

**Programmes After Market Services (P.A.M.S.)
Technical Documentation
NME-2A Series Transceivers**

Tuning Instructions

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Contents

	Page No
General	5
Required Equipment	5
Equipment Setup	6
Starting The Program	9
Starting options for PCLocals service software	9
Tuning Steps	10
1. RSSI Reference Signal Level Storage	10
2. AFC Diagram Storage	10
3. I/Q Modulator Amplitude Balance and Phase Shift Tuning	11
4. Tuning of Transmitter Power Levels	13

List of Figures

	Page No
Figure 1. Equipment setup with Audio Test Box –Tuning	7
Figure 2. Equipment setup without Audio Test Box – Tuning	8
Figure 3. Amplitude Balance /Phase Shift Graph	11

General

Most of the tuning are done with help of the PCLocals software. The PCLocals program turns the phone into the Locals mode, in which the phone can be outwardly controlled via the M2BUS interface.

Tuning is based on the PCLocals 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 PCLocals program 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.

If a repair has been carried out on the RF section of a system module then the appropriate tunings should be performed as described in the following section and using the on-screen help menus as a guide. Spare system modules will be delivered pre-tuned from the factory and will not require re-tuning.

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 PCLocals software; see different PCLocals Instructions for instructions on installation and use.
- M2BUS adapter DAU-2 and other service accessories; see equipment setup pictures.
- Multimeter or DVM.
- Power supply 13.2 V and minimum 5 A current capability.
- GSM radio telephone test station or separate measuring equipment as follows:
 - frequency counter (± 1 ppm)
 - 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.

To set up equipment, connect the M2BUS adapter to the serial port (RS-232) of the computer. In case you are using a 9-pin serial port (normal with an AT set) use the mating adapter supplied with the M2BUS adapter.

Attach one end of the DKH-1 modular cable to the DAU-2 PC/M2BUS adapter and the other end to the service box. Connect one end of another modular cable also to the service box and the other end to the phone's system cable.

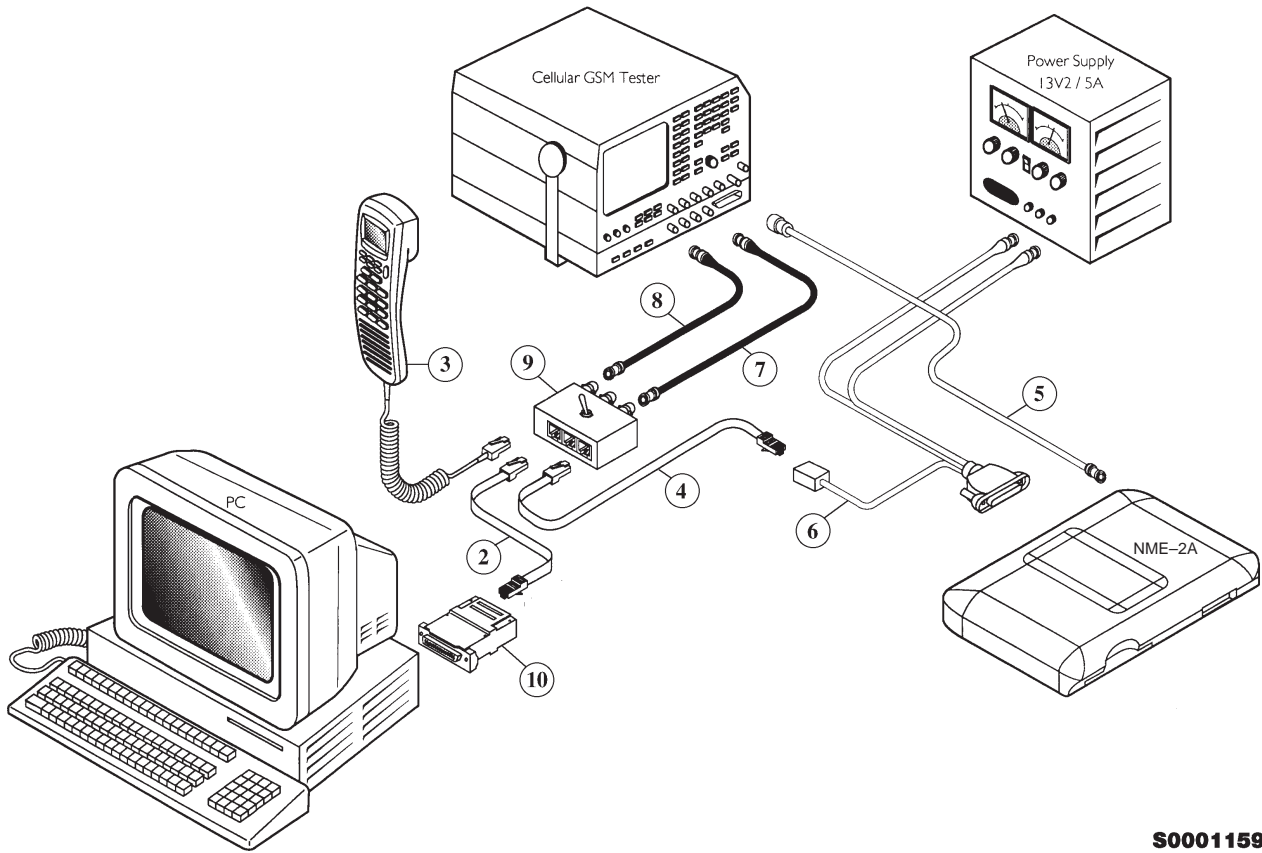
Then connect handset's spiral cable to the service box as well.

For audio testing connect the coaxial cables as follows:

- Connect both coaxial BNC – BNC cables to the connectors of service box
marked as MIC and EAR.
- Attach EAR line of coaxial cable to AF INPUT of test equipment.
- Attach MIC line of coaxial cable to MOD GEN OUTPUT of test equipment.

The RF cable should be connected between the RF connector of the phone and the RF connector of the test equipment.

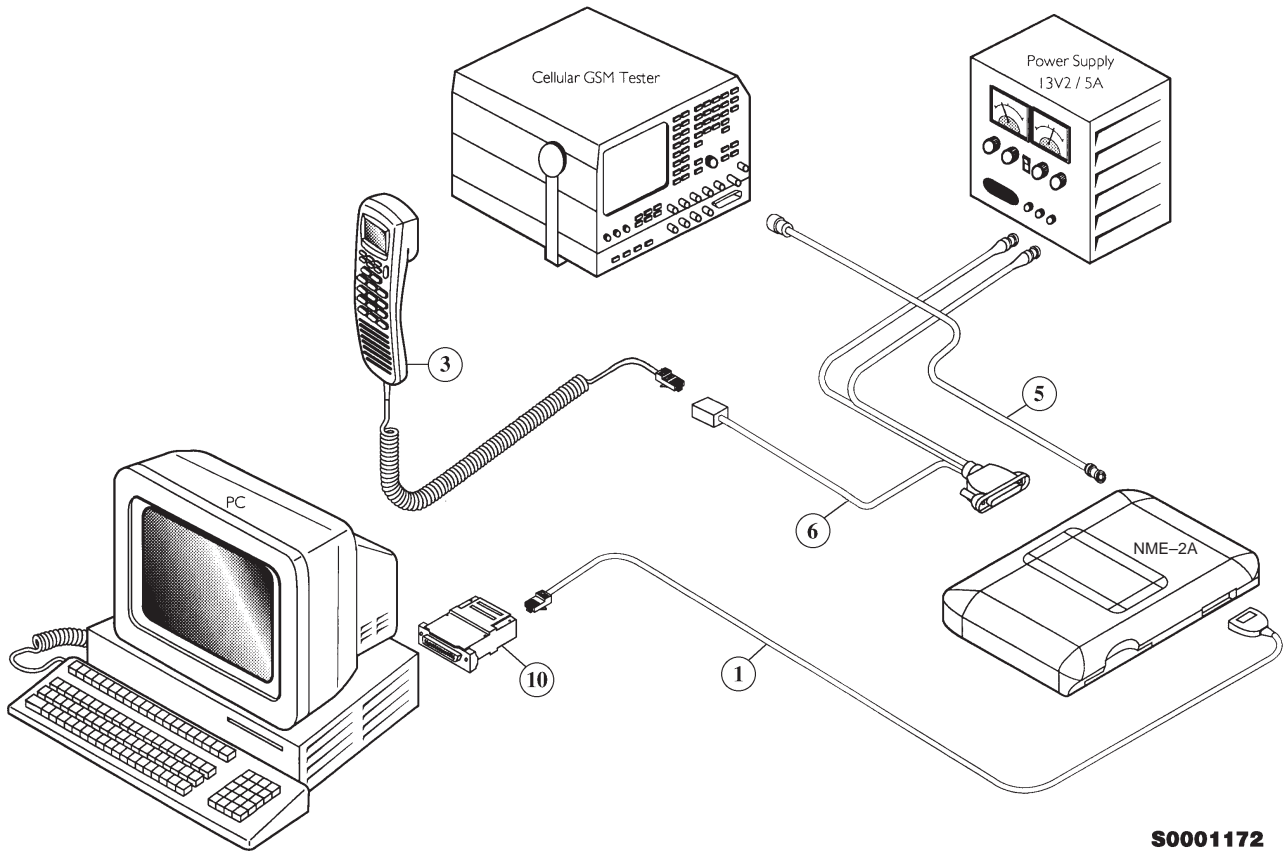
Last, connect the system cable to the phone as well as power supply and switch the power on to all equipments.



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Figure 1. Equipment setup with Audio Test Box –Tuning

Item: code:	Service accessory:	Product
2,4	Modular cable, DKH-1	9780084
3	Handset, HSE-6XA	0640098
5	Coaxial cable, mini UHF – BNC	not supplied
6	System Cable, SCM-1	0730066
7, 8	Coaxial cable, BNC – BNC	not supplied
9	Audio Test Box	TBA
10	PC/M2BUS adapter, DAU-2	0750006
–	RS-232 adapter (9 pin to 25 pin)	4626170
–	Software protection key PKD-1 "dongle"	0750018
–	Service Software diskette 3.5"	0774028
–	Service Software diskette 5.25"	0774031



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Figure 2. Equipment setup without Audio Test Box – Tuning

Item: code:	Service accessory:	Product
1	Service cable, DKH-5	0730038
3	Handset, HSE-6XA	0640098
5	Coaxial cable, mini UHF – BNC	not supplied
6	System Cable, SCM-1	0730066
10	PC/M2BUS adapter, DAU-2	0750006
–	RS-232 adapter (9 pin to 25 pin)	4626170
–	Software protection key PKD-1 "dongle"	0750018
–	Service Software diskette 3.5"	0774028
–	Service Software diskette 5.25"	0774031

Starting The Program

The program is delivered on a diskette and is copy protected with a dongle. The program can also be installed on the hard disk, which is recommendable to obtain a maximum data access rate. In case you want to store the program to the hard disk, proceed according to instructions given in PCLocals installation manual.

The program is started with the command:

NME2SERV *Enter* (or **PCLSTART** *Enter*)

The program can be set up work with different serial ports or display types.

Starting options for PCLocals service software

The program is started by entering the following command:

NME2SERV

For more information about how to operate the PCLocals software, refer to booklet PCLocals Software Instructions.

Tuning Steps

1. RSSI Reference Signal Level Storage

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

RSSI reference signal level programming:

- Start the service software and go to "Main" menu.
- Select "Phone mode" and select local mode with *Enter* key.
- Select "Testing and Adjustments" menu and press *Enter*.
- Select "Adjustments" menu and press *Enter*.
- Connect RF generator to antenna connector at 947.06771 MHz.
- Adjust signal generator level to -57 dBm + cable attenuation.
- Select "RSSI Calibration" and press *Enter*.
- RSSI offset value should be within 37...49 dB.
- AGC calibration values (Compensation Term) should be below ± 2.0 dB.
- Press *Esc* key.
- Store the value to the EEPROM with *Y* key.

2. AFC Diagram Storage

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

AFC tuning:

- Set RF generator frequency 947.06771 MHz at level -57 dBm.
- Select adjustments menu option "AFC Diagram" and press *Enter*
- Check that "Cont mode channel" is 60
- The measurement result should be;
 - Low over -22 kHz (< -10 kHz)
 - Middle ± 1.5 kHz (depends on generator frequency accuracy)
 - High below $+22$ kHz (> 10 kHz)
- Press *Esc* key and store with *Y* key.

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:

- Connect spectrum analyzer (with attenuator if needed) to phone antenna connector.
- Select adjustment menu option "TX I/Q Tuning" and press *Enter*.
- Press *Y*.
- Check that TX power level is level 10, 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.

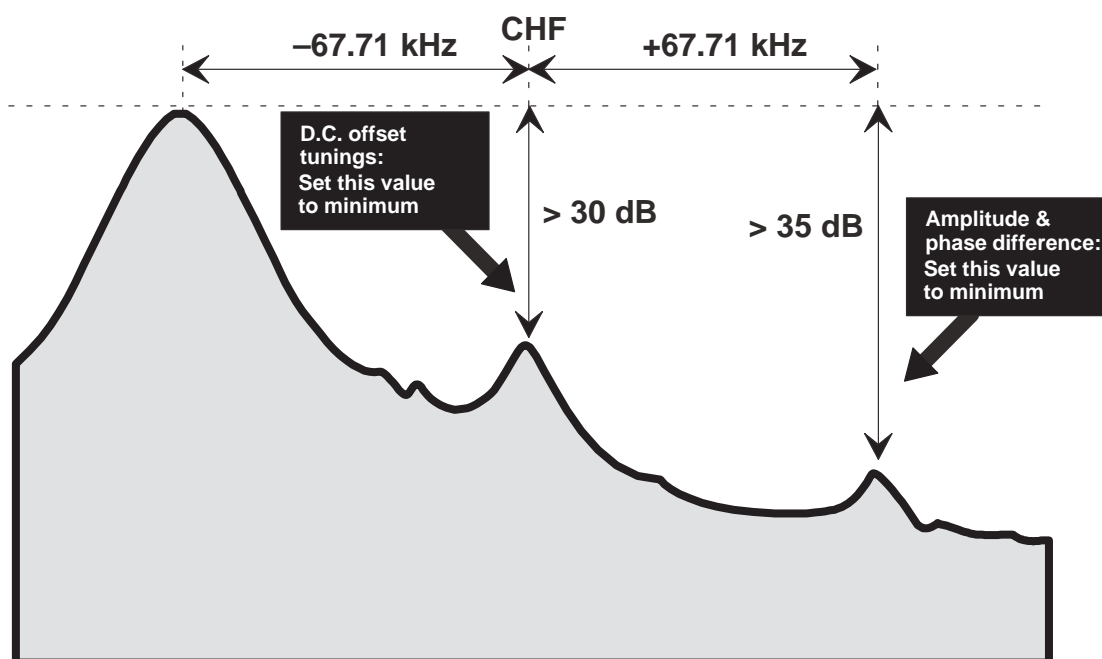


Figure 3. Amplitude Balance /Phase Shift Graph

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

- When value is OK press *Esc*.
- If the change when adjusting TX I was small, then repeat the Whole adjustment.
- Select option "TX I and Q d.c. offset" and press *Enter*.
- Adjust the level of signal CHF to minimum by varying D/A converter value with + and – keys.
- When value is OK press *Esc*.
- Select option "Tune Amplitude Difference" and press *Enter*.
- Adjust the level of signal CHF+67.7 kHz (902.06771 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.
- When value is OK press *Esc*.
- Select option "Tune Phase Difference" and press *Enter*.
- Adjust the level of signal CHF+67.7 kHz to minimum by varying D/A converter value with + and – keys.
- When value is OK press *Esc*.
- If the change in "Tune amplitude difference" was small, then repeat the adjustment again from "Tune amplitude difference".
- Press *Esc* key and store new values with *Y* key.

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.

Note: Before adjusting the power levels, you must be sure the test equipment have a measuring uncertainty less than ± 1 dB at desired levels.

Power levels programming:

-
- Connect pulse power meter or spectrum analyzer to antenna connector.
 - Check that continuous mode channel 60.
 - Select adjustments menu option "TX Power Tuning" and press *Enter*.
 - Press *Y*.
 - Start at Low-Powerlevel 15. Use F9 and F10 to tune the output with the DA step (don't tune it with the co-efficient !)

Secondly adjust power level 10 and finally level 2. To tune level 10 and 2, use the +/- keys. To change power levels, use up/down keys.

Power level	Tuning P _{OUT} /dBm (13.2 V, CH60)
2	39 <i>tune! Pwr coef</i>
3	37
4	35
5	33
6	31
7	29
8	27
9	25
10	23 <i>tune! pwr coef</i>
11	21
12	19
13	17
14	15
15	13 <i>tune! D/A step</i>

- Press *F3* to calculate all other levels.
- Once all TX levels are OK, press *Esc* and store readings in phone EEPROM with pressing *Y*.

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