

PLATO SCREEN V2 TEST BENCH SPECIFICATION AND USER GUIDE

Abstract: This document describes the test bench specification and user guide used for functional validation of SBRE Display Unit **PLATO SCREEN V2**.

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Document History

Version	Date	By	Changes
0.1	19-09-2019	Samiran	Creation.
0.2	16-05-2021	Bavithra Priya / Vidhya	Updates for Plato V2
0.3	18-05-2021	Bavithra Priya / Vidhya	Testbench Internal Review by Samiran , Review comments updated Section 4 updated
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List of requirement keywords

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1. INTRODUCTION

PURPOSE

This document describes the test bench specification and user guide used to validate functionality of SBRE Display Unit manufactured for Soft Bank Robotics.

SCOPE

1. The Assembled Display unit will be tested for 100% of production batch.
2. Traceability of serial numbers to test results will be available during the complete duration of production and maintenance phase.

2. RELATED DOCUMENTS

REFERENCED DOCUMENTS

1. SBRE_C2_REQ_200196_v2_C0000003 Spine Screen_HW_DRAFT_21.02.26 .pdf
2. (Signed)SBRE_C2_REQ_200196_v3_C0000003 Spine Screen_20210921210913-Plato-display-chassis-assembly-order.pdf
3. SBRE_PLATO_SCREEN_2.0_ATR_V1

3. DEFINITIONS, ABBREVIATIONS AND ACRONYMS

ABBREVIATIONS

DUT	: Device under Test
NFC	: Near-Field Communication
PCBA	: Printed circuit board Assembled
USB	: Universal Serial Bus
ICT	: In Circuit Tester
COC	: Certificate of Conformance
TBD	: To Be Defined
TBC	: To Be Confirmed
TBE	: To Be Explored
LVDS	: Low-voltage differential signalling
EVK	: Evaluation Kit
HW	: Hardware
PPS	: Programmable Power supply
XML	: extensible markup language
PDF	: Portable Document Format

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4. PLATO SCREEN V2 ASSEMBLY DETAILS:

OVERVIEW:

The Product is realized using the following components into the mechanical enclosure

- Main Board PCBA
- 10.1" IPS LVDS Display + Capacitive multi touch panel
- NFC antenna
- FX15 custom cable for the SD845 PCBA interface

MECHANICAL EXPLODED VIEW:

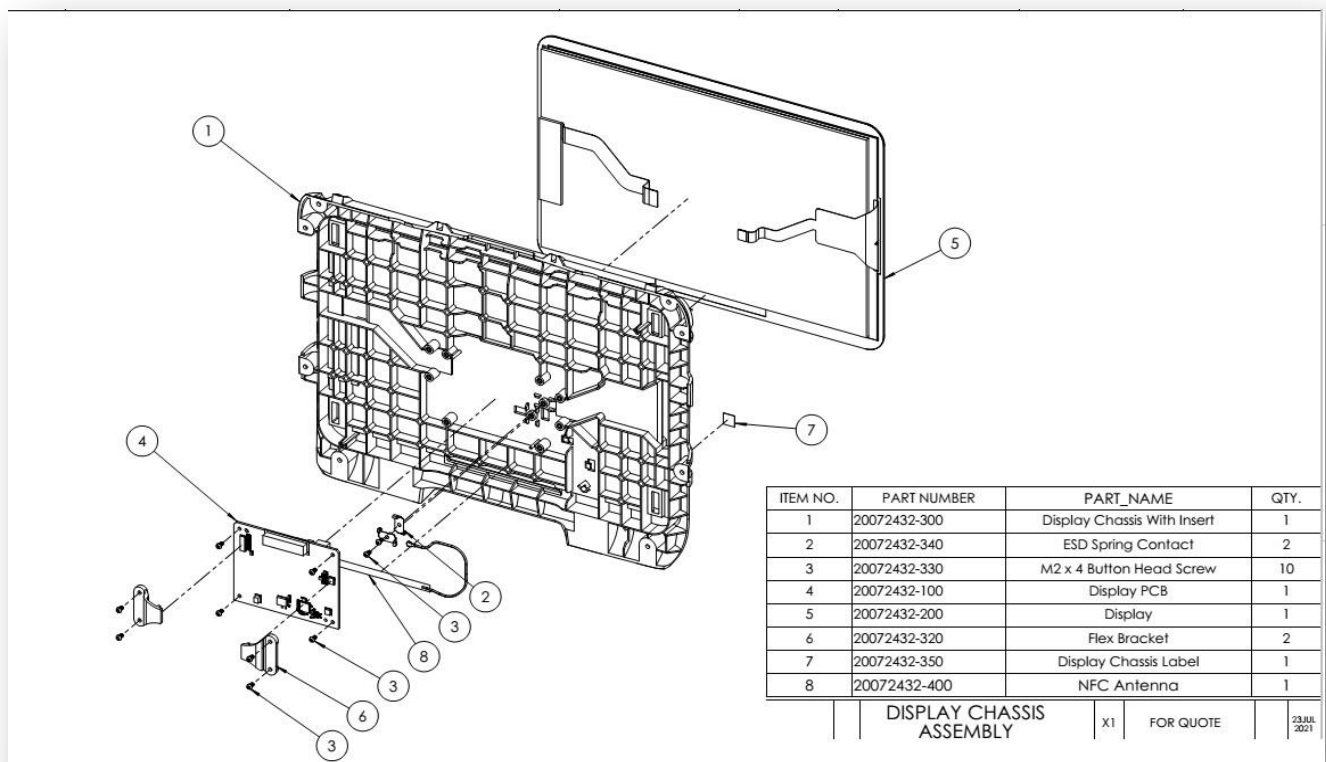


Figure 1 : Exploded View

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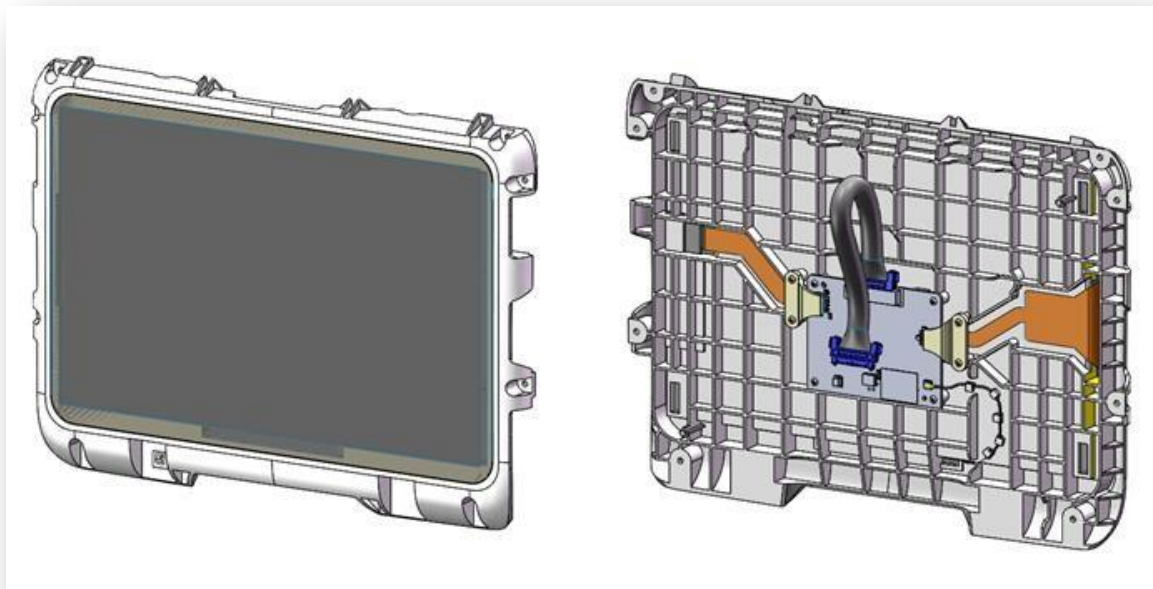


Figure 2 : Front and Rear view of the Final Product with FX15 Connector

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5. SBRE TRACEABILITY APPLICATION

1. During the SBRE display assembly process, EMS needs to maintain the traceability of the following using barcode scanner.
 - a. LCD serial number
 - b. PCBA serial number
 - c. DUT serial Number
2. Tessolve has developed an application "SBRE Traceability Application" to log the above mentioned data to the test PC in excel format

PRE-REQUISITE

Software

1. Microsoft Excel
2. Sbre Tracebility Application Folder in C Drive

Hardware

1. LCD
2. PCBA
3. DUT
4. Barcode Scanner

APPLICATION INSTALLATION

1. Copy the latest SBRE tracebility application folder into the pen drive.
2. Paste this folders into the **C drive** of the windows test PC as shown in the below figure.

; PC > Local Disk (C:) >

Name	Date modified	Type
Dell	29/12/2020 14:18	File folder
drivers	29/12/2020 14:36	File folder
Install_CD	29/12/2020 13:56	File folder
Intel	11/01/2022 18:10	File folder
Sbre Tracebility Application	07/09/2021 16:46	File folder
Lang	29/12/2020 14:04	File folder

Figure 3 : Tessolve SBRE tracebility application release files are copied to test PC C drive

3. Go to **C:\SBRE Tracebility application V1.1**. Double click on the setup.

; PC > Local Disk (C:) > SBRE Tracebility Application V1.1

Name	Date modified
Application Files	12/01/2022 13:24
SBRE Tracebility Application.application	25/11/2020 12:32
setup.exe	25/11/2020 12:32

Figure 4 : Set up file to install SBRE Tracebility application

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4. On clicking set up, below message will be pop on the test PC. Now click Install.

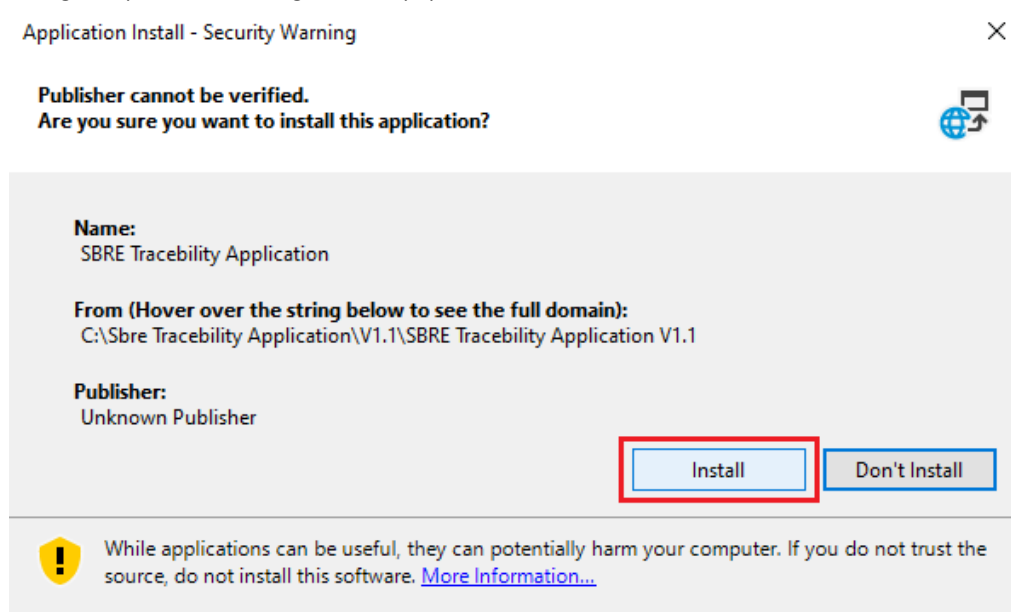


Figure 5 : SBRE Traceability application installation in PC

5. After successful installation of the test application, the GUI for the serial number scanning application is launched as shown in the image below:

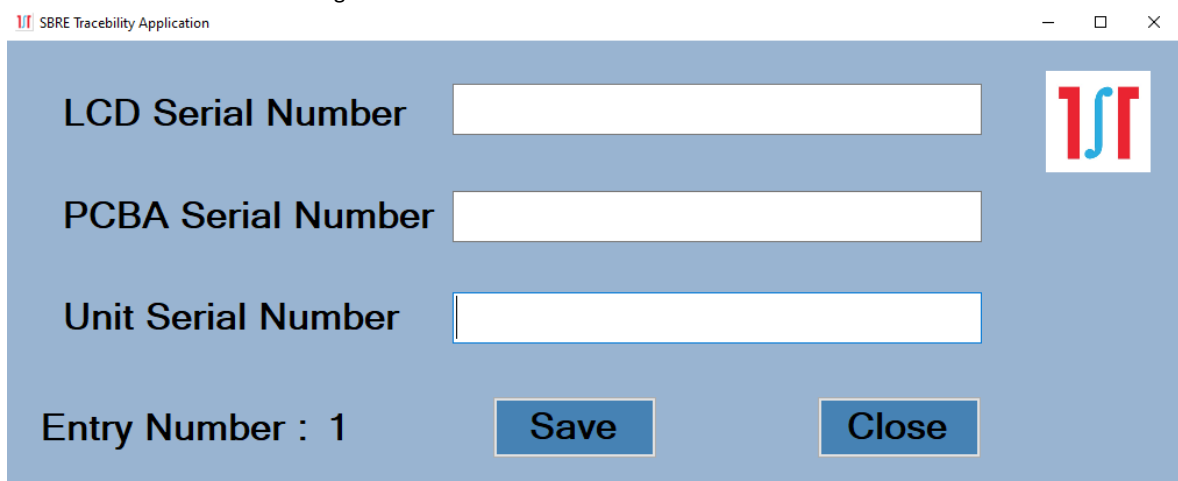


Figure 6 : Traceability Application GUI

Note : SBRE Traceability application installation needs to be done only once.

6. To Launch the application again, Go to installation folder (**C:\SBRE Traceability application V1.1**) and click on SBRE Traceability Application Icon

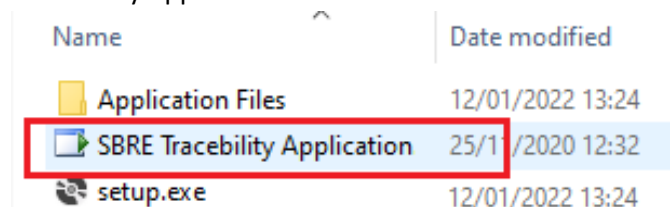


Figure 7 : Traceability Application GUI

OR Create a Shortcut as below

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7. Right click on SBRE Tracebility Application and Select **Send to** → **Desktop** as shown in the below figure.

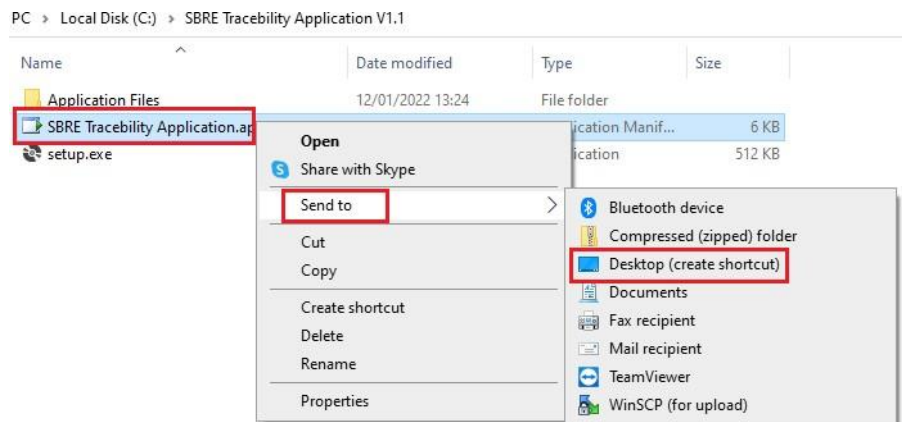


Figure 8 : Creating short cut for the application.

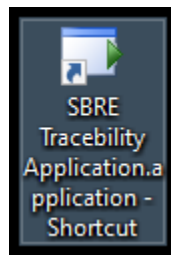
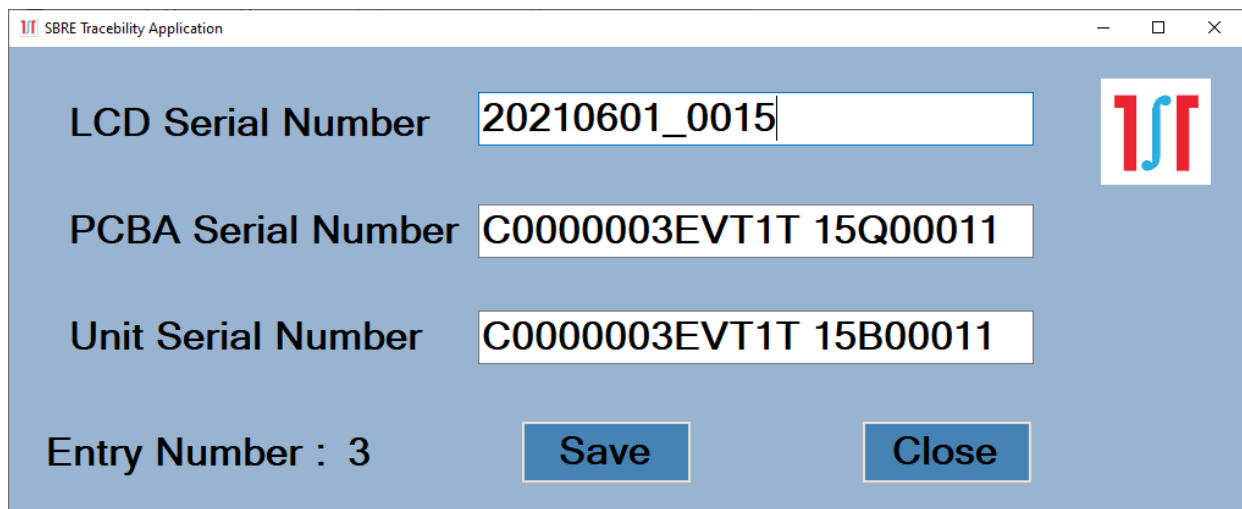


Figure 9 : Short cut created for the application.

8. A short cut key is created on the Desktop as shown in the belowfigure.

LAUNCHING APPLICATION

1. Connect the Barcode scanner to the TestPC and Launch the Tracebility application.
2. The Entry Number represents the Current Data Entry Count.
3. Scan the LCD, PCBA and DUT Serial number using bar code scanner



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Figure 10 : Serial number entered using bar code scanner.

1. Click on **Save** button and wait for “Data saved” to appear on the screen as shown below

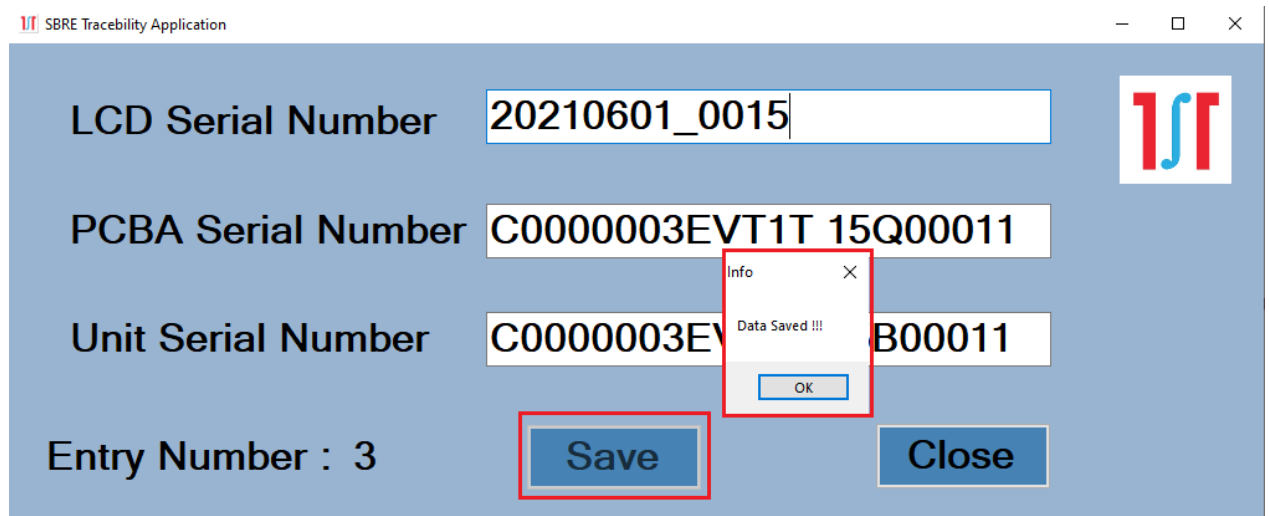
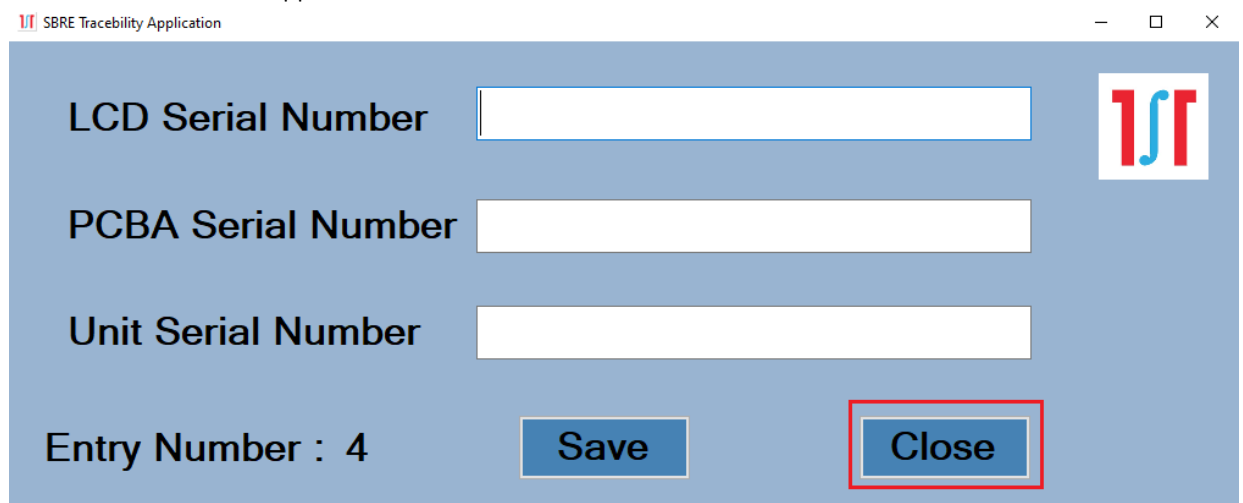


Figure 11 : Data saved pop up message.

2. Click on **Close** to exit the application



APPLICATION OUTPUT

1. **SBRE_Testbench** Project folder will automatically be created by the Traceblity application in C drive which will contain an Excel file named **Sbre_Traceability_Data**.

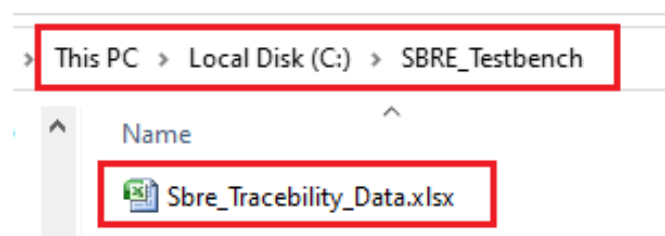


Figure 12 : Serial number -Traceability data path

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2. This excel will contain the traceability data in the format given below:

	A	B	C	D	E	F
1	SI No	Date	Time	LCD Number	PCBA Number	Unit Serial Number
2	1	01/12/2022	2:41:39 pm	20210601_0015	C0000003EVT1T 15Q00011	C0000003EVT1T 15B00011
3	2	01/12/2022	2:43:29 pm	20210601_0013	C0000003EVT1T 15Q00012	C0000003EVT1T 15B00022
4						
5						

Note:

1. During the Data entries of the Serial Numbers, traceability excel should be closed.
2. If traceability excel is open, the Data entries of the Serial Numbers will not be updated.

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6. TEST BENCH ARCHITECTURE

BLOCK DIAGRAM

A semi automated test setup is used to validate the Assembled SBRE Plato Screen V2 Display Unit.

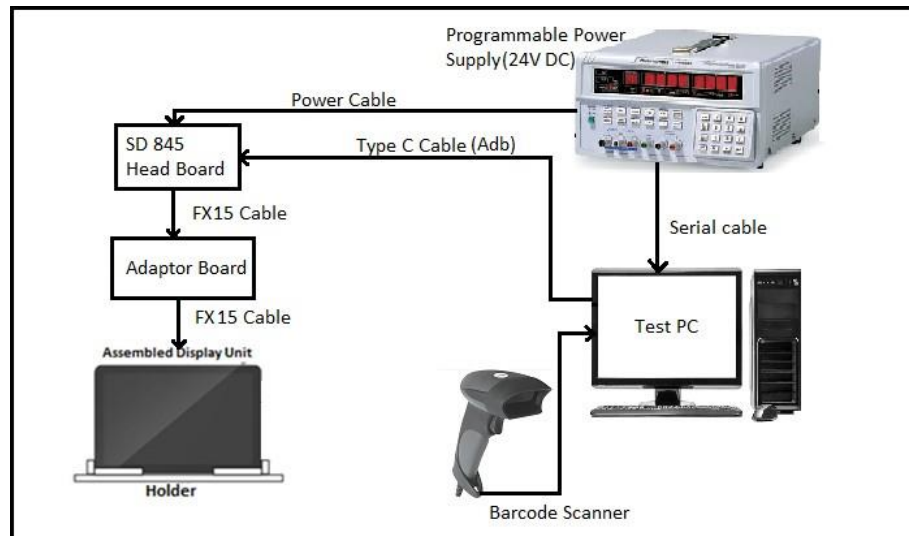


Figure 13 : Functionality Test Block Diagram

HARDWARE PRE-REQUISITE

The Test bench set up includes below components:

Sl.No	Component	Manufacturer	Remarks
1	Completely Assembled DUT	Tessolve	
2	SD845 Headboard	Softbank	
3	FX15 Cable(2 Nos)	Sinbon	
4	Programmable Power Supply	GWinstek- PPE 3323	Serial cable for communication
5	NFC Tag	NXP	
6	Bar code Scanner	ZEBRA TECH CORP - DS2208	
7	Display stand	Tessolve	
8	Windows PC		
9	Type C USB cable		Standard Type C USB Cable
10	Power Cable		Will be integrated with SD845 Headboard
11	USB to UART Converter (If TestPC does not have Serial Port for PPS)		
12	Adaptor Board		
13	25 Pin RS 232C to DB9 female		

Table 1: Hardware Pre- requisite for Test bench

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TESTBENCH ASSEMBLY SETUP

1. Main PCBA will be assembled with optically bonded LVDS display + Touch panel + NFC Antenna and fit into the front part of the mechanical enclosure.
2. Tessolve shall provide a display holder/stand to the operator to set the display in proper position and also enable access to the screen safely.
3. The assembled display Unit will be interfaced with the SD845Test bench EVK set up through FX15 Cable

SOFTWARE INSTALLABLE

1. Microsoft Excel 2007
2. PLATO_SCREEN_V2_TESTBENCH_APPLICATION **VX.X** (*Latest Application Folder*)
3. PlatoScreenV2_Testbench (*Project Folder*)
4. Notepad/Notepad++
5. Hex Editor
6. Pdf Reader
7. Adb Driver
8. USB to UART driver (if USB to UART converter is used)

TEST PC CONFIGURATION

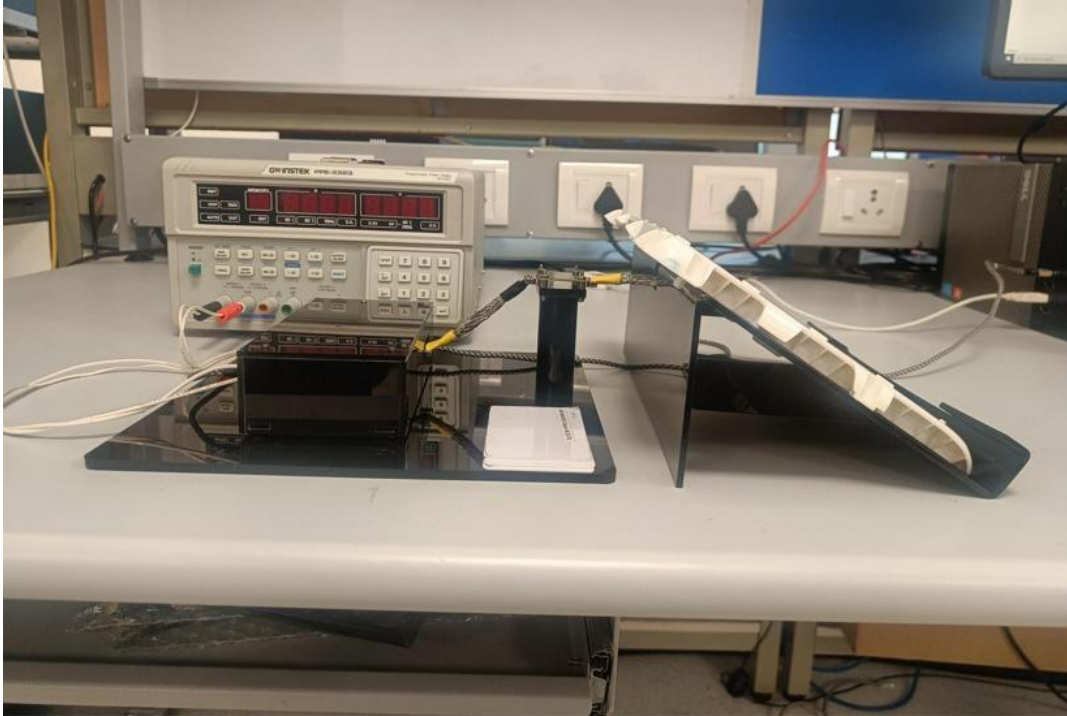
1. Three or more USB Port
2. Serial Port(DB9)
3. **OS** : Win 7 or 10 - 64 bit system

TESTBENCH OVERVIEW

1. GUI Based PC Test Application will be used to install Android Test Application (APK) on emulator through USB ADB.
2. The same application is used to perform the Functional Test on the Plato Production Unit.
3. DUT will be powered on with 15.5V (Min Volt) and 30V (Max Volt) sequentially to measure the current consumption, If the current is falls within the range, then DUT is powered with 24V and starts booting.
4. Once the Display is up, 1 Byte of data is written and read back from DUT's EEPROM and verified as a part of EEPROM Testcase
5. Android Test APK will be launched automatically by the PC application on the DUT Display Unit
6. User can test interfaces such as Touch, Resolution, Display, Display Backlight and NFC Read/Write. Tester has to manually execute the test APK using the LVDS display and touch interface.
7. Once the Android Test is completed on the DUT, a Test report can be generated in XML format by Android APK and stored in the on board Storage of the emulator.
8. The PC Application will extract the test report through USB ADB and Convert it in to a Test Report in Pdf format. Both the files will be saved on the Test PC.
9. If the XML report is extracted from the DUT, then a bin file will be created in the PC with the Production data and Functional Test results.
10. The bin file is flashed to the EEPROM and read back. Both the files will be saved on the Test PC.
11. If the XML report is not extracted, then the test is aborted.

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12. A summary of the Functional test data will be saved in the excel sheet.
13. The Power supply is switched off.
14. One COC document will be provided with each shipment lot.



Front View

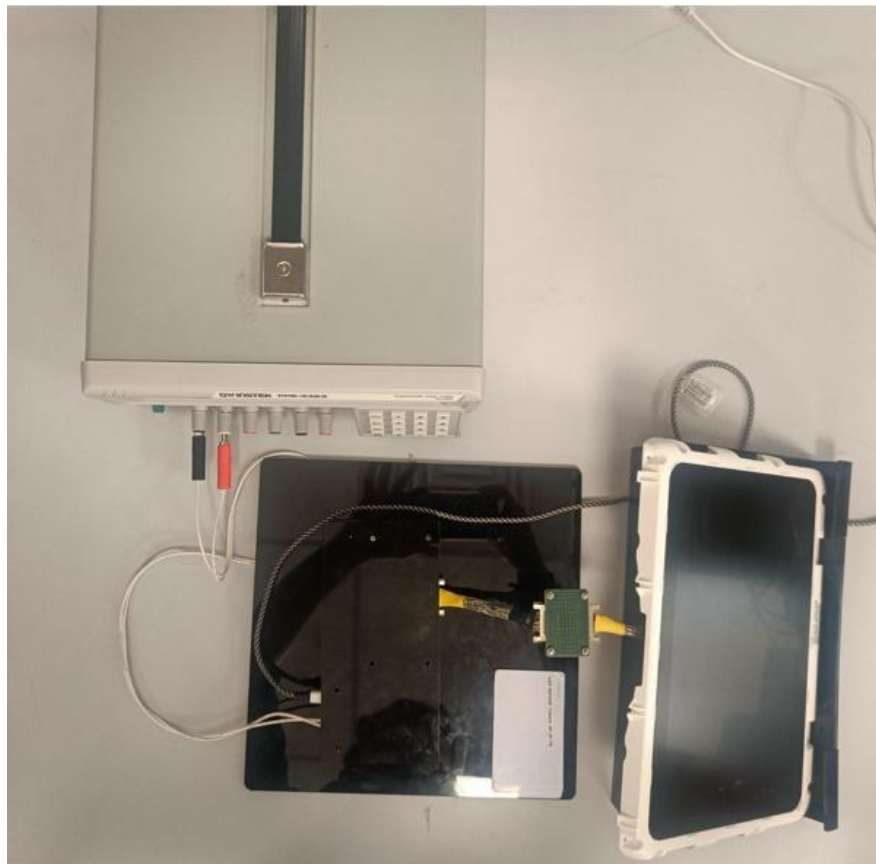
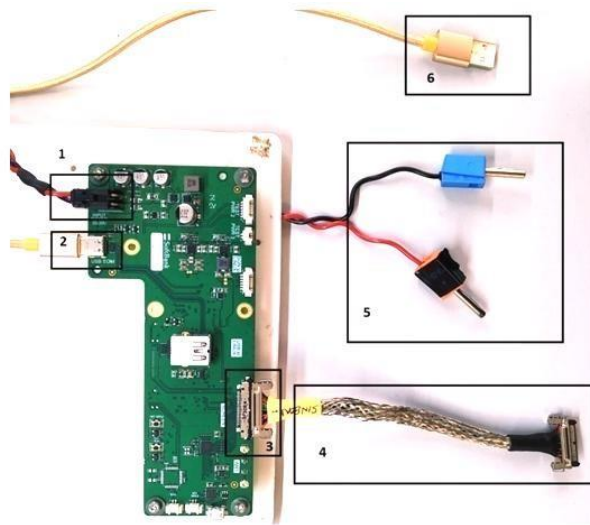


Figure 14 : Top View

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15. Sd845 Head Board Connector details



Number	Nomenclature	Description
1	PWR IN connector	Connect power cable to power ON SD845 test bench EVK
2	adb connector	Connect Type C USB cable from adb connector to test PC
3	FX15 Connector	Connect yellow thermal sleeve side of FX 15 cable to this connector with ground harness area facing top.
4	FX15 cable	Connect Black thermal sleeve side of cable to the DUT to be tested with ground harness area facing top.
5	Power cable	Plug power cable to 24VDC programmable power supply
6	Type C USB cable	Plug the USB cable from adb connector to test PC

Figure 15 : SD845 inside the Test Jig

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7. TESTBENCH PRE- REQUISITE SETUP

PROGRAMMABLE POWER SUPPLY

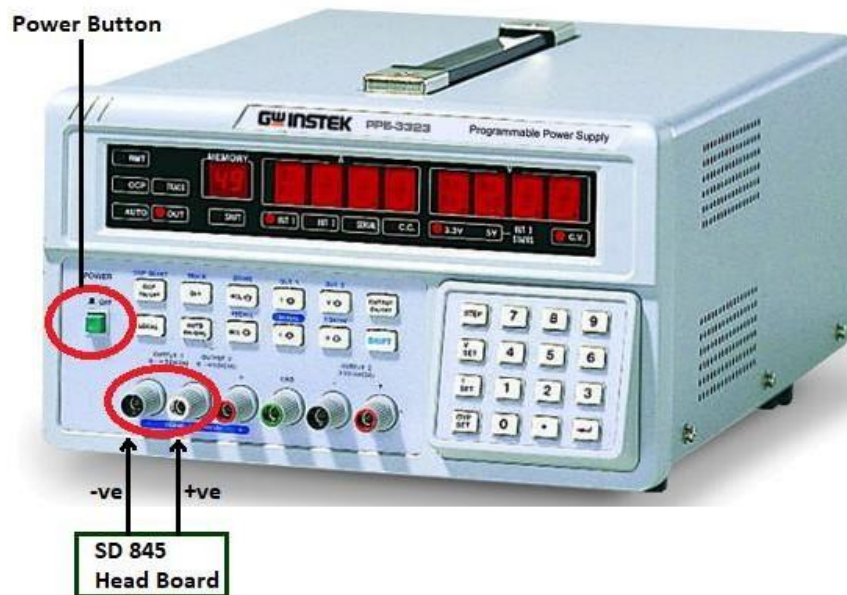


Figure 16 : Front View of the PPS



Figure 17 : Rear View of the PPS

Connection to Test PC

1. PPE 3323 is a Programmable power supply which is be controlled by Test PC during test execution.
2. A 25 Pin RS 232C Female to DB9 Female cable is used for communication between Test PC and the PPS

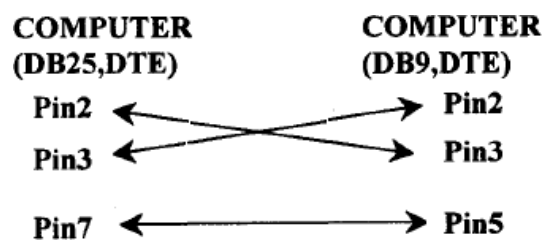
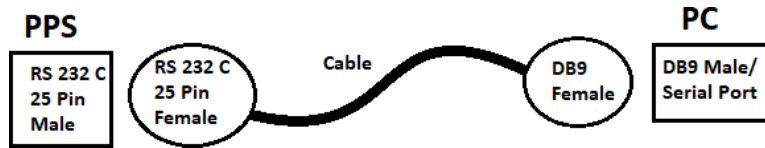


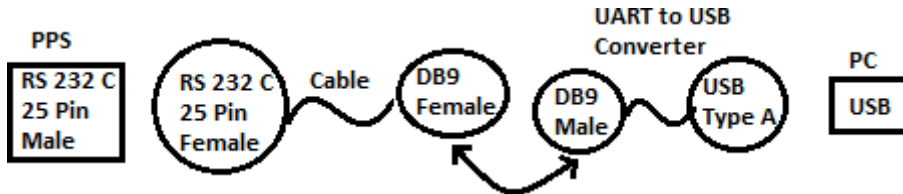
Figure 18 : Pin connection

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3. Connect the Cable from PPS to the serial port of the Test PC



4. If the PC/Laptop does not have Serial port, a UART to Usb converter can be used as below



Note: UART to USB driver needs to be installed in the PC/Laptop.

Communication to Test PC

1. Power On the Power supply
2. Press the **Power** button to switch ON the Power supply (Refer the PPS Front View [section 7.1](#))
3. Go to **Device Manager** and check if the PPS is detected as a COMP Port.

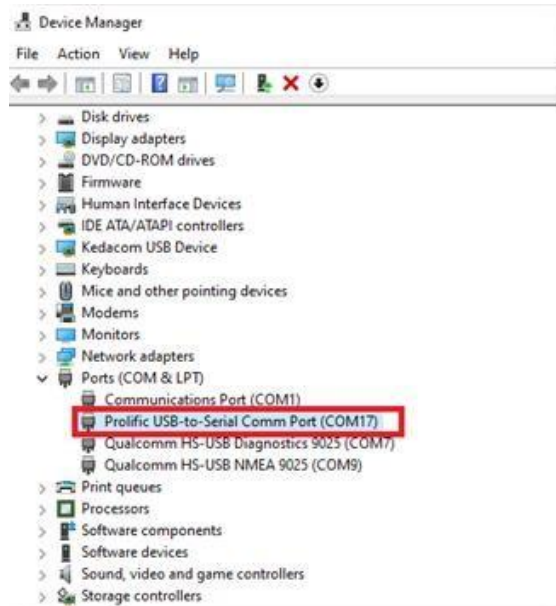


Figure 19 : Com Port number displayed in Device Manager

4. Connect the power cables from the DUT to the Power supply(Refer the PPS Front View [section 7.1](#))

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TESTBENCH RELEASE PACKAGE

1. The Testbench Software Package will contain two folders as below
 - i. PLATO_SCREEN_V2_TESTBENCH_APPLICATION **VX.X**(Setup Folder)
Note VX.X denotes the latest version of the Application given by Tessolve
 - ii. PlatoScreenV2_Testbench (Project Folder)
2. Both folders have to be placed in C drive of the Test PC

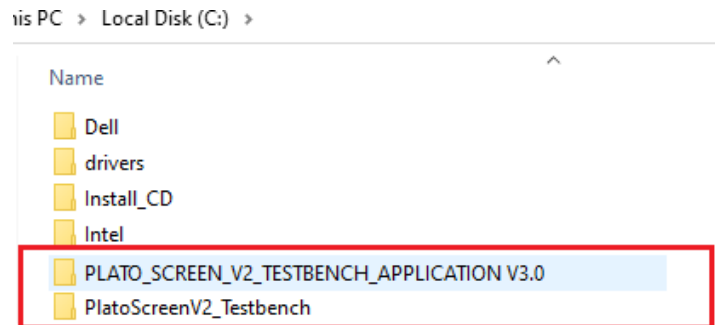


Figure 20 : Tessolve test bench release files are copied to test PC C drive

TEST BENCH APPLICATION INSTALLATION

1. Go to C:\ PLATO_SCREEN_V2_TESTBENCH_APPLICATION 3.0. Click on the setup.

This PC > Local Disk (C:) > PLATO_SCREEN_V2_TESTBENCH_APPLICATION_V3.0

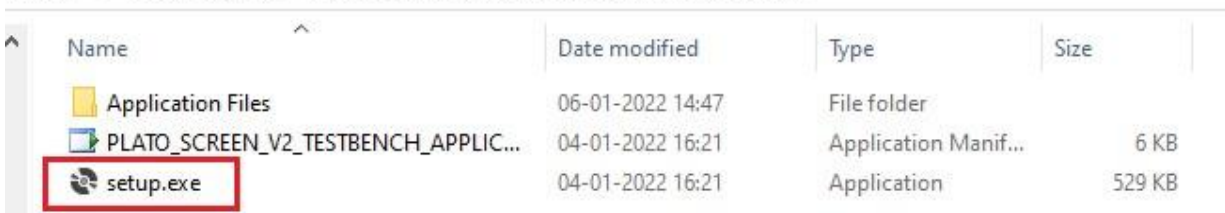


Figure 21 : Set up file to install test bench application

2. On clicking set up, below message will be pop on the test PC. Now click Install.

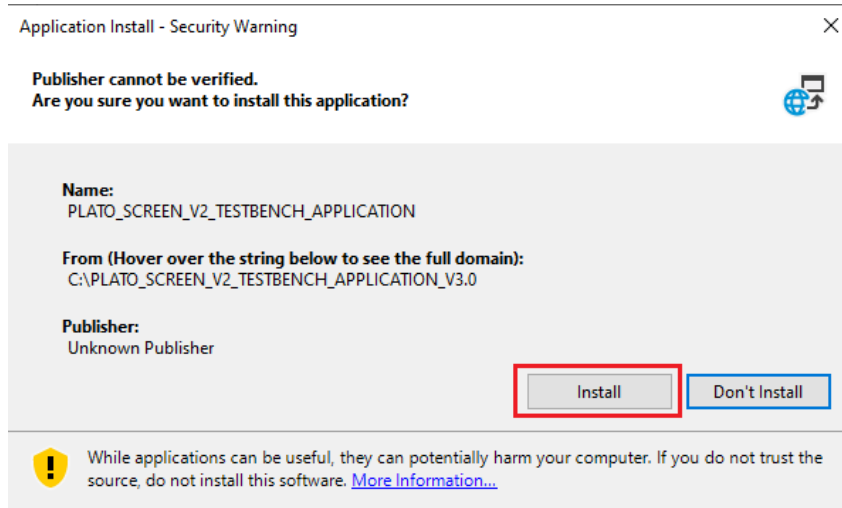


Figure 22 : Test bench application installation in test PC

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- After successful installation of the test application, GUI is launched on the windows test PC as shown in the below figure.

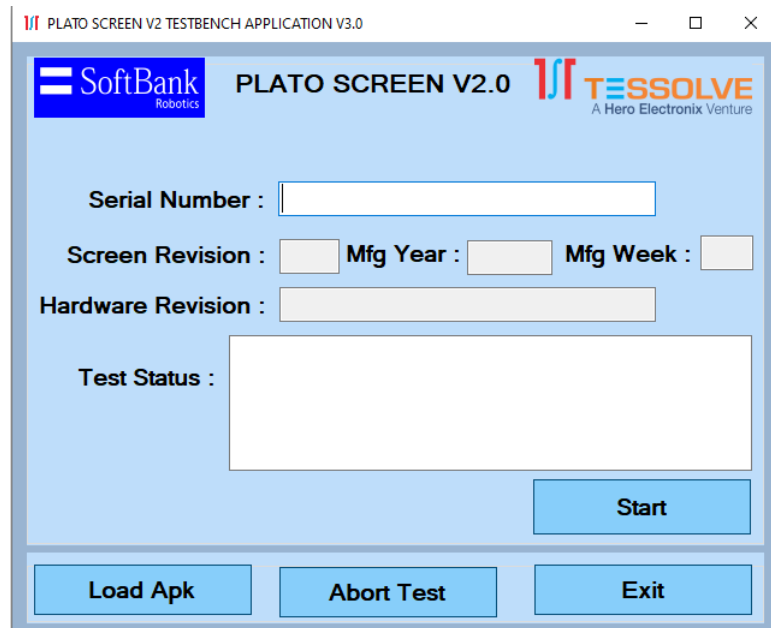


Figure 23 : GUI for Testing

Note : *PLATO_SCREEN_V2_TESTBENCH_APPLICATION installation needs to be done only once.*

- To Launch the application again, Go to installation folder (C:\PLATO_SCREEN_V2_TESTBENCH_APPLICATION 3.0) and click on PLATO_SCREEN_V2_TESTBENCH_APPLICATION Icon or Create short cut in desktop (Refer Section 5.2 step 7)

PROJECT FOLDER

The PlatoScreenV2_Testbench is the Testbench Folder

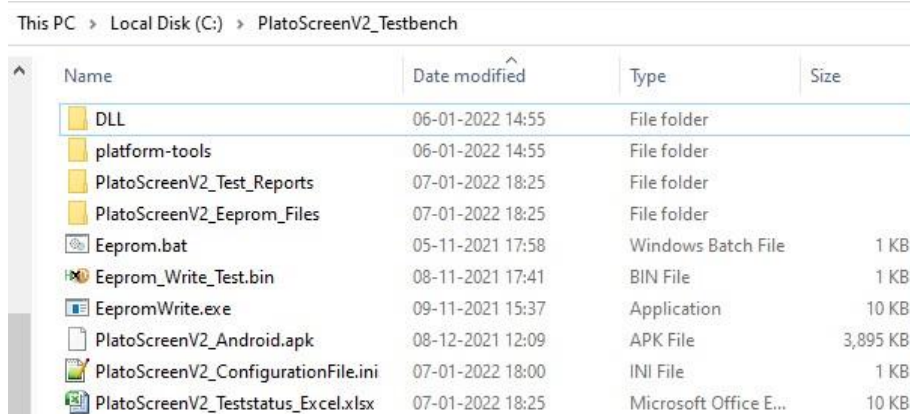


Figure 24 : PlatoScreenV2_Testbench contents

Android Application

- PlatoScreenV2_Android.apk** is the Android application which will be copied to the DUT through Test Application
- Path :** C:\PlatoScreenV2_Testbench\PlatoScreenV2_Android.apk

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3. To Update New Android Apk, replace the old apk file with the latest apk file and rename as a "PlatoScreenV2_Android.apk"

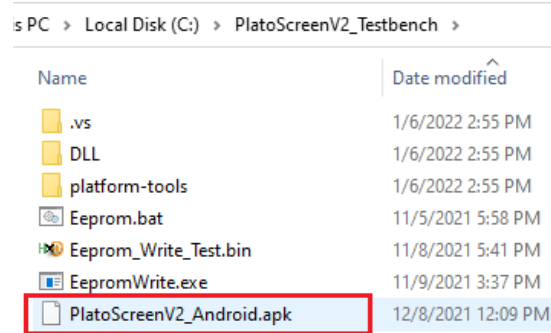


Figure 25 : Android application path

Configuration File

1. Configuration file is a .ini file which used to update Testbench and Production parameters before the Test execution
2. **Path** : C:\PlatoScreenV2_Testbench\PlatoScreenV2_ConfigurationFile.ini

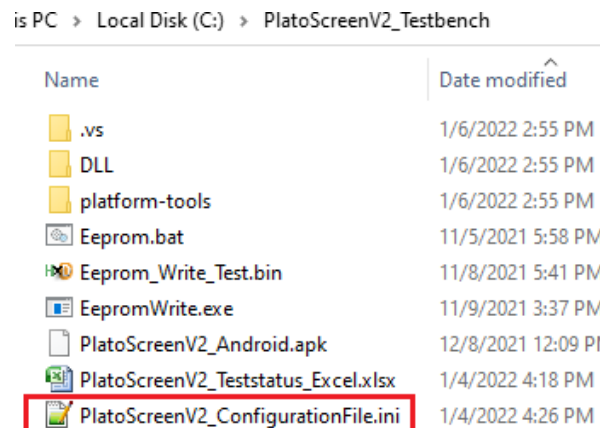


Figure 26 : Configuration file path

3. PlatoScreenV2_ConfigurationFile.ini contains the following parameters

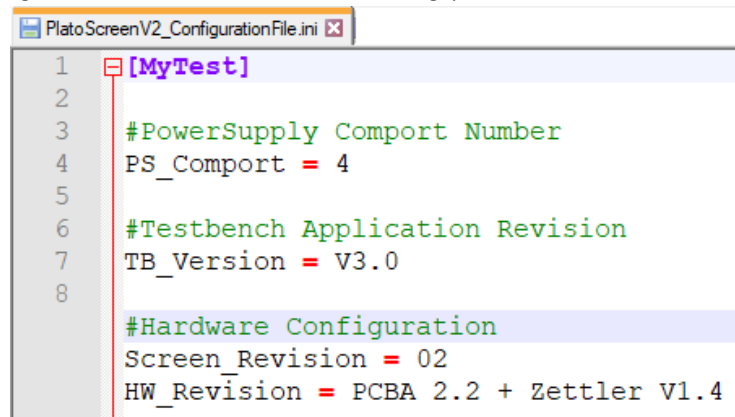


Figure 27 : Configuration File

- a. Power Supply Communication port Number(**PS_Comport**)
Enter the Comport Number detected in Device Manager (refer [section 7.1.2](#))

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b. Testbench Application Revision(TB_Version)

Enter the Application Version installed in the PC

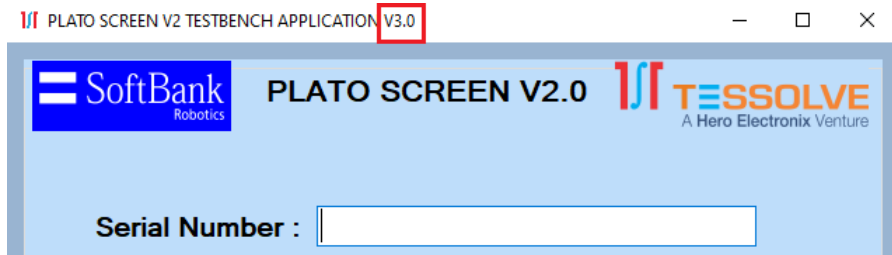


Figure 28 : Testbench Application Version

c. Hardware Configuration

i. Screen_Revision

ii. HW_Revision = PCBA 2.2 + Zettler V1.4

- The Screen Revision and HW revision helps to track the product Hardware configuration.
- For each Hardware configuration changes, the changes description should be added and respective Screen revision should be updated. The screen Revision starts from "00" and can be updated till "FF". The Screen Revision and HW revision should match at any time when tracked.

Below is the Example for Screen Configuration details:

Screen Revision	HW_revision
00	Plato PCBA V2.0 + Success
01	Plato PCBA V2.2 + Zettler V1.4
02	Plato PCBA V2.2 + Zettler V1.5
03	
"	
"	
"	
"	
FF	

Table 2 : Unit HW configuration traceability

- Considering above table 2 as an example, at any time
 - If PCBA V2.2 and Zettler V1.4 display combination used in a product then – Screen revision should be 01.
 - Similarly for PCBA V2.2 + Zettler V1.5 combination used Screen revision should be 02 and so on.

4. The File has to be closed after editing the respective parameters.

Note:

- If any Hardware changes or Screen revision changes are implemented, TESSOLVE will notify the EMS and EMS has to update same in Configuration File before Testing
- This Screen revision value will be written to **Byte 18** of the EEPROM by the Testbench application.

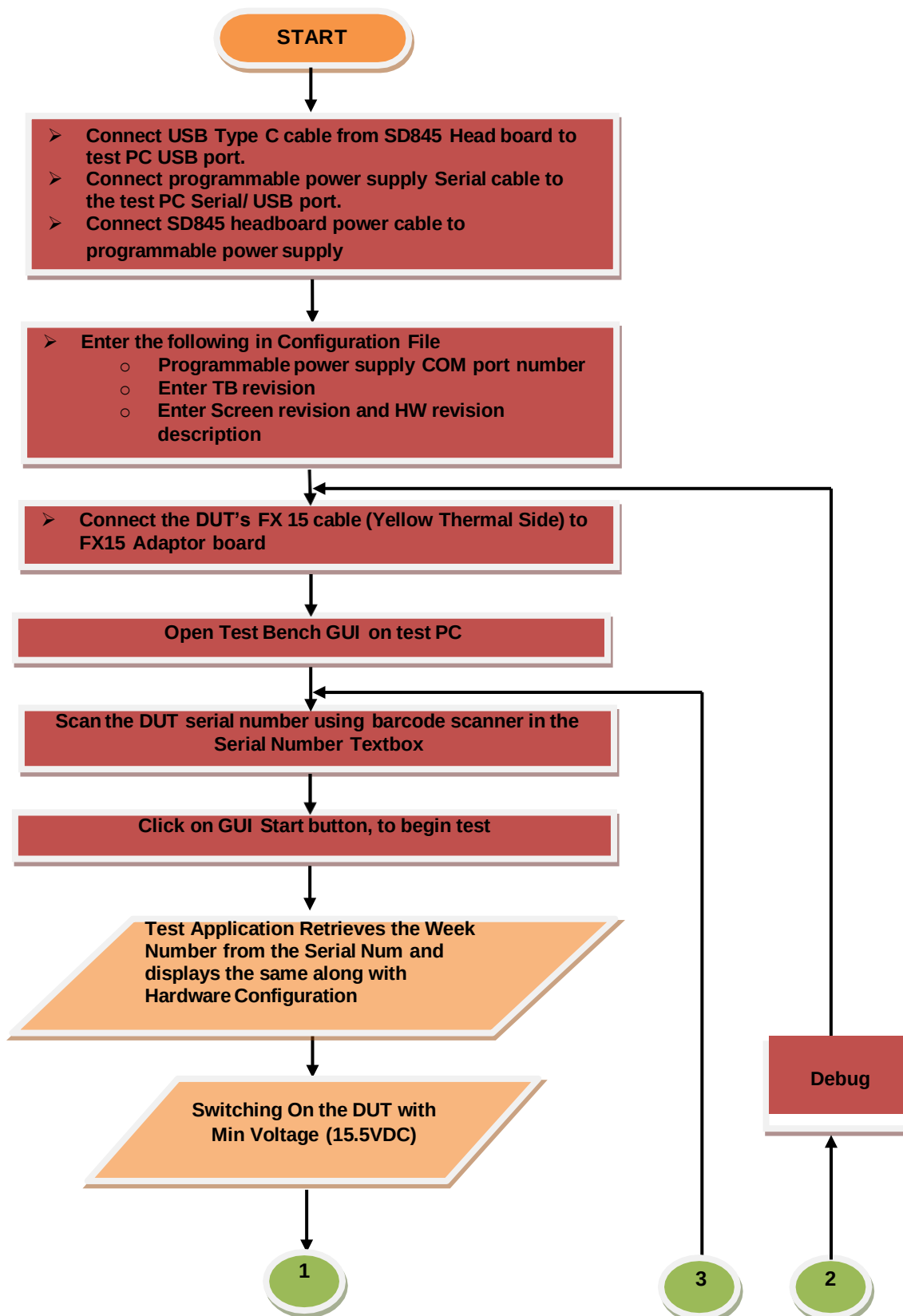
Developer Notes:

- **Platform Tools** folder contains adb exe and related files for ADB USB Communication
- **"PlatoScreenV2_Eeprom_Files"** and **"PlatoScreenV2_Test_Reports"** folder will be created automatically by Test application.

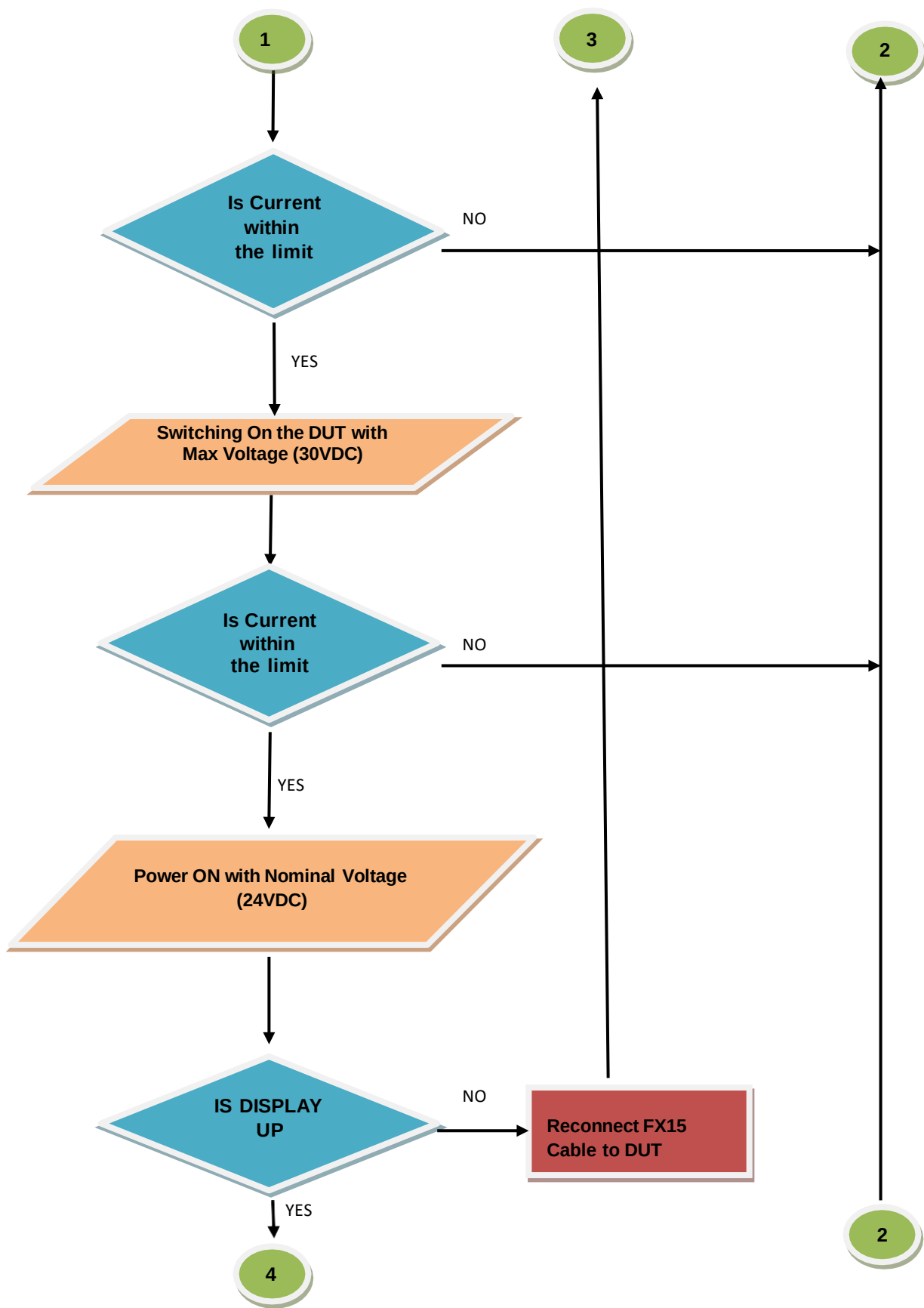
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8. FUNCTIONAL TESTBENCH

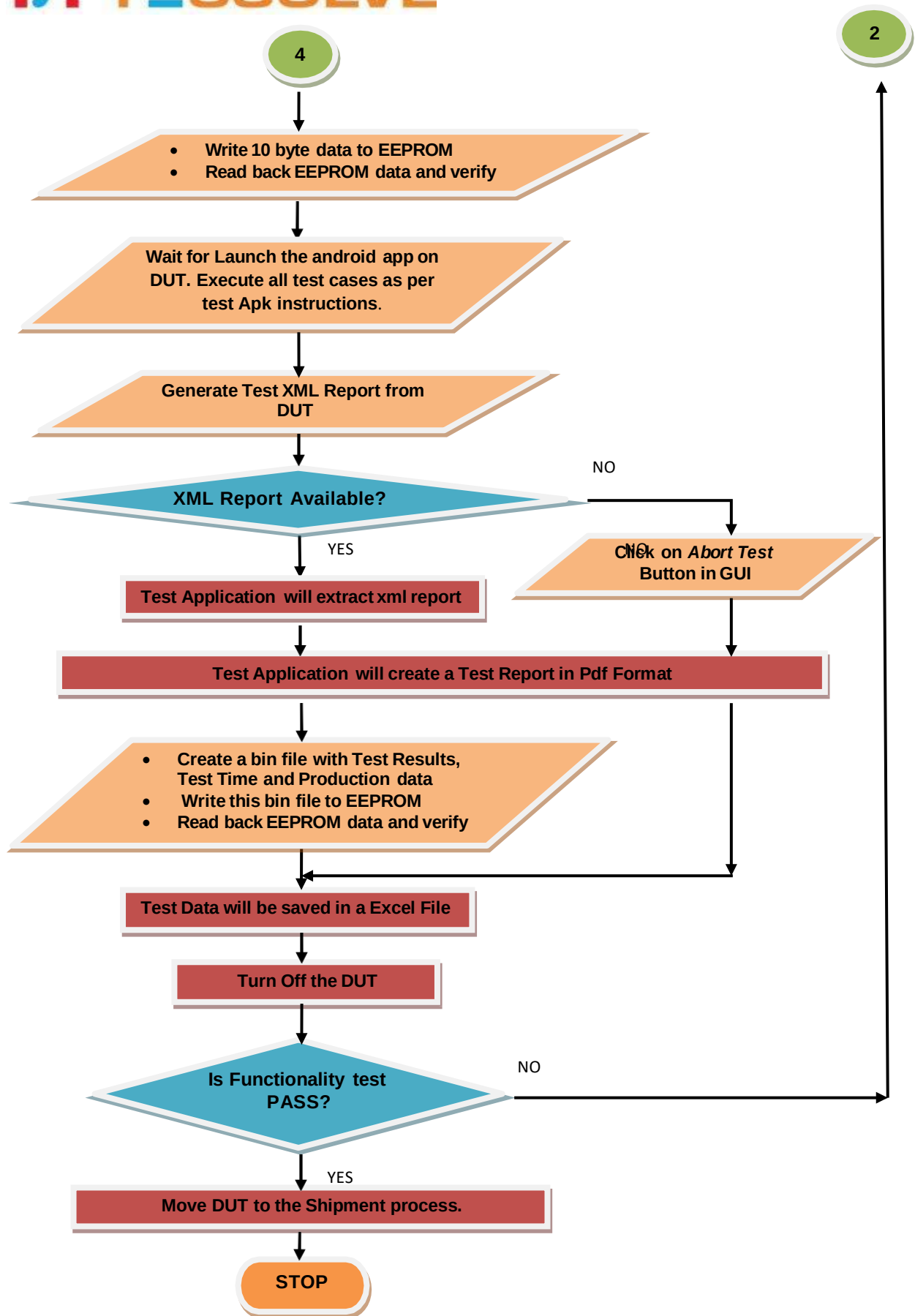
TESTBENCH FLOWCHART:



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TEST BENCH WINDOWS APPLICATION

Below figure provides the brief introduction about windows test application GUI

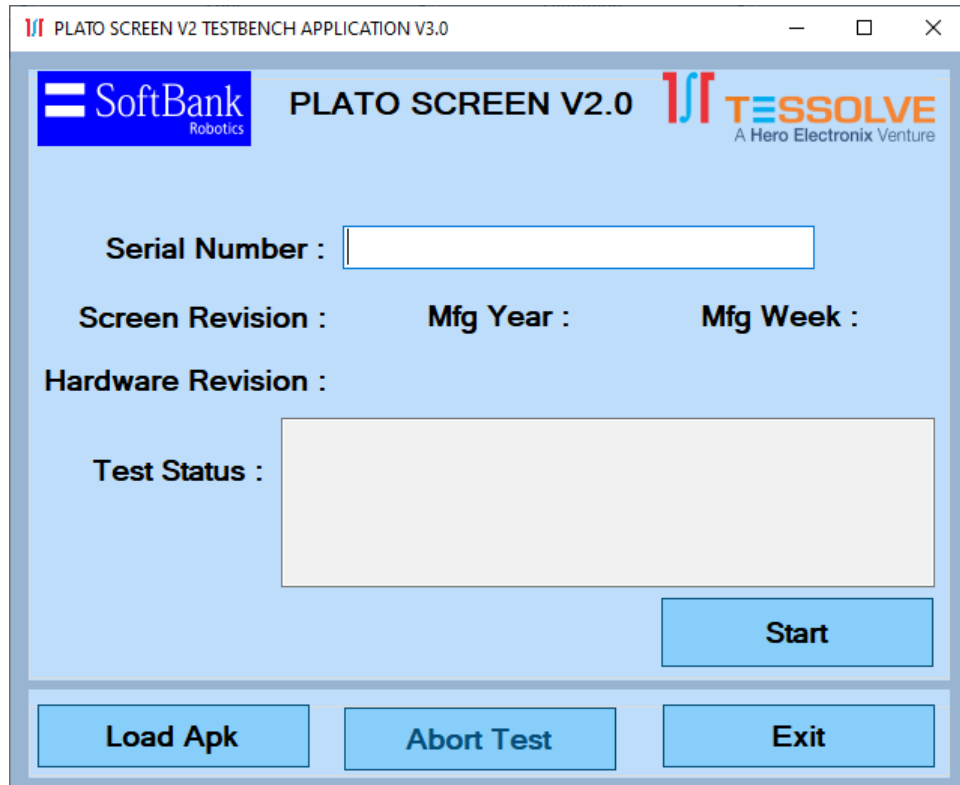


Figure 29 : GUI brief guide for the user

Nomenclature	Description
Serial Number	Field to enter the DUT serial number using barcode scanner
Test Status	Indicates the test status
Start	Button to start the test
Exit	Button to stop and exit the test application
Abort Test	To abort XML report extraction and end Test execution
Load Apk	To install the android application on the SD845 EVK(Only for first time)
Mfg Year	Test bench application will automatically decode and display the year code from the serial number of the DUT.
Mfg Week	Test bench application will automatically decode and display the week code from the serial number of the DUT.
Screen Revision	Shows Screen revision number of the DUT
Hardware revision	Shows hardware configuration description of the DUT

Table 3 : GUI description for the user

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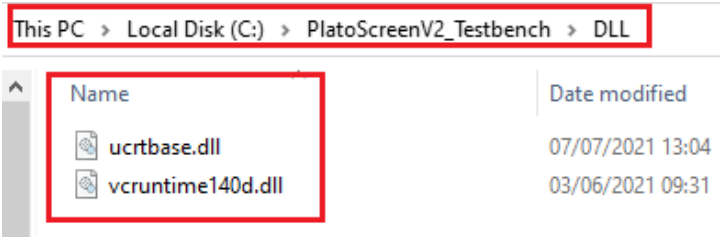
TEST PROCEDURE

Check the following before starting the Test

1. The Power supply should be Powered ON
2. Barcode Scanner should be connected to Test PC
3. Type C cable should be connected from DUT to Test PC
4. Communication cable should be connected from PPS to Test PC
5. Display's FX15 Cable should be connected to Adaptor board
6. Configuration File should be updated with proper data
7. Latest Test Application should be installed
8. Latest Project Folder should be available in C drive
9. NFC Tag

Note :

- Hardware Pre-requisite (Refer [Table 1: Hardware Pre-requisite for Test bench](#))
- Software Pre-requisite(Refer [6.4 Software Installable](#))
- Copy the below DLL to **C:\Windows\System32**.



Android Apk Installation

1. Android Apk should be loaded Only Once before starting the functionality Test
2. Launch the Test application and Select **Load Apk** Button

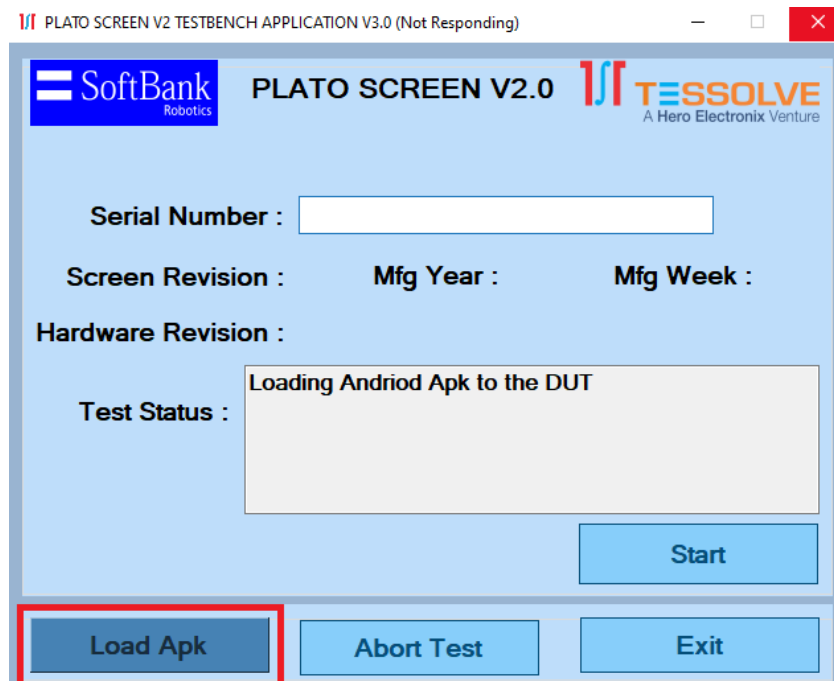


Figure 30 : Installing android test application

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3. Serial Number is not required for loading the Android Apk to the DUT
4. The Test application will enable 24V from power supply to the DUT
5. Once the Display is up ,ituninstalls if any android Test Apk is previously present.
6. Then It Installs the latest file from the Project Folder(Refer [7.4.1 Android Application](#))
7. Now click OK on the installation successful pop message displayed on test PC to complete installation as shown below.

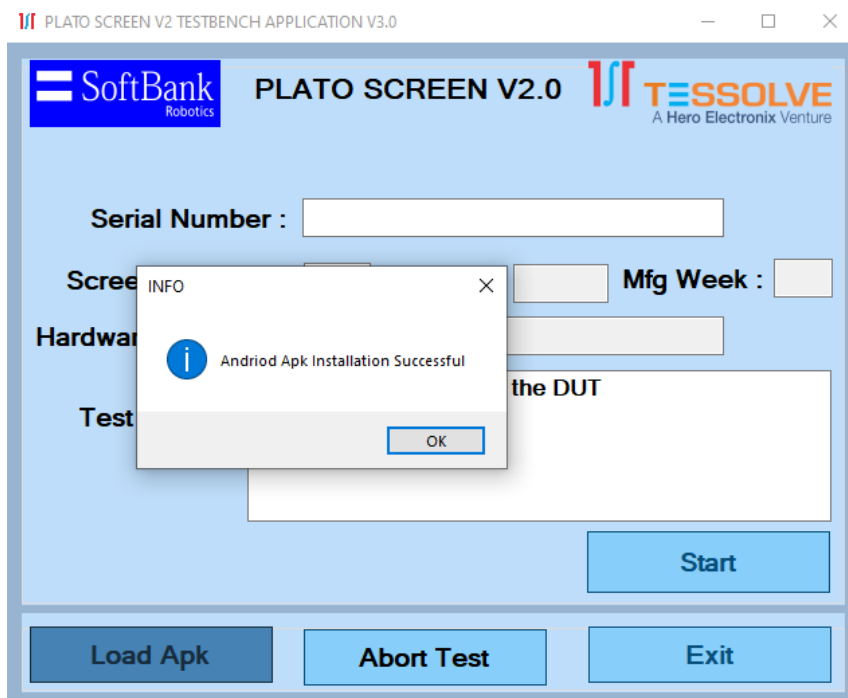


Figure 31 : Completion of android test application installation.

Note: If COM port number is not proper, upon selecting start button on GUI, pop up message “Check the Comport” will be displayed as shown below

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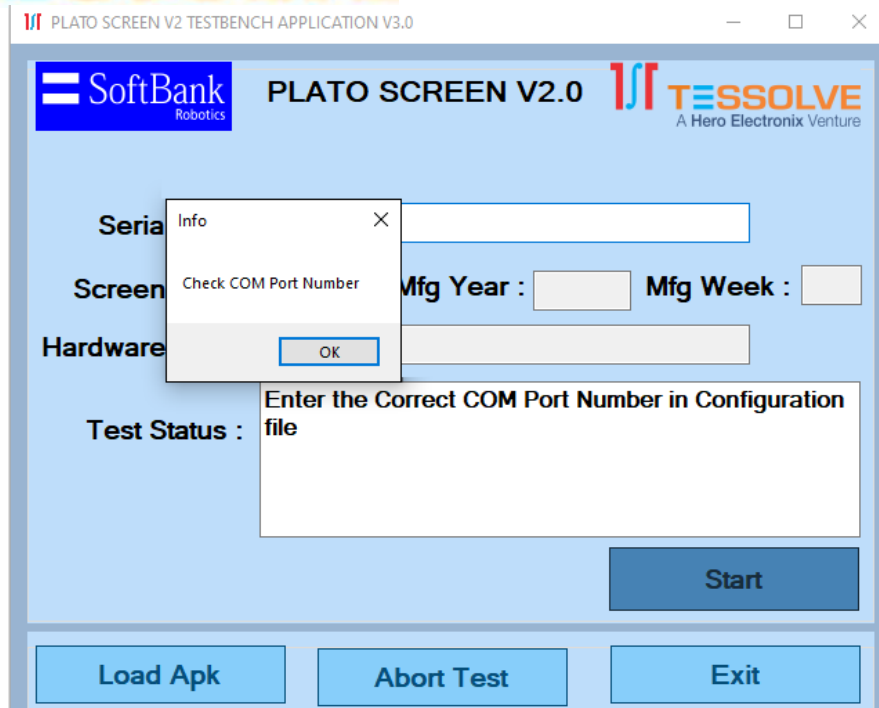


Figure 32 : Example for wrong Comp port number

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8. After the installation, the test app logo appears on the DUT display as shown below:

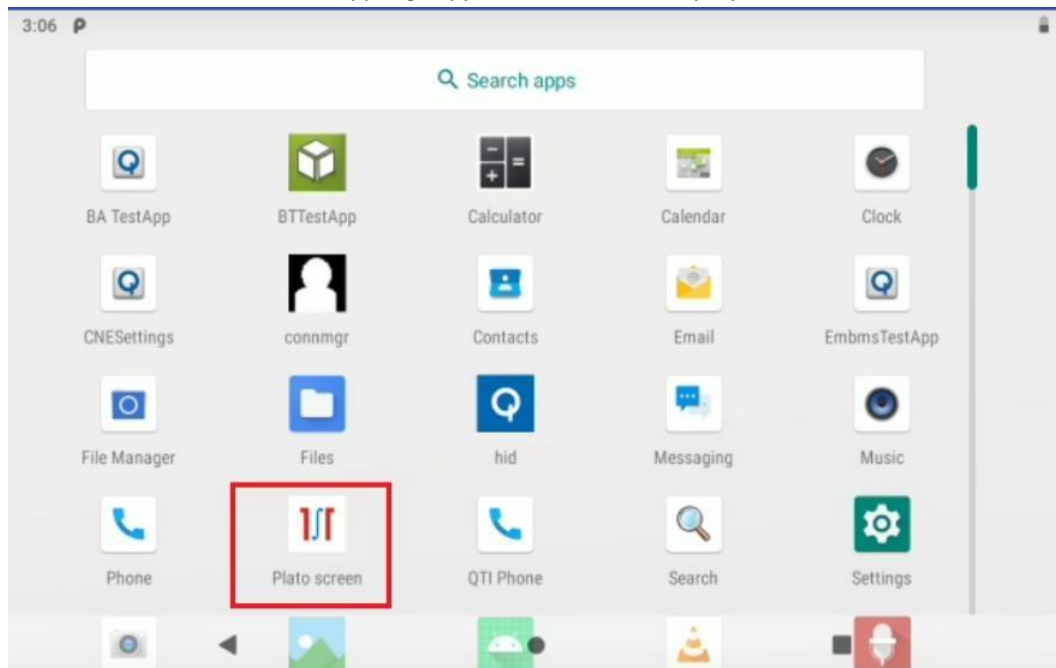
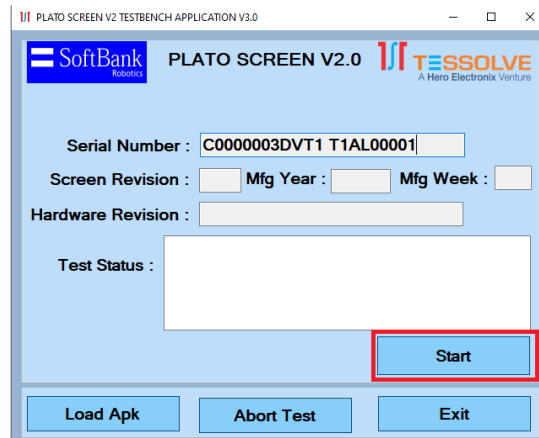


Figure 33 : Android test app logo on DUT display.

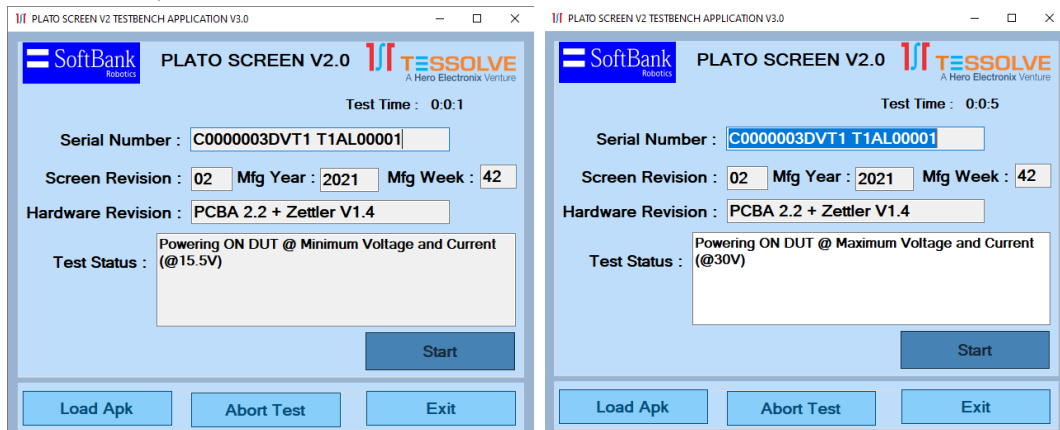
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FUNCTIONAL TEST PROCEDURE.

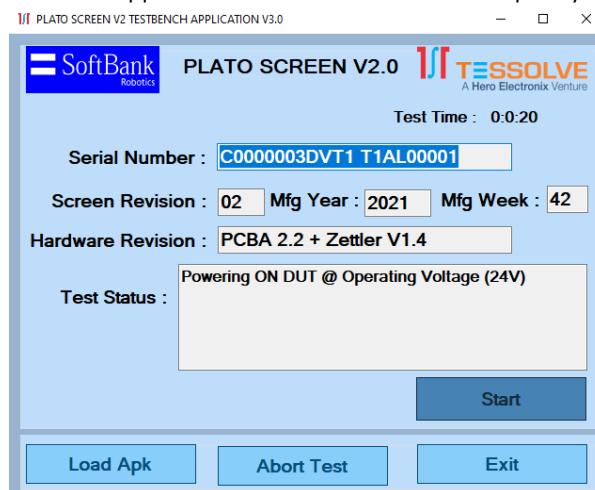
1. Switch ON the Power Supply and Open the windows test application GUI in test PC.
2. Scan the DUT Serial number on the GUI in Serial number field and Click on the **START** button to begin the test.



3. DUT will be powered with minimum voltage (15.5V DC) and checks for the current, if current are within the limit then, DUT is powered with Maximum voltage (30V) and again checks for current. If current is within the limit,



4. DUT is powered with 24V and TB application wait till device boots completely. (45 sec Approx)



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5. Once device is booted completely, pop up message “Is the display up?” will appear on test PC.

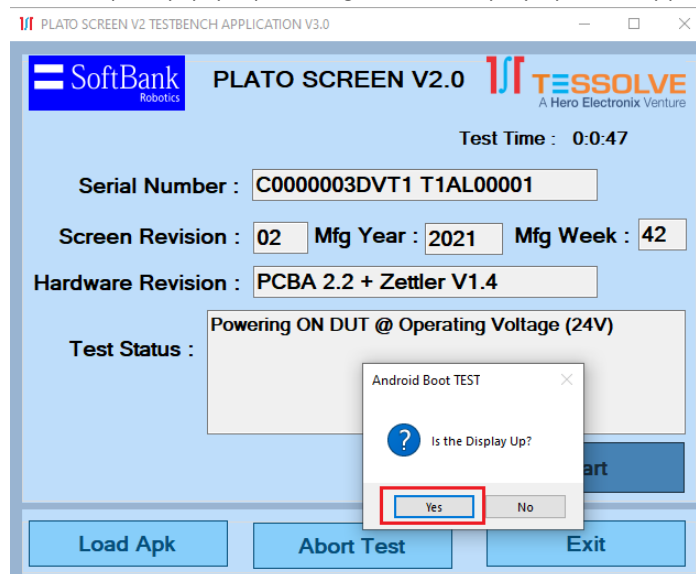
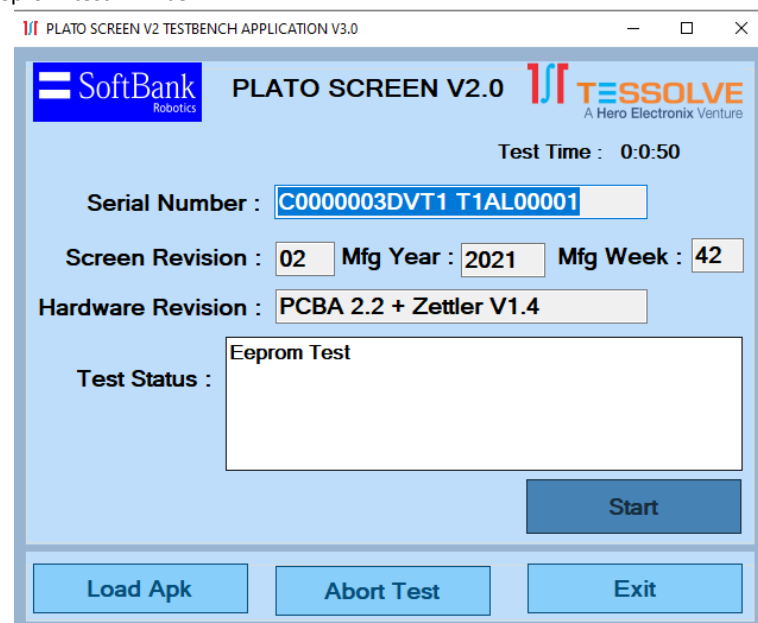


Figure 34 : Test is started and test status is displayed on test status field of GUI.

6. If the display is not up, click “No” then, remove and connect the FX15 cable to the DUT and restart the test.
7. If the display is UP, Click “Yes”. Upon clicking Yes, EEPROM write will be performed on EEPROM.
8. Eeprom test: 10 Bytes of data is written to EEPROM of the DUT and read back to the PC and compared with written file. If both the bin files are matching, Eeprom test will be PASS. If Read and Write file not matching then Eeprom test will be FAIL.



9. Android test app will be launched automatically on the DUT and pop up message saying “ **Perform the test on the target and generate the report**” will appear on the windows test PC.
10. This pop up message will disappear after 5 second. Else user can remove this pop up before this wait time by entering “OK” to the below pop up message.

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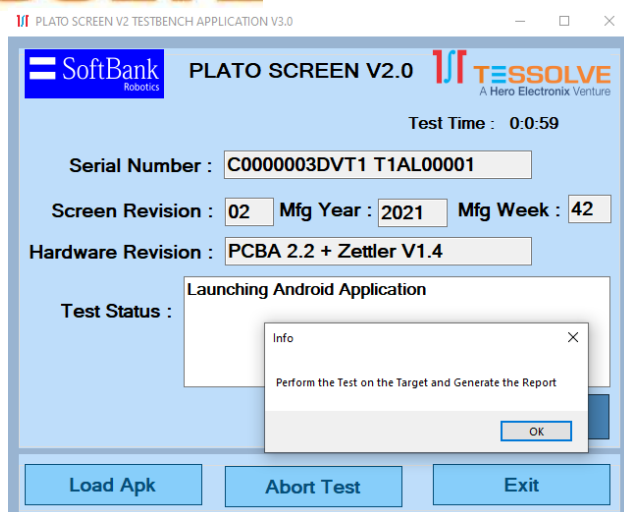


Figure 35 : Launching of android test app on DUT.

ANDROID TEST PROCEDURE

- Below figure provides the brief introduction about android apk:

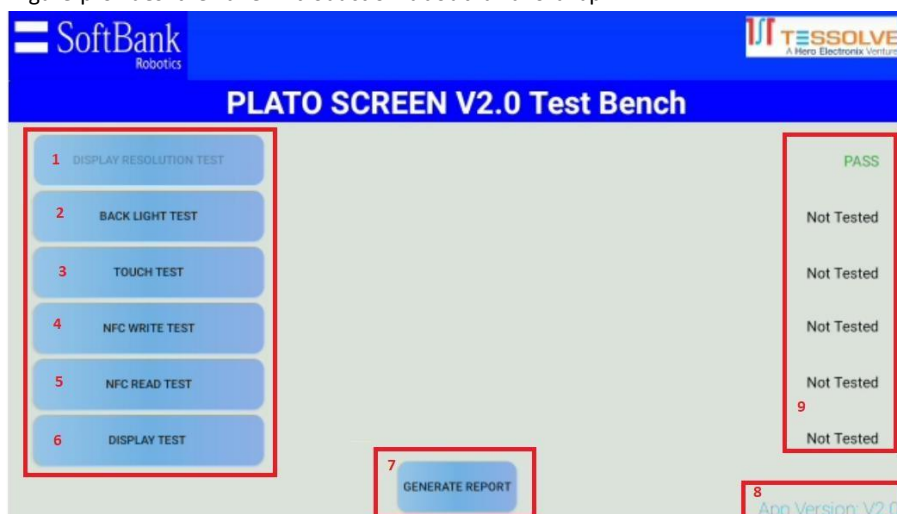


Figure 36 : Android apk brief guide for the user

Number	Nomenclature	Description
1	Backlight test	Button to select display brightness variation test.
2	Display resolution test	Button to select display resolution test
3	Touch test	Button to select touch test.
4	NFC Write test	Button to select NFC write test. After selecting this test hold NFC tag near display
5	NFC read test	Button to select NFC read test. After selecting this test hold NFC tag near display
6	Display test	Button to select display test.
7	Generate report	Button to generate test report after performing all the test
8	App Version V1.0.9	Indicates the app version information
9	Not Tested	Indicates the test status. After performing test, test status change to PASS/FAIL depending on test result.

Table 4 : Android apk description for the user

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LCD Backlight Test (Android Apk):

<TESSOLVE_BACKLIGHT_TEST>

Tester will be able to see the change in the brightness levels after initiating the test from the APK. Test is considered as Pass if brightness levels vary accordingly.

Display Resolution Test (Android Apk):

<TESSOLVE_DISPLAY_RESOLUTION_TEST>

Test APK will read the display resolution from the SBRE Display and validate against the expected value.

Touch Screen Test (Android Apk):

<TESSOLVE_TOUCH_TEST>

User will touch four corners and centre of the display after initiating the test from Test APK. Test APK will capture the touch events and validate the X-Y co ordinates against expected tolerance.

Nfc Write Test (Android Apk):

<TESSOLVE_NFC_TEST>

User will hold NFC Tag near to the SBRE Display Unit after initiating the test from the Test APK. Test APK will write sample data (random number generated by the test application each time) to the NFC Tag. Test is PASS if the application is able to write the data.

Nfc Read Test (Android Apk):

<TESSOLVE_NFC_TEST>

User will hold the same NFC Tag used for above NFC write test near to the SBRE Display Unit. Test APK will read data from the NFC Tag and compare it with the data written in to it. Test is PASS if read data matches with write data.

Display Test (Android Apk):

<TESSOLVE_DISPLAY_TEST>

Test apk will display RED color on the screen first. Then user has to touch the screen to change the color to Green, then Blue and then finally to white. Also the user has to look for any dead pixels or dark sport on the screen for every color. If no dark spots are identified, this test is considered as PASS.

Eeprom Test (Windows Test Application)

<TESSOLVE_EEPROM_TEST>

Window Test Application will create a bin file with production data configuration.

This file will be flashed to the eeprom of the DUT. The Written Data will be Read back from the DUT and Verified. If the Data matches, then the Test case will be made PASS, else FAIL.

11. After performing the entire test mentioned above, generate the test report by clicking "Generate report" on DUT and wait till .xml file created.

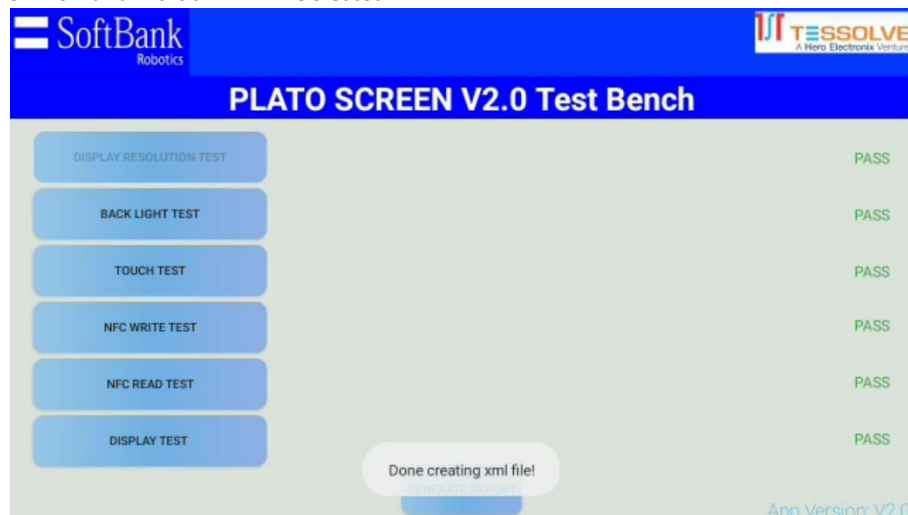


Figure 37 : Step to generate the test report.

Note: In some PC it may ask for permission to store the report. In this case, provide access to the storage.

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12. Test Application will extract the xml report from the DUT automatically
13. If the Xml file is available , Test application creates a Test Report in Pdf form with all the functional Tests
14. A Bin file will be created with Overall Test and Production data and will be written to Eeprom and Read back. These Eeprom files are available at **C:\PlatoScreenV2_Testbench\PlatoScreenV2_Eeprom_Files**
15. The Test Excel will be updated with the Test Data
16. If Xml report could not be generated from the DUT, user can click Abort Test in the GUI , which will stop extracting of xml report, Generate Test Report, Update Test excel and Terminate Testing.

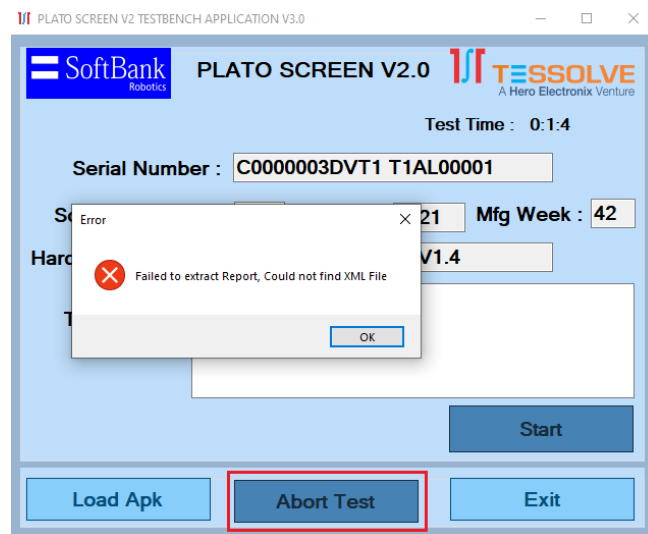


Figure 38 : Abort Test Pop up

17. Once test is completed, programmable power supply will be turned OFF.

TEST REPORT GENERATION

1. **PlatoDisplay_Test_Reports** is a Test Report folder which is automatically created **C:\PlatoDisplay_Testbench\PlatoDisplay_Test_Reports** by the application during the test execution
2. A test report can be identified by the DUT serial number, Date and Time of testing
3. It contains two types of reports :
 - XML Report : A Report generated by Android Application
 - Pdf Report : A Functional Test report generated by Testbench Application

PC > Local Disk (C:) > PlatoScreenV2_Testbench > PlatoScreenV2_Test_Reports

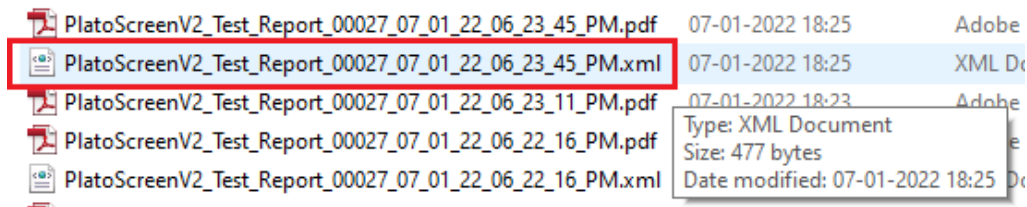
Name	Date modified	Type
 PlatoScreenV2_Test_Report_00027_07_01_22_06_23_45_PM.pdf	07-01-2022 18:25	Adobe Acrobat D...
 PlatoScreenV2_Test_Report_00027_07_01_22_06_23_45_PM.xml	07-01-2022 18:25	XML Document
 PlatoScreenV2_Test_Report_00027_07_01_22_06_23_11_PM.pdf	07-01-2022 18:23	Adobe Acrobat D...
 PlatoScreenV2_Test_Report_00027_07_01_22_06_22_16_PM.pdf	07-01-2022 18:22	Adobe Acrobat D...
 PlatoScreenV2_Test_Report_00027_07_01_22_06_22_16_PM.xml	07-01-2022 18:22	XML Document
 PlatoScreenV2_Test_Report_00027_07_01_22_06_18_49_PM.pdf	07-01-2022 18:20	Adobe Acrobat D...
 PlatoScreenV2_Test_Report_00027_07_01_22_06_18_49_PM.xml	07-01-2022 18:20	XML Document

Figure 39 : Test Reports Folder

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XML Report

1. Once the report is generated on the DUT , Test PC automatically extracts the Android Test report and saves it in the Test reports folder
2. The test report is in .xml file format



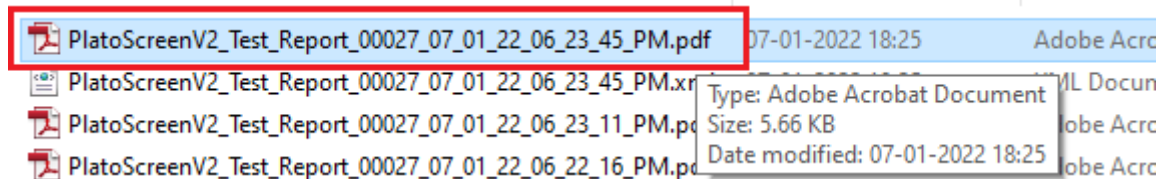
3. The XML file will contain the Android test cases and their test results respectively

```
<?xml version="1.0" encoding="UTF-8"?>
<testcases number="11">
  - <testcaseName name="BACKLIGHT">
    <status>PASS</status>
  </testcaseName>
  - <testcaseName name="DISPLAY RESOLUTION">
    <status>PASS</status>
  </testcaseName>
  - <testcaseName name="TOUCH">
    <status>PASS</status>
  </testcaseName>
  - <testcaseName name="NFC WRITE">
    <status>FAIL</status>
  </testcaseName>
  - <testcaseName name="NFC READ">
    <status>FAIL</status>
  </testcaseName>
  - <testcaseName name="DISPLAY">
    <status>PASS</status>
  </testcaseName>
</testcases>
```

Figure 40 : XML Test Report

PDF Report

1. The Test application will extract data from XML report and write to a unit test report with the DUT data and other Production details
2. This test report is in .pdf file format which will be saved in the Test reports folder



3. If all the Test cases are **PASS**, the overall Test result will be **PASS**.
4. If any one Testcase fails, the overall test result will be **FAIL**

Sample Reports are attached below

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Product : PLATO SCREEN V2.0
DUT Serial Number : C0000003DVT1 T1AL00001
Screen_Revision : 02
Hardware Revision : PCBA 2.2 + Zettler V1.4
Testbench Version : V3.0
TestPC OS Version : Windows 10 Enterprise
Android OS Version : 9
TB Android Apk Version : 2.0
Test Date : 05/01/22 08:48:55 PM
Production Week : 42,2021
Result : PASS

TESTCASE	RESULT	VALUE
DUT ON @ MIN VOLT and CURR(@15.5V)	PASS	0.006A
DUT ON @ MAX VOLT and CURR(@30V)	PASS	0.035A
DUT ON @ OPERATING VOLTAGE(24V)	PASS	
ANDROID BOOT	PASS	
EEPROM TEST	PASS	
BACKLIGHT	PASS	
DISPLAY RESOLUTION	PASS	
TOUCH	PASS	
NFC WRITE	PASS	
NFC READ	PASS	
DISPLAY	PASS	

End of Unit Test Report

Figure 41 : Example of PASS functionality test report

Unit Test Report

Product : PLATO SCREEN V2.0
DUT Serial Number : C0000003EVT1T T15Q00027
Screen_Revision : 02
Hardware Revision : PCBA 2.2 + Zettler V1.4
Testbench Version : V3.0
TestPC OS Version : Windows 10 Enterprise
Android OS Version : 9
TB Android Apk Version : 2.0
Test Date : 07/01/22 06:22:45 PM
Production Week : 21,2021
Result : FAIL

TESTCASE	RESULT	VALUE
DUT ON @ MIN VOLT and CURR(@15.5V)	PASS	0.006A
DUT ON @ MAX VOLT and CURR(@30V)	PASS	0.035A
DUT ON @ OPERATING VOLTAGE(24V)	PASS	
ANDROID BOOT	PASS	
EEPROM TEST	PASS	
BACKLIGHT	PASS	
DISPLAY RESOLUTION	PASS	
TOUCH	PASS	
NFC WRITE	FAIL	
NFC READ	FAIL	
DISPLAY	PASS	

End of Unit Test Report

Figure 42 : Example of FAIL functionality test report

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EEPROM FILE GENERATION

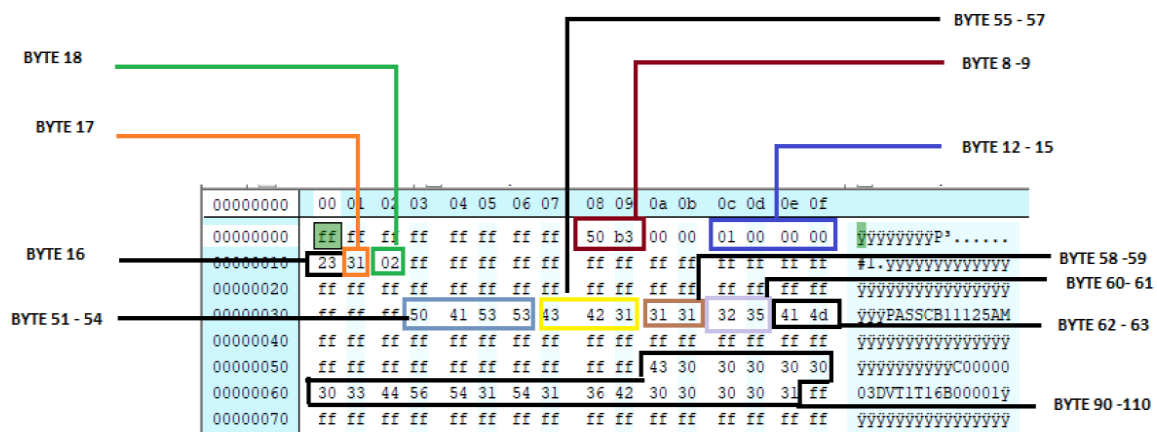
EEPROM Folder

1. **PlatoScreenV2_Eeprom_Files** is a EEPROM file folder which is automatically created
C:\PlatoDisplay_Testbench\ **PlatoScreenV2_Eeprom_Files** by the application during the test execution
2. A EEPROM file is a .bin file which can be identified by the DUT serial number, Date and Time of testing

Plato_Eeprom_Read_00027_07_01_22_06_23_45_PM.bin	07-01-2022 18:25	BIN File
Plato_Eeprom_Write_00027_07_01_22_06_23_45_PM.bin	07-01-2022 18:25	BIN File
Plato_Eeprom_Read_00027_07_01_22_06_22_16_PM.bin	07-01-2022 18:22	BIN File
Plato_Eeprom_Write_00027_07_01_22_06_22_16_PM.bin	07-01-2022 18:22	BIN File
Plato_Eeprom_Read_00027_07_01_22_06_18_49_PM.bin	07-01-2022 18:20	BIN File
Plato_Eeprom_Write_00027_07_01_22_06_18_49_PM.bin	07-01-2022 18:20	BIN File

Figure 43 : Eeprom Read/Write Test reports generated for each DUT

3. Bin File contents are explained below



Byte	Data	Content	COMMENT															
8-9	Manufacturer	TES	TES for TESSOLVE (Converting 3 byte String Data into 2 byte of Hex Data)															
12-15	Serial Number	00001 to 99999	5 digits, start again every batch (Hex of Integer)															
16	Week of manufacturer	01 to 53	Screen module week of manufacturer (Hex of Integer)															
17	Year of manufacturer	29 to 99	Screen module year of manufacture value=(year of manufacture - 1990) (Hex of Integer)															
18	Screen module electrical revision code	01 to FF	Reserved by the operating System for compatibility detection- Start at 1 (hex value) <table><tr><th colspan="3">Screen module electrical revision code</th></tr><tr><th>Revision</th><th>Description</th><th>Remarks</th></tr><tr><td>01</td><td>Success display</td><td>PLATO PCBA 1.0, PLATO PCBA 2.0</td></tr><tr><td>02</td><td>Zettler display V1.4</td><td>PLATO PCBA 2.2</td></tr><tr><td>03</td><td>Zettler display V1.5</td><td>PLATO PCBA 2.2</td></tr></table>	Screen module electrical revision code			Revision	Description	Remarks	01	Success display	PLATO PCBA 1.0, PLATO PCBA 2.0	02	Zettler display V1.4	PLATO PCBA 2.2	03	Zettler display V1.5	PLATO PCBA 2.2
Screen module electrical revision code																		
Revision	Description	Remarks																
01	Success display	PLATO PCBA 1.0, PLATO PCBA 2.0																
02	Zettler display V1.4	PLATO PCBA 2.2																
03	Zettler display V1.5	PLATO PCBA 2.2																
51-71	Reserved for tessolve		Byte 51 to 54 - STATUS BYTE PASS/FAIL BYTE 55 to 57 -Functionality test date - DMY format BYTE 58 and 59 - Hour (12 Hour format) BYTE 60 and 61- Minute BYTE 62 and 63- AM/PM															
72-89	Reserved for tessolve																	
90-110	Manufacturing serial number	Identical to label serial number	Converting String into ASCII															

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EEPROM data read and decode

Open Adb Shell from Platform Tools and use following commands to Read the Eeprom Data on the DUT

```
# Adb shell
```

su

```
# cd /data
```

```
# cat /sys/class/i2c-dev/i2c-2/device/2-0050/eeprom
```

[illegible]

Figure 44 : Eeprom Data of the DUT

TEST EXCEL

At the end of Each Test execution, the test data will be stored in the excel file as shown in the below figure.

	A	B	C	D	E	F	G	H
1	SNo	Test Date	Test Time	Serial Number	Production WeekNumber	Overall Test Status	Eeprom Status Write/Read	Failure Testcase
2	1	28/12/21	3:59:10 PM	C0000003A00T T1A100029	42	FAIL	NA	ANDROID TESTCASES
3	2	28/12/21	4:54:04 PM	C0000003DVT1 T1A100032	42	PASS	PASS	
4	3	29/12/21	2:36:41 PM	C0000003EVT1 T16400002	22	FAIL	NA	ANDROID TESTCASES
5	4	29/12/21	2:39:35 PM	C0000003DVT1 T1A100001	42	FAIL	NA	ANDROID TESTCASES

Figure 45 : Example showing the summary of the test status stored in excel format

Note: During testing, user should not open this excel file. If it is open , then the test result will not be updated in the excel.

9. EMS TEST RESULT BACK UP REQUIREMENT:

All the test results and reports back-up must be taken by the EMS partner and kept for traceability for 10 Years and it should be available for TESSOLVE review anytime.

Documents to be back up are listed below:

1. PlatoDisplay_Test_Reports pdf's
2. PlatoDisplay_Teststatus_Excel
3. Sbre_Traceability_Data excel
4. PlatoDisplay_Eeprom_Files
5. HW Revision and screen revision data
6. CoC document

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10. TEST TIME ESTIMATION- TBU

Below table shows the estimated time for the SBRE board validation. This is an approximate estimate and should be updated once the final test bench application and the test cases are finalized.

SBRE UNIT TEST TIME ESTIMATION				
SL NO		Functions	Description	Estimated time (Seconds)
1		Barcode Scanning	Scanning the serial number of DUT using bar code scanner before connecting to Test bench	5
2		COM port number, TB revision, HW_Revision and Screen Revision Update	Enter the programmable power supply COM port number from test PC device manager to configuration file. Enter the HW Revision details and respective Screen Revision	20
3	UNIT LEVEL TEST	DUT connection	Plug the FX15 cable coming out from SD845 test bench set up to the bar code scanned DUT.	10
		DUT Min and Max voltage test	Programmable power supply turns ON with Min and max voltage, check for current range	20
		DUT booting	Programmable power supply turns ON with 24VDC. Device booting and android home screen load + EEPROM Write/Read + NFC enable+ android apk launch	50
		Backlight Test	Display brightness level will change from low to high and high to low after initiating the test from the APK. Test is PASS if brightness levels varies accordingly.	10
		Touch Test	User has to touch all the touch screen areas, as mentioned by the android application. Test APK will capture the touch events and validate the X-Y co ordinates against expected tolerance.	10
		NFC Write Test	User will hold NFC Tag near to the SBRE Display Unit. The android APK will generate a random number and will be written to the NFC Tag. After successful write, the NFC test pass result will be displayed on DUT screen in green color.	5
		NFC Read Test	User has to hold the same tag used for NFC write test near the DUT. The test APK will read back the tag data, and compare it with the previously written random number. If both are matching APK will display a Pass	5

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			result.	
		Display test	Test apk will display RED color on the screen first. Then user has to touch the screen to change the color to Green, then Blue and then finally to white. Also the user has to look for any dead pixels or dark sport on the screen for every color. If no dark spots are identified, this test is considered as PASS.	10
4	Test report extract and excel update		Upon clicking on "generate report" in android apk. .xml file will be created. User has to click on extract report Test bench application running on PC.	10
	TOTAL TESTING TIME			155

Table 5 : DUT Functionality test - time estimation -TBU

NOTE: The timing mentioned here is based on the best case scenario.

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FCC Compliance Statement (USA)

FCC ID: 2A6PTC0000003

Compliance Statements: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including, an interference that may cause undesired operation.

Caution Statements:

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
- This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

INFORMATION TO THE USER

For Class A and Class B digital devices, information to the user is required to include the following statements (Section 15.105):

For a Class A digital device or peripheral, the instructions furnished to the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

For a Class B digital device or peripheral, the instructions furnished to the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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Steps to Find the FCC ID :

1. Remove the Plato Display from the complete Robot.
2. You can find the NFC FCC ID label placed on the back side of the Plato Display.

END OF DOCUMENT

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