

# **PAMS Technical Documentation TFE-2 Series Transceiver**

## **Chapter 5**

### **TFE-2 TUNING INSTRUCTIONS**



# TUNING INSTRUCTIONS

## Contents

Introduction .....	Page 4
General .....	Page 4
Required Equipment .....	Page 5
Equipment Setup .....	Page 5
Equipment Setup for Tuning a Phone without Removing Cover	Page 6
Equipment Setup for Tuning a Phone with Cover Removed	Page 7
Flash Prommer .....	Page 8
Starting The Software .....	Page 9
Tuning Steps .....	Page 10
1. RSSI Reference Signal Level Storage .....	Page 10
2. AFC Diagram Storage .....	Page 10
3. I/Q Modulator Amplitude Balance and Phase Shift Tuning	Page 11
4. Tuning of Transmitter Power Levels .....	Page 13

## Introduction

### General

In contrast to earlier second-generation analog cellular phones almost all tuning operations of the TFE-2 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 M2BUS 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 will also 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.

**N.B. During tuning, proceed as follows:**

- Take care not to damage sensitive measuring instruments with excessive RF power.
- Carry out all tuning steps in the shortest possible time 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

- PC/AT computer with service software; see Sect. 5 for instructions on installation and use.
- M2BUS adapter DAU-4S and other service accessories; see equipment set-up pictures.
- Multimeter or DVM.
- 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 PKD-1 key to the serial port. You may damage your PKD-1 !*

Attach the protection key PKD-1 to parallel port one (25-pin female D-connector) of the PC. 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 one, place the PKD-1 between the PC and your printer cable.

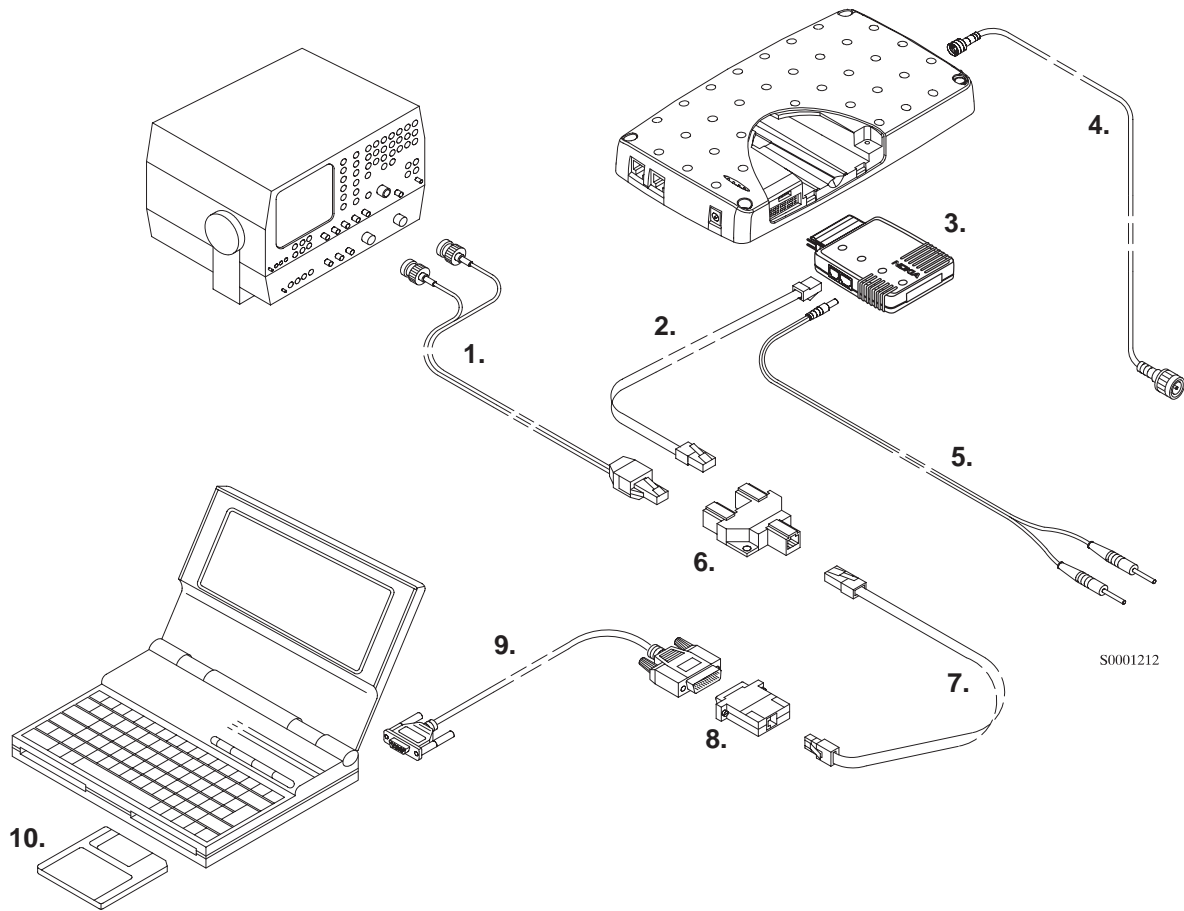
Next, attach the DAU-2T PC/MBUS adapter to the PC serial port, using an RS-232 9-pin to 25-pin adapter if necessary. Attach one end of the modular cable XCM-1 to DAU-2T, and the other end to the system connector with the help of the service adaptor AFW-2.

The RF cable should be connected between the RF connector of the test set and the Antenna 1 connector on TFE-2 with the help of a Mini UHF/BNC adapter. When the phone covers are removed the RF connection on the extension cable should be used instead.

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

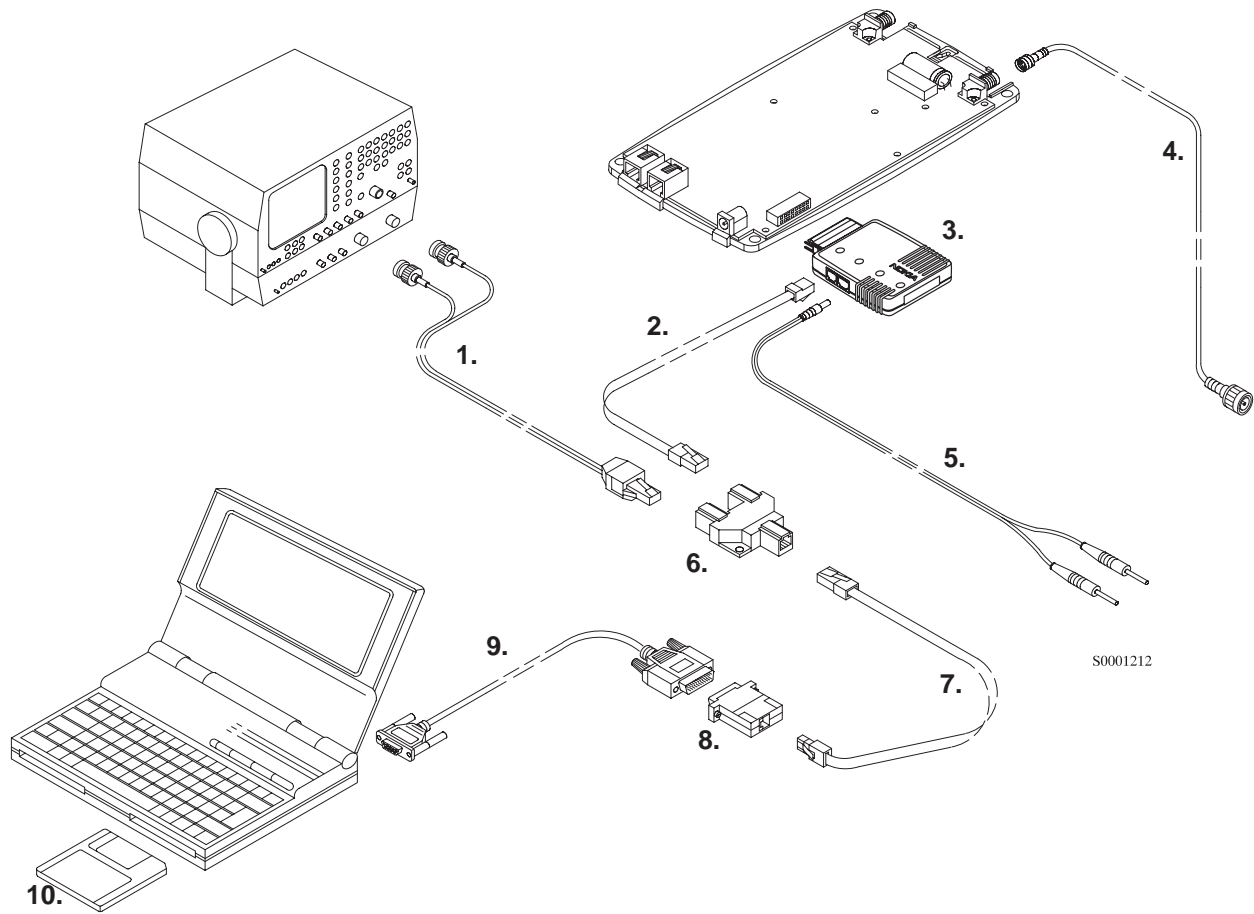
- EAR line to AF INPUT of test equipment
- MIC line to MOD GEN OUTPUT of test equipment

### Equipment Setup for Tuning a Phone without Removing Cover



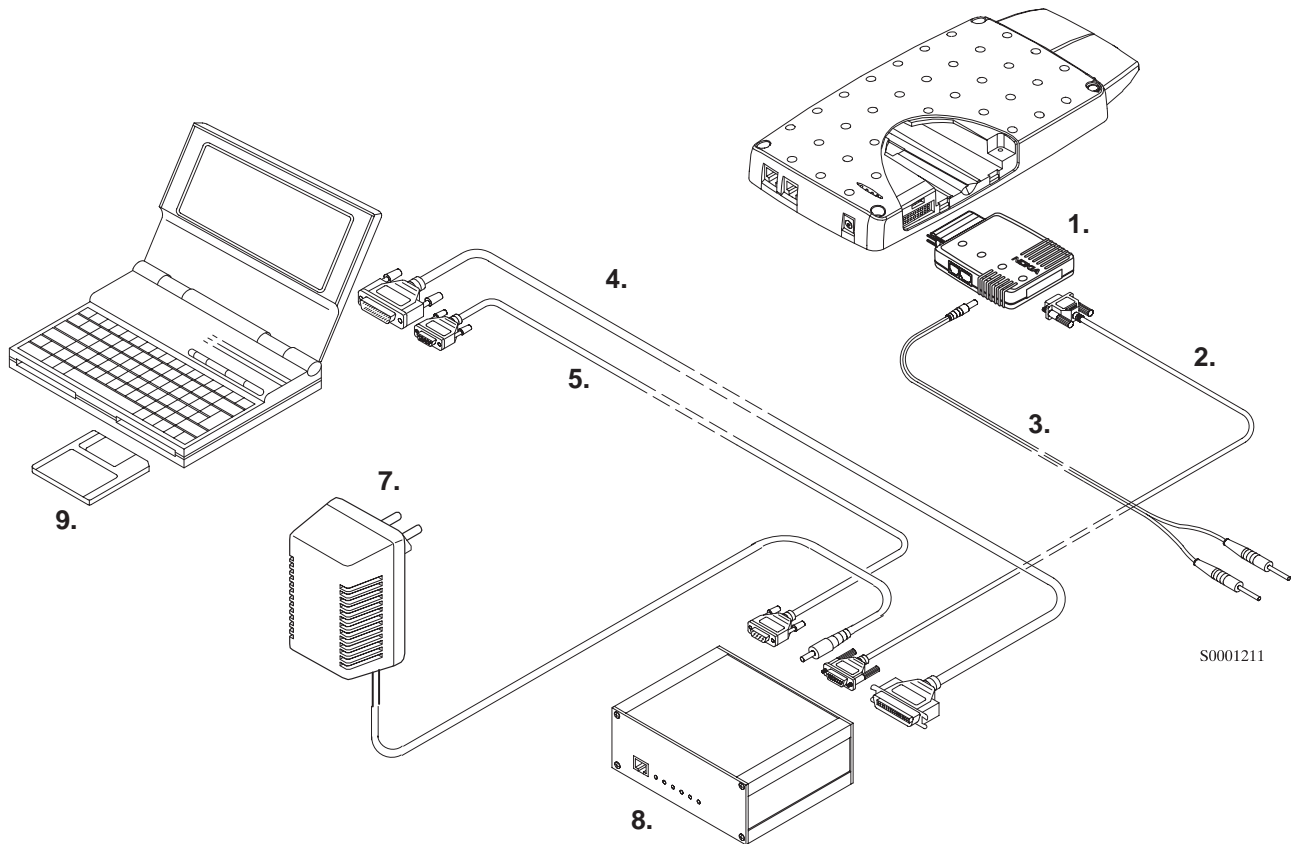
Item:	Service accessory:	Product code:
1.	Audio test cable, ADS-1	0730011
2.	Modular cable, XCM-1	4626131
3.	Service adapter, AFW-2	0750110
4.	RF cable (not supplied) Mini UHF/BNC Adapter	0198551
5.	Power supply cable, PCS-1	0730012
6.	Modular T-connector	4626134
7.	Modular cable, XCM-1	4626131
8.	PC/MBUS adapter, DAU-2T	0750006
9.	RS-232 adapter (9 pin to 25 pin)	4626170
10.	Service software diskette 3.5",	0774052
-	Service software diskette 5.1/4"	0774053
-	PKD SW Security Device	0750018

### Equipment Setup for Tuning a Phone with Cover Removed



Item:	Service accessory:	Product code:
1.	Audio test cable, ADS-1	0730011
2.	Modular cable, XCM-1	4626131
3.	Service adapter, AFW-2	0750110
4.	RF cable (not supplied) Mini UHF/BNC Adapter	0198551
5.	Power supply cable, PCS-1	0730012
6.	Modular T-connector	4626134
7.	Modular cable, XCM-1	4626131
8.	PC/MBUS adapter, DAU-2T	0750006
9.	RS-232 adapter (9 pin to 25 pin)	4626170
10.	Service software diskette 3.5",	0774052
-	Service software diskette 5.1/4"	0774053
-	PKD SW Security Device	0750018

## Flash Prommer



Item:	Service accessory:	Product code:
1.	Service adapter, AFW-2	0750110
2.	Cable, AXS-5	0730091
3.	Power supply cable, PCS-1	0730012
4.	Cable	0730029
5.	Cable	0730090
7.	AC/DC Adapter ACL-3E	0680020
8.	Flash prommer, FPS-4	0750090
9.	Service software diskette 3.5",	0774052
-	Service software diskette 5.1/4"	0774053



## Starting The Software

The software is delivered on a diskette and is copy protected with a dongle. The software must be installed on the hard disk, see installation instructions in Service Software User's Guide.

Starting steps:

---

- Start Windows
- Open NMP Service Software Group
- Start software by double-clicking the WinTesla Service PCLocals icon
- When Login windows appears enter user ID, OK, press CANCEL button,
- Choose from main menu *Product* → *New*.

## Tuning Steps

### 1. RSSI Reference Signal Level Storage

Reference value for the received signal strength meter are program tuned.

RSSI reference signal level programming:

---

- Select *Tuning* → *RSSI (AGC)*...
- Connect RF generator to antenna connector at 947.06771 MHz.
- Adjust signal generator level to –80 dBm + cable attenuation.
- Press *OK* button
- Adjust signal generator level to –55 dBm + cable attenuation.
- Press *OK* button.
- Values should be below  $\pm 3.0$  dB.
- Press *OK* button.

### 2. AFC Diagram Storage

This tuning is used to calibrate the automatic frequency control range.

AFC tuning:

---

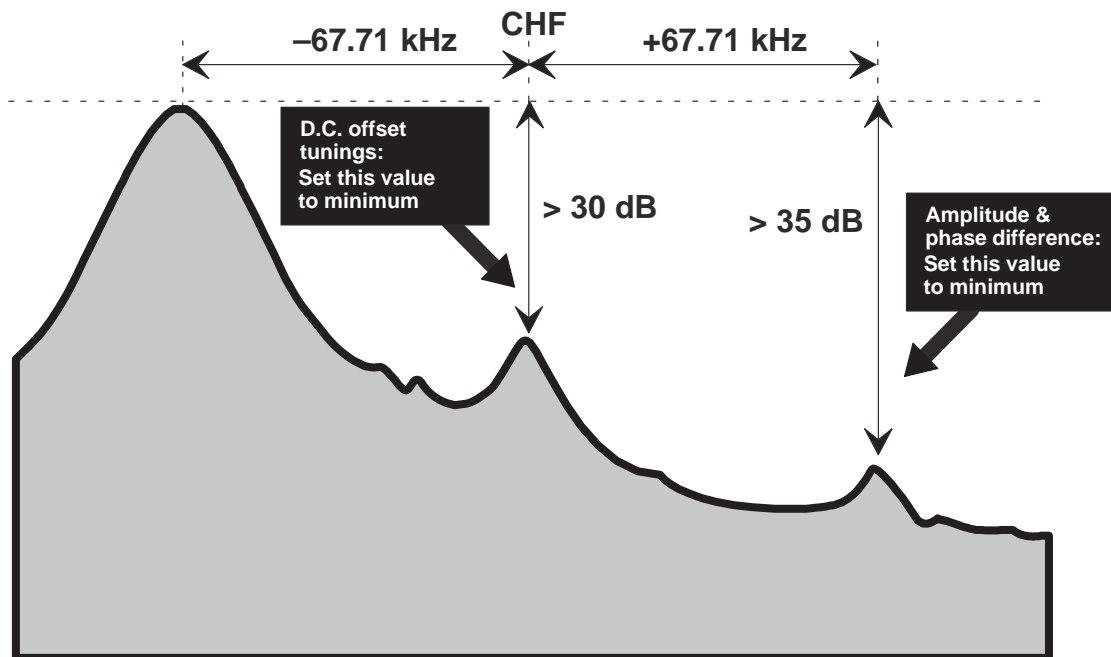
- Select *Tuning* → *AFC*...
- Set RF generator frequency 947.06771 MHz at level –55 dBm + cable attenuation.
- Check that "Cont. mode channel" is 60
- The measurement result should be;
  - Low over  $< -20$  kHz
  - Middle  $\pm 3.0$  kHz (depends on generator frequency accuracy)
  - High below  $> 20$  kHz
- Press *OK* button.

### 3. I/Q Modulator Amplitude Balance and Phase Shift Tuning

The purpose of this tuning operation is to adjust the I/Q modulator d.c. offsets and the I/Q modulator amplitude balance and phase shift.

I/Q modulator d.c. offsets, amplitude balance and phase shift tuning:

- Select *Tuning* → *TX I/Q...*
- Select I/Q tuning values from PC's memory, phone's EEPROM or factory default values.
- Connect spectrum analyzer (with attenuator if needed) to phone antenna connector.
- Check that TX power level is level 15, Cont. mode channel is 60 and TX data type is 1.
- Adjust spectrum analyzer centre frequency to 902 MHz, Span 200 kHz, Res BW 10 kHz, Video BW 1 kHz and Sweep time 0.5 s.



- Select option "TX I d.c. offset".
- Adjust the level of centre frequency (CHF signal) to minimum by varying D/A converter value with <- and -> buttons.
- The amplitude difference between CHF-67.7 kHz and CHF should be >30 dB.
- Select option "TX Q d.c. offset".
- Adjust the level of signal CHF to minimum by varying D/A converter value with <- and -> keys.

- Select option "Tune Amplitude Difference".
- Adjust the level of signal CHF+67.7 kHz to minimum by varying D/A converter value with <- and -> keys.
- The amplitude difference between CHF+67.7 kHz and CHF-67 kHz should be >35 dB.
- Select option "Tune Phase Difference".
- Adjust the level of signal CHF+67.7 kHz to minimum by varying D/A converter value with <- and -> keys.
- When values are correct press *OK* button.

#### 4. Tuning of Transmitter Power Levels

This adjustment loads the power levels of the phone transmitter into the EEPROM. When doing this, a pulse power meter or spectrum analyzer must be used.

Power levels programming:

- 
- Select *Tuning* -> *TX Power...*
  - Select I/Q tuning values from PC's memory, phone's EEPROM or factory default values.
  - Set power supply voltage to 6.8 V.
  - Connect pulse power meter or spectrum analyzer to antenna connector.
  - Check that continuous mode channel 60
  - Adjust the power level (levels 5, 13, 15 and 19) with + and - buttons and change levels with ↑ and ↓ keys.

Power level	Tuning P <sub>OUT</sub> /dBm (VB=6.0 V, CH60)
5	33
13	17
15	13
19	5

- Press *Calculate* button to calculate all other levels.
- Once all TX levels are correct, press *OK* button.