CCS Technical Documentation
RH-12/RH-28 Series Transceivers

3 - Service Software Instructions

Issue 1 02/04
©Nokia Corporation

[This page left intentionally blank]

©Nokia Corporation

Table of Contents

Page No

Quick Guide for Phoenix Service SW Installation 5
Phoenix Installation Steps in Brief 5
Phoenix Service SW 7
Before installation 7
Installing Phoenix 8
Updating Phoenix installation 12
Uninstalling Phoenix 13
Repair 15
Data Package for Phoenix (Product Specific) 17
Before installation 17
Installing Phoenix data package (product specific) 17
Uninstalling the data package 21
Configuring Users 22
Managing Connections 24
Manual Settings 25
Updating Flash Support Files for FPS-8* and FLS-4* 28
Before installation 28
Installing the flash support files (only separate installation package) 28
Updating the FPS-8* Flash Prommer SW 31
Activating and Deactivating FPS-8 34
Activation 34
Deactivation 35
JBV-1 Docking Station SW 37
Before installation 37
Installing SW needed for the JBV-1 SW update 37
Receiver tuning: Quick Guide for Tuning With Phoenix 43
General 43
Service Tool Concept for RH-12* Baseband Tunings 44
Service concept for RH-12* baseband tunings 44
Baseband Tunings 45
Energy management tuning 45
Service Tool Concept for RF Tunings 47
Service concept for RH-12* RF tunings 48
Receiver Tunings 49
RX channel select filter calibration 49
RX calibration 50
EGSM900 band 50
GSM1800 band 52
GSM1900 band 53
RX band filter response compensation 54
EGSM900 band 55
GSM1800 band 58
GSM1900 band 59
RX AM suppression 59
EGSM900 band 60
GSM1800 Band 61
GSM1900 Band 61

©Nokia Corporation

Transmitter Tunings 62
TX power level tuning 62
EGSM900 PA High Mode with EDGE off 63
EGSM900 PA low mode with EDGE off 64
EGSM900 PA high mode with EDGE on 64
EGSM900 PA low mode with EDGE on 65
GSM1800 PA high mode with EDGE off 65
GSM1800 PA high mode with EDGE on 67
GSM1900 PA high mode with EDGE off 68
GSM1900 PA high mode with EDGE on 69
TX I/Q tuning 70
EGSM900 band with EDGE Off 70
EGSM900 band with EDGE On 72
EGSM1800 band with EDGE Off 72
GSM1800 band with EDGE On 73
GSM1900 band with EDGE Off 73
GSM1900 band with EDGE On 73

©Nokia Corporation

Quick Guide for Phoenix Service SW Installation

Phoenix Installation Steps in Brief

DCT-4 generation Test and Service Software is called "Phoenix".

These are the basic steps to install the Phoenix:

- Connect a DK2 Dongle or FLS-4S POS Flash Device.
- Install the Phoenix Service SW.
- Install the Data Package for Phoenix.
- Configure users.
- Manage connection settings (depends on the tools you are using).

Phoenix is now ready for FLS-4S Point Of Sales Flash Device use.

If you use FPS-8:

- Update FPS-8 SW.
- Activate FPS-8.
- Update JBV-1 Docking Station SW (only when needed).

Phoenix is now ready to be used also with FPS-8 flash prommer and other tools.

©Nokia Corporation

The Phoenix Service Software installation contains:

- Service software support for all phone models included in the package
- Flash update package files for FPS-8* and FLS-4S programming devices
- All needed drivers for: DK2 dongle
  FLS-4S point of sales flash device
  USB devices

Separate installation packages for flash update files and drivers are also available, but it is not necessary to use them unless updates appear between Phoenix Service SW releases. If separate update packages are used, they should be used after Phoenix and data packages have been installed.

The phone model specific data package includes all changing product specific data:

- product software Binary files
- files for type label printing
- validation file for the Faultlog repair data reporting system
- all product specific configuration files for Phoenix software components

Please refer to Service Manual and Technical Bulletins for more information concerning phone model specific service tools and equipment setup.

Phoenix Service SW and phone data packages should only be used as complete installation packages. Uninstallation should be made from Windows Control Panel.

©Nokia Corporation

Phoenix Service SW

Before installation

- Check that a dongle is attached to the parallel port of your computer.
- Download the installation package (e.g. *phoenix_service_sw_a12_2003_50_6_35.exe*) to your computer (e.g. C:\TEMP).
- Close all other programs.
- Run the application file (e.g. *phoenix_service_sw_a12_2003_50_6_35.exe*) and follow instructions on the screen.

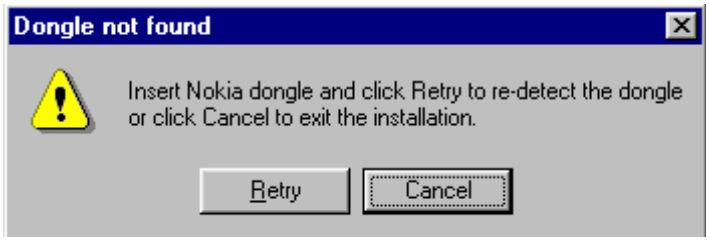
Administrator rights may be required to be able to install Phoenix depending on the Operating System.

If uninstalling or rebooting is needed at any point, you will be prompted by the Install Shield program.

If at any point during the installation you get this message, the dongle is not found and the installation can not continue.

Possible reasons may be defective or too old PKD-1Dongle (five digit serial number dongle when used with FPS-8 Prommer) or that the **FLS-4S** POS Flash Dongle is defective or power to it is not supplied by external charger.

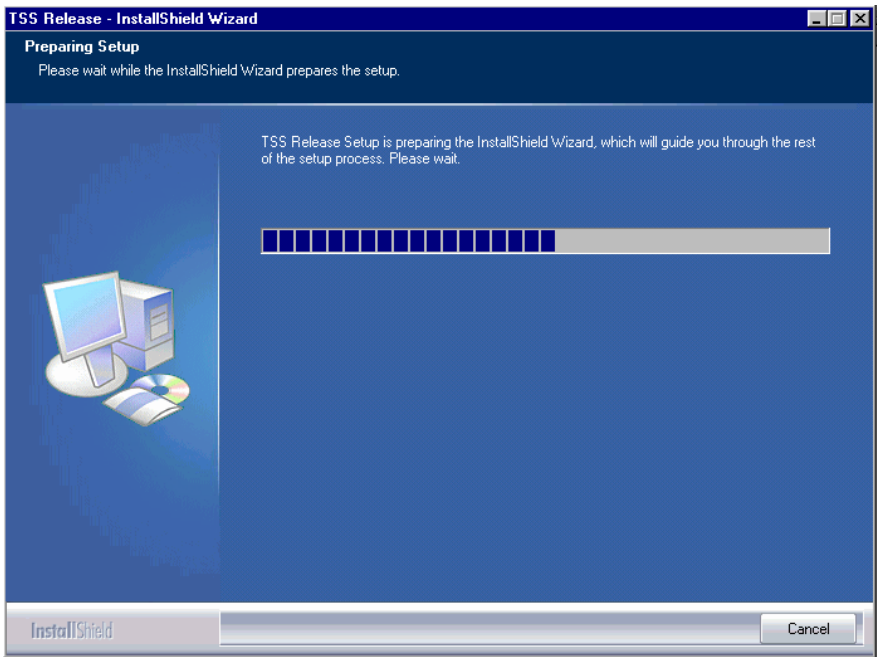
First, check the COM /parallel ports used! After correcting the problem, the installation can be restarted.



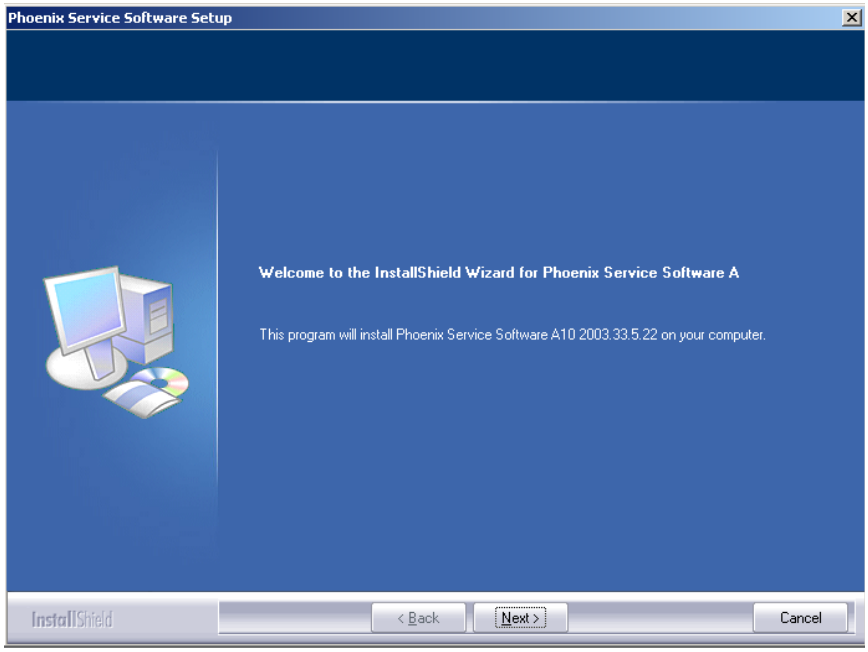
©Nokia Corporation

Installing Phoenix

Run the *phoenix_service_sw_a12_2003_50_6_35.exe* to start the installation. Install Shield will prepare.



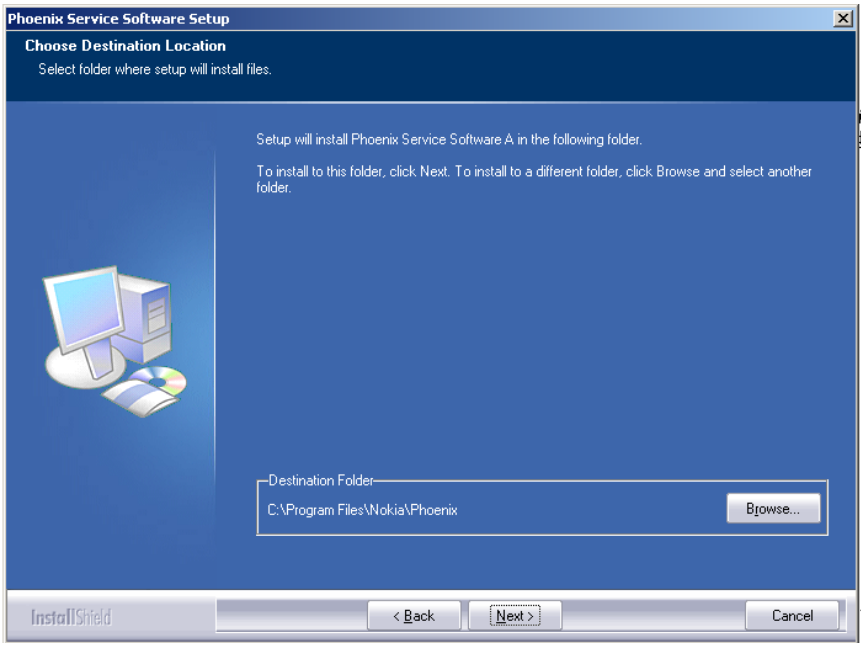
Click "Next" in Welcome dialog to continue.



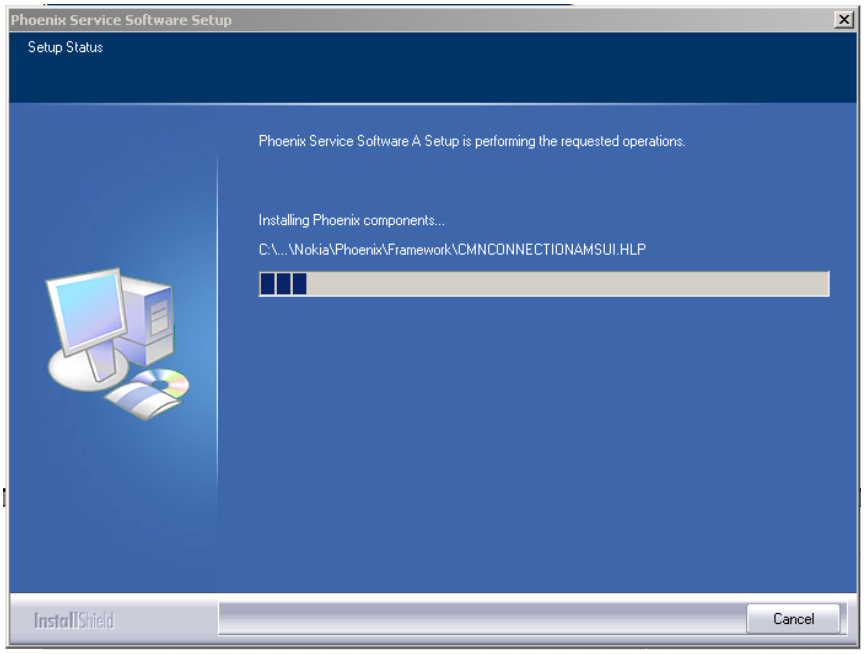
Choose the destination folder, it is recommended to use the default folder *C:\Program-Files\Nokia\Phoenix*.

©Nokia Corporation

Choose "Next" to continue. You may choose another location by selecting "Browse" (not recommended).

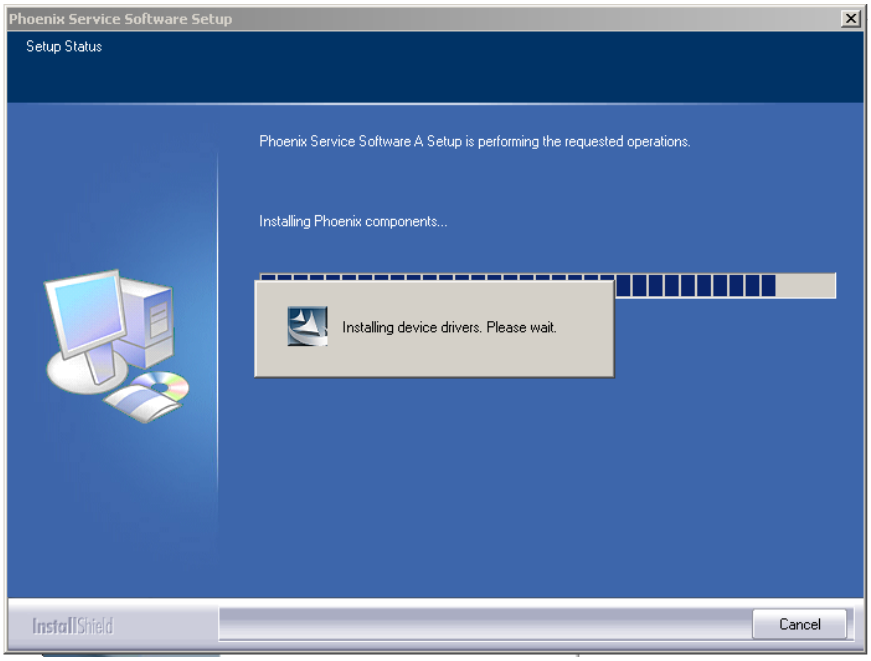


Setup copies the components, progress of the setup is shown. Please wait.

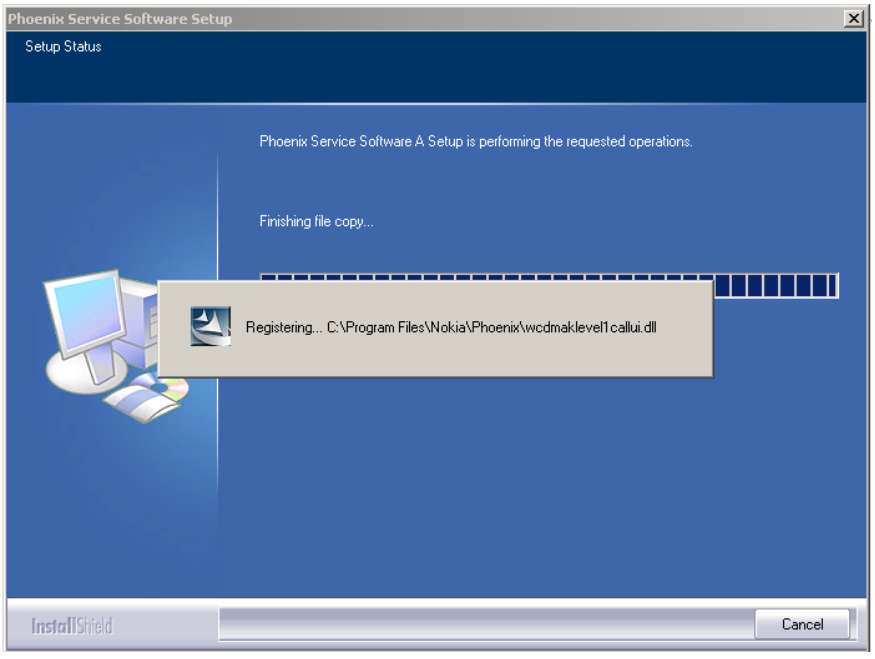


Drivers will be installed and updated, please wait. The process may take several minutes to complete.

©Nokia Corporation

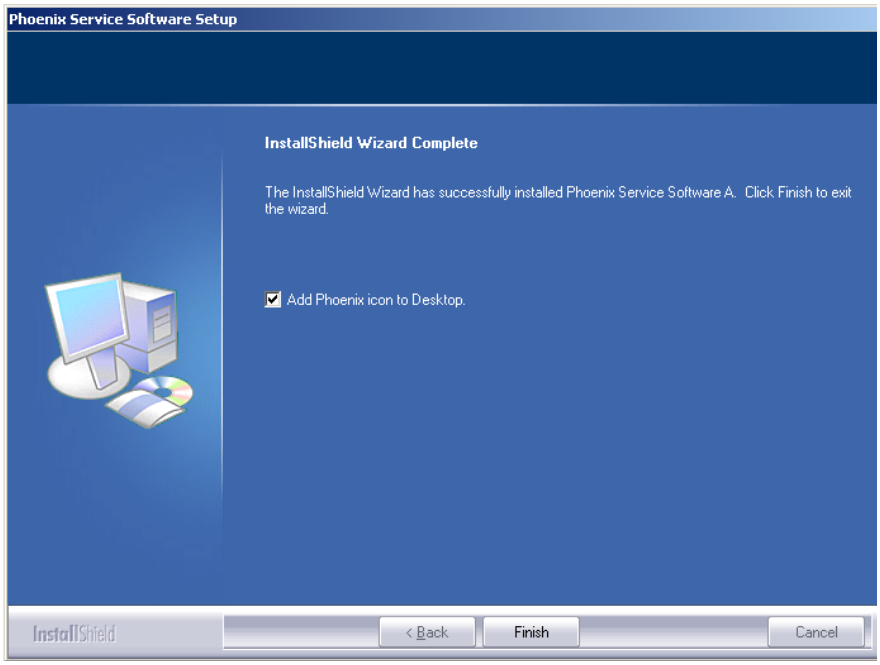


If the operating system does not require rebooting (Windows 2000, XP) the PC components are registered right away.

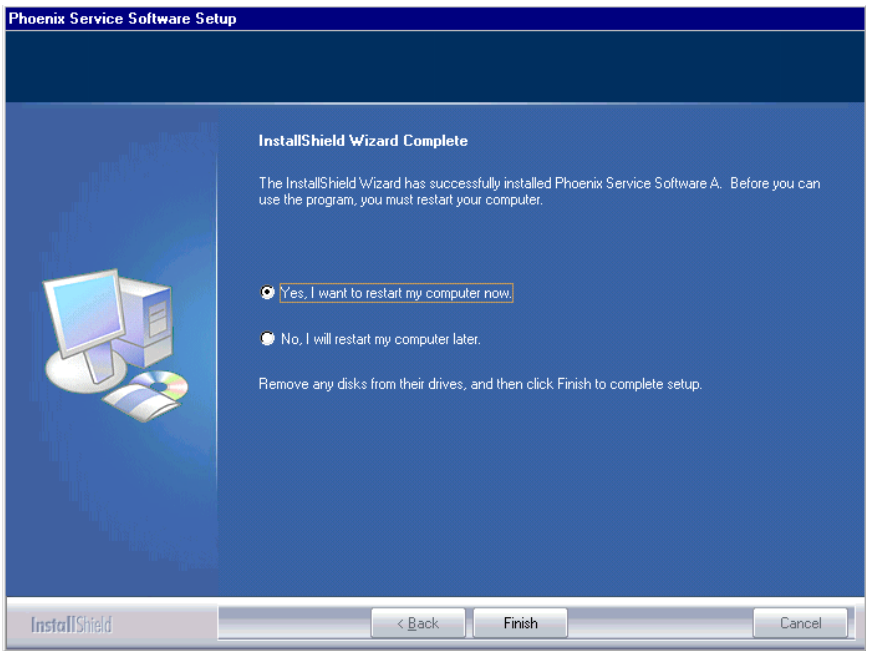


©Nokia Corporation

Click "Finish" to finalize. Phoenix is ready for use.



If the operating system used requires restarting your computer (Windows 98, SE, ME), the Install Shield Wizard will notify you about it. Select "Yes..." to reboot the PC immediately and "No..." to reboot the PC manually afterwards.



After the reboot components are registered and Phoenix is ready for use. Note that Phoenix doesn't work, if components are not registered.

©Nokia Corporation

Now the installation of Phoenix Service SW is ready and it can be used after :

- installing Phone model specific Phone Data Package for Phoenix
- configuring users and connections

FLS-4S can be used right away.

FPS-8* can be used after updating Flash Update Package files to it.

Updating Phoenix installation

If you already have the Phoenix Service SW installed on your computer, sooner or later there will be need to update it when new versions are released.

Always use the latest available versions of both the Phoenix Service SW and the Phone Specific Data Package. Instructions can be found in phone model specific Technical Bulletins and Phone Data package readme.txt files (shown during installation).

To update Phoenix, you need to take exactly the same steps as when installing it for the first time.

- Download the installation package to your computer hard disk.
- Close all other programs.
- Run the application file (e.g. *phoenix_service_sw_a12_2003_50_6_35.exe*).

Newer version of Phoenix will be installed.

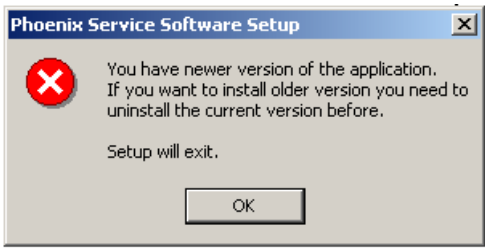
Driver versions will be checked and if need be, updated.

When you update Phoenix from an old to a new version (e.g. *a11_2003_41_5_28* to *a12_2003_50_6_35*), the update will take place automatically without uninstallation.

If you try to update Phoenix with the same version that you already have (e.g. *a12_2003_50_6_35* to *a12_2003_50_6_35*) you are asked if you want to uninstall the version of Phoenix you have on your PC. In this case, you can choose between total uninstallation and repair just like when you choose to uninstall Phoenix service software from the Windows control panel.

If you try to install an older version (e.g. downgrade from *a12_2003_50_6_35* to *a11_2003_41_5_28* installation will be interrupted.

©Nokia Corporation

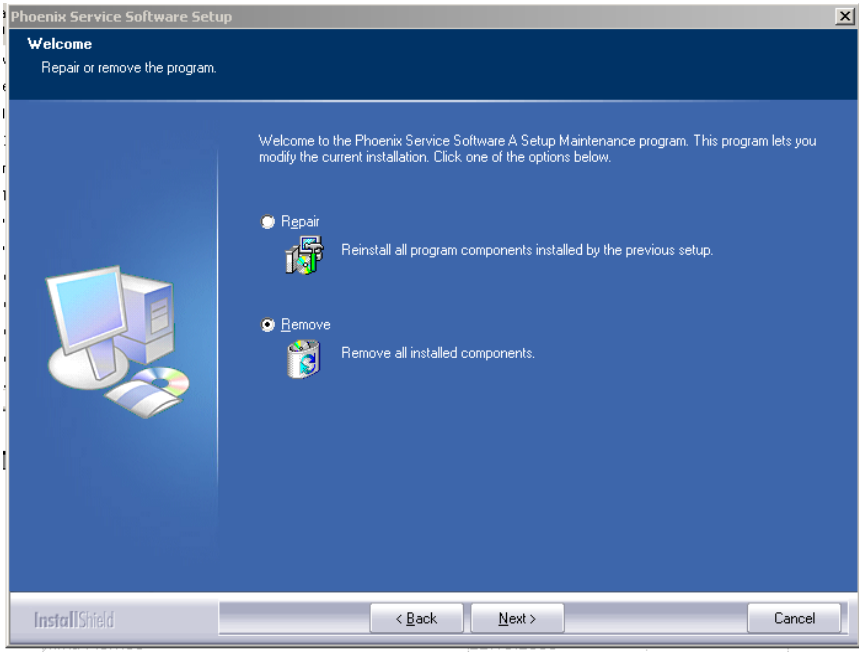


Please always follow the instructions on the screen.

Uninstalling Phoenix

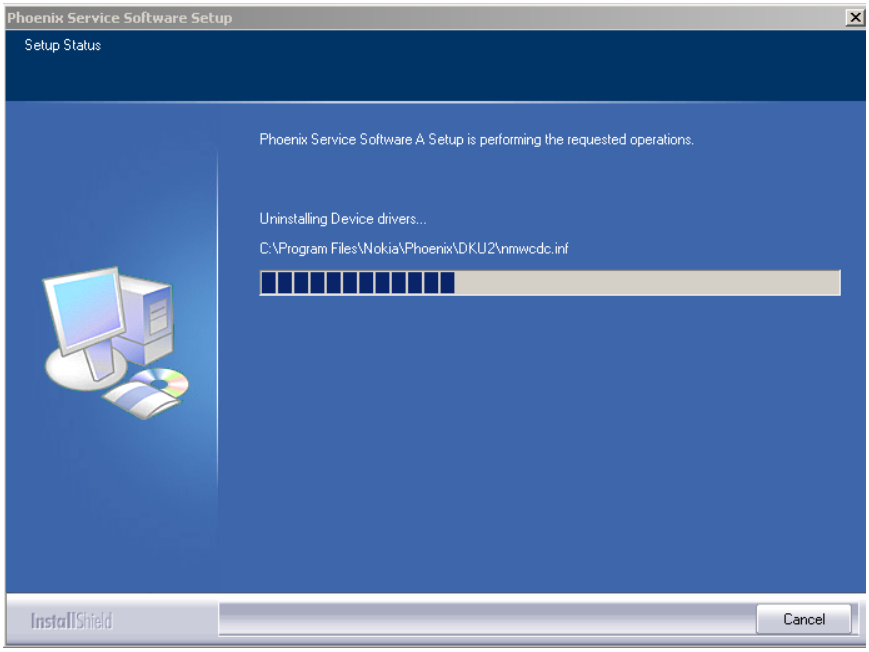
Uninstallation can be done manually from Windows Control Panel - Add / Remove Programs.

Choose "Phoenix Service Software" and click "Add/Remove". Choose "Remove" to uninstall Phoenix.

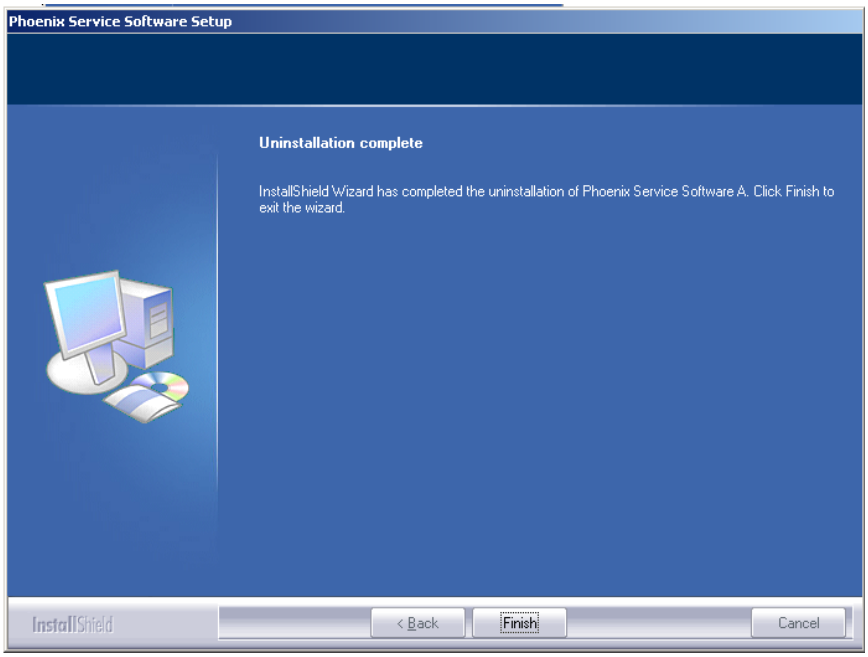


©Nokia Corporation

Progress of the uninstallation is shown.

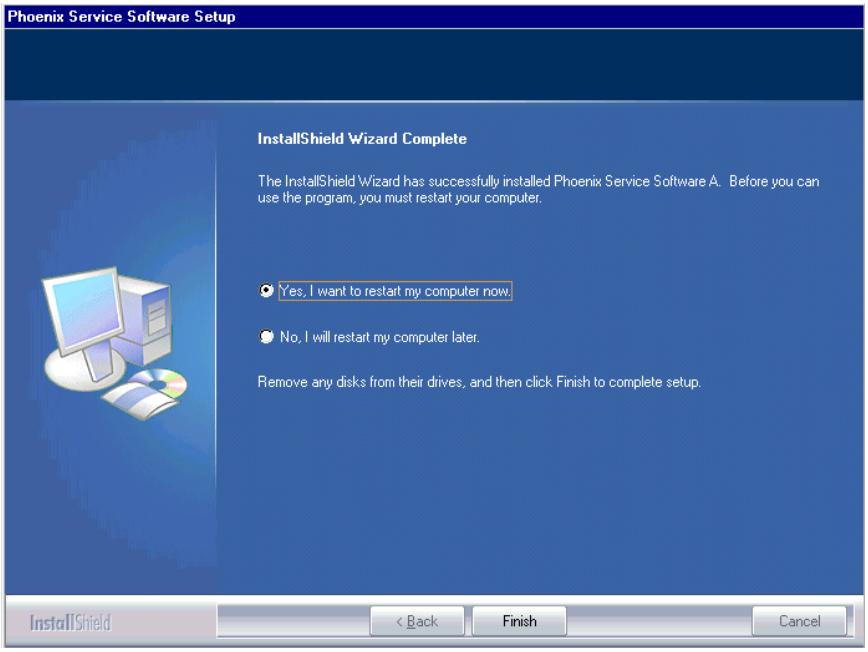


If the operating system does not require rebooting, select "Finish" to complete.



If the operating system used requires rebooting, Install Shield Wizard will notify you about it. Select "Yes..." to reboot the PC immediately and "No..." to reboot the PC manually afterwards.

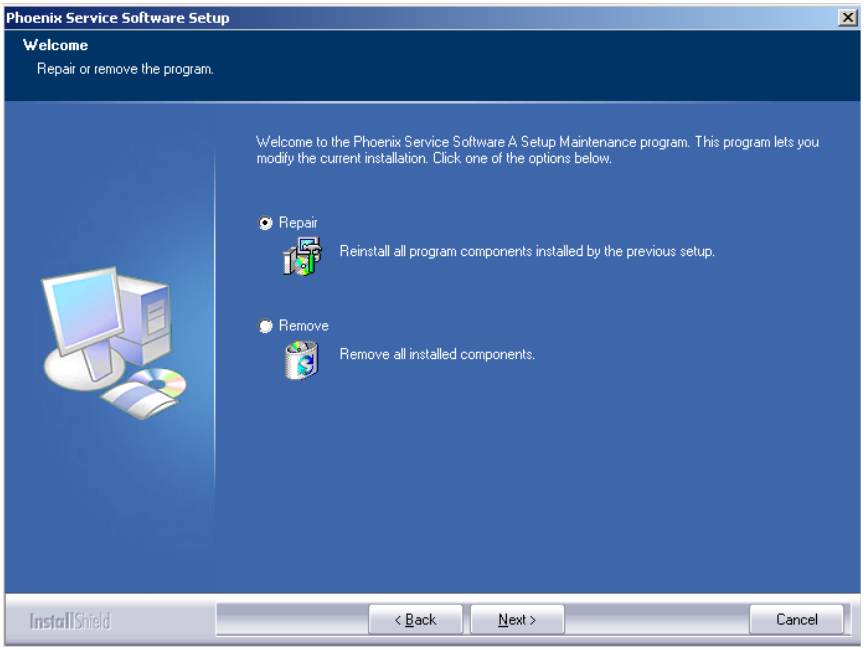
©Nokia Corporation



Repair

If you experience any problems with the service software or suspect that files have been lost, you can use the repair function before completely reinstalling Phoenix. Note that the original installation package (e.g. *phoenix_service_sw_a12_2003_50_6_35.exe*) must be found on your PC when you run the repair setup.

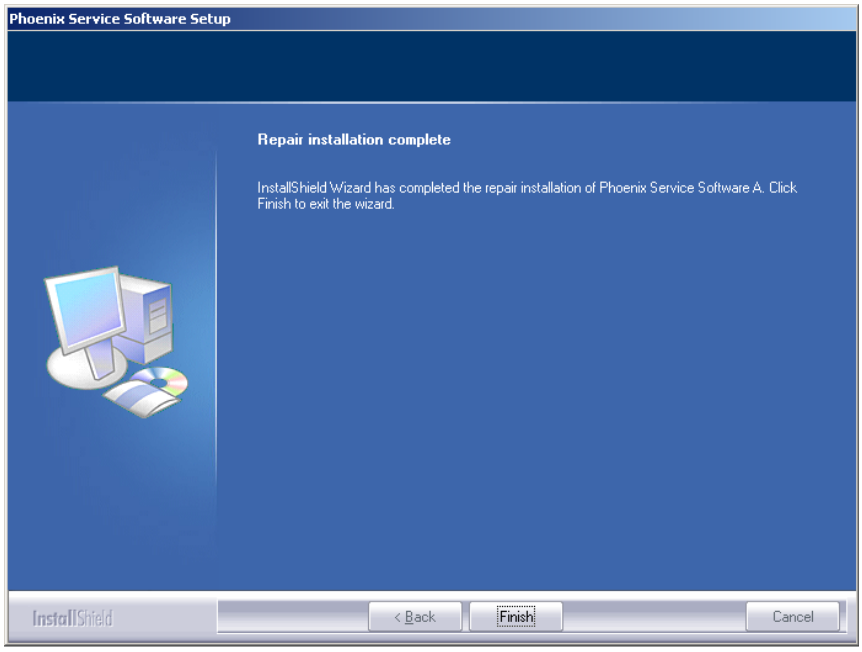
Run Windows Control Panel - Add / Remove Programs, choose "Phoenix Service Software" and click "Add/Remove". In the following view choose "Repair".



©Nokia Corporation

Phoenix will reinstall components and register them, the procedure is the same as in the update installation.

Choose “Finish” to complete.



©Nokia Corporation

Data Package for Phoenix (Product Specific)

Before installation

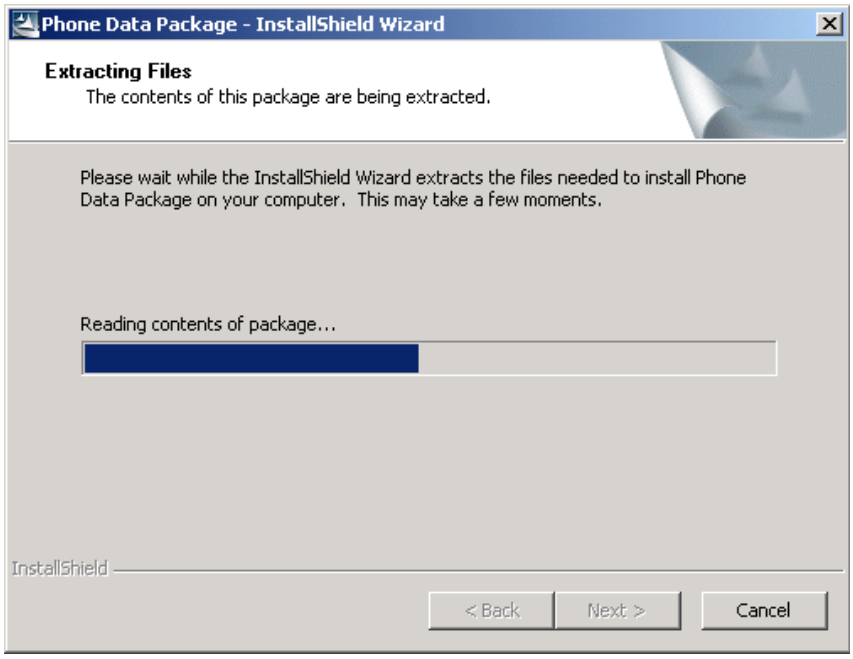
- Product Data Package contains all product specific data to make the Phoenix Service Software and tools usable with a certain phone model.
- Check that the dongle is attached to the parallel port of your computer.
- Install Phoenix Service SW.
- Download the installation package (e.g. *RH-12_dp_v_40.0_mcusw02.19.exe*) to your computer (e.g. C:\TEMP).
- Close all other programs.
- Run the application file (e.g. *RH-12_dp_v_40.0_mcusw02.19.exe)* and follow instructions on the screen.

Please note that very often the Phoenix Service SW and the Phone Specific Data Package for Phoenix come in pairs, meaning that certain version of Phoenix can only be used with certain version of Data Package. Always use the latest available versions of both. Instructions can be found in phone model specific Technical Bulletins and readme.txt files of the data packages.

Installing Phoenix data package (product specific)

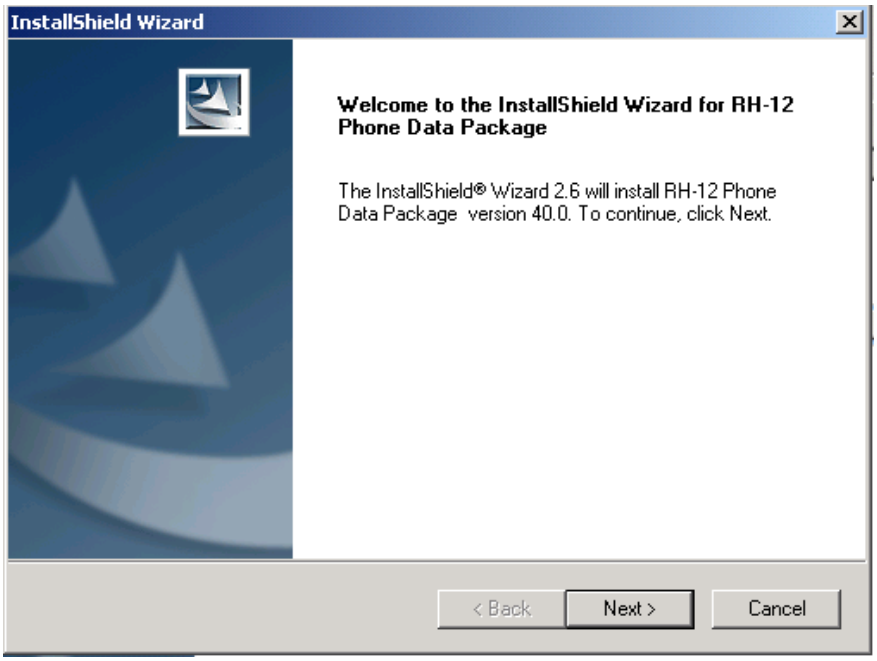
Run the *RH-12_dp_v_40.0_mcusw02.19.exe* to start the installation.

When you choose "Next" the files needed for the installation will be extracted. Please wait.

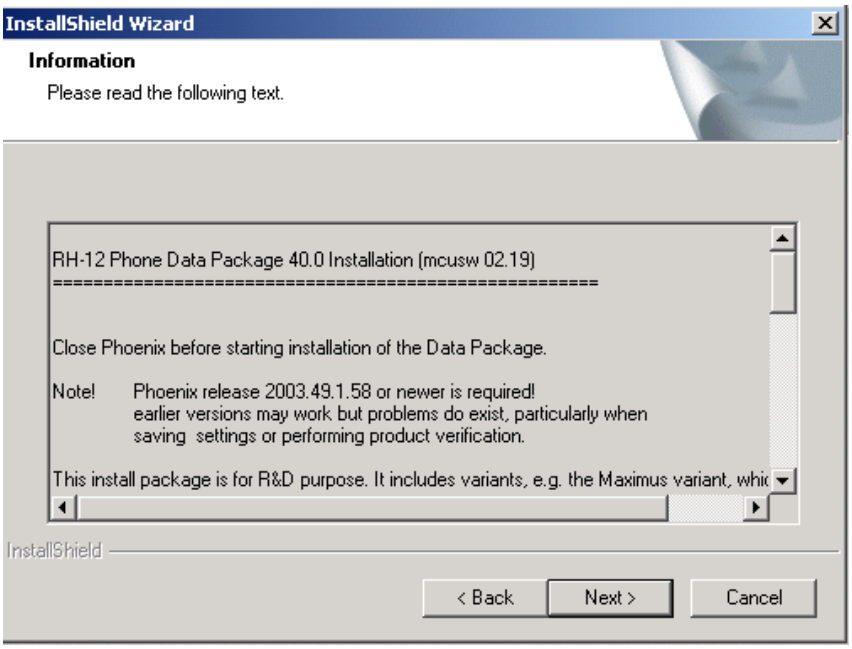


©Nokia Corporation

Choose "Next" to continue.



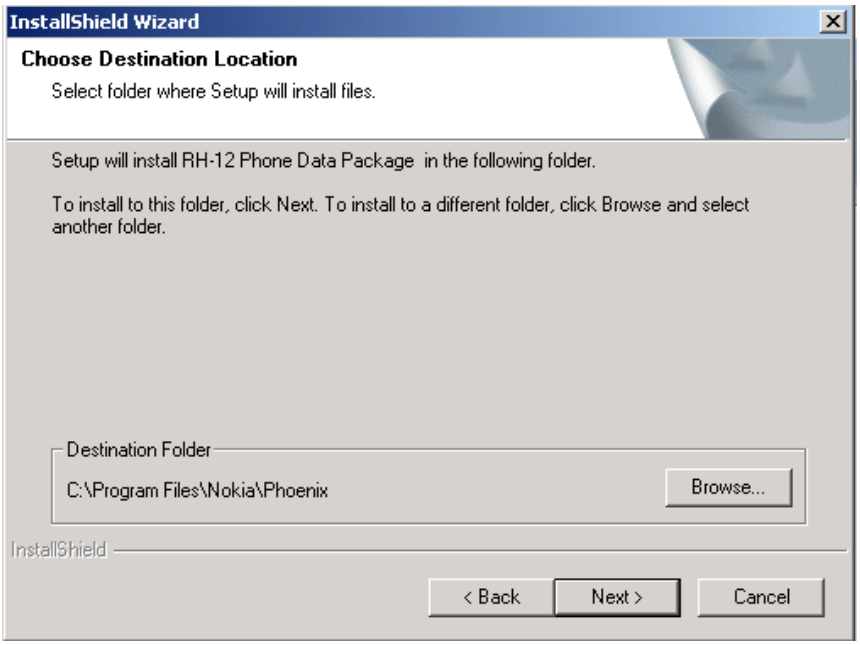
From this view, you can see the contents of the Data Package. **Read the text carefully**. There should be information about the Phoenix version needed with this data package. Choose "Next".



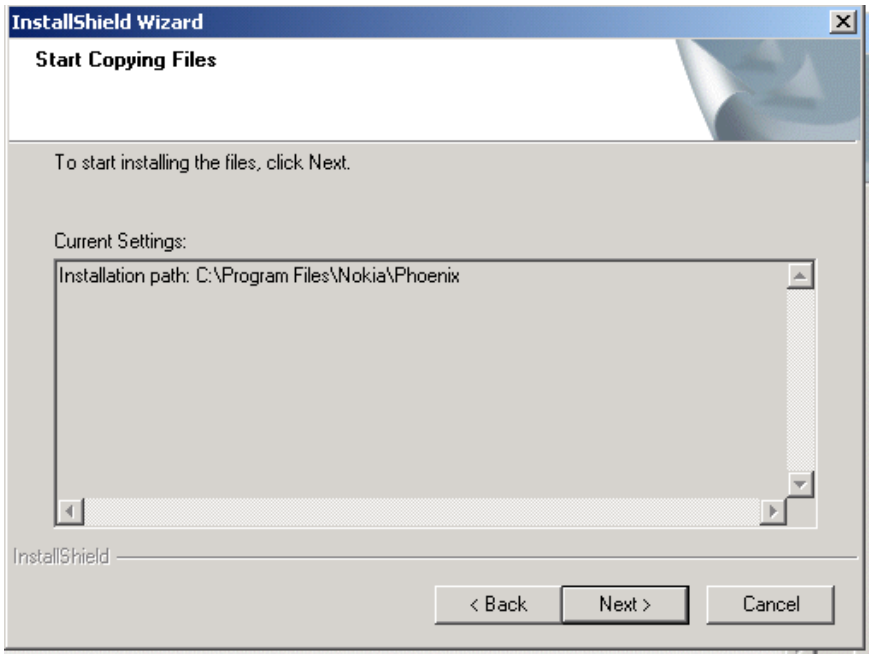
Confirm location and choose "Next" to continue. Install shield checks where the Phoenix

©Nokia Corporation

application is installed and the directory is shown. Choose "Next" to continue.

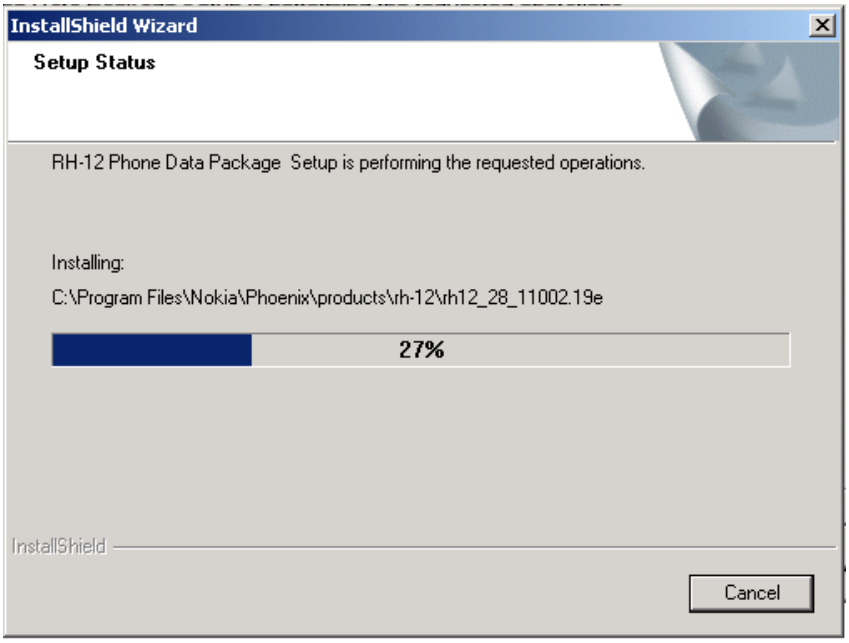


Choose "Next" to start copying the files.

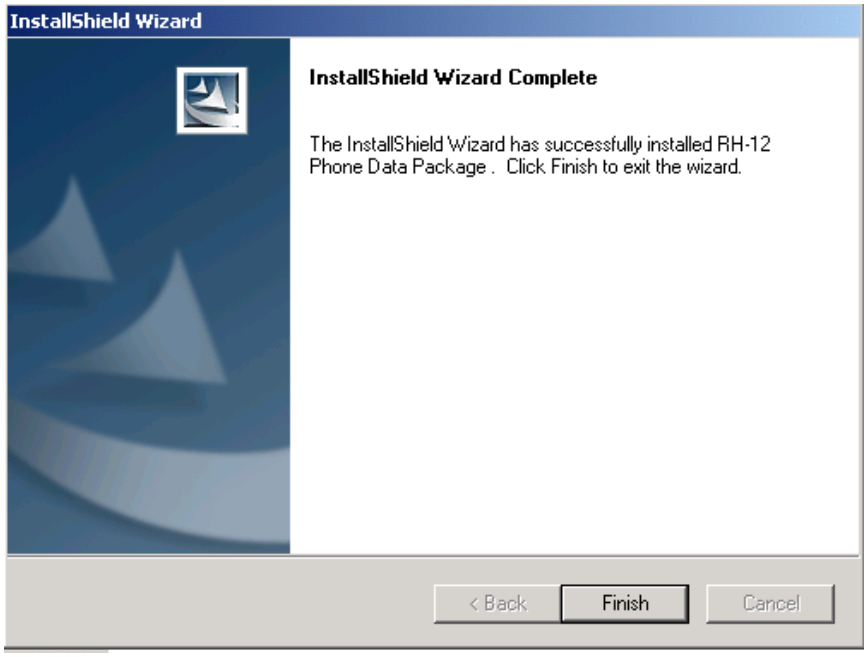


Phone model specific files will be installed. Please wait.

©Nokia Corporation



Choose "Finish" to complete the installation.



You now have all phone model specific files installed in your Phoenix Service SW.

Now Phoenix can be used to for example flash phones and print type labels after:

- configuring users
- managing connections

FLS-4S can be used right away.

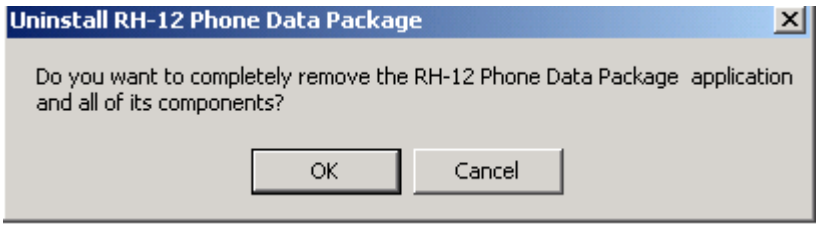
©Nokia Corporation

FPS-8* can be used after updating Flash Update Package files to it.

Uninstalling the data package

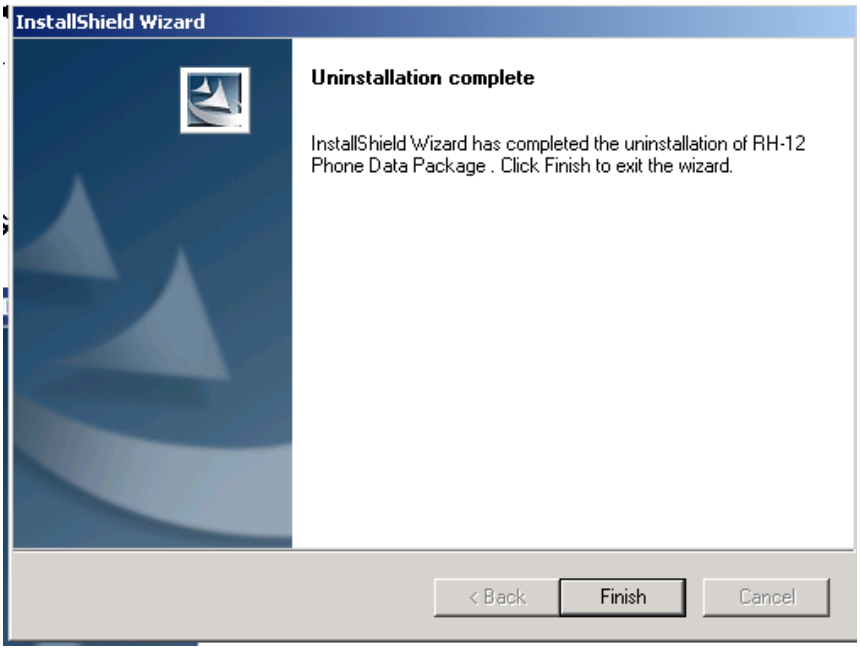
Uninstallation can also be done manually from Windows Control Panel / Add / Remove Programs / "RH-12 Phone Data Package".

If you try to install the same version of Phoenix Data Package that you already have, you are asked if you want to uninstall the version you have on your PC. Answer "OK" to uninstall, "Cancel" if you don't want to uninstall.



Older versions of data packages don't need to be uninstalled unless instructions to do so are given in the readme.txt of the data package and bulletins concerning the release. Please read all related documents carefully.

Once the previously installed Data package is uninstalled, choose "Finish".

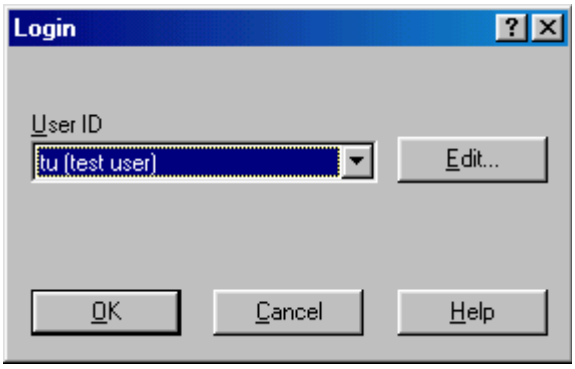


Run the *RH-12_dp_v_40.0_mcusw02.19.exe* again in case you want to continue the installation from the beginning.

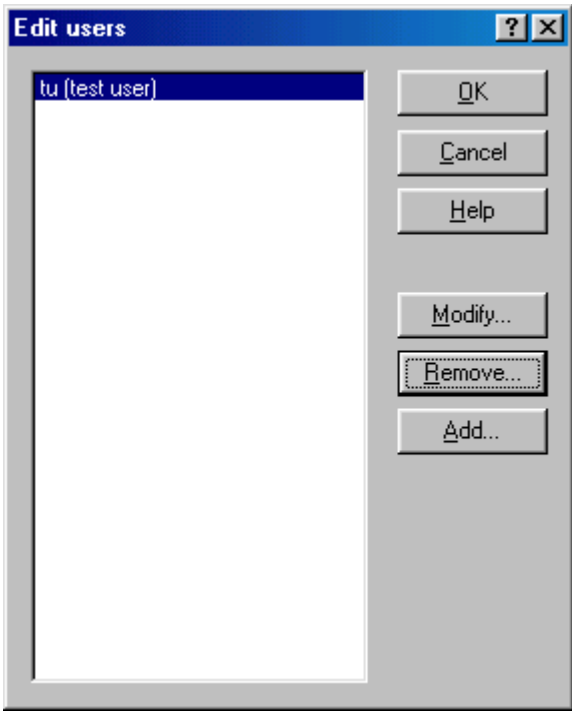
©Nokia Corporation

Configuring Users

Start Phoenix Service SW and Login. To add new user choose "Edit". If user ID is already configured, choose your own user ID from the list and choose "OK".



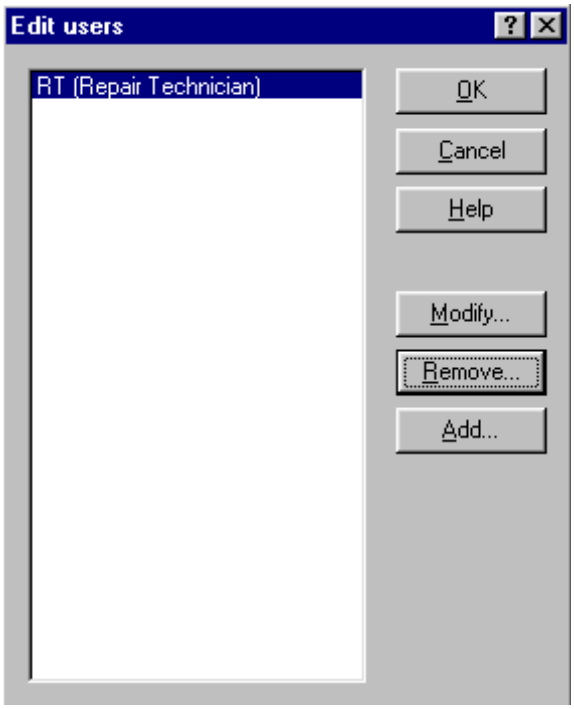
Choose "Add" to continue.



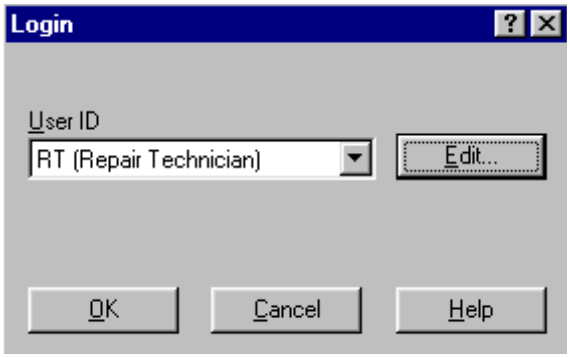
©Nokia Corporation

Type in your name and initials to fields and choose "OK".

User has now been created, choose "OK".



You are now able to login with this username, choose "OK".

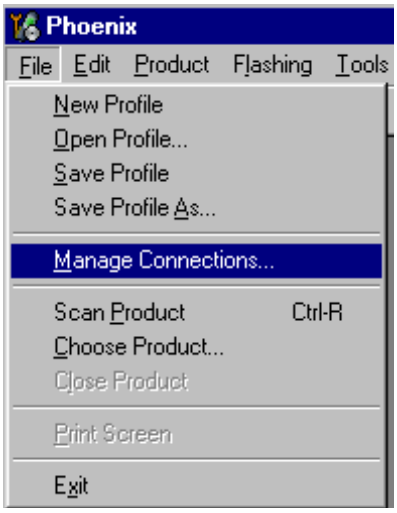


©Nokia Corporation

Managing Connections

Start Phoenix Service SW and Login.

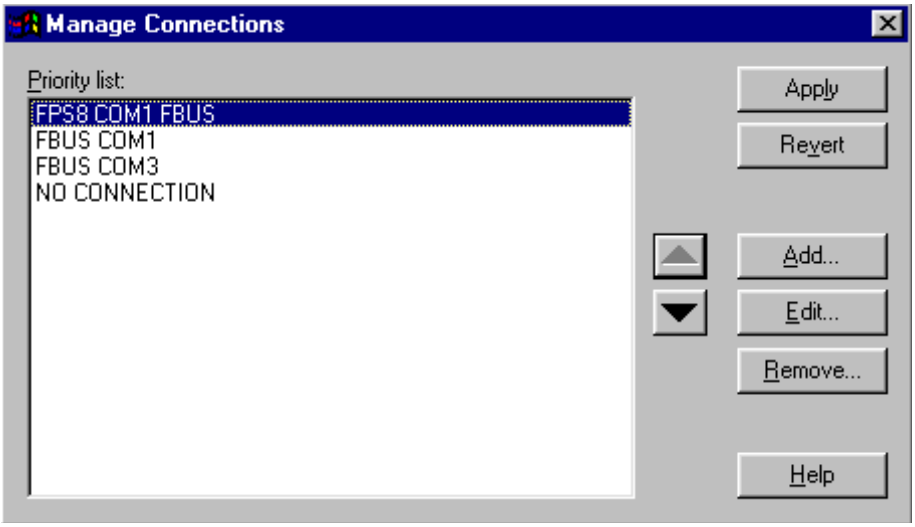
Choose "Manage Connections" From "File" Menu.



Existing connections can be selected , edited, deleted and new ones created by using this dialog.

A connection can be created either manually or by using a Connection Wizard.

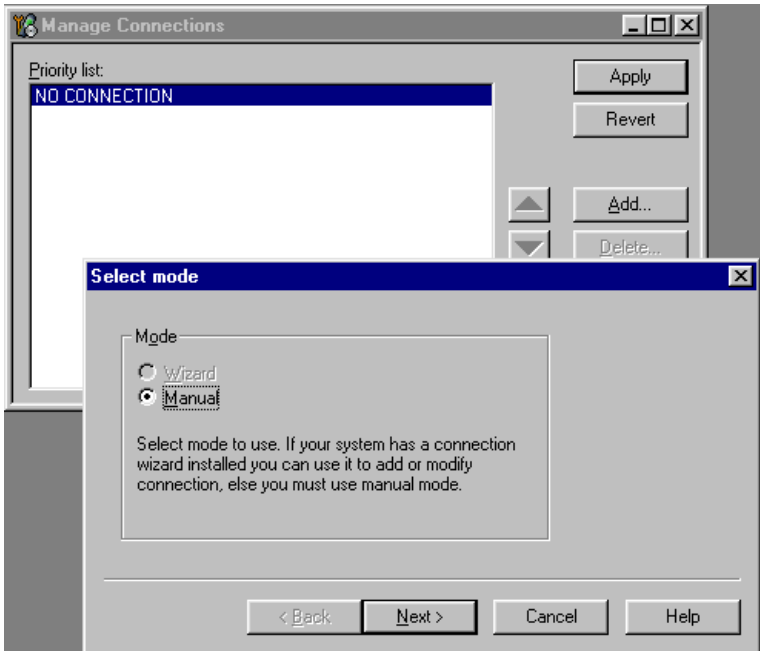
To add new connection, choose "Add" and select if you want to create it manually or by using the Wizard.



©Nokia Corporation

Choose "Next" to continue.

In the next dialogs you will be asked to select some settings for the connection.



Manual Settings

A) For **FLS-4S POS Flash Device** choose the following connection settings

- **Media:** FBUS
- **COM Port:** Virtual COM Port used by FLS-4 **Please check this always!**

(To check please go to Windows / Control Panel / FLS Virtual Port / Configuration)

B) For **FPS-8 Flash Prommer** choose the following connection settings:

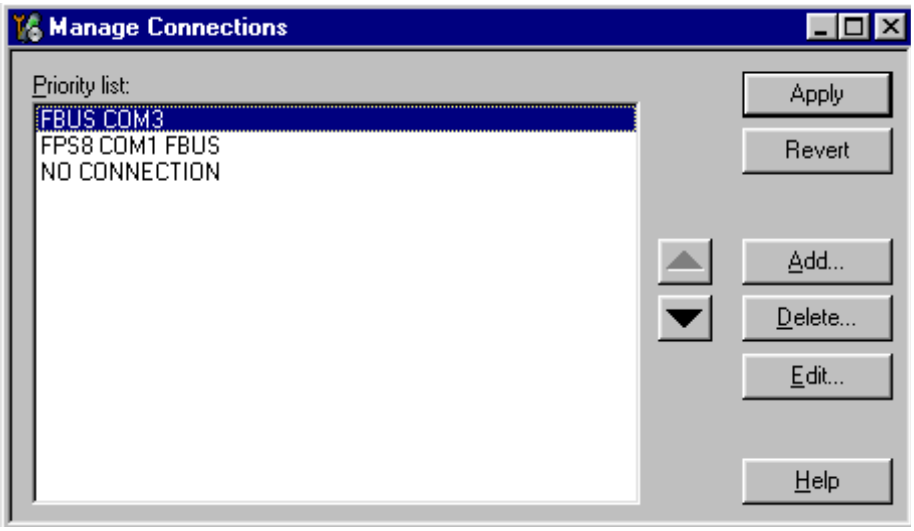
- **Media:** FPS-8
- **Port Num:** COM Port where FPS-8 is connected
- **COMBOX_DEF_MEDIA:** FBUS

©Nokia Corporation

Choose "Finish" to complete.

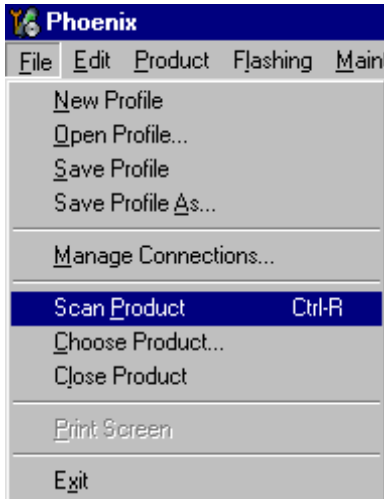
If you use the Wizard, connect the tools and a phone to your PC and the wizard will automatically try to configure the correct connection.

Activate the connection you want to use by clicking it and use up/down arrows to move it on top of the list. Choose "Apply". The connection is now selected and can be used after closing the "Manage Connections" window.



Selected connection will be shown on the right hand bottom corner of the screen.

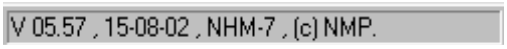
To use the selected connection, connect the phone to Phoenix with correct service tools, make sure that it is switched on and select "Scan Product".



When Product is found, Phoenix will load product support and when everything is ready,

©Nokia Corporation

name of the loaded product support module and its version will be shown on the bottom of the screen.



©Nokia Corporation

Updating Flash Support Files for FPS-8* and FLS-4*

Before installation

- Install Phoenix Service SW .
- Install phone model Specific Data package for Phoenix.

The flash support files are delivered in the same installation package with Phoenix data packages or newer Phoenix packages beginning from September 2003.

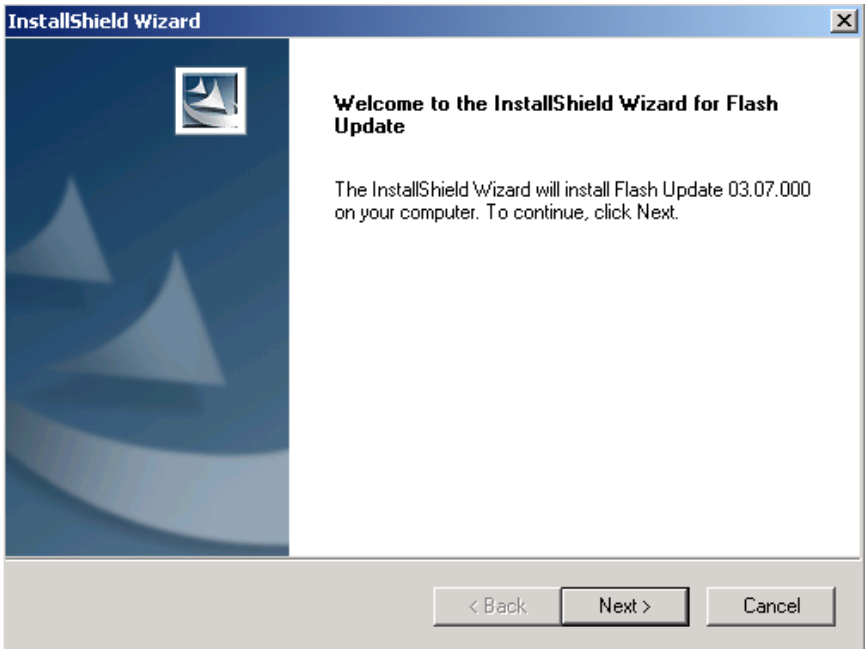
Normally it is enough to install the Phoenix and phone data package only because the Phoenix installation always includes the latest flash update package files for FLS-4S / FPS-8*.

Separate installation package for flash support files is available, and the files can be updated according to these instructions if updates appear between Phoenix / data package releases.

Installing the flash support files (only separate installation package)

If you are not using separate installation package, you can skip this section.

Start by double clicking *flash_update_03_07_000.exe* **. The i**nstallation begins.

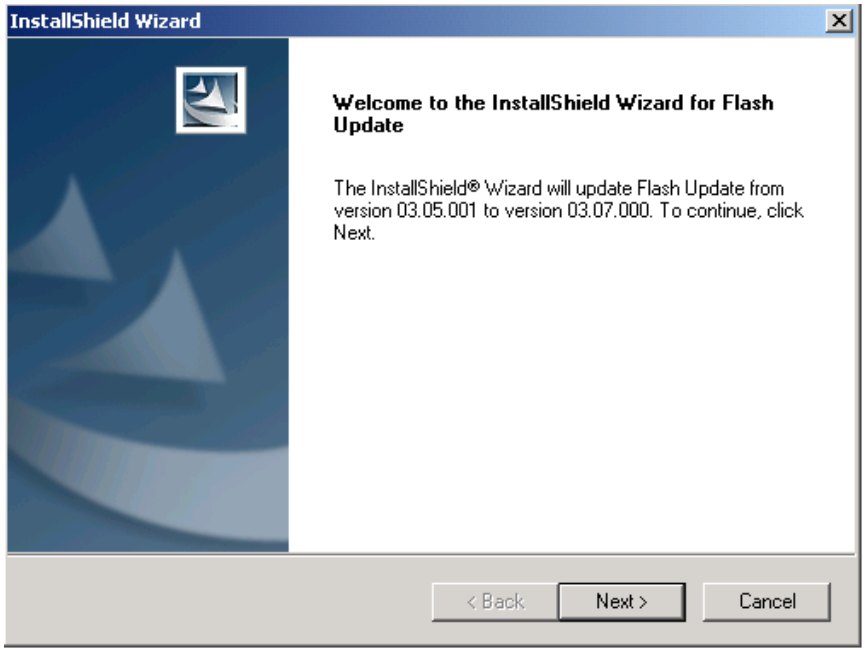


If the same version of Flash Update package already exists, and you want to reinstall them, the previous package is first uninstalled. Restart installation again after that.

©Nokia Corporation

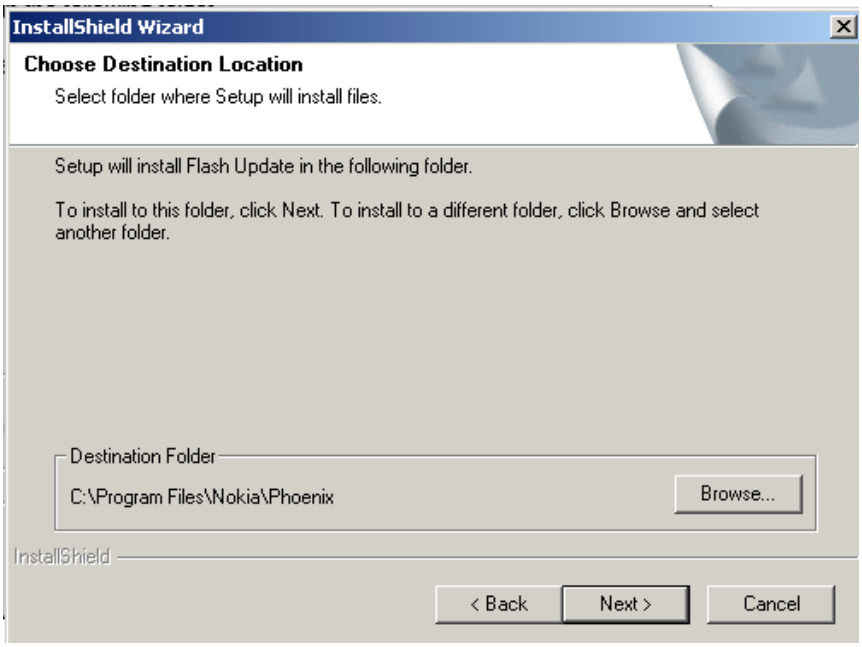
If you try to downgrade the existing version to older ones, the setup will be aborted. If you really want to downgrade, uninstall newer files manually from Control Panel and then re run the installation again.

If an older version exists on your PC and it needs to be updated, choose "Next" to continue the installation.

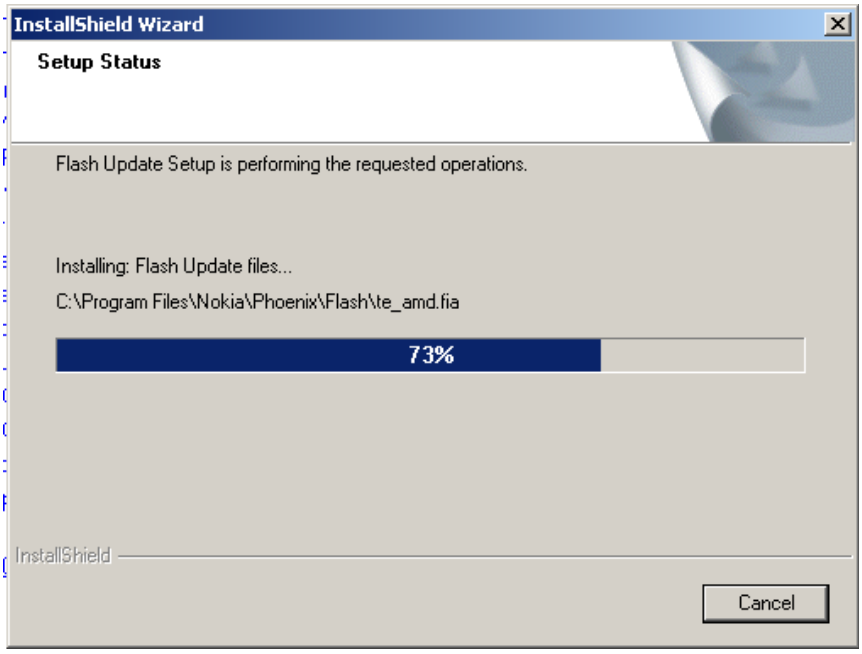


©Nokia Corporation

It is **highly** recommended to install the files to the default destination folder *C:\Program Files\Nokia\Phoenix*. Choose "Next" to continue. When installing the flash update files for the first time you may choose another location by selecting "Browse" (not recommended).



The installation continues.

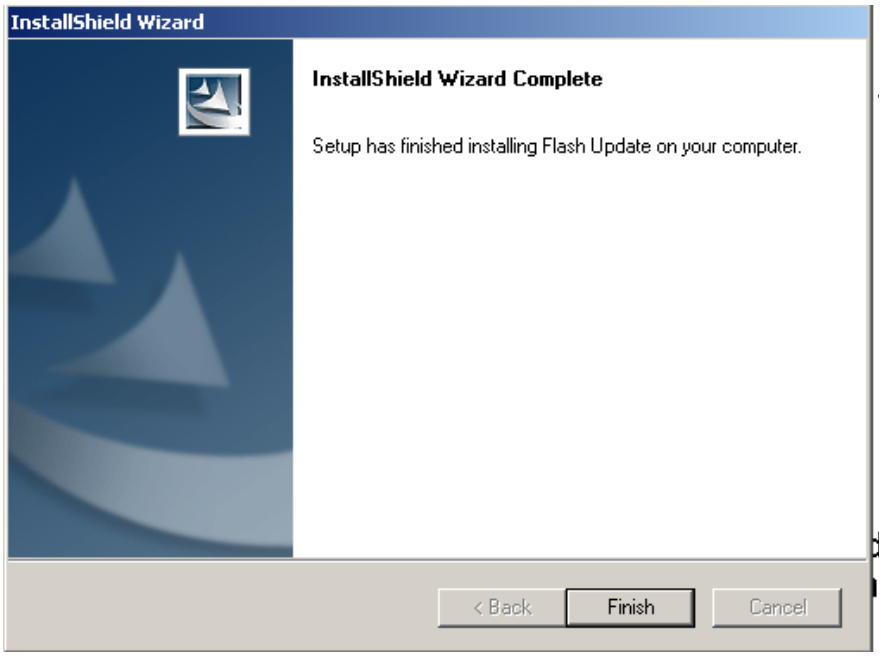


Choose "Finish" to complete the procedure.

FLS-4 can be used right after Flash Update Package is installed.

©Nokia Corporation

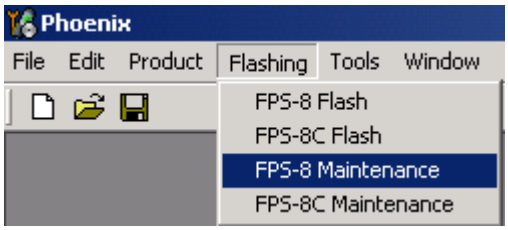
FPS-8* flash prommer must be updated by using Phoenix!



Updating the FPS-8* Flash Prommer SW

Start Phoenix Service Software and login, manage connection correctly for the FPS-8* flash prommer.

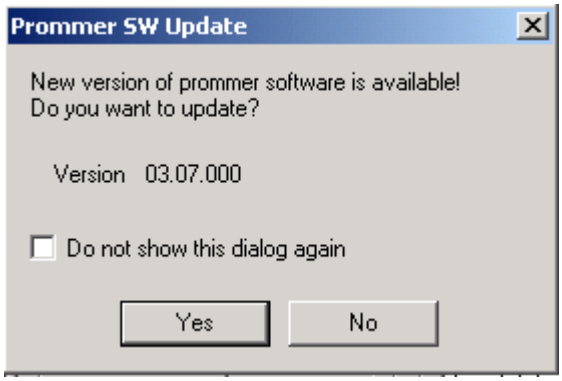
Select "FPS-8 maintenance" from "Flashing" menu.



When new FPS-8 flash update package is installed to computer you will be asked to update the files to your FPS-8 Prommer.

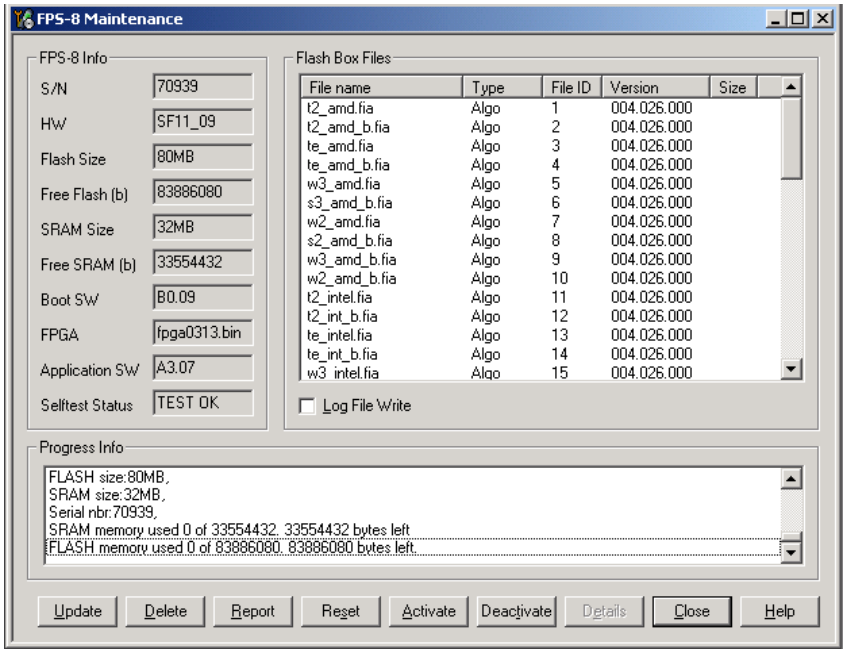
©Nokia Corporation

Select "Yes" to update files.



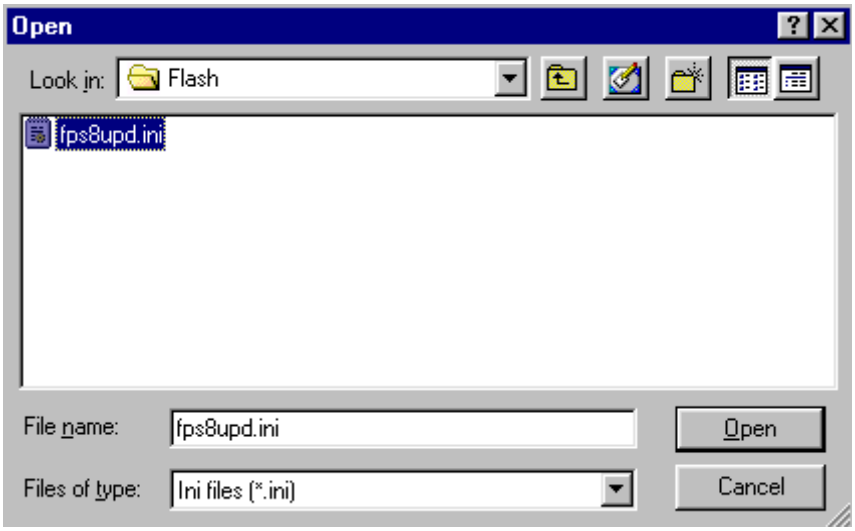
The update procedure takes a couple of minutes, please wait until you are notified that update has been successful. Choose "OK" and close "FPS8 Maintenance" UI.

View after a successful prommer software update.



©Nokia Corporation

FPS-8 sw can also be updated by pressing "Update" and selecting appropriate **fps8upd.ini** file under *C:\Program Files\Nokia\Phoenix***Flash**.



All files can be loaded separately to FPS-8. To do this, just press the right mouse button in the "Flash box files" window and select file type to be loaded.

More information and help can be found from "Help" dialog.

©Nokia Corporation

Activating and Deactivating FPS-8

- Before the FPS-8 can be successfully used for phone programming, it must be first activated.

- If there is a need to send FPS-8 box to somewhere e.g. for repair, box must be first deactivated.

Activation

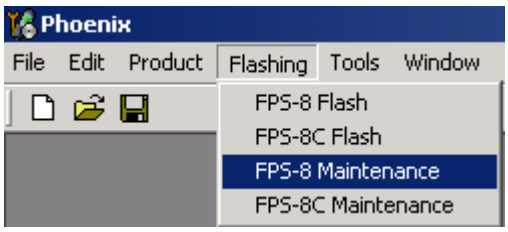
Before FPS-8 can be successfully used for phone programming, it must be first activated.

First, fill in the "FPS-8 activation request" sheet, in the FPS-8 sales package and follow the instructions in the sheet.

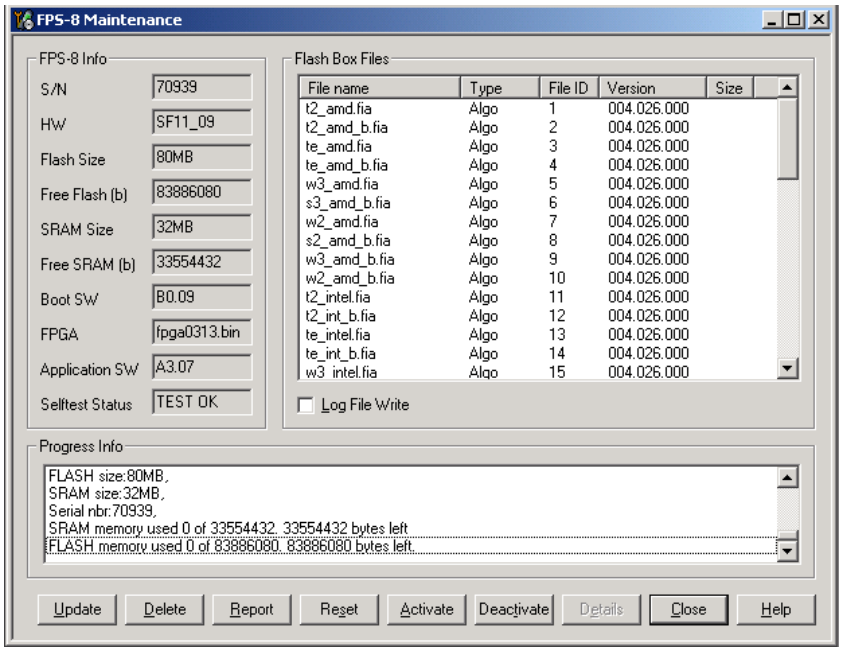
When activation file is received (e.g. 00000.in), copy it to *C:\ProgramFiles\Nokia\Phoenix\BoxActivation* directory on your computer (this directory is created when Phoenix is installed).

Start Phoenix Service Software.

Select "FPS-8 maintenance" from "Flashing" menu.



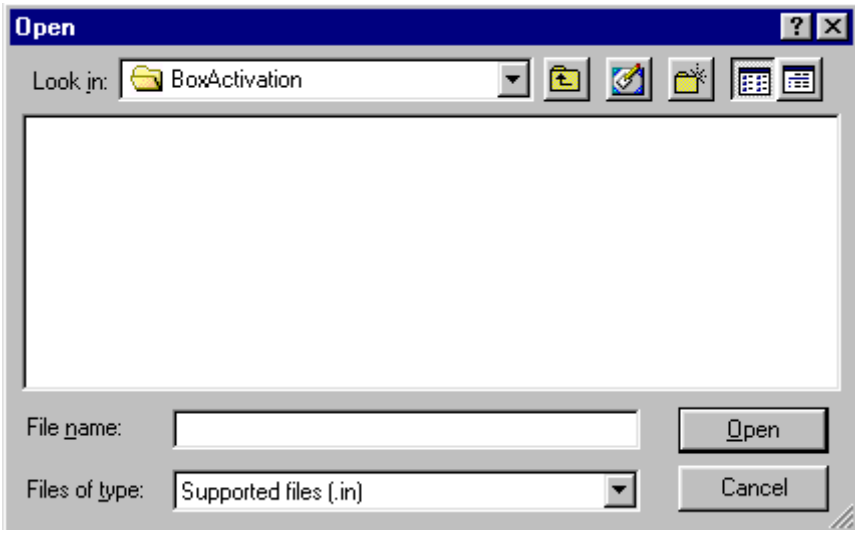
Select "Activate" from the "FPS8 Maintenance" UI. The box will be activated when you choose "**Activate**".



©Nokia Corporation

If you want to save the activation file to another directory on your PC, please browse to find it.

The box will be activated when you choose "**Open**".



Turn FPS-8 power off and on to complete the activation.

Deactivation

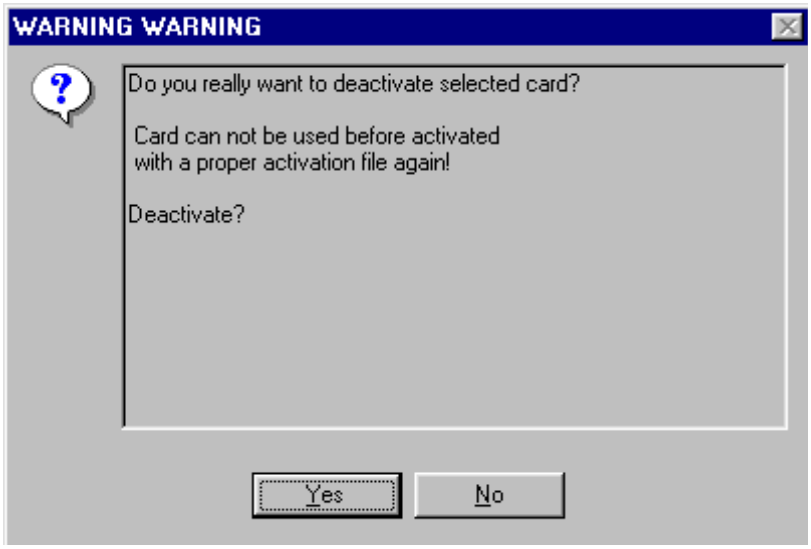
Start Phoenix Service Software.

Select "FPS-8 maintenance from the "Flashing" menu as when activating prommer or updating sw.

Select "**Deactivate**" from the "FPS8 Maintenance" UI.

Confirm Deactivation by choosing "Yes". The box will be deactivated.

©Nokia Corporation



Turn FPS-8 power off and on to complete deactivation.

©Nokia Corporation

JBV-1 Docking Station SW

The JBV-1 Docking Station is a common tool for all DCT-4 generation products.

In order to make the JBV-1 usable with different phone models, a phone specific Docking Station Adapter is used for different service functions.

The JBV-1 Docking Station contains Software (Firmware) which can be updated.

You need the following equipment to be able to update JBV-1 software:

- PC with USB connection
- operating System supporting USB (Not Win 95 or NT)
- USB Cable (Can be purchased from shops or suppliers providing PC hardware and accessories)
- JBV-1 Docking Station
- external Power Supply 11-16V

Before installation

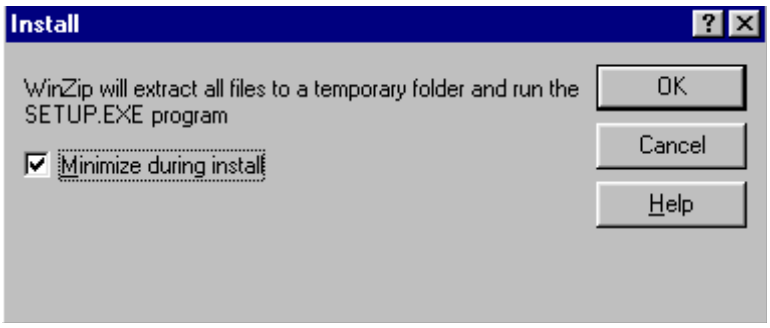
- Download *Jbv1_18_update.zip* – file to your computer (e.g. C:\TEMP) from your download web site.
- Close all other programs.
- Follow the instructions on the screen.

Installing SW needed for the JBV-1 SW update

Note: DO NOT CONNECT THE USB CABLE / JBV-1 TO YOUR COMPUTER YET!

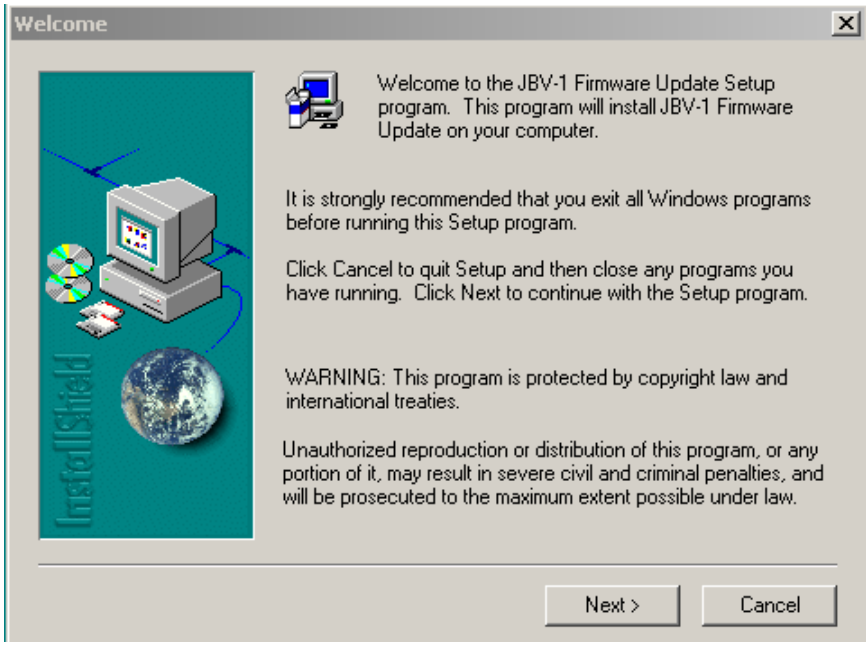
Run Jbv1_18_update.zip file and start the SW installation by double clicking Setup.exe.

Files needed for JBV-1 Package setup program will be extracted.

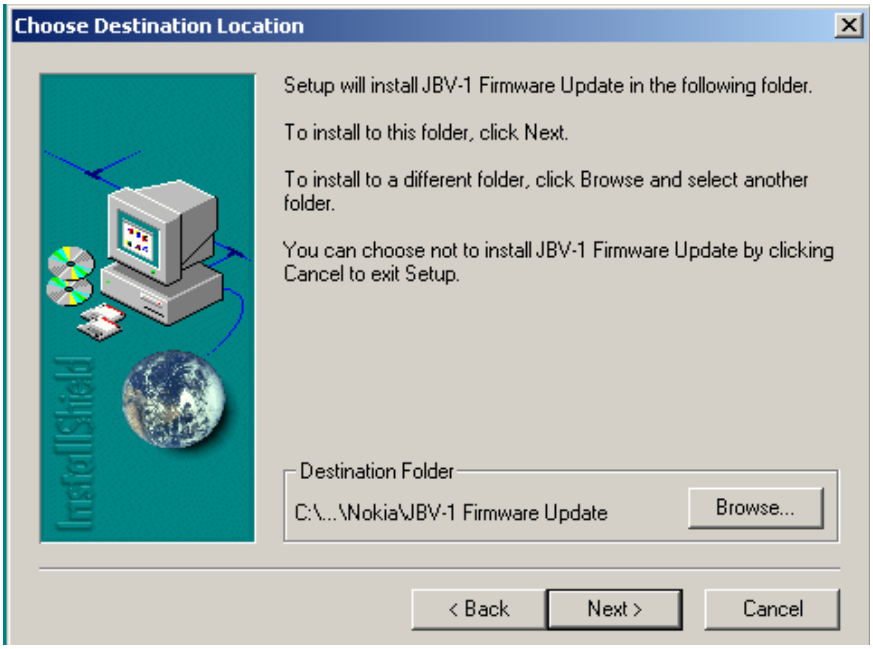


©Nokia Corporation

The installation begins, please read the information shown and choose "Next" to continue.

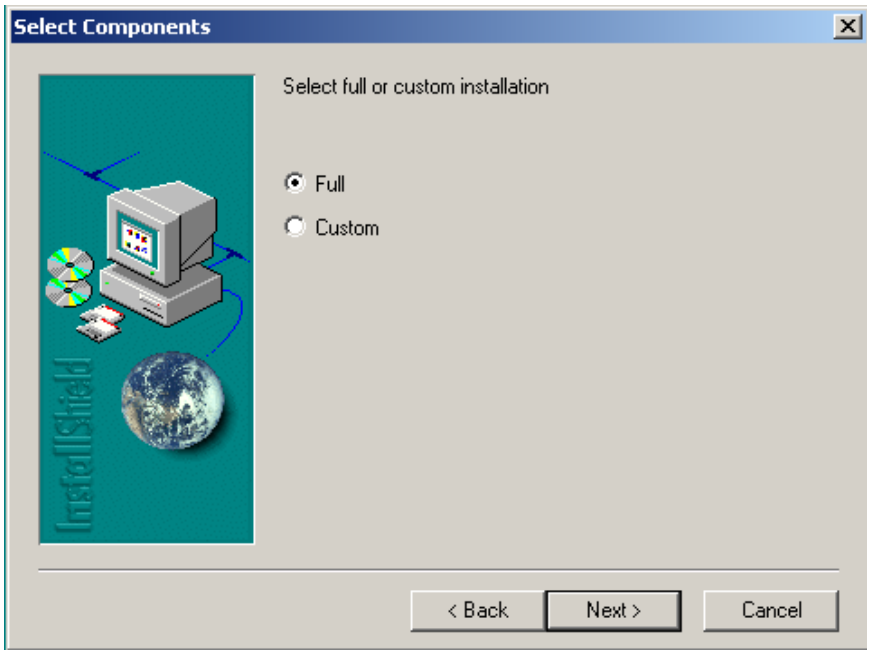


Use suggested destination folder where JBV-1 SW Package will be installed and choose "Next" to continue.

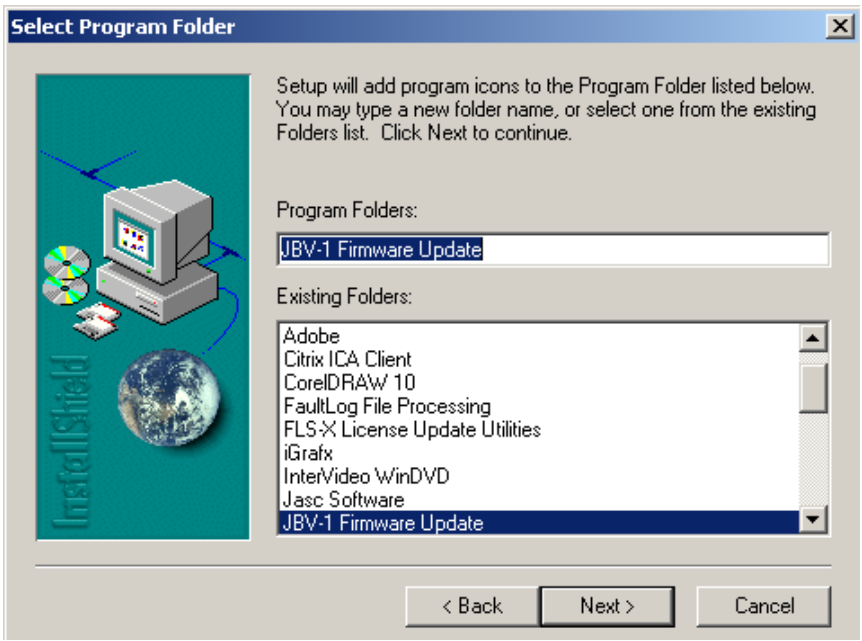


©Nokia Corporation

Select "Full" installation and choose "Next" to continue.

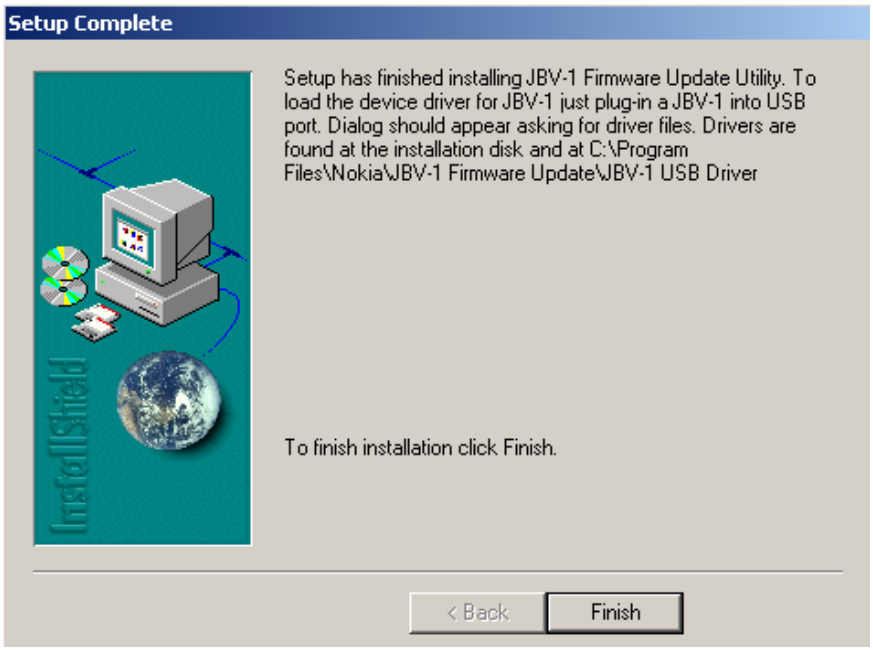


Program Folder will be created. Choose "Next" to continue, Software files will be installed.



©Nokia Corporation

After successful installation, choose "Finish" to complete.



YOU CAN NOW CONNECT THE USB CABLE / JBV-1 TO YOUR COMPUTER

Connect power to JBV-1 (11-16V DC) from an external power supply, then connect USB Cable between JBV-1 USB connector and PC.

The next step is to install or update the JBV-1 USB drivers which are delivered with the JBV-1 SW installation package. They can be found in folder:

C:\Program Files\Nokia\ JBV-1 Firmware Update\JBV-1USB driver

If there is no previously installed JBV-1 Firmware update package installed on your computer, Windows will detect the connected USB cable and detect drivers for new HW. You will be prompted about this, please follow the instructions and allow Windows to search and install the best Drivers available.

If there is a previously installed JBV-1 Firmware update package (v 17 or older) on your computer, please update the JBV-1 USB Driver. *Please see the readme.txt* file under C:\Program Files\Nokia\ JBV-1 Firmware Update\JBV-1USB driver folder for instructions on how to update the JBV-1 USB Driver.

After you have installed or updated the JBV-1 USB driver, the actual JBV-1 SW update can begin.

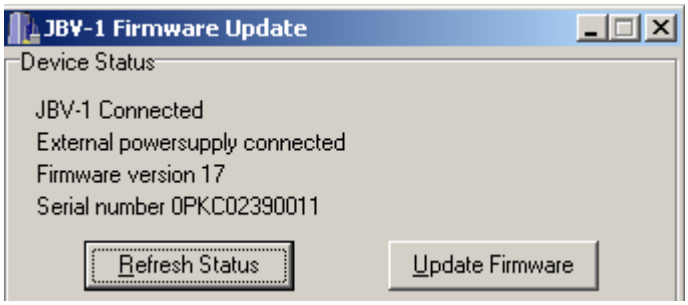
Go to folder *C:\Program Files\Nokia\JBV-1 Firmware Update\JBV-1 Firmware Update* and start JBV-1 Update SW by double clicking **fwup.exe**.

JBV-1 Firmware update starts and shows current status of the JBV-1 connected.

©Nokia Corporation

If the firmware version read from your JBV-1 is not the latest one available (v. 17 or older), it needs to be updated to version 18 by choosing "Update Firmware".

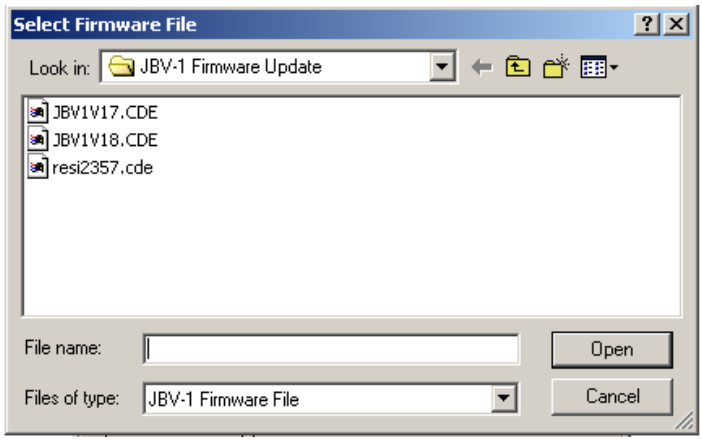
If you simply want to check the SW version, choose "Refresh Status".



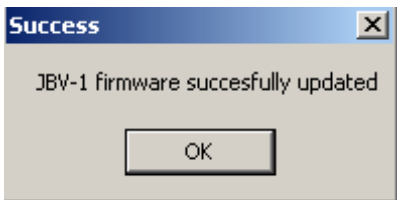
To update your JBV-1 to a new version, 18 choose file *JBV1v18.CDE* and "Open".

Please wait, it takes a while until you can hear a "**click**" from the JBV-1.

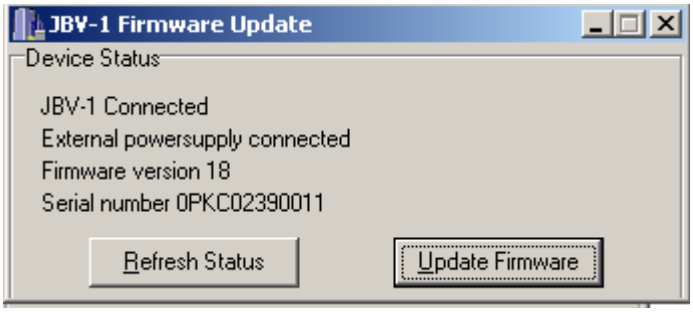
The older sw file JBV1v17.CDE is visible in this view only if the previous JBV-1 SW package has been installed on your computer.



After a successful update, the current JBV-1 status will be shown after you choose "OK".



©Nokia Corporation



You have now updated the software of your JBV-1 docking station and it is ready for use.

If you have several docking stations you need to update, disconnect the Power & USB cables from the previous one and connect them to the next docking station. Choose "Refresh Status" to see the current SW version and then "Update Firmware" to update the SW.

After you have updated all docking stations, close the "JBV-1 Firmware Update" dialog.

©Nokia Corporation

Receiver tuning: Quick Guide for Tuning With Phoenix

General

RF tunings should be made in the same order as shown in this document. The order of the corresponding menu items in the Phoenix Service SW may be different.

If baseband tunings are needed, they should be made before the RF tunings.

Avoid unnecessary tuning – factory tuning values are always the most accurate ones.

Views in this document may change as the service software is developed. Please refer to the Phoenix help files, phone model specific service manual and bulletins for help.

Service Tool Concept for RH-12* Baseband Tunings

EM calibrations should be carried out in JBV-1 Docking Station equipped with DA-8 Docking Station Adapter

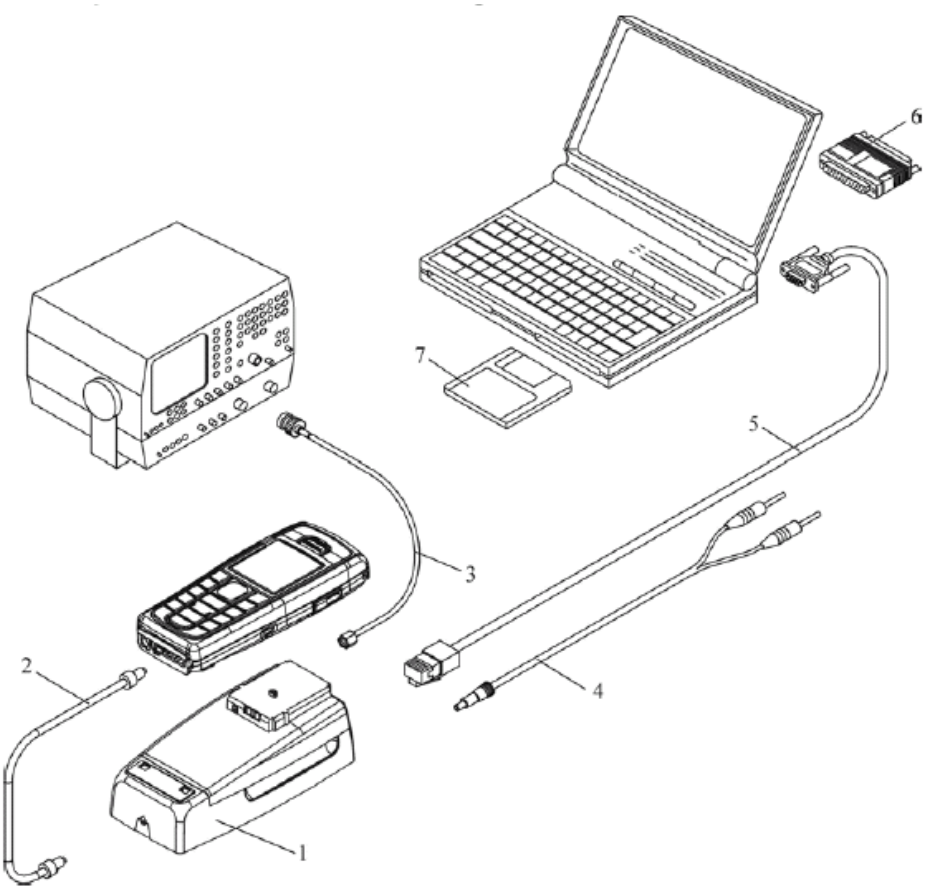
Note: RF tunings must be carried out in MJ-12 module jig.

Power to JBV-1 should be supplied from an external DC power supply, not FPS-8 prommer

JBV-1 input voltages:

- Maximum + 16 VDC
- Nominal input for RF tunings is +12 V DC

Service concept for RH-12* baseband tunings



©Nokia Corporation

Item	Service Accessory	Accessory type	Product code
1	Docking Station	JBV-1	0770298
2	Docking Station adapter	DA-8	0770546
4	DC-DC Cable	SCB-3	0730114
5	RF antenna cable	XRF-1	0730085
6	DC power cable	PCS-1	0730012
7	Service MBUS cable	DAU-9S	0730108
8	Software protection key	PKD-1	0750018
9	Phoenix service SW		8408031
9	Phoenix service SW	CD-ROM	0774286

Baseband Tunings

Energy management tuning

External power supply is needed.

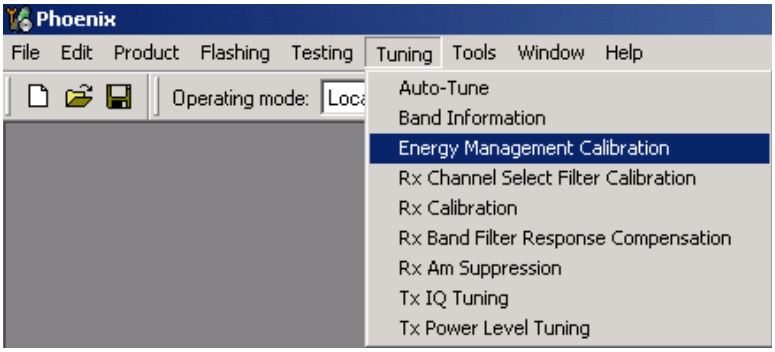
EM Calibration is used for calibrating Battery and Charger settings of the phone.

Preparation for EM Calibration:

- Connect DC Cable SCB-3 between JBV-1 and Vin of Phone for Charger calibration.
- Connect 12...15 V from Power Supply to JBV-1.

NOTE! Check that connection is F-BUS (doesn't work with M-BUS!).

Select **Tuning => Energy Management Calibration**

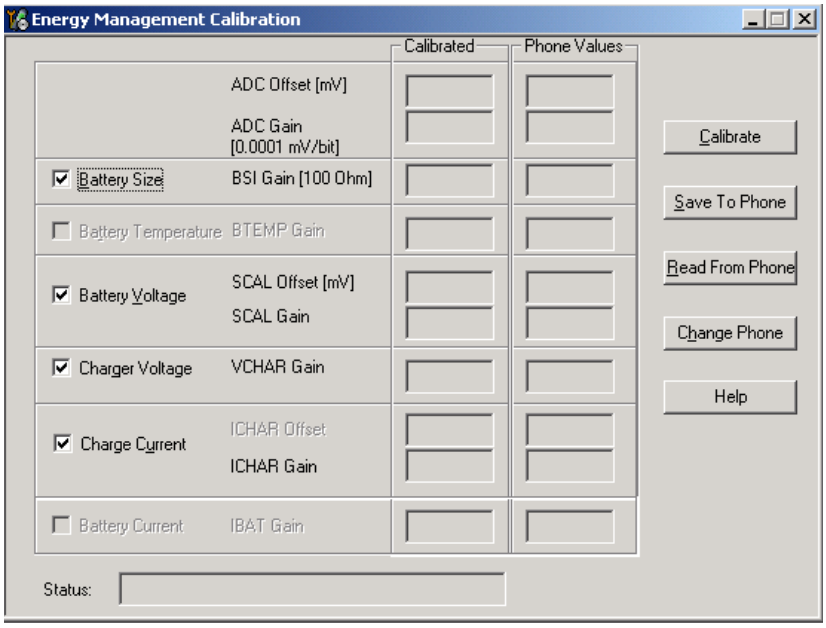


Energy Management values to be calibrated are checked.

©Nokia Corporation

Select "**Read from Phone**" to show current values in the phone memory and to check that the communication with the phone works.

Select "**Calibrate**" to run selected calibrations.



Limits for Energy Management Calibration:

	Min	Max
ADC gain	27000	28000
ADC offset	-50	50
BSI gain	930	1100
VBAT gain	10000	11000
VBAT offset	2400	2600
VCHAR	58000	62000
ICHAR	3500	4600

If values shown are within limits, select "**Save To Phone**" to save values to phone.

NOTE! Only values of checked tunings (Battery size, Battery Temperature etc...) will be saved.

Close the "**Energy Management Calibration**" dialog to end tuning.

©Nokia Corporation

Service Tool Concept for RF Tunings

All RF tunings for RH-12* phones must be carried out in MJ-12 Module Jig.

Power to MJ-12 should be supplied from an external DC power supply, not FPS-8 prommer.

MJ-12 input voltages:

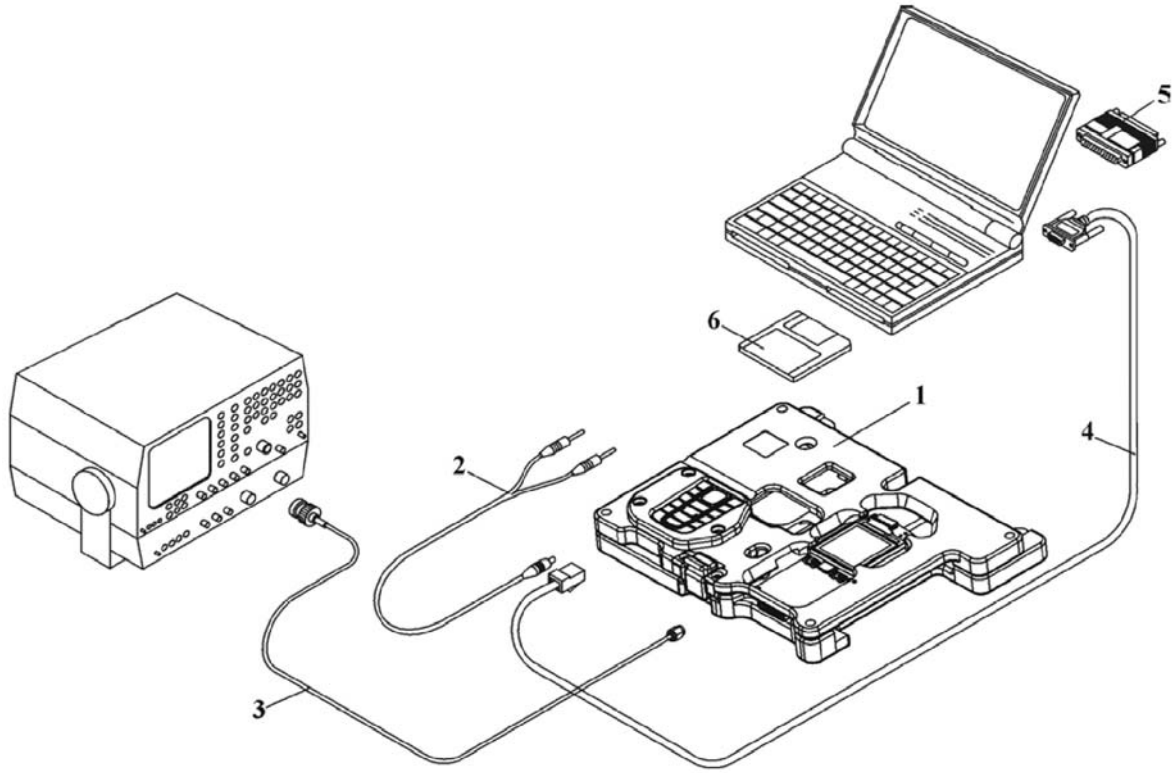
- Maximum + 16 VDC
- Nominal input for RF tunings is +12 V DC

Remember cable attenuation when setting required RF levels.

RF tunings should be made in the same order as shown in this document, the order of the corresponding menu items in the Phoenix Service SW may be different.

©Nokia Corporation

Service concept for RH-12* RF tunings



Item	Service accessory	Accessory type	Product code
1	Module jig	MJ-12	0770544
2	DC power cable	PCS-1	0730012
3	Modular cable	XRF-1	0730085
4	Service Mbus cable	DAU-9S	0730108

©Nokia Corporation

Receiver Tunings

RX channel select filter calibration

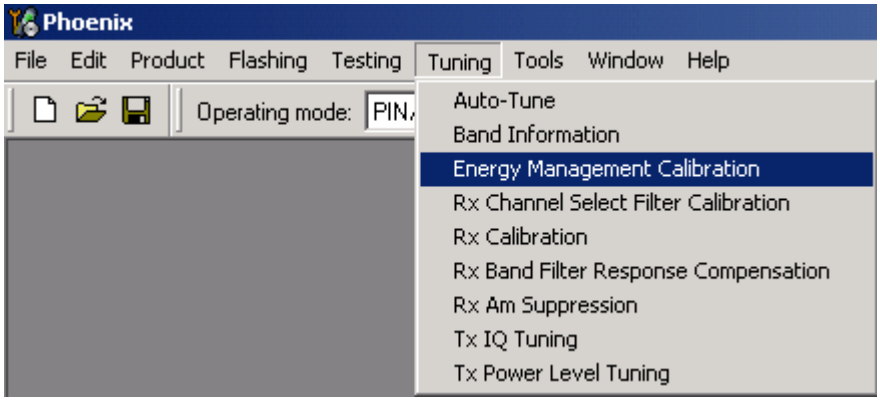
Extra equipment / external RF signal is not needed.

Must be done before other RX calibrations.

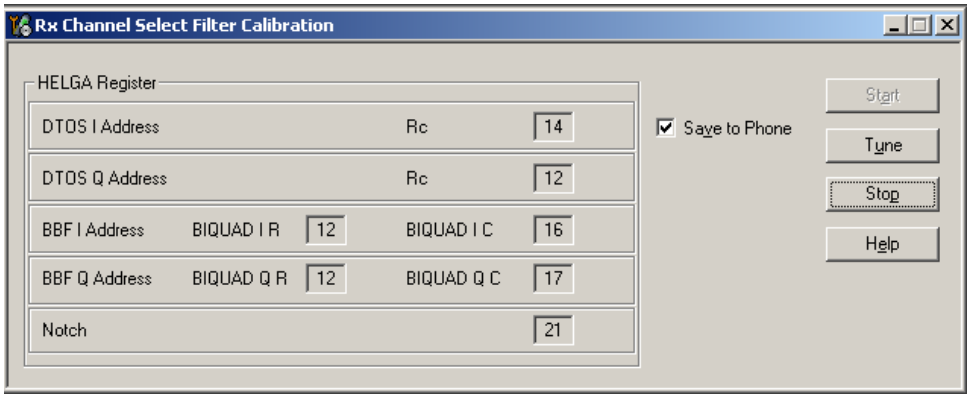
This function is used to calibrate RX channel select filter in GSM Phones.

Rx Channel select filter is tuned only in one (lowest) band = Single calibration for all bands.

Select **Tuning => Rx Channel select filter calibration.**



Press "**Tune**" to start the tuning.



Values will be saved to the phone when the "**Save to Phone**" tick box is checked.

If the "**Save to Phone**" tick box is *not* checked, the values are not saved to the phone when you stop the tuning or exit the dialog.

Tuning values should be 0...31.

©Nokia Corporation

Select "**Stop**".

Close the "**RX Channel Select Filter Calibration**" dialog to end tuning.

RX calibration

RF generator is needed.

This tuning performs RX Calibration.

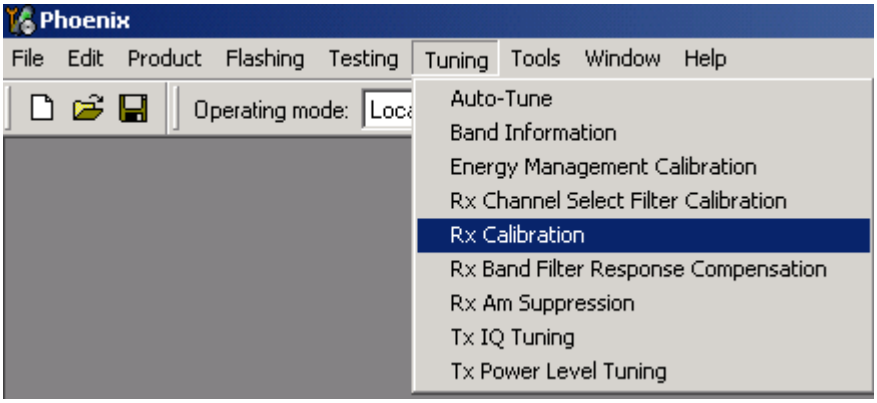
Must be done separately on all bands!

Calibration is automatically performed at EGSM (GSM900), then at GSM1800 and finally at the GSM1900 band. If the tuning is successful, it continues in the next band.

AFC tuning is carried out while EGSM (GSM900) band RX Calibration is performed.

Remember to take jig and cable attenuations into account!

Select **Tuning => Rx calibration**

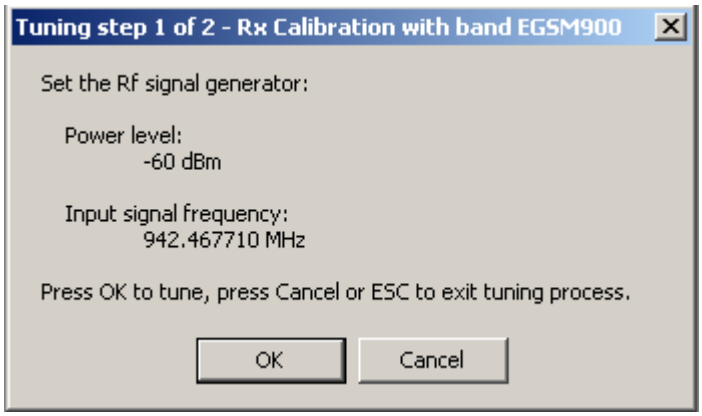


EGSM900 band

Press "**Start**" to begin.

©Nokia Corporation

Set RF generator to required EGSM900 frequency => OK



Tuning values and ADC readings will be shown

Typical values and limits in (GSM900) RX Calibration:

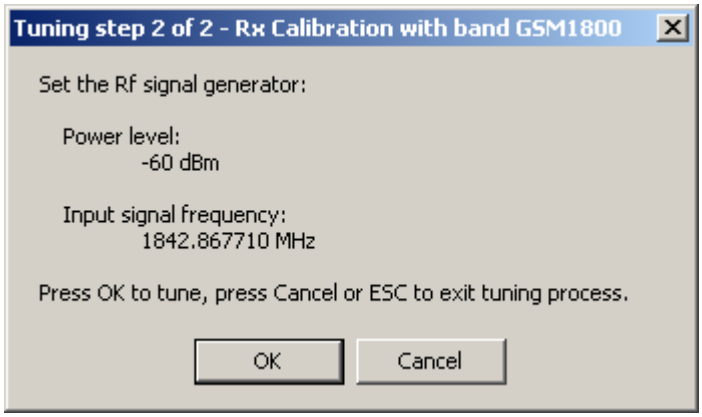
GSM900	Typical value	Low limit	High limit
AFC value	0	-350	350
AFC slope	150	50	350
RSSI 0	68	58	78
RSSI 1	74	64	84
RSSI 2	80	70	90
RSSI 3	86	76	96
RSSI 4	92	82	102
RSSI 5	97	87	107
RSSI 6	103	93	113
RSSI 7	109	99	119
RSSI 8	115	105	125
RSSI 9	121	111	131
RSSI 10	127	117	137
RSSI 11	133	123	143
RSSI 12	139	129	149
RSSI 13	145	135	155
RSSI 14	151	141	161

Tuning will automatically move to the next band (GSM1800) when you press "**Save & Continue**".

©Nokia Corporation

GSM1800 band

When asked, set the RF generator to required GSM1800 frequency => **OK**



Tuning values and ADC readings will be shown.

Typical values and limits in (GSM1800) RX Calibration:

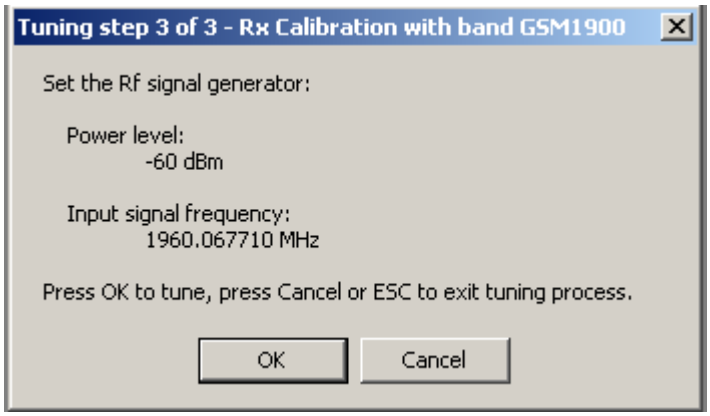
GSM1800	Typical value	Low limit	High limit
RSSI 0	65	55	75
RSSI 1	71	61	81
RSSI 2	77	67	87
RSSI 3	83	73	93
RSSI 4	89	79	99
RSSI 5	94	84	104
RSSI 6	100	90	110
RSSI 7	106	96	116
RSSI 8	112	102	122
RSSI 9	118	108	128
RSSI 10	124	114	134
RSSI 11	130	120	140
RSSI 12	136	126	146
RSSI 13	142	132	152
RSSI 14	148	138	158

Tuning will automatically move to the next band (GSM1900) when you press "**Save & Continue**"

©Nokia Corporation

GSM1900 band

Set RF generator to required GSM1900 frequency => OK



Tuning values and ADC readings will be shown

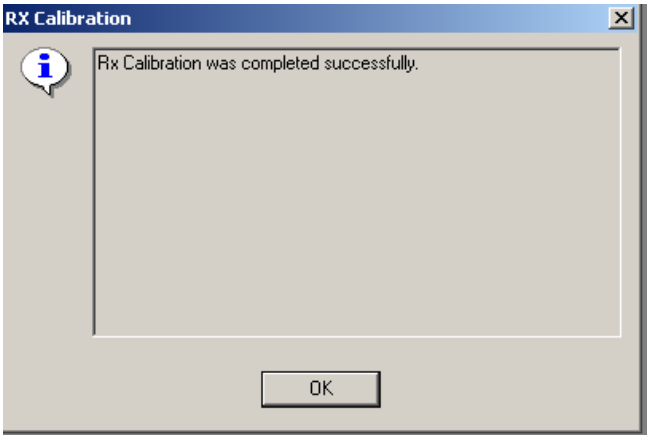
Typical values and limits in (GSM1900) RX Calibration:

GSM1900	Typical value	Low limit	High limit
RSSI 0	67	57	77
RSSI 1	73	63	83
RSSI 2	79	69	89
RSSI 3	85	75	95
RSSI 4	91	81	101
RSSI 5	98	88	108
RSSI 6	104	94	114
RSSI 7	110	100	120
RSSI 8	116	106	126
RSSI 9	122	112	132
RSSI 10	128	118	138
RSSI 11	134	124	144
RSSI 12	140	130	150
RSSI 13	146	136	156
RSSI 14	152	142	162

Tuning will be completed when you press **"Save & Continue"**.

©Nokia Corporation

Close the "**RX – Calibration**" dialog to end tuning.



RX band filter response compensation

RF generator needed.

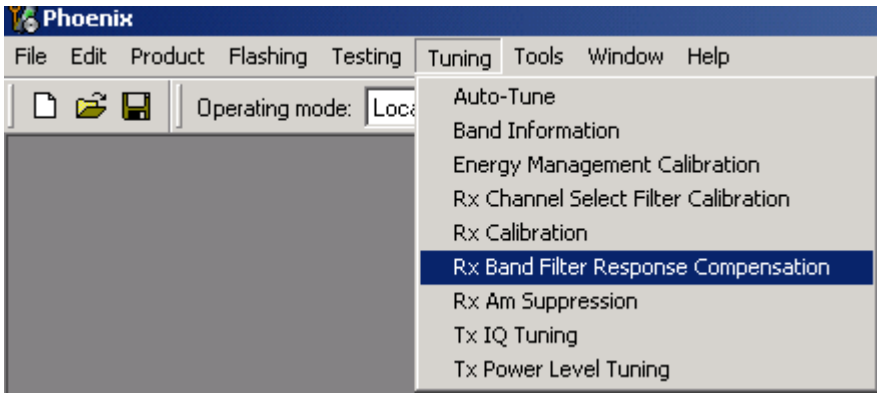
Must be performed separately on all bands!

Start the RX calibration at EGSM (GSM900), then continue to the GSM1800 band and finally to the GSM1900 band.

Remember to carry out the RX calibration before carrying out Rx band filter response compensation!

Remember to take jig and cable attenuations into account!

Select **Tuning => Rx Band Filter Response Compensation**



Select "**Manual tuning**" and "**Start**".

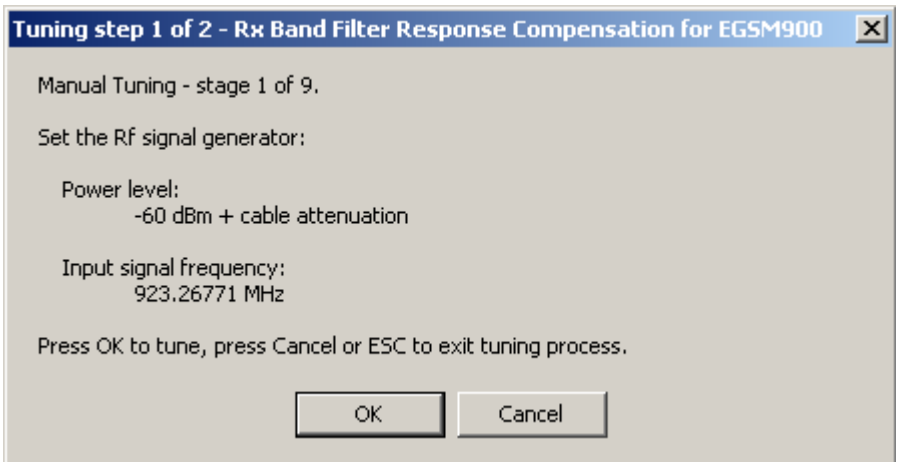
You will be asked to supply 9 different RF frequencies to the phone on each band.

The tuning begins from EGSM900 band and continues the same way for GSM1800 and GSM1900 bands.

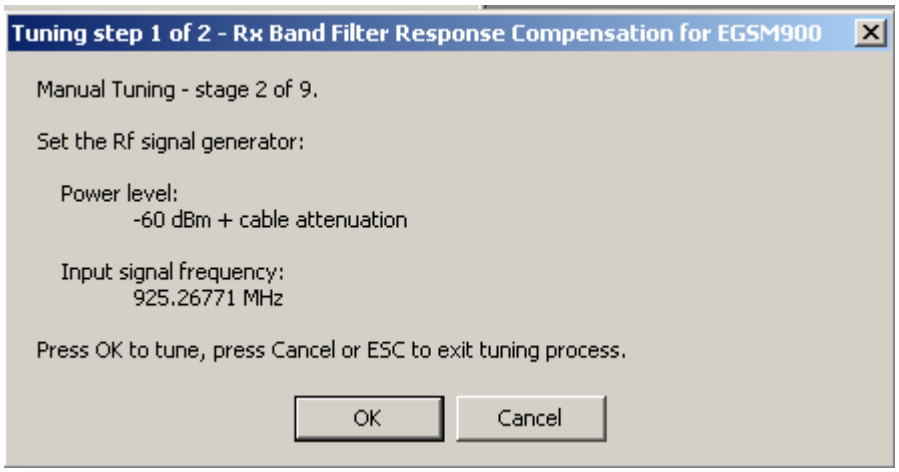
©Nokia Corporation

EGSM900 band

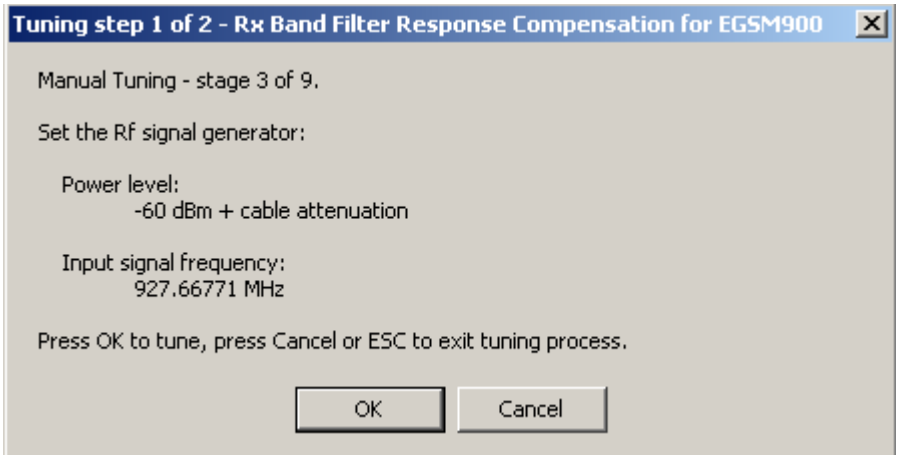
Set first required frequency and level => OK



Set 2nd required frequency and level => **OK**

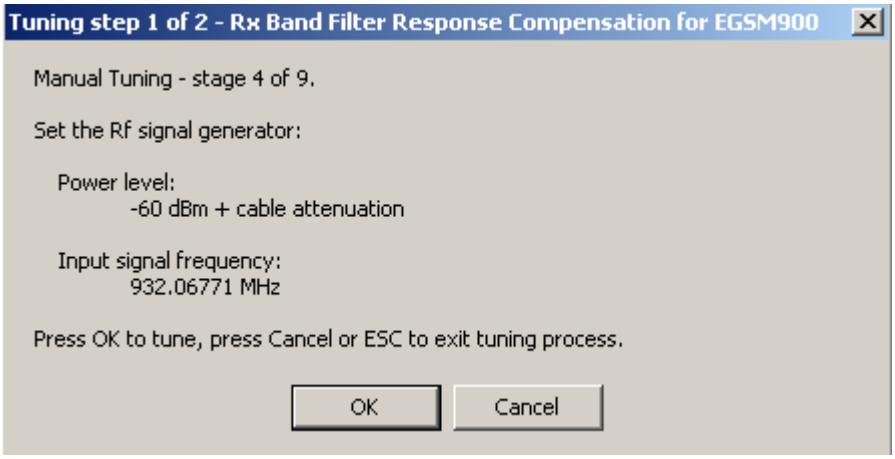


Set 3rd required frequency and level => **OK**

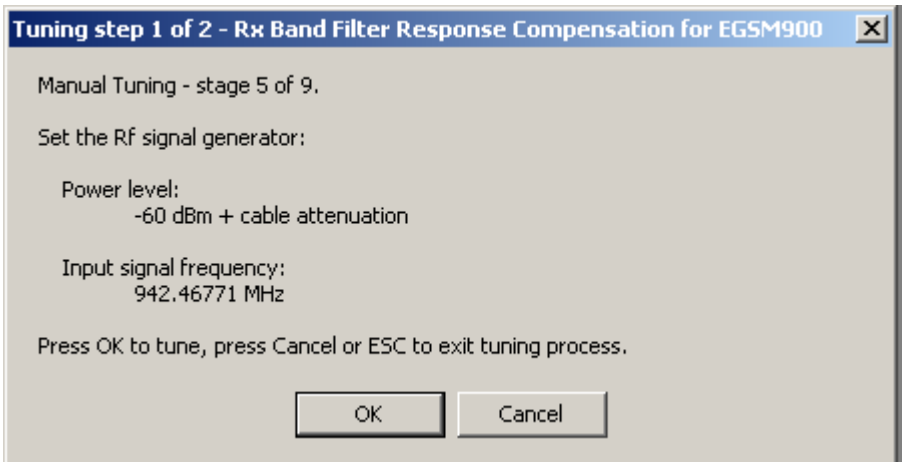


©Nokia Corporation

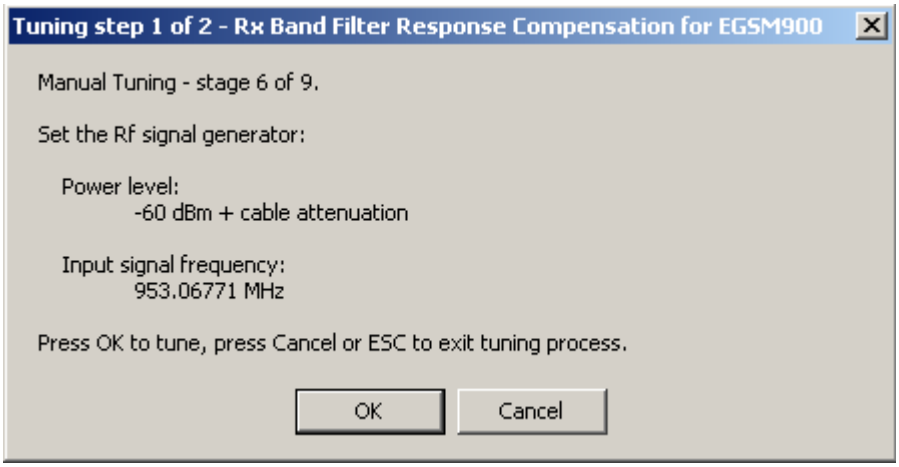
Set 4th required frequency and level => **OK**



Set 5th required frequency and level => **OK**

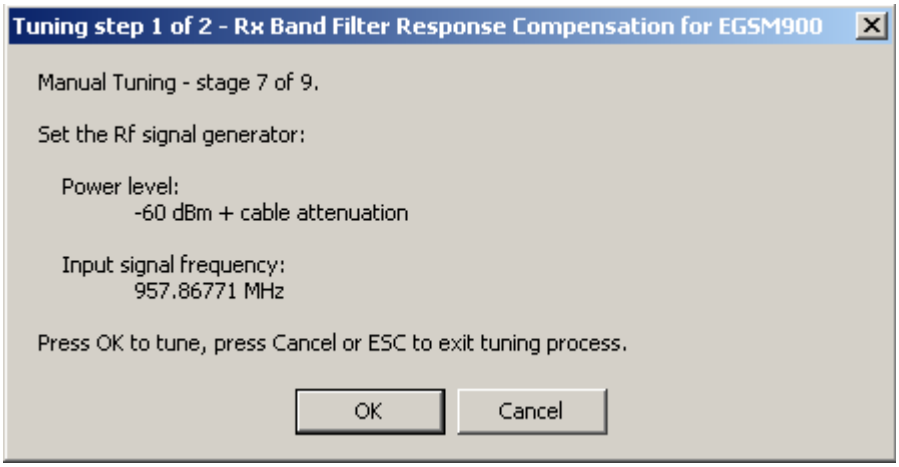


Set 6th required frequency and level => **OK**

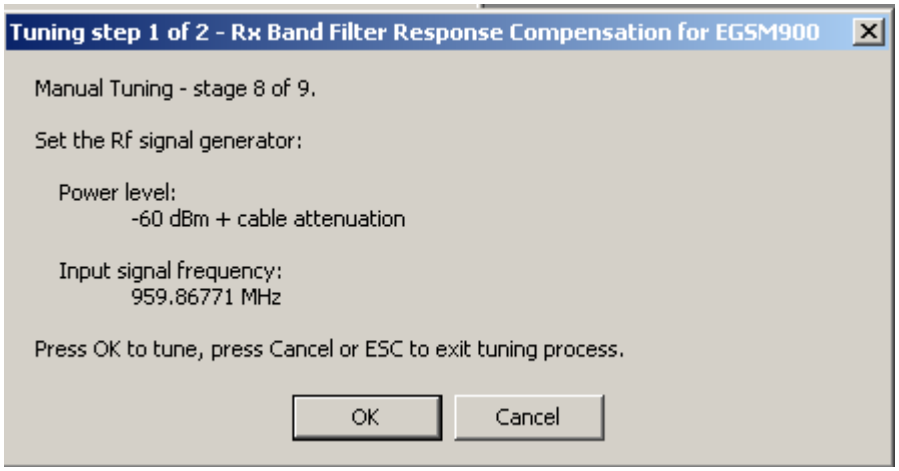


©Nokia Corporation

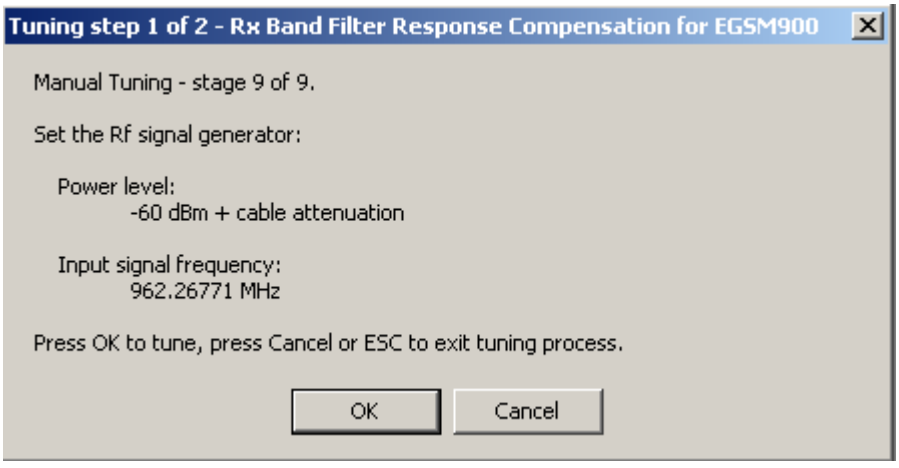
Set 7th required frequency and level => **OK**



Set 8th required frequency and level => **OK**



Set 9th required frequency and level => **OK**



Tuning values and ADC readings will be shown.

©Nokia Corporation

Typical values and limits in Rx Band Filter Response Compensation EGSM900:

Channel	Input frequency [MHz]	Typical value [dB]	Low limit [dB]	High limit [dB]
965	923.26771	+-3	-10	5
975	925.26771	+-1	-5	5
987	927.66771	+-1	-5	5
1009	932.06771	+-1	-5	5
37	942.46771	+-1	-5	5
90	953.06771	+-1	-5	5
114	957.86771	+-1	-5	5
124	959.86771	+-1	-5	5
136	962.26771	+-3	-10	5

Tuning will automatically move to the next band (GSM1800) when you press **"Save & Continue"**.

GSM1800 band

Repeat the same steps as for the EGSM900 band above.

Typical values and limits in Rx Band Filter Response Compensation GSM1800:

Channel	Input frequency [MHz]	Typical value [dB]	Low limit [dB]	High limit [dB]
497	1802.26771	+-3	-10	5
512	1805.26771	+-1	-5	5
535	1809.86771	+-1	-5	5
606	1824.06771	+-1	-5	5
700	1842.86771	+-1	-5	5
791	1861.06771	+-1	-5	5
870	1876.86771	+-1	-5	5
885	1879.86771	+-1	-5	5
908	1884.46771	+-3	-10	5

Tuning will automatically move to the next band (GSM1900) when you press **"Save & Continue"**.

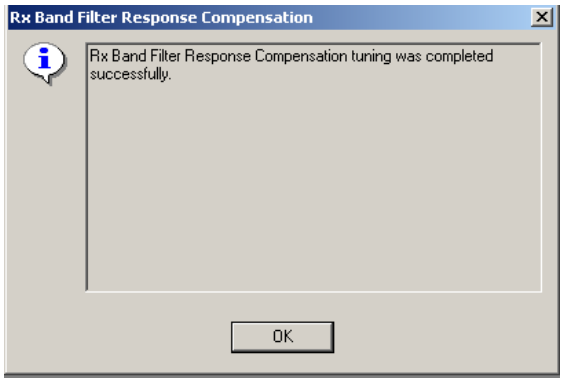
GSM1900 band

Repeat the same steps as for the EGSM900 and GSM1800 bands above.

Typical values and limits in Rx Band Filter Response Compensation GSM1900:

Channel	Input frequency [MHz]	Typical value [dB]	Low limit [dB]	High limit [dB]
496	1927.06771	+-3	-10	5
512	1930.26771	+-1	-5	5
537	1935.26771	+-1	-5	5
586	1945.06771	+-1	-5	5
661	1960.06771	+-1	-5	5
736	1975.06771	+-1	-5	5
794	1986.66771	+-1	-5	5
810	1989.86771	+-1	-5	5
835	1994.86771	+-3	-10	5

Tuning will be completed when you press **"Save & Continue"**.



Close the "RX Band Filter Response Compensation" dialog to end tuning.

RX AM suppression

RF generator needed (AM modulation).

Must be performed separately on all bands!

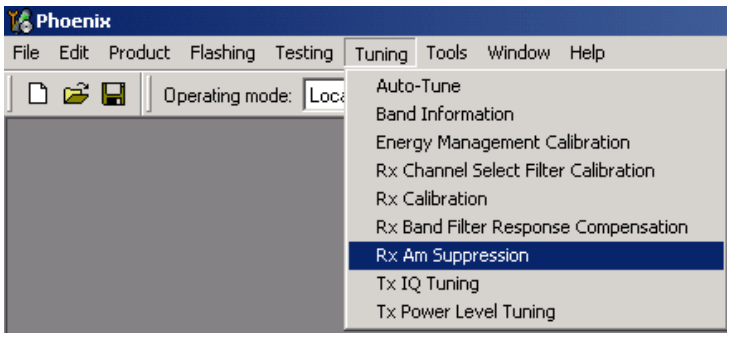
Start the RX calibration at EGSM (GSM900), then continue to the GSM1800 band and finally to the GSM1900 band.

This tuning performs RX AM suppression tuning.

©Nokia Corporation

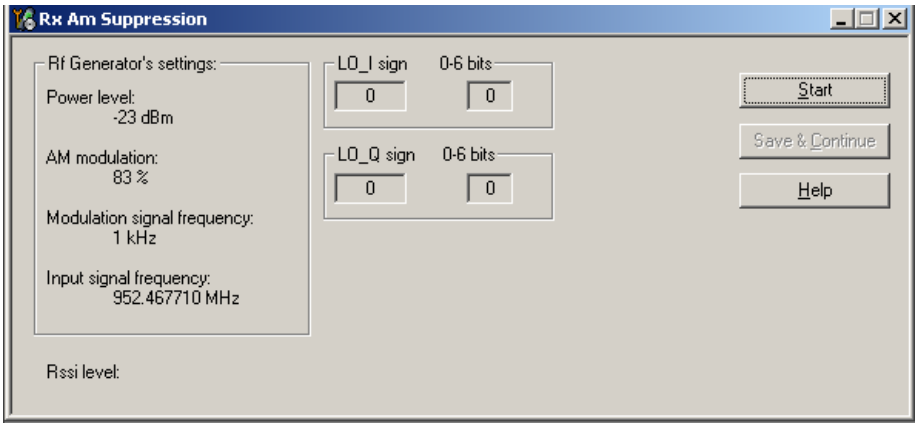
Remember to take jig and cable attenuations into account!

Select **Tuning => Rx Am suppression**



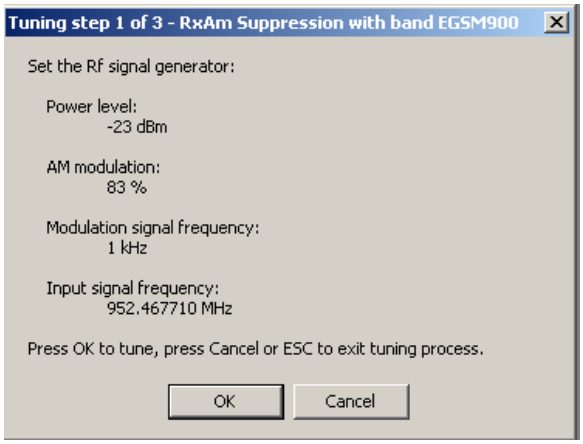
Set RF signal generator to correct settings described in the window on the left.

Select "**Start**" to begin tuning.



EGSM900 band

Set the required frequency and level => **OK**



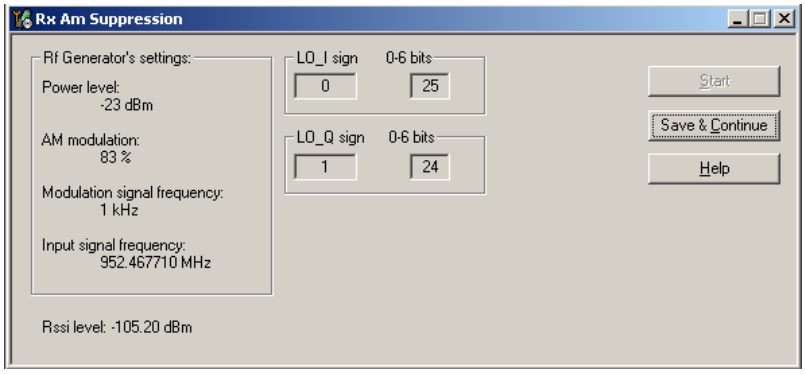
Rx Am suppression values received from DSP will be shown in the center part of the UI.

©Nokia Corporation

Rssi level value will be shown in the left bottom part of the UI.

One "I" and "Q" line values should be 0, other values 0..31.

RSSI value results vary typically between -88 dBm...-111 dBm at EGSM900, GSM1800 and GSM1900 bands.



Tuning will automatically move to the next band (GSM1800) when you press **"Save & Continue"**.

GSM1800 Band

Repeat the same steps as for the EGSM900 band above.

Tuning values and ADC readings will be shown.

Tuning will automatically move to the next band (GSM1900) when you press **"Save & Continue".**

GSM1900 Band

Repeat the same steps as for the EGSM900 and GSM1800 bands.

Tuning values and ADC readings will be shown.

Tuning will be completed when you press "Save & Continue".

Close the RX AM Suppression Tuning dialog to end the tuning.

©Nokia Corporation

Transmitter Tunings

TX power level tuning

Power Meter (or Spectrum analyzer) is needed.

With Tx power level tuning, the coefficients are adjusted for each power level.

Tuning must be performed separately on all band and all modes!

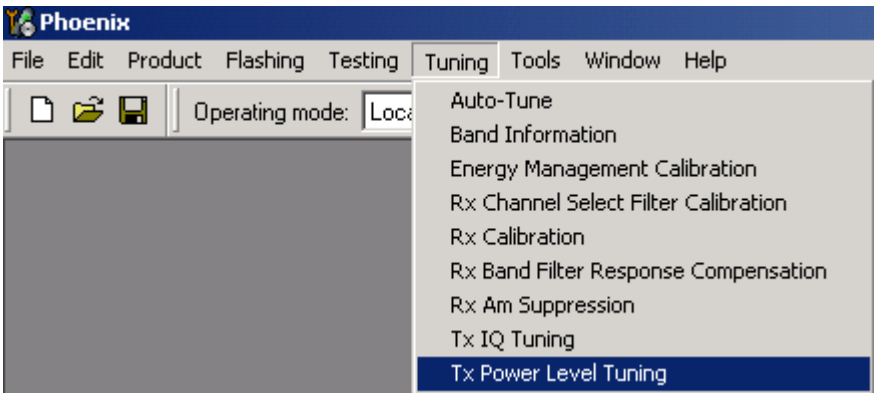
When EDGE is on, the tuning must be carried out for all power levels.

Tx power level tuning steps are:

- EGSM900 PA High Mode with EDGE off
- EGSM900 PA Low Mode with EDGE off *(NOT IN USE FOR RH-12)*
- EGSM900 PA High Mode with EDGE on
- EGSM900 PA Low Mode with EDGE *on (NOT IN USE FOR RH-12)*
- GSM1800 PA High Mode with EDGE off
- GSM1800 PA High Mode with EDGE on
- GSM1900 PA High Mode with EDGE off
- GSM1900 PA High Mode with EDGE on

Select **Tuning => Tx power level tuning**

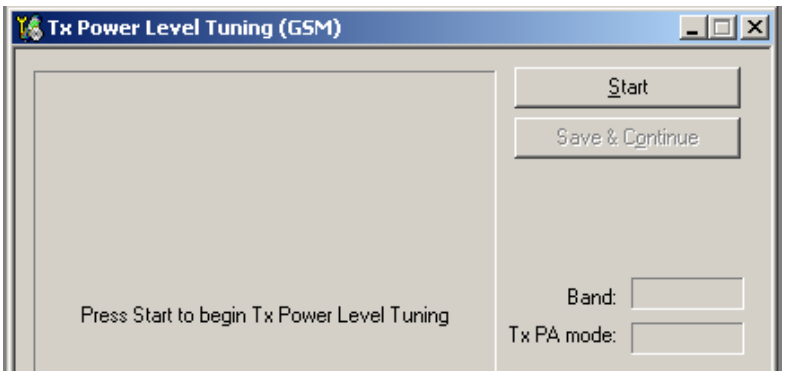
Remember to take jig and cable attenuations into account!



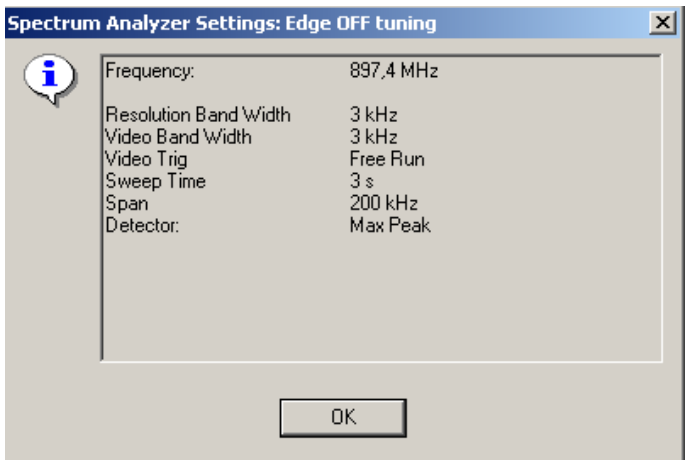
©Nokia Corporation

EGSM900 PA High Mode with EDGE off

Select "Start", the tuning begins automatically from the EGSM900 band.



Set Power Meter (or Spectrum analyzer) as required.



Note that TX PA mode is "High" at this point.

The coefficient table lists the power level, coefficient, target dBm and DAC value for each power level.

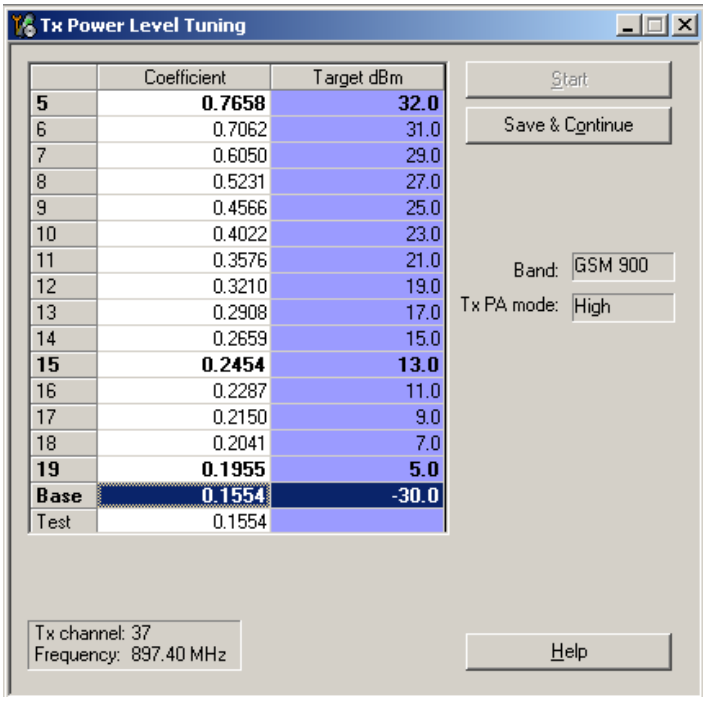
The tuned power level can be chosen by using up and down arrows or mouse.

The current power level is shown with inverse colors.

The tuning value can be adjusted with "-" and "+" keys.

©Nokia Corporation

Tune base level and power levels 19,15 and 5 to target level.



When tuning values are correct, choose "**Save & Continue".**

If all coefficients are within specified limits, tuning will continue on the EGSM900 PA Low Mode with EDGE off.

Typical values:

Power level	GSM900 EDGE off
5	0.650 ... 0.850
15	0.140 ... 0.200
19	0.120 ... 0.170
Base	0.090 ... 0.130

EGSM900 PA low mode with EDGE off

This tuning step is not required for the RH-12 Product, the phone will not react to any controls.

Please choose **"Save & Continue"**

Tuning will continue on the EGSM900 PA High Mode with EDGE on.

EGSM900 PA high mode with EDGE on

Set Power Meter (or Spectrum analyzer) as required.

©Nokia Corporation

Repeat the same steps as for EGSM high and low mode above.

When EDGE is on, the tuning must be made for all power levels.

Tune base level and all power levels from 19 to 8 to target level.

When tuning values are correct, choose **"Save & Continue"**.

If all coefficients are within specified limits, tuning will continue on the EGSM900 PA low mode with EDGE on.

Typical values:

Power level	GSM900 EDGE on
8	0.500 ... 0.650
9	0.400 ... 0.550
10	0.350 ... 0.500
11	0.320 ... 0.470
12	0.300 ... 0.440
13	0.280 ... 0.400
14	0.250 ... 0.350
15	0.230 ... 0.330
16	0.210 ... 0.310
17	0.200 ... 0.300
18	0.190 ... 0.290
19	0.180 ... 0.280
Base	0.100 ... 0.180

EGSM900 PA low mode with EDGE on

This tuning step is not required for the RH-12 Product, phone will not react to any controls.

Please choose **"Save & Continue".**

Tuning will continue on the GSM1800 PA high mode with EDGE off.

GSM1800 PA high mode with EDGE off

Set Power Meter (or Spectrum analyzer) as required.

Repeat the same steps as for EGSM high and low mode above.

Tune base level and power levels 15,11 and 0 to target level.

©Nokia Corporation

When tuning values are correct, choose **"Save & Continue".**

If all coefficients are within specified limits, tuning will continue on the GSM1800 PA high mode with EDGE on.

Typical values:

Power level	GSM1800 EDGE off
0	0.600 ... 0.750
11	0.130 ... 0.190
15	0.110 ... 0.150
Base	0.090 ... 0.130

©Nokia Corporation

GSM1800 PA high mode with EDGE on

Set Power Meter (or Spectrum analyzer) as required.

Repeat the same steps as for EGSM high and low mode above.

When EDGE is on, the tuning must be made for all power levels.

Tune base level and all power levels from 15 to 2 to target level.

When tuning values are correct, choose **"Save & Continue".**

If all coefficients are within specified limits, tuning will continue on the GSM1900 PA high mode with EDGE off.

Typical values:

Power level	GSM1800 EDGE on
2	0.550 ... 0.700
3	0.470 ... 0.620
4	0.400 ... 0.550
5	0.350 ... 0.500
6	0.320 ... 0.470
7	0.290 ... 0.430
8	0.260 ... 0.360
9	0.240 ... 0.330
10	0.220 ... 0.310
11	0.210 ... 0.300
12	0.200 ... 0.280
13	0.180 ... 0.260
14	0.170 ... 0.250
15	0.160 ... 0.240
Base	0.090 ... 0.160

©Nokia Corporation

GSM1900 PA high mode with EDGE off

Set Power Meter (or Spectrum analyzer) as required.

Repeat the same steps as for EGSM high and low mode above.

Tune base level and power levels 15,11 and 0 to target level.

When tuning values are correct, choose **"Save & Continue".**

If all coefficients are within specified limits, tuning will continue on the GSM1900 PA high mode with EDGE on.

Typical values:

Power level	GSM1900 EDGE off
0	0.600 ... 0.750
11	0.130 ... 0.190
15	0.110 ... 0.150
Base	0.090 ... 0.130

©Nokia Corporation

GSM1900 PA high mode with EDGE on

Set Power Meter (or Spectrum analyzer) as required.

Repeat the same steps as for EGSM high and low mode above.

When EDGE is on, the tuning must be made for all power levels.

Tune base level and all power levels from 15 to 2 to target level.

When tuning values are correct, choose "**Save & Continue".**

Typical values:

Power level	GSM1900 EDGE on
2	0.550 ... 0.700
3	0.470 ... 0.620
4	0.400 ... 0.550
5	0.350 ... 0.500
6	0.320 ... 0.470
7	0.290 ... 0.430
8	0.260 ... 0.360
9	0.240 ... 0.330
10	0.220 ... 0.310
11	0.210 ... 0.300
12	0.200 ... 0.280
13	0.180 ... 0.260
14	0.170 ... 0.250
15	0.160 ... 0.240
Base	0.090 ... 0.160

If values shown are within limits select "**Save & Continue**", values are saved to phone memory.

Close the "**TX Power Level Tuning**" dialog to end tuning.

©Nokia Corporation

TX I/Q tuning

Spectrum analyzer is needed.

Tx IQ tuning allows changing the Tx I DC Offset, Tx Q DC Offset, Amplitude difference and Phase difference.

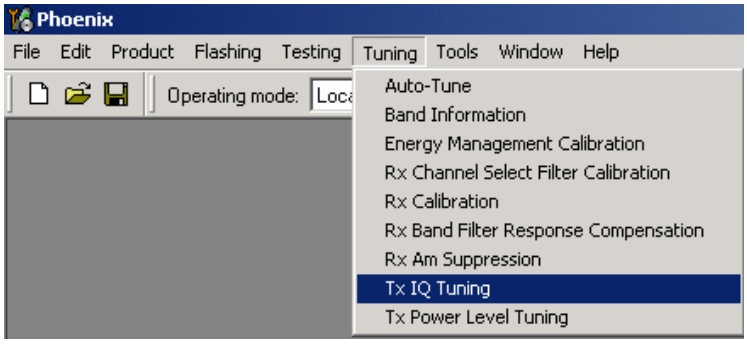
Must be performed separately on all bands!

TX I/Q tuning steps are:

- EGSM (GSM900) with EDGE off
- EGSM with EDGE on
- GSM1800 with EDGE off
- GSM1800 with EDGE on
- GSM1900 with EDGE off
- GSM1900 with EDGE on

Remember to take jig and cable attenuations into account!

Select **Tuning => TX IQ Tuning**

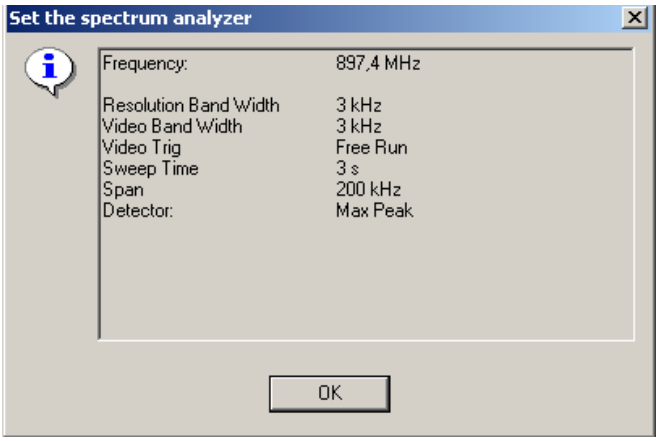


EGSM900 band with EDGE Off

Select "**Start**" to begin tuning at **EGSM900 band with EDGE off**.

©Nokia Corporation

Set spectrum analyzer to required settings => **OK**

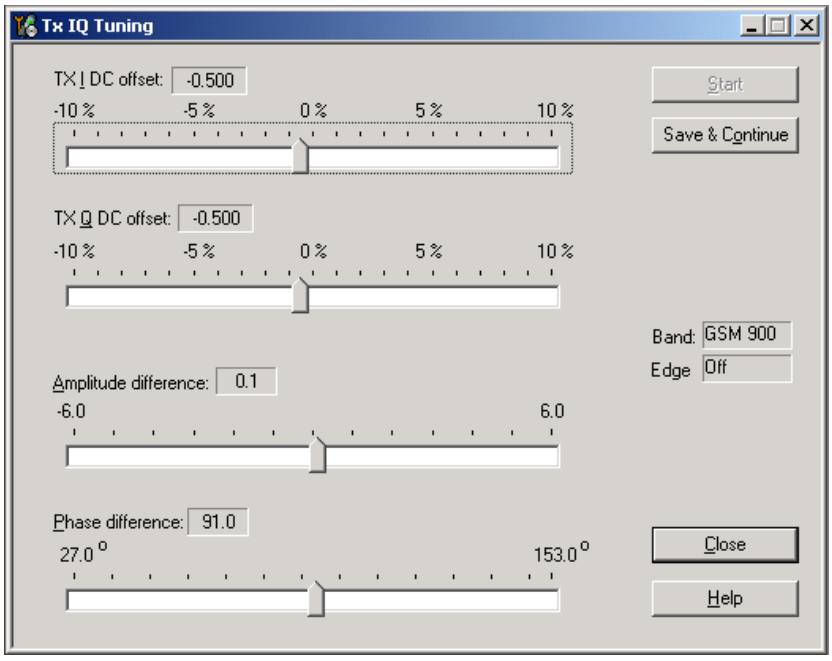


The tuning is carried out by setting each of the sliders to desired value. The sliders can be changed only when the tuning is ongoing.

The order of tuning should be the same as the order of the sliders e.g. the Tx I DC Offset is tuned first and Phase difference is tuned last.

Use <= , =>, PgUp or PgDn keys

The tuning is performed by setting each of the sliders to desired value.

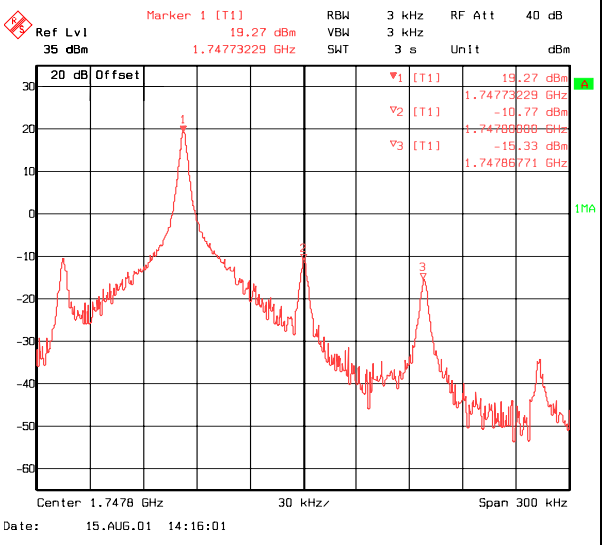
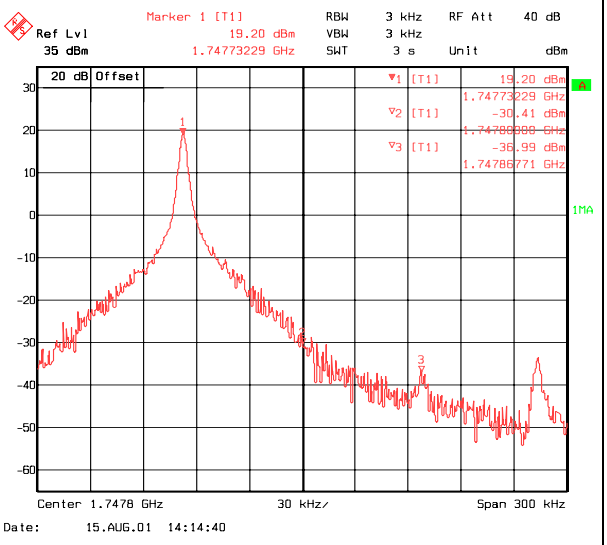


Tune LO leak to minimum with TXI/TXQ DC offset control (**f0 on spectrum analyzer screen**).

Tune the wrong sideband to minimum using Amplitude/Phase difference controls

©Nokia Corporation

(**f0+68kHz on spectrum analyzer screen**).

Before tuning	After tuning
	

Tx IQ Tuning limits are the same for all bands (GSM900, GSM1800 and GSM1900):

Tuning Limits	EDGE off	EDGE on
TX I DC Offset	-4 ... +4	-6 ... +6
TX Q DC Offset	-4 ... +4	-6 ... +6
Amplitude Difference	-1.2 ... +1.2	-1 ... +1
Phase Difference	80 ... 100	80 ... 100

Tuning will automatically move to the next step, **EGSM900 with EDGE on** when you press "**Save & Continue**".

EGSM900 band with EDGE On

Choose "Start" to begin tuning.

Set the spectrum analyzer to required settings for EGSM900 band => **OK**

Repeat the same tuning steps as for the EGSM900 with EDGE off above.

Tuning will automatically move to the next step, **EGSM1800 with EDGE off** when you press "**Save & Continue**".

EGSM1800 band with EDGE Off

Choose "Start" to begin tuning.

Set the spectrum analyzer to required settings settings for GSM1800 band => **OK**

©Nokia Corporation

Repeat the same tuning steps as for the EGSM900 band above.

Tuning will automatically move to the next step, **EGSM1800 with EDGE on** when you press "**Save & Continue**".

GSM1800 band with EDGE On

Choose "Start" to begin tuning.

Set the spectrum analyzer to required settings for GSM1800 band => **OK.**

Repeat the same tuning steps as for the EGSM900 band above.

Tuning will automatically move to the next step, **EGSM1900 with EDGE off** when you press "**Save & Continue.**

GSM1900 band with EDGE Off

Choose "Start" to begin tuning.

Set the spectrum analyzer to required settings for GSM1900 band=> **OK.**

Repeat the same tuning steps as for the EGSM900 band above.

Tuning will automatically move to the next step, **EGSM1900 with EDGE on** when you press "**Save & Continue**".

GSM1900 band with EDGE On

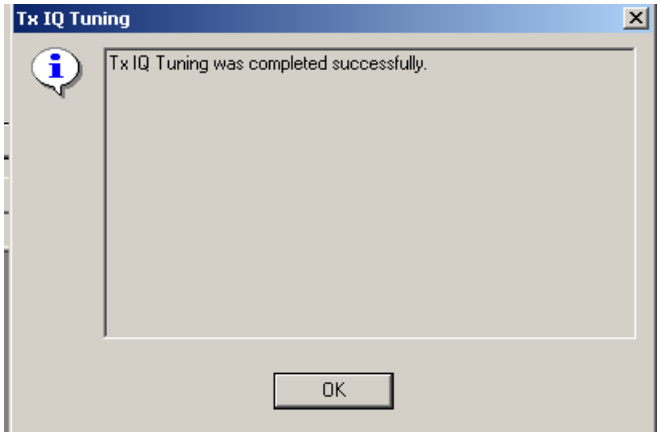
Choose "Start" to begin tuning.

Set the spectrum analyzer to required settings for GSM1900 band=> **OK.**

Repeat the same tuning steps as for the EGSM900 band above.

Tuning will be completed when you press **"Save & Continue".**

Choose "**OK**" to close the "**TX I/Q Tuning**" dialog.



©Nokia Corporation

[This page left intentionally blank]

©Nokia Corporation