Programmes After Market Services
NSC/W-1/3 Series Transceivers

Tuning Instructions

CONTENTS

Tuning Instructions

General

All tuning operations of the NSC-1/3 and NSW-1/3 phones are carried out using the service software. The service software turns the phone into the locals mode, in which the phone can be outwardly controlled via the MBUS interface.

Tuning is based on the software communicating with the D/A and A/D converters of the phone. In some instances, the phone processor also will calculate the required correction parameter.

The tuning values of the phone reside on the EEPROM. The contents of the EEPROM can be read by the service software and saved as a file. This is advisable when there is need to retain that information (e.g., in view of replacement of the circuit). The program also enables writing the default parameters on the EEPROM, in which case all tuning steps should be carried out.

Note: NSC-1 and -3 do not have upper band components. NSC-1 and -3 are 800 MHz transceivers.

During tuning, proceed as follows:

- Take care not to damage sensitive measuring instruments with excessive RF power.

- Carry out all tuning steps quickly to avoid excessive heating of RF units.

- Perform all tuning steps in the order presented.

- Never try to mask a fault by tuning it out!

Required Equipment

1 PC/AT computer with service software. (See separate section for instructions on installation and use.)

2 Service accessories. (See equipment setup pictures.)

3 Multimeter or DVM.

4 GSM radio telephone test station or separate measuring equipment as follows:

  - RF generator

  - pulse power meter

  - spectrum analyzer

  - attenuator and branching unit

Equipment Setup

Caution: Make sure that you have switched off the PC and the printer before making connections.

Caution: Do not connect the protection key (PKD-1) to the serial port. The result may be damage to the PKD-1.

Attach the protection key PKD-1 to the PC's parallel port 1 (25-pin female D-connector). When connecting the PKD-1 to the parallel port, be sure that you insert the PC end of the PKD-1 to the PC (male side). If you use a printer on parallel port 1, place the PKD-1 between the PC and your printer cable.

Next, connect the M2BUS service cable (DAU-9P) to the PC's serial port (RS-232). Attach one end of the service cable to the PC serial port and the other end to the service box (JBA-4).
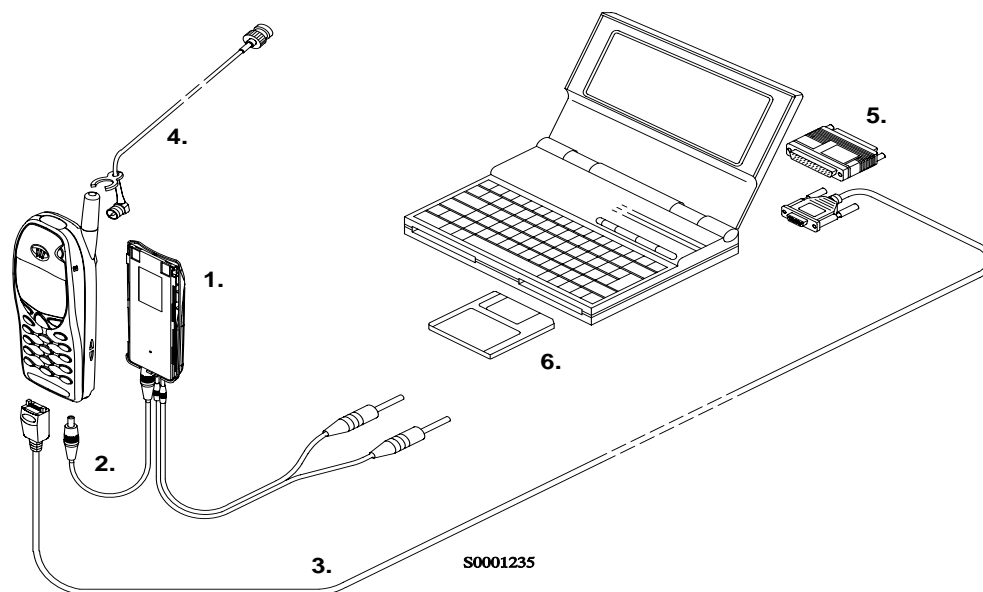
The service box should always be used when servicing the phone with the covers in place.

When the phone covers are removed, the jigs should be used.

For audio measurements, connect the audio cable (ADS-1) as follows:

- EAR line to AF INPUT of test equipment

- MIC line to MOD GEN OUTPUT of test equipment

Equipment Setup for Tuning a Phone Without Removing Covers

S0001235

Item	Service accessory	Product code
1	Service Battery BBD-3	0775071
or	Dummy Battery BTD-3	0670280
2	DC Cable SCB-3	0730114
3	Service MBUS Cable DAU-9P	0730109
4	External Antenna Calbe XRC-2	0730180
5	Software protection key PKD-1	0750018
6	Service SW diskette 3.5″ for NSC/W-1/3	0774099
	WinTesla Service SW application	0774046

Flash Concept for NSC/W-1/3
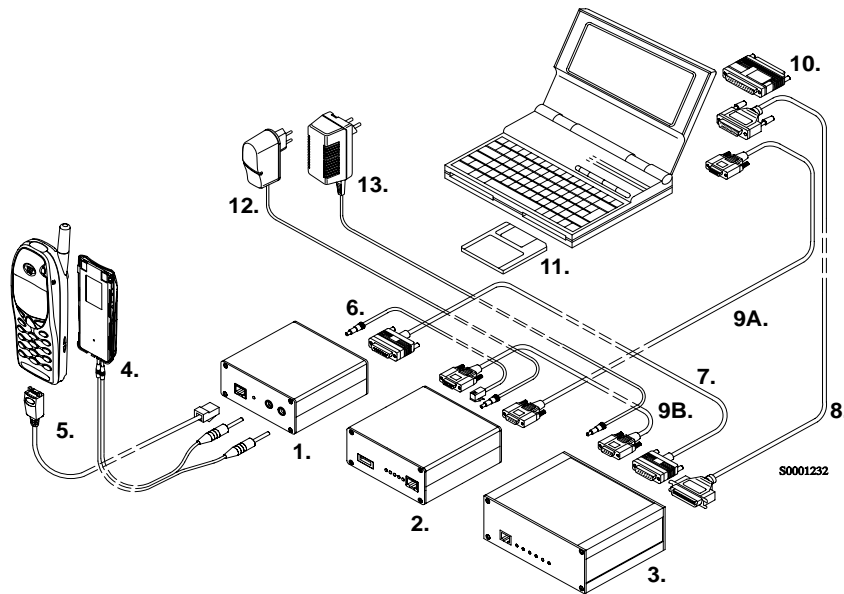
S0001232

Item	Service accessory	Product code
1	Flash Loading Adapter FLA-5	0080178
2	Flash Security Box TDF-4	0770106
3	Prommer FPS-4S	0085095
4	Service Battery BBD-3	0775071
5	Service Cable SCH-5/A	0730098/0730166
6	DC Cable PCC-1B	0770050
7	D15-D15 Cable AXS-5 (included in FLA-5 sales pack)	0730091
8	Printer Cable (included in FPS-4 sales pack)	0730029
9A	D9-D9 Cable AXS-4 (included in FPS-4 sales pack)	0730090
9B	D9-D9 Cable AXS-4	0730090
10	Software protection key PKD-1	0750018
11	Service SW diskette 3.5″ for NSC/W-1/3 (WinTesla Service SW application)	0774099 0774046
12	Travel Charger ACH-6E (Euro) Travel Charger ACH-6U (USA/Japan) Travel Charger ACH-6X (UK)	0270381 0270382 0270380
13	AC Charger ACL-3E (included in FPS-4 sales pack)	0680015

Light Flash Concept for NSC/W-1/3
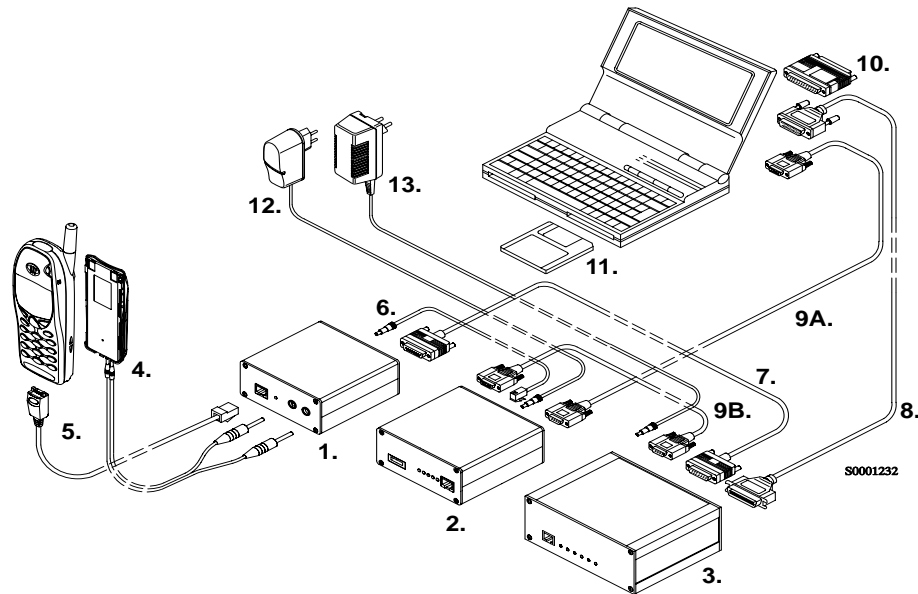
S0001232

Item	Service accessory	Product code
1	Flash Loading Adapter FLA-5	0080178
2	Flash Security Box TDF-4	0770106
3	Service Battery BBD-3	0775071
4	Service Cable SCH-5	0730098
or	Service Cable SCH-5A	0730166
5	DC Cable PCC-1	0770050
6	D9-D9 Cable AXS-4	0730090
7	Light Flash Cable FLC-5	0770107
8	XCM-1 Cable	4626131
9	Software protection key PKD-1	0750018
10	Light Flash SW diskette 3.5″ for NSB/C/W-1/3	0774094
11	Travel Charger ACH-6E (Euro) Travel Charger ACH-6U (USA/Japan) Travel Charger ACH-6X (UK)	0270381 0270382 0270380
11	Service SW diskette 3.5″ for NSC/W-1/3 (WinTesla Service SW application)	0774099 0774046

Easy Flash Concept for NSW-1/3
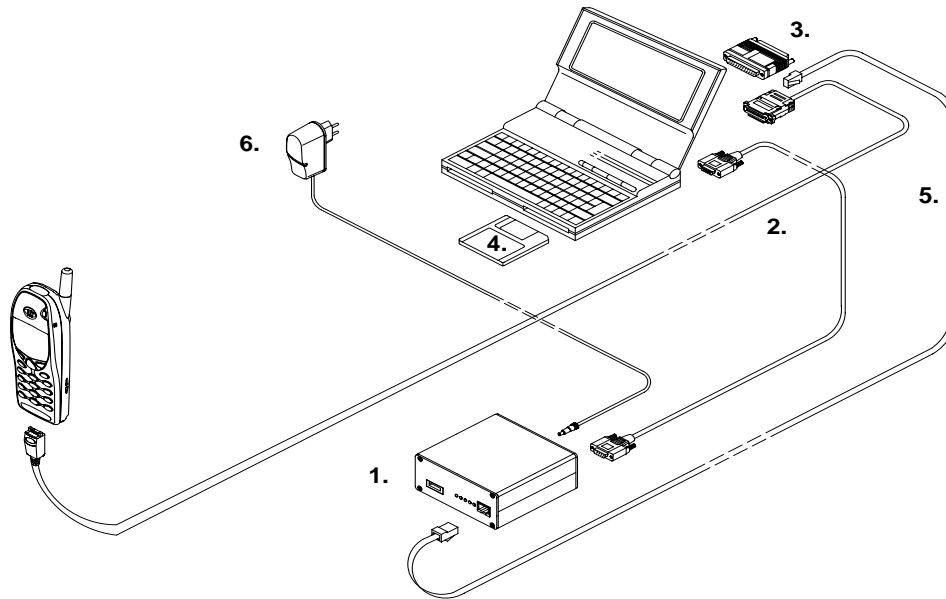
Item	Service accessory	Product code
1	Flash Security Box TDF-4	0770106
2	Easy Flash Cable FLE-5	0770147
3	Software protection key PKD-1	0750018
4	Easy Flash SW diskette 3.5″ for NSW-1/3	0730098
5	XCM-1 Cable	4626131
6	Travel Charger ACH-6E (Euro) Travel Charger ACH-6U (USA/Japan) Travel Charger ACH-6X (UK)	0270381 0270382 0270380

Point of Sale Flash Concept for NSW-1/3

With this equipment setup, you can flash new software in a phone.
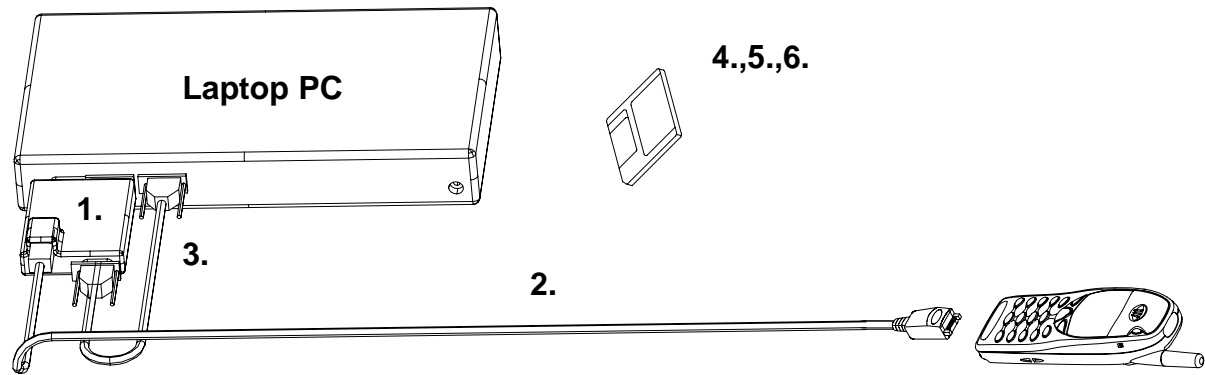
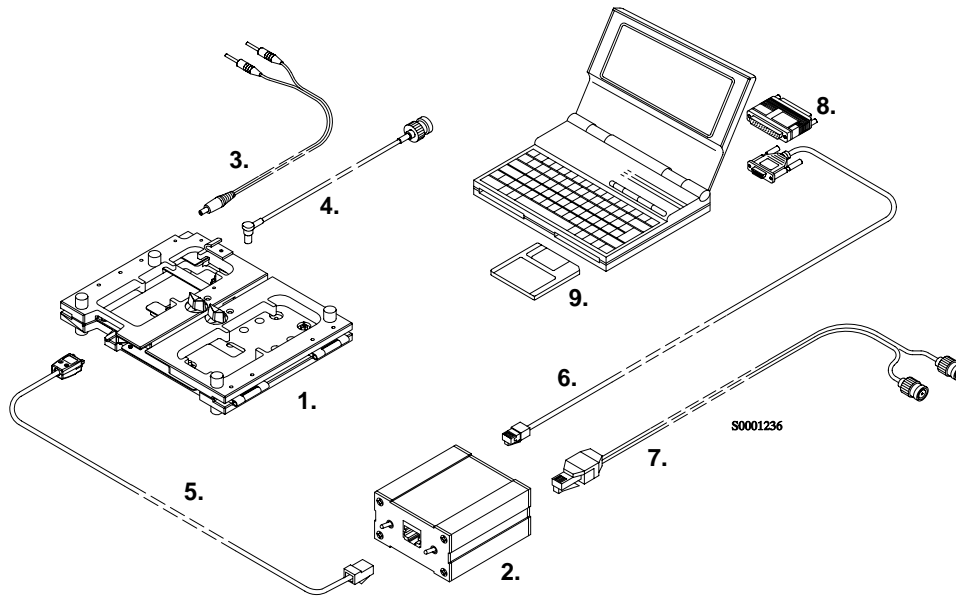| Item	Service accessory	Type	Product code
1	POS Flash Adapter	FLS-2D	0750130
2	Service Cable	SCH-5	0730098
or	Service Cable	SCH-5A	0730166
3	D9-D9 Cable	AXS-4U	0730090
4	Service SW diskette 3.5″ for 16-bit dongle drivers (Windows 3.1x)		0770177
Alt.	Service SW diskette 3.5″ for 32-bit dongle drivers (Windows 95/98/NT)		0770176
5	Service SW diskette 3.5″ for FLE-5 drivers		0774046
6	Service SW diskette 3.5″ for FLS-1 Remote Update Application Installation Pack: FLS-2D Sales Pack, Installation and User Guide FLS-2D Registration Request Form Service SW diskette 3.5″ for NSC/W-1/3		0774123 0275405 0275404 0774099

Tuning With Covers Off – Using Testframe JBS-19

S0001236

Item	Service accessory	Product code
1	Module Jig JBS-19 *	0770098
2	Service Audio Box JBA-4 **	0770094
3	DC Cable PCS-1	0730012
4	External Antenna Cable XRC-1B	0730128
or	External Antenna Cable XRC-2 ***	0730180
5	Service Cable SCH-5/A **	0730098/0730166
6	Service MBUS Cable DAU-9S **	0730108
7	Audio Cable ADS-1	0730011
8	Software Protection Key PKD-1	0750018
9	Service SW diskette 3.5″ for NSC/W-1/3	0774099
	WinTesla Service SW application	0774046
*	*The nominal operating voltage for JBS-19 is 3.6 V.* *The supply voltage for JBS-19 must never exceed 5.0 V.*	
**	*SCH-5, JBA-4, and DAU-9S can be replaced with DAU-9P*	
***	*Recommended*	

Tuning With Covers Off – Using Light Jig JBT-1
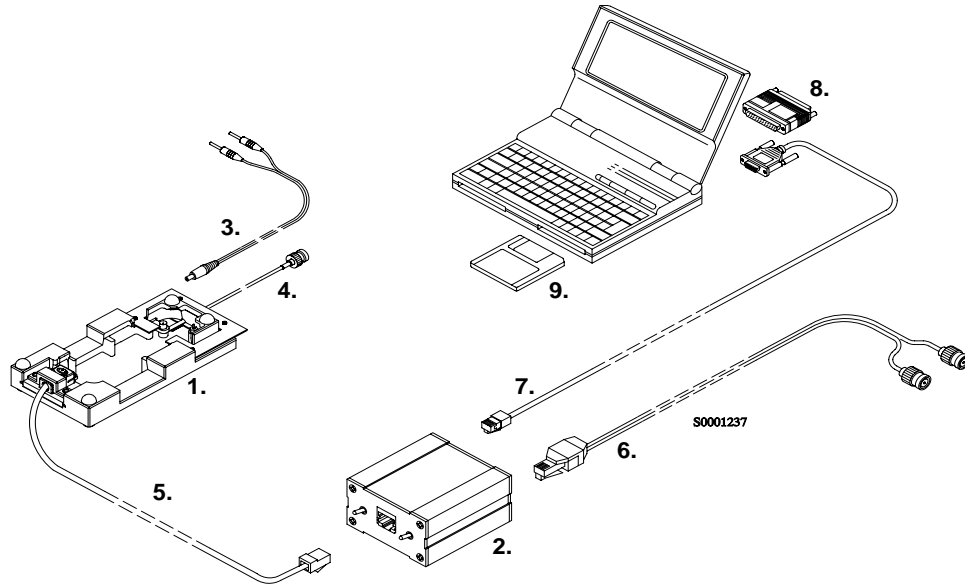
Item	Service accessory	Product code
1	Light Module Jig JBT-1*	0770109
2	Service Audio Box JBA-4 **	0770094
3	DC Cable PCS-1	0730012
4	External Antenna Cable XRC-1B	0730128
or	External Antenna Cable XRC-2 ***	0730180
5	Service Cable SCH-5/A **	0730098/0730166
6	Audio Cable ADS-1	0730011
7	Service MBUS Cable DAU-9S **	0730108
8	Software Protection Key PKD-1	0750018
9	Service SW diskette 3.5″ for NSC/W-1/3	0774099
	WinTesla Service SW application	0774046
*	*The nominal operating voltage for JBT-1 is 3.6 V.* *The supply voltage for JBT-1 must never exceed 5.0 V.*	
**	*SCH-5, JBA-4, and DAU-9S can be replaced with DAU-9P*	
***	*Recommended*	

Warranty Transfer
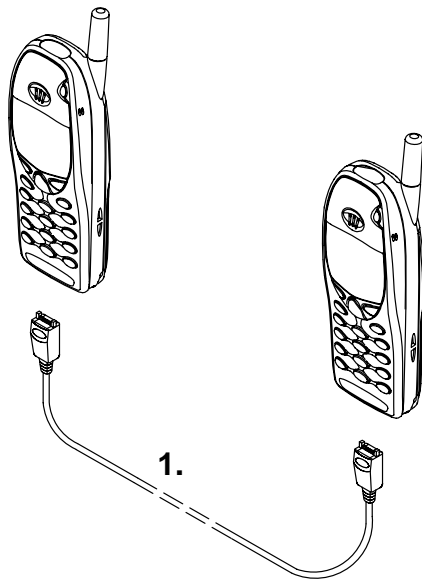
Item	Service accessory	Product code
1	Warranty Cable SCH-6*	0730099

Warranty Transfer

The Warranty Cable (SCH-6) is used to connect two phones to enable the transfer of warranty data (user settings and serial numbers) from one phone to another phone.

No warranty transfer is permitted between 6160 P1 and P3.

The warranty transfer procedure is as follows:

Point Of Sale

Phone No. 1 is broken.

1   To avoid confusion, label the phones No. 1 and No. 2.

2   Plug the Warranty Cable (SCH-6) into both phones (see diagram above).

3   Turn on phone No. 2. Select **Profiles** from the menu and select "Silent".

4   Start the warranty data transfer by selecting code **#92772689#** in phone No. 2.

5   Select the **"Transfer user data?"** option and press **OK**. The next prompt is: **"Confirm transfer?"** Press **OK** again.

6   Wait until the transfer is completed.

7   Turn off phone No. 2, then turn it on again. Check the Welcome note and profile

to determine if the data transfer was successful.

8   Return the broken phone No. 1 to the central service.

Central Service

A broken phone is received.

1   Check and repair the phone.

2   Change the Warranty state from *Defective* to *Exchange*. Use WinTesla and
PKD-1CS. (Menu Software ->Warranty Info ->Info State ->Exchange)

3   Send the repaired phone to the dealer.

Point of Sale

1   Use the returned phone as a swap phone.

2   Send the broken phone to Central Service.

Note: When Warranty information is transferred into a swap phone, the Warranty state changes to Use
mode.

Tuning Steps

1. AFC Tuning (Analog)

This tuning adjusts reference oscillators frequency so that the network's frequency crite-
ria will be met.

This adjustment loads the Analog center frequency DAC value into the EEPROM. A spec-
trum analyzer must be used to accomplish this task.

*Note: Do not leave tuning on. Analog transmitting takes maximum current. Tuning can damage the
phone or service battery. The service battery will be heated.*

The spectrum analyzer settings are shown in the AFC tuning window:

* Set the power supply voltage at 8.4V to service battery (or 3.6V to jig).

* Connect the spectrum analyzer to antenna connector.

* Verify that the spectrum analyzer frequency is correct.

* Tune the center frequency (CFR) to 832.500 MHz +/- 200 kHz.

* Press the **OK** button when the center frequency is correct.

2. VCTCXO Tuning

This tuning is used to verify that the radio unit has the correct adjustment to meet a net-

work's criteria for frequency stability.

This adjustment loads the VCTCXO DAC value into the EEPROM. The RF generator must be used in this process.

The spectrum analyzer settings are shown in the AFC tuning window:

- Set the power supply voltage at 8.4V to service battery (or 3.6V to jig).

- Connect the antenna connector to RF generator.

- Once all the RF generator frequency information is correct, press the **Meas** button.

- Set the correct RF level to signal generator *(Note: Attenuation).*

- Press the **OK** button when the frequency and RF level are correct.

3. Modulator Output - Low Band/High Band (NSW-1/3 only)

This tuning is used to adjust the radio unit's intermediate frequency level so that the RF small signal gain has its maximum dynamic range in use with some drift margin.

Here are the steps to perform:

- Select *Tuning>Modulator output>Low Band/High Band.*

- Set the power supply voltage at 8.4V to service battery (or 3.6V go jig).

- Connect the pulse power meter or spectrum analyzer to antenna connector.

- Check that the spectrum analyzer frequency is correct (RF information shows correct frequency).

- Tune the modulator output power to 22dBm.

- Press the **OK** button when the tuning level is correct.

4. TX I/Q Modulator Amplitude Balance and Phase Shift Tuning

This tuning is used to adjust the I/Q-modulator's DC offset and phase error so that the system's requirements for modulation accuracy are met.

Follow the steps as described here:

- Select *Tuning>TX I/Q*

- Connect the spectrum analyzer to the phone antenna connector (use attenuator, if needed).

- Check that the TX power level is at level 10, the channel is at 60, and the TX data type is set to 1.

- Adjust the spectrum analyzer center frequency to 830.700 MHz. Check all other settings by pressing <*Settings*>.
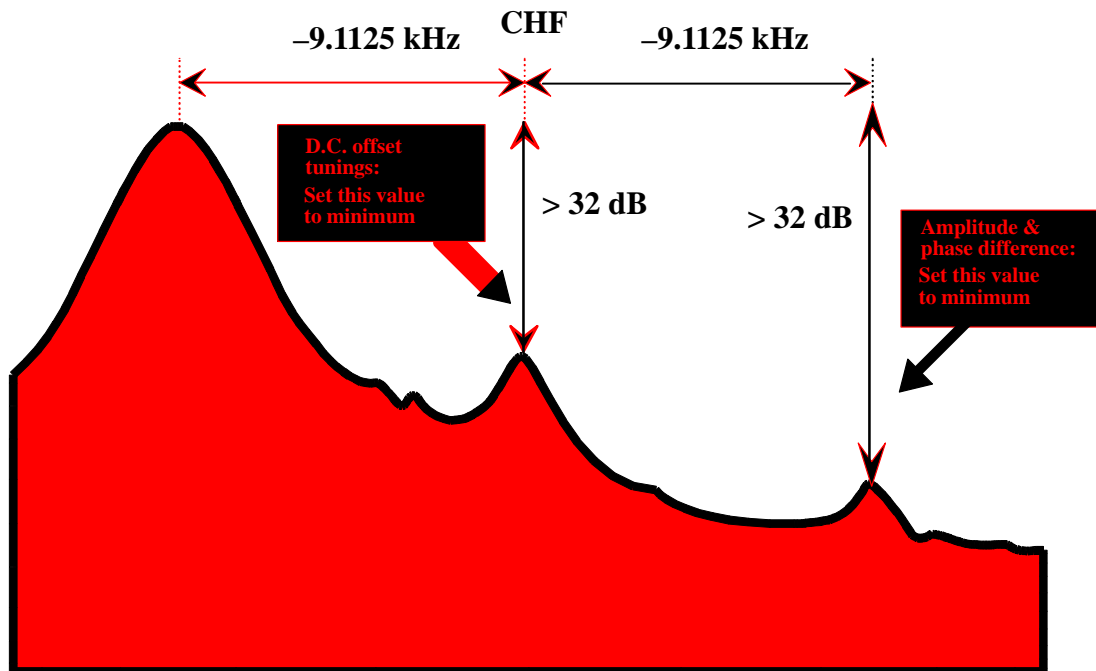
- Select the *TX I d.c. offset* option from the "Tuning" drop-down menu.

- Adjust the level of center frequency (CHF signal) to minimum by varying D/A converter value with the **<** and **>** buttons.

- Verify that the amplitude difference between CHF -9.1125 kHz and CHF is >30 dB.

- Select *TX Q d.c. offset* from the "Tuning" drop-down menu.

- Adjust the level of CHF signal to minimum by varying the D/A converter value with the **<** and **>** buttons.

- Use the *Amplitude Difference* option.

- Adjust the level of signal CFR -9.1125 kHz to minimum by varying D/A converter value with the **<** and **>** buttons.

- Verify that the amplitude difference between CHF +67.7 kHz and CHF -67 kHz is >35 dB.

- Select the *Phase Difference* option from the "Tuning" drop-down menu.

- Adjust the level of signal CHF +67.7 kHz to minimum by varying D/A

converter values with the **<** and **>** buttons.

- After verying that all values are correct, press the **Save** button.

5. TX Power – Low Band/High Band

Note: Use a Service Battery connected to 1.5A 8.4V power supply or use the phone's own battery.

This tuning is used to adjust the radio unit's output power level values according to system specification.

This adjustment loads the power levels of the phone transmitter into the EEPROM. A pulse power meter or spectrum analyzer must be used.

The *<Settings>* shows the spectrum analyzer settings.

The following steps are used for power levels programming:

- Select *Tuning>TX Power>Low Band/High Band*

- Read old tuning values from the phone's EEPROM. Repeat this test to tune all power channels (A, B, C, and D).

- Set the power supply voltage to 8.4V to service battery (or 3.6V to jig).

- Connect the pulse power meter or spectrum analyzer to antenna connector.

- Verify that the spectrum analyzer frequency is correct using the following settings:

    - Set span 0 Hz

    - Set Ref LVL 30 dB

    - Set Ref LVL offset = cable loss

    - Set RBW and VBW 300 kHz

    - Set TRIG: SWEEP CONT, VIDEO -10dBm

    - Set marker at middle of slot

- Adjust the power level by clicking the **+** and **-** buttons; change the levels using the *up arrow* and *down arrow* keys.

- Tune power levels 2, 7, and 9.

- Use the **Calculate** button to calculate all other levels.

- Press the **Save** button when all the TX levels are correct.

800 MHz Analog TX Output Power

Power level	RF Power at Ext. RF connector *	Tuning target tolerance	Testing limits
2	25.8 dBm	+/- 0.1 dB	+0.7...-1.2 dB 26.5...24.6 dB

800 MHz Digital TX Output Power

Power level	RF Power at Ext. RF connector *	Tuning target tolerance	Testing limits
2	26.8 dBm	+/- 0.1 dB	+1.0/-2.0 dB 27.8...24.8 dB
3	23.5 dBm	+/- 1 dB	+/- 2.0 dB
4	19.8 dBm	+/- 1 dB	+/- 2.0 dB
5	15.8 dBm	+/- 1 dB	+/- 2.0 dB
6	11.8 dBm	+/- 1 dB	+/- 2.0 dB
7	7.8 dBm	+/- 1 dB	+/- 2.0 dB
8	3.8 dBm	+/- 1 dB	+/- 2.0 dB
9	-0.2 dBm	+/- 1 dB	+/- 2.0 dB
10	-4.2 dBm	+/- 1 dB	+/- 2.0 dB

Check that the power level PL2 TXC DAC value is within the allowed range (-50...200).

* Note if there is a difference between the power measured from the panel test pad and the Ext. RF connector when calculating measurements from Ext. RF.

TDMA 1900 TX Output Power

Power level	RF Power at Ext. RF connector *	Tuning target tolerance	Testing limits
2	25.8 dBm	+/- 0.1 dB	+0.7...-1.8 dB 26.5 ... 24.0 dBm
3	22.2 dBm	+/- 1 dB	+/- 2.0 dB
4	18.4 dBm	+/- 1 dB	+/- 2.0 dB
5	14.6 dBm	+/- 1 dB	+/- 2.0 dB
6	10.8 dBm	+/- 1 dB	+/- 2.0 dB
7	7.0 dBm	+/- 1 dB	+/- 2.0 dB
8	3.4 dBm	+/- 1 dB	+/- 2.0 dB
9	-0.2 dBm	+/- 1 dB	+/- 2.0 dB
10	-4.2 dBm	+/- 1 dB	+/- 2.0 dB

Check that the power level PL2 TXC DAC value is within the allowed range of -10...+400.

* Note if there is a difference between the power measured from the panel test pad and the Ext. RF connector when calculating measurements from Ext. RF.

6. RSSI Digital (AGC)

This tuning is used to measure the small signal gain of the radio unit to meet system requirements for RSSI reporting.

The following steps are used:

- Select *Tuning>RSSI Digital (AGC)>Low Band/High Band*

- Set the power supply voltage 8.4 V to service battery (or 3.6 V to jig).

- Connect the RF generator to the antenna connector.

- Press *Meas>* (The program will show the correct frequency and signal level.)

- Press the **OK** button once all the RF generator settings are correct.

- Repeat this measurement for all signal levels.

- Press the **OK** button when the tuning is correct.

7. RSSI Analog

This measurement is used for RSSI in analog mode. The analog mode works only with 800 MHz.

The following steps are used for tuning RSSI analog:

- Select *Tuning>RSSI Analog*

- Set the power supply voltage 8.4 V to service battery (or 3.6 V to jig).

- Connect the RF generator to the antenna connector.

- Press *Meas>* (The program shows the correct frequency and signal levels.)

- Press the **OK** button once the RF generator settings are correct.

- Repeat this measurement for all signal levels.

- Press the **OK** button when the tuning is correct.

8. RX Audio

This measurement is used for Audio output calibration for DAMPS mode. The oscilloscope or multimeter must be used when performing this step.

- Select *Tuning>Rx Audio*

- Connect the XEAR line to the oscilloscope or multimeter.

- Tune the signal to 34-36mV RMS.

- Press the **OK** button when the tuning is correct.

9. TX Audio

This measurement is used for Audio output calibration for DAMPS mode. The signal generator must be used when performing this step.

- Select *Tuning>Tx Audio*

- Connect the XMIC line to the signal generator.

- Tune deviation level to 2.9 +/- 0.05 KHz.

- Press the **OK** button when the tuning is correct.

10. Charging

Perform the following steps:

- Select *Tuning>Charging*

- Connect the service battery to the phone and DC cable (SCB-3) between phone and service battery.

- Set the supply voltage to 10.5 V.

- Run calibrations all at once by pressing the **Meas** button.

- Set the supply voltage back to 8.4 V.