

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

**Service Software
Instructions**

AMENDMENT RECORD SHEET

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General

The Service Software "PCLocals" is specially designed to facilitate the servicing of GSM cellular telephones.

The software can be used to control the phone according to the user's wish merely by entering commands via the keyboard of a PC/AT connected to the phone.

This section refers to GSM PCLocals Version 1.0. To receive a free upgrade, please follow the de-install instructions in Appendix I and send the disk to Nokia Mobile Phones.

Required Servicing Equipment

- Computer: IBM PC/AT or compatible with one unused serial port (COM1 or COM2 ^{*)}, one parallel port (LPT1), hard disk recommended
- Operating System: DOS Version 3.2 or later
- Display: Any 80-character text display
- PCLocals program, 3.5" disk (product code: 0774028)
5.25" disk (product code: 0774031)
- Software protection key PKD-1 (product code: 0750018)
- M2BUS adapter DAU-2 (product code: 0750006)
- Modular cable XCM-1 (product code: 4626131)
- RS-232 adapter, 9-to-25 pins (product code: 4626170)
- Service cable SCS-1 (product code: 0770010)
- Service box JBS-7 (product code: 0770015)
- Power connector PCS-1 (product code: 0730012)
- Audio cable ADS-1 (product code: 0730011)
- Mini UHF – BNC cable

***) Note:** A number of PC's of an older generation use the Intel, National Semiconductor, or United Microelectronics IC 8250 as the serial port UART. This is a comparatively inefficient circuit for current purposes and does not necessarily support the M2BUS adapter at 9600 baud. The newer UART's NS16450 and NS16550AF of National Semiconductor offer solutions for these problems.

Mechanical Connections

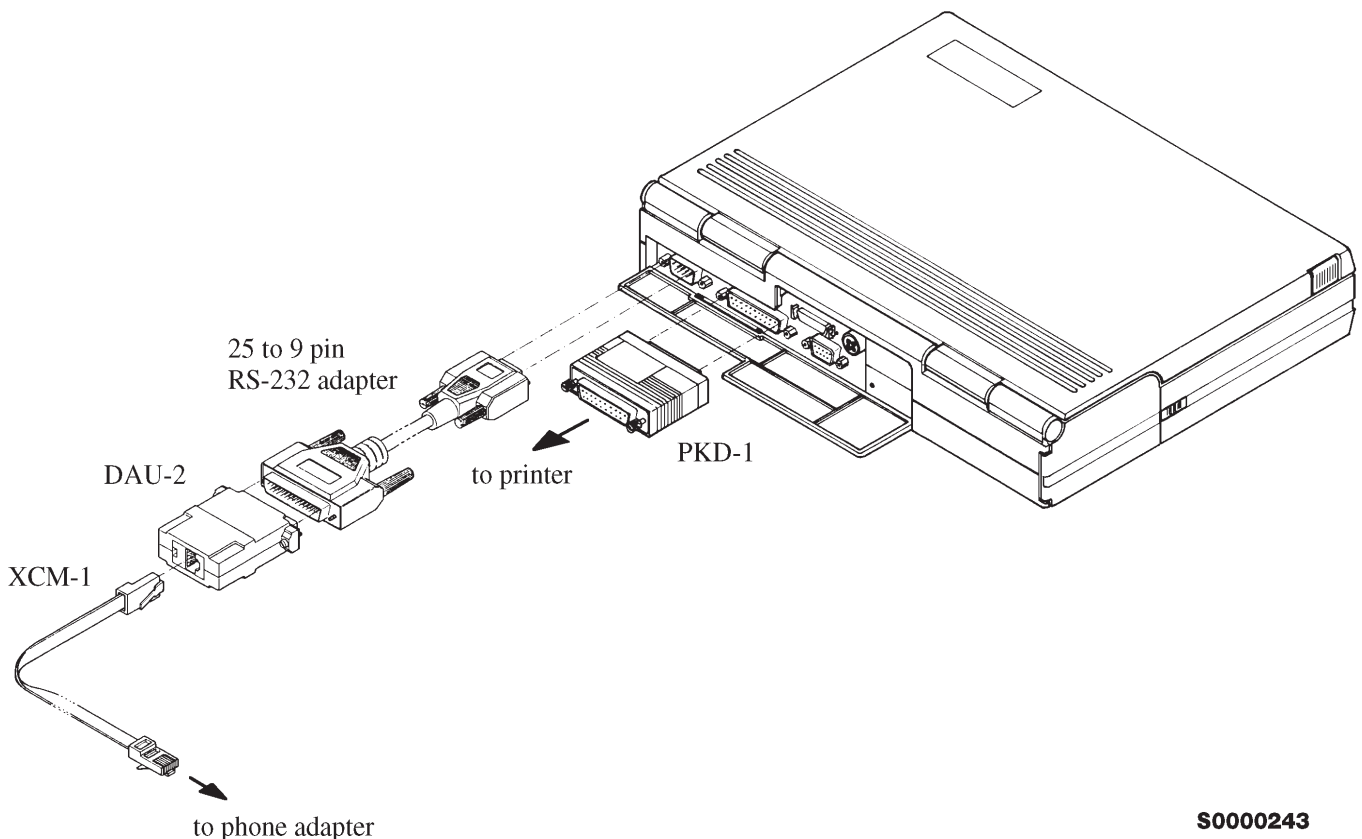
Caution: Make sure that you have switched off the PC and the printer before making connections !

Caution: Do not connect the PKD-1 key to the serial port. You may damage your PKD-1 !

The software controls the phone via a separate adapter connected to the serial port of the PC and to the telephone's M2BUS (DAU-2 and XCM-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.

The PKD-1 should not effect devices working with it. If some errors occur (errors in printing are possible) please try printing without the PKD-1. If printing is OK without the PKD-1 please contact your dealer. We will offer you a new PKD-1 in exchange for your old one.



S0000243

Figure 1. Connection Diagram

NOTE: When using a laptop to run PCLocals ensure the Powersave function of the laptop is switched **OFF**.

Connect the M2BUS adapter (DAU-2, item 11) to the serial port (25-pin male D-connector). In case your PC (as AT types in general) has a 9-pin serial port use the special connector adapter cable provided (item 8).

Attach one end of the SCS-1 service modular cable to the DAU-2 PC/M2BUS adapter and the other end to the phone data connector.

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

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

- Connect a modular cable XCM-1 to system cable handset connector.
- Attach T-adapter to other end of the modular cable.
- Connect handset and audio cable ADS-1 into T-adapter.
- Attach EAR line of audio cable to AF INPUT of test equipment
- Attach MIC line of the audio cable to MOD GEN OUTPUT of test equipment

Starting

Start the phone by pressing the power on button of the handset. Switch PC power on.

To start the program on diskette, proceed as follows:

1. insert PCLocals diskette into drive A: of your PC
2. log into drive A: *type A: and press Enter*
3. start NME2SERV.BAT and run PCLocals *type **NME2SERV** and press Enter*

To start the program on hard disk (if installed), proceed as follows:

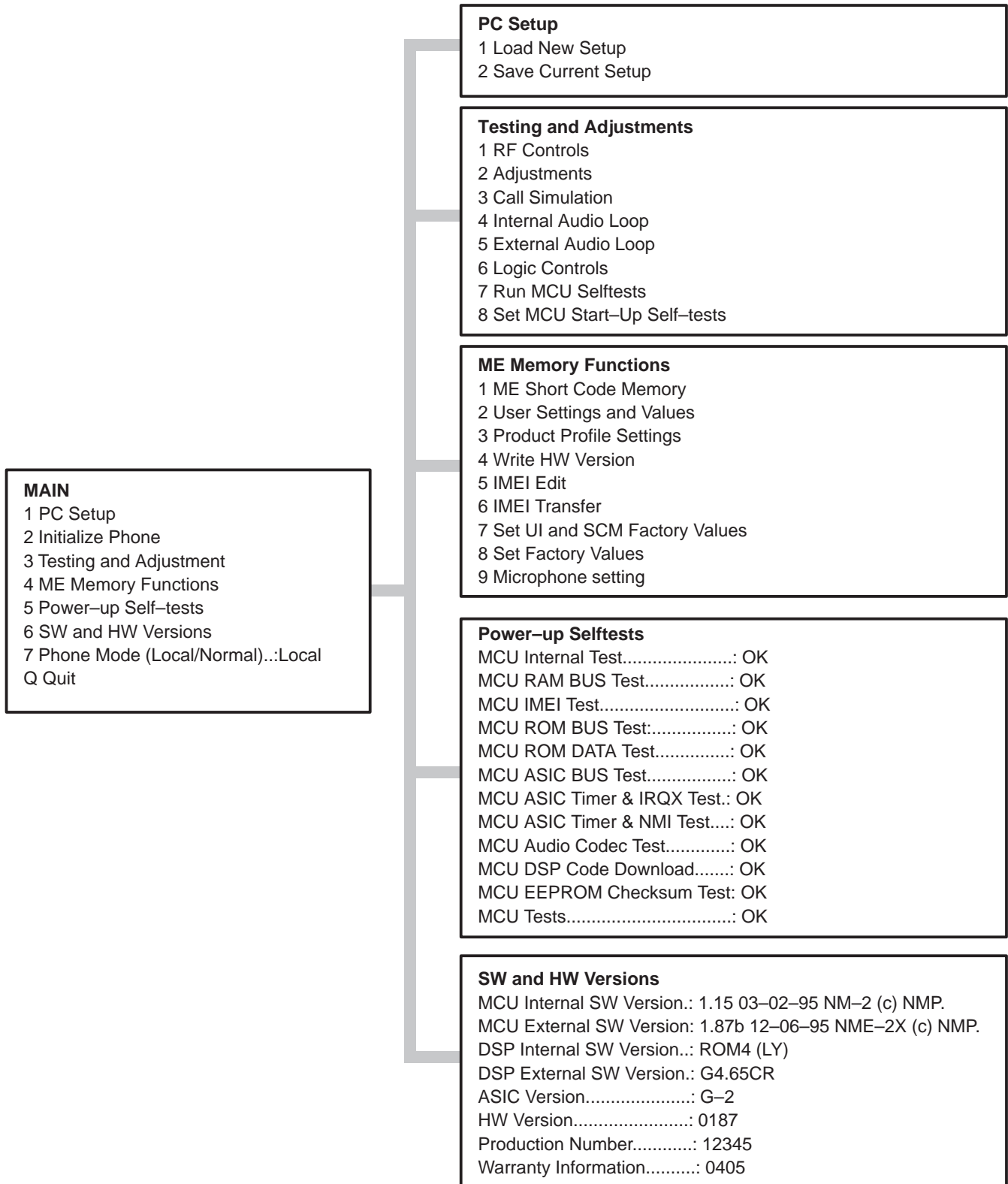
1. log into drive C: *type C: and press Enter*
2. start NME2SERV.BAT and run PCLocals *type **NME2SERV** and press Enter*

Note: See installation instructions in Appendix I.

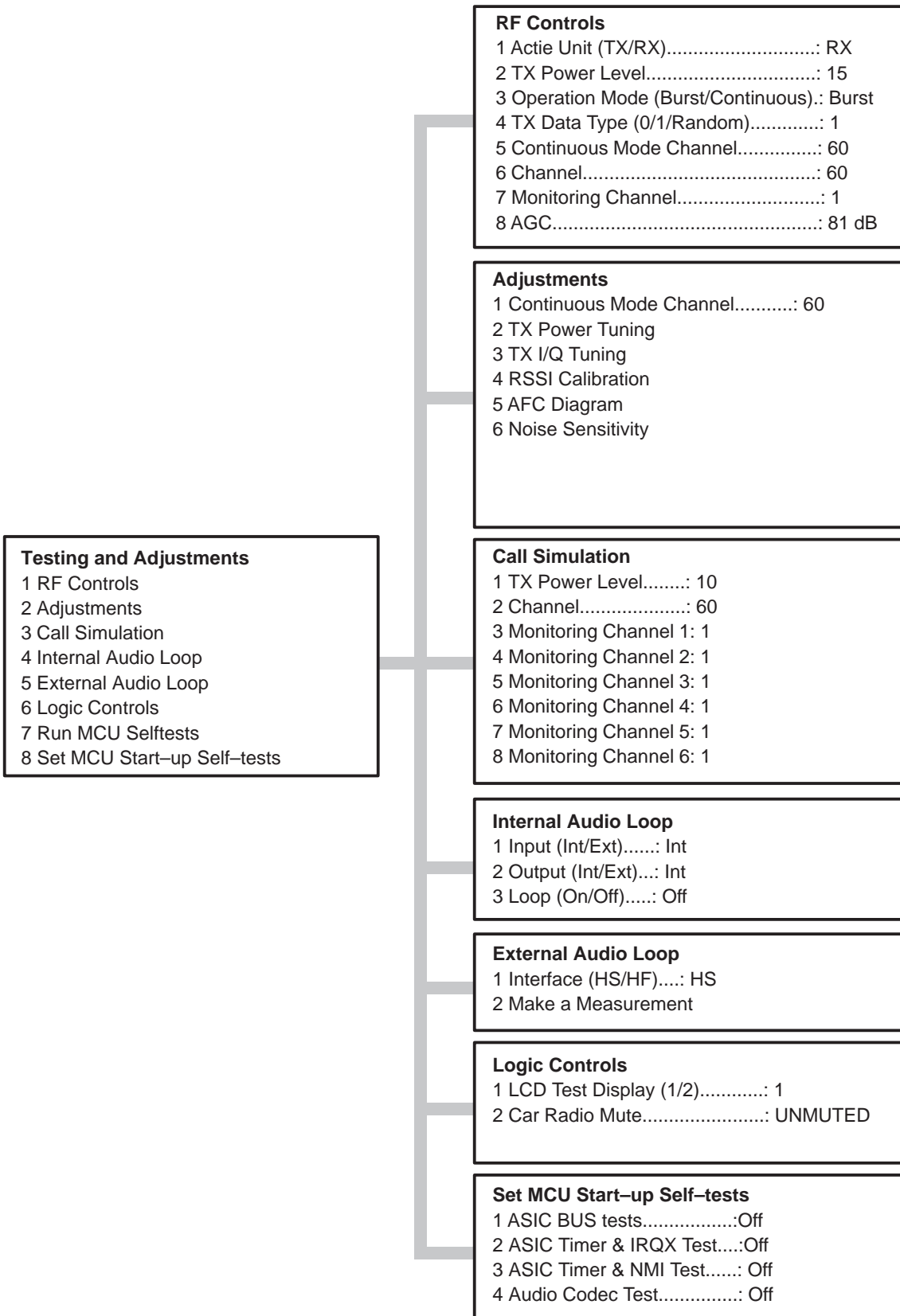
Note: For more information on PCLocals starting options, see Appendix II.

The PCLocals software version can be seen on the screen. Press *Enter*; the phone begins to scan the GSM channel. If the phone cannot find the correct reference channel, press *Esc* to seeing the main menu.

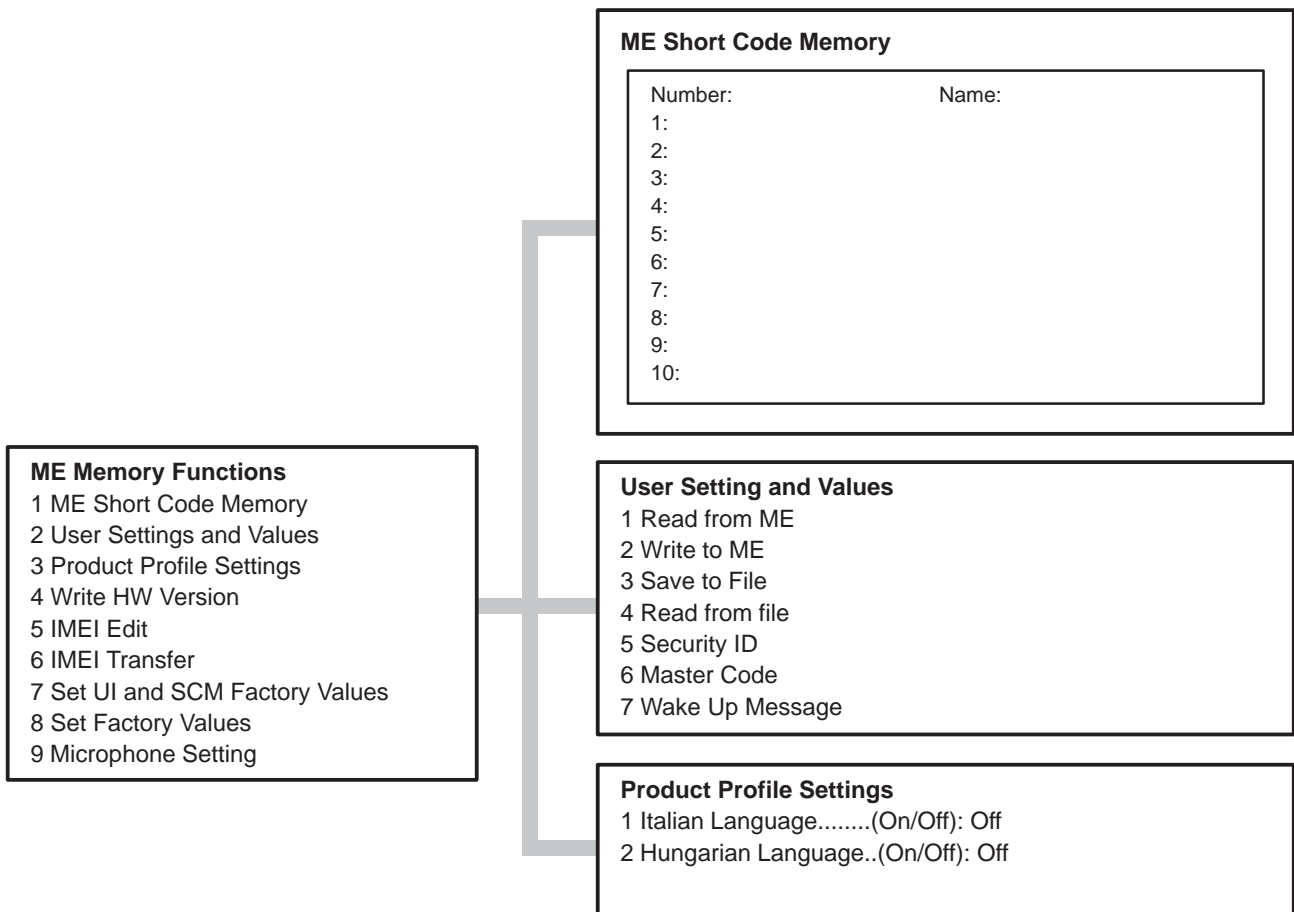
PCLocals Menu Structure, Main Menu



PCLocals Menu Structure, Testing and Adjustment Menu



PCLocals Menu Structure, ME Short Code Memory



Using Menus

All menu selections have a separate selection character in the first column. This character is a number, a letter or a special ASCII character (e.g., + or -). Menus have a fixed constant display structure, i.e. the texts cannot be scrolled.

You can select a function from a menu in two different ways. The first way is to press the key on the PC keyboard corresponding to the first character of the line. The other way is to move the cursor from line to line using arrow keys and make the selection with the *Enter* key.

When you have made your selection the new menu or window will appear on the PC screen. Every menu and window carries a name on the topmost line. The name is the same as the selection in the previous menu or window. When the new menu is activated the old one will disappear.

When a window is activated the selectable keys are seen in the window. Windows may have a scrolling or a constant display.

Common control key symbols are always seen on the help line (line 25) and the keys may be used always when seen on the last line.

With a window or menu active the *Esc* key is pressed to quit selection, put out the window or menu and bring the previous menu or window to the display. The *Esc* key doesn't have any effect when it is used with the main menu. When editing data the *Esc* key can be used as interrupt key. During edition the *Enter* key is used as exit key.

Help Functions

The last line (line 25) will always list the special keys which can be used. The help key *F1* can be used anytime when the menu is on the display. When the help key is used a new window will appear on the screen. The new window contains a text that describes the function over which the cursor was when the help key was used. The *Esc* key will move the cursor back to the menu and the help window will disappear.

Text Editing Windows

When you have made a selection which needs some additional information, the basic text editing window is activated.

The text editing window may have one or more editing lines. The length of the line varies depending on the function. When the window is activated the text which was previously in that window (default text) reappears on the screen.

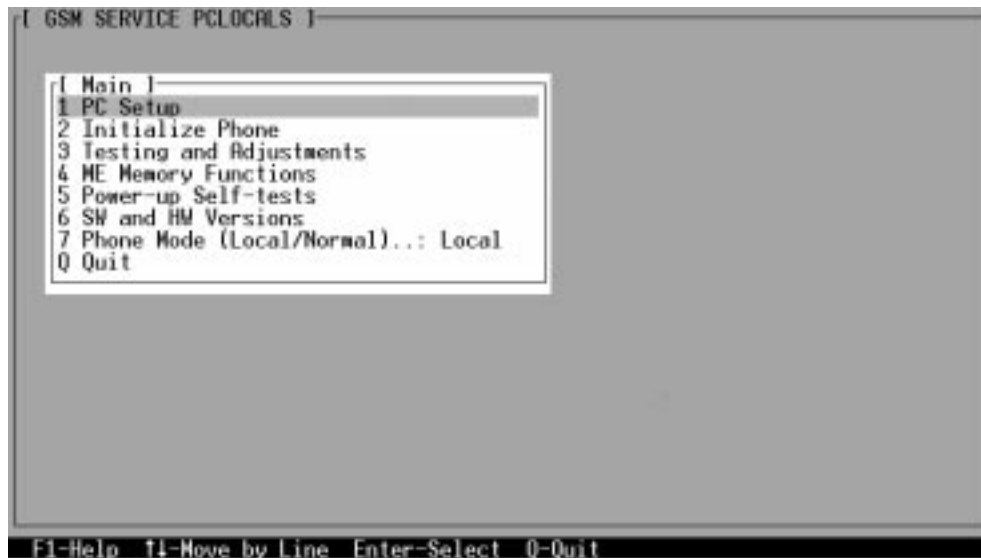
The following key selections are possible:

| Key | Function |
|--------------|--|
| <i>Enter</i> | Selects the text in the window; the editing window is turned off. The selected text will be the default text of the selection. |
| <i>Esc</i> | Interrupts editing; the previous menu is shown and the default text won't be updated. |
| <i>Ins</i> | Toggles the editing mode between insert and overstrike modes. The last line of the screen tells the current editing mode. When editing ends the editing mode is retained and same mode is used again when editing text. |
| ← | Arrow keys (right shift and left shift) move the cursor. The cursor moves as if the lines were positioned one after another. For instance right shift causes the cursor to move from the last column of the first line to the first column of the second line. If the right shift is used and the cursor is at the last position of the last line, the cursor is not moved. Similarly, the cursor does not move with the left shift key when it is at the first position of the first line. |
| <i>Home</i> | Moves the cursor to the start of the text. |
| <i>End</i> | Moves the cursor to the end of the text. |
| <i>BS</i> | The backspace key has two different meanings depending on the editing mode; <ul style="list-style-type: none"> • When the overstrike mode is activated the <i>Backspace</i> key moves the cursor back and changes the character under the cursor into a space. If the cursor is at the first position of the first line nothing happens. • When the insert mode is activated the <i>Backspace</i> key moves the cursor back and deletes the character under the cursor so that all characters after the deleted character are moved one position back. If the cursor is at the first position of the first line nothing happens. |

- Del* Has also two different meanings depending on the editing mode;
- When the overstrike mode is activated the *Del* key changes the character under the cursor into a space and moves the cursor for ward. If the cursor is at the last editing position of the last line nothing happens.
 - When the insert mode is activated the *Del* key removes the character under the cursor so that all characters after the removed character are moved one position back. If the cursor is at the last editing position of the last line nothing happens.
- F1* Function key number 1 activates the help window.
- F4* Clears text in the editing window.

PCLocals Menu Commands

When you start the PCLocals program, the main menu can be seen on the screen. There are eight main functions;



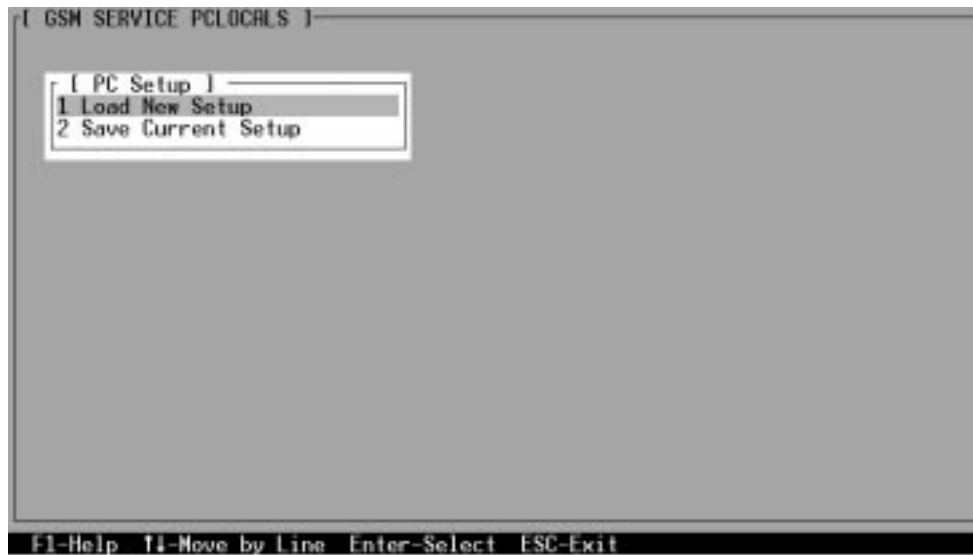
```
( GSM SERVICE PCLOCALS )
| Main |
1 PC Setup
2 Initialize Phone
3 Testing and Adjustments
4 ME Memory Functions
5 Power-up Self-tests
6 SW and HW Versions
7 Phone Mode (Local/Normal)...: Local
0 Quit

F1-Help F4-Move by Line Enter-Select 0-Quit
```

The phone should be in the local mode for the third and fourth functions. (After the program has started the phone automatically assumes the GSM mode). You can change phone mode by choosing function "7 – Phone mode".

The number identifier of each title refers to a main- and a sub-menu item. E.g., in *3.1.2 TX Power Level*; the first number (3) refers to the third block "3 – Testing and adjustment" of the main menu. The second number (1) refers to the first block "1 – RF control" of the testing and adjustment menu. The third number (2) refers to the second block "2 – TX power level" of the RF control menu.

1 – PC Setup



When save setup is selected the basic text window is made and the program asks setup file name. Enter the file name or use the default. Save with the *Enter* key. The saved information includes all next selections (on mentioned menus or windows) and parameters:

- Command line parameter value for COM port selection
- RF Controls menu
 - All selections
- Call Simulation
 - All selections which are not same as in the RF Controls menu
- Tuning parameters (PC default values; no effect on EEPROM values)
 - TX power coefficients
 - Power connection diagram
- Run MCU Self-tests
 - All selections

Next selections are **not saved** to setup file:

- Values which are asked from MS
 - AFC value
- Main Menu
 - Phone Mode (Start value = Normal)

- PC Setup menu
 - Default name for setup file (Start value = NME_2.CON)
- Internal audio loop:
 - input (Start value = Int)
 - output (Start value = Int)
 - loop (Start value = Off)
- External audio loop:
 - interface (Start value = HS)
- Logic controls
 - Car Radio Mute, CRM (Start value = Unmuted)
 - LCD Test Display (Start value = 1)

Load function generates same kind of basic text window as save function and asks setup file name. When the name has been give and *Enter* key has been used the file is loaded and all previously told selections and parameters are replaced with the values taken from the file. This has same effect as command line parameter -f.

Both save file and load file function has default name which is previously used name. For instance if setup was saved to file CONF.CON and load function is activated the default value is CONF.CON. If only *Enter* key is pressed default value is used. If *Esc* key is used the function will be interrupted. If invalid DOS filename is used or there isn't load file with given name error message will come to the display.

If phone mode had Local value before setup file loading, the mode is changed to Normal in the phone by special Normal mode message and all functions caused by the change are done. If mode was Normal before new setup, all needed setup file settings are sent to MS as in the previous case, but phone mode change command is not sent to MS. Note next exception: If phone mode is Normal and interface is M2BUS and communication port is different in the setup file than the value before file loading, then also Normal phone mode message has to be sent to MS.

Every time when phone mode change message from Local to Normal is received by MS it makes reset to the whole MS.

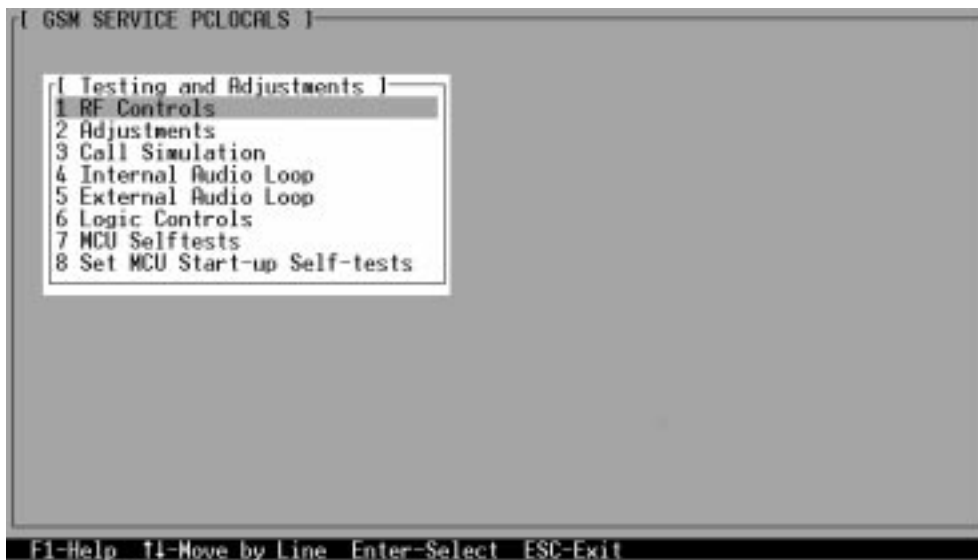
2 – Initialize Phone

With this function you can initialize the phone to accept M2BUS commands from the PC. This function should be used right after the phone is connected to the PC and powered up.

The initialization function performs the following sub-functions:

- MBUS registration
- Test mode message sent to the phone
- Phone mode set to GSM
- AFC value removed from info window

3 – Testing and Adjustments



When testing and adjustment menu is selected, the phone mode must be set to the "Local" value. If the local mode is not set, the error message is shown.

Caused by the test interface slowness when M2BUS is used there may be some delay between the user interface updating and the register controls in the hardware.

3.1 – RF Controls



RF Control Information Window

When RF controls menu is activated, the information window will be generated and it is updated when information is changed. This window is removed when exit is made from RF controls menu. The shown window type is used when burst operation mode is selected.

The text in the window has same meaning as in the selection menus. TX Power have value OFF or transmission power as GSM value. When the TX power is tuned with test value (smallest value) the TX Power has value TEST.

AGC value is shown only when its value is controlled by PC. When Active Unit has value RX and Operation Mode is continuous, AGC is controlled by PC except when next adjustment functions are activated:

- RSSI Calibration

The next table shows the information window display on different situations:

| | | |
|--|--|--|
| Active Unit = TX | Operation mode = BURST | Operation mode = CONT. |
| TX Data Type: AGC Values: TX Power Level: Continuous Mode Channel: Channel: Monitoring Channel: | Updated Removed Updated Removed Updated Removed | Updated Removed OFF Updated Removed Removed |
| Active Unit = RX | Operation mode = BURST | Operation mode = CONT. |
| TX Data Type: AGC Values: TX Power Level: Continuous Mode Channel: Channel: Monitoring Channel: | Removed OFF Removed Removed Updated Updated | Removed OFF Updated Updated Removed Removed |

3.1.1 – Active Unit

Either receiving or transmission tests can be selected. When TX is selected, the next functions are made:

- Data transmission is activated
- If operation mode is continuous,
- Continuous mode TX channel is activated
- If operation mode is burst,
- TX power is activated
- TX channel is activated
- Information window is updated

When RX is selected, the next functions are made:

- Data transmission is deactivated
- TX power is deactivated
- If operation mode is continuous,
- AGC is controlled
- Continuous mode RX channel is activated
- If operation mode is burst,
- RX and monitoring channel are activated
- Information window is updated

3.1.2 – TX Power Level

With this function is possible to change the transmission power. When the selection is made, the basic text editing window will come to the screen. The user can give the needed GSM power value (2...15) or select the test value, which is tuned with TX power tuning function. The test value selection is made by writing "test" with small or capital letters.

3.1.3 – Operation Mode

When burst selection is used,

- synthesizer is controlled by using GSM receiving/transmission /measuring synthesizer control sequence
- synthesizer channel numbers are as given with Channel/Monitoring Channel selections
- if Active Unit is TX, data (selected with TX Data Type) is sent and the TX power is connected

When continuous selection is used,

- synthesizer is set to constant frequency
- synthesizer channel number is as given with Continuous Mode Channel selection
- if Active Unit is TX, data (selected with TX Data Type) is sent
- transmitter power is not connected
- if Active Unit is RX, AGC is controlled

3.1.4 – TX Data Type

This function changes the transmission data type. Every time when selection is made the next value in the list is shown (i.e. 0/1/Random). After random data selection 0 is used. If operating mode is continuous, TX data type random causes different data sending than in burst mode.

3.1.5 – Continuous Mode Channel

Basic text editing window is used for giving continuous mode channel number. Continuous mode may have all GSM channel numbers (GSM: 1...124). The used frequency depends on the active unit. If active unit is RX, then RX frequency is used, else TX frequency.

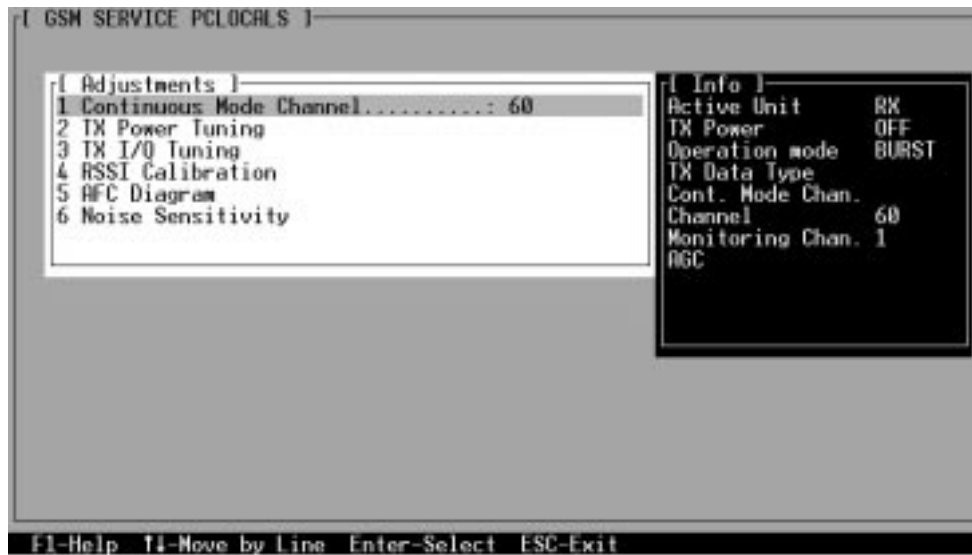
3.1.6 – Channel; Monitoring Channel

Basic text editing windows are used for giving burst mode channel numbers. "Channel" selection numbers are used for both transmission and receiving. "Monitoring channel" is selected separately for neighbor monitoring channel. All GSM channel numbers (in GSM phone: 1...124) are valid.

3.1.7 – AGC

After this selection new window will be made and AGC value can be edited in the basic text editing window. The AGC can have values (GSM: 0...93 dB) by 3 dB steps. If the number is not divisible evenly by 3 the number is rounded to the next bigger number divisible by 3. Only the number is edited (not letters dB).

3.2 – Adjustments



All adjustments which have EEPROM saving selection have the next kind of behaving with *F2* and *Esc* keys.

When adjustment function is activated and *F2* key is used, the program will ask whether the values should be saved to the EEPROM or not. If *Y* key is used, adjustment values are saved to the EEPROM. If *N* or *Esc* key is used the adjustment can be continued. If any other key is used nothing happens.

When *Esc* key is used during adjustment function, the program will ask whether the values should be saved to the EEPROM or not. If *Y* key is used, adjustment values are saved to the EEPROM and exit from the function is done. If *N* key is used exit is done from the function and nothing is saved to the EEPROM. If *Esc* key is used the adjustment can be continued. If any other key is used nothing happens. When exit is made from the adjustment menu, the used adjustment values are used with the normal DSP control commands in the local mode (i.e power connection diagram and power levels).

3.2.1 – Continuous Mode Channel

Continuous mode channel number can be selected from Adjustments menu. The real frequency (transmission or receiving frequency area) depends on the Active Unit selection and the selected tuning function. Active Unit defects to the frequency when no selection is made from the Adjustments menu. Note that this is same selection as in the RF Controls menu.

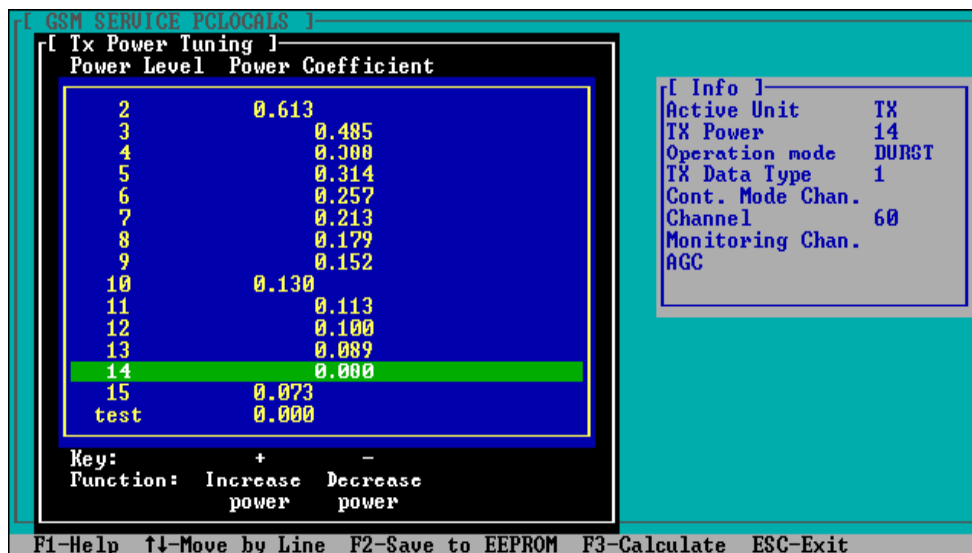
3.2.2 – TX Power Tuning (See updated version of PC Locals)

The next question is made to the user:

Values from EEPROM? (YES/NO) _

The user is also informed that TX power will be connected to lowest value if he does not break the selection with *Esc* key.

If *Y* key is used, tuning values from EEPROM are loaded. If *N* key is given, the values which PC program normally uses when DSP is controlled are used. If *Esc* key is used the selection is interrupted and the previous menu is shown on the screen. If any other key is used nothing happens. PC program values are tuning settings which are used for DSP control in the local mode.



The test power is selected automatically when the function is started. The power is presented in GSM values (2...15) the test power is selected automatically when the function is started. The test value is always same when the function is started first time after PCLocals start-up. The test value is not saved to the EEPROM. The test value can be changed during tuning as other power coefficients and the program remembers its value when tuning function is activated later again.

There is one selection which is used for power coefficient calculation. Only three power levels are needed to tune (DA Step at power level 15 and coefficients at level 10 and 2), the rest are calculated with F3.

The calculation is activated with F3 key. The power coefficients which are calculated from the tuned coefficients are displayed on the different columns than the others. All values can be tuned if needed.

The next automatic selections are made when this tuning function is activated:

- if transmission data is neither 0 nor 1 then continuous 1 data is selected
- Active Unit = TX
- the biggest power level is selected
- Operation mode = Burst
- Channel = 60

The cursor is shown on the tuning position. Next value is selected with arrow keys.

+ and – keys will cause power changing by 0.25 dB steps (D/A converter control value ratio is 1.0292). When these keys are used the coefficient value is updated on the tuning window.

When save or exit selection is used, the power value checking is made and if it is not succeeded, error message is shown. The test checks if all power coefficient values are in the same order of magnitude as power levels in the table.

When TX Power Tuning is ended and if the power values are not acceptable, the error message is displayed and the user is asked to continue or break the tuning. The next answers and responses are in use:

| Key | Response |
|------------------------|---|
| <i>N</i> or <i>Esc</i> | The tuning is continued |
| <i>Y</i> | The tuning is ended without EEPROM writing and power coefficients are asked from EEPROM (this is also informed to a user) |
| other key | – |

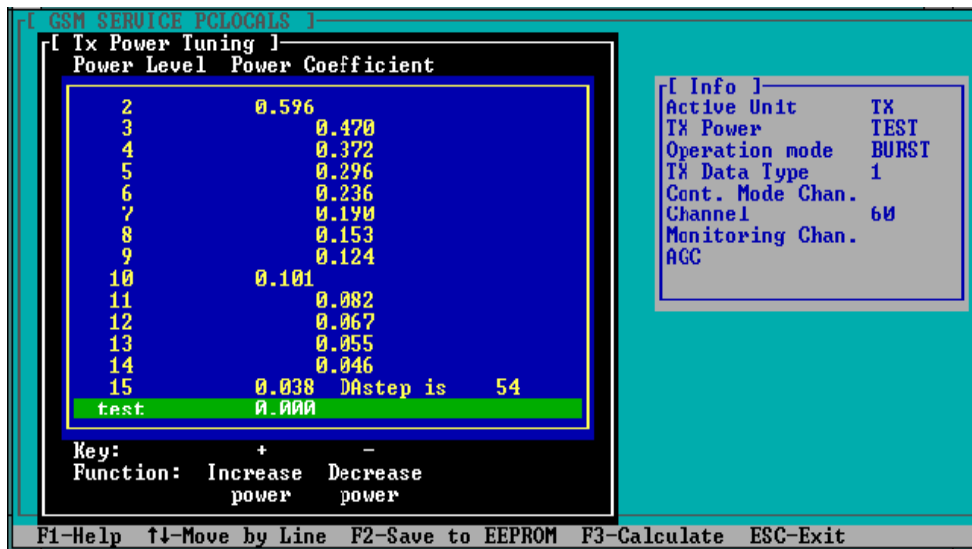
If the power tuning function is ended and EEPROM values are not received or EEPROM fault is noticed, an error message is shown. Error message asks to check M2BUS interface or set factory values. When any key is pressed, adjustment menu is selected and PC values are used as power coefficients, even though they have wrong values.

3.2.3 – TX Power Tuning (HW version 5.0 onwards)

From HW version 5.0 onwards a new way of compensating off-set values on the transmitter control line has been implemented; this consists of a D/A converter injecting an inverse offset voltage to cancel out initial offset.

The program automatically detects the HW version and shows controls for the D/A converter if the HW version is 5.0 or higher.

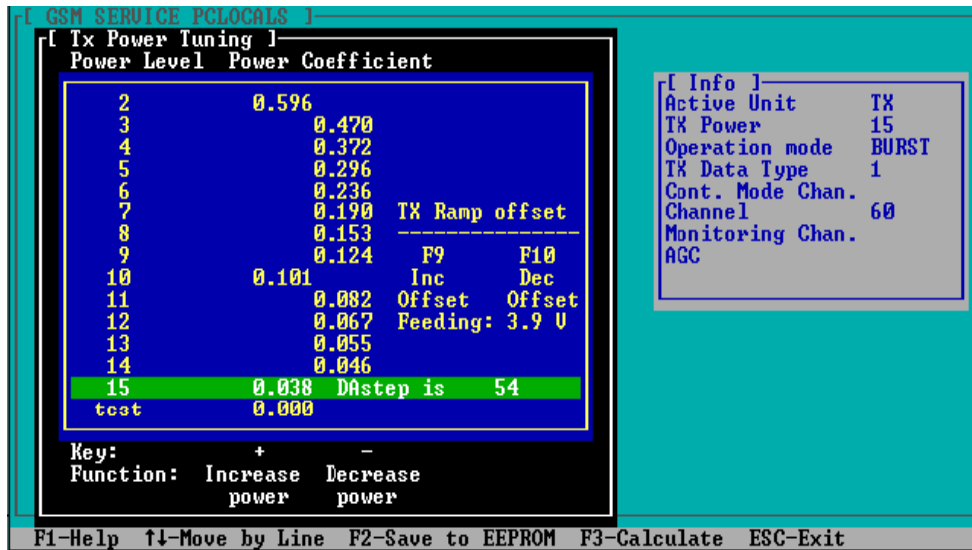
In this case the screen will be as shown below.



At level 15 the actual step of the D/A is displayed. The count can range from 0 to 63. The D/A converter can be controlled when positioning the bar at power level 15.

Having the bar positioned at any other level causes the program to display the D/A converter step only.

With the bar positioned at level 15, the following screen is shown.



Now F9 and F10 are used to control the D/A converter and subsequently the feeding voltage (to cancel out the initial offset) is displayed.

Tuning for HW vesion 5.0 differs from the earlier versions as such: The output power at level 15 MUST be tuned using the D/A converter; the rest of the tuning remains the same.

If the TX Power Tuning is ended and power coefficients are acceptable, the PC SW behaves as follows;

| Key | Response |
|-----------|--|
| Y | The coefficients are written to EEPROM and tuning is ended |
| N | The tuning is ended without EEPROM writing but the tuned coefficient values are used when RF controls are used |
| Esc | The tuning is continued |
| other key | - |

When all power coefficients have such values that they don't cause any error messages, exit can be made. The last used tuning power is in use after exit.

The next automatic selection is made when this tuning function is ended:

- Active Unit = RX

3.2.4 – TX I/Q Tuning

This function is used for tuning TX I and Q branch DC offset, amplitude difference and phase difference.

The function causes the same question about values (from EEPROM or PC) as power tuning.

The next automatic selections are made when this function is activated:

- Active Unit = TX
- Operation Mode = Burst
- TX Power Level = 10 (GSM)
- If TX Data Type= RANDOM => TX Data Type= 1
- Channel = 60 (GSM)

The next menu is displayed after the answer.



When one of the selection is made the menu will disappear from the display and the control will be on the tuning window.

On the right top hand corner of the tuning window is shown what tuning is activated. User can tune the current value with the plus + and minus – keys.

Tune TX I DC Offset

The DC Offset is shown as percentage (%) from the maximum value. 0 % means that there is no DC. The value range is –100 %...100 %. The value is rounded to the nearest integer value. When this tuning is active the text "I DC OFFSET TUNING" will be on the top right hand corner of the display.

Tune TX Q DC Offset

The operation of this function is the same as one above, except with this selection the Q branch DC Offset is tuned. When this tuning is active the text "Q DC OFFSET TUNING" will be on the top right hand corner of the display.

Tune TX I and Q DC Offset

The operation of this function is the same as one above, except with this selection the both I and Q branch DC Offset is tuned. When plus + or minus – key has pressed the both values are changed to the same direction. If another value is in the limit value it does not change, but the other value will change. When this tuning is active the text "I AND Q DC OFFSET TUNING" will be on the top right hand corner of the display.

Tune Amplitude Difference

When this selection is made user can increase or decrease the amplitude difference within 0.1 dB steps. The current amplitude difference is shown on the tuning window with numbers and bar figure. When this tuning is active the text "AMPLITUDE DIFFERENCE TUNING" will be on the top right hand corner of the display.

Tune Phase Difference

When this selection is made user can increase or decrease the phase difference within 0.5 steps. The current phase difference is shown on the tuning window with numbers and bar figure. When this tuning is active the text "PHASE DIFFERENCE TUNING" will be on the top right hand corner of the display.

After each value change the new value are send to the phone.

The next automatic selection is made when TX I / Q tuning function is ended:

– Active Unit = RX

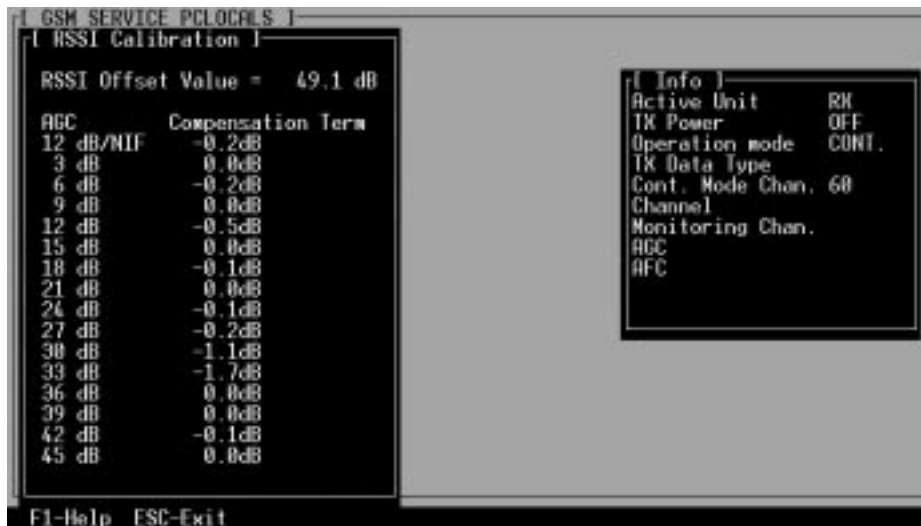
3.2.5 – RSSI Calibration

When function is activated the selected channel is checked. If none of the receiving channel numbers from 50 to 70 in GSM mode is selected then error message is shown and the user is asked to change the channel to the valid receiving channel area.

The next automatic selections are made when this tuning function is activated:

- Active Unit = RX
- Operation Mode = Continuous

The next window will be seen when the tuning function is selected. The positions of the measurement result values have empty places before measurement response message is received.



RSSI offset value and AGC compensation terms have the 0.1 dB precision.

The RSSI offset value and AGC compensation terms are read again when previous values are received and results are shown on the screen.

If none measurement result is received when *Esc* key is used, the information message is shown. The user can remove the information message with *Y*, *N* or *Esc* key. The measurement will be broken by using *Y* key.

The measurement will continue if *N* or *Esc* key is used. Any other key doesn't cause any effect.

When at least one measurement is done and *Esc* key is used, the user must answer to the values saving question. If *Esc* key is used, the measurement is continued.

When exit is made, the next selections are set to the values which were selected before this adjustment.

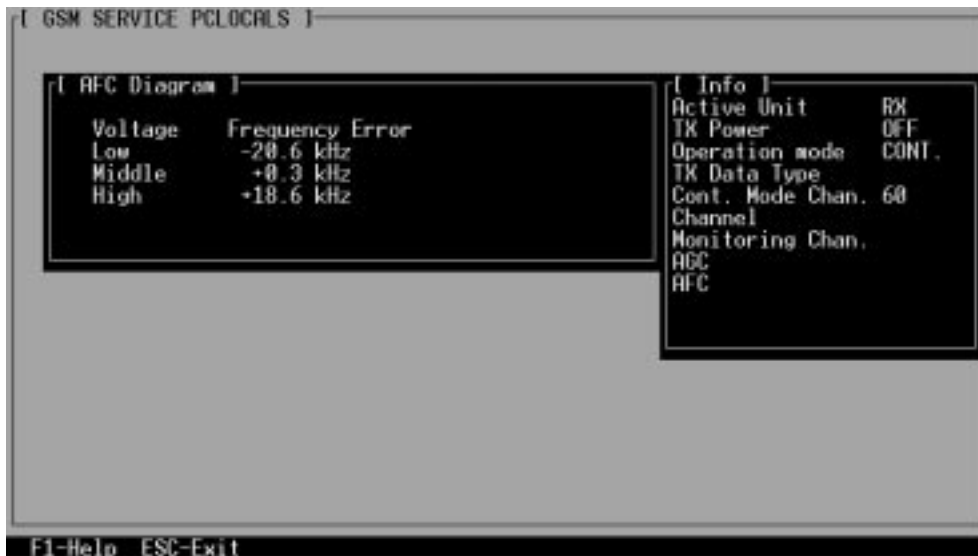
- Active Unit
- Operation Mode

3.2.6 – AFC Diagram

The next automatic selections are made when this tuning function is activated:

- Active Unit = RX
- Operation mode = Continuous

The next window will come to the display after function activation.



The value range of the error values is between -22 kHz and $+22$ kHz with the precision 0.1 kHz. The rounding is made to the closest value.

If the measurement is not ready when *Esc* key is used, the information message is shown. The user can remove the information message with *Y*, *N* or *Esc* key. The measurement will be broken by using *Y* key. The measurement will continue if *N* or *Esc* key is used. Any other key doesn't cause any effect.

When exit is made, the next selections are set to the values which were selected before this adjustment.

- Active Unit
- Operation mode

Also AFC is set to the previous value when exited from this function.

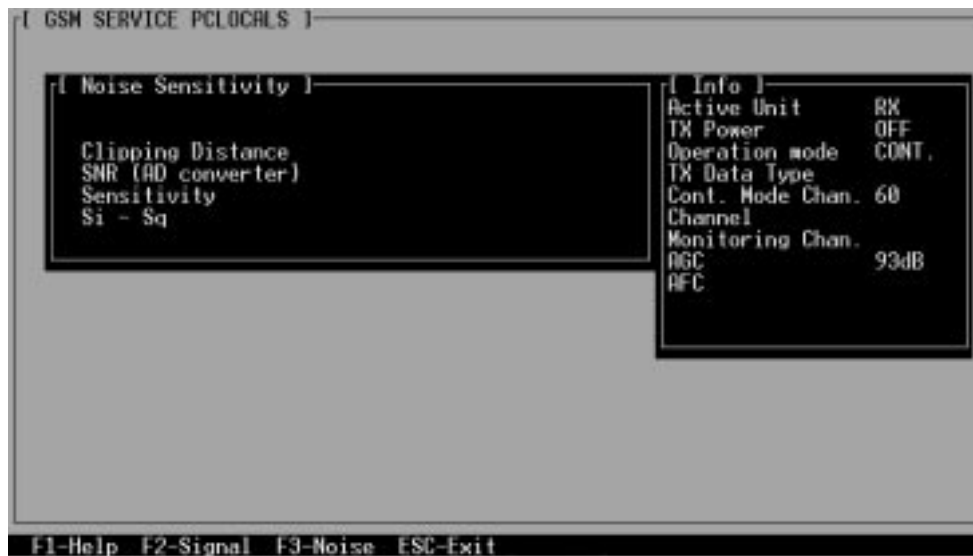
3.2.7 – Noise Sensitivity

This function is used for making Signal to Noise measurement.

The next automatic selections are made when this tuning function is activated:

- Active Unit = RX
- Operation mode = Continuous
- AGC = 93 dB in GSM

When this selection is made the next window comes to the display.



```
Clipping Distance      30dB
SNR (AD converter)    16.5dB  OUT OF RANGE
Sensitivity            -98.2dBm OUT OF RANGE
Si - Sq              1.2dB  OUT OF RANGE
```

Clipping distance is the difference to the signal clipping value. SNR is measured in A/D converter.

Clipping distance = clipping level (66) – signal value + comp_factor1
 SNR = signal value – noise value + comp_factor1

Sensitivity = –92 dBm + 8 dB + comp_factor2 – SNR

The last value on the display is signal power difference between I and Q branch. The numbers are shown in 0.1 dB accuracy. The error messages, "OUT OF RANGE", are shown only if the SNR and/or amplitude difference values are not acceptable

(SNR <= 18 dB + comp_factor2 – 0.5 dB(=accuracy) ;
 Sensitivity >= –102 dBm + 0.5 dB ; |Si – Sq| > 1dB).

When *F2* or *F3* key is pressed, the RX I and Q burst data is asked, text "SIGNAL MEASURING" or "NOISE MEASURING" will come to the measurement window and the next help line will come to the last line. The power level value should be -92 dBm during signal measurement.

Only *Esc* key is accepted during measurement. *Esc* breaks the measurement routine in the PC and returns the program to the state before *F2* or *F3* pressing. Normally *Esc* is not needed.

When signal data is received, distance to clipping signal level is shown as dBs on the display. When either signal or noise measurement results are received "MEASURING" text is removed and the first mentioned help line is on the display. When both measurements (signal and noise) are done at least once, the signal to noise relation and difference are also shown on the display.

When exit is made, the next selections are set to the values which were selected before this adjustment.

- Active Unit
- Operation mode
- AGC value

Compensation factors:

comp_factor1 = 4.64 dB (Compensation factor for 67.71 kHz signal, because ASIC filter attenuates 67.71 kHz signal 4.64 dB)

comp_factor2 = 2.27 dB (Compensation factor for real and calculated noise bandwidth difference. Real noise bandwidth is 80 kHz and calculated bandwidth is 135 kHz)

3.3 – Call Simulation



3.3.1 – TX Power Level

All power levels (2...15) can be selected. This updates same parameter as TX Power Level in the RF Controls menu. Note that TEST value cannot be selected. If TEST value was in use when Call simulation menu selected, power level is changed to smallest value (15).

3.3.2 – Channel

This tells the normal operating RF channel number. Normal GSM channel numbers can be selected. Same channel is used both for transmission and receiving. This updates same parameter as Channel in the RF Controls menu.

3.3.3 – 3.3.8 – Monitoring Channels

Channels for monitoring are specified with these six selections. All GSM channel numbers can be used. If more than one selection has same number, the monitoring channel list (neighbor list) will have less than 6 selected channels. The minimum number of monitoring channels is one (all channels have same value). The monitoring channel can also have same value as normal operating channel. The first monitoring channel updates same parameter as Monitoring Channel in the RF Controls menu.

3.4 – Internal Audio Loop



Test interface input and output (Internal/External) is possible to select. The third selection connects and disconnects the test loop. The sent audio signal level has constant value which depends on the selected interfaces.

When *Esc* key is used, the internal loop is automatically ended (Loop=Off).

3.5 – External Audio Loop



The first item selects the interface (Internal/External).

The sent audio signal level has constant value which depends on the interface. The frequency is changed, the received signal strength is measured and if too big difference to expected values is noticed, error message is displayed. Three different frequencies are used.

When Make a Measurement is selected, the received signal strength is displayed (square root of the received value) on the separate window. If any of the shown signal values differs more than ± 3 dB from the below presented reference values, the OUT OF RANGE message will be shown.

| Frequency | HS interface ref./accepted value | HF interface ref./accepted value |
|-----------|----------------------------------|----------------------------------|
| 300 | 25 / 15...35 | 63 / 53...73 |
| 1000 | 32 / 22...42 | 68 / 58...78 |
| 3000 | 32 / 22...42 | 68 / 58...78 |

Received level data fields have no value before measurement results are received. Below is the separate window where results are shown:

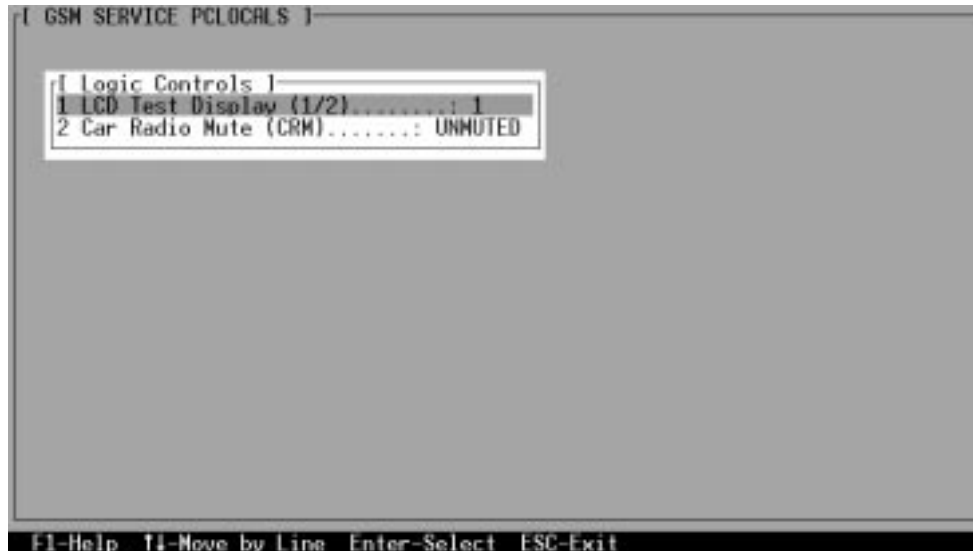
```

FREQUENCY/Hz      300    1000    3000
RECEIVED LEVEL    120     122     179    OUT OF RANGE
    
```

Received level value has scale from 0 to 256.

3.6 – Logic Controls

After this selection new window is shown:



3.6.1 – LCD Test Display

The LCD display is changed by using the number or *Enter* key. Two different test displays can be selected. When Logic Controls menu is selected, the display is controlled to the state shown in the menu.

- In test display 1 half of indicators are displayed and the display is filled with chessboard letters.
- In test display 2 other half of the indicators are displayed and the display is filled with inverse chessboard letters.

3.6.2 – Car Radio Mute

This function can be used to select car radio mute (CRM) option on or off.

3.7 – MCU Selftests

When this selection is used, user is informed that if he gives *Y* answer the MCU will be controlled to the special test mode; reset will be made and MCU SW will be run only inside MCU ROM code (minimum mode). Also the test results (about those tests that have been executed after last power up) will be asked from phone. *N* and *Esc* keys will cancel the selection.

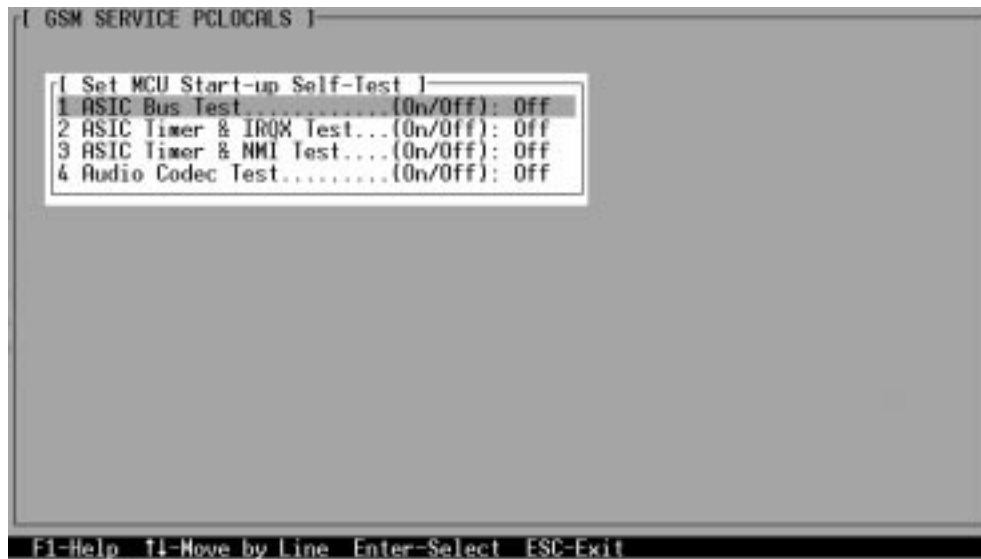
IMEI test cannot be executed with this menu.

When the selection is made, the test result is waited and special waiting window is shown. The test result will be shown to the user after each menu selection. If no response was received in the defined time, an error message is shown and "no response" text will be shown in the menu.

Note that power-off test (if passed) turns power off and power should be reconnected by using the phones keypad after the successful test. After the power has been connected to phone, the normal start-up routines are made and the self-test results are shown in the MCU self-tests menu (i.e. all other than power-up self-tests are in NOT EXECUTED state after the power-up routines).

Test results will be one of the next: no response, OK, NOT EXECUTED, FAILED. Note that power-off test have no values, because if test has been passed, power has been turned off. If power-off test fails a special error message window is shown. If no response is received to power off test message in a few seconds, the user is informed by special info window, where user is asked to turn the power on and then press the return key.

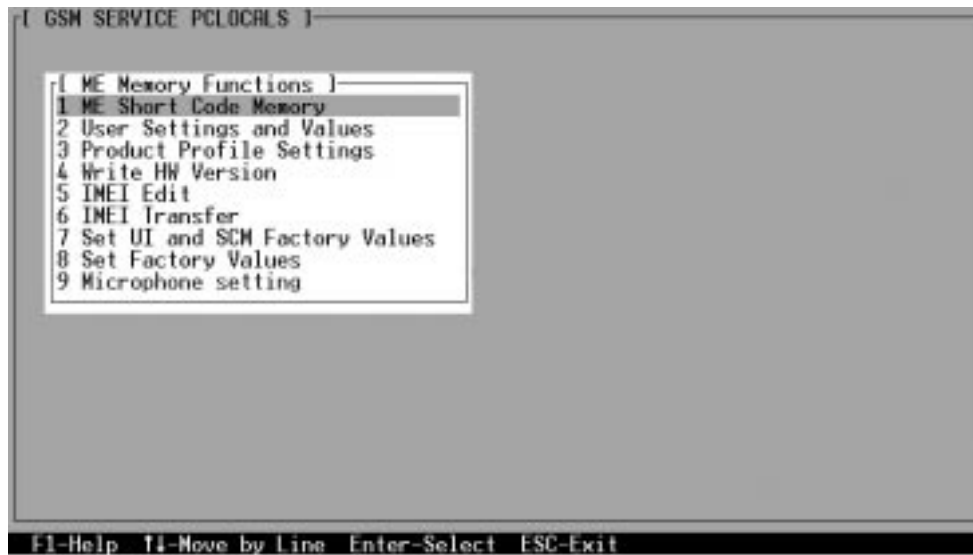
3.8 – Set MCU Start-up Self-tests



This menu is used for changing the state of the EEPROM selectable tests. When selection is "On", the test will be run every time when automatic start-up self-tests are activated (e.g. in power-up).

When menu is selected, the previous values will be read from the MCU EEPROM and shown on the screen. When *Esc* is used, user is asked to confirm the EEPROM values saving. Error handling is done as in other functions which read and save EEPROM values.

4 – ME Memory Functions



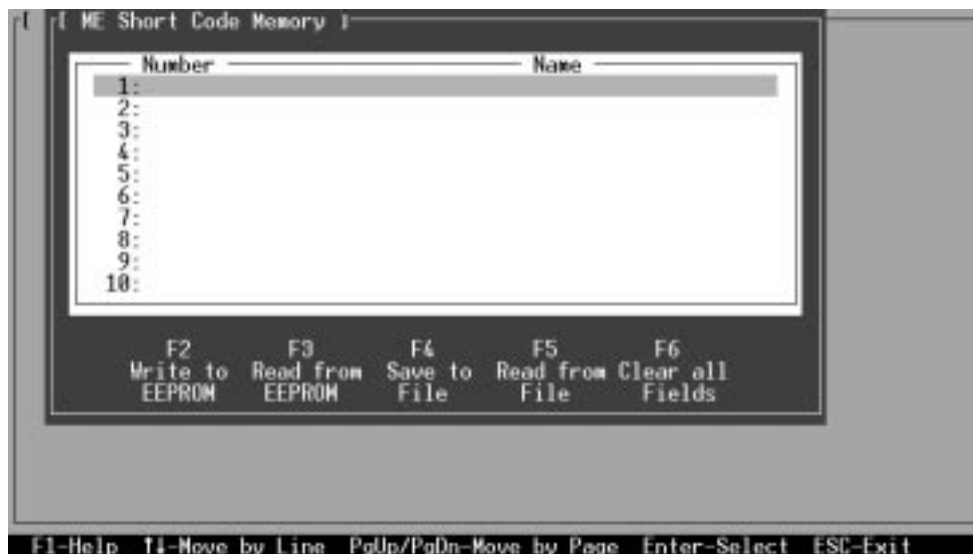
The user interface of the phone is disabled (keypad cannot be used, display is not updated and tones are not generated) when this selection is made. When this menu is exited, user interface is enabled again.

When program should save values to ME memory in any selection, it asks for confirmation. If *Y* key is used, values are saved to the memory. If *N* or *Esc* key is used, the values are not saved to the memory. If any other key is used, nothing happens.

4.1 – ME Short Code Memory

With this function you can process the short code memory. Short code memory data is read only from the phone's internal EEPROM (not from SIM card memory). After activating the short code memory function, you will see a new window appearing on the screen.

First you select whether to read the codes from EEPROM (PC function key *F3*) or from a file *F5*.



Short codes from the selected source are then displayed on the screen, ten at a time. Memory position numbers are on the left side of the window. The phone number field has 32 and the name field 20 character positions.

You can move among the codes with arrow up and down and page up and down keys until the desired memory item is highlighted. With *End* you can choose the last and with *Home* the first memory item.

When the *Enter* key is pressed the basic text editing window is displayed and the selected item can be edited. When the number editing ends and the *Enter* key is pressed, the name is displayed can be edited. If the *Esc* key is used, only changes in the edited field are removed.

Keys *F2* and *F3* are used for writing/reading all phone numbers and names (memory positions 1 to 98) to/from the EEPROM of the phone. When an attempt is made to write values to EEPROM or read them from EEPROM, a request is made to confirm the selection. When values are read from the EEPROM, they are cleared from the screen and shown again when received from the phone.

The information window is shown during writing and reading. The window tells the approximate time taken read/write values. When all values have been read (responses received) or written, the waiting window is removed and a short code window is shown.

The waiting state can be interrupted with the *Esc* key. If writing to the EEPROM is interrupted, only part of the values in the EEPROM may be updated. If reading is interrupted, part of the values (values received before interrupt command) may appear on the display and go to PC memory.

All values can be saved to file and read from file with the *F4* and *F5* keys respectively. The file name is asked when the function is selected. The previous file name is the default value. Both save and read functions have a common default file name. After start up no default file name is used.

When the clear function (the *F6* key) is used, all number and name fields are cleared from the screen. Before this, confirmation is asked. If you want to clear the whole EEPROM area, you must use the *F2* key after *F6* key.

When either phone number or name editing is tried to end the session, the characters are checked. If wrong characters are found, an error message is shown and editing is not stopped. The edited wrong value is shown so you can correct it.

Accepted characters in the number field are:

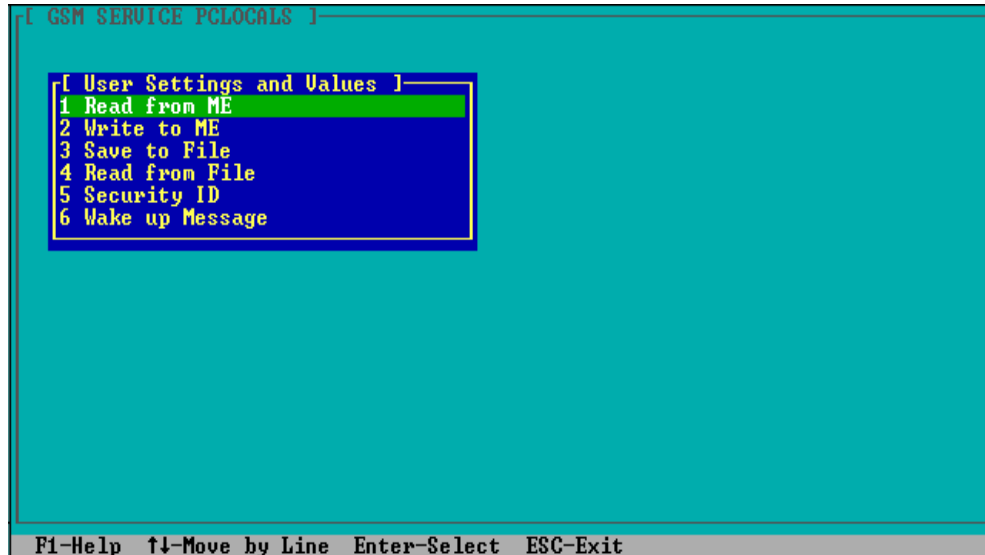
- all numbers 0..9; hexadecimal values: 30H..39H
- * (asterisk); hexadecimal value: 2AH
- # (hash); hexadecimal value: 23H
- p, P; hexadecimal value: 70H, 50H
- w, W; hexadecimal value: 77H, 57H
- + (plus); hexadecimal value: 2BH

Characters are converted between the phone and the PC character code when the values are received from EEPROM and before being set to EEPROM. Some DOS versions or code page selections in the PC may cause differences between the PC display and the phone display. The PC codes are taken from the multilingual code page, number 850, as specified for MS-DOS 5.0. Below is a list of characters that can be edited in the name field. Both capital and small letters can be edited.

| <u>Key</u> | <u>Alpha mode characters</u> | | | | | | | | | | | | | |
|------------|------------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1 | - | ? | ! | , | . | : | " | ' | & | \$ | £ | (|) | 1 |
| 2 | A | B | C | À | Ä | Ç | 2 | | | | | | | |
| 3 | D | E | F | È | É | 3 | | | | | | | | |
| 4 | G | H | I | 4 | | | | | | | | | | |
| 5 | J | K | L | 5 | | | | | | | | | | |
| 6 | M | N | Ñ | 6 | | | | | | | | | | |
| 7 | P | R | S | ß | 7 | | | | | | | | | |
| 8 | T | U | V | Ü | 8 | | | | | | | | | |
| 9 | W | X | Y | 9 | | | | | | | | | | |
| 0 | Q | Z | O | Ö | Ø | 0 | | | | | | | | |
| # | space | | | | | | | | | | | | | |

4.2 – User Settings and Values

After this selection new window is shown:



4.2.1 – Read from ME

When this selection is used, Security Code, Lock Code and Wakeup message values from the memory of ME are read to PC if the user gives positive answer to a confirmation question. Information window, which tells how long time it will approximately take to read values will be shown. When all values are received, waiting window is removed and User Settings and Values menu is shown. The waiting state can be broken with *Esc* key. If *Esc* is used, all user data is deleted in the PC memory and User Settings and Values menu is shown.

If the ME data is corrupted when reading, an error message is shown. The message is removed when any key is pressed.

4.2.2 – Write to ME

The program asks if the user settings and values should be saved to the ME or not. If *Y* key is used, all data is saved to the ME. If *N* or *Esc* key is used, the User Settings and Values menu will come to the screen and nothing is saved. If any other key is used, nothing happens.

Information window is shown during writing. The window tells how long time it will approximately take to write values. When all values are sent and responses received, waiting window is removed and User Settings and Values menu is shown. The waiting state can be broken with *Esc* key. If writing to the ME is broken, only part of the values in the ME may be changed.

4.2.3 – Save to File

The basic text window is shown and the program asks the file name. The user settings and values are saved when the *Enter* key is pressed.

4.2.4 – Read from File

The user data is read from given file to PC memory. The file name is given as with save to file selection.

Both save to file and read from file function has default name which is previously used name. For instance if user data was saved to file USERA.DAT and read function is activated the default value is USERA.DAT. If only *Enter* key is pressed default value is used. If *Esc* key is used, the function will be interrupted. If illegal DOS filename is used or there isn't load file with given name error message will come to the display.

Note that file name handling works in the same way with setup file.

4.2.5 – Security ID

The security code is put to the text editing window, when this function is activated. The code can be edited in the window. Note that code is saved to the ME memory together with other user settings and values. Only digits are accepted for Security code.

4.2.6 – Master Code

Master code comes to the text window and it can not be edited.

4.2.7 – Wake Up Message

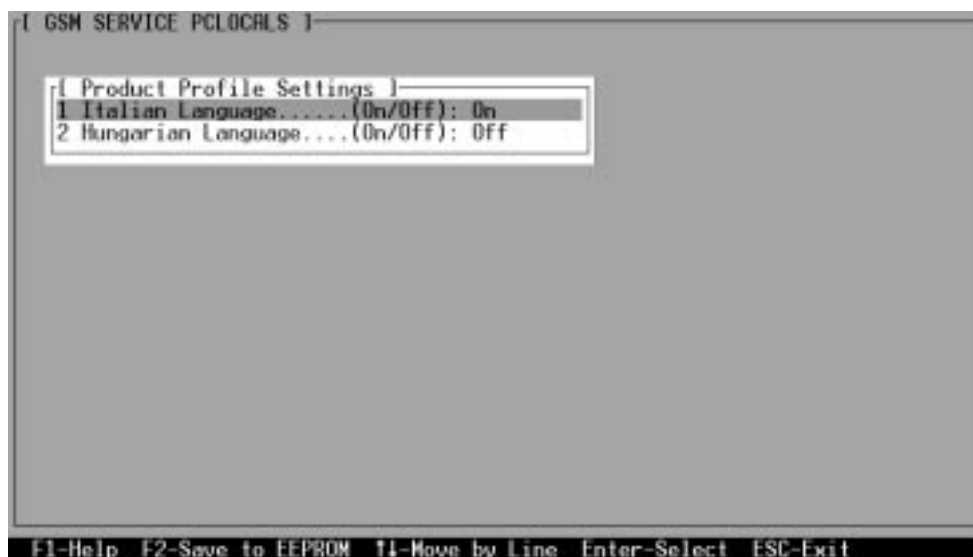
Wake up message comes to the text editing window and it can also be edited. When the editing complete, the characters are checked. If wrong characters are noticed, the error message is shown and editing is not ended. The wake up message name can have same characters as short code memory name. The maximum length is 16 characters.

4.3 – Write HW Version

When HW version is selected, the current version is read from the phone and shown in the text editing window. When the new version editing is ended by using *Enter* key, the version is saved to the phone.

4.4 – Product Profile Settings

When Product Profile Settings selection is activated the Product Profile information is read from EEPROM. If the information is not received within 2 seconds an error message is shown and the ME Memory Functions menu is displayed. Otherwise the Product Profile Settings menu is displayed, where the user can select needed features.



The menu items will be added when new features will be added to Product Profile.

When *Esc* key is used in this menu, the program will ask whether the values should be saved to the EEPROM or not. If *Y* key is used, values are saved to the EEPROM and the ME Memory Functions menu is shown. If *N* key is used the ME Memory Functions menu is shown and nothing is saved to the EEPROM. If *Esc* key is used the Product Profile Setting menu is shown and the values can be changed. If any other key is used nothing happens.

4.5 – IMEI Edit

With this function you can read the IMEI from the phone, edit the IMEI code and write to the EEPROM. Normally this function is needed when IMEI transfer can't be done.

Caution: Be very careful with this function. Don't try to program the IMEI if you are not absolutely sure of how to define the correct IMEI code.

To edit IMEI its password must be known.

When you choose this selection, the old IMEI is requested from the EEPROM. If the IMEI is not received within few seconds, an error message is shown. After any key press the error window will disappear and the previous menu "EEPROM functions" will be displayed.

The software will produce the text editing window and the received IMEI will be shown in the window. If the IMEI or EEPROM check sum value was incorrect, an error message will be shown. After error acknowledges the editing window will be shown without data. A fifteen-digit IMEI password must be known before editing. To get the IMEI password you must take the old IMEI-number from the back cover of the phone and call to the NMP After Sales Finland, or European Service Center, Düsseldorf. Now type the wanted IMEI-number and after this, the password (total 30 digits). Then press *Enter* and data is written to the EEPROM; the IMEI number and password are entered as one long number. Writing must be accepted as with other EEPROM writing functions. If no response message from the MCU to the IMEI writing function is received within few seconds, an error message will be shown and the IMEI text editing window will appear when any key is pressed.

4.6 – IMEI Transfer

The purpose of this function is to transfer the IMEI code from an old system board to a new system board. This function is used when you are changing the system board.

When you make the selection, program asks to confirm the function with *Y* key. Pressing the *N* or *Esc* keys the selection is cancelled. If any other key is used, nothing happens.

After pressing *Y* key the IMEI is read from EEPROM to PC. When the IMEI code is received by PC, information comes to the screen and the IMEI code is destroyed in the EEPROM. After clearing the IMEI number, the old system board is unusable.

The IMEI is situated in the PC at this moment. If you quit the PCLocals program, the IMEI data will be lost.

Now you can switch the phone power off and exchange the system boards and switch the phone power on again. A "Selftest failed" -message will appear in the phones display.

After pressing the *Enter* key the IMEI will be transferred to the new system board. The IMEI data in the PC will be cleared and cannot be used again.

For resetting the phone you must select the "Initialize phone" option from the "Main menu". If the phone does not show the "Selftest failed"-message, the transfer was successful. In case of the "Selftest failed"-message, you must contact technical support of local importers.

4.7 – Set UI and SCM factory Values

This function sets the UI parameters to factory default values and clears the short code memory.

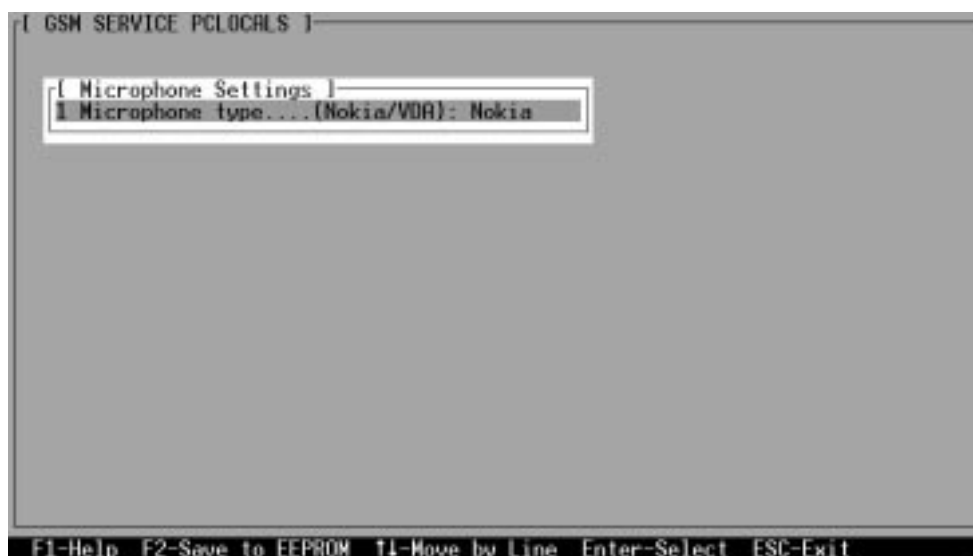
Phone mode must be in Local mode when this menu is selected.

4.8 – Set Factory Values

The selection sets all except IMEI factory values (including UI and SCM). Even though no memory patch message is sent to mobile, the user is asked to confirm the functions with *Y* key.

4.9 – Microphone Setting

This function can be used to select external (HF) microphone type.



The VDA microphone has as build in preamplifier (approx 40 dB).

The selected microphone type will be stored into EEPROM if the user press *Y* key to store, when he leaves the menu or if he press *F2*.

5 – Power-up Selftests

This selection generates two windows:

```

[ GSM SERVICE PCLOCALS ]
[ Selftests ]
MCU Internal Test.....: No Response
MCU RAM BUS Test.....: No Response
MCU IMEI Test.....: No Response
MCU ROM BUS Test.....: No Response
MCU ROM DATA Test.....: No Response
MCU ASIC BUS Test.....: No Response
MCU ASIC Timer & IROM Test.: No Response
MCU ASIC Timer & NMI Test.: No Response
MCU Audio Codec Test.....: No Response
MCU DSP Code Download.....: No Response
MCU EEPROM Checksum Test...: No Response
DSP Tests.....: OK
  
```

F1-Help F8-Bus Test ESC-Exit

When the window is activated, all test result fields have value no response. When responses are received, the values will be updated. When *Esc* key is used, the previous menu will come to the screen. Below is the list of DSP processor test faults. Only one fault value is indicated in the DSP processor selftest message. MCU test results are indicated one by one on the separate lines.

- RAM BUS Fault
- ASIC BUS Fault
- RFI BUS Fault
- Download Error

MCU test results will be one of the following: No Response, OK, NOT EXECUTED, FAILED

When *F8* key is pressed, the next window will be shown. The test results are from the first failed MCU BUS test. When none of MCU BUS tests has been failed, user is informed by the special message on the screen after pressing of the *F8* key, and the below told test data cannot be displayed. *Esc* key removes BUS test window and returns previous described test result window. The window includes also the name of the failed BUS test.

| Address Written/Read | | | Address Written/Read | | | Address | |
|----------------------|----------|-----|----------------------|----------|-----|---------|-------------|
| Written/Read | | | Written/Read | | | | |
| zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx |
| XX/ | | | | | | | |
| | yyyyyyyy | YY | | yyyyyyyy | YY | | yyyyyyyy YY |
| zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx |
| XX/ | | | | | | | |
| | yyyyyyyy | YY | | yyyyyyyy | YY | | yyyyyyyy YY |
| zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx |
| XX/ | | | | | | | |
| | yyyyyyyy | YY | | yyyyyyyy | YY | | yyyyyyyy YY |
| zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx |
| XX/ | | | | | | | |
| | yyyyyyyy | YY | | yyyyyyyy | YY | | yyyyyyyy YY |
| zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx | XX/ | zzzzz | xxxxxxxx |
| XX/ | | | | | | | |
| | yyyyyyyy | YY | | yyyyyyyy | YY | | yyyyyyyy YY |

zzzzz = hexadecimal address
 xxxxxxxx = binary written data
 yyyyyyyy = binary read data
 XX = hexadecimal written data
 YY = hexadecimal read data

6 – SW and HW Versions

When versions selection is used a new window will be generated.



The window has next information:

```
MCU Internal SW Version: XX.YY dd-mm-yy ZZ-Z (c) NMP.
MCU External SW Version: XX.YY dd-mm-yy ZZZ-ZZZ (c)
NMP.
DSP Internal SW Version: ROMx (Lj)
DSP External SW Version: sx.zzz
DATA Device SW Version: XX.YY dd-mm-yy ZZZ-Z (c) NMP.
ASIC Version: AAA
HW Version: BBBB
Production number: BBBB BBBB
Warranty information: mmyy
```

The next symbols are used:

| Symbol | Meaning |
|----------|--|
| XX.YY | SW version e.g. 04.00 |
| dd-mm-yy | Day-month-year e.g. 05-10-1991 |
| ZZ-Z | Product type e.g. NM-1 |
| ZZZ-Z | Product type e.g. NME-2 |
| ZZZ-ZZZ | Product type e.g. NME-2X |
| AAA | three ASCII characters (+ NULL) |
| BBBB | four digits version number |
| x | the mask ROM version number and the first digit of the external memory program (should be the same; otherwise the DSP might not work properly) |
| j | the same letter as printed on the chip in the format "DSP1616 S20 Lj" |
| s | 'G' for GSM |
| zzz | the running version number of the external memory program |

If some SW version is not received spaces are shown in that version number place. The function is broken with *Esc* key.

In later versions the date information may appear to the DSP external SW version. In the beginning it is not available, because suitable tools for automatic updating are not yet available.

7 – Phone Mode

With this function you can change the phone state (GSM or local mode).

When GSM is selected the normal start up functions take place in the phone and the phone is in normal operating mode.

When you are selecting the GSM mode, the phone tries to synchronize into the base station and the waiting window appears into the screen. If the phone gets the connection, the waiting window will be removed (you do not need press the *Esc* key) and the AFC value witch used can be read from the phone. This value is used when selecting local mode.

If the phone does not connect the base station, the middle value of the AFC is used in the local mode.

When the local mode is selected the phone is deactivated to enable e.g. special RF tuning, adjustment values are requested from the phone and used to control hardware and the AFC value is stored in the AFC control register.

Q – Quit

With this selection you can terminate (quit) the program.

Appendix I

Installing PCLocals service software on PC hard disk

The program is delivered on a diskette and is protected with a protection key PKD-1, which must be attached to the parallel port when the PCLocals service software is being used.

The program can also be installed on the hard disk, which is recommendable to obtain maximum data access rate.

Do not lose your original diskette. It will be needed when upgrading the program !

If you are planning to use PCL-Start service software, you must install it before installing the PCLocals. See PCL-Start installation instructions.

To install the PCLocals software, proceed as follows:

1. insert the new PCLocals diskette
into drive A: of your PC
2. log into drive A: *type A: and press Enter*
3. start INSTALL.EXE and *type **INSTALL C:***
install PCLocals into drive C: *and press Enter*

Appendix II

Starting options for PCLocals service software

The program is started by entering the following command:

NME2SERV [-serial port] [-video mode] [-text mode] [-file name]

where:

[-serial port] = the communication port used for M2BUS (COM1 or COM2). -c1 or -c2

[-video mode] = video control method (BIOS video or HW video). -vb or -vh (default) Note: If PCLocals screen updating is slow, try change this option.

[-text mode] = screen text mode (CO80, MONO, BW80 or last mode). -tco80, -tmono, -tbw80 or -tlast (default)

[-file name] = name of the configuration file. -ffilename (default filename is -fNME_2.CON)

Example 1; The program is to be used to test the NME-2 phone.

NME2SERV *Enter*

Example 2; The program is used to test the NME-2 phone, using a PC with black-and-white display. In addition, use of BIOS controls is desirable to avoid compatibility problems.

NME2SERV -TBW80 -VB *Enter*

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