# Solihull Functional Test Specification

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| 0.1 | M. Tinkler | 28/6/2002 | First Draft |
| 0.2 | M. Tinkler | 2/7/2002 | Corrections based on input from Christophe Lancelot. PSU use MIN current range for CURR_OFF, CURR_DEEP_SLEEP. BER levels changed to –103dBm based on input from Antoine Assaf. |
| 0.3 | M. Tinkler | 12/7/2002 | Modification to the charge calibration for the Li-Ion battery. |
| 1.0 | M. Tinkler | 28/8/2002 | Modified AUXOP_CONNECTOR test. (Specified EXTERNAL MICROPHONE). Deleted ADIN442 limit, VBATT42 limit, ADIN432 limit, VBATT32 limit. Added GTPR19_190, GSM_TX_Current and PCS_TX_Current. Added PCL column to in call tests. Modified synthesizer checking to be the same as TECN058 to define test frequencies. Changed PCS RX adjust to suit calypso software. Changed GSM850 and PCS1900 Rx adjust to suit calypso software. Removed CHK_VPPMEM. |
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**Controlled Statement**
The electronic copy of this document held on the Sendo server is the definitive version. Printed copies are uncontrolled.

**Update/Amendment Procedure**
This document is controlled and updated in accordance with the Sendo change

control procedure.

Table of contents

## 2. Scope

This document defines the Functional test procedure.

## 3. Purpose

The purpose of the Functional test is to verify that all RF functionality is fully operational and that the components on the PCB are fully working and been fitted correctly. Functional test calibrates the RF, Battery and charger control values.

## 4. References

SP5515 Solihull Functional Test Limits spec.

## 5. Hardware Matrix

1 GS8000 - Wireless Appliance Functional Tester
1 Serial Printer RS244648
1 Agilent 66319B Dual Output Mobile Communication DC Source
1 Agilent 34970A Data Acquisition/Switch Unit
2 x PCI -1750 Advantech Digital IO Card
2 x Agilent 34903 20 Channel Acuator/General Purpose Switch
1 Agilent 34901 20 Channel Multiplexor
1 Walker Precision BB Test Fixture Revision 1
1 Industrial PC with RS232

## 6. Test system software version

Software version 1.0

# 7. Functional board test and electronic tuning

The Serial connection to the mobile should be made with open drain on the RXD line on the modem. A 2kΩ pull up may be necessary if problems occur.

The phone serial number is entered using a barcode scanner at the beginning of the test sequence.

### 7.2. Switch ON procedure

7.2.1. Purpose

Validate that the switch ON procedure operates correctly using the 'On' Key.

Formatted: Bullets and Numbering

7.2.2. Test procedure for switch ON.

Apply 0V at TP107 (GND)
Apply at X400 PIN 3 (VBATT) +3.6V
Wait 70ms (time to be optimised)

7.2.3. TP108 (VRTC) **CHK_VRTC**

This test measures the power supply to the real time clock of calypso

7.2.4. Off Current

Select MIN current range on the DMM of the power supply.
Verify off current provided by power supply. **CURR_OFF**
Select MAX current range on the DMM of the power supply.

7.2.5. Power up current

Apply 0v at TP403 (PWR_ON) for 45ms to switch on phone.
Wait 1 seconds for unit to switch on and initialise.
Measure Power up current. **POWER_UP_CURRENT**

Wait 5 seconds for software to stabilise.

### 7.3. USP communication test

7.3.1. Purpose

Tests the Micro-controller Serial Port between Iota and Calypso.

7.3.2. Test procedure

Activate Test_UspRW with the command USP_RW. MS should return PASS (0)/FAIL (non zero) **USP_COMM**

### 7.4. Retest Status test

Read the prior test indicator in the NVM to determine if the phone has been tested at Functional test. This will be saved in the report file to be used for first time yield calculations.

### 7.5. Software Version check

7.5.1. Purpose

Verify that the software version matches the test equipment software version.

7.5.2. Test procedure

Get the software version from the MS using the command GET_SOFTWARE_VERSION. **SW_Version**

Check the software version: Application & DSP (if it's in the list of version supported by the test equipment). **DSP_Version**

### 7.6. Current in ON mode and supply voltages:

7.6.1. Purpose

Verify that the power consumption of the mobile in ON mode is within the limit.
Verify set up of baseband chip set.

7.6.2. Test procedure

Set Current limitation of VBATT to 400mA for this test only.

Send the initialisation procedure STABLE_ON_MODE (This should perform initialisation of the Baseband, switch off the backlight, stop radio activity apart from 13MHz) in order to put phone in well know state.

Wait 50ms – this is to wait for the unit current to stabilize.

7.6.3. ON Current

Measure current provided by power supply. **CURR_ON**

7.6.4. TP202 (VCORE) **CHK_VCORE**

This test measures the power supply VCORE from the Iota chip that supplies the Calypso.

7.6.5. TP500 (2V8_RF) **CHK_2V8_RF**

This test measures the supply voltage to the front-end module.

### 7.7. SIM card control

7.7.1. Purpose

Verify that SIM card interface is fully functional.

7.7.2. Test procedure

Use a test SIM card (3V) connected to the test points listed below.
X402-1 (SIMVCC)
X402-2 (SIMRST)
X402-3 (SIMCLK)
X402-6 (SIMIO)

Apply at XP400 PIN 3 (VBATT): +3.6V

Via the serial interface, activate SIM test with the command CHECK_SIM with parameter 3.00V.

Measure X402-1 (SIM_VCC) **SIM_VON**

### 7.8. Analogue to Digital converter (ADC) Control

7.8.1. Purpose

Check link between Calyspo and Iota, Iota auxiliary converters and external resistor values.

7.8.2. Test procedure:

Current limitation 475mA max on TP208 (VCHARGE)

Connect a 10 KΩ ± 5% resistor between XP400 pin 2 (TEMP_BATT) and TP107 (GND).

7.8.3. Check Battery type measurement

Via the serial interface, activate TYPE_BAT ADC test with the command READ_ADC and the parameter BATTERY TYPE.
Read result and compare with limit table **TYP_BAT**

7.8.4. Check Battery voltage measurement.

An accurate battery voltage measurement is necessary to Monitor discharge level indication and to monitor the voltage regulation for Li Ion charging.

A calibration is done with the two following levels:
+4.2V (ADC_VBAT42 NVM parameter, ADC_ADIN42)
+3.2V (ADC_VBAT32 NVM parameter, ADC_ADIN32)

Apply at XP400 PIN 3 (VBATT): 4.2V (as accurate as possible)
Wait 50ms

Via the serial interface, activate VBATT ADC test with the command READ_ADC with the parameter ADIN4

Read result and compare with **ADIN 4 42**
**VBATT42**

Store result in NVM

Apply at XP400 PIN 3 (VBATT): + 3.2 V
Via the serial interface, activate VBATT ADC test with the command READ_ADC with the parameter ADIN4

Read result and compare with **ADIN 4 32**
**VBATT32**

Store result in NVM

7.8.5. Check Temperature measurement

Via the serial interface, activate TEMP ADC test with the command READ_ADC and the parameter TEMP.

Read result and compare with limit table **ADC_TEMP**

### 7.9. Audio Loop Control

7.9.1. Purpose

Verify Calypso & Iota connections, external filtering and polarisation of components.

7.9.2. Test procedure

Aux-Mic to Aux-Speaker

Via the serial interface, send the command START_AUDIO_LOOP using the parameters:
INPUT DEVICE: EXTERNAL MICROPHONE
OUTPUT DEVICE: AUX_SPEAKER
Side tone and volume gains are fixed:
Side tone = 1dB
Volume control gain = 0dB.
Input gain (uplink PGA), set 0dB = 6
Output gain (downlink PGA), set 0dB = 6

Measure bias of the TP209 (BB_AUX_MIC) **AUX_MIC_BIAS**

Measure MICBIAS using ADC ADIN3 **AUX_MIC_ADC**

Apply a sine wave signal of 150mVrms, F = 1 kHz between BB_AUX_MIC TP209 and GND TP107.

Measure the following on AUX_OP_CONNECTOR TP208:

| | |
|---|---|
| AC Volts | **AUXOP_CONNECTOR** |
| THD | **AUXOP_CONNECTOR_THD** |
| SINAD | **AUXOP_CONNECTOR_SINAD** |

Send the command STOP_AUDIO_LOOP

### 7.10. Buzzer

7.10.1. Purpose

Check and ensure that the buzzer and control components are correctly fitted.

7.10.2. Test procedure

Apply at XP400 PIN 3 (VBATT): +3.6V
Via the serial interface, activate Buzzer test with constant 50% duty cycle (Max volume 63): the command is Test_CheckBuzzer
Measure the increase in supply current: **BUZZ_ON**

Switch Buzzer off using the command Test_StopBuzzer

### 7.11. Vibrator control

7.11.1. Purpose

Verify vibrator drive circuit functions correctly.

7.11.2. Test procedure

Apply to XP400 PIN 3 (VBATT): +3.60V

Connect a resistor 20 ohms 0.5W between TP405 (VIBRATOR) and TP107 (GND).

Via the serial interface, activate Vibrator test with the command Test_RWPorts (vibrator on)

Measure on test point TP405 **VIB_ON**

Switch Vibrator off using the command Test_RWPorts (Vibrator off)
Wait 10ms
Measure on test point TP405 (VIBRATOR) **VIB_OFF**

## 7.12. Keyboard/LCD backlight

7.12.1. Purpose

Verify that the keyboard / LCD backlight control circuit is functioning correctly.

7.12.2. Test procedure

Apply on XP400 PIN 3 (VBATT) +3.6V

Via the serial interface, activate BACKLIGHT test with the function Test_RWPorts (Backlight On)

Wait 10ms

Measure the supply current

Via the serial interface, disable BACKLIGHT test with function Test_RWPorts (Backlight Off)

Wait 10ms

Measure the supply current.
The backlight current is the difference between these two currents.
**BKLT_CURR**

## 7.13. Check charge current & charger voltage

7.13.1. Purpose

To check charging circuit functions correctly.

7.13.2. CALIBRATION of the charge DAC:

Apply at X400-pin 3 (VBATT) 4.2V
Apply GND at X400-pin 1 or TP107 (GND)
Apply at TP208 (VCHARGE): + 6.2v

Set Current limitation for charger 475mA max on power supply.

Find DAC_calib by dichotomy using the following algorithm.

Initialise DAC_up = 800; DAC_low = 200;

< Do >
DAC = (DAC_up + DAC_lo)/2;
Write DAC (via serial link by the SW mobile, register CHGREG)

Check VBAT = 4.2, if not adjust it (test equipment)

Read charging current on the test equipment.

If charging current < 20 mA DAC_low = DAC
Else DAC_up = DAC

While DAC_up –DAC_low > 2
Return DAC_calib=DAC
write DAC_calib in the **DAC CALIBRATION VALUE**

7.13.3. CALIBRATION of the end of charge current:

Apply at X400-pin 3 (VBATT) 4.2V
Apply GND at X400-pin 1 or TP107 (GND)
Apply at TP208 (VCHARGE): + 6.2v

Write DAC (via serial link by the SW mobile, register CHGREG=3FF

Set Current limitation for charger 100mA max on power supply.

Check accuracy of VBATT = 4.2 V with the test equipment
Via the serial interface, activate Test_readADC_current test .
**CURRENT ADC 1**

STORE result ADC to bat_current_end_of_charge_1

Set Current limitation for charger 50mA max on power supply.

Check accuracy of VBATT = 4.2 V with the test equipment

Via the serial interface, activate Test_readADC_current test.
**CURRENT ADC 2**

STORE result ADC to bat_current_end_of_charge_2

7.13.4. Charge current tests.

Apply GND at X400 pin1 (GND).
Apply at X400 pin3 (VBATT) +4.2V +/- 0.1V
Apply at TP208 (VCHARGE): +6V +/-0.1V, 350mA

Set Current limitation for charger to 350mA max on power supply charger input

Measure charge current with power supply unit.
Charge current should be 0 +/- 1mA **CHARGE_CURR_OFF**

Enable charge current and set CHARGE_DAC to 0x3FF
Measure charge current with power supply charger
Charge current should be 350 mA **CHARGE_CURR_ON**

Measure current with ADC
Result should be 0x100 --> 0x0x300 **CHARGE_CURR_ADC**

Disable charge current
Measure charge current with power supply unit.
Charge current should be 0 +/- 1mA **CHARGE_CURR_OFF2**

7.14. Sleep mode

7.14.1. Purpose

To check deep sleep mode functions correctly

7.14.2. Test procedure

This will be the last test sequence for the PCB tester.

Put the software in deep sleep mode.

Select MIN current range on the DMM of the power supply.
Measure the supply current **CURR_DEEP_SLEEP**
Select MAX current range on the DMM of the power supply.

# 8. RF Phasing (Alignment)

## 8.1. Purpose

The purpose of this phase is to describe the production alignment of the radio. The alignment is done at the PCB level. The alignment procedures necessary are:

AFC 1V Calibration.
13MHz oscillator calibration
Transmit output power calibration
Receiver Level output calibration
Save the updated RAM values into the EEPROM in the phone

These procedures are detailed in the following sub sections.

A test SIM is not necessary for these tests.

The alignment procedure will make adjustments to the default values and then the new table has to be saved in the EEPROM in the phone.

The default table should be as close as possible to the post alignment values. This table will be updated from time to time according to the values found after the prototype runs, and during the production. A statistical analysis should be made (over a significant sample size) in order to determine the default values. The average value shall be used to update the default parameters; the min and max values must be recorded in order to determine the failure specification levels.

The radio table should be written to the flash memory before call connect and also care should be taken not to write erroneous values if the radio fails.

## 8.2. Automatic Frequency Control (AFC) DAC calibration

### 8.2.1. Purpose

Calibrate the AFC value at + **1.20V** (middle of the DAC output range). This value will be used to adjust the 13 MHz.

### 8.2.2. Test procedure

Apply to X400 PIN 3 (VBATT): +3.6V
Apply low value **$-2300_{10}$** (called AFC_LOW) on AFC
Send the command Test_WriteDAC (AFC_LOW)
Read voltage TP204 **AFC_VOLT_LOW**
Apply high value **$1200_{10}$** (called AFC_HIGH) on AFC
Send the command Test_WriteDAC (AFC_HIGH)
Read voltage at TP204 **AFC_VOLT_HIGH**
Calculate the DAC value to give **1.20V** on TP204 (AFC_INITIAL_DAC)
Send the command Test_WriteDAC (AFC_INITIAL_DAC)
The test equipment must measure TP204 (AFC): +1.20V +/- 1%
**AFC_INITIAL_VOLTAGE**
Store the result AFC_INITIAL_DAC in test rack memory.
Store INITIAL DAC value (AFC_INITIAL_DAC) in the test result. Save this

value as AFC_INITIAL_DAC for later use.
Keep the following value -AFC slope- AFC_DAC_PER_VOLT for later user (in section 6.4.2.1)

$$\text{AFC\_DAC\_PER\_VOLT} = \frac{(\text{AFC\_HIGH - AFC\_LOW})}{(\text{AFC\_VOLT\_HIGH - AFC\_VOLT\_LOW})}(LSB/Volt)$$

## 8.3. Synthesizer checking

8.3.1. Purpose

The purpose of this procedure is to check the RF chip set synthesizers.
The synthesizers performances are subject to PCB and components tolerances.
The aim of this procedure is to read VCOs lock registers for various frequencies that are GSM/DCS limits.

8.3.2. Test procedure

Switch ON the RF BLOCK: set RF_REF_ON to ON.
Initialise AERO: Aero_Initialise().

Read_Vco_Lock_Register with the following arguments:

| VCO Number | Frequency (MHz) | Result has to be stored in the following variables and checked against limits spec. |
|---|---|---|
| 1 | 1738 | **N_PLL1_FMAX_QB** |
| 1 | 1805 | **N_PLL1_FMAX_DB** |
| 1 | 1990 | **N_PLL1_FMIN** |
| 2 | 1223 | **N_PLL2_FMAX_QB** |
| 2 | 1279 | **N_PLL2_FMAX_DB** |
| 2 | 1483 | **N_PLL2_FMIN** |
| 3 | 766 | **N_PLL3_FMAX** |
| 3 | 854 | **N_PLL3_FMIN** |

## 8.4. Adjustment of the 13 MHz oscillator

8.4.1. Purpose

The system timing and reference source for the synthesizers is provided by the onboard 13MHz VCO. The first version of BRUM will use the 4133 T (IC602). This device requires an external VCXO (IC 603 OSC1622A). In Q2 2002 IC602 will be replaced by SI4143T and IC603 will be removed. In this case the adjustment of the 13 MHz procedure will have to change. Therefore the following adjustment procedure will be applied as long as the following ICs are in the BOM (and ECN will be released):
SI4143T AND OSC1622A.

The purpose of the 13 MHz adjustment algorithm is to determine the DAC value applied on the VCXO when the mobile is switched on. According to the specs, after soldering the VCXO (OSC1622), the frequency offset should be at 3.5PPM (max).

This value must set the reference frequency shift to less than 1 PPM at room temperature.

To achieve this, the transmit frequency needs to be adjusted to tolerance less than +/- 1 PPM or on transmit ARFCN 190 to a tolerance less than +/- 902 Hz.

NOTE – The AFC DAC calibration must be completed before this section is attempted i.e. the AFC DAC value is set to 1.20V.

8.4.2. Initial 13MHz Adjustment

Apply on VBATT (test point TP400): +3.6V
Radio initialisation: Test_InitRadio. This will set the phone to use its default value for the AFC DAC. This AFC DAC has been calculated in the previous section (section 7.2), AFC_FINAL_DAC.
Set the transmission on channel ARFCN 190: Test_StartTXBurst
Set the output power level 19: (1 to 9 dBm)
Measure the channel frequency error:
Stop the Transmit burst by: Test_StopTXBurst
$Freq_{error} = F_{normal} - F_{measured}$ (Hz)
Where $F_{normal}$ is Theoretical Frequency for Channel
$F_{measured}$ is the measured Frequency for Channel
Then compute Freq_error_ppm = $Freq_{error}$/(902.4) (PPM)
Record in the test result file the following values:

**FREQ_ERROR_INITIAL_PPM**

If abs(Freq_error_ppm) is less than 1 PPM then AFC is calibrated go to 7.17.4.

NB:If the tester is not able to measure the frequency error, the VCXO is damaged, and the phone must be declared as a failure.

8.4.3. 13MHz Fine Adjustment

If abs(Freq_error_ppm) is greater than 1 PPM then correct the transmit frequency by modifying the AFC DAC value, compute a new AFC_FINAL_DAC as following:

$$\text{AFC\_FINAL\_DAC} += \frac{\text{AFC\_DAC\_PER\_VOLT} * \text{Freq\_error\_ppm}}{13}$$

Repeat section 7.13.3

NB: If after 4 loops the TX frequency is not tuned(i.e. abs(Freq_error_ppm)> 1PPM , there is a failure in the VCXO an the phone must be declared as a failure.

8.4.4. Store AFC DAC

Record in the test result file the following values:

**FREQ_ERROR_FINAL_PPM**
**AFC_FINAL_DAC**

Save AFC_FINAL_DAC in the mobile EEPROM.

Compute the AFC DAC voltage as following:

$$AFC\_VOLTAGE = AFC\_INITIAL\_VOLT + \frac{(AFC\_FINAL\_DAC - AFC\_INITIAL\_DAC)}{AFC\_DAC\_PER\_VOLT}$$

AFC_INITIAL_DAC computed in section 6.3.3
And store this value in the test file.

**AFC_DAC_VOLTAGE**

This value must be between AFC_VOLTAGE_MIN and AFC_VOLTAGE_MAX *otherwise the phone must be declared as failure.*
By this, we avoid reading AFC DAC voltage at TP204 (AFC_VOLT).

### 8.5. Adjustment of the Transmitter output power level

8.5.1. Purpose

The transmitter output power level needs to be adjusted to meet the criteria in the test limits specification.

8.5.2. Test Procedure

Apply on VBATT (test point TP400): +3.6V
Radio initialisation: Test_InitRadio
Set the transmission on channel ARFCN 190 in the GSM850 band Test_StartTXBurst
Select PCL 7 and measure the average power from the mobile over 1 burst. If the measured value is not as specified above adjust the APC DAC value for level 7 until the tolerance of output power is met.

The DAC value range is 0 to 1023.

Repeat the above procedure for:

| Channel | PCL |
|---|---|
| GSM850 - 190 | 19 to 8 |
| PCS1900 - 661 | 15 to 0 |
| GSM850 - 128 | 7 |
| GSM850 - 251 | 7 |
| PCS1900 - 512 | 0 |
| PCS1900 - 810 | 0 |

All the values computed and calibrated must be saved in the EEPROM at the end of the calibration procedure for the phone. The measured power levels are recorded in the test results obviating the need to repeat the measurements in the verification phase later.

Stop the Transmit burst by: Test_StopTXBurst

### 8.6. Adjustment of the Received level

8.6.1. Purpose

Tune the VGA (Voltage Gain Adjustment) of the reception chain.
Input –98 dBm, nominal value of 60dB, and adjust the VGA so the receiver reads this value to ± 1 dB accuracy.
NB: The receiver GAIN values are nominal and they should be reviewed and after the first test and checked by the RF team.

8.6.2. GSM850 Tuning Procedure

Apply on VBATT (test point TP400): +3.6V
Radio initialisation: Test_InitRadio0
Set for reception on channel ARFCN 190: Test_StartRXBurst
Set the GSM tester as a continuous RF signal generator, and feed the mobile with this signal. We call this signal GSM850_RX_INPUT_LEVEL and it has the following settings:

Level: -98 dBm
Modulation: GMSK.
Frequency: RX Channel 190.

NB: Check the calibration of the receive path.

Get from the mobile the value that is on “AGC_IL_VGA_GAIN_REF” in the production table (You can find this value in the Sate production table), measure the GSM850_RX_LEVEL reported by the mobile and update AGC_IL_VGA_GAIN_REF as following:

AGC_IL_VGA_GAIN_REF +=
(int) ( (GSM850_RX_INPUT_LEVEL – GSM850_RX_LEVEL) * **2**).

Until ABS(GSM850_RX_INPUT_LEVEL-GSM850_RX_LEVEL)<**1.0** dB
The **1.0** dB limit should be tuned.

NB: Normally we should have an accuracy of **1/2** (**0.5** dB on the reading, the DSP reports the power on **1/2** dB units) but, due to the fluctuation of the reading this may affect the calibration get some phones declared as faulty whereas they are correct.

If after 5 loops condition is FALSE the phone is untenable and therefore it should declared as *FAULTY ON THE GSM850 RX PATH*.

Each loop record AGC_IL_VGA_GAIN_REF so this should be helpful for debug purposes.

If the tuning is successful store this value into the test report as **GSM850_AGC_DAC**.

This value is modelled as:

**GSM850_AGC_DAC** = SW_Gain + **2***GSM850_VGA_GAIN,

therefore one part of it is used for the HW compensation (VGA compensation) and another part is used for SW compensation.

8.6.3. PCS1900 Tuning Procedure

Once GSM850 receive path is tuned, the PCS1900 receive path has to be tuned using a similar method.

Set for reception on channel ARFCN 661: Test_StartRXBurst
Set the GSM tester as a continuous RF signal generator, and feed the mobile with this signal. We call this signal PCS1900_RX_INPUT_LEVEL and it has the following settings:

Level: -98 dBm
Modulation: GMSK.
Frequency: RX Channel 661.

NB: Check the calibration of the receive path.

Get from the mobile the value that is on "AGC_IL_VGA_GAIN_REF" in the production table (You can find this value in the Sate production table), measure the PCS1900_RX_LEVEL reported by the mobile and update AGC_IL_VGA_GAIN_REF as following:

AGC_IL_VGA_GAIN_REF +=
(int) ( (PCS1900_RX_INPUT_LEVEL – PCS1900_RX_LEVEL) * **2**).

Until ABS(PCS1900_RX_INPUT_LEVEL-PCS1900_RX_LEVEL)<**1.0** dB
The **1.0** dB limit should be tuned.

NB: Normally we should have an accuracy of **1/2** (**0.5** dB on the reading, the DSP reports the power on **1/2** dB units) but, due to the fluctuation of the reading this may affect the calibration get some phones declared as faulty whereas they are correct.

If after 5 loops condition is FALSE the phone is untenable and therefore it should declared as *FAULTY ON THE PCS1900 RX PATH*.

Each loop record AGC_IL_VGA_GAIN_REF so this should be helpful for debug purposes.

If the tuning is successful store this value into the test report as **PCS1900_AGC_DAC**.

This value is modelled as:

**PCS1900_AGC_DAC** = SW_Gain + **2***PCS1900_VGA_GAIN,

therefore one part of it is used for the HW compensation (VGA compensation) and another part is used for SW compensation.

### 8.7. Update Radio section

The calibration of the phone is now complete.
Transfer the modified alignment values from RAM to EEPROM.
In EEPROM set flag to confirm successful calibration of the phone.

## 9. RF Performance Verification

### 9.1. Purpose

The tests detailed below are necessary to ensure the radio section has been manufactured correctly and conforms to the Sendo requirements. A test SIM (Part No - 9JF1-01022-00000) is necessary for these tests.

### 9.2. Test Procedure

Apply on VBATT (test point TP400): +3.6V
The tests detailed in the table below are conducted and results stored in a text file that can be manipulated to check production yield and product performance.
Reference to RF signal levels assume no cable losses, therefore the actual signal levels used will increase due to cable losses.

| Channel | PCL | TEST | Measure Code |
|---|---|---|---|
| GSM850 | | Test Set in GSM850 mode initiates call and answer on mobile | CALL_CON |
| 128 | 19 | Transmit o/p Average Power | C_GTXP19_128 |
| 128 | 7 | Receiver Level<br>Receiver Quality | GRXL_128_0795<br>GRXQ_128_0795 |
| 128 | 7 | Transmitter Power Ramp | GTPR07_128 |
| 128 | 7 | RMS Phase Error | GRMP07_128 |
| 128 | 7 | Peak Phase Error | GPKP07_128 |
| 128 | 7 | Frequency Error | GFRQ07_128 |
| 128 | 7 | Transmit o/p Average Power | C_GTXP07_128 |
| 190 | 19 | Transmit o/p Average Power | C_GTXP19_190 |
| 190 | 19 | Transmitter Power Ramp | GTPR19_190 |
| 190 | 7 | Receiver Level<br>Receiver Quality | GRXL_190_0795<br>GRXQ_190_0795 |
| 190 | 7 | Average Tx current | GSM_TX_Current |
| 190 | 7 | Transmitter Power Ramp | GTPR07_190 |
| 190 | 7 | RMS Phase Error | GRMP07_190 |

| | | | |
|---|---|---|---|
| 190 | 7 | Peak Phase Error | GPKP07_190 |
| 190 | 7 | Frequency Error | GFRQ07_190 |
| 190 | 7 | Transmit o/p Average Power | C_GTXP07_190 |
| 190 | 7 | RBER classII average over 100 bursts | GRBRII190_103 |
| 190 | 7 | RBER class 1b average over 100 bursts | GRBRIB190_103 |
| 251 | 19 | Transmit o/p Average Power | C_GTXP19_251 |
| 251 | 7 | Receiver Level<br>Receiver Quality | GRXL_251_0795<br>GRXQ_251_0795 |
| 251 | 7 | Transmitter Power Ramp | GTPR07_251 |
| 251 | 7 | RMS Phase Error | GRMP07_251 |
| 251 | 7 | Peak Phase Error | GPKP07_251 |
| 251 | 7 | Frequency Error | GFRQ07_251 |
| 251 | 7 | Transmit o/p Average Power | C_GTXP07_251 |
| PCS1900 | | Dual Band Handover from GSM850 to PCS1900 | G_P_HAND |
| 512 | 15 | TX Output Average Power | C_PTXP15_512 |
| 512 | 0 | Receiver Level<br>Receiver Quality | PRXL_512_0795<br>PRXQ_512_0795 |
| 512 | 0 | Transmitter Power Ramp | PTPR00_512 |
| 512 | 0 | RMS Phase Error | PRMP00_512 |
| 512 | 0 | Peak Phase Error | PPKP00_512 |
| 512 | 0 | Frequency Error | PFRQ00_512 |
| 512 | 0 | TX Output Average Power | C_PTXP00_512 |
| 661 | 15 | Transmitter Power Ramp | PTPR15_661 |
| 661 | 15 | TX Output Average Power | C_PTXP15_661 |
| 661 | 0 | Receiver Level<br>Receiver Quality | PRXL_661_0795<br>PRXQ_661_0795 |
| 661 | 0 | Average Tx current | PCS_TX_Current |
| 661 | 0 | Transmitter Power Ramp | PTPR00_661 |
| 661 | 0 | RMS Phase Error | PRMP00_661 |
| 661 | 0 | Peak Phase Error | PPKP00_661 |
| 661 | 0 | Frequency Error | PFRQ00_661 |
| 661 | 0 | TX Output Average Power | C_PTXP00_661 |
| 661 | 0 | RBER class II average over 100 bursts | PRBRII661_103 |
| 661 | 0 | RBER class 1b average over 100 bursts | PRBRIB661_103 |
| 810 | 15 | TX Output Average Power | C_PTXP15_810 |
| 810 | 0 | Receiver Level<br>Receiver Quality | PRXL_810_0795<br>PRXQ_810_0795 |
| 810 | 0 | Transmitter Power Ramp | PTPR00_810 |
| 810 | 0 | RMS Phase Error | PRMP00_810 |
| 810 | 0 | Peak Phase Error | PPKP00_810 |
| 810 | 0 | Frequency Error | PFRQ00_810 |
| 810 | 0 | TX Output Average Power | C_PTXP00_810 |
| | | Terminate call from test set | TS_END_CALL |

# 10. Write Transceiver ID and Serial Number

## 10.1. Purpose

To store the transceiver ID and serial number into the phone ensuring that they are the correct format.

### 10.2. Test procedure

Check Serial number digits to ensure all digits are of acceptable alpha-numeric values.

Read Serial number from NVM to ensure it matches scanned value.

Read Transceiver ID from NVM and confirm that it matches model.

## 11.Transfer Test data

Write to the phone NVM 198:

- Test Status (Pass/Fail)
- Increment Pass or Fail test iteration storage location
- BABT results
- FIXTURE ID
- Channel ID
- Test station (RF)
- Fail code
- Software ID

## 12.End of Procedure