FCC ID: XCRLBPFK-140US –
Pocket Finder Tune Up / Calibration. 850/ 1900

General Remarks To Testing at PCB Level:

The PocketFinder SW has special section in the Device FLASH where all the calibration values are stored, this is in the part referred to as the "Radio Table in EEPROM". Roughly about 1000 different constants related to setting HW and RF values are in the Radio Table. SMSD has preformed testing on many samples of PocketFinder and found the best values for the current HW. This means that, after downloading the SW into the devices FLASH during the manufacturing process, it is well enough in calibration so that it can camp on to a GSM network and make a call. During the production process we fine tune the following values:

- ADC value to read battery level
- ADC value to read Temperature
- AFC value to compensate differences between crystals used on particular PCBs
- Rx level/ Automatic Gain Control,
- Tx level on all PCLs, all bands
- Ramping of RF Power Amplifier

The final step of a Calibrated Device is to write the IMEI if all test passed.
A Device with a Valid IMEI has Been Calibrated.

All calibration data is stored in files. We have in SMSD all log files from all produced devices, normally this is used for tracking quality of calibration.

The Calibration Test Program is written in Lab View and Communicates with the Device over an RS232 connection.
The Test Program is delivered to Jabil in Executable form (.exe)

The Configuration Files for the Test Program are Text Files and have the Following Naming Convention:
XXX_TestStart.000

Where XXX is the Product Name.
Test Start is the Test Module.
000 is the Version of the Configuration File.

Once Mass Production Starts (Ramp Up) then any changes to the Configuration Files will mean that the Version Number should be increased by 1. The Test Program automatically Loads the configuration File with the highest version number. In this way any changes to the Testing Limits or Constants are recorded.

Regarding the Calibration of Tx Power Levels:

The RF Connection for conducted Calibration of the Device is by way of a High Quality RF Nail providing a 50-Ohm connection to the Device Under Test
(DUT).

The Cable Loss Between the DUT and Rhode & Schwarz CMU 200 will be Accurately Measured and can be entered into one of the Configuration Files of the Test Program.

Calibration Method for RF Power:

There are a set of DAQ values (15 or 16) for controlling GSM Tx Power Levels, these values can be written to the DUT Ram for the purpose of Power Level Calibration, on completion of calibration these values are copied to the DUT EEPROM as part of the DUT Radio Table.

During the Ramp up Period of Pocket Finder Production :

GSM850:

A set of 15 DAC Values are written to the DUT RAM,
The highest value should produce a Transmitted Power Above 32.1dBm,
The lowest value a Transmitted Power Below 5 dBm, with the other values evenly spaced between the Highest and Lowest.
All Power Levels are Measured.
A Polynomial Fitting algorithm is use to calculate the DAC values for the Desired Power Levels, This is written to the DUT Ram.
All Power Levels are measured again and checked to be in Tolerance against the Configuration File. At the end of the Test Program DUT Ram is copied to DUT EEPROM.

Calibrated Values are compared against the Limits File.
[TxCal_Lim]
8_DAQ5=2;650;990;LSB:
8_DAQ6=2;540;900;LSB:
8_DAQ7=2;480;850;LSB:
8_DAQ8=2;420;800;LSB:
8_DAQ9=2;360;700;LSB:
8_DAQ10=2;310;650;LSB:
8_DAQ11=2;280;600;LSB:
8_DAQ12=2;250;550;LSB:
8_DAQ13=2;230;500;LSB:
8_DAQ14=2;210;450;LSB:
8_DAQ15=2;190;400;LSB:
8_DAQ16=2;180;350;LSB:
8_DAQ17=2;170;300;LSB:
8_DAQ18=2;160;250;LSB:
8_DAQ19=2;150;240;LSB:
8_PCL5=2; Low Limit = 32; High Limit = 32.4;dBm(2):
8_PCL6=2;29.8;30.2;dBm(2):
8_PCL7=2;28.3;28.7;dBm(2):
8_PCL8=2;26.8;27.2;dBm(2):
8_PCL9=2;24.8;25.2;dBm(2):
8_PCL10=2;22.8;23.2;dBm(2):
8_PCL11=2;20.8;21.2;dBm(2):
8_PCL12=2;18.8;19.2;dBm(2):

8_PCL13=2;16.8;17.2;dBm(2):
8_PCL14=2;14.8;15.2;dBm(2):
8_PCL15=2;12.8;13.2;dBm(2):
8_PCL16=2;10.8;11.2;dBm(2):
8_PCL17=2;8.7;9.3;dBm(2):
8_PCL18=2;6.5;7.7;dBm(2):
8_PCL19=2;4.3;5.7;dBm(2):

PCS:

A set of 16 DAC Values are written to the DUT RAM,
The highest value should produce a Transmitted Power Above 29.1dBm,
The lowest value a Transmitted Power Below 0 dBm, with the other values evenly spaced between the Highest and Lowest.
All Power Levels are Measured.
A Polynomial Fitting algorithm is use to calculate the DAC values for the Desired Power Levels, This is written to the DUT Ram.
All Power Levels are measured again and checked to be in Tolerance against the Configuration File. At the end of the Test Program DUT Ram is copied to DUT EEPROM.

Calibrated Values are compared against the Limits File.
[TxCal_Lim]
P_DAQ0=2;550;980;LSB:
P_DAQ1=2;480;970;LSB:
P_DAQ2=2;410;900;LSB:
P_DAQ3=2;360;800;LSB:
P_DAQ4=2;310;700;LSB:
P_DAQ5=2;290;600;LSB:
P_DAQ6=2;260;500;LSB:
P_DAQ7=2;240;450;LSB:
P_DAQ8=2;210;400;LSB:
P_DAQ9=2;200;350;LSB:
P_DAQ10=2;180;300;LSB:
P_DAQ11=2;170;300;LSB:
P_DAQ12=2;165;300;LSB:
P_DAQ13=2;160;300;LSB:
P_DAQ14=2;155;250;LSB:
P_DAQ15=2;150;250;LSB:
P_PCL0=2; Low Limit = 29; High Limit = 29.4;dBm(2):
P_PCL1=2;27.3;27.7;dBm(2):
P_PCL2=2;25.3;25.7;dBm(2):
P_PCL3=2;23.8;24.2;dBm(2):
P_PCL4=2;21.8;22.2;dBm(2):
P_PCL5=2;19.8;20.2;dBm(2):
P_PCL6=2;17.8;18.2;dBm(2):
P_PCL7=2;15.8;16.2;dBm(2):
P_PCL8=2;13.8;14.2;dBm(2):
P_PCL9=2;11.8;12.2;dBm(2):
P_PCL10=2;9.8;10.2;dBm(2):

P_PCL11=2;7.7;8.3;dBm(2):
P_PCL12=2;5.7;6.3;dBm(2):
P_PCL13=2;3.5;4.5;dBm(2):
P_PCL14=2;1.3;2.7;dBm(2):
P_PCL15=2;-0.7;0.7;dBm(2):

GSM850 & PCS:

Test Results Files for each device tested have Unique numbers and contain the IMEI of the device tested, this provides Tractability.

During Ramp up a number of Results Files (say 200) will be analysed regarding the form of the Response of the Power Amplifier. Max, Min and Average Values will be calculated for Each Power Control Level.

After the Ramp up Period of Pocket Finder Production :

Using Data From the Ramp up it may be possible to have a reduced calibration routine for Tx Power Levels.
This Reduced Method would be a **minimum** of the following:

A set of 15 (GSM850) or 16 (PCS) DAC Values are written to the DUT RAM,
The highest value should produce a Transmitted Power Above [(GSM850, 32.1dBm) (PCS, 29.1dBm)],
The lowest value a Transmitted Power Below [(GSM850, 5 dBm) (PCS, 0dBm)].
Highest and Lowest Power Levels are measured.
A Linear Fitting Algorithm is used to calculate the DAQ values for Highest and Lowest Power Levels, the other DAQ values are calculated using fixed Coefficients of the Highest and Lowest Power Levels.
These Values are Programmed into DUT Ram.

Highest, Mid and Lowest Power Levels are measured and checked to be in Tolerance against the Configuration File. At the end of the Test Program DUT Ram is copied to DUT EEPROM.