	CU_ASSERT_EQUAL(current_time[SEC],1)		
	Running test test 3.2 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	122
Condition	CU_ASSERT_EQUAL(current_time[SEC],0)		
	Running test test 3.2 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	123
Condition	CU_ASSERT_EQUAL(current_time[MIN],1)		
	Running test test 3.3 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	131
Condition	CU_ASSERT_EQUAL(current_time[SEC],0)		
	Running test test 3.3 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	132
Condition	CU_ASSERT_EQUAL(current_time[MIN],0)		
	Running test test 3.3 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	133
	Running test test 3.5 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	167
Condition	CU_ASSERT_EQUAL(current_time[YEAR],1)		
Running Suite suite4			
	Running test test 4.1 ...	Passed	
	Running test test 4.2 ...	Passed	
	Running test test 4.3 ...	Passed	
	Running test test 4.4 ...	Passed	
	Running test test 4.5 ...	Passed	
	Running test test 4.6 ...	Passed	
	Running test test 4.7 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	211
Condition	CU_ASSERT_EQUAL(current_time[SEC],1)		
	Running test test 4.8 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	218
Condition	CU_ASSERT_EQUAL(current_time[SEC],0)		
	Running test test 4.9 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	225
Condition	CU_ASSERT_EQUAL(current_time[MIN],1)		
	Running test test 4.10 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	232
Condition	CU_ASSERT_EQUAL(current_time[MIN],0)		
	Running test test 4.11 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	239
Condition	CU_ASSERT_EQUAL(current_time[HOUR],1)		
	Running test test 4.12 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	246
Condition	CU_ASSERT_EQUAL(current_time[HOUR],0)		
	Running test test 4.13 ...	Failed	

File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	133
Condition	CU_ASSERT_EQUAL(current_time[HOUR],1)		
	Running test test 3.4 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	144
Condition	CU_ASSERT_EQUAL(current_time[SEC],0)		
	Running test test 3.4 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	145
Condition	CU_ASSERT_EQUAL(current_time[MIN],0)		
	Running test test 3.4 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	146
Condition	CU_ASSERT_EQUAL(current_time[HOUR],0)		
	Running test test 3.4 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	148
Condition	CU_ASSERT_EQUAL(current_time[DAY],2)		
	Running test test 3.5 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	161
Condition	CU_ASSERT_EQUAL(current_time[SEC],0)		
	Running test test 3.5 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	162
Condition	CU_ASSERT_EQUAL(current_time[MIN],0)		
	Running test test 3.5 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	163
Condition	CU_ASSERT_EQUAL(current_time[HOUR],0)		
	Running test test 3.5 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	165
Condition	CU_ASSERT_EQUAL(current_time[DAY],1)		
	Running test test 3.5 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	166
Condition	CU_ASSERT_EQUAL(current_time[MONTH],1)		

	Running test test 3.5 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	167
Condition	CU_ASSERT_EQUAL(current_time[YEAR],1)		
Running Suite suite4			
	Running test test 4.1 ...	Passed	
	Running test test 4.2 ...	Passed	
	Running test test 4.3 ...	Passed	
	Running test test 4.4 ...	Passed	
	Running test test 4.5 ...	Passed	
	Running test test 4.6 ...	Passed	
	Running test test 4.7 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	211
Condition	CU_ASSERT_EQUAL(current_time[SEC],1)		
	Running test test 4.8 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	218
Condition	CU_ASSERT_EQUAL(current_time[SEC],0)		
	Running test test 4.9 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	225
Condition	CU_ASSERT_EQUAL(current_time[MIN],1)		
	Running test test 4.10 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	232
Condition	CU_ASSERT_EQUAL(current_time[MIN],0)		
	Running test test 4.11 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	239
Condition	CU_ASSERT_EQUAL(current_time[HOUR],1)		
	Running test test 4.12 ...	Failed	
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number	246
Condition	CU_ASSERT_EQUAL(current_time[HOUR],0)		

Running test test 4.13 ...		Failed
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number 254
Condition	CU_ASSERT_EQUAL(current_time[DAY],2)	
Running test test 4.14 ...		Failed
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number 264
Condition	CU_ASSERT_EQUAL(current_time[DAY],1)	
Running test test 4.15 ...		Failed
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number 274
Condition	CU_ASSERT_EQUAL(current_time[DAY],1)	
Running test test 4.16 ...		Failed
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number 284
Condition	CU_ASSERT_EQUAL(current_time[DAY],1)	
Running test test 4.17 ...		Passed
Running Suite suite5		
Running test test 5.1 ...		Failed
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number 297
Condition	CU_ASSERT_EQUAL(Stopwatch_value[2],1)	
Running test test 5.2 ...		Failed
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number 305
Condition	CU_ASSERT_EQUAL(running_flag,1)	
Running test test 5.3 ...		Passed
Running test test 5.4 ...		Failed
File Name	C:\Users\Jaeyeon Jo\workspace\DigitalWatch\src\unit_test.c	Line Number 319
Condition	CU_ASSERT_EQUAL(Stopwatch_value[0],0)	
Running test test 5.5 ...		Passed

Cumulative Summary for Run					
Type	Total	Run	Succeeded	Failed	Inactive
Suites	5	5	- NA -	0	0
Test Cases	33	33	15	18	0
Assertions	46	46	17	29	n/a