2. Specification

2.1 LTE General Specification

	GPS	LTE FDD B1	LTE FDD B3	LTE FDD B19
Tx Freq. range	-	1920~1980 MHz	1710~1785 MHz	830~845 MHz
Rx Freq. range	1575.42MHz	2110~2170 MHz	1805~1880 MHz	875~890 MHz
Channel Bandwidth	2MHz	5, 10,15, 20 MHz	5, 10,15, 20 MHz	5, 10, 15 MHz
Channel Spacing	Not Used	100KHz	100KHz	100KHz
Number of Channel	1	25, 50, 75, 100	25, 50, 75, 100	25, 50, 75
Duplex Separation	-	90MHz	95MHz	45 MHz
Modulation	-	Uplink DCM : QPSK/16QAM KDDI : QPSK/16QAM/64QAM Downlink DCM : QPSK/16QAM/64QAM/256QAM KDDI : QPSK/16QAM/64QAM/256QAM	Uplink DCM : QPSK/16QAM KDDI : QPSK/16QAM/64QAM Downlink DCM : QPSK/16QAM/64QAM/256QAM KDDI : QPSK/16QAM/64QAM/256QAM	Uplink DCM : QPSK/16QAM KDDI : QPSK/16QAM/64QAM Downlink DCM : QPSK/16QAM/64QAM/256QAM KDDI : QPSK/16QAM/64QAM/256QAM
Rx Local Frequency	F_{Rx} * 2	-	-	-
Operating Temperature	-30℃ ~ +60℃	-30℃ ~ +60℃	-30℃ ~ +60℃	-30℃ ~ +60℃

2. Specification

	LTE FDD B21	LTE FDD B26	LTE FDD B28	LTE TDD B41
Tx Freq. range	1447.9~1462.9 MHz	814 ~ 849 MHz	703~748 MHz	2496 ~ 2690 MHz
Rx Freq. range	1495.9~1510.9 MHz	859 ~ 894 MHz	758~803 MHz	2496 ~ 2690 MHz
Channel Bandwidth	5, 10, 15 MHz	1.4, 3, 5, 10 MHz	5, 10, 15, 20 MHz	5, 10, 15, 20 MHz
Channel Spacing	100KHz	100Khz	100KHz	100KHz
Number of Channel	25, 50, 75	6, 15, 25, 50, 75	25, 50, 75,100	25, 50, 75,100
Duplex Separation	48 MHz	45 MHz	55 MHz	N/A
Type of Emission	Uplink DCM : QPSK/16QAM KDDI : QPSK/16QAM/64QAM Downlink DCM : QPSK/16QAM/64QAM/256QAM KDDI : QPSK/16QAM/64QAM/256QAM	Uplink DCM : QPSK/16QAM KDDI : QPSK/16QAM/64QAM Downlink DCM : QPSK/16QAM/64QAM/256QAM KDDI : QPSK/16QAM/64QAM/256QAM	Uplink DCM : QPSK/16QAM KDDI : QPSK/16QAM/64QAM Downlink DCM : QPSK/16QAM/64QAM/256QAM KDDI : QPSK/16QAM/64QAM/256QAM	Uplink DCM : QPSK/16QAM KDDI : QPSK/16QAM/64QAM Downlink DCM : QPSK/16QAM/64QAM/256QAM KDDI : QPSK/16QAM/64QAM/256QAM
Operating Temperature	-30℃ ~ +60℃	-30℃ ~ +60℃	-30℃ ~ +60℃	-30℃ ~ +60℃

2. Specification

	LTE TDD B42
Tx Freq. range	3400 ~ 3600 MHz
Rx Freq. range	3400 ~ 3600 MHz
Channel Bandwidth	5, 10, 15, 20 MHz
Channel Spacing	100KHz
Number of Channel	25, 50, 75,100
Duplex Separation	N/A
Type of Emission	Uplink DCM : QPSK/16QAM KDDI : QPSK/16QAM/64QAM Downlink DCM : QPSK/16QAM/64QAM/256QAM KDDI : QPSK/16QAM/64QAM/256QAM
Operating Temperature	-30℃ ~ +60℃

2. Specification

2-2. GSM/WCDMA General Specification

	GSM850	EGSM 900	DCS1800	PCS1900	WCDMA 2100	WCMDA 850
Freq. Band[MHz] Uplink/ Downlink	824~849 869~894	880~915 925~960	1710~1785 1805~1880	1850~1910 1930~1990	1922~1977 2112~2167	824~849 869~894
ARFCN range	128~251	0~124 & 975~1023	512~885	512~810	UL: 9612~9888 DL: 10562~10838	UL: 4132~4233 DL: 4357~4458
Tx/Rx spacing	45MHz	45MHz	95MHz	80MHz	190MHz	45MHz
Mod. Bit rate/ Bit Period	270.833kbps 3.692us	270.833kbps 3.692us	270.833kbps 3.692us	270.833kbps 3.692us	3.84Mcps	3.84Mcps
Time Slot Period/ Frame Period	576.9us 4.615ms	576.9us 4.615ms	576.9us 4.615ms	576.9us 4.615ms	FrameLength: 10ms Slotlength: 0.667ms	FrameLength: 10ms Slotlength: 0.667ms
Modulation	0.3GMSK	0.3GMSK	0.3GMSK	0.3GMSK	QPSKHQPSK	QPSKHQPSK
MS Power	33dBm~5dBm	33dBm~5dBm	30dBm~0dBm	30dBm~0dBm	24dBm~ -50dBm	24dBm~ -50dBm
Power Class	5pcl ~ 19pcl	5pcl ~ 19pcl	0pcl ~ 15pcl	0pcl ~ 15pcl	3(max+24dBm)	3(max+24dBm)
Sensitivity	-102dBm	-102dBm	-100dBm	-100dBm	-106.7dBm	-106.7dBm
TDMA Mux	8	8	8	8	8	8
Cell Radius	35Km	35Km	2Km	2Km	2Km	2Km

2. Specification

2-3. GSM Tx Power Class

TX Power control level	GSM850	TX Power control level	EGSM900	TX Power control level	DCS1800	TX Power control level	PCS1900
5	33±2 dBm	5	33±2 dBm	0	30±3 dBm	0	30±3 dBm
6	31±2 dBm	6	31±2 dBm	1	28±3 dBm	1	28±3 dBm
7	29±2 dBm	7	29±2 dBm	2	26±3 dBm	2	26±3 dBm
8	27±2 dBm	8	27±2 dBm	3	24±3 dBm	3	24±3 dBm
9	25±2 dBm	9	25±2 dBm	4	22±3 dBm	4	22±3 dBm
10	23±2 dBm	10	23±2 dBm	5	20±3 dBm	5	20±3 dBm
11	21±2 dBm	11	21±2 dBm	6	18±3 dBm	6	18±3 dBm
12	19±2 dBm	12	19±2 dBm	7	16±3 dBm	7	16±3 dBm
13	17±2 dBm	13	17±2 dBm	8	14±3 dBm	8	14±3 dBm
14	15±2 dBm	14	15±2 dBm	9	12±4 dBm	9	12±4 dBm
15	13±2 dBm	15	13±2 dBm	10	10±4 dBm	10	10±4 dBm
16	11±3 dBm	16	11±3 dBm	11	8±4 dBm	11	8±4 dBm
17	9±3dBm	17	9±3dBm	12	6±4 dBm	12	6±4 dBm
18	7±3 dBm	18	7±3 dBm	13	4±4 dBm	13	4±4 dBm
19	5±3 dBm	19	5±3 dBm	14	2±5 dBm	14	2±5 dBm
-	-	-	-	15	0±5 dBm	15	0±5 dBm

3. Operation Instruction and Installation

Main Function

Item	Description
OS	Android V7.1.1
RF	2G GSM 850(B5) / 900(B8) / 1800(B3) / 1900(B2) 3G WCDMA : B1 / B5 / B6 / B19 4G(LTE) - FDD : B1 / B3 / B4 / B5 / B7 / B/12/ B13 /B17 / B19 / B21 / B26 / B28 - TDD : B38 / B39 / B40 / B41 / 42
Battery	3,300mAh
Base Band	MSM8998 / 2.35GHz, 1.9GHz
Other RF	GPS, Glonass, BT 4.2, USB 3.1, WIFI 802.11 a/b/g/n/ac (2.4G+5GHz), NFC, MST
Camera	12 MP Rear(wide+tele), Dual Pixel, AF 8.0 MP Front
LCD	6.32” Quad HD, 2960 x 1440, dual edge Super AMOLED
RAM	6GB LPDDR4X + 64GB UFS
Sensor	Accelerometer, Barometer, Fingerprint Sensor, Gyro Sensor, Geomagnetic Sensor, Hall Sensor, HR Sensor, Iris Sensor, Proximity Sensor, RGB Light Sensor, Pressure Sensor
Accessory	Charger : 5V/2A or 9 V/1.67 A Data cable : USB Type-C Earjack : 3.5pi, 4Pin

9. Reference Abbreviate

Reference Abbreviate

— **AAC**: Advanced Audio Coding.
— **AVC** : Advanced Video Coding.
— **BER** : Bit Error Rate
— **BPSK**: Binary Phase Shift Keying
— **CA** : Conditional Access
— **CDM** : Code Division Multiplexing
— **C/I** : Carrier to Interference
— **DMB** : Digital Multimedia Broadcasting
— **EN** **:** European Standard
— **ES** **:** Elementary Stream
— **ETSI**: European Telecommunications Standards Institute
— **MPEG**: Moving Picture Experts Group
— **PN** : Pseudo-random Noise
— **PS** : Pilot Symbol
— **QPSK**: Quadrature Phase Shift Keying
— **RS** : Reed-Solomon
— **SI** : Service Information
— **TDM** : Time Division Multiplexing
— **TS** **:** Transport Stream

1. Safety Precautions

1-1. Repair Precaution

Before attempting any repair or detailed tuning, shield the device from RF noise or static electricity discharges.

Use only demagnetized tools that are specifically designed for small electronic repairs, as most electronic parts are sensitive to electromagnetic forces.

Use only high quality screwdrivers when servicing products. Low quality screwdrivers can easily damage the heads of screws.

Use only conductor wire of the properly gauge and insulation for low resistance, because of the low margin of error of most testing equipment.
We recommend 22-gauge twisted copper wire.

Hand-soldering is not recommended, because printed circuit boards (PCBs) can be easily damaged, even with relatively low heat. Never use a soldering iron with a power rating of more than 100 watts and use only lead-free solder with a melting point below 250°C (482°F).

Prior to disassembling the battery charger for repair, ensure that the AC power is disconnected.
Always use the replacement parts that are registered in the SEC system. Third-party replacement parts may not function properly.

1. Safety Precautions

1-2. ESD(Electrostatically Sensitive Devices) Precaution

Many semiconductors and ESDs in electronic devices are particularly sensitive to static discharge and can be easily damaged by it. We recommend protecting these components with conductive anti-static bags when you store or transport them.

Always use an anti-static strap or wristband and remove electrostatic buildup or dissipate static electricity from your body before repairing ESDs.

Ensure that soldering irons have AC adapter with ground wires and that the ground wires are properly connected.

Use only desoldering tools with plastic tips to prevent static discharge.

Properly shield the work environment from accidental electrostatic discharge before opening packages containing ESDs.

The potential for static electricity discharge may be increased in low humidity environments, such as air-conditioned rooms. Increase the airflow to the working area to decrease the chance of accidental static electricity discharges.

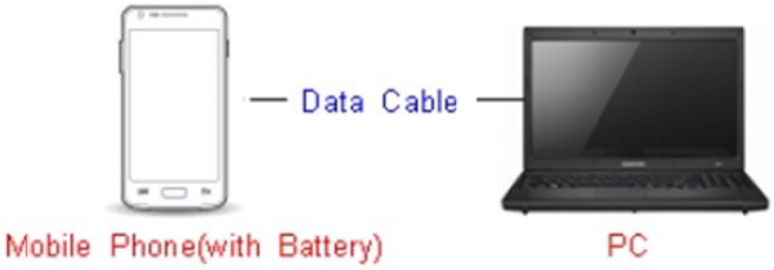
6. Level 1 Repair

6-1. S/W Download

6-1-1. Prepare for S/W Downloading

- Installation program: Downloader Program (**Odin3 v3.12.10.exe**)
- Mobile Phone
- Data Cable
- Mobile device specific S/W: Binary files

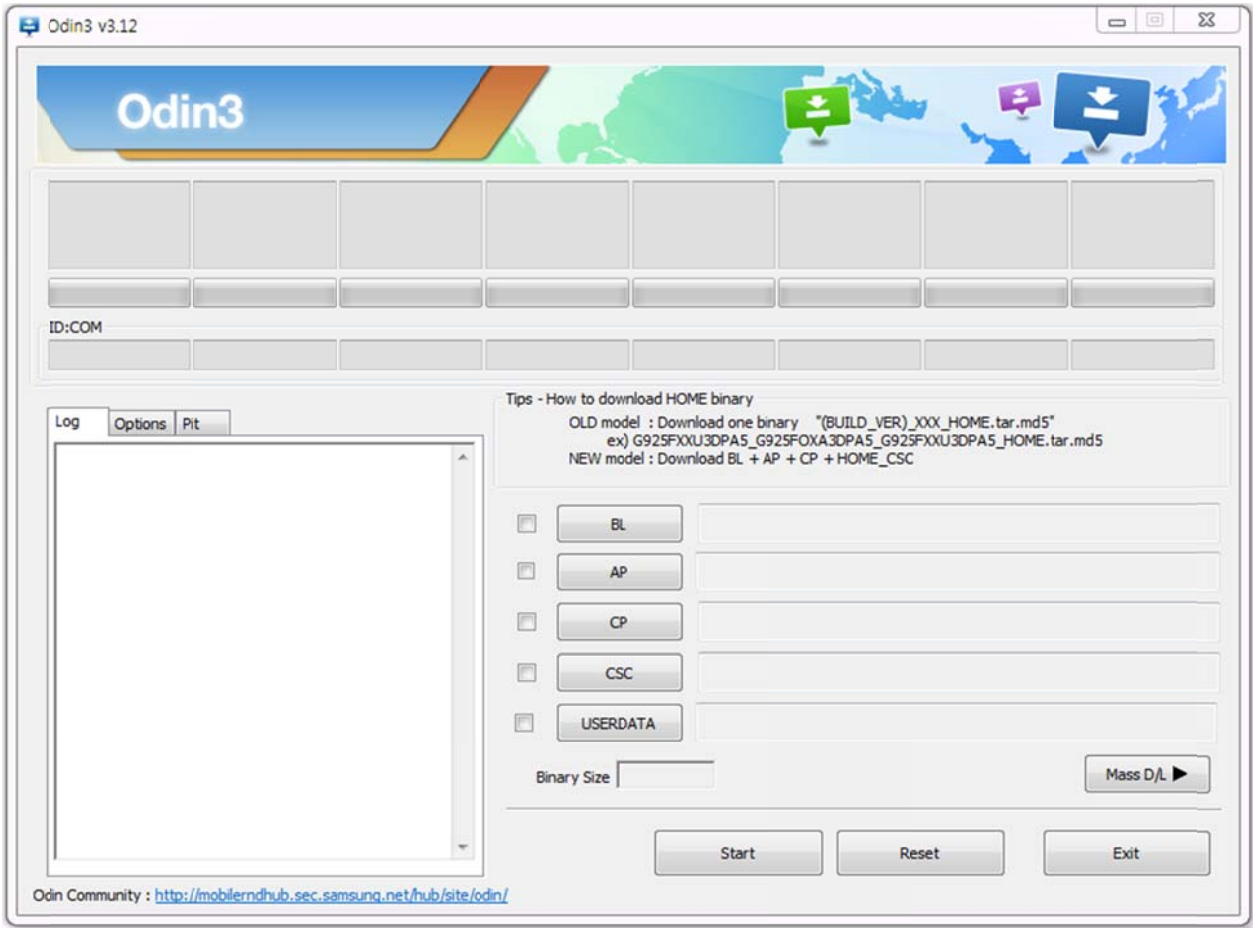
※ Settings



Data Cable : GH39-01949A

6-1-2. S/W Installation Program (Downloader program)

■ Open up the S/W Installation Program by executing the **"Odin3 v3.12.10.exe"**

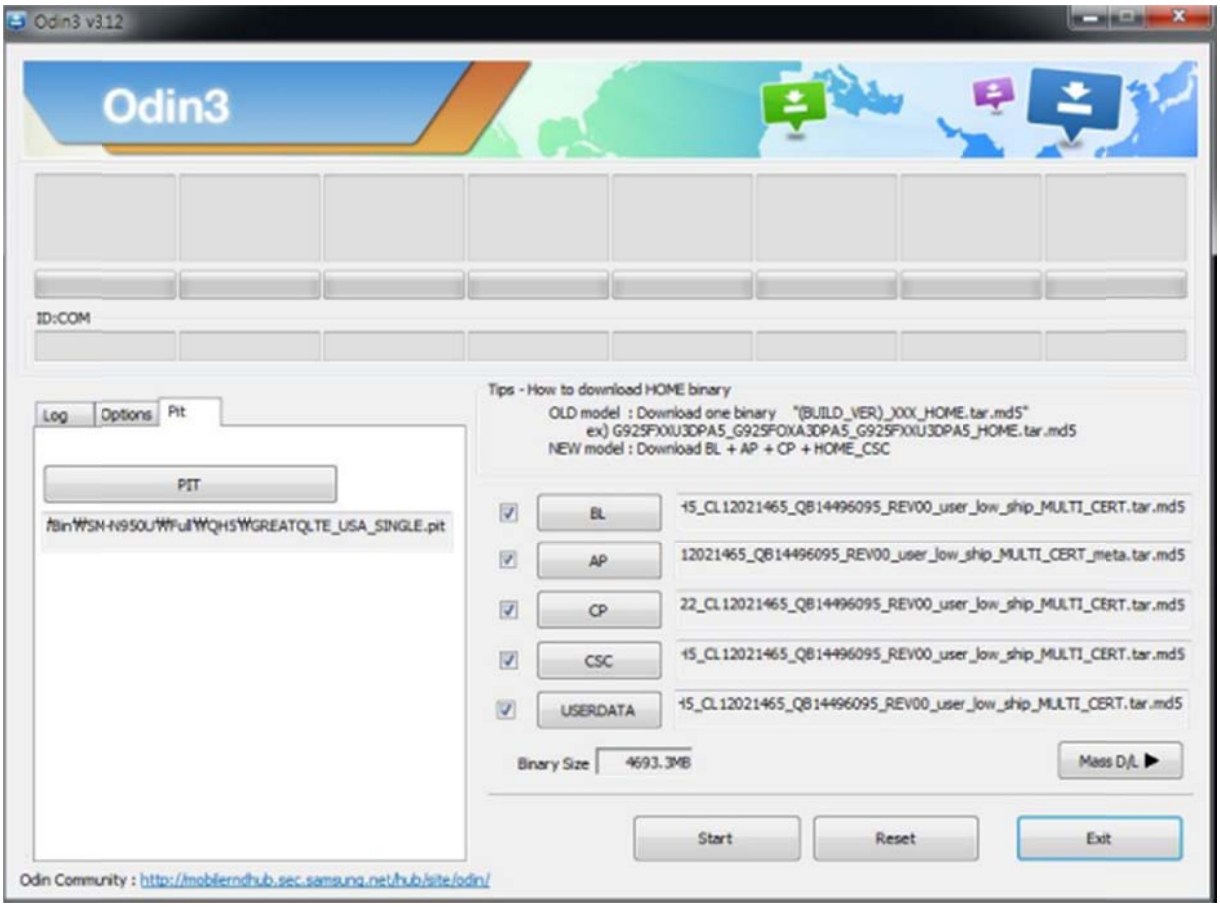


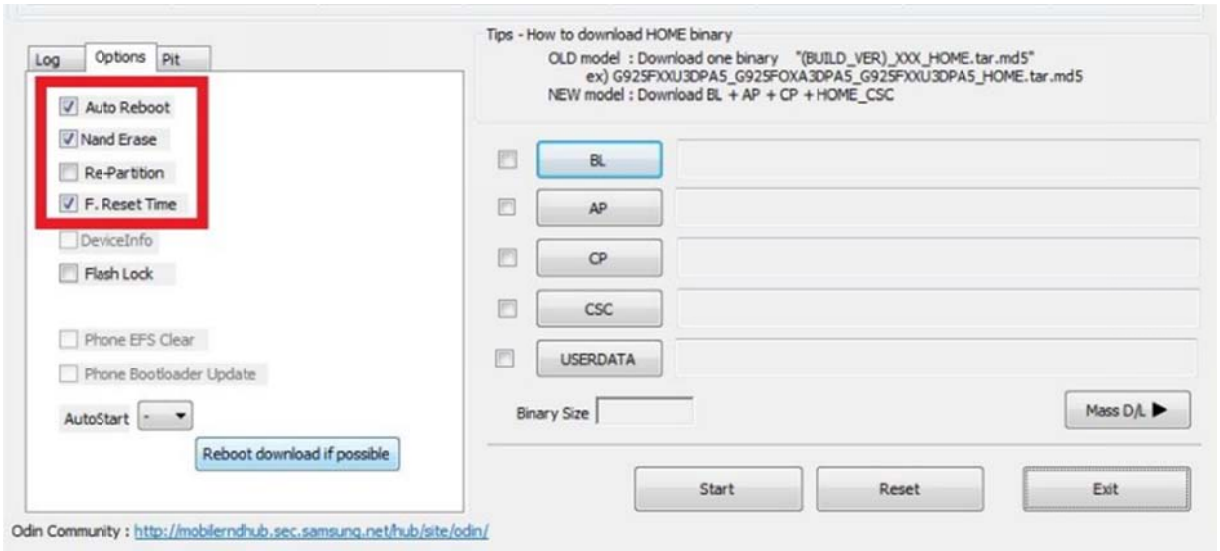
6. Level 1 Repair

1. Enable the check mark by click on the following options,

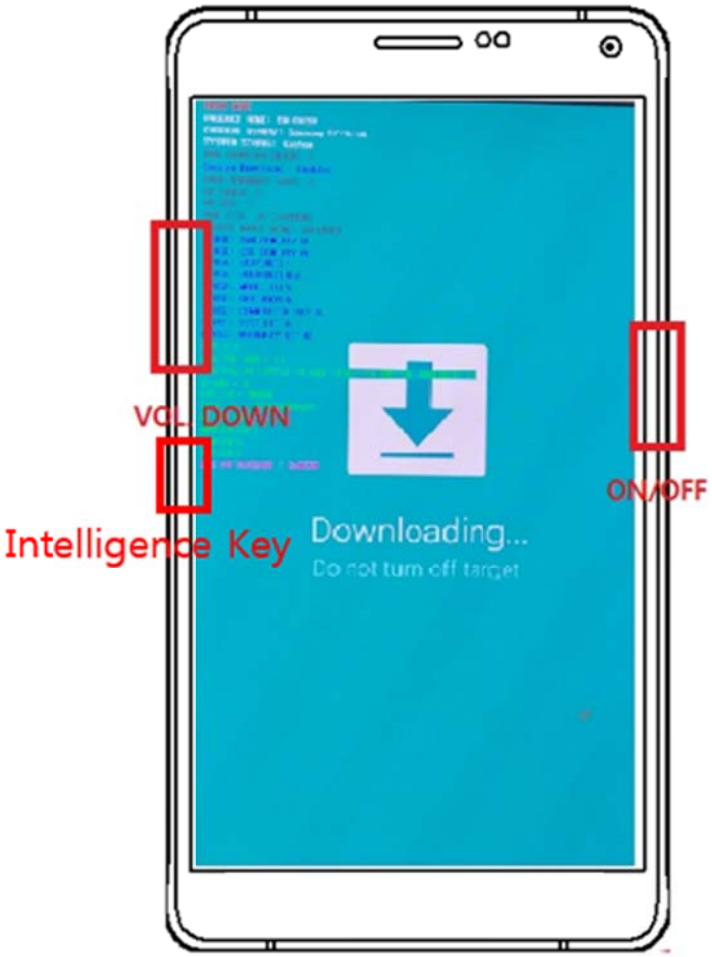
- Check Auto Reboot, F. Reset Time, Nand Erase
- Check PIT
- Check BOOTLOADER, PDA, PHONE, CSC and USERDATA Files

* Note : "Odin v3.12.10 or above" checks MD5 checksum just after file selection.

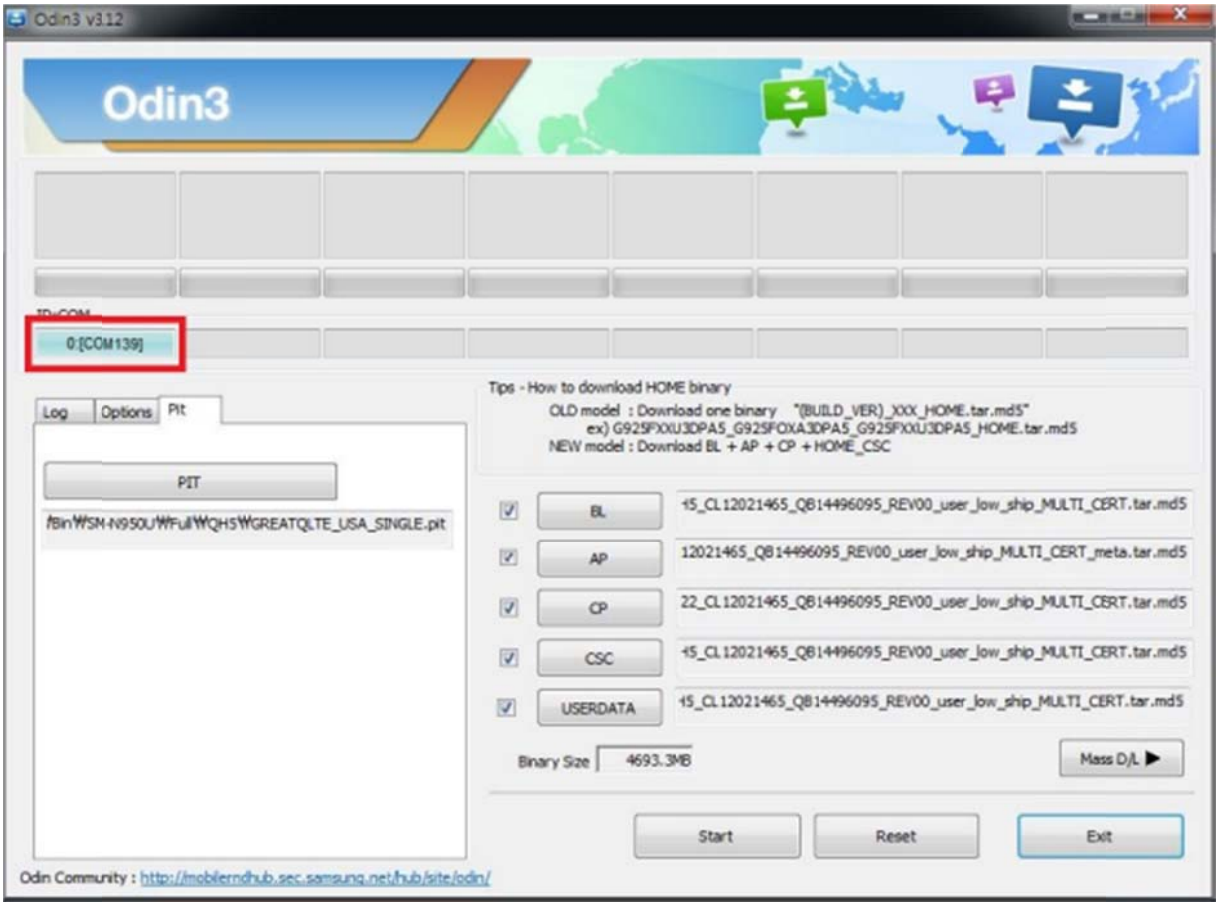




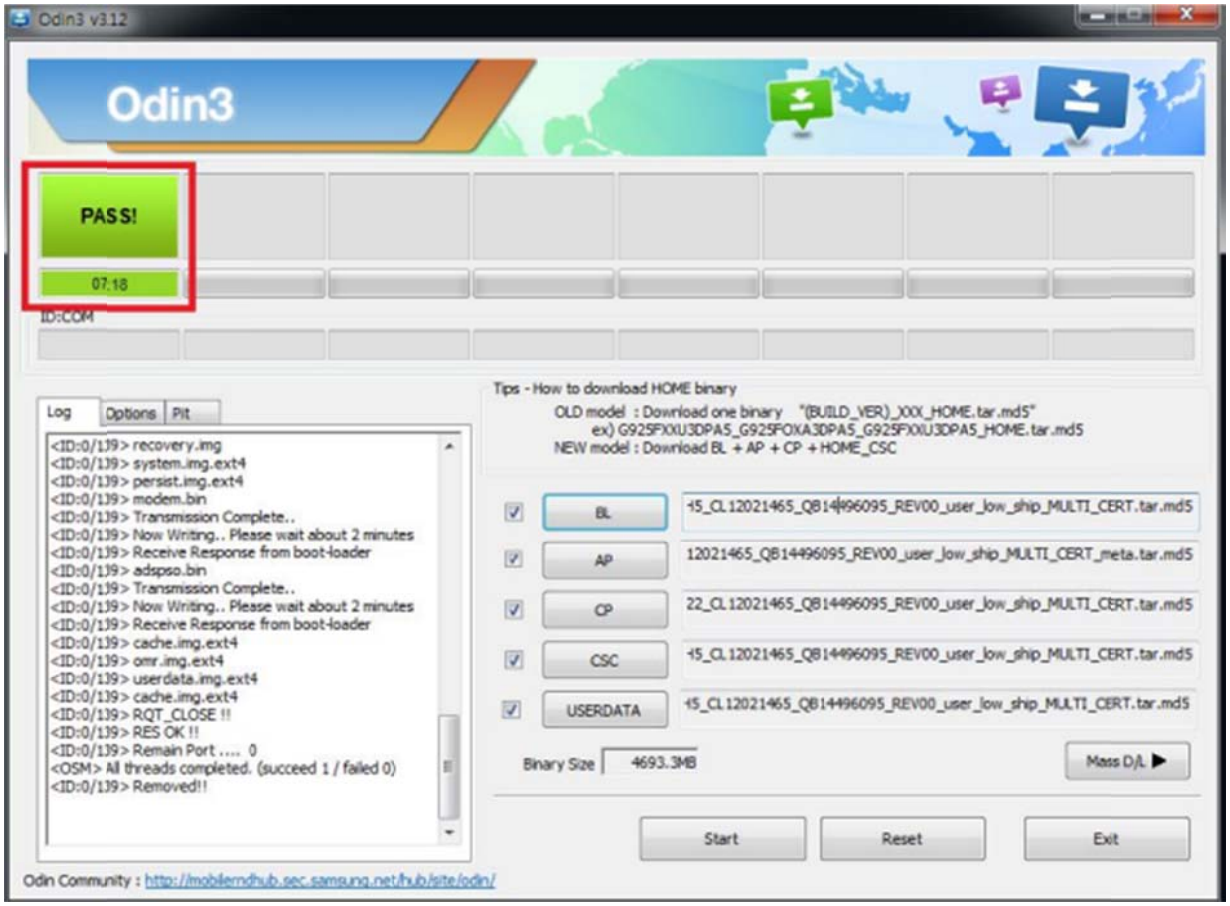
2. Enter into Download Mode
- Enter into Download Mode by pressing Volume Down button, Intelligence button and ON/OFF Button simultaneously followed by pressing Volume up button as a direction of the phone.



3. Connect the device to PC via Data Cable.
Make sure that the one of communication ports [ID:COM] box is highlighted in sky blue. The device is now connected with the PC and ready to download the binary files in it.



4. Start downloading the binary files into the device by clicking Start button on the screen. The green colored "PASS!" sign will appear on the upper-left box if the binary files have been successfully downloaded into the device.



5. Disconnect the device from the Data cable.

6. Once the device boots up, you can check the version of the binary file or name by pressing the following code in sequence; ***#1234#**

You can perform Factory data Reset by Settings → General Management → Reset

※ Caution. Never disconnect during the S/W downloading.

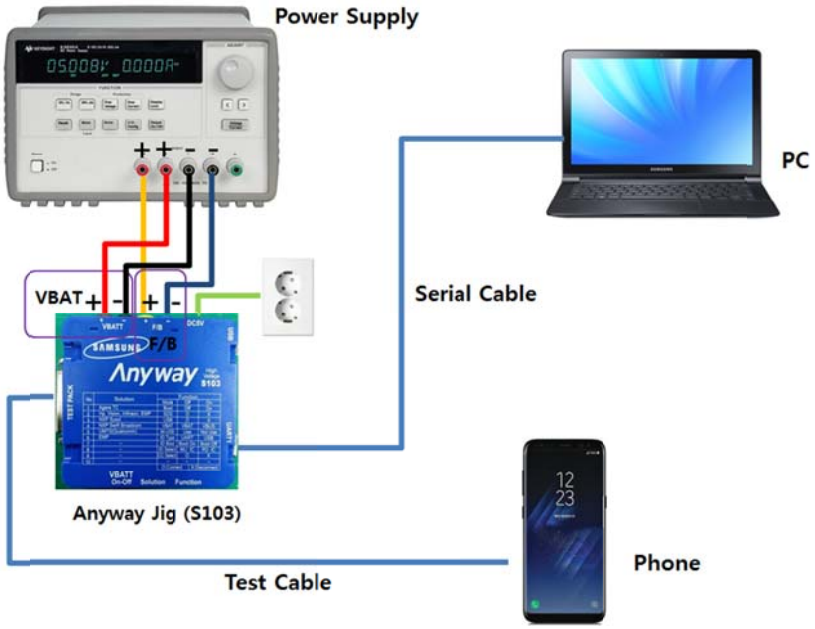
6. Level 1 Repair

6-2. IMEI writing

6-2-1. Preparation

- New IMEI writing Program has been released.
- Supported Model : Models which CAB files are uploaded on HHPsvc INI File category, instead of ini file.
- Refer to below IMEI writing procedure.

- H/W

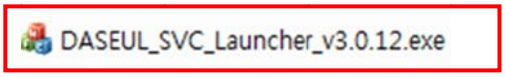


- S/W

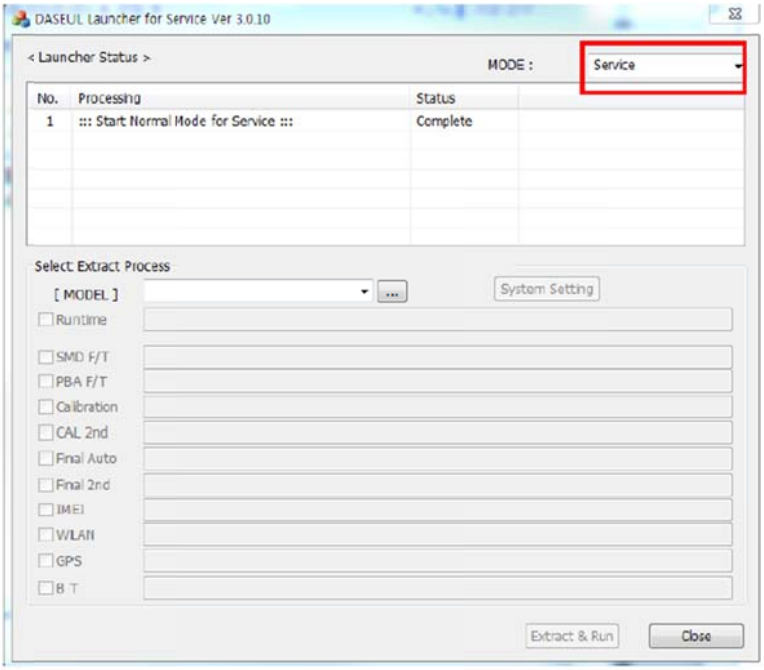
① Library Install	To use Daseul, library files should be installed. Refer to SVC Bulletin "(11-82) Daseul (New IMEI writing Program) Library Install guide_rev1.0"
②Launcher	**DASEUL_SVC_Launcher_v3.0.12** or higher -Uploaded on HHPsvc Notice
③ Runtime File	1. **DASEUL_IMEI_ALL_Runtime_3.1.316.0_r00464.CAB** or higher -Uploaded on HHPsvc Notice 2. Make 'ModelName' folder at the same position with launcher & Runtime file. DASEUL_IMEI_ALL_Runtime_3.1.316.0_r00464.CAB DASEUL_Launcher_v4.0.0.exe SM-N950U_VZW(SIM)_IMEI_Ver_3.1.315.5.CAB
④Model File	Copy Model File under the 'Model Name' folder

6-2-2. IMEI writing Process

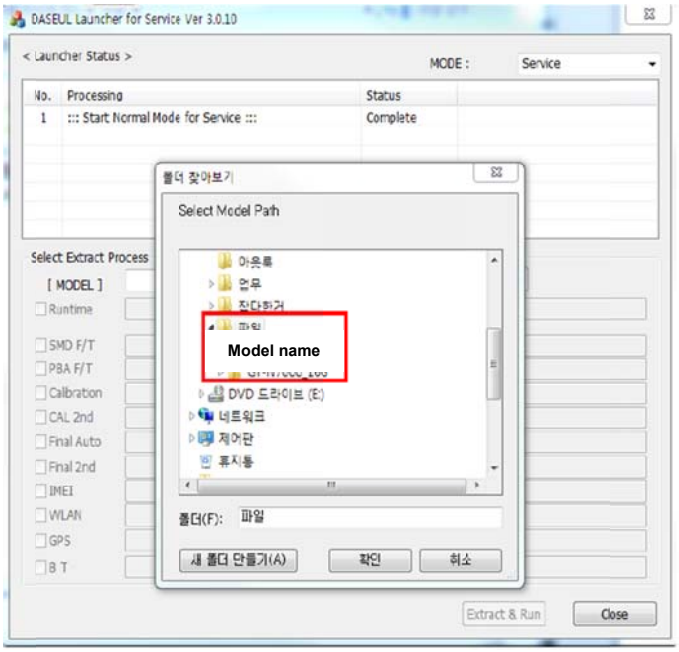
1. Run DASEUL_SVC_Launcher_v3.0.12.exe



2. Select Service Mode

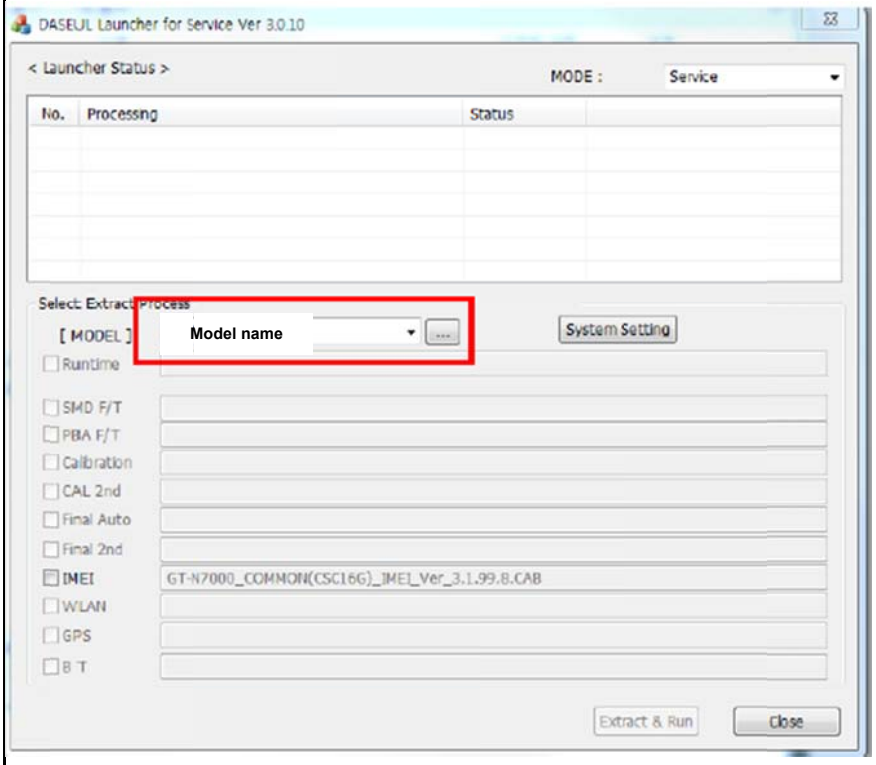


3. Click ... and Select folder where the Launcher exists



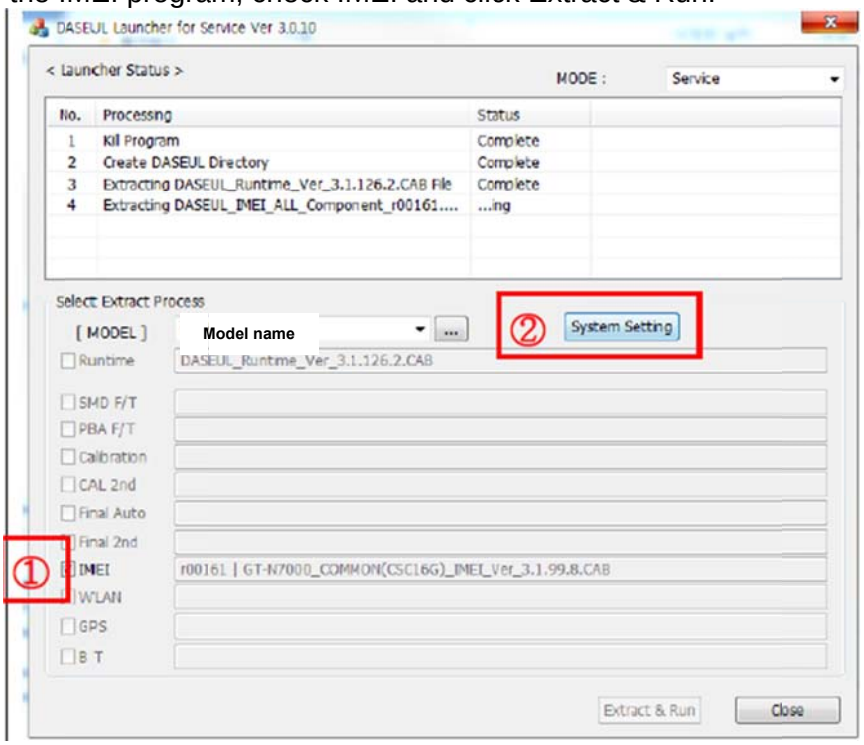
6. Level 1 Repair

4. Select Model



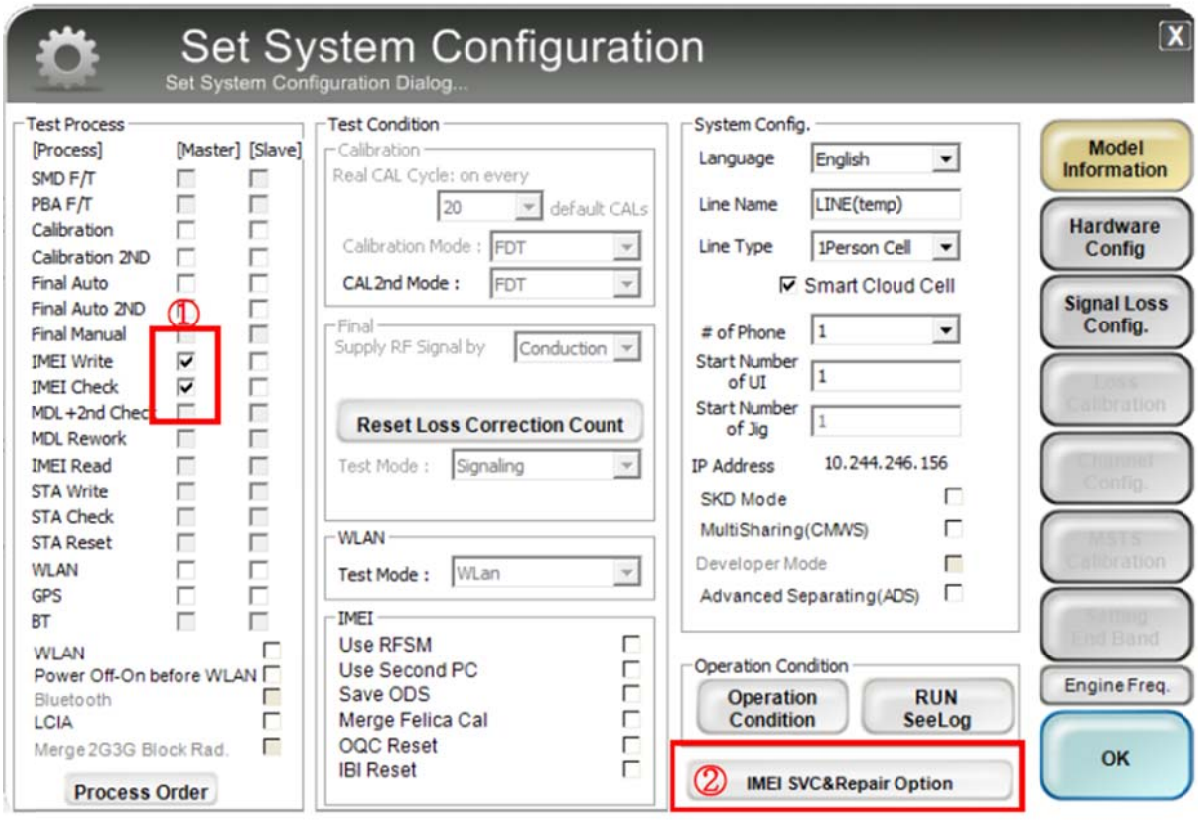
5. Check IMEI and click System Setting

※Once you setup the setting, you don t have to do it again, unless there is change.
From second run of the IMEI program, check IMEI and click Extract & Run.

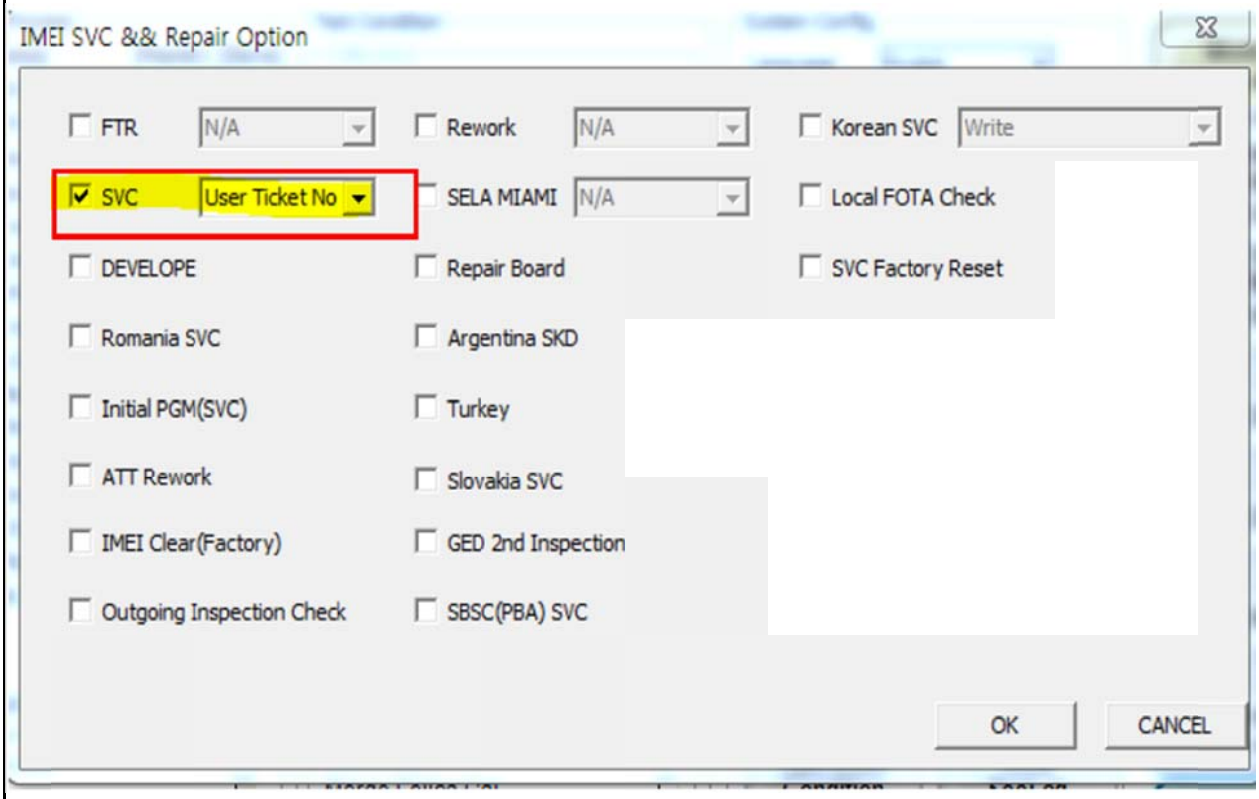


6. Level 1 Repair

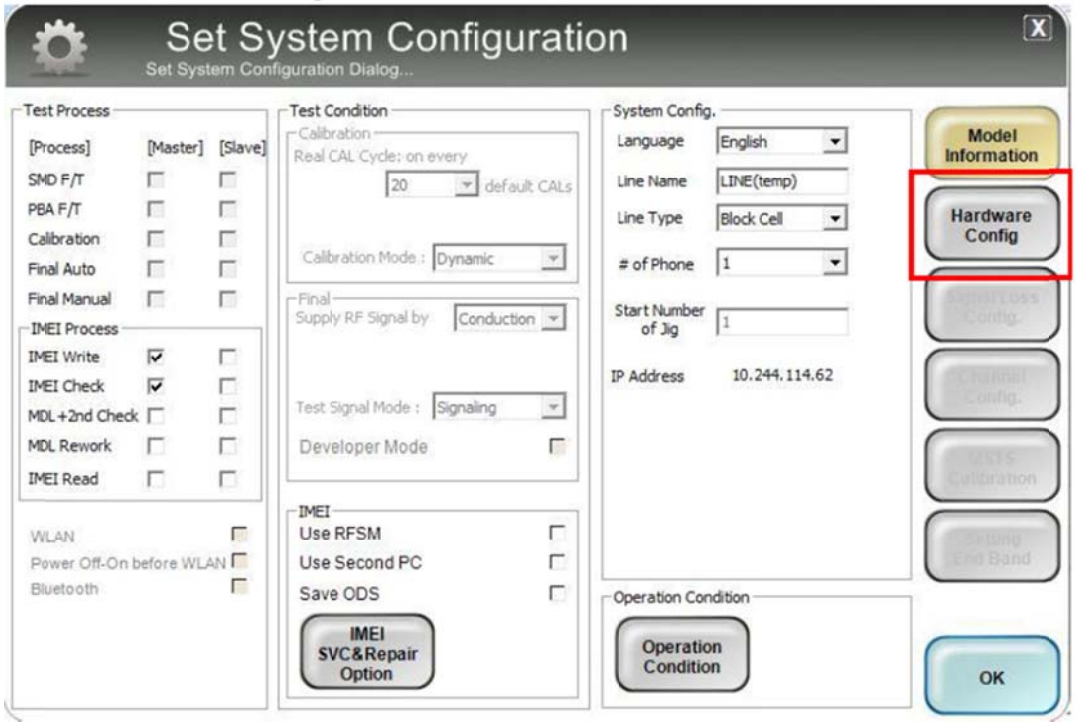
6. Check IMEI Write / IMEI Check and click IMEI SVC & Repair Option.



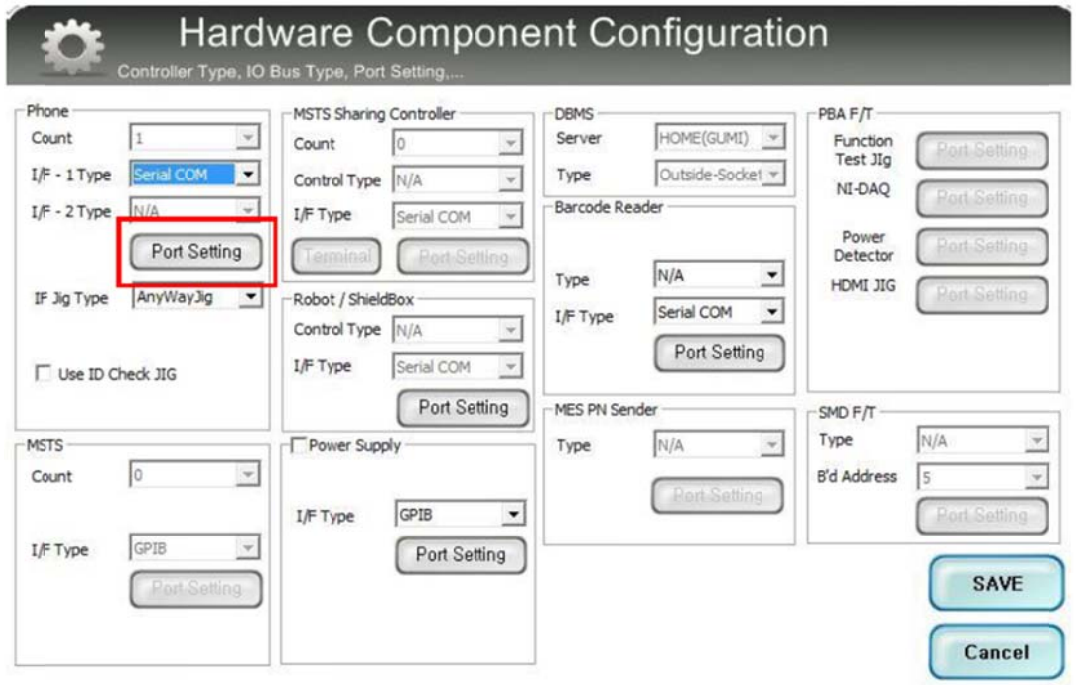
7. Check 'SVC , User Ticket No' and click OK



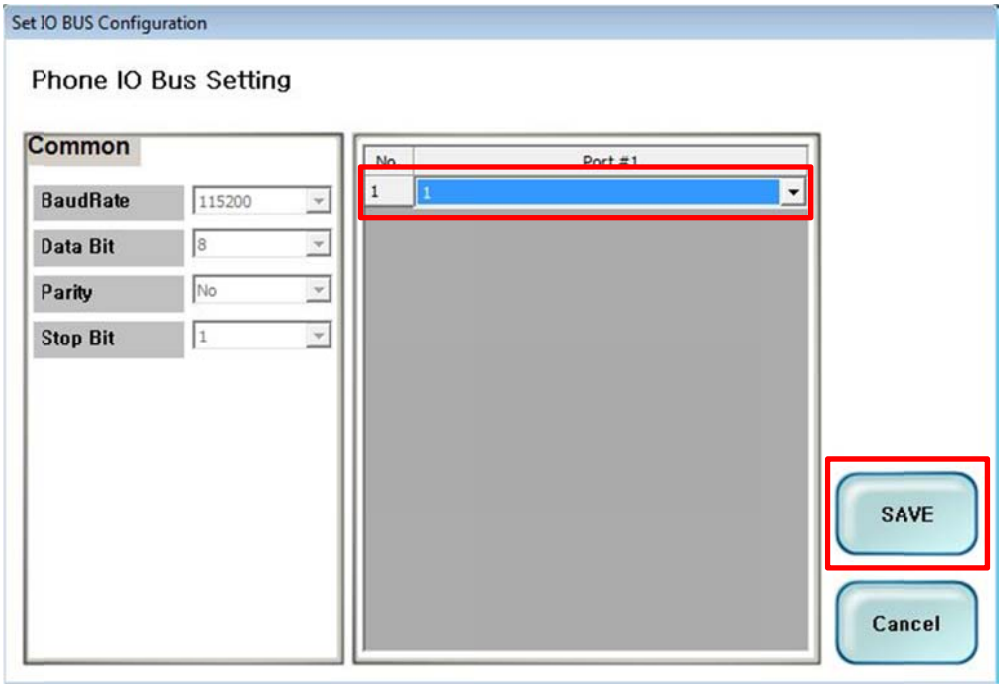
8. Click ‘Hardware Config’



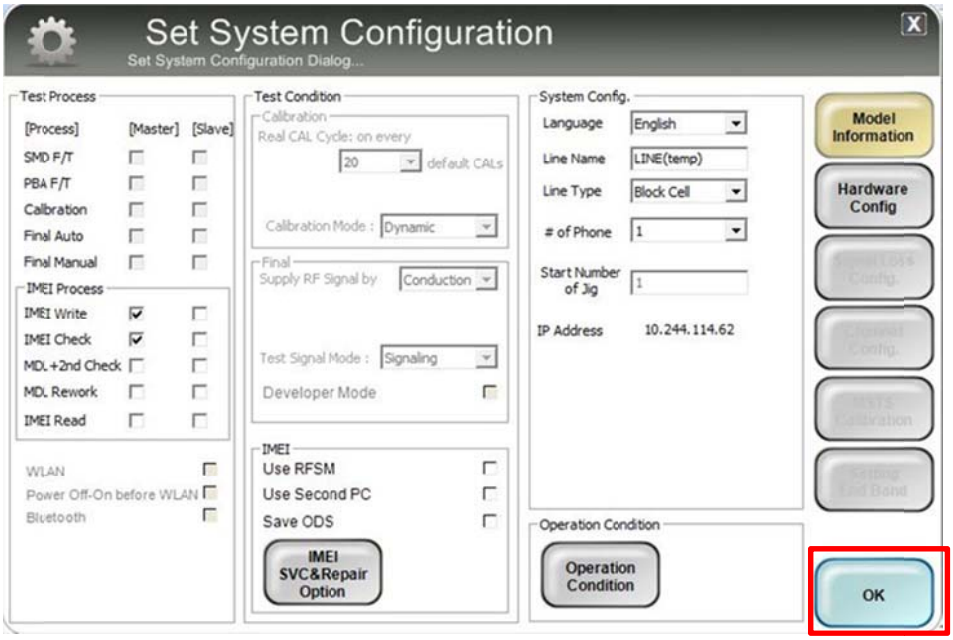
9. Click ‘Port Setting’



10. Select Port Number and SAVE

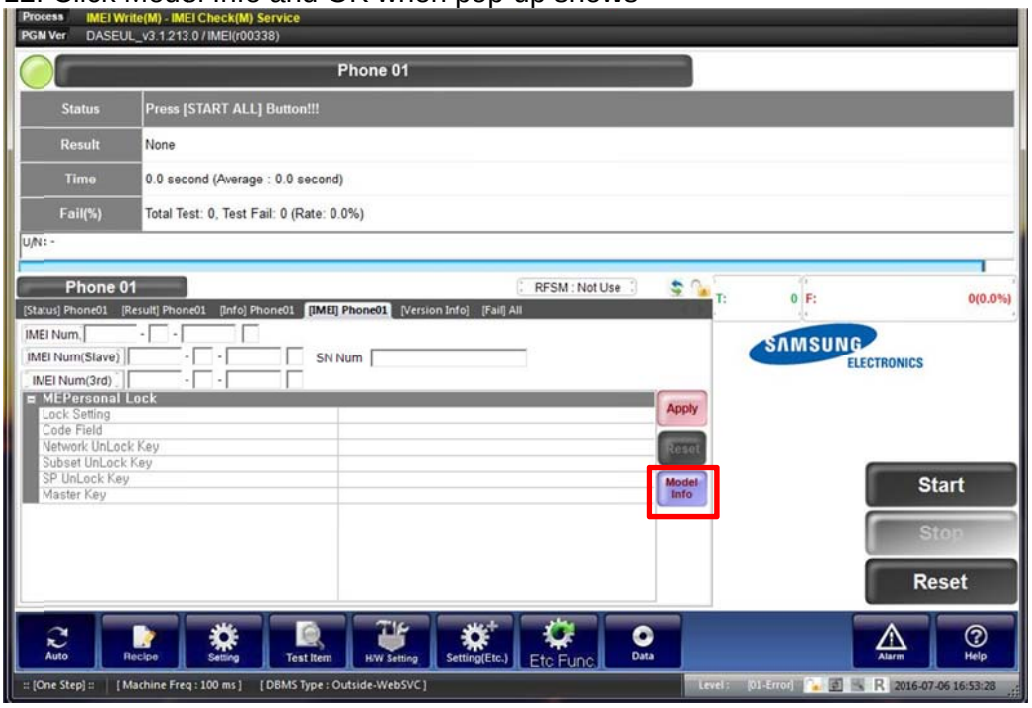


11.Click OK to proceed



6. Level 1 Repair

12. Click Model Info and OK when pop-up shows



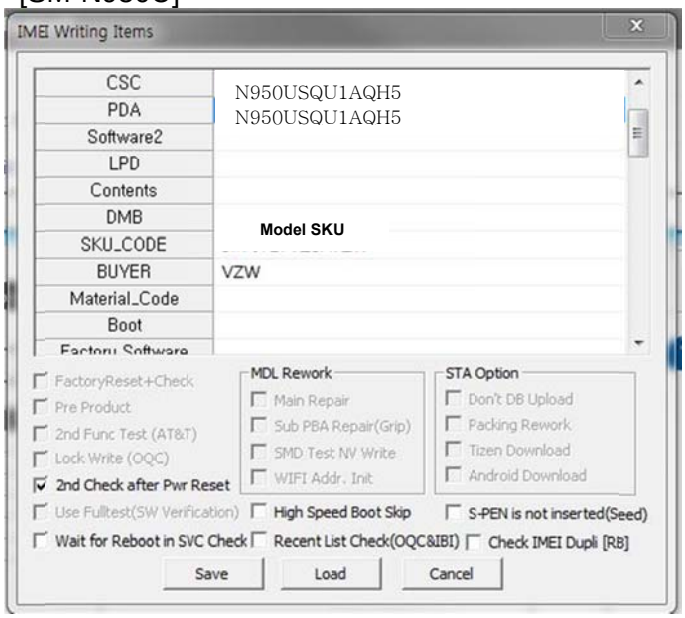
13. Click OK

6. Level 1 Repair

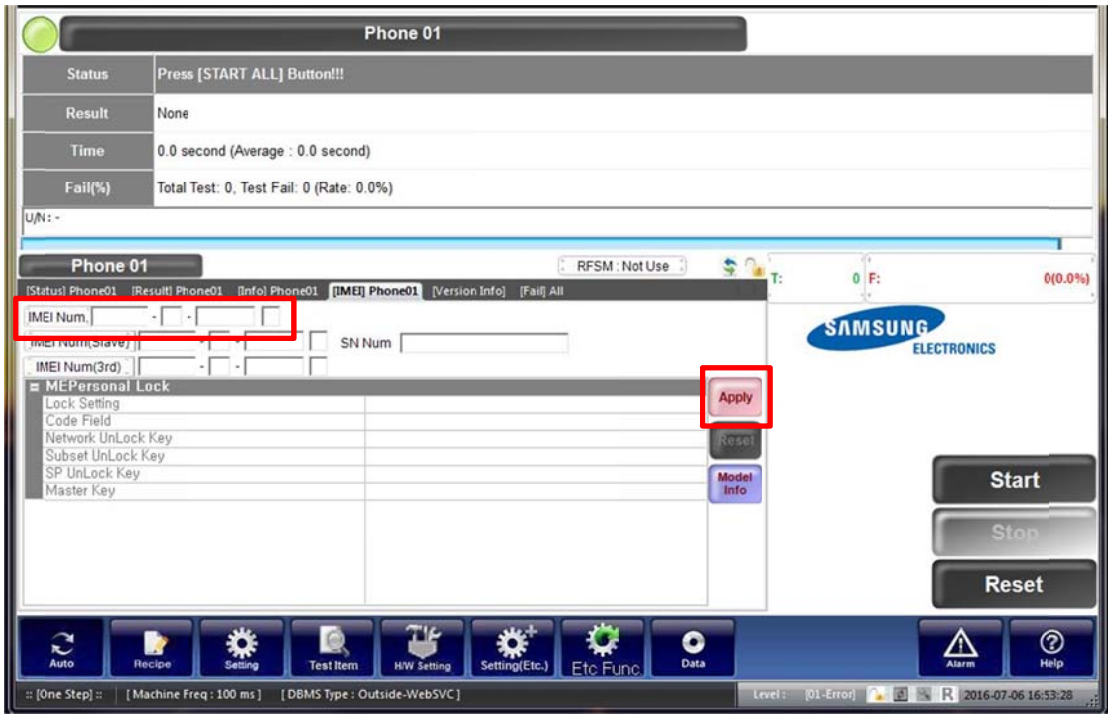
14. Input SKU_CODE and BUYER, then click Save button.

※ Refer to HHPsvc→IMEI Review to check SKU Code and buyer

[SM-N950U]

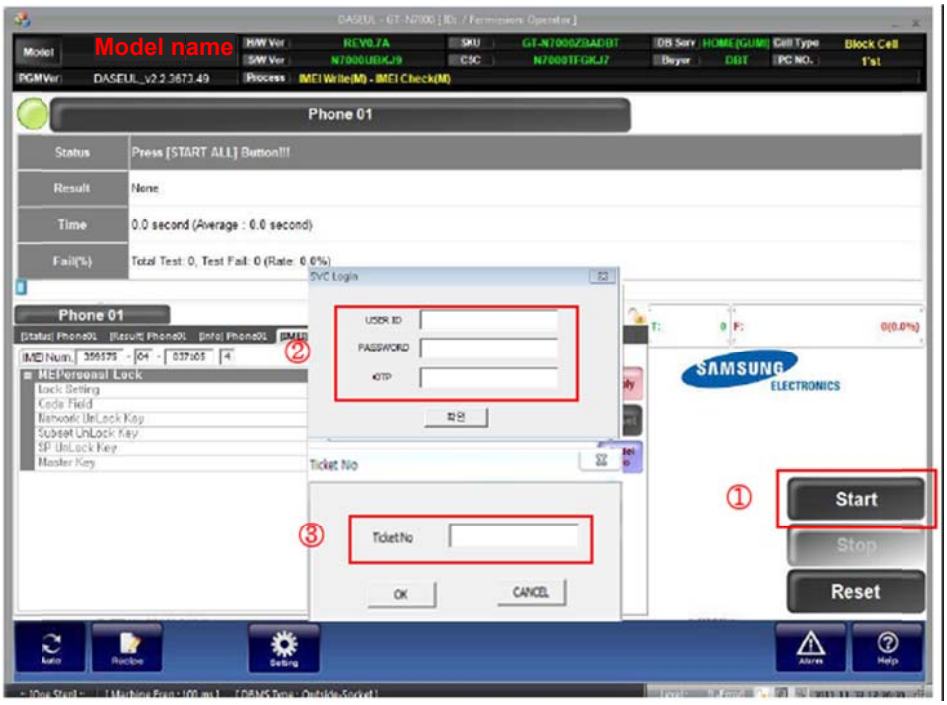


15. Input IMEI Number and click Apply



6. Level 1 Repair

16. ① Click Start → ②Input IMEI writing ID and Password & OTP → ③Input Ticket No



※ OTP(One time Password) : OTP is valid for 6 hours.

After that, you can get new OTP by click the "Forgotten your IMEI OTP PW or Crete new IMEI OTP PW" button.

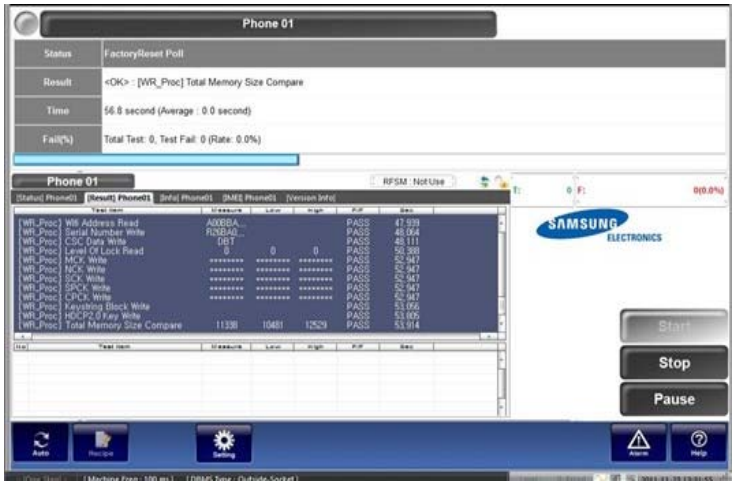
☞ OTP Location : GSPN → Knowledge → HHP svc → Home

6. Level 1 Repair

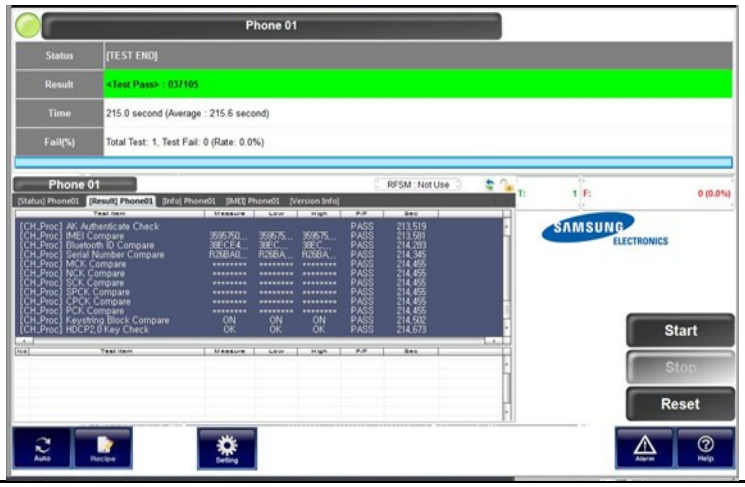
17. Connect the phone to Anyway JIG

※ When you connect the phone, the phone should be turned off.
After connecting the phone, the phone will be booted automatically.

18. IMEI Writing Proceeding



19. IMEI Writing Success



6. Level 1 Repair

6-3. RF Calibration

6-3-1. Required items in order to calibrate RF

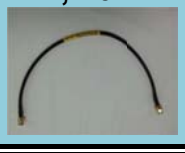
• Installation program: RF Calibration Program

- DASEUL_Launcher_v4.0.0.exe
- DASEUL_CAL_ALL_Runtime_3.1.316.0_r00537.CAB
- Model File (SM-N950U_OPEN_CALIBRATION_Ver_3.1.315.4.CAB)

※ It is required to use the latest program.

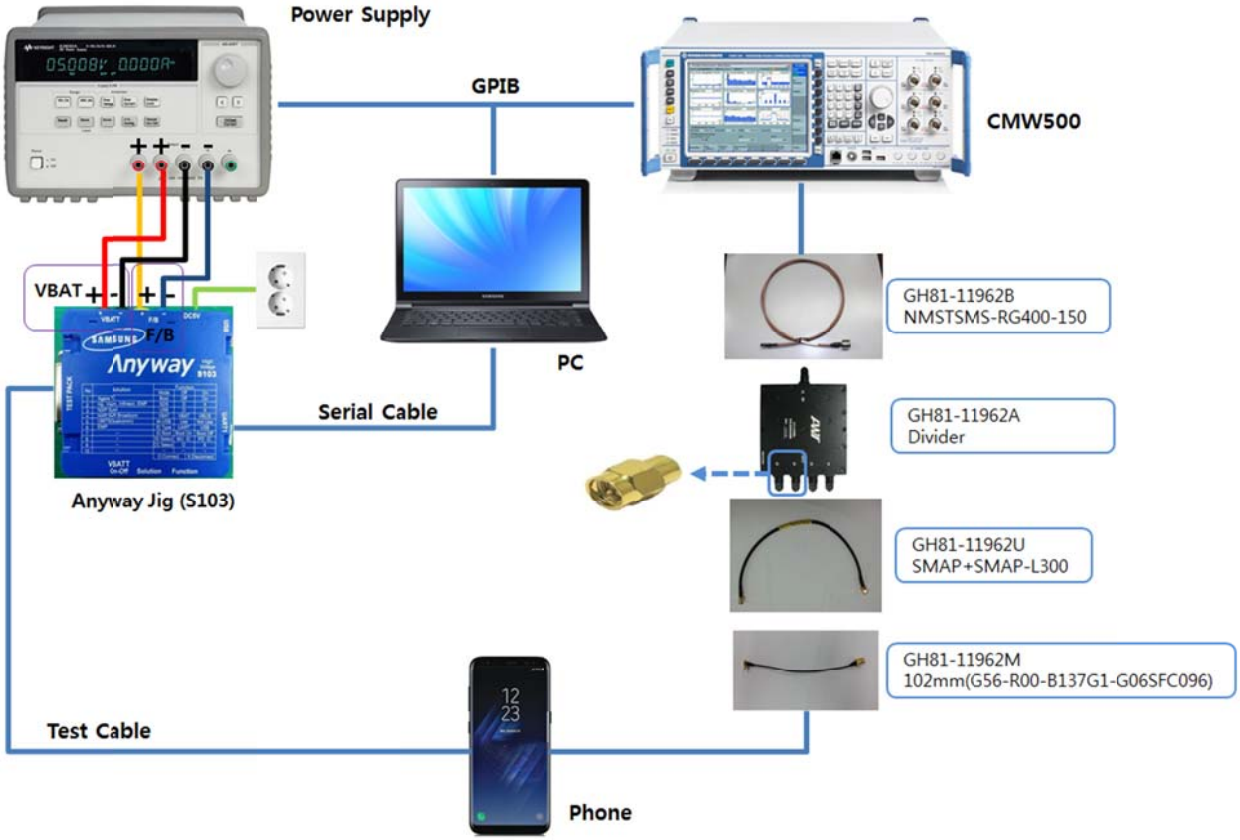
- Mobile Phone
- R&S CMW500
- E3632A Power Supply
- GPIB Cable (2ea)
- JIG BOX(S103)
- Adapter
- UART Serial Cable
- IF Cable (GH81-11962W)

❖ **Table of test cables**

<table>
<tr><td rowspan="2">RF Cable
(Manual)</td><td>GH81-11962M
(2ea)</td><td>GH81-11962U
(2ea)</td><td></td></tr>
<tr><td>1.2T, 102mm
  </td><td>1.2T, 102mm
  </td><td></td></tr>
<tr><td rowspan="2">4 Port Divider</td><td>GH81-11962A</td><td>GH81-11962B</td><td>GH81-11962E</td></tr>
<tr><td>Divider
  </td><td>Divider Cable
  </td><td>50Ω terminator
  </td></tr>
</table>

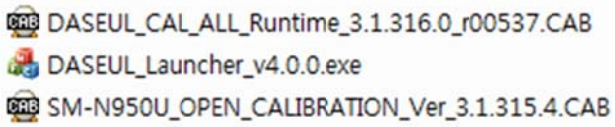
6. Level 1 Repair

❖ Setting

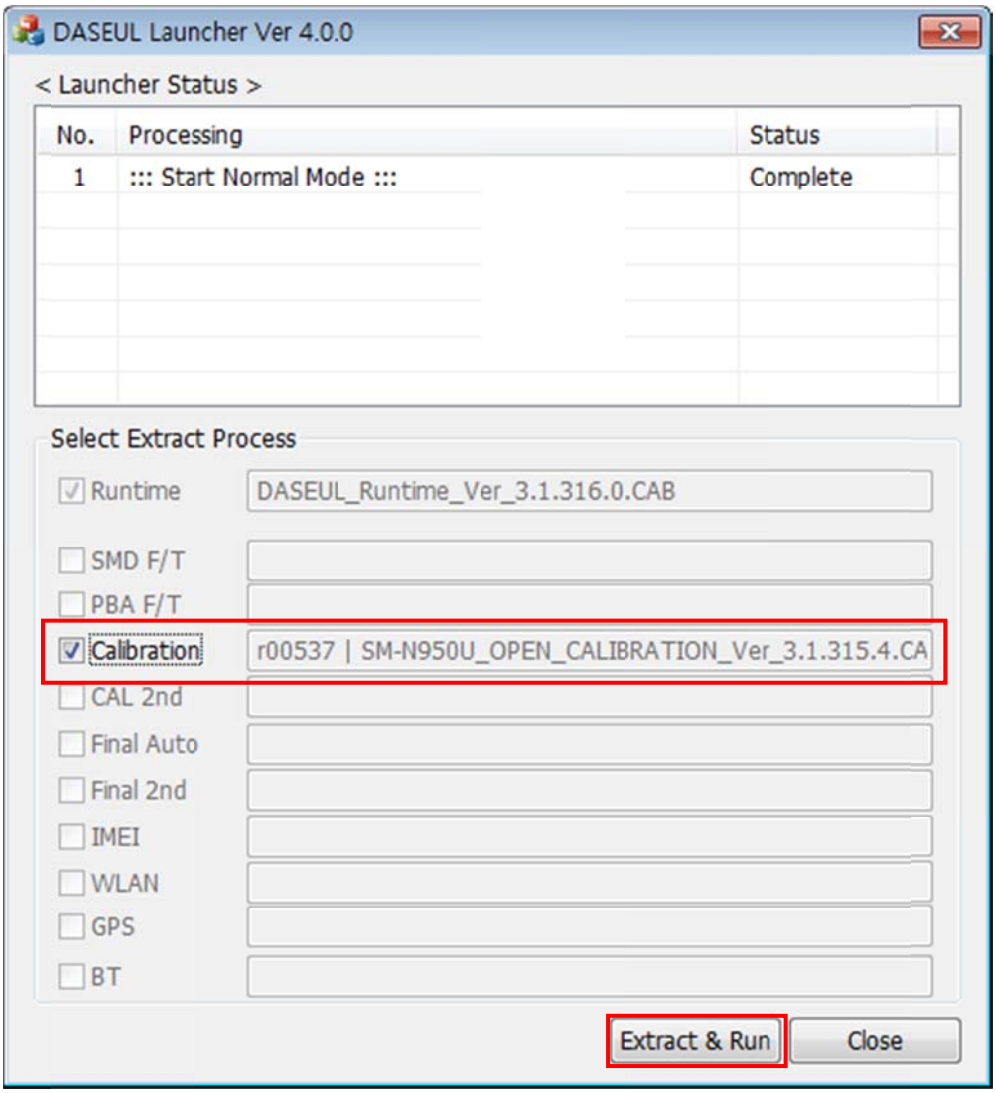


6-3-2. RF Calibration Program

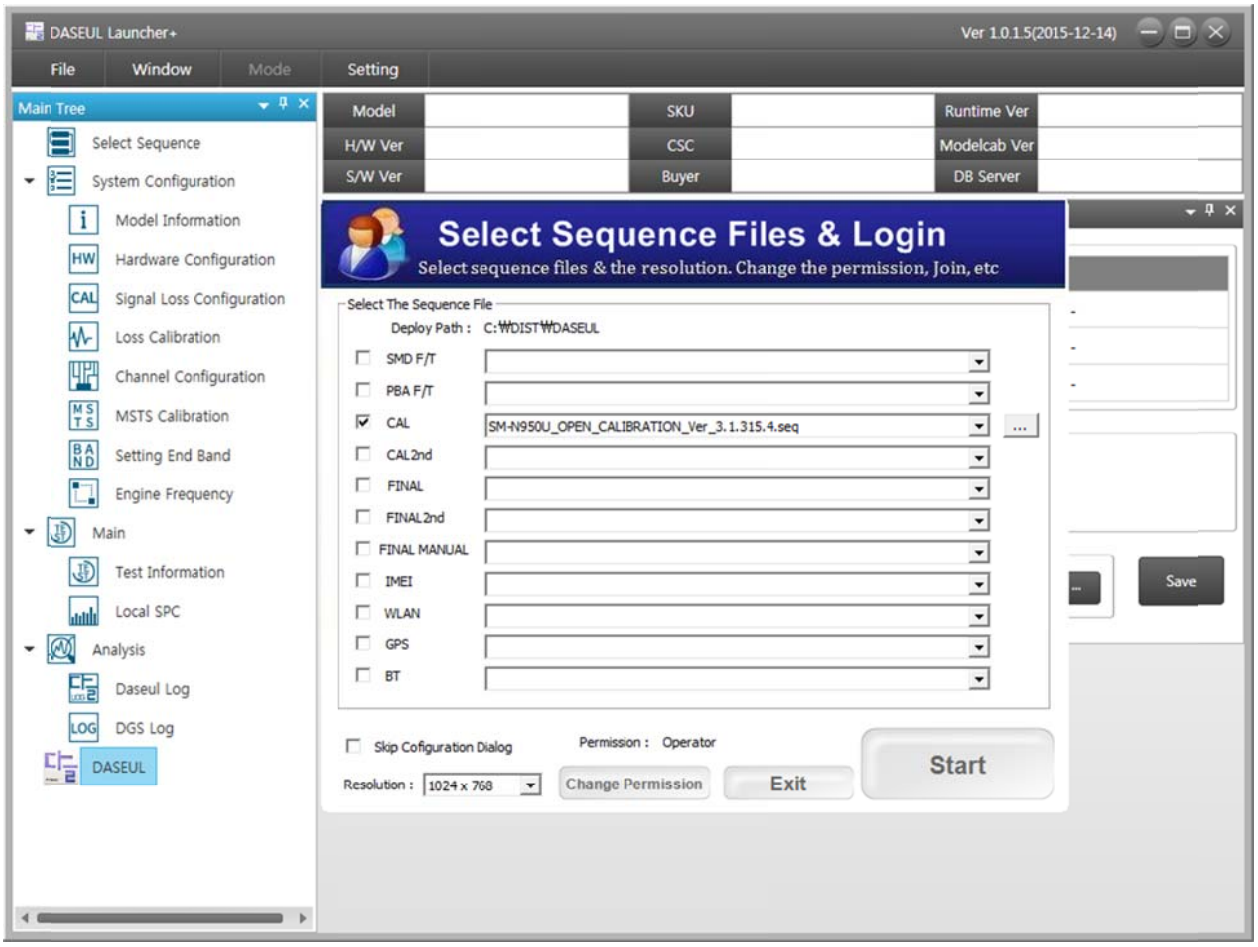
1. Run the RF Calibration Program Launcher, 'DASEUL_Launcher_vx.x.xx.exe'.



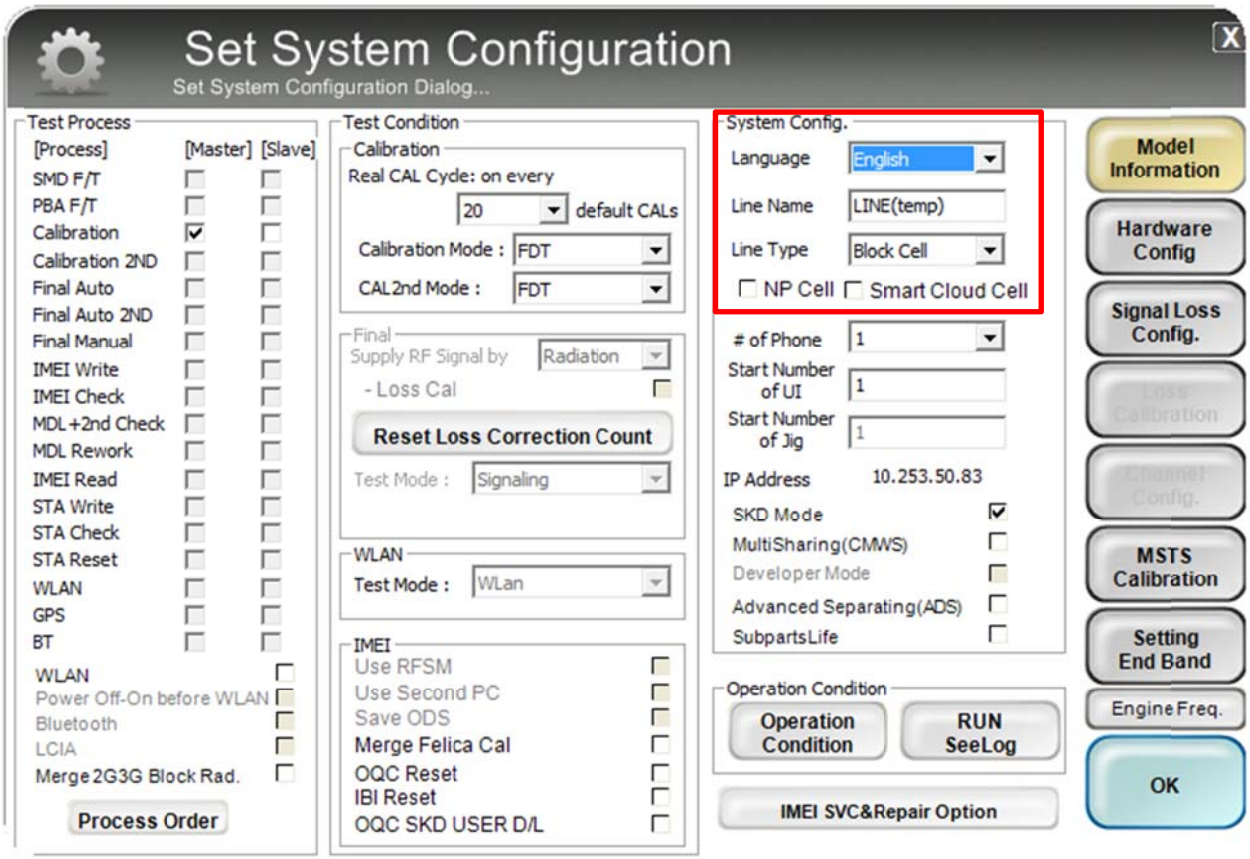
2. Check the 'Calibration' menu, and select 'Extract & Run'.



3. Check the 'CAL' and open the model file, then select 'Start' button.

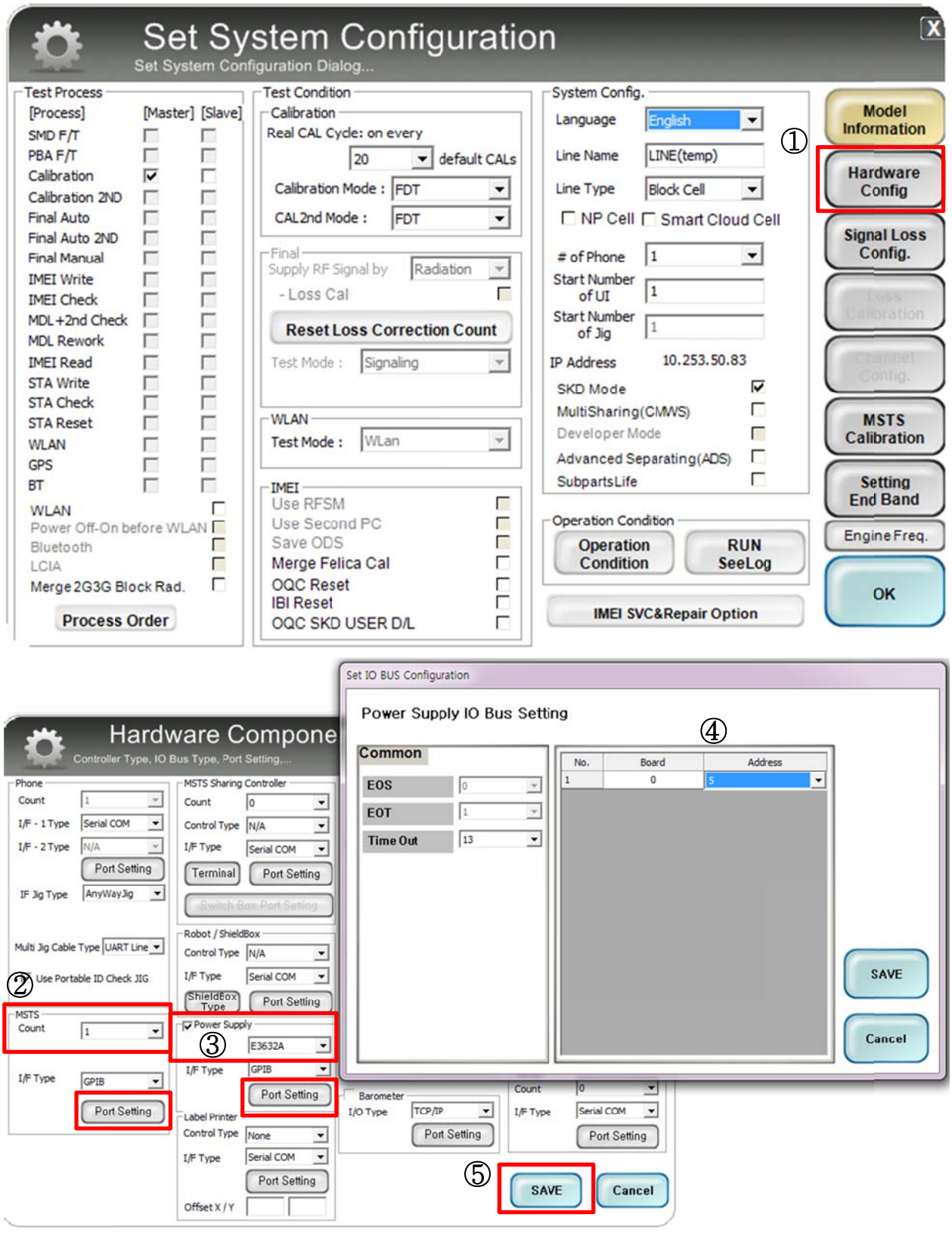


4. Change the Line Type to 'Block Cell' and disable 'Smart Cloud Cell'.



6. Level 1 Repair

5. Set the GPIB address of MSTS(CMW500) and Power Supply(E3632A) to enter 'Hardware Config' and 'Save'. (Check the GPIB address of equipments in advance)



6. Level 1 Repair

6. Press 'OK' to start RF Calibration after completing all settings.