Meridian/Succession Companion DECT

Site Planning Guide

Publication Number: 553-3601-101
Document Release: Standard 4.00
Date: June 2001

Publication history

June 2001

Standard, Release 4.00. This version introduces a new document title *Meridian/Succession Companion DECT* and the NTP number 553-3601-101.

This version replaces all previous versions.

March 1999

Standard, Release 3.00. This version introduces information about the C4610 base station deployment, an improved deployment tool, and a better layout of chapters. This version also introduces changes that improve the on-line and printed document.

July 1998

Standard, Release 2.00. This version updates information about the Deployment process.

June 1998

Standard, Release 1.00. The first release of the *Meridian Companion DECT Site Planning Guide.*

Contents

About this guide

Target audience

The Meridian Companion DECT Installation Guide provides information for installers, site maintenance personnel, and administrators.

Identifying Nortel Networks PBX systems

The following systems are referred to in this guide as Large systems:

- Option 51
- Option 61
- Option 71
- Option 81
- Option 51C
- Option 61C
- Option 81C

The following systems are referred to as Small systems.

- Option 11
- Option 11E
- Option 11C
- Option 11C Mini
- Succession Communication Server for Enterprise 1000

Call out boxes

CAUTION: Data loss

This symbol alerts you to a procedure that can result in a loss of data.

CAUTION: Equipment damage

This symbol alerts you to a procedure that can result in equipment damage.

CAUTION: Electrostatic sensitive device

This symbol alerts you to a procedure that can result in equipment damage due to ElectroStatic Discharge (ESD).

CAUTION: Service interruption

This symbol alerts you to a procedure that can result in an interruption of service.

DANGER: Electric shock

This symbol alerts you to the risk of a serious injury, or death, caused by an electric shock.

DANGER: Serious injury

This symbol alerts you to the risk of a serious injury, or death, caused by an immediate hazard.

WARNING: Personal injury

This symbol warns you to the risk of a minor or moderate injury caused by an immediate hazard.

NOTE

This symbol is used to indicate advice.

Table 1: A sample Step Action table

Step	Action
1	This portion of the step action table details the required step.
	This portion of the step action table details the action to carry out the above step.

A summary of site planning

Site planning starts with a site survey and ends with deployment. The site survey process is an information gathering process. The information received in the site survey determines customer requirements and the number of cells required to support traffic.

Deployment is the process of locating base stations at the site. The module has a title "Things to know before a deployment" on page 25 contains general information about the deployment process. This module includes information about a key piece of deployment equipment, the Companion DECT Radio Deployment Tool. The module has a title "Things to do before a deployment" on page 39 explains how to prepare equipment for deployment.

Other modules describe in detail the procedures related to deployment. These procedures vary according to site details and user requirements.

Site survey

This chapter contains the following topics:

The site survey process is an information gathering process. The information received in the site survey determines customer requirements and the number of cells required to support traffic.

A normal site survey

The site survey process includes the gathering of:

- survey materials
- site contact information
- site plans or maps
- building information
- existing cable information
- base station radio coverage information

- handset user information
- reviewing your work

Methods and examples for surveying more detailed sites are shown in the Detailed Site Planning section of this guide. Use one or more of the following surveying methods in your site survey:

- single floor
- subsequent system installation
- high handset density area
- multiple systems installation

Learn through example: site planning for Able-Studio

This section describes a site survey for a fictional company, Able-Studio. Follow this example to conduct your site survey.

The facts for Able-Studio

- The contact is Rolf Sundby at 555-0000. You need a guest lab coat to be on the site. Get this lab coat from Rolf.
- The sales representative has recommended the Meridian Companion DECT system.
- The location of the users' offices (and their wired telephones) often changes within the coverage area.
- Not all users have offices and desk telephones. Some users only have handsets.
- The customer does not need coverage in the toilet facility.
- The telephone switch room is next to the toilet facility.
- The customer has no installation restrictions.

The site survey process for Able-Studio

Able-Studio needs to gather the following information to conduct a site survey:

- Survey items, page 15
- Site contacts, page 16

Survey items

Get the following items before you begin the site survey. The items are not customer supplied.

Table 1 Survey items

Step	Action
1	Pick up your Meridian Companion DECT tool kit (consisting of tripod and deployment tool kit).
2	Get the appropriate Companion Provisioning Record.
3	Gather a pencil, an eraser, a ruler, and colored pencils.

END

Site contacts

Gather the following information and enter it into the work-order and the Provisioning records. The installer needs the following information.

Table 2 Site contacts

Step	Action
1	Get the company name.
	Record this information.
2	Get the company address.
	Record this information.
3	Contact name.
	Record this information.
4	Get the contact telephone number.
	Record this information.
5	Get scheduling times and date.
	Record this information.
6	Access to controlled areas.
	Record this information.
7	Get any keys or codes needed for secured site areas where radio coverage is required.
8	Get additional contact information, if required.
	Record this information.

Table 2 Site contacts

Step	Action
9	Get any required safety equipment, such as a hard hat or safety glasses.
10	Find out if there is an another DECT system within the radio coverage area.
	Record this information.
	

Site plans

Get two scaled plans. The scale is required to check wiring distances from the controller to the base stations. The scale is in the form of a measured line so that it remains in proportion to the floor plan through reduction copiers.

Figure 1 Example of a site coverage floor plan

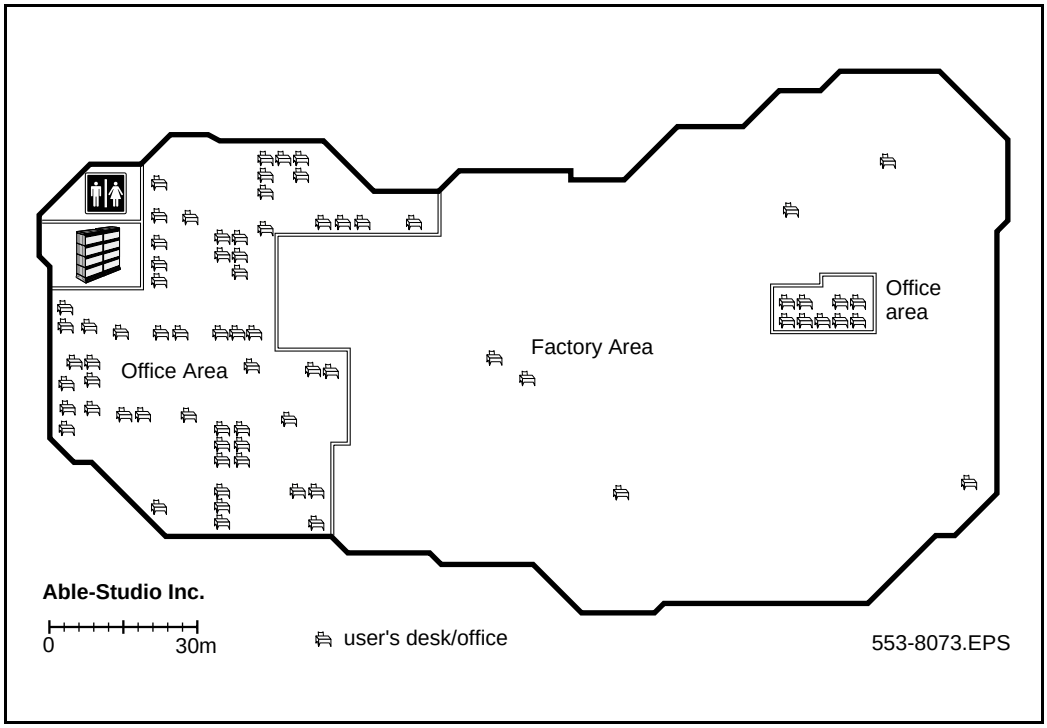


Table 3 Site plans

Step	Action
1	Obtain two site plans/maps, with dimensions marked.
	One working copy to identify critical points, cell centers, and cell boundaries. One clean copy to attach to the site Provisioning Record for the installer, customer, or maintenance.

END

Building information

Gather the following information and enter it into the work-order.

Table 4 Building information

Step	Action
1	Get building identification.
	Record this information.
2	Obtain information on construction materials, such as walls, floors, ceilings.
	Record this information.
3	Note the type of use of facilities, such as office, hotel, factory, store.
	Record this information.
4	Find the number of floors.
	Record this information. If the building contains atriums, multiple floors, floors not all the same shape or any unusual conditions, see "Multiple floor deployment" on page 58.
5	Find the height of floors.
	Record this information.
6	Ask about the partitioning of floors.
	Record this information.
7	Discuss the details of furniture, cupboards, and machinery in the interior of buildings on every floor.
	Record this information.
8	Ask about other building details, as necessary.
	Record this information.
	END

Existing cabling

Gather the following information and enter it into the work-order.

Table 5 Existing cabling

Step	Action
1	Get the location of the telephone switching room.
	What is the total length of the cable.
2	Ask about the existing cabling for base station to MDF wiring.
	Wiring from the base station to the shelf or cabinet must be at least UTP Cat 3. UTP Cat 5 is recommended as it provides a greater line length before signal degradation occurs.
3	Review the possibility of new UTP Cat 5 cabling required.
	If the cabling does not meet at least UTP Cat 3, have UTP Cat 5 installed.
	

Radio coverage

Gather the following information and enter it into the work-order.

NOTE

If the customer requires the base stations be installed out of sight, this can reduce the coverage capability of each base station. It can limit the performance of the system and substantially increase the cost.

Table 6 Radio coverage

Step	Action
1	Inquire about areas where radio coverage is required.
	Record this information.
2	Ask about areas where radio coverage is not required.
	Record this information.
3	Ask about external or outdoor radio coverage.
	Record this information.
4	Discuss areas where radio coverage is not feasible or requires specific base stations.
	Record this information.
5	Talk about areas excluded from radio coverage due to the proximity of sensitive electronic equipment.
	Record this information.
6	Ask about objects inside buildings that could affect radio coverage.
	Record this information.
7	Discuss unsuitable base station locations, such as stone columns, air ducts or horizontally on the ceiling.

Table 6 Radio coverage

Step	Action
8	What base stations are to be installed out of sight.
	Discuss with the customer. See the preceding note.
9	Inquire about areas of special coverage, such as, elevators, stairwells, toilets.

Handset users

Gather the following information and enter it into the work-order.

NOTE

Areas of above average traffic density can have a low number of incumbent users, but many incoming users. Areas such as cafeterias, restaurants, canteens, and meeting room areas where handset users tend to gather.

A further example of above average traffic density can be an environment where all occupants of a given area are provided with handsets. This area will require special planning.
Areas of below average traffic density are areas infrequently accessed by users, such as store rooms and
maintenance areas.

Table 7 Handset user

Step	Action
1	Document the number of handset users.
	Record this information.
2	Get an estimate of the potential growth of handset users.
	Record this information.

Table 7 Handset user

Step	Action
3	Locate areas of above average and below average traffic density.
	Record this information. See the preceding note.
4	Determine which users have a wired telephone in their office.
	Record this information.
5	Determine the locations of users' offices.
	Record this information.
6	Ask about the mobility of the users. For example, will the users move from cell to cell, or is the area of movement restricted, such that the users will always be within one cell.
	Record this information.
	

Things to know before a deployment

This chapter contains the following topics:

Basic terms

The terms used in this guide are described in Table 8 and illustrated in Figure 2.

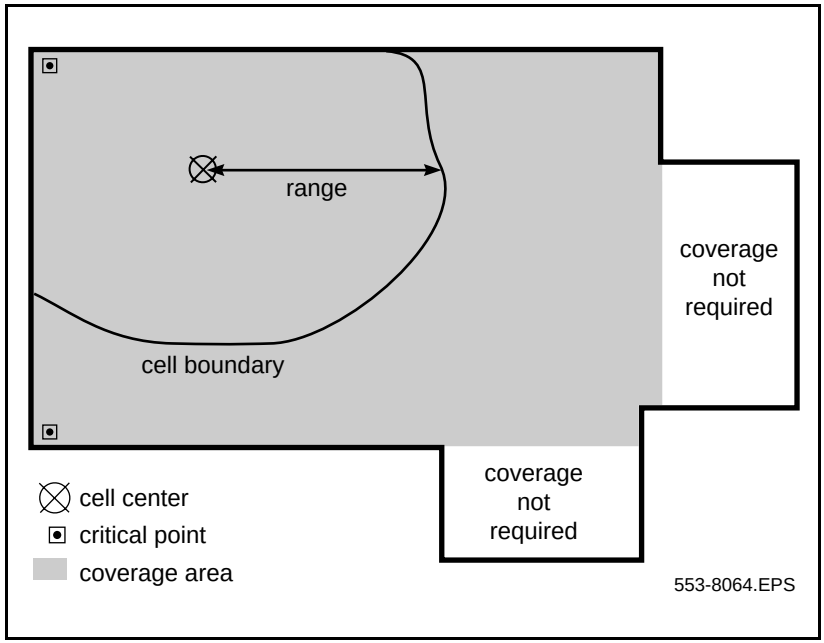
Table 8 Basic terms

Term	Definition
Estimated number of handsets	The average number of handsets expected in a particular cell.
Cell	The coverage area provided by a base station.
Cell boundary	The edge of a cell showing the cell coverage area.
Cell center	The place where you install the base stations.

Table 8 Basic terms

Term	Definition
Companion DECT Radio Deployment Tool	The tool used to determine the radio range of a base station.
Critical point	A point or location defined as an outer corner of a coverage area, or points that can be difficult for the radio signal to reach.
Coverage area	The area defined by the customer in which a handset user should be able to make and receive calls.
Link	When a handset and a base station are in radio communication with each other.
Range	The distance from a cell center to the cell boundary.
Office	The location where a handset user spends the majority of their day.
Traffic table	Traffic tables record site traffic information from the floor plan and the customer. The traffic table helps you determine the required number of base stations for each cell.

Figure 2 Coverage terms



Rules and guidelines

To install base stations, comply with the following when selecting cell centers:

- Ensure that the installation complies with your local electrical code.
- Install base stations indoors where there is no condensation and the temperature remains between 0°C and 50°C.
- Install base stations within 1500 meters of the MDF. Wiring from the base station to the shelf or cabinet must be at least UTP Cat 3. UTP Cat 5 is recommended as it provides a greater line length before signal degradation occurs.
- Position base stations upright on walls. Base stations must be at least 30 centimeters from the ceiling.

- Position base stations at least 1 m from large concrete or stone columns and from any major building structural members such as support beams or columns.
- Position the base stations high enough to clear obstructions between the base stations and the cell edge close to the ceiling.
- Mount the base stations clear of obstacles such as pipes or ducts.
- Do not install base stations in spaces that transport air, such as ducts or plenums.
- Do not mount base stations on the ceiling.

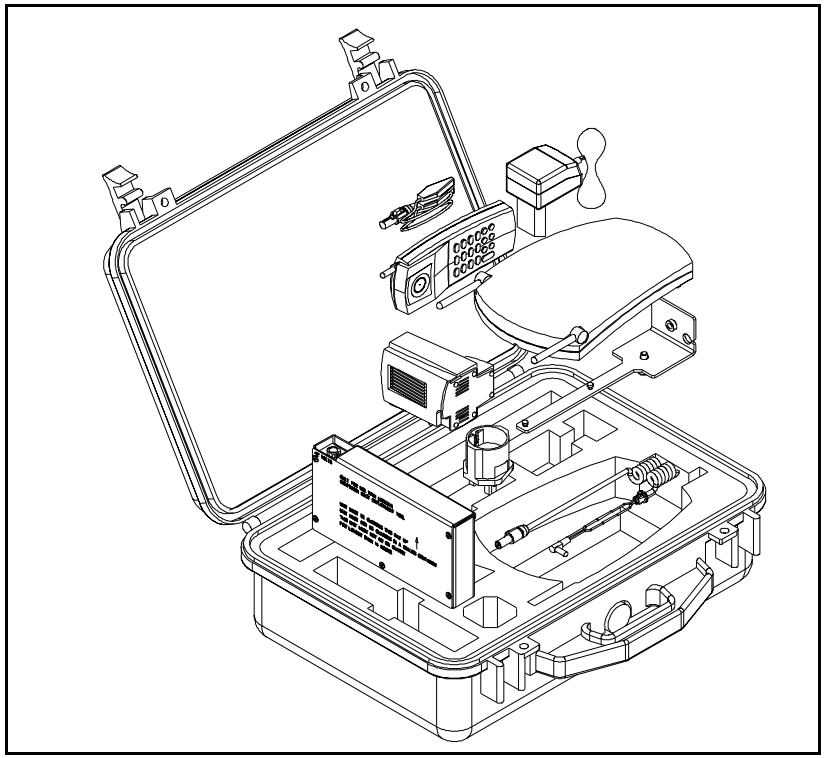
Special rules about outdoor deployment

- Cover outdoor areas before covering indoor areas. Use the deployment tool to determine outdoor cell centers.
- Use the deployment handset to determine the outdoor coverage provided by a base station located indoors.
- External housings for outdoor base stations must be mounted directly on walls or similar vertical surfaces.
- When using the deployment tool outdoors, be careful that the deployment tool does not fall over or come in contact with electrical wires and cables.
- If you cannot reach an outdoor critical point, inform the customer.

The Companion DECT Radio Deployment Tool

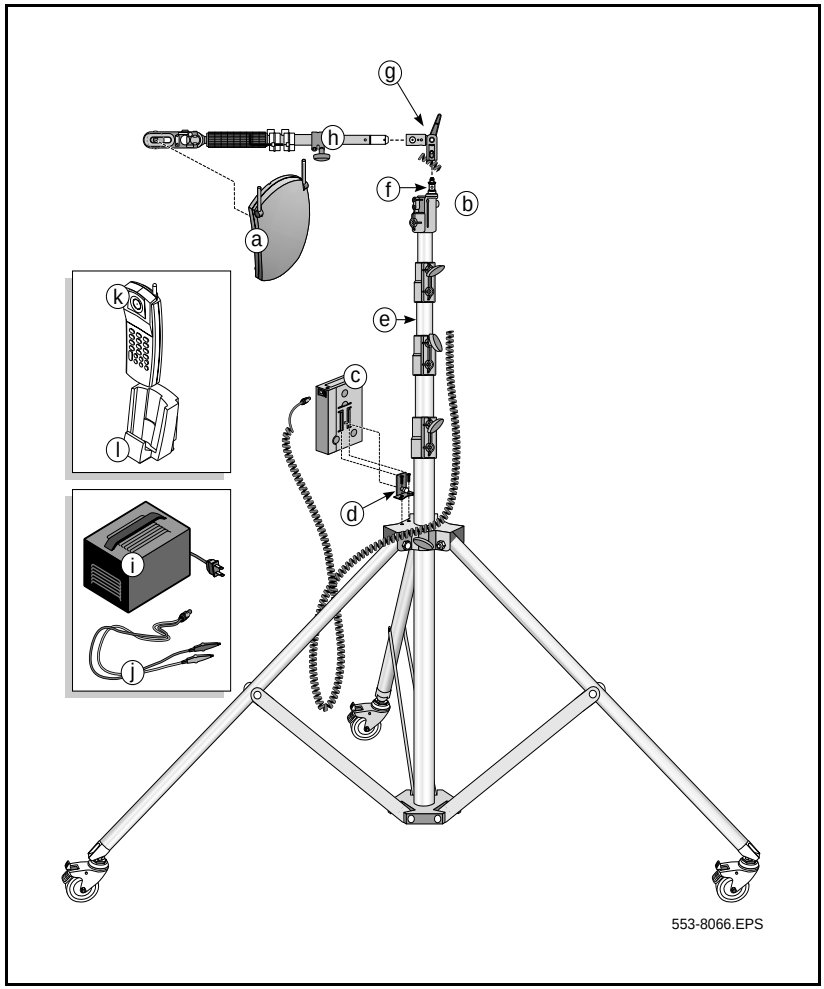
The Companion DECT Deployment Tool (deployment tool) determines cell centers and cell boundaries.

Figure 3 Deployment tool carrying case and packing details



The deployment tool

Figure 4 Deployment tool



Key

a. base station

b. power cord

c. battery

d. battery mount

e. adjustable tripod

f. extender arm connector

g. extender arm swivel and clamp

h. extender arm

i. battery charger (separately ordered)

j. battery charger cable

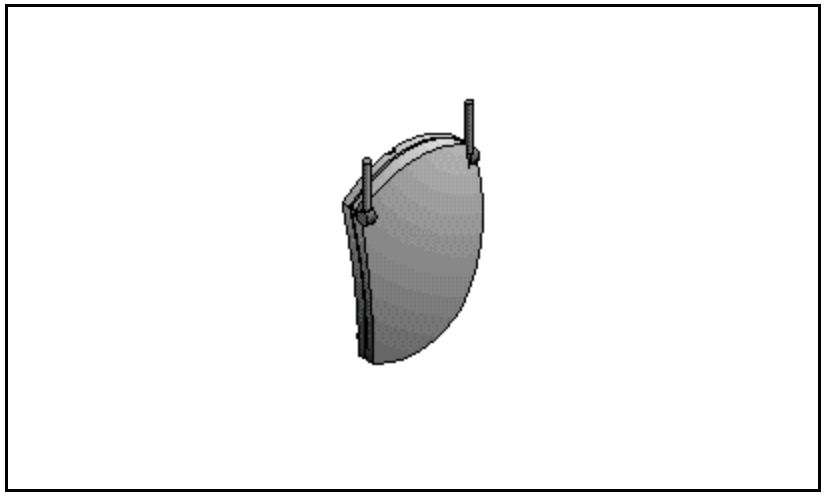
k. deployment handset

l. deployment handset battery charger

The deployment tool tripod is available in three heights:

- 2.4 meters
- 3.6 meters
- 4.8 meters

Figure 5 Deployment tool base station



Do not position your deployment tool base station next to large concrete or stone columns. This affects the contour of the cell boundary. Keep the deployment tool base station at least 1 m from such columns.

How the deployment tool works

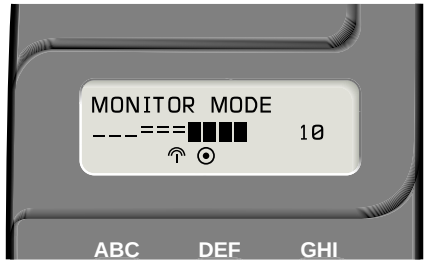
The deployment tool base station and the deployment handset establish a radio link:

- when the handset is in the deployment mode
- when the handset and base station are within range of one another

The closer the handset is to the base station the stronger the link. As the handset moves away form the base station, a point is reached where the signal is no longer reliable for telephone conversations.

When a link is established, the handset emits a continuous 1.4kHz tone and displays a Radio Signal Strength Indication (RSSI).

Figure 6 Deployment handset link display



The display, shown in Figure 6, denotes the following:

- a circle and dot indicates a locked signal
- the antenna symbol indicates a link establishment
- the number 10 indicates an RSSI value
- the dash, equal sign and shaded box icons indicate signal strength

The maximum RSSI is 10. As signal strength diminishes, the number 10 decrements and the icons disappear. For example, at signal strength 7, the three right hand shaded boxes disappear. At signal strength 5, all the shaded boxes and one of the equal sign icons disappear.

The signal strength diminishes as the distance between the handset and the base station increases. The tone will remain unchanged until you are out of range of the base station.

How to use the deployment tool

The deployment tool is assembled as shown in Figure 4, with the extension arm parallel to the floor.

Position the base station antenna upwards.

Place the base station as close to the wall as possible and at the height recommended for base stations.

To test the deployment tool, stand in an open area approximately three to five meters away from the deployment tool on its tripod. Establish a link between the base station and the handset. Keep the deployment tool base station in plain view. Ensure there are no obstructions including people.

Walk away from the base station and observe the deployment handset link display. As you walk away from the base station, the RSSI value changes. When the RSSI value changes from 7 to 6 and the last shaded block disappears, you have reached the
cell boundary.

When you reach the cell boundary, stop and listen to the tone. Make sure the tone is clear with no tone changes, tone brake-up, modulation, mutes or clicks.

Do not select a cell edge that has an RSSI reading of less than 6. However, keep the following in mind:

- there can be environments that cause poor tone at a RSSI meter reading of between 7 and 10. For this condition get help from your Nortel support team.
- the tone stops when the radio link is lost

Interpreting handset tones

The handset tones indicate how close the handset is to the deployment tool base station:

- steady tone – the handset is within the cell boundary, or at the cell boundary edge
- tone change, tone break-up, modulation, mute or click – the handset is beyond cell boundary edge

Rules for using the deployment tool outside

- Do not use the deployment tool on windy days.
- Do not use in inclement weather.
- Keep all personnel away from the apparatus.
- Follow all safety requirements.

- Use batteries to power the deployment tool.
- Charge the batteries indoors.

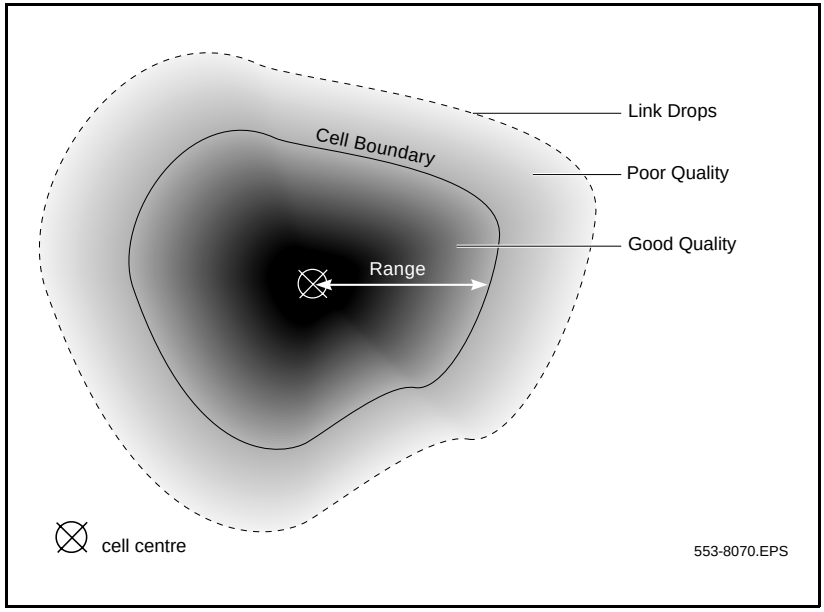
The cell boundary

A specific RSSI value on the handset defines the cell boundary range. Links can be made outside the cell boundary but the audio quality of the link is poor. The link drops when the handset and the base station are too far apart.

As shown in Figure 7, the cell boundary is the furthest point from the cell center where you can hear a clear radio signal.

The range from the cell center to the cell boundary, or the distance to a potential cell center from a critical point, is determined using the cell boundary value and the deployment tool.

Figure 7 Cell boundary terminology



How to label a floor plan

This section describes how to label critical points, cell centers, and cell boundaries on the floor plan.

Mark the information clearly on the floor plans during the survey. The customer, the sales group, the installer, and maintenance personnel need to read these floor plans.

Recording information

Use a different color for each cell. Use the same color for each cell center and its corresponding cell boundaries. Indicate the information on the floor plan as follows:

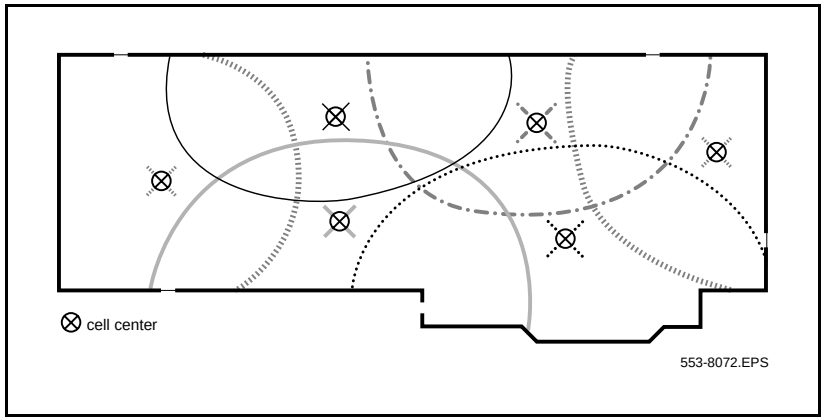
- critical points – mark  on the floor plan
- cell centers – mark  on the floor plan.
- cell center - label each as xCn where x is the floor and n is the next sequential cell center.
- cell boundaries – mark wide, colored lines on the floor plan

For example, label a cell center on the second floor as 2C3. The 2 before the C tells you that the cell center is on the second floor. The 3 after the C tells you that this cell is the third cell in sequence in the site planning process.

Table 9 Example cell labels

Floor	Cell label
First floor	2C1, 2C2, 2C3
Ground floor	1C1, 1C2, 1C3
Basement level one	-1C1, -1C2, -1C3
Basement level two	-2C1, -2C2, -2C3

Figure 8 Example cell boundaries



Things to do before a deployment

This chapter contains the following topics:

Charge the deployment tool battery

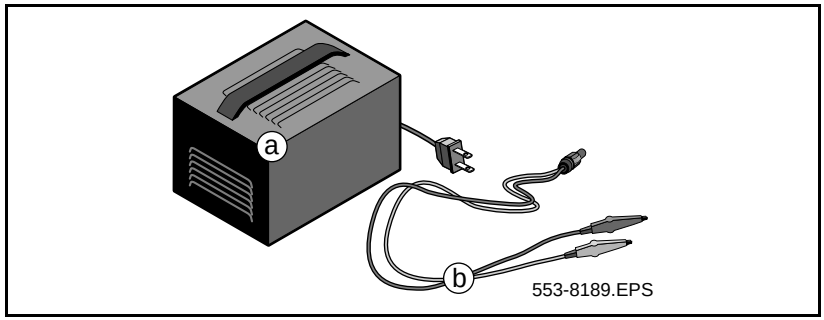
Charge the deployment tool battery for at least six hours before using.

CAUTION: Equipment damage

Use the Nortel battery charger. This charger is a separately ordered item. Failure to use an automatic shut-off battery charger can damage the battery.

Do not use the battery supplied with the Meridian Companion CT2 deployment tool with the Meridian Companion DECT deployment tool. The CT2 and DECT batteries are not interchangeable.

Figure 9 Deployment tool battery charger



Key

a. battery charger (separately ordered)

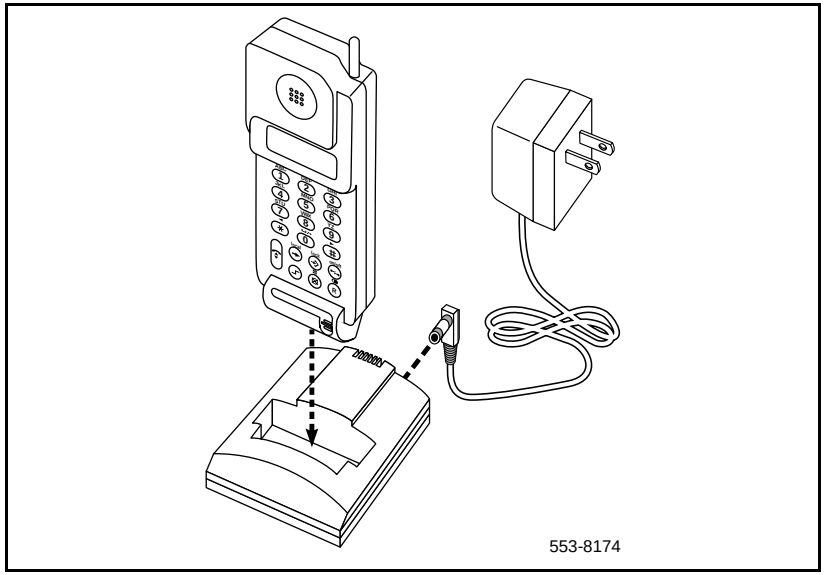
b. battery charger cable

Table 10 Charge the deployment tool battery

Step	Action
1	Set up the deployment tool battery charging equipment.
	Remove the deployment tool battery, charger and charger cord from the yellow case.
2	Charge the deployment tool battery.
	Connect the charger cord plug into the battery. Connect the red alligator clip to the positive lead of the charger and the black clip to the negative lead of the charger. Connect the battery charger to the AC mains.
3	Remove the deployment tool battery from the charger after it is charged.
	The battery must charge for at least six hours.
	END

Charge the deployment handset battery

Figure 10 Deployment handset battery charger



Charge the deployment handset battery for at least 12 hours before using the first time. Charge the handset at least six hours before any subsequent use.

Table 11 Charge the deployment handset battery

Step	Action
1	Set up the deployment handset battery charging equipment.
	Remove the deployment handset battery, charger and charger cord from the yellow case.

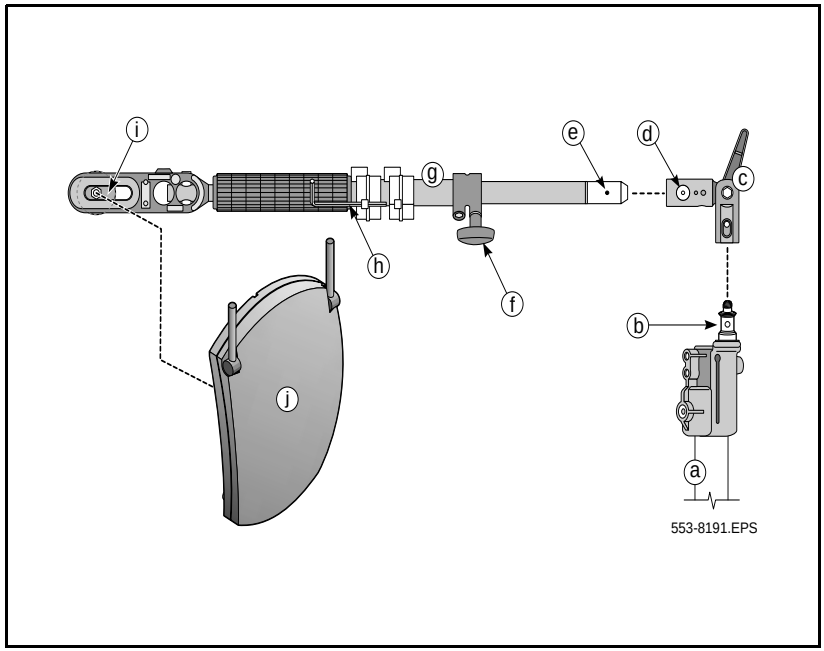
Table 11 Charge the deployment handset battery

Step	Action
2	Charge the deployment tool battery.
	Connect the charger cord to the charging stand. Connect the charger cord to the AC mains. Place the handset into the charging stand. The red LED flashes while the handset is charging.
3	Remove the handset from the charger when it is ready for use.

END

Assemble the deployment tool

Figure 11 Deployment tool extension details



Key

a. adjustable tripod

b. extender arm connector

c. extender arm swivel

d. detente stop

e. detente

f. extension thumb screw

g. telescopic extension

h. allen key

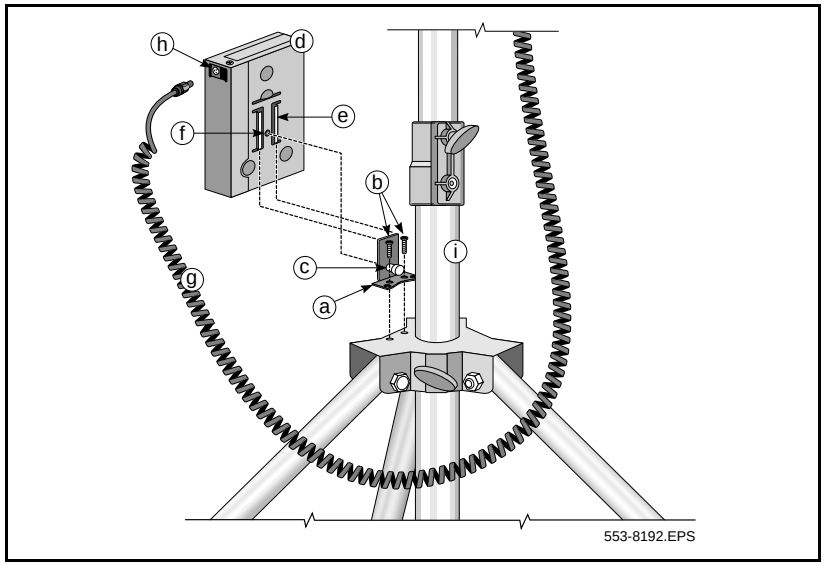
i. base station attaching thumb screw

j. base station

NOTE

The deployment tool battery and the deployment handset battery must be charged for at least six hours before use.

Figure 12 Deployment tool battery details



Key

- **a.** battery mount
- **b.** allen screws
- **c.** thumb screw
- **d.** battery pack
- **e.** guides
- **f.** thumb screw nut
- **g.** power cord
- **h.** power cord receptacle
- **i.** tripod

Table 12 Assemble the deployment tool

Step	Action
1	Set up the tripod.
	Remove the tripod from its carrying case and set upright. Lock the casters.
2	If required, install the extension arm fitting on the tripod. If not required, go to step 4.
	Place the extension arm fitting, shown in Figure 3, onto the brass fitting on the top of the tripod.
3	If required, secure the extension arm fitting.
	Use the allen key attached to the extender arm to secure the extension arm fitting allen screw.
4	Mount the extension arm on the tripod.
	Place the brass end of the extension arm into the fitting, so that the keying hole of the extension arm mates with the retaining thump screw locking device of the tripod fitting. The thump screw locking device will click into the keying hole of the extension arm.
5	Position the extension arm.
	Orient the arm into the proper position. Secure the tripod fitting and the extension arm thumb screw.
6	Affix the base station to the extension arm.
	Remove the base station from the yellow case. Mount the base station onto the end of the arm. Screw the arm's brass thumb screw into the bottom of the base station and secure into place with the grey lock thumb screw.
7	Position the antenna.
	Rotate the antenna from its stowed position, against the body of the base station, to its upright operating position.
8	Position the base station. The normal position is with the antenna pointing upwards.
	Secure the base station with the arm thumb screw.
9	Mount the battery fixture on the tripod.

Table 12 Assemble the deployment tool

Step	Action
	Remove the battery bracket, shown in Figure 12, from the yellow case. Screw the battery bracket onto the tripod caster brace, with the two machine screws.
10	Mount the battery.
	Pull the release pin on the bracket back and slide the battery grooves on to the bracket. Ensure the bracket pin locks into the battery.
11	Connect the base station to the battery.
	Plug the base station power cord connector into the upper right edge of the battery.

Test the deployment handset

Figure 13 Handset display and keypad details

Table 13 Test the deployment tool handset

Step	Action
1	Start the test and establish a link with the base station.
	Remove the handset from its charger.
2	Turn on the handset.

Table 13 Test the deployment tool handset

Step	Action
	Press the shift key and press the ON/OFF button. The handset displays DECT HANDSET.
3	Select system mode.
	Press the shift key and press the local key. The handset displays SYSTEM.
4	Select the monitor mode.
	Press the star key. The handset displays MONITOR MODE.
5	Select the monitor mode code.
	Press the lock button. The handset displays CODE.
6	Enter the monitor mode code.
	On the dial pad, enter 2530. Press the lock button.
7	Interpret the handset RSSI display and test tone.
	Follow the explanation on “How the deployment tool works” on page 32 and “How to use the deployment tool” on page 33.

Single and multiple floor deployment

This chapter contains the following topics:

General rules

Whether your deployment situation involves a single floor or multiple floors, the deployment process has basic rules:

- Deploy the external or outdoor areas first.

- Deploy from one side of the coverage area, then deploy the opposite side of the coverage area.
- Finish by deploying the middle of the coverage area.

Follow these rules to prevent cell centers from clustering at one end of the site.

Check your floor plan to be sure that there are no areas where a handset in the required coverage area could be outside the range of a cell center.

Defining a cell typically takes 25 to 40 minutes.

Single-floor deployment

Deploying a single floor coverage area involves methods that apply to all other applications of coverage. For multi-floor deployment see page 58.

You will use one or all of the following methods of deploying cells

When determining a cell center, during deployment you will use one or all of the following methods of deploying cells:

- Single cell deployment – covers the distance between two outside corners at the end of a coverage area with one cell
- Double cell deployment – covers the distance between two outside corners at the end of a coverage area with two cells
- Multi cell deployment – covers the distance between two outside corners at the end of a coverage area with more than two cells

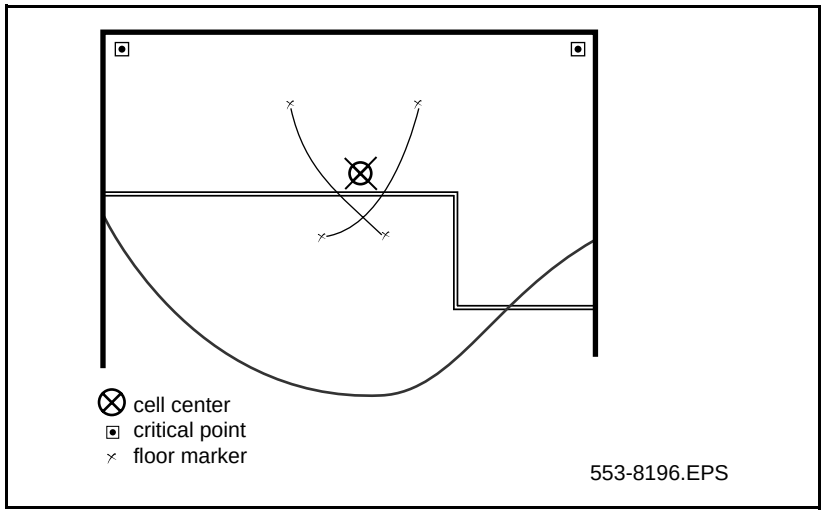
Always start with the single-cell method, because you do not always know what the range is, and therefore how many cells you will require to cover the area between the critical points.

Start at the “short” side of the coverage area. First cover the corners, then the side between those corners, and finally inward to the center of the coverage area. Repeat the process for the other end of the coverage area.

By deploying your site using this method, cell centers are distributed throughout the site. If you deploy the site from one end to the other you can cluster cell centers at one end of the site.

Single cell deployment

Figure 14 Single cell distance



Always start with the single-cell technique regardless of the width between the two critical points. With this technique you find one cell center that serves two critical points, as shown in Figure 14.

Overview of the single cell deployment process

1. Identify the initial critical points. Mark them on the floor plan with a ⊡. Use different color pencils for each critical point.
2. Choose the first critical point at the edge of the coverage area furthest away from the center of the coverage area. Place the deployment tool at this critical point.
3. Establish a link. Refer to the section titled "The Companion DECT Radio Deployment Tool" on page 29 for details.

4. Measure the range into the coverage area in a few directions to determine where a cell centre can be located, and still be within range of the critical point. Watch the deployment tool handset RSSI value while moving away from the base station. When the display value changes from 7 to 6, you have detected the cell boundary.
5. Record the cell boundary by marking a small x on the floor plan where you reached the cell boundary value. Use the pencil that is the same color as the critical point where the deployment tool is located.
6. Repeat step 4 and 5 several times, walking in different directions to determine where the cell center can be located and still be within range of the critical point.
7. Draw a thin contour line through the x's to mark an arc on the floor plan.
8. Choose the other critical point adjacent to the first critical point and repeat steps 3 to 7.
9. If the contour lines do not cross, or if they cross close to the edge of the coverage area between the two critical points, then see "Double cell deployment" on page 53. Choose a position on the floor plan for the cell center that:
   a. is furthest from the critical points and still provides good audio quality at the critical point
   b. complies with the "Rules and guidelines" on page 27 • is in the coverage area
10. With a pencil, label the cell center on the floor plan with  xCn. The x is the floor, and n is the cell number in sequence of the entire plan.
11. Place the deployment tool at each cell center to locate the cell boundary.
12. Mark the cell boundary on the floor plan.
13. Repeat this task for the remaining coverage area from the extremes of the coverage area toward the center until you cover all of the floor.

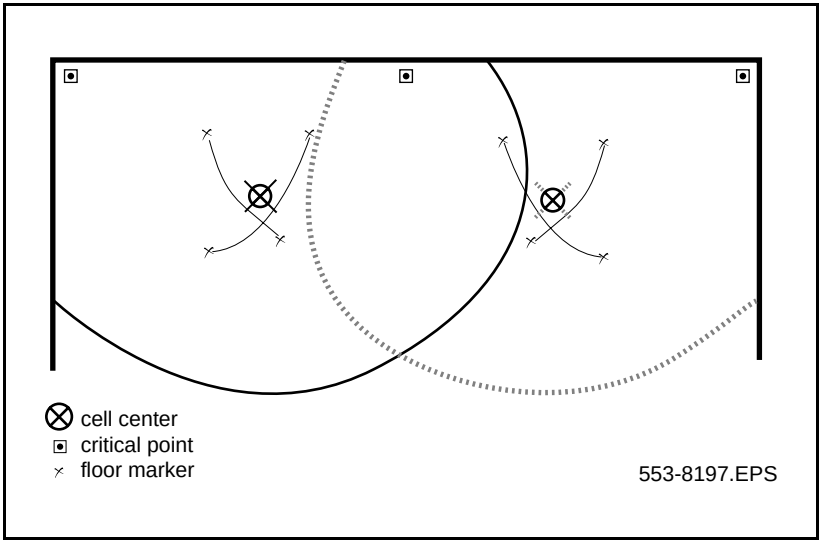
14 If the cell boundary covers any other critical points, ignore these critical points when proceeding with coverage deployment.

NOTE

If it is not possible to place the base station at the exact crossover points of the arcs, place the base station as close as possible to the crossover.

Double cell deployment

Figure 15 Double cell distance



Use the double cell technique only if you are referred here from the single-cell technique. Before you begin this technique you should have two critical points that one cell center cannot serve. Using the double cell technique, you find two locations for cell centers that cover three critical points, as shown in Figure 15.

Overview of the double cell deployment process

1 Mark a third critical point mid-way between the two critical points already identified.

2 Place the deployment tool at this mid-way critical point.

3 Establish a link.

4 Walk briskly into the coverage area within range of either of the first two critical points until you reach the cell boundary.

5 Record the cell boundary by marking a small x on the floor plan where you reached the cell boundary.

6 Repeat step 4 and 5 several times, walking in different directions to get an idea where the cell center can be located and still be within range of the critical point.

7 Draw a thin contour line through the x's to mark an arc on the floor plan.

8 Repeat steps 2 through 5 walking into the coverage area of the other of the first two critical points.

9 If the contour lines do not cross, or if the amount of overlap between the cells is less than 1/2 the distance between the cell center and the cell boundary, then see "Multi cell deployment" on page 56.

10 Choose a position on the floor plan for the cell center that:

- **a.** is furthest from the critical points and still provides good audio quality at the critical point
- **b.** complies with the "Rules and guidelines" on page 27
- **c.** is in the coverage area

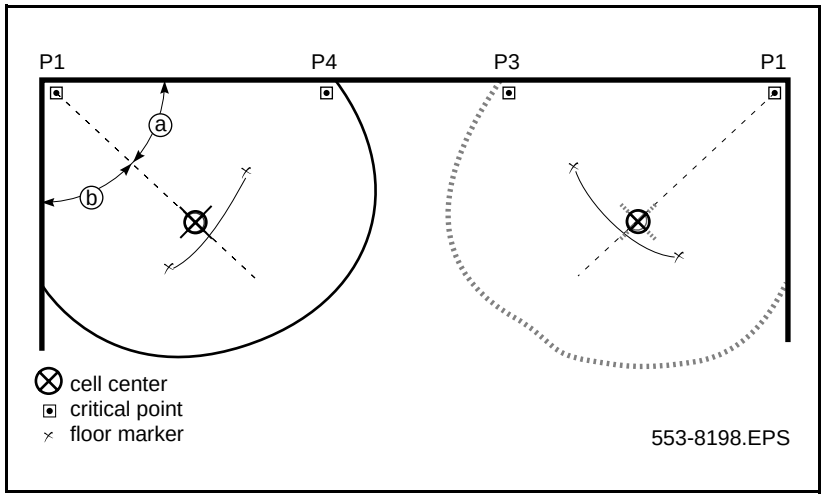
11 Mark each cell center on the floor plan  and label them 1C1 and 1C2.

12 Place the deployment tool at each cell center to find the cell boundary and mark it on the floor plan.

13 Repeat this technique for the remaining coverage area from the extremes of the coverage area toward the center until you cover all of the floor. If the cell boundary covers any other critical points ignore these critical points when proceeding with coverage deploying.

Multi cell deployment

Figure 16 Multi-cell distance



Use the multi cell technique only if you are referred here from the double cell technique. Before you begin this technique you should have two critical points that one cell center cannot serve. Using the multi cell technique you find two cell centers, each one serving one of the two critical points, as shown in Figure 16.

Overview of the multi cell deployment process

1 Choose a position on the floor plan for the cell center that:

- **a.** is furthest from the critical points and still provides good audio quality at the critical point
- **b.** complies with the "Rules and guidelines" on page 27
- **c.** is in the coverage area

2 Place the deployment tool at critical point **P1**.

3 Establish a link.

4 Walk briskly into the coverage area away from the critical point until you reach the cell boundary.

5 Mark a small x on the floor plan where you reached the cell boundary.

6 Repeat step 4 and 5 several times, walking in different directions from the critical point to establish an arc. The arc is at the cell boundary and is within range of the critical point.

7 Draw a thin contour line to mark an arc through the x's on the floor plan.

8 Repeat steps 4 through 7 walking into the coverage area of critical point **P2**.

9 Locate the cell center on the arc along a line from the critical point that is equal distant from the adjacent walls.

10 Mark each cell center on the floor plan  and label them **1C1** and **1C2**.

11 Place the deployment tool at each cell center.

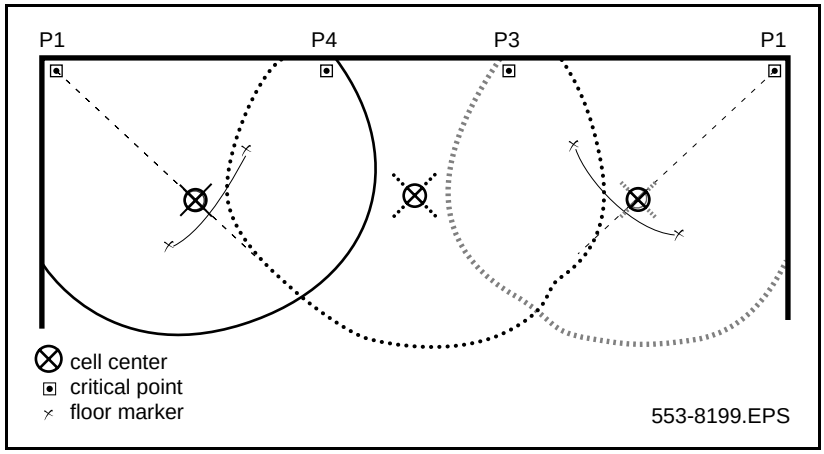
12 Locate the cell boundary and mark it on the floor plan. (Mark the contours in different colors for easy differentiation of cell centers)

13 Define and mark on the plan any subsequent critical points, where each cell boundary crosses the edge of the coverage area.

14 If the cell boundary covers any other critical points ignore these critical points when proceeding with coverage deploying.

15 Repeat the multi cell technique for the remaining area to be covered from the extremes of the coverage area toward the center until all of the floor is covered.

Figure 17 Multi cell distance using the single cell technique



16 Use the subsequent critical points to fill in the coverage area between the first two cells using the "Single cell deployment" on page 51. An example of this is shown in Figure 17.

Multiple floor deployment

This applies to deployment scenarios in which:

- the coverage area is on more than one floor
- the floors are not adjacent to each other

Check for through-the-floor coverage

The first measure in covering a multi-floor building is assessing the availability of through-the-floor coverage. In buildings mainly constructed of wood through-the-floor coverage can be used. However, due to the construction of most modern buildings with raised floors, high metal content, and reinforced concrete, through-the-floor coverage with the Meridian Companion DECT
is limited.

Table 14 Check for through-the-floor coverage

Step	Action
1	Place the deployment tool in a middle floor of the site.
2	Go to the floor above the deployment tool and establish a link with the deployment handset.
	Use the procedure on page 47.
3	Measure the deployment contour as if the base station was on the same floor as you are currently located.
	If you are only able to cover a small area (less than 10 meters radius) then there is effectively no through-the-floor coverage on the floor above an installed base station.
4	Go to the floor below the deployment tool and repeat the above process.
	If the area that can be covered is small, then there will be no through-the-floor coverage below a base station location.
5	If there is no through floor coverage or just small coverage.
	Deploy each floor using critical points or if the floors are exactly similar, deploy as multi floors with the same layout.
	

Assess floor layout

The deployment procedure changes according to the similarities and differences of the floors.

All floors have the same layout

To start a multi-floor deployment when all of the floors have the same layout, deploy one floor and enter the data on the floor plan. Use the data for the deployed floor for other identical floors.

For example, if floor 2 of an office tower is laid out with cubicle style offices with a perimeter of enclosed offices, and floor 3 is designed and laid out in the **exact** same manner, then both floors can have the exact same installation profile for base stations.

All floors do not have the same layout

If there are **any deviations** in the floor plan from floor to floor, use the critical point method to deploy each distinct floor. For more information, see "Basic deployment procedures" on page 65.

NOTE

Do not underestimate the importance of changes in floor layout. Simple changes in a room from a meeting room to a storage room can have significant impact on the coverage from a base station.

Multi-floor coverage situations

The following situations require multi-floor coverage:

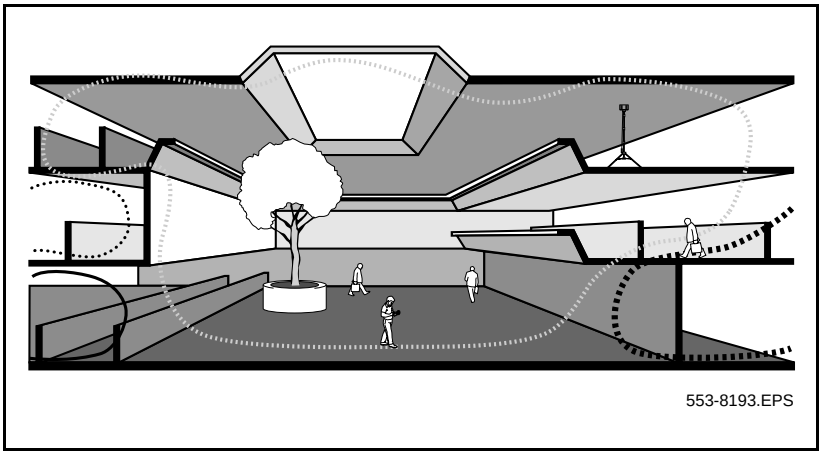
- Atriums
- High rise buildings
- Unusual conditions

Use Multi-floor coverage procedure if instructed to do so from "Building information" on page 19.

Atriums

Cells in an atrium, as shown in Figure 18, are usually larger than the cells of the rest of the building. This section gives guidelines on how to plan an atrium. There are no precise steps to follow when deploying an atrium, however there are points to consider. See also "Unusual conditions" on page 62.

Figure 18 An atrium



Consider the following when deploying an atrium:

- plan atriums to their full height
- plan an atrium as one full size room not floor by floor
- place cell centers within an atrium only when they are intended to cover the atrium
- do not put cell centers into an atrium if they are intended to serve adjacent areas
- to serve adjacent areas put the cell centers into these areas.
- deploy the atrium first if the atrium is more than a third the size of the building or more than one cell in size
- if cell centers in adjacent dense areas serve one floor of an atrium, check the coverage of the cell on all of the floors that meet with the atrium.

High rise buildings

Deploy high rises buildings as unusual conditions of multi-floor deployment.

Test through-the-floor coverage first. If there is no through-the-floor coverage, then deploy each floor. Repeat as many floors as possible where the floor layout is the exact same as any other, in all other cases deploy floor by floor. A floor with many meeting rooms will deploy differently from a building with cubicle style offices.

Unusual conditions

There are no precise steps to follow when deploying for an unusual condition, however there are points to consider.

To plan an unusual condition, consider the following situations:

- Cell centers are too close
- Cell centers are too far apart
- Too many cell centers

Cell centers are too close

If cell centers are deployed less than 10 meters apart, the handsets can initiate unnecessary handovers. Unnecessary handovers result in excessive internal messaging and degraded speech quality.

Cell centers are too far apart

If cell centers are deployed too far apart, the edge of a cell does not overlap the coverage from another cell.

Cell centers must be located within the edge of other cell centers to provide satisfactory overlap.

Overlap can be difficult to achieve where coverage is received from the floor above or the floor below. Internal structures can cause overlap deficiencies.

It is not necessary that the cell center is on the same floor or an adjacent floor of the area that it is covering. It is only necessary that the deployment tool indicates that you are within the cell boundary value.

The installation of base stations in places other than the location shown on the plan can cause coverage problems. For example, if the base station is mounted on the opposite side of a wall from its planned location. Consider the following when you choose base station locations:

- choose locations only where it is possible to mount base stations
- install base stations as close as possible to planned locations
- follow safety codes or aesthetic considerations
- allow sufficient access for installation of base stations
- provide clear installation instructions
- test the coverage during post-deployment checks.

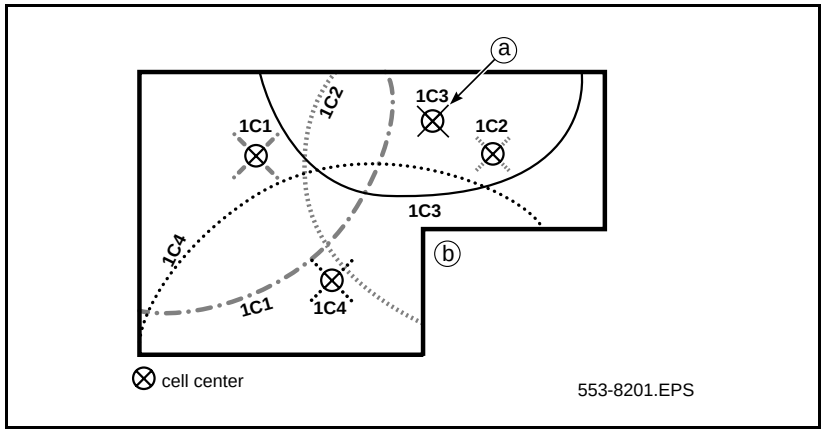
Too many cell centers

The primary concern with deploying too many cell centers is cost. To deploy the correct number of cell centers and reduce cost, do the following:

- check the coverage and traffic volume before adding additional cells
- remove a cell served by other cells unless it is required for high handset density
- check the coverage area of each cell
- verify that there is at least one area that each cell serves that is not served by another cell

In the example shown below, cell 1C3 is redundant unless required for high handset density.

Figure 19 Locating redundant cells



Basic deployment procedures

This chapter contains the following topics:

Procedure 1: How to deploy a DECT system

Table 15 How to deploy a DECT system

Step	Action
1	Identify and mark initial critical points.
	Mark critical initial points on the floor plan with the symbol: ⊡. Figure 20 on page 70 shows the initial critical points: P1, P2, P3, P5, P6 and P7.
2	Demarcate the cell contour for the critical point farthest from the center of the full coverage area.

Table 15 How to deploy a DECT system

Step	Action
	To demarcate a cell contour: a Set up the deployment tool base station. Raise the deployment tool base station as high as it can go or until it is at the height that you recommend for base stations. b Establish a link. See "The Companion DECT Radio Deployment Tool" on page 29 for details. c Measure the range into the coverage area in a few directions to determine where a cell centre can be located and still be within range of the critical point. Listen to the deployment tool handset while moving away from the base station. When the RSSI value changes from 7 to 6, you have detected the cell boundary. d Mark the cell boundary on the floor plan with a small x. e Repeat steps c and d until you make enough x's to draw a thin contour arc through the x's. In Figure 21 on page 71, P1 is the initial critical point.
3	Demarcate the cell contour of the closest adjacent critical point to the first critical point.
	See step 2 for details. In Figure 22 on page 71, P2 is the closest adjacent critical point to the first critical point.
4	Use the cell contours to locate a cell center.
	Locate the cell center where the cell contours meet. Choose a position on the floor plan that: • is furthest from the critical points • still provides good audio quality at the critical point • complies with the "Rules and guidelines" on page 27 • is in the coverage area With a pencil, label the cell center on the floor plan with the symbol:  **xCn,** where **x** = the floor and **n** = is the cell number in sequence of the entire plan. In Figure 23 on page 72, IC1 is a cell center.
5	Demarcate a cell boundary.

Table 15 How to deploy a DECT system

Step	Action
	To demarcate a cell boundary: a Set up the deployment tool base station at the cell center. b Establish a link. c Refer to the floor plan and check audio quality in user offices within the cell. If a user office is in a zone where audio quality deteriorates, relocate the cell center closer to the critical point or the office. d Walk into all of the areas (rooms) necessary to demarcate the complete cell boundary. Radio signals travel further in uncluttered areas than they do in cluttered areas. Record the cell boundary. e Find the cell boundary by measuring the range and marking it on the floor plan with a small x. Repeat steps c and d until you make enough x's so that you can draw a contour arc around the cell center. See Figure 24 on page 72 for an example of a cell boundary.
6	Mark and label the cell boundary on the floor plan
	Steps: a Mark each office within the cell that is isolated from the office area. b Label any subsequent critical point on the floor plan the following symbol: ⊡ c Mark the cell contour on the floor plan. Trace a contour line through the x's with a marker. d Trace the cell boundaries and cell centers with colored markers.
7	Identify new critical points.

Table 15 How to deploy a DECT system

Step	Action
	Steps: a Identify one new critical point just inside of where the cell boundary meets the outside wall. In Figure 25 on page 73, this new critical point is P9. b Identify another new critical point which is adjacent to the first new critical point. Locate this critical point on the opposite side of the cell boundary area. In Figure 25 on page 73, the cell boundary area is IC1 and the new critical point is P8.
8	Mark and label these new critical points on the floor plan with the symbol: ⊡.
	See step 6 on page 67 for details.
9	Using the critical points from step 7, demarcate new cell contours, a new cell center and a new cell boundary.
	See steps 2 to 5 starting on page 65 for details. **Note:** Cell contour arcs must pass near the cell boundary of adjacent cells. For an example of this, see Figure 26 on page 73.
10	Demarcate additional cell contours, centers and boundaries at the other end of the building.
	Repeat steps 1 to 8 as necessary to demarcate new cell boundaries at the other end of the building. In Figure 27 on page 74, new cells are formed around cell centers IC3 and IC4.

Table 15 How to deploy a DECT system

Step	Action
11	Identify new critical points which are:
	These critical points must be: • adjacent to a critical point and on the opposite side of the cell boundary area. (critical point = P11 in Figure 28 on page 74, where cell boundary area = IC2) • just inside of where the cell boundary meets the outside wall (P12, P13, P14 and P15 in Figure 28 on page 74) • where cell boundaries meet (P16 and P17 in Figure 28 on page 74)
12	Demarcate additional cell boundaries to cover all areas of the building.
	Repeat steps 1 to 8 as necessary to demarcate new cell boundaries in the middle of the building. Refer to Figures 29, 30, and 31 starting on page 75. Critical points P11, P13 and P16 form: • contours in Figures 29 • the cell center 1C5 in Figures 30 • a new cell boundary in Figures 31 Refer to Figures 32 and 33 starting on page 76. Critical points P11, P12 and P17 form: • contours in Figures 32 • a new boundary based on cell center 1C6 in Figure 33 on page 77 Figure 29 on page 75 shows a floor plan with complete radio coverage. The floor plan is made complete by cell boundary 1C7.

Deployment illustrations

These illustrations represent the deployment process from start to finish.

Figure 20 Example of initial critical points

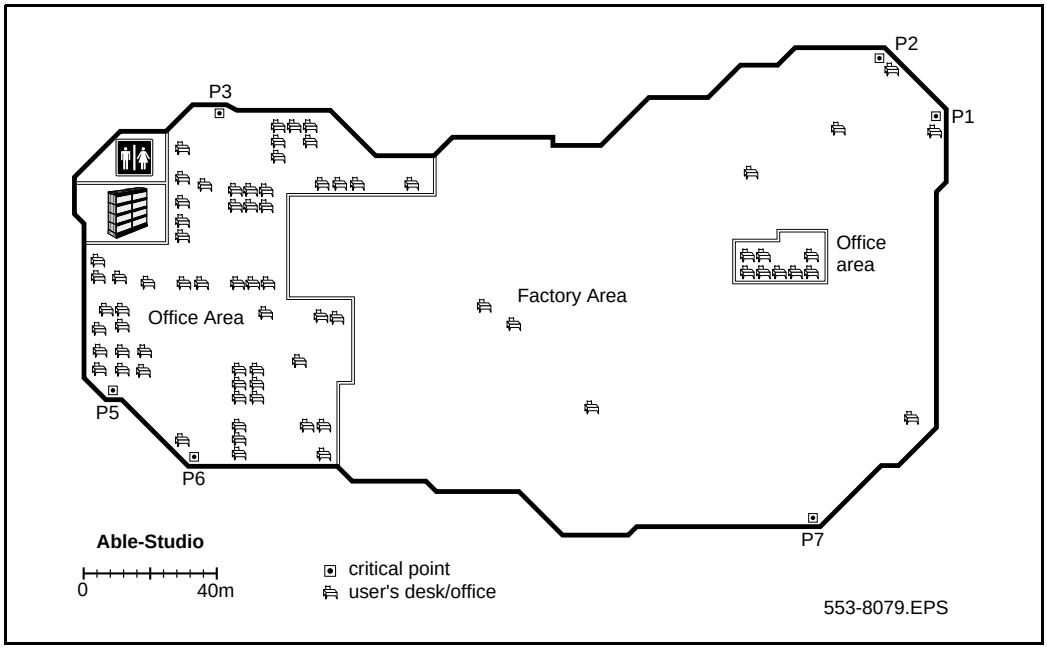


Figure 21 Cell contour of the initial critical point

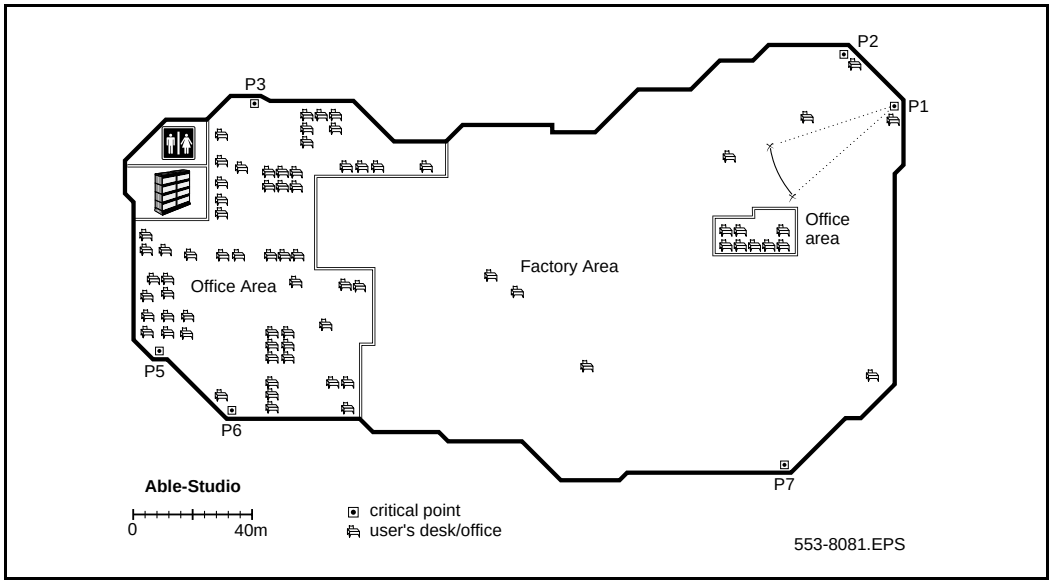


Figure 22 Cell contour of the closest adjacent critical point to the initial critical point

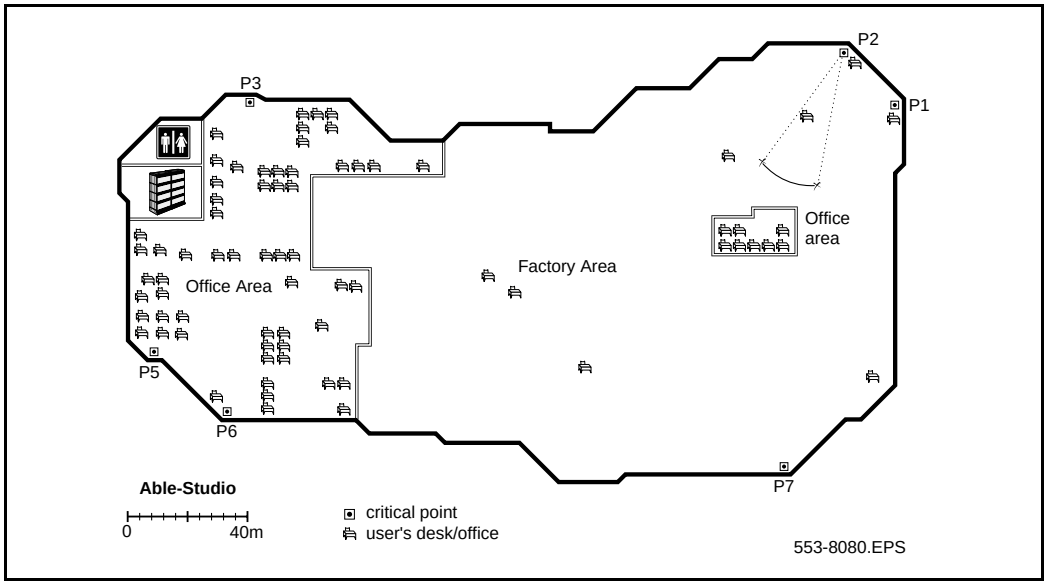


Figure 23 Example of a cell center

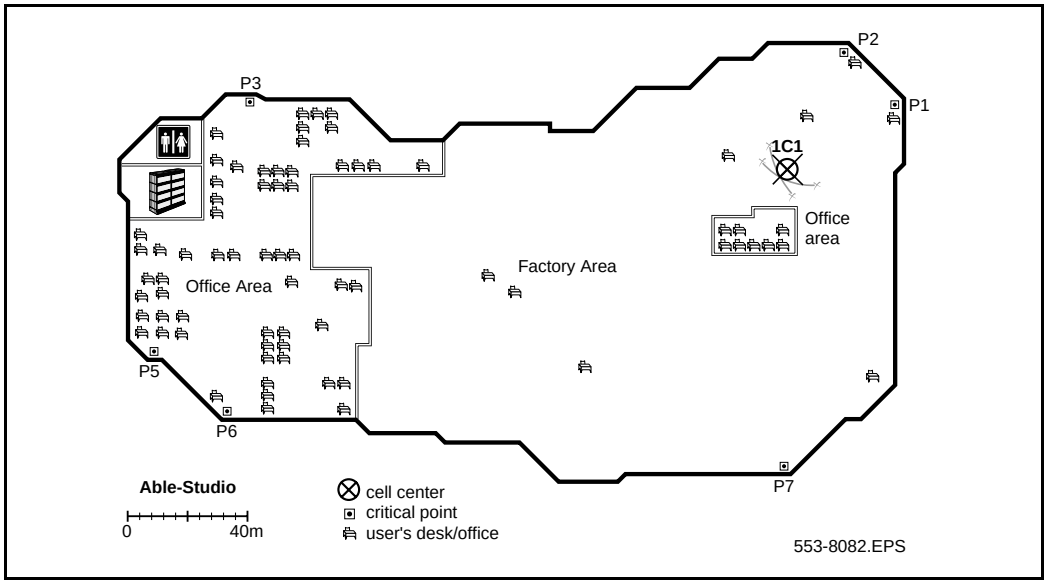


Figure 24 Example of a cell center boundary

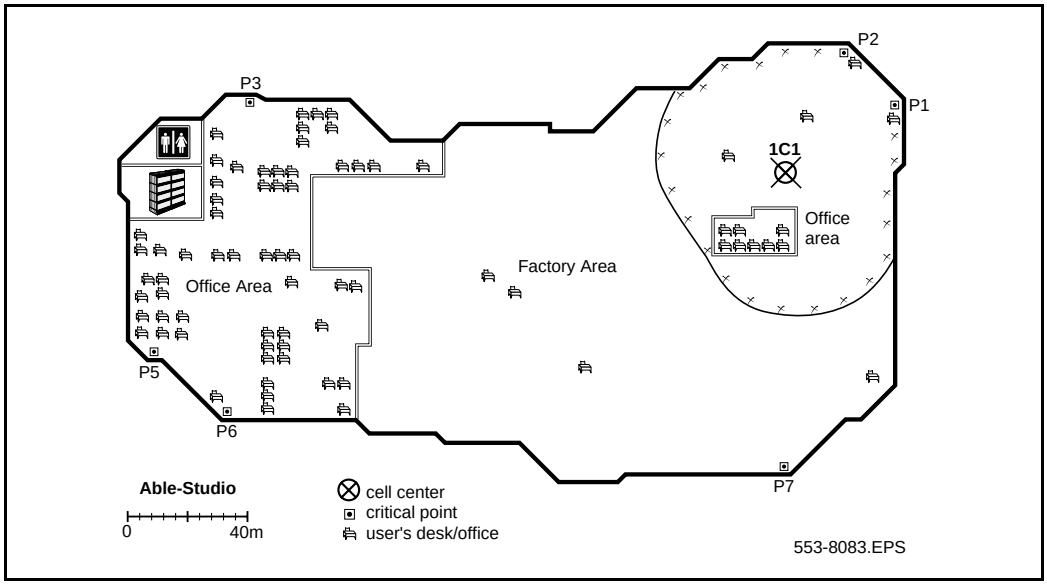


Figure 25 Example of new critical points (P8 and P9)

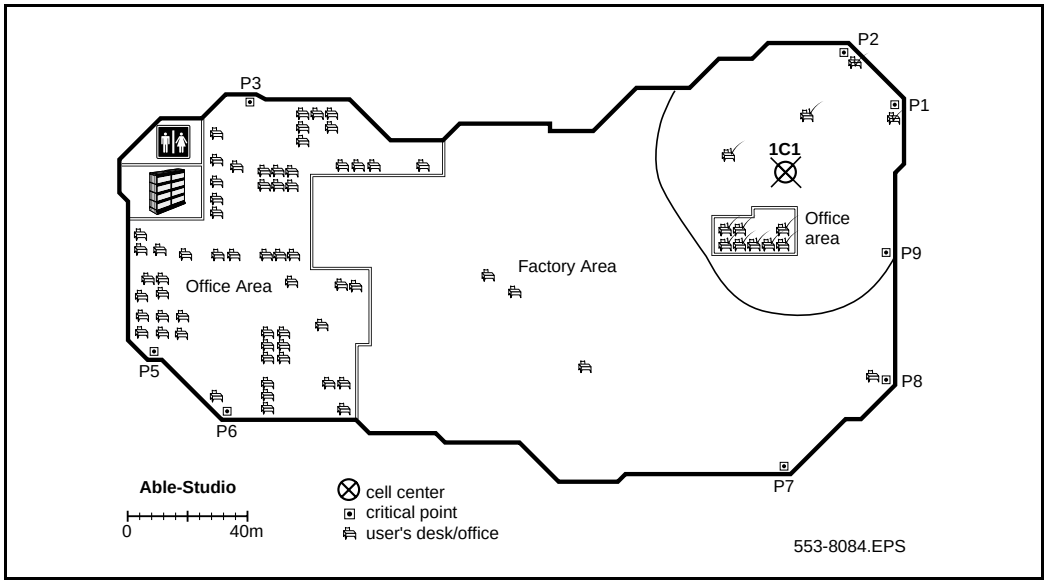


Figure 26 Example of deployment for cell center 1C2

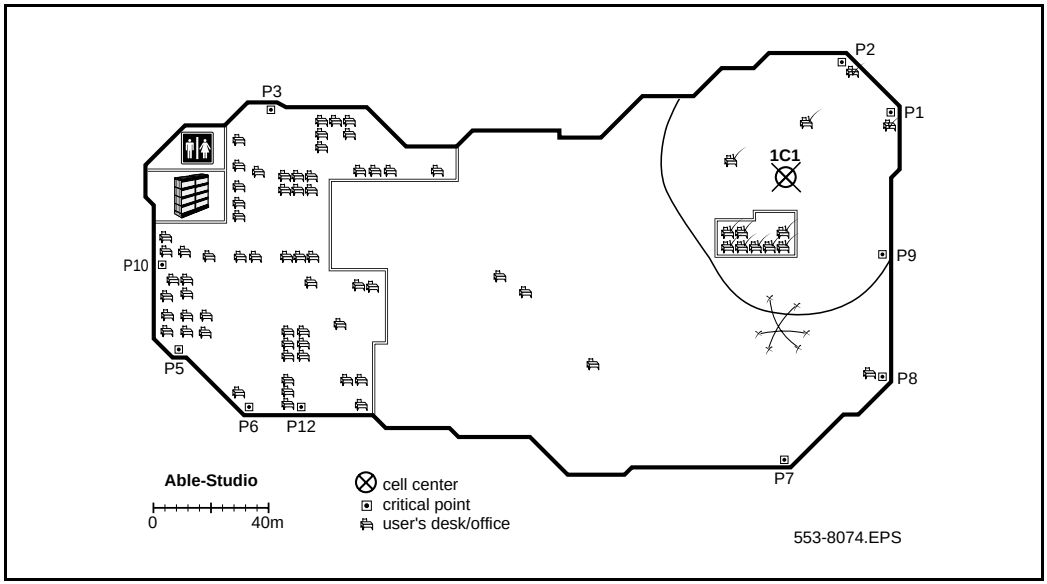


Figure 27 Example of deployment for cells 1C3 and 1C4

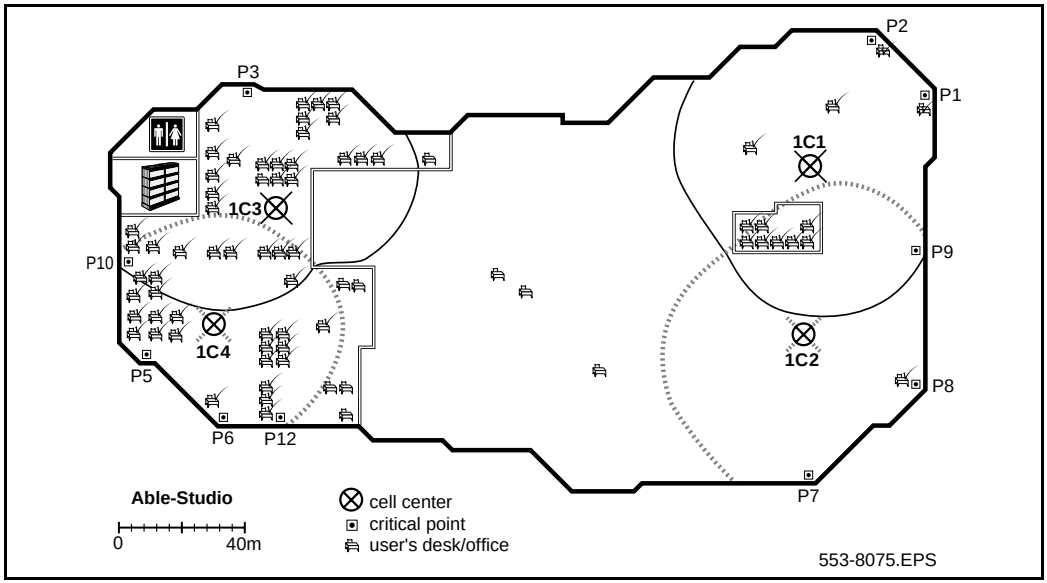


Figure 28 Identify new critical points (P11, P12, P13, P14, P15, P16, P17)

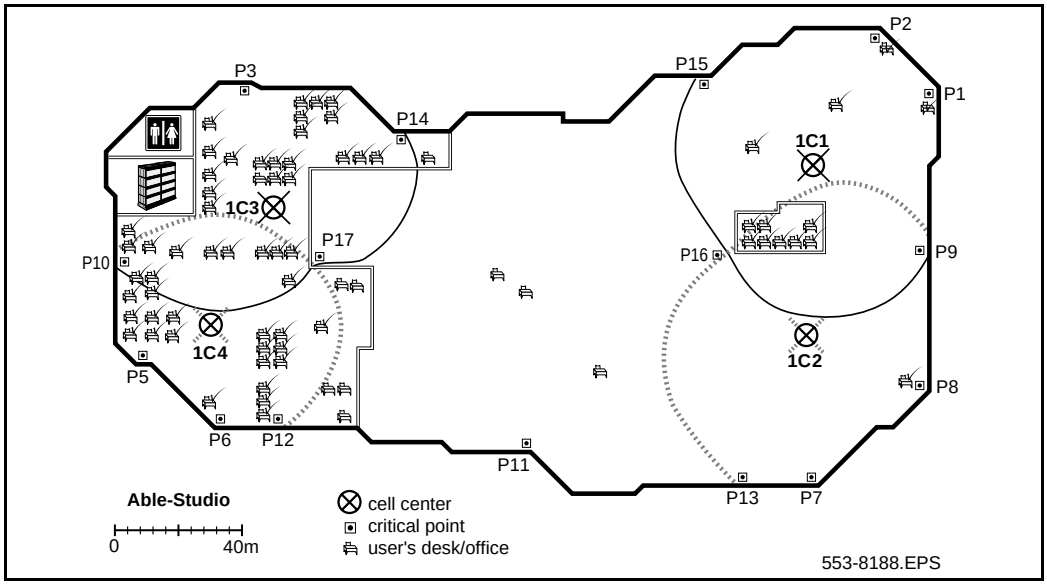


Figure 29 Contours formed by critical points P11, P13 and P16

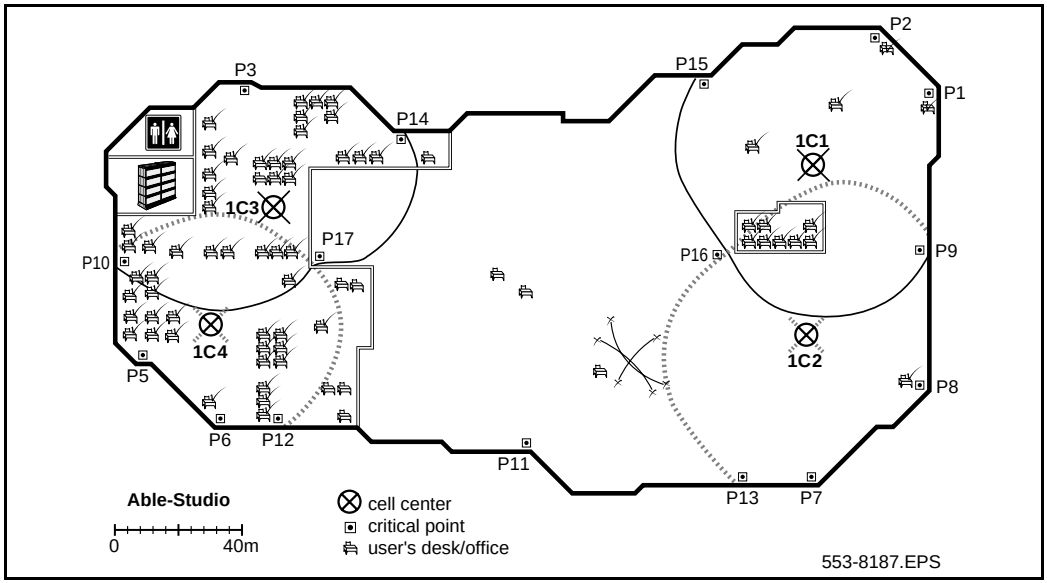


Figure 30 Cell center 1C5 formed by critical points P11, P13 and P16

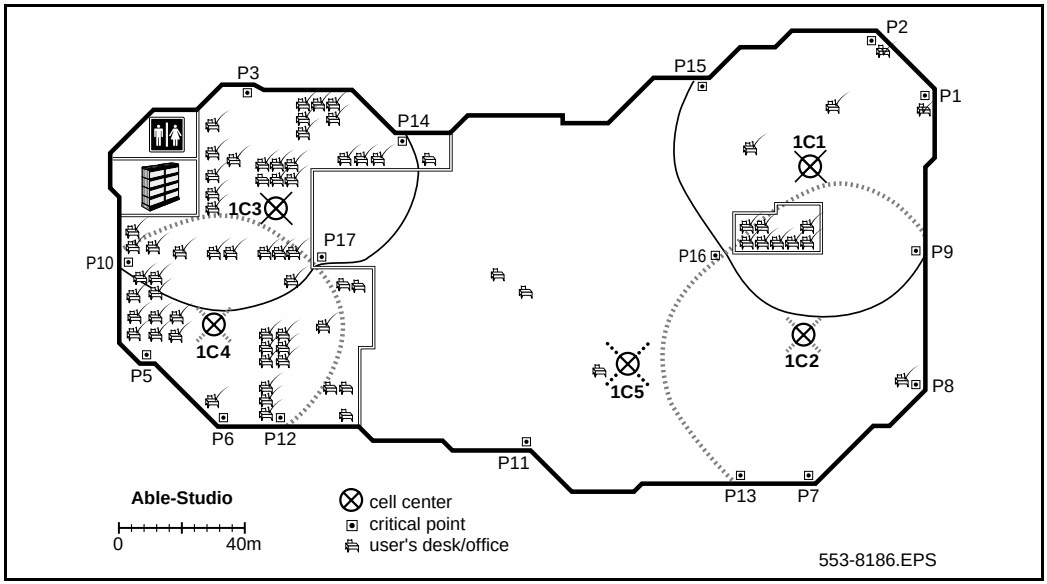


Figure 31 Cell boundary 1C5 formed by critical points P11, P13 and P16

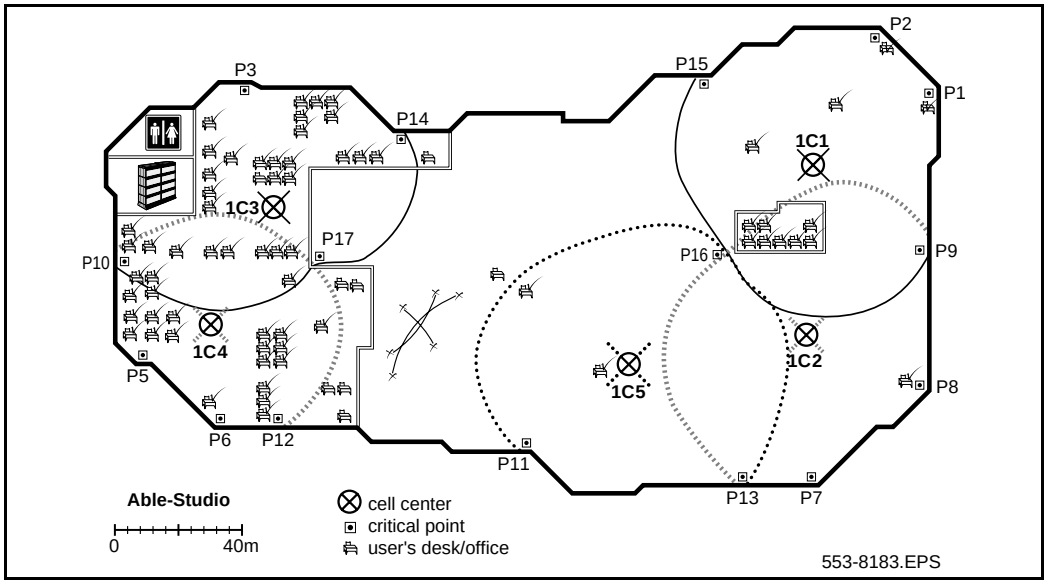


Figure 32 Example of critical point cell boundaries

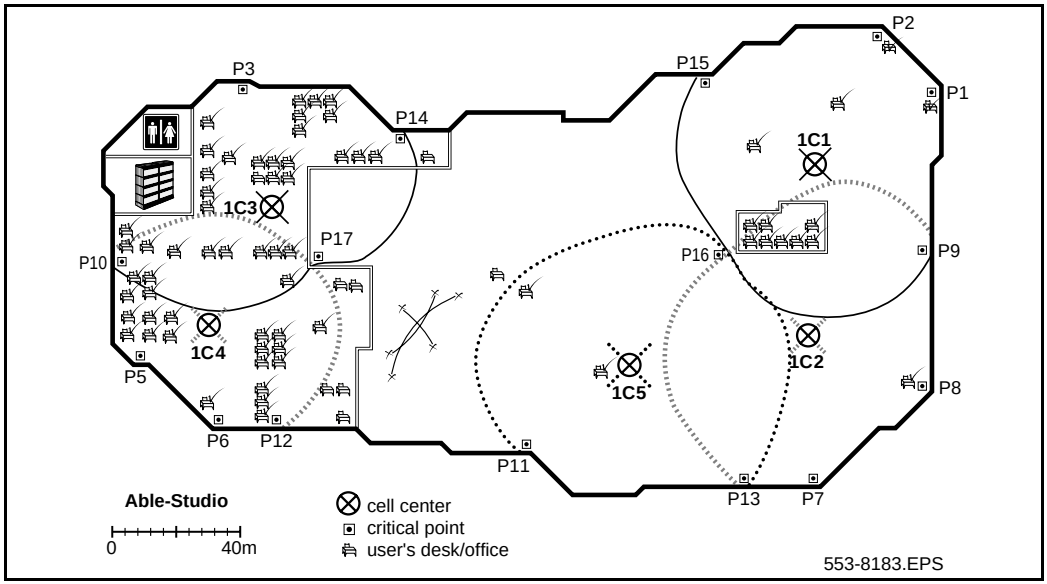


Figure 33 Example of cell center boundary 1C6

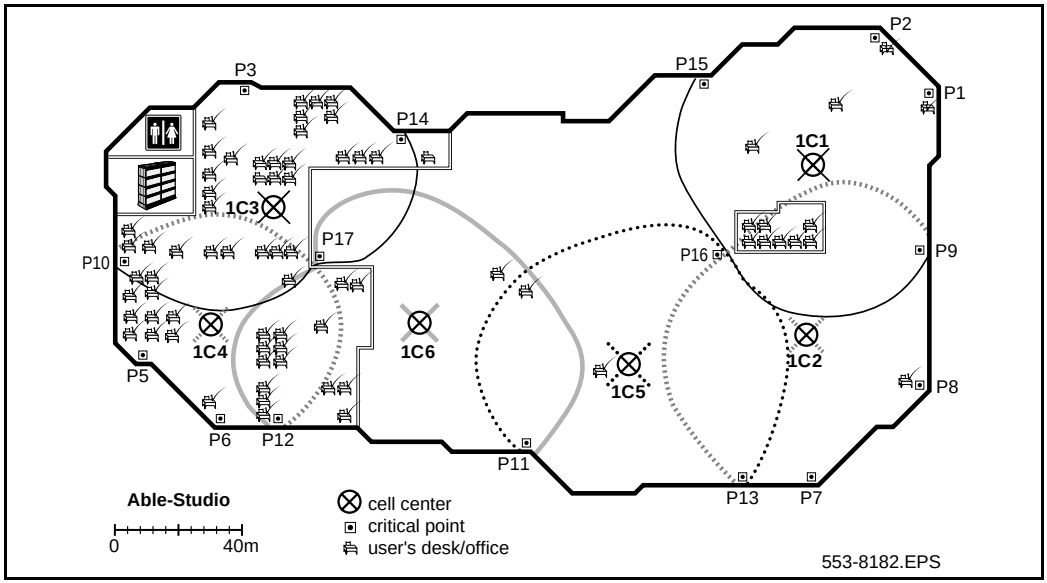
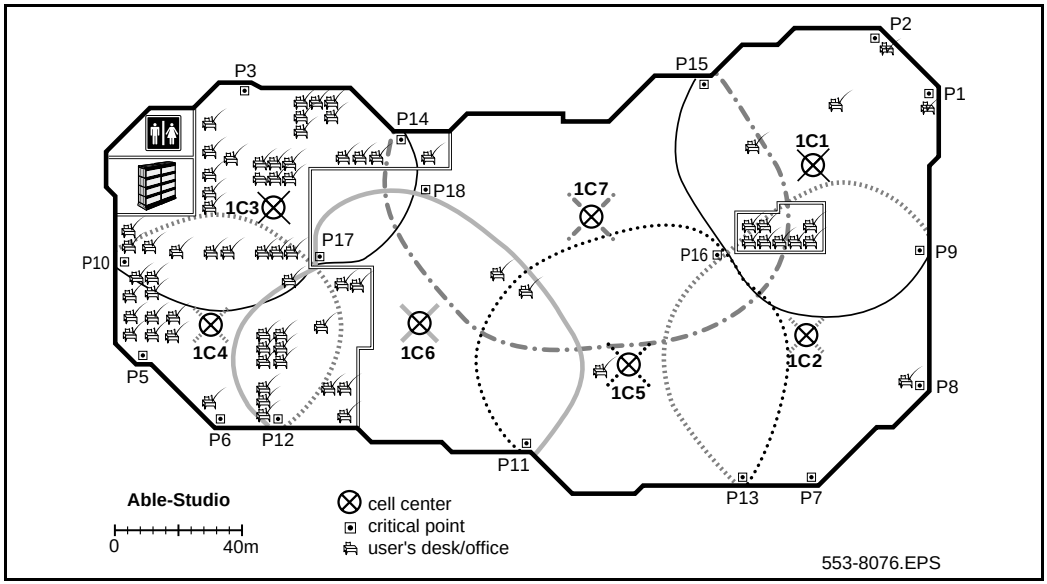


Figure 34 Example of a floor plan showing complete radio coverage



Procedure 2: How to correct problems with audio quality

If a user office is near the critical point and the audio quality deteriorates within the user office, then the deployment tool and the cell center are not properly located.

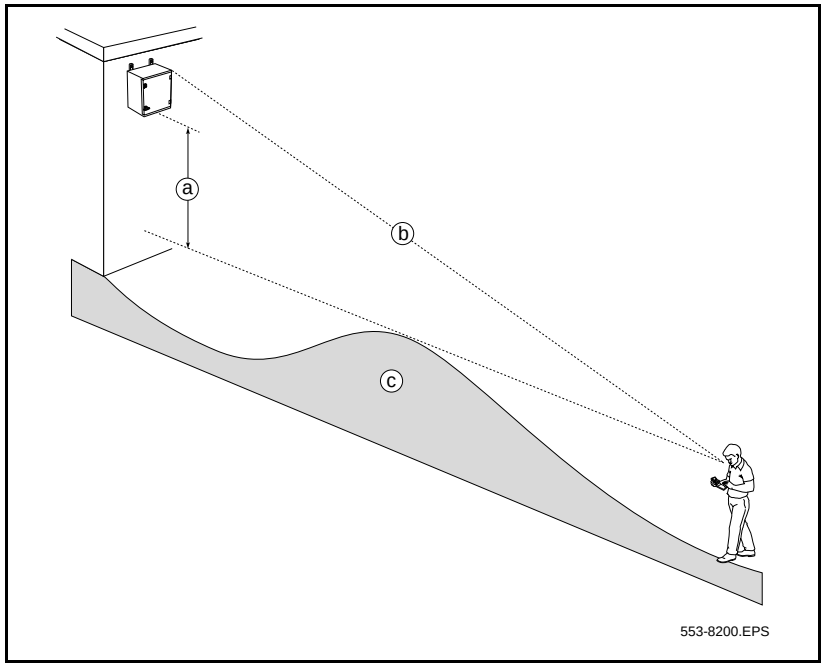
Table 16 How to correct problems with audio quality

Step	Action
1	Move the cell center closer to the office or work area in question.
2	Repeat the coverage test in that area and ensure that coverage is sufficient.
	This can impact the coverage at other points, and you must ensure that all critical points are still properly covered by the new location.
3	Go into every location where users make and receive calls.
	This includes washrooms, coffee areas, and meeting rooms. Do not speculate where users may make calls.
	

Procedure 3: How to deploy an external base station

1. Note each of the critical points that you want to reach on the site plan.
2. Position the deployment tool at the potential location for a cell center that is closest to the critical point.
3. Check for outdoor coverage to the critical point with the deployment handset.
4. If you can reach the critical point, your cell center is at the position of the deployment tool. Determine the cell boundary. If you cannot reach the critical point, determine and record the cell boundary that you did reach on the site plan.
5. For each critical point, determine the potential location of external base stations. The location should be:
   - **a.** outdoors
   - **b.** as close as possible to the critical point that you need to reach
   - **c.** more than 4 m above the highest ground you need to cover.

Figure 35 Elevation of external base station and terrain



Key

a. External housing positioned at least 4 m from the ground.

b. Clear line of sight to the external housing at the cell boundary.

c. The range does not encompass any structures or earth mounds more than 2 m tall and more than 2 m wide.

6 If you could not reach the critical point, inform the customer to determine if they want you to continue planning.

7 Repeat this procedure until you completely cover all of the outdoor areas.

Cell re-engineering for high traffic areas

This chapter contains the following topics:

The deployment process ensures coverage throughout the service area. It does not, however, take into account the effect of traffic. In a high traffic area a shortage of radio channels at the base station can cause calls to be blocked.

Two options are available to support the volume of telephone calls in cells that carry heavy traffic:

- increase the number of cells deployed
- use 12-channel base stations

The calculation of expected telephone traffic includes an allowance for the user population in a cell, and the roaming user.

About the 12-channel base station

An optional 12-channel base station must be used where telephone traffic levels exceed those that can be carried on the standard 6-channel base station. The radio performance of the 12-channel unit is the same as that of the 6-channel unit so the cell sizes are the same for both units.

Do not connect more than two 12-channel base stations to a DMC card. Two 6-channel base stations can also be attached to a DMC serving two 12-channel units. If loop resistance exceeds 100 ohms, external power must be used.

The cell re-engineering process

The cell re-engineering process involves the following elements:

- Estimating traffic within a cell, page 83
- Separating the coverage area and recording the number of offices, page 84
- Creating an estimate table, page 85
- Calculating the number of users inside the cell with an office, page 86
- Calculating the number of users with an office outside the cell who walk into the cell, page 87
- Calculating the number of users without an office, page 88
- Totalling the estimate for users in a cell, page 89
- Calculating the data for all remaining cells, page 90

- Creating a table to document “telephone types in a cell”, page 91
- Determining cell re-engineering, page 92

Estimating traffic within a cell

Modify the previous deployment procedure to adjust your estimated number of users. To carry out this procedure:

- determine the number of handset users with an office within each cell
- determine how many of these users have wired sets
- determine how many users without an office are normally in each cell

Some users have both wired and handset telephones: other users rely on handsets only.

Re-engineered cells for high traffic areas are represented by an adjusted estimate for the two groups: handset and wireless, and handset only. Use the adjusted estimate to determine whether the cell sizes, indicated by the earlier deployment procedure, can handle the telephone traffic. If the traffic handling capacity of the cells is not adequate, use 12-channel base stations and subdivide them into smaller cells to ensure the traffic is handled properly in accordance with these instructions.

Separating the coverage area and recording the number of offices

Figure 36 Example of dividing the coverage area and recording offices

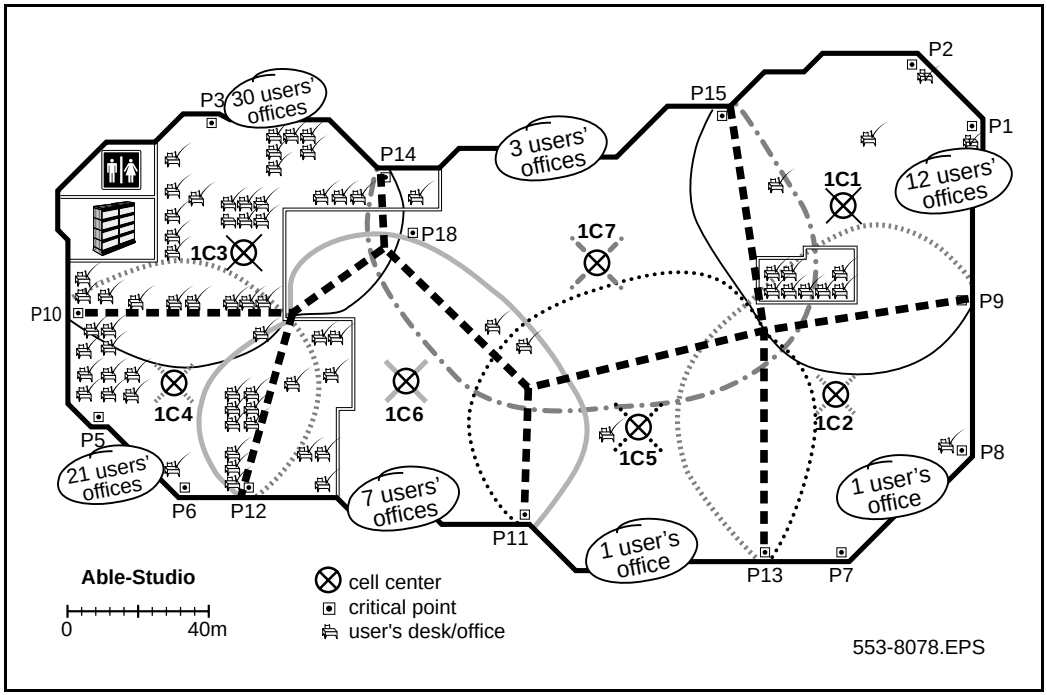


Table 17 Separate the coverage area and record the number of offices

Step	Action
1	Divide the floor plan into cell areas.
	Mark the cell areas on the floor plan, one area for each cell, splitting cell overlap areas in half. Shown in Figure 36 as heavy dotted lines.
2	Count the number of users' offices in each cell area.
	Record the number of users' offices on the floor plan in each cell area.
	END

Creating an estimate table

Use this table later to estimate the number of handset users for each cell.

Table 18 Estimated users in a cell

Estimate for:	1C1	1C2	1C3	1Cn
Users inside the cell with an office				
Users with an office outside of a cell who walk into the cell				
Users without an office				
Users in a cell				

Table 19 Create an estimate table

Step	Action
1	Make an estimate table.
	Include as many columns as there are cell centers.
2	Label the rows.
	Example shown in Table 18.
3	Label each column heading with the cell center indicator.
	Use this table to determine how many times to subdivide each cell to carry the handset telephone traffic.

Calculating the number of users inside the cell with an office

Table 20 Example of the table first row calculation

Estimate for:	1C1	1C2	1C3	1C4	1C5	1C6	1C7
Users inside the cell with an office	8.4						
Users with an office outside of a cell who walk into the cell							
Users without an office							
Users in a cell							

Table 21 Calculate the number of users inside the cell with an office

Step	Action
1	Calculate the estimate for users in the first cell with an office.
	Use the formula: (Users with an office in the cell $\times$ 0.7)
2	Enter the result in the row, “users inside the cell with an office”.
	In the example shown in Figure 36 on page 84, twelve users in cell 1C1 spend 70% of their time in their offices. (12 x 0.7 = 8.4)

END

NOTE

Traffic engineering has determined that handset users with an office spend seventy percent of their time within their home cell.

Calculating the number of users with an office outside the cell who walk into the cell

Table 22 Example of the table second row calculation

Estimate for:	1C1	1C2	1C3	1C4	1C5	1C6	1C7
Users inside the cell with an office	8.4						
Users with an office outside of a cell who walk into the cell	3.2						
Users without an office							
Users in a cell							

Table 23 Calculating the number of users with an office outside the cell who walk into the cell

Step	Action
1	Calculate the estimate for users in the first cell with an office outside of the cell who walk into the cell.
	Use the formula: $\frac{(\text{Total users with an office} - \text{Users with an office inside the cell}) \times 0.3}{(\text{Total number of cells} - 1)}$
2	Enter the result in the row, “users with an office outside the cell who walk into the cell.”
	For the example shown in Figure 36 on page 84. There are a total of 75 telephone users in Able-Studio, minus the 12 users already in cell 1C1. Therefore, 63 users can walk into cell 1C1. However, the 63 walk in users only spend 30% of their time outside their offices. There are seven cells on the floor plan minus cell 1C1. Accordingly, an estimate of 3.2 walk-in users can be in cell 1C1. $\frac{(75 - 12) \times 0.3}{(7 - 1)} = 3.2$

Calculating the number of users without an office

Table 24 Example of the table third row calculation

Estimate for:	1C1	1C2	1C3	1C4	1C5	1C6	1C7
Users inside the cell with an office	8.4						
Users with an office outside of a cell who walk into the cell	3.2						
Users without an office	0						
Users in a cell							

Table 25 Calculating the number of users without an office

Step	Action
1	Calculate the estimate for users in the first cell without an office.
	Use the formula: $\frac{\text{Total number of users without an office}}{\text{Number of cells}}$
2	Enter the result in the row, “users without an office”.
	In the example shown in Figure 36 on page 84, there are no users without an office.
	END

Totalling the estimate for users in a cell

Table 26 Example of the table first column total

Estimate for:	1C1	1C2	1C3	1C4	1C5	1C6	1C7
Users inside the cell with an office	8.4						
Users with an office outside of a cell who walk into the cell	3.2						
Users without an office	0						
Users in a cell	11.6						

Table 27 Totalling the estimate for users in a cell

Step	Action
1	Total the estimate for the number of users in the first cell by adding the three rows in the first column.
2	Enter the result in the bottom row “users in a cell”.
	For the example shown in Figure 36 on page 84, 1C1 handset estimate equals 11.6. 8.4 + 3.2 + 0 = 11.6.

Calculating the data for all remaining cells

Table 28 Example of a completed estimate table

Estimate for:	1C1	1C2	1C3	1C4	1C5	1C6	1C7
Users inside the cell with an office	8.4	0.7	21.0	14.7	0.7	4.9	2.1
Users with an office outside of a cell who walk into the cell	3.2	3.7	2.3	2.7	3.7	3.4	3.6
Users without an office	0	0	0	0	0	0	0
Users in a cell	11.6	4.4	23.3	17.7	4.4	8.3	5.7

Table 29 Calculate the data for all remaining cells

Step	Action
1	Repeat the last four tasks to calculate all the remaining user cell estimates.
2	Enter the result in the estimate table.
	The information contained in Figure 36 on page 84, is shown entered into Table 29. This table will be used to note the results of the calculations for cells that require re-engineering.

Creating a table to document “telephone types in a cell”

Use a table like Table 30 to record the different telephone types in each cell.

Table 30 Telephone types in a cell

Telephone type	1C1	1C2	1C3	1Cn
User telephone types				

Use the following symbols in each cell to denote the type of telephones in use in the cell:

- H&W refer to a cell in which all the users have both wired and handsets (wireless sets)
- H refers to a cell in which users have only handsets (wireless sets)
- M refer to a mix of H and H&W users

Table 31 Creating a table to document “telephone types in a cell”

Step	Action
1	Make a Telephone types table.
2	Label the row, “User telephone types” and include as many columns as there are cell centers.
3	Label each column heading with the cell center indicator.
	The information in this table is used to determine the number of cells that require re-engineering.

Determining cell re-engineering

Table 32 Example of a completed estimate table

Estimate for:	1C1	1C2	1C3	1C4	1C5	1C6	1C7
Users inside the cell with an office	8.4	0.7	21.0	14.7	0.7	4.9	2.1
Users with an office outside of a cell who walk into the cell	3.2	3.7	2.3	2.7	3.7	3.4	3.6
Users without an office	0	0	0	0	0	0	0
Users in a cell	11.6	4.4	23.3	17.7	4.4	8.3	5.7

Table 33 Example of a completed telephone types table

Telephone type	1C1	1C2	1C3	1C4	1C5	1C6	1C7
User telephone types	H&W	H&W	M	M	H&W	H&W	H&W

Table 34 Cell re-engineering

Estimate for:		
Users with both a handset and a wired telephone	Users with only a handset	Action
From 0 up to 20	From 0 up to 12	Keep cell size as deployed.
Greater than 20 but no more than 80	Greater than 12, but no more than 40	Install a 12-channel base station or sub divide the cell[a].
Greater than 80	Greater than 40	Sub divide the cell[a] to meet the above conditions.

a. For details on how to subdivide cells refer to "High handset density deployment" on page 103. Use a 12-channel base station in areas of high traffic capacity. Cell subdivision is appropriate when it helps to improve coverage where the loop resistance exceeds 100 ohms or when a DMC can not support more than two 12-channel units.

NOTE

Use Table 34 only for user types H&W and H. For user type “M” see page 94.

Table 35 Determine cell re-engineering

Step	Action
1	Locate the estimate for users in the first cell.
	In the example shown in Table 32 on page 92, the handset estimate is 11.6.
2	Determine the telephone types in the first cell.
	In the example shown in Table 33 on page 92, the telephone type is H&W.
3	Locate the telephone type column in Table 33 on page 92.
	In the example H&W is the “users with both a handset and a wired telephone”.
4	Find the handset estimate range in Table 34 on page 92.
	In the example 11.6 falls within the “From 0 up to 20” category.
5	Determine if a cell requires division or use a 12-channel base station.
	In the example “From 0 up to 20” division is not required.
6	Repeat the above steps to determine the required number of cells that need subdivision, except for telephone types M. For M see “A mix of users with and without wired telephones in a cell” on page 94.
7	Transfer the results of Table 35 into the Provisioning records.

Cell division requirements in special cases

Use the following to determine cell division in special cases where:

- you have no office information
- there are a mix of handset users with and without wired telephones

No office information

If you do not know where any of the users offices are, calculate the estimated number of handsets for each cell using this formula:

$$\frac{\text{Number of handsets}}{\text{Number of cells}}$$

The formula assumes that users are located evenly throughout the cells. However, most users offices are clustered in specific areas of a building.

The formula has limitations as cells can vary in size. The method described starting on page 81 gives more accurate cell division results.

A mix of users with and without wired telephones in a cell

Use this procedure for mixed handset users. This procedure then enables the telephone traffic generated by handset users, to be equated to that of handset and wired users. You can then combine the two groups for cell size recalculation purposes.

Table 36 Adjustment for users without wired telephones

Estimated number of handsets for users without wired telephones	Adjusted estimated number of handsets for each cell
0	0
1	2
2	3
3	5
4	7

Table 36 Adjustment for users without wired telephones

Estimated number of handsets for users without wired telephones	Adjusted estimated number of handsets for each cell
5	9
6	11
7	12
8	14
9	16
10	18
11	20
12	22
13	24
14	25
15	27
16	29
17	31
18	34
19	36
20	38
21	40
22	42
23	44
24	46
25	48
26	49
27	50
28	53
29	55
30	57

Table 36 Adjustment for users without wired telephones

Estimated number of handsets for users without wired telephones	Adjusted estimated number of handsets for each cell
31	60
32	62
33	64
34	66
35	69
36	71
37	73
38	76
39	78
40	80

Table 37 Adjust for users without wired telephones

Step	Action
1	Count the number of user's offices that have handsets and wired telephones (H&W), and record the number.
2	Count the number of user's offices that have only wireless handsets, (H).
3	Use Table 36 to determine the equivalent number of H&W users and record this number.

Table 37 Adjust for users without wired telephones

Step	Action
4	Add the numbers received from steps 1 and 3 to determine and adjust the value for the number of users with wired telephones.
5	Use Table 36 to determine the criteria shown in the left column to determine if the cell has to be resized in the same manner described in the section “Determine cell re-engineering”.

Cell division requirements in special cases

This chapter contains the following topics:

Use the following to determine cell division in special cases where:

- you have no office information
- there are a mix of handset users with and without wired telephones

No office information

If you do not know where any of the users offices are, calculate the estimated number of handsets for each cell using this formula:

$$\frac{\text{Number of handsets}}{\text{Number of cells}}$$

The formula assumes that users are located evenly throughout the cells. However, most users offices are clustered in specific areas of a building.

The formula has limitations as cells can vary in size. The method described starting on page 81 gives more accurate cell division results.

A mix of users with and without wired telephones in a cell

Use this procedure for mixed handset users. This procedure then enables the telephone traffic generated by handset users, to be equated to that of handset and wired users. You can then combine the two groups for cell size recalculation purposes.

Table 38 Adjustment for users without wired telephones

Estimated number of handsets for users without wired telephones	Adjusted estimated number of handsets for each cell
0	0
1	2
2	3
3	5
4	7
5	9
6	11
7	12
8	14
9	16
10	18
11	20
12	22
13	24
14	25
15	27
16	29
17	31
18	34

Table 38 Adjustment for users without wired telephones

Estimated number of handsets for users without wired telephones	Adjusted estimated number of handsets for each cell
19	36
20	38
21	40
22	42
23	44
24	46
25	48
26	49
27	50
28	53
29	55
30	57
31	60
32	62
33	64
34	66
35	69
36	71
37	73
38	76
39	78
40	80

Table 39 Adjust for users without wired telephones

Step	Action
1	Count the number of user's offices that have handsets and wired telephones (H&W), and record the number.
2	Count the number of user's offices that have only wireless handsets, (H).
3	Use Table 38 to determine the equivalent number of H&W users and record this number.
4	Add the numbers received from steps 1 and 3 to determine and adjust the value for the number of users with wired telephones.
5	Use Table 38 to determine the criteria shown in the left column to determine if the cell has to be resized in the same manner described in the section "Determine cell re-engineering".
	END

High handset density deployment

This chapter contains the following topics:

The high handset density deployment includes limiting the expected number of handsets for each cell center.

NOTE

Use the high handset density procedure if instructed to do so from Table 34, "Cell re-engineering," on page 92. Do not use more than one base station for each cell centre.

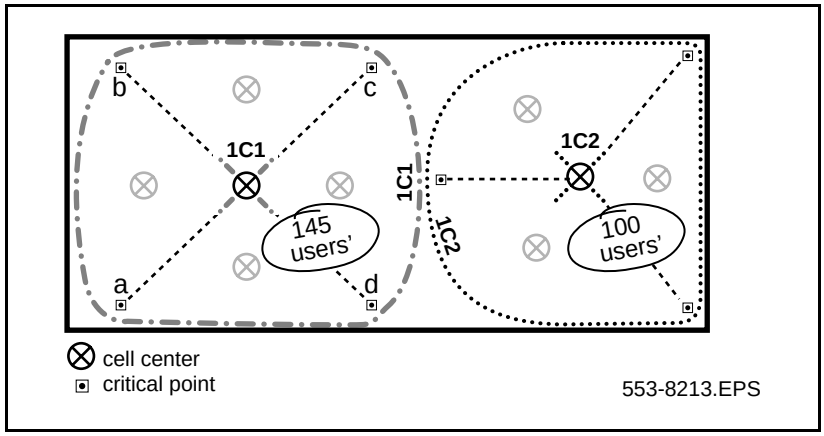
Limiting the anticipated number of handsets

Limit the anticipated number of handsets for each cell centre to the limits shown in Table 34 on page 92. Only subdivide high handset density areas. If a cell falls into the category of a high density area, use the procedure on the following page to subdivide the cell.

Subdividing a cell

To subdivide the area for smaller cells, divide the cell into as many smaller cells as necessary to provide for the number of users in the area.

Figure 37 Example of a subdivided cell



In Figure 37, cell 1C1 has 140 handset users and cell 1C2 has 100 handset users. For example, Table 34 on page 92 indicates that:

- if the handset users in cell 1C1 are all handset only users, one cell can support 39 handset only users. Therefore, four cells are needed to support 140 users. (140÷39 = 3.5 cells)
- if the handset users in cell 1C1 are handset and wired telephone users, and one cell can support 83 users. Therefore, two cells are needed to support 140 handset and wired telephone users. (140÷83 = 1.6 cells)

Table 40 High handset density deployment

Step	Action
1	Determine the number of handset users in the high handset density cell.
	Count the number of users. Include users served by through-the-floor coverage of this cell.
2	Calculate the cell subdivisions as required.

Table 40 High handset density deployment

Step	Action
	Divide the number of users by the appropriate value (12 or 20) shown in Table 34 on page 92. Round up the result to the next whole number. The result will equal the number of cells required after subdividing the cell.
3	Divide the cell.
	Draw lines from the cell center to the critical points on the cell boundary. Shown in Figure 37, the cell 1C1 divides into four sectors and cell 1C2 divides into three sectors.
4	Relocate new cell centers.
	Mark new cell centers within the sectored areas.
5	Check the number of handset users in the new cell areas.
	Count the number of user offices within each smaller sector and make sure there are less user offices within the cell than the traffic limit.
6	Check the locations.
	Take the deployment tool to the locations that you have calculated on the floor plan and make sure that there is a location that meets the guidelines on page 27.
7	Check the new cells for complete coverage.
	Use the deployment handset to check coverage.
8	Repeat the anticipated handsets for each cell calculation to make sure that each smaller cell provides appropriate traffic coverage to the users in the area.

Deployment review

This chapter contains the following topics:

Review your plan to make sure that the sales group can use it. The plan must be complete for the installer, legible for maintenance purposes, and acceptable to the customer.

Complete a floor plan

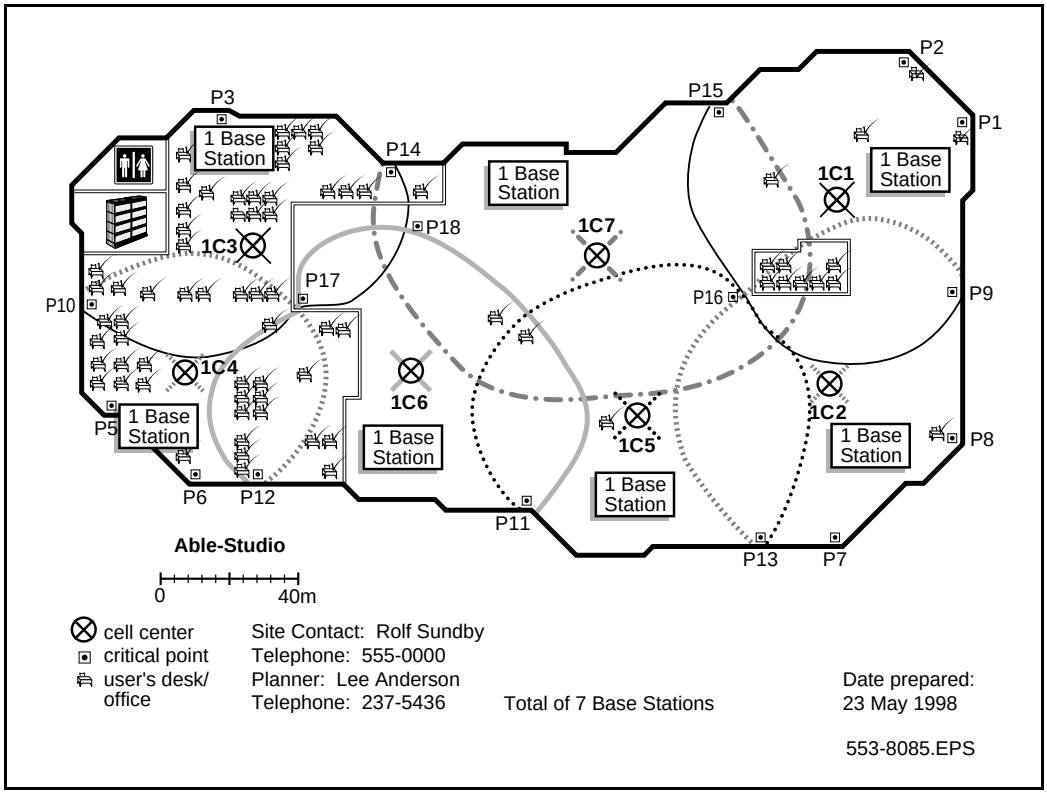
Table 41 Complete a floor plan

Step	Action
1	Record the planner's name and telephone number on the floor plans.
2	Record the name of the customer company on the floor plans.
3	Record the site contact's name and telephone number on the floor plans.

Table 41 Complete a floor plan

Step	Action
4	Record any installation restrictions.
5	Record the details of the installation of an identified cell on the floor plans, recording any 12-channel base stations.
6	Record the positions of users' offices on the floor plans.

Figure 38 Example of a completed floor plan



Check the system capacity

Table 42 Check system capacity

Step	Action
1	Check that the system does not exceed the Meridian Companion DECT system capacity: that is no more than 512 handsets or 128 base stations for the system with no more than sixty-four 12-channel base stations.
2	Check that there is no ‘cell’ limit for a Meridian Companion DECT system. The limit is the total count of the base stations.
3	Check that the limits on base stations and handsets are independent of each other. Increasing the handset count does not decrease the number of base stations available to install as in a Meridian Companion CT2 system.
4	If you have deployed more than 128 base stations, you need to replan the site with multiple systems. See the Detailed Site Planning section.
5	Check that the location of the controller is not more than 1500 m (wiring length for Category 5 UTP) from all 6-channel base stations or 1000 m from 12-channel base stations (unless external power is used). If the location is farther than the allowed distance, the customer needs to examine other installation and equipment configurations with the sales representative and Nortel support personnel.
	

Review with the customer

When you finish, show the customer:

- The final positions of the base stations with a walk-about.
- The areas, if any, where you can not meet the coverage requirements.

Record floor plan information

Provide the planning information to the installer or your sales group. It is important that you communicate this information in a clear and accurate way.

Remember that you received two copies of the floor plans. Neatly transfer the information from the working copy to the clean copy. Use your colored markers to mark the cell boundaries and matching cell centers.

Record or attach the following information to the floor plans:

- All areas needing coverage.
- The location of the controller.
- The total number of all base stations.
- All the named cell centers (for example, 2C5) and their matching cell boundaries.
- All the critical points that you used.
- Any installation restrictions.
- Any notes detailing the installation at a identified cell, recording any 12-channel base stations.
- The location of any base station servicing outdoor areas, and the current restrictions on the placing of those base stations.
- Attach a completed traffic table with the floor plans.

Record provisioning record information

Record the following information on the applicable provisioning record:

- The date prepared.

- The Customer information.
- The Deployer information (you).
- The cell numbers.
- The location of the base stations (cell centers).
- The calculated number of users in each cell.
- Include some notes on the agreed coverage area of the site and any information for the installer.

Review your work

At the completion of your site plan make sure you have the following:

- A customer, satisfied with your plan for a Companion system.
- A clean floor plan with all the information, as shown in Figure 38.
- A traffic table.
- A completed provisioning record.

Meridian/Succession Companion DECT

Site Planning Guide

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Publication Number: 553-3061-101
Document Release: Standard 4.00
Date: June 2001

Printed in Canada

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