Chapter 6

RPE–1 TUNING INSTRUCTIONS

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AMENDMENT RECORD SHEET

Amendment Number	Date	Inserted By	Comments

RPE–1 TUNING INSTRUCTIONS

Contents

Introduction

General

In contrast to earlier second–generation analog cellular phones almost all tuning operations of the RPE–1 are carried out using the service software. The service software turns the phone into tuning 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 separate section for instructions on installation and use.

– M2BUS adapter DAU−9P 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 connect the M2BUS service cable, DAU−9P, to the serial port (RS−232) of the computer. Attach one end of the service cable to the PC serial port and the other end to the service box.

The RF cable should be connected between the RF connector of the test set and the appropriate connector.

Equipment Setup for Tuning
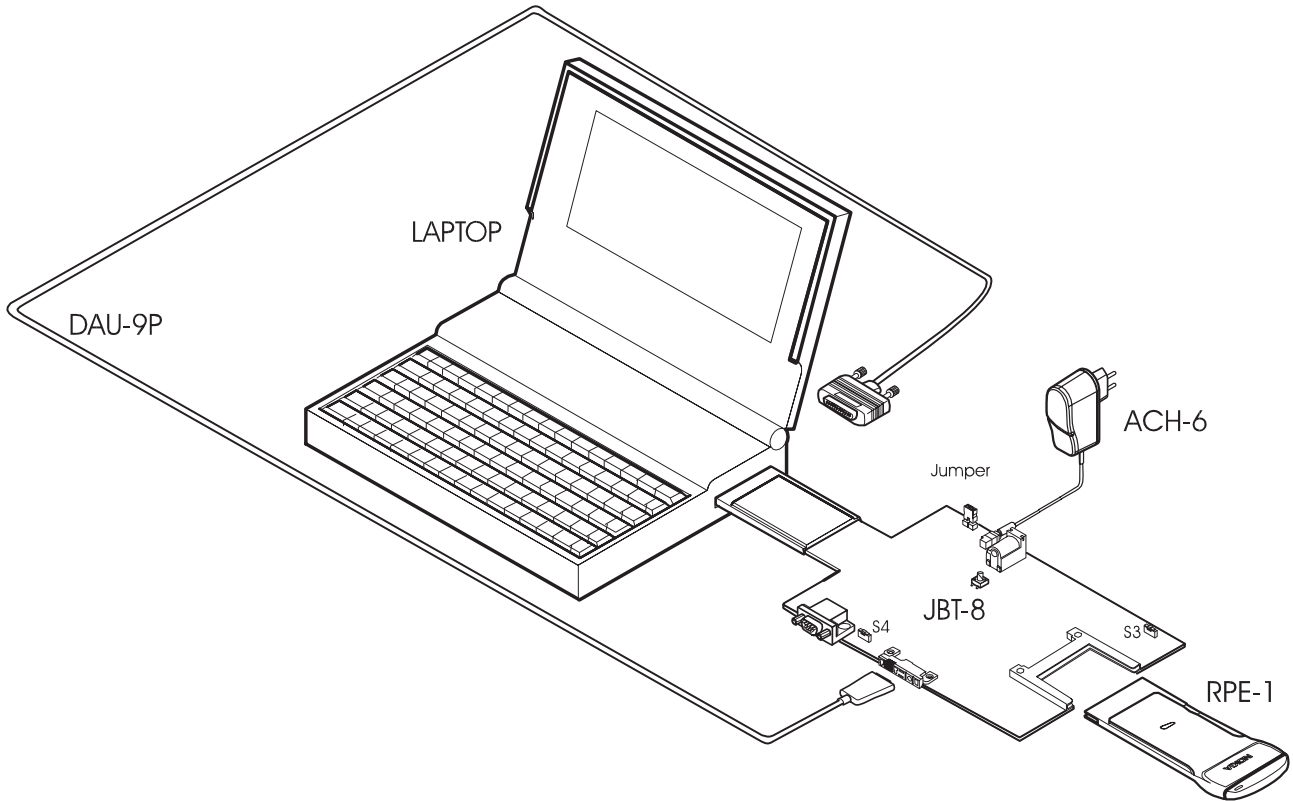
Item:	Service accessory:	Product code:
1.	Transceiver Card RPE–1	
2.	Service Adapter JBT–8	0770099
3.	Fast Travel Charger ACH–6E	0675084
4.	MBUS Cable DAU–9P	0730109
5.	RF cable XRP–1	0730124
6.	SW Security Device PKD–1	0750018

Equipment Setup for SW Upgrading with Flash Security Box
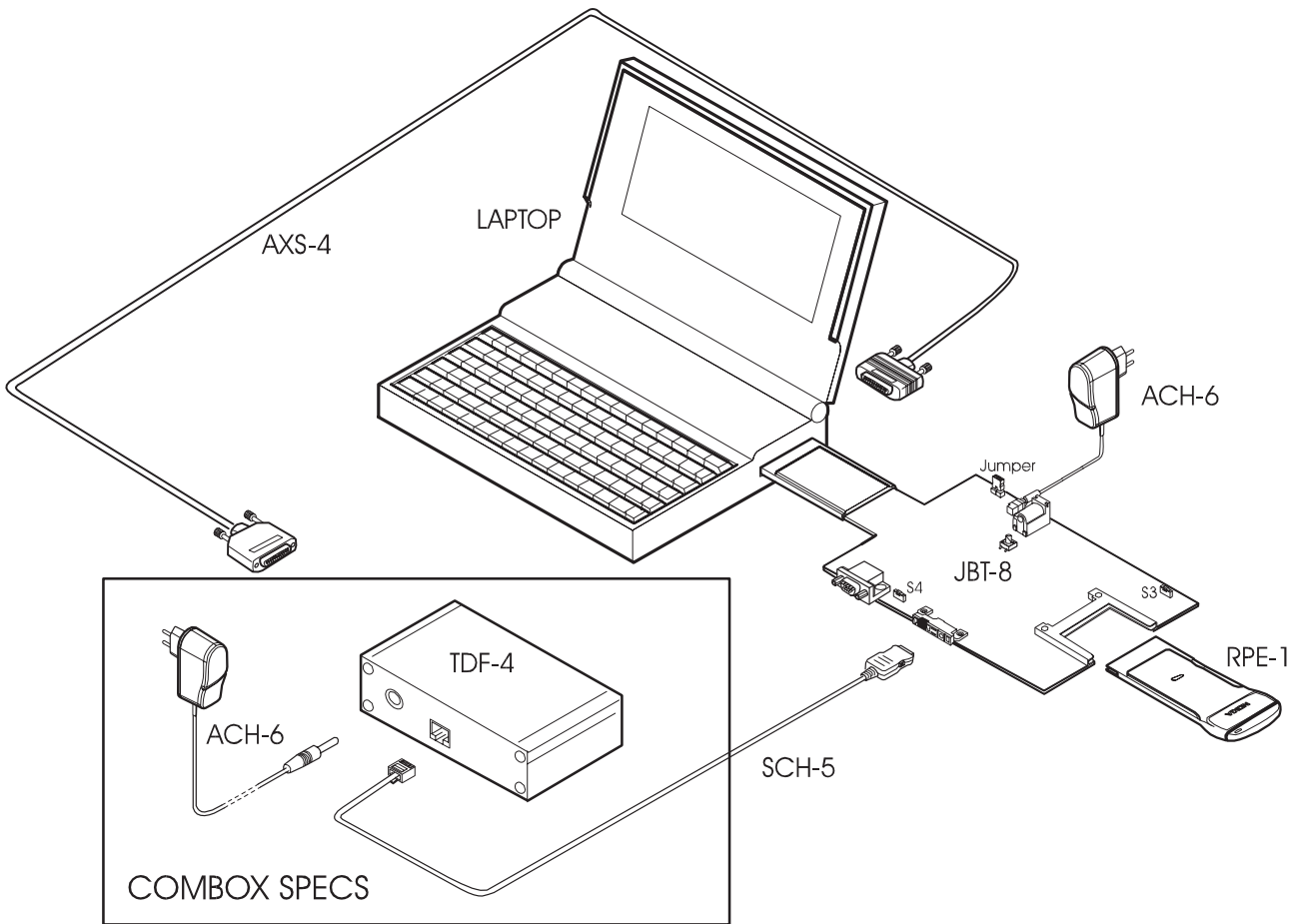
Item:	Service accessory:	Product code:
1.	Transceiver Card RPE–1	
2.	Service Adapter JBT–8	0770099
3.	Fast Travel Charger ACH–6E	0675084
4.	Flash Security Box TDF–4	0770106
5.	Service Cable SCH–5	0730098
6.	Cable Assembly AXS–4	0730090

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

– When Login windows appears press *OK* 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 947.067710 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 ±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 947.067710 MHz at level –55 dBm + RF cable attenuation.
- Check that "Cont. mode channel" is 60
- The measurement result should be;
    - Low > –20 kHz
    - Middle ±3.0 kHz (depends on generator frequency accuracy)
    - High < 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 10, 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.
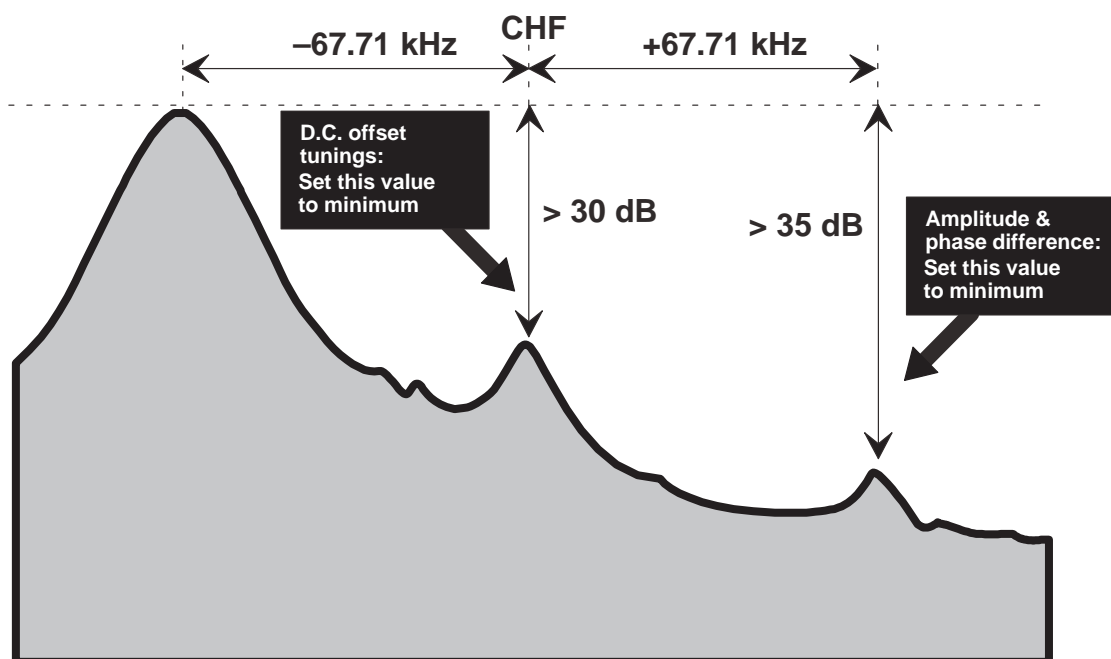
– Select option "TX I d.c. offset".

– 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 (902.06777 MHz) 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 EE-PROM. 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.

– Connect pulse power meter or spectrum analyzer to antenna connector.

– Check that channel is 60.

– Adjust the power level (levels 7, 13 and 15) with + and – buttons and change levels with $\uparrow$ and $\downarrow$ keys.

Power level	Tuning P_{OUT}/dBm (Ch 60)
7	28.5 29,0
13	17.5
15	14.2

– Press *Calculate* button to calculate all other levels.

– Once all TX levels are correct, press *OK* button.