SAMSUNG

DECT 500/1500

Installation and Programming Manual

SAMSUNG TELECOMS

Publication Information

Samsung Telecoms reserves the right without prior notice to revise information in this publication for any reason.

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Disclaimer

Samsung Telecoms is not responsible for errors or problems arising from users not installing or programming their Samsung systems as described in this manual.

PN: 13872 Version 1.0

EU Declaration of Conformity

Appropriate to the law of radio and telecom terminal (FTEG) and Directive 1999/5/EC (R&TTE)

DECT 500 conforms with the following standards:
Health & Safety requirements contained in §3(1)1, Article 3(1)a:
EN 60950: 2000
Protection requirements with respect to electromagn. compatibility §3(1)2, Article 3(1)b:
EN 301 489-1: 2000
EN 301 489-6: 2000
Other relevant harmonised standards:
TBR6, TBR21, TBR22

DECT 1500 conforms with the following standards:
Health & Safety requirements contained in §3(1)1, Article 3(1)a:
EN 60950
EN 41003:1998
Protection requirements with respect to electromagn. compatibility §3(1)2, Article 3(1)b:
EN 50081-1
EN 50082-1
Other relevant harmonised standards:
CTR10, CTR22

The relevant declarations for the DECT 500 and DECT 1500 systems can be obtained from Samsung Telecoms (UK) Ltd at the address shown at the end of this guide.

Intended Use

This DECT telephone handset is intended to communicate with a Samsung telephone system, where such a telephone system is provided with the appropriate DECT interface. It allows the user to make and receive voice calls. An optional ear-microphone (headset) unit can be connected. The telephone is powered by an integral battery which is charged through the base unit provided. It should not be used for any other purpose.

Contents

Introduction

This guide describes the procedures required for installing the Samsung DECT 500 and 1500 systems with Base Stations, Repeaters and handsets. Before installing the hardware, a careful site survey must be carried out to determine the exact requirements of the site and the optimum locations for installing equipment.

The site survey and installation phase starts by surveying the site with the Site Survey kit and marking your findings on a plan of the site; it ends when the system has been running for one or two weeks.

The procedure for the site survey and installation phase is summarised below.

1. Site survey by an accredited DECT engineer.
2. Install the Base Stations (and Repeaters if required) for optimum coverage.
3. Evaluate the site survey. If necessary, install additional Base Stations / Repeaters, or move existing Base Stations / Repeaters.
4. Register handsets.

Part 1 describes the site survey and provides a detailed overview of the various components of your DECT system, including how Base Stations and Repeaters should be positioned to provide optimum performance.

Part 2 provides information on procedures to install and configure the hardware components for each system (CCFP, Base Stations, handsets etc.) and how to install Repeaters.

Installation and configuration of the DECT 1500 system requires the use of the supplied administration program running on a PC connected to the system. This is optional for a DECT 500 system.

Some Terminology

Throughout this guide, you will find the following terms used:

CCFP=Central Control Fixed Part (the system “central processing unit”)
RFP=Radio Fixed Parts (Base Stations)
WRFP=Wireless Radio Fixed Parts (Repeaters)
PP=Portable Parts (handsets)

Important: The DECT system is not intended to be a cordless PABX solution. It is provided as an “add-on” to enhance the current range of Samsung PABXs.

Part 1: Site Survey and Overview of DECT Systems

Preliminaries

The DECT 500 is an entry-level system comprising a single Base Station/Controller (CCFP) allowing up to eight handsets to be used. The DECT 1500 comprises a central control unit (CCFP) supporting up to eight Base Stations and 64 handsets. The DECT 1500 can also be installed with an expansion board to support up to 16 Base Stations, or can be configured as two “linked” systems supporting up to 32 Base Stations.

The site survey defines the locations of Base Stations needed to cover the area of the site adequately, and the number required for a 1500 system.

During the site survey and before the Base Stations are installed, an estimate of the expected number of users and the required coverage area should be made. In particular:

- *How many handsets are expected to be used now and in the future?*
- *How many calls are made, and how long is the average call?*
- *Is it necessary to have 100% coverage?*

Before Starting the Survey

Due to the nature of radio waves, wireless telecommunication, to a large extent, depends on the environmental characteristics of a site.

- The signal strength of radio waves transmitted from a Base Station should be measured carefully at several points. The results can then be recorded in the form of contour lines on the site map.
- A great deal of time and effort can be saved if simulation devices or measuring devices are available.
- The pre-prepared survey kit and a DECT D-5000 handset can be used to measure the strength of radio signals.
- All the test results should be kept safely for effective maintenance of the site.

Environmental Considerations for Users and Buildings

- Carefully track the movement of users to establish movement patterns. The number of Base Stations required is determined by the number of users and their movements.
- The distance between Base Stations should be at least 3m to avoid interference. Keep the distance between Base Stations shorter the more frequently users move while in conversation.
- Do not install a Base Station where it could spoil architectural features.
- Consider ease of maintenance when installing a Base Station.

Other Considerations

- There should be at least one Base Station with an RSSI (Receive Signal Strength Indicator) value greater than 65 hex and a “Q” value (bit error rate) greater than 52 at some location within the service area for DECT users.
- Take into account radio interference caused by objects such as trees, walls and glass. Try to install in an open environment where masking by objects is minimised. Refer to Table 1 for details.

Table 1: Radio Interference by Materials

Material	Approximate Loss in dB
Glass	2
Glass, metal reinforced grid	10
Glass, metal-clad sun guard	10
Wall, indoor, wood	2
Wall, brick, 10cm	3.5
Wall, concrete, 15cm	9
Wall, concrete, 20cm, large windows	6
Wall, concrete, 40cm	17
Concrete	15
Concrete, metal clad	30
Concrete, window	8–9
Venetian blinds open	10
Venetian blinds closed	20
Soft partitioning	3–4

- When installing cables for Base Stations, keep them away from high-speed LAN cables and power cables which can cause electrical interference. Maintain at least 1m distance.
- Avoid installing a Base Station near windows since radio interference between floors of a building might be more active due to diffraction of radio waves.
- It is recommended that a Base Station should be installed at a distance of 2m from the floor and 30cm from the ceiling, and cables should come from the ceiling rather than the floor.

- Take into account interference from adjacent cells when the DECT system is installed in a multi-storey building (Hot Spot).
- Take into account the following characteristics of radio waves.
  - **Body effect:**

    The RSSI and Q values may differ depending on the location of the handset on the human body.
  - **Speed of moving handset:**

    The RSSI and Q values may fluctuate if a handset moves at speed.
  - **Line of sight:**

    Much more consideration is required when a Base Station is to be installed in a wide-open area.
  - **Multi-storey deployment:**

    Characteristics of cells in each storey may differ due to the structure and materials of the building.

Information Required

- Obtain a map of the site.
- Note the general construction materials used in walls and doors of the building(s), including window coating and covering, if any. Also note any large metal objects such as equipment, doors, and fluorescent lamp shades. In general, radio frequency (RF) signals are attenuated to some degree when passing though materials. Some materials, such as metal, attenuate RF signals to a higher degree. (See Table 1, above.)
- Define the number of handset users and which are the high traffic areas, such as conference rooms, cafeterias and manufacturing departments.
- Check which positions allow and prohibit Base Station installation.
- Determine the required coverage areas, such as elevators, stairwells, toilets, outdoor areas etc.
- Establish the position of the DECT system and available cabling.

Tools Needed for Site Survey

- DECT Demonstration and Installation Kit
- Handsets (D-5000): 2
- Base Station (RFP)
- Sound source (CD player and headset)
- Tape measure
- Map of the building

Site Survey Procedure

Before you start cell planning, the coverage estimation for the site should be completed and the possible Base Station locations indicated on the site map. Cell planning is done as follows:

1. At a selected Base Station location, set up the survey kit.

2. Place the Base Station near the ceiling or at a height of about 2.5m.

3. Press * **99989 *** on the handset.

   The handset displays the RSSI and Q values of the Base Station.

4. Move away from the Base Station and check the RSSI and Q values until they read the minimum (RSSI=65, Q=52). Stop and mark this as the border of the cell on the map. Note that:

   - When measuring RSSI and Q values, hold the handset close to your body or shield the aerial with the handset with your hand, pause for 2–3 seconds, take a reading and move on.
   - To avoid confusion, different cell boundaries should be marked with different line patterns, e.g. dashed line, dotted line, etc. Do not use colours as these may be lost when photocopying.
   - For a multi-storey building it must be clear on what floor the Base Station was positioned and that the result may be several cell contours on different floors.

5. Using the following numbering conventions, name the Base Stations and cells and mark them on the map.

   - xRyy : refers to the identity of the Base Station, where
     x is the level (-1 is basement, 0 is ground, 1 is the 1st floor, etc)
     R means this is a Base Station
     yy is the Base Station position number. This number should be unique.

     For example, a Base Station on the 2nd floor and with position number 4 is identified as 2R04.

   - xCyy : refers to the identity of the cell, where
     x is the level at which the measurement was made (-1 is basement, 0 is ground, 1 is the 1st floor, etc)
     C means this is a cell
     yy is the position number of the Base Station being measured.

     For example, if measurement is made on the 2nd floor and the measured Base Station position number is 4, the identity of the cell is 2C04.

6. Repeat steps 1–5 for the remaining planned Base Station positions.

7. At this stage, it may be necessary to move some of the planned Base Station positions or add new ones to eliminate shadows or optimise cell size. If so, it may also be necessary to do additional measurements to check that the new Base Station positions do not create other problems.

Choose the Base Station positions required. This may need to be done in consultation with a customer engineer. In choosing Base Station positions, the required cabling to the keyphone system should be considered. Base Station positions must be defined such that later installation problems are minimised.

8. Having completed the above procedures, install the Base Stations in the positions marked on the map.

Some example cell planning results are shown at the end of this chapter.

Checklist for Survey Data

Building Characteristics (for each building)

- Building identification (refer to maps if available)
- What building is used for
- Dimensions (refer to maps if available)
- Number of floors
- Height of each floor
- Partitioning per floor
- Construction details

Radio Coverage

List areas where radio coverage is not necessary or which are to be excluded from radio coverage. Also list areas where radio coverage is not feasible or requires specific Base Stations.

Keyphone System

Type and location of keyphone system (e.g. OfficeServ 500).

Reporting Site Survey Results

It is important to make a comprehensive survey report that records site survey results and provides useful information for the engineer who is to actually install the equipment. The following information should be included in the survey report. (See the DECT Survey Report Form over the page.)

- A description of the site, explaining which buildings and grounds are to be included in the report. A description of the topography of outdoor areas may be useful.
- A specification of the construction of the buildings and construction materials.
- Customer requirements for:
  - the number of handsets
  - required coverage
  - performance requirements (traffic density, grade of service etc.)
- The location and the type of the keyphone system (e.g. *i*DCS500, OfficeServ500).

- Cabling details: a specification of cables already present on the site and a list of new cabling required, including the distance between the Base Station and IWU card for existing and new cabling.
- Copies of the maps of the site with the position of Base Stations and cell boundaries clearly marked.
- A list of possible configurations to help the customer decide exactly what is required.
- A specification of where Base Stations should be placed. This can be marked on the survey map, but additional information such as height and fixing instructions should be included where appropriate.
- A specification of the areas that will be covered by the Base Stations and areas that may cause problems. This can be useful when testing the system. The theoretical maximum number of overlapping cells is 10, if all time slots and frequencies are used. If not all time slots and frequencies are used, this value is higher, although this is unlikely to be the case in practical situations. For a large site where a thorough survey has been impossible, it may be prudent to add 10–20% more Base Stations to requirements to allow for unforeseen problems.

DECT Survey Report Form

Number: Date:

From : [Survey Engineer]
To : [Customer Installation Engineer]

1. SITE
[full address of site]

2. Survey Engineers
[name and addresses of engineer(s) who executed the survey]

3. Outline description of site
[short description of site (dimensions, environment, number and type of buildings, etc)]

4. Number of handsets and expected traffic
[description of expected traffic and indication of above- or below-average traffic areas]

5. Test results
[this should include the site maps and any additional information that may be useful]

6. Connections to Base Stations
[list of planned Base Stations with approximate cable length and type, and whether existing wiring can be used or new cabling is required]

7. Type and location of keyphone system
[description, location and system configuration]

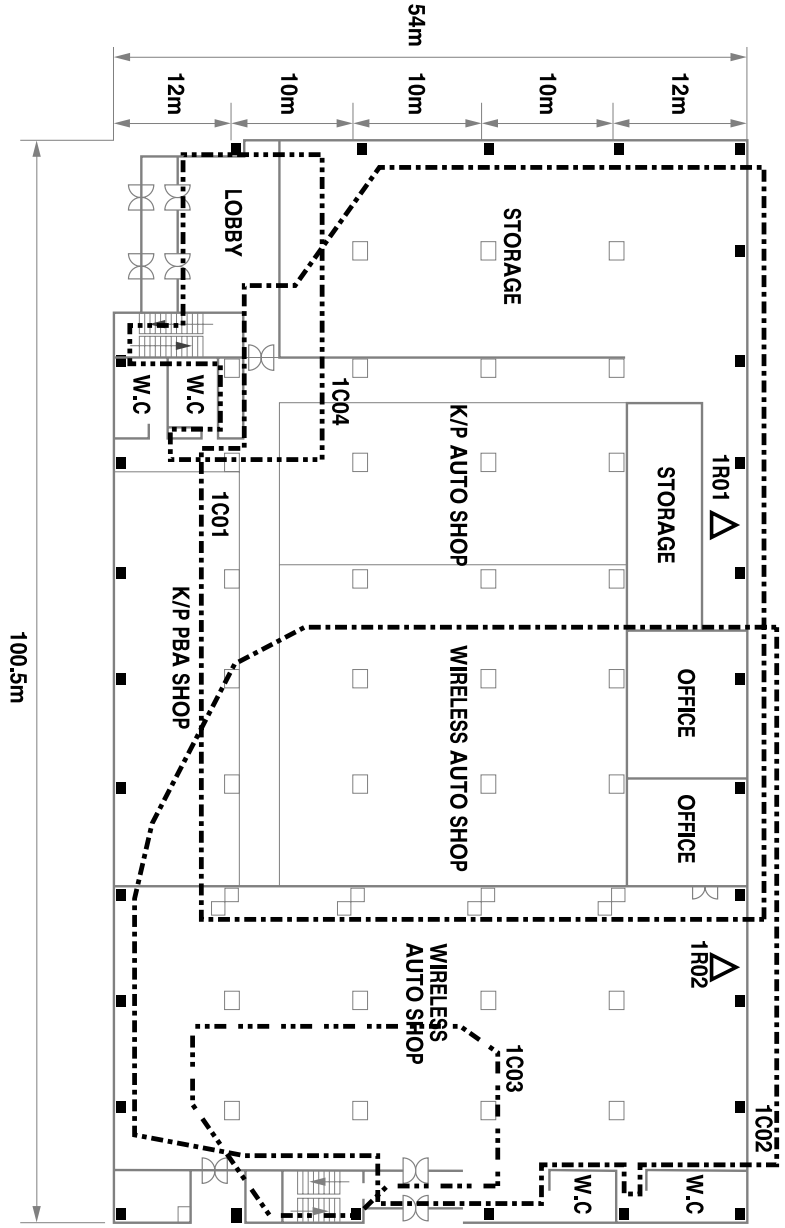
8. Existing cabling
[indicate what cabling is available and how it is distributed across the site]

9. Base Station installation
[for each Base Station, indicate exactly where it can be installed, e.g. “in the corridor against the wall of room 32, 2.5m high” and where customer restrictions apply as to where Base Stations may be installed]

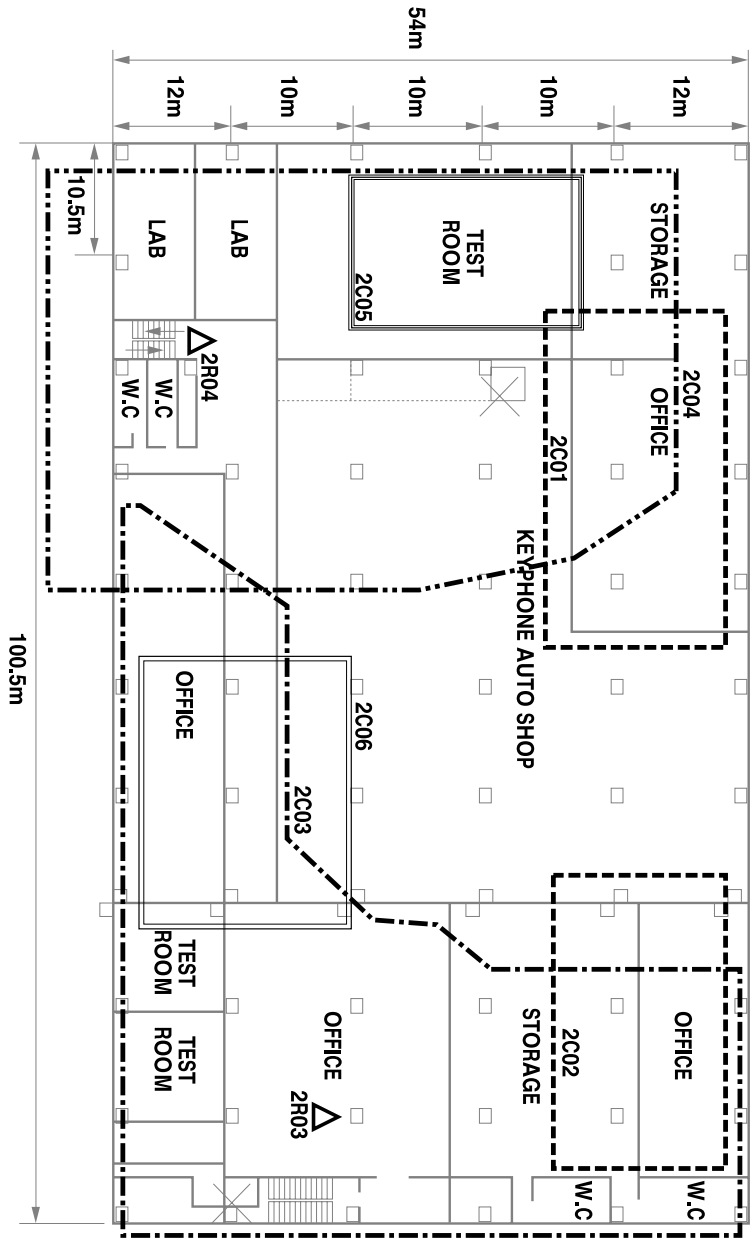
10. Possible configurations
[list alternative configurations for the deployment of Base Stations—refer to coverage maps and indicate areas where coverage cannot be guaranteed]

Example Cell Planning Results

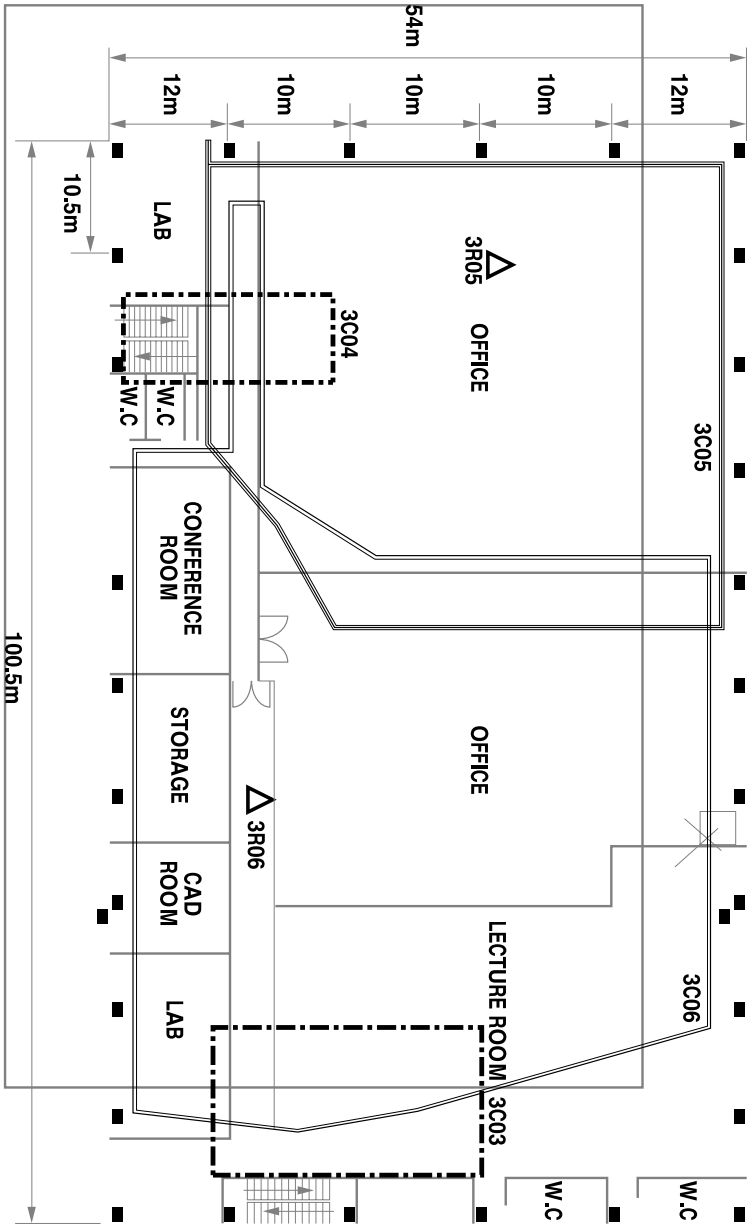
Survey Map of the 1st Floor



Survey Map of the 2nd Floor



Survey Map of the 3rd Floor



Positioning Base Stations

The coverage area for a Base Station within a building varies from 50 to 150 metres. The radiation graph from a Base Station is almost circular, horizontally, when working in “free” areas. If a Base Station is placed in the corner of a building, part of the coverage area is outside the building (Figure 1.1). This means that a Base Station should not be placed in the corner of a building if the required coverage area is within the building. The shaded area in Figure 1.1 is the “unexploited” area. In practice the radiation graph will not be as neat as in Figure 1.1, but it is a good starting position for planning the installation during the site survey phase.

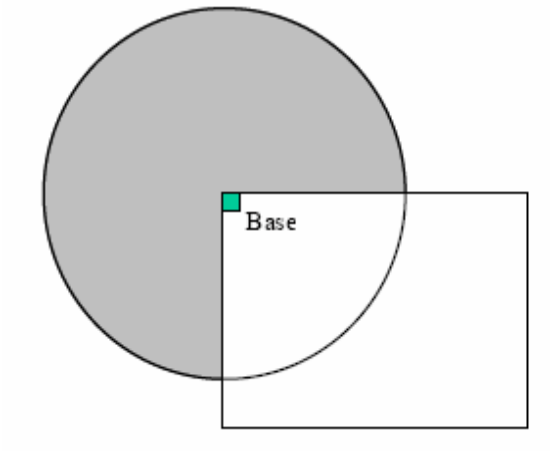


Figure 1.1

A Base Station should be placed at a minimum height of two metres. If the Base Station is any lower, people moving around the building could affect the radio signal from the Base Station. If the Base Station is placed too high, especially in buildings with a steel roof, steel girders and/or large air shafts in the ceiling, there is a risk of gaps in the coverage area. This is party due to “shadows” and/or reflections. The design of the building, and especially equipment made of metal (shelving, racking, machinery etc) may effect the radio signals a great deal. For example, in a warehouse where goods are moving in and out constantly the quality of radio signals can vary from day to day. Refer to section 1 for more information.

Using the Demonstration Base Station

To find the correct place to locate a Base Station, the Deployment Base Station included in the DECT Demonstration and Installation Kit can be used. Refer to the example in Figure 1.2. In practice, this method will not result in a symmetric solution as shown in Figure 1.2, but it does ensure optimum placing of the Base Stations.

A survey and demonstration Base Station is placed in the corner of the building (position 1 or 2). The broken circle indicates the coverage area to be measured for the Base Station. The coverage of the area is defined by the fact that an RSSI value of 85dBm can be measured along the broken line.

The RSSI value can be measured with a Samsung D-5000 handset. Note that when carrying out measurements, the handset must be off-hook.

During measurement it is necessary to take into account the effect a human body has on the radio signal. This is done by either holding a hand over the antenna of the handset or by turning the handset and body away from the Base Station in a way that causes a “worst case” scenario, i.e. a position which results in the lowest RSSI value.

Approximately RSSI 65 / Q52>54 should be measured at the broken line. The Q value should be stable.

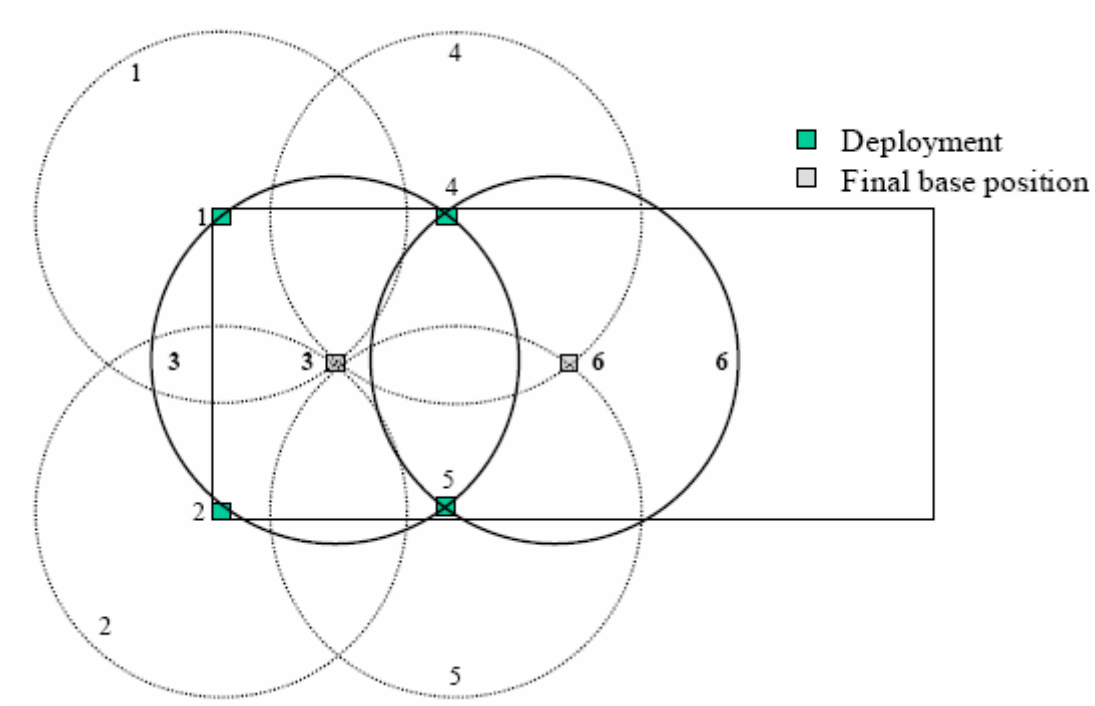


Figure 1.2

The permanent Base Station should be placed in the position (position 3) in which the RSSI value is 65 and has a stable Q value of 52 from the measured survey and the demonstration Base Station in positions 1 and 2. Then the survey and demonstration Base Station can be moved to positions 4 and 5. The measuring process can be repeated and the permanent Base Station is placed in position 6.

Hot Spots

It is possible to have four simultaneous calls on one DECT 1500 Base Station. If the radio coverage in an area is OK, but users require more than the allowed number of simultaneous calls, this is called a “Hot Spot”. In a Hot Spot area, additional Base Stations can be installed.

One or more additional Base Stations can be placed next to the existing Base Station. In this way, small overlaps between the coverage areas of the Base Stations are avoided.

A maximum of three Base Stations can be placed next to each other. Any more will interrupt each other and interfere with the whole system. If there is a need for a fourth Base Station, this must be placed at least 25 metres away.

Final Testing

The overall performance of the system can only be fully evaluated after the installation has been completed. If is necessary to move between coverage areas (cells) of different Base Stations to conclude if the handover between Base Stations is possible. At the same time, Base Station synchronisation can be tested. This is done by means of the test display on a handset. It will be necessary to move between the coverage areas of the different Base Stations to determine whether a handset can "see" the different cells.

Traffic Measurement

When the cells and radio coverage are in place, the traffic must be calculated for each cell (Figure 1.3).

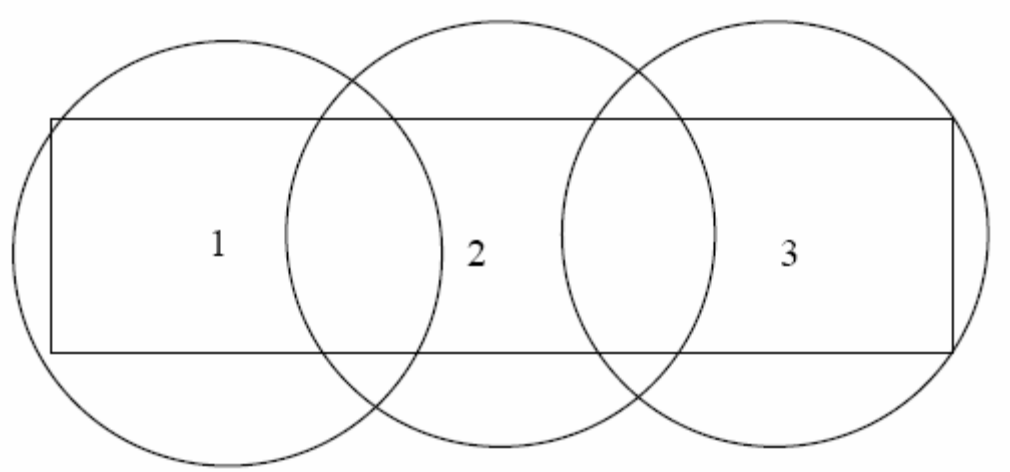


Figure 1.3

Map out where handset users are typically concentrated and calculate how many Base Stations will be required for each cell. The flowchart in Appendix 1 can be used as a guide. In Appendix 2, some general calculations have already been made which can also be used as a guide.

Example: How many Base Stations must be installed in a cell with 40 handsets, assuming that 1% of the time users won't be able to make a call and each handset makes three calls per hour and each call lasts three minutes?

Erlang = E.
3 calls per hour, lasting 3 mins (3 calls x 3 mins)/60 min = 0.15 E
40 x 0.15 = 6 E
With 1% rejection, 6 E equals 12 channels according to the Erlang table (Appendixes 1 and 2).
A Base Station has 4 channels: 12/4 = 3 Base Stations per cell (Figure 1.4)

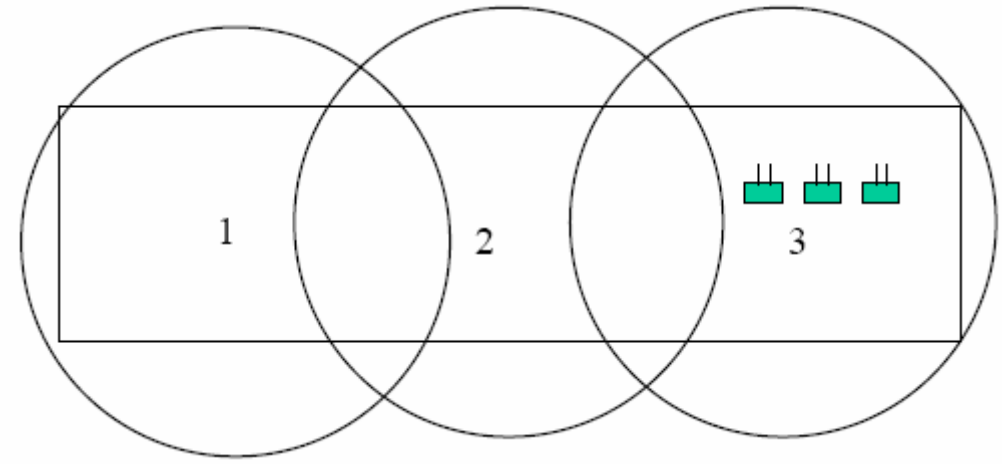


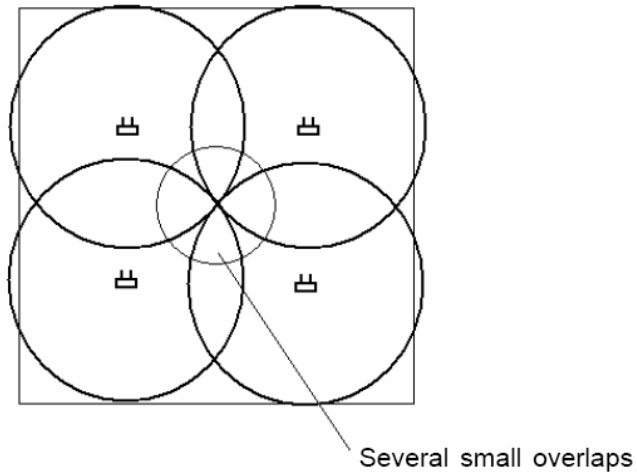
Figure 1.4

Troubleshooting with Base Stations

Here are some examples of situations in which problems such as lost calls, bad call quality or not being able to go off-hook may occur.

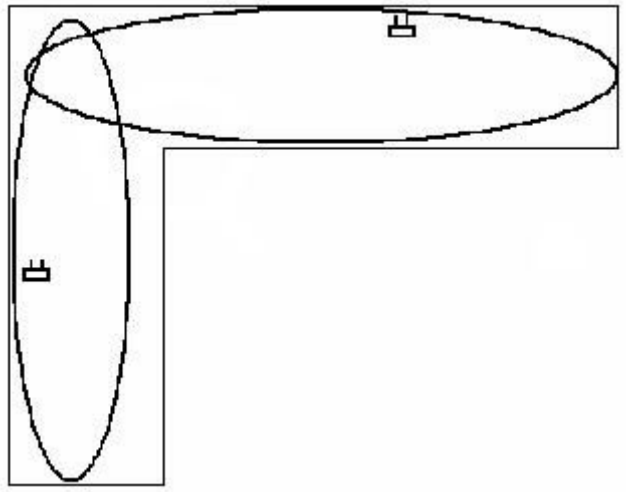
Example 1: Several small overlap areas

If you are in an area with a lot of small overlaps and you are moving in a given direction, there is a risk of losing the call because the Base Station which the handset has as its alternative may not necessarily be the Base Station that you are moving towards. This can be solved by placing a Base Station in the middle of the area.



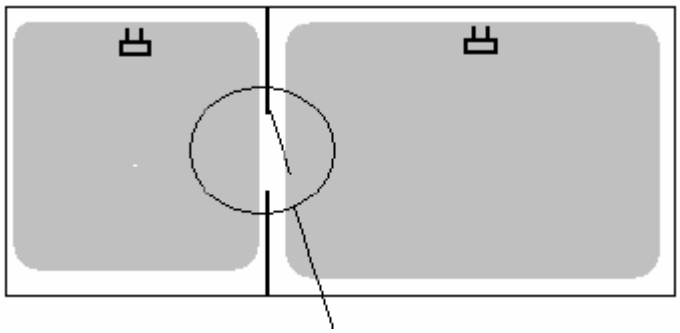
Example 2: Small overlap area

In areas where two coverage areas meet perpendicularly (such as two passageways), there may be an area of very small overlap which can cause the loss of a call. This is because you are moving from an area with only one Base Station to an area also with only one Base Station. Therefore the handset does not have enough time to register to the other Base Station until you are out of the coverage area of the first Base Station. The problem may be solved by moving one of the Base Stations closer to the corner point where the two passageways meet in order to cover both.



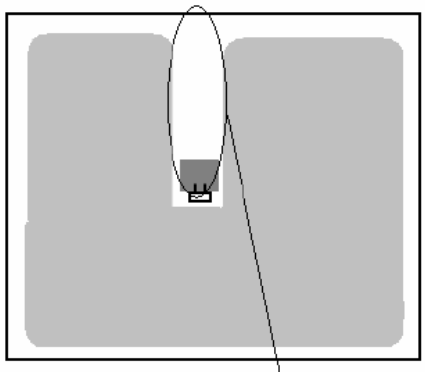
Example 3: No overlap

In areas where the coverage between two Base Stations is separated by steel doors or gates, the handset does not have time to hand over and register itself to the next Base Station, thus causing the call to be dropped. This may be solved by moving the Base Stations closer to each other.

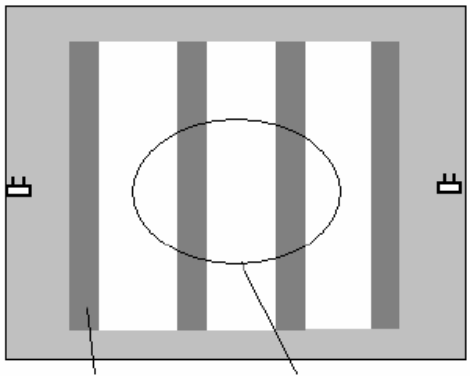


Example 4: Shadows

If Base Stations are placed on pillars of concrete or steel (e.g. in warehouses with steel shelves or racking), shadows may appear with no radio coverage. This may be solved by covering the shadow areas with one or more additional Base Stations.



No radio coverage – shadow



Steel shelves/racking No coverage - shadows

Using Repeaters

Introduction

A Repeater is used to extend DECT coverage. It is not a real Base Station and does not increase the number of DECT traffic channels but it can give a larger physical spreading of traffic channels and thereby extend the radio service of the traffic channels established with real Base Stations

The normal method of establishing multi-cell installations is to make pre-installation site surveys to map the coverage and determine the number and location of Base Stations. After the system is installed and tested, gaps in the coverage may be found, or different coverage may be required, often in areas with limited traffic such as basements, lofts or outdoor areas.

To increase the number of Base Stations requires further installation work. In such cases the Repeater is ideal because it is not physically connected to the DECT system and, therefore, is easier to work with.

Function of Repeaters

A Repeater can be considered as a DECT unit, comprising a DECT handset and a Base Station in one unit that can handle up to three traffic channels. The Repeater has the same coverage as a normal Base Station.

A Repeater must be placed within the coverage area of the existing Base Station and, therefore, extends the coverage of the Base Station by 50% (Figure 1.5).

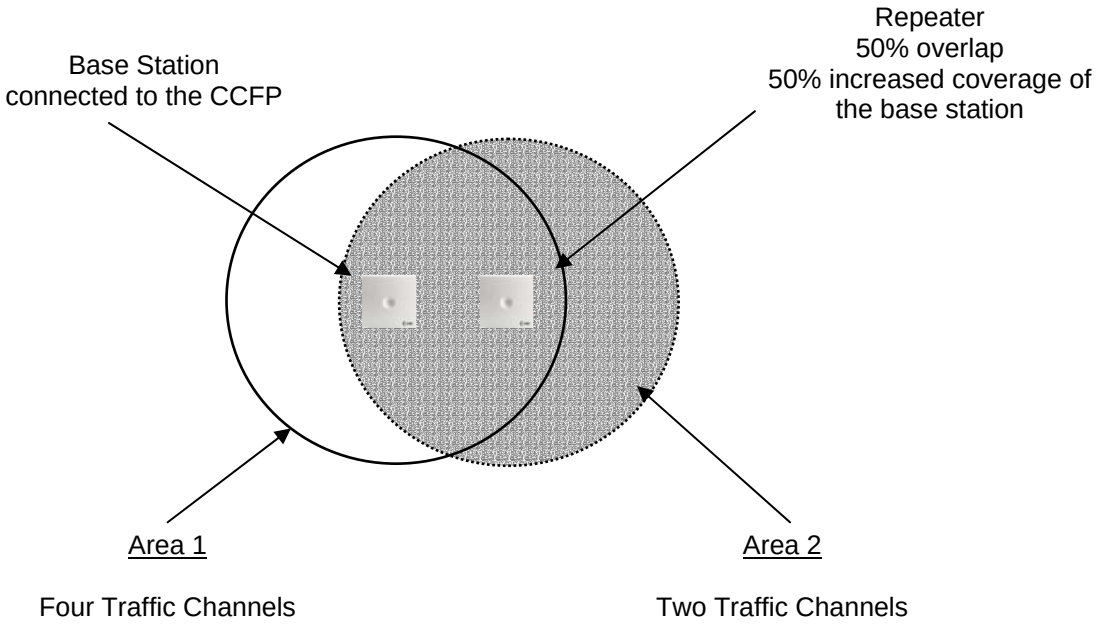


Figure 1.5

When there is active traffic on the Repeater, it takes traffic channels from the Base Station. Thus, the total number of traffic channels is neither increased nor reduced with the Repeater.

When an active handset moves from Area 1 to Area 2 (Figure 1.5), the Repeater takes over the active traffic channel and the handset can move around within Area 2 (within the coverage of the Repeater); however, as “seen” from the Base Station the Repeater is now the active handset. When the active handset moves back to Area 1 and outside the coverage of the Repeater, the Repeater lets go of the active channel, gives it back to the Base Station and there is a full handover between the Repeater and the Base Station.

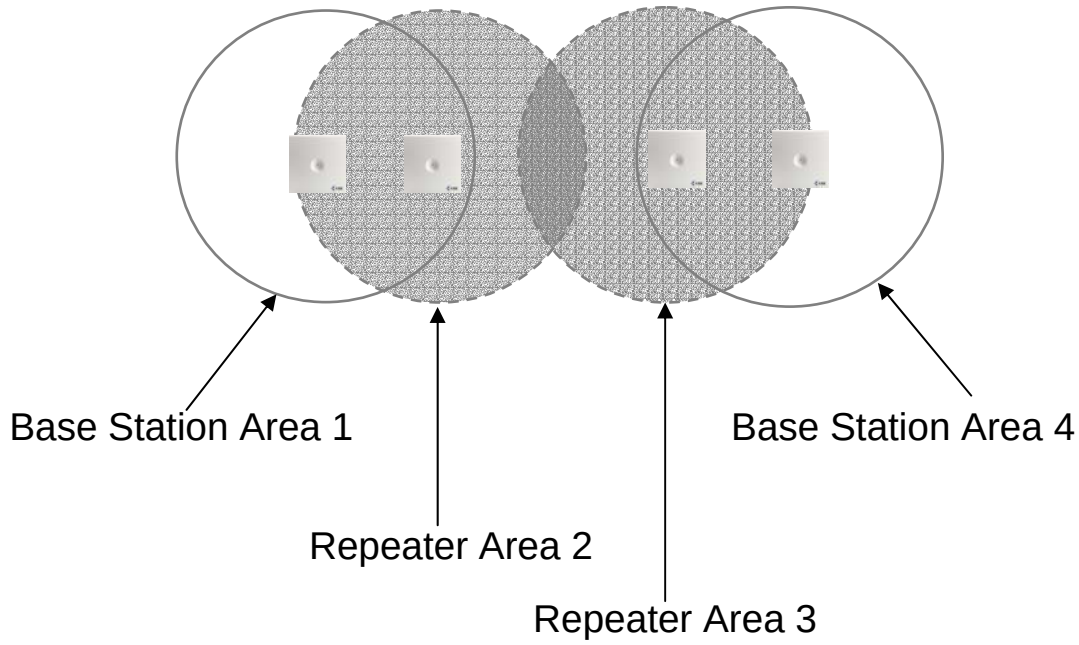


Figure 1.6

In Figure 1.6 an installation with two Repeaters and two Base Stations is shown. An active handset can move from Area 1 to Area 4 without losing its call since handover is made from the Base Station in Area 1 to the Repeater in Area 2, then to the Repeater in Area 3 and then to the Base Station in Area 4.

This means that the installation gives a wider spread of the area of traffic channels without having to add extra channels.

Repeaters in Multi-Cell Systems

When a multi-cell system is installed, two considerations determine the number of Base Stations:

1. Establishment of necessary radio coverage.
2. The number of traffic channels must be available to secure good performance of DECT traffic.

To fulfil point 2, under normal circumstances, one Base Station should be installed per 10 handsets. In a busy office the system will be able to handle traffic of 0.15E per handset registration, corresponding to an average of nine minutes per hour (approximately five calls per hour) with a blocking value of 1%

In a normal office this will not be a problem, as the coverage area of a Base Station and the number of square metres per employee normally secures the necessary overlap.

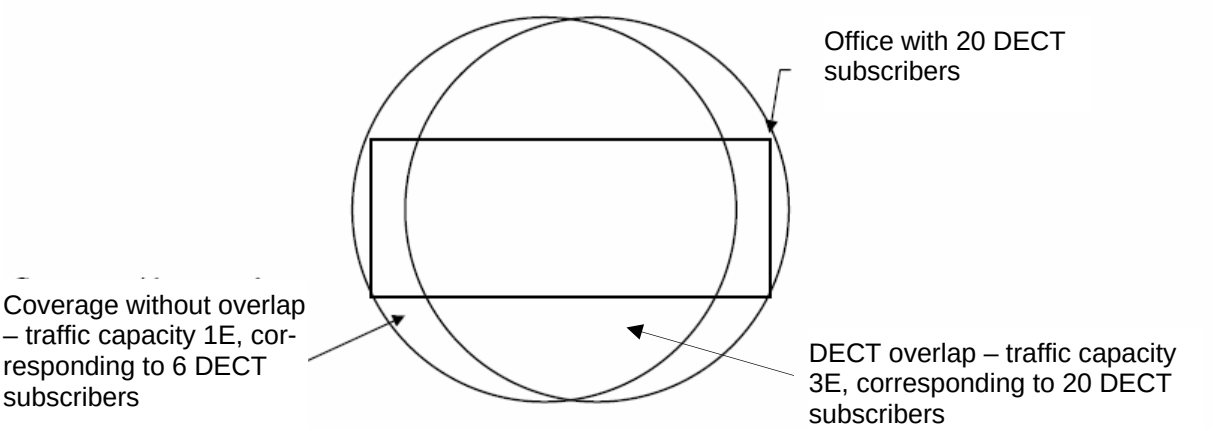


Figure 1.7

If the building is a multi-storey building with an even distribution of employees, this rule is sufficient as the physical coverage of the Base Stations secures the necessary overlap.

If the building is a warehouse with a large spread of employees, the Repeater can be used to establish the necessary radio coverage, but problems with traffic capacity may arise.

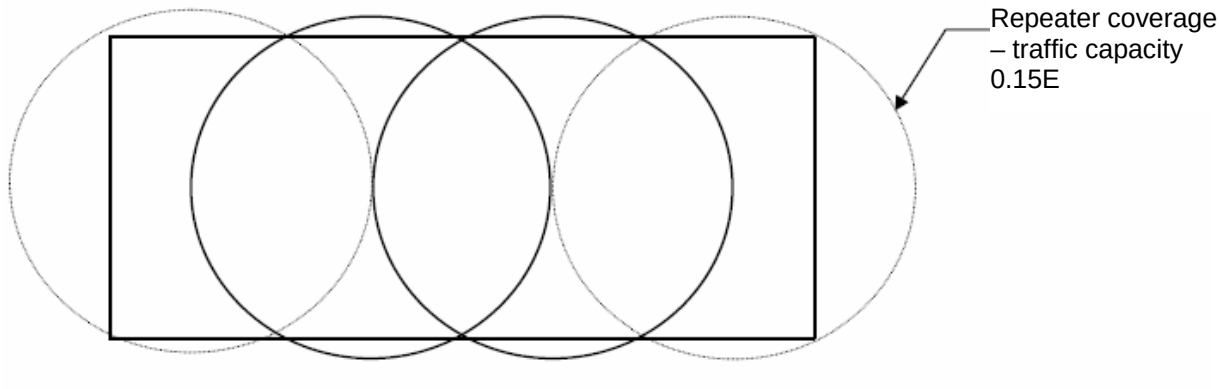


Figure 1.8

The traffic capacity in the Repeater area is only 0.15E, which does not mean that there can only be one active handset in the area. The Repeater can handle two traffic channels and therefore two simultaneous calls and the probability that the Repeater is busy with traffic for two handsets (0.15 + 0.15 = 0.3E) is more than 1% (actually 3%) and therefore there will be no even distribution of traffic.

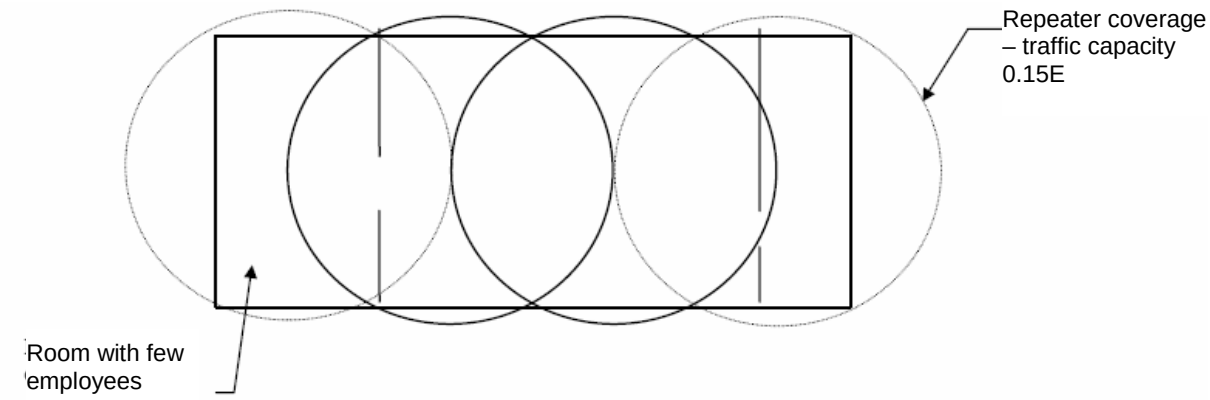


Figure 1.9

If the Repeater is used to obtain coverage in areas of low traffic, i.e. areas with few employees with DECT handsets, the Repeater can be used as shown in Figure 1.9. Another possibility is to install two Repeaters in the outer areas, giving an even distribution of traffic capacity. However, such a solution may be more expensive than establishing coverage with real Base Stations as the traffic capacity increased.

The Repeater can only be used to a limited extent as a substitute for a real Base Station since the Repeater does not increase the traffic capacity. Therefore, the correct procedure to installing a DECT system is to establish coverage of the primary areas with real Base Stations and use Repeaters in areas where the radio coverage is wanted, but where the traffic intensity is low.

Areas with Low Traffic Intensity

The Repeater can be used to establish coverage in areas with low traffic intensity. This could be a passageway between DECT areas or coverage outdoors (Figure 1.10).

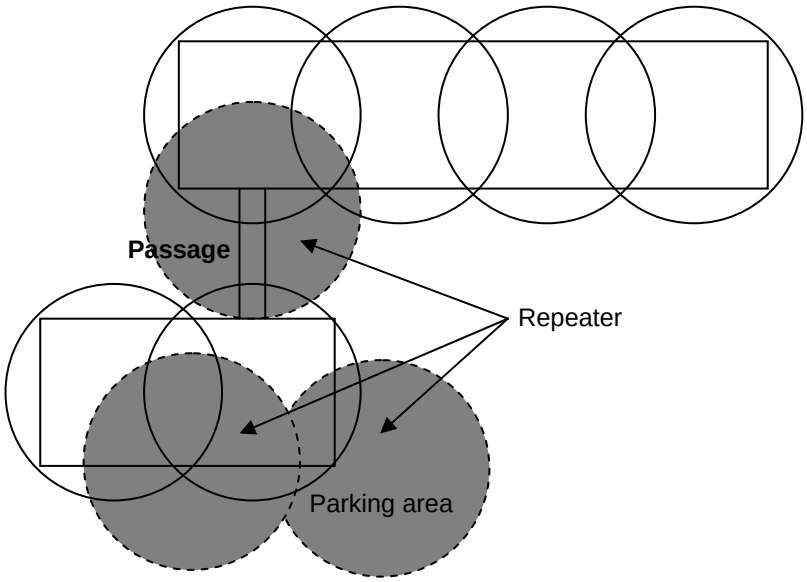


Figure 1.10

Figure 1.11 demonstrates a hotel installation where the radio coverage is established by registering two Repeaters on the same Base Station. The Base Stations are placed in the area where the highest traffic intensity may occur. This can be repeated on each floor and thus create the radio coverage with a relatively small number of Base Stations compared to the area of the building.

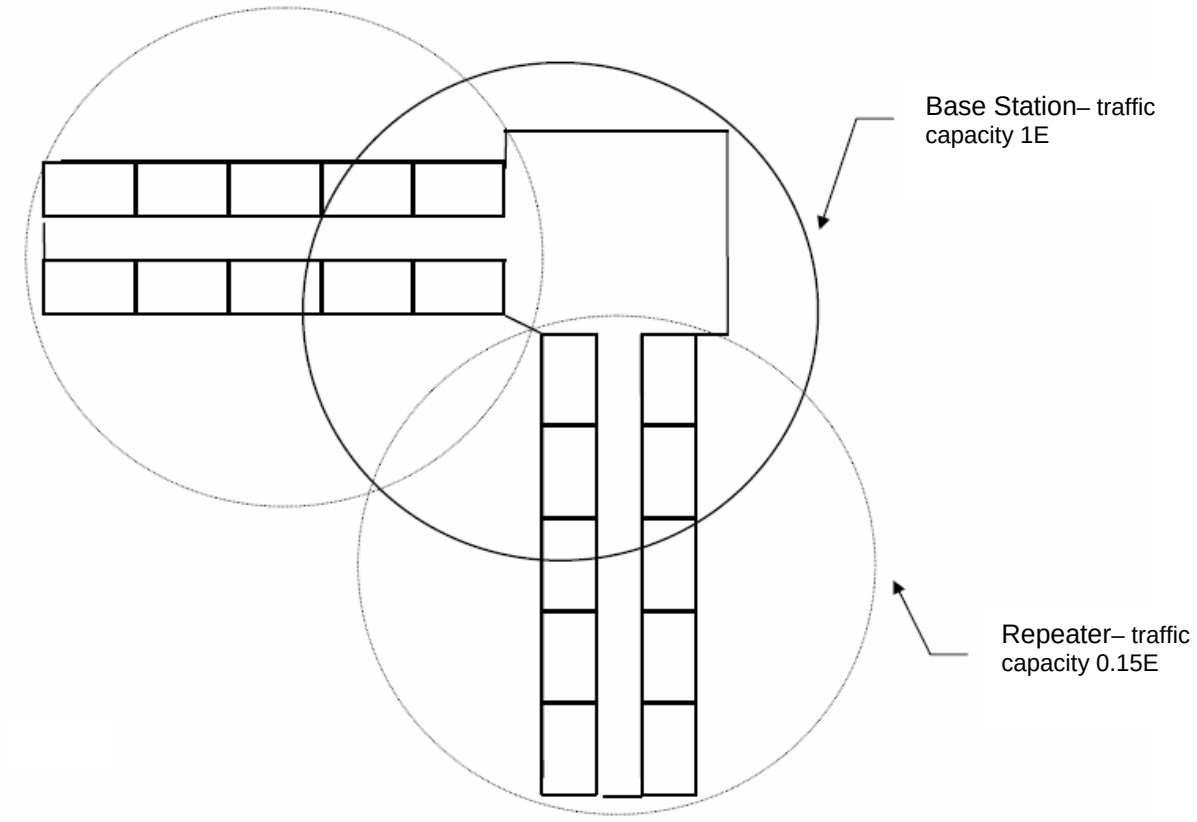


Figure 1.11

Displacement of Traffic Capacity Using Repeaters

In multi-cell installations it may be necessary to establish high traffic areas, depending on working conditions and movement patterns. An example would be a meeting room or canteen. The task can be achieved by installing more Base Stations covering the same area and increasing the channels. Another solution is to move traffic channels from an adjoining Base Station, so that the capacity is available when needed rather than all the time.

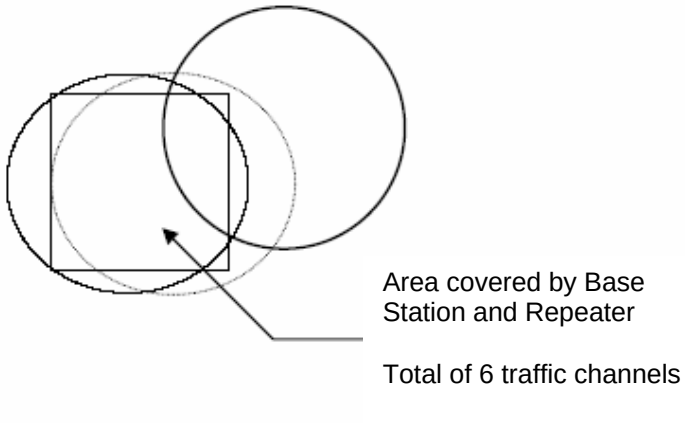


Figure 1.12

Repeaters as Problem Solvers in Multi-Cell Systems

Typical problems with multi-cell systems are:

- Missing radio coverage
- Missing traffic capacity

One of the typical problems is lack of coverage even after the site survey showed no problems. This could be because in multi-cell systems some of the cells may interfere with each other; the Base Station may not have been installed in exactly the same location as the survey Base Station during the site survey; or when the building is busy (especially in the case of warehouses) shelving, racking and stored goods may influence the radio coverage.

The radio coverage is not the same all year, as coverage may depend on humidity or building material. Therefore, a DECT system must be installed with a security overlap between coverage areas which can cause a rise in overall installation costs.

Repeaters are excellent tools for adjusting multi-cell installations: they are easy to install and move, as they need no cabling.

Installation of Repeaters with External Directional Antenna

The Repeater can be installed with an external directional antenna so it can be used to create radio coverage in a remote building or area (Figure 1.13). With a standard antenna, coverage can be extended to a distance of around 1,000 metres, but this may be greater or less if a higher or lower gain antenna is used. This is useful where cabling is not possible or too expensive to install (Figure 1.14).

When the Repeater does not have to hand over, the Repeater can be programmed to repeat up to three traffic channels.

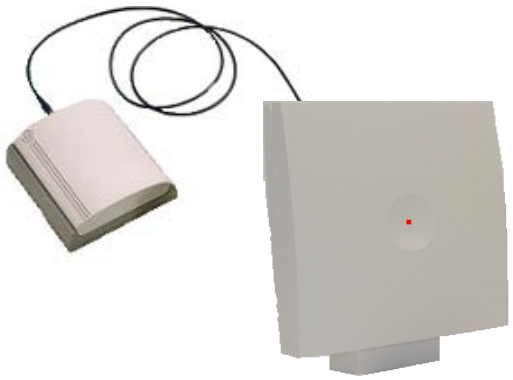


Figure 1.13

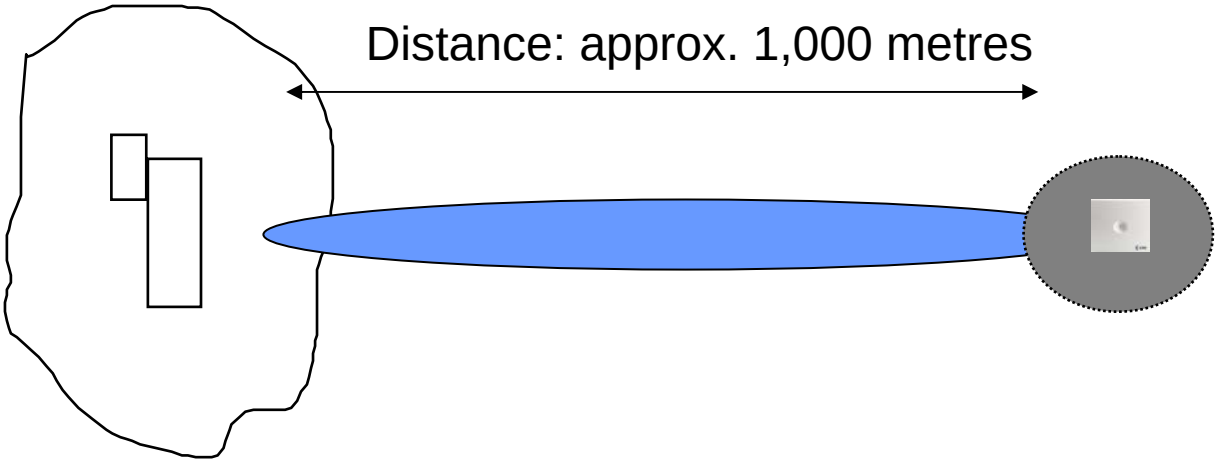


Figure 1.14

Repeater Jumps

Repeaters can be linked together in a chain of up to three. In this way a large cell can be created. In Figure 1.15 a configuration is shown with an external antenna on the first Repeater.

There are only two traffic channels in the Repeater-covered area as there must be space for any handovers.

This configuration can be used to expand the coverage area of a Repeater installation, but only in areas with very low traffic demand as the total area will have to share two traffic channels.

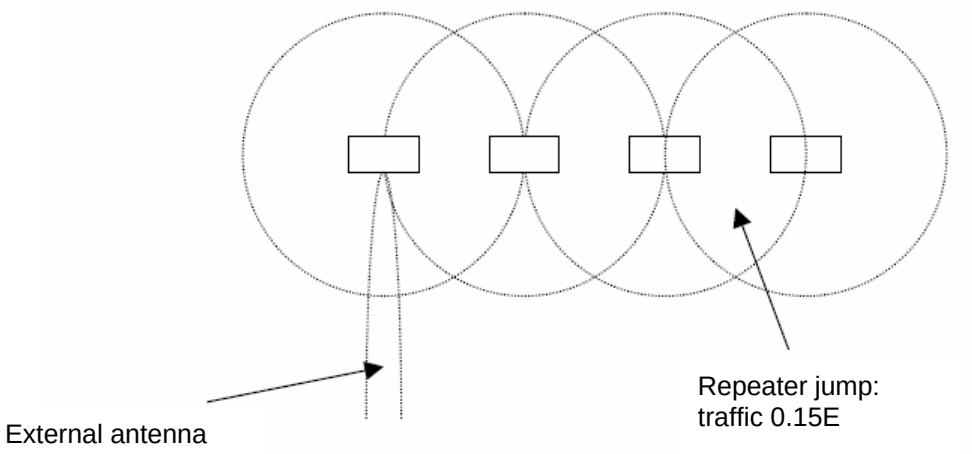


Figure 1.15

Part 2: DECT Hardware Installation and Programming

DECT 1500 System

Hardware Configuration Overview

The DECT 1500 system is an “add on” to existing or new PABX installations. The system can handle up to 64 cordless handsets.

It comprises a Central Control Fixed Part (CCFP), up to 16 Radio Fixed Parts (RFP or Base Stations) and Portable Parts (PP, handsets). It may also include up to three Repeaters (WRFP) per Base Station (i.e. up to 48 per system). A PC is also connected to the CCFP via the RS-232 serial port for configuring the system using the administration program.

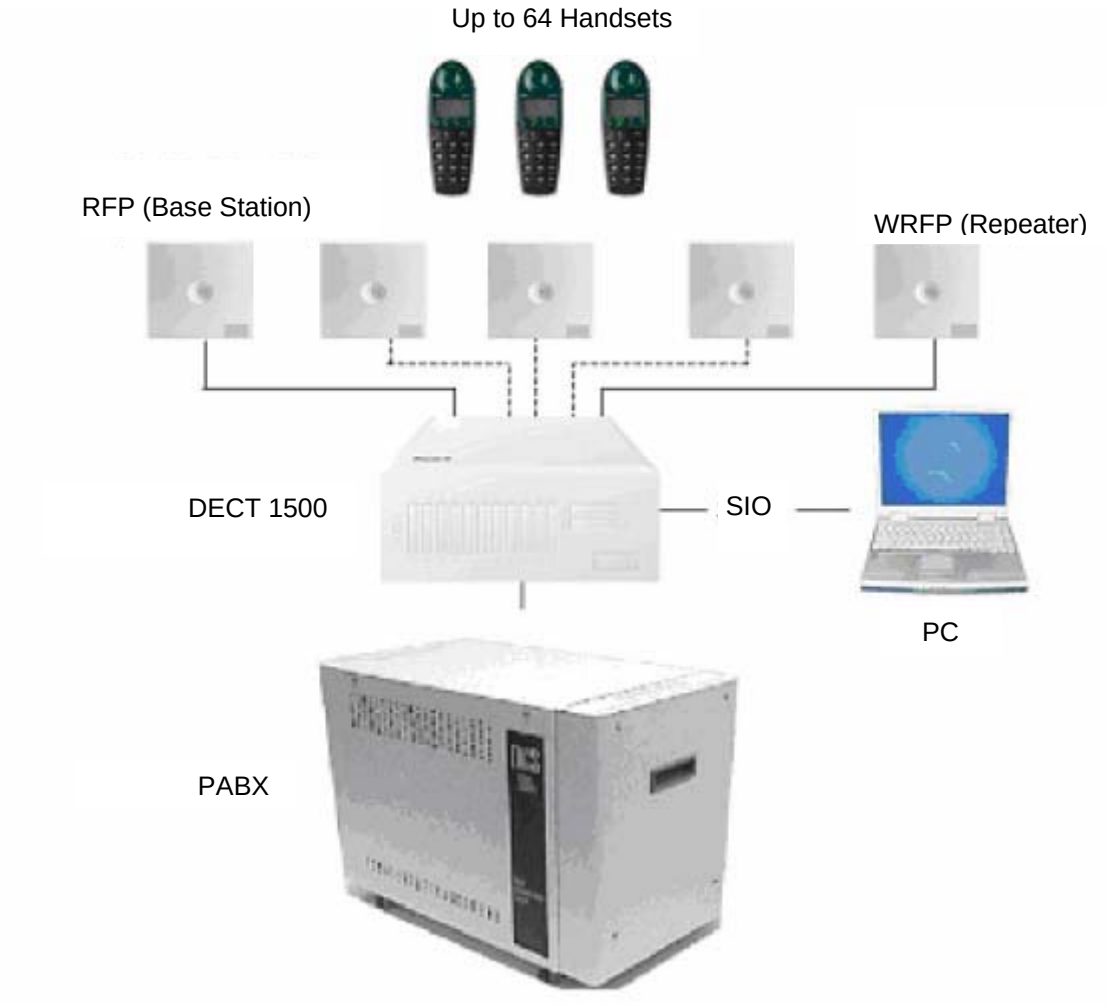


Figure 2.1 DECT 1500 System

Configuring the CCFP

The CCFP comprises a power supply and a main board. One expansion board, a Link card and up to eight Inter-Working Units (IWUs) can be mounted in the CCFP in slots 0–7 (Figure 2.2). There are three extra slots 8–10.

- One IWU A8 handles eight analogue telephone lines for eight handsets. Eight IWUs are therefore required for 64 handsets.
- The main board handles eight RFPs. The expansion board is required if more than eight RFPs are needed. The number of RFPs depends on the traffic density and the coverage area.
- One RFP can handle four simultaneous handsets calls.
- The Link card is used to connect two 1500 systems together. It installs in slot 10 of the extra slots. A combined system increases the number of Base Stations to a possible 32 and Repeaters to a possible 96.
- Extra slots 8 and 9 are not used.

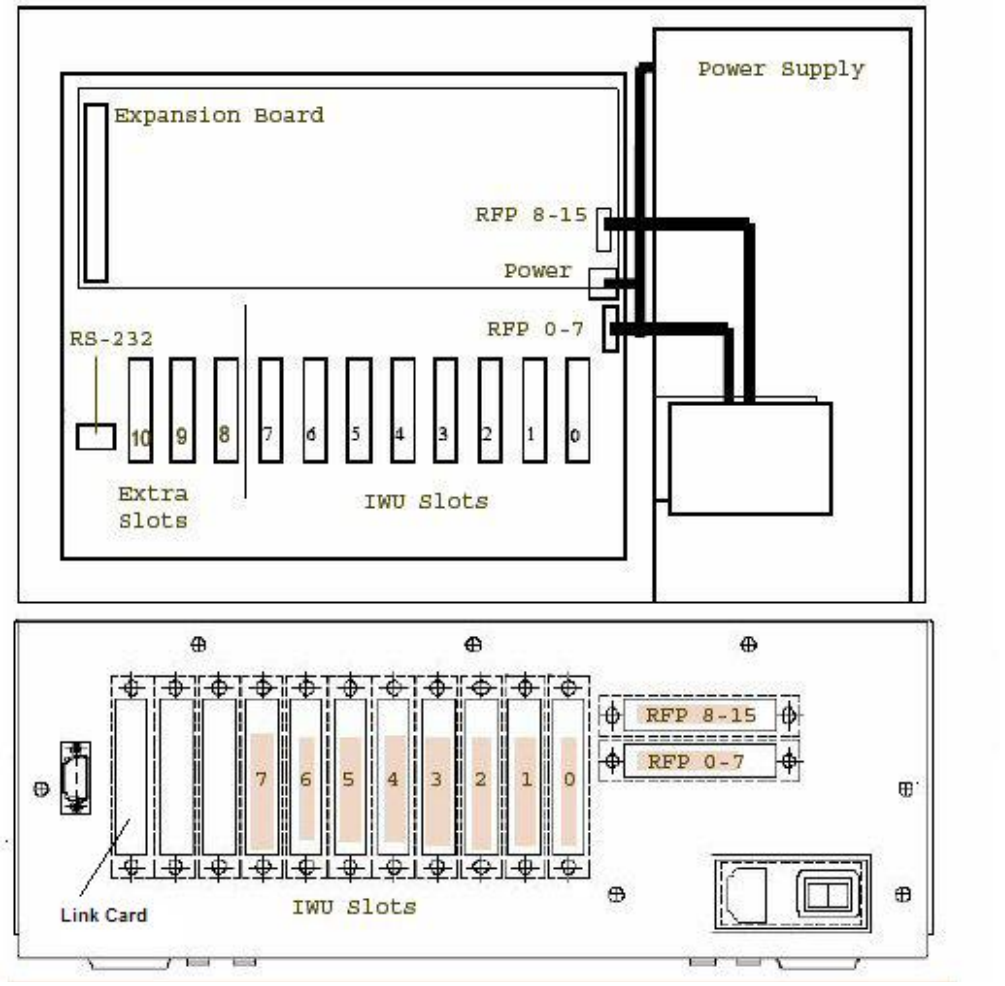


Figure 2.2 The CCFP

Installing the Expansion Board and IWUs

The CCFP expansion board has to be mounted in the CCFP if more than eight RFPs are needed. The expansion board handles up to eight RFPs besides the eight RFPs the CCFP main board handles (maximum 16 RFPs).

The CCFP needs the FLASH software PCS3 or later edition to control the expansion board. If the CCFP has an older software version it is necessary to upgrade the system. Upgrade software is not included in expansion kit (PN 13816).

1. Disconnect the CCFP from its power supply.
2. Remove the top cover.
3. Remove the blind cover plates.
4. Mount the expansion board on the CCFP by inserting the two plastic pins (Figures 2.2 and 2.3).
5. Insert the IWUs starting at slot no. 0 (Figure 2.2).

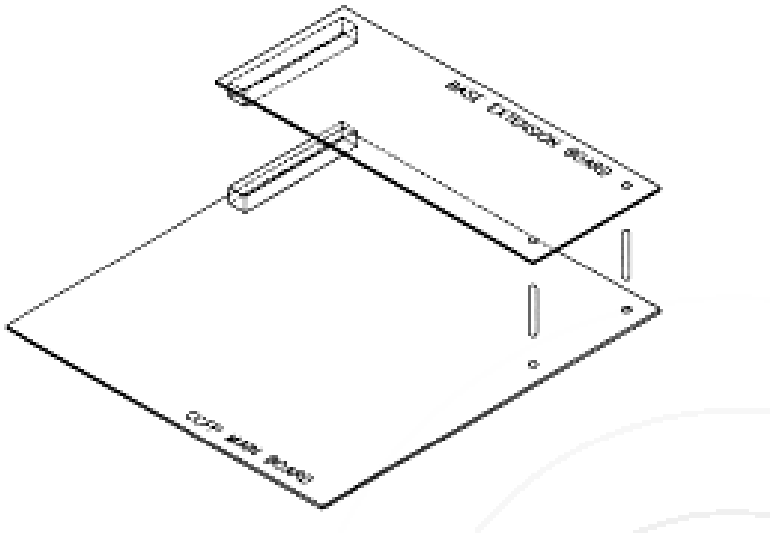


Figure 2.3 Mounting Expansion Board

5. Mount the expansion board internal cable in place of the blind covers (Figure 2.4).

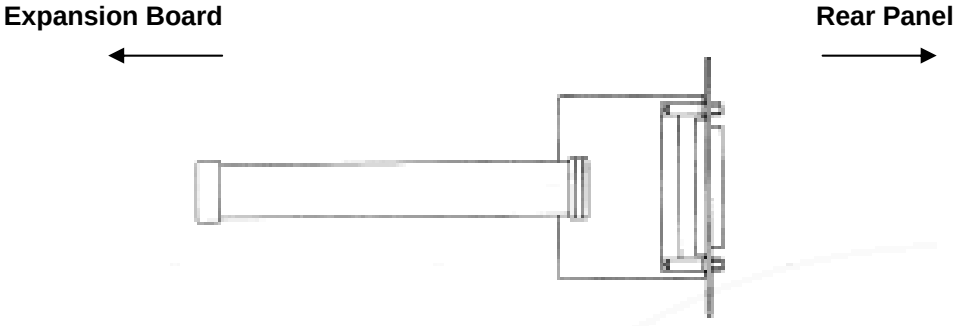


Figure 2.4 Internal Cable

6. Replace the top cover.
7. Connect the RFPs or the PBX extension lines to the DP 25 connectors.
8. Power up the CCFP.

If the RFPs are installed, make a cable measurement.

Cable Connections

RFPs (Base Stations)

D-Sub Pin No.	Cable Colour	Base Conn 0	Base Conn 1
1	WHITE/BLUE	0A	8A
14	BLUE/WHITE	0B	8B
2	WHITE/ORANGE	1A	9A
15	ORANGE/WHITE	1B	9B
3	WHITE/GREEN	2A	10A
16	GREEN/WHITE	2B	10B
4	WHITE/BROWN	3A	11A
17	BROWN/WHITE	3B	11B
5	WHITE/SLATE	4A	12A
18	SLATE/WHITE	4B	12B
6	RED/BLUE	5A	13A
19	BLUE/RED	5B	13B
7	RED/ORANGE	6A	14A
20	ORANGE/RED	6B	14B
8	RED/GREEN	7A	15A
21	GREEN/RED	7B	15B
9	RED/BROWN	NC	NC
22	BROWN/RED	NC	NC
10	RED/SLATE	NC	NC
23	SLATE/RED	NC	NC
11	BLACK/BLUE	NC	NC
24	BLUE/BLACK	NC	NC
12	BLACK/ORANGE	NC	NC
25	ORANGE/BLACK	NC	NC

Analogue Telephone Extensions

Extensions connect to the IWUs.

D-Sub Pin No.	Cable Colour	IWU Line
EE		
14	WHITE/BLUE	0A
1	BLUE/WHITE	0B
15	WHITE/ORANGE	1A
3	ORANGE/WHITE	1B
2	RED/SLATE	0 EARTH
16	BLACK/ORANGE	1 EARTH
17	WHITE/GREEN	2A
4	GREEN/WHITE	2B
18	WHITE/BROWN	3A
6	BROWM/WHITE	3B
5	SLATE/RED	2 EARTH
19	ORANGE/BLACK	3 EARTH
20	WHITE/SLATE	4A
7	SLATE/WHITE	4B
21	RED/BLUE	5A
9	BLUE/RED	5B
8	BLACK/BLUE	4 EARTH
22	RED/BROWN	5 EARTH
23	RED/ORANGE	6A
10	ORANGE/RED	6B
24	RED/GREEN	7A
12	GREEN/RED	7B
11	BLUE/BLACK	6 EARTH
25	BROWN/RED	7 EARTH

Power Connection

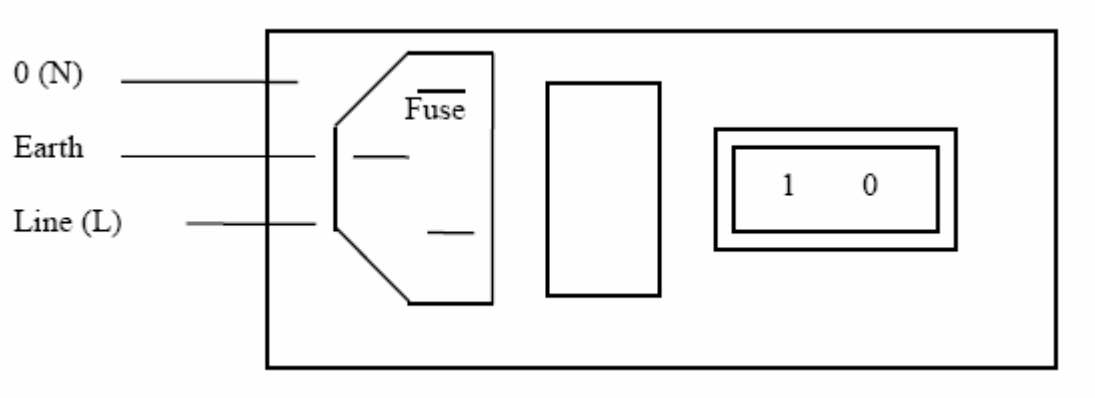


Figure 2.5 Power Connection

Serial Connection

The serial port is a 9-pin D-SUB male type. When connecting a PC to the CCFP, a full connection DTE-DTE must be used (Figure 2.6).

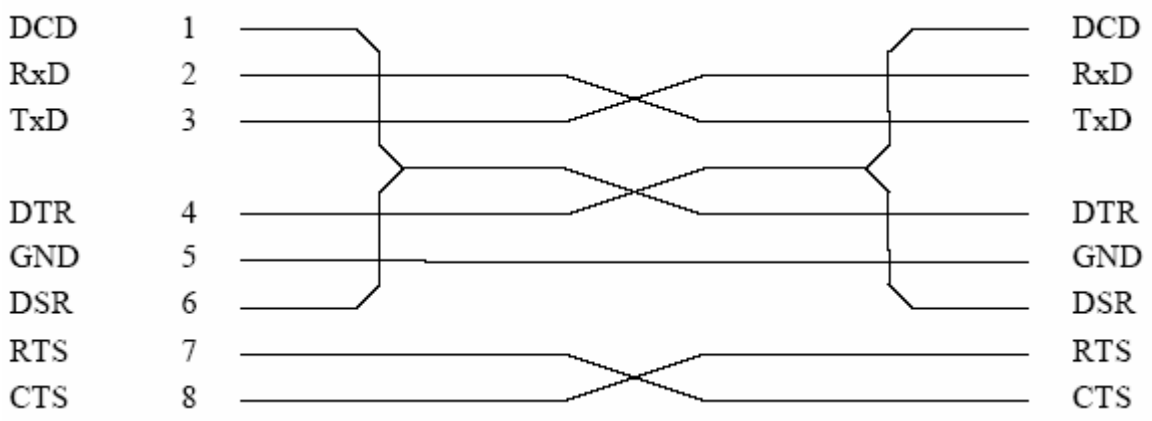


Figure 2.6 Serial Connection

Installing the CCFP

When mounting the CCFP on a wall it is important that the supplied bracket is used. If is also important to make allowance for accessing the connecting cables via the base of the unit.

Installing RFPs (Base Stations)

Overview

The Radio Fixed Part (RFP) is designed with two internal antennas and supports antenna diversity. The RFP can also carry out a handover between the RF channels under the same RFP, and handles four DECT speech channels simultaneously. The RFP is able to frame synchronise with other RFPs under the same CCFP.

Transmission length is up to 2 km on 0.5mm twisted pair, e.g. cat.4, between the RFP and CCFP. The RFP is also supplied with power from this connection (maximum supply 1.5 W). The DECT radius of coverage is up to 600 metres with a handset in free sight. It is possible to connect a maximum of eight RFPs to a CCFP without an expansion board, 16 RFPs with an expansion board and 32 with a link system (using the Link card to connect two systems).

Installation

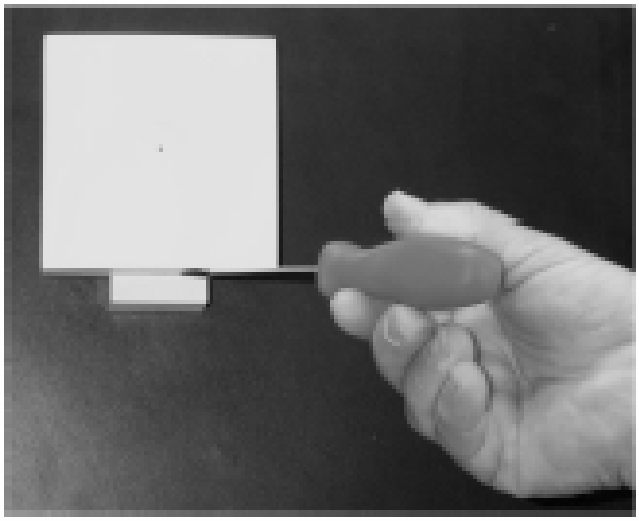
First determine where to install the RFP to have the correct coverage. The average coverage within buildings is 75 metres. Coverage depends on the construction of the building, the architecture and choice of buildings materials. You must use the DECT Demonstration and Installation Kit to optimize your installation. This deployment tool consists of an RFP which has no need for a CCFP. It can easily be moved around in the building and one to eight handsets can be connected.

1. Pull the a/b wire from your installation through the wall holder and then mount the wall holder on the wall.

2. Connect the a/b wire to the plug on the back of the RFP. Use pins 3 and 4 on the RJ-11 connector.

3. Ensure the RFP is the right way up and “click” it onto the wall holder.

If you need to remove the base station, separate it from the wall holder with a gentle push of a screwdriver.



Starting the DECT 1500 System

1. Install the CCFP administration software on an IBM-compatible PC.
2. Make sure that all RFPs are connected correctly. Also, make sure that all IWU connections are made to PABX lines.
3. Connect a serial cable (RS-232) between the CCFP and the PC installed with the administration software.
4. Connect the power cable to the CCFP. Ensure that there is an earth connection in the power supply plug.
5. Power up the CCFP.
6. Use the administration program to:
    - Configure the system.
    - Make a cable measurement to all installed RFPs.
    - Adjust IWU parameters as required.
    - Register each handset to the system.

DECT 500 System

Hardware Configuration Overview

The DECT 500 system is an “add on” to existing or new PABX installations. The system can handle up to eight cordless handsets.

It comprises a Base Station/Control Unit (CCFP) and a number of Portable Parts (PP, handsets). It may also include up to six Repeaters (WRFP). The RS-232 connector can be used to connect a PC or a modem for programming, etc.

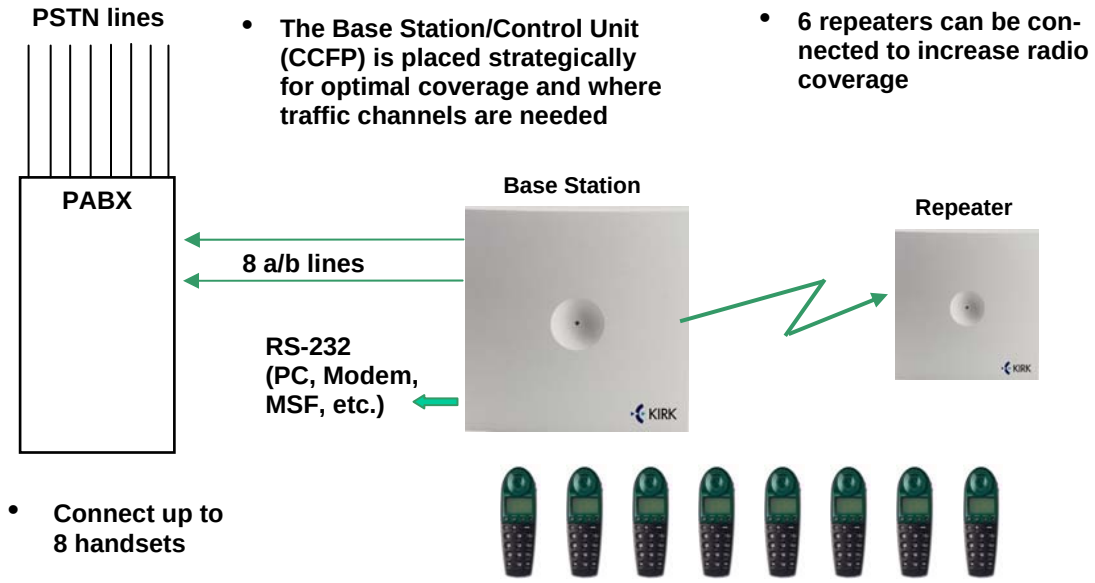


Figure 2.7 DECT 500 System

The Base Station supports six simultaneous handset calls.

Setting Optional Password Protection

An optional password protection feature can be enabled which requires a password to be entered before the administration program can be accessed. The feature is disabled by default by a plastic jumper mounted on the ALT connector on the CCFP main board (Figure 2.8).

To enable password protection, remove the jumper from the connector and set a password using the administration program.

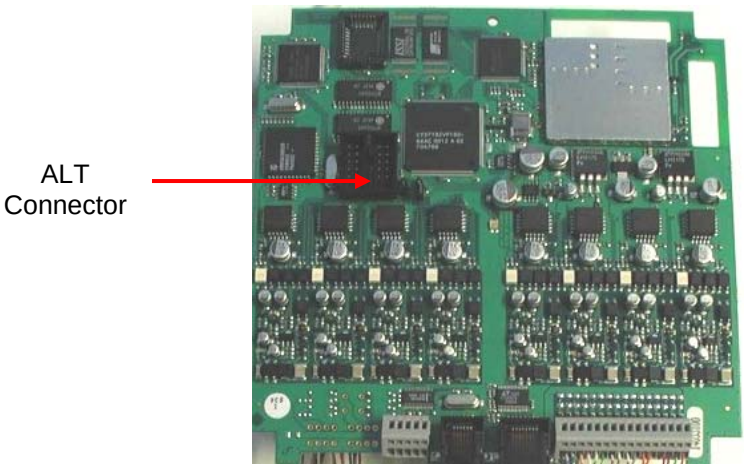
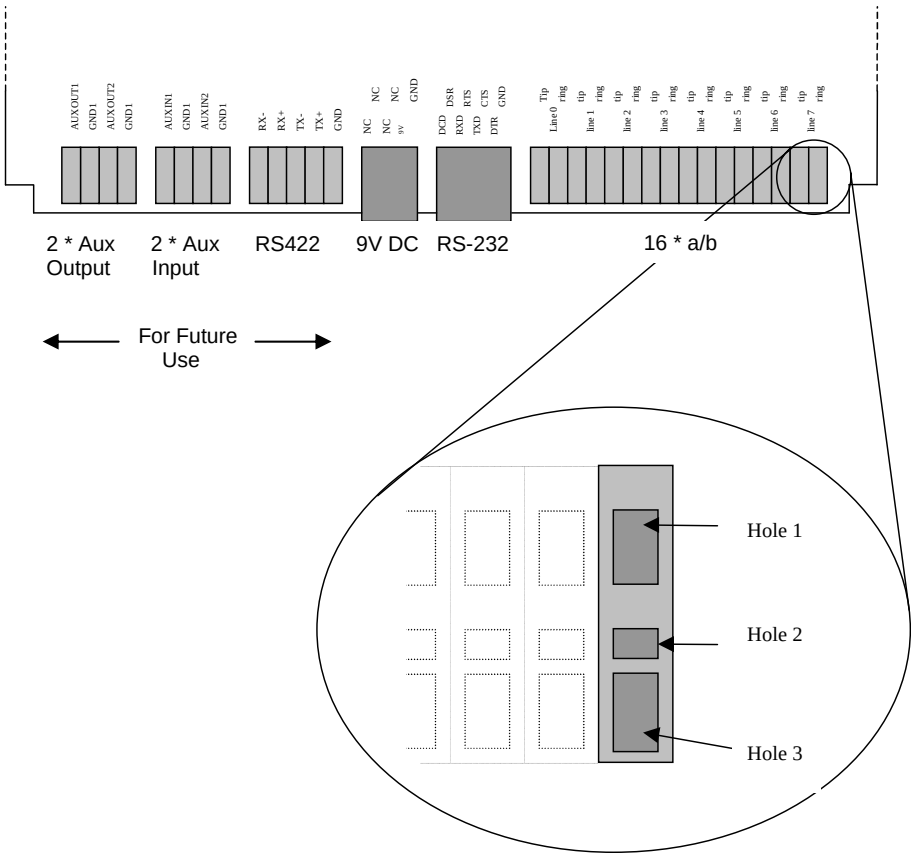


Figure 2.8 Selecting Password Protection

Installing the Base Station/Control Unit (CCFP)

The Base Station/Control Unit may be located up to 1km from the PABX, connected via a standard 0.5mm twisted pair cable.

Connections



Starting the DECT 500 System

When you are ready to begin using the system and register handsets, switch the power on at the mains.

When operational, the status of the DECT system is shown by the LED display.

- Steady red and green means there is a fault, or it is in flash programming mode. (If faulty, power up the system with the 'Boot Strap' jumper mounted on the main board.)
- Fast flashing red means the system is not programmed and Master handset subscription is not allowed.
- Fast flashing green means the system is not programmed and Master handset subscription is allowed.
- Slow flashing red means it is in operation with the maximum active connections (busy).
- Slow flashing green means it is in operation with active connections.
- Steady green means it is in operation and ready for use with no active connections.

Registering Handsets

Registering a Master Handset

When switched on, the DECT 500 system will automatically go into registration mode for a period of 15 minutes. During this period you can register the Master handset. This handset is automatically configured to channel 00.

NOTE: it is only possible to log in one Master on each system. The first handset is automatically the Master handset.

1. Switch on the handset.
2. Press the MENU key.
3. Press the < key and go to MENU LOGIN.
4. Press the OK key and go to SUBSCRIPTION CREATE.
5. Press the OK key.

The handset will start searching for your system. When the handset finds a system, a number will appear in the display. The handset may detect more than one system (another system nearby); if so, a black triangle will appear in the bottom of the display.

6. Scroll through the numbers in the display by pressing the < or the > key to find your system's number. It is important that the number shown in the display is identical to the number on your system. The number is indicated as an ARI (on the label on the back of the base station).

7. When you have selected the correct number, press the OK key and the handset will be configured as the Master handset for the system.

Now you must allocate an extension number to the handset.

1. Press the MENU key and go to EXT SERVICE.

2. Press the OK key and go to READ/WRITE USERDATA.

3. Press the OK key.

   The serial number of the Master handset shows in the display.

4. Press the OK key.

   The handset asks for an extension number.

5. Enter the extension number. This can be the existing extension number for the corded phone being paired with the handset, or any number available in the PABX if the handset is being used as the only phone.

6. Press the OK key.

7. Switch the handset off and on again: the extension number is displayed.

Referring to this handset as the 'Master' means that you can configure more handsets in the system using this handset, as described next.

Registering Additional Handsets via the Master Handset

To register a handset, the Master handset must "allow" you to do so. Each handset registered is configured to a channel 01 to 07.

1. Press the MENU key and go to EXT SERVICE.

2. Press the OK key and go to READ/WRITE USERDATA.

3. Press the OK key.

The Serial Number of the Master handset (channel 00) is displayed.

4. Press the > key and enter the serial number of the new handset (found inside the handset on the label under the battery).

   The handset is registered to channel 01.

5. Press the OK key.

   The handset asks for an extension number.

6. Enter the extension number. This can be the existing extension number for the corded phone being paired with the handset, or any number available in the PABX if the handset is being used as the only phone.

7. Press the OK key.

The new handset is now registered in the system. To register more handsets, press the < key to return to the registration menu and follow the same procedure.

Deleting a Registered Handset

To delete the Master handset, use the CCFP administration program. To delete an additional handset, either use the administration program or follow this procedure:

1. Press the MENU key and go to EXT SERVICE.

2. Press the OK key and go to DELETE USERDATA.

3. Press the OK key.

   The Serial Number of the Master handset (channel 00) is displayed.

4. Select the number of the handset (Master or additional) to delete.

5. Press the OK key.

Installing and Configuring a Samsung Repeater (WRFP)

Although Repeaters look similar for both the 500 and the 1500 system, they are not interchangeable. Do not attempt to use a Repeater intended for a 500 system on a 1500 system, or vice versa.

To install a Samsung Repeater, it is recommended you use the instructions in part A. If you do not have access to the *Repeater / Handset Programming Tool* ***(****PN 13821)* **and a PC, use the instructions in part B.**

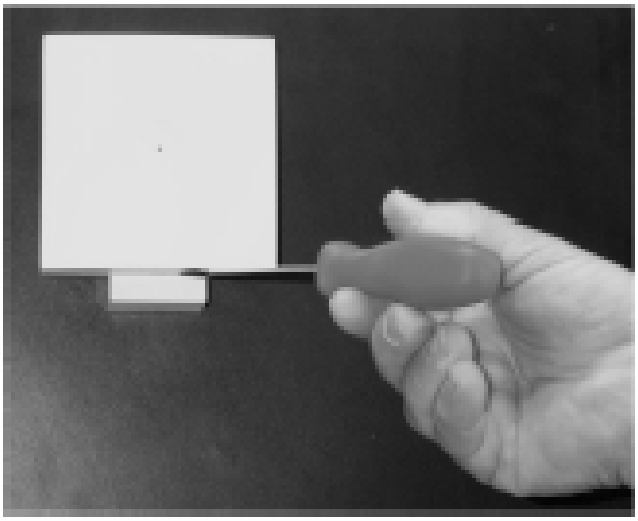
A.

You will need the Repeater / Handset Programming Tool running on a PC connected to the DECT system and documentation on how to connect the cables.

1. Pull the wire from the power supply through the wall holder and then mount the wall holder on the wall.

2. Connect the wire to the plug on the back of the Repeater and "click" the WRFP onto the wall holder.

If you need to remove the Repeater, separate it from the wall holder with a gentle push of a screwdriver.



To configure the Repeater, run the Repeater / Handset Programming Tool.

B.

(NOTE: For the DECT 500, please disregard point 3.)

1. Switch on the Base Station (RFP) and a registered handset.

2. Switch on the Repeater for more than one second and less than five seconds (see note 1). Switch off the Repeater and switch it on again.

   The Repeater is now in “subscription” mode. This is indicated by a flashing LED immediately after power is switched on. In this mode the Repeater is searching for a Base Station. This mode is active for a maximum of five minutes. (If the subscription procedure is not completed within this time, the Repeater restarts in normal mode with previous data.)

3. Start subscription mode in the Base Station. The usual procedure is to press the button on the Base Station for several seconds. This is the mode normally used when registering a handset to the Base Station (see note 2).

   The Repeater is synchronised with the Base Station in subscription mode. This is indicated by a fast flashing LED.

4. Verify that the Repeater is synchronised with the requested Base Station. Press the Hook-key or INT-key on the handset. The LED on the Repeater (visible through the “keyhole” on the back) should light steady. If the LED does not light after pressing the Hook-key or INT-key a few times, the Repeater is probably synchronised with another Base Station: if this is the case, the subscription procedure should be repeated from step 2.

5. Select the Radio Part Number (RPN). Hook off and press a number on the handset in the range 2–7. When the number is accepted by the Repeater, this is acknowledged by the LED flashing the number of times corresponding to the digit pressed. Digits may be entered several times. Only the last accepted digit is recorded (see note 3). If you are using more Repeaters on the same Base Station, they must have different RPNs.

6. Accept subscription identities by hook off and pressing the * key. When the key is accepted by the Repeater the LED indicates that the key is turned off for two seconds. Alternatively, the subscription can be accepted by pressing the # key (see note 4).

   The Repeater now restarts with the new subscription identities in normal mode. The LED lights steady for five seconds and the Repeater is then ready to use.

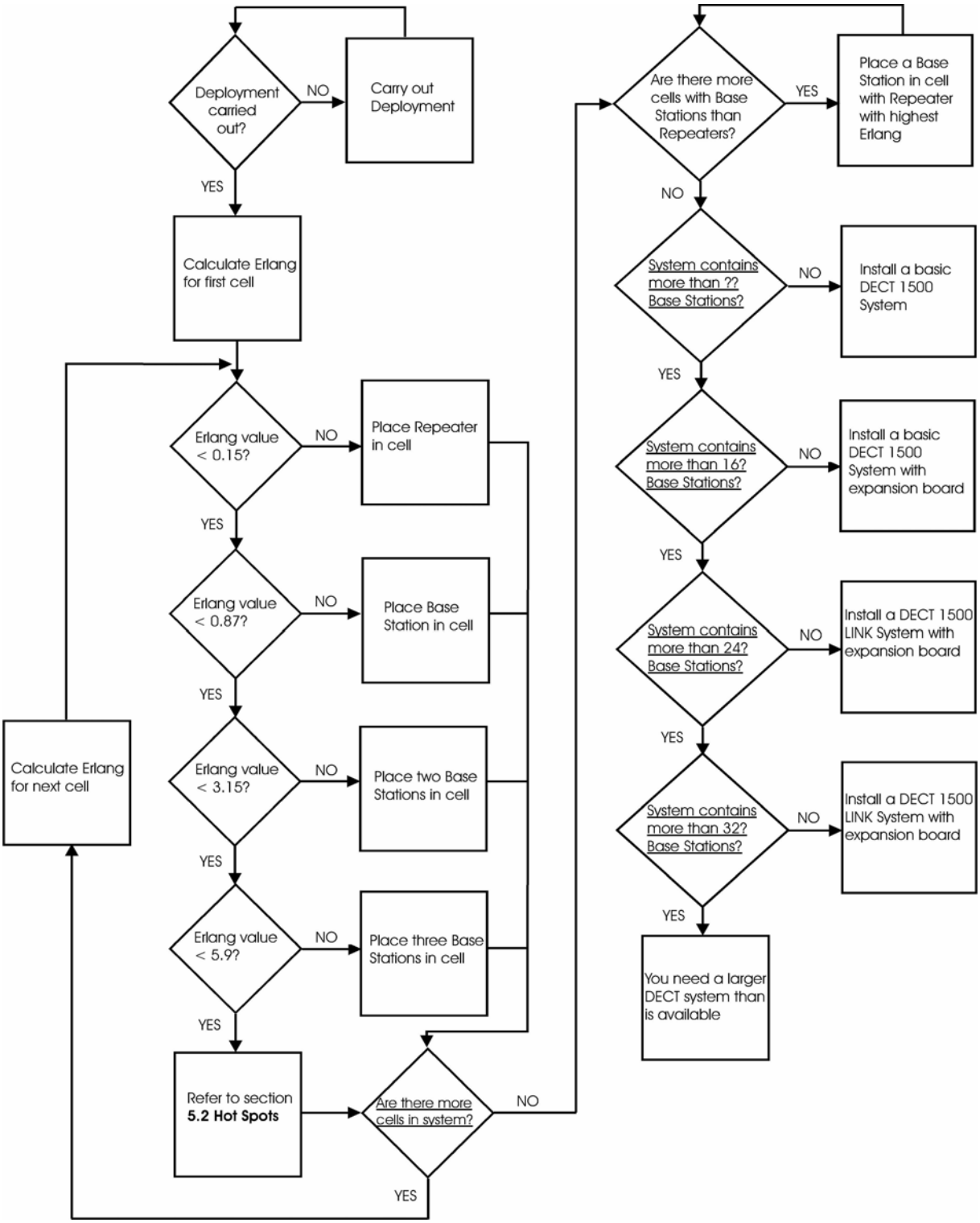
Note 1: In normal operation mode the LED will light steady for the first five seconds after powering up. Afterwards, the LED flashes when the Repeater is unsynchronised and becomes steady when synchronised to a base station. Whenever a connection is established via the Repeater, a short flash occurs on the LED.

Note 2: Subscription mode is indicated by broadcasting DECT FP-Capabilities (bit a44=1).

Note 3: When the base station is a residential single cell base station, the valid RPN is in the range 2–7. When the Repeater is used on a PABX or public system, the RPN may be in the range 0–255. In this case, the Repeater accepts up to three digits entered. The last three valid digits only are recorded.

Note 4: If the #-key is used to accept the subscription identities, an inspection tone is enabled. The Repeater will then, when relaying connections, insert a short tone every two seconds in the audio path to handsets. This feature can be used for inspection and verification of the Repeater placement. When the operation has been verified, the inspection tone should be disabled. Performing step 2 only of the subscription procedure will disable the inspection tone. When the LED has started flashing in subscription mode, switch off the Repeater and then on again. The Repeater is then back in normal mode without affecting the subscription identities and the inspection tone has been disabled.

Appendix 1: Deployment Flowchart



Appendix 2: Traffic Calculations

NOTE: The table of figures is intended as a guide *only*.

Number of DECT RFP	Number of DECT channels	Traffic in E with 1% busy/rejection	Number of PP/handsets 0.15E
1	4	1	7
2	8	3	20
3	12	6	40
4	16	9	60
5	20	12.6	84
6	24	16	107
7	28	19	127
8	32	22	147
9	36	26	173
10	40	30	200
11	44	33.7	225
12	48	37	247
13	52	41	273
14	56	44.7	298
15	60	48	320
16	64	52	347

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