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Product
Defining
Documentation

ip.access

Installation and Configuration
110#010

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Warnings and Cautions

This system is designed to be operated indoors as a fixed system device and must be located either on or near the ceiling away from the user. It must be mounted in a manner to ensure that all users and bystanders and users are kept a minimum of 60mm away from antennas at all times.

Do not touch or move the antenna(s) while the unit is transmitting or receiving.
Do not hold any component containing a radio such that the antenna is very close to or touching any exposed parts of the body, especially the face or eyes while transmitting.

In most parts of the world, regulatory approval(s) are needed before the nanoBTS is operated.

Do not connect any device other than the nanoBTS to any RJ45 socket that has been enabled for nanoBTS connection (i.e. 48Vdc operation).

The nanoBTS is intended for dry indoor applications only. If evidence of condensation is present do not apply power to the nanoBTS.

The nanoBTS must only be powered using a PSU supplied by ip.access.

PSUs supplied by ip.access must not be used for powering any other equipment.

Introduction

The nanoBTS

The nanoBTS is a picocellular basestation operating in one of the GSM frequency bands and complies with all the relevant ETSI / FCC specifications. A nanoBTS basestation is mounted on a wall or ceiling, taking its power and traffic from a single 10/100 switched Ethernet connection.

The range of the nanoBTS exceeds half a kilometre in an uncluttered environment and inside buildings can be expected to support users within a radius of up to 50m or more, depending on the building construction materials.

The nanoBTS is physically linked to the BSC over an IP network and uses standard GSM protocols to connect to the existing Public Land Mobile Network (PLMN)

The diagram below shows the system architecture. Calls within the installation are passed over the IP network and are handed over to the PLMN if the mobile leaves the installation coverage area and is out of range of the ip.access basestations.

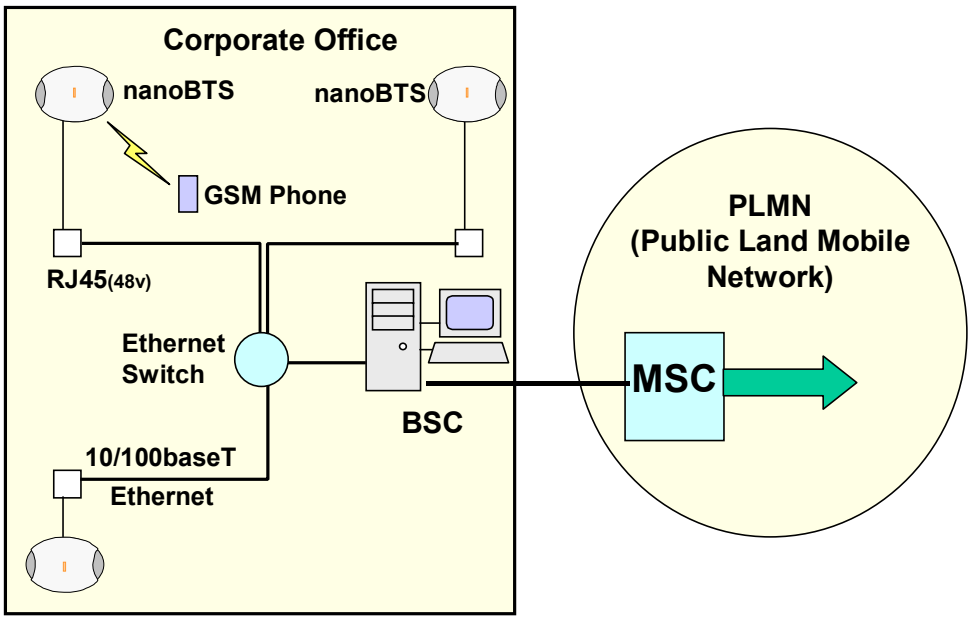

Figure 1 System Architecture

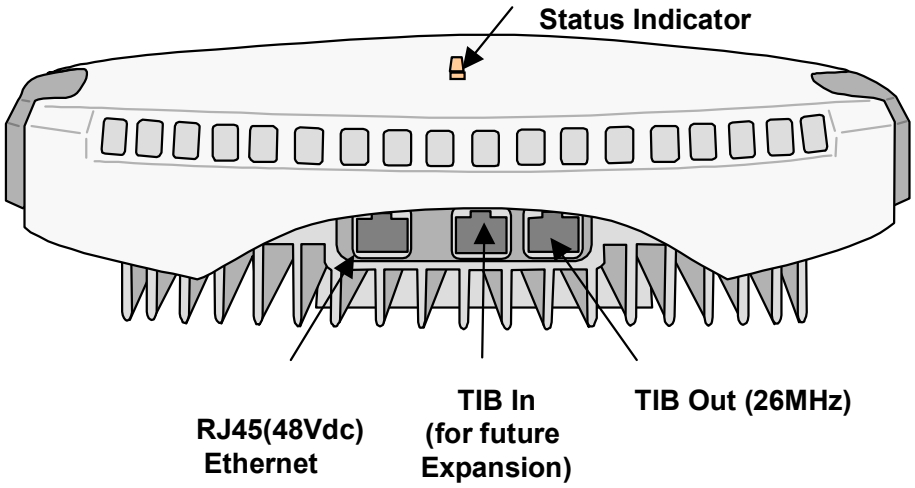

Figure 2 nanoBTS

The nanoBTS may be mounted on walls or ceilings, in convenient locations chosen at the system planning stage, to provide adequate coverage in a building. Power to the nanoBTS is via the RJ45 socket enabled for 48Vdc. The nanoBTS has a LED indicator used to convey its status. **Note.** This indicator can be disabled after commissioning if required using the nanoBTS installer software. For wall mounted installations and installations on sloping surfaces it is preferred that the cable access is from the bottom as this prevents the ingress of dust and condensation, but where circumstances dictate the nanoBTS may be mounted to allow cables access from the top of the unit. When mounted on a ceiling the plastic clip-on cover **MUST** be removed to necessitate ventilation and cooling.

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Installing the nanoBTS

Pre-Installation Checklist

Prior to installation and following a technical site survey, ensure that the following items are available.

1. Details of placement of PSUs (at central site or at nanoBTS).
2. The following system information is required for each nanoBTS:
    - The ARFCN (Absolute Radio Frequency Channel Number) to be allocated to that cell.
    - A specific IP address may be allocated to each nanoBTS location or a pool of IP addresses may be provided and the installer allocates the IP address for each nanoBTS.
    - Requirements for and details of any external antenna and mounting and locations.
    - BTS Id for each nanoBTS.
    - IP address subnet mask and default router IP address for the each nanoBTS.
3. For the installation site, the following information is required.
    - IP address subnet mask and default router IP address for the installation PC.
    - Printout of the site configuration plan produced as a result of the survey
    - A floor plan showing the mounting location of each nanoBTS, together with location name and btsid.

Installing the nanoBTS

Parts required for each nanoBTS:

- Wall fixings: These are not provided as part of the nanoBTS but should be suitable for the wall material and weight of the nanoBTS (2.7kg). Suggested materials are 4 x 30mm no.10 woodscrews or M5 bolts and wall plugs (if required).
- PSU.
- NanoBTS complete with mounting bracket.
- RJ45-RJ45 connecting leads

Tools required:

Installation:

- Drill and masonry or wood bit.
- Mounting bracket removal tool for removal of the bracket from the nanoBTS.
- Spanner or screwdriver suitable for any fixings used for the mounting bracket.

- Ruler dimensioned in mm.
- T20 Torx screwdriver required if external antenna kit is used

Configuration:

- Frequency counter with 12-digit display with a reference oscillator stability better than 10^{-9}.
- If the reference nanoBTS adjustment is to be performed manually, then an isolated 10-way RJ45 to BNC lead is required.
- Laptop PC preinstalled with the ip.access "nanoInstaller" and associated configuration files.

Walk Test:

- A test mobile or other GSM measuring device.

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Installation Steps

1. Unpack nanoBTS
2. Install PSUs
3. Fix mounting brackets
4. Modify nanoBTS for external antennas (if required)
5. Attach nanoBTS to mounting bracket
6. Record nanoBTS MAC address and location.

Configuration Steps

1. Set up PC for configuring nanoBTS
2. Connect the nanoBTS
3. Set IP address and optionally download operational software
4. Set frequency of nanoBTS oscillator
5. Calibrate the nanoBTS using frequency synchronisation
6. Check macro network channel usage
7. Retrieve BCCH frequency information
8. Measure path loss between nanoBTS sites
9. Walk Test
10. Installation Report

Unpacking nanoBTS

Unpack nanoBTS and check to see that the unit has not been damaged in transit. Any damaged units should be returned to your supplier.

Provision of Power to the nanoBTS

Power for the nanoBTS may be at either the RJ45 outlet or at the output of the last Ethernet switch/hub/router etc. See Figure 3 below

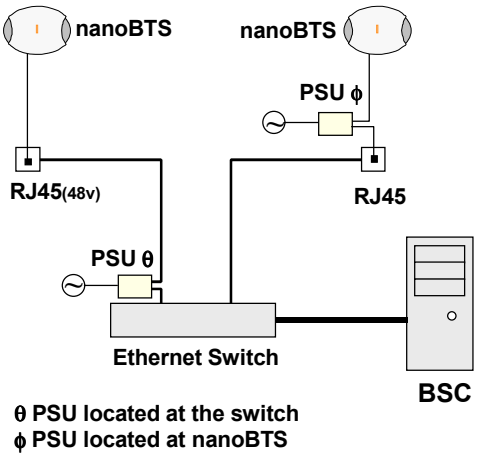


Figure 3 nanoBTS PSU location

IF THE NETWORK HAS AN EXISTING DHCP SERVER DO NOT CONNECT THE nanoBTS TO THE SWITCH AT THIS TIME.

Installing the PSU at the Ethernet switch.

If the PSU is located at the patch panel /output port of the Ethernet switch, it is important that the PSU is connected exactly as illustrated below (failure to do so will cause damage to the switch). Ensure that the PSU is placed in a location that is ventilated and that the connection leads provide no safety hazard.

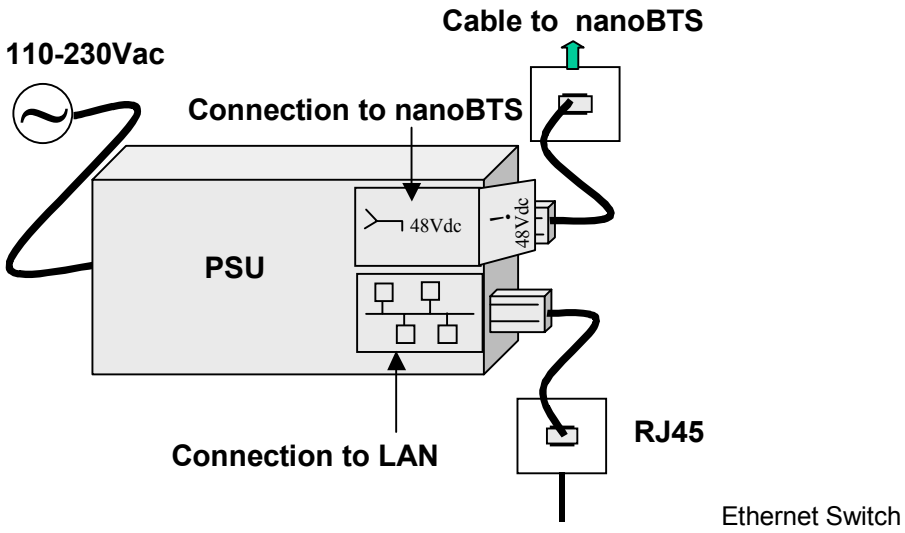
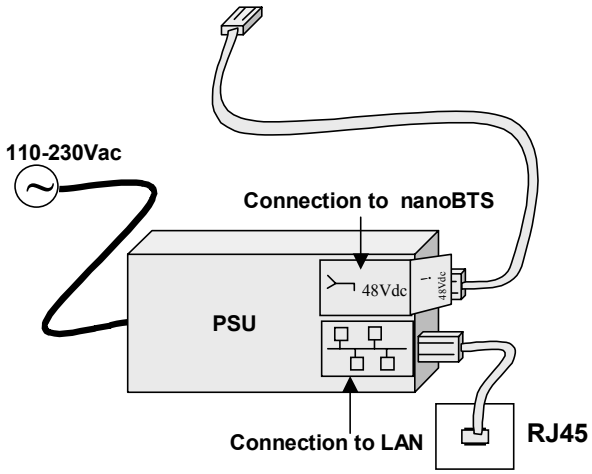


Figure 4 PSU location at Switch

Installing the PSU at the nanoBTS.

Ensure that the PSU is placed in a location that is ventilated and that the connection leads provide no safety hazard.



Mounting the nanoBTS.

The location of each nanoBTS is shown on the installation floor plan produced at the network planning stage. The network wiring must be complete before the nanoBTS can be tested. The nanoBTS should be placed on a wall at or above head height or on a ceiling.

Note: If the nanoBTS is to be used with an external antenna the nanoBTS should be modified as shown in appendix 1 before mounting the nanoBTS

a) Fixing to a wall

1) Remove the nanoBTS from the bracket by sliding the removal tool over the central fin between the bracket and the body of the unit to disengage the locking spring, slide bracket to separate it from the main body of the unit. The tool may be inserted from the top or bottom of the nanoBTS

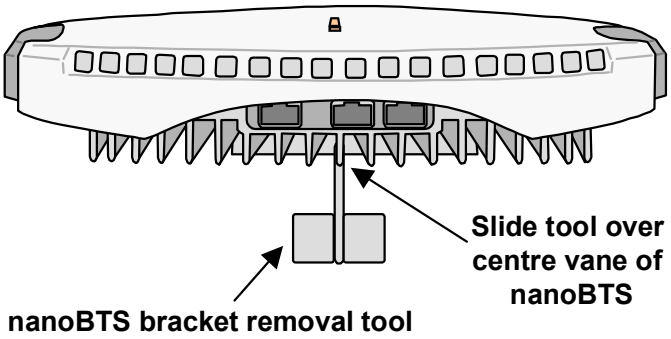


Figure 5 Separating nanoBTS and mounting bracket

2) Position the bracket on the wall and mark the position of the four screw holes. The top of the bracket **MUST** be positioned uppermost. Ensure that the bracket is level and sufficient clearance is maintained to allow the unit to be located on the bracket (at least 80mm from the bracket to the top of wall and 120mm from the side of the bracket to a side wall). See the diagram below.

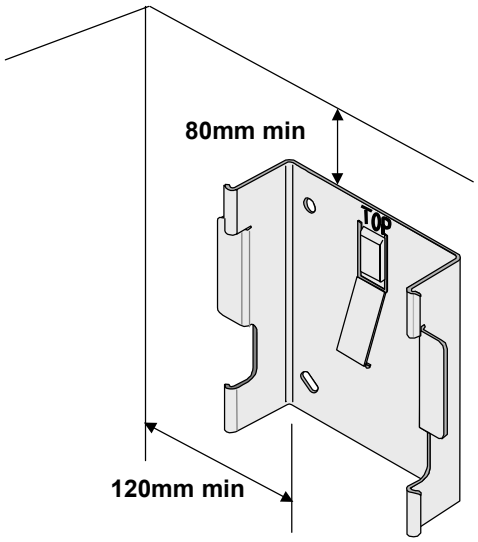


Figure 6 Positioning mounting bracket

3) Drill the four holes in the positions marked in step 2 and insert the wall plugs (if required). Fix the mounting bracket securely to the wall. The bracket is designed to allow the nanoBTS unit to be mounted with the connections either to the top or bottom of the unit.

4) Slide the nanoBTS onto the bracket and ensure that the retaining spring engages into the indent at the rear of the unit.

5) Record the MAC address from the label against the correct location of the nanoBTS in the site configuration plan.

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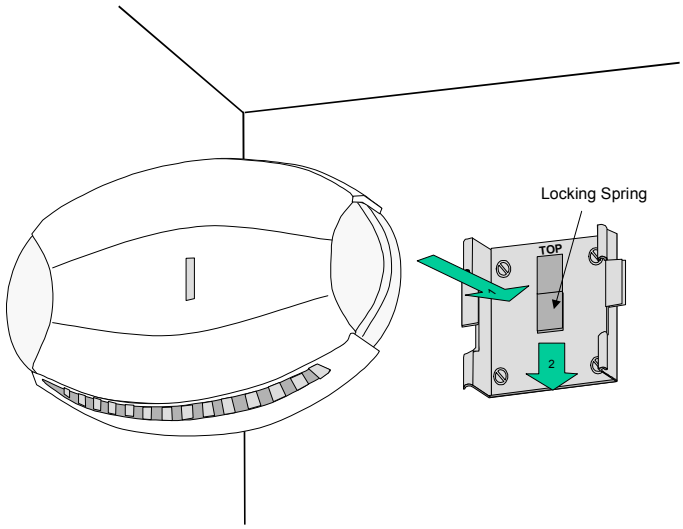

Figure 7 Mounting the nanoBTS

b) Fixing to a ceiling or a sloping surface

When fixing to a ceiling or a sloping wall the same fixing process and clearances should be observed as for fixing to a wall (at least 80mm from the bracket to the top of wall and 120mm from the side of the bracket to a side wall). On a sloping surface the top of the bracket **MUST** be uppermost. Once the unit has been attached to the bracket the outer cover **MUST** be removed to expose the cooling vanes.

Preparation for configuring nanoBTS

Connect the nanoBTS as per figure 3, to either a 48volt wall socket or to the nanoBTS side of a PSU.

Check the power on self-test sequence by observing the Status Indicator on the nanoBTS. The normal sequence is described below,

a) Red shows briefly.

b) Orange glows continuously for around 45 seconds as unit boots up.

c) If the boot process is successful the Status Indicator shows orange with a slow blink (Off – 0.1 seconds. On – 1.9 seconds).

NOTE: *Do not connect the nanoBTS to the LAN until the DHCP server is running on the configuring PC. This is especially important if there is already a DHCP server running on the LAN*

Repeat for all other nanoBTS before proceeding to the configuration.

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Configuring the nanoBTS

Step 1. Setting up PC for configuring nanoBTS

Three options exist for commissioning the nanoBTS.

Option 1: Configuring mostly at the site IP switch room
Option 2: Configuring mostly at the BTS. See appendix 3
Option 3: Configuring mostly at the NOC (Network Operations Centre) See appendix 4

This section covers the steps required to configure the nanoBTS using option 1. The other options are covered in the appendixes

Check that the following files are loaded onto the laptop PC
`C:\ipaccess\Software Releases\"software file name.sdp"`
`C:\ipaccess\Tools\Windhcpd\windhcpd.exe`
`C:\ipaccess\Tools\Windhcpd\com.ipaccess.nanoBTS.v1`

Using a text editor, open the file C:\ipaccess\windchpd\com.ipaccess.nanoBTS.`v1` that has been prepared as part of the system planning process. The file is in the following format.

```
# FILENAME: com.ipaccess.nanobts.v1
# Configuration file for windhcpd to server to ip.access nanoBTSs
# NOTE: values in this file override those in dhcpd.conf for nanoBTSs
#
#####################################################################
############  Basic IP configuration in standard DHCP ############
#####################################################################
subnet = 255.255.0.0
router = 172.28.0.254

# The lease time is mandatory for a successful lease
# The value is in seconds. NOTE nanoBTSs assume lease-time=-1 makes the served
# IP and VSI configuration static, and disables future DHCP !!!
lease-time -1

# filename and next-server options tell the nanoBTS to do a TFTP download
# from the next-server (or from this server if omitted) using the given filename
filename    = bts-software.sdp
next-server = 172.28.0.1

#####################################################################
##############  VENDOR SPECIFIC INFORMATION (VSI) ###############
#####################################################################
#
# VSI options for all MAC addresses can be specified here
#omlipaddr = 172.28.0.30
# default omlipport is 3002 for IPA SW BTS builds, may as well has this default.
omlipport = 3002


#####################################################################
###############          MAC SPECIFIC (VSI)        ################
#####################################################################
# MAC-specific options can be included too - these override the above defaults
# e.g.
#   00:02:95:ff:ff:01 ipaddr=172.28.3.1 lease-time=-1  omlipaddr=172.28.2.42
#
```

```
# you can specify any of the following options per MAC address line:
# ipaddr=
# subnet=
# router=
# lease-time=3600
# filename=
# next-server=
# omlipaddr = 172.28.0.30
# omlipport = 3002
# 2ndomlipaddr = 172.28.0.30
# 2ndomlipport = 3006
# location  = "On my desk"
# btsid     = 42
# trxid     = 0
#
# NOTE that MAC addresses are case sensitive and should be in lower case.

00:02:95:00:00:0a ipaddr=172.28.6.10    btsid=1   location=”room 1”
00:02:95:00:00:03 ipaddr=172.28.6.3     btsid=2a  location="room 2 west wall"
00:02:95:00:00:04 ipaddr=172.28.6.4     btsid=2b  location="room 2 east wall"
00:02:95:00:00:05 ipaddr=172.28.6.5     btsid=3   location=”reception”
```

Update the file to reflect the settings specified in the site configuration plan. The DHCP server uses this file, to pass all of the configuration information, including the IP address to the nanoBTS, and then stores the IP address as a fixed address.

Note: *If no software is to be downloaded to the nanoBTS, the [filename] field should be left blank.*

Step 2. Connecting the nanoBTS

Connect all the RJ45s to the switch.

Start the DHCP server and the TFTP server by running C:\ipaccess\tools\windhcpd\windhcpd.exe (or use the desktop icon). The following screens are displayed when the servers are running and no further intervention is required, as the servers will automatically respond to requests from the nanoBTS.

Figure 8 DHCPD server

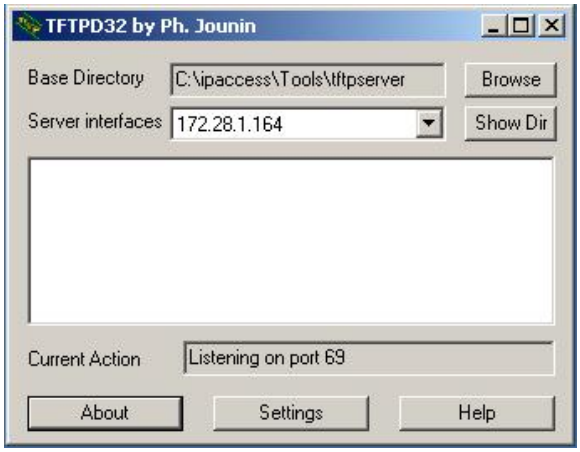


Figure 9 TFTP server

Step 3. Setting IP addresses and downloading software

The DHCP server automatically responds to the nanoBTS broadcast with the relevant IP configuration.

If a .sdp filename has been specified in the "com.ipaccess.nanoBTS.v1" configuration file, then the software will download from the TFTP server to the nanoBTS. Check against the IP address in the TFTP server window that the .sdp file has been downloaded and that no error / fail message is displayed.

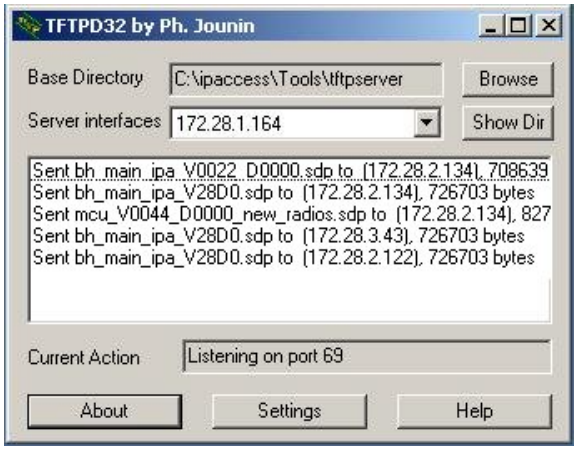


Figure 10 TFTP server window when active

Setting the frequency of nanoBTS oscillator

The frequency of the nanoBTS is referenced to a crystal oscillator that has to be accurately calibrated to 26MHz ± 20ppb. The frequency can be adjusted using either of two methods:
a) Calibration by synchronisation to other GSM base stations transmitting locally. This is the preferred method, as described below.
b) Using a frequency counter and manually adjusting the frequency. This is an alternative method that can be used at the BTS site as described in Appendix 2)

Note: *The following steps 4, 5, 6 and 7 should be done on one nanoBTS and then repeated on each remaining nanoBTS in turn.*

Step 4. Calibration of nanoBTS using frequency synchronisation

Note: *Prior to calibration, the unit must be powered up for a minimum of 60 minutes, to ensure frequency stability.*

Start the nanoInstaller and open a session to the nanoBTS by entering the IP address of the nanoBTS for which the calibration is to be performed.

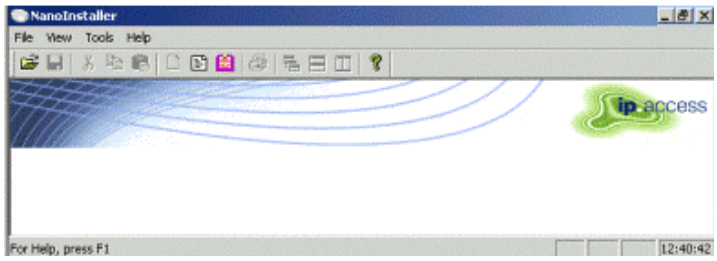


Figure 11 nanoInstaller opening screen

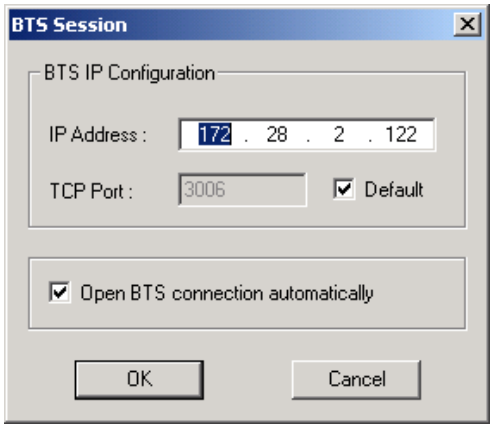
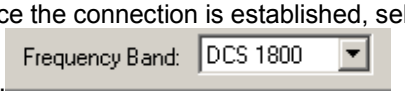


Figure 12 BTS Session

Wait until the mode and BTS status boxes indicate idle.

Once the connection is established, select the frequency band from the tool bar.



Select, on the, *Frequency Synchronisation Test icon* .

Select the NWL Properties ( ) icon and then select the ARFCN Lists tab and check that no lists are selected.

Select the *RXLEV Threshold* tab and set (tick) "*Apply a Threshold".*
Set the threshold to 1 to ensure a sufficiently strong signal is used for calibration.

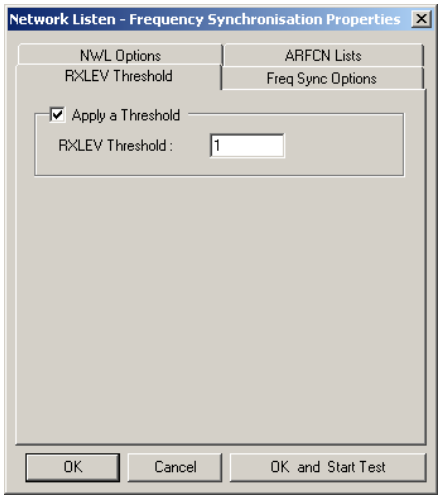


Figure 13 RXLEV Threshold

Select the *Freq Sync Options* tab and apply *Frequency Sync Options*.

Set drop menus to: "*Report a single frequency error"* and "*Adjust the clock to correct the reported errors"*

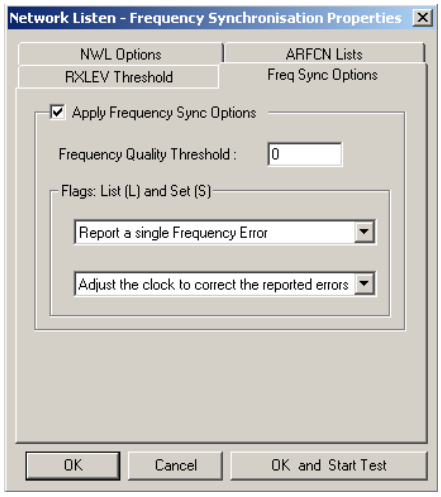


Figure 14 Freq Sync Options

Click "*OK and Start Test"* button. Perform Test ACK is reported in the message pane.

On completion of the test, the average frequency error following adjustment will be displayed.

Step 5. Check macro network channel usage

This test is designed to check for possible interferers with the nanoBTS

Click *Channel Usage* icon followed by the properties ( ) icon and then select the ARFCN Lists tab and check that no lists are selected.

The RXLEV threshold should not be applied.

Click *OK and start test* or select *NWL Start* ( ) from the menu bar.

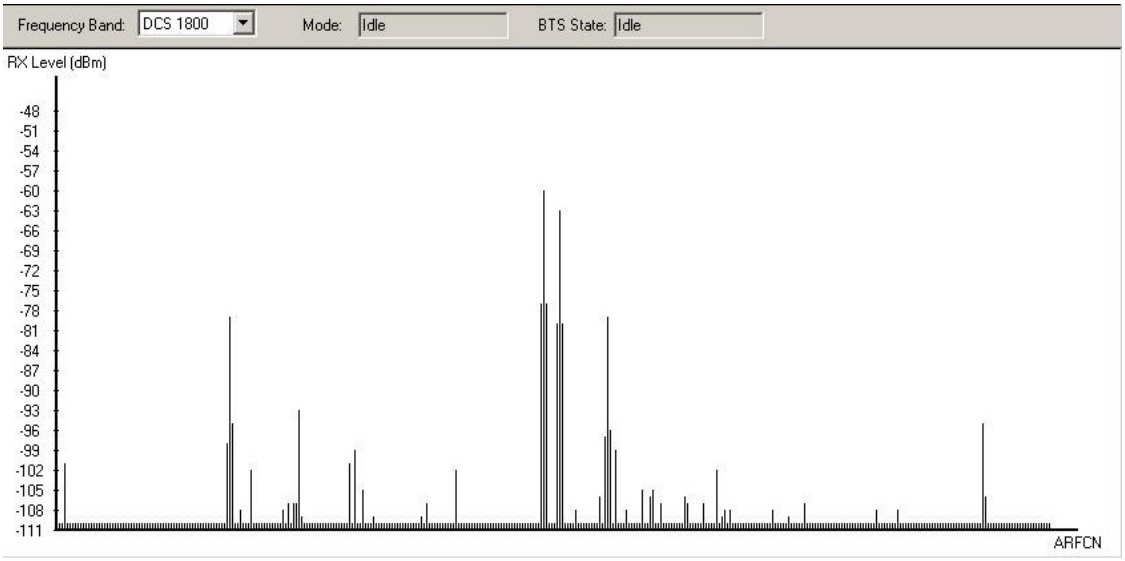


Figure 15 NWL Test Results

At the end of the test the bar chart shows the received level of signals, as shown in Figure 15.

The received levels can also be seen in a list view by clicking on the “List View” Icon ( ).

The maximum acceptable level for any interference is -95dBm and any signal above this and on a channel close to that planned for the nanoBTS should be investigated.

Export results to file by selecting ‘File’ ‘Export To File’ and save the file as the default file name, which will be a combination of the units IP address and the test name to a pre-determined directory.

Step 6. BCCH Channel Usage Test

This test is designed to identify GSM BCCH signals, which can be interrogated later during the BCCH Information Test.

Select *BCCH Channel Usage* icon .

Select the Properties ( ) icon and then select the *ARFCN Lists* tab and check that the *Apply a White List* and *Apply a Black List* boxes are unchecked.

Click *OK and start test* or select *BCCH Channel Usage Test Start* ( ) from the menu bar. Wait for the test to complete.

Step 7. Retrieve BCCH frequency information

This test measures the receive levels from neighbouring cells in order that the network operator can effectively plan for handovers. Within the building the handovers will be designed to pass to other nanoBTS but from the entrance of the building handovers may be passed to the macro network as the caller moves away from the building.

Select *BCCH Information* icon and open the *Network Listen BCCH* information screen, using the Properties ( ) icon. Select the *RXLEV Threshold* tab and set threshold to 1.

Select the BCCH Info Type tab and check the boxes as shown below.
Click *OK and Start test*.

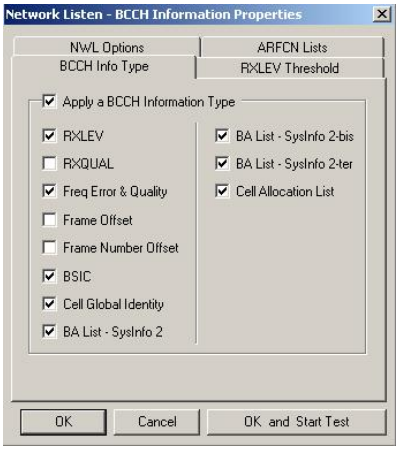


Figure 16 BCCH Information Properties

Frequencies selected as a result of the channel usage test are plotted. Placing the cursor over the frequency plot displays 'Info' summary.

When the test has completed, export the results to a file by selecting ‘File’ ‘Export To File’ and save the file as the default file name, which will be a combination of the units IP address and the test name, in a pre-determined directory.

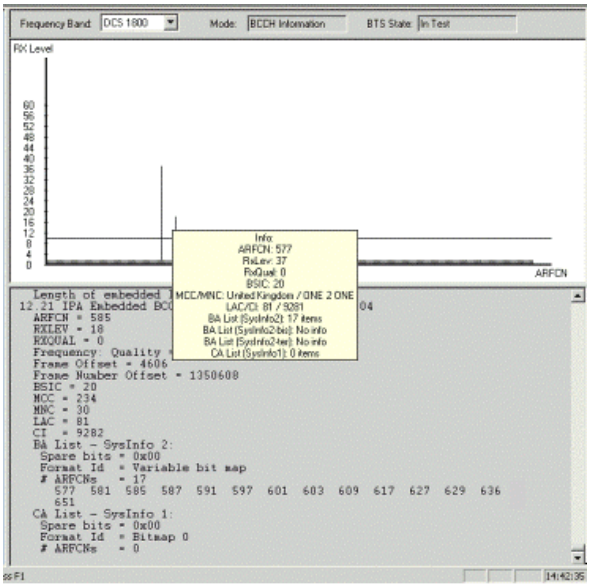


Figure 17 BCCH Information Test Results

Repeat tests 4, 5, 6 and 7 for each nanoBTS.

Step 8. Measuring path loss between nanoBTS

This test is designed to measure path loss between pairs of BTS sites so that the TX power can be adjusted to achieve required coverage (typically 95%).

In this step each nanoBTS is selected in turn to transmit and the signal is measured on all other nanoBTS in the building. The information from each test will be entered into a matrix on the installation report, as shown below.

Extend matrix to cover all nanoTRX Record path loss for each basestation pair	nTRX a	nTRX b	nTRX c
nTRX a	X		
nTRX b		X	
nTRX c			X

Table 1 Path Loss Matrix

If a connection is not already established to each nanoBTS, in the installation, open a BTS session by selecting *File, OpenBTS session* (or Ctrl +O).

Enter the IP address of a nanoBTS and click OK

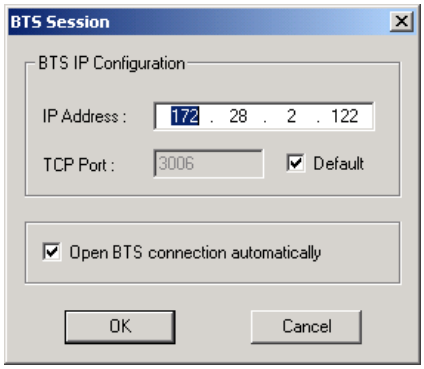


Figure 18 BTS Session

Select the window for the nanoBTS to be used as the beacon

Select Transmit Beacon from the side menu (when set as a beacon the cell is active but barred).

Click NWL Properties ( ) and check the *Perform the tests until stopped* box

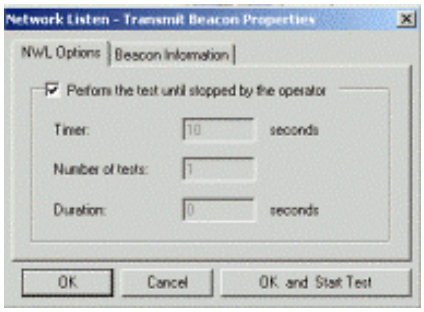


Figure 19 Transmit Beacon Properties: NWL options

On the *Beacon Information* tab and enter one *ARFCN* from the site configuration plan.
Set the *BSIC* (Base Station Identity Code) from the site configuration plan and
Set the *Absolute Power* to the maximum power allowed, specified in the site configuration plan.

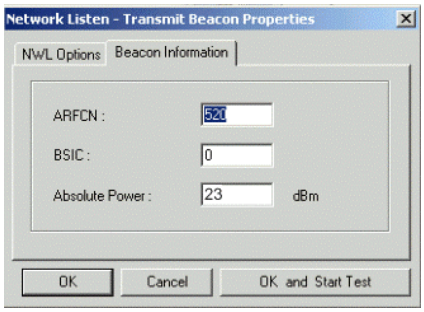


Figure 20 Transmit Beacon Properties: Beacon Information

Click the *OK and Start Test* button

Figure 21 NWL Transmit Beacon

Select the *Channel Usage* ( ) icon from the side menu.

Click NWL Properties ( ) and select the ARFCN list tab and select the channel being used by the beacon from the white list (only one should be set).

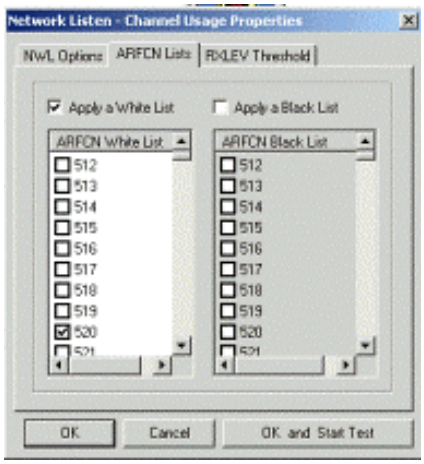


Figure 22 NWL Channel Usage Properties

Click *OK*

For each nanoBTS, except the one that is determined to be the beacon;

Select the *Channel Usage* ( ) icon from the side menu and then *Test Start* ( ) from the main menu bar.

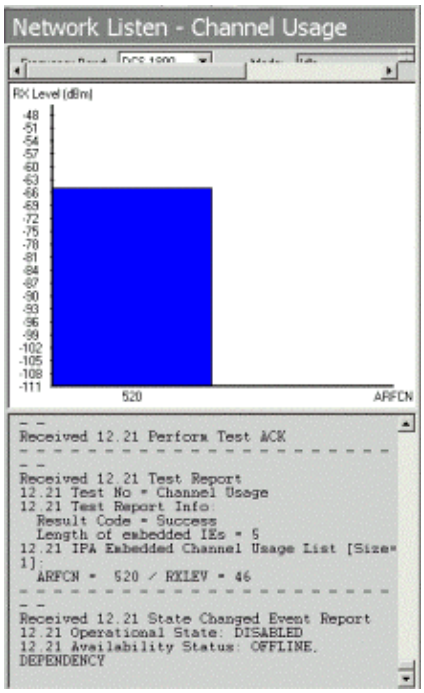


Figure 23 NWL Channel Usage measurement

From the displayed bar chart note the reading. In the example above the value shown is –65dbm

Calculate the path loss by subtracting the RX level from the TX level
i.e. [=23dBm TX] – [-65dBm RX] = 88dB path loss.

Record the path losses in the path loss matrix spreadsheet contained within the installation report.

Calculate and record the transmit power level for each nanoBTS so that the received power level, detected by at least two neighbouring BTS shall typically be -85dBm and will be specified in the "Site Configuration Plan"

Select the window for the beacon nanoBTS, and click on the NWL stop ( ) icon.

Repeat the test for each nanoBTS in turn; by setting each into transmit beacon test and measuring the path loss between it and each other nanoBTS to complete the matrix.

Step 9. Walk Test

This test is performed to fine adjust the nanoBTS(s) as agreed to give a suitable service meeting the coverage levels specified in the site configuration plan.

Set each nanoBTS into beacon test mode on its allocated ARFCN and power level as calculated in the previous step. (See Step 8)

Using a test mobile or other GSM measuring device, walk through the installation site looking for areas where service is below the threshold specified in the site configuration plan, recording black spots.

Individual BTS power levels may be adjusted to minimise areas of poor network performance.

Record all locations that are subject to poor reception.

Step 10. Installation Report

Compile an installation report for the network operator to enable them to set their BTS neighbours, cell list, power levels and handover thresholds to optimise the network.

The report should contain: -

- BCCH information
- Channel usage
- Path loss matrix
- Walk test results
- Completed site configuration plan

This completes the installation and configuration of the nanoBTS site.

Regulatory Compliance

The nanoBTS conforms to the following regulatory standards.

Type Approvals

- FCC Rule 47 Parts 2, 15, 24

Safety Certifications

- UL 60950 3rd Edition

NOTE: Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate this equipment.

Appendix 1: Modifying nanoBTS for use with external antenna

Remove Plastic cover.
Remove the top and bottom plates from both ends of the nanoBTS. Lever gently apart with screwdriver in notch.

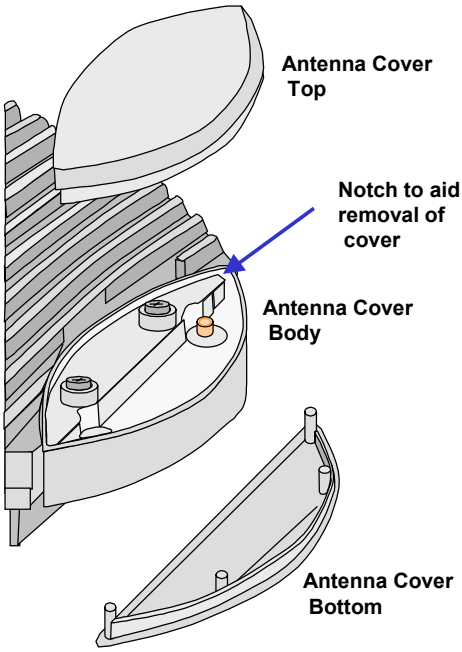


Figure 24 Removal of antenna covers

Remove the antenna cover body, by unscrewing the two Torx T20 screws retaining

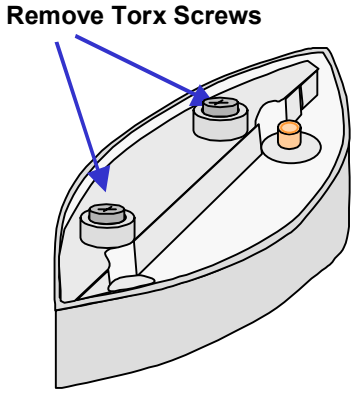


Figure 25 Removal of antenna cover body

Fit the replacement antenna cover body ensuring that the feeder cable connector fits into the antenna. Note that one cover only fits the receiver whilst the other fits the transmitter.

Fit the clamp as shown below and second Torx screw, then replace top and bottom covers.

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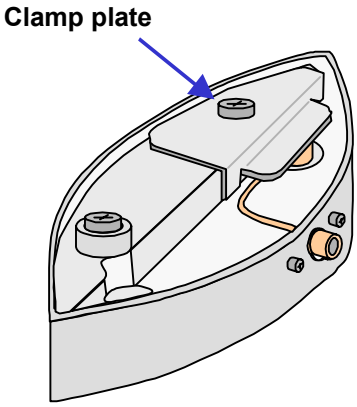


Figure 26 Fit clamp plate

Repeat the process for the other end of nanoBTS

Appendix 2: Alternative method to set frequency of nanoBTS oscillator

Note: The nanoBTS should be powered on for at least 60 minutes before performing the frequency calibration procedure, in order to allow the oscillator to reach its normal operating temperature

Start the nanoInstaller. Select from menu *File, Open BTS Session*

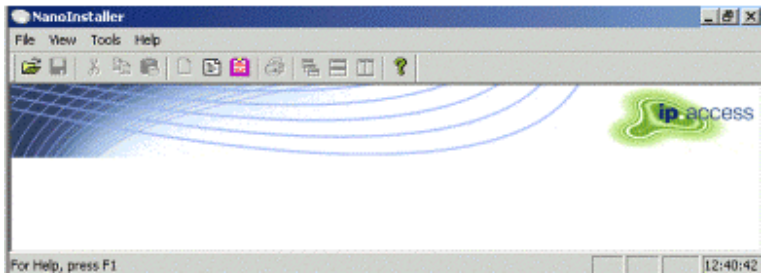


Figure 27 NanoInstaller Opening Screen

Enter the IP address of the nanoBTS that is to be calibrated.

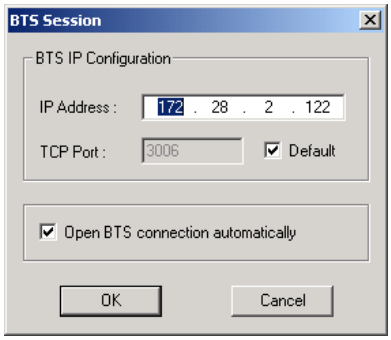
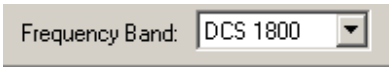


Figure 28 BTS Session

Click OK and wait until the Mode and BTS State boxes indicate idle.

Once the connection is established, select the frequency band from the tool bar.



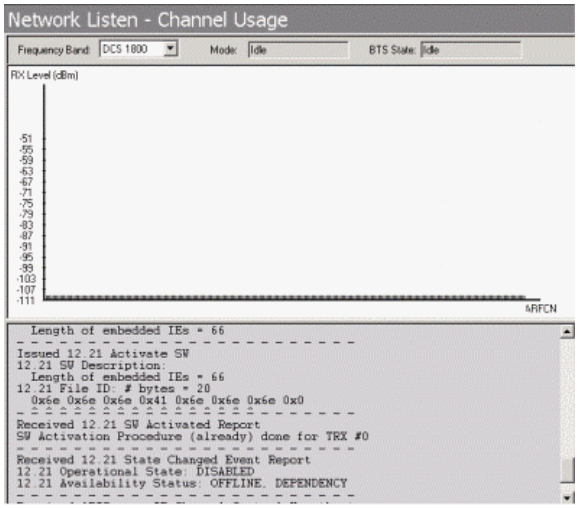


Figure 29 nanoInstaller after connection to the nanoBTS

From the menu select Tools/ Get NV attributes and check the Frequency Control box.

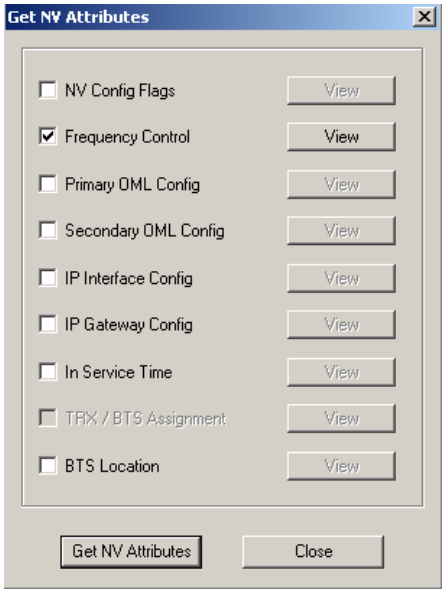
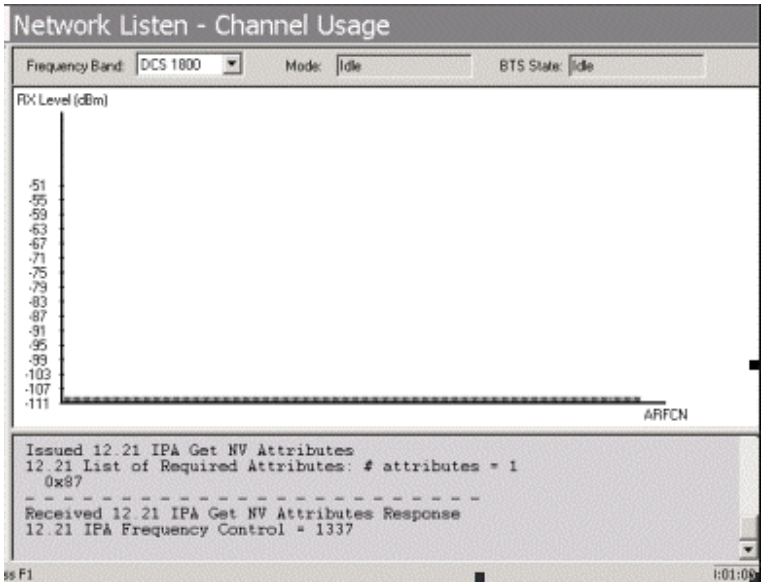


Figure 30 Get NV Attributes

Click the *Get NV Attributes* button. When View button alongside is enabled, click on it and the value will be displayed.



From the menu select Tools/ Set NV attributes and check the Frequency Control box.

Connect a frequency counter to the TIB out port on the nanoBTS

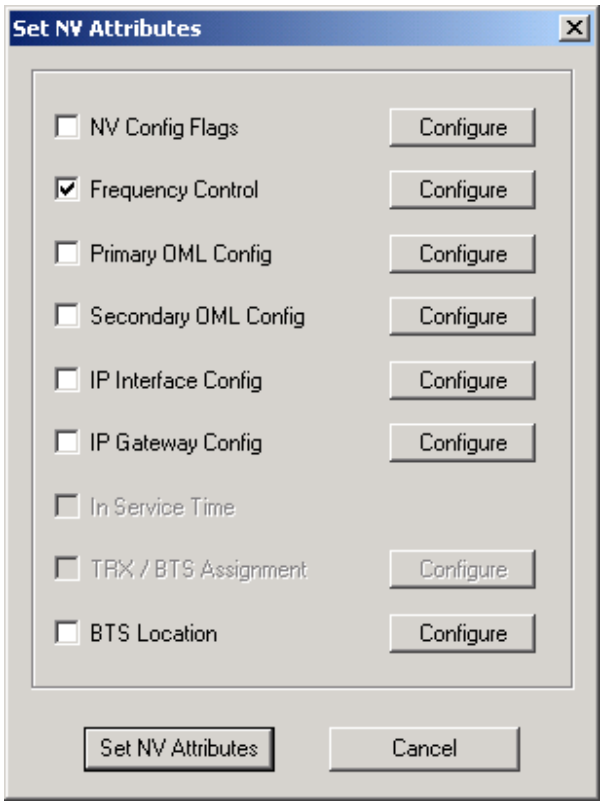


Figure 31 Set NV Attributes

Click the *Set NV Attributes* button.

Click the configure button alongside frequency control and adjust the frequency control value until the measured frequency is 26MHz± 20ppb.

Adjustment of the 26MHz is typically in the order of 1.5Hz per 100 DAC steps.

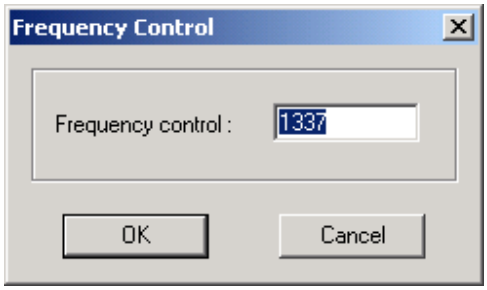


Figure 32 Frequency Control

Appendix 3: Commissioning at the nanoBTS

If commissioning is to be done mostly at the nanoBTS instead of connecting the PC to LAN in switch room (step 2) the laptop PC should be set up at the nanoBTS as shown the diagram below using the power over Ethernet adapter to connect the PC onto the LAN (the adapter applies the 48V DC to the nanoBTS). Connect a crossed RJ45 lead from the adapter to the Ethernet connector on the nanoBTS.

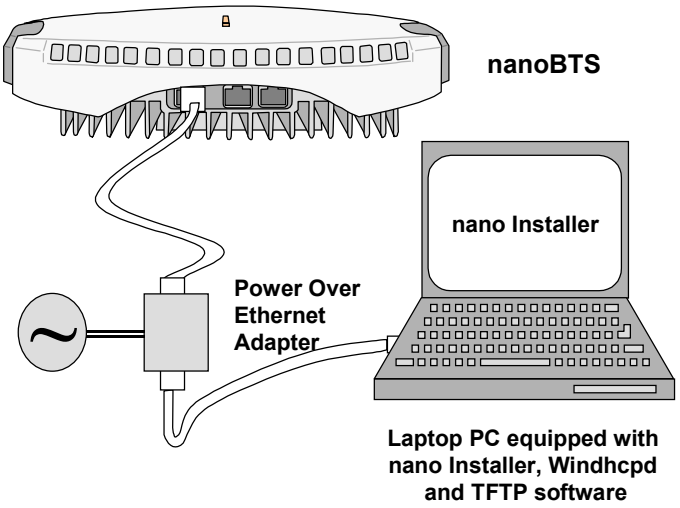


Figure 33 Test Setup, Option 1

Page

Step 1. Setting up PC for configuring nanoBTS 15

Steps 2 to 7 performed at the nanoBTS

Step 2. Connecting the nanoBTS 16
Step 3. Setting IP address and downloading operational software 17
Step 4. Calibration of nanoBTS using frequency synchronisation 18
Step 5. Check macro network channel usage 19
Step 6. BCCH Channel Usage Test 21
Step 7. Retrieve BCCH frequency information 21

Disconnect installation PC and connect to RJ45 Ethernet

Step 8 performed at the BSC / Switch room

Step 8. Measuring path loss between nanoBTS 22

Steps 9 and 10 performed in building

Step 9. Walk Test 26
Step 10. Installation Report 26

Appendix 4: Commissioning mostly at the NOC

Steps 1 to 3 performed at the nanoBTS **Page**

Step 1. Setting up PC for configuring nanoBTS 15
Step 2. Connecting the nanoBTS 16
Step 3. Setting IP address and downloading operational software 17

Steps 4 to 8 performed at the NOC

Step 4. Calibration of nanoBTS using frequency synchronisation 18
Step 5. Check macro network channel usage 19
Step 6. BCCH Channel Usage Test 21
Step 7. Retrieve BCCH frequency information 21
Step 8. Measuring path loss between nanoBTS 22

Steps 9 and 10 performed in building

Step 9. Walk Test 26
Step 10. Installation Report 26

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Appendix 5 Troubleshooting

Checking that the nanoBTS has successfully downloaded an IP address

Start the program 'Bts Finder' select the IP address and MAC address boxes and click the *Find BTS* button.

Figure 34 Bts Finder Opening Screen

Check that the IP address and MAC address are as required.

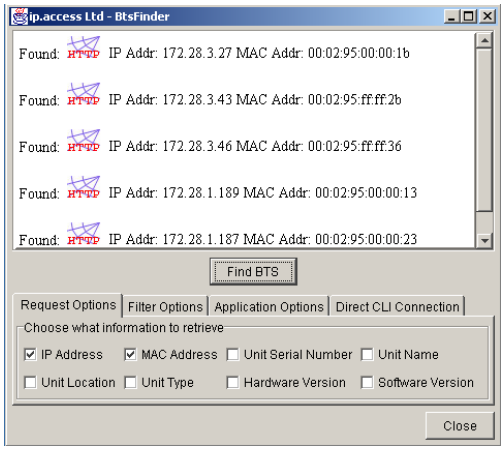

Figure 35 Find BTS Results

Resetting the nanoBTS to factory default settings.

1. Remove the connecting cable providing power to the nanoBTS.
2. Insert the dongle into the "TIB IN" port.
3. Power ON the unit by reconnecting the Ethernet cable to the nanoBTS.
4. Wait until the LED shows fast blinking red (0.3 seconds on and 0.1 seconds off)
5. Remove the dongle.
6. Reboot the unit by removing the Ethernet power cable, waiting 10 seconds and then reconnect the Ethernet cable.

Communication Problems

No LEDs	
Does the BTS have Power?	Check that the BTS is connected to the Ethernet cable and ensure it is plugged in fully into the Ethernet socket.
	Check that the Ethernet cable is plugged into a power supply.
	Check that the Ethernet is plugged into the correct socket on the power supply (BTS).
	LED's have been disabled using nanoInstaller
	Check that the power supply is connected to the mains and powered up.
LED is on but is flashing orange (1sec on, 1sec off)	
The unit is powered up but does it have proper connection to the installation PC.	Check the Ethernet cable between power supply unit and installation PC.
	Check that the cable between PC and Power supply unit is crossed, if connecting directly to the nanoBTS
	Check that the Ethernet is connected to a correct (Live) socket on the hub.
	Check that the DHCP server is running on installation PC
No communication between the nanoInstaller and the BTS	
	Check that nanoInstaller is not set to look at the wrong IP address or port number
	Check that the Ethernet cable is connected between the installation PC and the BTS via the power supply box.

Clock Adjustment Problems

No 26MHz clock during Frequency adjustment	
	Clock adjustment cable not plugged into TIB-OUT socket on BTS.
Unsettled 26MHz during frequency adjustment	
	Has the BTS been powered up long enough to warm up? Warm up time is normally less than 60 minutes but can sometimes take over one hour if the unit has been stored in a cold environment before power up.

Problems During Beacon Test

No signal seen on other nanoBTS during beacon test	
	The nanoBTS is not enabled to transmit a beacon
	The power level of the beacon BTs is set too low. Select a higher power level.
	A white list has been applied which does not include the beacon channel
	If using the external antenna, ensure that the cable connections are in place.

Glossary of Terms and Abbreviations

10 Base-T	Basic Ethernet at 10 Mbit/sec
100 Base-T	Ethernet running at 100 Mbit/sec
ACH	Access Channel
ACK	Acknowledgement signal
ARFCN	Absolute Radio Frequency Channel Number
BCCH	Broadcast Control Channel
BCH	Broadcast Channel. A channel transmitted by one (e.g. BS) and received by many (e.g. MS)
BER	Bit Error Rate
BSC	Base Station Controller. The 'brains' of a base station subsystem, controlling the radio equipment in the BTS
BSS	Base Station Subsystem (includes BTS and BSC)
BTS	Base Transceiver System (radio portion of BS)
dB	Decibel. 10 times the logarithm of the value in base 10
dBm	Decibels referenced to one milliwatt
DHCP	Dynamic Host Control Protocol. Allows automatic assignment of IP addresses on a network
DL	Downlink. Radio link from network 'down' to the terminal. Compare with UL
Ethernet	A LAN protocol using collision detection to resolve access contention
ETSI	European Telecommunications Specification Institute
FTP	File Transfer Protocol
Gateway MSC	A MSC designed to receive wireless calls from the PSTN
GSM	Global System for Mobile Communications
Handoff	The process of a MS changing from one frequency in one cell or sector to a different frequency in a neighbouring cell or sector
IP	Internet Protocol
kbps	Kilobits per second
LAN	Local Area Network
LED	Light Emitting Diode
MAC	Medium Access Control (layer in a protocol stack)
MS	Mobile Station (wireless phone)
MSC	Mobile Switching Centre
NAK	Negative Acknowledgement signal
nanoBSC	ip.access term for a base station controller
nanoBTS	ip.access term for a picocellular basestation
NL	Neighbour List
NOC	Network Operations Centre
NWL	Network Listen Ip.access term for functionality of monitoring surrounding basestations from the nanoBTS
OCXO	Oven Controlled Crystal Oscillator
OMC	Operations and Maintenance Centre
PC	Personal Computer
PLMN	Public Land Mobile Network. A cellular or PCS network
Protocol	A specification of the messages used to communicate over one or more interfaces
PS	Packet Switched
PSTN	Public Switched Telephone Network
QoS	Quality of Service. A list of measurable attributes such as bandwidth, delay and jitter that should be met for a customer
RF	Radio Frequency

RJ45	Minature 8-position keyed data jack, providing electrical network connection for data
RX	Receiver
.sdp	Software download packages
SysInfo	System Information
TCP	Transmission Control Protocol. A protocol that provides for reliable delivery of messages over the Internet. See IP
TCP/IP	TCP used over IP
TFTP	Trivial File Transfer Protocol
TRX	Transceiver
TX	Transmit
UL	Uplink. Radio link in the direction ‘up’ to network. Compare with DL
VoIP	Voice over IP